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INKJET RECORDING APPARATUS AND INK CARTRIDGE

Abstract of the Disclosure

5 There is disclosed an ink cartridge capable of being removably held in an ink cartridge accommodation portion simply by pushing in the cartridge in an insertion direction. The ink cartridge (5) is mounted on a carriage (4) having a cartridge accommodation region. A one-push type fixing member (30) in a position facing a surface parallel to an insertion direction in which the cartridge is inserted into the
10 cartridge accommodation region is engaged with a fixing protrusion (12a) forming another one-push type fixing member and cooperating with the first-mentioned one-push type fixing member, so that the cartridge (5) is held in a predetermined position in a state in which the cartridge is resiliently urged by a spring (24) in a direction opposite to the insertion direction.

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Invention Title:	Inkjet Recording Apparatus and Ink Cartridge

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

INKJET RECORDING APPARATUS AND INK CARTRIDGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an inkjet recording apparatus fitted with a recording head for ejecting droplets of ink onto a recording medium in response to a print signal and also to an ink cartridge used in this inkjet recording apparatus.

2. Description of the Related Art

An inkjet recording apparatus has a recording head for ejecting droplets of ink. This head is mounted on a carriage that reciprocates relative to a recording medium. The recording apparatus currently available is so designed that ink is supplied to the recording head from an ink cartridge via an ink channel such as a tube or that ink is supplied to the recording head via an ink supply needle formed on the carriage where an ink cartridge is mounted.

Either of these types employs an arrangement in which an ink leading-out member, such as the ink supply needle, of the main body side is inserted into or connected to an ink supply port of the ink cartridge, and therefore the ink cartridge and the ink leading-out member must be reliably connected and fixed to each other so as to avoid an unintentional disconnection therebetween. To this end, it is necessary to provide a member

for fixing the ink cartridge to the cartridge accommodation portion in the related art.

The arrangement using the aforementioned fixing member, however, requires two operations, i.e., mounting an ink supply port of the ink cartridge to a coupling member formed at an end of the ink supply path, and thereafter fixing the cartridge by the fixing member. Consequently, the sequence of operations for mounting is cumbersome to perform. Further, the fixing means is required to make the structure complicated.

Accordingly, a need exists to provide an inkjet recording apparatus permitting an inkjet cartridge to be fixed to an ink cartridge accommodation portion simply by pushing-in the ink cartridge in the mounting direction.

Another need exists to provide an ink cartridge adapted for the recording apparatus described above.

Object of the Invention

It is an object of the present invention to overcome or ameliorate some of the disadvantages of the prior art, or at least to provide a useful alternative.

Summary of the Invention

According to an aspect of the present invention, there is provided an inkjet recording apparatus having a recording head that receives supply of ink from an ink cartridge installed in a cartridge accommodation region, the ink cartridge having a first fixing member formed on the ink cartridge, the inkjet recording apparatus comprising:

a second fixing member capable of engaging with the first fixing member to fix the cartridge in the cartridge accommodation region, and that is formed in a position facing a plane that is substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge accommodation region, wherein in operation, after being inserted, the ink cartridge is held in a predetermined position in a state in which the ink cartridge is resiliently urged by resiliently urging means in a direction opposite to the insertion direction;

wherein the second fixing member comprises a protrusion whose range of motion is restricted; and

wherein the first fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide

path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

According to another aspect of the present invention, there is provided an inkjet recording apparatus having a recording head that receives supply of ink from an ink cartridge installed in a cartridge accommodation region, the ink cartridge having a first fixing member formed on the ink cartridge, the inkjet recording apparatus comprising:

a second fixing member capable of engaging with the first fixing member to fix the cartridge in the cartridge accommodation region, and that is formed in a position facing a plane that is substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge accommodation region, wherein in operation, after being inserted, the ink cartridge is held in a predetermined position in a state in which the ink cartridge is resiliently urged by resiliently urging means in a direction opposite to the insertion direction;

wherein the first fixing member comprises a protrusion whose range of motion is restricted; and

wherein the second fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

According to another aspect of the present invention, there is provided an ink cartridge having fixing means, the fixing means comprising:

an engagement guide path leading from an entrance portion to a holding portion;

and

a disengagement guide path distinct from the engagement guide path and leading from the holding portion to an exit portion.

According to another aspect of the present invention, there is provided an ink cartridge having an ink storing portion storing ink therein and an ink supply port communicating with the ink storing portion, the ink cartridge being adapted to be removably mounted on a cartridge mounting portion of a recording apparatus to supply the ink in the ink storing portion via the ink supply port to a recording head provided on the recording apparatus, the ink cartridge comprising:

a first fixing member that is formed on a plane substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge mounting portion, and that is capable of engaging with a second fixing member of the recording apparatus to fix the cartridge in the cartridge accommodation region;

5 wherein the first fixing member comprises a protrusion whose range of motion is restricted; and

10 wherein the second fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

15 According to another aspect of the present invention, there is provided a method for attaching an ink cartridge having a first fixing member to an inkjet recording apparatus having a second fixing member capable of engaging with the first fixing member to attach the ink cartridge to the inkjet recording apparatus, wherein the second fixing member comprises a protrusion whose range of motion is restricted, and wherein the first fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, comprising the steps of:

20 positioning the cartridge in a cartridge accommodation region of the recording apparatus;

25 applying a first force to the cartridge in an insertion direction relative to the recording apparatus, whereby the protrusion is led by the engagement guide path towards the holding portion; and

removing the first force from the cartridge, the cartridge being urged by resilient urging means in a direction opposite the insertion direction such that the protrusion engages the holding portion, thereby holding the cartridge in a predetermined position.

30 According to another aspect of the present invention, there is provided a method for attaching an ink cartridge having a first fixing member to an inkjet recording apparatus having a second fixing member capable of engaging with the first fixing member to attach the ink cartridge to the inkjet recording apparatus, wherein the first fixing member comprises a protrusion whose range of motion is restricted, and wherein the second fixing member comprises a combination of an engagement guide path, a

holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, comprising the steps of:

positioning the cartridge in a cartridge accommodation region of the recording apparatus;

5 applying a first force to the cartridge in an insertion direction relative to the recording apparatus, whereby the protrusion moves through the engagement guide path to the holding portion; and

removing the first force from the cartridge, the cartridge being urged by resilient urging means in a direction opposite the insertion direction such that the protrusion
10 engages the holding portion, thereby holding the cartridge in a predetermined position.

According to embodiments of the present invention, when the cartridge is mounted, the ink cartridge is pushed-in against the resiliently urging means, so that the cartridge is held in the predetermined position by the action of the one-push type fixing members and the biasing force of the resiliently urging means. When the ink cartridge is
15 detached, the ink cartridge is pushed-in against the biasing force. This disengages the one-push type fixing members, and therefore the ink cartridge is moved in the removing direction opposite to the insertion direction, by the biasing force.

Therefore, when the cartridge is installed, the ink cartridge can be held into a predetermined position simply by pushing in the cartridge against resilient means.
20 Furthermore, the ink cartridge can be disengaged by pushing it in against the biasing force, so that the cartridge can be moved in the removing direction

by the biasing force. Moreover, fixing means such as a cover member for fixing the cartridge to the cartridge accommodation region can be dispensed with, and further the ink cartridge can be easily taken out.

5 According to embodiments of the present invention,
 a simplified structure can be realized because an additional member, i.e. a spring, for biasing the ink cartridge is unnecessary.

 According to embodiments of the present invention,
10 owing to the clearance between the dead point and the holding position, the packing of the ink supply port can be reliably brought into close contact with the ink supply needle to improve the air tightness. Further ink can flow in between the packing and the ink supply needle during the removal to reduce
15 the friction, so that the ink cartridge can be surely taken out only by the stored force of the resiliently urging means.

 According to embodiments of the present invention,
 it is unnecessary to dispose, on the ink cartridge side, a movable member for fixing the ink cartridge to the carriage, and further
20 the arrangement can be realized simply by forming protruded and recessed portions on the wall surface. Therefore, the structure and the package can be simplified.

 According to embodiments of the present invention,
 the region as close to the ink supply port
25 as possible can be used as a holding region of the ink cartridge,

and therefore it is possible to eliminate the displacement of the ink cartridge caused by an external force, and to reduce an adverse effect on the joint portion between the ink supply port and the ink supply needle.

5 The present disclosure relates to the subject matter contained in Japanese patent applications having No. 2002-175691 (filed on June 17, 2002), and No. 2003-168570 (filed on June 13, 2003), which are expressly incorporated herein by reference in their entireties.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing an embodiment of an inkjet recording apparatus of the present invention.

Fig. 2 is a perspective view showing the structure of a cartridge accommodation holder of a carriage which is a component of the inkjet recording apparatus of the invention.

15 Fig. 3A is a perspective view showing an embodiment of a fixing protrusion; Fig. 3B is a perspective view showing a mounting state of the fixing protrusion at a front side on a vertical wall in the holder, and Fig. 3C is a perspective view showing the mounting state of the fixing protrusion at a rear side on the vertical wall in the holder.

20 Fig. 4 is a perspective view of an embodiment of an ink cartridge adapted for the recording apparatus.

25 Fig. 5 is a cross-sectional view of the ink cartridge, taken through the ink supply port, and in which the cartridge is mounted

on the carriage.

Fig. 6 is an enlarged perspective view of a fixing member formed in the ink cartridge.

5 Figs. 7I and 7II are views illustrating the former half of steps performed when the ink cartridge is mounted.

Figs. 8I and 8II are views illustrating the latter half of the steps performed when the ink cartridge is mounted.

Figs. 9I and 9II are views illustrating steps for taking out the ink cartridge.

10 Fig. 10 is an exploded perspective view showing another embodiment of the ink cartridge to which the invention can be applied.

Fig. 11 is a view showing an embodiment of a cartridge holder adapted for the ink cartridge.

15 Fig. 12 is a perspective view in which another embodiment of the recording apparatus of the invention is shown by the structure of a cartridge accommodation region.

Figs. 13A and 13B are perspective views, each showing another embodiment of the ink cartridge of the invention.

20 DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is hereinafter described in detail with reference to the illustrated embodiments.

25 Fig. 1 shows an embodiment of an inkjet recording apparatus of the present invention. A case is made up of a case body 1 and a cover 2. A carriage 4 is accommodated in the case to be

opposed to a platen 3 and to be reciprocatingly movable. Two kinds of ink cartridges 5 and 6 having different widths are detachably mounted on the top surface of the carriage 4.

Fig. 2 shows an embodiment of the carriage 4. In this embodiment, inkjet recording heads 7 and 8 that receive supply of inks from ink cartridges 5 and 6, respectively, are disposed on the bottom surface of the carriage 4. Vertical walls 11 form a boxlike enclosure on the upper surface of the carriage 4 to accommodate the ink cartridges 5 and 6 such that their top surfaces are exposed. In this way, a cartridge holder 9 is integrally formed.

The cartridge holder 9 is partitioned by a rib 10 into two sections to accommodate the two kinds of ink cartridges 5 and 6 in given regions. Windows 11c and 11d for forming fixing members are respectively formed at substantially central portions of the vertical walls 11a and 11b that respectively define the regions for accommodating the cartridges. Fixing protrusions 12a and 13a of fixing members 12 and 13 as described later protrude through the windows 11c and 11d into the side of the cartridge accommodation regions.

The windows 11c and 11d are formed as arc-shaped through holes which limit the movement of the fixing protrusions 12a and 13a to a certain angular range L . Mounting holes 11e and 11f are formed on the centerlines of the windows 11c and 11d and under these windows 11c and 11d.

These window 11c, 11d and fixing member 12, 13 together form a one-push type fixing member.

Fig. 3A shows an embodiment of the fixing member 12, 13.

In this embodiment, the fixing members 12 and 13 are shaped identically. The fixing members 12 (13) has an arm 12b (13b). The fixing protrusion 12a (13a) that is longer than the thickness of the vertical wall 11a (11b) but does not hinder insertion of the cartridge is formed at one end of the arm 12b (13b) perpendicularly to the longitudinal direction of the arm 12b (13b). A mounting portion 12c (13c) that is rotatably inserted into the mounting hole 11e (11f) is formed at the other end in the same direction as the fixing protrusion 12a (13a). A tapering portion 12d (13d) for preventing disconnection and a split groove 12e (13e) are formed at the front end of the mounting portion 12c (13c). The arm 12b (13b) is so designed that the position of the fixing protrusion 12a (13a) is displaceable in a direction intersecting a surface direction of a fixing member 30 described later in conformity with recessed and protruded portions of the fixing member 30, and that the arm 12b (13b) has such an elasticity as to cause the fixing protrusion 12a (13a) to contact the fixing member 30 with a given contact force. This ensures reliable contact between the fixing protrusion 12a (13a) and the fixing member 30, to thereby eliminate failure of fixing the ink cartridge caused due to insufficient contact.

Because of this structure, when the fixing protrusion 12a

(13a) of the fixing member 12 (13) is inserted into the window 11c (11d) and the tapering portion 12d (13d) of the mounting portion 12c (13c) is forced into the mounting hole 11e (11f), the mounting portion is permitted by the split groove 12e (13e) to be deformed and then rotatably fitted in the mounting hole 11e (11f).

Figs. 4A and 4B show embodiments of the ink cartridges 5 and 6 of the invention. Namely, Fig. 4A shows the ink cartridge which contains one kind of ink, black ink in this embodiment, and Fig. 4B shows the ink cartridge which is formed with a plurality of separate ink storage chambers by partition walls or the like and which contains different kinds of inks, yellow, magenta and cyan in this embodiment, in respective ink storage chambers, each having an independent ink supply port.

Here, only one ink cartridge 5 is described. A fixing member 30 that guides and engages the aforementioned fixing protrusion 12a is formed in one wall surface 21 parallel to the direction of insertion of a container 20 that contains ink therein.

Another wall surface 29 that is perpendicular to the direction of insertion is provided with an ink supply port 22 that engages an ink supply needle 14 of the carriage to discharge the ink inside the cartridge therefrom.

In this ink cartridge, the fixing member 30 is disposed at a position offset toward the surface (the bottom surface) 29 where the ink supply port 22 is formed, i.e. at a lower portion

region in the insertion direction of the ink cartridge in this embodiment, and further the ink supply port 22 is disposed at a position offset toward the wall surface (the side surface) 21 (i.e. at the right side in the figure). Consequently, the fixing member 30 can surely fix a portion of the ink cartridge in the vicinity of the ink supply port 22. This arrangement can prevent the displacement of the ink cartridge even when an external force is applied in a state in which the ink supply needle 14 is inserted into the ink supply port 22, to thereby reduce an adverse affect on the connection portion between the ink supply port 22 and the ink supply needle 14. That is, since the ink supply port 22 is located at the position offset toward the wall surface 21 where the fixing member is formed, the fixing member 30 can receive the external force to reliably provide the above-noted advantageous effect.

As shown in Fig. 5, a packing 26 and a valve body 23 are loaded in the ink supply port 22 in such a way that the valve body 23 is biased by a spring 24 which is a coiled spring. The packing 26 serves as a sealing member, which closely and sealingly contacts the circumference of the ink supply needle 14. The valve body 23 contacts one end face of the packing 26 to close and seal an opening formed through the packing 26 when the cartridge is removed from the carriage, and opens the ink supply port by insertion of the ink supply needle 14 when the ink cartridge is mounted on the carriage. The extent of resilience of the spring

24 is such that even when the ink cartridge 5 is fully filled with ink and the ink supply port 22 engages the ink supply needle 14, the spring can bias the cartridge 5 in the direction opposite to the direction of insertion against the frictional force caused between the ink supply needle 14 and the packing 26.

In the aforementioned embodiment, the spring 24, provided in the ink supply port 17, for biasing the valve body 23 in the direction to close the valve body 23 is used to bias the ink cartridge in the direction opposite to the direction in which the cartridge 5 is inserted. In a case where the repulsion force of the spring 24 is small or the cartridge does not have the valve body 23 biased by the spring 24, the same advantages can be obtained by mounting a biasing spring 25 near the ink supply port 22 and in the front-end surface as viewed in the direction of insertion of the ink cartridge (i.e., the surface in which the ink supply 22 is formed) or in the surface of the carriage 4 that faces the ink supply port 22.

Fig. 6 shows an embodiment of the fixing member 30 formed on the ink cartridge, which constitutes the one-push type fixing member. A recess portion 31 having an entrance port of width W capable of almost covering the range of movement L of the fixing protrusion 12a is formed at the front end as viewed in the direction in which the cartridge is loaded (in this embodiment, in a lower portion). A guide portion 32 having an upper portion on one side is formed in the center of the recess portion 31 as viewed in

the direction of insertion of the cartridge. A protruded portion 32a is formed in the center of the guide portion 32 such that passages through which the protrusion 12a can pass are formed on both sides of the protruded portion 32a.

5 In a lower portion side (the left side in the figure) relative to the protruded portion 32a, there are formed a vertical wall 32b over which the protrusion 12a cannot pass during the movement of the ink cartridge in the insertion direction, and an inclined surface 32c, above the vertical wall 32b, over which the protrusion
10 12a can easily pass during the movement of the ink cartridge in the removal direction.

In the other side, i.e. an upper portion side (the right side in the figure) relative to the protruded portion 32a, there are formed an inclined surface 32d over which the protrusion
15 12a can easily pass during the movement of the ink cartridge in the insertion direction, and a vertical wall 32e, above the inclined surface 32d, over which the protrusion 12a cannot pass during the movement of the ink cartridge in the removal direction.

This arrangement of the inclined surface 32d and the vertical
20 wall 32e in the upper portion side is reverse to the arrangement of the vertical wall 32b and the inclined surface 32c in the lower portion side. The protrusion 12a enters through the inclined surface 32d, and exits through the inclined surface 32c.

An angular vertical wall 33a, whose vertex 33 is located
25 slightly offset from the centerline C of the recess portion 31

toward the inclined surface 32d, is formed in a deeper portion of the recess portion 31 relative to the entrance side of the protrusion 12a. A vertical wall 32g obliquely upwardly extends substantially from the centerline C of the protruded portion 32a toward the exit side (the left side in the figure) to provide a holding portion 34 made up of a V-shaped recess portion for engagement with the protrusion 12a.

This holding portion 34 is disposed at a center in the width direction of the cartridge, or on a plane which passes through a central axis of the ink supply port and which is perpendicular to the wall surface, so that the holding portion 34 in cooperation with the protrusion 12a can reliably fix the ink cartridge 5 at a predetermined position, while causing no movement of the ink supply needle 14.

Indicated by numeral 35 in the figure is a movement direction-restricting member disposed closer to the inclined surface 32c than to the holding portion 34. This restricting member 35 has an inclined surface 35a over which the protrusion 12a can easily pass and a vertical wall 35 over which the protrusion 12a cannot easily pass.

In this embodiment, when the ink cartridge 5 is inserted, the fixing protrusion 12a enters the opening of the recess portion 31 of the fixing member 30 and reaches the inclined surface 32d while being guided by the guide portion 32 (the vertical wall 32b) in one direction (Fig. 7I). Then, the fixing protrusion

12a passes over this inclined surface 32d (Fig. 7II).

Under this condition, when the cartridge 5 is further pushed-in against the elastic force of the spring 24 of the ink supply port, the ink cartridge 5 reaches a dead point at which the fixing protrusion 12a contacts the angular wall 33a located in the deeper portion of the recess portion 31 (Fig. 8I). Under this condition, if the hand is released from the ink cartridge 5, the ink cartridge 5 is moved by a slight distance ΔG in the direction opposite to the direction of insertion by the reaction force of the spring 24 so that the fixing protrusion 12a is fitted into the holding portion 34, while being guided toward the centerline C by the vertical wall 32e (Fig. 8II).

There is a slight clearance between the dead point at the pushing-in of the ink cartridge 5 into the cartridge holder and a cartridge holding position. For this reason, when the ink cartridge is moved from the dead point at the pushing-in to the cartridge holding position, the packing 26 is moved in the contracting direction due to the friction to the ink supply needle 14, so that the packing 26 reliably contacts the circumference of the ink supply needle 14 elastically, to thereby ensure air-tightness.

In addition, such clearance can be determined by the diameter of the fixing protrusion 12a, the position of the holding portion 34, or the like.

On the other hand, in a case where the ink in the ink cartridge

has been consumed and the ink cartridge 5 is replaced, the cartridge 5 is pushed-in against the reaction force of the spring 24. The fixing protrusion 12a passes over the inclined surface 35a of the movement-restricting member 35, while being guided by the angular wall 33a located in the deeper portion of the recess portion 31 (Fig. 9I). The amount of the movement during this pushing-in corresponds to the aforementioned slight clearance between the dead point at the pushing-in and the cartridge holding position. By this movement, the packing 26 is relatively moved with respect to the ink supply needle 14 so that ink flows in therebetween. The ink serves as lubricant to reduce the friction during the removal.

Under this condition, if the hand is released from the cartridge 5, the reaction force of the spring 24 elevates the cartridge 5. During this process, the fixing protrusion 12a passes over the inclined surface 32c to be free from the restriction (Fig. 9II).

When a new cartridge 5 is loaded into a given position and then pushed-in, the ink cartridge can be fixed into a predetermined position in the same way as the foregoing.

In the embodiment described above, a recording apparatus of the type where the cartridge holder is mounted to the carriage has been described. It is apparent that similar advantages can be produced when the invention is applied to a type of the recording apparatus in which the cartridge is installed on the case body

1 forming the recording apparatus and ink is supplied to the
recording head by the use of an ink supply tube.

That is, in a case of an ink cartridge 45 in which a flexible
bag 41 containing ink therein and having an ink supply port 40
5 on one side thereof is accommodated in a hard case 44 made up
of a case body 42 and a cover 43 in such a way that the ink supply
port 40 is exposed, the aforementioned one-push type fixing member
30 is formed on a side surface of the hard case 44 such that
the front side as viewed in the direction of insertion becomes
10 an opening portion.

On the other hand, the other one-push type fixing member
is formed such that the fixing protrusion 12a is protruded from
the rotational range limiting window 47 at the side of the ink
cartridge accommodating holder 46 to be opposed to the fixing
15 member 30. A resilient member 48 is disposed on the side of
an ink supply needle 49. In this way, the cartridge 45 can be
fixed into a predetermined position simply by pushing it in.
When the ink cartridge 45 is removed, the ink cartridge 45 is
pushed in against the resilient member 48. In this way, the ink
20 cartridge 45 can be taken out.

This embodiment can also employ, in place of the resilient
member 48, a valve arrangement having the valve body 23 installed
in the ink supply port 22 and the spring 24 for biasing the valve
body 23 toward the ink supply port side as discussed with reference
25 to Fig. 5, in order to produce the same effect using the elastic

force of the spring for biasing the valve body.

In the embodiment described above, a one-push type fixing member for receiving a fixing protrusion and another one-push type fixing member having the fixing protrusion are formed on the ink cartridge and cartridge holder, respectively. It is
5 apparent that, the same advantages can be obtained when one-push type fixing member 30 for receiving the fixing protrusion is arranged on the cartridge holder 9 and another one-push type fixing member having the fixing protrusion 12a, 13a is arranged
10 on the ink cartridge 5, 6 as shown in Figs. 12 and 13.

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The claims defining the invention are as follows:-

1. An inkjet recording apparatus having a recording head that receives supply of ink from an ink cartridge installed in a cartridge accommodation region, the ink cartridge having a first fixing member formed on the ink cartridge, the inkjet recording apparatus comprising:

5 a second fixing member capable of engaging with the first fixing member to fix the cartridge in the cartridge accommodation region, and that is formed in a position facing a plane that is substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge accommodation region, wherein in operation, after
10 being inserted, the ink cartridge is held in a predetermined position in a state in which the ink cartridge is resiliently urged by resiliently urging means in a direction opposite to the insertion direction;

wherein the second fixing member comprises a protrusion whose range of motion is restricted; and

15 wherein the first fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the
20 inkjet recording apparatus.

2. An inkjet recording apparatus having a recording head that receives supply of ink from an ink cartridge installed in a cartridge accommodation region, the ink cartridge having a first fixing member formed on the ink cartridge, the inkjet recording apparatus comprising:

25 a second fixing member capable of engaging with the first fixing member to fix the cartridge in the cartridge accommodation region, and that is formed in a position facing a plane that is substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge accommodation region, wherein in operation, after being inserted, the ink cartridge is held in a predetermined position in a state in which the
30 ink cartridge is resiliently urged by resiliently urging means in a direction opposite to the insertion direction;

wherein the first fixing member comprises a protrusion whose range of motion is restricted; and

35 wherein the second fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path

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distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

5 3. The inkjet recording apparatus as set forth in claim 1 or claim 2, wherein the engagement guide path is arranged to guide the protrusion into the holding portion during insertion of the cartridge.

 4. The inkjet recording apparatus as set forth in claim 1 or claim 2, wherein the disengagement guide path is arranged to receive the protrusion from the
10 holding portion in response to a selected motion of the ink cartridge from the predetermined position to enable removal of the cartridge.

 5. The inkjet recording apparatus as set forth in claim 1, wherein the resiliently urging means includes a spring that biases a valve body loaded in an ink supply port.

15 6. The inkjet recording apparatus as set forth in claim 1, wherein the resiliently urging means includes a spring disposed in the ink cartridge accommodation region or a spring disposed on an outer surface of a container of the ink cartridge.

 7. The inkjet recording apparatus as set forth in claim 1, wherein a position of the holding portion or a diameter of the protrusion is selected to define a clearance
20 between a dead point at pushing-in of the ink cartridge and the predetermined position.

 8. An ink cartridge having an ink storing portion storing ink therein and an ink supply port communicating with the ink storing portion, the ink cartridge being adapted to be removably mounted on a cartridge mounting portion of a recording apparatus to supply the ink in the ink storing portion via the ink supply port to a recording
25 head provided on the recording apparatus, the ink cartridge comprising:

 a first fixing member that is formed on a plane substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge mounting portion, and that is capable of engaging with a second fixing member of the recording apparatus to fix the cartridge in the cartridge accommodation region;

30 wherein the second fixing member comprises a protrusion whose range of motion is restricted; and

 wherein the first fixing member comprises fixing means including an engagement guide path leading from an entrance portion to a holding portion, and a disengagement guide path distinct from the engagement guide path and leading from the
35 holding portion to an exit portion, wherein the engagement guide path is arranged to

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guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

9. An ink cartridge having an ink storing portion storing ink therein and an ink supply port communicating with the ink storing portion, the ink cartridge being adapted to be removably mounted on a cartridge mounting portion of a recording apparatus to supply the ink in the ink storing portion via the ink supply port to a recording head provided on the recording apparatus, the ink cartridge comprising:

a first fixing member that is formed on a plane substantially parallel to an insertion direction in which the ink cartridge is inserted into the cartridge mounting portion, and that is capable of engaging with a second fixing member of the recording apparatus to fix the cartridge in the cartridge accommodation region;

wherein the first fixing member comprises a protrusion whose range of motion is restricted; and

wherein the second fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, wherein the engagement guide path is arranged to guide the protrusion during insertion of the ink cartridge and the disengagement guide path is arranged to guide the protrusion during removal of the ink cartridge from the inkjet recording apparatus.

10. An ink cartridge according to claim 8 or claim 9, wherein the holding portion engages and holds in place the protrusion when a force is applied to the ink cartridge in a direction opposite the insertion direction of the ink cartridge.

11. The ink cartridge as set forth in any one of claims 8 to 10, further comprising resiliently urging means for resiliently urging the ink cartridge in a direction opposite the insertion direction.

12. The ink cartridge as set forth in claim 11, wherein the resiliently urging means includes a spring that biases a valve member loaded in the ink supply port.

13. The ink cartridge set forth in claim 11, wherein the resiliently urging means includes a spring mounted on a container wall surface of the ink cartridge.

14. The ink cartridge as set forth in claim 8 or claim 9, wherein the first fixing member is disposed on a wall surface intersecting a wall surface on which the ink supply port is disposed, and located at a position offset toward the wall surface on which the ink supply port is disposed.

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15. The ink cartridge as set forth in claim 14, wherein the ink supply port is located at a position offset toward the wall surface on which the first member is disposed.
16. The ink cartridge as set forth in claim 8 or claim 9, wherein the protrusion whose range of motion is restricted is movable in a plane direction of the plane substantially parallel to the insertion direction, and also movable in a direction intersecting the plane.
17. The ink cartridge as set forth in claim 8 or claim 9, wherein the holding portion of the first member is resiliently held by the protrusion by an urging force of resiliently urging means.
18. The ink cartridge as set forth in claim 8 or claim 9, wherein a position of the holding portion or a diameter of the protrusion is selected to define a clearance between a dead point at pushing-in of the ink cartridge and the predetermined position.
19. An ink cartridge according to claim 8, wherein the entrance portion and the exit portion are the same.
20. An ink cartridge according to claim 8 or claim 19, wherein a portion of the engagement guide path leading away from the entrance portion leads in a first engagement direction having a component opposite an insertion direction of the ink cartridge.
21. An ink cartridge according to claim 20, wherein the first engagement direction also has a component in a first orthogonal direction, which is orthogonal to the insertion direction.
22. An ink cartridge according to claim 21, wherein a portion of the engagement guide path leading into the holding portion leads in a second engagement direction having a component in the insertion direction.
23. An ink cartridge according to claim 22, wherein said second engagement direction also has a component in a second orthogonal direction opposite the first orthogonal direction.
24. An ink cartridge according to claim 23, wherein a portion of the disengagement guide path leading away from the holding portion leads in a first disengagement direction having a component opposite the insertion direction.
25. An ink cartridge according to claim 24, wherein the first disengagement direction also has a component in the second orthogonal direction.

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26. An ink cartridge according to claim 25, wherein:
the portion of the engagement guide path leading into the holding portion and the portion of the disengagement guide path leading away from the holding portion meet at a wall of the holding portion;
- 5 the wall of the holding portion has first and second ends, and an intermediate portion between the first and second ends;
a first wall part of the wall of the holding portion extends from the intermediate portion to the first end in a direction having a component opposite the insertion direction and a component in the first orthogonal direction; and
- 10 a second wall part of the wall of the holding portion extends from the intermediate portion to the second end in a direction having a component opposite the insertion direction and a component in the second orthogonal direction.
27. An ink cartridge according to claim 25 or claim 26, wherein a portion of the disengagement guide path leading into the exit portion leads in a second
15 disengagement direction having a component in the insertion direction.
28. An ink cartridge according to any one of claims 8 and 19 to 27, wherein the engagement guide path, the holding portion and the disengagement guide path all comprise indented portions of a wall of the ink cartridge.
29. An ink cartridge according to claim 28, wherein the entrance and exit
20 portions are disposed at an edge of the wall of the ink cartridge.
30. An ink cartridge according to any one of claims 8 and 19 to 29, wherein the engagement guide path comprises a first latching portion, the first latching portion being capable of allowing substantial movement of the cartridge in the insertion direction but not the direction opposite the insertion direction.
- 25 31. The ink cartridge according to claim 30, wherein the first latching portion comprises:
a first ridge extending substantially across the engagement guide path, the first ridge having a steeper face on the side leading to the holding portion and a less steep face on the side leading to the entrance portion.
- 30 32. The ink cartridge according to claim 30 or 31, wherein the disengagement guide path comprises a second latching portion, the second latching portion being capable of allowing substantial movement of the cartridge in the direction opposite the insertion direction but not the insertion direction.
33. The ink cartridge according to claim 32, wherein the second latching
35 portion comprises a second ridge extending substantially across the engagement guide

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path, the second ridge having a steeper face on the side leading to the exit portion and a less steep face on the side leading to the holding portion.

34. The ink cartridge according to claim 32 or claim 33, wherein the disengagement guide path comprises a third latching portion, the third latching portion
5 having a steeper face on the side leading to the exit portion and a less steep face on the side leading to the holding portion.

35. An ink cartridge according to any one of claims 8 and 19 to 34, wherein the ink cartridge is held in place via the holding portion when a force is applied to the ink cartridge in a direction opposite the insertion direction of the ink cartridge.

10 36. A method for attaching an ink cartridge having a first fixing member to an inkjet recording apparatus having a second fixing member capable of engaging with the first fixing member to attach the ink cartridge to the inkjet recording apparatus, wherein the second fixing member comprises a protrusion whose range of motion is restricted, and wherein the first fixing member comprises a combination of an
15 engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, comprising the steps of:

positioning the cartridge in a cartridge accommodation region of the recording apparatus;

20 applying a first force to the cartridge in an insertion direction relative to the recording apparatus, whereby the protrusion is led by the engagement guide path towards the holding portion; and

25 removing the first force from the cartridge, the cartridge being urged by resilient urging means in a direction opposite the insertion direction such that the protrusion engages the holding portion, thereby holding the cartridge in a predetermined position.

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37. A method according to claim 36, further comprising subsequently detaching the cartridge from the recording apparatus by:

applying a second force to the cartridge in the insertion direction, whereby the protrusion moves from the holding portion to the disengagement guide path; and

5 removing the second force from the cartridge, whereby the protrusion moves through the disengagement guide path to release the cartridge.

38. A method for attaching an ink cartridge having a first fixing member to an inkjet recording apparatus having a second fixing member capable of engaging with the first fixing member to attach the ink cartridge to the inkjet recording apparatus,
10 wherein the first fixing member comprises a protrusion whose range of motion is restricted, and wherein the second fixing member comprises a combination of an engagement guide path, a holding portion for engaging the protrusion, and a disengagement guide path distinct from the engagement guide path, comprising the steps of:

15 positioning the cartridge in a cartridge accommodation region of the recording apparatus;

applying a first force to the cartridge in an insertion direction relative to the recording apparatus, whereby the protrusion moves through the engagement guide path to the holding portion; and

20 removing the first force from the cartridge, the cartridge being urged by resilient urging means in a direction opposite the insertion direction such that the protrusion engages the holding portion, thereby holding the cartridge in a predetermined position.

39. A method according to claim 38, further comprising subsequently detaching the cartridge from the recording apparatus by:

25 applying a second force to the cartridge in the insertion direction, whereby the protrusion moves from the holding portion to the disengagement guide path; and

removing the second force from the cartridge, whereby the protrusion moves through the disengagement guide path to release the cartridge.

40. An inkjet cartridge, substantially as herein described with reference to
30 Figures 1, 2, 3A to 3C, 4 to 6, 7I, 7II, 8I, 8II, 9I, 9II, 10 to 12, 13A and 13B.

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41. A method for attaching an ink cartridge to an inkjet recording apparatus, substantially as herein described with reference to Figures 1, 2, 3A to 3C, 4 to 6, 7I, 7II, 8I, 8II, 9I, 9II, 10 to 12, 13A and 13B.

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Dated 10 June 2008

Seiko Epson Corporation

Patent Attorneys for the Applicant/Nominated Person

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FIG. 1

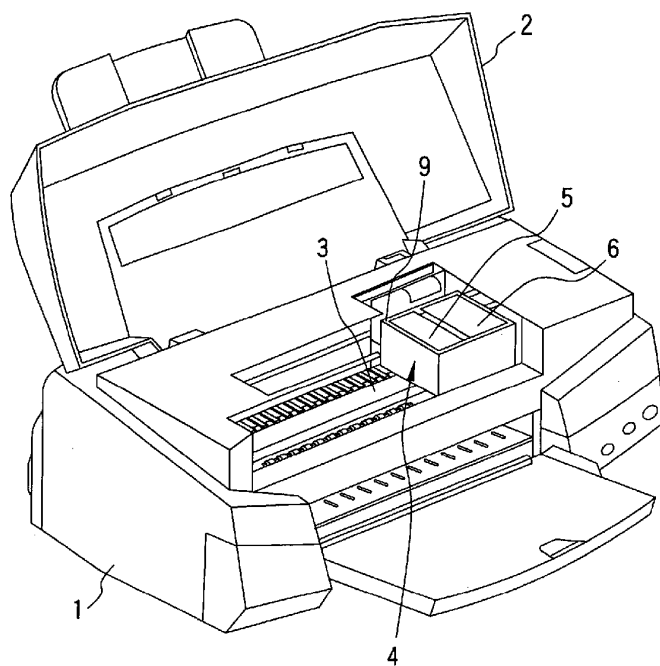
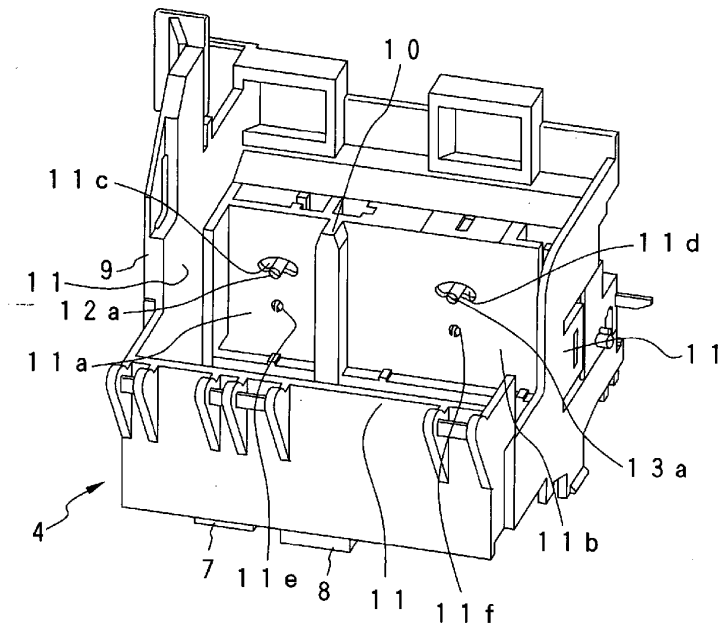


FIG. 2



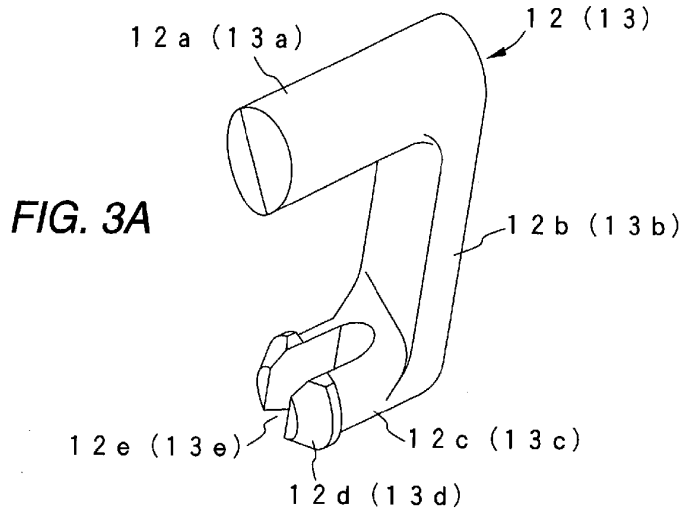


FIG. 3A

FIG. 3B

FIG. 3C

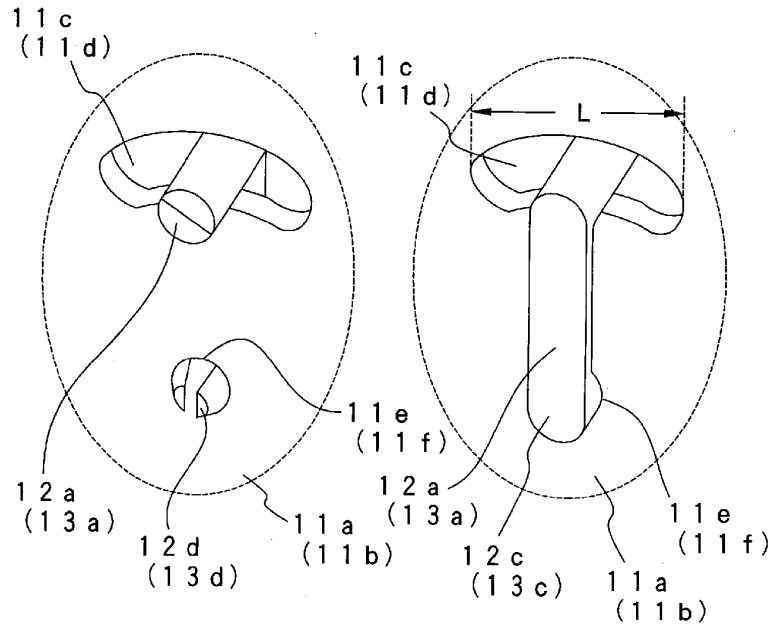


FIG. 4A

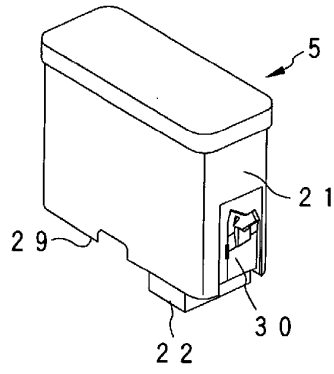


FIG. 4B

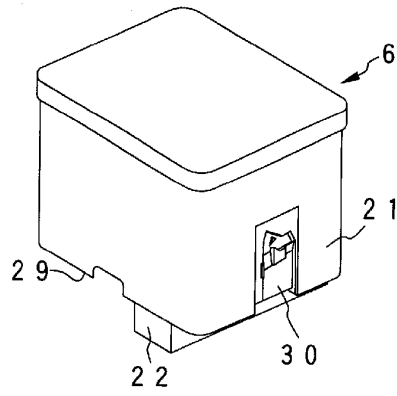


FIG. 5

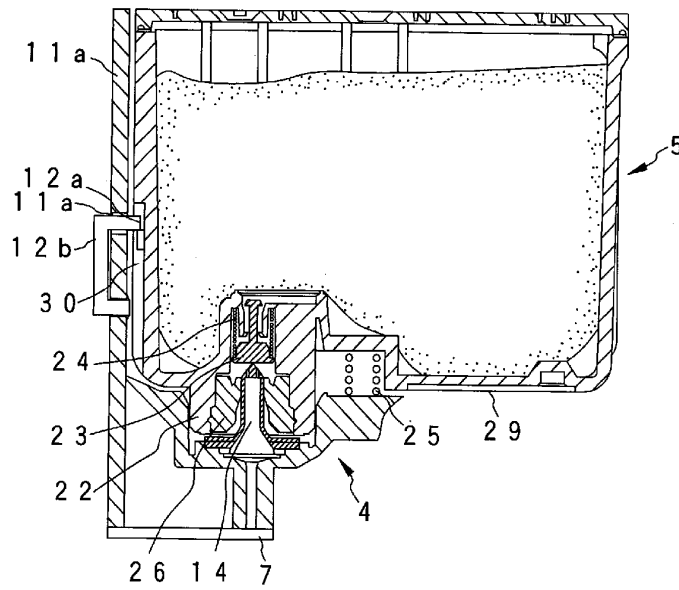


FIG. 6

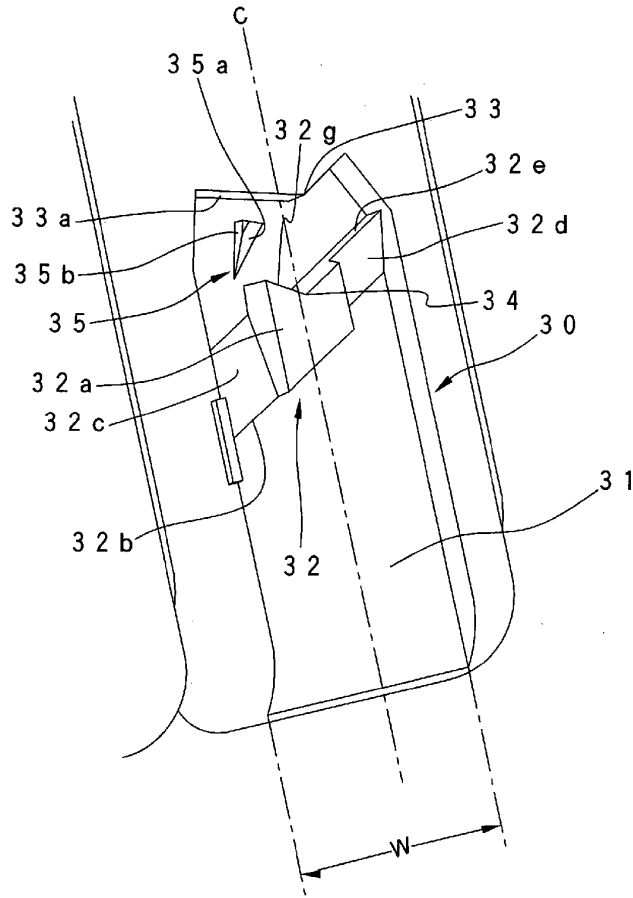


FIG. 7 (I)

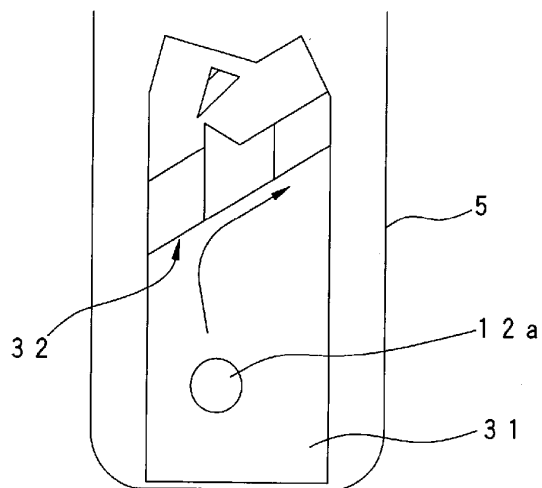


FIG. 7 (II)

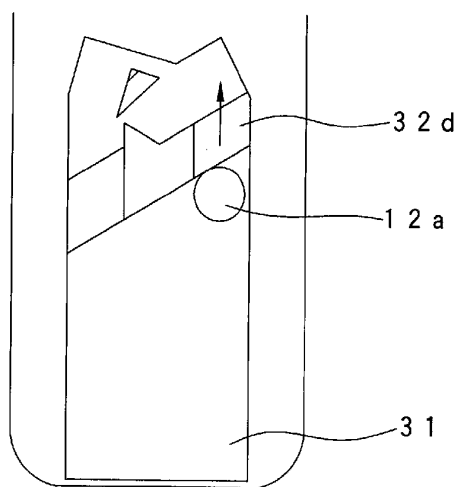


FIG. 8 (I)

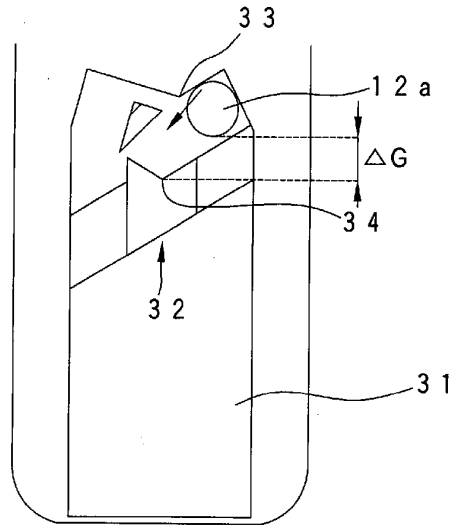


FIG. 8 (II)

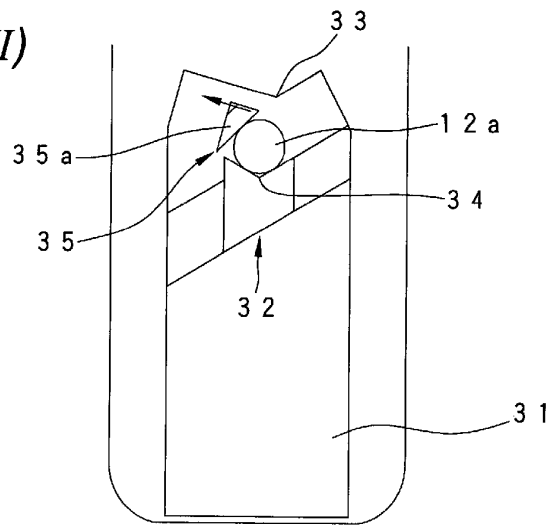


FIG. 9 (I)

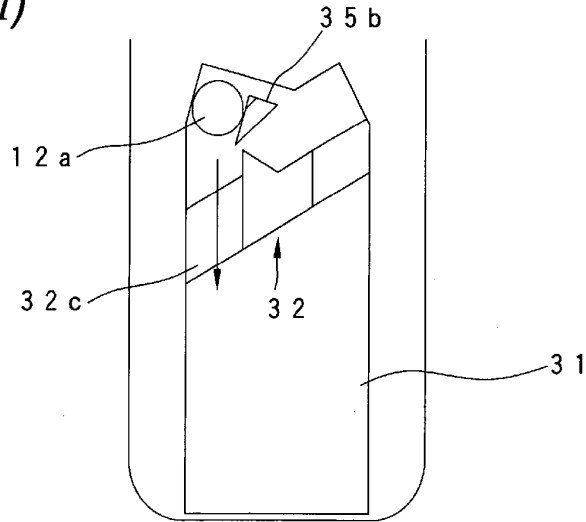
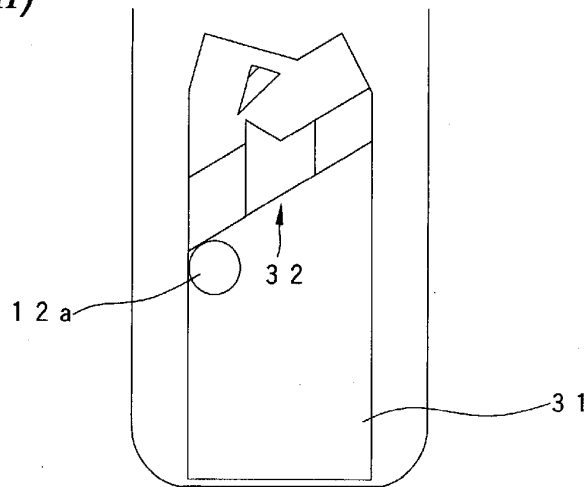


FIG. 9 (II)



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FIG. 10

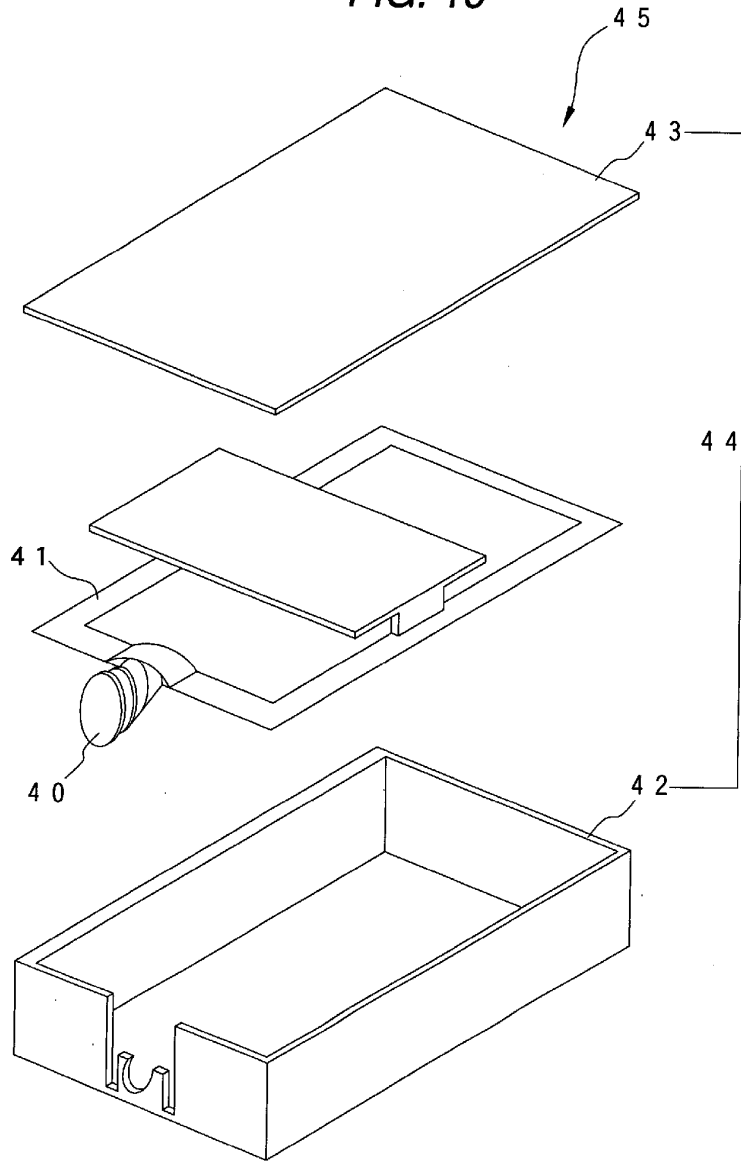


FIG. 11

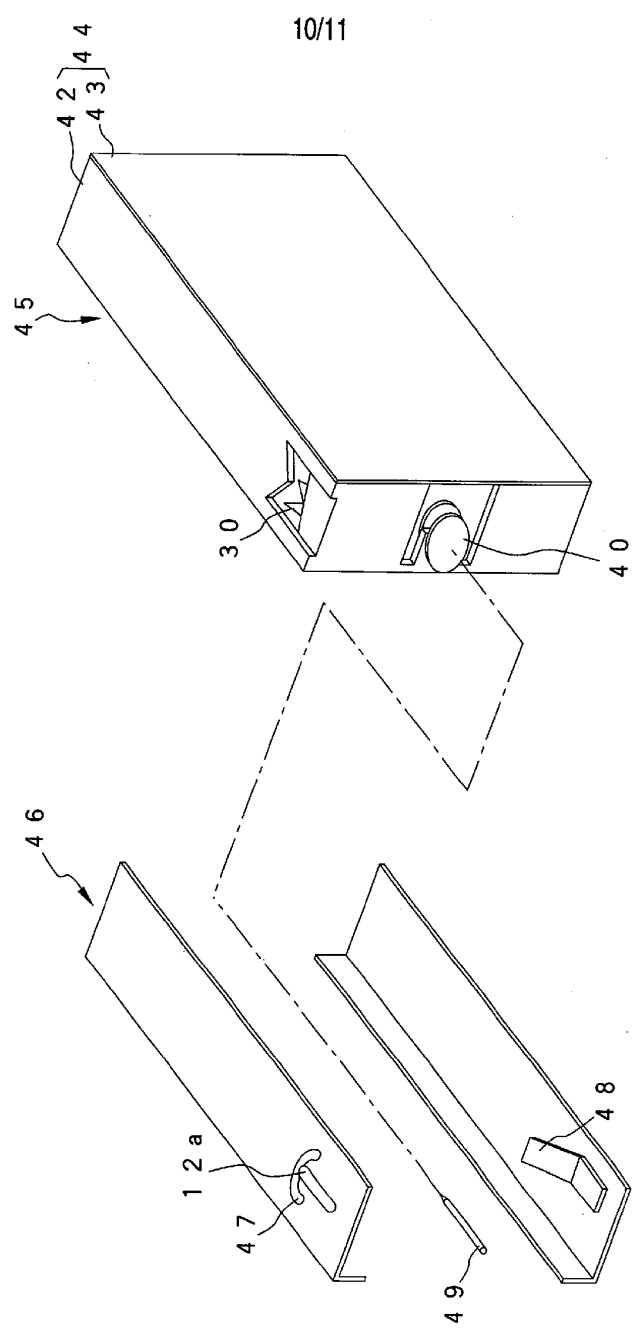


FIG. 12

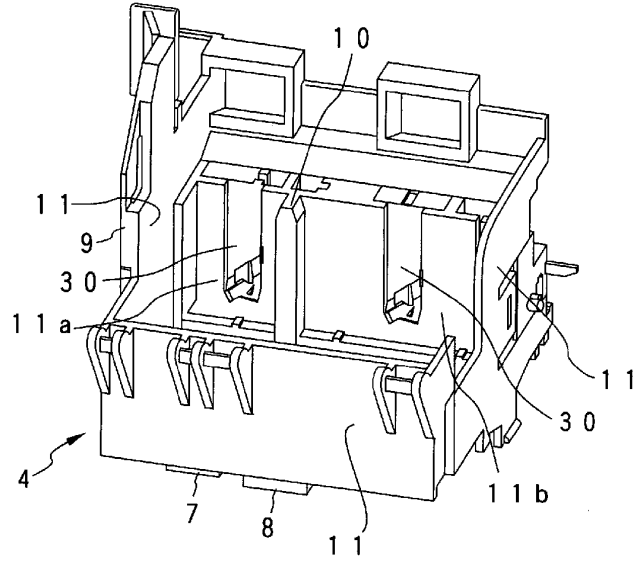


FIG. 13A

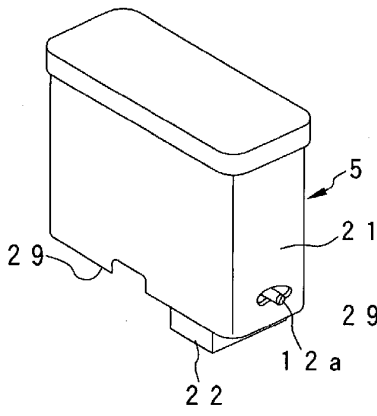


FIG. 13B

