

DESCRIPTION

DISCHARGE CONTAINER

Field of the Invention

The present invention relates to a discharge container which contains solutions such as a drug solution and which discharges the solution by a pump function.

BACKGROUND OF THE INVENTION

As disclosed in Japanese Patent Laid-Open Publication No. 2002-18330, the present inventors have proposed various constitutions of a discharge container which discharges solutions such as a drug solution. This discharge container includes: a container which contains the solution; a cylinder disposed in the container; a first piston which slides/moves in the cylinder and which is urged in a backward direction by a first spring; and a second piston moving backwards while compressing a second spring, when the first piston proceeds. Moreover, when the first piston reaches a predetermined stroke, a solution passage for connecting the cylinder to a nozzle opens. When the second piston proceeds by an urging force of the second spring, the solution in the cylinder is discharged from the nozzle.

According to these discharge containers, since the solution in the container is discharged by the urging force of the second spring, and vertical movement of the nozzle at

a discharge time is slight, a stable discharge state can constantly be maintained.

On the other hand, the solutions contained in this type of the discharge container range in various fields such as a medical field and cosmetics field. Since the solutions include many inexpensive solutions, there has also been a demand for a simpler constitution and easy manufacturing with respect to the container for containing the solution.

An object of the present invention is to improve the discharge container. In more detail, an object is to provide a discharge container which has a simple constitution but which can secure a stable discharge state.

SUMMARY OF THE INVENTION

To achieve the object, according to the present invention, there is provided a discharge container comprising a container which contains a solution, a cylinder which is extended downwards from above in the container and which includes a large-diameter portion in an upper part and which also includes a slope portion tapered downwards from the large-diameter portion, a small-diameter portion extended downwards from the slope portion, and an inflow port for allowing the solution in the container to flow into the small-diameter portion, a first piston slidably disposed in the large-diameter portion, an actuator which presses down the first piston and which includes a discharge port for discharging the solution to the outside of the container,

when the first piston is pressed, a second piston which is slidably disposed in the small-diameter portion and urged upwards by a spring, and an interval hold member which abuts on the first and second pistons and which holds a predetermined interval between the first and second pistons in a non-depressed state of the actuator.

Moreover, the first piston includes a seal portion which abuts over a whole inner peripheral surface of the large-diameter portion in a liquid-tight manner, a valve member which is disposed at an interval below the seal portion and which is vertically moved together with the seal portion and which abuts over the whole inner peripheral surface of the large-diameter portion in the liquid-tight manner in the non-depressed state of the actuator and which has flexibility, a protrusion which extends downwards to the slope portion from a lower end of the valve member, and a solution passage for connecting a space between the seal portion and the valve member to the discharge port through the inside. The second piston includes an inflow passage which vertically passes through the second piston, and an inflow valve which is disposed in the inflow passage and which allows the solution from below to pass and which blocks outflow of the solution from above.

Furthermore, when the actuator is depressed, the valve member of the first piston moves down the second piston via the solution in the cylinder to compress the spring. When the protrusion is pressed down to abut on the slope

portion, the protrusion is guided by the slope portion and moved inwards to detach a part of the valve member from the inner peripheral surface of the cylinder. The second piston discharges the solution in the cylinder via the discharge port through the solution passage from the interval between the valve member and the cylinder by an urging force of the spring.

In this manner, according to the discharge container of the present invention, when a user depresses the actuator, the solution between the valve member and the second piston presses down the second piston, and the spring is compressed. Subsequently, the protrusion is guided by the slope portion to open the valve member, and the solution is discharged from the discharge port via the solution passage by the urging force of the spring. Therefore, when the solution is discharged from the discharge port, the actuator moves little, and therefore the solution can exactly be discharged. Since a pressure for discharging the solution is the urging force of the spring, a stable discharge state can constantly be obtained.

In the discharge container of the present invention, a lower edge of the valve member is preferably formed in a flat shape in a horizontal direction. Alternatively, a concave portion concaved inwards and upwards from the lower edge is disposed in the valve member, a filling member which has the flexibility and with which the concave portion is filled is attached to the concave portion, and a bottom

surface of the filling member and the lower edge of the valve member may be formed in the flat shapes. In this manner, the bottom surface of the valve member or the filling member is formed in the flat shape. Accordingly, even when bubbles are mixed in the cylinder, the solution in the cylinder is pushed out by the second piston, and the bubbles are discharged to the outside via the valve member. Therefore, when the actuator is depressed next, the solution can be discharged without any bubble in the cylinder.

Moreover, with the use of the filling member, a containing hole in which the interval hold member is fit with a play may also be disposed in a middle of the filling member. When the containing hole is disposed in this manner, and when the valve member is deformed by the protrusion, the containing hole is deformed, and therefore the valve member is easily deformed. Therefore, a gap between the valve member and an inner wall of the cylinder can easily be secured, and the solution can smoothly be discharged.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an explanatory sectional view showing a discharge container according to one example of an embodiment of the present invention; FIG. 2 is an explanatory view showing a valve member; FIGS. 3a to c are explanatory sectional views showing an operation of the discharge container of FIG. 1; FIG. 4 is an explanatory view showing a relation between a cylinder and the valve member; and FIGS.

5a to e are explanatory sectional views showing a main part of the discharge container according to another embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Next, one example of an embodiment of a discharge container according to the present invention will be described with reference to FIGS. 1 to 5. As shown in FIG. 1, a discharge container 1 of the present embodiment includes: a container 3 which contains a solution 2; and an actuator 4 attached to an upper end of the container 3. A nozzle 4a (discharge port) via which the solution 2 in the container 3 is discharged is disposed in the actuator 4.

A cylinder 5 is contained inside the container 3. As shown in FIG. 1, the cylinder 5 is extended downwards from an upper end of the container 3 inside, a large-diameter portion 5a is disposed in an upper part of the container, and a small-diameter portion 5b is disposed in a lower part of the container. A boundary portion between the large-diameter portion 5a and small-diameter portion 5b forms a slope portion 5c which is tapered downwards. An inflow port 6 is extended toward a bottom surface of the container 3 from below the small-diameter portion 5b.

A first piston 7 including a valve member 8, a second piston 9, a spring 10, and an interval hold member 11 are contained in the cylinder 5. The first piston 7 can vertically be slid by the actuator 4. The valve member 8 is vertically moved together with the first piston 7 by the

actuator 4. When the first piston 7 is pressed down by the actuator 4, the second piston 9 is pressed down by the solution 2 in the cylinder 5. The spring 10 urges upwards the second piston 9. The interval hold member 11 is disposed between the valve member 8 and second piston 9.

The first piston 7 and valve member 8 are both formed by a synthetic resin which has flexibility, and can slide in the large-diameter portion 5a of the cylinder 5. As shown in FIG. 1, the first piston 7 includes: a seal portion 7a which is formed downwards in an umbrella shape and which abuts over a whole inner peripheral surface of the large-diameter portion 5a in a liquid-tight manner; a shaft portion 7b extended upwards from the seal portion 7a; and a solution passage 7c disposed in the shaft portion 7b. As shown in FIGS. 1 and 2, the valve member 8 includes: a valve portion 8a formed downwards in a dome shape; a pair of protrusions 8b extended downwards from the valve portion 8a; a shaft portion 8c extended upwards from the valve portion 8a; and a solution passage 8d disposed in the shaft portion 8c.

On the other hand, the second piston 9 is formed by a synthetic resin which has flexibility, and can slide in the small-diameter portion 5b of the cylinder 5. The second piston 9 includes: a seal portion 9a which is formed upwards in the umbrella shape and which abuts over the whole inner peripheral surface of the small-diameter portion 5b in the liquid-tight manner; an inflow passage 12 which vertically passes through a center portion and which includes a lower

small-diameter portion 12a and upper large-diameter portion 12b; and a check ball 13 (inflow valve) disposed in the large-diameter portion 12b of the inflow passage 12. The check ball 13 closes the small-diameter portion 12a of the inflow passage 12 by its own weight. When a pressure is added to the solution 2 from above, the solution 2 is prevented from flowing downwards from the small-diameter portion 12a. On the other hand, when the solution 2 is sucked upwards from below the small-diameter portion 12a, the check ball 13 floats above the small-diameter portion 12a, and the solution 2 is charged into the cylinder 5 between the valve member 8 and second piston 9.

As shown in FIG. 1, the interval hold member 11 is held between the valve member 8 and second piston 9, when the actuator 4 is not depressed. A connection groove 11a for connecting the inflow passage 12 of the second piston 9 to the inside of the cylinder 5 above the second piston 9 is formed in a bottom surface portion of the member.

For the actuator 4, the shaft portion 8c of the first piston 7 is fit in a solution passage 4b disposed in the actuator. The nozzle 4a is disposed in a tip end of the solution passage 4b, and atomizes the solution 2 discharged via the solution passage 4b.

Next, an operation of each portion in discharging the solution 2 by the discharge container 1 of the present embodiment will be described. First, as shown in FIG. 1, when the actuator 4 is not depressed, the cylinder 5 is

filled with the solution 2. When the user depresses the actuator 4 from this state, as shown in FIG. 3a, the first piston 7 and valve member 8 are pressed down. Accordingly, the pressure is added to the solution 2 between the valve member 8 and second piston 9. Therefore, the second piston 9 compresses and presses down the spring 10. At this time, the solution 2 moves to the small-diameter portion 5b from the large-diameter portion 5a of the cylinder 5, but a volume of the solution 2 does not change. Therefore, as shown in FIG. 3a, a stroke in which the second piston 9 is pressed down is larger than a stroke in which the valve member 8 and first piston 7 are pressed down. Accordingly, the tip end of the interval hold member 11 is detached from the valve member 8.

When the actuator 4 is further depressed from this state, the protrusions 8b of the valve member 8 abut on the slope portion 5c of the cylinder 5. When the actuator 4 is further depressed, the protrusions 8b are curved inwards along the slope portion 5c. Accordingly, since the valve portion 8a is also curved inwards, as shown in FIG. 4, a gap 14 is formed between the inner wall of the cylinder 5 and the valve portion 8a. Since the solution 2 in the cylinder 5 is urged by the spring 10 via the second piston 9, the solution 2 is pushed out upwards from the gap 14 generated between the inner wall of the cylinder 5 and the valve portion 8a. The solution 2 pushed out in this manner passes through the solution passage 8d disposed in the shaft portion 8c of the valve member 8, passes through the solution passage 7c

disposed in the shaft portion 7b of the first piston 7, further passes through the solution passage 4b in the actuator 4, is atomized by the nozzle 4a, and is discharged to the outside.

The discharge of the solution 2 to the outside continues from when the second piston 9 moves upwards by the spring 10 until the interval hold member 11 moving upwards with the second piston 9 abuts on the valve member 8. During this, the solution 2 is discharged from the nozzle 4a at a stable pressure by the urging force of the spring 10.

When the user releases the actuator 4 from this state, the second piston 9 moves upwards by the spring 10. Accordingly, the valve member 8 and first piston 7 are pushed upwards via the interval hold member 11. At this time, the seal portion 7a of the first piston 7 and the valve portion 8a of the valve member 8 slide while abutting over the whole inner peripheral surface of the large-diameter portion 5a of the cylinder 5 in the liquid-tight manner. Since the solution 2 in the cylinder 5 between the valve member 8 and second piston 9 moves to the large-diameter portion 5a from the small-diameter portion 5b, a negative pressure is obtained inside the cylinder 5. Accordingly, the pressure of the solution 2 in the cylinder 5 below the second piston 9 is higher than that of the solution 2 between the valve member 8 and second piston 9. Therefore, the solution 2 presses up the check ball 13, and the solution 2 below enters the inflow passage 12 of the second piston 9. Accordingly, the cylinder

5 between the valve member 8 and second piston 9 is filled with the solution via the connection groove 11a of the interval hold member 11.

In this manner, according to the discharge container 1 of the present embodiment, since the fill-in of the cylinder 5 with the solution 2 and the push-up of the actuator 4 are performed by one spring 10, the constitution is simplified. In the discharge container 1 of the present embodiment, the large-diameter portion 5a, slope portion 5c, and small-diameter portion 5b are formed upwards from below, and the shape of the cylinder 5 is formed in such a manner that the diameter is gradually reduced. Therefore, when the cylinder 5 is injected/molded by a metal mold (not shown), the constitution of the metal mold can be simplified, and injection molding can be facilitated.

Next, a discharge container 1' according to another embodiment of the present invention will be described with reference to FIGS. 5a and 5b. In the other embodiment, as shown in FIGS. 5a and 5b, a substantially cylindrical filling member 15 is attached to an inner portion (concave portion) of the valve member 8. In the same manner as the valve member 8, the filling member 15 is formed by the flexible synthetic resin, and a containing hole 15a, in which the interval hold member 11 is fit with play, is disposed in the middle of the member. The filling member 15 is formed in the flat shape on a back-surface side, and formed in the same height as that of the lower edge of the valve portion 8a of

the valve member 8. It is to be noted that the other constitution is similar to that of the above-described embodiment, and is therefore denoted with the same reference numerals as those of the above-described embodiment, and detailed description thereof is omitted.

According to the discharge container 1' of the other embodiment, as shown in FIG. 5a, even when gas inside the container is mixed as a bubble A between the valve member 8 and second piston 9, the gas adheres to the bottom surface of the filling member 15. Subsequently, when the user depresses the actuator 4, and when the gap is generated between the valve portion 8a of the valve member 8 and the large-diameter portion 5a of the cylinder 5, the bubble A is discharged to the outside together with the discharged solution 2. Therefore, when the user next depresses the actuator 4, the bubble A disappears between the valve member 8 and second piston 9, and therefore an exact amount of the solution 2 can be discharged. The containing hole 15a is disposed in the middle of the filling member 15. Therefore, when the seal portion 8a of the valve member 8 is deformed by the protrusions 8b, the deformation of the seal portion 8a is not hindered.

It is to be noted that in the other embodiment, the filling member 15 including the containing hole 15a is attached to the valve member 8, but the present invention is not limited to this. As shown in FIGS. 5c and 5d, a filling member 15', in which the containing hole 15a is not disposed,

may also be attached to the valve member 8. In this case, the interval hold member 11 is preferably shorten by the thickness of the filling member 15'. As shown in FIG. 5e, the bottom-surface portion of the valve member 8 itself may also be formed in the flat shape. The bottom surface of the valve member 8 or filling member 15 is formed in the flat shape. Therefore, even when the bubble A is mixed between the valve member 8 and second piston 9, the bubble A can be discharged to the outside together with the solution 2 at the discharge time of the solution 2.

Industrial Applicability

As described above, the present invention is useful as a discharge container which contains solutions such as a drug solution and which discharges the solution by a pump function.

CLAIMS

1. A discharge container comprising: a container which contains a solution; a cylinder which is extended downwards from above in the container and which includes a large-diameter portion in an upper part and which also includes a slope portion tapered downwards from the large-diameter portion, a small-diameter portion extended downwards from the slope portion, and an inflow port for allowing the solution in the container to flow into the small-diameter portion; a first piston slidably disposed in the large-diameter portion; an actuator which presses down the first piston and which includes a discharge port for discharging the solution to the outside of the container, when the first piston is pressed; a second piston which is slidably disposed in the small-diameter portion and urged upwards by a spring; and an interval hold member which abuts on the first and second pistons and which holds a predetermined interval between the first and second pistons in a non-depressed state of the actuator,

the first piston comprising: a seal portion which abuts over a whole inner peripheral surface of the large-diameter portion in a liquid-tight manner; a valve member which is disposed at an interval below the seal portion and which is vertically moved together with the seal portion and which abuts over the whole inner peripheral surface of the large-diameter portion in the liquid-tight manner in the non-depressed state of the actuator and which has flexibility; a

protrusion which extends downwards to the slope portion from a lower end of the valve member; and a solution passage for connecting a space between the seal portion and the valve member to the discharge port through the inside,

the second piston comprising: an inflow passage which vertically passes through the second piston; and an inflow valve which is disposed in the inflow passage and which allows the solution from below to pass and which blocks outflow of the solution from above,

wherein the valve member of the first piston moves down the second piston via the solution in the cylinder to compress the spring, when the actuator is depressed; the protrusion is guided by the slope portion and moved inwards to detach a part of the valve member from the inner peripheral surface of the cylinder, when the protrusion is pressed down to abut on the slope portion; and the second piston discharges the solution in the cylinder via the discharge port through the solution passage from the interval between the valve member and the cylinder by an urging force of the spring.

2. The discharge container according to claim 1, wherein a lower edge of the valve member is formed in a flat shape in a horizontal direction.

3. The discharge container according to claim 1, wherein a concave portion concaved inwards and upwards from

the lower edge is disposed in the valve member, a filling member which has the flexibility and with which the concave portion is filled is attached to the concave portion, and a bottom surface of the filling member and the lower edge of the valve member are formed in flat shape.

4. The discharge container according to claim 3, wherein a containing hole in which the interval hold member is fit with a play is disposed in a middle of the filling member.