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(54) MEDIUM FILLING DEVICE AND METHOD

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USPC **222/167**

(57) **ABSTRACT**

A medium filling device includes a container rotatably supported, to contain an image forming medium, a dispenser configured to receive a constant quantity of the image forming medium from the container by a turn of the container, and a discharger configured to discharge the image forming medium from the dispenser to a target.

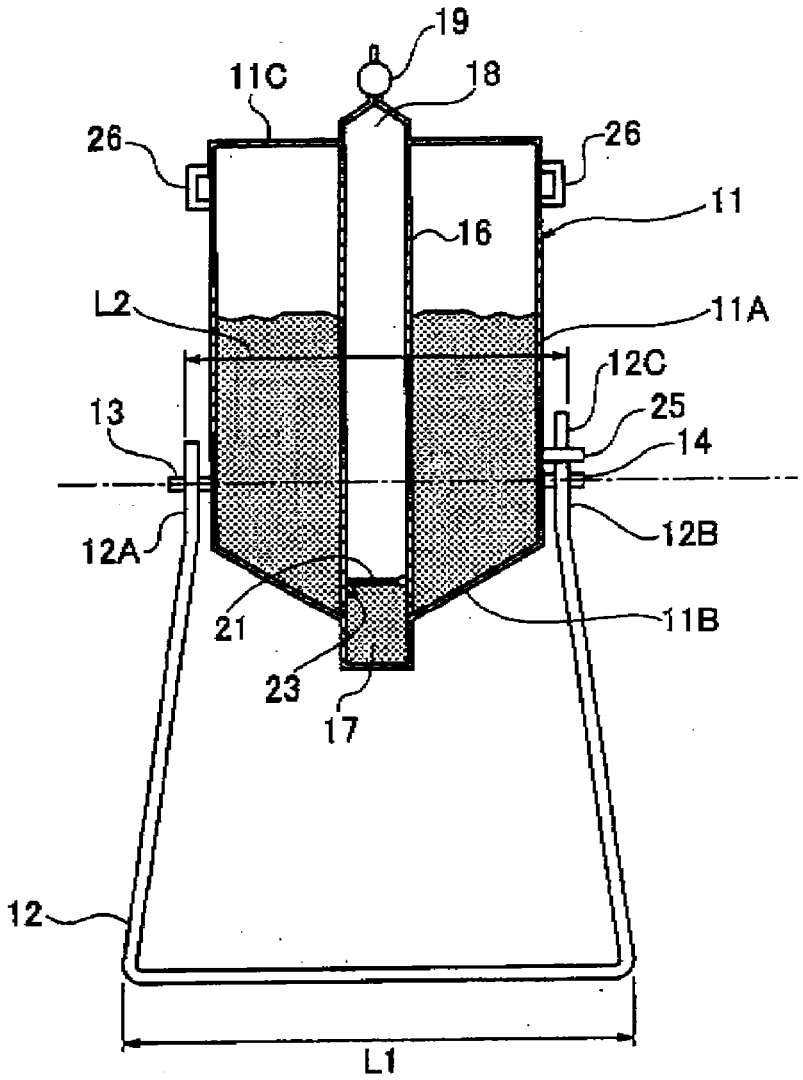

FIG.1B

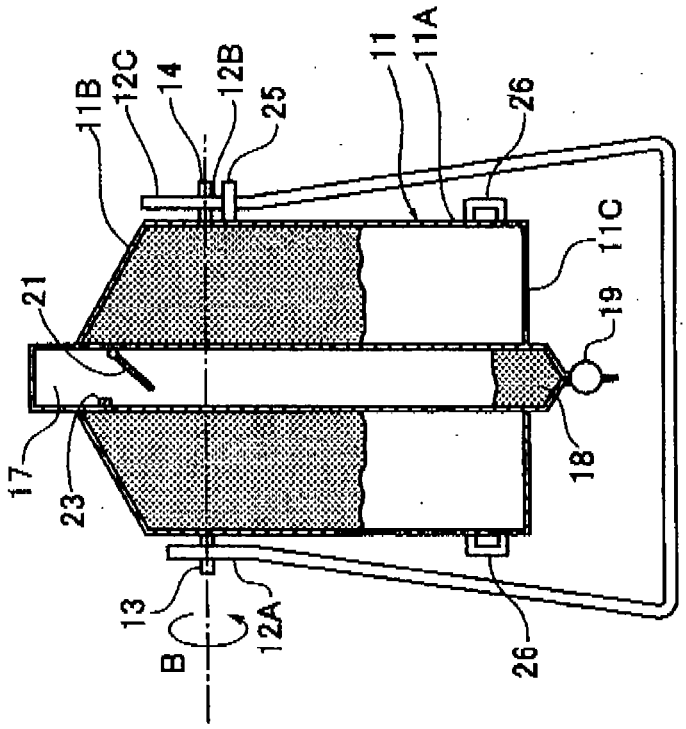
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FIG.1A

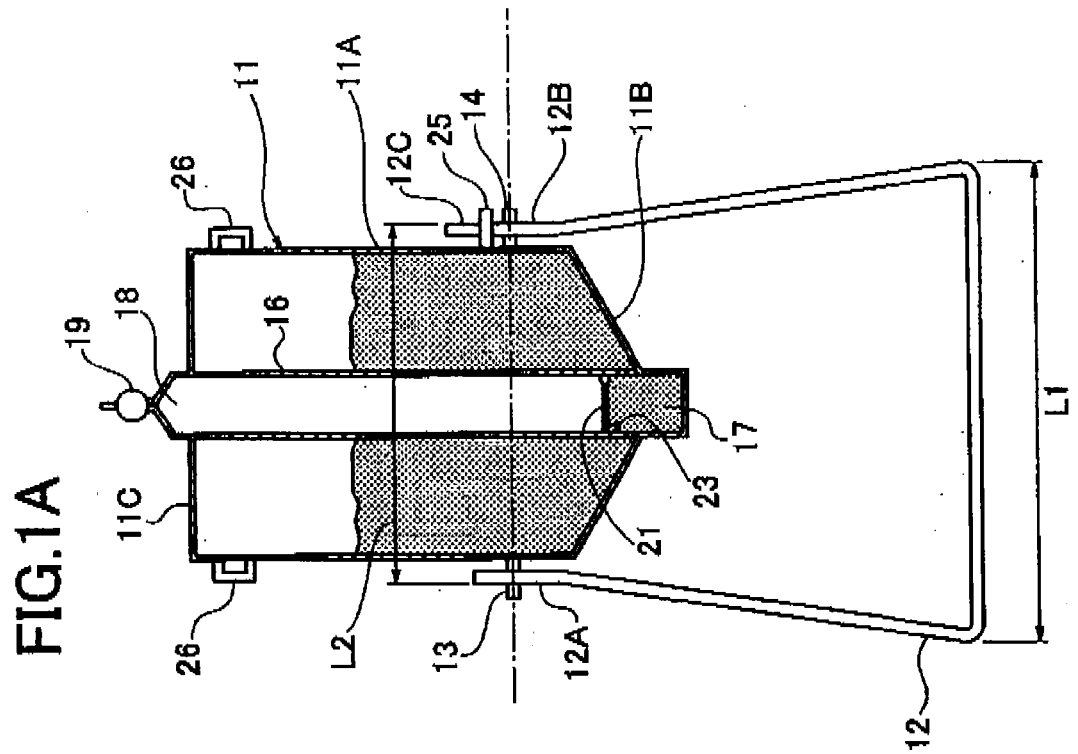
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FIG.2

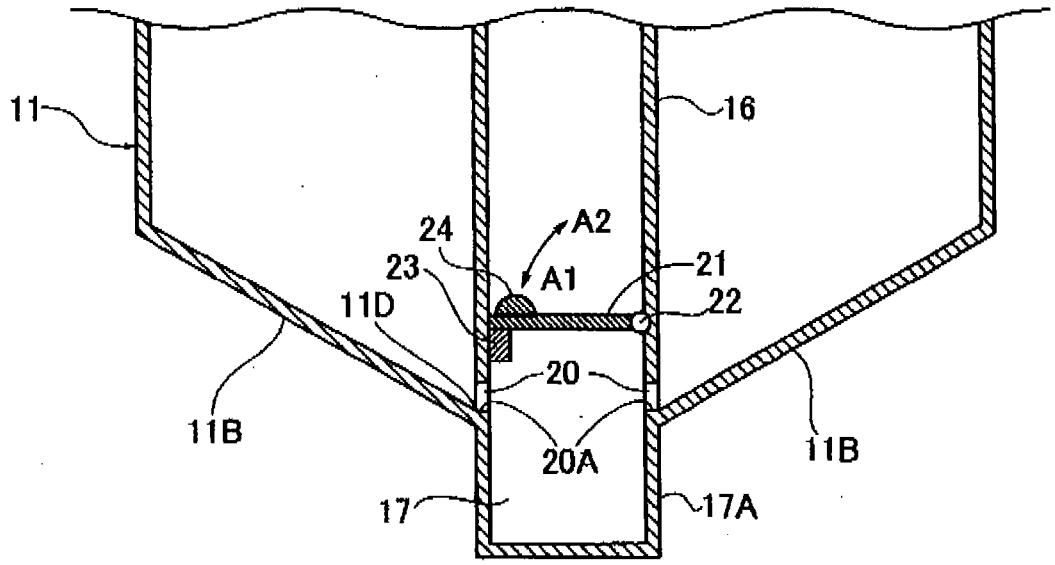

FIG.3B

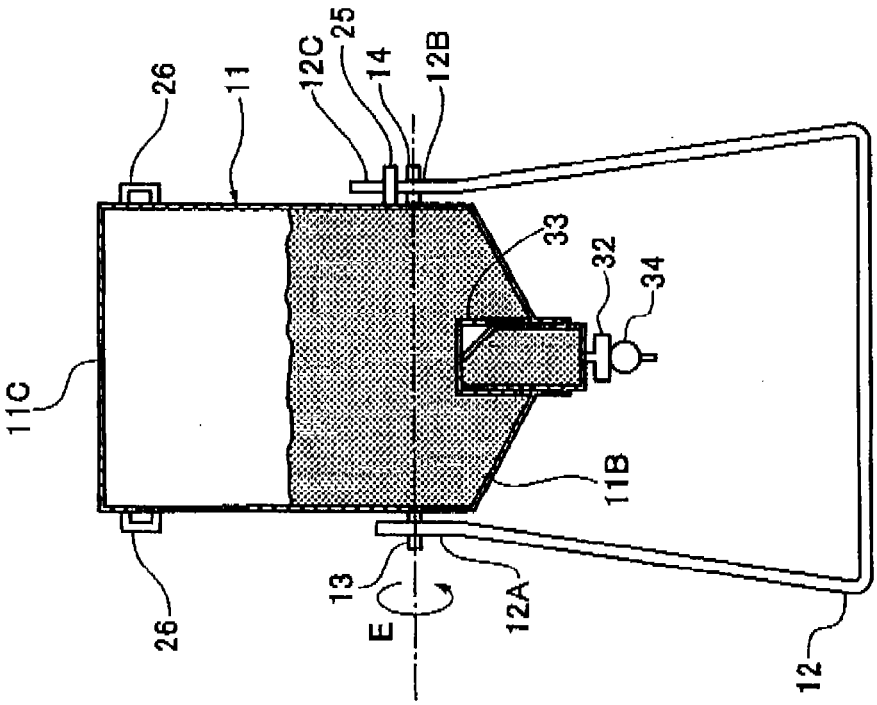
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FIG.3A

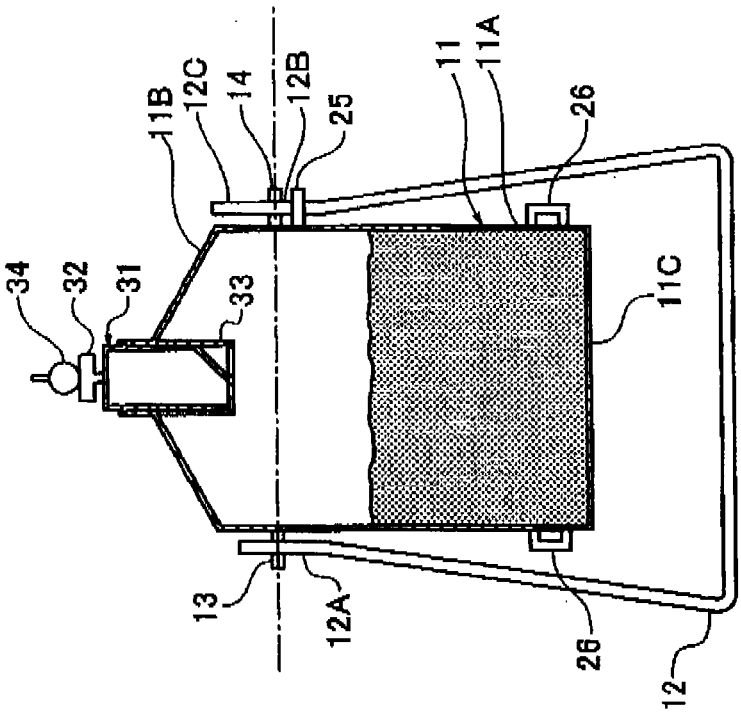
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FIG.4

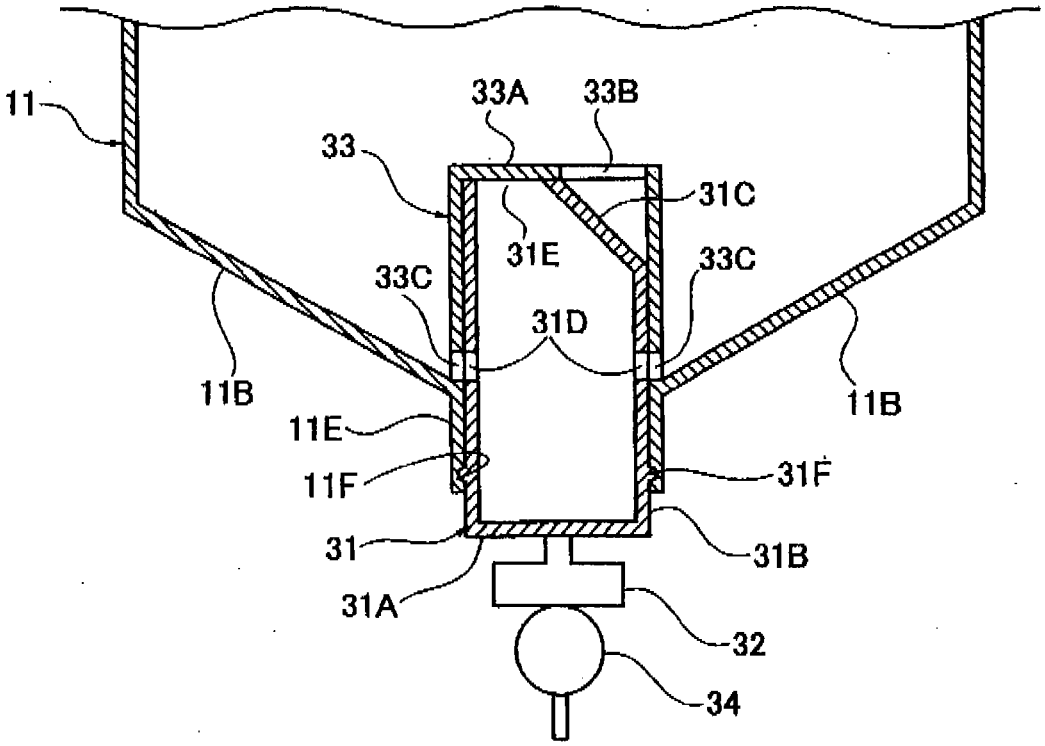
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FIG.5

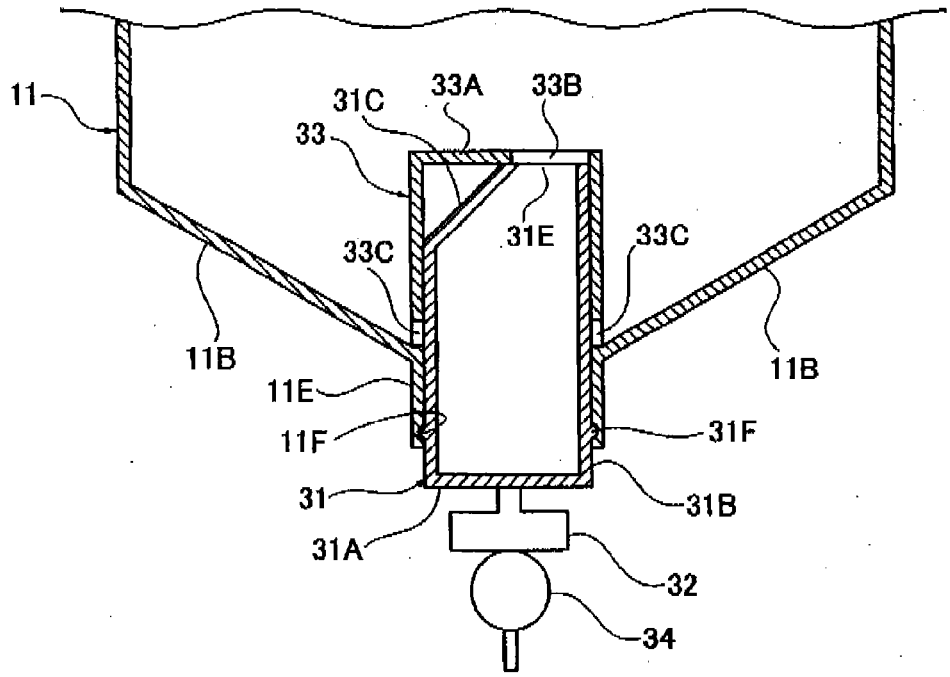

FIG.6

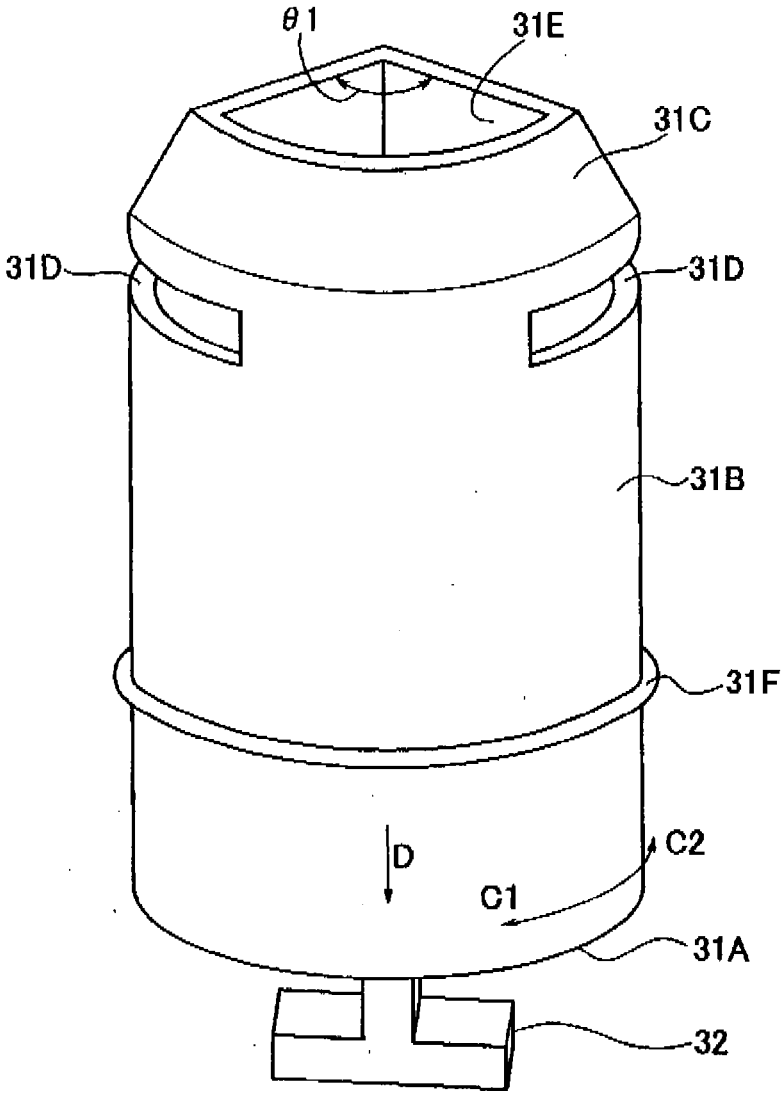

FIG.7

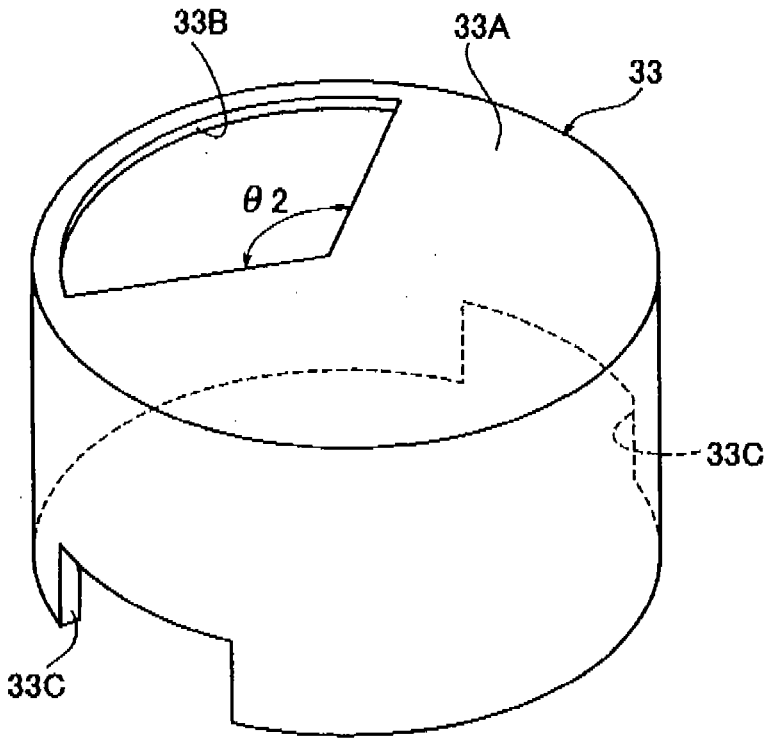

FIG.8

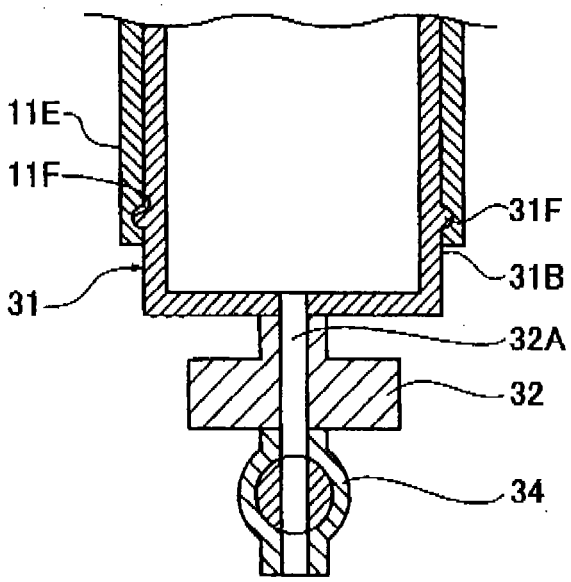

FIG.9

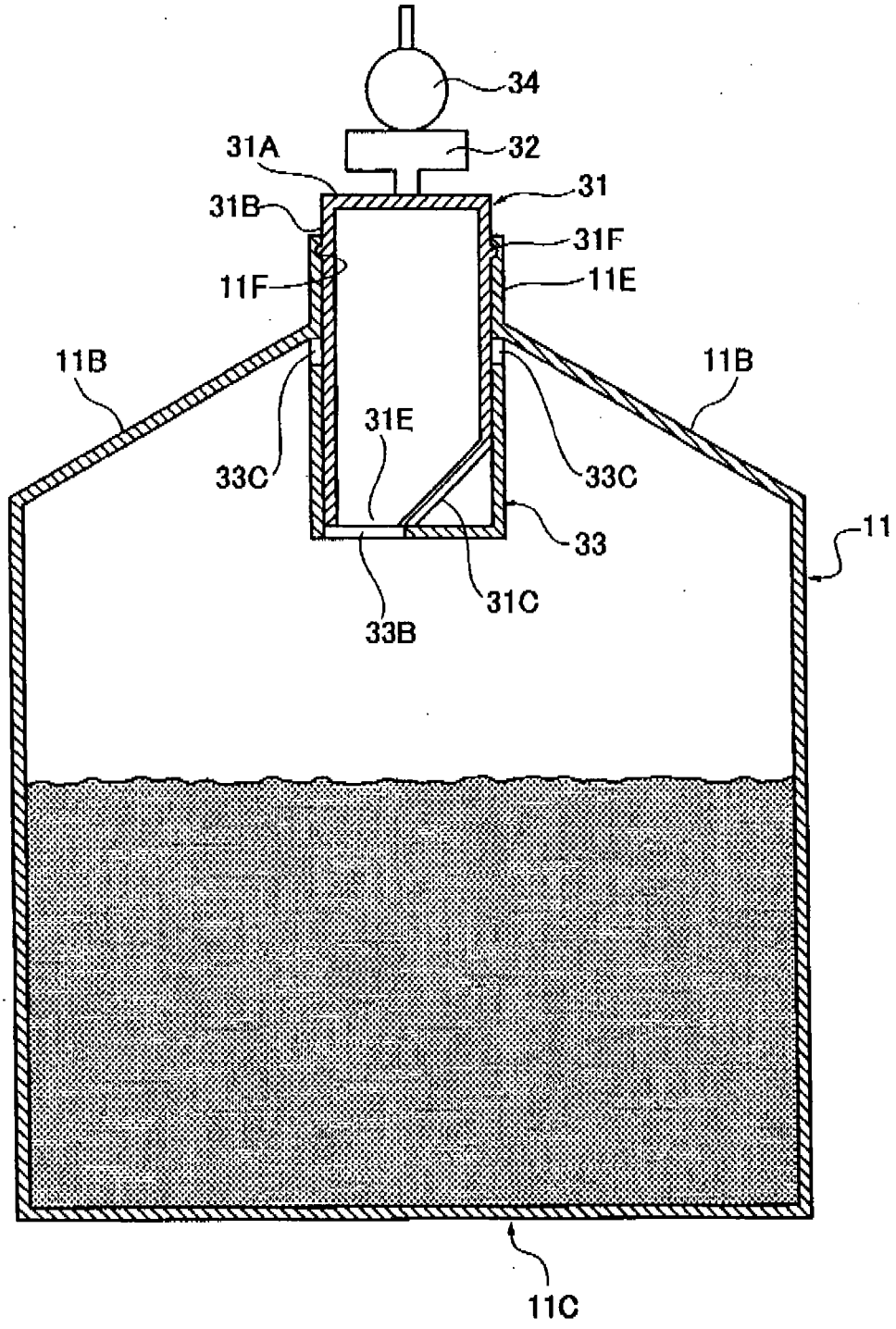

FIG.10A

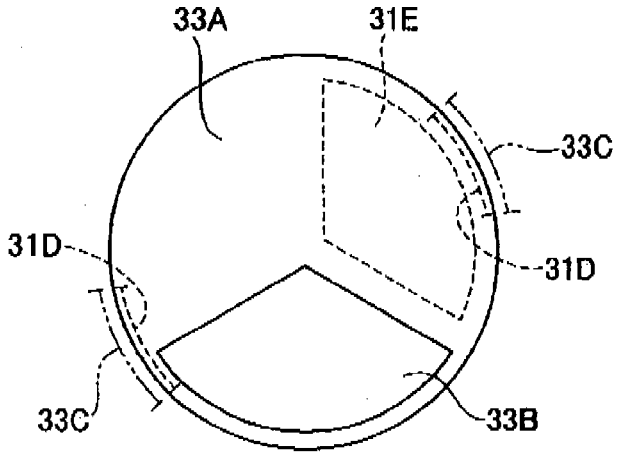

FIG.10B

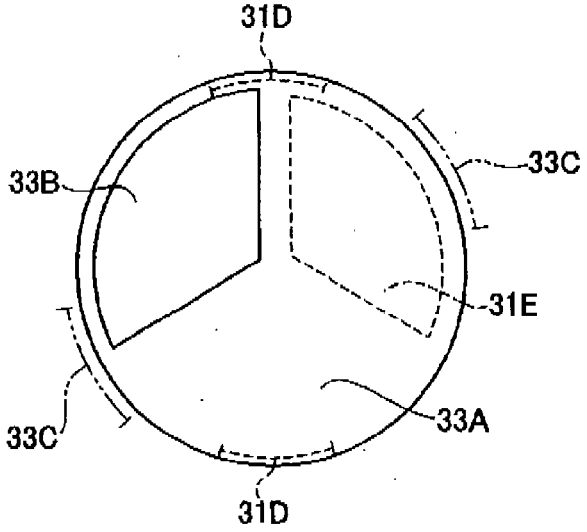

FIG.10C

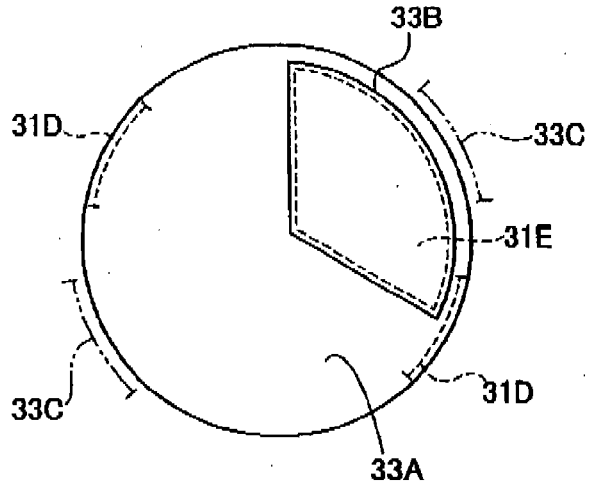

FIG.11A

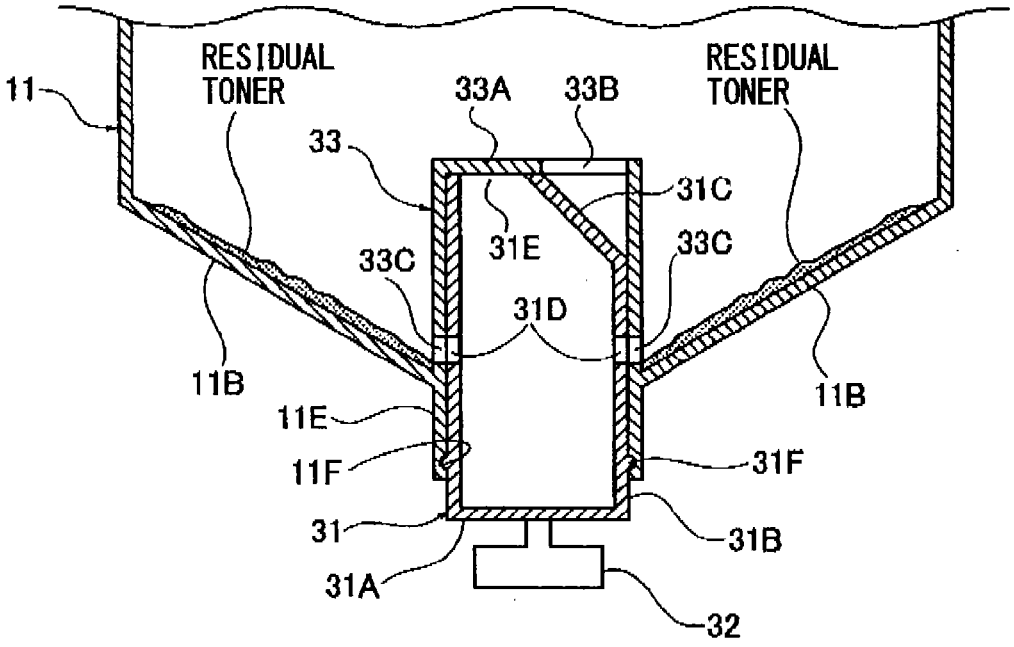

FIG.11B

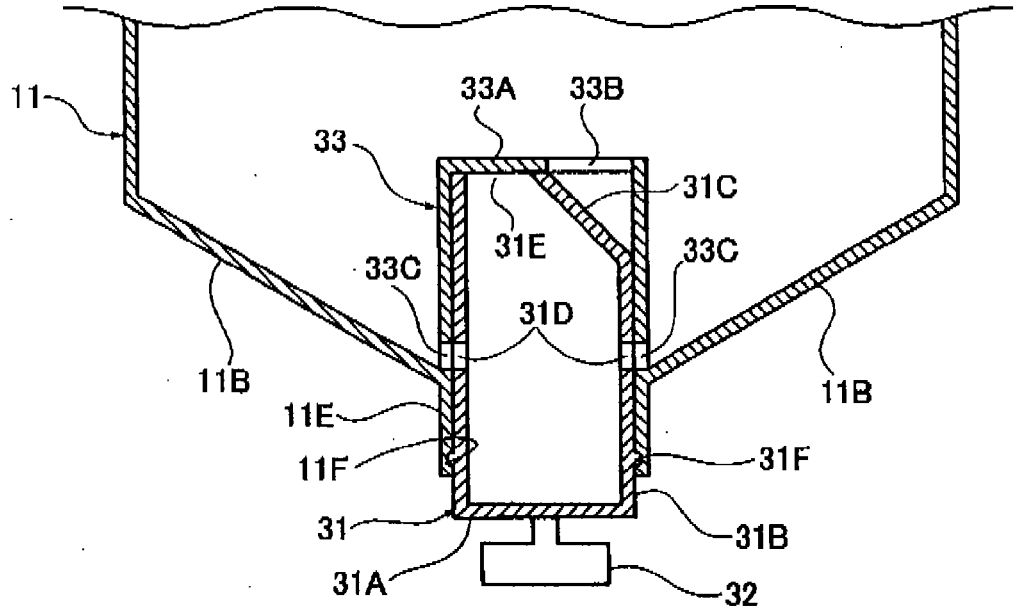

FIG.12A

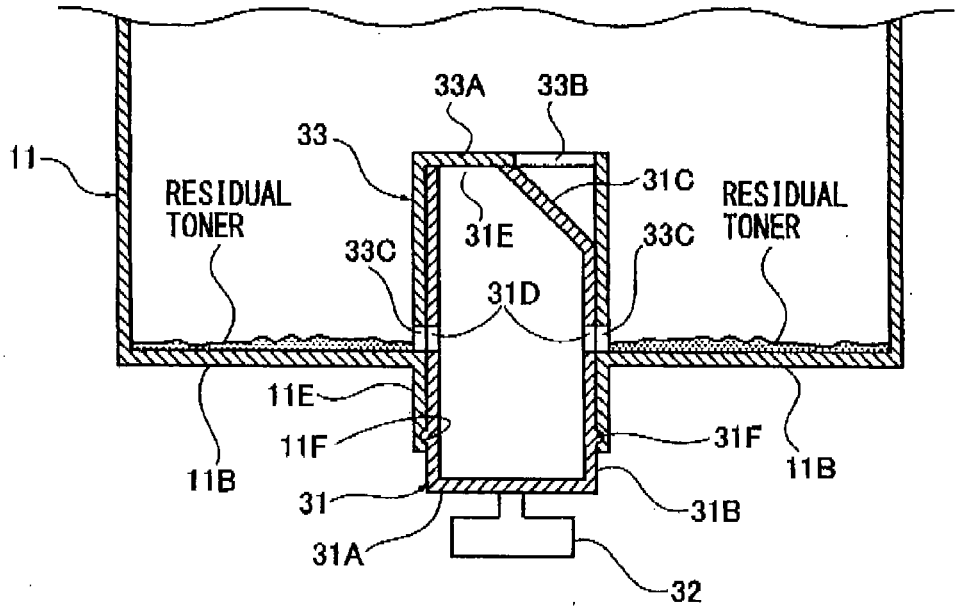

FIG.12B

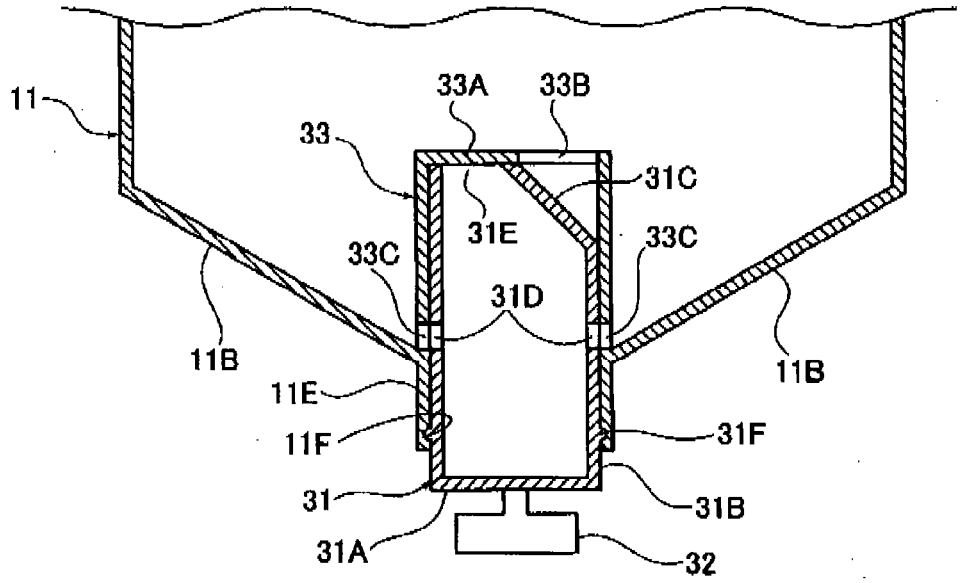

FIG.13A

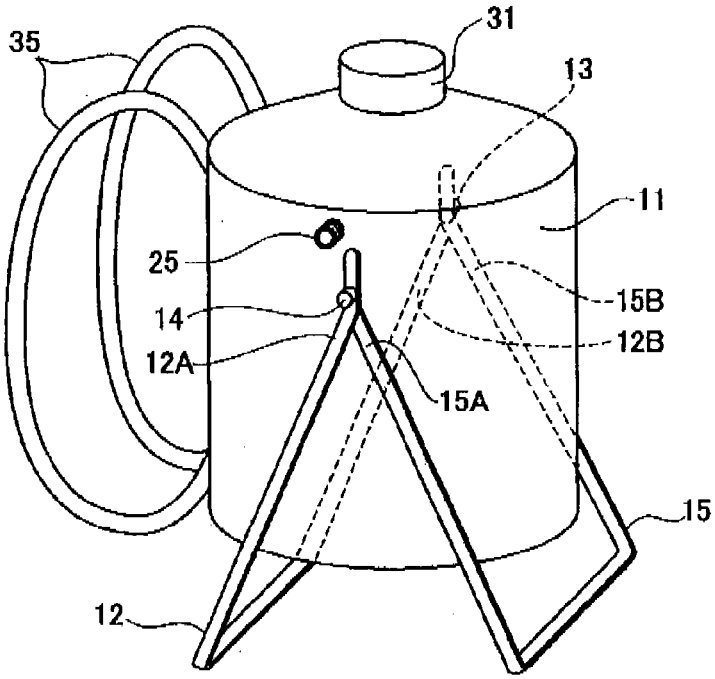

FIG.13B

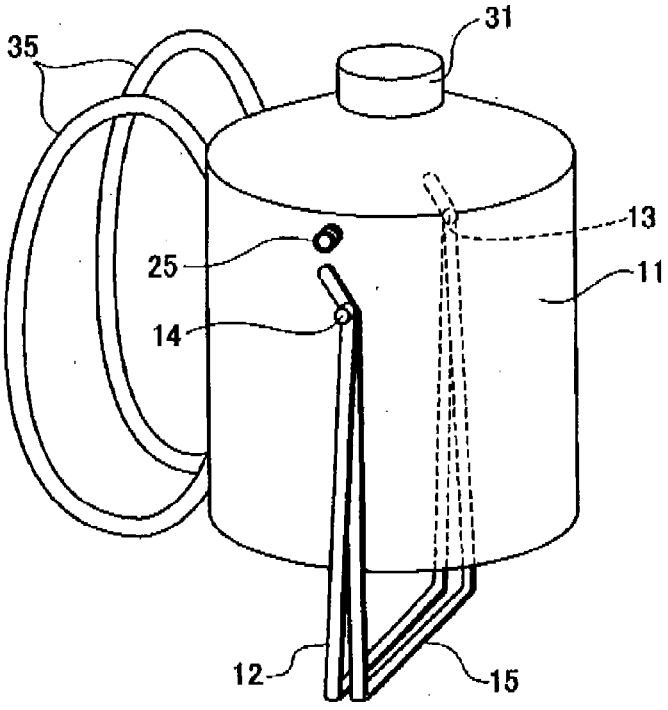

FIG.14

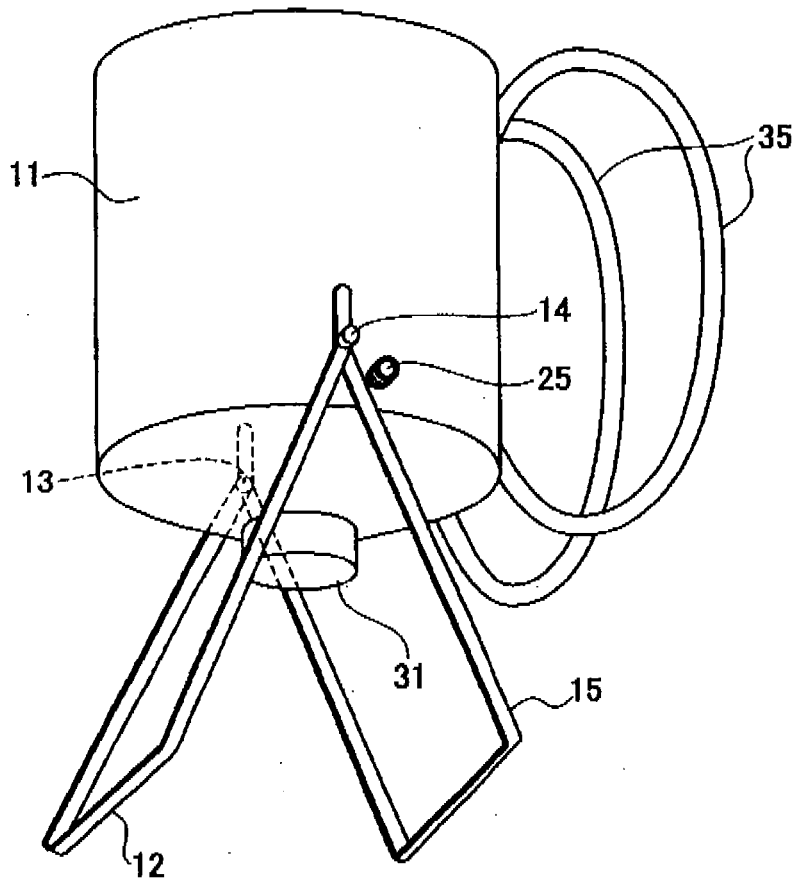

FIG.15

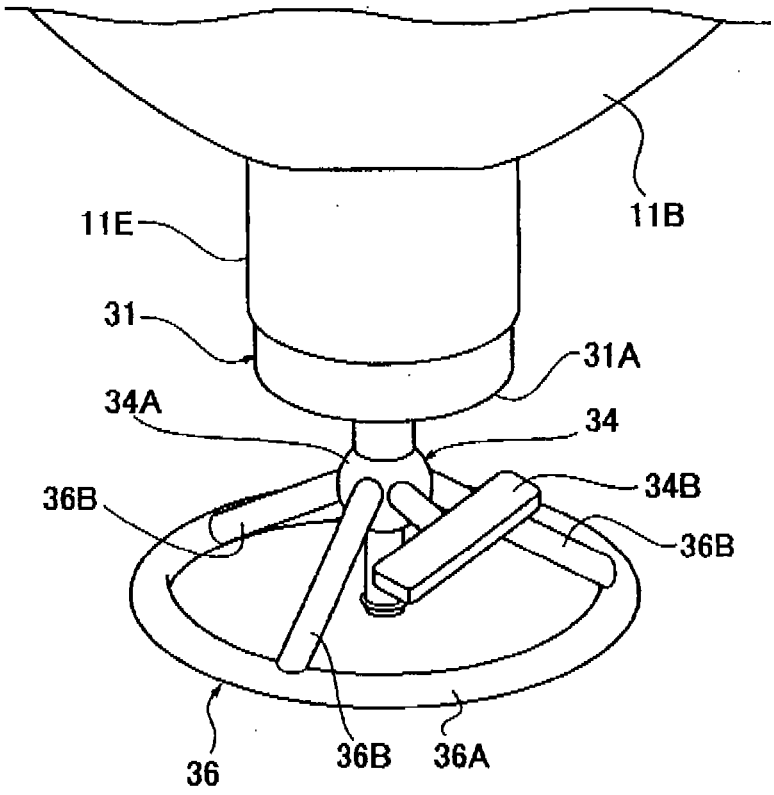

FIG.16A

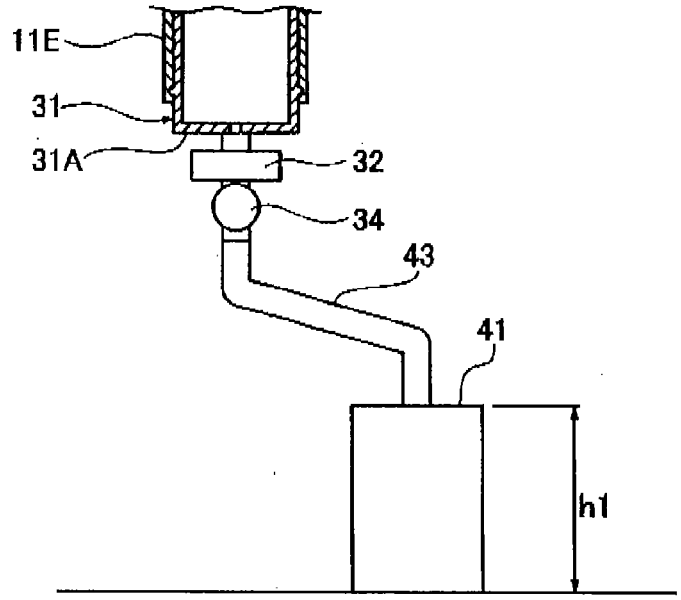

FIG.16B

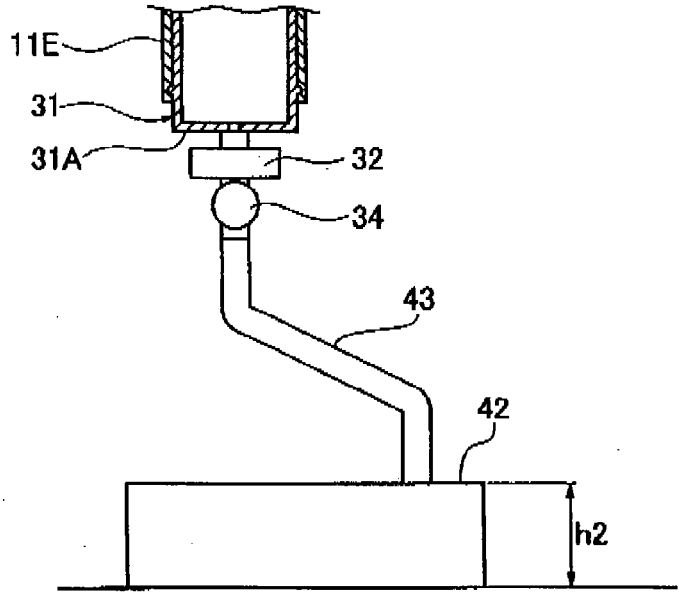

FIG.17

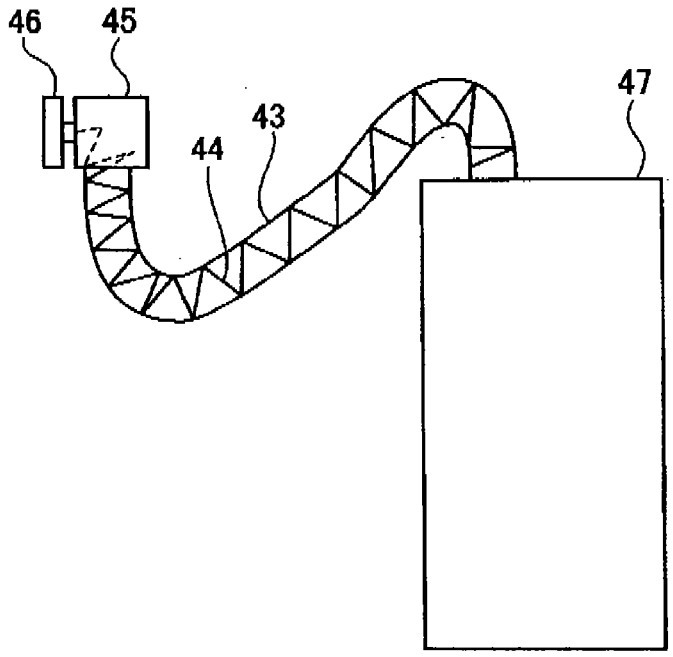

FIG.18A

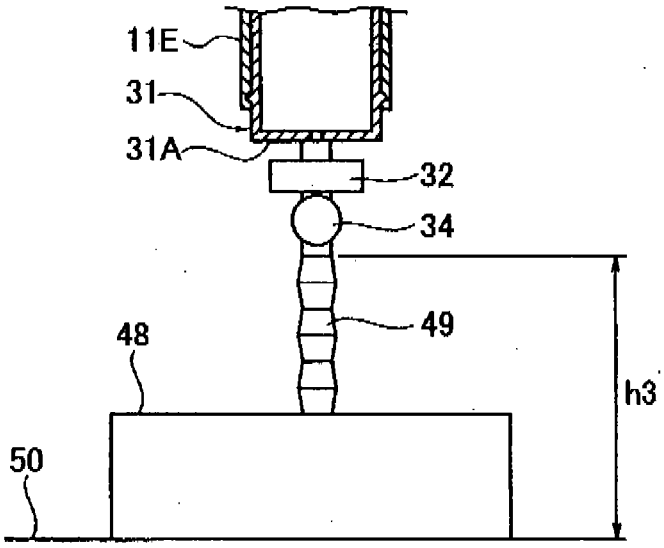

FIG.18B

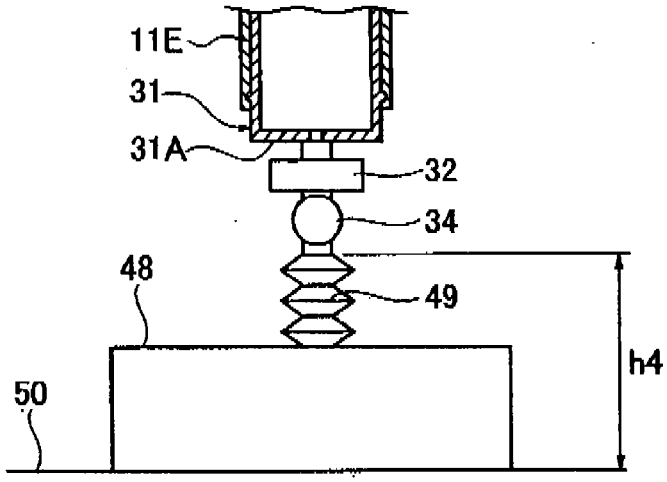

FIG.19

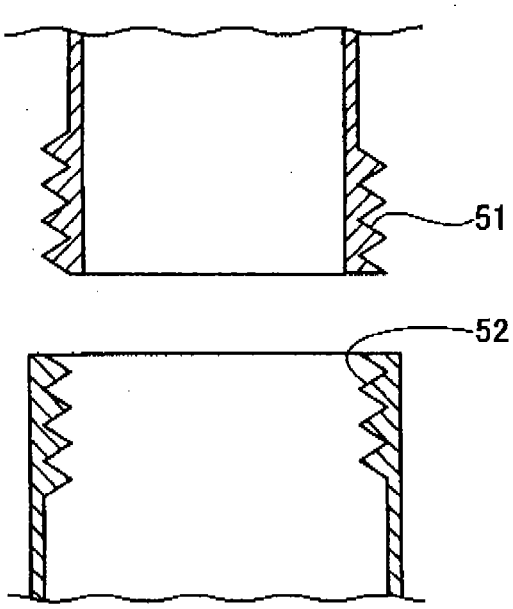

FIG.20

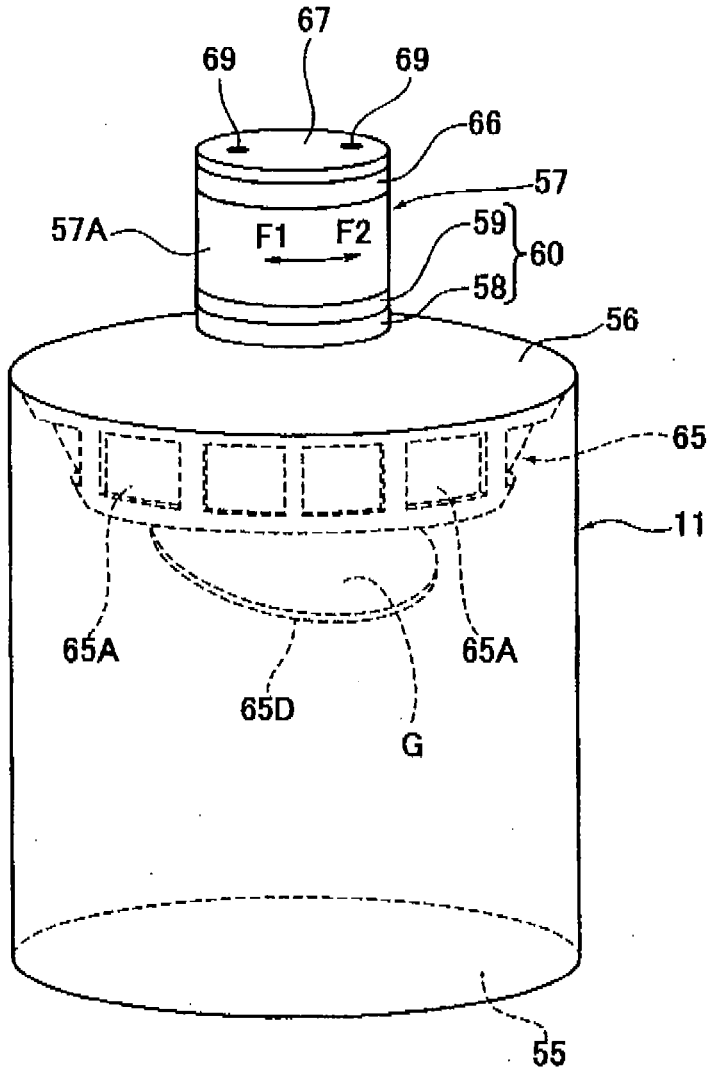

FIG.21

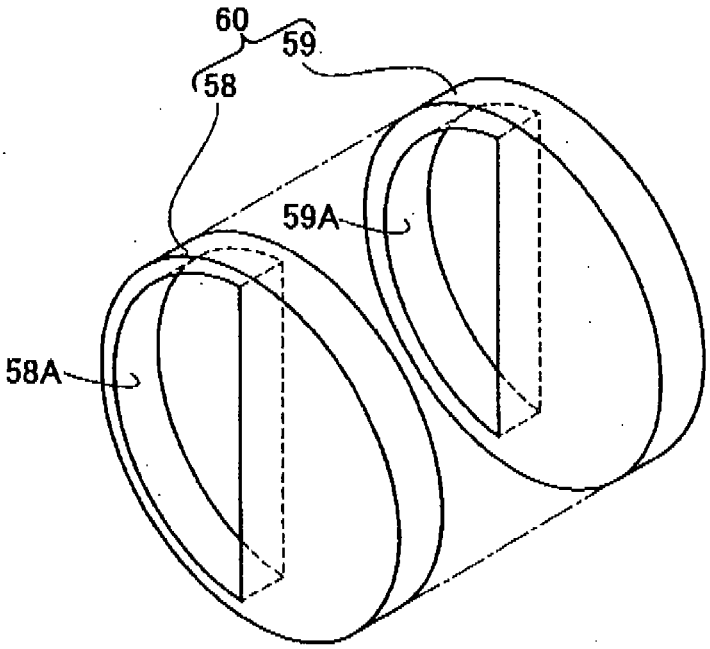

FIG.22

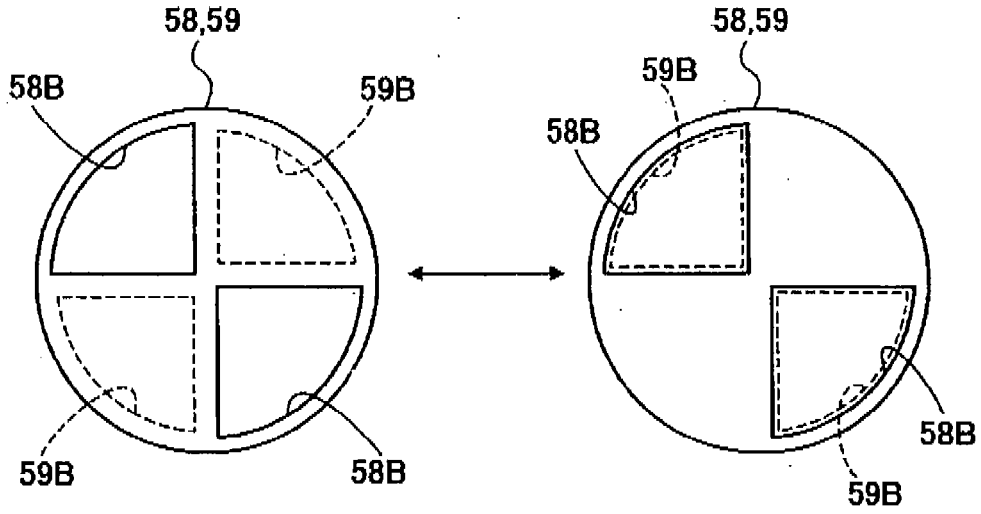

FIG.23

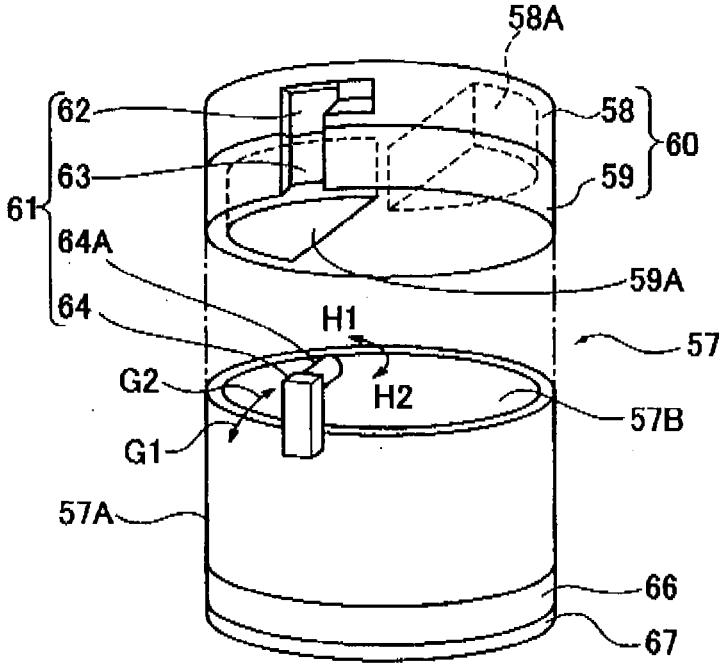

FIG.24A

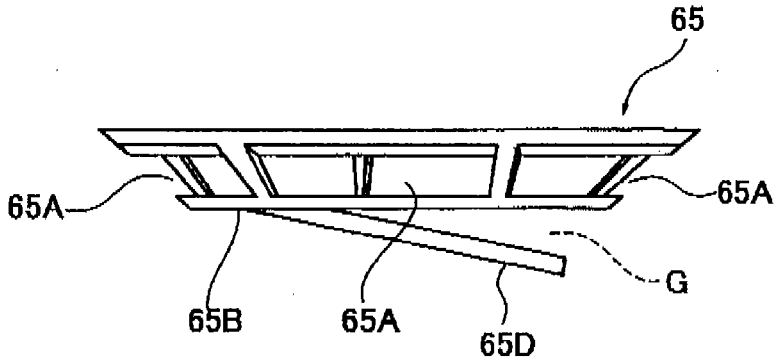

FIG.24B

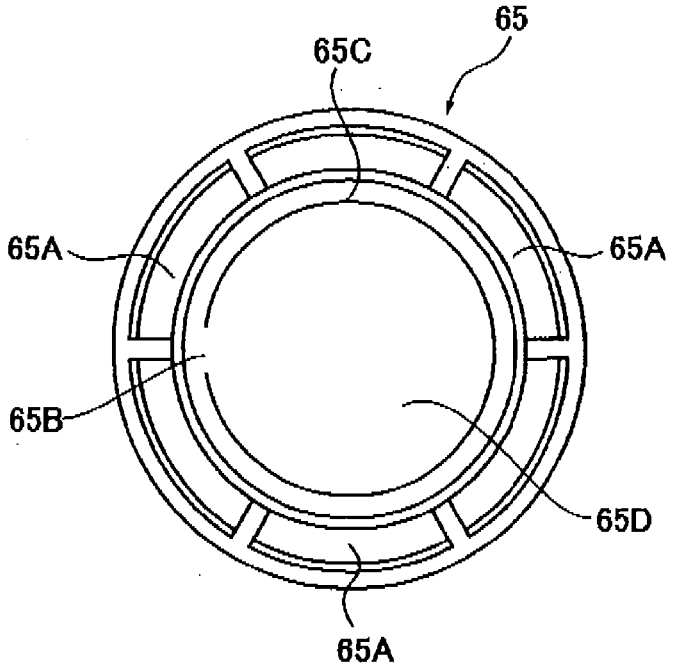

FIG.25

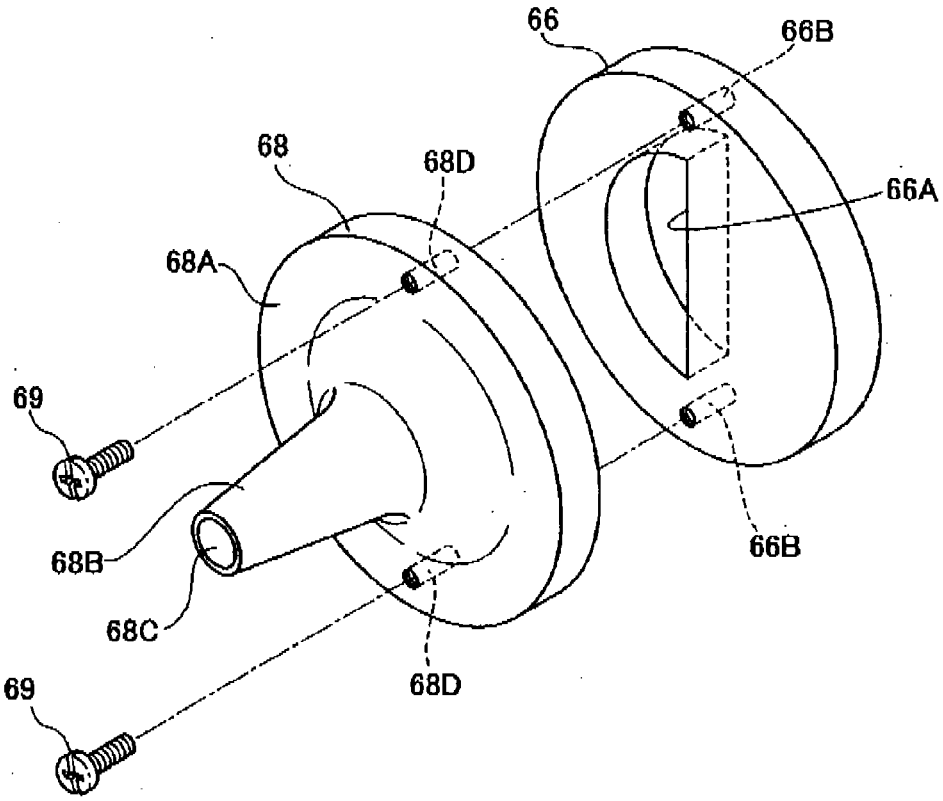
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FIG.26

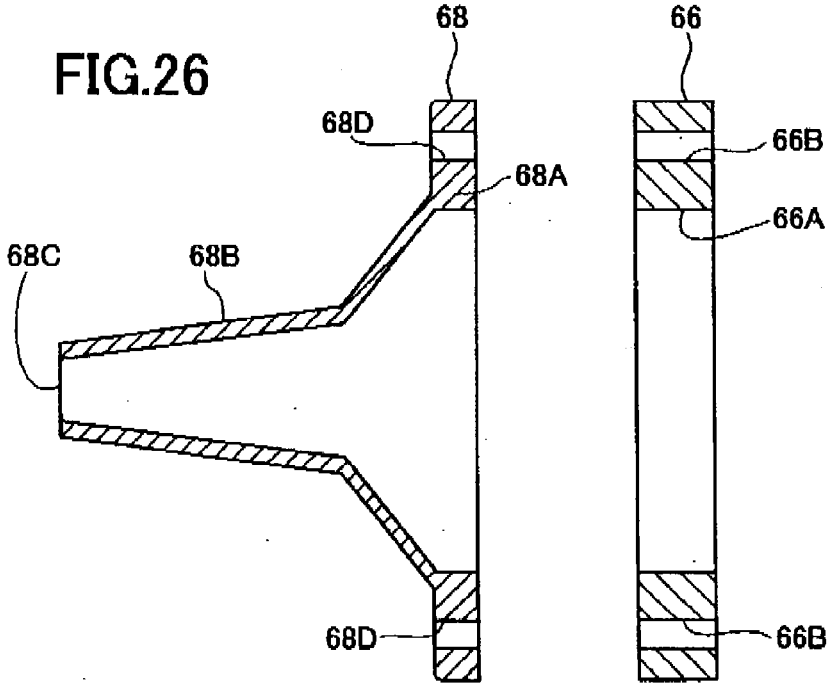
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FIG.27

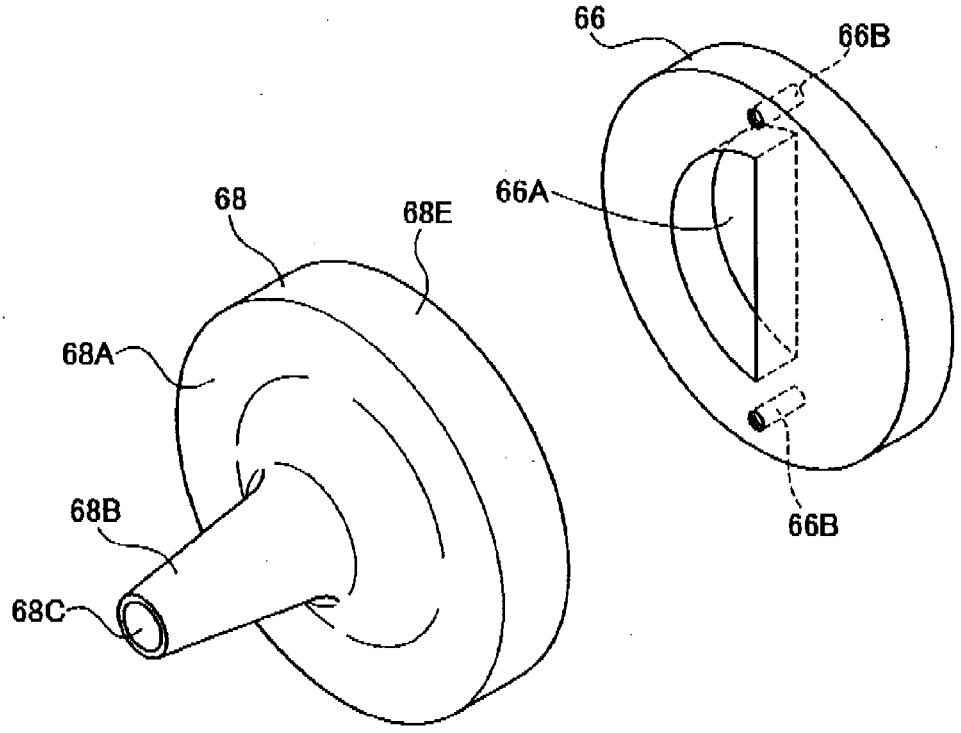
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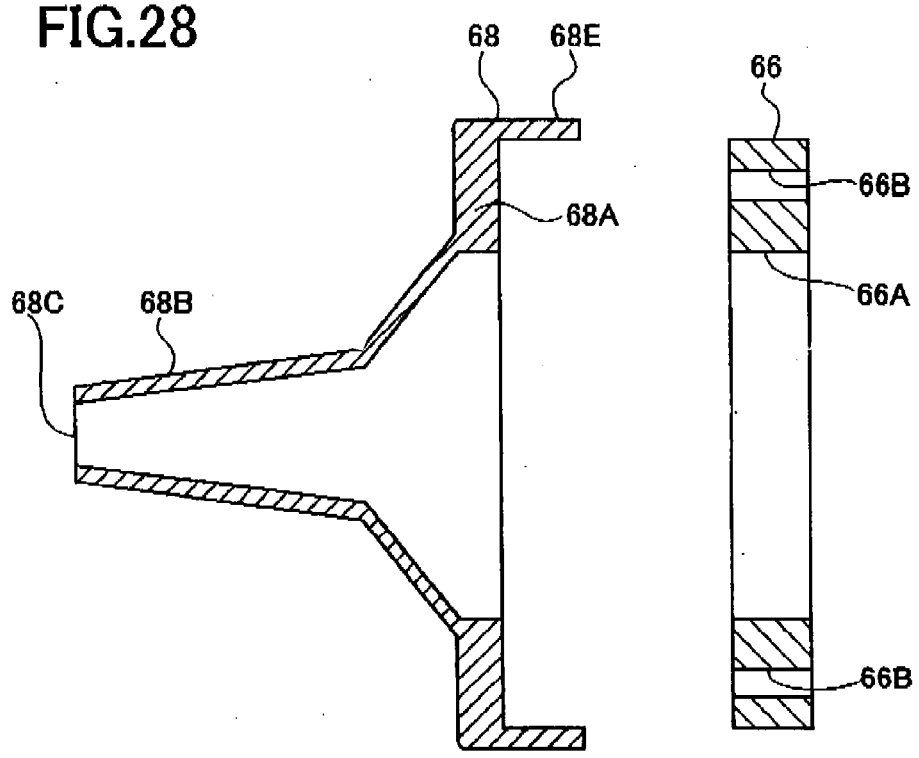
FIG.28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MEDIUM FILLING DEVICE AND METHOD

PRIORITY CLAIM

[0001] The present application is based on and claims priority from Japanese Patent Application No. 2012-065319, filed on Mar. 22, 2012, the disclosure of which is hereby incorporated by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a medium filling device and method for filling an image forming medium such as a toner into a toner container, a toner cartridge, or a process cartridge.

[0004] 2. Description of the Related Art

[0005] There are two kinds of toners for use in an electrophotographic image forming devices, that is, genuine products offered by the manufacturers of the image forming devices and refilled products offered by toner suppliers to users. The latter, the refilled products are more cost-effective for users, therefore, are higher in demand than the former.

[0006] However, in emerging countries there are few suppliers offering refilled products and the transportation infrastructure has not been well developed, so that toner refill products are not available in some areas.

[0007] Japanese Patent Application Publication No. 2005-92100, for example, discloses a toner filling device for a toner container, a toner cartridge, or a process cartridge (hereinafter referred to as a toner container) configured to supply an airflow into a toner filling device to fill a toner container with the toner.

[0008] In addition, Japanese Patent Application Publication No. 2003-104301, for example, discloses a powder filling device configured to introduce a gas into a container containing powder to fluidize powder, and fill a powder container with the fluidized powder.

[0009] However, the above-mentioned filling devices are suitable to fill a larger number of toner containers (or powder containers) with toners in well-equipped working facilities such as a plant, but the devices are so large in scale that the costs required for initial investment are heavy burden on suppliers. Accordingly, the users of image forming devices have to be charged higher filling costs.

[0010] In addition, due to an adequate transportation infrastructure, filling work at facilities such as a plant costs more in some areas, further increasing filling costs. Moreover, the suppliers faces a problem that using a productive large-lot toner filling device is not good for filling a variety of small-lot toner containers and decreases productivity because a large amount of man-hours are required to switch toner types or powder types.

[0011] Another problem is that a large-scale device requires enormous amounts of electricity for operation, which also increases the filling costs.

SUMMARY OF THE INVENTION

[0012] It is an objective of the present invention to provide a medium filling device and method that enables anyone to easily fill a target with an image forming medium anywhere with a simple structure at low cost.

[0013] According to one aspect of an embodiment, a medium filling device includes a container rotatably supported, to contain an image forming medium, a dispenser configured to receive a constant quantity of the image forming medium from the container by a turn of the container, and a discharger configured to discharge the image forming medium from the dispenser to a target.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Features, embodiments, and advantages of the present invention will become apparent from the following detailed description with reference to the accompanying drawings:

[0015] FIGS. **1**A, **1**B are schematic cross sectional view showing the configuration of a toner filling device according to a first embodiment when a container of the toner filling device is inverted and when the container of the toner filling device is erected, respectively;

[0016] FIG. **2** is an enlarged view of neighborhood of a dispenser in the toner filling device of FIG. **1**;

[0017] FIGS. **3**A, **3**B are schematic cross sectional views showing the configuration of a toner filling device according to second embodiment when a container of the toner filling device is inverted and when the container of the toner filling device is erected;

[0018] FIG. **4** is an enlarged view of neighborhood of a dispenser in the toner filling device of FIG. **3**;

[0019] FIG. **5** is an enlarged view of neighborhood of a dispenser in the toner filling device of FIG. **3**, showing an auxiliary container further rotated than that in FIG. **4**;

[0020] FIG. **6** is a perspective view of the auxiliary container;

[0021] FIG. **7** is a perspective view of an inward protrusion provided on the bottom of a container body;

[0022] FIG. **8** is a cross sectional view of the auxiliary container, a handle, and a ball valve;

[0023] FIG. **9** is a cross sectional view of the container body in an erected state;

[0024] FIGS. **10**A, **10**B, and **10**C show positional relations between a suction hole of the inward protrusion and a suction hole of the auxiliary container and between an outlet hole of the auxiliary container and an outlet hole of the inward protrusion;

[0025] FIGS. **11**A, **11**B show the container body including residual toner and the same including no residual toner according to the second embodiment, respectively;

[0026] FIGS. **12**A, **12**B show another feature of the container body including residual toner and including no residual toner according to the second embodiment, respectively;

[0027] FIG. **13**A is a perspective view the container body having a carrying assistance member when legs are extended, and FIG. **13**B is a perspective view of the same when the legs are folded;

[0028] FIG. **14** is a perspective view of the container body inverted;

[0029] FIG. **15** is a perspective view of another example of the toner filling device according to the second embodiment;

[0030] FIGS. **16**A, **16**B show a flexible hose according to a third embodiment for use in filling toner when the height of a filling target is high and when the height of a filling target is low, respectively;

[0031] FIG. **17** shows an example of a coiled spring inserted into the flexible hose;

[0032] FIGS. **18**A, **18**B show an example of a bellows type hose when the ball valve is positioned high from a floor surface and when the ball valve is positioned low from the floor surface, respectively;

[0033] FIG. **19** is a cross sectional view of a screw portion connecting the flexible hose or the bellows type hose with a tip end of the ball valve;

[0034] FIG. **20** is a perspective view of a container body according to a fourth embodiment;

[0035] FIG. **21** is an exploded perspective view of an opening/closing mechanism;

[0036] FIG. **22** is a view of another example of the opening/closing mechanism;

[0037] FIG. **23** is a detailed exploded perspective view of the auxiliary container.

[0038] FIG. **24**A is a front view of a regulation member and FIG. **24**B is a bottom view thereof;

[0039] FIG. **25** is an exploded perspective view of a discharge regulation plate and a toner filler;

[0040] FIG. **26** is a cross sectional view of the discharge regulation plate and the toner filler.

[0041] FIG. **27** is an exploded perspective view of another example of the discharge regulation plate and the toner filler; and

[0042] FIG. **28** is a cross sectional view of the discharge regulation plate and the toner filler in FIG. **27**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0043] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts. Note that the toner is used as an image forming medium in the following descriptions of the present embodiments.

First Embodiment

[0044] FIGS. **1**A, **1**B are schematic cross sectional view showing the configuration of a toner filling device according to a first embodiment when a container of the toner filling device is inverted and when the container of the toner filling device is erected, respectively.

[0045] A container body **11** is comprised of a main portion **11**A as a bottomed cylinder and a cone portion **11**B above the main portion **11**A. The container body **11** is held at two locations on its sides by stainless legs **12**. Specifically, supporting shafts **13**, **14** are fixed to the sides of the main portion **11**A of the container body **11**, and one end **12**A of the legs **12** is rotatably attached to the supporting shaft **13** while the other end **12**B of the legs **12** is rotatably attached to the supporting shaft **14**.

[0046] In addition to the legs **12**, stainless legs **15** (see FIG. **13** and FIG. **14**) are also attached to the supporting shafts **13**, **14**. Likewise, one end **15**A of the legs **15** is rotatably attached to the supporting shaft **13** while the other end **15**B is rotatably attached to the supporting shaft **14**. Note that the container body as a whole is made of an ABS material.

[0047] The supporting shafts **13**, **14** are arranged on opposed sides, placing the container body **11** therebetween. The legs **12**, **15** are U-shaped with L-folded portions on the bottom side. Then, width L**1** of the bottom side is set larger than that L**2** of a top side (width between the one end **12**A and the other end **12**B of the legs **12**). In addition, the supporting shafts **13**, **14** as the rotation center of the container body **11** are arranged above the center of gravity of the container body **11** while the container body **11** is erected.

[0048] The container body **11** includes, at the center of in vertical direction, a cylindrical member **16** provided with a dispenser **17** and a discharger **18**. With the container body **11** inverted, the dispenser **17** is located on the bottom side of the container body **11**, and the discharger **18** is located on the top side of the container body **11**. The dispenser **17** is shaped of a cylinder having a bottom closed. The discharger **18** is formed to have a tapered top portion of which a ball valve **19** is attached to a tip end.

[0049] The discharger **17** penetrates an end of the cone portion **11**B of the container body **11** and is integrally formed with the cone portion **11**B (see FIG. **2**). The discharger **18** also penetrates a bottom wall **11**C of the container body **11** and is integrally formed with the bottom wall **11**C.

[0050] FIG. **2** is an enlarged view of neighborhood of a dispenser in the toner filling device of FIG. **1**. A peripheral wall **17**A is integrally formed with the cone portion **11**B of the container body **11**. Specifically, the end of the cone portion **11**B is closely placed on the peripheral wall **17**A of the dispenser **17**. Then, several inflow holes **20** are formed around a portion of the peripheral wall **17**A of the dispenser **17** in close contact with the cone portion **11**B. The inflow holes **20** are designed to allow a toner to flow from the container body **11** into the dispenser **17**. It includes a base **20**A to be flush with a top surface **11**D of the cone portion **11**B of the container body **11** at the portion in close contact with the cone portion **11**B is placed closely.

[0051] The discharger **17**A comprises a check valve **21** on the top portion. The check valve **21** is formed of a circular plate one lateral side of which (right side in FIG. **2**) is attached to an inner peripheral wall of the cylindrical member **16** through a hinge **22**. Also, a stopper **23** is attached to an opposite side of the inner peripheral wall, facing the hinge **22**. This makes the check valve **21** rotatable in A**1** and A**2** directions. Then, when rotating in the A**1** direction, the check valve **21** abuts the stopper **23** to block communications of the interior of the dispenser **17** with that of the cylindrical member **16**, or the valve becomes closed. When rotating in the A**2** direction, the check valve **21** allows the communication of the interior of the dispenser **17** with the interior of the cylindrical member **16**, or the valve becomes opened. Note that the check valve **21** is provided with a weight **24** on a surface opposite to the surface abutting the stopper **23**.

[0052] As shown in FIG. **1**, the container body **11** further includes a bar-like holder **25** protruding in the vicinity of the supporting shaft **14** on the lateral side. The holder **25** abuts an extended portion **12**C to hold the container body in the inverted state. The extended portion **12**C extends from the other end **12**B of the leg **12**. Note that two handles **26** for an operator to manually rotate the container body **11** are provided on the lateral sides of the container body **11**.

[0053] The operation of the toner filling device according to the present embodiment will be described as follows.

[0054] Normally, the container body is placed in an erected state, as shown in FIG. **1**B. Note that although FIG. **1**B shows a toner indicated by shading in the discharger **18**, no toner is normally present in the discharger **18** when the container body **11** is carried or stored.

[0055] First, for filling a target with a toner, as shown in FIG. **1**A, the container body **11** is turned to be inverted. Then, the toner flows from the container body **11** into the dispenser **17** through the inflow hole. The dispenser **17** is set to have a constant capacity to flow a constant quantity of the toner into the dispenser **17**. In the present embodiment, owing to the

weight **24**, in particular, the check valve is prevented from opening, even if the toner in the dispenser **17** is applied with pressure from the toner in the container body **11** by its own weight. Consequently, the quantity of the toner in the dispenser **17** can be constantly maintained.

[0056] Next, the container body **11** is turned as indicated by arrow B in FIG. **1**B. Then, owing to the weight **24**, the check valve **21** rotates in the A**2** direction in FIG. **2** around the hinge **22** and is opened, as shown in FIG. **1**B. Consequently, the toner drops into the discharger **18** from the dispenser **17** due to its own weight through the cylindrical member **16** and is accumulated in the discharger **18**. Then, the toner can be filled into a target from the discharger **18** by connecting the tip end of the ball valve to the target and opening the ball valve.

[0057] Thus, according to the present embodiment the toner is flowed from the container body into the dispenser **17** by increments by rotating the container body **11** to be in the inverted state from the erected state. Then, by turning the container body **11** from the inverted state to the erected state, the toner is transferred from the dispenser **17** into the discharger **18** to fill a target. Accordingly, this is a very simple operation for anyone with no experience in any place to smoothly fill the target with the toner.

Second Embodiment

[0058] FIG. **3** shows a toner filling device according to a second embodiment. The same symbols are assigned to same parts as the first embodiment, and a detailed description thereof will be omitted.

[0059] This embodiment differs from the first embodiment in the structure to flow a constant quantity of toner from the container body **1** and discharge the toner to a target. Specifically, the device additionally comprises an auxiliary container **31** as a dispensing discharger on an upper tip end of a cone portion **11**B of the container body **11** when the container body **11** is erected.

[0060] As shown in FIG. **4**, a cylindrical outward protrusion **11**E is formed on the tip end of the cone portion **11**B of the container body **11**. The auxiliary container **31** is fitted into the outward protrusion **11**E.

[0061] In FIG. **4**, the auxiliary container **31** is comprised of a cylindrical main portion **31**B having a bottom wall **31**A and a tapered portion **31**C above the main portion **31**B. As shown in FIG. **6**, the main portion **31**B includes two inlet holes **31**D in the side walls and the tapered portion **31**C includes a fan-like outlet hole **31**E in a top end. A center angle θ**1** of the fan-like outlet hole **31**E is 120 degrees. Here, the inlet holes **31**D are intended to flow the toner from the container body **11** into the dispensing discharger while the outlet hole **31**E is intended to flow remaining toner from the auxiliary container **31** to the container body **11**. The two inlet holes **31**D are provided on opposed sides, placing a center shaft of the auxiliary container **31** therebetween.

[0062] In addition, the auxiliary container **31** includes a projection **31**F on the entire outer circumference of the main portion **31**B. The projection **31**F is fitted into a groove **11**F formed on the inner circumference of the outward protrusion **11**E when the auxiliary container **31** is fitted into the outward protrusion **11**E of the container body **11**. Thereby, when fitted into the outward protrusion **11**E, the auxiliary container **31** is easily rotated around the center shaft (arrow C**1**, C**2** directions) while it is not easily moved in a direction along the center shaft (arrow D direction). Specifically, this makes it difficult for the auxiliary container **31** to come off from the outward protrusion **11**E. In replace of the projection **31**F or the groove **11**F, a female screw and a male screw are formed on the inner circumference of the outward protrusion **11**E and on the outer circumference of the auxiliary container **31**, respectively, to engage them.

[0063] A T-shaped handle **32** is provided on the bottom wall **31**A to allow an operator to easily rotate the dispensing discharger in the arrow C**1** and C**2** directions by a manual manipulation of the handle.

[0064] FIG. **7** is a perspective view of an inward protrusion **33** provided on an inner end of the cone portion **11**B of the container body **11**. The inward protrusion **33** protrudes towards the inside of the container body **11** and is of a cylindrical shape with one end (top surface side in the figure) closed. The other end of the inward protrusion **33** is opened and bonded to the end of the cone portion **11**B of the container body **11**. The inward protrusion **33** is integrally formed with the container body **11**.

[0065] The inward protrusion **33** includes on the one end a blocking wall **33**A which includes a fan-like outlet hole **33**B. A center angle θ**2** of the fan-like outlet hole **33**B is 120 degrees. Further, the inward protrusion **33** includes two inlet holes on the peripheral wall closer to the open end. The inlet holes **33**C are formed on the opposed sides, placing a center shaft of the inward protrusion **33** therebetween. The outlet hole **33**B has almost the same shape as the outlet hole **31**C of the tapered portion **31**C of the auxiliary container **31**. The inlet holes **33**C have an almost same shape as the outlet hole **31**E of the main portion **1**B of the auxiliary container **31**.

[0066] Then, the inlet holes **33**C of the inward protrusion **33** and the inlet hole **31**D of the auxiliary container **31** are formed so that their bases match when the auxiliary container **1** is completely fitted into the outward protrusion **11**E and the inward protrusion **33**.

[0067] As shown in FIG. **8**, the handle **32** includes a toner passage **32**A at the center part connected to the ball valve **34** attached to the handle **32**.

[0068] The operation of the toner filling device according to the present embodiment will be described as follows:

[0069] The container body **11** is normally placed in an erected state in storage or when carried as shown in FIG. **3**B. For filling a target with a toner, first, as shown, the container body **11** is turned in arrow E direction to be inverted in FIG. **3**B. Then, by a further manipulation of the handle **32** the auxiliary container **31** is rotated in the arrow C**1**, C**2** directions, so that the inlet hole **31**D of the auxiliary container **31** matches the inlet hole **33**C of the inward protrusion **33**. Then, the toner (a shaded part) flows from the container body **11** into the auxiliary container **31** through the inlet hole **33**C and the inlet hole **31**D.

[0070] When the toner flow into the auxiliary container **31** has completed, the auxiliary container **31** is rotated in either of the arrow C**1** and C**2** directions by 120 degrees with the handle **32** to deflect the inlet hole **31**D of the auxiliary container **31** from the inlet hole **33**C of the inward protrusion **33**. The auxiliary container **31** is set to have a constant capacity and flow a constant quantity of toner into the auxiliary container **31**.

[0071] As described above, the handle **32** includes the toner passage **32**A at the center connected to the ball valve **34** attached to the handle **32**. Then, for filling a not-shown target with the toner in the auxiliary container **31**, the tip end of the ball valve **32** is connected to the target and opened to flow the

toner from the auxiliary container **31** into the target and fill it with the constant quantity of toner.

[0072] When the filling of the target with the toner is completed, the ball valve **34** is closed. The handle **32** is further rotated by 120 degrees so that the outlet hole **31**E of the auxiliary container **31** matches the outlet hole **33**B of the inward protrusion **33**. The container body is then rotated in a direction opposite to the arrow E direction of FIG. **3** to be brought into the erected state. Then, the remaining toner in the auxiliary container **31** drops into the container body **11** through the outlet hole **31**E and the outlet hole **33**B due to its own weight.

[0073] In filling the target with the toner from the auxiliary container **31**, the toner may not be completely discharged but may slightly remain in the auxiliary container **31**. However, allowing the outlet hole **31**E to match the outlet hole **33**B enables any remaining toner in the auxiliary container **31** to completely flow back to the container body **11**.

[0074] FIGS. **10**A to **10**C show a positional relation between the inlet hole **33**C of the inward protrusion **33** and the inlet hole **31**D of the auxiliary container **31** and that between the outlet hole **31**E of the auxiliary container **31** and the outlet hole **31**E of the inward protrusion **33**.

[0075] Specifically, in FIG. **10**A, while the inlet hole **33**C of the inward protrusion **33**C matches the inlet hole **31**D of the auxiliary container **31**, the outlet hole **31**E of the auxiliary container **31** does not match the outlet hole **33**B of the inward protrusion **33**.

[0076] In FIG. **10**B the auxiliary container **31** is turned to the arrow C**1** direction by 120 degrees from that in FIG. **10**A. The inlet hole **33**C of the inward protrusion **33** does not match the inlet hole **31**D of the auxiliary container **31**, and the outlet hole **31**E of the auxiliary container **31** does not match the outlet hole **33**B of the inward protrusion **33**, either.

[0077] In FIG. **10**C the auxiliary container **31** is further rotated to the arrow direction C**1** from that in FIG. **10**B. In FIG. **10**C, while the inlet hole **33**C of the inward protrusion **33** does not match the inlet hole **31**D of the auxiliary container **31**, the outlet hole **31**E of the auxiliary container **31** matches the outlet hole **33**B of the inward protrusion **33**.

[0078] According to the present embodiment, by turning the container body **11** to be in the inverted state from the erected state, the toner flows from the container body into the auxiliary container **31** by increments. Then, the target can be filled with the toner in the auxiliary container **31** by opening the ball valve **34**. Hence, this is a very simple operation for anyone with no experience in any place to smoothly fill the target with the toner.

[0079] FIG. **11** shows the features of a toner filling device according to the present embodiment. Specifically, as shown in FIG. **11**A, a bottom side of the inlet hole **33**C of the inward protrusion **33** is located slightly above a bottom side of the inlet hole **31**D of the auxiliary container **31**. This may create a problem that a small amount of toner remaining in the container body **11** is blocked by the inlet hole **31**D of the toner filling container **31** from flowing. As a result, a very small amount of the toner remains in the container body **11**.

[0080] Meanwhile, as shown in FIG. **11**B, in the present embodiment the base of the inlet hole **33**C of the inward protrusion **33** matches or is flush with that of the inlet hole **31**D of the auxiliary container **31**, so that the toner even in a small amount in the container body **11** is not blocked by the inlet hole **31**D of the auxiliary container **31**. No toner remains in the container body **11** accordingly.

[0081] FIG. **12** shows another feature of the toner filling device according to the present embodiment. Specifically, in FIG. **12**A, the face of the container body **11** on which the auxiliary container **31** is provided is flat. In this case a small amount of the toner remaining in the container body **11** remains on the flat surface.

[0082] Meanwhile, as shown in FIG. **12**B, in the present embodiment the cone portion **11**B of the container body **11** is inclined, so that the toner in the container body **11**, even in a small amount, easily flows along the inner surface of the cone portion **11**B. Thus, no toner remains in the container body **11**.

[0083] FIG. **13** is a perspective view of a carrying assistance member **35** provided on the container body **11**. As described above, the two supporting shafts **13**, **14** are fixed on the lateral side of the container body **11**, and the legs **12**, **15** are rotatably attached to the supporting shafts **13**, **14**. Thus, with the legs **12**, **15** rotated so that their bottoms are spaced from each other, as shown in FIG. **13**A, the container body **11** can be stably placed on a floor. In addition, for transportation of the container body **11**, an operator can fold the legs **12**, **15** as shown in FIG. **13**B, easily carry the container body over the shoulders by using the carrying assistance member **35**.

[0084] FIG. **14** shows the legs **12**, **15** spaced apart and the container body **11** stably placed on a floor. In this state the auxiliary container **31** is connected to a target via the ball valve **34** in FIG. **8** to be able to fill the target with the toner from the auxiliary container **31**.

[0085] FIG. **15** shows another example of the present embodiment. In this example a handle **36** and a ball valve **34** are integrally formed. The handle **36** is intended for rotating an auxiliary container **31** in the arrow C**1** and C**2** direction in FIG. **6**. Specifically, the handle **36** is comprised of a ring-shaped grip **36**A, and three stays **36**B on the inner side of the grip **36**A. The three stays **36**B are joined at one end with inner periphery of the grip **36**A and joined at the other end with a valve housing **34**A of the ball valve **34**. The three stays **36**B are inclined upward from the one end to the other end. The ball valve **34** is positioned between the bottom wall **31**A of the auxiliary container **31** and the grip **36**A, which enables an operator to easily manipulate the handle **34**B of the auxiliary container **31**.

Third Embodiment

[0086] The third embodiment describes a mechanism for filling a target with the toner in the auxiliary container **31**. As shown in FIGS. **16**A, **16**B, the auxiliary container **31** includes a handle **32** on a bottom wall **31**A and a ball valve **34** is attached to the handle **32**. Then, a tip end of the ball valve **34** and a target **41** or **42** are connected to each other with a flexible hose **43**. The flexible hose **43** is transparent partially or entirely. In FIG. **16**A the target **41** has a height h**1** while the target **42** has a height **2** (h**1**<h**1**). The target **41** is higher than the target **42**.

[0087] In the present embodiment, an intermediate part of the flexible hose **43** can be gradually tilted for the target with a high height, and steeply tilted for the target **42** with a low height. Thus, the same flexible house **43** can be used for the tip end of the ball valve **34** and the targets **41**, **42**. In addition, due to the partly or entirely transparent flexible hose **43**, it is made possible for an operator to observe how a toner flows in the flexible hose **43**. Additionally, the flexible hose **43** can connect the ball valve **34** and the target **41** or **42** reliably even if there is a slight difference in the diameter of the tip end of the ball valve and a receiving port of the target **41** or **42**.

[0088] The flexible hose **43** in FIG. **17** additionally includes a coiled spring **44**. One end of the flexible hose **43** is connected to a not-shown discharge mechanism **45**, and one end of the coiled spring **44** is internally coupled to a manual rotation member **46**. In addition, the other end of the flexible hose **43** is connected to a target **47**. Note that the discharge mechanism **45** is connected to the auxiliary container **31**.

[0089] When the operator manually rotates the manual rotation member **46**, the coiled spring **44** is rotated as a screw conveyor to carry toner in the flexible hose **43** to the target **47**. In addition, when the flexible hose **43** is bent, the coiled spring **44** in the flexible hose **43** is freely bent along the flexible hose **43**, thus improving operability for connecting the flexible hose **43** to the target **47**.

[0090] In FIGS. **18**A, **18**B the tip end of the ball valve **34** and the target **48** are connected with each other by a bellows type hose **49**. Here, the height where a target **48** is placed, that is to say, a distance from a floor surface **50** where the target **48** is placed to the tip end of the ball valve **34**, is height h**3** in FIG. **18**A and h**4** (h**4**<h**3**) in FIG. **18**B. It is shorter in FIG. **18**B than in FIG. **18**A.

[0091] In the present embodiment, the bellows type hose **49** can be extended long in FIG. **18**A in the long distance h**3**. In FIG. **18**B in a short distance h**3** the bellows type hose **59** can be shrunk. Thus, the same bellows type hose **49** can be used for the tip end of the ball valve **34** and the two targets **48**.

[0092] FIG. **19** shows a connection mechanism between the tip end of the ball valve **34** and the flexible hose **43** or between the tip end of the ball valve **34** and the bellows type hose **49**. A female screw **51** and a male screw **52** are formed on the tip end of the ball valve **34** and on the one end of the flexible hose **43** or the bellows type hose, respectively. By the engagement of the male and female screws **52** and tightening the male screw **5**, the flexible hose **43** or the bellows type hose **49** can be easily attached to the tip end of the ball valve **34**. The flexible hose **43** or the bellows type hose **49** can be detached from the ball valve **34** by disengaging the female screw **52** and the male screw **51**.

Fourth Embodiment

[0093] FIG. **20** is a perspective view of a toner filling device according to a fourth embodiment. In the present embodiment, a container body is of a cylindrical shape with a bottom closed with the bottom wall **55** and a top closed with a cap **56**.

[0094] The container body **11** is made from an ABS material in an overall thickness of 5 mm a height of 40 cm, an outer diameter of 40 cm and an internal capacity of 50 liters. The toner content in the container body **11** is 15 kg at 0.3 g/cc.

[0095] The cap **56** of the container body **11** includes an auxiliary container **57** as a dispensing discharger at the center. The auxiliary container **47** has an auxiliary container body **57**A made from the same ABS material as that of the container body **11**.

[0096] The auxiliary container **57** has an outer diameter of 10 cm and a height of 5 cm, and a capacity of approximately 400 cc. The toner is temporarily transferred from the container body **11** to the auxiliary container body **57**A and then filled into a target such as a toner container, a toner cartridge, or a process cartridge.

[0097] As shown in FIG. **21**, an opening/closing mechanism **60** comprised of opening/closing members **58**, **59** are provided between the auxiliary container body **57**A and the container body **11**. The opening and closing members **58**, **59** are disk-shaped and includes in semi-circular through holes **58**A, **59**A, respectively. The opening/closing member **58** is fixed to the cap **56** so that it does not easily come off from the cap **56**. In addition, the opening/closing member **59** is fixed to the auxiliary container body **57**A so that it does not easily come off from the auxiliary container body **57**A. Furthermore, although the opening/closing members **58**, **59** are closely attached to each other, they are relatively rotatable. Specifically, along with the rotation of the auxiliary container body **57**A in arrow F**1** and F**2** directions, the opening/closing **59** is rotated in the directions together with the auxiliary container body **57**A while the opening/closing member **58** is not rotated.

[0098] By the rotation of the opening/closing member **59** in the arrow F**1** and F**2** directions, the interior of the container body **11** can be spatially communicated or blocked with/from the interior of the auxiliary container body **57**A.

[0099] Alternatively, the opening/closing members **58**, **59** can include two each of fan-like through holes **58**B, **59**B having a center angle of 90 degrees, as shown in FIG. **22**. In FIG. **21** the auxiliary container body **57**A has to be rotated by 180 degrees to repeatedly open and close the holes or vice versa. Meanwhile, in FIG. **22** the auxiliary container body **57**A needs to be rotated only by 90 degrees for the repeated opening and closing operation, which can reduce the amount of rotation.

[0100] Moreover, as shown in FIG. **23**, the auxiliary container **57** further includes a fixing mechanism **61** for the opening/closing members **58**, **59** on the outer periphery thereof. Specifically, an inverted L-shape groove **62** including an axial groove and a peripheral groove is formed on the outer periphery of the opening/closing member **58**. In addition, a groove **63** is formed along the axis on the opening/closing member **59**. Meanwhile, the auxiliary container body **57**A includes a fixing member **64** on the outer periphery in accordance with the grooves **62**, **63**. The fixing member **64** can be tilted in the arrows G**1** and G**2** directions and includes a pin **64**A on the tip end which is rotatable in the arrows H**1** and H**2** directions in a plane parallel to the open end **57**B of the auxiliary container body **57**A. The pin **64**A is generally biased to the arrow H**1** direction by a bias member such as a spring.

[0101] Further, when the auxiliary container **57** is attached to the container body **11** for the transportation or storage of the container body **11**, the fixing member **64** is tilted to fit into the grooves **62**, **63** in the arrow G**2** direction. Then, the pin **64**A abuts the groove **62**, is tilted in the arrow H**2** direction, and completely fitted into the groove **62**. By fitting the fixing member **64** into the grooves **62**, **63**, the auxiliary container body **57**A can be firmly fixed and prevented from inadvertently moving or rotating relative to the container body **11**.

[0102] Moreover, in FIG. **20** the container body **11** comprises a regulation member **65** at the top portion for regulating a flow of toner from the container body **11** to the auxiliary container **57** when the container body **11** is inverted.

[0103] FIG. **24**A is a front view of the regulation member **65** and FIG. **24**B is a bottom view thereof. The regulation member **65** is of a casserole shaped as a whole, and includes six slots **65**A in the inclined side surface thereof. The regulation member **65** is provided with an approximately circular notch **65**C attaching at the member **65** only at one end (left side in the FIG. **65**B to form a receiving port **65**D which can pivot only downward around the one end **65**B. A top part of the regulation member **65** is opened. When the regulation member **65** is mounted in the top portion of the container

body **11** (underside of the cap **56**), as shown in FIG. **20**, the interior of the container body **11** is spatially connected to the opening/closing mechanism **60** through the regulation member **65**.

[0104] A circular discharge regulation plate **66**, as shown in FIG. **25** and FIG. **26**, is fixed to the one end of the auxiliary container body **57**A (an end face on the opposite side to the side where the opening/closing mechanism **60** is provided). The discharge regulation plate **66** is to regulate a discharge amount of toner, and has a semi-circular through hole **66**A formed at the center and two threaded holes **66**B. A circular blocking plate (see FIG. **20**) is normally attached to the discharge regulation plate **66** through the threaded holes **66**B so as not to leak the toner from the auxiliary container **57** to the outside.

[0105] The operation of the toner filling device according to the present embodiment will be described as follows.

[0106] The container body **11** is normally placed in an erected state in storage or when carried, as shown in FIG. **20**. For filling a target with the toner from the container body **11**, the auxiliary container body **57**A is turned to one direction (arrow F**1** or F**2** direction), so that the through hole **59**A of the opening/closing member **59** matches the through hole **58**A of the opening/closing member **58**. Then, the container body **11** is turned to be inverted to flow the toner from the container body **11** into the opening/closing mechanism **60** through the slots **65** of the regulation member **65** due to its own weight. The flow of the toner is appropriately regulated by the regulation member **65**. In other words, by turning the container body **11** upside down, the receiving port **65**D is pressed down due to the toner weight to eliminate a gap G, and the toner flows to the opening/closing mechanism **60** only through the slots **65**A.

[0107] Moreover, flowing into the opening/closing mechanism **60**, the toner passes through the through-hole **58**A of the opening/closing member **58** and the through-hope **59**A of the opening/closing member **59**, and flows into the auxiliary container body **57**A. The auxiliary container body **57**A is sufficiently filled with the toner is turned in the reverse direction to seal the interior thereof by avoiding the through-hole **59**A of the opening/closing member **59** from coinciding with the through-hole **58**A of the opening/closing member **58**. The auxiliary container body **57**A including the through-hole **59**A of the opening/closing member **59** and the through-hole **66**A of the discharge regulation plate **66** is set to have a certain capacity. Thus, by the operations the certain quantity of toner can be flowed.

[0108] Next, a method of filling a target with the toner from the auxiliary container body **57**A will be described. To fill the target, the blocking plate **67** on the discharge regulation plate **66** at one end of the body **57**A is removed and a toner filler **68** is attached to the discharge regulation plate **66**, as shown in FIG. **25**.

[0109] The toner filler **68** has a ring-shaped base **68**A and a conical filling portion **68**B at the center of the base **68**A, and a filling port **68**C at an end of the filling portion **68**B. It additionally includes two screw holes **68**D so as to match a screw hole **66**B of the discharge regulation plate **66**. Then, in order to attach the toner filler **68** to the discharge regulation plate **66**, two screws **69** are threadably engaged into the screw hole **66**B of the discharge regulation plate **66** through the screw hole **68**D of the toner filler **68** and tightened. Thus, the toner filler **68** can be firmly attached to the discharge regulation plate **66**.

[0110] Once the toner filler **68** is attached, the filling port **68**C of the toner filler **68** is connected to the target to be then filled with toner from the auxiliary container body **57**A. Upon completion of the filling operation, the container body **11** is placed into the erected state and the toner receiving portion **65**D drops due to its own weight, forming the gap G. Hence, any toner remaining in the auxiliary container body **57**A drops into the container body **11** through the gap G.

[0111] FIG. **27** and FIG. **28** show the other examples of the present embodiment. It takes a lot of time and labor to attach the toner filler **68** with the screw **69** as shown in FIG. **25** and FIG. **26**. In the present embodiment, the outer diameter of the toner filling base **68**A is protruded slightly more than that of the discharge regulation plate **66**, and a ring-like projection **68**E towards the discharge regulation plate **66** is provided on the protruded portion of the base **68**A. The rest of the configurations are the same as those in FIG. **25** and FIG. **26**.

[0112] With such a configuration, the toner filler **68** is attachable to the discharge regulation plate **66** with a single step, simply by pressing the projection **68**E of the toner filler **68** along the outer periphery of the discharge regulation plate **66**. The toner filler **68** can be also easily removed from the discharge regulation plate **66**.

[0113] In the present embodiment, although not shown, the legs **12**, **15** and the carrying assistance member **35** in FIG. **13** and else can be attached to the container body.

[0114] Further, the present invention can provide a medium filling method which comprises the steps of turning a container containing an image forming medium to thereby flow a constant quantity of the image forming medium to a dispenser, and discharging the image forming medium from the dispenser to fill a target.

[0115] Although the present invention has been described in terms of exemplary embodiments, it is not limited thereto. It should be appreciated that variations or modifications may be made in the present embodiments described by persons skilled in the art without departing from the scope of the present invention as defined by the following claims.

[0116] For example, the toner filling device according to any of the above embodiments can be applied for filling any powder other than toner.

What is claimed is:

1. A medium filling device, comprising:

a container rotatably supported, to contain an image forming medium;

a dispenser configured to receive a constant quantity of the image forming medium from the container by a turn of the container; and

a discharger configured to discharge the image forming medium from the dispenser to a target.

2. A medium filling device, comprising:

a container rotatably supported, to contain an image forming medium;

a dispenser provided in a top part of the container and configured to receive a constant quantity of the image forming medium from the container when the container is turned to be inverted; and

a discharger provided in a bottom part of the container and configured to discharge the image forming medium from the dispenser to a target when the container is turned again to be erected.

3. The medium filling device according to claim **2**, wherein the container comprises a tubular member to connect the dispenser and the discharger, through which the received

image forming medium is conveyed from the dispenser to the discharger when the container becomes erected.

4. The medium filling device according to claim **2**, further comprising:

an inflow hole between the container and the dispenser, through which the image forming medium is flowed into the dispenser; and

a check valve provided between the dispenser and the tubular member and configured to allow the image forming medium to be conveyed from the dispenser to the discharger when the container becomes erected.

5. The medium filling device according to claim **4**, wherein

the container comprises a cone-shaped top portion and is formed such that a bottom end of the inflow hole is located below a top surface of the cone-shaped top portion when the container becomes inverted.

6. A medium filling device comprising:

a container rotatably supported, to contain an image forming medium; and

a dispensing discharger configured to receive a constant quantity of the image forming medium from the container by a turn of the container and to be connected to a target to discharge the received image forming medium to the target when the container is turned to be inverted.

7. The medium filling device according to claim **6**, wherein

the dispensing discharger is rotatably attached to the container and is detachable from the container.

8. The medium filling device according to claim **6**, wherein

the dispensing discharger includes an inlet hole into which the image forming medium is flowed from the container and an outlet hole from which the image forming medium is flowed back to the container, and has a blocking function to block between an interior of the dispensing discharger and an interior of the container.

9. The medium filling device according to claim **6**,

wherein the dispensing discharger includes an opening/closing mechanism for allowing or blocking a flow of the image forming medium.

10. The medium filling device according to claim **6**, wherein

the dispensing discharger comprises a filler detachably attached thereto, to fill the target with the received image forming medium.

11. The medium filling device according to claim **10**, wherein

the container includes a cone-shaped top portion formed such that a bottom side of the inlet hole is flush with a top surface of the cone-shaped top portion when the container becomes inverted.

12. The medium filling device according to claim **1**, further comprising

a flexible hose attached to a tip end of the discharger for discharging the image forming medium to the target.

13. The medium filling device according to claim **12**, wherein

the flexible hose comprises a rotatable coiled spring.

14. The medium filling device according to claim **12**, wherein

the flexible hose is a bellows type hose.

15. The medium filling device according to claim **12**, wherein

the flexible hose is formed to be transparent partially or entirely.

16. The medium filling device according to claim **12**, wherein

the flexible hose comprises, at an end, a fixing bracket formed to be detachably attached to the tip end of the discharger or the dispensing discharger by use of a screw.

17. The medium filling device according to claim **1**, wherein

the container comprises a leg on a lateral side and rotatably supported by the leg.

18. The medium filling device according to claim **17**, wherein

a rotation center of the container is positioned above a gravity center of the container while the container is erected.

19. The medium filling device according to claim **1**, wherein

the container comprises a holder on a lateral side to hold the container when the container becomes inverted.

20. The medium filling device according to claim **1**, wherein

the container comprises a carrying assistance member on a lateral side to allow an operator to carry the container on an operator's back.

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