



(12) **EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 158(3) EPC

(43) Date of publication:  
**29.10.2008 Bulletin 2008/44**

(21) Application number: **07714239.6**

(22) Date of filing: **15.02.2007**

(51) Int Cl.:  
**E03D 11/02** <sup>(2006.01)</sup> **E03D 5/012** <sup>(2006.01)</sup>  
**E03D 9/10** <sup>(2006.01)</sup> **F16L 55/00** <sup>(2006.01)</sup>  
**B02C 18/00** <sup>(2006.01)</sup> **E03C 1/12** <sup>(2006.01)</sup>

(86) International application number:  
**PCT/JP2007/052709**

(87) International publication number:  
**WO 2007/094400 (23.08.2007 Gazette 2007/34)**

(84) Designated Contracting States:  
**DE FR GB**

(30) Priority: **17.02.2006 JP 2006041130**

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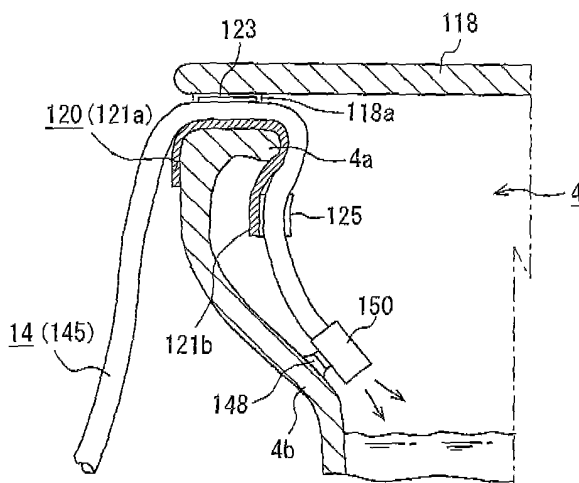
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(54) **DISCHARGE HOSE AND TOILET SYSTEM USING THE SAME**

(57) A tubular water control portion 150 is attached to a tip end of a drain hose body 14. The tubular water control portion is a tubular member or a tube which is formed as a reverse-funnel configuration (a flare configuration) and contains a plurality of water control pieces therein. The water control pieces are formed so as to be arranged in the staggered manner so that the discharging amount can be kept as constant as possible and the dis-

charging speed can be reduced. An amount of discharged mixture (excrement or the like) discharging from a tip end of the drain hose body is almost kept constant and discharging speed (flow speed) thereof is suppressed by the tubular water control portion 150, so that waving etc. of the tip end of the drain hose can be avoided while the fluidized mixture (the excrement) is delivered from a portable toilet device with pressure.

**FIG. 10**



## Description

### TECHNICAL FIELD

[0001] The invention relates to a drain hose which eliminates shaking etc. of a drain hose body occurring when pressurized delivery substance is discharged by disposing a tubular water control portion at a tip end of the drain hose body. Further, it relates to a toilet system which prevents excrement and the like delivered with pressure from scattering in a toilet device.

### BACKGROUND ART

[0002] A portable toilet device for an aged person who is necessary for any care or a handicapped person who has any difficulty of going to an existing toilet in his or her house has been developed.

[0003] This portable toilet device is designed to become a chair-type one in order to be able to be installed indoors so that bowel movement can be done with sitting on the chair. The portable toilet device is provided with a water-supplying hose that flushes rinse water into the toilet device, a drain hose for drain, which drains the excrement, and means for delivering the excrement with pressure. Further, the existing toilet is utilized for both water-supplying and draining thereof.

[0004] Thus, the toilet system for processing excrement in the portable toilet device by utilizing the existing toilet can be so configured as to be, for example, one shown in Fig. 20.

[0005] The toilet system shown in FIG. 20 is an example in which an existing toilet 3 is set facing a corridor 2 in a house 1. In the existing toilet 3, a toilet device 4 and a water-supply tank 5 for rinse water are installed. Along the corridor 2, in this example, a room 6 is positioned as a bedroom in which, for example, a bed 7 is set. A portable toilet device 10 is set inside the room 6 and bowel movement can be done at this portable toilet device 10 without going to the existing toilet 3.

[0006] The portable toilet device 10 is a flush toilet. Therefore, water-supplying means and draining means are disposed. A water-supplying hose 12 as the water-supplying means is connected to a water supply system, and a drain hose 14 as the draining means is introduced to the existing toilet device 4.

[0007] The drain hose 14 can be connected to a sewerage system. However, in this case, piping works are needed so that the cost therefor increases. In the case that a connection portion for the drain hose 14 is disposed at the existing toilet device 4, modification of the toilet device is needed or a new toilet device has to be prepared so that the cost therefor increases similarly. In FIG. 20, the existing toilet device 4 is configured so as to be utilized as it is.

[0008] When the existing toilet device 4 is utilized as it is, a tip end portion of the drain hose 14 is connected as, for example, one shown in FIG. 21. In this example,

the drain hose 14 is passed through and inserted by utilizing a space between the existing toilet device 4 and formed by a base 118a which is disposed at a lower surface of the toilet seat 118. A simple hose support 120 is attached to the toilet seat 118 in the existing toilet device 4. A tip end 14b of the drain hose 14 is free to move but it is also possible to fix the tip end 14b inside the existing toilet device 4.

### DISCLOSURE OF INVENTION

#### PROBLEM TO BE SOLVED BY THE INVENTION

[0009] By the way, as it is feared that excrement stays inside the drain hose 14 only with the water pressure of rinse water when the drain hose 14 is installed by utilizing the existing toilet device 4 as it is as shown in FIG. 21, a pressurizing type flush toilet is preferred as the portable toilet device 10.

[0010] When it is structured as the pressurizing type one, the discharging pressure to some extent is applied to the drain hose 14 but when the excrement is discharged from the drain hose 14, it is feared that the tip end portion 14b of the drain hose 14 irregularly shakes or waves by the discharging pressure. When the tip end portion 14b shakes, it is feared that the excrement scatters in the existing toilet device 4, which is unsanitary.

[0011] Although it is conceivable to fix the tip end portion 14b in the existing toilet device 4 or put the tip end portion 14b into the stagnant water (rinse water) of the existing toilet device 4, scattering of the excrement cannot be effectively suppressed in such cases since the discharging speed of the excrement is unexpectedly fast.

[0012] This invention then solves such conventional problems and proposes a drain hose which can effectively suppress scattering of discharging substance and a toilet system utilizing the same.

#### MEANS FOR SOLVING THE PROBLEM

[0013] To solve the above-mentioned problems, a drain hose according to claim 1 of the invention is characterized in that the drain hose contains a hose body and a tubular water control portion which is attached at a tip end of the hose body, wherein the tubular water control portion includes a plurality of water control pieces disposed therein with the water control pieces being arranged in a staggered manner.

[0014] Further, a toilet system according to claim 3 of the invention is characterized in that the toilet system is constituted of an existing toilet and a portable toilet device, wherein a drain hose for draining excrement is connected to the portable toilet device and a tubular water control portion which is attached to a tip end of the drain hose is fixed to an inside of the existing toilet through a space between a toilet device and a toilet seat of the existing toilet.

[0015] In the invention, the tubular water control por-

tion is attached to the tip end of the drain hose body. The tubular water control portion is disposed so as to control a discharging amount of and discharging speed (flow speed) of the discharging substance (the excrement etc.) to be discharged from the tip end portion of the drain hose body. The tubular water control portion is a tubular member or a tube which is formed as a reverse-funnel configuration (a flare configuration) and contains a plurality of water control pieces therein.

[0016] The water control pieces are formed so as to be arranged in the staggered manner so that the discharging amount can be kept as constant as possible and the discharging speed can be reduced. However, length and width of the water control piece, an arrangement interval, numbers and the like of the water control pieces are selected so as to obstruct no discharge of the discharging substance.

[0017] Due to the water control pieces, discharging speed (flow speed) of fluidized mixture at the tip end opening portion of the tubular water control portion can be reduced and the inner pressure thereof can be dispersed, thereby enabling the fluidized mixture to be discharged at the rate of almost constant amount in a reduced speed condition even when the fluidized mixture is delivered with it being pressurized. Because the inner pressure can be gradually decreased, the tip end portion of the drain hose is prevented from waving caused by the reaction force of the discharging force of the fluidized mixture, which may avoid the fluidized mixture scattering.

[0018] In this manner, when this drain hose is applied to both of the portable toilet device and the existing toilet device, which constitute the toilet system, the scattering of excrement to the inside of the whole existing toilet device can be prevented even when the excrement is delivered with it being pressurized, which is sanitary.

[0019] The portable toilet device is a pressurizing type flush toilet. The portable toilet device contains a device body including a water-supplying nozzle which supplies rinse water from the vicinity of an opening portion of a toilet device, a stagnant portion which is disposed at the deep place thereof under the opening portion, and a draining port which communicates with the stagnant portion.

[0020] Breaking means for breaking the excrement is installed in the stagnant portion. Pressurizing delivery means of broken substance for delivering the broken substance of the excrement with it being pressurized is disposed at the upper part of the stagnant portion and a lid for open and closure which closes the stagnant portion tightly is disposed at the upper side of the pressurizing delivery means of broken substance. An on-off valve (an electromagnetic valve for draining) is disposed at the draining port side of the toilet device body.

[0021] When the excrement etc. drop onto the lid for open and closure, a top end portion of the lid for open and closure is being apart from a rim of a reducing size portion by its weight so that the excrement automatically drops into the stagnant portion by its weight. The lid for

open and closure automatically closes after bowel movement is done so that the stagnant portion is automatically closed tightly again. In this manner, deodorization of the excrement and concealment of the breaking means can be performed.

[0022] The breaking means is driven to break the excrement. After the breaking process of the excrement is performed, the pressure in the stagnant portion is increased (to about 2 atmospheric pressures) by supplying compressed air into the stagnant portion. Then, by opening the electromagnetic valve for draining, the broken fluidized mixture is delivered with it being pressurized towards a side of the existing toilet device via the drain hose. Such pressurized delivery process allows the fluidized mixture to be drained to the existing toilet device without remaining in the drain hose.

[0023] When the water-supplying hose for washing that supplies water to the portable toilet device and the above-mentioned drain hose are integrated, attaching, detaching, and arranging of these hoses become easy.

## EFFECTS OF INVENTION

[0024] The invention is to provide the drain hose having the tubular water control portion. Further, the invention is to provide the toilet system which has such drain hose.

[0025] Accordingly, as the discharging amount and the discharging speed of the fluidized mixture can be suppressed by the tubular water control portion, waving etc. of the tip end portion of the drain hose can be avoided while the fluidized mixture is discharged. Therefore, in the toilet system equipped with the drain hose, the waving of the tip end portion of the drain hose can be suppressed while the excrement is drained into the existing toilet device, so that a sanitary toilet system can be provided.

## BRIEF DESCRIPTION OF DRAWINGS

[0026]

[FIG. 1] is a sectional view of an embodiment of a portable toilet device according to the invention for showing an important portion thereof;

[FIG. 2] is a sectional view of the portable toilet device, which is shown in FIG. 1, for showing a usage state thereof;

[FIG. 3] is a schematic diagram for showing an embodiment in which a water-supplying hose and a drain hose are connected to an existing toilet device;

[FIG. 4] is a diagram for showing a configuration of the water-supplying hose;

[FIG. 5] is a diagram for showing a configuration of the drain hose;

[FIG. 6] is a sectional view of an embodiment of a check valve for showing an important portion thereof;

[FIG. 7] is a perspective view of a hose support for the drain hose for showing an embodiment thereof;

[FIG. 8] is a sectional view of an important portion of the existing toilet device in a state that the hose support is attached thereto;

[FIG. 9] is a sectional view of another important portion of the existing toilet device in a state that the hose support is attached thereto;

[FIG. 10] is a sectional view of an important portion of the existing toilet device in a state that the drain hose is attached thereto;

[FIG. 11] is a sectional view of an important portion of a tubular water control portion (No. 1) which is utilized for the invention;

[FIG. 12] is a sectional view of an important portion of a tubular water control portion (No. 2) which is utilized for the invention;

[FIG. 13] is a sectional view of an important portion of a tubular water control portion (No. 3) which is utilized for the invention;

[FIG. 14] is a sectional view of an important portion of a tubular water control portion (No. 4) which is utilized for the invention;

[FIG. 15] is a sectional view of an important portion of a tubular water control portion (No. 5) which is utilized for the invention;

[FIG. 16] is a sectional view taken on line I-I of FIG. 15;

[FIG. 17] is a system diagram for showing an embodiment of a control system for a portable toilet device according to the invention;

[FIG. 18] is wave form charts for operation description of the portable toilet device;

[FIG. 19] is wave form charts for operation description of water drain;

[FIG. 20] is an explanatory diagram for showing an embodiment of a toilet system; and

[FIG. 21] is a sectional view of the existing toilet device for showing an example of attachment of the drain hose thereto.

## BEST MODE FOR CARRYING OUT THE INVENTION

[0027] The following will describe preferred embodiments of the drain hose and the toilet system using the same according to the invention more detailed with reference to drawings. The portable toilet device that is applicable to the invention is preferable for a portable toilet device equipped with a so-called shower toilet having any buttock-washing function. Any description on the shower toilet equipment will be omitted in the following description. The portable toilet device is applied to a flush toilet of western type.

### (Embodiment 1)

[0028] As shown in FIG. 20, a toilet system according to the invention is constructed of an existing toilet 3, a portable toilet device 10, and a water-supplying hose 12 and a drain hose 14, which connect them. Since the con-

figuration of FIG. 20 has been already explained, the detailed explanation thereof will be omitted. The existing toilet 3 is also a western type flush toilet. The portable toilet device 10 is a pressurized delivery type flush toilet.

[0029] FIG. 1 is a sectional view of an embodiment of the pressurized delivery type portable toilet device 10, to which the invention is applicable, for showing an important portion thereof. The portable toilet device 10 has a body 20 of the toilet device. The body 20 of the toilet device has a profiled configuration of a funnel that is almost like that of a normal flush toilet (of western style), but has a whole configuration of box. It is to be noted that the body 20 of the toilet device may be not only formed as a box but also formed as, for example, chair-type one equipped with armrests.

[0030] In order to save the weight of the body 20 of the toilet device, in this embodiment, plastic molded body is used as the body 20 of the toilet device but any other materials such as ceramics may be used. A toilet seat 21 is mounted on the body 20 of the toilet device at a side of its upper opening and a cover 23 is provided for closing the toilet seat 21 and the upper opening.

[0031] A stagnant portion 18 of trap water and the excrement is formed at a bottom of the body 20 of the toilet device. A drain portion 22 having a profiled configuration turned down at ends thereof, which is communicated with the stagnant portion 18, is provided and a drain hose 14 according to the invention is connected to a drain opening 27.

[0032] The portion having a profiled configuration turned down at ends thereof is generally called S-shape trap. Thus, in this embodiment, a connection portion 26 is formed on a rear surface portion 20b of the body 20 of the toilet device and an electromagnetic valve 24 acting as on-off valve is mounted near the connection portion 26 inside the body 20 of the toilet device. It is conceivable that a configuration of the drain portion 22 communicated with the stagnant portion 18 includes configurations of P type, U type, bowl type and the like in addition to the shown configuration. All of these configurations cause similar effects.

[0033] The electromagnetic valve 24 is controlled so that it opens only when the trap water including the excrement in the stagnant portion 18 is drained out of the toilet device and it closes when the toilet is not used. This is because the water is prevented from leaking. In addition to preventing water leaking, the electromagnetic valve 24 also has a function to prevent compressed air from leaking when the pressure in the stagnant portion 18 is increased (to about 2 atmospheric pressures) by using an air compressor (described later) which constitutes pressurizing delivery means.

[0034] A water-supplying nozzle 28 for rinse water is provided on a wall surface 18a, on a side of the drain portion, of the body 20 of the toilet device near an upper portion thereof. A connecting pipe 30 is arranged between a connection portion 34, which is provided on the rear surface portion 20b of the body, and the water-sup-

plying nozzle 28. A diverging pipe is utilized as the connecting pipe 30 and an electromagnetic valve 32 for controlling the rinse water is attached to the connecting pipe 30 that extends towards the water-supplying nozzle 28. This is because the water-supply from the water-supply hose 12 which is connected to the connection portion 34 can be controlled by the electromagnetic valve 32.

**[0035]** A washing hose (a washing pipe) 240 is also connected to the divided connecting pipe 30 via an electromagnetic valve 33. A tip end of the washing hose 240 is arranged so as to project above the water surface of the trap water of the stagnant portion 18. With the water pouring (actually, the water injecting) through the washing hose 240, the washing of the inside of the stagnant portion 18 and the rear surface of the lid body 212 is preformed, which will be mentioned later.

**[0036]** A rubber-like leak proof tube 29 is inserted between the water-supplying nozzle 28 and the wall surface 18a, and a leak proof tube 242 is also inserted at the stagnant portion 18 where the washing hose 240 penetrates, which causes water leaking to the outside to be prevented.

**[0037]** Breaking means 40 for breaking the excrement etc. is disposed at the bottom portion of the stagnant portion 18. The breaking means 40 is used for breaking the excrement (excreta etc.) and/or toilet paper (hereinafter, collectively called as excrement), which are remained in the stagnant portion 18, and the fluidized mixture thus broken is drained out with it being mixed with trap water.

**[0038]** The breaking means 40 may be constituted of a motor (an electromagnetic motor) 42 and a breaking blade 44. In FIG. 1, only the breaking blades 44 of them is so installed as to meet in the stagnant portion 18. Accordingly, the motor 42 is positioned on a side of an outside wall 19 of the bottom of the stagnant portion 18, and is attached and fixed to the body 20 of the toilet device by means of supporting members 46 such as bolts and nuts. A rotating shaft of the motor 42 is attached to the bottom of the stagnant portion 18 in a hermetic manner against water. The motor 42 may be fixed to a bottom plate 20c of the body 20 of the toilet device, not to the side of the outside wall of the bottom of the stagnant portion 18.

**[0039]** A control unit 50 constituted of CPU and the like is arranged on the bottom plate 20c. Any driving of the above-mentioned electromagnetic valve 24 for drain, electromagnetic valve 32, 33 for water supply, motor 42 and the like is controlled by the control unit 50 only during a predetermined period of time and at a predetermined timing. A power switch 52 for the control unit 50 is arranged on the rear surface portion 20b of the body, and an open/close switch 55 (which will be described later) is arranged on an upper surface of the body and under a lower surface of the cover 23.

**[0040]** The portable toilet device 10 further has the following configuration. As shown in FIG. 1, pressurizing delivery means 200 of broken substance for sending pre-

scribed compressed air to the stagnant portion 18 is provided at a desired position of upper portion of the stagnant portion 18 in the body 20 of the toilet device and of lower portion than the water-supplying nozzle 28. A reducing size portion 230 is provided at a position of upper portion of the stagnant portion 18 and of slightly upper side than a portion where the pressurizing delivery means 200 is disposed. Further, a lid-opening and closing mechanism 210 is provided under a lower surface of the reducing size portion 230 so that it can block the reducing size portion 230 and close the stagnant portion 18 tightly.

**[0041]** The pressurizing delivery means 200 may be constituted of an air compressor and a sending pipe 204 of this air compressor 200 extends into the side of the stagnant portion 18 via attaching means 206. The attaching means 206 is positioned at a position upper than a surface of trap water in the stagnant portion 18. The air compressor 200 is fixed on an attaching plate 202 provided in the back-side space 20a of the body 20 of the toilet device.

**[0042]** A similar effect can be expected even when having such a system as to intake compressed air from the outside of the portable toilet device body, not to dispose the air compressor 200 at the body 20 of the toilet device.

**[0043]** The reducing size portion 230 is configured so as to be a ring-shaped flange portion which extends inwardly to the stagnant portion 18 by a predetermined length. The above-mentioned sending pipe 204 is positioned between the trap water in the stagnant portion 18 and the reducing size portion 230.

**[0044]** The reducing size portion 230 is so designed as to be wholly inclined somewhat toward a side of the drain portion 22, as clearly shown in FIG. 1. A lid-opening and closing mechanism 210, which can block this reducing size portion 230, is provided under the lower surface of the reducing size portion 230. A rotational type and a slide type are conceivable for the lid-opening and closing mechanism 210. FIG. 1 shows an example of the rotational type.

**[0045]** In this example, a lid body 212 constituting the lid-opening and closing mechanism 210 is provided because of the rotational type. An end of the lid body 212, a right end thereof in a shown embodiment, is set as a rotation axis portion 214 and the rotation axis portion 214 is pivoted rotatably on the body 20 of the toilet device so that the rotation axis portion 214 can be positioned under a lower surface portion 232 of the reducing size portion 230. This pivoted portion is pivoted under the body 20 of the toilet device in a hermetic manner against water.

**[0046]** The lid body 212 is urged so that its periphery can come into contact with a lower rim 234 of the reducing size portion 230. The lid body 212 has a shape like extending along the lower rim 234 and a spring 216 for urging is twisted between the rotation axis portion 214 and a wall surface of the lower surface portion 232, thereby enabling the lid body 212 to be come into contact with the lower rim 234 normally to close the interior of the

stagnant portion 18 tightly.

**[0047]** Since the reducing size portion 230 is provided so as to be inclined somewhat toward a side of the drain portion 22 as described above, the lid body 212 itself constituting the lid-opening and closing mechanism 210 is also attached so as to be inclined toward the side of the drain portion 22. Thus, when the lid body 212 is attached in an inclined manner, any excrement dropped on an upper surface of the lid body 212 can be dropped down into the stagnant portion 18 (see FIG. 2).

**[0048]** A tip end of the above-mentioned washing hose 240 is attached inside the stagnant portion 18 with an angle being able to jet rinse water into both of a side of rear surface of the lid body 212 and a part of the periphery of the stagnant portion 18. In this embodiment, as shown in FIG. 1, it is attached and fixed in a hermetic manner against water to a portion thereof near and under the rotation axis portion 214 of the lid body 212.

**[0049]** The water-supplying hose 12 and the drain hose 14 are connected to the body 20 of the toilet device thus structured and they are extended to the existing toilet 3.

**[0050]** FIG. 3 shows an outline of the existing toilet 3. FIG. 3 illustrates the existing toilet device 4 that is equipped with a shower toilet 80. In this embodiment, a diverging pipe 84 is connected to a water pipe (water supply pipe) 82 and a first diverging port 86 is provided to the diverging pipe 84 at a side of the water pipe 82, and is connected with a hose 87 for the shower toilet. A second diverging port 88 is provided thereto nearer the end thereof than the first diverging port 86, and is connected with a hose 89 for the rinse water.

**[0051]** In this embodiment, the diverging pipe 84 having such diverging configuration is used, a check valve 90 is arranged between the first and second diverging ports 86, 88, and a connection portion 92 for connecting the water-supplying hose 12 is provided at a tail end of the diverging pipe 84. The connection portion 60A provided at a tip end of the water-supplying hose 12 is connected to this connection portion 92.

**[0052]** Thus, arranging the new diverging pipe 84 and attaching the water-supplying hose 12 thereto enables the rinse water to be supplied to the portable toilet device 10. furthermore, it is because if an error such that water from the hose 89 and the water-supplying hose 12 flows backward should happen, the water to be supplied to a side of the shower toilet is prevented from being mixed with the water flown backward, to arrange the check valve 90 between the first and second diverging ports 86, 88.

**[0053]** A tank 96 filled with a sterilizing solution is further inserted to a connection portion for the sterilizing solution at the tail end portion of the diverging pipe 84. Using the sterilizing solution enables any sanitary conditions in not only the existing toilet 3 but also the portable toilet device 10 to be improved. The drain hose may be also washed at the same time. The tank 96 has not always to be provided but may be suitably provided at need.

**[0054]** In this manner, by commonly using the water-

supplying system of the existing toilet, the portable toilet device 10 can be used with simple adding works which adds only the diverging pipe 84.

**[0055]** The drain hose 14 is inserted between the existing toilet device 4 and the toilet seat 118 so that the tubular water control portion 150 meets the inside of the existing toilet device 4. The way how to insert it is the same way as shown in FIG. 21.

**[0056]** FIG. 4 shows an example of the water-supplying hose 12 and FIG. 5 shows an example of the drain hose 14. When an end 12a of the water-supplying hose 12 is an end that is connected to a side of a water supply pipe and the other end 12b thereof is an end that is connected to the portable toilet device 10, the ends 12a, 12b are respectively provided with connection portions 60A, 60B, each of which has a check valve.

**[0057]** A connection portion 62A with a check valve is disposed at one end portion 14a of a hose body 145 constituting the drain hose 14, and the tubular water control portion 150 is provided at the other end portion 14b thereof. The end portion 14a is the end portion to be connected to the side of the portable toilet device 10.

**[0058]** Since the water-supplying hose 12 is used for rinse water supplied to the body 20 of the toilet device, a vinyl hose having a small diameter or the like may be used. On the other hand, since the drain hose 14 enables any fluidized mixture formed by breaking the excrement and the like to be flown therein, a vinyl hose or the like having the same as or a larger diameter than that of the water-supplying hose 12 may be used. This is because the fluidized mixture with the rinse water, not solidified excrement, is treated. FIG. 5 shows a case where the drain hose 14 having a larger diameter than that of the water-supplying hose 12 is used.

**[0059]** If the water-supplying hose 12 and the drain hose 14 having different diameters are used, rudimentary mistake in connection manipulation such that the water-supplying hose 12 is used as a drain hose or the drain hose 14 is accidentally connected as a water-supplying hose may be certainly prevented because of difference in their diameters.

**[0060]** Each of the connection portions 60 (62), which has a check valve, forms a hollow valve operation room 64 with, for example, a rectangular profile inside a body 63, as shown in FIG. 6, and a ball member 65 acting as valve action and a push spring 66 urging against it are provided in the room, thereby enabling the valve to be opened by an action of water pressure in a direction of an arrow "a". This prevents backflows from both of the sides of portable toilet device and the water supply pipe.

**[0061]** On the other hands, at the other connection portion 60B, it is configured so that a projection member, not shown, retreating the ball member 65 of the check valve against the push spring 66 when the other connection portion 60B is connected to a side of the portable toilet device 10 is provided in the side of the portable toilet device, thereby enabling an internal valve to be opened to become any communicate condition in a case

where the connection portion 60 is connected or enabling the internal valve to be closed in a case where when it is not connected, to prevent liquid in the hose from leaking to outside.

**[0062]** The tubular water control portion 150 attached to the drain hose 14 is arranged so as to position inside the existing toilet device 4 passing over an opening rim 4a (see FIG. 10) of the existing toilet device 4. At that time, a hose support 120 for fixing the drain hose 14 is utilized and it is fitted to and fixed at the opening rim 4a of the existing toilet device 4.

**[0063]** FIG. 7 shows a specific example of the hose support 120. The hose support 120 is molded of resin and the like and a hose support body 121 has a profiled configuration of the character "7" and a shape corresponding to the opening rim 4a. A left end portion 121a of the body 121 functions as a piece to support the outer rim side of the opening rim 4a. Similarly, a right end portion 121b functions as a piece to support the inner rim of the opening rim 4a. A first hose support portion 123 is disposed on the upper surface of the body 121. The first hose support portion 123 is formed so as to have a profiled semicircular configuration with a part thereof being lacked, and an inner diameter portion is slightly larger than a diameter of the drain hose 14.

**[0064]** The side of the right end portion 121b is formed to be about two times longer than that of the left end portion 121a, and the tip end portion thereof is formed so as to be warped to the outside to some extent. Further, a second hose support portion 125 is formed integrally with the body 121 at the end portion side thereof so as to extend outwardly. The second hose support 125 is also formed so as to have a profiled semicircular configuration with a part thereof being lacked, and an inner diameter portion is slightly larger than a diameter of the drain hose 14.

**[0065]** FIG. 8 shows a state in which the hose support 120 is fitted onto the side of the opening rim 4a. FIG. 9 particularly shows a case where the hose support 120 is fitted onto a back side of the base 118a which is disposed at a bottom portion of the toilet seat 118.

**[0066]** FIG. 10 shows a section of the hose support 120 on a state where it is fitted. The drain hose 14 according to the invention is utilized as the drain hose 14. The drain hose 14 is constituted of the hose body 145 and the tubular water control portion 150 which is attached and fixed to the tip end portion of the hose body 145. The drain hose 14 extends into the inside of the existing toilet device 4 while its periphery is supported by the first and second hose support portions 123, 125, respectively.

**[0067]** Furthermore, it is supposed that an outer diameter of the drain hose 14, a height of the first hose support portion 123, a height of the base 118a and the like are selected so that the drain hose 14 fits in a space generated by the base 118a from a bottom portion of a toilet seat 118 when the toilet seat 118 is lowered.

**[0068]** The tubular water control portion 150 which is

attached to the tip end portion of the drain hose 14 extending into the inside of the existing toilet device 4 is attached and fixed to the vicinity of a neck portion 4b of the existing toilet device 4. For example, the tubular water control portion 150 is attached to the neck portion 4b with a rubber-like adsorbing member 148 which is shaped as a flare configuration and the like. By utilizing the adsorbing member 148, the tubular water control portion 150 can also be detached from the neck portion 4b, thereby enabling cleaning of the tubular water control portion 150 to be made easy.

**[0069]** FIG. 11 is a sectional view of an embodiment of the tubular water control portion 150 for showing an important portion thereof. The tubular water control portion 150 is constituted of a connection portion 151 to the hose body 145 and a tubular body 152 disposed next to the connection portion 151. As the tubular body 152, a cylindrical member is used, and a plurality of water control pieces 154 is disposed therein.

**[0070]** The water control pieces 154 are arranged in a staggered manner and in the case of FIG. 11, they contain a right side water control piece 154a with approximately semicircle shape and a left side water control piece 154b with approximately semicircle shape similarly, and they are arranged in a staggered manner with a specific interval being maintained. The water control pieces 154 are disposed as to project to a flowing direction of the fluidized mixture with them being approximately orthogonal to the flowing direction.

**[0071]** The water control pieces 154 are controlling pieces so that the fluidized mixture which is drained from the drain hose 14 flows down at the rate of constant amount while flowing speed is reduced. The number, the size, the interval and the like of the water control pieces 154 are optional but when the number is too many or the interval is too narrow, it is feared that fluidized mixture that is flowing down becomes stagnant or the flowing time becomes too long, so that it is necessary to select conditions in accordance with the inner diameter of the drain hose 14 and the like. In the embodiment shown in FIG. 11, the tubular water control portion 150 is configured by utilizing three water control pieces 154 in total and even in this case, sufficient water control effect (the effects of regulation of discharging amount and deceleration) can be obtained.

**[0072]** In this manner, due to the water control pieces 154, the discharging speed (the flow speed) of the fluidized mixture at the tip end opening portion of the tubular water control portion 150 can be reduced and the inner pressure thereof can be dispersed, so that it is possible to discharge the fluidized mixture at the rate of almost constant amount in a decelerated condition even when the fluidized mixture is delivered with it being pressurized. Further, because the inner pressure can be gradually decreased, the tip end portion of the drain hose 14, namely, the tubular water control portion 150, is prevented from waving caused by the reaction force of the discharging pressure of the fluidized mixture and the scattering of the

fluidized mixture can be prevented.

**[0073]** Therefore, when the drain hose 14 which has the tubular water control portion 150 is applied to both of the portable toilet device 10 and the existing toilet device 4 of the toilet system, it is sanitary because the scattering of excrement to the inside of the whole existing toilet device can be prevented even when the excrement is delivered with it being pressurized.

**[0074]** FIG. 12 and after show other embodiments of the tubular water control portion 150. FIG. 12 shows a case where the projecting directions of the water control pieces 154 are declined to the flowing direction to some extent while utilizing the same water control pieces 154 in FIG. 11. With this structure, the passing of the fluidized mixture becomes smoother.

**[0075]** FIG. 13 shows an embodiment in which the tubular body 152 is formed so as to have a reverse-funnel configuration (a flare configuration), not to be a cylindrical member, the remained configuration of which is the same as that of FIG. 11. Since the reaction force by the fluidized mixture can be suppressed by directing the opening towards the downstream, the waving in accordance with the flowing-down of the fluidized mixture can be decreased.

**[0076]** FIG. 14 shows a modified example of FIG. 13 and the declinations of the water control pieces 154 are formed as to be the same as the case shown in FIG. 12. The effect thereof is similar to that of FIG. 12.

**[0077]** In FIG. 15, in addition to the water control pieces 154, a dividing piece 156 is disposed above the water control pieces 154. Therefore, the tubular body 152 is a prism-shaped body while, as shown in FIG. 16, the dividing piece 156 is formed as an arc and is disposed so that the projecting portion faces upwards.

**[0078]** The flowing speed of the fluidized mixture is decreased due to the collision with the dividing piece 156 and the fluidized mixture flows evenly in the tubular body 152 because the flow is divided into the right and left, thereby enabling the water control effect to be further improved.

**[0079]** FIG. 17 shows an embodiment of a control system for the portable toilet device 10. In addition to the above-mentioned power switch 52, an open/close switch 55, and a drain switch 244 are provided and their on/off signals are supplied to the control unit 50.

**[0080]** The power switch 52 is turned on when the portable toilet device 10 is installed. On the other hand, the open/close switch 55 is a switch that is turned on/off in connection with the open and closure of the cover 23 for closing an upper portion of the toilet seat 21. Therefore, as shown in FIG. 1, in this embodiment, the open/close switch 55 (a sensor switch for detecting the open and closure etc.) is mounted under a lower surface of the cover 23 so as to face to the cover 23. The drain switch 244 can be disposed, for example, at the back side more than the cover 23. This is because the usage frequency is low.

**[0081]** Any control signals from the control unit 50 con-

stituted of CPU control each driving state of the above-mentioned electromagnetic valve 24 for drain, electromagnetic valve 32 for water supply, the electromagnetic valve 33 for washing, motor 42 for breaking, and air compressor 200.

**[0082]** FIG. 18 shows an example of such control timing. In a case of this portable toilet device 10, it is supposed that the lid body 212 as the lid for open and closure is closed when the toilet is not used.

**[0083]** The portable toilet device is used while the cover 23 is opened. Open manipulation of the cover 23 is detected by the open/close switch 55 (a sensor switch for detecting the open and close etc.) (A in FIG. 18). Bowel movement is carried out while the cover 23 is opened. When the excrement drops down onto the lid body 212, the lid body 212 is opened by excrement's weight and the excrement drops into the trap water in the stagnant portion 18 (see FIG. 2). When the excrement drops, the lid body 212 is automatically closed. This is because the lid body 212 is always urged toward a side of the reducing size portion 230.

**[0084]** After the bowel movement has been finished, the cover 23 is closed (A in FIG. 18). If it is determined that the cover is closed, any excrement is broken into fragments for a period of time  $T_a$  (B in FIG. 18). It is to be noted that instead of closure operation of the cover 23, a start switch corresponding to the open/close switch 55 may be operated by any manual operation to start such breaking operation. The period of time  $T_a$  for breaking operation is set to a period of time when the excrement and toilet paper may be suitably broken into fragments. It is normally set to a period of time of 20 seconds or less, preferably about 5 through 10 seconds.

**[0085]** When the breaking operation has been finished, an air compressor 200 is driven to send compressed air into an interior of the stagnant portion 18 which is then pressurized (E in FIG. 18). A period of time  $T_b$  for pressurizing process is set to a period of time when internal pressure in the stagnant portion 18 is increased up to a predetermined value (for example, 2 atmospheric pressures). The predetermined value of the internal pressure means a pressure such that the fluidized mixture is certainly delivered with it being pressurized and drained to the existing toilet device 4 through the drain hose 14. A period of time  $T_b$  that is a predetermined value of the internal pressure is actually set in advance and this period of time  $T_b$  is counted.

**[0086]** When the period of time  $T_b$  for pressurizing has been elapsed, the electromagnetic valve 24 for drain is driven while the air compressor 200 is driven, namely, the compressed air is sent to the interior of the stagnant portion 18 (D in FIG. 18). When the electromagnetic valve 24 for drain is driven to open the drain opening 27, the trap water (fluidized mixture) in the stagnant portion 18 is delivered at once with it being pressurized by the compressed air and drained out toward a side of the drain hose 14. Since the drain hose 14 is connected with the existing toilet device 4, the excrement broken into frag-

ments by the breaking means 40 is drained to a side of the existing toilet device 4.

[0087] A period of time  $T_c$  for pressuring delivery is normally set to a period of relatively longer time, for example, about 10 through 30 seconds, in order to prevent the fluidized mixture from being remained in the drain hose 14, though there may be a difference in a set length of the drain hose 14.

[0088] When the period of time  $T_c$  for pressuring delivery has been elapsed, the electromagnetic valve 24 for drain is turned off and driving of the air compressor stops (D, E in FIG. 18). This enables the drain opening 27 to be closed. The electromagnetic valve 32 for water-supply is then activated to start the water supply to the stagnant portion 18 (C in FIG. 18). A period of time  $T_d$  for water supply is set to a period of water supply time when the trap water in the stagnant portion 18 reaches a predetermined amount. It is to be noted that the predetermined amount means an amount of supplied water up to a case where a surface of the trap water exceeds a bend portion of the drain portion 22. When the water supply to the stagnant portion 18 has been completed, its standby condition therefor occurs.

[0089] It is to be noted that, in this embodiment, an electromagnetic valve 33 for washing is also driven with synchronization with the operation of the electromagnetic valve 32 for water-supply, as shown in C in FIG. 18. If the electromagnetic valve 33 operates, water is supplied into the stagnant portion 18 through the washing hose 240; the water is concretely jet toward a rear surface of the lid body 212 and a wall surface of the stagnant portion 18. Since, by means of this jet by the rinse water, the rear surface of the lid body 212 and the wall surface of the stagnant portion 18 are washed, the lid body 212 and the stagnant portion 18 can be always kept clean.

[0090] Such washing process may be performed before the water supply to the stagnant portion 18, namely, after the fluidized mixture has been delivered with it being pressurized and drained, not simultaneous execution of the water supply to the stagnant portion 18 and the washing of the lid body 212 and the like, to deliver the rinse water therefor with it being pressurized and/or drain it at the same time. Therefore, the water supply to the stagnant portion 18 is then performed after the electromagnetic valve 24 has been closed.

[0091] If the portable toilet device 10 is moved or removed, it is preferable to drain the trap water from the stagnant portion 18. Such drain processing is separately performed from the above-mentioned drain process. In this case, as shown in FIG. 19, the drain switch 244 is turned on, so that the air compressor 200 is activated (A, C in FIG. 19). The start of the air compressor 200 enables the interior of the stagnant portion 18 to be pressurized (C in FIG. 19). After the pressurizing process over a period of time  $T_f$  has been finished, the electromagnetic valve 24 for drain is driven so that the drain opening can be opened for a predetermined period of time  $T_g$  (B in FIG. 19).

[0092] This pressurizing delivery enables the trap water to be drained from the stagnant portion 18. The electromagnetic valve 24 for drain is closed with a small amount of delay ( $\Delta T_f$ ) starting from when the driving of the air compressor 200 stops. This causes any drain processing (of the trap water) to be completed. It is to be noted that the period of time  $T_f$  may be set to the above-mentioned period of time  $T_b$  and the period of time  $T_g$  may be set to the period of time  $T_c$ .

[0093] Accordingly, it is obvious that various modifications may be made without departing from the spirit of the invention.

## INDUSTRIAL APPLICABILITY

[0094] The invention is available for a care assistance device for care facilities, care at home and the like.

## Claims

1. A drain hose **characterized in that** the drain hose comprises:

a hose body; and  
a tubular water control portion which is attached to a tip end of the hose body,

wherein the tubular water control portion includes a plurality of water control pieces disposed therein.

2. The drain hose according to Claim 1 **characterized in that** the tubular water control portion is a tubular member or a reverse-funnel like tube and contains a plurality of water control pieces inside thereof with the water control pieces being arranged in a staggered manner.

3. A toilet system **characterized in that** the toilet system is constituted of an existing toilet and a portable toilet device,  
wherein a drain hose for draining excrement is connected to the portable toilet device; and  
wherein a tubular water control portion which is attached to a tip end of the drain hose is fixed to an inside of the existing toilet through a space between a toilet device and a toilet seat of the existing toilet.

4. The toilet system according to Claim 3 **characterized in that** the portable toilet device is a pressurizing type flush toilet; and the portable toilet device contains:

a toilet device body that includes a water-supplying nozzle which supplies rinse water from the vicinity of an opening portion of a toilet device, a stagnant portion which is disposed at the deep place thereof under the opening portion,

and a draining port which communicates with the stagnant portion and is connected with the drain hose;

breaking means for breaking the excrement, the breaking means being disposed in the stagnant portion; 5

pressurizing delivery means of broken substance for delivering the broken substance of the excrement with pressure, the pressurizing delivery means being disposed at the upper part of the stagnant portion; and 10

a lid for open and closure which closes the stagnant portion tightly, the lid being disposed at the upper side of the pressurizing delivery means of broken substance. 15

5. The toilet system according to Claim 4 **characterized in that** an on-off valve mechanism is disposed in the vicinity of the draining port; and 20
- by opening the on-off valve mechanism when the pressurizing delivery means of broken substance is driven and inner pressure of the closed space exceeds a predetermined pressure, the excrement of the existing toilet is delivered with pressure towards a side of the toilet device. 25

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FIG. 1

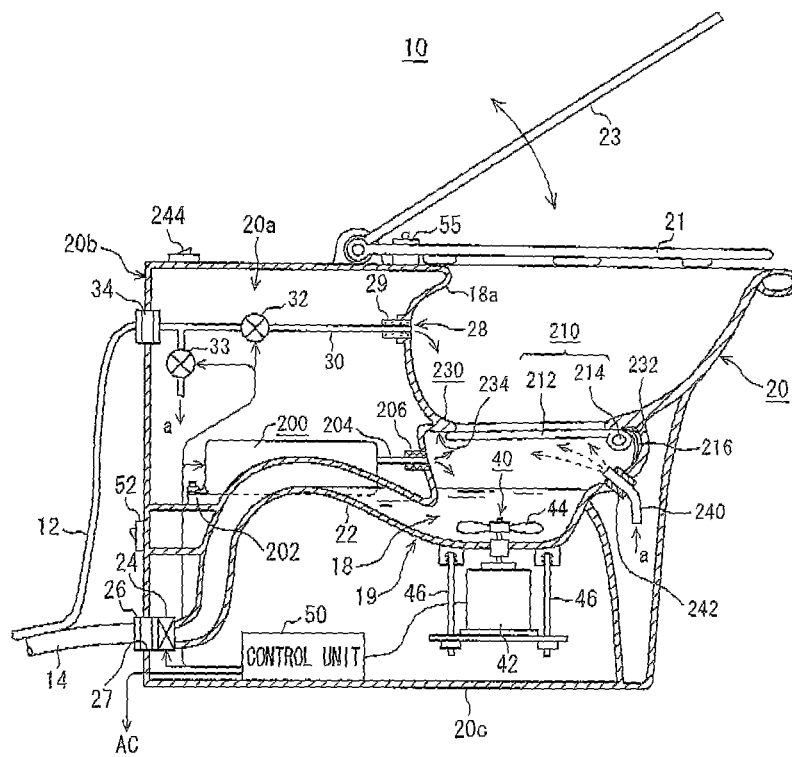
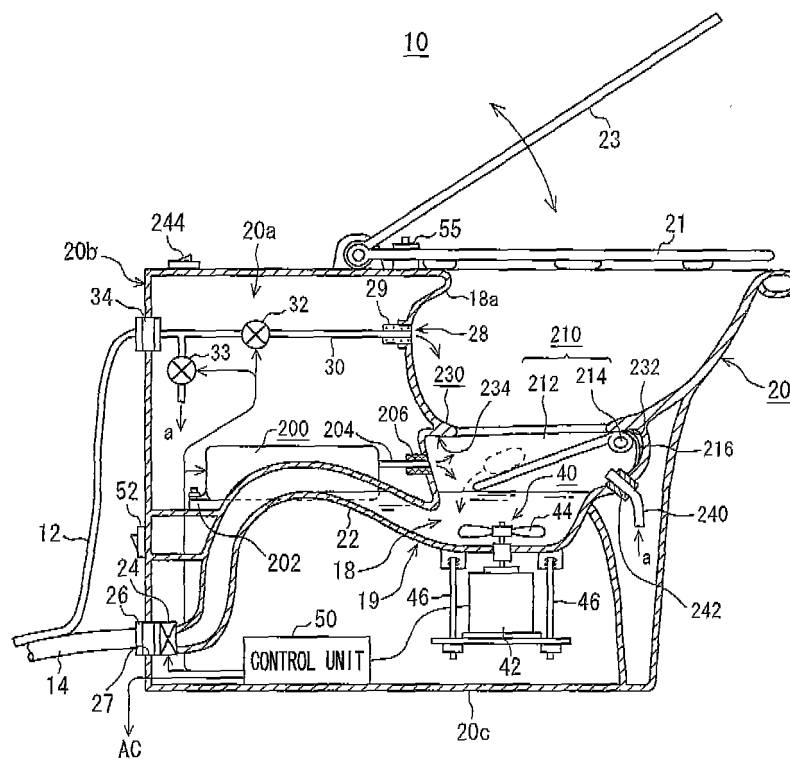


FIG. 2



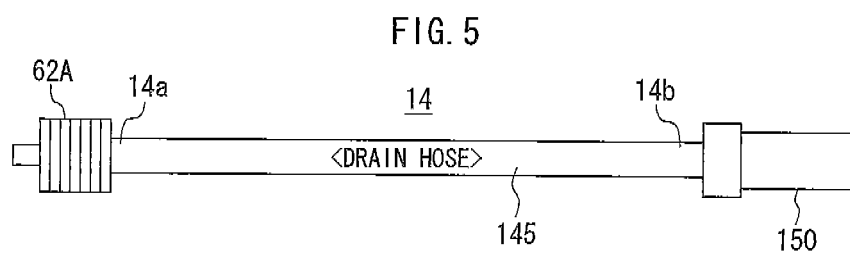
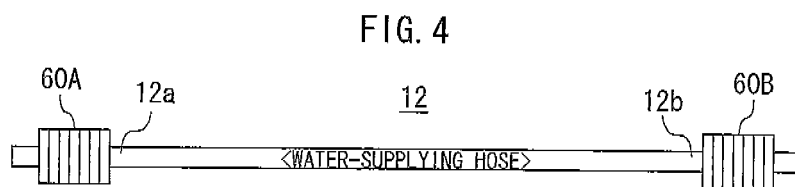
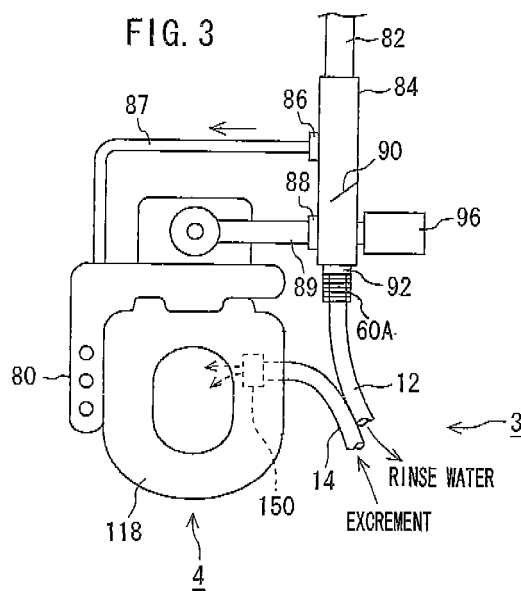


FIG. 6

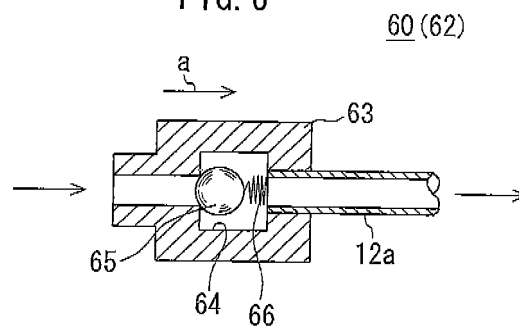


FIG. 7

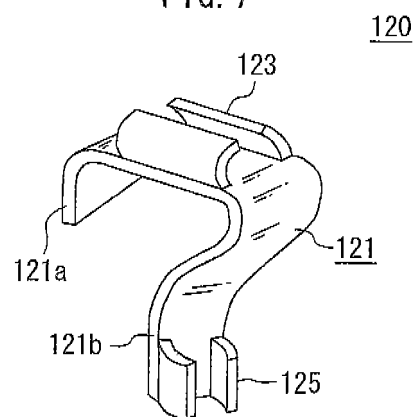


FIG. 8

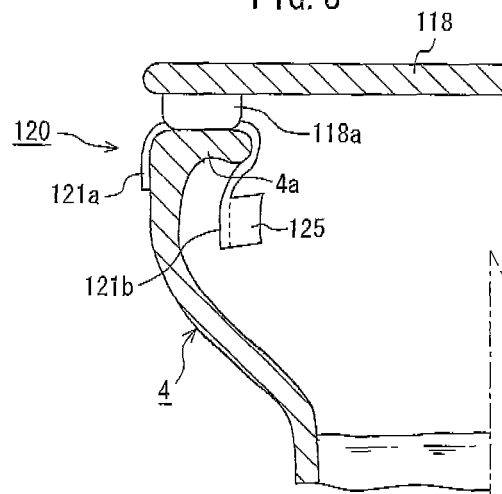


FIG. 9

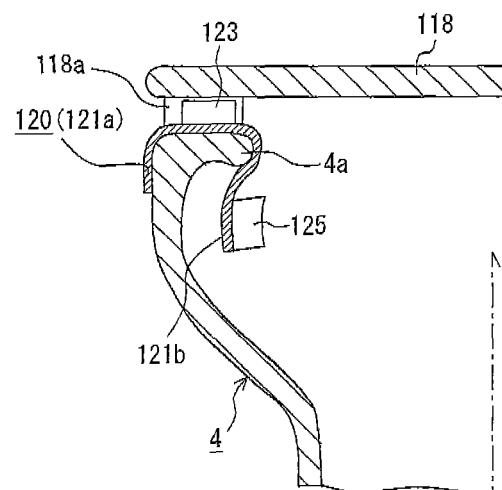


FIG. 10

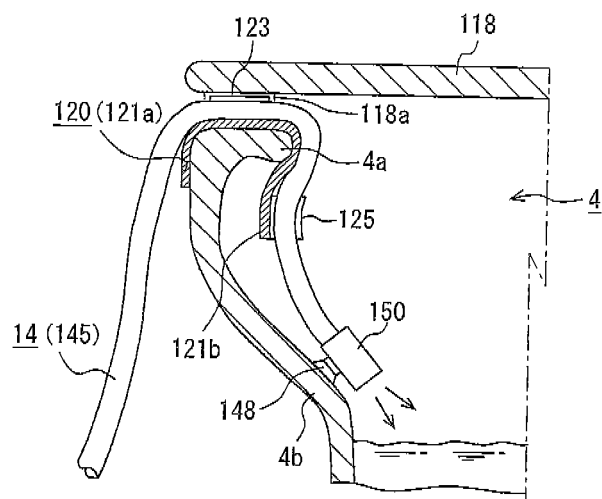
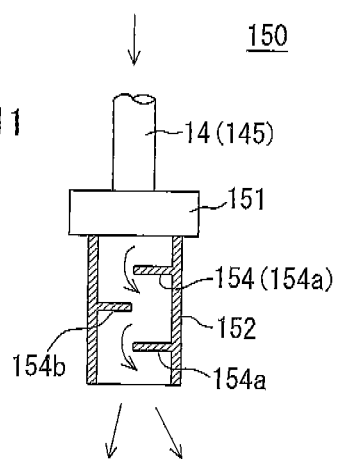
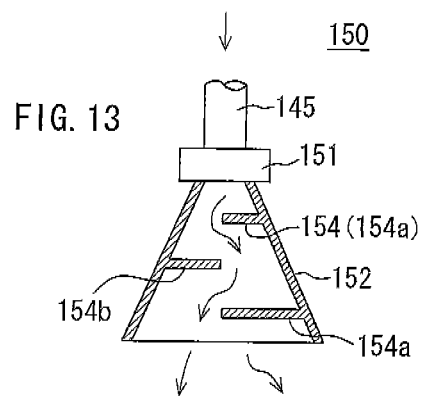
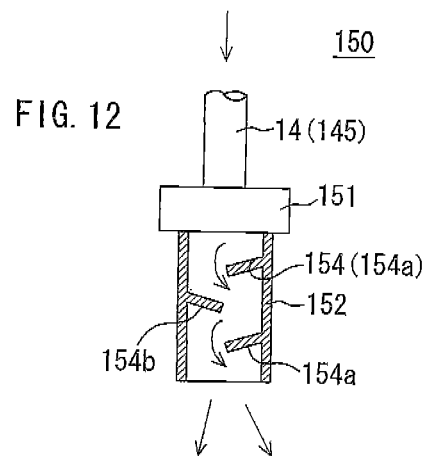
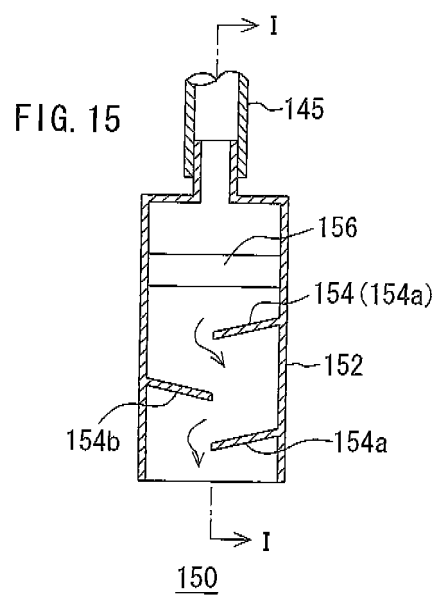
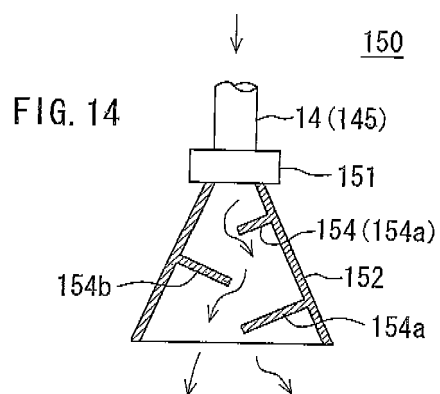


FIG. 11







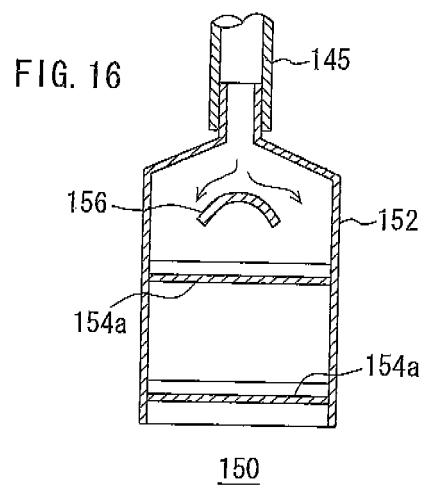


FIG. 17

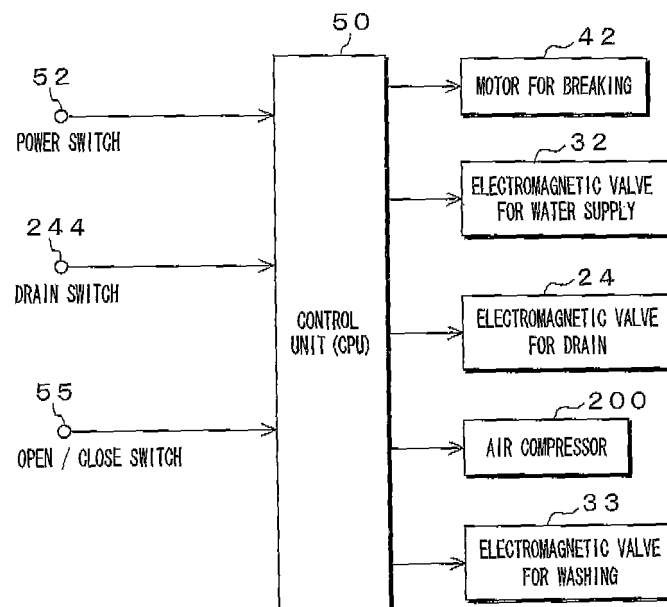


FIG. 18

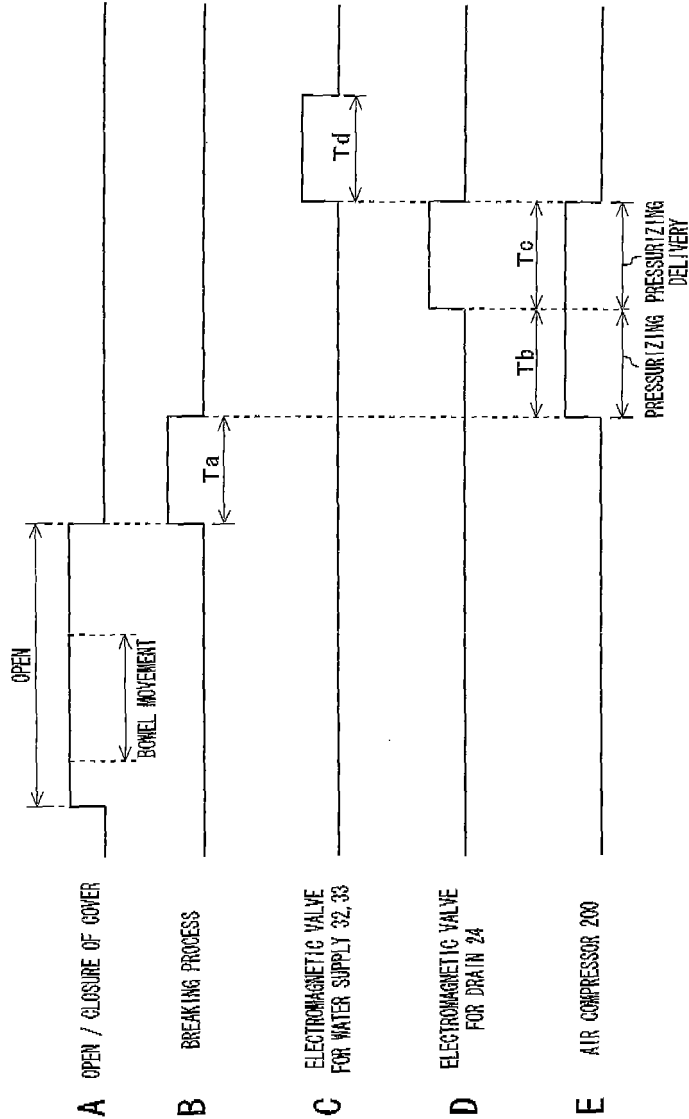


FIG. 19

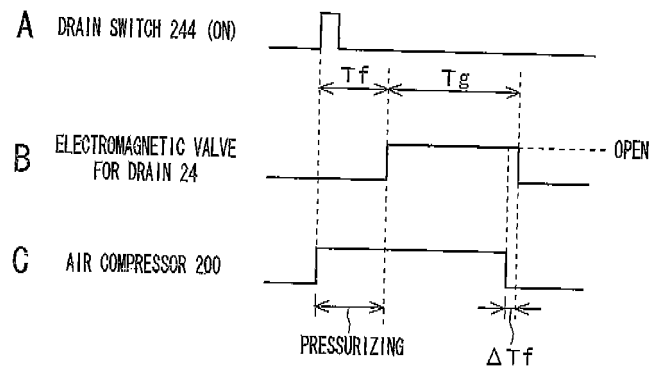


FIG. 20

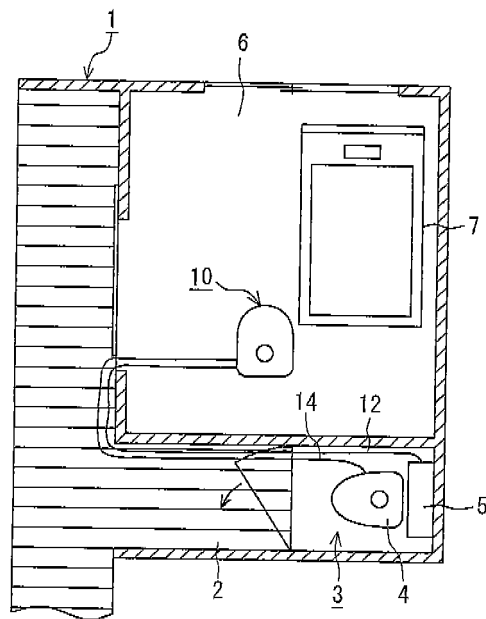
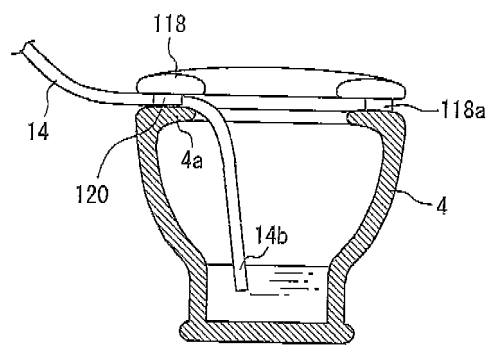


FIG. 21



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/052709

## A. CLASSIFICATION OF SUBJECT MATTER

E03D11/02(2006.01)i, E03D5/012(2006.01)i, E03D9/10(2006.01)i, F16L55/00(2006.01)i, B02C18/00(2006.01)n, E03C1/12(2006.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E03D11/02, E03D5/012, E03D9/10, F16L55/00, B02C18/00, E03C1/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

|                           |           |                            |           |
|---------------------------|-----------|----------------------------|-----------|
| Jitsuyo Shinan Koho       | 1922-1996 | Jitsuyo Shinan Toroku Koho | 1996-2007 |
| Kokai Jitsuyo Shinan Koho | 1971-2007 | Toroku Jitsuyo Shinan Koho | 1994-2007 |

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                  | Relevant to claim No. |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 104449/1990 (Laid-open No. 62998/1992) | 1                     |
| Y         | (Nippon Telegraph And Telephone Corp.),<br>28 May, 1992 (28.05.92),<br>Full text; all drawings<br>(Family: none)                                    | 2                     |
| Y         | JP 2004-27579 A (Kubota Corp.),<br>29 January, 2004 (29.01.04),<br>Par. Nos. [0017], [0023]; Fig. 1<br>(Family: none)                               | 2                     |

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search  
07 May, 2007 (07.05.07)

Date of mailing of the international search report  
15 May, 2007 (15.05.07)

Name and mailing address of the ISA/  
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2007/052709

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                | Relevant to claim No. |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 4809/1991 (Laid-open No. 101097/1992) (Nippon Telegraph And Telephone Corp.), 01 September, 1992 (01.09.92), Par. Nos. [0001] to [0013]; all drawings (Family: none) | 1, 2                  |
| Y         | JP 2000-8442 A (Kan FUJITA), 11 January, 2000 (11.01.00), Par. Nos. [0013] to [0028]; Fig. 2 (Family: none)                                                                                                                                                                       | 3-5                   |
| Y         | JP 2001-275885 A (Denso Corp.), 09 October, 2001 (09.10.01), Par. Nos. [0025], [0048]; Fig. 1 (Family: none)                                                                                                                                                                      | 3-5                   |
| Y         | US 2003/0229939 A1 (Claude L. Berman), 18 December, 2003 (18.12.03), Par. Nos. [0037] to [0039]; Fig. 1 & EP 1371789 A2                                                                                                                                                           | 5                     |

Form PCT/ISA/210 (continuation of second sheet) (April 2005)