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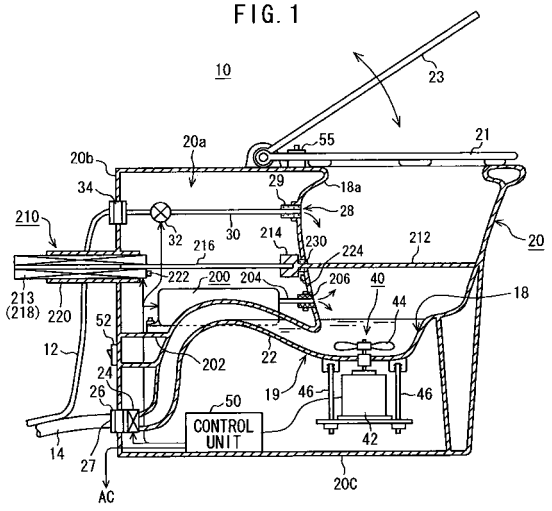
(54) PORTABLE FACILITATED TOILET APPARATUS

(57) This is a portable toilet device. Broken excrement may be certainly drained. Means (40) for breaking the excrement having crushing blades is installed in the stagnant portion (18) of the body (20) of the toilet device, means (200) for sending the broken excrement by compression, which sends compressed air into the stagnant portion (18), and a lid for open and closure that closes the stagnant portion (18) tightly are provided.

When treating the excrement after bowel movement, the lid for open and closure is closed and then, by driving the means for breaking the excrement, the excrement is stirred and broken into fragments with the stagnant portion being tightly closed. After breaking the excrement into fragments, compressed air is jetted into the stagnant portion so that a liquid mixture formed by breaking the excrement into fragments can be sent by compression toward a side of drain hose (14).

Since the drain hose is connected to an existing toilet device of an existing toilet facility or the like, this liquid mixture can be certainly drained to a side of the existing toilet device if the broken excrement is sent by compression.

FIG. 1



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Description

Technical Field

[0001] This invention relates to a portable toilet device and it particularly relates to a portable toilet device that is available indoors. It, more particularly, relates to such that can certainly treat any excrement and the like with preventing the excrement from being spilt by providing within a body of the toilet device means for performing breaking-processing (stirring-processing) on the excrement and sending the broken excrement by compression, and a lid for open and closure, which prevents the excrement from being spilt and sending the excrement by compression efficiently.

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 (see, for example, Japanese Patent Application Publication No.2004-308404).

[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 sending the excrement by compression.

[0004] By the way, although technology disclosed in the above-mentioned patent document has related to such the technology that the excrement can be drained from the toilet device by sending the excrement by compression, the excrement can be stagnant halfway through the drain hose when insufficient pressure for sending it by compression is supplied because the excrement is sent by compression as it is, so that any insanitation may occur.

[0005] Thus, this invention has solved such the conventional problem and provides a portable toilet device that is available indoors, which can certainly treat any excrement and the like with preventing the excrement from being spilt by particularly providing a lid for open and closure, which prevents the excrement from being spilt, with performing breaking-processing on the excrement, and by performing drain-processing on the broken excrement with sending it by compression.

Disclosure of the Invention

[0006] In order to solve the above-mentioned problem, a portable toilet device according to this invention, which is claimed in claim 1, is characterized in that the device comprises a body of the device containing a water-supplying nozzle that flushes rinse water near an opening, and a drain opening that is communicated with a stagnant portion provided at a bottom thereof, means for breaking the excrement, which is installed at the stagnant portion of the body of the device, means for sending the broken excrement by compression, which is provided on an upside of the stagnant portion, and a lid for open and closure that closes the stagnant portion tightly, which is provided on an upside of the means for sending the broken excrement by compression.

[0007] The stagnant portion of the body of the device is provided with the means for breaking the excrement. It is conceivable that the means for breaking the excrement includes breaking/stirring type one and the other type one (such as breaking the excrement into fragments by a jet stream). Whatever happen, this means forces the excrement to be broken. The lid for open and closure is provided on an upside of the stagnant portion. It is conceivable that the lid for open and closure includes slidable type one and open/close type one. In course of the breaking process, the upside of the stagnant portion is closed by the lid for open and closure. Therefore, this prevents the excrement that is being broken into fragments from being spilt toward an opening side of the body of the toilet device.

[0008] The means for sending the broken excrement by compression is driven before or after the breaking process has been completed so that internal pressure in a closed space formed by the stagnant portion and the lid for open and closure can be increased. When the internal pressure reaches to a predetermined one, an electromagnetic valve is opened at a side of the drain opening. This enables the broken excrement to be sent toward a side of an existing toilet device, thereby preventing the excrement from being remained in a drain pipe connected to the existing toilet device.

[0009] Thus, according to this invention, the broken excrement and the like can be certainly drained with preventing the excrement from being spilt.

Brief Explanation of Drawings

[0010]

FIG. 1 is a cross sectional view for showing an important portion of an embodiment of a portable toilet device according to the invention;
FIG. 2 is a diagram for showing a configuration of a water-supplying hose;
FIG. 3 is a diagram for showing a configuration of a drain hose;
FIG. 4 is a cross sectional view for showing an important portion of an embodiment of a check valve;
FIG. 5 is a diagram for illustrating a connection example of the water-supplying hose and the drain hose using the existing toilet;
FIG. 6 is a plane view for showing an embodiment of a lid body constituting a lid for open and closure;
FIG. 7 is a cross sectional view for showing an open condition of the lid body;

FIG. 8 is a schismatic diagram for showing an embodiment of a control system for a portable toilet device according to the invention;
FIGS. 9A through 9K are wave form charts for operation description;
FIG. 10 is a cross sectional view for showing an important portion of another installed example of means for breaking that is available for the invention;
FIG. 11 is a sketch for showing an application example of a portable toilet device according to the invention;
FIG. 12 is a cross sectional view similar to that shown in FIG. 1 for showing an important portion of another embodiment of a lid for open and closure;
FIG. 13 is a cross sectional view for showing an opened condition of the lid for open and closure in FIG. 12;
FIG. 14 is a schismatic diagram for showing an embodiment of a control system that is applicable for a portable toilet device shown in FIG. 12;
FIGS. 15A through 15E are timing charts for a processing operation example;
FIGS. 16A through 16C are timing charts for another processing operation example;
FIG. 17 is a cross sectional view similar to that shown in FIG. 1 for showing another embodiment of means for breaking and a lid for open and closure;
FIG. 18 is a cross sectional view for showing an opened condition of the lid for open and closure in FIG. 17;
FIG. 19 is a schismatic diagram for showing an embodiment of a control system that is applicable for a portable toilet device shown in FIG. 17;
FIGS. 20A through 20F are timing charts for a processing operation example;
FIGS. 21A through 21F are timing charts for another processing operation example;
FIG. 22 is a cross sectional view similar to that shown in FG. 17 for showing another example in FIG. 17;
FIG. 23 is a diagram for showing a configuration of an important portion of an embodiment of means for attaching the water-supplying hose and the drain hose that are attached to a nursing facility;
FIG. 24 is a diagram for showing a configuration of an important portion of an embodiment of means for attaching the drain hose (No. 1) ;
FIG. 25 is a diagram for showing a configuration of an important portion of another embodiment of means for attaching the drain hose (No. 2);
FIG. 26 is a diagram for showing a configuration of an important portion of further embodiment of means for attaching the drain hose (No. 3);
FIG. 27 is a diagram for showing a configuration of an important portion of other embodiment of means for attaching the drain hose (No. 4);
FIG. 28 is a cross sectional view for showing an important portion in an attached condition of the drain hose;
FIG. 29 is a diagram for showing a configuration of an important portion of still further embodiment of means for attaching the drain hose (No. 5);
FIG. 30 is a perspective view of an embodiment of an attachment of the drain hose;
FIG. 31 is a diagram for showing a configuration of an important portion of still another embodiment of means for attaching the drain hose (No. 6);
FIG. 32 is a perspective view of an embodiment of an attachment of the drain hose;
FIG. 33 is a diagram for showing a configuration of an important portion of still other embodiment of means for attaching the drain hose (No. 7);
FIG. 34 is a perspective view for showing an embodiment of means for attaching the drain hose;
FIG. 35 is a perspective view for showing an important portion of an attaching example of the drain hose when this invention is applied to a toilet of Japanese style;
FIG. 36 is a perspective view for showing an embodiment of means for attaching the drain hose for use of this time;
FIG. 37 is a horizontally cross sectional view for showing an important portion of further embodiment of a portable toilet device according to the invention;
FIG. 38 is a horizontally cross sectional view for showing an important portion of still further embodiment of a portable toilet device according to the invention;
FIG. 39 is a plane view of a bed, to which this invention is applied, for showing an embodiment thereof; and
FIG. 40 is a cross sectional view for showing an important portion thereof.

Preferred Embodiments for carrying out the Invention

[0011] The following will describe preferred embodiments of the portable toilet device according to the invention more detailed with reference to drawings. The portable toilet device according to the invention is particularly suitable for a portable toilet 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. In the embodiments, the portable toilet device is applied to a toilet of western type.

(Embodiment 1)

[0012] FIG. 11 relates to an application example of this invention. In this example, a toilet facility 3 is set facing a corridor 2 in a house 1. In the toilet facility 3, a toilet device 4 and a water-supply tank 5 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.

[0013] FIG. 1 is a cross sectional view for showing an

important portion of an embodiment of a portable toilet device 10 according to the invention. 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 almost like that of a normal water-washing toilet device (of western style), but has a whole configuration of box. 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. In order to save the weight of the body 20 of the toilet device, in this example, plastic molded body is used as the body 20 of the toilet device. Any other materials such as ceramics may be used to be molded. A 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 seat 21 and the upper opening.

[0014] 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 is connected to a drain opening 27. 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.

[0015] 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 device is not used. This is because the water is prevented from leaking. Simultaneously, this is also because the excrement can be efficiently drained based on a pressure by an air compressor 200, which will be described later.

[0016] 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-supplying nozzle 28 and an electromagnetic valve 32 is arranged near the connection portion 34. This is because this electromagnetic valve 32 may control any water supply from a water-supplying hose 12 connected to the connection portion 34. A leak-proof rubber tube 29 is inserted between the water-supplying nozzle 28 and the wall surface 18a, so that water is prevented from leaking to a side of a back-side space 20a of the body 20 of the toilet device.

[0017] Means 40 for breaking the excrement is installed at a bottom of the stagnant portion 18. The means 40 breaks into fragments the excrement and toilet paper, which are totally referred to as "the excrement", stagnated in the stagnant portion 18, various kinds of the configurations of which are conceivable. Stirred (rotational) typed means, jet-stream typed means or the like is conceivable and in the jet-stream typed means, the excrement and the like is efficiently broken into fragments by means of cooperation with any breaking portion. Any liquid mixture broken by the means 40 for breaking the excrement is mixed with the trap water and drained.

[0018] The means 40 for breaking the excrement, which is shown in FIG. 1, is illustrated as the stirred typed means. In this embodiment, a motor 42 and crushing blades 44 constitute the means 40 for breaking the excrement, which is installed within the stagnant portion 18.

[0019] In FIG. 1, only the crushing 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 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.

[0020] 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 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 detection switch 55 for the cover 23 is arranged on an upper surface of the body and under a lower surface of the cover 23.

[0021] FIG. 2 shows an example of the water-supplying hose 12 and FIG. 3 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.

[0022] Similarly, of the drain hose 14, an end 14a and the other end 14b are respectively provided with connection portions 62A, 62B, each of which has a check valve. In this moment, the end 14a is an end that is connected to a side of the portable toilet device 10, but the other end 14b is an end that is connected to a side of the drain pipe or the like.

[0023] 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. Since the drain hose 14 enables any liquid mixture (fragments) formed by breaking the excrement and the like to be flown therein, a vinyl hose or the like having a larger diameter than that of the water-supplying hose 12 may be used. This is because liquid mixture with the rinse

water, not solidified excrement, is treated. FIG. 3 shows a case where the vinyl hose 14 having a larger diameter than that of the water-supplying hose 12 is used.

[0024] If diameters of the water-supplying hose 12 and the drain hose 14 are so selected as to be become the diameters described above, 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. Of course, not only in a case where hoses having different diameters are used but also in a case where hoses having same diameter are used, as shown in FIGS. 2 and 3, any marked names such as "Water-supplying Hose" and "Drain Hose" are stamped on a surface of each of the hoses, so that any accidental connection may be certainly prevented. Anti-standardization for shapes or forms of metal connection fittings in the connection portions enables any accidental connection to be prevented. The water-supplying hose and the drain hose are colored with different colors so that such the different colors enable any accidental connection to be also prevented.

[0025] The connection portions 60 (62), each of which has a check valve, form a hollow valve operation room 64 with a rectangular profile inside a body 63, as shown in FIG. 4, 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.

[0026] On the other hands, when the other connection portions 60B (62B) of the connection portions 60 (62) are connected to a side of the portable toilet device and a side of drain pipe of the existing toilet device, for example, their internal valves are opened to become any communicate condition in a case where the connection portions 60 (62) are connected if projection members, not shown, each retreating the ball member 65 of the check valve against the push spring 66, are respectively provided in the side of portable toilet device and the side of the drain pipe, or when they are not connected, their internal valves are closed to prevent liquid in each of the hoses from leaking to outside.

[0027] Therefore, even if the connection portion 60A is detached while the connection portion 60A of the water-supplying hose 12 is connected to the water supply pipe and the connection portion 60B thereof is connected to the side of the body 20 of the toilet device, any liquid in the hose is not leaked; and even if the other connection portion 60B is detached, any liquid in the hose is not leaked. Similarly, even if the used drain hose 14 is detached, any waste liquid in the hose is not leaked to outside.

[0028] FIG. 5 shows an outline of an existing toilet facility 3. FIG. 5 illustrates an 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, and is connected with a hose 89 for the rinse water.

[0029] In this embodiment, the diverging pipe 84 having such the 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.

[0030] 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. 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.

[0031] A tank 96 filled with a sterilizing solution is further able to be 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 facility 3 but also the portable toilet device 10 to be improved. The drain hose 14 may be also washed at the same time. The pour-water tank 96 has not always to be provided but may be suitably provided at need.

[0032] The drain hose 14 may be arranged as to drain the waste water and the like directly to the drain pipe, for example, the drain pipe in the existing toilet facility 3 but, in a simple case, the drain hose 14 extends to the toilet device 4 and the waste water and the like pour directly into the toilet device 4. Alternatively, a drain outlet for drain is provided in the toilet device 4 and the drain hose 14 is connected to it so that the waste water and the like can pour into the toilet device 4 therethrough. An embodiment shown in FIG. 5 is an embodiment in which it is connected to a connection hole bored in the toilet device 4. In this moment, this is accomplished by reforming a body 108 of the toilet device and connecting the connection potion 60B of the drain hose 14 to the connection hole.

[0033] Thus, by utilizing the existing toilet facility 3, it is possible to supply water to the portable toilet device 10 and drain from the portable toilet device 10 if a simple work to attach only the diverging pipe 84 is carried out.

[0034] The portable toilet device 10 according to the invention further has the following configuration. As shown in FIG. 1, means 200 for sending the broken excrement by compression, which sends prescribed compressed air to the stagnant portion 18, and a lid-opening and closing mechanism 210, which closes the stagnant

portion 18 tightly, are provided at a desired position of the body 20 of the toilet device behind the stagnant portion 18, upper than the stagnant portion 18 and lower than the water-supplying nozzle 28.

[0035] The means 200 may be constituted of an air compressor and a sending pipe 204 of the air compressor 200 extends through the wall surface 18a 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. Similarly, in order to demonstrate the same function as the means 200 to supply prescribed compressed air to the stagnant portion 18, it is possible to take the compressed air therein from outside of the body of the portable toilet device and to demonstrate the same faculty.

[0036] The lid-opening and closing mechanism 210 exists in a position upper than the means 200 for sending the broken excrement by compression, and positioned away from the means 200 by a small amount of allowed distance. The lid-opening and closing mechanism 210 shown in FIG. 1 is constituted of a lid body 212 (lid for open and closure) that closes the stagnant portion 18 tightly, and a open/close driving portion 213 that opens or closes the stagnant portion 18 by means of advancing or retreating the lid body 212, or the like.

[0037] As how to open and close the lid body 212, slidable type one and open/close (rotational) type one to open and close it upwardly or downwardly by an angle of more than 90 degrees as one example are conceivable, so that the open/close driving portion 213 may have different configurations depending on the slidable type one or the rotational type one.

[0038] The embodiment shown in FIG. 1 is an embodiment in which the slidable type one is configured. In this embodiment, an electromagnetic solenoid 218 is used as the open/close driving portion 213 and a tip end of a piston (rod) 216 that is advanced or retreated in the electromagnetic solenoid 218 is attached to a connection portion 214. The connection portion 214 is a part of the lid body 212 as described above.

[0039] The lid body 212 has a form of plane that corresponding to an internal circumference form of the stagnant portion 18, as an example thereof shown in FIG. 6, in which it has a form like an egg, apple or a strawberry. In this embodiment, an antibacterial coated plastic molding one is used.

[0040] In this example, the lid body 212 and the connection portion 214 are cast together so that a part of the lid body 212 can be formed as the connection portion 214. The connection portion 214 has a rectangular form. A tip end of the above-mentioned piston 216 is fit and fixed by means of press fit to an opposite side of the connection portion 214. The piston 216 is an operation column rod that is advanced and retreated inside the electromagnetic solenoid 218 by turning the electromagnetic solenoid 218 on electricity. In addition thereto, a combination of an air cylinder and gears or the like can perform the same advanced and retreated movement for open and closure.

[0041] FIG. 1 shows a condition such that the lid body 212 is closed as the lid for open and closure and by the lid body 212, an interior of the stagnant portion 18 is closed tightly. On the other hands, FIG. 7 shows a condition such that the lid body 212 is retreated to open the stagnant portion 18.

[0042] Such the advanced and retreated movement for the lid body 212 is performed by turning the electromagnetic solenoid 218 on or off and its stroke is detected by a first switch 222 that is positioned at the electromagnetic solenoid 218 on its side of the lid body 212 and a second switch 224 that is positioned at the body 20 of the toilet device on its side of the wall surface 18a. Attaching the connection portion 214 to the first or second switch 222, 224 enables a stroke termination of the lid body 212 to be detected.

[0043] Slide and connection of the lid body 212 toward an upper surface of the stagnant portion 18 causes an interior of the stagnant portion 18 to be closed tightly. It is not necessary to close the interior of the stagnant portion 18 tightly to the full. Under this closed condition of the lid, if the air compressor 200 is driven, compressed air is sent into the stagnant portion 18 so that any pushing pressure can be applied to the trap water and any broken matters in the stagnant portion 18 can be sent to a side of the drain hose 14 by compression. It is to be noted herein that the broken matters indicate to a liquid mixture of the broken excrement and the trap water.

[0044] Since the stagnant portion 18 is thus closed tightly by the lid body 212, the compressed air affects the side of stagnant portion 18 effectively. Since the broken excrement becomes liquid mixture, the liquid mixture can be easily drained together with rinse water through the drain hose 14 when the compressed air affects the stagnant portion 18.

[0045] Thus, the liquid mixture is prevented from being remained in the drain hose 14. The liquid mixture is sent by compression while the stagnant portion 18 is closed tightly so that a relatively small-sized compressor may be used as the air compressor used as the means 200 for sending by compression. Using the lid-opening and closing mechanism 210 enables the excrement to be prevented from being spilt into the body 20 of the toilet device when breaking the excrement into fragments, so that no unhygienic environment may occur in the body 20 of the toilet device.

[0046] FIG. 8 shows an embodiment of a control system for the portable toilet device 10. In addition to the above-mentioned power switch 52, a detection switch 55 for open and closure and the first and second switches 222, 224 are provided and their on/off signals are supplied to the control unit 50.

[0047] The power switch 52 is turned on when the portable toilet device 10 is installed. On the other hand, the

detection switch 55 for open and closure 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 seat 21. Therefore, as shown in FIG. 1, in this embodiment, the detection switch 55 for open and closure is mounted on a lower surface of the cover 23 so that it can be opposed to the cover 23. The first and second switches 222, 224 are switches that are turned on/off based on the stroke of the lid body 212.

[0048] Any control signals from the control unit 50 constituted of CPU control each driving state of the above-mentioned electromagnetic valve 24 for drain, electromagnetic valve 32 for water supply, motor 42 for breaking, air compressor 200, and electromagnetic solenoid 218.

[0049] FIGS. 9A through 9K show an example of such the 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.

[0050] The portable toilet device 10 is used by opening the cover 23. Open manipulation of the cover 23 is detected by the detection switch 55 (detection sensor switch or the like) for open and closure (FIGS. 9A and 9B). When the cover 23 is opened, the electromagnetic solenoid 218 is turned on so that the lid body 212 can be opened (FIG. 9C). The stroke Tx of the lid body 212 is detected by the first switch 222 and when the first switch 222 is turned on, the electromagnetic solenoid 218 is turned off (FIG. 9D).

[0051] The lid body 212 is opened so that the toilet device can be used and when bowel movement and/or urination are finished and the cover 23 is closed, the detection switch 55 for open and closure detects it to close the lid body 212. Alternatively, when an electric signal by a manual switch notifies the control unit that bowel movement and/or urination have been finished, the lid body 212 is closed. The stroke Tx of the lid body 212 in a closure direction thereof is detected by the second switch 224 (FIG. 9E).

[0052] When the lid body 212 is closed so that an interior of the stagnant portion 18 is closed tightly, the motor 42 for breaking is now activated to start the breaking process in the stagnant portion 18 (FIG. 9F). A period of breaking process time Ta is selected so as to able to break the excrement and toilet paper suitably into fragments. As such the period of time, 20 seconds or less, for example, 20 seconds or less are selected.

[0053] The breaking process is performed during only a predetermined period of time Ta and then, the air compressor 200 is turned on to send the compressed air into the stagnant portion 18; and the electromagnetic valve 24 for drain is opened to create a drain passage (FIGS. 9H and 9I) with a small amount of delay (ΔTb) starting from when the air compressor 200 is turned on. Thus, the electromagnetic valve 24 is turned on with a small amount of delay starting from when the air compressor 200 is turned on, so that interior pressure of the stagnant portion 18 can be increased. If the electromagnetic valve 24 is opened while the interior pressure of the stagnant portion 18 is increased, the liquid mixture in the stagnant portion 18 is sent by compression toward a side of the drain hose 14 by sending the compressed air and supplying rinse water. Such the sending process is performed over a predetermined period of time Tb.

[0054] As the predetermined period of time Tb, a relatively longer period of time, for example, about 10 through 30 seconds are normally selected so that any liquid mixture may not be remained in the drain hose 14, though there may be differences in connection with lengths of the set drain hose 14.

[0055] When the predetermined period of time Tb has been elapsed, it is now moved to the open operation of the lid body 212 (FIG. 9C). When such the open operation is performed and the open position of the lid body 212 is detected by the first switch 222, the upper portion of the stagnant portion 18 is opened. After opening the upper portion of the stagnant portion 18, the electromagnetic valve 32 for water supply is activated to supply the rinse water into the stagnant portion 18 during a predetermined period of time Tc (FIG. 9G). The predetermined period of time Tc is selected so as to become a period of water-supplying time when the trap water in the stagnant portion 18 reaches a predetermined amount thereof. It is herein to be noted that an amount of water storage until a surface of the trap water exceeds a bending portion of the drain portion 22 is referred to as "the predetermined amount".

[0056] When the water supply into the stagnant portion 18 has been completed, the lid body 212 is closed so that it can be returned to its initial state (FIGS. 9C and 9D). Such the operation timing of each component is controlled based on on/off signals from a plurality of switches and periods of times set by software inside the control unit 50. Water supply and drain are respectively repeated so that clean washing can be further attained.

[0057] By setting such the operation timings, breaking the excrement into fragments, the drain process, and the trap process of the trap water may be accomplished. It is to be noted that any drain switch, not shown, may be provided for opening the electromagnetic valve 24 to drain the trap water by manually operating it in order to be made suitable when the portable toilet device 10 is carried or the like.

[0058] The above-mentioned open/close timings and the like of the electromagnetic valves and the like are only their examples. Alteration may be suitably added thereto. For example, as shown in FIGS. 9J and 9K, a period of pressured time ΔTb is set to longer one ΔTb' and after it has been suitably pressured, sending-by-compression process is performed during a period of time Tb'.

[0059] FIG. 10 shows another installed example of the means 40 for breaking. In this embodiment, an attaching cap 67 having a predetermined depth and diameter is provided at a side of the bottom of the stagnant portion 18 with it being in one united body with the stagnant portion 18. The motor 42 for breaking is fit and fixed into the

attaching cap 67 through vibration-proofing rubber material 69 and the like. The attaching cap 67 is covered by a cover plate 68 made of rubber, plastic members or the like so that the attaching cap 67 can be closed in a hermetic manner against water.

[0060] In order to realize that the attaching cap 67 can be closed in a hermetic manner against water, a bottom of the stagnant portion 18 that is contacted with the cover plate 68 is recessed somewhat and the cover plate 68 is fixed to the bottom of the stagnant portion 18 by means of screws 70 and the like. Thus, the means 40 for breaking can be also attached. It is to be noted that although it has been described that the motor 42 and the crushing blades 44 constitutes the means 40 for breaking, a screw, a blade, or a cylindrical roller with projections on its circumference or the like may be configured instead of the crushing blades and a configuration in which a rotational shaft of the motor is arranged horizontally may be configured.

(Embodiment 2)

[0061] The following will describe another embodiment (embodiment 2) of the portable toilet device 10 according to the invention with reference to FIG. 12 and later figures. Description on components being common to those shown in FIG. 1 will be omitted and in this embodiment, the lid body is configured so as to be rotatable.

[0062] As shown in FIG. 12, at an upper of the stagnant portion 18 in the body 20 of the toilet device, a reducing size portion 260 is provided at a slightly upper side of an attached position of the means 200 for sending-by-compression. The reducing size portion 260 is configured so as to be a ring-shaped flange portion which extends inwardly 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 260.

[0063] The reducing size portion 260 is so designed as to be wholly inclined somewhat toward a side of the drain portion 22, as clearly shown in FIG. 12. A rotatable lid-opening and closing mechanism 250, which can close an interior of the stagnant portion 18 tightly by closing this reducing size portion 260, is provided under a lower surface of the reducing size portion 260.

[0064] The lid-opening and closing mechanism 250 has a lid body 252 and an end of the lid body 252, a right end thereof in a shown embodiment, is provided as a rotation axis portion 214 for rotational type; 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 260. This pivoted portion is pivoted under the body 20 of the toilet device in a hermetic manner against water.

[0065] The lid body 252 is urged so that its periphery can come into contact with a lower rim 264 of the reducing size portion 260. The lid body 252 has a form like along that of the lower rim 264 and a spring 256 for urging is twisted between the rotation axis portion 254 and a wall surface of the lower surface portion 232, thereby enabling the lid body 252 to be come into contact with the lower rim 264 normally to close the interior of the stagnant portion 18 tightly.

[0066] Herein, since the reducing size portion 260 is provided so as to be inclined somewhat toward the drain portion 22 as described above, the lid body 252 itself constituting the lid-opening and closing mechanism 250 is also attached so as to be inclined toward the drain portion 22. Thus, when the lid body 252 is attached in an inclined manner, any excrement dropped on an upper surface of the lid body 252 can be dropped dawn into the stagnant portion 18 (see FIG. 13).

[0067] The lid-opening and closing mechanism 250 is thus configured so as to be rotated so that any driving mechanism as shown in FIG. 1 is not necessary, thereby reducing the costs thereof.

[0068] 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 252 and a part of the periphery of the stagnant portion 18. In this embodiment, as shown in FIG. 12, it is attached and fixed in a hermetic manner against liquid to a portion thereof near and under the rotation axis portion 254 of the lid body 252. Even if being thus configured, any processing similar to that shown in FIG. 1 can be performed.

[0069] FIG. 14 shows an embodiment of a control system in the portable toilet device 10 shown in FIG. 12. The following description is partially overlapped with the description of FIGS. 8 and later. In this embodiment, an open/close switch 55 and a drain switch 244 are provided in addition to the power switch 52 and their on-off signals are supplied to the control unit 50. The drain switch 244 is positioned further back than the cover 23. This is because it has less frequency in use.

[0070] In an example of control timing of FIGS. 15A through 15E, open manipulation of the cover 23 is detected by the open/close detection switch 55 (FIG. 15A). Bowel movement is carried out while the cover 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 is dropped into the trap water in the stagnant portion 18 (see FIG. 13). When the excrement is dropped, 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.

[0071] After the bowel movement has been finished, the cover is closed (FIG. 15A). If it is determined that the cover is closed, any excrement is broken into fragments for a period of time Ta (FIG. 15B). 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 the breaking operation. The period of time Ta 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, pref-

erably about 5 through 10.

[0072] 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 pressed (FIG. 15E). A period of time Tb for pressing 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 liquid mixture is certainly sent by compression and drained to the existing toilet device 4 through the drain hose 14. A period of time Tb that is a predetermined value of the internal pressure is actually set in advance and this period of time Tb is counted.

[0073] When the period of time Tb 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 (FIG. 15D). When the electromagnetic valve 24 for drain is driven to open the drain opening 27, the trap water (liquid mixture) in the stagnant portion 18 is sent at once by the compressed air 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 fragments by means 40 for breaking the excrement is drained to a side of the existing toilet device 4.

[0074] A period of time Tc for sending-by-compression is normally set to a period of relatively longer time, for example, about 10 through 30 seconds, in order to prevent the liquid mixture from being remained in the drain hose 14, though there may be a difference in a set length of the drain hose 14.

[0075] When the period of time Tc has been elapsed, the electromagnetic valve 24 for drain is turned off and driving of the air compressor stops (FIGS. 15D, 15E). 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 (FIG. 15C) . A period of time Td for 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 water supplies up to an amount 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.

[0076] 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 FIG. 15C. 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.

[0077] Such the washing process may be performed before the water supply to the stagnant portion 18, namely, after the liquid mixture has been sent by compression 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 send and/or drain the rinse water therefor at the same time. Therefore, the water supply to the stagnant portion 18 is then performed after the electromagnetic valve 24 has been closed.

[0078] If the portable toilet device 10 is moved or removed, it is preferable to drain the trap water from the stagnant portion 18. Such the drain processing is separately performed from the above-mentioned drain process. In this case, as shown in FIGS. 16A through 16C, the drain switch 244 is turned on, so that the air compressor 200 is activated (FIGS. 16A, 16B). The start of the air compressor 200 enables the interior of the stagnant portion 18 to be pressed (FIG. 16C). After the press process over a period of time Tf 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 Tg by driving the electromagnetic valve 24 for drain (FIG. 16B).

[0079] This sending-by-compression 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 (ΔTf) 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 Tf may be set to the above-mentioned period of time Tb and the period of time Tg may be set to the period of time Tc.

(Embodiment 3)

[0080] FIG. 17 and later figures show further embodiment (embodiment 3) of the portable toilet device 10. The embodiment 3 uses the same lid-opening and closing mechanism as that of the embodiment 2 but has a different configuration of the means for breaking the excrement therefrom. The means for breaking the excrement in the embodiment 3 uses a jet stream from the means 200 for sending-by-compression and in this embodiment, in addition to this jet stream, a crashing portion for allowing the excrement to crash with the excrement being stirred by the jet stream is provided in the stagnant portion 18. In the portable toilet device 10, the description of components being common to the above-mentioned components will be omitted.

[0081] The means 200 for sending-by-compression is utilized for crashing process of the excrement and the like in addition to sending the excrement and the like by compression. An air compressor of small size is used as the means 200 for sending-by-compression. The means 200 for sending-by-compression is attached and fixed to a predetermined position inside the body 20 of the toilet device.

[0082] The sending pipe 204 is connected to the means 200 for sending-by-compression and a jet outlet 206 is fixed at a position of the stagnant portion 18, which is positioned upper than a surface of the trap water in the stagnant portion 18, with the jet outlet being exposed on the side of the stagnant portion 18. In this embodiment, the jet outlet 206 is attached and fixed with it being inclined somewhat, so that the jet outlet 206 can face toward a side of the surface of the trap water.

[0083] The diverging pipe is used as the sending pipe 204 and a jet outlet 207a of a diverging branch pipe 207 is positioned at a side of the bottom of the stagnant portion 18 with the jet outlet being exposed therein. The jet outlet 207a is attached and fixed with it being inclined somewhat, so that the jet outlet 207a can face toward a side of the wall surface of the stagnant portion 18, not face just above in the stagnant portion 18. This is because the excrement can easily crash to the wall surface of the stagnant portion 18 with the excrement being stirred by the jet stream based on the compressed air jetted from the jet outlet 207a.

[0084] The excrement drops into the stagnant portion 18 when an opening/closing lid 252 is opened by its weight, as shown in FIG. 18. Since the jet stream by the compressed air from the means 200 for sending-by-compression is jetted into the stagnant portion 18, the dropped excrement is broken into fragments by striking the dropped excrement directly to this jet stream. Since the jet stream crushes the excrement to the wall surface of the stagnant portion 18, the excrement is further crushed by an impact of this crush.

[0085] In order to enhance crushing power to the excrement by the jet stream, in the embodiment shown in FIG. 17, a crushing portion 270 is further attached to a side wall of the stagnant portion 18 in which the trap water is accumulated.

[0086] The crushing portion 270 is constituted of a plurality of projections 272 and in this embodiment, the plurality of projections 272 is so configured as to be regularly formed as several lines. It is preferable that the projections have a sharp pinnacle form to make the excrement easy to crash when the excrement is run crash into these projections 272.

[0087] Numbers, length, thickness, set line number and the like of the projections 272 constituting the crushing portion 270 are optional. Their material is also optional but plastic mold articles are preferable therefor. This is because, if they are plastic mold articles, the crushing portion 270 is produced at a low price and its attachment to the wall surface of the stagnant portion 18 is also performed by utilizing a binder or the like so that any execution can be easily carried out.

[0088] Thus, it is possible to perform any crashing process effectively on the excrement by utilizing the jet stream using the means 200 for sending-by-compression and then allowing the excrement and the like to crash utilizing the means 200 for sending-by-compression and the crushing portion 270, particularly utilizing the crushing portion 270.

[0089] FIG. 19 shows an embodiment of an important portion in a control unit 50 that is provided in the portable toilet device 10. A power switch 52, an open/close detection switch 55, and a washing button 274 are respectively arranged, and their on-off signals are supplied to the control unit 50 constituted of CPU.

[0090] Any control signals from the control unit 50 control each driving state on the above-mentioned electromagnetic valve 24 for drain, electromagnetic valve 32 for water-supply, and air compressor 200 as the means for sending-by-compression.

[0091] FIGS. 20A through 20F show each example of such the control timing. Open manipulation of the cover 23 is detected by the detection switch 55 for open and closure (FIGS. 20A and 20B). Bowel movement is carried out while the cover 23 is opened. When the excrement such as solid body waste is dropped down onto the lid body 252, the lid body 212 is opened by excrement's weight and the excrement is then dropped into the trap water in the stagnant portion 18 (see FIG. 18). When the excrement is dropped, 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 260.

[0092] The detection switch 55 for open and closure is provided in connection with the washing button 274, which will be next described. This is because it is prevented from performing any washing process even if the washing button 274 is manipulated before the cover 23 is opened. Thus, this detection for open and closure may be provided as occasion demands.

[0093] After the bowel movement has been finished, the cover is closed; the washing button 273 is then pushed down (FIG. 20C). If it is determined that this washing operation is detected, the compressor 200 is driven to send the compressed air to the stagnant portion 18 and any breaking process starts (FIG. 20D).

[0094] The compressed air is respectively supplied to an upper space into the stagnant portion 18 and the trap water simultaneously. The excrement exposed on a surface of the trap water is attached to plural projections 272 by compression with the excrement being first dropped into the trap water by pressure of the compressed air sent into the upper space. The jet stream by the compressed air sent into the trap water causes any water current, by which the trap water is flown round in the stagnant portion 18.

[0095] Since a jet direction of the compressed air is set so that the compressed air is jetted toward a side of the wall of the stagnant portion 18, the excrement crashes to an inner wall of the stagnant portion 18 by means of the water current by the compressed air. There are plural projections 272 in this inner wall so that the excrement crashes to the projections 272. The trap water is flown round, so that the excrement is flown with it crashing to the projections 272 over and over. Such the flow allows the excrement to be broken into fragments. Since the excrement contains moisture from the trap water, it easily

crumbles.

[0096] Therefore, sending the compressed air to the stagnant portion 18 for a predetermined period of time Ta starting from a point of crash-starting time t1 enables the excrement to be broken into fragments, as shown in FIGS. 20A through 20F. This period of crash-processing time Ta is set to a period of time when the excrement can suitably crash and if it is set to a period of time, 30 seconds thought one minute, the excrement can be suitably broken into fragments.

[0097] Since the tightly closed upper space in the stagnant portion 18 is almost closed by the opening/closing lid 252 so that an electromagnetic valve 24 at a side of the drain opening 27 is closed for a period of the breaking process time (points of time t1 through t2), as shown in FIG. 20F, the stagnant portion 18 is kept high in its internal pressure by continuing to supply the compressed air into the stagnant portion 18.

[0098] The control unit 50 counts a period of time from the point of time t1 when the washing button 274 is manipulated so that when the period of crash-processing time Ta has been elapsed at (point of time t2), the process then shifts to the washing process automatically (FIG. 20E). Supplying rinse water enables the washing process to be carried out and, in this moment, a control signal form the control unit 50 enables the electromagnetic valve 32 to be opened. The electromagnetic valve 24 is also controlled at the same time of the washing process to release the drain opening 27.

[0099] When the drain opening 27 is released, any internal pressure (about 2 atmospheric pressures) in the stagnant portion 18 enables the broken excrement (broken mixture) to be drained (sent by compression) to a side of the drain hose 14 once together with the trap water that has been trapped and rinse water that is newly supplied from a side of the water-supplying nozzle 28 (FIG. 20F). Thus, the washing process and the drain process proceed simultaneously.

[0100] While the washing process goes on for the period of time Tb starting from the point of time t2 up to the point of time t4, the drain process is assigned to a shorter period of time Tc than the predetermined period of time Tb by Td (FIG. 20F). Thus, the electromagnetic valve 24 at the side of the drain opening 27 is closed, in order to complete the drain process at a point of time t3 when it is advanced more than the point of time t4 by Td. Even when the electromagnetic valve 24 is closed, the washing process has not yet completed, thereby continuing to supply the rinse water the stagnant portion 18. The electromagnetic valve 32 is first closed at the point of time t4 to stop the supply of rinse water. Therefore, for the period of time Td, a trap process of the rinse water is performed to the stagnant portion 18. When this trap process is completed, the toilet device can be used again.

[0101] Although in the embodiment shown in FIGS. 20A through 20F, the process has been shifted to the washing and draining process mode for performing the washing and drain processes after the breaking process mode for sending the compressed air has been completed, both of the breaking process mode and the washing and draining process mode can proceed at almost same time.

[0102] In this embodiment, the breaking process mode starts preceding the washing and draining process mode somewhat. It is because the breaking (crashing) effect to the excrement can be enhanced if the compressed air is previously sent to precede the breaking process mode.

[0103] Although in FIG. 17, the jet outlet 207a of the diverging branch pipe 207 has been positioned at the bottom of the stagnant portion 18, it can be positioned at a position under the jet outlet 206 and the surface of the trap water with it facing the opposite projections 272.

(Embodiment 4)

[0104] FIG. 22 shows an additional embodiment of the portable toilet device 10 according to the invention, in which water current and water pressure are actively utilized as the means for breaking the excrement, in addition to the compressed air.

[0105] Thus, a base 292 is set inside the toilet device 20 and a water-supply tank 290 is fitted on the base 292 as shown in FIG. 22. The water-supplying hose 12 supplies rinse water to the water-supply tank 290 via an electromagnetic valve 288 and the compressed air from compressor 200 is guided thereto through the diverging branch pipe 207. A jet outlet 294a of a connection pipe 294 connected to the water-supply tank 290 is attached to the bottom of the stagnant portion 18 with it facing the side wall of the stagnant portion 18. The other configurations are similar to those shown in FIG. 17.

[0106] When the water-supply tank 290 is thus newly provided to discharge the rinse water together with the compressed air from the bottom of the stagnant portion 18 into the trap water, the trap water is made as high-speed water current so as to crash to the side water of the stagnant portion 18. Since there is crashing means 270 in the side water of the stagnant portion 18, the excrement crashes to this crashing means 270, so that the excrement is flown round in the stagnant portion 18 together with the trap water in cooperation with a spray of the compressed air, the water current and water pressure of the trap water while the excrement crashes to the projections 272, thereby enabling the excrement to be effectively broken into fragments at a short time.

[0107] Breaking and draining processes shown in FIG. 22 are based on those shown in FIG. 20. In this embodiment, the compressed air is controlled so that it can be supplied into the trap water for a period of time of the breaking process and the rinse water is controlled so that it can be supplied in only the washing and draining process mode by using the electromagnetic valve 288. Of course, if the breaking process and the washing and draining processes are performed at almost same time, the electromagnetic valves 32 and 288 can be used in common.

(Embodiment 5)

[0108] FIG.23 is an example of piping when taking an aging society into consideration. Aged people more than 65 years old would occupy a considerably large proportion in a population after several years are elapsed. If so, it is expected that persons utilizing a nursing-care facility would be increased. It is expected that in order to reduce a burden of care workers, plural beds 96 are prepared in a care room 94. In this moment, it must figure out a good way that they can relieve themselves in this care room 94.

[0109] In such a case, if it is supposed that the room can include six care-receivers, the beds 96 are arranged as shown in FIG. 23. At the middle thereof, a main pipe 98a for water supply and a main pipe 98b for drain, which are used for the portable toilet device, are arranged on its floor.

[0110] FIG.23 is an example of piping in which one portable toilet device 10 is set beside one bed 96, not portable toilet device 10 is shared. Accordingly, each portable toilet device 10 is set near the bed 96. Connecting portions 199,102 are provided on respective positions of the main pipes 98a, 98b that are near a set position of the portable toilet device 10. A water-supplying hose 12 that is connected to each of the portable toilet devices 10 is connected to each of the connection portions 100; and a drain hose 14 that is connected to each of the portable toilet devices 10 is connected to each of the connection portions 102.

[0111] This enables plural users to be treated. It is to be noted that though in this case, of course, a diameter of the drain hose 14 having a small diameter can be used.

(Embodiment 6)

[0112] FIG. 24 is a connection embodiment in which the drain hose 14 that is connected to the portable toilet devices 10 is connected to an existing toilet device 4. In this embodiment, the existing toilet device 4 is modified so that their connection can be realized.

[0113] In this moment, a main body 108 of the existing toilet device 4 is modified. In FIG. 24, although a drain pipe 110 is connected to the main body 108 of the toilet device, a drain outlet 112 is also provided at an upper side than a stagnant portion thereof, in the main body 108 of the toilet device, so that to a connection portion 114 installed on a rear surface thereof, a connection portion 62B of the drain hose 14 is connected. The outlet may be connected to the trap portion that is positioned lower.

[0114] It is to be noted that if the existing toilet divice4 is thus modified, any liquid mixture may be remained in the drain hose 14 when the existing toilet device 4 is set at a higher position in a case where the portable toilet device 10 and the existing toilet device 4 are set with a difference of altitude. If, however, the above-mentioned air compressor 200 is provided and the liquid mixture is sent by compression by means of its compressed air, this prevents this liquid mixture from being remained in the drain hose 14.

(Embodiment 7)

[0115] FIG. 25 is a modification of FIG. 24. In FIG. 25, in addition to the configuration shown in FIG. 24, a trapping lid 116 that traps an upper portion of the stagnant portion is further provided and it is configured so that the trapping lid 116 can be closed in connection with the drain process of the portable toilet device 10.

[0116] Thus, this trapping lid 116 is preferably trapped in an electric powered manner and is controlled so as to be opened or closed simultaneously as the electromagnetic valve 24 for drain in the portable toilet device 10 is operated. If the trapping lid 116 is configured so as to be slidable as shown in FIG. 25, the trapping lid 116 can be opened or closed by means of an electromagnetic solenoid 117. An opening/closing mechanism by gears may be used instead of the electromagnetic solenoid 117. The trapping lid 116 can be controlled so as to be trapped (opened or closed) simultaneously as an electromagnetic valve 32 for water supply, not the electromagnetic valve 24 for drain, is operated.

[0117] If a system such that the trapping lid 116 is opened or closed, not being slid, to have an angle of 90 degrees or more, as one example, is employed, a shaft-driving mechanism is provided for a rotation shaft of the trapping lid 116 and its rotation is controlled simultaneously as the electromagnetic valve 24 is operated. A system that can open or close it simultaneously as a cover (an outer cover for closure of the toilet seat) provided on the main body 108 of the toilet device, not cooperation with the electromagnetic valve 24, may be employed.

[0118] Since the trapping lid 116 must be opened or closed even if the existing toilet device 4 is used, the trapping lid 116 may be configured so that if the existing toilet device 4 is equipped with a toilet seat with shower toilet, an opening/closing detection switch, not shown, is provided on the toilet seat with shower toilet and the trapping lid 116 is controlled by using a control signal based on its switch manipulation.

(Embodiment 8)

[0119] FIGS. 26 and later are embodiments in which the drain hose 14 is attached to the existing toilet device 4. In FIG. 26, a toilet seat 118 set on the existing toilet device 4 is modified so that the drain hose 14 can be guided into the main body 108 of the toilet device.

[0120] In FIG. 26, a hole 119 for holding the drain hose is formed so that it can be passed through a part of a left portion 118a of the toilet seat 118 above and below, and by inserting a tip end of the drain hose 14 therethrough, it is designed as to be connected to the existing toilet device 4.

[0121] In this case, a connection portion to be connected to a connection portion 62B provided on the drain

hose 14 is installed in the hole 119. Further, if the existing toilet device 4 is used, the drain hose 14 must be detached therefrom.

(Embodiment 9)

[0122] FIG. 27 is a modification of FIG. 26. In an embodiment shown in FIG. 27, an attaching and fixing member 120 for the drain hose 14 is integral with a side of a lower surface of the left portion 118a of the toilet seat, and it is attached and fixed by using a space formed between the main body 108 and the toilet seat 118.

[0123] A piping such that a tip end of the drain hose 14 can reaches the stagnant portion is approval and a piping such that a tip end of the drain hose 14 can has a length enough to extend slightly from the toilet seat 108 is also approval. Since the drain pipe 14 has a small diameter, it can be attached and fixed by using the space formed between the main body 108 and the toilet seat 118.

[0124] In this moment, as shown in FIG. 28, the attaching and fixing member 120 is configured to have a profiled hollow grip (inserting) portion with an opened lower end. Such the configuration enables the existing toilet device 4 and the portable toilet device 10 to be used simultaneously.

(Embodiment 10)

[0125] FIG. 29 is a modification of FIG. 27. In this embodiment, the attaching and fixing member 120 for the drain hose 14 is configured so that it can be separated from the toilet seat 118 and as shown in FIG. 30, a holding portion 122 for allowing it to be held to the toilet seat 118 and a grip portion 124 that extending downward from the holding portion 122 toward a lower surface thereof are provided so that the grip portion 124 can grip the drain hose 14. Such the configuration can also realize the same effect as that shown in FIG. 27.

(Embodiment 11)

[0126] FIG. 31 is a modification of any of FIGS. 27 and 29. In this embodiment, the attaching and fixing member 120 for the drain hose 14 is configured so that it can be separated from the toilet seat 118 and as shown in FIG. 31, it is fixed to the main body 108 of the toilet device. Thus, a holding portion 122 for allowing it to be held to the main body 108 of the toilet device and a hollow grip portion 124 that extending upward from the holding portion 122 toward an upper surface thereof are provided so that the grip portion 124 can grip the drain hose 14. Therefore, such the configuration can realize the same effects as those shown in FIGS. 27 and 29.

(Embodiment 12)

[0127] FIG. 33 shows still further embodiment for attachment of the drain hose 14. In this embodiment, as the attaching and fixing member 120 for the drain hose 14, an elastic member, as shown in FIG. 34, configured to have a shape realizing by deforming a funnel is used. An outer surface thereof has a shape corresponding to an outer surface of the stagnant portion. Plural slits 132 are formed on a funnel-shaped open end thereof (at an opposite side of the stagnant portion) to keep its elasticity and by inserting it into a side of the stagnant portion with its open end being held, the attaching and fixing member 120 can be installed with it being attached tightly to a periphery of the stagnant portion.

[0128] An attachment 128 for the drain hose 14 is integral with a portion of the attaching and fixing member 120, which faces a side of the drain portion 110 when inserting it, and at forward end thereof, an attachment portion 128a that is folded at 90 degrees or more in a shown condition, is provided. The attachment portion 128a is provided with a grip (inserting) portion 134 having an open end. A large opening 130 is formed on the surface thereof facing the drain portion 110.

[0129] The attaching and fixing member 120 thus configured is inserted into the stagnant portion of the main body of the toilet device so that the opening 130 can face the drain portion 110. Such the insertion enables the attaching and fixing member 120 to be fixed to the stagnant portion with them being tightly attached to each other. The forward end of the drain hose 14 is then attached and fixed to the grip portion 134 of the attachment portion 128a as shown in FIG. 33, thereby enabling the drain hose 14 to be set with it facing the stagnant portion.

[0130] It is to be noted that if the attaching and fixing member 120 has not enough elasticity, pipe member for enlargement by which an inner hollow portion of the attaching and fixing member 120 is enlarged may be used. By inserting such the pipe member into this inner hollow portion, it is possible to attach and fix almost whole of the attaching and fixing member 120, the inner hollow portion of which has been enlarged, to an internal circumference of the stagnant portion tightly.

(Embodiment 13)

[0131] FIG. 35 is an embodiment for the attachment of the drain hose 14 when the existing toilet device is Japanese style one. In this embodiment, as the attaching and fixing member 120, in order to allow it to be fitted to Japanese toilet device 180 as shown in FIG. 36, a holding portion 136 having both of bending ends to some extent is provided and an attaching portion 138 of the drain hose 14 is provided at the middle of this holding portion 136. The attaching portion 138 has a configuration of hollow grip.

[0132] The attaching and fixing member 120 is fitted and fixed to Japanese toilet device 180 by expanding (widening) both ends of the holding portion 136 and utilizing its elastic force. Using such the attaching and fixing member 120 enables the drain hose 14 to be attached

and fixed with it facing the stagnant portion.

[0133] The attaching portion 138 of the drain hose 14 may be provided at not only the middle of this holding portion 136 but also a side of any of the ends of the holding portion 136 with it being shifted to any of right and left.

(Embodiment 14)

[0134] FIG. 37 provides a sanitary portable toilet device 10. In this embodiment, a tank 142 containing an antiseptic solution fully is provided on a wall surface 18a of the body 20 of the toilet device at an upper position thereof than the stagnant portion 18.

[0135] Since the air compressor 200 is provided at an upper position of the stagnant portion 18 as shown in FIG. 1, it is configured in a case shown in FIG. 37 so as to be arranged in parallel with the air compressor 200. Accordingly, an inlet 140 for the antiseptic solution is provided on the wall surface 18a near the air compressor 200.

[0136] Means for forcing, not shown, the tank 142, is operated for a period of predetermined time Tb when the toilet is used, specifically to link the drain timing of the liquid mixture. This enables a predetermined antiseptic solution to be sent to the stagnant portion 18 by forcing the tank 142 only when using the toilet.

[0137] Thus, a portion of the body 20 of the toilet device near the stagnant portion 18 is always antisepticised by the antiseptic solution so that it can be sanitary. By dropping the antiseptic solution thereinto, the drain hose 14 is also antisepticised at the same time, thereby enabling any much sanitary portable toilet device to be provided.

(Embodiment 15)

[0138] FIG. 38 is an embodiment of the portable toilet device 10 with deodorization ability. In this embodiment, similar to FIG. 37, means for deodorizing is provided to be arranged in parallel with the air compressor 200. Accordingly, an inhalation port 150 is provided on a wall surface 18a of the body 20 of the toilet device at an upper position thereof than the stagnant portion 18 so that it can be arranged in parallel with the air compressor 200, and a ventilation fan 152 acting as the means for deodorizing, which is provided in a casing 153, is attached to the inhalation port 150. An exhaust pipe 154 is connected to a back side of the inhalation port 150, thereby exhausting air to outside.

[0139] The ventilation fan 152 is driven in rotation at least when using the toilet. Thus, air within the body 20 of the toilet device can be inhaled and exhausted to outside so that any smell from the excrement can be efficiently exhausted to outside. Accordingly, any smell from the excrement is prevented from being drifted in a room, thereby allowing any comfortable environment to be realized.

(Embodiment 16)

[0140] FIG. 39 shows an embodiment in which a bed is equipped with the portable toilet device 10 according to the invention. Therefore, a mattress164 is put down over an upper surface of a frame 162 of the bed 160, as shown in FIG. 40. At the middle of the mattress 164a, an opening 164a having a predetermined diameter is formed and a cover 166 for open and closure is prepared to cover the opening. Accordingly, the cover 166 for open and closure constitutes the mattress 164.

[0141] On the other hand, a hole 168 having a smaller diameter than that of the opening 164a is also formed on the frame 162 opposite to the opening 164a, and shutters 170 for operating to shut the hole to link each other are provided.

[0142] The portable toilet device 10 is attached and fixed to a side of the lower surface of the frame 162 so that it can close the hole 168.

[0143] When the portable toilet device 10 is used while a patient lies down in the bed 160, the cover 166 constituting the mattress is opened and the shatters (electric-power shutters) 170 for open and closure are also opened. This causes the portable toilet device 10 to be ready for use. Preferably, if an incline of the frame 162 can alter by electric power, the portable toilet device 10 is easy to be used by inclining the frame 162.

[0144] The shutters 170 for open and closure are configured as shown in diagram so as to use a pair of shutter plates that can be opened or shut back and forth and make them opened and shut to link each other. Alternatively, it can be configured so as to use one shutter plate that can be opened or shut by rotating it by more than 90 degrees on the same plane.

Industrial Applicability

[0145] This invention is preferably applicable to a nursing-care assisted appliance for any nursing-care facilities, home-based care or the like.

Claims

1. A portable toilet device **characterized in that** the device comprises:

   a body of the device containing a water-supplying nozzle that flushes rinse water near an opening, and a drain opening that is communicated with a stagnant portion provided at a bottom thereof,
   means for breaking the excrement, which is installed at the stagnant portion of the body of the device,
   means for sending the broken excrement by compression, which is provided on an upside of the stagnant portion; and

a lid for open and closure that closes the stagnant portion tightly, which is provided on an upside of the means for sending the broken excrement by compression.

2. The portable toilet device according to Claim 1 **characterized in that** as the means for breaking the excrement, rotational typed means for breaking the excrement or means for sending compressed air by compression is used.

3. The portable toilet device according to Claim 2 **characterized in that** the rotational typed means for breaking the excrement includes a motor and crushing blades that are attached to the motor; and
a part or whole of the crushing blades is immersed under a surface of trap water that is trapped in the stagnant portion.

4. The portable toilet device according to Claim 2 **characterized in that** the means for breaking the excrement, which uses the means for sending compressed air by compression, breaks the excrement by a jet stream by the compressed air with the excrement being stirred.

5. The portable toilet device according to Claim 4 **characterized in that** a crashing portion for allowing the trapped excrement to crash is further attached to a wall surface of the stagnant portion; and
the excrement is crashed by crashing to the crashing portion with the excrement being stirred by the jet stream from the means for sending the broken excrement by compression.

6. The portable toilet device according to Claim 5 **characterized in that** the crashing portion is constituted of plural projections.

7. The portable toilet device according to Claim 4 or 5 **characterized in that** a water-supply tank is provided to jet rinse water and air into the stagnant portion;
a jet of the means for sending the broken excrement by compression is provided to face in the closed space and the other jet thereof is connected to the water-supply tank; and
when the excrement crashes, the compressed air is jetted into the stagnant portion at the same time of jetting the rinse water from the water-supply tank.

8. The portable toilet device according to Claim 1 **characterized in that** the lid for open and closure includes slidable type one and open/close type one.

9. The portable toilet device according to Claim 8 **characterized in that** the lid for open and closure of slidable type is advanced and retreated by an electromagnetic solenoid or rotation gears.

10. The portable toilet device according to Claim 1 **characterized in that** the lid for open and closure is positioned inside the body of the toilet device so that it can have a smaller area than that of the opening of the toilet device while the stagnant portion is closed tightly.

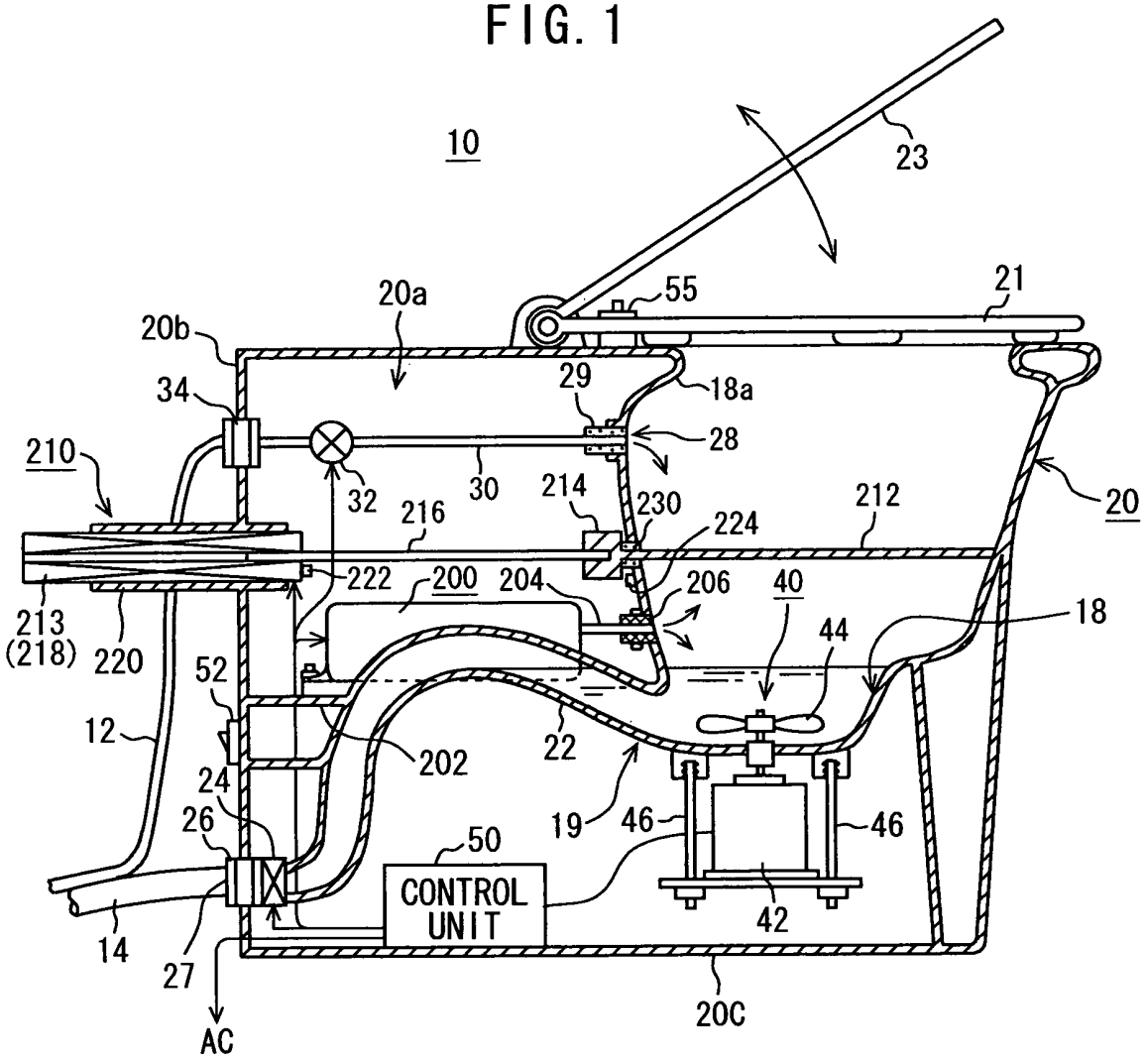
11. The portable toilet device according to Claim 1 **characterized in that** the body of the toilet device has a reducing size portion having a diameter smaller than that of the opening thereof between the opening and the means for sending the broken excrement by compression; and
the lid for opening and closure is attached to a lower side of the reducing size portion by means of a hinge mechanism and the lid is urged toward the reducing size portion so that a rim of the lid for opening and closure comes into contact with an edge of the reducing size portion.

12. The portable toilet device according to Claim 1 **characterized in that** an on-off valve mechanism is provided at a lower stream side of a drain opening; and
after the lid for open and closure is tightly closed with the on-off valve mechanism is closed, the means for sending the broken excrement by compression starts its operation and the on-off valve mechanism is opened after internal pressure within the closed space is increased to a pressure more than a predetermined pressure.

13. The portable toilet device according to Claim 12 **characterized in that** a rinse-water-jetting mechanism for jetting rinse water into the area closed by the lid for open and closure is provided; and
the rinse-water-jetting mechanism jets the rinse water after the on-off valve mechanism is opened.

14. The portable toilet device according to Claim 1 **characterized in that** a drain switch is provided; and
a drain-processing mode is provided in which water within the stagnant portion is drained by manipulating the drain switch to drive the means for sending the broken excrement by compression.

FIG. 1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20a
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21
20b
29
18a
34
28
210
32
30
214
230
212
20
216
224
222
200
204
206
40
18
213
(218)
220
44
52
12
22
202
24
19
46
46
26
50
CONTROL
UNIT
42
14
27
AC
20C

FIG. 2

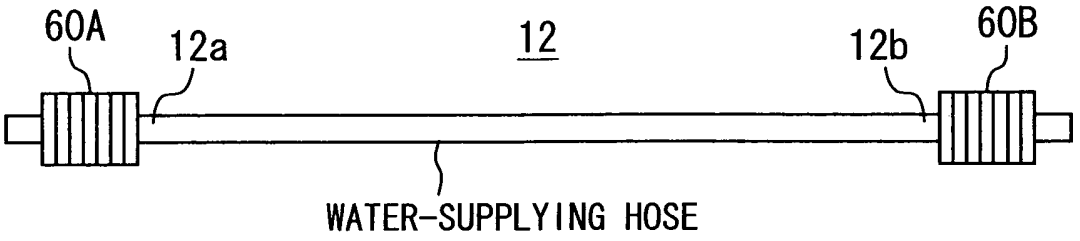

60A
12a
12
12b
60B
WATER-SUPPLYING HOSE

FIG. 3

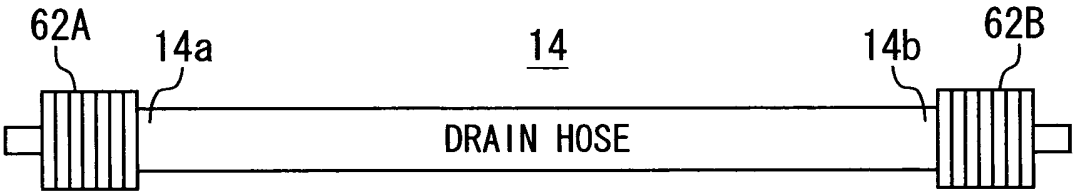

62A
14a
14
14b
62B
DRAIN HOSE

FIG. 4

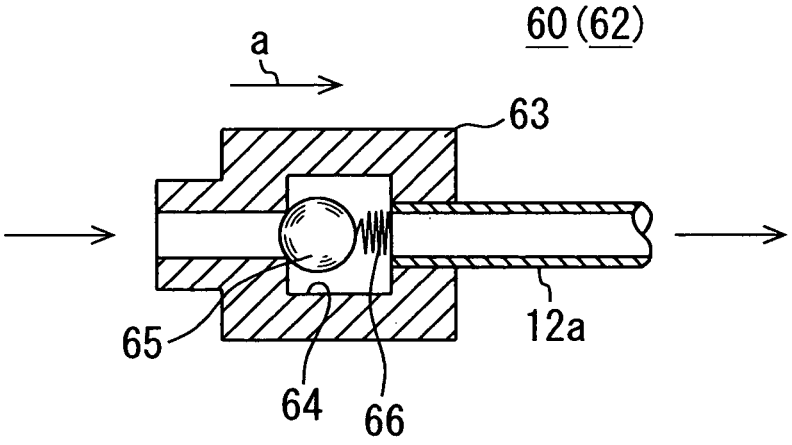


FIG. 5

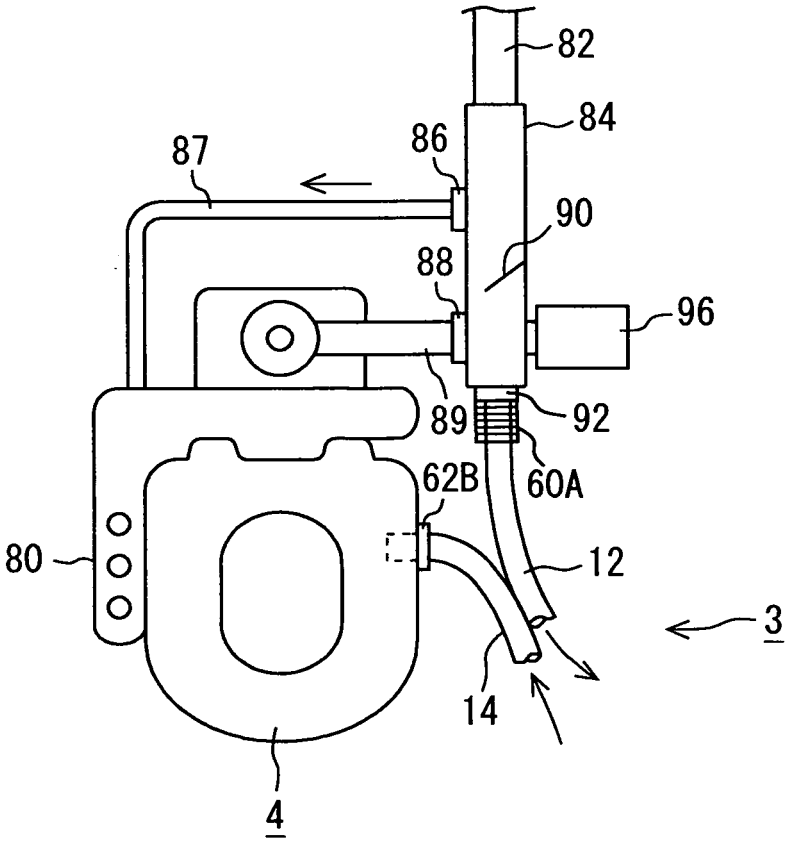


FIG. 6

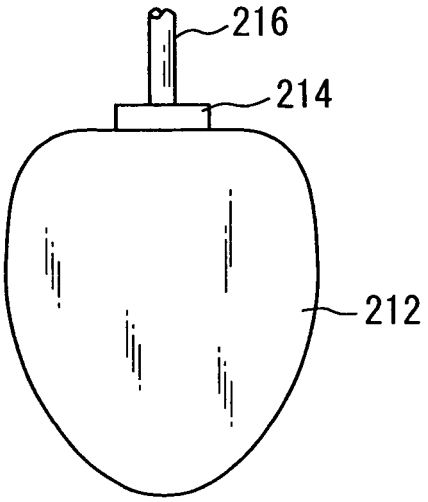


FIG. 7

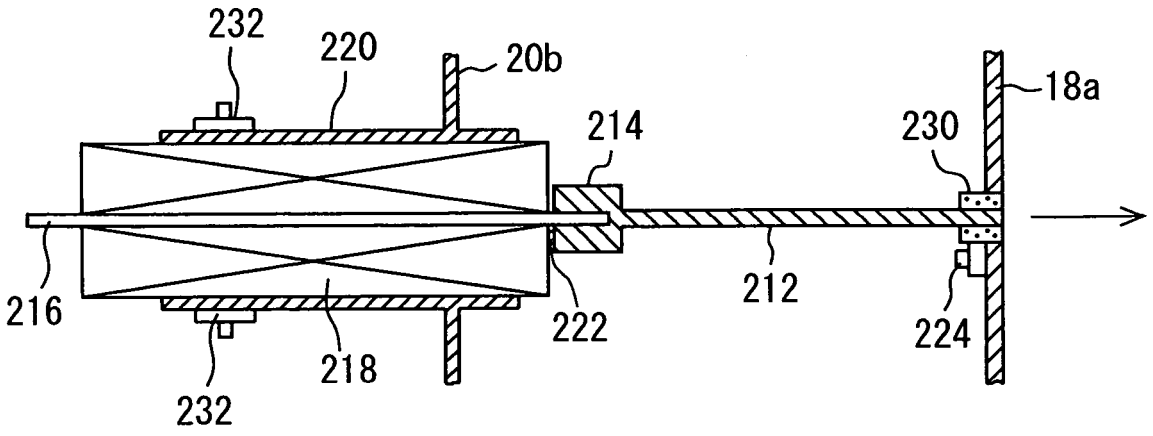
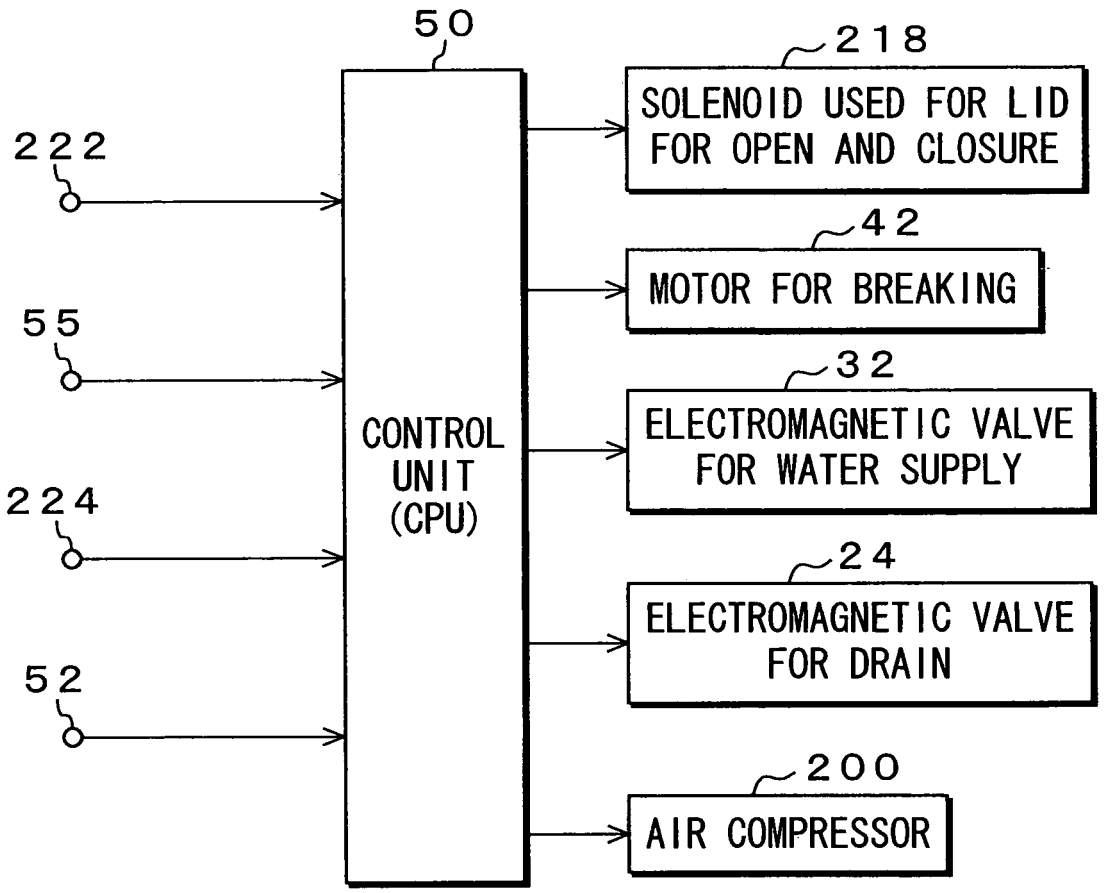


FIG. 8


50
218
SOLENOID USED FOR LID FOR OPEN AND CLOSURE
222
42
MOTOR FOR BREAKING
55
32
ELECTROMAGNETIC VALVE FOR WATER SUPPLY
CONTROL UNIT (CPU)
224
24
ELECTROMAGNETIC VALVE FOR DRAIN
52
200
AIR COMPRESSOR

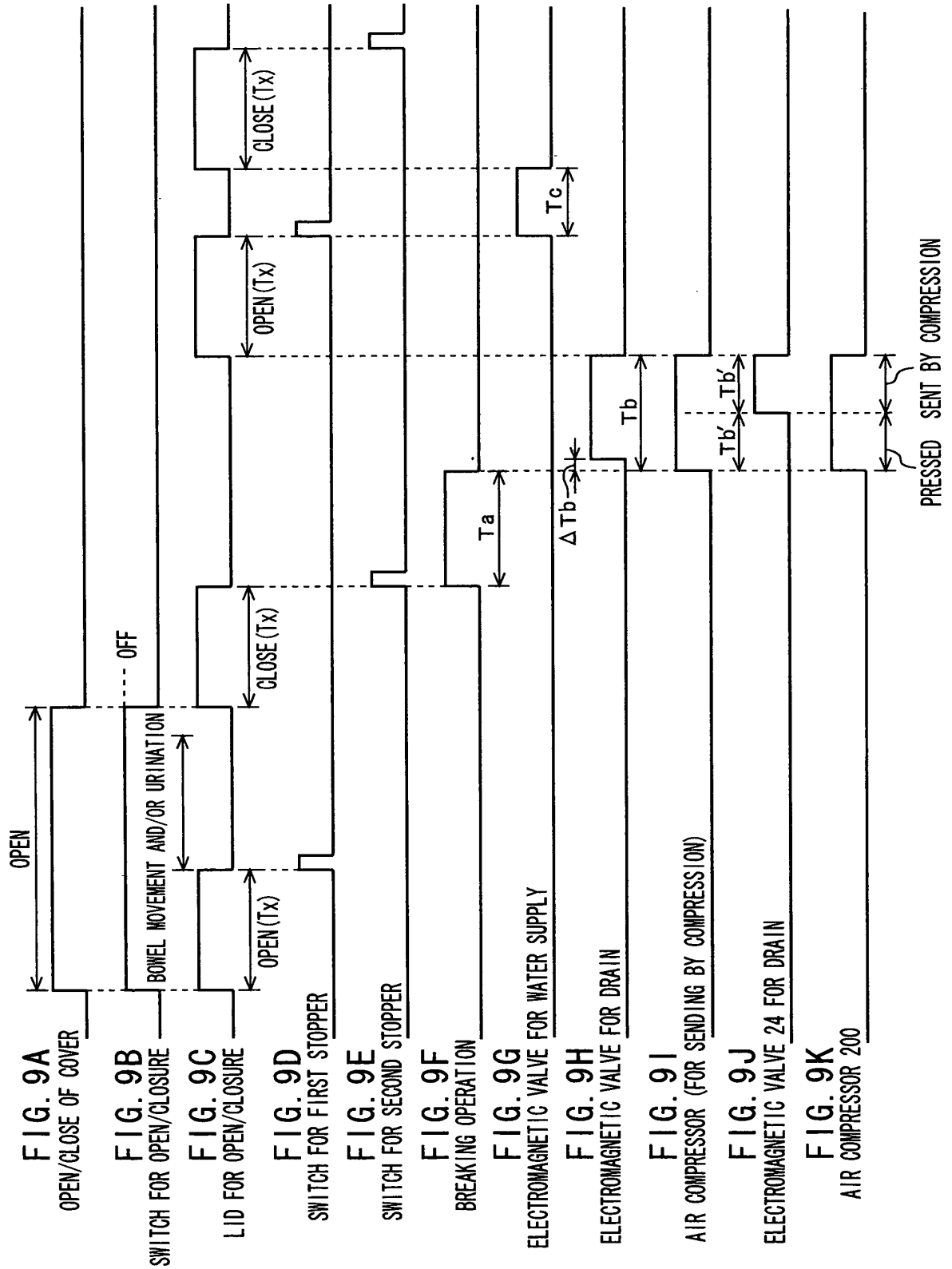


FIG. 9A OPEN/CLOSE OF COVER

FIG. 9B SWITCH FOR OPEN/CLOSURE BOWEL MOVEMENT AND/OR URINATION

FIG. 9C LID FOR OPEN/CLOSURE

FIG. 9D SWITCH FOR FIRST STOPPER

FIG. 9E SWITCH FOR SECOND STOPPER

FIG. 9F BREAKING OPERATION

FIG. 9G ELECTROMAGNETIC VALVE FOR WATER SUPPLY

FIG. 9H ELECTROMAGNETIC VALVE FOR DRAIN

FIG. 9I AIR COMPRESSOR (FOR SENDING BY COMPRESSION)

FIG. 9J ELECTROMAGNETIC VALVE 24 FOR DRAIN

FIG. 9K AIR COMPRESSOR 200

FIG. 10

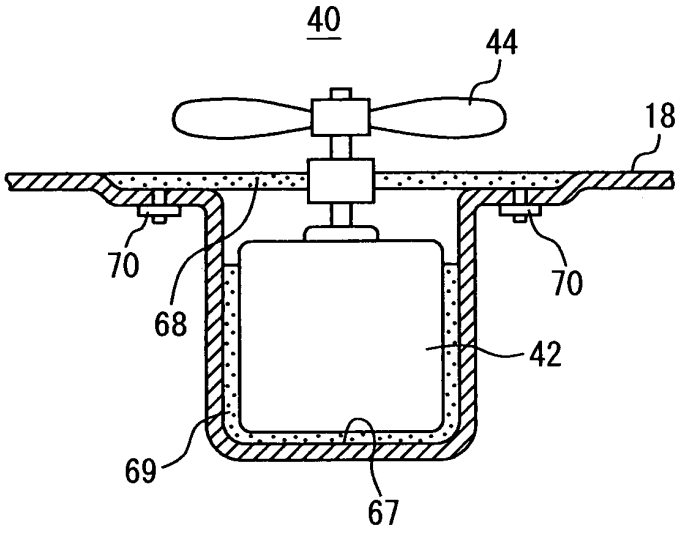


FIG. 11

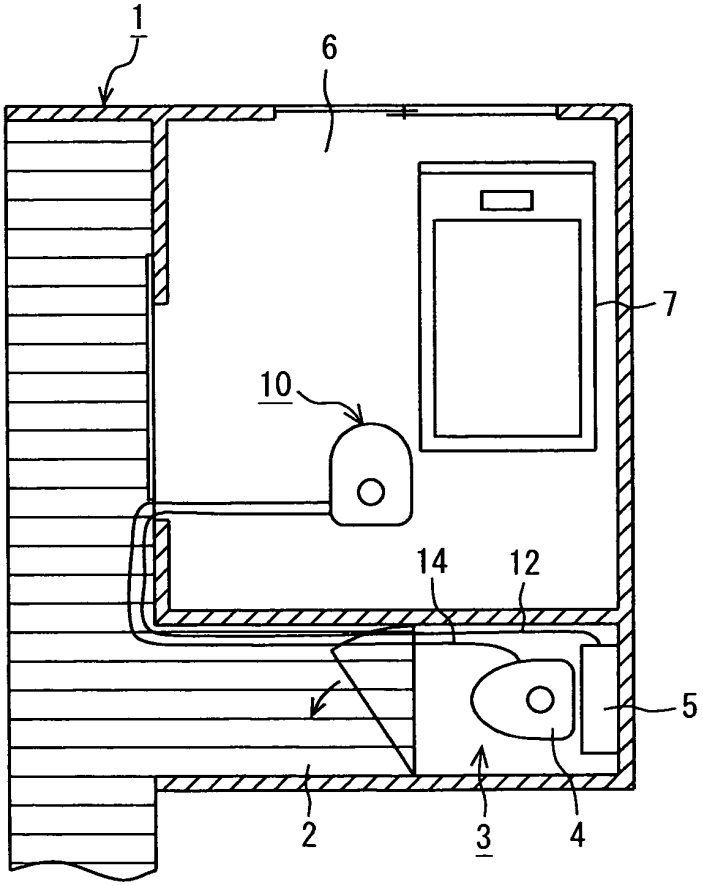
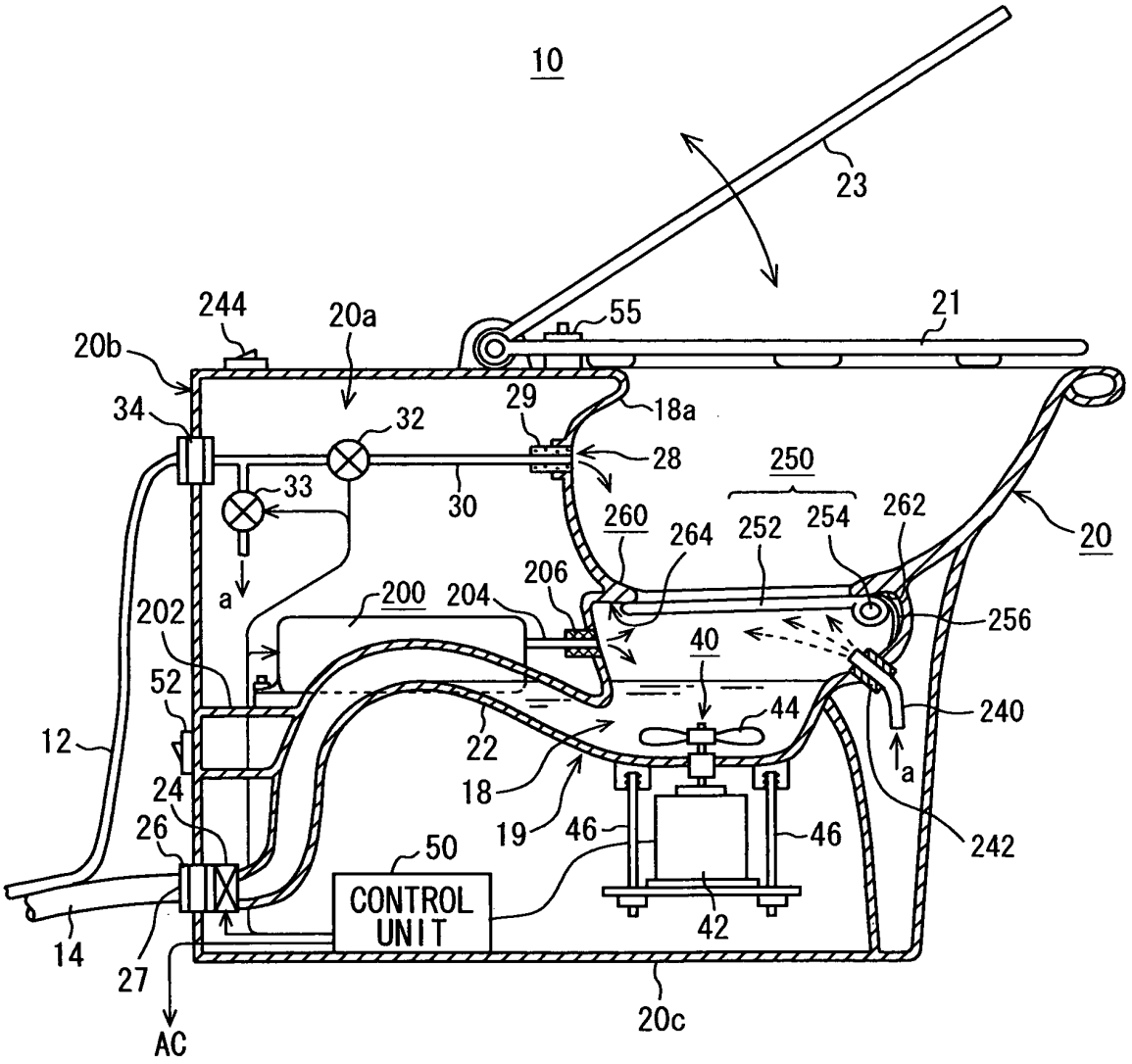


FIG. 12


10
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244
20a
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20b
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32
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18a
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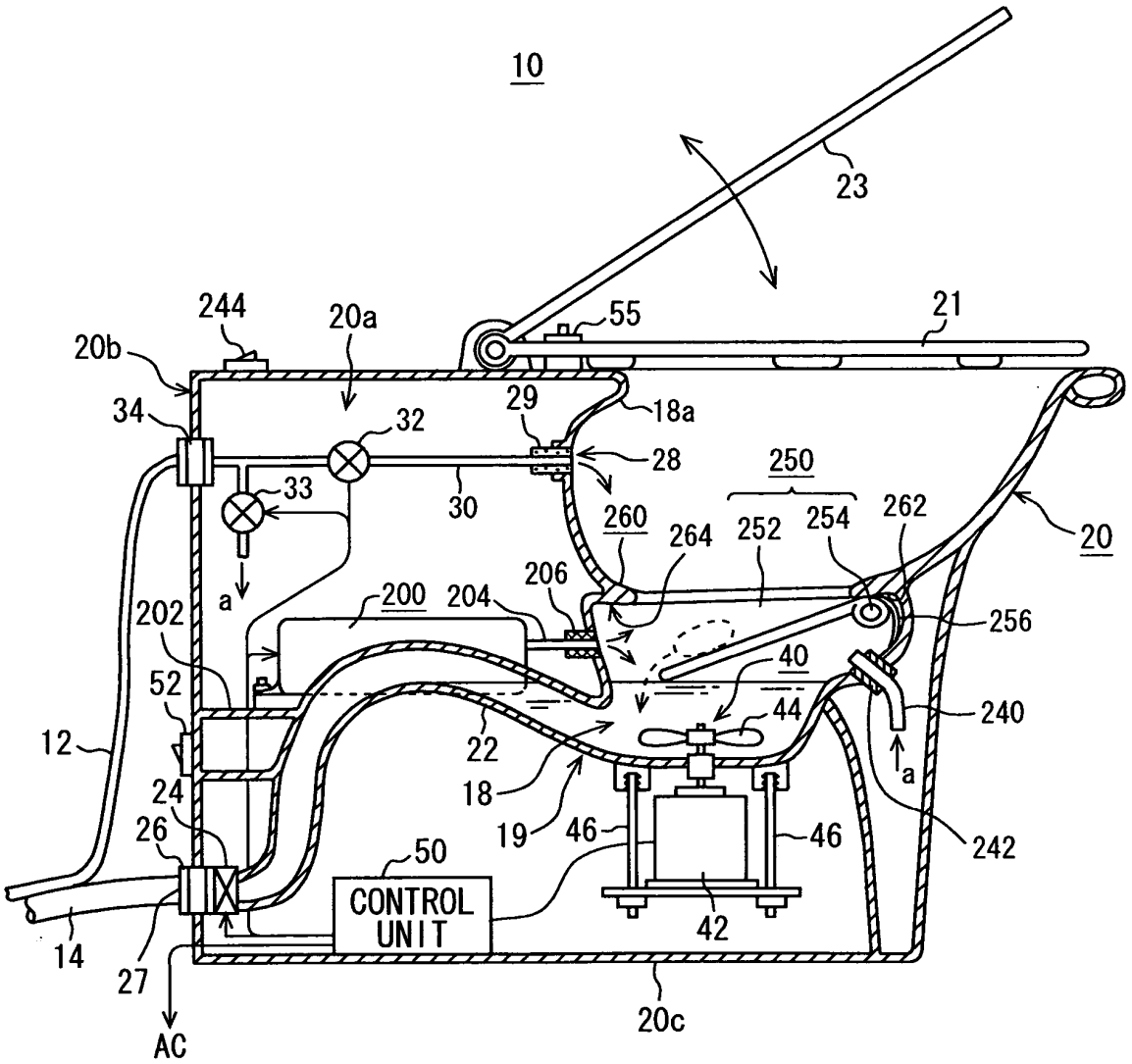
250
33
30
260
264
252
254
262
20
a
200
204
206
202
256
40
52
44
240
22
12
18
a
24
19
46
46
242
26
50
CONTROL UNIT
42
14
27
AC
20c

FIG. 13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a
200
204
206
202
256
40
52
240
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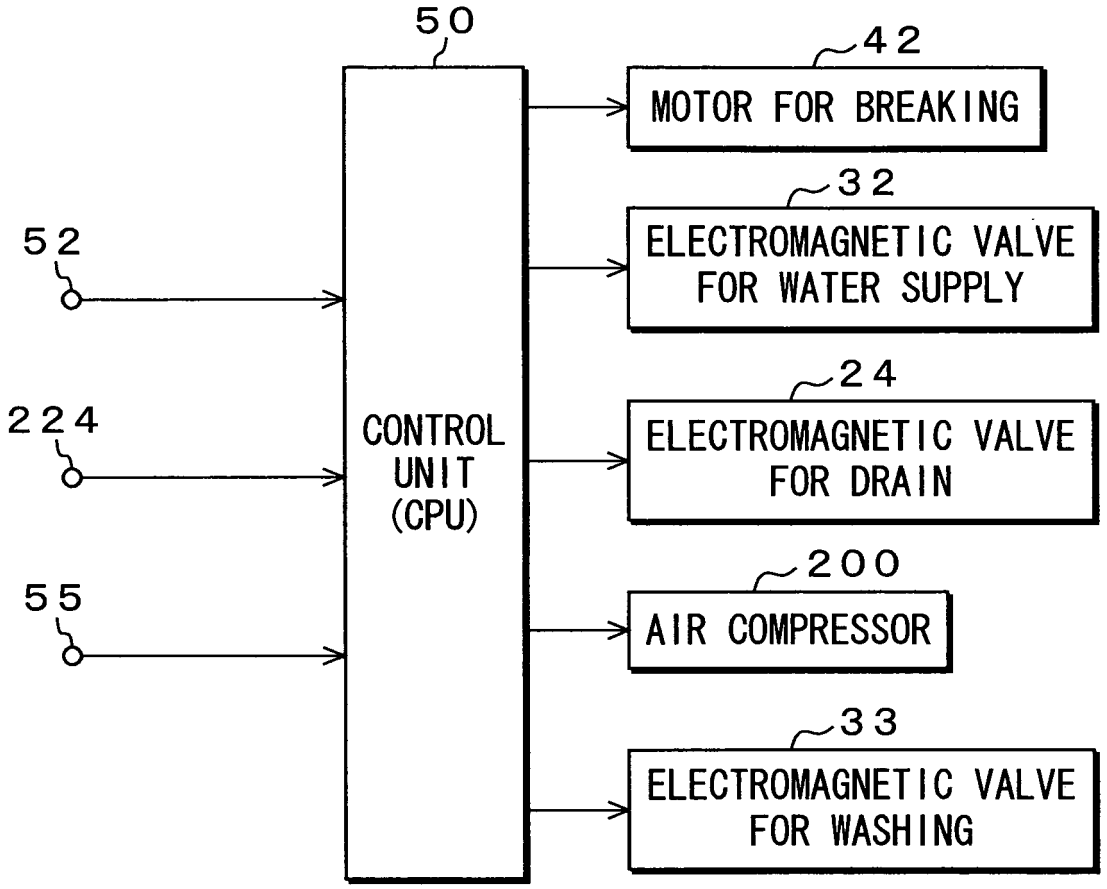
24
19
46
46
26
50
242
CONTROL UNIT
14
27
42
AC
20c

FIG. 14


50
42
MOTOR FOR BREAKING
32
ELECTROMAGNETIC VALVE FOR WATER SUPPLY
52
24
ELECTROMAGNETIC VALVE FOR DRAIN
224
CONTROL UNIT (CPU)
200
AIR COMPRESSOR
55
33
ELECTROMAGNETIC VALVE FOR WASHING

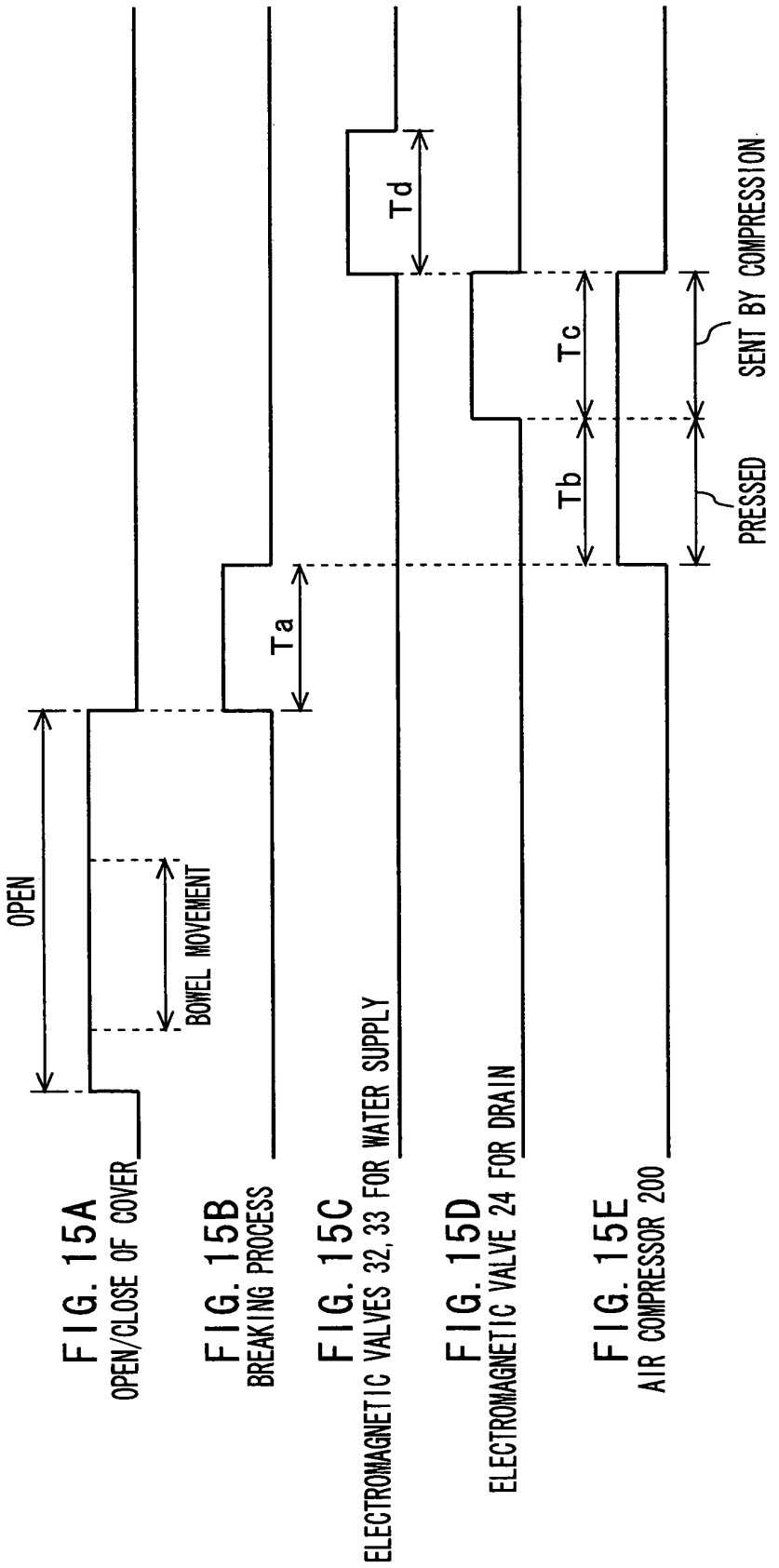


FIG. 15A
OPEN/CLOSE OF COVER

FIG. 15B
BREAKING PROCESS

FIG. 15C
ELECTROMAGNETIC VALVES 32, 33 FOR WATER SUPPLY

FIG. 15D
ELECTROMAGNETIC VALVE 24 FOR DRAIN

FIG. 15E
AIR COMPRESSOR 200

FIG. 16A
DRAIN SWITCH 244 (ON)

FIG. 16B
ELECTROMAGNETIC VALVE 24 FOR DRAIN

FIG. 16C
AIR COMPRESSOR 200

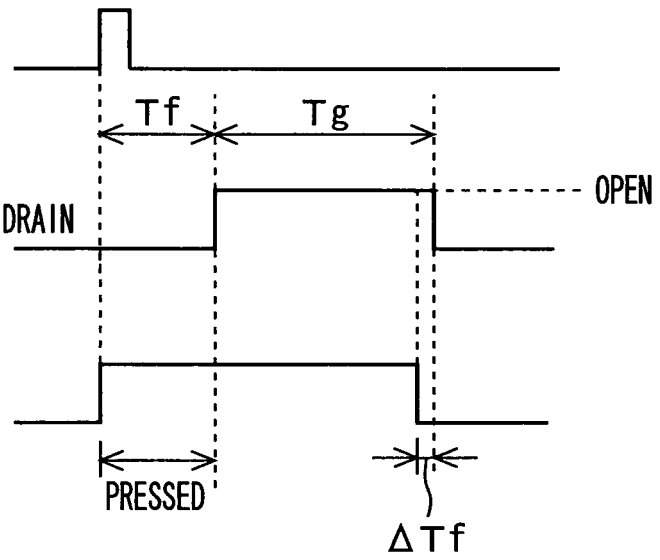
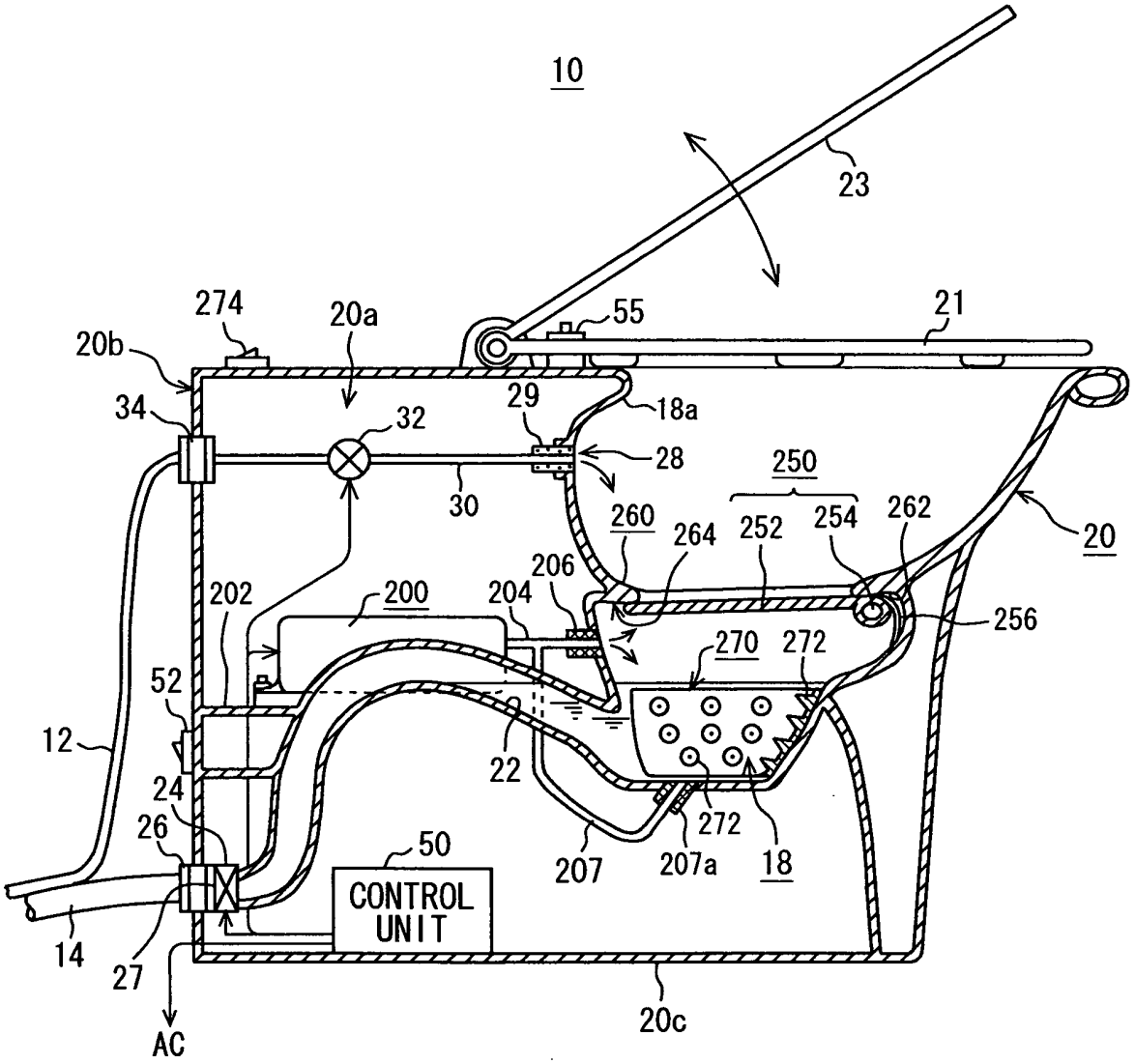


FIG. 17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262
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206
202
200
204
256
270
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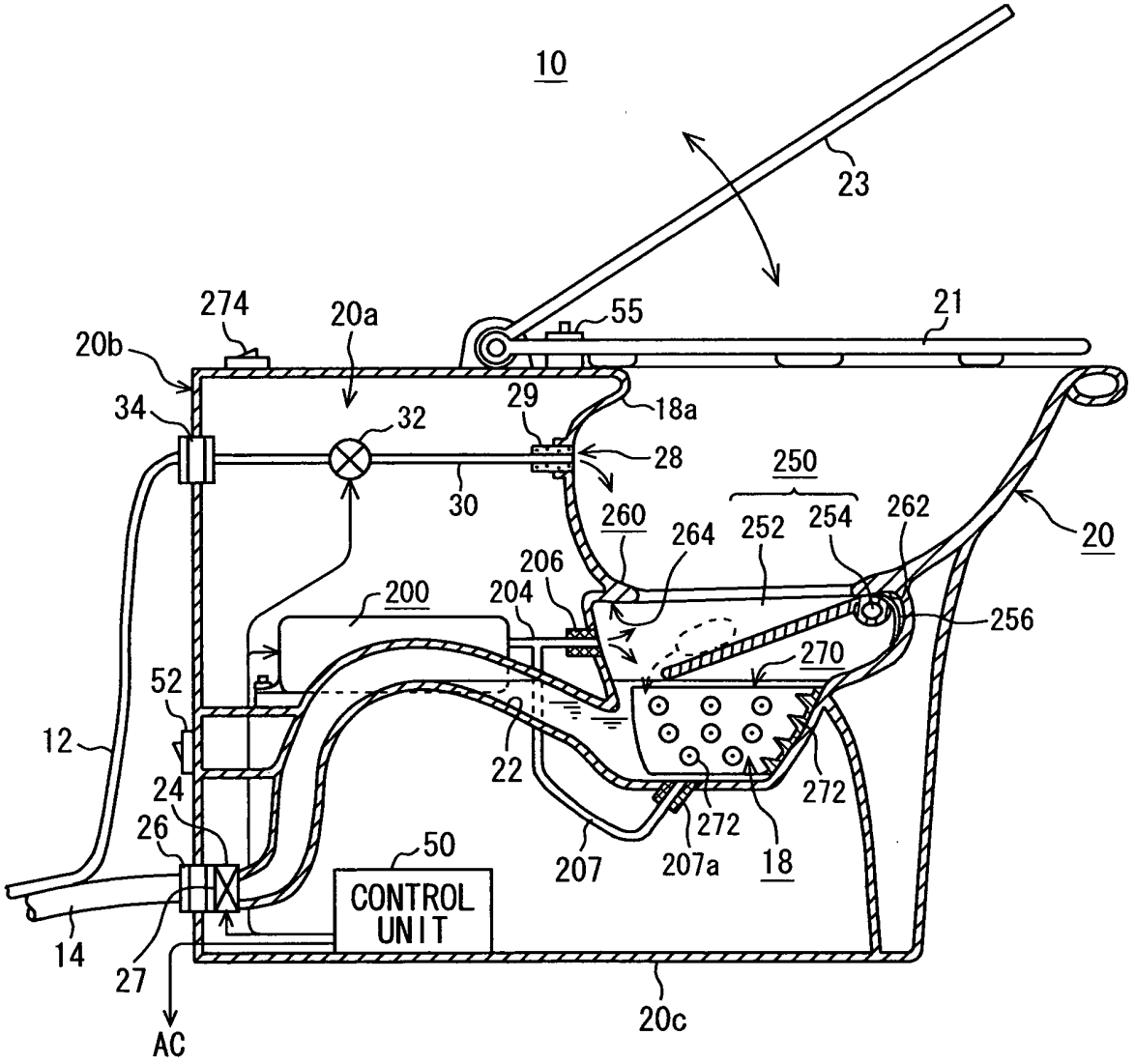
26
272
50
CONTROL UNIT
207
207a
18
14
27
AC
20c

FIG. 18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274
20a
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21
20b
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29
18a
32
28
250
30
260
264
252
254
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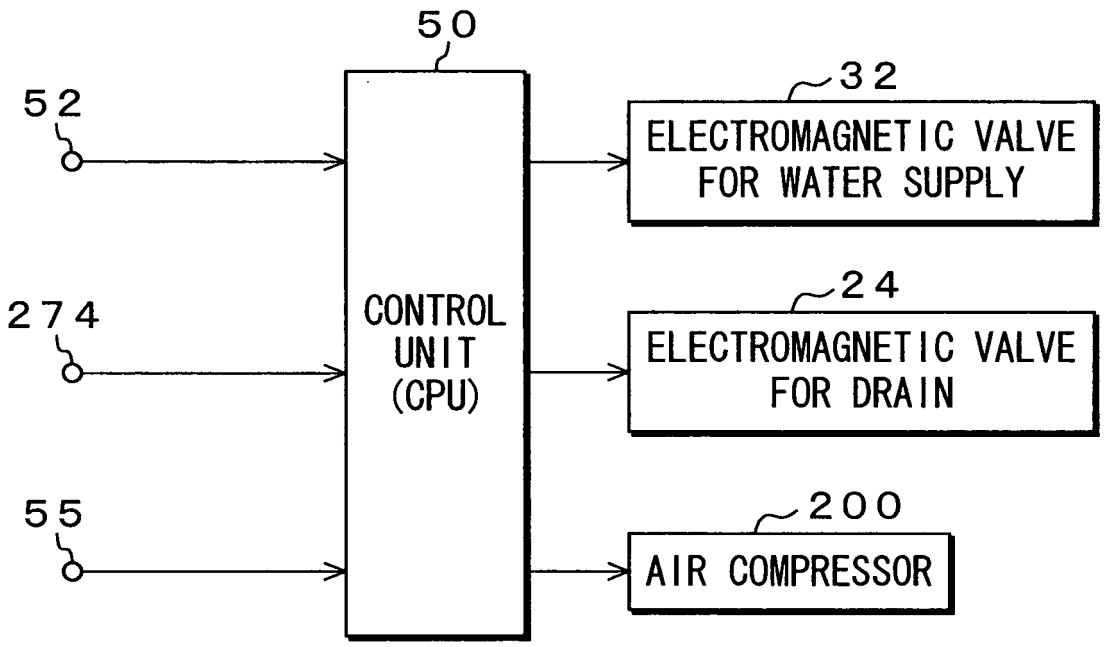
20
206
200
204
256
270
52
12
22
272
24
272
26
50
207
207a
18
CONTROL UNIT
14
27
AC
20c

FIG. 19


50
52
274
55
CONTROL UNIT (CPU)
32
ELECTROMAGNETIC VALVE FOR WATER SUPPLY
24
ELECTROMAGNETIC VALVE FOR DRAIN
200
AIR COMPRESSOR

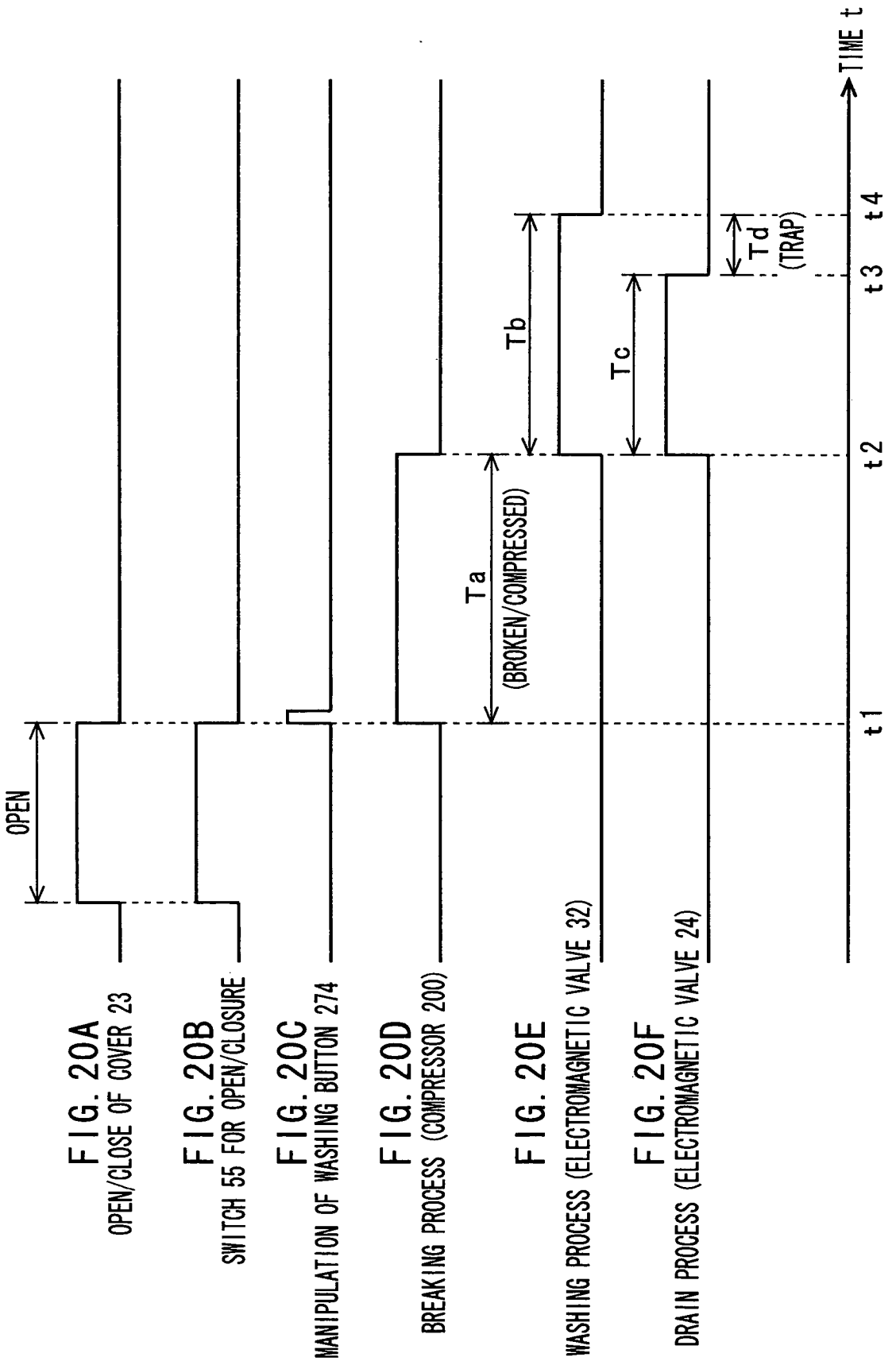


FIG. 20A
OPEN/CLOSE OF COVER 23

FIG. 20B
SWITCH 55 FOR OPEN/CLOSURE

FIG. 20C
MANIPULATION OF WASHING BUTTON 274

FIG. 20D
BREAKING PROCESS (COMPRESSOR 200)

FIG. 20E
WASHING PROCESS (ELECTROMAGNETIC VALVE 32)

FIG. 20F
DRAIN PROCESS (ELECTROMAGNETIC VALVE 24)

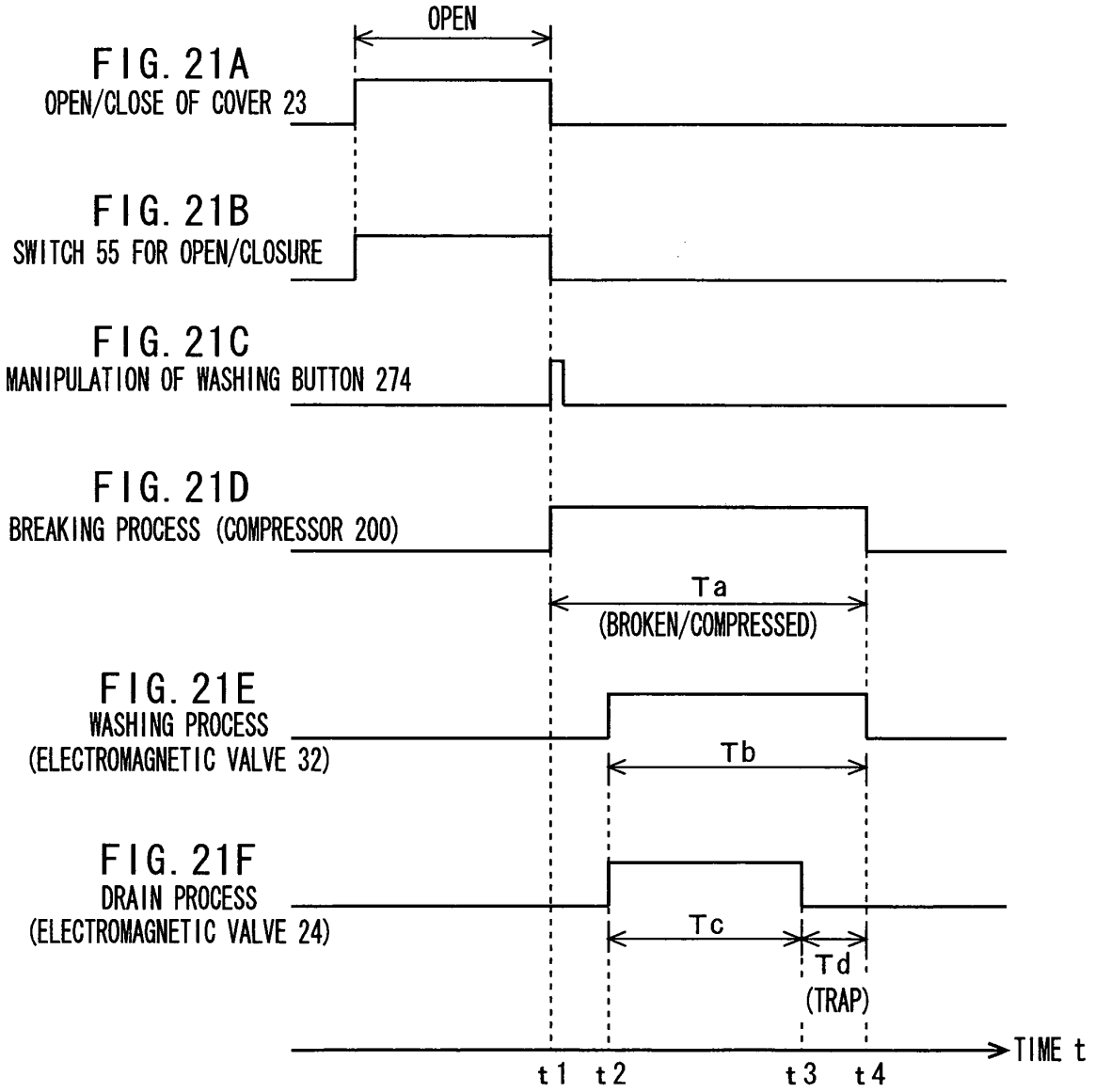
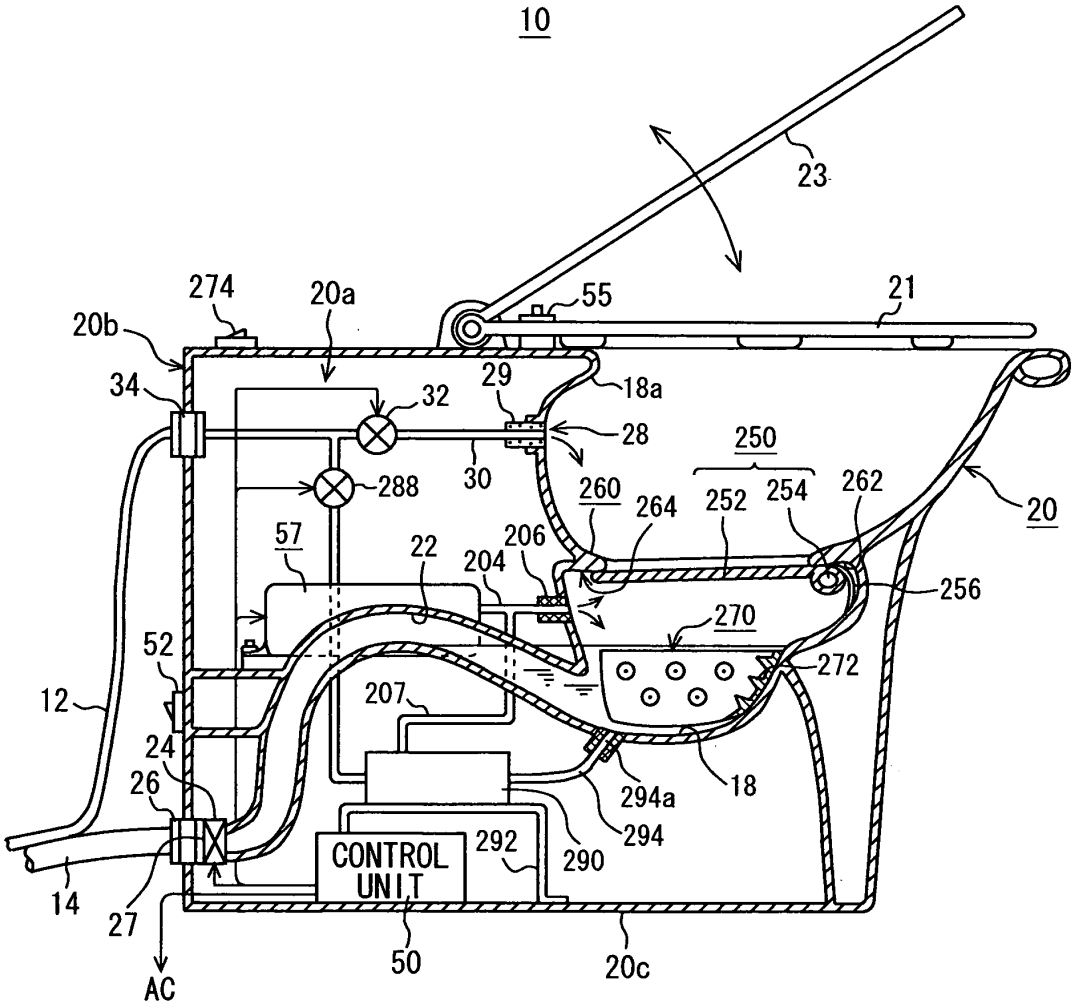

OPEN
FIG. 21A
OPEN/CLOSE OF COVER 23
FIG. 21B
SWITCH 55 FOR OPEN/CLOSURE
FIG. 21C
MANIPULATION OF WASHING BUTTON 274
FIG. 21D
BREAKING PROCESS (COMPRESSOR 200)
Ta
(BROKEN/COMPRESSED)
FIG. 21E
WASHING PROCESS
(ELECTROMAGNETIC VALVE 32)
Tb
FIG. 21F
DRAIN PROCESS
(ELECTROMAGNETIC VALVE 24)
Tc
Td
(TRAP)
TIME t
t1
t2
t3
t4

FIG. 22


10
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274
20a
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20b
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18a
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288
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20
57
22
206
204
256
270
52
272
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207
24
26
18
294a
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292
290
CONTROL UNIT
14
27
AC
50
20c

FIG. 23

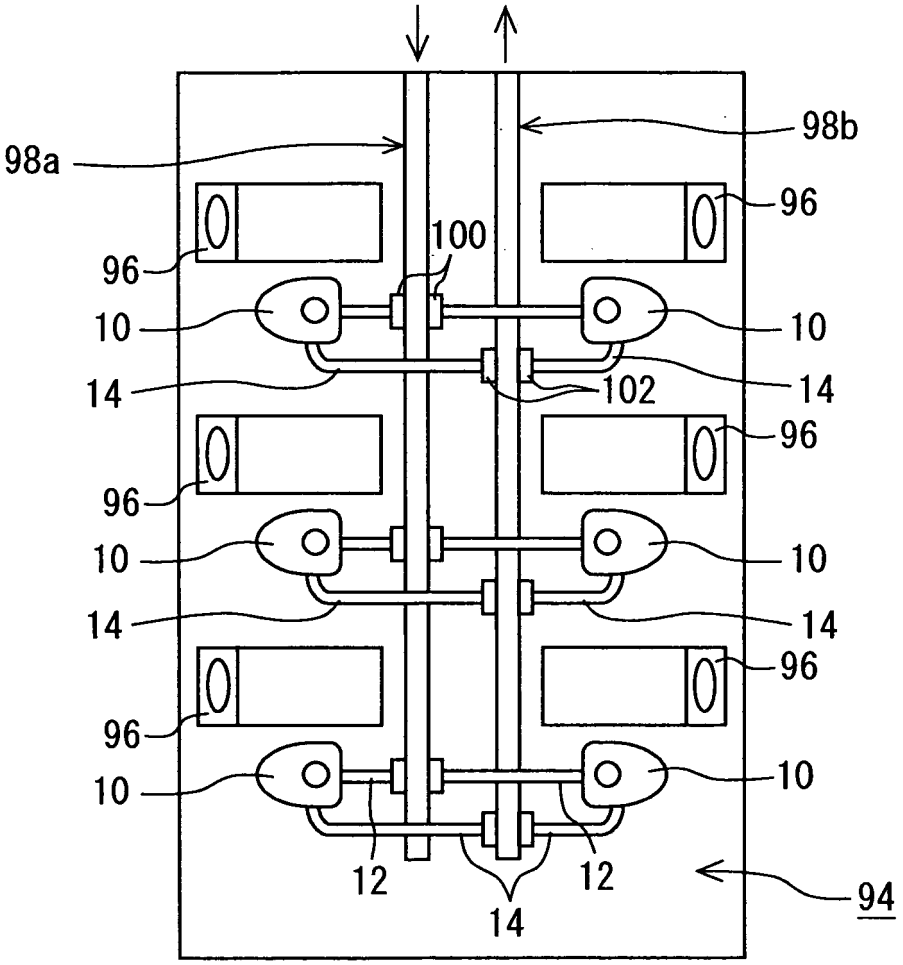


FIG. 24

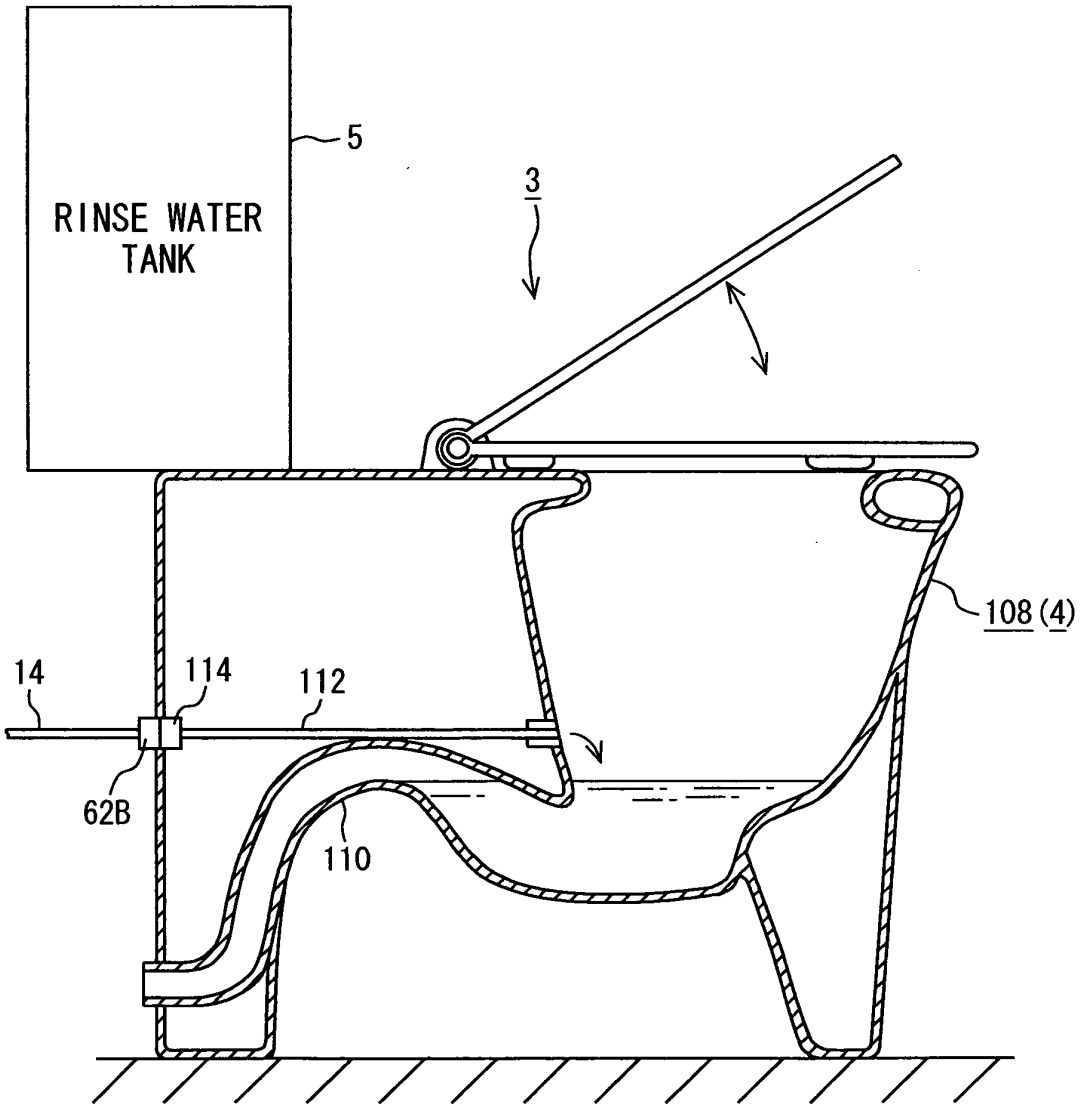


FIG. 25

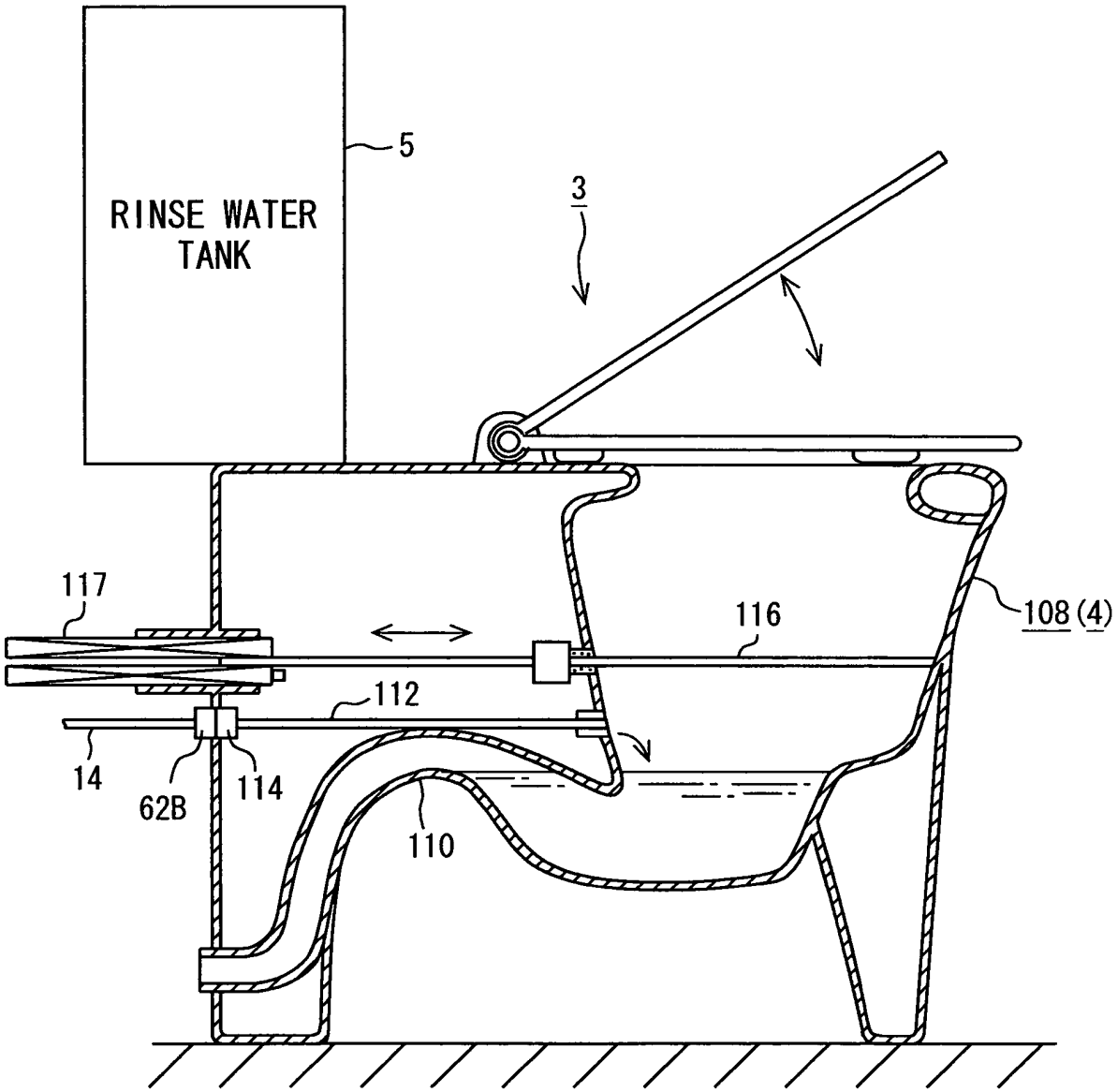


FIG. 26

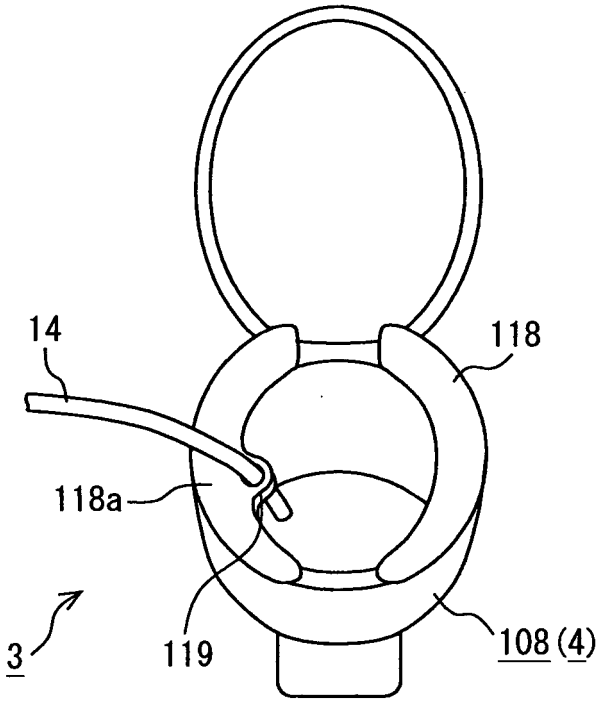


FIG. 27

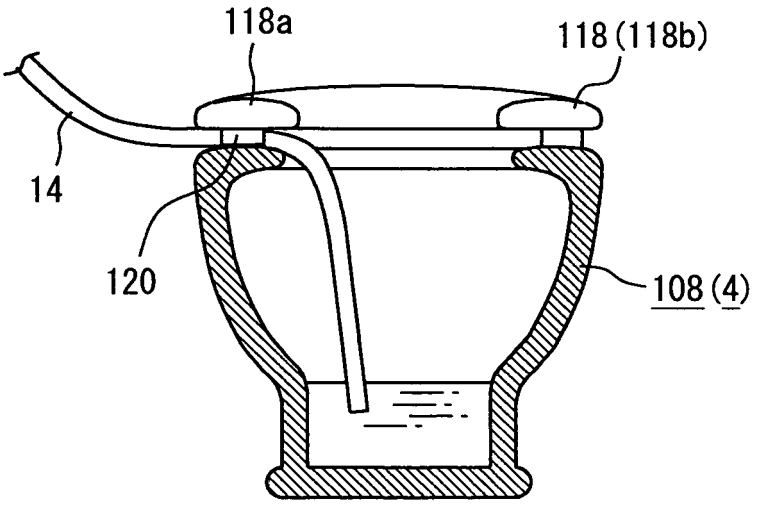


FIG. 28

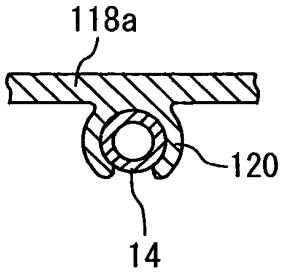


FIG. 29

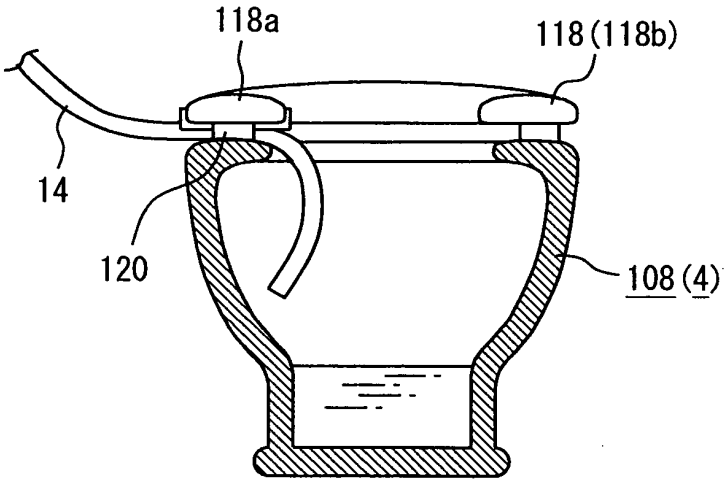


FIG. 30

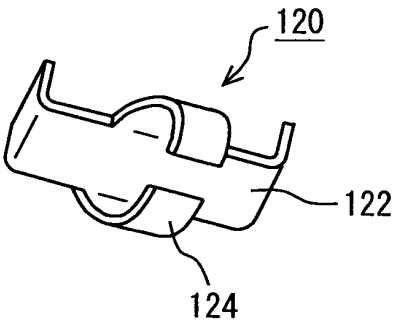


FIG. 31

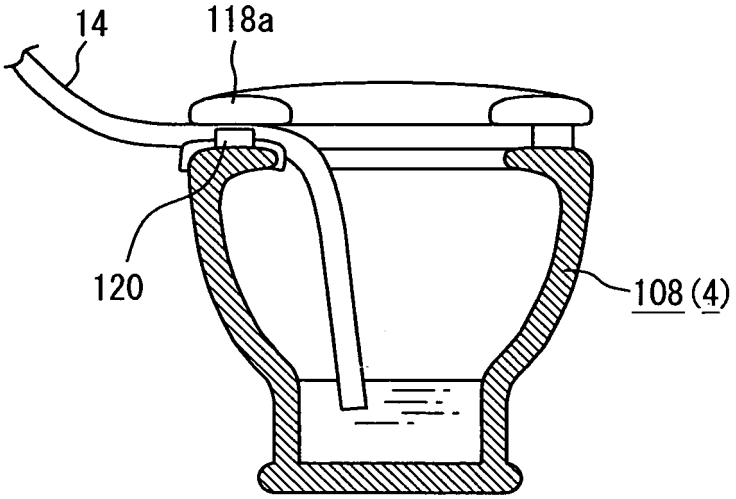


FIG. 32

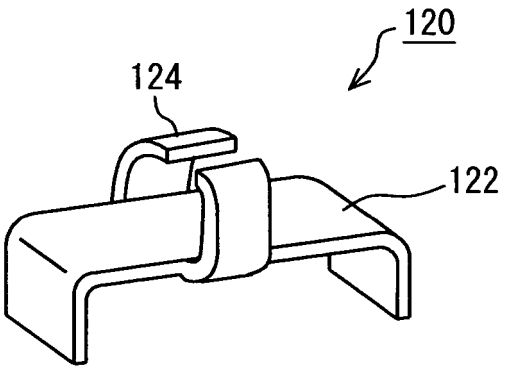


FIG. 33

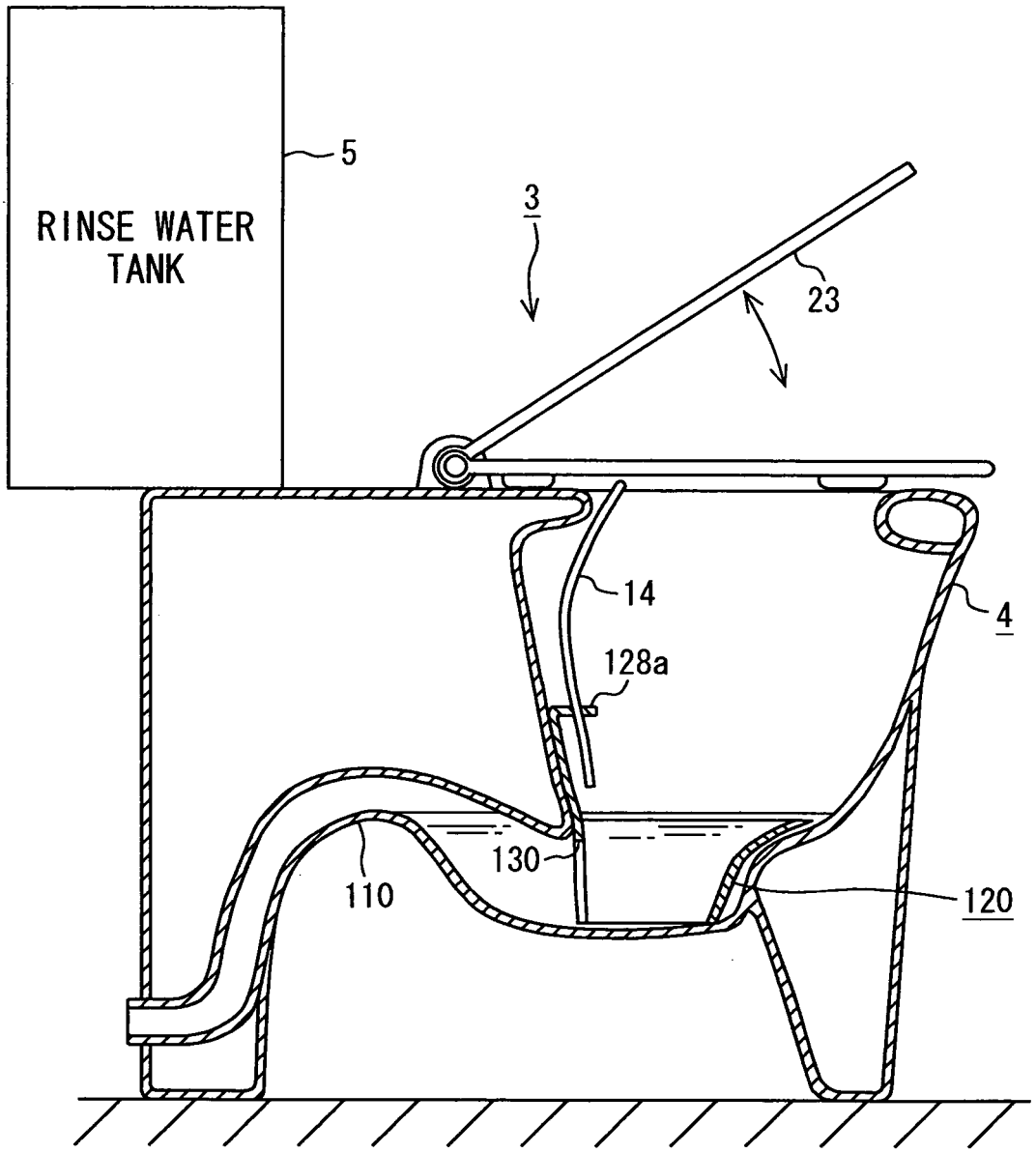


FIG. 34

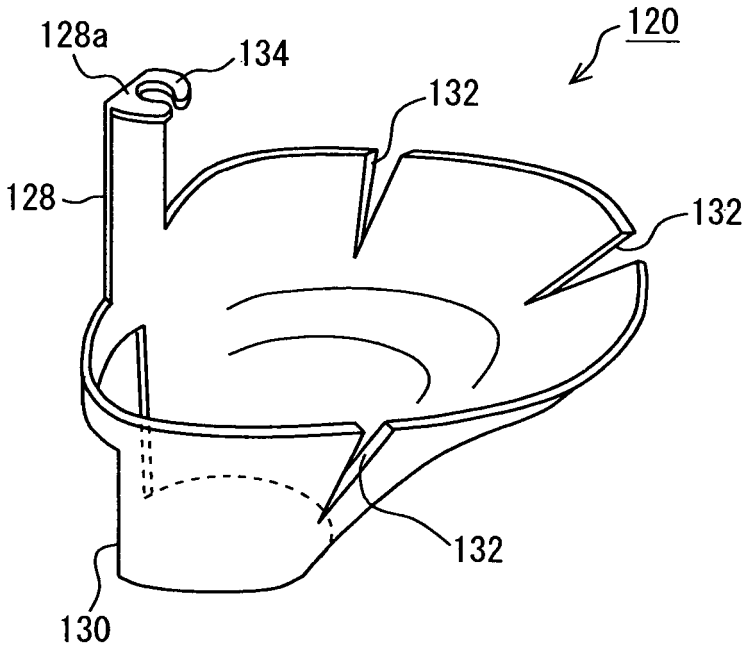


FIG. 35

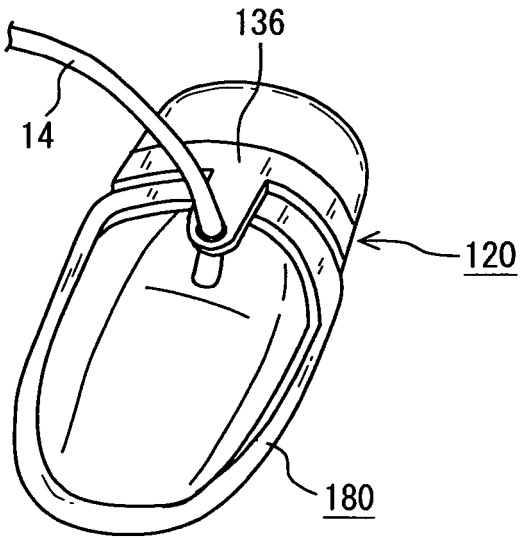


FIG. 36

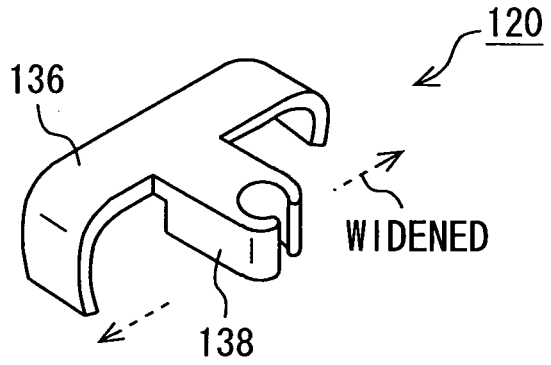


FIG. 37

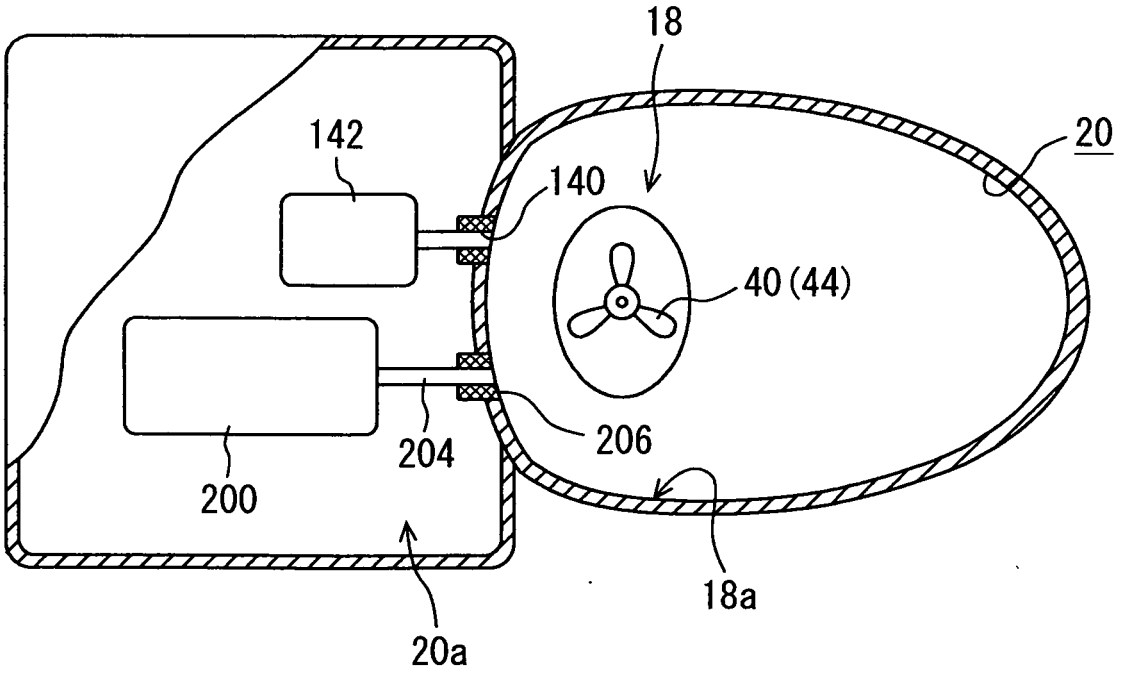


FIG. 38

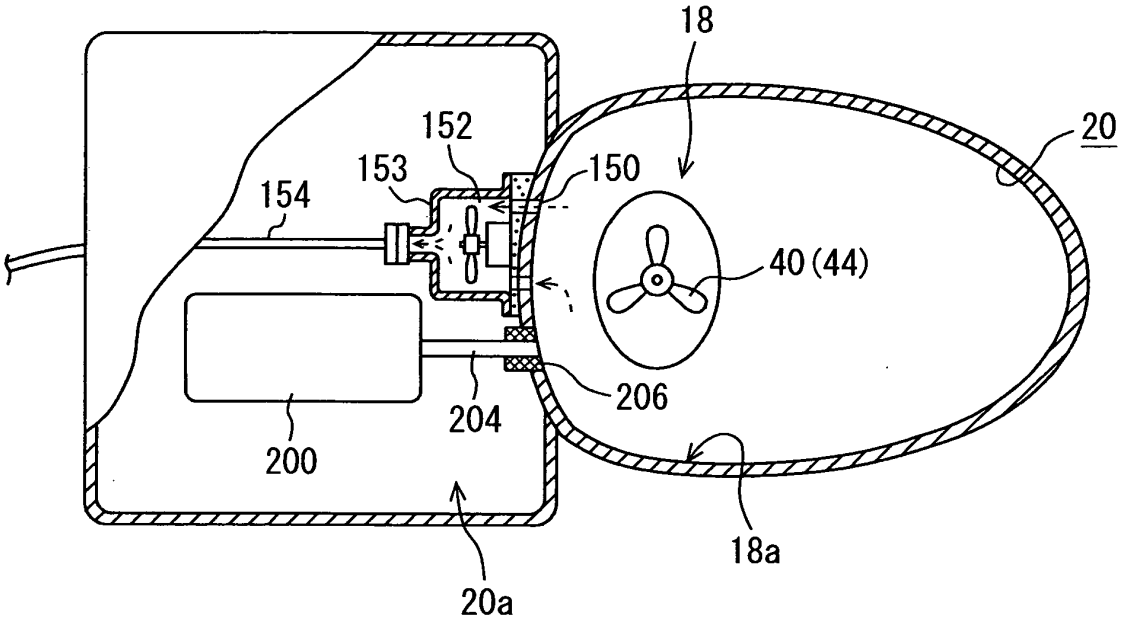


FIG. 39

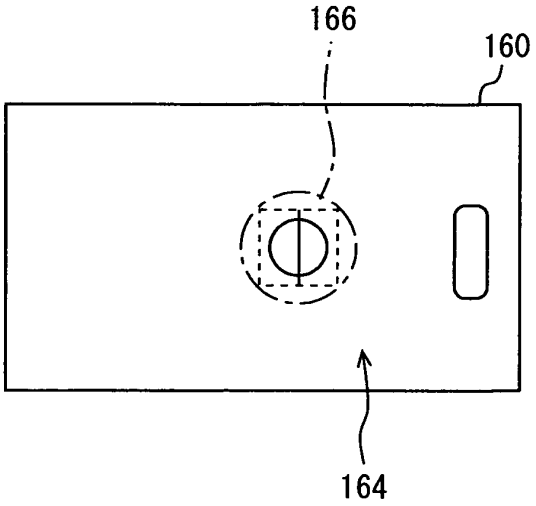
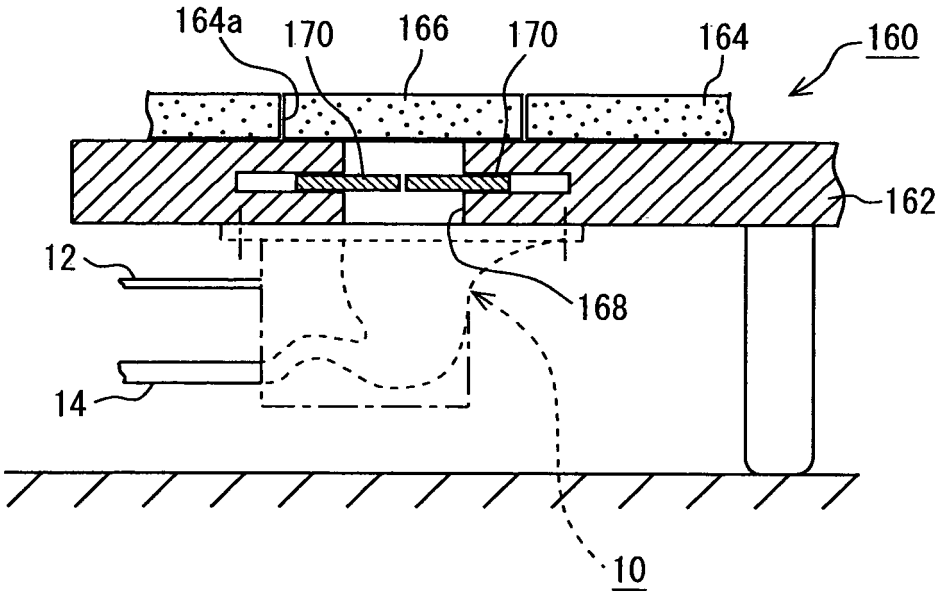


FIG. 40



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/306990

A. CLASSIFICATION OF SUBJECT MATTER
E03D9/10(2006.01), ***B02C18/00***(2006.01), ***E03D11/00***(2006.01), ***E03D11/02***(2006.01)

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)
E03D9/10(2006.01), ***B02C18/00***(2006.01), ***E03D11/00***(2006.01), ***E03D11/02***(2006.01)

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 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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 Y	JP 2000-8442 A (Hiroshi FUJITA), 11 January, 2000 (11.01.00), Par. Nos. [0001], [0013] to [0020]; Fig. 1 (Family: none)	1-3,8,12,13 2,4-11,14
Y	JP 11-148162 A (Toto Ltd.), 02 June, 1999 (02.06.99), Par. Nos. [0060] to [0062]; Fig. 1 (Family: none)	2,4-7
Y	JP 9-136042 A (Isao YOSHIMURA), 27 May, 1997 (27.05.97), Par. No. [0018]; Fig. 1 (Family: none)	8,9

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
16 June, 2006 (16.06.06)	27 June, 2006 (27.06.06)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2006/306990

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2001-275885 A (Denso Corp.), 09 October, 2001 (09.10.01), Par. Nos. [0023] to [0058]; all drawings (Family: none)	10,11 1-3,8
Y	JP 10-88643 A (Matsushita Electric Works, Ltd.), 07 April, 1998 (07.04.98), Par. Nos. [0012], [0013]; Fig. 1 (Family: none)	11
Y	WO 2004/029374 A1 (Toto Ltd.), 08 April, 2004 (08.04.04), Page 12, line 14 to page 13, line 6; Fig. 11 & JP 2005-48577 A	14

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004308404 A **[0002]**