



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
15.07.2015 Bulletin 2015/29

(51) Int Cl.:
E03D 11/08^(2006.01) E03D 11/13^(2006.01)

(21) Application number: **13879541.4**

(86) International application number:
PCT/JP2013/065886

(22) Date of filing: **07.06.2013**

(87) International publication number:
WO 2014/027499 (20.02.2014 Gazette 2014/08)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

- **KOSHIMIZU, Noriyuki**
Tokyo 136-8535 (JP)
- **IMADA, Keiichi**
Tokyo 136-8535 (JP)
- **HONJO, Yoshiro**
Chita-gun
Aichi 470-2201 (JP)

(30) Priority: **17.08.2012 JP 2012180841**

(71) Applicant: **Lixil Corporation**
Koto-ku
Tokyo 136-8535 (JP)

(74) Representative: **Algemeen Octrooi- en Merkenbureau B.V.**
P.O. Box 645
5600 AP Eindhoven (NL)

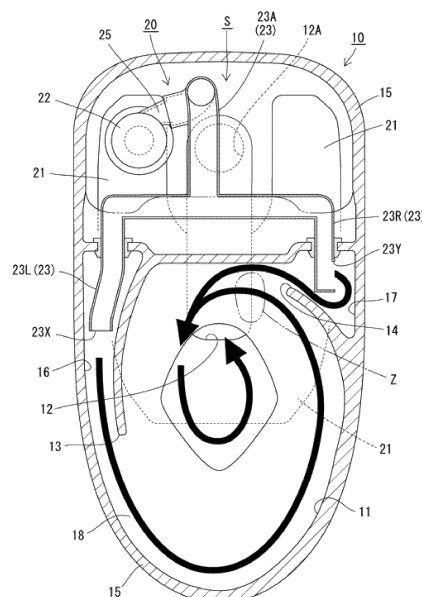
(72) Inventors:
• **HIRAI, Keisuke**
Tokyo 136-8535 (JP)

(54) **FLUSH TOILET**

(57) A flush toilet bowl capable of efficiently performing toilet bowl cleaning is provided. The flush toilet bowl includes : a toilet bowl portion (11); a toilet drainage channel (12); a toilet bowl main body that includes: a first water discharge port (13) that is open on the upper periphery of the toilet bowl portion (11) and that discharges cleaning water that forms a swirling flow swirling inside the toilet bowl portion (11) in the planar view; and a second water discharge port (12) that is open on the upper periphery of the toilet bowl portion (11) and discharges cleaning water that is joined, on the downstream side of the cleaning water discharged from the first water discharge port (13) and flowing on the surface of the toilet bowl portion (11), by the cleaning water discharged from the first water discharge port (13) and forms a downward flow toward the toilet drainage channel (12); and a toilet bowl cleaning device (20) that supplies cleaning water to the first water discharge port (13) and the second water discharge port (14), wherein by the time the cleaning water discharged from the first water discharge port (13) flows on the surface of the toilet bowl portion (11) and reaches a merging point (Z) where the cleaning water discharged from the first water discharge port (13) joins the cleaning water discharged from the second water discharge port (14) that forms the downward flow, the cleaning water dis-

charged from the second water discharge port (14) has been increased to a set flow rate.

FIG.4



Description

[TECHNICAL FIELD]

[0001] The present invention relates to a flush toilet bowl.

[BACKGROUND ART]

[0002] Patent document 1 discloses a conventional flush toilet bowl. This flush toilet bowl is provided with a toilet bowl main body and a toilet bowl cleaning device. The toilet bowl main body has a toilet bowl portion and a toilet drainage channel that communicates with the downstream side of the toilet bowl portion. The toilet bowl main body also has a first water discharge port that is in the upper periphery on the right side (on the right side toward the tip from the back of the toilet bowl main body on which a cleaning tank is placed) of the toilet bowl portion and that discharges cleaning water to an approximate center part of the toilet bowl portion in the longitudinal direction. The first water discharge port is open toward the front side. The cleaning water discharged from the first water discharge port forms a swirling flow swirling in a counterclockwise direction inside the toilet bowl portion in the planar view. The toilet bowl main body also has, at the upper periphery portion on the left rear part thereof, a second water discharge port that discharges cleaning water. The second water discharge port is open toward the right direction. The cleaning water discharged from the second water discharge port joins the cleaning water discharged from the first water discharge port, allowing the strength of the swirling flow to be weakened. This allows the centrifugal force of the swirling flow inside the toilet bowl portion to be reduced, spreading of waste (dirt) inside the toilet bowl portion to be suppressed, and the waste to be thus discharged favorably.

[Patent document 1] Japanese Laid-Open Publication No. 2011-157738

[DISCLOSURE OF THE INVENTION]

[PROBLEM TO BE SOLVED BY THE INVENTION]

[0003] However, the flush toilet bowl according to Patent document 1 is designed without consideration of the flow rate (the volume of water that flows per unit time: the same applies hereinafter) and the water discharge start time of the cleaning water discharged from the first water discharge port, and the flow rate and the water discharge start time of the cleaning water discharged from the second water discharge port. Therefore, this flush toilet bowl discharges cleaning water at a large flow rate from the second water discharge port immediately after the start of toilet bowl cleaning. Further, initially at the start of the toilet bowl cleaning, a swirling flow inside the toilet bowl portion is not formed by the cleaning water discharged from the first water discharge port and the

cleaning water discharged from the second water discharge port flows into the toilet drainage channel without joining the cleaning water discharged from the first water discharge port. In this case, the cleaning water discharged from the second water discharge port cannot be used effectively for the toilet bowl cleaning.

[0004] The present invention is made in consideration of the above-described problem in the related art, and a purpose thereof is to provide a flush toilet bowl capable of efficiently performing toilet bowl cleaning.

[MEANS TO SOLVE THE PROBLEM]

[0005] A flush toilet bowl according to the present invention includes:

- a toilet bowl portion;
- a toilet drainage channel that communicates with the downstream side of the toilet bowl portion;
- a toilet bowl main body that includes : a first water discharge port that is open on the upper periphery of the toilet bowl portion and that discharges cleaning water that forms a swirling flow swirling inside the toilet bowl portion in the planar view; and a second water discharge port that is open on the upper periphery of the toilet bowl portion and discharges cleaning water that is joined, on the downstream side of the cleaning water discharged from the first water discharge port and flowing on the surface of the toilet bowl portion, and forms a downward flow toward the toilet drainage channel; and
- a toilet bowl cleaning device that supplies cleaning water to the first water discharge port and the second water discharge port,
- wherein, after the toilet bowl cleaning device starts supplying the cleaning water to the first water discharge port and the second water discharge port, and, by the time the cleaning water discharged from the first water discharge port flows on the surface of the toilet bowl portion and reaches a merging point where the cleaning water discharged from the first water discharge port joins the cleaning water discharged from the second water discharge port that forms the downward flow, the cleaning water discharged from the second water discharge port has been increased to a set flow rate.

[0006] In this flush toilet bowl, when the cleaning water discharged from the first water discharge port reaches the merging point, the cleaning water discharged from the second water discharge port is increased to the set flow rate (e.g., the peak flow rate for the discharge from the second water discharge port) . In other words, the flush toilet bowl does not discharge a large amount of cleaning water from the second water discharge port before the cleaning water discharged from the first water discharge port reaches the merging point. Therefore, the flush toilet bowl is capable of suppressing the discharge

of cleaning water that cannot be effectively used for toilet bowl cleaning from the second water discharge port and is thus capable of saving water. Further, since the cleaning water discharged from the second water discharge port is increased to the set flow rate (peak flow rate) when the cleaning water discharged from the first water discharge port reaches the merging point in the flush toilet bowl, the cleaning water discharged from the second water discharge port joins the cleaning water discharged from the first water discharge port, ensuring the formation of a downward flow toward the toilet drainage channel.

[0007] Another flush toilet bowl according to the present invention includes:

a toilet bowl portion;
 a toilet drainage channel that communicates with the downstream side of the toilet bowl portion;
 a toilet bowl main body that includes : a first water discharge port that is open on the upper periphery of the toilet bowl portion and that discharges cleaning water that forms a swirling flow swirling inside the toilet bowl portion in the planar view; and a second water discharge port that is open on the upper periphery of the toilet bowl portion and discharges cleaning water that is joined, on the downstream side of the cleaning water discharged from the first water discharge port and flowing on the surface of the toilet bowl portion, by the cleaning water discharged from the first water discharge port and forms a downward flow toward the toilet drainage channel; and
 a toilet bowl cleaning device that supplies cleaning water to the first water discharge port and the second water discharge port such that the start of discharge of the cleaning water from the second water discharge port is delayed compared to the start of discharge of the cleaning water from the first water discharge port.

[0008] This flush toilet bowl allows the start of discharge of the cleaning water from the second water discharge port to be delayed compared to the start of discharge of the cleaning water from the first water discharge port. Therefore, the flush toilet bowl is capable of discharging cleaning water from the second water discharge port at the time when the cleaning water discharged from the first water discharge port reaches the merging point where the cleaning water joins the cleaning water discharged from the second water discharge port. In this manner, since the flush toilet bowl does not discharge cleaning water from the second water discharge port at first when toilet bowl cleaning is started, the flush toilet bowl is capable of suppressing the discharge of cleaning water that cannot be effectively used for the toilet bowl cleaning from the second water discharge port and is thus capable of saving water. Further, since the flush toilet bowl is capable of discharging cleaning water from the second water discharge port at a large flow rate when the cleaning water discharged from the first water

discharge port reaches the merging point, the cleaning water discharged from the second water discharge port joins the cleaning water discharged from the first water discharge port, ensuring the formation of a downward flow toward a toilet drainage channel.

[0009] Therefore, these flush toilet bowls according to the present invention are capable of efficiently performing toilet bowl cleaning.

10 [BRIEF DESCRIPTION OF THE DRAWINGS]

[0010]

Fig. 1 is a cross-sectional view showing a flush toilet bowl according to a first exemplary embodiment and the flow of cleaning water immediately after the start of toilet bowl cleaning;

Fig. 2 is a lateral central cross-sectional view of the flush toilet bowl according to the first exemplary embodiment;

Fig. 3 is a cross-sectional view showing the flush toilet bowl according to the first exemplary embodiment and a flow after the start of the toilet bowl cleaning and immediately before cleaning water discharged from a first water discharge port and cleaning water discharged from a second water discharge port join together;

Fig. 4 is a cross-sectional view showing the flush toilet bowl according to the first exemplary embodiment, and a flow after the cleaning water discharged from the first water discharge port and the cleaning water discharged from the second water discharge port join together after the start of the toilet bowl cleaning; and

Fig. 5 is a cross-sectional view showing a flush toilet bowl according to a second exemplary embodiment.

[BEST MODE FOR CARRYING OUT THE INVENTION]

[0011] An explanation will be given regarding a preferred embodiment in the present invention.

[0012] The flow of the cleaning water discharged from the first water discharge port is changed to flow downward when joining the cleaning water discharged from the second water discharge port and can form a mainstream that flows into the toilet drainage channel. In this case, the cleaning water discharged from the first water discharge port is intended to clean the surface of the toilet bowl portion and mainly flows in a swirling direction. Therefore, by joining the cleaning water discharged from the first water discharge port, the cleaning water discharged from the second water discharge port is capable of changing the flow of the cleaning water discharged from the first water discharge port to flow downward in the direction of the toilet drainage channel and form a mainstream of cleaning water flowing into the toilet drainage channel from one direction. Thus, this flush toilet bowl allows waste to be favorably conveyed into the toilet

drainage channel and allows the waste to be discharged to the outside of the toilet bowl main body via the toilet drainage channel.

[0013] The toilet bowl main body has a water supply chamber with the second water discharge port open toward the inside of the toilet bowl portion, and the toilet bowl cleaning device can have a water supply pipe through which cleaning water flows out that is placed inside the water supply chamber. In this case, the water supply chamber serves as a buffer space and is capable of delaying the timing at which the cleaning water discharged from the second water discharge port is increased to a set flow rate and delay the time for starting water discharge from the second water discharge port.

[0014] The water supply pipe can allow cleaning water to flow out in a direction approximately opposite to that of the second water discharge port. In this case, the cleaning water flowing out from the water supply pipe can be prevented from being discharged to the inside of the toilet bowl portion directly through the second water discharge port. This allows the time for starting the water discharge from the second water discharge port to be delayed.

[0015] The second water discharge port can have an opening area that is larger than that of an outlet port of the water supply pipe. In this case, the flow speed of the cleaning water discharged from the second water discharge port becomes lowered, and scattering of the cleaning water inside the toilet bowl portion can be prevented.

[0016] Next, an explanation will be made regarding a first exemplary embodiment and a second exemplary embodiment in which a flush toilet bowl according to the present invention is embodied with reference to figures.

<First Exemplary Embodiment>

[0017] As shown in Figs. 1-4, a flush toilet bowl according to the first exemplary embodiment is provided with a toilet bowl main body 10, a toilet bowl cleaning device 20, and a toilet seat device 30. The toilet bowl main body 10 has a toilet bowl portion 11, a toilet drainage channel 12, a first water discharge port 13, and a second water discharge port 14. The toilet bowl cleaning device 20 has a cleaning tank 21, a pump 22, and a water supply distribution pipe 23. The toilet seat device 30 has: a toilet seat device main body 31 placed and fixed on the upper surface of the toilet bowl main body 10; and a toilet seat and a toilet lid 32 that are rotatably and pivotably supported at the front of the toilet seat device main body 31.

[0018] The toilet bowl main body 10 has a peripheral wall portion 15 that extends downward from the upper-surface periphery thereof. The toilet bowl main body 10 forms a toilet bowl portion 11 on the front side thereof inside the peripheral wall portion 15 (the lower side in Fig. 1) and forms a storage space S for storing the toilet bowl cleaning device 20 and the like below and behind the toilet bowl portion 11 (in the upper direction in Fig.

1). The toilet drainage channel 12 connects to the downstream side of the toilet bowl portion 11 and extends toward the rear part of the toilet bowl portion 11. The toilet bowl main body 10 has a water sealing portion formed by the lower part of the toilet bowl portion 11 and the toilet drainage channel 12 on an upstream side. In the toilet drainage channel 12, a discharge outlet 12A, which is the downstream end of the toilet drainage channel 12, is placed inside the storage space S behind the toilet bowl portion 11. The discharge outlet 12A communicates with an inlet port that is open at the upper part of a drainpipe 50, which is drawn to a floor surface F via a drainage connecting pipe 40, inside the storage space S behind the toilet bowl portion 11.

[0019] The toilet bowl main body 10 has a first water supply chamber 16 provided outside the upper periphery portion on the left side of the toilet bowl portion 11 (the left side in Fig. 1) and inside the peripheral wall portion 15. The first water supply chamber 16 extends backward from the approximate center part of the toilet bowl portion 11 in the longitudinal direction (in the upward in Fig. 1). An end portion of a left side water supply pipe 23L, which is described later, of the water supply distribution pipe 23 is inserted from behind the first water supply chamber 16 and placed inside the first water supply chamber 16. The first water discharge port 13 is provided in an open manner at a front end portion of the first water supply chamber 16. In other words, the first water discharge port 13 is in the upper periphery on the left side of the toilet bowl portion 11 and is open toward the front direction at the approximate center part of the toilet bowl portion 11 in the longitudinal direction (in the downward direction in Fig. 1). The toilet bowl main body 10 has a rim water passage 18 connecting to the bottom surface of the first water discharge port 13 and formed at the upper periphery.

[0020] The toilet bowl main body 10 has a second water supply chamber 17 provided outside the upper periphery portion on the right rear part of the toilet bowl portion 11 (the upper right part in Fig. 1) and inside the peripheral wall portion 15. An end portion of a right-side water supply pipe 23R, which is described later, of the water supply distribution pipe 23 is inserted from behind the second water supply chamber 17 and placed inside the second water supply chamber 17. The second water discharge port 14 is provided in an open manner in the rear part of a side surface of the second water supply chamber 17 on the side of the toilet bowl portion 11. In other words, the second water discharge port 14 is in the upper periphery on the right rear part of the toilet bowl portion 11 and is open toward the left direction (in the left direction in Fig. 1).

[0021] A cleaning tank 21 is in the storage space S and is placed below and behind the toilet bowl portion 11. The pump 22 is placed inside the storage space S behind the toilet bowl portion 11 and above the cleaning tank 21. An inlet port of the pump 22 is connected to the upper end of the cleaning tank 21 via a connecting pipe 24. The

pump 22 connects a discharge pipe 25 to the water supply distribution pipe 23. The water supply distribution pipe 23 has: an upstream pipe 23A connected to the discharge pipe 25 of the pump 22; and a left-side water supply pipe 23L and a right-side water supply pipe 23R branched from the upstream pipe 23A.

[0022] The left-side water supply pipe 23L of the water supply distribution pipe 23 has an outlet port 23X with an open end. Cleaning water that has flowed out from the outlet port 23X of the left-side water supply pipe 23L flows inside the first water supply chamber 16 toward the first water discharge port 13 and is discharged from the first water discharge port 13. The cleaning water discharged from the first water discharge port 13 flows along the rim water passage 18 and forms a swirling flow swirling in a counterclockwise direction inside the toilet bowl portion 11 in the planar view.

[0023] The right-side water supply pipe 23R of the water supply distribution pipe 23 has a closed end and has an outlet port 23Y that is open on the side of the peripheral wall portion 15 of the second water supply chamber 17 on a side surface portion thereof. The outlet port 23Y of the right-side water supply pipe 23R allows cleaning water to flow out in a direction approximately opposite to that of the second water discharge port 14. Cleaning water that has flowed out from the outlet port 23Y of the right-side water supply pipe 23R is discharged from the second water discharge port 14 while filling the inside of the second water supply chamber 17. The cleaning water discharged from the second water discharge port 14 joins the cleaning water discharged from the first water discharge port 13 in a merging point Z (see Fig. 4) and forms a downward flow toward the toilet drainage channel 12. The second water discharge port 14 has an opening area that is larger than that of the outlet port 23Y of the right-side water supply pipe 23R. Therefore, the flow speed of the cleaning water discharged from the second water discharge port 14 becomes lowered, and scattering of the cleaning water can be prevented when the cleaning water joins the cleaning water discharged from the first water discharge port 13 at the merging point Z inside the toilet bowl portion 11, and so on.

[0024] An explanation will now be given regarding how cleaning water flows when toilet bowl cleaning is performed in a flush toilet bowl having such a structure.

[0025] In this flush toilet bowl, when a toilet bowl cleaning switch provided on a remote controller (not shown) is operated, a pump 22 is activated for a set period of time, and cleaning water stored in a cleaning tank 21 is discharged from a first water discharge port 13 and a second water discharge port 14 via a water supply distribution pipe 23. With this, this flush toilet bowl performs toilet bowl cleaning.

[0026] Since an outlet port 23X of a left-side water supply pipe 23L of the water supply distribution pipe 23 allows cleaning water to flow out toward the first water discharge port 13, this flush toilet bowl is capable of discharging cleaning water from the first water discharge port 13

along a rim water passage 18 as shown in Fig. 1 immediately after the start of the toilet bowl cleaning. Meanwhile, since an outlet port 23Y of a right-side water supply pipe 23R of the water supply distribution pipe 23 allows cleaning water to flow out in a direction approximately opposite to that of the second water discharge port 14, the flush toilet bowl does not discharge cleaning water inside the toilet bowl portion 11 from the second water discharge port 14 immediately after the start of the toilet bowl cleaning. In other words, since the outlet port 23Y of the right-side water supply pipe 23R allows cleaning water to flow out in the direction approximately opposite to that of the second water discharge port 14, the cleaning water flowing out from the outlet port 23Y of the right-side water supply pipe 23R can be prevented from being discharged to the inside of the toilet bowl portion 11 directly through the second water discharge port 14, and the time for starting the water discharge from the second water discharge port 14 can be delayed.

[0027] After that, with a short lapse of time, the cleaning water discharged from the first water discharge port 13 flows to the right side of the toilet bowl portion 11 along the rim water passage 18 as shown in Fig. 3. On the other hand, the cleaning water that has flowed out from the outlet port 23Y of the right-side water supply pipe 23R starts being gradually discharged from the second water discharge port 14. Until the second water supply chamber 17 is filled with the cleaning water that has flowed out from the outlet port 23Y of the right-side water supply pipe 23R, the cleaning water discharged from the second water discharge port 14 is gradually increased. As described, the second water supply chamber 17 serves as a buffer space and is capable of delaying the timing at which the cleaning water discharged from the second water discharge port 14 is increased to a set flow rate (a peak flow rate, e.g., 25 L/min or more and desirably 35 L/min or more) and/or delay the time for starting water discharge from the second water discharge port 14.

[0028] After that, as shown in Fig. 4, by the time the cleaning water discharged from the first water discharge port 13 reaches the merging point Z, the second water supply chamber 17 is filled with the cleaning water that has flowed out from the outlet port 23Y of the right-side water supply pipe 23R, the cleaning water discharged from the second water discharge port 14 is increased, and cleaning water of the set flow rate (peak flow rate) is discharged from the second water discharge port 14. In other words, the flush toilet bowl does not discharge a large amount of cleaning water from the second water discharge port 14 before the cleaning water discharged from the first water discharge port 13 reaches the merging point Z. Therefore, the flush toilet bowl is capable of suppressing the discharge of cleaning water that cannot be effectively used for toilet bowl cleaning from the second water discharge port 14 and is thus capable of saving water. Further, since the cleaning water discharged from the second water discharge port 14 is increased to the set flow rate (peak flow rate) when the cleaning water

discharged from the first water discharge port 13 reaches the merging point Z in the flush toilet bowl, the cleaning water discharged from the second water discharge port 14 joins the cleaning water discharged from the first water discharge port 13, ensuring the formation of a downward flow toward the toilet drainage channel 12.

[0029] Therefore, a flush toilet bowl according to the first exemplary embodiment is capable of efficiently performing toilet bowl cleaning.

[0030] The flow of the cleaning water discharged from the first water discharge port 13 is changed to a downward flow when joining the cleaning water discharged from the second water discharge port 14, forming a mainstream that flows into the toilet drainage channel 12. In other words, the cleaning water discharged from the first water discharge port 13 is intended to clean the surface of the toilet bowl portion 11 and mainly flows in a swirling direction. Therefore, by joining the cleaning water discharged from the first water discharge port 13, the cleaning water discharged from the second water discharge port 14 is capable of changing the flow of the cleaning water discharged from the first water discharge port 13 to flow downward in the direction of the toilet drainage channel 12 and form a water flow of cleaning water flowing into the toilet drainage channel 12 from one direction. Thus, this flush toilet bowl allows waste to be favorably conveyed into the toilet drainage channel 12 and allows the waste to be discharged to the outside of the toilet bowl main body 10 via the toilet drainage channel 12.

[0031] A part of the cleaning water discharged from the first water discharge port 13 joined by the cleaning water discharged from the second water discharge port 14 does not flow into the toilet drainage channel 12 and forms a swirling flow swirling in the counterclockwise direction inside the toilet bowl portion 11. After the set period of time is elapsed, the activation of the pump 22 is stopped, and the toilet bowl cleaning is ended.

[0032] <Second Exemplary Embodiment> As shown in Fig. 5, a flush toilet bowl according to a second exemplary embodiment is different from that of the first exemplary embodiment in that the flush toilet bowl according to the second exemplary embodiment connects a water supply distribution pipe 123 of a toilet bowl cleaning device 120 directly to a water supply source (e.g., water pipe) so as to supply cleaning water to a first water discharge port 13 and a second water discharge port 14 using water supply pressure of the water supply source. The same reference numerals are assigned to the same configurations, and the detailed descriptions are omitted.

[0033] The toilet bowl cleaning device 120 connects an upstream end of an upstream pipe 123A of the water supply distribution pipe 123 to a water shutoff valve (not shown) connected to a water pipe that is drawn to a room in which this flush toilet bowl is installed. The toilet bowl cleaning device 120 has on-off valves 124 and 125 respectively provided in a left-side water supply pipe 123L and a right-side water supply pipe 123R branched from the upstream pipe 123A. These on-off valves 124 and

125 are capable of controlling the timing for opening and closing.

[0034] An explanation will now be given regarding, in a flush toilet bowl provided with a toilet bowl cleaning device 120 having such a structure, the operation of the toilet bowl cleaning device 120 and the way cleaning water flows when toilet bowl cleaning is performed.

[0035] In this flush toilet bowl, when a toilet bowl cleaning switch provided on a remote controller (not shown) is operated, an on-off valve 124 provided in a left-side water supply pipe 123L is opened first. Therefore, the flush toilet bowl discharges cleaning water along a rim water passage 18 from a first water discharge port 13, and the cleaning water flows toward a merging point Z where the cleaning water joins cleaning water discharged from a second water discharge port 14.

[0036] After that, an on-off valve 125 provided in a right-side water supply pipe 23R is opened after a set period of time is elapsed. This allows the time for starting the water discharge from the second water discharge port 14 to be delayed. In other words, the flush toilet bowl is capable of discharging cleaning water from the second water discharge port 14 at the time when the cleaning water discharged from the first water discharge port 13 reaches the merging point Z where the cleaning water joins the cleaning water discharged from the second water discharge port 14. As described, since the flush toilet bowl does not discharge cleaning water from the second water discharge port 14 immediately after the start of toilet bowl cleaning, the flush toilet bowl is capable of suppressing the discharge of cleaning water that cannot be effectively used for the toilet bowl cleaning from the second water discharge port 14 and is thus capable of saving water. Further, since the flush toilet bowl is capable of discharging cleaning water from the second water discharge port 14 at a large flow rate when the cleaning water discharged from the first water discharge port 13 reaches the merging point Z, the cleaning water discharged from the second water discharge port 14 joins the cleaning water discharged from the first water discharge port 13, ensuring the formation of a downward flow toward a toilet drainage channel 12.

[0037] Therefore, a flush toilet bowl according to the second exemplary embodiment is capable of efficiently performing toilet bowl cleaning.

[0038] In this flush toilet bowl, the flow of the cleaning water discharged from the first water discharge port 13 is also changed to a downward flow when joining the cleaning water discharged from the second water discharge port 14, forming a mainstream that flows into the toilet drainage channel 12. In other words, the cleaning water discharged from the first water discharge port 13 is intended to clean the surface of the toilet bowl portion 11 and mainly flows in a swirling direction. Therefore, by joining the cleaning water discharged from the first water discharge port 13, the cleaning water discharged from the second water discharge port 14 is capable of changing the flow of the cleaning water discharged from the

first water discharge port 13 to flow downward in the direction of the toilet drainage channel 12 and form a water flow of cleaning water flowing into the toilet drainage channel 12 from one direction. Thus, this flush toilet bowl allows waste to be favorably conveyed into the toilet drainage channel 12 and allows the waste to be discharged to the outside of the toilet bowl main body 10 via the toilet drainage channel 12.

[0039] A part of the cleaning water discharged from the first water discharge port 13 joined by the cleaning water discharged from the second water discharge port 14 does not flow into the toilet drainage channel 12 and forms a swirling flow swirling in the counterclockwise direction inside the toilet bowl portion 11. After the set period of time is elapsed, the on-off valve provided in the left-side water supply pipe 23L and the on-off valve provided in the right-side water supply pipe 23R are closed, and the toilet bowl cleaning is ended.

[0040] The present invention is not limited to the first and second exemplary embodiments explained according to the above descriptions and the figures, and, for example, the following exemplary embodiments are also included in the technical scope of the present invention.

(1) In the first and second exemplary embodiments, the opening area of a second water discharge port is larger than that of an outlet port of a right-side water supply pipe. Alternatively, these opening areas may be equal.

(2) In the first and second exemplary embodiments, a first water discharge port is placed on the left side of a toilet bowl portion and at an approximate center part of the toilet bowl portion in the longitudinal direction, and a second water discharge port is placed on the right rear part of the toilet bowl portion. Alternatively, the arrangement of the water discharge ports may be appropriately changed according to the respective shapes of the toilet bowl portion and a toilet drainage channel, a positional relationship thereof, and the like. (3) In the first exemplary embodiment, a cleaning tank is placed inside a storage space formed in a toilet bowl main body. Alternatively, the cleaning tank may be placed in a different place such as on a rear upper surface of the toilet bowl main body.

(4) In the second exemplary embodiment, a second water supply chamber is provided. However, the second water supply chamber does not need to be provided. (5) In the second exemplary embodiment, an outlet port of a right-side water supply pipe is open on the side of a peripheral wall portion of a second water supply chamber such that cleaning water flows out in a direction approximately opposite to that of a second water discharge port. Alternatively, the outlet port of the right-side water supply pipe may be open toward the second water discharge port.

[DESCRIPTION OF THE REFERENCE NUMERALS]

[0041]

10 toilet bowl main body
11 toilet bowl portion

12 toilet drainage channel
13 first water discharge port
14 second water discharge port
17 second water supply chamber (water supply chamber)
5
20, 120 toilet bowl cleaning device
23R, 123R right-side water supply pipe (water supply pipe)
23Y outlet port
10 Z merging point

Claims

15 1. A flush toilet bowl comprising:

a toilet bowl portion;
a toilet drainage channel that communicates with the downstream side of the toilet bowl portion;
a toilet bowl main body that includes : a first water discharge port that is open on the upper periphery of the toilet bowl portion and that discharges cleaning water that forms a swirling flow swirling inside the toilet bowl portion in the planar view; and a second water discharge port that is open on the upper periphery of the toilet bowl portion and discharges cleaning water that is joined, on the downstream side of the cleaning water discharged from the first water discharge port and flowing on the surface of the toilet bowl portion, by the cleaning water discharged from the first water discharge port and forms a downward flow toward the toilet drainage channel; and
a toilet bowl cleaning device that supplies cleaning water to the first water discharge port and the second water discharge port, wherein, after the toilet bowl cleaning device starts supplying the cleaning water to the first water discharge port and the second water discharge port, and, by the time the cleaning water discharged from the first water discharge port flows on the surface of the toilet bowl portion and reaches a merging point where the cleaning water discharged from the first water discharge port joins the cleaning water discharged from the second water discharge port that forms the downward flow, the cleaning water discharged from the second water discharge port has been increased to a set flow rate.

2. A flush toilet bowl comprising:

55 a toilet bowl portion;
a toilet drainage channel that communicates with the downstream side of the toilet bowl portion;

a toilet bowl main body that includes : a first water discharge port that is open on the upper periphery of the toilet bowl portion and that discharges cleaning water that forms a swirling flow swirling inside the toilet bowl portion in the planar view; and a second water discharge port that is open on the upper periphery of the toilet bowl portion and discharges cleaning water that is joined, on the downstream side of the cleaning water discharged from the first water discharge port and flowing on the surface of the toilet bowl portion, by the cleaning water discharged from the first water discharge port and forms a downward flow toward the toilet drainage channel; and
 a toilet bowl cleaning device that supplies cleaning water to the first water discharge port and the second water discharge port such that the start of discharge of the cleaning water from the second water discharge port is delayed compared to the start of discharge of the cleaning water from the first water discharge port.

3. The flush toilet bowl according to claim 1 or 2, wherein the flow of the cleaning water discharged from the first water discharge port is changed to a downward flow when joining the cleaning water discharged from the second water discharge port, forming a mainstream that flows into the toilet drainage channel.
4. The flush toilet bowl according to claim 1 or 2, wherein the toilet bowl main body has a water supply chamber with the second water discharge port open toward the inside of the toilet bowl portion, and wherein the toilet bowl cleaning device has a water supply pipe through which cleaning water flows out that is placed inside the water supply chamber.
5. The flush toilet bowl according to claim 4, wherein the water supply pipe allows cleaning water to flow out in a direction approximately opposite to that of the second water discharge port.
6. The flush toilet bowl according to claim 4, wherein the second water discharge port has an opening area that is larger than that of an outlet port of the water supply pipe.

FIG.1

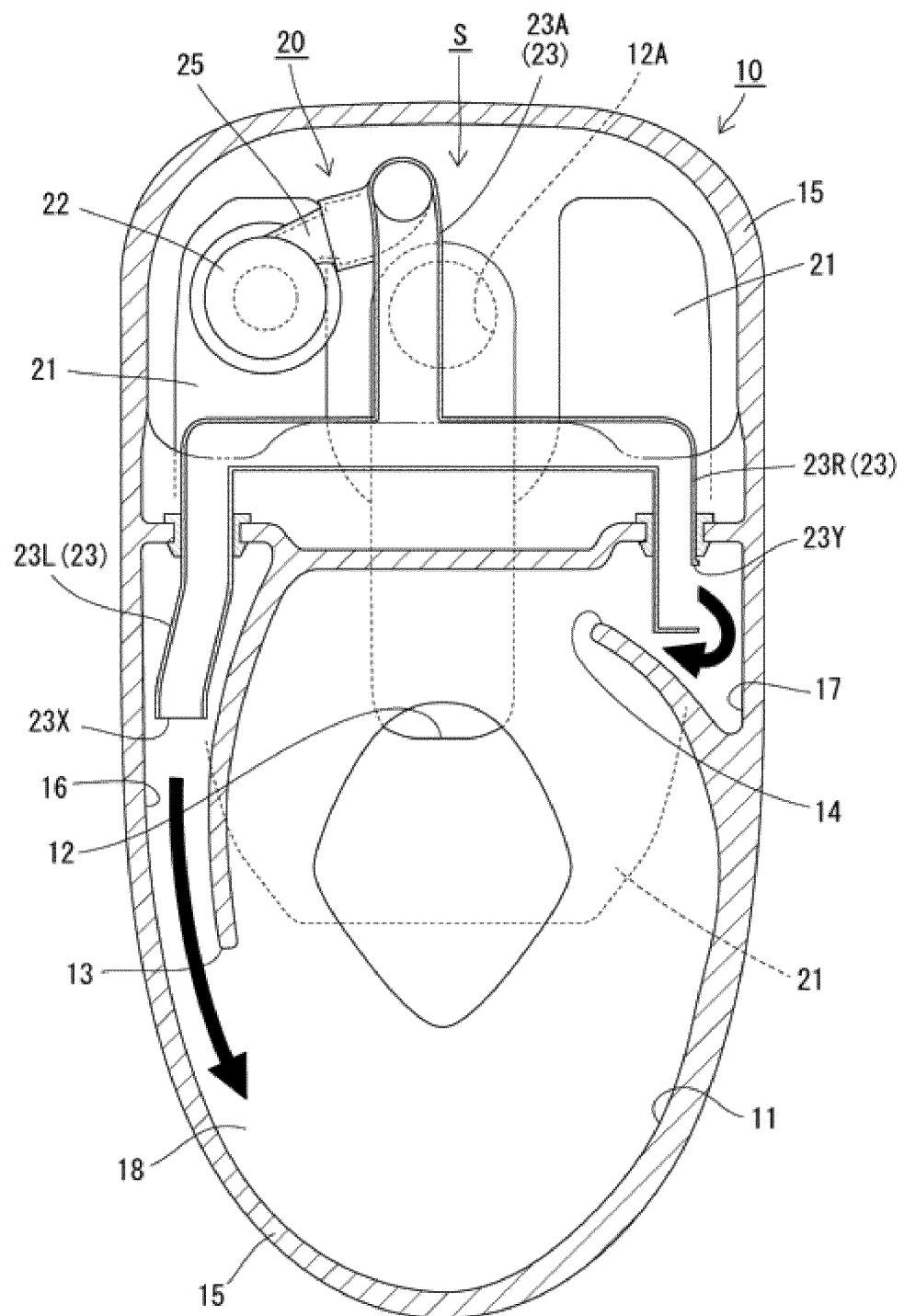


FIG.2

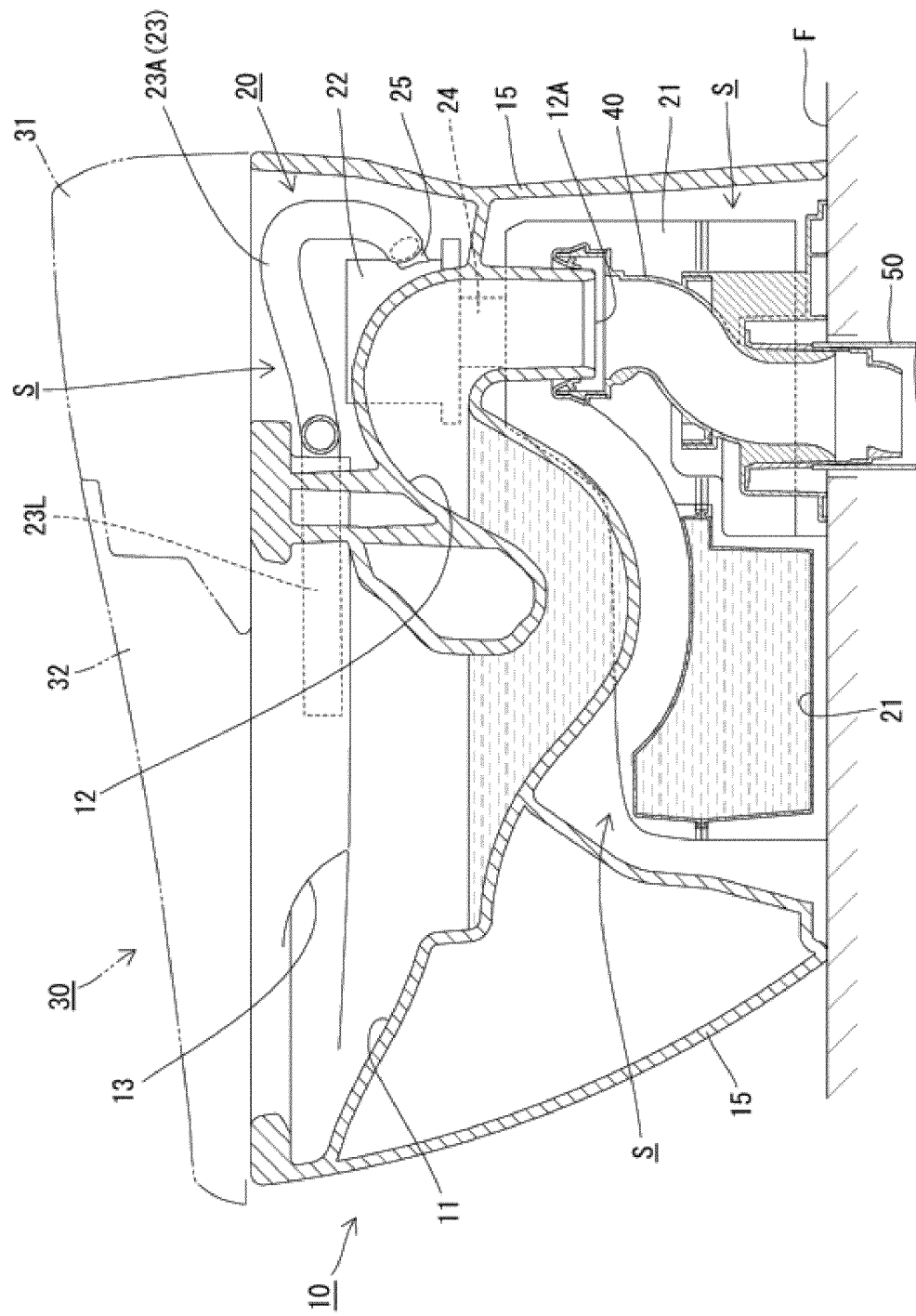


FIG.3

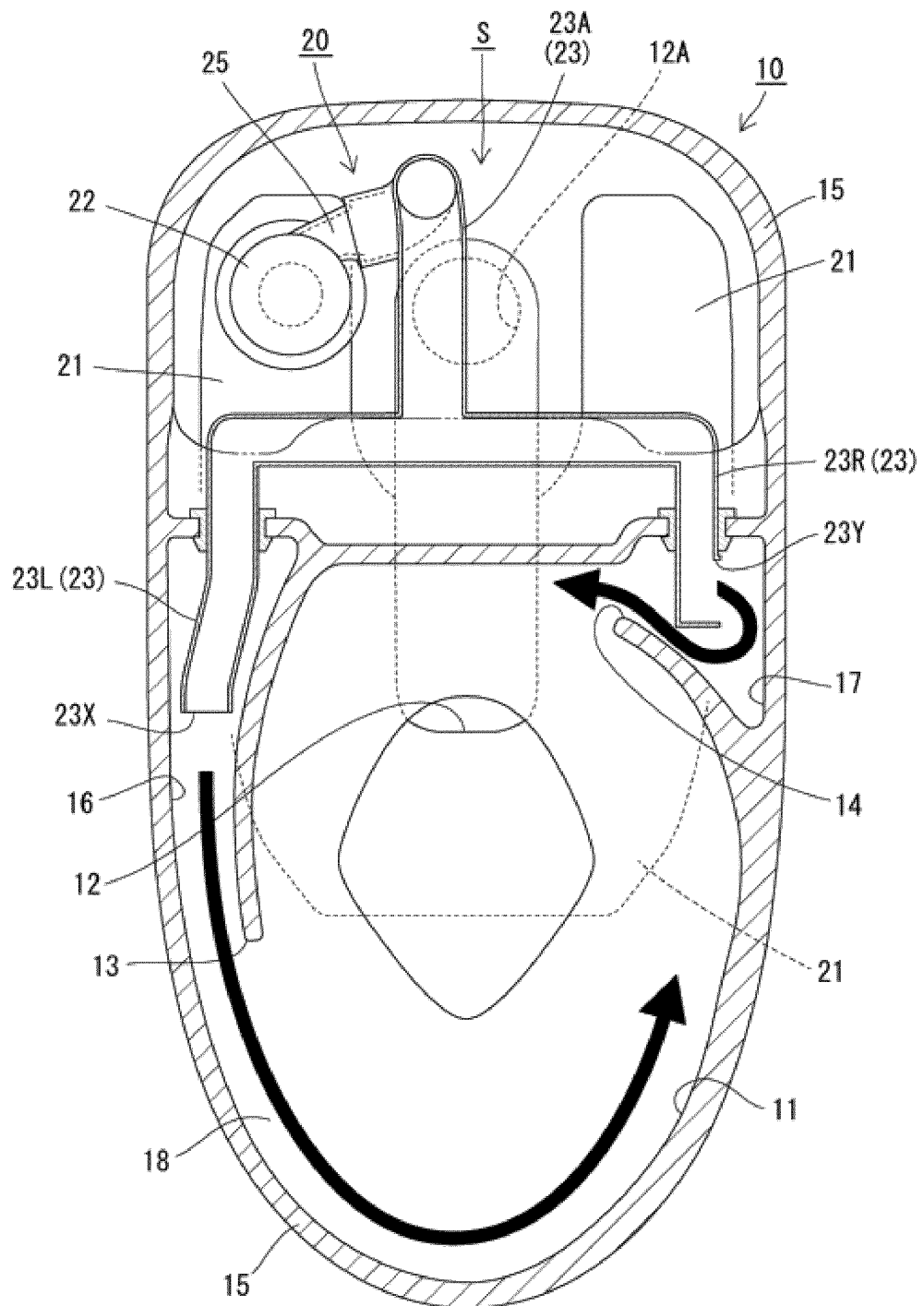


FIG.4

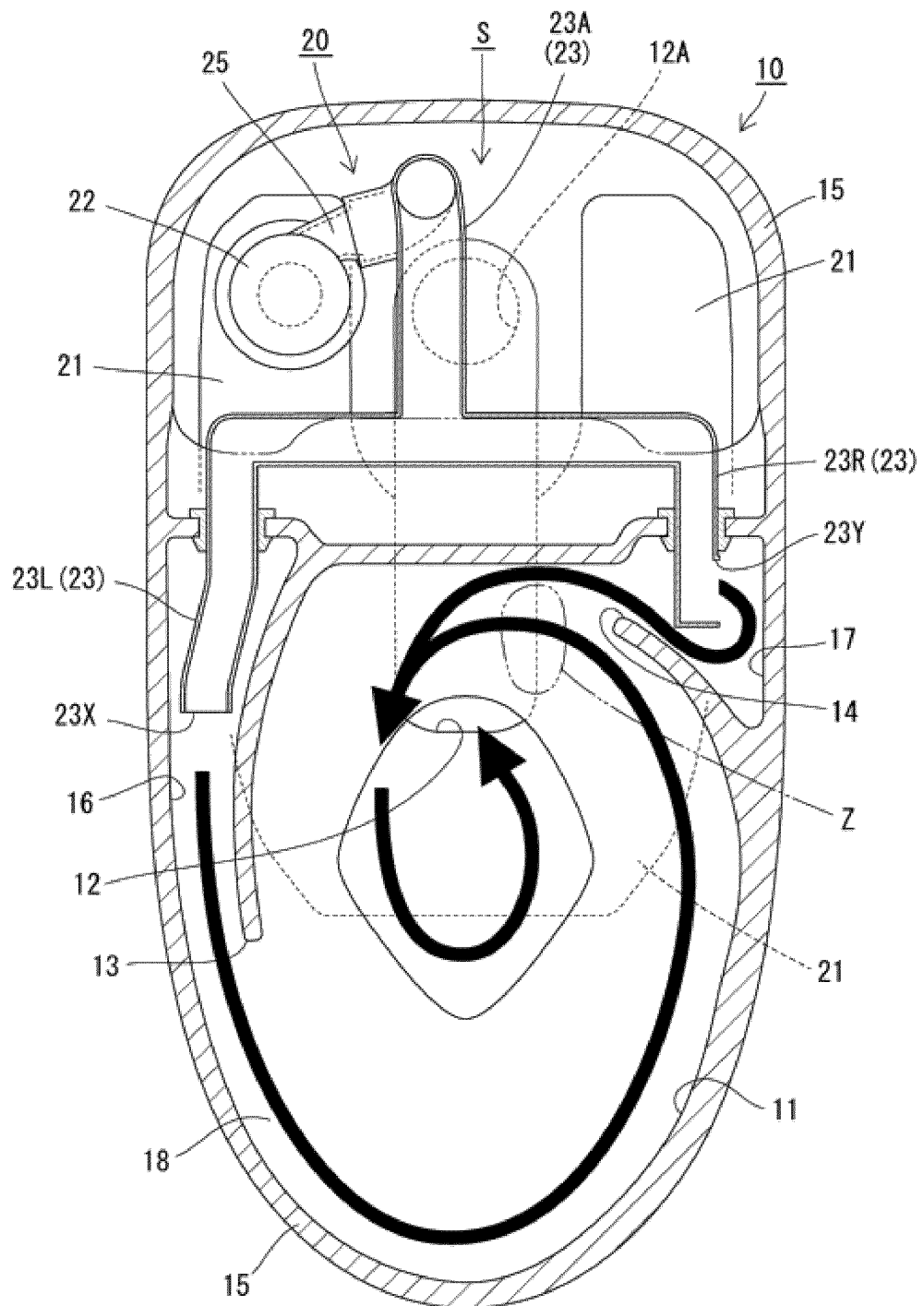
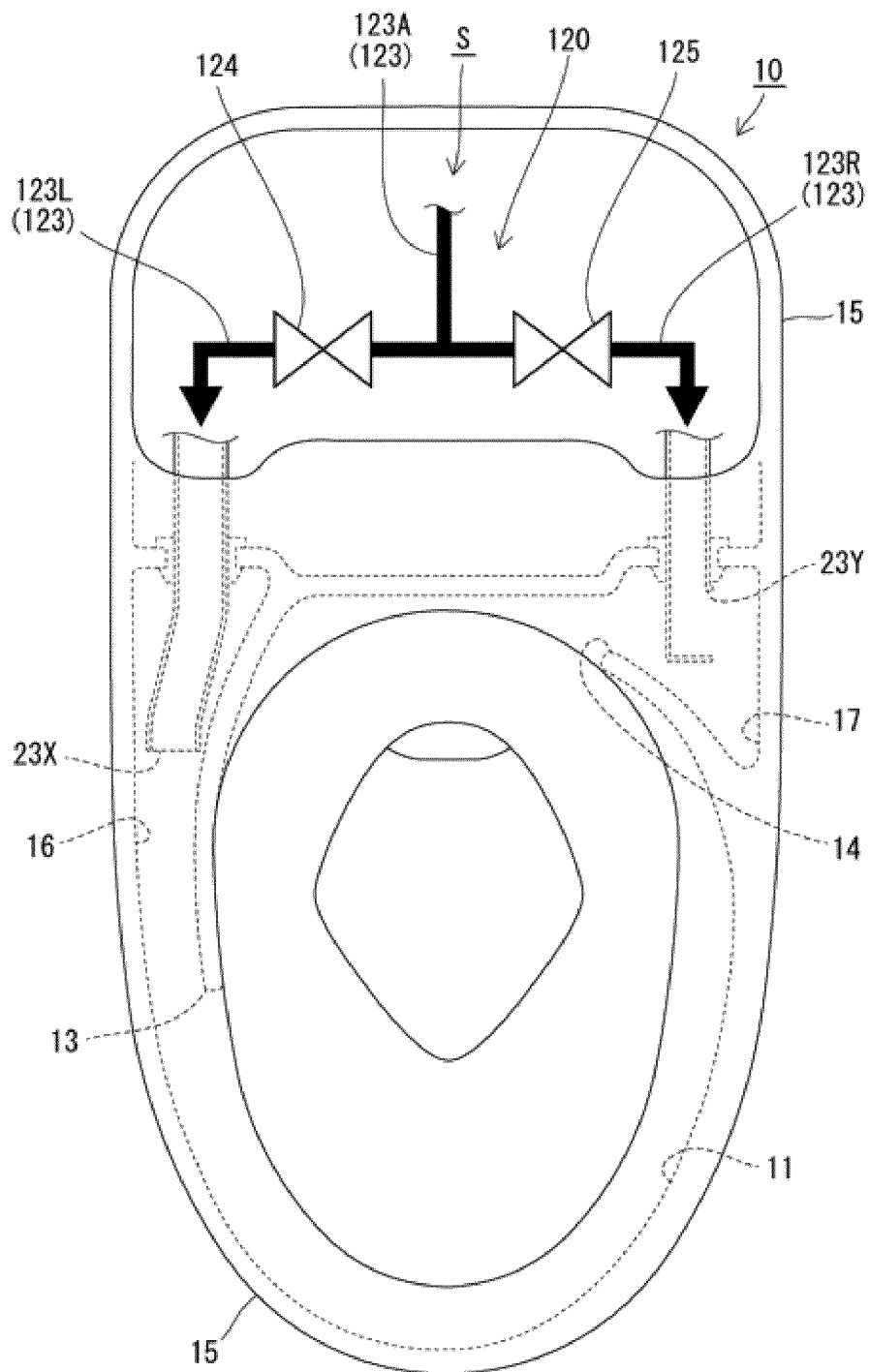


FIG.5



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/065886

A. CLASSIFICATION OF SUBJECT MATTER

E03D11/08(2006.01)i, E03D11/13(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E03D11/08, E03D11/13

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 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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	JP 2012-202143 A (LIXIL Corp.), 22 October 2012 (22.10.2012), paragraphs [0018], [0023], [0029]; fig. 1, 2 (Family: none)	1-6
A	JP 2011-157738 A (LIXIL Corp.), 18 August 2011 (18.08.2011), entire text; all drawings (Family: none)	1-6
A	JP 11-210051 A (Inax Corp.), 03 August 1999 (03.08.1999), entire text; all drawings (Family: none)	1-6

☐ 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

29 August, 2013 (29.08.13)

Date of mailing of the international search report

10 September, 2013 (10.09.13)

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2011157738 A [0002]