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(54) **TOILET DEVICE**

(57) The toilet apparatus according to the present invention includes: a toilet including a bowl, a recess formed on an upper face to communicate with the bowl, and a communicating portion that links the bowl and the recess; a casing provided above the toilet; a toilet seat pivotally supported to open and close with respect to the casing; a cleansing nozzle, at least partially disposed on the recess, that passes through the communicating portion and extends into and retracts from the bowl; and a shutter, pivotally supported to rotationally move with respect to the casing, that opens the communicating portion when the cleansing nozzle extends and closes the communicating portion when the cleansing nozzle retracts. The casing mounted on an upper portion of the toilet can be downsized to improve the sitting comfort of the toilet seat while maintaining functions of a local cleansing apparatus.

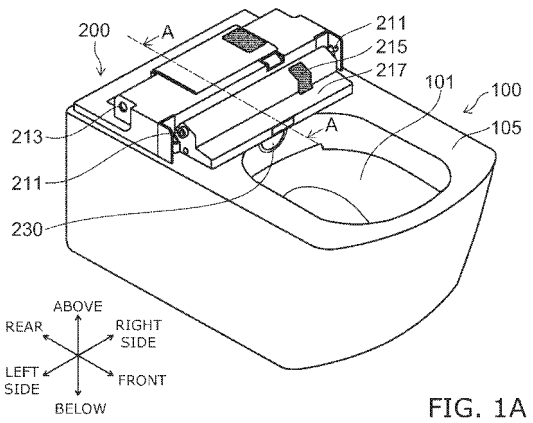

FIG. 1A

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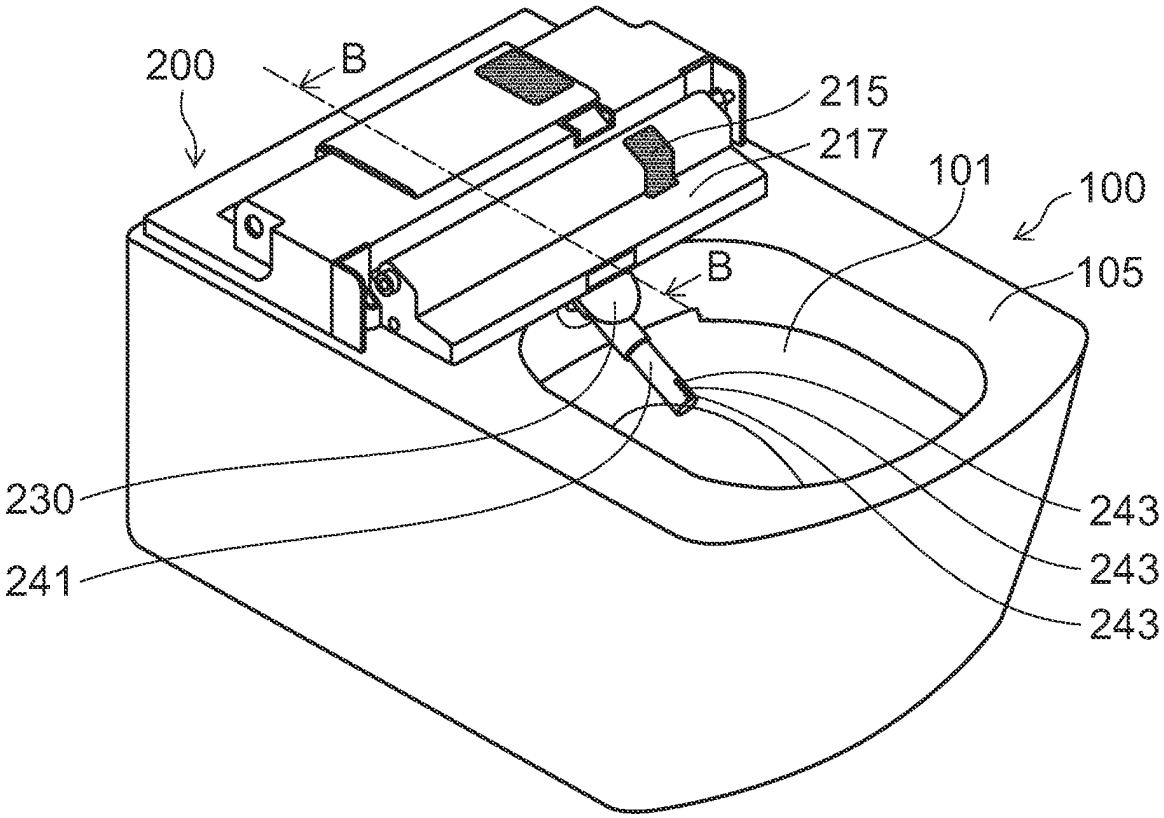


FIG. 1B

Description

Technical Field

[0001] Aspects of the present invention generally relate to a toilet apparatus, and specifically relate to a toilet apparatus capable of using water to cleanse the "bottom" and the like of a user sitting on a western-style sit-down toilet.

Background Art

[0002] Initial local cleansing apparatuses were not provided with warm air drying functions, deodorizing functions, and the like; and therefore, the interior of the casing of the functioning units was provided with merely parts such as a cleansing nozzle, an instantaneous-type heat exchanger, a control substrate, and the like (for example, refer to Patent Document 1).

[0003] Conversely, as local cleansing apparatuses have become commonly recognized, additional functions such as warm air drying functions, deodorizing functions, and the like have been added. Currently, many functional parts such as a cleansing nozzle, warm air drying apparatus, deodorizing apparatus, control substrate, and the like are disposed in the interior of the casing (for example, refer to Patent Document 2). Therefore, casings are larger than those of the initial local cleansing apparatuses. The enlargement of the casing leads to a decline of the product functions of the local cleansing apparatus. As one example, the sitting comfort of the toilet seat declines.

[0004] The cause of this decline is that the enlargement of the casing causes the hinge position of the toilet seat to be higher than that of the initial local cleansing apparatuses. I n other words, this decline is because a rear portion of the seat face of the toilet seat has an ascending configuration inclined upward, and the rear of the buttocks of a person sitting on the toilet seat undesirably contacts the inclined portion. The contact of the rear of the buttocks with a foreign object results in a ticklish sensation; and further, in the case of a heated toilet seat including a heater in the interior of the toilet seat, a cold sensation is experienced, causing a decline in the sitting comfort of the toilet seat.

Patent Document 1 : JP-A 55-75034(Kokai) (1980)
Patent Document 2: JP-A 2001-152512(Kokai)

Disclosure of Invention

Problems to be Solved by the Invention

[0005] Aspects of the present invention were conceived based on the awareness of the relevant problems, and are directed to downsize a casing mounted on an upper portion of a toilet to improve the sitting comfort of a toilet seat while maintaining functions of a local cleansing apparatus.

Solution to the Problems

[0006] According to an aspect of the invention, there is provided a toilet apparatus comprising: a toilet including a bowl, a recess formed on an upper face to communicate with the bowl, and a communicating portion that links the bowl and the recess; a casing provided above the toilet; a toilet seat pivotally supported to open and close with respect to the casing; a cleansing nozzle, at least partially disposed on the recess, that passes through the communicating portion and extends into and retracts from the bowl; and a shutter, pivotally supported to rotationally move with respect to the casing, that opens the communicating portion when the cleansing nozzle extends and closes the communicating portion when the cleansing nozzle retracts.

Brief Description of Drawings

[0007]

FIGS. 1A and 1B are schematic perspective views illustrating a toilet apparatus according to an embodiment of the invention.
FIG. 2 is an enlarged schematic cross-sectional view of the shutter proximity of this embodiment.
FIG. 3 is a schematic perspective view illustrating the toilet of this embodiment.
FIGS. 4A and 4B are schematic perspective views illustrating a mount structure between the shutter and the case plate.
FIG. 5 is an enlarged schematic cross-sectional view of the shutter proximity of this embodiment.
FIG. 6 is a schematic cross-sectional view of the toilet apparatus according to this embodiment from the side.
FIG. 7 is an enlarged schematic perspective view of the shutter proximity of this embodiment.
FIG. 8 is a schematic plan view of the shutter proximity of this embodiment from the front.
FIG. 9 is a schematic plan view of the shutter proximity of this embodiment from above.
FIG. 10 is an enlarged schematic cross-sectional view of the protruding wall of the shutter of this embodiment.
FIG. 11 is a schematic view illustrating the toilet apparatus according to another embodiment of the invention.
FIG. 12 is a schematic view illustrating a state in which a toilet seat and a toilet lid of the toilet apparatus of this embodiment are closed.
FIG. 13 is a schematic perspective view illustrating the toilet of this embodiment.
FIG. 14 is a schematic side view for describing the warm air drying apparatus of this embodiment.
FIG. 15 is a schematic cross-sectional view illustrat-

ing a casing interior of a state in which the cleansing nozzle is stored.

FIG. 16 is a schematic side view for describing the deodorizing apparatus of this embodiment.

FIG. 17 is a schematic cross-sectional view illustrating a casing interior in the state in which the cleansing nozzle is extended.

FIG. 18 is an enlarged schematic view of an enlarged portion of the interior of the casing of this embodiment.

FIG. 19 is a schematic view obliquely from the front of a portion of the interior of the casing of this embodiment.

FIG. 20 is a schematic top view from above of a portion of the interior of the casing of this embodiment.

FIG. 21 is a schematic perspective view of the detailed structure inside the casing and inside the toilet of this embodiment from the front left.

FIG. 22 is a schematic perspective view of the detailed structure inside the casing and inside the toilet of this embodiment from the front right.

FIG. 23A is a perspective view illustrating an internal structure of a sanitary cleansing apparatus of the toilet apparatus according to yet another embodiment of the invention.

FIG. 23B is a schematic view illustrating a water discharge nozzle disposed on a notched portion.

FIG. 24 is a block diagram illustrating a water path configuration of the toilet apparatus according to this embodiment.

FIGS. 25A to 25D are schematic views illustrating the subtank configuration and the flow of water used in the toilet apparatus according to this embodiment.

FIG. 26 is a schematic view illustrating a water discharge nozzle 241 disposed in a notched portion 103 of a toilet apparatus according to this modification of an embodiment.

FIG. 27A is a schematic view illustrating the disposition of a subtank 680 on a case plate 620 of a toilet apparatus according to another modification of an embodiment.

FIG. 27B is a schematic view illustrating the flow of water flowing out from the subtank 680.

FIGS. 28A to 28E are schematic views illustrating the configuration of the subtank 680 and the flow of water used in the toilet apparatus according to another modification of an embodiment.

FIG. 29 is a schematic plan view of a case plate of yet another embodiment of the invention from above.

FIGS. 30A and 30B are schematic views illustrating a proximity of the front end portion of the recessed portion of the case plate.

FIG. 31 is a schematic cross-sectional view of the toilet apparatus according to this embodiment from the side.

FIG. 32 is a schematic cross-sectional view illustrating a proximity of the front end portion of the recessed portion in the state in which the cleansing nozzle is stored.

FIG. 33 is a schematic cross-sectional view illustrating a proximity of the front end portion of the recessed portion in a state in which the cleansing nozzle extends from the casing.

FIG. 34 is a timing chart illustrating an example of an operation of the toilet apparatus according to this embodiment.

[0008] Description of Reference Numerals

100	toilet
101	bowl
101a	bowl inner wall face
103	recess
103a	rear end portion
103b	communicating portion
103c	stepped recess portion
104	bowl
105	bowl upper face
106	rim
107	elastic body
110	accumulated water
133	nozzle notch
150	side panel
151	drive unit
152	recessed side face portion
200	casing
202A, 202B	human body detection sensor
206	seat contact sensor
208	casing front face
210	case cover
211, 213	pivotal support portion
215	seat contact sensor
217	extended portion
217a	front face
220	case plate
221	shutter
221a	protruding portion
223	recessed portion
223a	rear end portion
223b	aperture portion
223c	outer circumferential face
223d	support portion
224	protruding wall
224a	rear face
225	notched portion
225a	rear end portion
226	jutting portion
227	bearing portion
228	shaft
229	urging member
229a	arm portion
230	shutter
231	protruding wall
231a	outer circumferential face
233	vertical face
235	inclined face

237	pivotal support portion
239	protruding portion
240	nozzle unit
241	cleansing nozzle
243	water discharge port
245	nozzle washing chamber
245a	aperture portion
250	heat exchanger
270	water supply valve unit
271	check valve
272	strainer
273	constant flow rate valve
274	solenoid valve
280	tank
280a	subtank casing
280b	upper face
280c	side face
280d	bottom face
281	flow inlet
282	flow outlet
283	drainage port
284	flow regulation plate
284a	perforations
285	first chamber
286	second chamber
287	enclosure plate
288	guided water path
288a	guided water path outlet
291	pump
292	switch valve
300	toilet seat
302	flat portion
304	ascending portion
310	electric toilet seat opening/closing unit
400	toilet lid
402	sensor window
410	electric toilet lid opening/closing unit
500	warm air duct
502	jet outlet
504	warm air fan
506	heater
508	warm air damper
510	open/close axis
512	bent portion
520	cleansing nozzle
522	nozzle washing chamber
524	cleansing nozzle tip
526	cylinder portion
528	water discharge port
530	deodorizer duct
532	intake port
534	deodorizing air fan
536	deodorizing catalyst
550	heat exchange unit
552	water supply valve unit
554	pump unit
556	tank
560	controller substrate
601	service-water pipe
602	stopcock
603	flexible hose
604	inlet pipe
605	outlet pipe
606	nozzle washing flow path
620	case plate
623	recessed portion
680	subtank
680a	subtank casing
680b	upper face
680c	side face
680d	lower face
681	flow inlet
682	flow outlet
683	drainage port
684	baffle
685	upper space
686	lower space
687	brim portion

Best Mode for Carrying Out the Invention

[0009] Hereinbelow, embodiments of the present invention will be described with reference to the drawings. Like structural components in the drawings are marked with like reference numerals, and a detailed description is omitted as appropriate.

[0010] FIG. 1 shows schematic perspective views illustrating a toilet apparatus according to an embodiment of the present invention.

[0011] FIG. 1A is a schematic perspective view illustrating a state in which a cleansing nozzle is stored in a casing; and FIG. 1B is a schematic perspective view illustrating a state in which the cleansing nozzle is extended out from the casing.

[0012] The toilet apparatus of this embodiment includes a western-style sit-down toilet (hereinbelow referred to as simply "toilet") 100 and a casing 200 provided on a rear upper portion thereof. An interior of the casing 200 is provided with, for example, a local cleansing unit, which performs a cleansing of the "bottom" and the like of a user sitting on a not-illustrated toilet seat, and the like. The toilet seat and a toilet lid, which are not illustrated, are pivotally supported to open and close with respect to the casing 200 by pivotal support portions 211 and 213, respectively, provided on the casing 200.

[0013] An upper portion of the casing 200 is provided with a seat contact sensor 215 that detects that the user is sitting on the toilet seat. In the case where the seat contact sensor 215 detects that the user is sitting on the toilet seat, an operation of a not-illustrated switch by the user may cause the cleansing nozzle 241 to extend into a bowl 101 of the toilet 100 as illustrated in FIG. 1B. As elaborated below, the cleansing nozzle 241 extends by passing through an aperture portion of the casing 200. At this time, the cleansing nozzle 241 may extend into the bowl 101 by upwardly pushing a shutter 230, which

opens and closes the aperture portion of the casing 200. Also, a tip portion of the cleansing nozzle 241 is provided with one or a plurality of water discharge ports 243.

[0014] Then, the cleansing nozzle 241 can cleanse the "bottom" and the like of a user sitting on the toilet seat by squirting water from the water discharge port 243 provided on the tip portion thereof in the state of being extended into the bowl 101. References to "water" in the description of the present application include not only cold water but also heated warm water.

[0015] The shutter 230 is pivotally supported to rotationally move with respect to the casing 200; and is urged in a direction to close the aperture portion of the casing 200 by an urging member such as a spring, etc. Therefore, the shutter 230 can open the aperture portion of the casing 200 by rotationally moving around an upper portion, as illustrated in FIG. 1B, by receiving a force from the extending cleansing nozzle 241. On the other hand, in the case where the cleansing nozzle 241 retracts, the shutter 230 no longer receives the force from the cleansing nozzle 241 and therefore can rotationally move due to the urging force to close the aperture portion of the casing 200.

[0016] The casing 200 includes an extended portion 217 provided to extend toward the front of the bowl 101. At least a portion of the extended portion 217 enters into the bowl 101 when viewed perpendicular to a bowl upper face (hereinbelow also referred to as simply "upper face") 105. Therefore, the shutter 230 is disposed below the extended portion 217. That is, the shutter 230 in the closed state is covered from above by the extended portion 217.

[0017] The interior of the casing 200 may be provided with, for example, a deodorizing unit (hereinbelow also referred to as "deodorizing apparatus") that draws air from inside the bowl 101 of the toilet 100 and reduces offensive-odor components via a filter, catalyst, etc.; a warm air drying unit (hereinbelow, also referred to as "warm air drying apparatus") that dries by blowing warm air toward the "bottom" and the like of the user sitting on the toilet seat; a room heating unit (hereinbelow also referred to as "room heating apparatus") that heats the toilet room by blowing warm air into the toilet room; and the like.

[0018] FIG. 2 is an enlarged schematic cross-sectional view of the shutter proximity of this embodiment.

[0019] Also, FIG. 3 is a schematic perspective view illustrating the toilet of this embodiment.

[0020] FIG. 2 illustrates the state in which the cleansing nozzle is stored in the casing and corresponds to a cross-sectional view along A-A of FIG. 1A.

[0021] The casing 200 includes a case cover 210 and a case plate 220. Devices such as a local cleansing unit are disposed on the case plate 220 and covered from above by the case cover 210. The case plate 220 includes a recessed portion 223 formed in a configuration recessed downward. The recessed portion 223 is provided on a portion of the case plate 220 and is inclined to become lower from the rear toward the front. Also, a front end portion of the recessed portion 223 is provided with an aperture portion 223b which allows the cleansing nozzle 241 to pass through. That is, the cleansing nozzle 241 extends or retracts by passing through the aperture portion 223b.

[0022] On the other hand, the toilet 100 includes a recess 103 formed in a configuration recessed downward from the bowl upper face 105 as illustrated in FIG. 3. A communicating portion 103b that communicates with the bowl 101 is provided on a front end of the recess 103; and similar to the recessed portion 223 provided on the case plate 220, the recess 103 is inclined to become lower from a rear end portion 103a thereof toward a front end portion (the communicating portion) 103b. Then, the case plate 220 is disposed on the bowl upper face 105 of the toilet 100 in a state in which the recessed portion 223 is stored in the recess 103 of the toilet 100. Therefore, the cleansing nozzle 241 extending and retracting by passing through the aperture portion 223b is equivalent to the cleansing nozzle 241 extending and retracting by passing through the communicating portion 103b.

[0023] The shutter 230 is mounted on the case plate 220 to open and close the aperture portion 223b of the recessed portion 223. The shutter 230 is provided to cover the communicating portion 103b and the aperture portion 223b, and is pivotally supported to rotationally move with respect to the case plate 220. More specifically, the shutter 230 is pivotally supported to rotationally move with respect to the case plate 220 around a shaft 228 held by a bearing portion 227 of the case plate 220.

[0024] Further, the shutter 230 includes a protruding wall 231 extending toward the communicating portion 103b and the aperture portion 223b in the closed state. I n other words, the shutter 230 includes the protruding wall 231 on a back face that faces the communicating portion 103b and the aperture portion 223b. The protruding wall 231 partially abuts the aperture portion 223b in the state in which the shutter 230 is closed. In other words, the protruding wall 231 partially abuts the aperture portion 223b; and thereby, the closed stopping position of the shutter 230 is determined.

[0025] The case cover 210 includes an extended portion 217 provided to extend toward the front of the bowl 101. At least a portion of the extended portion 217 enters into the bowl 101 as illustrated in FIG. 2. Therefore, the shutter 230 is disposed below the extended portion 217. That is, the shutter 230 in the closed state is covered from above by the extended portion 217. I n other words, the shutter 230 is provided at a position retracted further than the front face 217a of the extended portion 217. Therefore, the extended portion 217 overhangs the shutter 230 in the closed state.

[0026] It follows that the bearing portion 227 of the case plate 220, the shaft 228 held by the bearing portion 227, and a pivotal support portion 237 (referring to FIG. 4) provided on the shutter 230 are disposed below the extended portion 217, and are covered from above by the extended portion 217. I n other words, the bearing portion

227, the shaft 228, and the pivotal support portion 237 are provided at a position retracted from the front face 217a of the extended portion 217. Therefore, the extended portion 217 overhangs the bearing portion 227, the shaft 228, and the pivotal support portion 237.

[0027] Accordingly, urine that is excreted by a male in a standing posture does not readily fall on the shutter 230. That is, even in the case where urine is excreted and travels toward the shutter 230, the shutter 230 is covered from above by the extended portion 217; and therefore, the travel of the urine is blocked by the extended portion 217. Therefore, urine that is excreted does not readily fall directly on the shutter 230. The upper portion of the shutter 230 is disposed directly below the extended portion 217, and therefore is less apt to be directly excreted upon than is the lower portion of the shutter 230.

[0028] Also, the bearing portion 227, the shaft 228, and the pivotal support portion 237 are provided at an upper portion of the aperture portion 223b as illustrated in FIG. 2. That is, the shutter 230 is pivotally supported to rotationally move at the upper portion thereof. Therefore, the bearing portion 227, the shaft 228, and the pivotal support portion 237 are disposed directly below the extended portion 217. Accordingly, the bearing portion 227, the shaft 228, and the pivotal support portion 237 are less apt to be directly excreted upon than is the lower portion of the shutter 230.

[0029] Further, the shutter 230, as illustrated in FIG. 2, includes a vertical face 233 on a surface on the bowl 101 side, and an inclined face 235. The vertical face 233 is provided on the upper portion of the shutter 230. On the other hand, the inclined face 235 is provided on the lower portion of the shutter 230 and is inclined to retract from the upper portion toward the lower portion.

[0030] Accordingly, even in the case where urine splatters from an inner wall face of the bowl 101 and adheres to the inclined face 235 of the shutter 230, the urine does not run up the inclined face 235. Also, even in the case where urine splatters from the inner wall face of the bowl 101 and adheres to the vertical face 233 of the shutter 230, the urine quickly runs downward. Therefore, even in the case where urine splatters from the inner wall face of the bowl 101 and adheres on the shutter 230, there is almost no risk that the urine may run toward the bearing portion 227, the shaft 228, or the pivotal support portion 237.

[0031] Accordingly, the toilet apparatus according to this embodiment can inhibit the adhesion of urine to the shaft 228 which pivotally supports the shutter 230; and therefore, the occurrence of offensive odors and the appearance of urinary calculus can be inhibited. Therefore, the toilet apparatus according to this embodiment can inhibit discrepancies such as the inability to open and close the shutter 230 due to urinary calculus.

[0032] An elastic body 107 having elasticity is provided between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. The elastic body 107 supports the recessed portion 223 at a proximity to the aperture portion 223b, while ensuring a fluidic seal between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. That is, the elastic body 107 prevents urine and the like from entering between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. The elastic body 107 is disposed also on the upper face 105 of the toilet 100 along the front edge of the case plate 220; ensures a fluidic seal between the case plate 220 and the upper face 105 of the toilet 100; and prevents the entry of urine and the like.

[0033] Although the bearing portion 227 is provided on the case plate 220 and the pivotal support portion 237 is provided on the shutter 230 in the specific examples illustrated, the present invention is not limited thereto; the pivotal support portion may be provided on the case plate; and the bearing portion may be provided on the shutter.

[0034] FIG. 4 shows schematic perspective views illustrating a mount structure between the shutter and the case plate.

[0035] FIG. 4A is a schematic perspective view illustrating a state prior to mounting the shutter on the case plate; and FIG.4B is a schematic perspective view illustrating a state after the shutter is mounted on the case plate.

[0036] The case plate 220 includes the bearing portion 227 above the aperture portion 223b as described above in regard to FIG. 2. The shaft 228 is then held by the bearing portion 227. Also, the shaft 228 is bent in a hook shape at one end portion and held by being latched on a jutting portion 226 of the case plate 220. The urging member 229 is mounted on the shaft 228 to urge the shutter 230. Examples of the urging member 229 include, for example, a so-called "torsion coil spring" and the like.

[0037] On the other hand, the shutter 230 includes the pivotal support portion 237 on the upper portion of a surface on the side opposite to the bowl 101 , that is, on the backside of the vertical face 233. The pivotal support portion 237 includes a shaft hole that receives the shaft 228 mounted on the case plate 220. Also, at least a portion of the pivotal support portion 237 is provided with a notched portion in which the shaft 228 can be forcibly inserted into the shaft hole. Therefore, from the state illustrated in FIG. 4A, that is, the state in which the shaft 228 is mounted in the bearing portion 227 of the case plate 220, the shaft 228 can be forcibly inserted into the pivotal support portion 237 of the shutter 230. Thereby, the pivotal support portion 237 supports the shaft 228 held by the bearing portion 227; and the shutter 230 is pivotally supported to rotationally move with respect to the case plate 220 around the shaft 228.

[0038] At this time, a protruding portion 239 provided on the shutter 230 abuts an arm portion 229a of the urging member 229. Then, the protruding portion 239 rotationally moves with an operation of the shutter 230 and receives a load from the arm portion 229a. That is, when the shutter 230 is opened, the protruding portion 239 rotationally moves against the load from the arm portion

229a. Therefore, the shutter 230 is urged in a direction to close by the urging member 229.

[0039] Accordingly, the shutter 230 cannot open by itself, and opens by receiving a force from the cleansing nozzle 241 that extends into the bowl 101. Restated, the shutter 230 is pushed by the cleansing nozzle 241 and thereby opens around the shaft 228. On the other hand, when the cleansing nozzle 241 retracts to be stored in the casing 200, the shutter 230 does not receive the force from the cleansing nozzle 241 and therefore closes due to the urging force from the urging member 229. That is, in the state in which the cleansing nozzle 241 is not extended, the shutter 230 is in the closed state as illustrated in FIG. 1A. Accordingly, the shutter 230 can prevent urine excreted by the user, splashing sealing water, or the like from entering the cleansing nozzle 241 side through the aperture portion 223b.

[0040] FIG. 5 is an enlarged schematic cross-sectional view of the shutter proximity of this embodiment.

[0041] FIG. 5 illustrates the state in which the cleansing nozzle is extended from the casing, corresponding to a cross-sectional view along B-B of FIG. 1B.

[0042] A nozzle unit 240 including the cleansing nozzle 241 includes a nozzle washing chamber 245 on one end portion. The nozzle washing chamber 245 can wash the outer circumferential surface of the cleansing nozzle 241 by squirting water from a water discharge port provided on an interior thereof. The nozzle washing chamber 245 also can inhibit wash water that washes the outer circumferential surface from scattering when the cleansing nozzle 241 extends and retracts. The cleansing nozzle 241 extends by passing through the nozzle washing chamber 245. At this time, the cleansing nozzle 241 pushes the shutter 230 from the rear and extends into the bowl 101 as illustrated in FIG. 5.

[0043] Then, in the state in which the cleansing nozzle 241 is extended into the bowl 101, the cleansing nozzle 241 can squirt water from the water discharge port 243 and cleanse the "bottom" and the like of the user sitting on the toilet seat. Here, the cleansing water squirted from the water discharge port 243 may splatter from the "bottom" and may splatter from the inner wall face of the bowl 101. Therefore, liquid waste and solid waste may scatter toward the shutter 230; but the bearing portion 227, the shaft 228, and the pivotal support portion 237 are disposed directly below the extended portion 217; and therefore, the liquid waste and the solid waste do not readily fall on the bearing portion 227, the shaft 228, or the pivotal support portion 237. Additionally, in the state in which the shutter 230 is open, the route from inside the bowl 101 toward the bearing portion 227, the shaft 228, or the pivotal support portion 237 becomes narrow; and therefore, the liquid waste and solid waste falls even less readily on the bearing portion 227, the shaft 228, or the pivotal support portion 237.

[0044] Accordingly, the toilet apparatus according to this embodiment can inhibit the adhesion of liquid waste and solid waste on the shaft 228 that pivotally supports the shutter 230; and therefore, the occurrence of offensive odors and the appearance of urinary calculus can be inhibited. Therefore, the toilet apparatus according to this embodiment can inhibit discrepancies such as the inability to open and close the shutter 230 due to urinary calculus or solid waste.

[0045] FIG. 6 is a schematic cross-sectional view of the toilet apparatus according to this embodiment from the side.

[0046] FIG. 6 corresponds to a cross-sectional view along A-A of FIG. 1A.

[0047] As described above in regard to FIG. 2, the shutter 230 in the closed state is disposed below the extended portion 217 and is covered from above by the extended portion 217. Therefore, it would be nearly impossible for a user standing in front of the toilet 100 to see the shutter 230 from the standing posture.

[0048] Therefore, the toilet apparatus according to this embodiment has an attractive appearance and can improve the designability. Also, a male that urinates in a standing posture cannot see the shutter 230, and therefore would rarely think to intentionally sprinkle urine on the shutter 230. That is, if the shutter 230 is in the line of sight of the user during urination, the user may think to intentionally sprinkle urine on the shutter 230; but for the toilet apparatus according to this embodiment, such thoughts are unlikely. Therefore, there is a low risk that urine may be sprinkled intentionally on the shutter 230.

[0049] Further, the bearing portion 227, the shaft 228, and the pivotal support portion 237 are disposed directly below the extended portion 217 as described above in regard to FIG. 2. Therefore, in the case where urine is intentionally sprinkled toward the bearing portion 227, the shaft 228, or the pivotal support portion 237, it is necessary to urinate substantially along a double dot-dash line C illustrated in FIG. 6. However, such an action is nearly impossible. Accordingly, the risk is low that urine may be intentionally sprinkled on the bearing portion 227, the shaft 228, and the pivotal support portion 237.

[0050] FIG. 7 is an enlarged schematic perspective view of the shutter proximity of this embodiment.

[0051] Also, FIG. 8 is a schematic plan view of the shutter proximity of this embodiment from the front.

[0052] Further, FIG. 9 is a schematic plan view of the shutter proximity of this embodiment from above.

[0053] FIG. 9 corresponds to a cross-sectional view along D-D of FIG. 8.

[0054] As illustrated in FIG. 3, the toilet 100 includes the stepped recess portion 103c connected to the bowl inner wall face 101a. Then, the shutter 230 is provided to be received by the stepped recess portion 103c. Therefore, as illustrated in FIG. 7 and FIG. 9, the surface of the shutter 230 on the bowl 101 side is in substantially the same plane as the bowl inner wall face 101a. That is, the difference in levels between the surface of the shutter 230 on the bowl 101 side and the bowl inner wall face 101a is minimized. Accordingly, effects can be obtained such as easy cleaning of the bowl inner wall face

1 01 a and the surface of the shutter 230.

[0055] Also, the shutter 230 is provided to be received by the stepped recess portion 103c; and therefore, a unified appearance is provided to the shutter 230 and the toilet 100 as illustrated in FIG. 7 and FIG. 8. Therefore, the toilet apparatus according to this embodiment has an attractive appearance and can improve the designability.

[0056] FIG. 10 is an enlarged schematic cross-sectional view of the protruding wall of the shutter of this embodiment.

[0057] FIG. 10 corresponds to an enlarged view of a region E of FIG. 9.

[0058] As described above in regard to FIG. 2, the shutter 230 includes the protruding wall 231 that extends toward the aperture portion 223b in the closed state. An outer circumferential face 231 a of the protruding wall 231 is disposed a distance F from an outer circumferential face 223c of the recessed portion 223 of the case plate 220 toward the central portion side of the toilet apparatus.

[0059] Accordingly, urine can be prevented from entering the aperture portion 223b side from the periphery of the shutter 230. Therefore, the adhesion of urine on the shaft 228 that pivotally supports the shutter 230 can be inhibited. Moreover, the adhesion of urine on the cleansing nozzle 241 can be inhibited. Therefore, the cleanliness of the cleansing nozzle can be ensured.

[0060] Further, interference between the shutter 230 and the toilet 100 can be inhibited. Therefore, discrepancies such as the inability to close the aperture portion 223b of the recessed portion 223 due to interference between the shutter 230 and the toilet 100 can be inhibited. Furthermore, occurrences of an unpleasant sound (impact sound) due to interference between the shutter 230 and the toilet 100 each time the shutter 230 opens and closes can be inhibited.

[0061] The elastic body 107 is provided between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. Therefore, even in the case where the outer circumferential face 231 a of the protruding wall 231 is disposed further on the central side of the toilet apparatus than is the outer circumferential face 223c of the recessed portion 223, the entry of urine between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100 can be inhibited.

[0062] As described above, according to this embodiment, the shutter 230 is disposed below the extended portion 217 in the closed state and covered from above by the extended portion 217. I n other words, the shutter 230 is provided at a position retracted from the front face 217a of the extended portion 217. Also, the bearing portion 227 of the case plate 220, the shaft 228 held by the bearing portion 227, and the pivotal support portion 237 provided on the shutter 230 are disposed directly below the extended portion 217. Therefore, urine that is excreted by the user does not readily fall on the bearing portion 227, the shaft 228, and the pivotal support portion 237. Thereby, the toilet apparatus according to this embodiment can inhibit the adhesion of urine to the shaft 228 that pivotally supports the shutter 230; and therefore, the occurrence of offensive odors and the appearance of urinary calculus can be inhibited. Therefore, the toilet apparatus according to this embodiment can inhibit discrepancies such as the inability to open and close the shutter 230 due to urinary calculus.

[0063] Next, a toilet apparatus according to another embodiment of the present invention will be described with reference to the drawings.

[0064] FIG. 11 is a schematic view illustrating the toilet apparatus according to another embodiment of the present invention.

[0065] Also, FIG. 12 is a schematic view illustrating a state in which a toilet seat and a toilet lid of the toilet apparatus of this embodiment are closed.

[0066] Further, FIG. 13 is a schematic perspective view illustrating the toilet of this embodiment.

[0067] The toilet apparatus of this embodiment, similar to the toilet apparatus described above in regard to FIG. 1 , includes the toilet 100, the casing 200 provided on a rear upper portion thereof, and a toilet seat 300 pivotally supported to open and close with respect to the casing 200. Also, the toilet apparatus of this embodiment includes a toilet lid 400 pivotally supported to open and close with respect to the casing 200 similar to the toilet seat 300. The casing 200 is provided on the rear upper portion of the toilet 100; and an interior thereof is provided with a local cleansing unit that performs cleansing of the "bottom" and the like of a user sitting on the toilet seat 300. The local cleansing unit is covered by side panels 150 provided on left and right sides of the toilet 100.

[0068] More specifically, as illustrated in FIG. 13, recessed side face portions 152, which are recessed inward, are formed on rear side face portions of the toilet 100. The recessed side face portions 152 are provided with various mechanisms such as a "warm air drying apparatus" that dries by blowing warm air on the "bottom" and the like of the user in the state of being seated on the toilet seat 300; a "deodorizing apparatus" that draws air from inside the bowl (hereinbelow also referred to as "bowl portion") 101 and removes offensive-odor components; and a "room heating apparatus" that heats the toilet space by blowing warm air into the surroundings. Further, the recessed side face portions 152 may be provided with an "automatic water wash unit" that flushes the bowl portion 101 of the toilet 100 with wash water. This unit is a unit that automatically flushes the toilet 100 with wash water by operating a valve that supplies the cleansing water to the toilet 100. By providing these units on the recessed side face portions 152, it is possible to configure a compact sanitary cleansing apparatus disposed on the upper face of the toilet 100. The sanitary cleansing apparatus is an apparatus including the warm air drying apparatus, the deodorizing apparatus, and the like described above; and the casing 200 forms an outer shell of the sanitary cleansing apparatus. Also, the recessed side face portions 152 are covered by side panels (hereinbelow also referred to as "side face panels") 150;

and therefore, designability also can be realized.

[0069] The toilet 100 includes a recess (hereinbelow also referred to as "notched portion") 103. The notched portion 103, as elaborated below, is provided on a central rear portion of the rim 106 of the toilet 100 and has a shape that is recessed downward. A tip of the cleansing nozzle is disposed in the notched portion 103 when the cleansing nozzle is stored, and extends into the bowl 104 as described above when in use. In other words, the tip of the cleansing nozzle is disposed further on the interior side of the casing 200 than is the rim 106 when the cleansing nozzle is stored. Therefore, the tip of the cleansing nozzle in the stored state is disposed rearward of the casing front face 208.

[0070] Further, the upper portion of the casing 200 is provided with a seat contact sensor 206 that detects that the user is sitting on the toilet seat 300. A rear upper portion of the casing 200 may be provided with a human body detection sensor 202A that detects that the user has entered the toilet room. The human body detection sensor 202A can detect a user entering the toilet room through a sensor window 402 of the toilet lid 400 even in the state in which the toilet lid 400 is closed. For example, the toilet lid 400 may be opened automatically when the human body detection sensor 202A detects the user.

[0071] Furthermore, the front upper portion of the casing 200 can be provided with a human body detection sensor 202B that detects the presence/absence of a user in the toilet room. For example, the toilet seat 300 and the toilet lid 400 may be closed automatically when the human body detection sensor 202B no longer detects the user and a prescribed time has elapsed.

[0072] The interior of the casing 200, as elaborated below, is provided with a warm air drying apparatus that dries by blowing warm air toward the "bottom" and the like of the user in the state of being seated on the toilet seat 300. The warm air drying apparatus is provided with a warm air duct for guiding warm air in the bowl 104 of the toilet 100. The warm air duct includes a jet outlet 502 on a tip; and the jet outlet 502 is disposed to look into the bowl 104 from the casing front face 208. Therefore, the jet outlet 502 is disposed on an upper portion of the notched portion 103 of the toilet 100, and is disposed, as further elaborated below, more proximal to the bowl 104 (toward the front) than is the cleansing nozzle in the stored state.

[0073] As illustrated in FIG. 15 described below, the toilet seat 300 is pivotally supported to open and close around a pivotal support portion (hereinbelow also referred to as "open/close axis") 211 with respect to the casing 200. Also, the toilet lid 400 is pivotally supported to open and close around a pivotal support portion (hereinbelow also referred to as "open/close axis") 213 with respect to the casing 200.

[0074] The toilet apparatus of this embodiment may automatically open and close the toilet seat 300 using an electric toilet seat opening/closing unit described below according to the detection status of the human body detection sensor 202A and the human body detection sensor 202B or an operation of a non-illustrated switch by the user. Similar thereto, the toilet lid 400 may be automatically opened and closed using an electric toilet lid opening/closing unit described below according to the detection status of the human body detection sensor 202A and the human body detection sensor 202B or an operation of a non-illustrated switch by the user.

[0075] FIG. 14 is a schematic side view for describing the warm air drying apparatus of this embodiment.

[0076] Also, FIG. 15 is a schematic cross-sectional view illustrating a casing interior of a state in which the cleansing nozzle is stored. I n other words, FIG. 15 corresponds to a cross-sectional view along G-G of FIG. 12. The toilet apparatus illustrated in FIG. 14 also illustrates the state in which the cleansing nozzle is stored in the notched portion 103 of the toilet 100.

[0077] The interior of the casing 200 is provided with the warm air drying apparatus that dries by blowing warm air toward the "bottom" and the like of the user in the state of being seated on the toilet seat 300. The warm air drying apparatus includes a warm air duct 500 for guiding warm air into the bowl 104 of the toilet 100, a warm air fan 504, and a heater 506. The warm air fan 504 is disposed on a rear portion of the casing 200 interior. A majority of the warm air fan 504 is disposed below the upper face of the toilet 100. The warm air duct 500 includes the jet outlet 502 on one end on the bowl 104 side; and the other end communicates with the warm air fan 504. Additionally, the warm air duct 500 includes a bent portion 512 bent upward between the warm air fan 504 and the jet outlet 502. The heater 506 is provided in the warm air duct 500 between the bent portion 512 and the end portion on the side communicating with the warm air fan 504. As elaborated below, the entire warm air fan 504 may be disposed below the upper face of the toilet 100.

[0078] The warm air duct 500 further includes a warm air damper 508 that closes the jet outlet 502; and the warm air damper 508 is pivotally supported to open and close around an open/close axis 510 with respect to the warm air duct 500. The warm air damper 508 illustrated in FIG. 15 is shown in an open state. The warm air damper 508 may be opened by a not-illustrated opening/closing unit, and may be opened by the wind pressure of warm air sent through the interior of the warm air duct 500 by the warm air fan 504. The warm air sent through the heater 506 by the warm air fan 504 is blown toward the "bottom" and the like of the user from the jet outlet 502 in the state in which the warm air damper 508 is open as illustrated in FIG. 15.

[0079] The interior of the casing 200 is further provided with a cleansing nozzle unit. The cleansing nozzle unit includes a cleansing nozzle 520 (referring to FIG. 16) that extends into the bowl 104 of the toilet 100 due to a driving force transmitted from a not-illustrated nozzle motor; a nozzle washing chamber 522 that washes an outer circumferential surface of the cleansing nozzle 520 in the

state in which the cleansing nozzle 520 is stored; and a cylinder portion 526 that stores at least a portion of the cleansing nozzle 520.

[0080] The cleansing nozzle 520 is provided to slide with respect to the cylinder portion 526 and the nozzle washing chamber 522; and at least a portion thereof is storable in the cylinder portion 526. I n the state in which the cleansing nozzle 520 is stored as illustrated in FIG. 15, the cleansing nozzle tip 524 is disposed in the interior of the notched portion 103 of the toilet 100, and is stored in the nozzle washing chamber 522. Also, a majority other than the cleansing nozzle tip 524 is stored in the interior of the cylinder portion 526. At this time, the cleansing nozzle 520 has an inclined posture with a downward front.

[0081] Therefore, as illustrated in FIG. 15, the jet outlet 502 of the warm air duct 500 is disposed more frontward (toward the bowl 104) than is the cleansing nozzle 520 in the stored state. In other words, the jet outlet 502 of the warm air duct 500 is not disposed directly above the cleansing nozzle 520 in the stored state or the nozzle washing chamber 522. Accordingly, the height of the casing 200 in the vertical direction can be kept low. Thereby, the sitting sensation of the user sitting on the toilet seat 300 is better.

[0082] The reason thereof is that the height of the open/close axis 211 of the toilet seat 300 can be kept low, that is, the height of an ascending portion 304 of the rear portion of the toilet seat 300 can be kept low, because the height of the casing 200 can be kept low. The toilet seat 300 includes a flat portion 302 from the front end portion to the rear portion, and an ascending portion 304 that gradually inclines over the rear portion. Then, the user attempts to dispose his or her buttocks further toward the rear portion of the toilet seat 300 to stabilize his or her posture when sitting on the toilet seat 300. Therefore, in the case where the flat portion 302 is elongated to the rear portion and the height of the ascending portion 304 is further reduced, the sitting comfort of the toilet seat 300 is better. The reason thereof is that no foreign object contacts the rear portion of the buttocks; and therefore, no ticklish sensation is experienced by the user and no coldness is felt by the user in the case where the toilet seat is a heated toilet seat.

[0083] The toilet apparatus according to this embodiment, as described above, can keep the height of the casing 200 low by disposing the jet outlet 502 further forward than the cleansing nozzle 520 in the stored state; and therefore, the sitting sensation of the user when sitting on the toilet seat 300 is better. Also, the jet outlet 502 is disposed at a substantially central portion of the casing 200 with respect to the left and right directions and toward the bowl 104; and therefore, the jet outlet 502 can be brought near the buttocks of the user. Therefore, the drying efficiency of the "bottom" and the like can be improved.

[0084] FIG. 16 is a schematic side view for describing the deodorizing apparatus of this embodiment.

[0085] Also, FIG. 17 is a schematic cross-sectional view illustrating a casing interior in the state in which the cleansing nozzle is extended. I n other words, FIG. 17 corresponds to a cross-sectional view along G-G of FIG. 12. The toilet apparatus illustrated in FIG. 16 also illustrates the state in which the cleansing nozzle is extended into the bowl.

[0086] The interior of the casing 200 is provided with a deodorizing apparatus that draws air from inside the bowl 104 and removes offensive-odor components. The deodorizing apparatus includes a deodorizing air fan 534 that draws air from inside the bowl 104; a deodorizer duct 530 for guiding the air from inside the bowl 104 to the deodorizing air fan 534; and a deodorizing catalyst 536 that removes offensive-odor components from air discharged from the deodorizing air fan 534. The deodorizer duct 530, as elaborated below, includes an intake port proximal to one end on the bowl 104 side; and the other end communicates with the deodorizing air fan 534. Additionally, not less than half of the deodorizing air fan 534 is disposed below the upper face of the toilet 100. Further, the deodorizing catalyst 536, which is disposed below the deodorizing air fan 534, is entirely disposed below the upper face of the toilet 100. As elaborated below, the entire deodorizing air fan 534 may be disposed below the upper face of the toilet 100.

[0087] The air in the bowl 104 is drawn through the intake port of the deodorizer duct 530, and passes through the deodorizer duct 530 to be drawn into the deodorizing air fan 534. Continuing, the air drawn into the deodorizing air fan 534 is blown out toward the deodorizing catalyst 536 and passes through the deodorizing catalyst 536. Thus, the offensive-odor components of the air in the bowl 104 are removed.

[0088] The cleansing nozzle 520 illustrated in FIG. 17 is shown in the state of being extended into the bowl 104. At this time, it is more favorable that the warm air damper 508 is closed. This is because there is a risk that the water discharged from the cleansing nozzle 520 may rebound from the "bottom" and the like of the user and fall on the heater 506 disposed in the warm air duct 500. I n the case where the water falls on the heater 506, there is a risk that the heater 506 may be damaged. Therefore, it is more favorable that the warm air damper 508 is closed in the state in which the cleansing nozzle 520 is extended into the bowl 104.

[0089] Furthermore, the warm air duct 500 includes the bent portion 512 that is bent upward; and the heater 506 is disposed in the warm air duct 500 between the bent portion 512 and the warm air fan 504 that communicates with the end portion on the side opposite to the jet outlet 502; and therefore, even in the case where water or urine enters through the jet outlet 502, there is little risk that the water or urine may surmount the bent portion 512, which is upwardly bent, to fall on the heater 506.

[0090] FIG. 18 is an enlarged schematic view of an enlarged portion of the interior of the casing of this embodiment.

[0091] Also, FIG. 19 is a schematic view obliquely from

the front of a portion of the interior of the casing of this embodiment.

[0092] Further, FIG. 20 is a schematic top view from above of a portion of the interior of the casing of this embodiment.

[0093] The toilet apparatus illustrated in FIG. 18 to FIG. 20 is shown in the state in which the cleansing nozzle 520 is extended into the bowl 104.

[0094] The warm air duct 500, as illustrated in FIG. 18 to FIG. 20, extends along the side of the cylinder portion 526 of the cleansing nozzle unit from the warm air fan 504, that is, along the side of the cleansing nozzle 520 in the stored state; extends over the cleansing nozzle 520; and extends frontward (toward the bowl 104) of the cleansing nozzle 520 in the stored state. Therefore, as described above in regard to FIG. 15, the jet outlet 502 is provided frontward of the cleansing nozzle 520 in the stored state. The warm air duct 500 may include an airflow directing rib proximal to the jet outlet 502 to arrange the airflow direction in a substantially constant direction, to blow warm air sent by the warm air fan 504 with higher certainty toward the buttocks of the user.

[0095] On the other hand, the deodorizer duct 530, as illustrated in FIG. 18 to FIG. 20, extends from the deodorizing air fan 534 (referring to FIG. 16) along the side of the warm air duct 500; and the intake port 532 provided proximal to the end on the bowl 104 side is disposed to look into the bowl 104. At this time, the intake port 532 is disposed distal to the jet outlet 502 of the warm air duct 500 at a side thereof. I n other words, the jet outlet 502 and the intake port 532 do not overlay in the vertical direction. Therefore, in the proximity of the intake port 532, the warm air duct 500 and the deodorizer duct 530 do not overlay in the vertical direction.

[0096] As a result, the height of the casing 200 in the vertical direction can be kept low. Thereby, as described above in regard to FIG. 15, the sitting sensation of the user sitting on the toilet seat 300 is better. Other effects also can be obtained similar to the effects described above in regard to FIG. 15.

[0097] Next, the details of the internal structure of the casing and the toilet of this embodiment will be described.

[0098] FIG. 21 is a schematic perspective view of the detailed structure inside the casing and inside the toilet of this embodiment from the front left.

[0099] Also, FIG. 22 is a schematic perspective view of the detailed structure inside the casing and inside the toilet of this embodiment from the front right.

[0100] As illustrated in FIG. 21, a heat exchange unit 550 is provided on a lower left portion in the toilet 100. Further, a water supply valve unit 552 and a pump unit 554 are provided on an upper portion of the heat exchange unit 550. Water supplied from the water supply valve unit 552 to the heat exchange unit 550 may be heated, drawn by the pump unit 554 jointly provided on the nozzle unit, and supplied to the cleansing nozzle 520.

[0101] A tank 556 is provided on a central rear portion inside the casing 200. The tank 556, as elaborated below, is provided on a water path between the water supply valve unit 552 and the pump unit 554 and includes a backward flow prevention function. Also, an electric toilet lid opening/closing unit 410 is provided on an upper portion of the heat exchange unit 550 on a rear portion inside the casing 200 for automatically opening and closing the toilet lid 400. Further, a front right portion inside the casing 200 is provided with an electric toilet seat opening/closing unit 310 for automatically opening and closing the toilet seat 300.

[0102] As illustrated in FIG. 22, the deodorizing air fan 534, which draws air from inside the bowl 104, is provided below the casing 200 on a right side portion inside the toilet 100. A controller substrate 560 is provided below the deodorizing air fan 534. The controller substrate 560 can determine from an operation of a not-illustrated switch by the user or from the detection status of the human body detection sensor 202A, the human body detection sensor 202B, the seat contact sensor 206, or the like, and control an operation of the cleansing nozzle unit, the warm air drying apparatus, the deodorizing apparatus, and the like.

[0103] The human body detection sensor 202A and the seat contact sensor 206 are provided on the upper face of the casing 200 as described above. Further, the warm air fan 504 is disposed below the casing 200 and below the upper face of the toilet 100. The warm air duct 500 is provided frontward of the warm air fan 504; and as described above in regard to FIG. 18 to FIG. 20, the warm air duct 500 extends along the side of the cylinder portion 526 and extends frontward of the cleansing nozzle 520 in the stored state.

[0104] The cleansing nozzle unit is provided on a central front portion in the casing 200. As described above in regard to FIG. 11 to FIG. 12, the cleansing nozzle unit can cause the cleansing nozzle 520 to extend into the bowl 104 from the notched portion 103 of the toilet 100; squirt water from the water discharge port 528 provided proximal to the tip of the cleansing nozzle 520; and cleanse the "bottom" and the like of the user sitting on the toilet seat 300.

[0105] In the toilet apparatus of this embodiment, the entirety or a portion of the warm air fan 504 of the warm air drying apparatus, and/or the entirety or a portion of the deodorizing catalyst 536 and the deodorizing air fan 534 of the deodorizing apparatus can be disposed below the casing 200 and below the upper face of the toilet 100, that is, at a location concealed by the side panels 150. Thereby, the casing 200 can be formed in a compact size; the height from the front portion of the casing 200 to the rear portion can be kept low; and the upper face of the casing 200 can be formed in a planar configuration with few recessions and protrusions. Accordingly, a toilet apparatus of high designability can be realized.

[0106] According to this embodiment as described above, the jet outlet 502 of the warm air duct 500 is disposed further frontward (toward the bowl 104) than is the cleansing nozzle 520 in the stored state. Also, the intake

port 532 of the deodorizer duct 530 is provided distal to the jet outlet 502 of the warm air duct 500 at a side thereof; and therefore, the warm air duct 500 and the deodorizer duct 530 do not overlay in the vertical direction. Therefore, the height of the casing 200 in the vertical direction can be kept low; and the sitting sensation of the user sitting on the toilet seat 300 can be better.

[0107] Next, a toilet apparatus according to yet another embodiment of the present invention will be described with reference to the drawings. For this embodiment, the flow of water and the backward flow prevention function of the tank will be mainly described.

[0108] FIG. 23A is a perspective view illustrating an internal structure of a sanitary cleansing apparatus of the toilet apparatus according to yet another embodiment of the present invention. FIG. 23B is a schematic view illustrating a water discharge nozzle disposed on a notched portion.

[0109] The casing 200 of the sanitary cleansing apparatus, as described above, includes a case cover (hereinbelow also referred to as "upper casing") 210 that pivotally supports the toilet seat 300 and the toilet lid 400 to rotationally move, and a case plate (hereinbelow also referred to as "lower casing") 220 covered by the upper casing 210 and having a plate configuration that abuts the upper face of the toilet 100. The lower casing 220 is provided with, in addition to the cleansing nozzle (hereinbelow also referred to as "water discharge nozzle") 241, various components necessary for sanitary cleansing such as a drive unit 151 that causes the water discharge nozzle 241 to extend into and retract from the bowl portion 101, a tank (hereinbelow also referred to as "subtank") 280, and the like. Further, a shutter 221 is pivotally supported by the lower casing 220 to cover the communicating portion (hereinbelow also referred to as "aperture") 103b of the recess (hereinbelow also referred to as "notched portion") 103. The shutter 221 covers the aperture 103b in the state in which the water discharge nozzle 241 is stored in the sanitary cleansing apparatus, but is pushed open by the water discharge nozzle 241 that extends into the bowl portion 101 to open the aperture 103b when water is discharged from the water discharge nozzle 241.

[0110] The lower casing 220 is disposed on a rear portion of the toilet 100; and a front edge thereof juts slightly forward of a rear end of the bowl portion 101. Further, the lower casing 220 is provided with a nozzle notch 133 at a position corresponding to the notched portion 103 of the toilet 100. The water discharge nozzle 241 extends into the bowl portion 101 via the nozzle notch 133, the notched portion 103, and the aperture 1 03b when the water is discharged.

[0111] Thus, a height H1 from the rim face of the sanitary cleansing apparatus can be reduced and made compact by disposing the water discharge nozzle 241 in the notched portion 103 formed in the toilet 100 and causing the water discharge nozzle 241 to extend into the bowl portion 101 via the notched portion 103 and the aperture 103b. Moreover, a height H2 of the toilet seat 300 pivotally supported by the upper casing 210 of the sanitary cleansing apparatus also can be reduced, and the toilet seat 300 can be configured with few inclines in the frontward and rearward direction. I n particular, it is possible to avoid as much as possible an upward incline of the rear of the toilet seat 300. That is, a toilet seat 300 having a wide, flat portion can be realized. As a result, the position of the toilet seat 300 can be kept low, and even a user of small stature can stably be seated on the toilet seat 300. Further, even a user with large buttocks is provided with an improved sitting sensation. This result is as described above.

[0112] On the other hand, for a toilet 100 thus formed, there is a risk that liquid waste may enter through the aperture 103b into the notched portion 103 in cases such as when liquid waste splatters from the bowl portion 101 during the discharge of water from the water discharge nozzle 241 ; a drainage clog of the toilet 100 occurs and the water level of the bowl portion 101 rises; etc. I n the case where liquid waste enters and the notched portion 103 is soiled or damaged, the inaccessible configuration thereof makes it difficult for the user to clean manually.

[0113] Therefore, the toilet apparatus according to this embodiment has a configuration in which a subtank 280 is disposed rearward of the water discharge nozzle 241 and the notched portion 103, and overflow water flowing out of the subtank 280 is introduced into the notched portion 103. In other words, the overflow water that flows out of the subtank 280 washes the notched portion 103. The overflow water that flows along and washes the notched portion 103 drops through the aperture 103b into the bowl portion 101 and flows out with water of the bowl 101 during drainage of the toilet 100.

[0114] The washing of the notched portion by the overflow water and the subtank will be elaborated below with reference to the drawings.

[0115] FIG. 24 is a block diagram illustrating a water path configuration of the toilet apparatus according to this embodiment; and FIG. 25 shows schematic views illustrating the subtank configuration and the flow of water used in the toilet apparatus according to this embodiment.

[0116] As illustrated in FIG. 24, a stopcock 602 connected to a service-water pipe 601 is connected to a water supply valve unit (hereinbelow also referred to as simply "valve unit") 270 by a pliant flexible hose 603. The valve unit 270 includes a check valve 271 that prevents a backward flow of water from the valve unit 270 upstream; a strainer 272 that captures foreign objects in the water; a constant flow rate valve 273 that maintains a constant flow rate of water regardless of the water supply pressure; a solenoid valve 274 that selectively switches, by a flow of electric current, between passing water downstream/stopping water; and the like. The valve unit 270 is disposed on the recessed side face portion 152 of the toilet 100, and therefore is positioned lower than the upper face (hereinbelow also referred to as "rim face")

105 of the toilet 100.

[0117] The water passing through the solenoid valve 274 is sent above the rim face 105 by an inlet pipe 604 and is supplied to the subtank 280 disposed on the lower casing 220. On the subtank 280, a flow inlet 281 that introduces water into the interior is provided at the top and a flow outlet 282 that discharges water from the interior is provided at the bottom. Further, a side face of the subtank 280 is provided with a drainage port 283 that discharges overflow water. Accordingly, even in the case where a backward flow of water from the flow outlet 282 into the interior of the subtank 280 occurs and the water level of water retained in the subtank 280 rises, water flows out from the drainage port 283 as overflow water and does not reach the flow inlet 281 ; and therefore, a backward flow of water into the solenoid valve 274 can be prevented.

[0118] Next, the flow of the water flowing out from the flow outlet 282 of the subtank 280 will be described. A cleansing pump (hereinbelow also referred to as simply "pump") 291 is connected downstream of an outlet pipe 605 connected to the flow outlet 282. The pump 291 draws water from inside the subtank 280 through the flow outlet 282, urges the water downstream, and can also adjust the flow rate (water force).

[0119] A heat exchanger 250 is provided downstream of the pump 291. The heat exchanger 250 includes a heat source such as, for example, a sheathed heater, and heats the water sent by the pump 291 located upstream. Although the heat exchanger 250 may be a so-called instantaneous type or storage type, hereinafter, the description will proceed assuming that the heat exchanger 250 is an instantaneous type.

[0120] A switch valve 292, the water discharge nozzle 241, and a nozzle washing flow path 606 are provided downstream of the heat exchanger 250. The destination of the water passing through the heat exchanger 250 is switched alternatively between the water discharge nozzle 241 and the nozzle washing flow path 606 by the switch valve 292. In the case where the user seated on the toilet seat 300 selects to cleanse his or her "bottom" by a not-illustrated remote control or the like, the heat exchanger 250 heats water; and the switch valve 292 switches to send the water to the water discharge nozzle 241. Thereby, warm water is squirted from the water discharge nozzle 241 ; and the user can cleanse his or her "bottom." It is possible for the water force and temperature of the warm water squirted from the water discharge nozzle 241 to be modified according to the user's preference; and the user adjusts the driving state of the pump 291 and the heating amount of the heat exchanger 250 by a remote control or the like.

[0121] Also, it is possible to perform a washing of the water discharge nozzle 241 itself after the cleansing of the "bottom," when the user instructs by an operation of the remote control, etc. In such a case, the heating of the water is not performed by the heat exchanger 250; and the switch valve 292 switches to send water to the nozzle washing flow path 606. The water sent to the nozzle washing flow path 606 is squirted toward the water discharge nozzle 241 ; and thereby, the water discharge nozzle 241 is washed.

[0122] On the other hand, in the case where the flow rate of the water drawn by the pump 291 and discharged through the flow outlet 282 is low in comparison to the flow rate of the water flowing into the subtank 280 through the flow inlet 281, water (overflow water) is discharged from inside the subtank 280 through the drainage port 283 as illustrated by an arrow OF. The overflow water is introduced into the notched portion 103 of the toilet 100 and flows along the notched portion 103 toward the bowl portion 101; and thereby, the notched portion 103 is washed. The overflow water that flows along and washes the notched portion 103 drops through the aperture 103b into the bowl portion 101 and flows out with water of the bowl portion 101 during drainage of the toilet 100.

[0123] Next, the configuration of the subtank 280 will be described with reference to FIG. 25.

[0124] FIG. 25A is a perspective view of the subtank 280; FIG. 25B is a plan view of the subtank 280; FIG. 25C is a cross-sectional view along I-I of the subtank 280; and FIG. 25D is a cross-sectional view along J-J of the subtank 280. The subtank 280 includes a subtank casing 280a that forms an outer shell thereof; and an interior of the subtank casing 280a is provided with a space capable of retaining water. An upper face 280b of the subtank casing 280a is provided with the flow inlet 281 to which the inlet pipe 604 is connected; and the flow outlet 282 to which the outlet pipe 605 connects is provided to protrude on a lower portion of the side face 280c. A flow regulation plate 284, having a flat-plate configuration with many perforations 284a perforated therein, is disposed in the interior of the subtank casing 280a substantially parallel to a bottom face 280d of the subtank casing 280a. The flow regulation plate 284 has a configuration such that the interior of the subtank casing 280a is partitioned into a first chamber 285 having a substantially L-shaped cross section and a second chamber 286 thereabove; and the multiplicity of perforations 284a link the first chamber 285 and the second chamber 286.

[0125] The rectangular drainage port 283 is made in a portion of the side face 280c of the subtank casing 280a corresponding to the second chamber 286 to communicate with the outside of the subtank casing 280a. Then, an enclosure plate 287 is provided on the side face 280c to enclose the drainage port 283. In addition to the enclosure plate 287 being open above and below, the enclosure plate 287 protrudes slightly below the bottom face 280d of the subtank casing 280a and forms a guided water path 288 between the enclosure plate 287 and the side face 280c.

[0126] Continuing, the flow of water for the subtank 280 will be described. Water flowing through the inlet pipe 604 and through the flow inlet 281 into the subtank casing 280a first flows into the first chamber 285. The water flows along the substantially L-shaped configura-

tion of the first chamber 285 and flows toward the flow outlet 282 as illustrated by an arrow F1.

[0127] When the sanitary cleansing apparatus discharges water from the water discharge nozzle 241, the pump 291 connected downstream of the outlet pipe 605 drives; and thereby, the water in the subtank casing 280a is drawn through the flow outlet 282. In the case where the flow rate of the water flowing through the flow inlet 281 is high in comparison to the flow rate of the water drawn through the flow outlet 282, the amount of water retained in the subtank casing 280a increases, and the water level thereof rises.

[0128] As the water level of the water retained in the subtank casing 280a rises, the water passes through the perforations 284a and flows into the second chamber 286 as illustrated by arrows F2.

[0129] As the water level rises further after the water flows into the second chamber 286, the water in the second chamber 286 flows through the drainage port 283 to the outside of the subtank casing 280a as illustrated by an arrow F3. The overflow water that flows out through the drainage port 283 drops through the guided water path 288 below and flows out through a guided water path outlet 288a.

[0130] Here, as illustrated in FIG. 23B, the subtank 280 is disposed on the lower casing 220 at the rear of the water discharge nozzle 241 and the notched portion 103 as described above. Then, the overflow water flowing out through the guided water path outlet 288a is introduced into the notched portion 103, flows along the notched portion 103, and reaches the bowl portion 101 ; and therefore, the notched portion 103 can thereby be washed.

[0131] Moreover, the guided water path outlet 288a is disposed to be positioned directly above the notched portion 103; and therefore, the overflow water dropping through the interior of the guided water path 288 is introduced into the notched portion 103 without losing the water force from the drop. Accordingly, a high washing effect due to the water force of the overflow water can be expected. Also, the enclosure plate 287 is disposed to partition the drainage port 283 and the drive unit 151, therefore preventing the overflow water flowing out through the drainage port 283 from scattering on the drive unit 151 side. I n other words, the overflow water does not become a cause of failure on the water discharge nozzle 241 or drive unit 151 side.

[0132] Thus, this embodiment has a configuration such that the subtank 280, which is a so-called open tank, is disposed in the water path; and the notched portion 103 of the toilet 100 is washed by the overflow water flowing out therefrom. In other words, ingenuity is exercised so that the overflow water flowing out from the open tank, which prevents backward flow, is effectively utilized to wash the notched portion of the toilet which is easily soiled or damaged.

[0133] The washing of the notched portion 103 by the overflow water of the subtank 280 can be executed regardless of whether or not the sanitary cleansing apparatus is discharging water from the water discharge nozzle 241. That is, when water is discharged from the water discharge nozzle 241 (in other words, when the pump 291 is driving) as described above, water is passed through the valve unit 270 such that the flow rate of the water flowing-in is high in comparison to the flow rate of the water drawn from inside the subtank casing 280a; and thereby, the overflow water can be obtained. Also, when water is not discharged from the water discharge nozzle 241 (in other words, when the pump 291 is not driving), water is not drawn from inside the subtank casing 280a; and therefore, by water simply being passed by the valve unit 270, the water level of the water retained in the subtank casing 280a can be caused to rise; and overflow water can be obtained. Accordingly, by adjusting the time that water passes through the valve unit 270, the amount of overflow water that washes the notched portion 103 can be appropriately adjusted.

[0134] A modification of an embodiment of the present invention will be described below with reference to the drawings. Components similar to those of the embodiments described above in regard to FIG. 23 to FIG. 25 are marked with similar reference numerals, and a description also is omitted as appropriate.

[0135] FIG. 26 is a schematic view illustrating the water discharge nozzle 241 disposed in the notched portion 103 of a toilet apparatus according to this modification of an embodiment.

[0136] In this modification of an embodiment, a recessed portion (hereinbelow also referred to as "lower casing groove portion") 223, which is recessed downward to correspond to a configuration to be inserted into the notched portion 103, is formed on the lower casing 220. The lower casing groove portion 223 covers and protects the water discharge nozzle 241 from below. I n other words, protection is provided against mistakenly dropping the sanitary cleansing apparatus and undesirably damaging the water discharge nozzle 241 when the sanitary cleansing apparatus is removed from the toilet 100 for transporting, etc.

[0137] An elastic body (hereinbelow also referred to as "packing") 107 is disposed between the lower casing groove portion 223 and the notched portion 103, and the water seal is maintained therebetween. However, in the case where such a lower casing groove portion 223 is formed on the lower casing 220, there is a risk that liquid waste may enter through the aperture 103b into the lower casing groove portion 223 in cases such as when liquid waste splatters from the bowl portion 101 during the discharge of water from the water discharge nozzle 241 ; a drainage clog of the toilet 100 occurs and the water level of the bowl portion 101 rises; etc. I n the case where liquid waste enters and the lower casing groove portion 223 is soiled or damaged, the inaccessible configuration thereof makes it difficult for the user to clean manually.

[0138] Therefore, the toilet apparatus according to this modification of an embodiment has a configuration in

which a subtank 280 is disposed at the rear of the water discharge nozzle 241 and the lower casing groove portion 223 for preventing the backward flow of water, and overflow water flowing out of the subtank 280 is introduced into the lower casing groove portion 223. I n other words, the overflow water that flows out of the subtank 280 washes the lower casing groove portion 223. The overflow water that flows along and washes the lower casing groove portion 223 flows through the aperture 103b into the bowl portion 101 and drops out with water of the bowl portion 101 during drainage of the toilet 100.

[0139] Next, another modification of an embodiment of the present invention will be described with reference to the drawings. Components similar to those of the embodiments described above in regard to FIG. 23 to FIG. 26 are marked with similar reference numerals, and a description also is om itted as appropriate.

[0140] FIG. 27A is a schematic view illustrating the disposition of a subtank 680 on a case plate 620 of a toilet apparatus according to this other modification of an embodiment; and FIG. 27B is a schematic view illustrating the flow of water flowing out from the subtank 680.

[0141] Also, FIG. 28 shows schematic views illustrating the configuration of the subtank 680 and the flow of water used in the toilet apparatus according to this other modification of an embodiment.

[0142] First, as illustrated in FIG. 27, similar to the embodiment described above in regard to FIG. 26, a recessed portion (hereinbelow also referred to as "lower casing groove portion") 623 is provided as a recess on a case plate (hereinbelow also referred to as "lower casing") 620, and has a configuration such that overflow water flowing out of the subtank 680 washes the lower casing groove portion 623. In this modification of an embodiment, the subtank 680 is disposed on the lower casing groove portion 623 (and the not-illustrated water discharge nozzle 241) side. In the case where the subtank 680 cannot be disposed at the rear of the lower casing groove portion 623 (and the water discharge nozzle 241) due to relationships with the front-to-rear dimension of the toilet 100, even in the case where overflow water is introduced from the subtank 680 thus disposed on the side, it is possible to wash the lower casing groove portion 623.

[0143] The configuration of the subtank 680 will be described below with reference to FIG. 28.

[0144] FIG. 28A is a perspective view of the subtank 680; FIG. 28B is a plan view of the subtank 680; FIG. 28C is a front view of the subtank 680; FIG. 28D is a right side view of the subtank 680; and FIG. 28E is a cross-sectional view along K-K of the subtank 680.

[0145] The subtank 680 includes a subtank casing 680a that forms an outer shell thereof; and the interior of a subtank casing 680a is provided with a space capable of retaining water. An upper face 680b of the subtank casing 680a is provided with a flow inlet 681 into which water supplied from an inlet pipe 604 flows. Also, a flow outlet 682 to which the outlet pipe 605 connects is provided to protrude on a lower face 680d. The interior of the subtank casing 680a is provided with a baffle 684 and is partitioned into an upper space 685 and a lower space 686.

[0146] The rectangular drainage port 683 is made in a portion of the side face 680c of the subtank casing 680a corresponding to the upper space 685 to communicate with the outside of the subtank casing 680a. Then, a brim portion 687 is provided along a circumferential edge of the drainage port 683 to protrude from the side face 680c.

[0147] Continuing, the flow of water for the subtank 680 will be described. Water passing through the inlet pipe 604 and flowing through the flow inlet 681 into the subtank casing 680a as illustrated by an arrow F4 impacts the baffle 684, and the water force thereof is reduced. The baffle 684 is formed to curve directly below the flow inlet 681 and slightly inclines toward the tip; and therefore, the incoming water flows along the configuration to go around from the upper space 685 to the lower space 686 as illustrated by an arrow F5.

[0148] When the sanitary cleansing apparatus discharges water from the water discharge nozzle, the pump 291, which is connected downstream of the outlet pipe 605, drives to draw water from inside the subtank casing 680a through the flow outlet 682 as illustrated by an arrow F6. I n the case where the flow rate of the water flowing through the flow inlet 681 is high in comparison to the flow rate of the water drawn through the flow outlet 682, the amount of water retained in the subtank casing 680a increases, and the water level thereof rises.

[0149] As the water level of the water in the subtank casing 680a rises, water flows through the drainage port 683 and flows (overflows) out of the subtank casing 680a as illustrated by an arrow F7. The overflow water flowing out through the drainage port 683 drops and is introduced into the lower casing groove portion 623 below.

[0150] Thus, in this modification as well, in which the subtank 680 is disposed on the side of the lower casing groove portion 623, the lower casing groove portion 623 can be washed by the overflow water. Further, the overflow water flowing out through the drainage port 683 drops downward at a position slightly distal from the side face 680c due to the brim portion 687 provided along the circumferential edge of the drainage port 683 to protrude. Accordingly, even in the case where the side face 680c of the subtank casing 680a must be provided at a position distal to the side end portion of the lower casing groove portion 623, the overflow water can be introduced into the lower casing groove portion 623 by the brim portion 687.

[0151] Next, a toilet apparatus according to yet another embodiment of the present invention will be described with reference to the drawings. For this embodiment, the flow of the overflow water and the like draining from the recessed portion 223 of the casing 200 will mainly be described.

[0152] FIG. 29 is a schematic plan view of a case plate of yet another embodiment of the present invention from

above.

[0153] As described above, in the case where the flow rate of the water drawn by the cleansing pump 291 and flowing through the flow outlet 282 is relatively low in comparison to the flow rate of the water flowing through the flow inlet 281 into the tank (hereinbelow also referred to as "open tank") 280, the water level of the water retained in the open tank 280 rises, and water flows out through the drainage port (hereinbelow also referred to as "overflow port") 283 as excess water as illustrated by the arrow OF. The excess water, as elaborated below, drains into the bowl 101 of the toilet 100 and drains with water from inside the bowl 101 during drainage of the toilet 100.

[0154] The water draining into the bowl 101 is not only the excess water from the overflow port 283. For example, water that washes the water discharge port 243 prior to the cleansing nozzle 241 extending from the casing 200 (pre-wash), water that washes the water discharge port 243 after the cleansing nozzle 241 is stored in the casing 200 (post-wash), etc., may be discharged into the bowl 101 of the toilet 100. Water that washes the body of the cleansing nozzle 241 while the cleansing nozzle 241 extends and retracts (body wash) also may be discharged into the bowl 101 of the toilet 100. Further, water condensation occurring due to functional members of the local cleansing unit and the like provided in the casing 200 also may be discharged into the bowl 101 of the toilet 100. Water such as this occurring in the casing 200 that is discharged into the bowl 101 of the toilet 100 is referred to in the description of the present application as "drainage."

[0155] The case plate 220, as illustrated in FIG. 29, includes a recessed portion 223 formed in a configuration recessed downward. The recessed portion 223 is provided on a portion of the case plate 220 and is inclined to become lower from a rear end portion 223a thereof toward an aperture portion (hereinbelow also referred to as "front end portion") 223b. On the other hand, the toilet 100 includes a recess 103 formed in a configuration recessed downward from the upper face 105 thereof as illustrated in FIG. 3. The recess 103 is formed to communicate with the bowl 101; and similar to the recessed portion 223 provided on the case plate 220, the recess 103 is inclined to become lower from the rear end portion 103a thereof toward the front end portion 103b. Then, the case plate 220 is disposed on the upper face 105 of the toilet 100 in a state in which the recessed portion 223 is stored in the recess 103 of the toilet 100.

[0156] The recessed portion 223 of the case plate 220, as described above, is formed in a configuration recessed downward and is inclined to become lower from the rear end portion 223a toward the front end portion 223b; and therefore, the drainage from devices disposed in the casing 200, as illustrated by the arrows in FIG. 29, can be discharged into the bowl 101. That is, the recessed portion 223 functions as a drainage water path that drains drainage from the devices disposed in the casing 200 into the bowl 101.

[0157] The recessed portion 223 is provided with an outflow water force control plate (protruding wall) 224 that controls the water force of the drainage drained from the interior of the casing 200 to the exterior. In other words, the protruding wall 224 can reduce the water force of the drainage that flows from the rear end portion 223a side of the recessed portion 223 toward the front end portion 223b side. Also, the front end portion 223b of the recessed portion 223 is provided with a notched portion 225 formed to retreat toward the rear end portion 223a. The protruding wall 224 may have a plate configuration that does not pass water, and may have a slit configuration, a mesh configuration, or a porous configuration that limits the amount of water passing through the protruding wall 224.

[0158] The drainage from the devices disposed in the casing 200 flows toward the front end portion 223b of the recessed portion 223 and impacts the protruding wall 224. Continuing, the water force of the drainage that impacts the protruding wall 224 is controlled, and the drainage passes around both sides of the protruding wall 224 as illustrated by the arrows in FIG. 29. The water passing around both sides of the protruding wall 224 passes along the notched portion 225 in a state of controlled water force and is discharged into the bowl 101.

[0159] Accordingly, the drainage from the devices disposed in the casing 200 is drained into the bowl 101 in the state of controlled water force and therefore is discharged along an inner wall face of the bowl 101 into accumulated water 110. Therefore, even in the case where the flow rate of the drainage is high, the toilet apparatus according to this embodiment can inhibit the drainage from falling directly into the accumulated water 110 and splattering. Further, the drainage is discharged along the inner wall face of the bowl 101 into the accumulated water 110; and therefore, the toilet apparatus according to this embodiment can inhibit water splattering from the inner wall face of the bowl 101. References to "water splattering" in description of the present application include not only water splattering from the accumulated water 110 but also water splattering that occurs due to the inner wall face of the bowl 101.

[0160] At least a portion of the cleansing nozzle 241, which extends into and retracts from the bowl 1 01 , is provided in the recessed portion 223. Then, the nozzle unit including the cleansing nozzle 241 is supported by a support portion 223d provided on the recessed portion 223.

[0161] Next, a proximity of the front end portion 223b of the recessed portion 223 will be described in further detail.

[0162] FIG. 30 shows schematic views illustrating a proximity of the front end portion of the recessed portion of the case plate. FIG. 30A is a schematic cross-sectional view of the proximity of the front end portion of the recessed portion of the case plate from the side, and corresponds to a cross-sectional view along L-L of FIG. 29.

Also, FIG. 30B is a schematic cross-sectional view of the proximity of the front end portion of the recessed portion of the case plate from above, and corresponds to a cross-sectional view along M-M of FIG. 30A.

[0163] Further, FIG. 31 is a schematic cross-sectional view of the toilet apparatus according to this embodiment from the side.

[0164] FIG. 31 corresponds to a cross-sectional view along A-A of FIG. 1A.

[0165] As described above in regard to FIG. 29, the recessed portion 223 is provided with the protruding wall 224 that controls the water force of the drainage drained from the interior of the casing 200 to the exterior. As illustrated in FIG. 30B, the protruding wall 224 is formed so that the wall thickness of both end portions is slightly smaller than the wall thickness of the central portion. That is, a rear face 224a of the protruding wall 224 is inclined slightly such that both end portions are positioned forward of the central portion. Therefore, the drainage of the devices disposed in the casing 200 does not surmount the protruding wall 224 after impacting the protruding wall 224, and flows smoothly toward both end portions of the protruding wall 224. At this time, the water force of the drainage is controlled by the protruding wall 224.

[0166] Continuing, the drainage passing by both end portions of the protruding wall 224 flows toward the notched portion 225. Here, the protruding wall 224 is provided proximal to the front end portion 223b, that is, proximal to the notched portion 225; and therefore, the drainage flows toward the notched portion 225 in a state of controlled water force. Conversely, in the case where the protruding wall 224 is provided proximal to the rear end portion 223a, there is a risk that the water force of the drainage may once again increase before the drainage reaches the notched portion 225 even after being controlled by the protruding wall 224. Therefore, it is more favorable that the protruding wall 224 is provided proximal to the front end portion 223b, that is, proximal to the notched portion 225.

[0167] Also, the recessed portion 223 is inclined to become low from the rear end portion 233a toward the front end portion 223b; and therefore, the drainage flows toward the notched portion 225 without accumulating in the proximity of the protruding wall 224. Then, the drainage passes through the notched portion 225 and drains into the bowl 101 of the toilet 100.

[0168] Here, the front end portion 223b of the recessed portion 223, as illustrated in FIG. 30A, does not protrude from the bowl inner wall face 1 01 a into the bowl 101. On the other hand, the notched portion 225, as described above in regard to FIG. 29, is formed to retreat toward the rear end portion 223a at the front end portion 223b of the recessed portion 223. Therefore, the notched portion 225, similar to the front end portion 223b, does not protrude from the bowl inner wall face 1 01 a into the bowl 101. Therefore, the drainage passing along the notched portion 225 is discharged along the bowl inner wall face 101a into the bowl 101 as illustrated by the arrows in FIG. 30A.

[0169] Also, the case plate 220 is provided with the shutter 221 to cover the front end portion 223b of the recessed portion 223. The shutter 221, as described above in regard to FIG. 4, is urged in a direction to close by a spring and the like. Additionally, the shutter 221 includes a protruding portion 221a that protrudes toward the recessed portion 223 in the closed state. The protruding portion 221 a abuts the front end portion 223b of the recessed portion 223 in a state in which the shutter 221 is closed. Restated, the protruding portion 221 a abuts the front end portion 223b of the recessed portion 223; and thereby, the closed stopping position of the shutter 221 is determined. Therefore, the lower end portion of the shutter 221 and the rear end portion 225a of the notched portion 225 are mutually distal as illustrated in FIG. 30A and FIG. 30B. Accordingly, even when the shutter 221 is closed, the drainage can pass along the notched portion 225 and be discharged into the bowl 101.

[0170] Furthermore, the drainage can pass along the notched portion 225 even when the shutter 221 is closed; and therefore, the drainage does not readily contact the shutter 221. Therefore, there is little risk that the shutter 221, in the closed state, may receive a force from the drainage and open. Accordingly, there is little risk that an impact sound may occur between the shutter 221 and the front end portion 223b of the recessed portion 223.

[0171] To describe more specifically, in the case where drainage contacts and applies a force to the shutter 221 , there is a risk that the shutter 221 may repeatedly open and close due to the water force of the drainage because the shutter 221 is urged in the closing direction. Repeatedly opening and closing the shutter 221 causes repeated contact of the protruding portion 221 a and the front end portion 223b; and therefore, there is a risk that each contact may cause an unpleasant sound (impact sound) to occur. Conversely, in the toilet apparatus according to this embodiment, there is little risk that the drainage and the shutter 221 come into contact; and therefore, there is little risk that an impact sound thereof may occur.

[0172] Then, the water force of the drainage is controlled by the protruding wall 224; and the drainage passes along the notched portion 225, and as illustrated by an arrow N in FIG. 31, is discharged along the bowl inner wall face 101a into the accumulated water 110 which is provided as sealing water. Also, as described above, the front end portion 223b of the recessed portion 223 and the notched portion 225 do not protrude from the bowl inner wall face 1 01 a into the bowl 101. Therefore, even in the case where the bowl inner wall face 101 a proximal to the front end portion 223b of the recessed portion 223 is provided in a vertical direction, the drainage is discharged along the bowl inner wall face 101a into the accumulated water 110 as illustrated by the arrow N of FIG. 31.

[0173] Accordingly, even in the case where the flow rate of the drainage is high, the drainage can be inhibited

from falling directly into the accumulated water 110 and splattering. Also, the drainage can be discharged along the bowl inner wall face 101a into the accumulated water 110; and therefore, the toilet apparatus according to this embodiment can inhibit water splattering from the bowl inner wall face 101a. Additionally, the drainage can be inhibited from dropping directly into the accumulated water 110; and therefore, the occurrence of a splashing sound made by the drainage dropping into the accumulated water 110 can be inhibited.

[0174] Conversely, in the case where the protruding wall 224 is not provided on the recessed portion 223, there is a risk that the drainage from the devices disposed in the casing 200 may drop directly into the accumulated water 110 as illustrated by an arrow O of FIG. 31. Or, there is a risk that the drainage from the devices disposed in the casing 200 may not pass along the bowl inner wall face 101a but may drop onto the bowl inner wall face 1 01 a as illustrated by an arrow P in FIG. 31. There is a risk that drainage discharged from the recessed portion 223 may drop into the accumulated water 110 or onto the bowl inner wall face 1 01 a and splatter as illustrated by the arrow O or the arrow P of FIG. 31. Splattering drainage is not favorable because there is a risk that the splattering water may adhere to the buttocks and the like of the user seated on the toilet seat. Further, it is not favorable for the drainage to drop directly into the accumulated water 110 because a splashing sound is created.

[0175] Next, the relationship between the cleansing nozzle 241 and the drainage will be described with reference to the drawings.

[0176] FIG. 32 is a schematic cross-sectional view illustrating a proximity of the front end portion of the recessed portion in the state in which the cleansing nozzle is stored.

[0177] FIG. 32 corresponds to a cross-sectional view along A-A of FIG. 1A.

[0178] A nozzle unit 240 of this embodiment includes the cleansing nozzle 241 and includes the nozzle washing chamber 245 at one end portion. The nozzle washing chamber 245 squirts water supplied by the switch valve 292 from a water discharge port provided on an interior thereof and thereby can wash (body wash) an outer circumferential surface of the cleansing nozzle 241. Also, the nozzle washing chamber 245 can inhibit scattering of wash water that washes the outer circumferential surface during the extending and retracting of the cleansing nozzle 241. The cleansing nozzle 241 passes through the nozzle washing chamber 245 to extend or retract.

[0179] At least a portion or desirably a majority of the wash water that performs the body wash drops through the aperture portion 245a provided on a lower portion of the nozzle washing chamber 245 onto the recessed portion 223 of the case plate 220 as "drainage." At this time, the aperture portion 245a of the nozzle washing chamber 245 is disposed further on the rear end portion 223a side than is the protruding wall 224 as illustrated in FIG. 32; and therefore, the drainage passing through the aperture portion 245a drops on the rear end portion 223a side of the protruding wall 224.

[0180] On the other hand, the nozzle unit 240 of this embodiment can perform a wash (pre-wash) of the water discharge port 243 portion of the cleansing nozzle 241 in the nozzle washing chamber 245 prior to the cleansing nozzle 241 passing through the nozzle washing chamber 245 and extending. Similar thereto, the nozzle unit 240 can perform a wash (post-wash) of the water discharge port 243 portion of the cleansing nozzle 241 in the nozzle washing chamber 245 after the cleansing nozzle 241 passes through the nozzle washing cham ber 245 and retracts.

[0181] At least a portion or desirably a majority of the wash water that thus performs the pre-wash and the post-wash, similar to the wash water that performs the body wash, drops onto the recessed portion 223 further on the rear end portion 223a side than is the protruding wall 224 after passing through the aperture portion 245a.

[0182] Continuing, the water force of the drainage dropping further on the rear end portion 223a side than is the protruding wall 224 is controlled by the protruding wall 224. The drainage having the water force controlled by the protruding wall 224 passes along the notched portion 225 and is discharged along the bowl inner wall face 101a into the accumulated water 110 as described above in regard to FIG. 30. Therefore, even in the case where the flow rate of drainage of the wash water performing the body wash, the pre-wash, or the post-wash is high, it is possible to inhibit the drainage from falling directly into the accumulated water 110 and splattering. Moreover, the drainage thereof is discharged along the bowl inner wall face 101a into the accumulated water 110; and therefore, the toilet apparatus according to this embodiment can inhibit water splattering from the bowl inner wall face 101a.

[0183] The elastic body 107 having elasticity is provided between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100 as illustrated in FIG. 32. The elastic body 107 supports the front end portion 223b of the recessed portion 223 while ensuring a fluidic seal between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. That is, the elastic body 107 prevents urine and the like from entering between the recessed portion 223 of the case plate 220 and the recess 103 of the toilet 100. The elastic body 107 is disposed also on the upper face 105 of the toilet 100 along the front edge of the case plate 220; ensures a fluidic seal between the case plate 220 and the upper face 105 of the toilet 100; and prevents the entry of urine and the like.

[0184] FIG. 33 is a schematic cross-sectional view illustrating a proximity of the front end portion of the recessed portion in a state in which the cleansing nozzle extends from the casing.

[0185] FIG. 33 corresponds to a cross-sectional view along A-A of FIG. 1A.

[0186] As illustrated in FIG. 33, the cleansing nozzle

241 can extend by passing through the nozzle washing chamber 245, push the shutter 221 upward, and extend into the bowl 101. At this time, although at least a portion of the cleansing nozzle 241 is proximal to a bottom portion of the recessed portion 223 of the case plate 220, the notched portion 225 is provided on the front end portion 223b; and therefore, a sufficient distance between the cleansing nozzle 241 and the rear end portion 225a of the notched portion 225 is provided in regard to the discharge of the drainage.

[0187] Therefore, there is little risk that the drainage from the devices disposed in the casing 200 may contact the cleansing nozzle 241. Further, the water force of the drainage is controlled by the protruding wall 224 provided on the recessed portion 223; and therefore, there is little risk that the drainage may forcefully gush from the recessed portion 223 and contact the cleansing nozzle 241. Therefore, there is little risk that the drainage may drop along the cleansing nozzle 241 into the accumulated water 110 or drop onto the bowl inner wall face 101 a. Thereby, the toilet apparatus according to this embodiment can inhibit the drainage passing along the cleansing nozzle 241 from splattering from the accumulated water 110 or from the bowl inner wall face 101 a.

[0188] Conversely, in the case where the protruding wall 224 or the notched portion 225 is not provided on the recessed portion 223, there is a risk that the drainage may contact the cleansing nozzle 241. There is a risk that drainage contacting the cleansing nozzle 241 may pass along to the tip portion side (the water discharge port 243 side) of the cleansing nozzle 241. The tip portion of the cleansing nozzle 241 in the extended state is disposed on an upper side of the accumulated water 110; and therefore, there is a risk that the drainage passing along the cleansing nozzle 241 may drop directly into the accumulated water 110. Drainage that drops directly into the accumulated water 110 and splatters is not favorable because there is a risk that the splattering water may adhere to the buttocks and the like of the user seated on the toilet seat.

[0189] Next, the timing that the "drainage" is discharged will be described with reference to the drawings.

[0190] FIG. 34 is a timing chart illustrating an example of an operation of the toilet apparatus according to this embodiment.

[0191] Chart (A) illustrates a state in which the seat contact sensor 215 detects whether or not a user is seated on the toilet seat; and chart (B) illustrates an open/close state of the solenoid valve 274 of the water supply valve unit 270. Also, chart (C) illustrates a driving state of the cleansing pump 291 ; chart (D) illustrates a position of cleansing nozzle 241 ; and chart (E) illustrates a discharge position of the switch valve 292.

[0192] From a standby state, the toilet apparatus waits for the user to select an operation mode by a remote control when the seat contact sensor 215 detects at a timing t1 that the user is seated on the toilet seat. When the user operates a "bidet" switch at a timing t2, a not-illustrated control unit opens the solenoid valve 274 and starts supplying water to the open tank 280. Thereby, the water is retained in the open tank 280 to prepare for discharging water from the cleansing nozzle 241. At this time, when the open tank 280 becomes full of water and the water level of the water retained in the open tank 280 rises and goes over the overflow port 283, the water is discharged from the recessed portion 223 into the bowl 101 as drainage. Also, simultaneous to opening the solenoid valve 274, the switch valve 292 is switched to a position to discharge water from all water discharge ports; and after a short delay, the driving of the cleansing pump 291 is started; the wash water inside the open tank 280 is supplied to the cleansing nozzle 241 ; and a prewash of the water discharge port 243 portion of the cleansing nozzle 241 is performed. The wash water at this time, as described above in regard to FIG. 32, passes through the aperture portion 245a of the nozzle washing chamber 245 and is discharged from the recessed portion 223 into the bowl 101 as drainage. I n other words, drainage is discharged between the timing t2 and a timing t3.

[0193] Continuing, the not-illustrated control unit switches the switch valve 292 at the timing t3 to a body wash position (a position at which water is discharged from the water discharge port of the nozzle washing chamber 245); subsequently, a nozzle drive apparatus provided on the nozzle unit 240 is driven; and the cleansing nozzle 241 is extended from inside the casing 200 to a position corresponding to "bidet." At this time, during the extension of the cleansing nozzle 241, the body wash of the cleansing nozzle 241 is performed in the interior of the nozzle washing chamber 245. The wash water at this time, as described above in regard to FIG. 32, passes through the aperture portion 245a of the nozzle washing chamber 245 and is discharged from the recessed portion 223 into the bowl 101 as drainage.

[0194] Continuing, the switch valve 292 is switched to a bidet water discharge position at a timing t4; and until a timing t5, the cleansing pump 291 is driven to increase the flow rate (water force) of the supplied water over five levels. Thereby, water is squirted from the water discharge port 243 of the cleansing nozzle 241 with gradually increasing force. At this time, the not-illustrated control unit continues to supply water to the open tank 280, and constantly discharges excess water through the overflow port 283 of the open tank 280 to keep the open tank 280 in a filled state. Therefore, drainage is discharged also between the timing t4 and the timing t5.

[0195] When the user operates a "stop" switch of the remote control at a timing t6, the not-illustrated control unit drives a nozzle drive unit after switching the switch valve 292 to the body wash position, and stores the cleansing nozzle 241 in the casing 200. Also at this time, similar to the body wash during the extension, a body wash of the cleansing nozzle 241 is performed in the interior of the nozzle washing chamber 245 while retracting the cleansing nozzle 241. The wash water at this time

passes through the aperture portion 245a of the nozzle washing chamber 245 and is discharged from the recessed portion 223 into the bowl 101 as drainage.

[0196] When the cleansing nozzle 241 is stored in the casing 200 at a timing t7, similar to the pre-wash prior to the extension, the switch valve 292 is switched to the position that discharges water from all water discharge ports to perform a post-wash of the water discharge port 243 portion of the cleansing nozzle 241. The wash water at this time passes through the aperture portion 245a of the nozzle washing chamber 245 and is discharged from the recessed portion 223 into the bowl 101 as discharge.

[0197] As described above, the toilet apparatus according to this embodiment discharges drainage from the recessed portion 223 into the bowl 101 between the timing t2 and the timing t8.

[0198] As described above, according to this embodiment, the recessed portion 223 of the case plate 220 is provided with the outflow water force control plate (protruding wall) 224 that controls the water force of drainage discharged from the interior to the exterior of the casing 200. Therefore, the drainage of the devices disposed in the casing 200 is discharged into the bowl 101 in a state of a controlled water force and therefore is discharged along the bowl inner wall face 101a into the accumulated water 110. Accordingly, even in the case where the flow rate of the drainage is high, the toilet apparatus according to this embodiment can inhibit the drainage from splattering from inside the bowl 101.

[0199] Moreover, the notched portion 225 is provided on the front end portion 223b of the recessed portion 223; and therefore, the drainage from the devices disposed in the casing 200 does not pass along the cleansing nozzle 241, and is discharged along the bowl inner wall face 101a into the accumulated water 110. The toilet apparatus according to this embodiment thereby can inhibit the drainage from splattering from inside the bowl 101.

[0200] Hereinabove, embodiments of the present invention are described. However, the present invention is not limited to these descriptions. In regard to the embodiments described above, appropriate design modifications added by one skilled in the art are included in the scope of the present invention to the extent that the features of the present invention are included. For example, the configurations, dimensions, materials, disposition, etc., of components of the toilet 100, the casing 200, etc., or the disposition methods, etc., of the shutters 221 and 230 are in no way limited to the examples herein and may be appropriately modified.

[0201] Furthermore, the components of the embodiments described above may be combined to the extent of technical feasibility; and such combinations also are included in the scope of the present invention to the extent that the features of the present invention are included.

Industrial Applicability

[0202] According to the present invention, a toilet apparatus is provided to improve the sitting comfort of a toilet seat by downsizing a casing mounted on an upper portion of a toilet while maintaining functions of a local cleansing apparatus.

Claims

1. A toilet apparatus comprising:

a toilet including a bowl, a recess formed on an upper face to communicate with the bowl, and a communicating portion that links the bowl and the recess;
a casing provided above the toilet;
a toilet seat pivotally supported to open and close with respect to the casing;
a cleansing nozzle, at least partially disposed on the recess, that passes through the communicating portion and extends into and retracts from the bowl; and
a shutter, pivotally supported to rotationally move with respect to the casing, that opens the communicating portion when the cleansing nozzle extends and closes the communicating portion when the cleansing nozzle retracts.

2. The toilet apparatus according to claim 1, wherein the casing includes an extended portion provided to extend toward a front of the bowl to cover the shutter from above.

3. The toilet apparatus according to claim 2, wherein:

one of the casing and the shutter includes a bearing portion that holds a shaft;
the other of the casing and the shutter includes a pivotal support portion that supports the shaft held by the bearing portion; and
the bearing portion and the pivotal support portion are provided below the extended portion and are covered by the extended portion from above.

4. The toilet apparatus according to either of claims 2 or 3, wherein the toilet further includes a stepped recess portion connected to an inner wall face of the bowl.

5. The toilet apparatus according to either of claims 2 or 3, wherein the shutter includes a protruding wall on a back face facing the communicating portion, the protruding wall extending toward the communicating portion.

6. The toilet apparatus according to claim 1, further comprising:

a warm air drying apparatus including a warm air duct provided with a jet outlet on a tip, a warm air fan that communicates with the warm air duct, and a heater disposed in the warm air duct;
the recess being provided on a central rear portion of a rim of the toilet;
the warm air duct extending in an interior of the casing, from a side of the cleansing nozzle stored in the recess, over the cleansing nozzle toward the bowl; and
the jet outlet being provided more proximal to the bowl than is the cleansing nozzle in a state of being stored in the recess.

7. The toilet apparatus according to claim 6, wherein at least a portion of the warm air fan is disposed below an upper face of the toilet.

8. The toilet apparatus according to claim 6, further comprising:

a deodorizing apparatus including a deodorizer duct provided with an intake port proximal to a tip, a deodorizing air fan, and a deodorizing catalyst;
the intake port being provided distal to the jet outlet of the warm air drying apparatus; and
the deodorizer duct being provided not to overlay with the warm air duct in a vertical direction proximal to the intake port.

9. The toilet apparatus according to claim 1, further comprising
an open tank connected to a supply water path to the cleansing nozzle and capable of passing water into an interior, the open tank including:

a flow inlet that allows water to flow into an interior of the open tank;
a flow outlet that allows water of an interior of the open tank to flow out to the cleansing nozzle; and
a drainage port that allows overflow water to flow out from an interior of the open tank;

the overflow water flowing out through the drainage port of the open tank being introduced into the recess.

10. The toilet apparatus according to claim 1, further comprising
an open tank connected to a supply water path to the cleansing nozzle and capable of passing water into an interior, the open tank including:

a flow inlet that allows water to flow into an interior of the open tank;
a flow outlet that allows water of an interior of the open tank to flow out to the cleansing nozzle; and
a drainage port that allows overflow water to flow out from an interior of the open tank;

the casing including a recessed portion that covers the cleansing nozzle from below while being inserted into the recess; and
the overflow water flowing out through the drainage port of the open tank being introduced into the recessed portion.

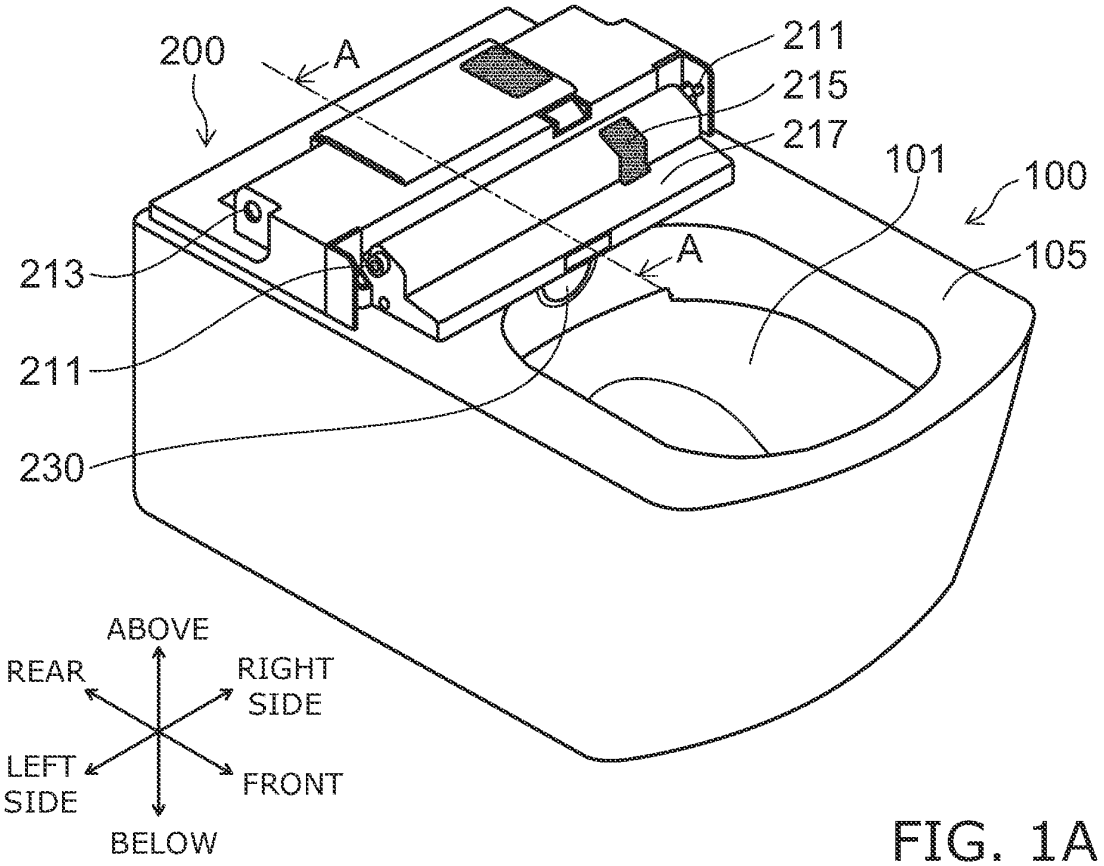
11. The toilet apparatus according to claim 1 , wherein:

the casing includes a case plate having a recessed portion formed in a configuration recessed downward; and
the recessed portion is stored in a recess of the toilet, discharges drainage from devices disposed in the case plate into the bowl, and includes a protruding wall that controls a water force of the drainage.

12. The toilet apparatus according to claim 11, wherein a front end of the recessed portion does not protrude from an inner wall face of the bowl.

13. The toilet apparatus according to either of claims 11 or 12, wherein
the recessed portion is inclined to become lower from a rear end portion toward a front end portion, and
the protruding wall is disposed proximal to the front end portion.

14. The toilet apparatus according to either of claims 11 or 12, wherein the recessed portion further includes a notched portion formed in the front end portion.


200
A
211
215
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101
100
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230
A
ABOVE
REAR
RIGHT SIDE
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BELOW

FIG. 1A

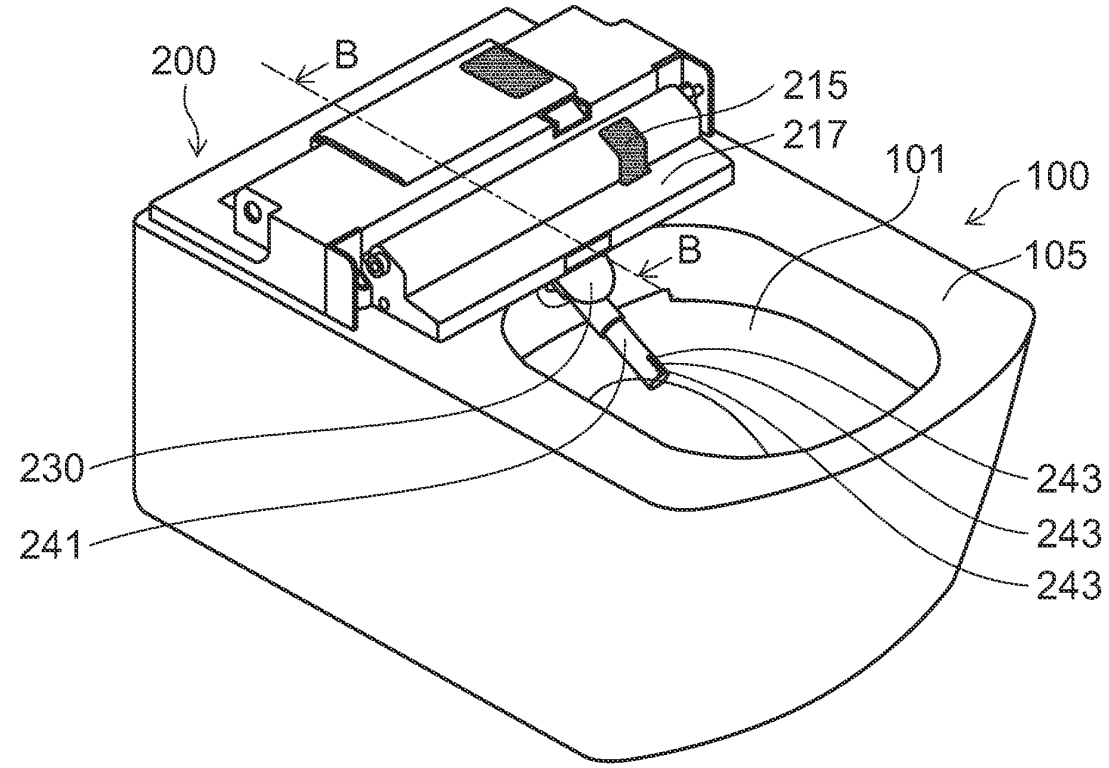

200
B
215
217
101
100
105
B
230
241
243
243
243

FIG. 1B

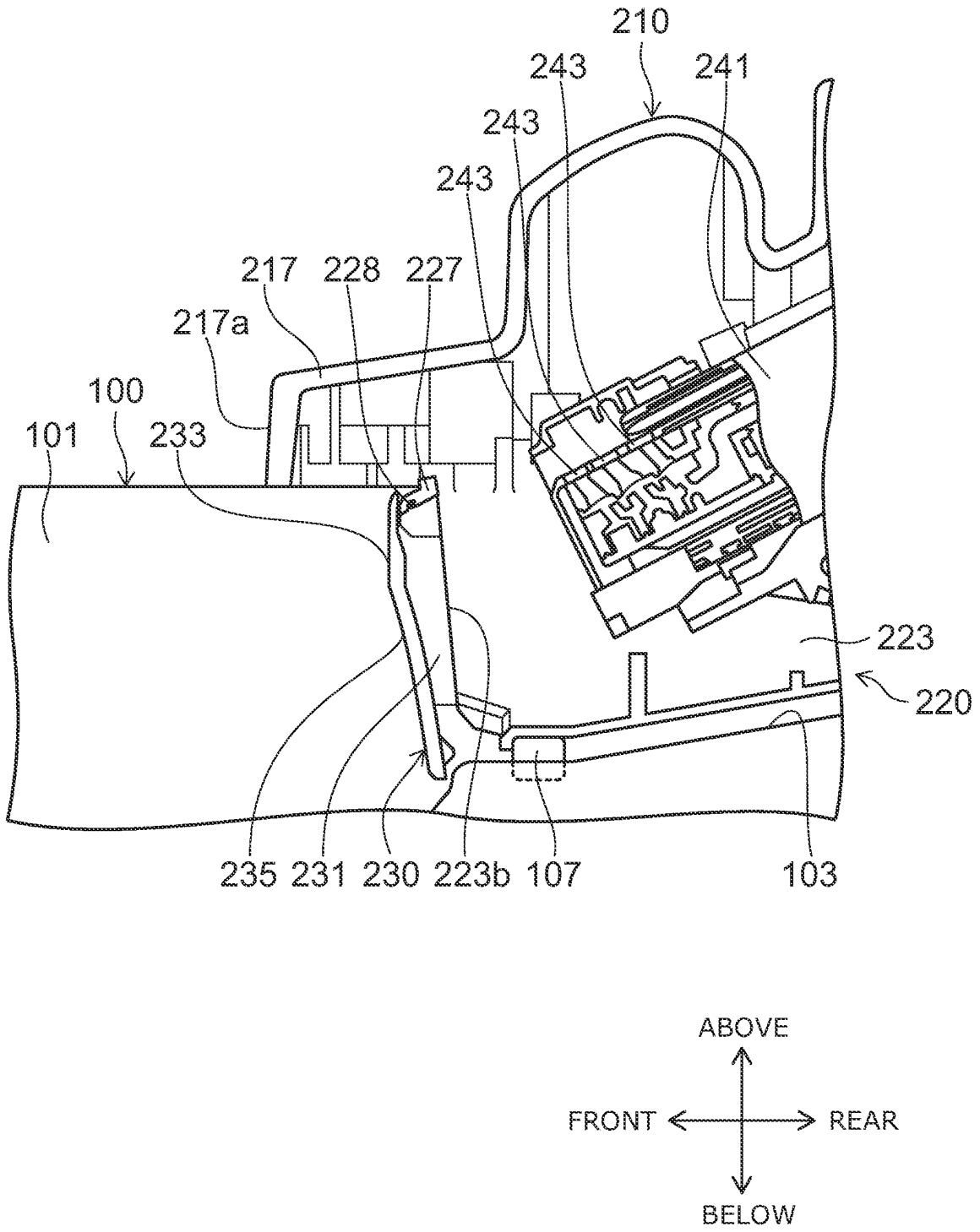

210
243
241
243
243
217
228
227
217a
100
101
233
223
220
235
231
230
223b
107
103
ABOVE
FRONT
REAR
BELOW

FIG. 2

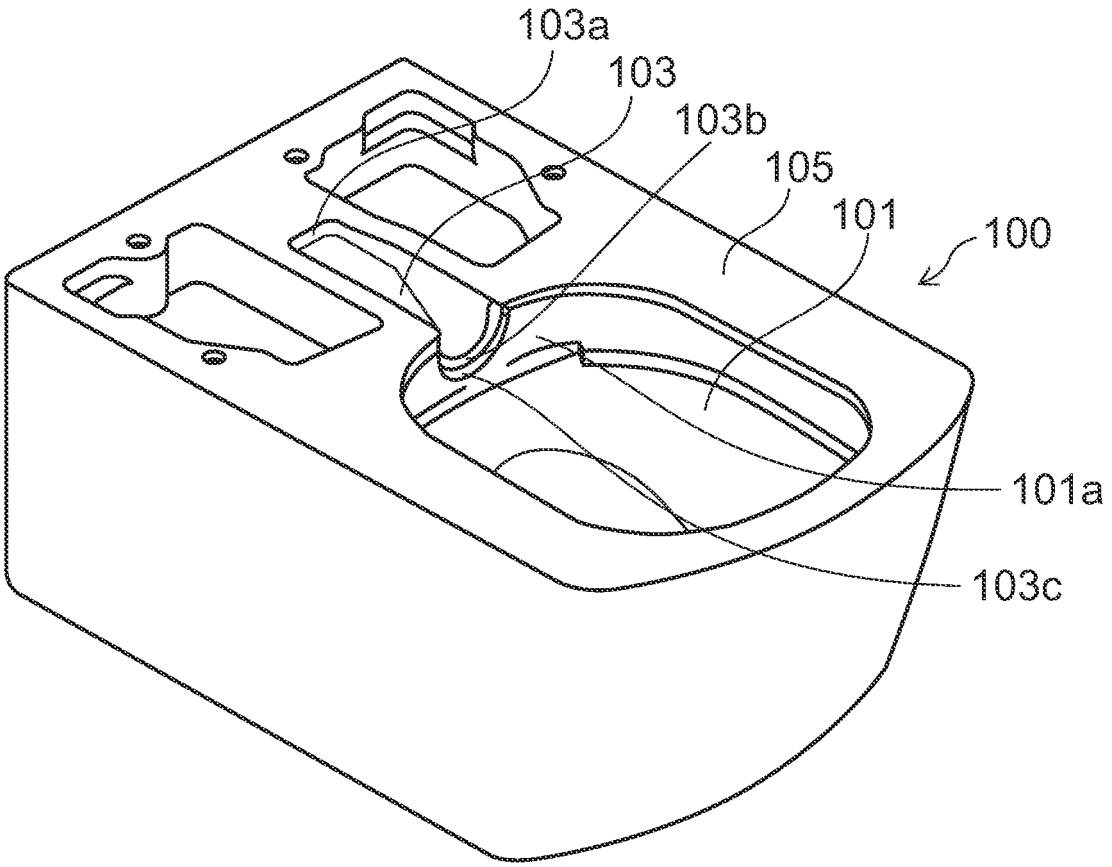


FIG. 3

FIG. 4A

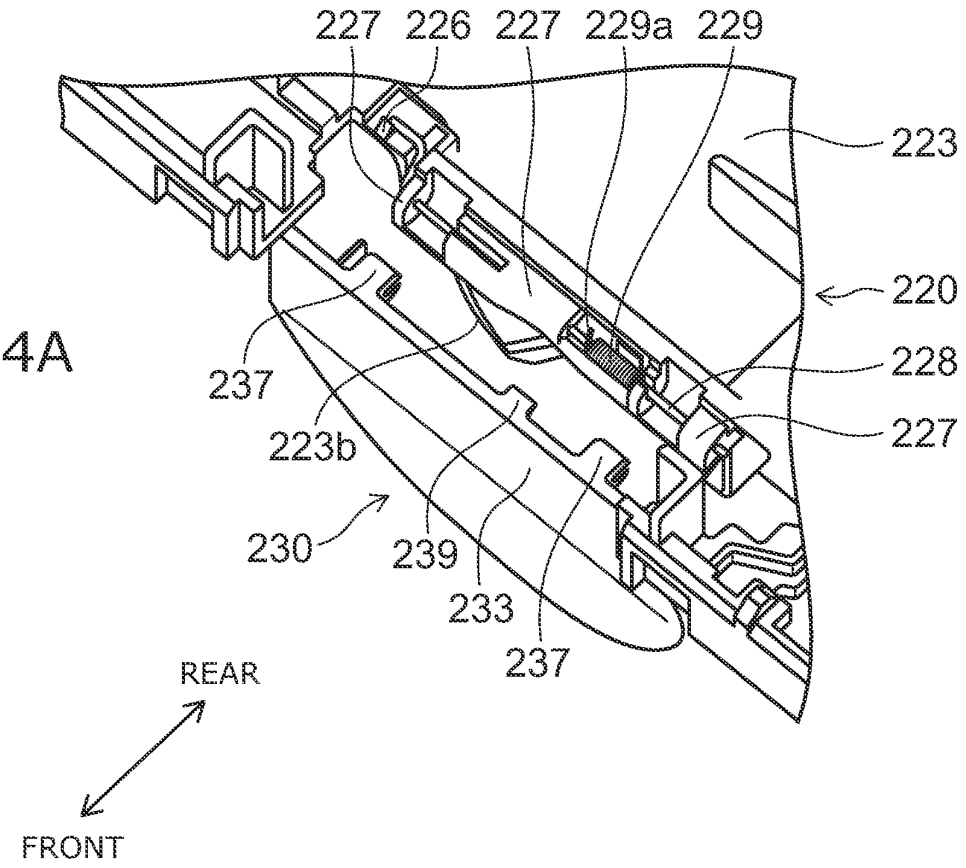
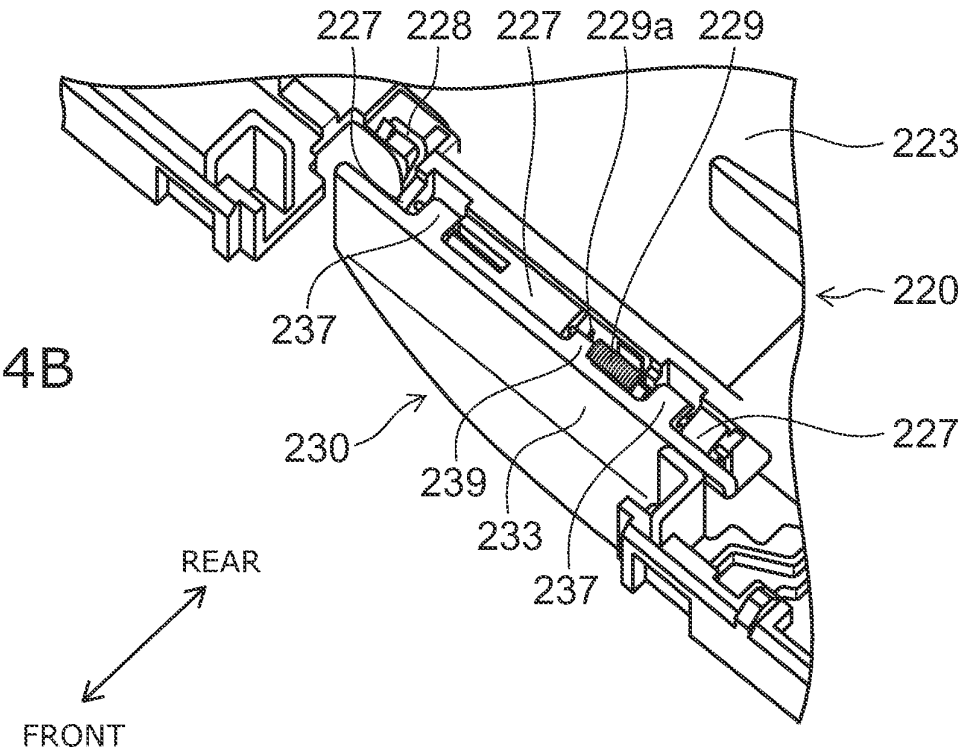

227
226
227
229a
229
223
220
228
227
237
223b
230
239
233
237
REAR
FRONT

FIG. 4B


227
228
227
229a
229
223
220
237
230
239
233
237
227
REAR
FRONT

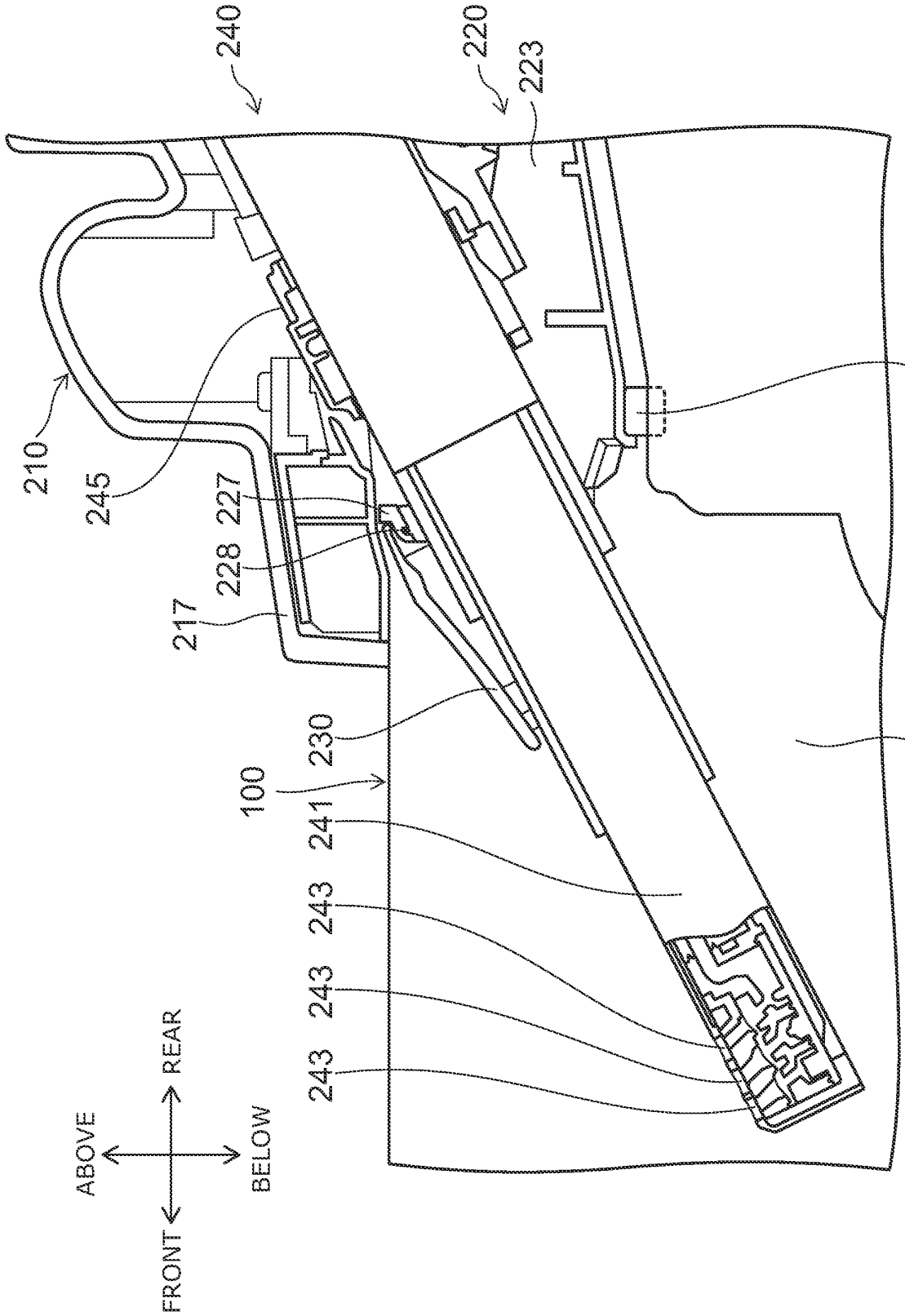

240
220
223
210
245
227
228
217
230
100
241
243
243
243
107
101
ABOVE
REAR
BELOW
FRONT

FIG. 5

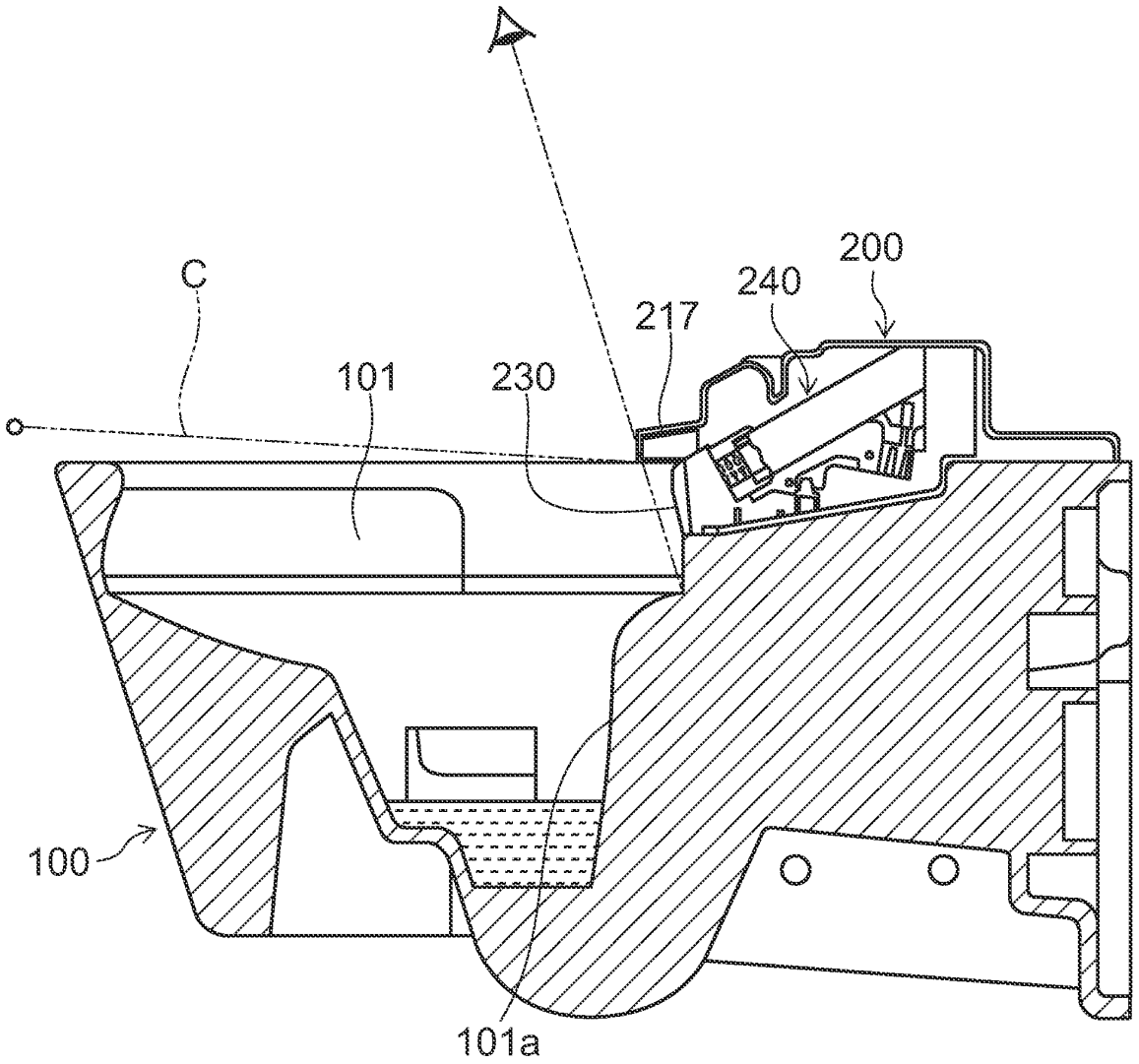


FIG. 6

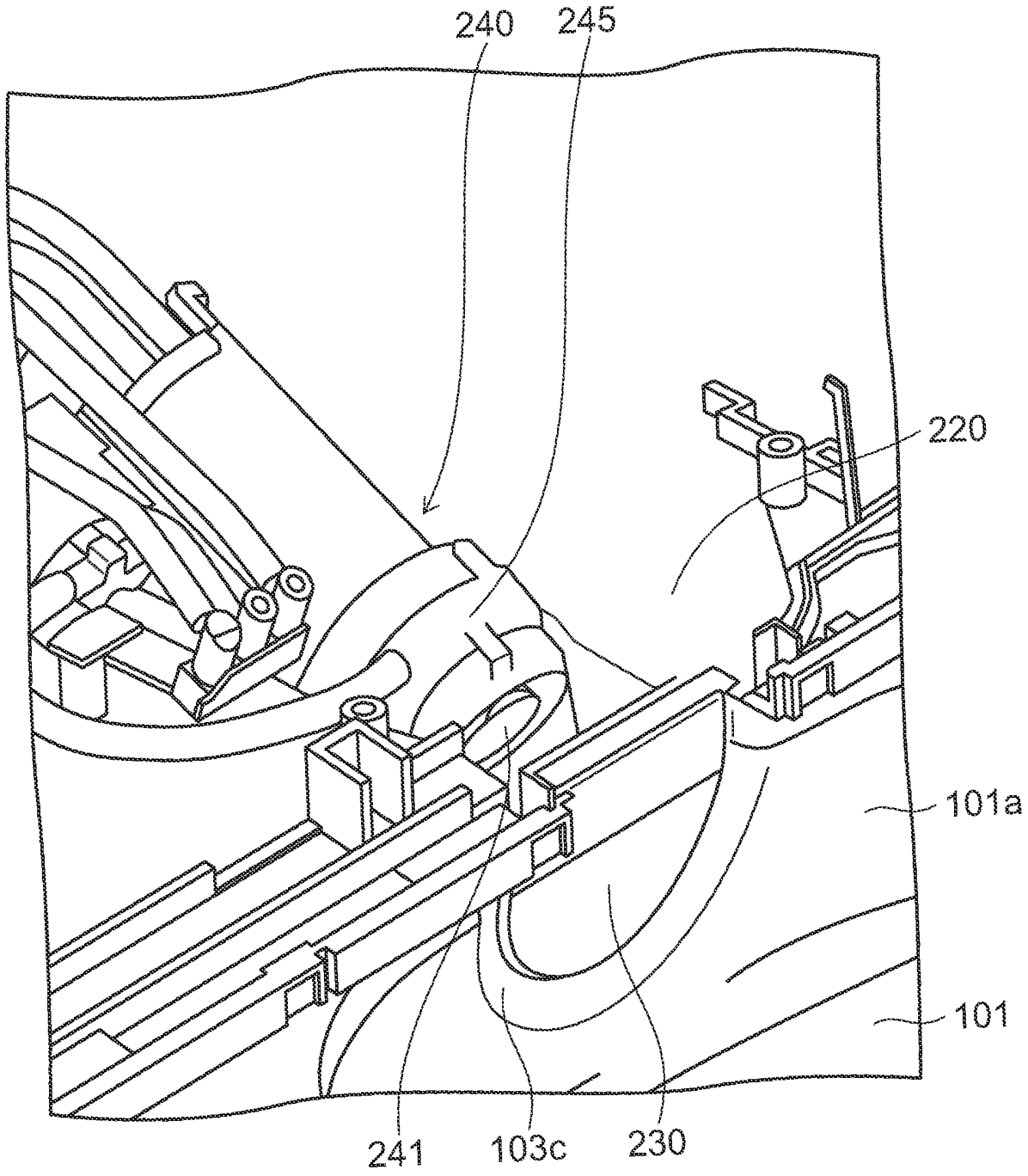


FIG. 7

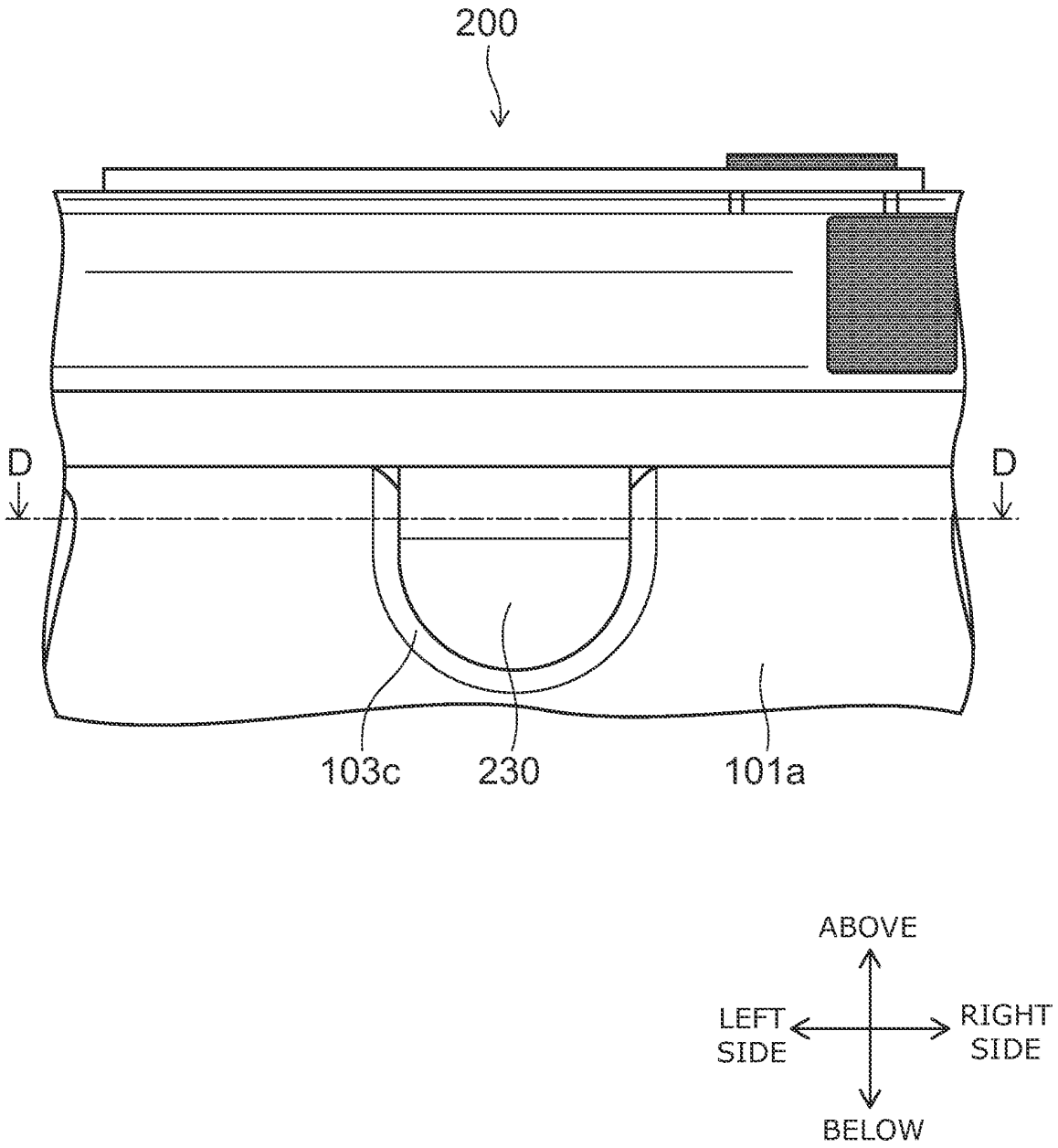


FIG. 8

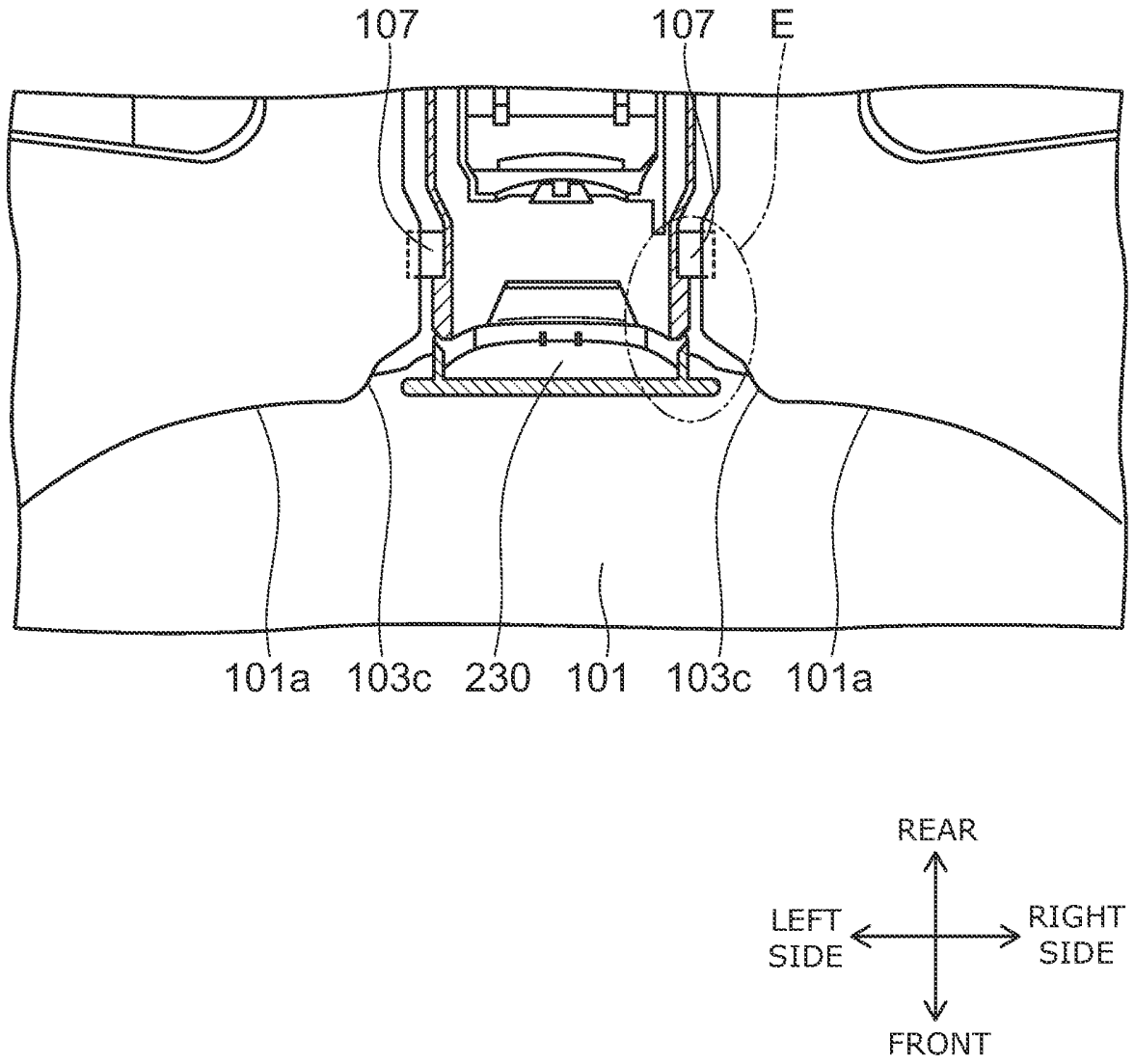

107
107
E
101a
103c
230
101
103c
101a
REAR
LEFT SIDE
RIGHT SIDE
FRONT

FIG. 9

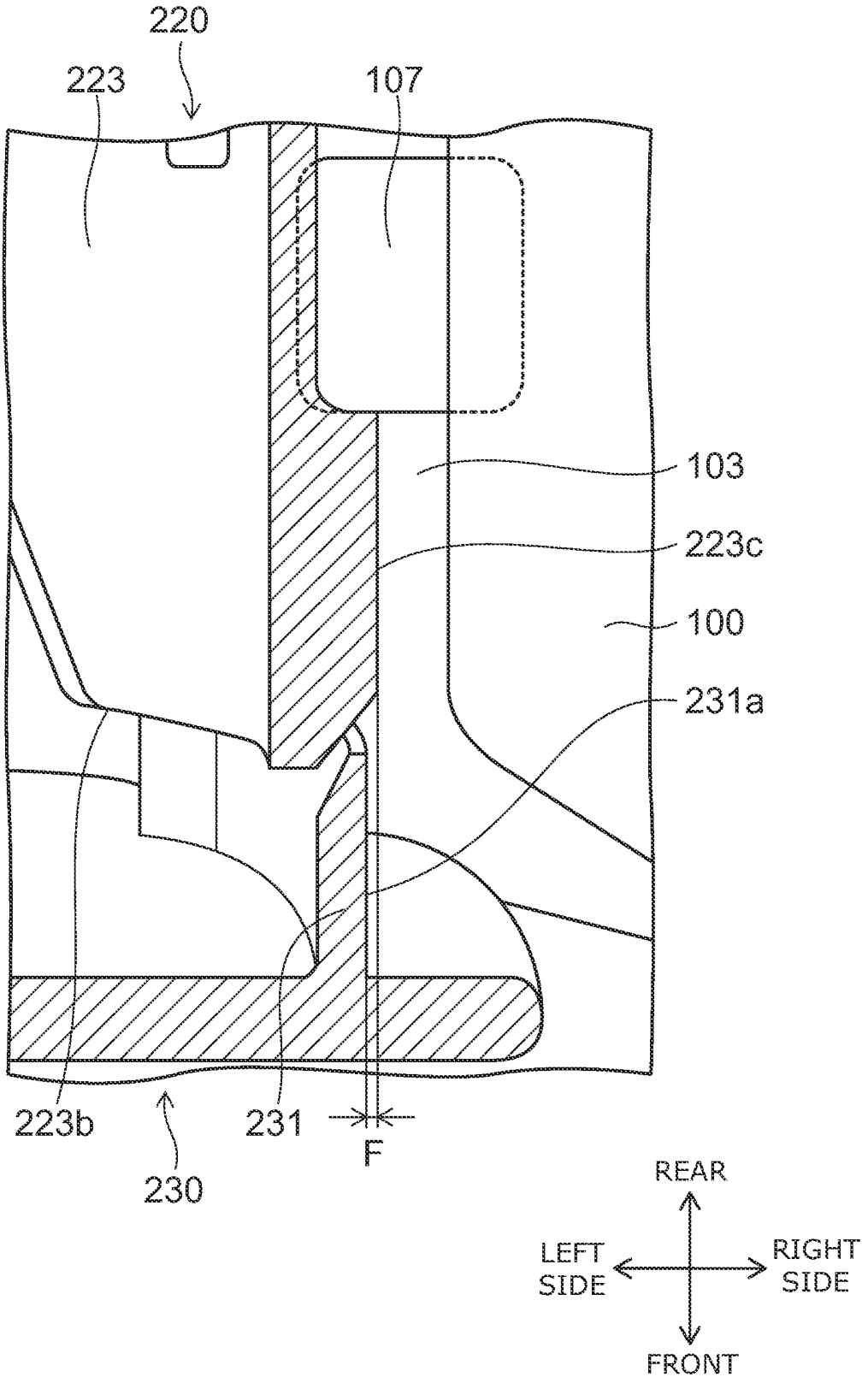
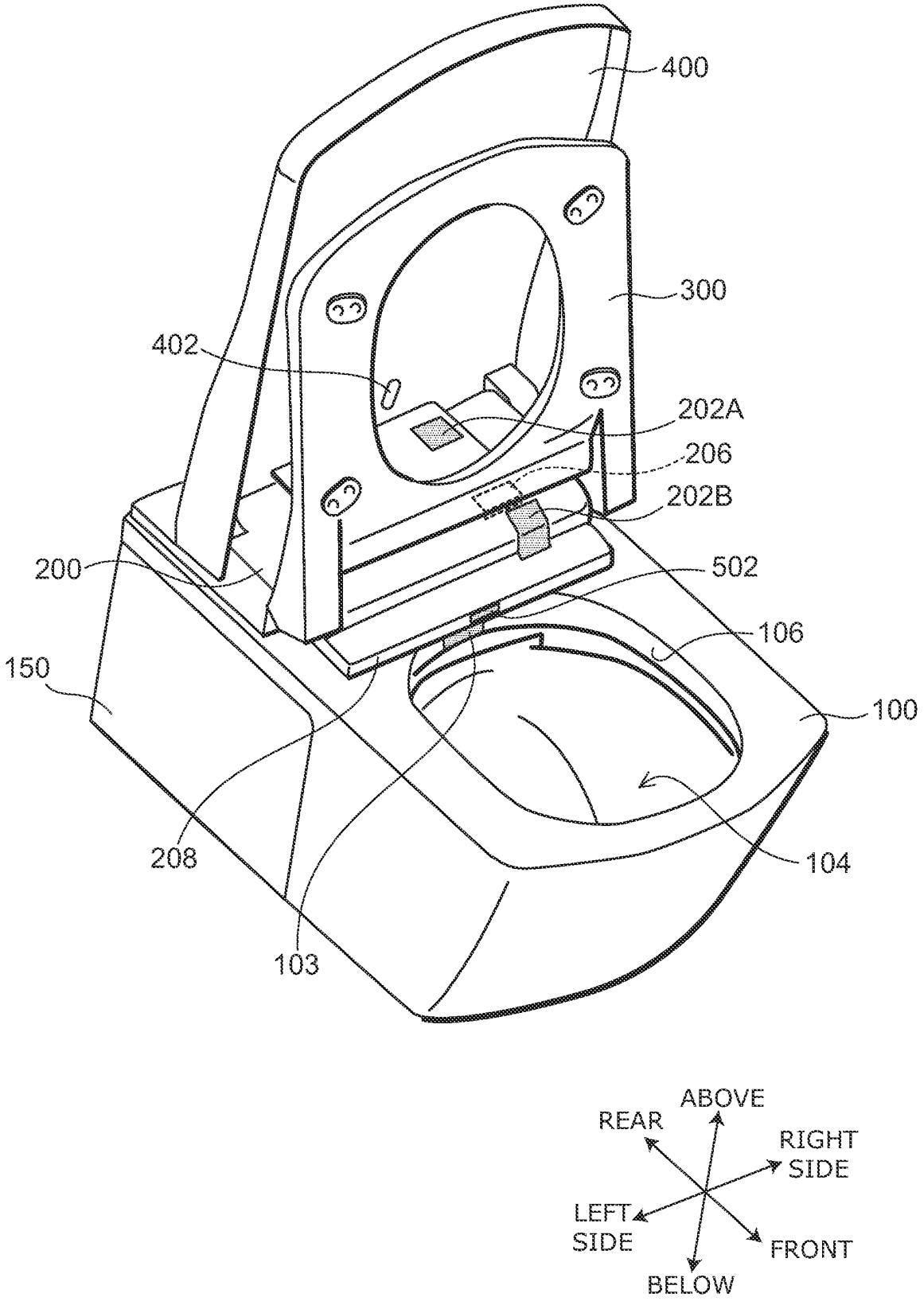

220
223
107
103
223c
100
231a
223b
230
231
F
REAR
LEFT SIDE
RIGHT SIDE
FRONT

FIG. 10


400
300
402
202A
206
202B
200
502
106
150
100
208
104
103
ABOVE
REAR
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LEFT SIDE
FRONT
BELOW

FIG. 11

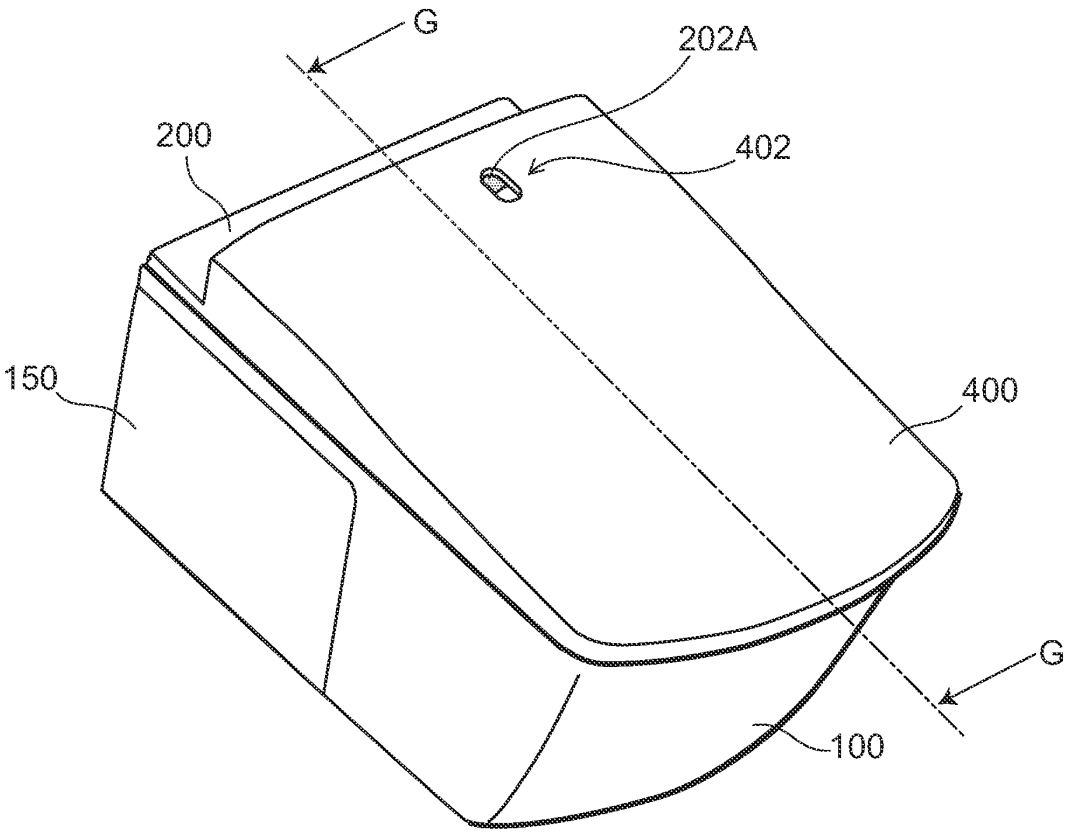


FIG. 12

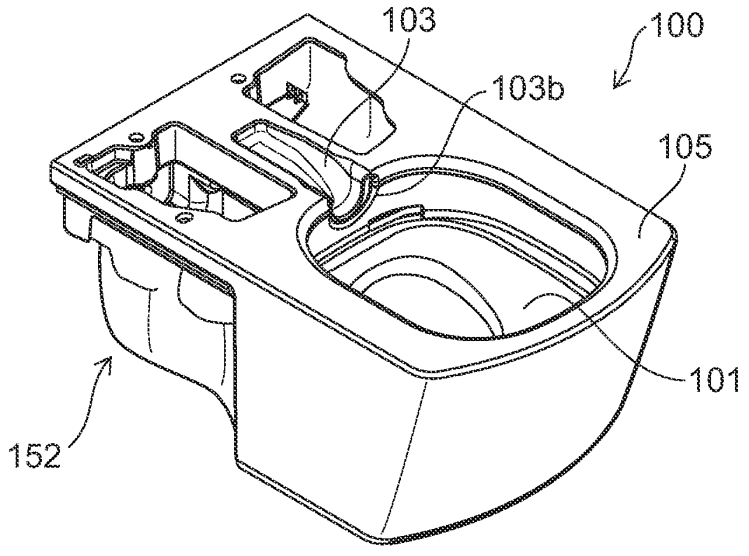
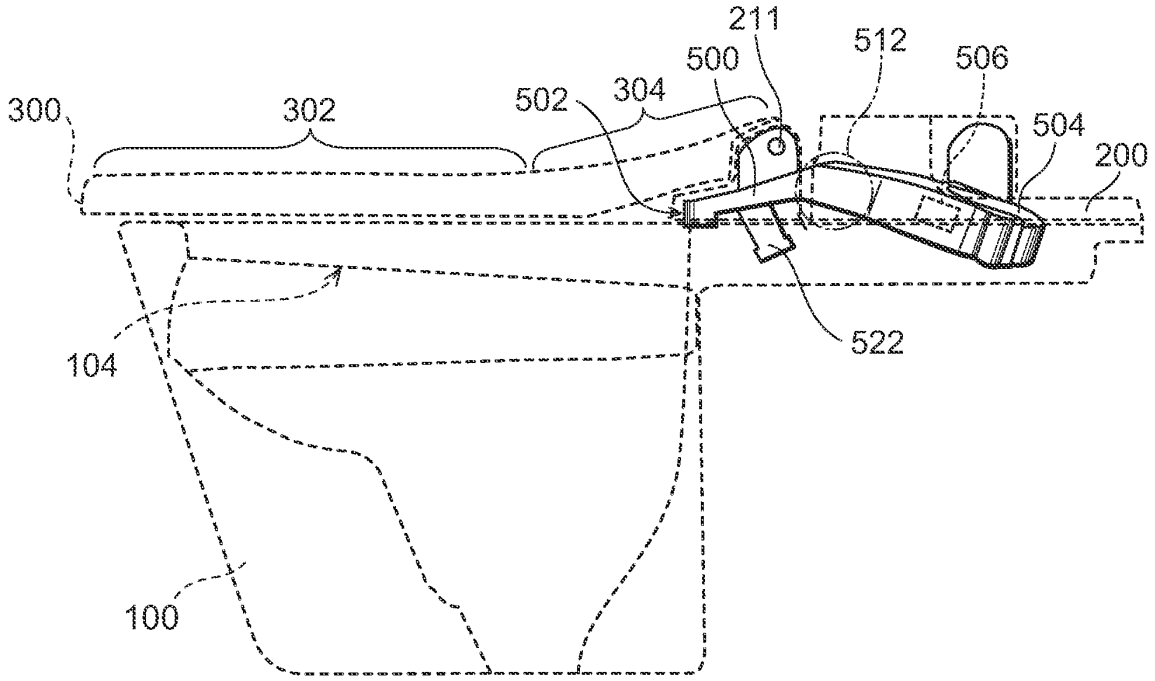


FIG. 13


211
512
500
506
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304
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302
504
200
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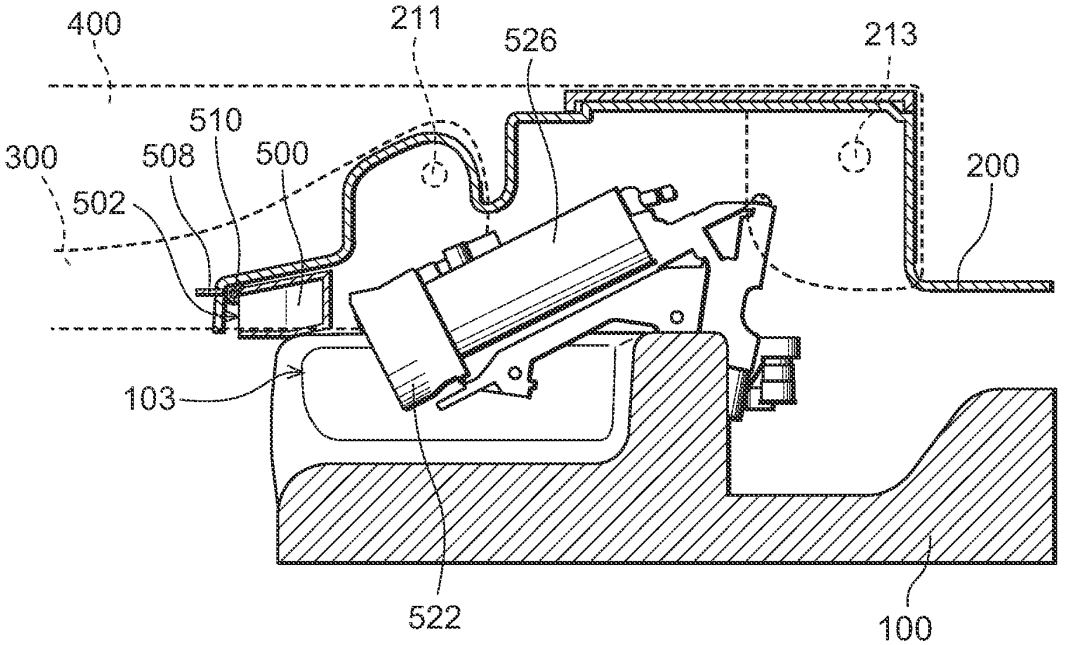
522
100

FIG. 14


400
211
526
213
510
300
508
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200
502
103
522
100

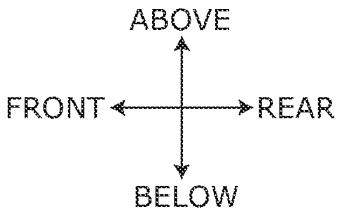
ABOVE
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FIG. 15

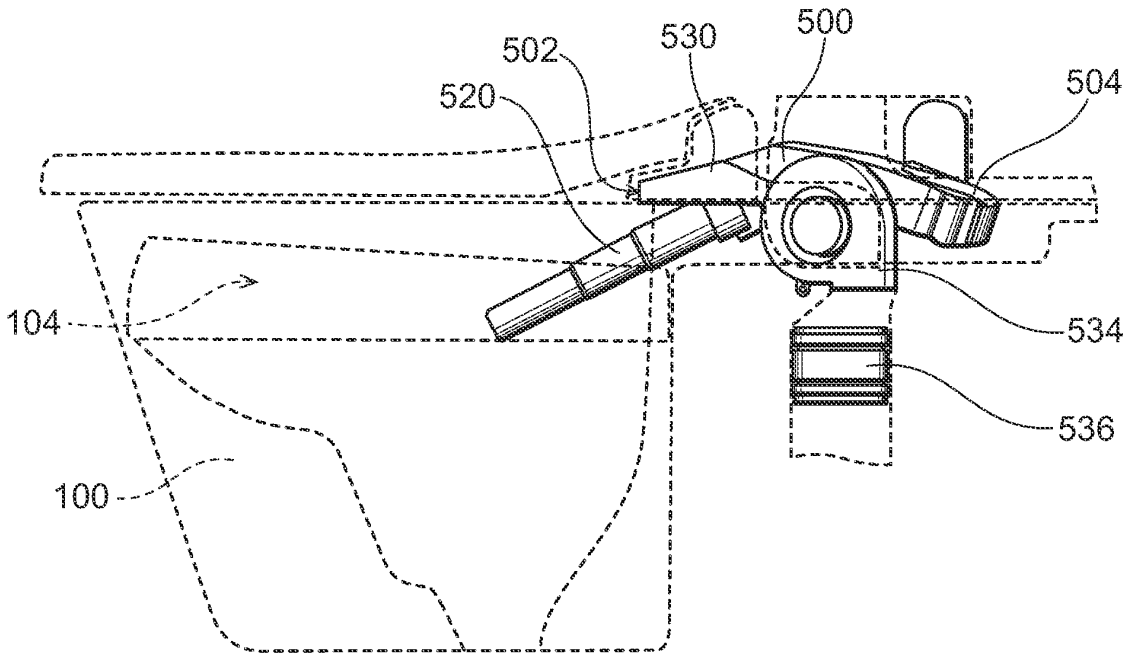
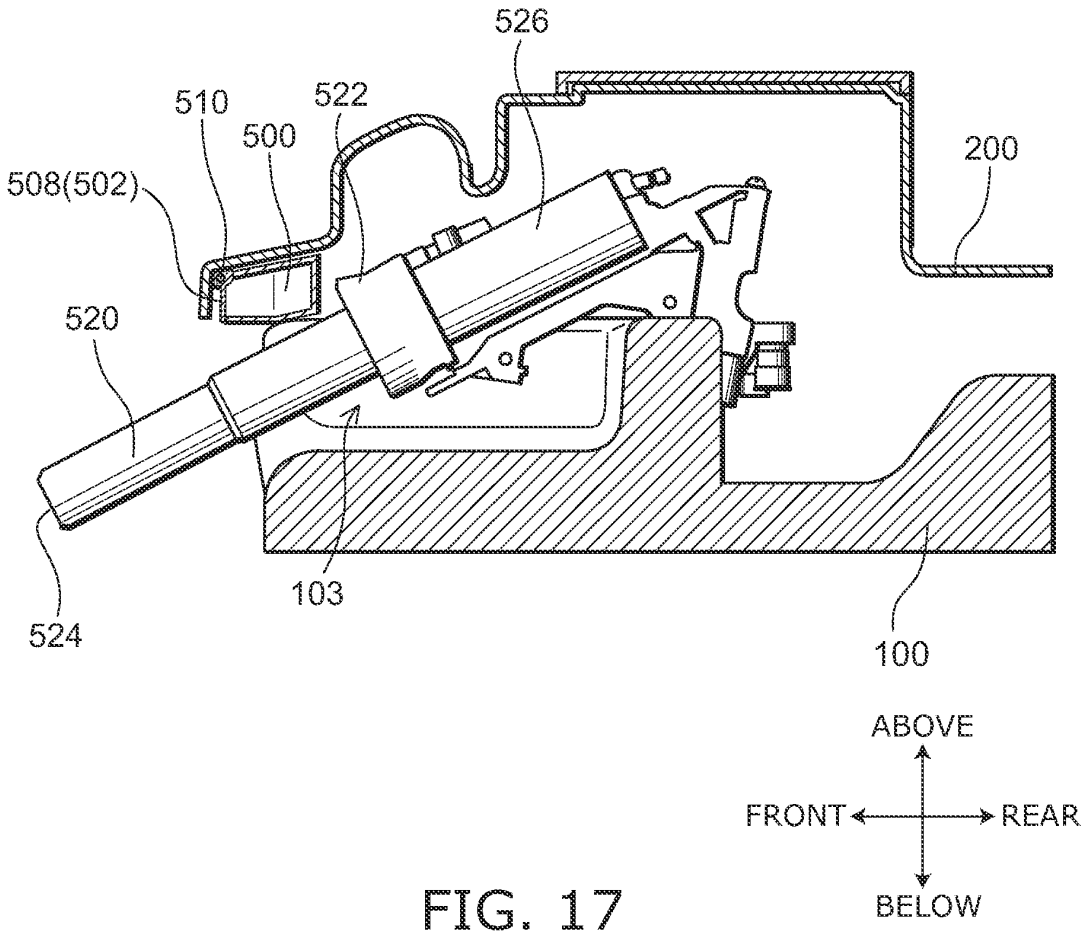

502
530
500
504
520
104
534
536
100

FIG. 16


526
510
522
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200
508(502)
520
103
524
100
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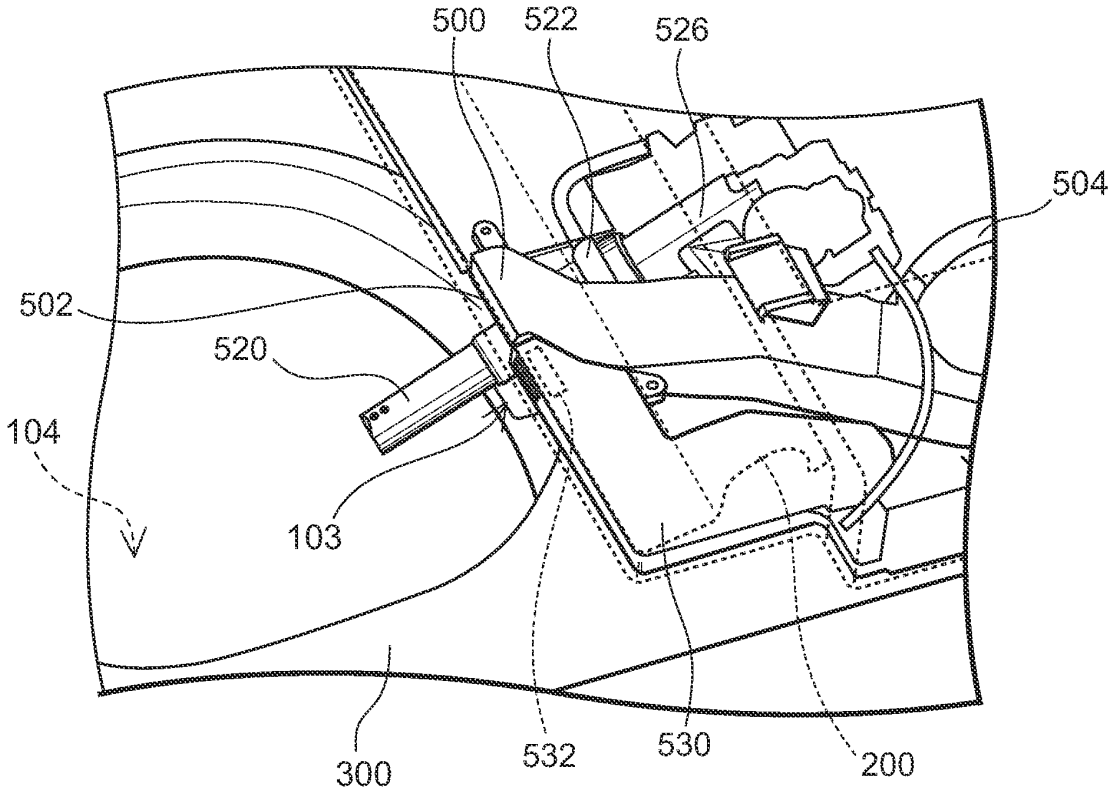
BELOW

FIG. 17


500
522
526
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103
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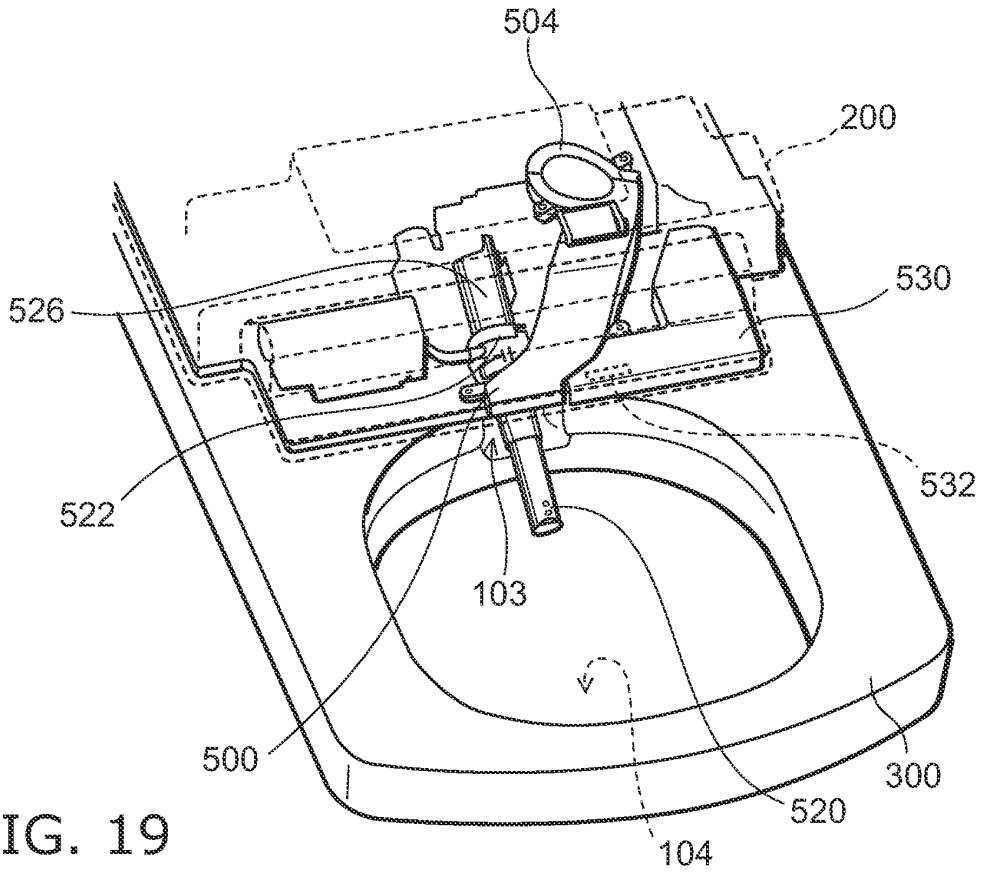
532
530
200

FIG. 18


504
200
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532
522
103
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104

FIG. 19

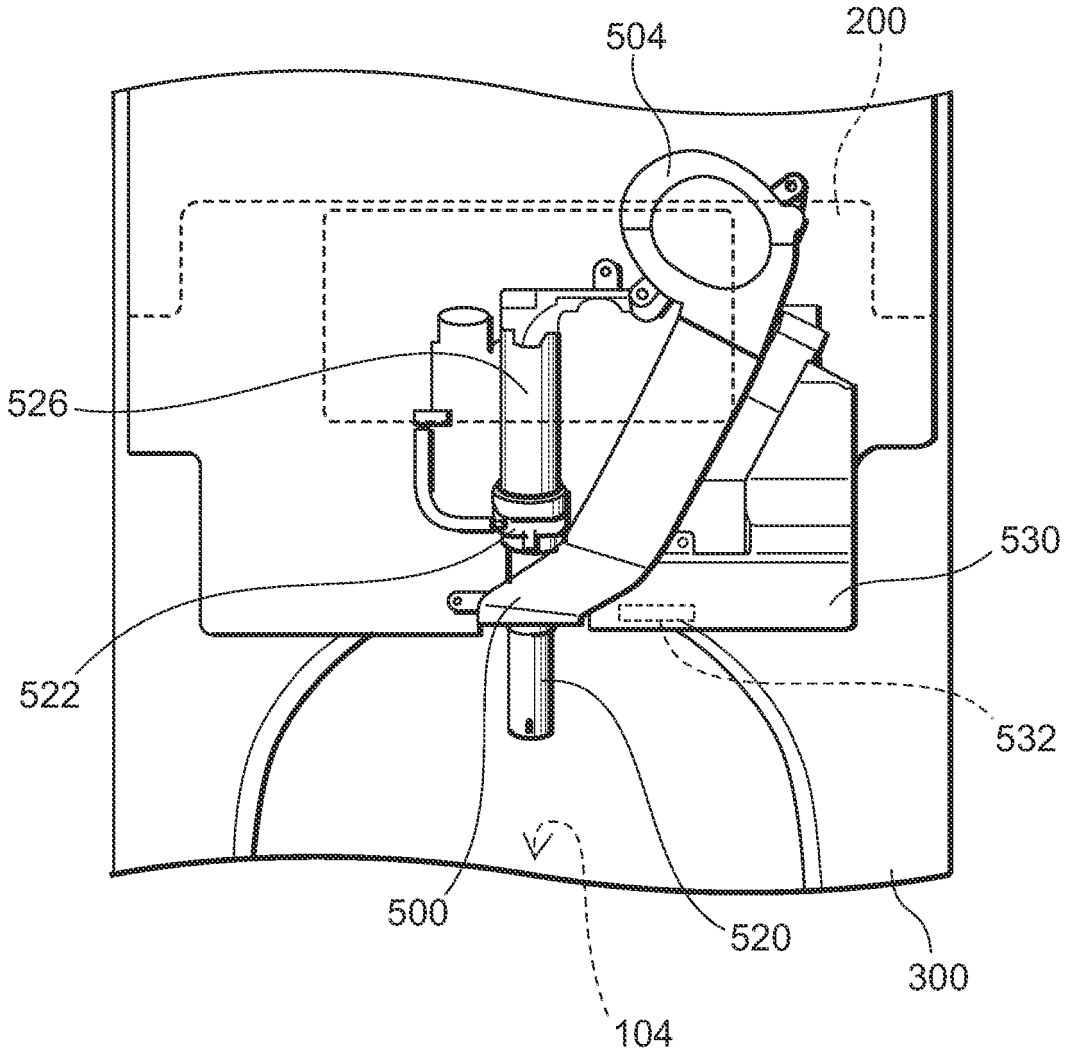

FIG. 20

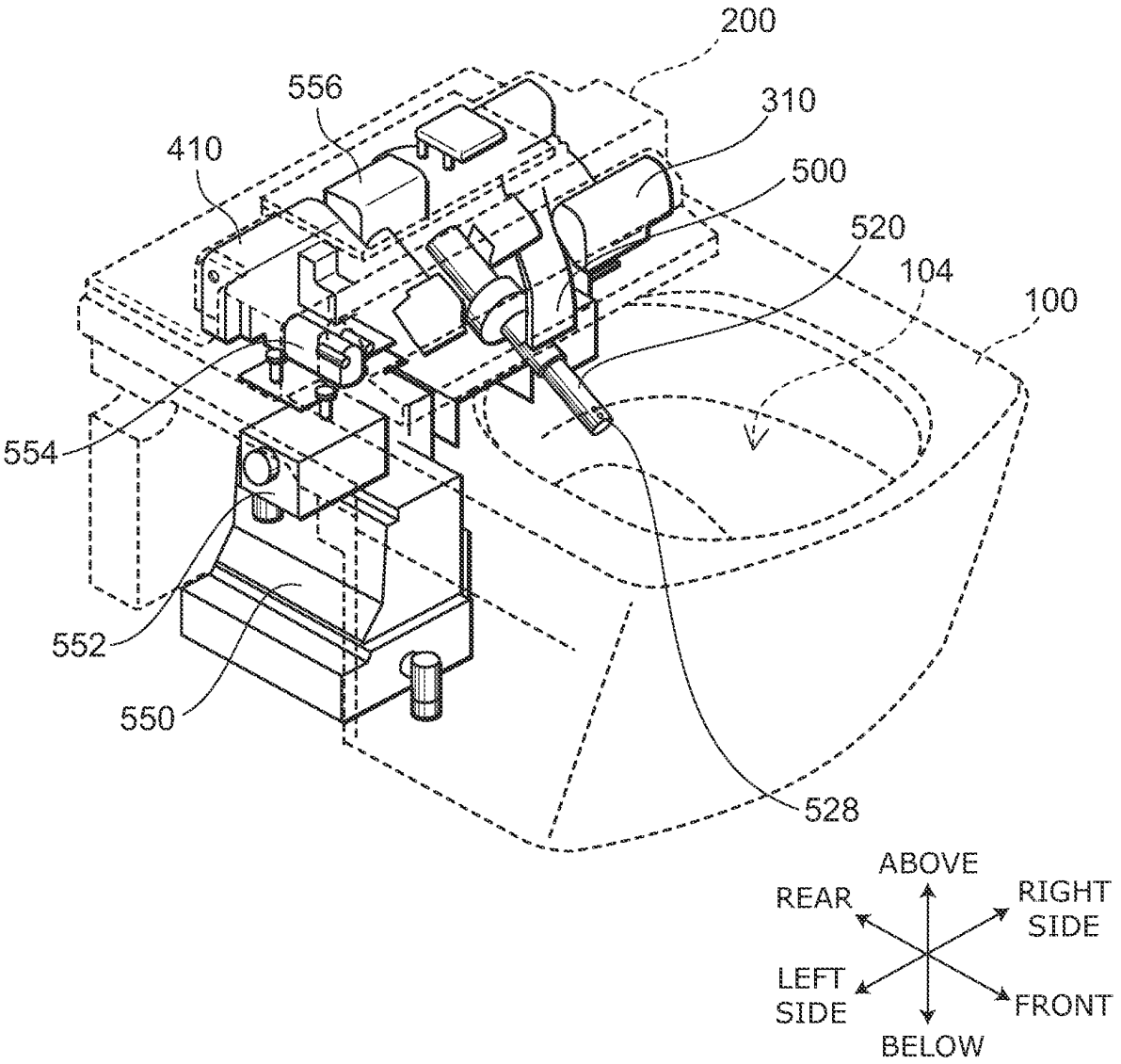
200
556
310
410
500
520
104
100
554
552
550
528
ABOVE
REAR
RIGHT SIDE
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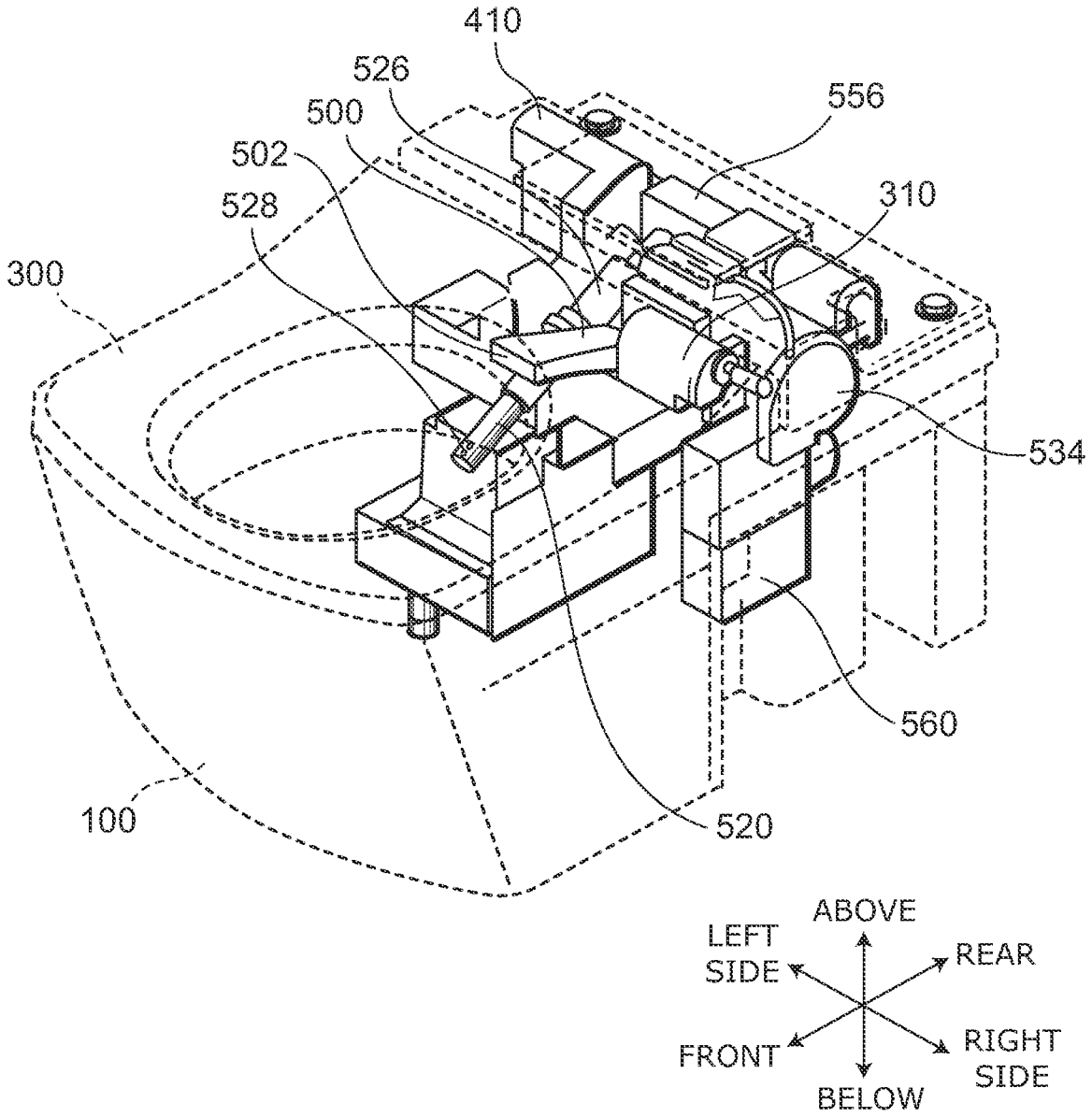
FIG. 21


410
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BELOW

FIG. 22

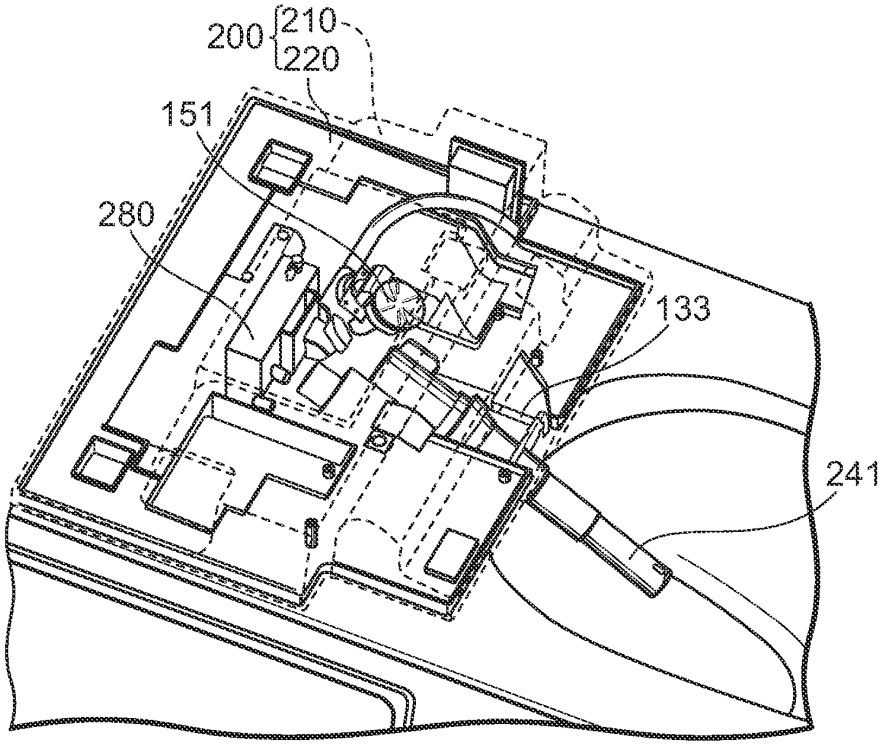


FIG. 23A

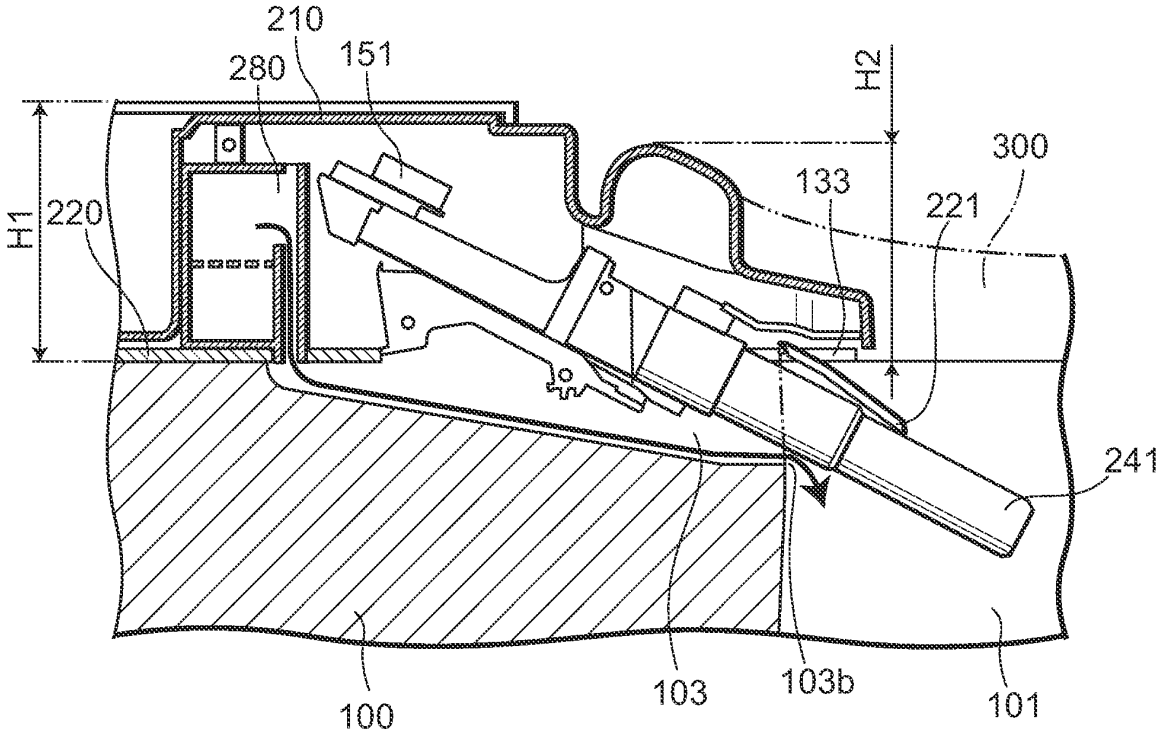
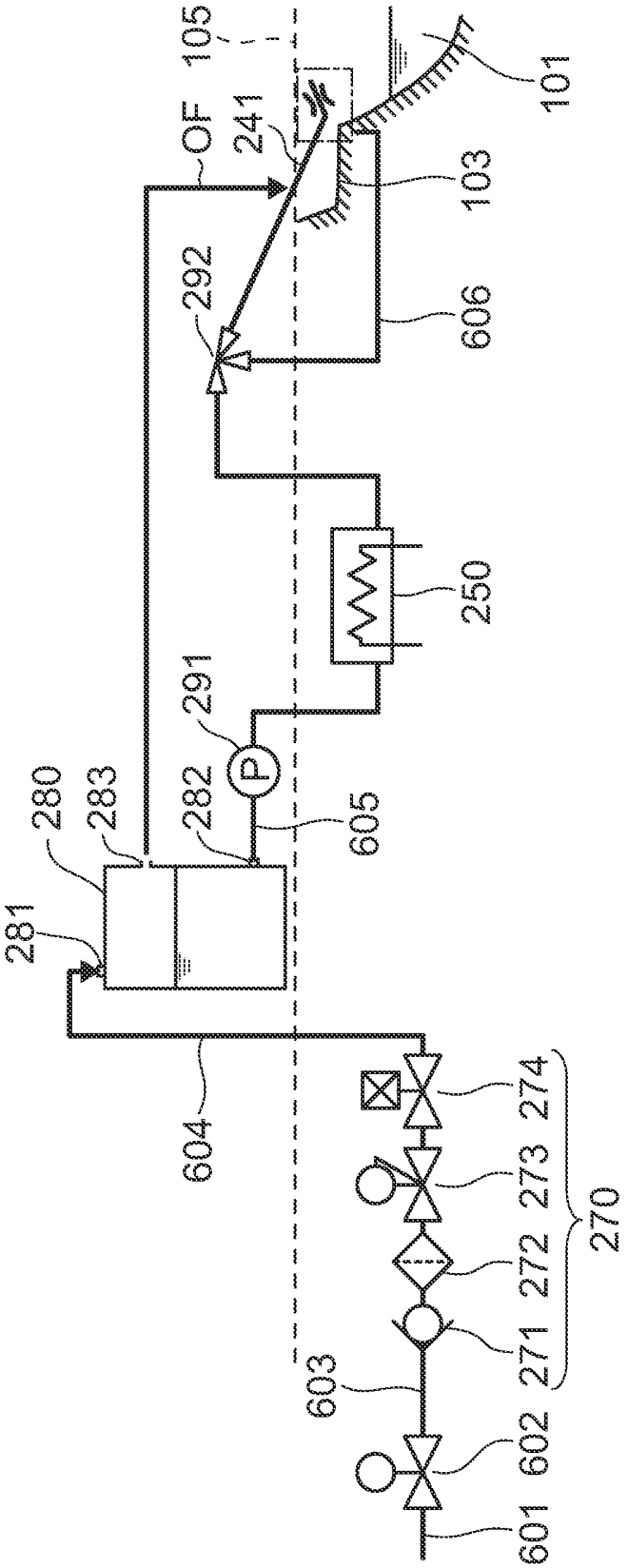


FIG. 23B


105
OF
241
101
103
292
606
250
291
P
280
283
282
605
281
604
274
273
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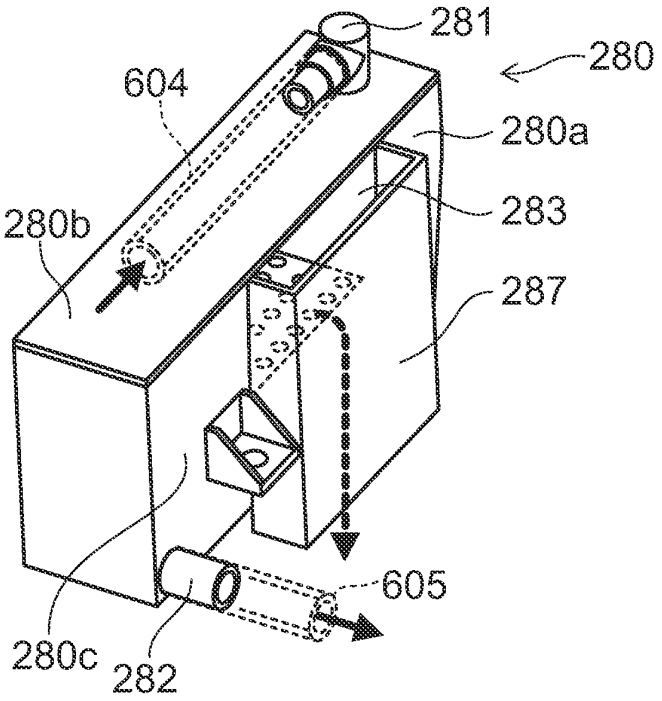
271
270
603
602
601

FIG. 24

FIG. 25A



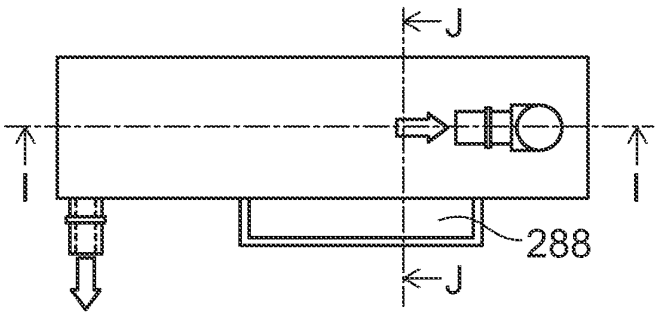


FIG. 25B

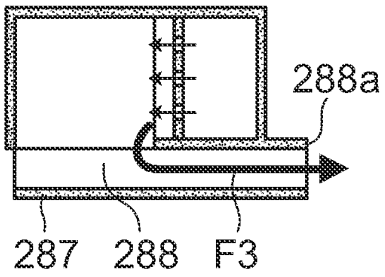


FIG. 25D

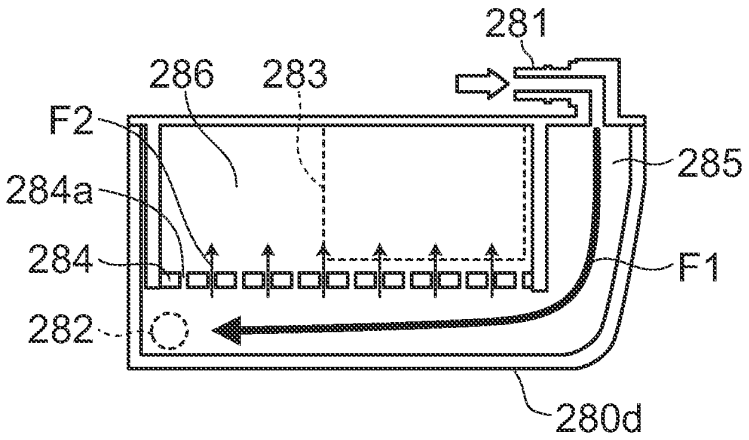


FIG. 25C

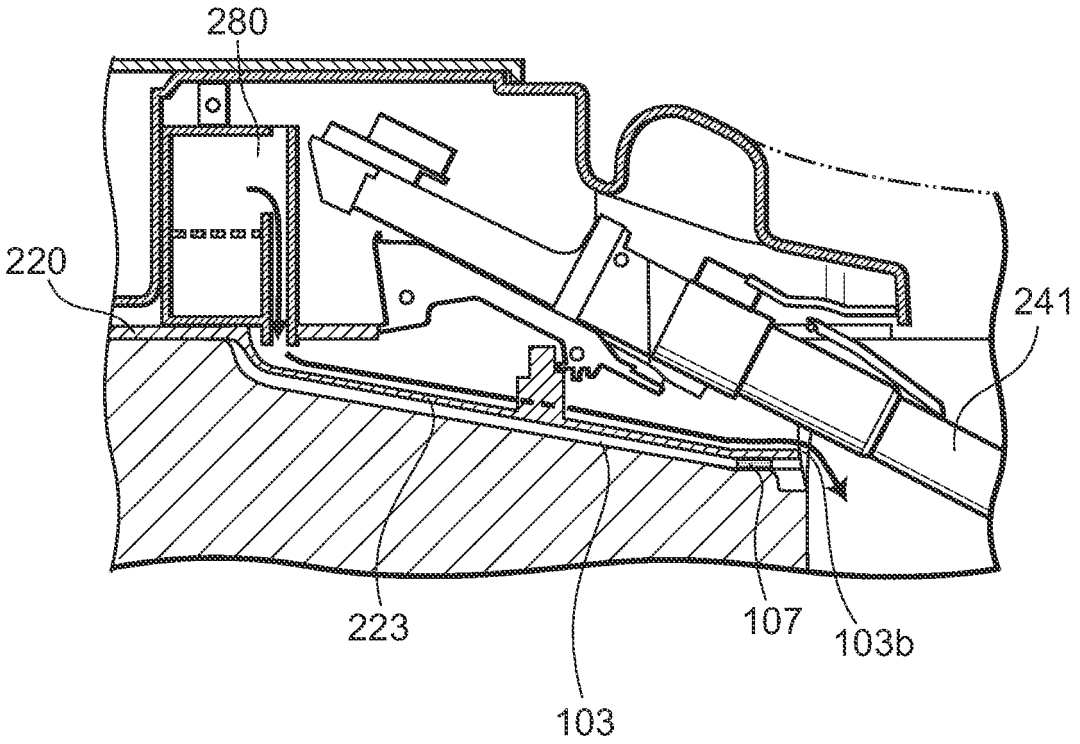


FIG. 26

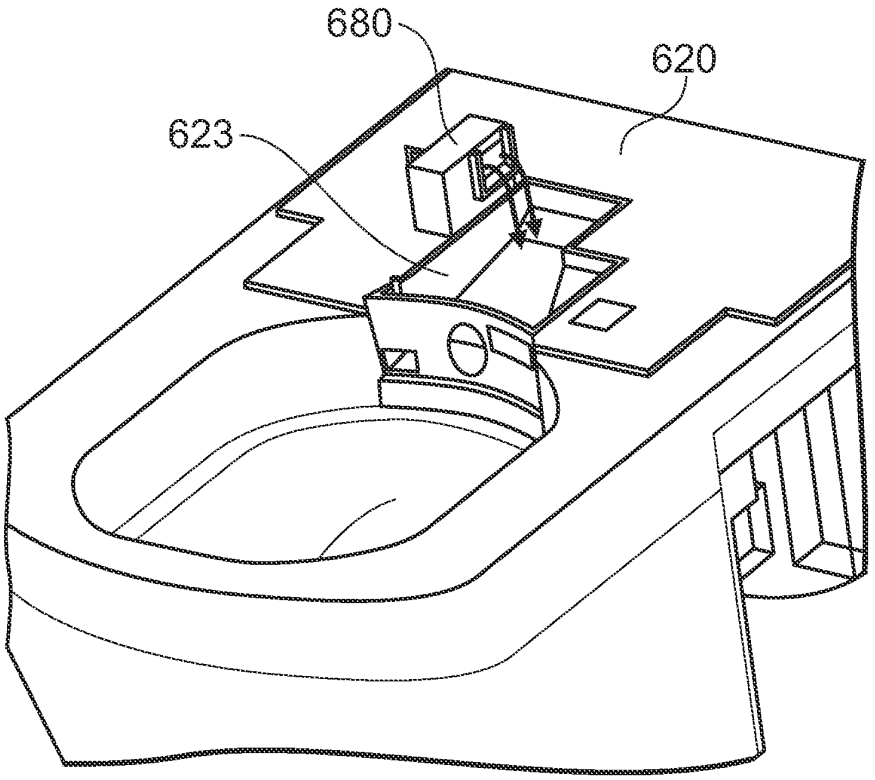


FIG. 27A

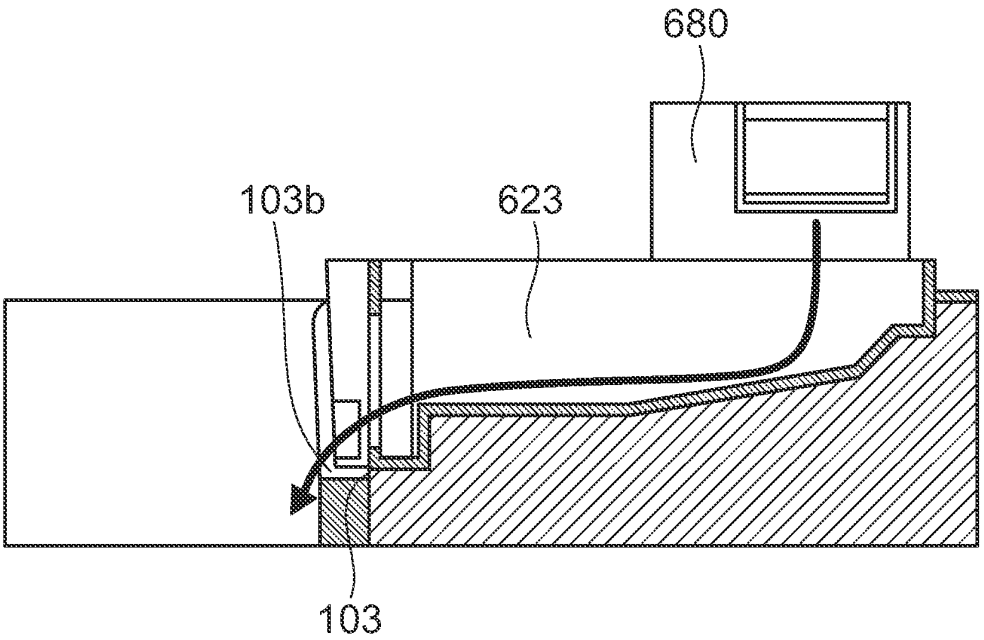


FIG. 27B

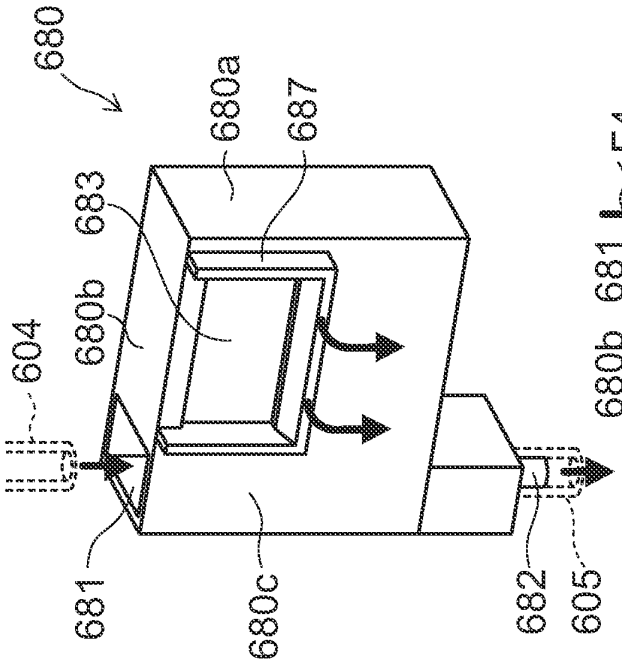


FIG. 28A

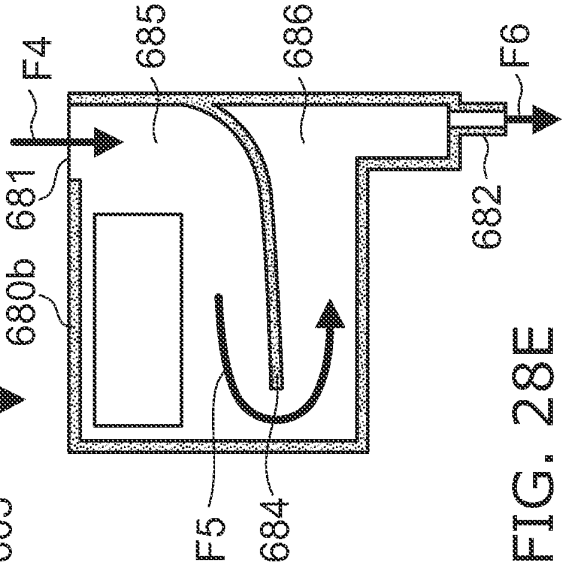


FIG. 28E

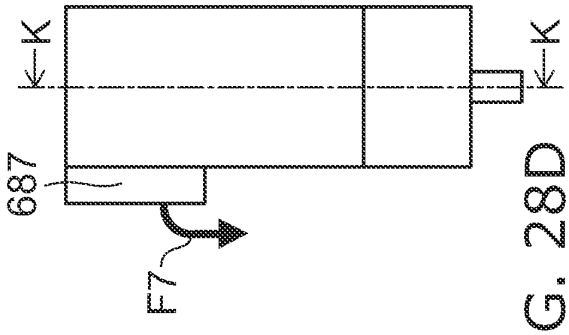


FIG. 28D

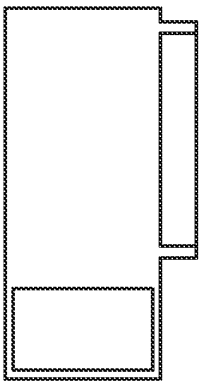


FIG. 28B

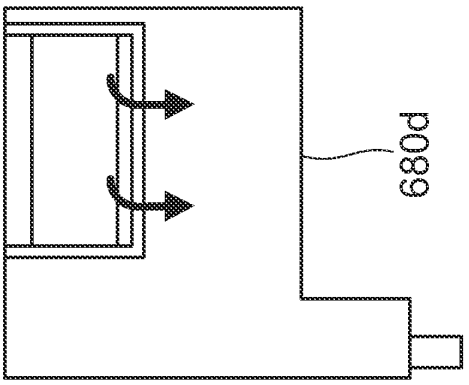


FIG. 28C

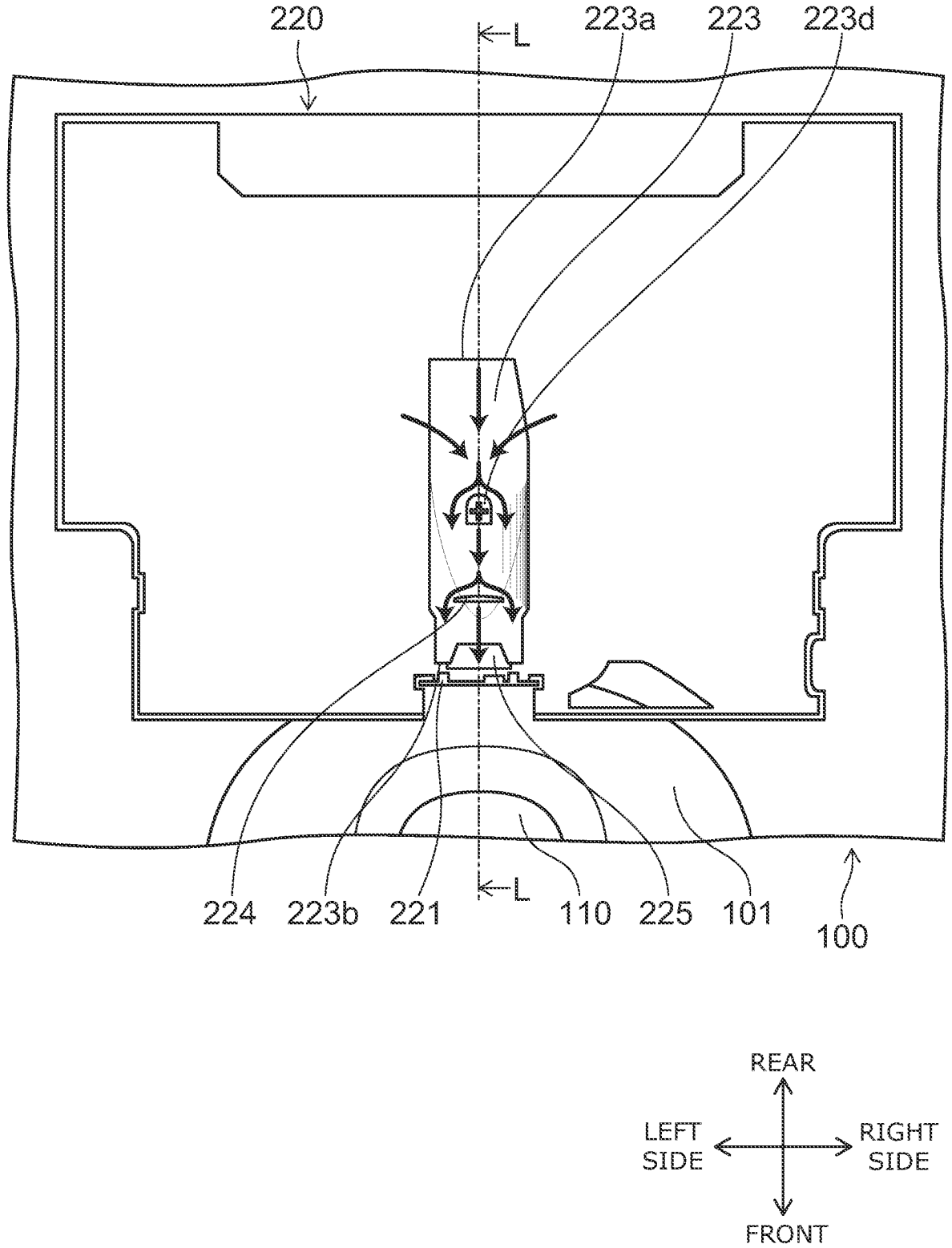

220
L
223a
223
223d
224
223b
221
L
110
225
101
100
REAR
LEFT SIDE
RIGHT SIDE
FRONT

FIG. 29

FIG. 30A

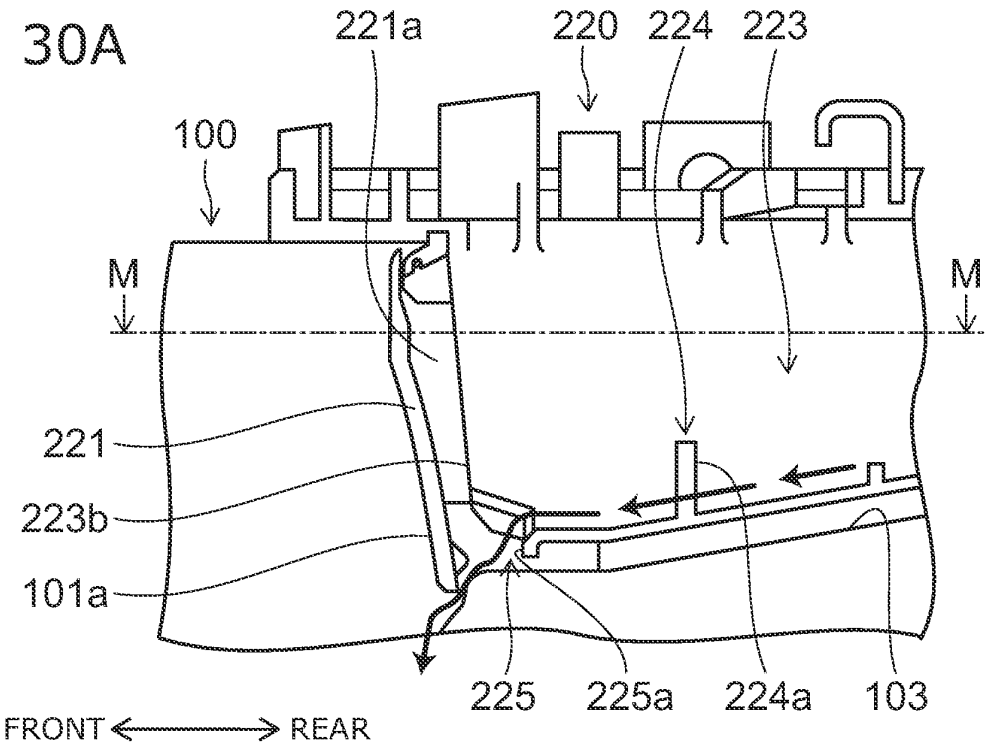
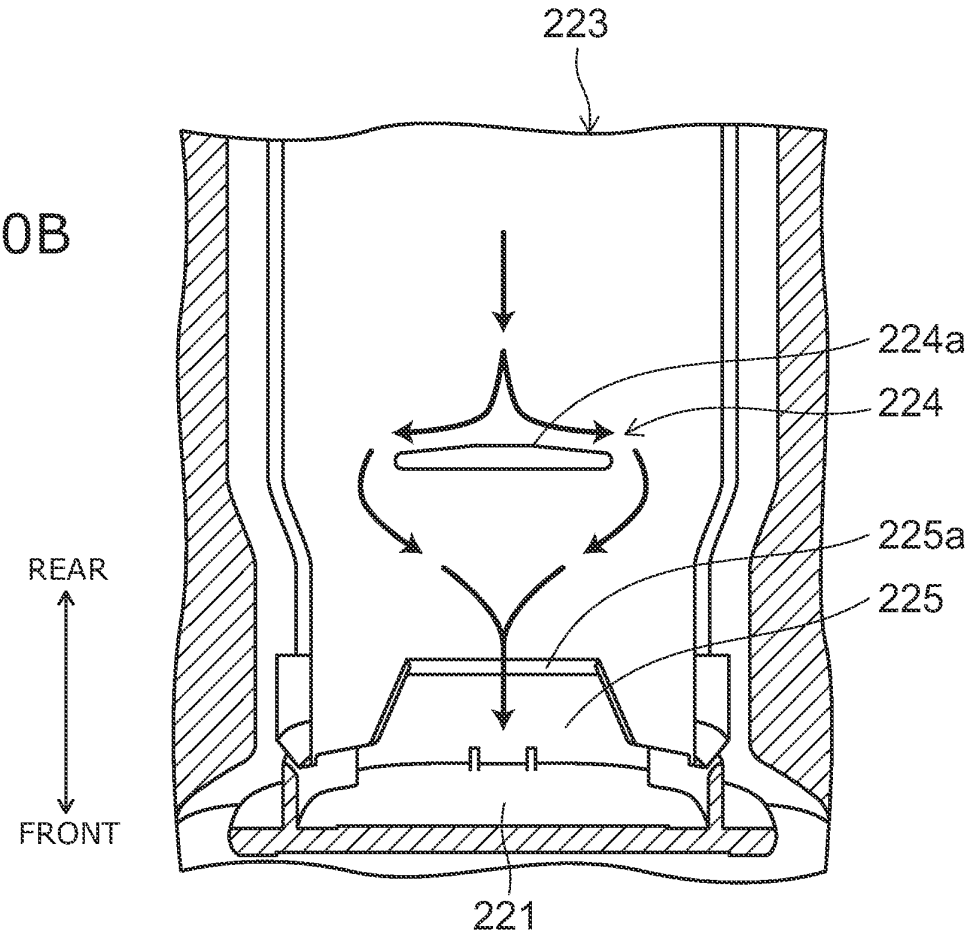


FIG. 30B



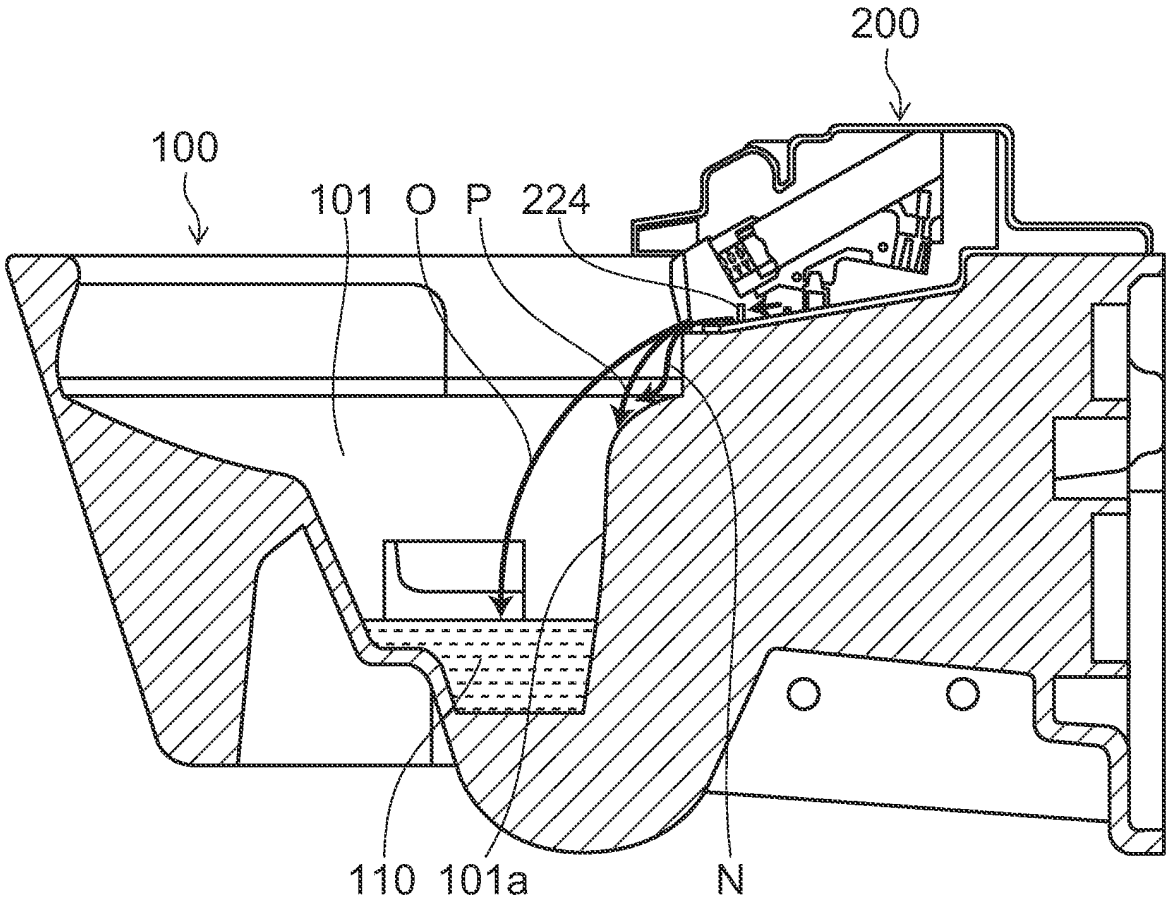


FIG. 31

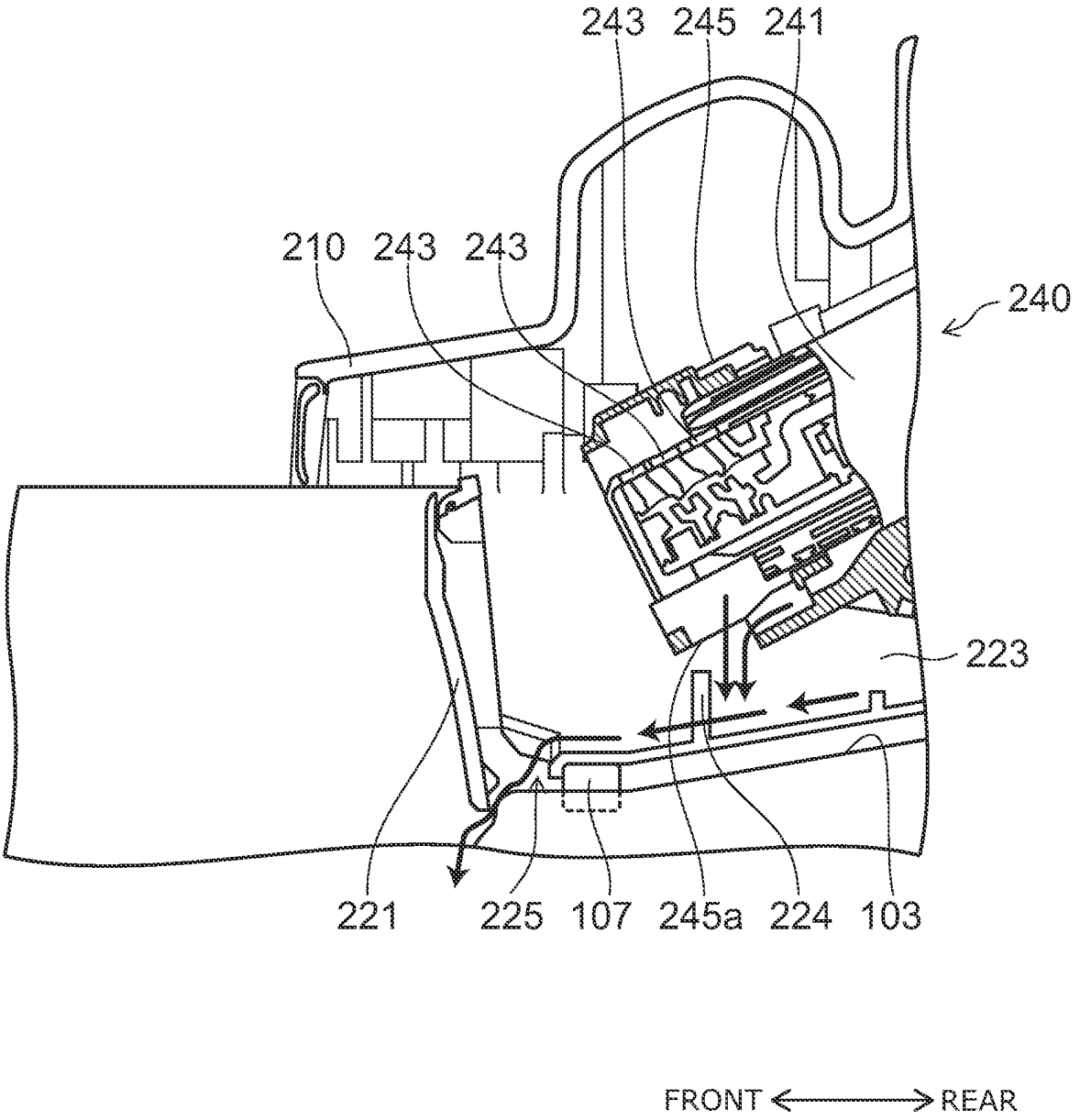

243
245
241
210
243
243
240
223
221
225
107
245a
224
103
FRONT
REAR

FIG. 32

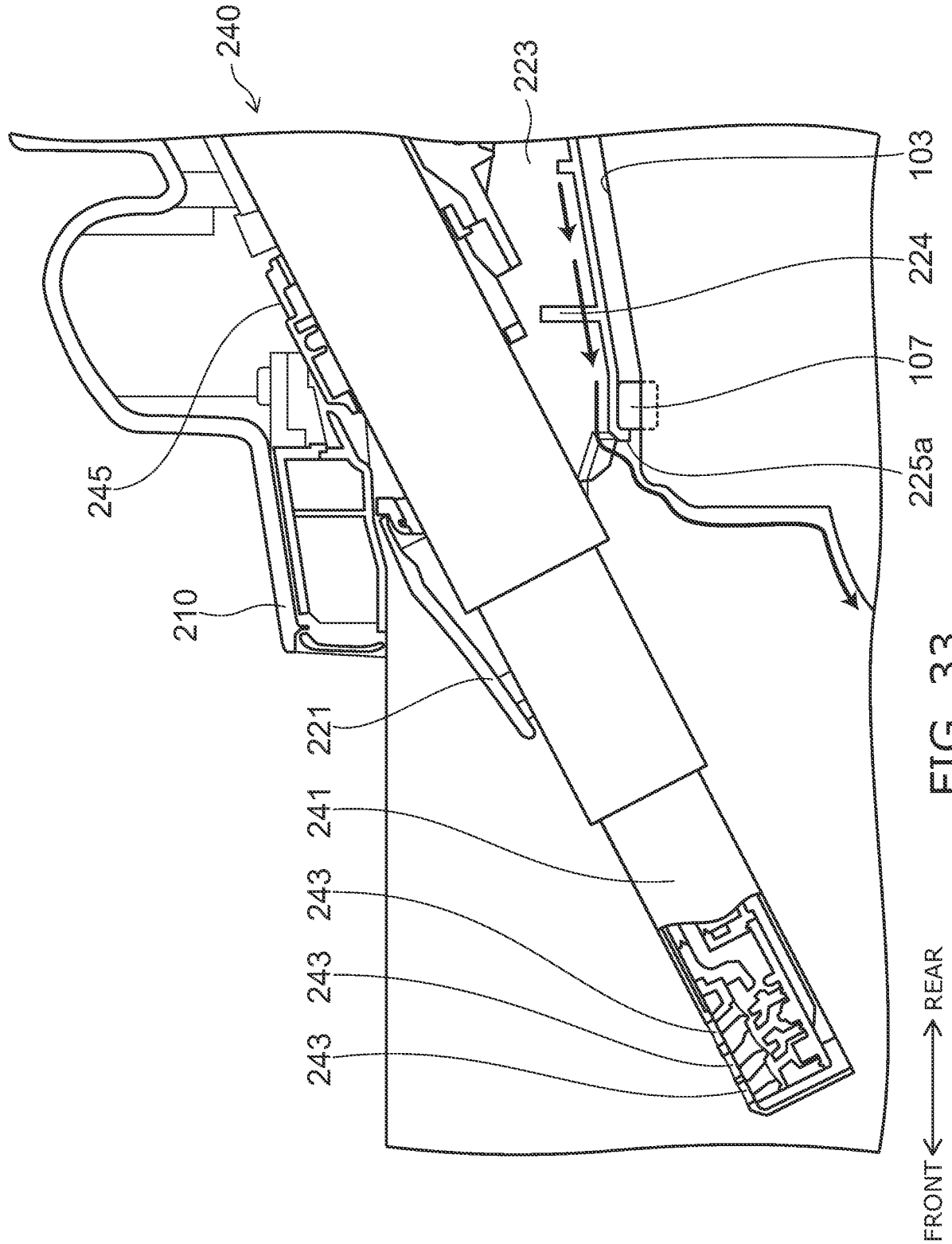


FIG. 33

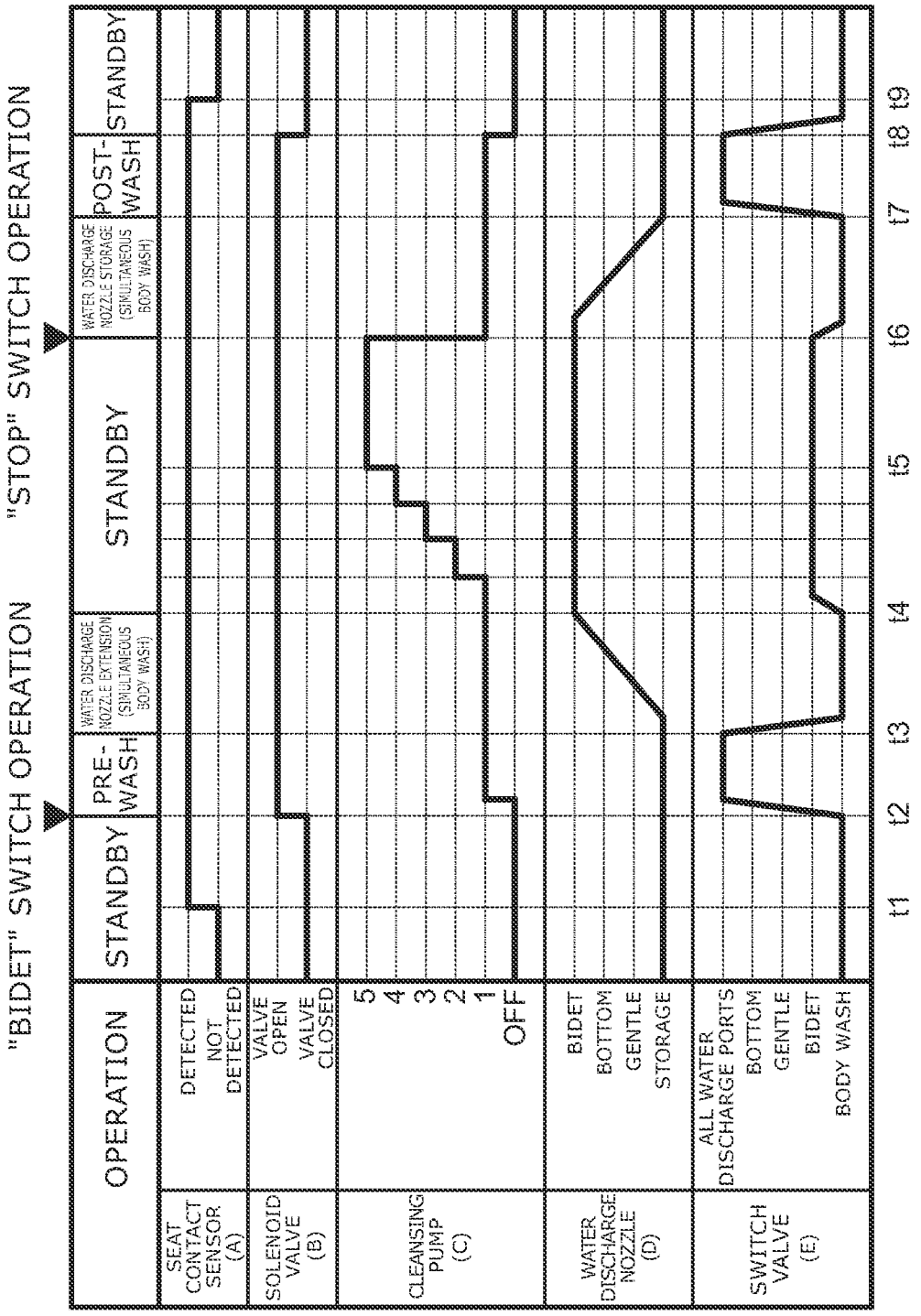

"BIDET" SWITCH OPERATION
"STOP" SWITCH OPERATION
OPERATION
STANDBY
PRE-WASH
WATER DISCHARGE NOZZLE EXTENSION (SIMULTANEOUS BODY WASH)
STANDBY
WATER DISCHARGE NOZZLE STORAGE (SIMULTANEOUS BODY WASH)
POST-WASH
STANDBY
SEAT CONTACT SENSOR (A)
DETECTED
NOT DETECTED
SOLENOID VALVE (B)
VALVE OPEN
VALVE CLOSED
CLEANSING PUMP (C)
5
4
3
2
1
OFF
WATER DISCHARGE NOZZLE (D)
BIDET
BOTTOM
GENTLE
STORAGE
SWITCH VALVE (E)
ALL WATER DISCHARGE PORTS
BOTTOM
GENTLE
BIDET
BODY WASH
t1
t2
t3
t4
t5
t6
t7
t8
t9

FIG. 34

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/053758

A. CLASSIFICATION OF SUBJECT MATTER
E03D9/08(2006.01)i, *E03D11/02*(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)
E03D9/08, E03D11/02

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 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

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.
Y	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 143935/1983(Laid-open No. 53872/1985) (Ina Seito Kabushiki Kaisha), 16 April, 1985 (16.04.85), Page 3, lines 9 to 19; Fig. 2 (Family: none)	1-14
Y	JP 2006-283397 A (Toto Ltd.), 19 October, 2006 (19.10.06), Par. Nos. [0015], [0019], [0029], [0035], [0036], [0038], [0052], [0057], [0058]; Figs. 4 to 6, 16, 18 (Family: none)	1-14

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

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"E" earlier application or patent but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 May, 2009 (12.05.09)	19 May, 2009 (19.05.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/053758

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 58-160445 A (Matsushita Electric Industrial Co., Ltd.), 22 September, 1983 (22.09.83), Page 2, lower left column, line 7 to lower right column, line 18; Figs. 2, 3 & US 4558473 A1 & EP 103648 A1 & WO 83/3272 A1	6-8
Y	JP 5-339971 A (Matsushita Electric Industrial Co., Ltd.), 21 December, 1993 (21.12.93), Par. Nos. [0004] to [0007]; Fig. 4 (Family: none)	9,10
Y	JP 2003-313921 A (Matsushita Electric Works, Ltd.), 06 November, 2003 (06.11.03), Par. Nos. [0019] to [0022]; Figs. 5, 11 (Family: none)	10-14
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 203444/1985(Laid-open No. 114976/1987) (Aichi Electric Co., Ltd.), 22 July, 1987 (22.07.87), Page 4, line 11 to page 5, line 20; Fig. 1 (Family: none)	3
A	JP 2006-2485 A (Matsushita Electric Works, Ltd.), 05 January, 2006 (05.01.06), Par. No. [0018]; Fig. 1 (Family: none)	4
A	JP 2008-25176 A (Matsushita Electric Works, Ltd.), 07 February, 2008 (07.02.08), Par. No. [0027]; Fig. 2 & WO 2008/010570 A1	4
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 64908/1982(Laid-open No. 171972/1983) (Matsushita Electric Works, Ltd.), 17 November, 1983 (17.11.83), Page 5, lines 9 to 17; Fig. 5 (Family: none)	5

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2009/053758

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 52249/1987(Laid-open No. 161976/1988) (Inax Corp.), 21 October, 1988 (21.10.88), Page 10, lines 3 to 4; Fig. 3 (Family: none)	7
A	JP 2002-81122 A (Toto Ltd.), 22 March, 2002 (22.03.02), Fig. 1 (Family: none)	12

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 55075034 A **[0004]**
- JP 2001152512 A **[0004]**