(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 818 423 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.10.2026 Bulletin 2026/41

(21) Application number: **26165990.8**

(22) Date of filing: **19.03.2026**

(51) International Patent Classification (IPC):
E03D 5/012 *(2006.01)* ***E03C 1/10*** *(2006.01)*
E03D 3/00 *(2006.01)* ***E03D 5/10*** *(2006.01)*
E03D 9/08 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E03D 5/012; E03C 1/102; E03D 3/00; E03D 5/10;
E03D 9/08; E03D 2201/30; E03D 2201/40

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

(30) Priority: **20.03.2025 US 202563775090 P**
16.01.2026 US 202663961999 P
06.03.2026 US 202619559471

(71) Applicant: **Kohler Co.**
Kohler, WI 53044 (US)

(72) Inventors:
- **MAHONEY, Douglas**
  Kohler, WI 53044 (US)
- **LAMBERT, Tony**
  Kohler, WI 53044 (US)
- **SMITH, Michael**
  Kohler, WI 53044 (US)
- **SMITH, Andrew**
  Kohler, WI 53044 (US)
- **MURAOKA, Hiroyuki**
  Kohler, WI 53044 (US)

(74) Representative: **Barker Brettell LLP**
100 Hagley Road
Edgbaston
Birmingham, West Midlands B16 8QQ (GB)

(54) **TOILET**

(57) A network of pressurized pathways for a toilet includes a pressurized water supply, a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet, a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet, and a third valve configured to open at least a portion of a water path to a drain valve.

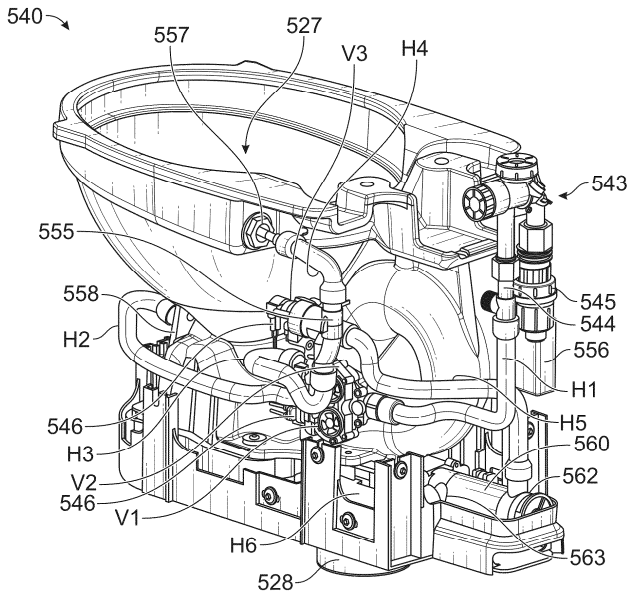


FIG. 11

EP 4 818 423 A1

Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of priority to U.S. Provisional Application No. 63/775,090 filed on March 20, 2025, U.S. Provisional Application No. 63/961,999 filed on January 16, 2026 and U.S. Patent Application No. 19/559,471 filed on March 06, 2026, which are hereby incorporated by reference in their entirety.

FIELD

[0002] The present disclosure relates generally to toilets.

BACKGROUND

[0003] Water conservation is an increasing priority in any new toilet design. Water conservation may be limited by conventional flushing techniques. For example, in gravity-fed siphonic toilets, water is introduced through gravity to the bowl of the toilet and expelled via a siphon in a trapway. During operation of a conventional gravity toilet, after a large volume of water is introduced to the toilet bowl, water is forced from the bowl downstream through the trapway and generates a siphon in the trapway, pulling the rest of the water from the bowl into the trapway. The siphon continues as long as water completely fills the entire cross section of the trapway near the trapway inlet. When the water level in the bowl drops below the top of the trapway inlet, air is introduced through the trapway inlet into the trapway and stops (i.e., breaks) the siphon. Such a flush sequence requires relatively large amounts of water to break the siphon. Accordingly, it would be advantageous to provide a toilet that uses less water.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] Exemplary embodiments are described herein with reference to the following drawings, according to an exemplary embodiment.

FIG. 1 is a view of a toilet according to an exemplary embodiment.

FIG. 2 is an example floor anchor for the toilet of FIG. 1.

FIG. 3 illustrates an example shell for the toilet of FIG. 1.

FIGS. 4A-4C illustrate an installation of the toilet over the floor anchor.

FIG. 5 illustrates the toilet including a skirt.

FIGS. 6A, 6B and 6C illustrate toilet height adapters for a base of the toilet.

FIG. 7 illustrates an alternative floor anchor for the toilet of FIG. 1.

FIG. 8 illustrates an example toilet engine.

FIG. 9 illustrates the toilet body and portions of a flush engine.

FIG. 10 illustrates a flowchart for portions of the manufacturing of the toilet.

FIG. 11 illustrates a flush engine for the toilet.

FIG. 12A illustrates a drain valve for the flush engine of FIG. 10.

FIG. 12B illustrates a cross section of the drain valve in a closed state.

FIG. 12C illustrates a cross section of the drain valve in an open state.

FIG. 13 illustrates a vacuum breaker for the flush engine of FIG. 10.

FIG. 14 illustrates another view for the flush engine of FIG. 10.

FIG. 15 illustrates a block diagram for the mechanical-electrical system of the flush engine of FIG. 10.

FIG. 16A illustrates a sequence for operation of a valve assembly.

FIG. 16B illustrates timing chart for operation of a valve assembly.

FIG. 17 illustrates an example manual bidet for any of the embodiments herein.

FIG. 18 illustrates an example power bidet for any of the embodiments herein.

FIG. 19 illustrates another example toilet including a raised hinge and a control panel on the raised hinge.

FIG. 20 illustrates an example attachment for the toilet shell using the raised hinge of FIG. 19.

FIG. 21 illustrates the raised hinge of FIG. 19.

FIG. 22 illustrates a mirrored control panel for the raised hinge of FIG. 19.

FIG. 23 illustrates a sensor system for the raised

hinge of FIG. 19.

FIG. 24 illustrates an example pressure control knob.

FIG. 25 illustrates an example controller for operation of the toilet.

FIG. 26 illustrates a flow chart for the operation of the controller.

FIG. 27 illustrates modular seat assemblies and bidet modules for the toilet.

FIG. 28 illustrates a hinge assembly.

FIG. 29A illustrates a connector for the cowling of the toilet.

FIG. 29B illustrates a water housing of the seat hinge assembly.

DETAILED DESCRIPTION

[0005] The following embodiments include toilets that uses less water than conventional toilets. By selectively controlling the water at the entrance to the system (e.g., rim jet and sump jet) as well as at the exit of the system (e.g., drain), the toilet can be flushed with less water than a conventional gravity fed toilet. Another benefit may include the easy implementation of exterior trim levels, shapes, and sizes because the construction is generally modular with an external shell. Further, a toilet with interchangeable or removable parts that allow access to the internal components of the toilet, can improve the ease of maintenance and repair of the toilet. For example, removable panels provide access to the inside of the toilet, improving maintenance possibilities.

[0006] FIG. 1 is a view of a toilet 500 according to an exemplary embodiment. The toilet 500 includes a cowling 501, at least one side panel 502, at least one front panel 503 (e.g., front shell), at least one skirt 504, a raised cavity 505, a toilet seat assembly including a cover 506, and a seat 507. One or more or all of these components may be formed from resin, polymer or plastic materials. The cowling 501 may include one or more openings for securing a toilet seat assembly to the toilet 500. In the example of FIG. 1, the toilet seat assembly connects directly to the cowling 501. In other examples, the raised cavity 505 may include one or more hinge members or connects to couple the toilet 500 to the toilet seat assembly. Additional, different or fewer components may be included.

[0007] The toilet 500 may be manufactured or assembled according to a predetermined sequence or technique. FIGS. 2-7 illustrate stages in the manufacturing or assembly of the toilet 500. FIG. 8 provides one particular example procedure for the manufacturing or assembly of the toilet 500.

[0008] FIG. 2 is an example floor anchor 510 for the toilet of FIG. 1. The floor anchor 510 includes a main body 511 and protruding up from the main body 511 are multiple legs 513. The legs 513 are configured to connect to a toilet base, as described further herein. Each of the legs 513 may also thread a bolt (e.g., tee bolt) from the floor such that four bolts securely connect the floor anchor 510 to the floor. The bolts may be held by a seat 514. In addition, the legs 513 may include a connector or a latch that mates with the toilet base. The floor anchor 510 may include a seal 512. The seal 512 may also mate with the toilet base. The seal 512 is flexible and housed within the floor anchor 510. The seal 512 may be glued to the floor anchor 510. In one example alternatively or addition, apertures 81 may provide a path for one or more bolts (e.g., tee bolts) from the floor. Additional, different or fewer components may be included.

[0009] The floor anchor 510 may rest on the floor and be semi-permanently coupled with the floor via a wax ring or another seal (e.g., rubber gasket). A drainpipe (e.g., drainpipe 528 in FIG. 3) may extend from the floor anchor 510 into the floor. The floor anchor 510 may be square or rectangular. In order to position the toilet 500 at a predetermined angle, the floor anchor 510 may be aligned with a wall W. For example the edge 516 of the floor anchor 510 may be aligned with the edge 517 of the wall as shown by line 515. For example, the edge 516 may be positioned to be parallel with the edge 517 of the wall. When the floor anchor 510 is parallel with the wall, once the toilet 500 is installed, the toilet 500 will also be parallel with the wall.

[0010] FIG. 3 illustrates an example shell for a toilet 520, which may be adapted for the toilet 500 of FIG. 1. The main body 511 of the floor anchor 510 is illustrated with dotted lines to illustrate that the floor anchor 510 is inside of the toilet base 524. A drainpipe 528 extends down from the floor anchor 510. Also, visible in FIG. 3 and described in later examples are a bowl 527, a support rib 579, a seal 526, and a raised hinge support 525. The main opening to the bowl is defined by a rim 578 of the top cover. The raised hinge support 525 may perform multiple functions. The raised hinge support 525 may provide a user interface (e.g., buttons) facing the rear of the toilet, which allows the user to provide instructions to the toilet 520 such as flush activation, bidet activation, seat heater activation, cleaning cycle activation, and other functions. The raised hinge support 525 may also be configured to rotatably attach a toilet seat to the toilet 520. Additional, different or fewer components may be included.

[0011] Between the support rib and the top shell one or more pads 626 may seal the area and prevent slippage between the base 524 and the shell. The pads 626 may extend around the circumference of the toilet and/or be included around the circumference of the bowl.

[0012] The toilet shell may include at least two components or panels. The toilet shell includes a right panel 521, a left panel 522, and a rear panel 523. The panels may be formed from a variety of materials include resin,

polymer or plastic materials. The panels may be connected to the toilet base 524 in a predetermined order. The panels may be assembled during the manufacturing process. In one example, either the right panel 521 or the left panel 522 is snapped onto the toilet base 524 via a tab, hook, or latch. The right panel 521 may be attached first and the left panel 522 is attached overlapping the right panel 521, or vice versa. After the right panel 521 and the left panel 522 are attached to the toilet base 524, the rear panel 523 is attached.

[0013] FIGS. 4A-4C illustrate an installation of the toilet 520 over the floor anchor 510. In FIG. 4A, the toilet 520 is held over and lowered onto the floor anchor main body 511. The floor anchor 510 may include at least one alignment device configured to align the toilet 520 in the correct lateral and depth position with respect to the floor anchor 510. In one example, the legs 513 are alignment devices that line up with a tapered cavity that guides the toilet 520 into mating connection with the floor anchor 510.

[0014] In FIG. 4B, the toilet base 524 of the toilet 520 rests onto the main body 511. The floor anchor 510 may be preloaded with one or more connectors 518 such as screws, or bolts. The connectors 518 may be removed from the floor anchor 510 and placed through one or more openings 519 then tightened to securely attach the toilet 520 to the floor anchor 510. When attached through the alignment device (e.g., legs 513) and the connectors 518, the toilet 520 is placed in a predetermined orientation (e.g., parallel to) the wall W. The connectors 518 may be referred to as nonvariable connectors to couple the toilet base 524 to the floor anchor 510. The term "nonvariable" refers to the single relative position to connect the toilet base 524 and floor anchor 510, as opposed to the slidably adjustable connectors described herein for connecting the toilet base 524 to the toilet body at multiple possible heights.

[0015] FIG. 4C illustrates internal linking of the toilet 520 to the floor anchor 510. For example the gate valve 560 may be coupled to a drain extender 566 or leg that extends from the main body 511 of the floor anchor 510. The drain extender 566 may be placed through the seal 512 and into the drainpipe 528. The valve plate of the gate valve 560 may open directly into the drain extender 566 so that water and other contents of the toilet 520 fall under gravity from the trapway 567 to the drain to a sanitary system (e.g., sewer pipe or septic tank pipe). In other words, the gate valve 560 is configured to selectively open a drain of the toilet 520, and the drain extender 566 may be a tube that extends from the toilet 520 through the flexible seal 512 and is configured to mate with the floor anchor 510.

[0016] FIG. 5 illustrates the toilet including a skirt 584. After the toilet 520 is securely attached to the floor anchor 510, the skirt 584 may be placed over the overlapping portions or junction between the floor anchor 510 and the toilet base 524. The skirt 584 may cover the connectors 518 and opening 519.

[0017] FIGS. 6A, 6B, and 6C illustrate toilet height adapters for a base of the toilet 520. The toilet height adapter has a height H that defines a distance from the floor to the rim of the toilet 520. In FIG. 6A the toilet height adapter 550 is separate from and independent of the toilet base 524. Any one toilet height adapter may be used, and the toilet height adapter may be omitted.

[0018] In other examples, as shown by FIGS. 6B and 6C the toilet height adapter 551 may be integrated with the toilet base 524. FIG. 6B illustrates a toilet height adapter 551 having a low height H1. The floor anchor 510 may also have a height corresponding to the toilet height adapter 551. In FIG. 6B the seal 512 is at a low position with respect to the main body 511 of the toilet anchor 510. FIG. 6C illustrates a toilet height adapter 551 having a tall height H2. In FIG. 6C, the seal 512 is at a high position with respect to the main body 511 of the toilet anchor 510. The seal 512 may be spaced apart from the main body 511 of the toilet anchor 510 via a seal tower 549.

[0019] The toilet base 524 may include multiple support arms for supporting and coupling the toilet base 524 to a toilet body 530 or toilet housing. Some support arms 541 are parallel to the side panels of the toilet shell and some support arms 541 are parallel to the rear panel of the toilet shell. Each of the support arms include a hole or opening 537 that align with the toilet body 530 or housing. The hole or opening 537 is a variable connector on the toilet housing configured to couple to the toilet base 425 at a plurality of positions on the toilet body 530 housing along a slot 536. In this way the toilet body 530 or housing can mount at various positions on the slot 536 depending on the height of the toilet height adapter 550. In other words, the toilet height adapter 550 includes a height H corresponding to one of the plurality of positions of the slot 536 on the toilet body 530 housing.

[0020] FIG. 7 illustrates an alternative floor anchor 610 for the toilet of FIG. 1. The floor anchor 610 includes a main body 611 and a seal 512. As previously described, the main body 611 may include legs to connect to a toilet base. The floor anchor 610 may be secured to the floor and drainpipe 528 using one or more bolts or other types of fastener. The seal 512 may also mate with the toilet base. The seal 512 is flexible and housed within the floor anchor 610. The floor anchor 510 may rest on the floor and be semi-permanently coupled with the floor via a wax ring or another seal (e.g., rubber gasket). A drainpipe (e.g., drainpipe 528 in FIG. 3) may extend from the floor anchor 510 into the floor. The seal 512 may be glued to the floor anchor 510. The main body 511 may also include an anti-slippage pad 628 or foot one the front or real to prevent slippage between the main body 511 and the floor. Additional, different or fewer components may be included.

[0021] FIG. 8 illustrates another example toilet base 524 supported by the main body 611 of the floor anchor 610. The toilet base 524 supports a toilet engine 720. The toilet engine 720 may be formed of vitreous

[0022] The toilet engine 720 is an example plumbing fixture and may include a bowl 527, a sump 613, a trapway 616, a base 614, and one or more mounting apertures 615. As general operation of the toilet engine 720, water is provided to the bowl 527. The sump 613 includes an orifice, which may be a jet orifice, for introducing water into the trapway 616. The water may be used to assist in the draining of the contents of the bowl 527 and sump 613 of the plumbing fixture. The contents of the bowl 527 and sump 613 may be drained through the trapway 616 to the drainpipe 528 and ultimately sanitary path including a septic or sewer line. Such plumbing fixtures may be made from a vitreous material by a solid casting process, where a slip material or tube is utilized to form the trapway within the plumbing fixture when the plumbing fixture is cast.

[0023] As shown in FIG. 8, the floor anchor 610 may have a length that is substantially the same as an example toilet engine 720 or the base 614 of the toilet engine 720. A majority of the weight of the toilet is attributable to the toilet engine 720, which may be formed of a ceramic or vitreous material. With the floor anchor 610 extending to the full length of the toilet engine 720 or substantially the full length of the toilet engine 720 support is provided to support the toilet by the floor through the floor anchor 610.

[0024] For additionally stability, the mounting apertures 615 may be arranged on opposite sides of the drainpipe 528. In this way, the toilet engine 720 is secured to the base 614 through screws, bolts, or other fasteners through the mounting apertures 615 in such a way that the toilet engine 720 is prevent from rotating or torque about the connected to the floor at the bolt or tee bolt (as described with respect to FIG. 2 for apertures 81 and/or seats 514). As shown in FIG. 8, at least one of the mounting apertures 615 is on one side of the drainpipe 528 and the tee bolt, and at least one of the mounting apertures 615 is on another side of the drainpipe 528 and the tee bolt. Mounting the toilet engine 720 to the base 614 on both sides prevents the toilet engine 720 from flexing.

[0025] FIG. 9 illustrates the toilet 520 with the toilet shell removed to show connection between the toilet body 530 or housing and the toilet base 524. Internal components illustrated in FIG.7 are discussed in more detail in subsequent embodiments and include the toilet bowl 527, the vacuum breaker 533, and valve array 532. The toilet body 530 may include at least two separated portions including front portion 531 and rear portion 439, which may be referred to individually or in combination as toilet body 530. The toilet body 530 may include at least one mounting cavity or sight aperture for a sensor. For example, the front portion 531 as illustrated includes a first aperture for sensor 534 and a second aperture for sensor 535. There may be a variety of sensors. In one example, one or both of the sensors are proximity sensors configured to detect the presence of user in front of or approaching the toilet 520. Example sensors include multimeter wave sensors as described in further detail herein.

[0026] FIG. 9 illustrates the alignment and attachment of the toilet body 530 to the toilet base 524. Each of the support arms include opening 537 that align with the slot 536 of the toilet body 530. The slot 536 is a variable connector in that the slot 536 may be aligned with the opening 537 at multiple positions to create different heights for the toilet 520. A fastener (e.g., screw, bolt) may pass through the slot 536 into the opening 537 at one of the multiple positions according to the height of the toilet 520 as determined by the toilet height adapter. Alternatively, an opposite approach may be used in which the variable connector includes a slot on the toilet base 524 and a hole in the toilet body 530, and a fastener connects the toilet body 530 and the toilet base 524 using the slot on the toilet base 524 and the hole in the toilet body 530. In any examples, the toilet body 530 may be formed from acrylonitrile butadiene styrene (ABS), polycarbonate, or another hard material having high tensile strength sufficient to support the flush engine.

[0027] FIG. 10 illustrates a flowchart for portions of the manufacturing of the toilet 520. Additional, different or fewer acts may be included.

[0028] At act S101, a toilet height adapter 550, 551 is applied to the toilet base 524. The toilet height adapter 550, 551 has a height that defines a distance from a floor to a rim of the toilet 520. The toilet height adapter 550, 551 may be selected according to the height of the toilet. Example toilet heights include chair heights, comfort heights, standard heights or any other height. In one example, the comfort height is lower than the standard height. The toilet height adapter 550 may be coupled to the toilet base using fasteners or glue. The toilet height adapter 551 may be integrally formed with the toilet base. The toilet height adapter 550, 551 may be selected according to a model of toilet.

[0029] At act S103 includes variably coupling the toilet base to a toilet body at a position corresponding to the toilet height adapter 550, 551. The variable coupling may include a screw hole opening that aligns with a mounting slot at multiple possible positions. The variable coupling may include an array of mounting holes at different predetermined positions.

[0030] At act S105, a toilet skin is attached around the toilet body. The toilet skin may include multiple panels and a cover. In one example, two side panels are used. In another example two side panels and a rear panel are used. In another example, two side panels, a rear panel, and a front panel are used. Attaching the toilet skin may include placing a first side skin on a first side of the toilet body and placing a second side skin on a second side of the toilet body.

[0031] At act S109, attach a main cover to the toilet body via a toilet seat hinge. The main cover may define a rim of the toilet bowl 527. A toilet seat hinge may pass through the main cover as it is attached to the toilet body 530. The toilet seat hinge may provide an opening into the toilet body 530 to fasten one or more connector to couple

the main cover to the toilet body 530. In other words, the main cover is coupled to the toilet body 530 with at least one cover fastener within a toilet hinge (e.g., as shown in FIG. 18 with fastener 585).

[0032] At act S111 includes attachment of a hinge cover to the toilet seat hinge. The hinge cover may cover the fastener that attached the main cover to the toilet body 530. The hinge cover may also be integrated with the toilet seat assembly. The toilet seat assembly may couple with one or more rotatable arms or another type of shaft.

[0033] In addition, a skirt may be slid along the toilet base over at least a portion of the toilet skin. The height of the skirt may be selected according to the toilet height adapter 550, 551.

[0034] FIG. 11 illustrates another example toilet 540. Any of the features and components of other toilets (e.g., toilet 500, 520) described herein may be incorporated with toilet 540. The toilet 540 includes a flush engine having one or more components for selectively delivering water to the toilet 540. The flush engine may include a pressure regulator 545, a vacuum breaker 543, a split connector 544, a valve array, and gate valve 560. The valve array includes a first valve V1, a second valve V2, and a third valve V3. Several hoses connect the valve array to various other components of the flush engine, as described in detail herein. A network of pressurized pathways including the valves and tubes provides water to the flush engine to flush the toilet 540. Additional, different or fewer components may be included.

[0035] The network of pressurized pathways may include a pressurized water supply. The pressurized water supply may be set according to a water supply input (e.g., line level pressure) that is provided directly to the toilet 540. The pressurized water supply may be defined by the pressure regulator 545 configured to set the pressurized water supply to a predetermined pressure. The pressure regulator 545 may include a valve and a feedback mechanism such as a sensor that provides negative feedback from the controlled pressure to control the pressure regulator 545 to the predetermined pressure. The bottom threading of the pressure regulator 545 is configured to attached to a water supply hose from the water supply.

[0036] FIG. 12 illustrates details for the drain valve 560 for the flush engine of FIG. 11. The drain valve 560 is configured to selectively open and close a drain of the toilet 540 so that waste or other contents from the toilet bowl 527 fall to the sanitary line downstream of the toilet 540. The drain valve 560 may be water driven. That is, the drain valve 560 may be opened and closed through a flow of water that is different than the flow that flows through the valve. The network of pressurized pathways controls the flow of water to operate the drain valve 560.

[0037] FIG. 12B illustrates a cross section of the drain valve in a closed state at the end of the stroke where the valve plate 561 forms a seal in the extender tube 566. FIG. 12C illustrates a cross section of the drain valve in an open state. There may be more free movement of the valve in the open state (e.g., vertical and horizontal) and/or in the movement to and from the open state.

[0038] The drain valve 560 may include the extender tube 566 just below a valve plate 561. Adjacent to the valve plate 561 is a valve chamber 564. A hydraulic lever or a piston 568 within the valve chamber 564 may move in response to water. For example, a first flow of water may be provided to input 562 and a second flow of water may be provided to input 563. The first flow of water may apply a force to push the hydraulic lever or a piston 568 within the valve chamber 564 in a first direction that opens, or tends to open, to valve plate 561. The second flow of water may apply a force to push the hydraulic lever or a piston 568 within the valve chamber 564 in a second direction that closes, or tends to close, to valve plate 561. The supply chamber 559 may provide a first path between the input 562 to the valve chamber 564 through a first internal tube and a second path between the input 563 and the valve chamber 564 through a second internal tube. For example, the supply chamber 559 may include two concentric tubes at at least one cross section such that the first path is a tube within the second path.

[0039] The piston 568 may be coupled to a valve arm 761 that extends from the supply chamber 559 to the extender tube 566. The valve arm 761 is coupled with the valve plate 561. The valve plate 561 may have a wedge shaped profile as defined by one or more slanted surfaces 763. The extender tube 566 may included a wedge shaped pocket 784 that aligns with the valve plate 561.

[0040] FIG. 13 illustrates a vacuum breaker 543 for the flush engine of FIG. 9. The network of pressurized pathways may include the vacuum breaker 543. The vacuum breaker 543 is configured to prevent back flow into the water supply or prevent siphoning in the reverse direction. This prevents contamination of the water supply.

[0041] The vacuum breaker 543 may include an input pipe 571, an output pipe 572, a vertical portion 575, and a horizontal portion 573 including a spring 574, and a disk 576. The horizontal portion 573, from the left to right of the vacuum breaker 543, is longer than the vertical portion 575, from the top to the bottom of the vacuum breaker 543. The disk 576 is pushed to the left (in FIG. 11) under the water pressure from the inlet pipe 571. The disk 576 under water pressure causes small vent holes to be closed. When the water pressure drops through an interruption of the pressurized water supply, the disk 576 is pushed to the right under elastic force from the spring 574, causing the small vent holes to be opened, atmospheric pressure air flows into the vacuum breaker 543. If the water supply pressure drops, the disk 576 springs back, opening the vent holes to let is atmospheric air and prevent the backflow of water.

[0042] Returning to FIG. 11, the network of pressurized pathways may include a valve array with multiple valves arranged in a vertical direction. The valves V1, V2, and V3 may be implemented in a valve array that is a single device. The valves V1, V2, and V3 may be arranged vertically in that at least a portion of valve V1 is directly

below valve V2 and at least a portion of valve V2 is directly below valve V3. Each of the valves may include a solenoid or another mechanical driver that opens and closes the valve under an electrical signal (e.g., pulse) from a controller or control circuit. The solenoid or other mechanical driver may be electrically coupled to the controller or control circuit via one or more terminals or electrical contacts 546. One or more of the valves may be internally connected in the valve array. For example, valve V1 and V2 may share an input.

[0043] The first valve V1 configured to open at least a portion of a water path from the pressurized water supply to a sump jet 558. A hose H1 connects the first valve V1 to the connector 544 to receive the regulated water supply and provided the regulated water supply to the first valve V1. The other wise of the first valve V1 is connected to the sump jet 558 such that when the first valve V1 is open the sump jet 558 injects water into the sump of the toilet bowl 527. A hose H2 connects the first valve V1 to the sump jet 558. The sump jet 558 pushes water and other contents (e.g., urine and/or feces) through the trapway which leads to the gate valve 560.

[0044] A hose H6 connects the valve array to the second inlet 563 of the gate valve 560. In one example, the hose H6 is connected to the first valve V1 and the second inlet 563 of the gate valve 560 such that gate valve 560 is opened when the first valve V1 is opened. That is, the gate valve 560 is opened at the same or nearly the same time as the sump jet 558 is activated.

[0045] The second valve V2 is configured to open at least a portion of a water path from the pressurized water supply to a rim jet 557. The water supplied to the second valve V2 may flow internally from the valve array. The hose H1 may connect the connector 544 to the second valve V2 to receive the regulated water supply and provide the regulated water supply to the second valve V2. An internal cavity may at the connection to hose H1 may be fluidly coupled to both the first valve V1 and the second valve V2. A hose H3 connects the second valve V2 to an electric generator 555, which is described in more detail herein. Water passes through the electric generator 555. In some instances the water pressure is lower at an outlet of the electric generator 555 that at the inlet of the electric generator 555. A hose H4 connects the electrical generator 555 to the rim jet 557.

[0046] The third valve V3 is configured to open at least a portion of a water path to the drain valve 560. A hose H5 connects the third valve V3 to the first inlet 562 of the gate valve 560. Thus, when the third valve V3 is opened, the gate valve 560 is pushed closed by the flow of water through the gate valve 560.

[0047] For any of valves V1, V2, and/or V3 a pilot shuttle or pilot valve may be used to replace one or more solenoids. The pilot shuttle or pilot valve is mechanical and does not require electrical current to control flow through specific water channels. In one example, the shuttle valve may include a tube with three openings. The openings may include a first inlet, a second inlet, and a common outlet. A ball or another movable blocking member (e.g., shuttle) may move freely in a cavity that connects the first inlet, the second inlet, and the common inlet. When fluid pressure is present at the first inlet, the movable blocking member (e.g., shuttle) is pushed towards the second inlet. This blocks the second inlet and allows flow from the first inlet to the outlet. Similarly, when fluid pressure is present at the second inlet, the movable blocking member (e.g., shuttle) is pushed towards the first inlet. This blocks the first inlet and allows flow from the second inlet to the outlet. This construction uses no electrical power and prevents backflow.

[0048] FIG. 14 illustrates another view for the flush engine of FIG. 9. The valve array is on a first side of the flush engine. On the second side of the flush engine a controller 100 and a battery 556 are mounted or otherwise secured to the toilet body 530. The controller 100 and/or battery 556 are electrical connected to the electric generator 555. The electric generator 555 includes an impeller or other rotatable member that receives a force from the flow of water (mechanical) and generates an electrical output. The electrical generator 555 is configured to generate electrical power in response to the pressurized water supply. While a variety of arrangements are possible and the electrical generator 555 may operate along any of the water paths of the flush engine, in the embodiment of FIG. 9, the electrical generator 555 is connected to the second valve V2 and connected to the rim jet 557 such that the electrical generator 555 is upstream of the rim jet 557. It should be noted that this location for the electrical generator 555 may maximize the water pressure provided to the sump jet 558 because the sump jet water supply (hose H2) branches from the valve array upstream of the electrical generator 555.

[0049] FIG. 15 illustrates a block diagram for the mechanical-electrical system of the flush engine of FIG. 11. Additional, different or fewer components may be included.

[0050] The electric generator 555, its mechanical input (valve array), and electrical output (controller 100 and/or battery 556) may be referred to as a mechanical-electrical system.

[0051] As water flows, in this example, from the valve V3 through the turbine or electrical generator 555 to the rim jet 557, electrical power is generated. The electrical power may be a sine wave or other sinusoidal function corresponds to electrical coils (e.g., stator and rotor) within the turbine of the electrical generator 555. A conditioning circuit 604 may modify the electrical power to be suitable for charging the battery 556. In some instances, the conditioning circuit 604 may include an AC (alternating current) to DC (direct current) converter.

[0052] The battery 556 is electrically connected to the electrical generator 555 and configured to be charged by the electrical generator 555. The electrical power output of the electrical generator 555 is provided to the battery 556 to increase the stored charge in the battery 556. The

battery 556 provides stored power to the controller 100 and accessories 601 of the toilet 520. The accessories 601 may include internal accessories such as the solenoids or other mechanical drivers for the valves (e.g., V1, V2, V3, V4, and/or V5) as well as external accessories visible to the user such as a bidet, heater, dryer, lights, sensors, etc.

[0053] The controller 100 is electrically coupled to the battery 556. In some examples, the electrical power output of the electrical generator 555 is provided to the controller 100, and the controller 100 performs filtering or another function such as a power invertor or a power convertor on the electrical output.

[0054] The controller 100 is configured to activate and deactivate the first valve, the second valve, and the third valve. The controller 100 may generate a command signal including a pulse with a duration to command the solenoids or other mechanical drivers for each of the valves to open for the duration. In some examples, the drivers are held open as long as the pulse train is received. In other examples, the pulse may include a height or a width that indicates a particular duration for the valve to be opened. In other examples, each solenoid or other driver may be set to a predetermined amount of time so that the command signal triggers the valve to open for the predetermined amount of time. In any of these examples, the controller 100 may be configured to generate electrical pulses for a first solenoid corresponding to the first valve V1, a second solenoid corresponding to the second valve V2, and a third solenoid corresponding to the third valve V3.

[0055] The controller 100 may receive commands or instructions from one or more inputs. For example, a remote control may provide a remote input 602 via various buttons or dials. The remote control may communicate wirelessly (e.g., using a radio and protocol such as Bluetooth) with the toilet 520. The remote control may communicate with a network (e.g., Wifi) that also exchanges data with the toilet 520. Other remote inputs 602 may be provided by a mobile device (e.g., smartphone, tablet, laptop).

[0056] A local input 603 includes one or more buttons, dials, or other inputs physically located on the toilet 520. Some local inputs 603 may be implemented with sensors such as proximity sensors (e.g., hand wave or gesture sensors). Some local inputs 603 may be provided on a surface of the toilet 520 such as illustrated by FIG. 20.

[0057] The battery 556 may provide power to one or mor accessories 601. The controller 100 may provide commands to the one or more accessories 601. Example accessories 601 include bidet, heaters, lights, misters, ultraviolets lights and others.

[0058] FIG. 16A illustrates a sequence for operation of a valve assembly to provide pressurized water to a toilet. Additional, different or fewer acts may be included. FIG. 16B illustrates timing chart for operation of the valve assembly. Many examples are possible but FIG 14A and B illustrates at least one example in which the controller 100 is configured to operate the second valve V2 (rim valve) and third valve V3 (auxiliary valve) in at least a first time period, the first valve V1 (sump valve) and third valve V3 (auxiliary valve) in at least a second time period, and the second valve V2 (rim valve) in at least a third time period.

[0059] At act S201, the controller 100 generates and/or sends a command for opening a rim valve and an auxiliary valve at a first time period (after t1). The auxiliar valve is configured to close the gate valve for the drain of the toilet.

[0060] At act S203, the controller 100 generates and/or sends a command for opening a sump valve at a second time period (after t2).

[0061] At act S205, the controller 100 generates and/or sends a command for closing the rim valve at a third time period (after t3).

[0062] At act S207, the controller 100 generates and/or sends a command for closing the auxiliary valve and the sump valve at a fourth time period (after t4).

[0063] At act S209, the controller 100 generates and/or sends a command for opening the rim valve at a fifth time period (after t5).

[0064] At act S211, the controller 100 generates and/or sends a command for closing the rim valve a sixth time period (after t6).

[0065] The controller 100 may also generate and/or send a command for opening a bidet valve at a seventh time period and closing the bidet valve at an eighth time period.

[0066] The controller 100 may also operate in a recharge mode in which the second valve V2 is activated in order to operate the electrical generator 555 to charge the battery 556. The recharged mode may be triggered in a variety of techniques. The recharge mode may be triggered automatically when the battery falls below a threshold charge level as detected by an electrical parameter sensor (e.g., voltage sensor). The recharge mode may be triggered by an input from the remote input 602 or the local input 603. That is, the user may request the recharge mode cycle and press a button to trigger the recharge mode. The recharge mode may also operate on a calendar or time schedule. For example, the controller 100 may cause the recharge mode to trigger at a particular time of day (e.g., 2AM) and/or a particular day (e.g., Sunday or the 1st of the month). The recharge mode may also be triggered by a "hidden" button. For example, button 581 is hidden under the skirt. In this scenario, when the battery 556 dies or another error is received, the user may remove the skirt to press button 581 and trigger the recharge mode.

[0067] FIG. 17 illustrates an example manual bidet 600 for any of the embodiments herein. The manual bidet 600 may be mounted on the toilet body 530 and complete housed under the skin top or cover 594 as shown in FIG. 19. The connector 544 is configured to divide the water flow upstream of the first valve V1, the second valve V3, and the third valve V3, to a bidet. At least one bidet valve

selectively controls the flow of water to the manual bidet.

[0068] The manual bidet 600 may include a wand 609, a mount 673, a first supply tube 624 and first bidet valve V4, a second supply tube 674 and a second bidet valve V5, a mixing rod 605, an input tube 607 and an intermediate tube 606.

[0069] The controller 100 is configured to operate a solenoid or other mechanical driver for the first bidet valve V4 and the second bidet valve V5 independently. The first bidet valve V4 may be associated with a front wash (e.g., upward from the of the bowl 527) and the second bidet valve V5 may be associated with a rear wash (e.g., upward from the rear of the bowl 527). The manual bidet 600 may be activate by the remote input 602 or the local input 603. The controller 100 may activate the valves V4 and/or V5 in response to the input and send a pulse or other command signal to the solenoids or other mechanical drivers for the first bidet valve V4 and the second bidet valve V5. One user input may indicate the first bidet valve V4 and another input signal may indicate the second bidet valve V5.

[0070] The mixing rod 605 may be connected to a dial 597 or other physical device external to the toilet 520. FIG. 22 illustrates an example dial 597. Rotation of the dial 597 and rod 605 in one direction (e.g., clockwise) causes the water pressure in the manual bidet 600 to increase. Rotation of the dial 597 and rod 605 in another direction (e.g., counterclockwise) causes the water pressure in the manual bidet 600 to decrease.

[0071] FIG. 18 illustrates an example power bidet 620 for any of the embodiments herein. The power bidet 620 may include a power source separate from the battery 556 (e.g., power cord plugged into a home or building power supply). Alternatively, the power bidet 620 may be connected to the battery 556 for one or more functions. The power bidet 620 may include a dryer 631 and a deodorizer 633.

[0072] FIG. 19 illustrates another example toilet 520 including a raised hinge 525 and a control panel 595 on the raised hinge 525. FIG. 20 illustrates an example attachment for the toilet shell using the raised hinge of FIG. 17. FIG. 21 illustrates another view of the raised hinge 525. Additional, different or fewer components may be included.

[0073] A toilet skin including side panels 521, 522 and optionally a rear panel 523 is attached around the toilet body 520. The toilet skin may include skin cover 594 that overlaps the side panels. The skin cover 594 couples to the main body 530 using the raised hinge 525. For example, inside the raised hinge 525, one or more fasteners 585 may be threaded through the skin cover 594 and into the toilet body 530. After the fasteners 585 secure the skin cover 594 to the toilet body 530, a hinge cover 529 is placed over the raised hinge 525.

[0074] The raised hinge 525 is a hinge body coupled to the toilet base 524 and configured to rotatably connect to a toilet seat. For example the raised hinge 525 may include a shaft 586 that fastens to the toilet seat and cover. The shaft 586 may be spring loaded such that it is depressed toward the raised hinge 525. The shaft 586 may be pushed inside the raised hinge 525 so that the seat and/or cover mounting holes can be aligned with the shaft 586. When the shaft 586 is released, it protrudes through the mounting holes and secures the seat and/or cover to the raised hinge 525.

[0075] FIG. 22 illustrates a mirrored control panel 595 for the raised hinge of FIG. 17. The control panel 595 includes one or more buttons. A first button B1 performs a first toilet function. A second button B2 performs a second toilet function. A third button B3 performs a third toilet function. A fourth button B4 performs a fourth function.

[0076] In some examples, the control panel 595 is a backup system in case of failure of the remote input 602. The control panel 595 may include all functions of the toilet such as flush, flush size, bidet operation, and other functions. In other examples, the control panel 595 may be a maintenance system for configuring the toilet.

[0077] The control panel 595 is not visible from the front of the toilet. A cover 590 coupled to the toilet base 524 by way of the raised hinge 525 may reveal the control panel 595 through reflection. The cover 590 rotates via the shaft 586 of the raised hinge 525. The cover 590 includes a reflective surface. When the cover 590 rotates to an up position, the reflective surface is positioned to provide a reflection of the control panel 595 to the user. In other words, when the cover 590 is raised the at least one button B1-B4 is visible in a reflection provided by the cover 590.

[0078] FIG. 23 illustrates a sensor 592 and motor 593 for the raised hinge 525 of FIG. 19. Shown in an exploded view in FIG. 21, when assembled, the sensor 592 and the motor 593 are placed within the raised hinge 525. A single support 599 may support the toilet seat, the cover 590, the sensor 592, and the motor 593. The motor 593 is configured to rotate the toilet seat with respect to the toilet base in order to raise or lower the toilet seat with respect to the toilet base. Additional, different or fewer components may be included.

[0079] The sensor 592 supported within the hinge body is configured to detect a user. The sensor 592 may be a millimeter wave sensor. The sensor 592 may emit waves (e.g., pulses) include millimeter electromagnetic wave energy that reflects of an object such as the user. The return waves (e.g., pulses) includes a smaller amount of electromagnetic wave energy than the emitted waves. The return waves are received at the at least one receiver after a propagation delay and at a reflection angle. The controller 100 may be configured to calculate one or more kinematic properties of the object based on the energy, time, and/or angle of the return pulse. The controller 100 or an integrated control unit of the millimeter wave sensor performs fast Fourier transform (FFT) operation on the intermediate frequency signal to obtain the distance, intensity, and velocity information of the objects. Based on the characteristics of radar signals, when a person approaches or leaves may be identified. The emitted

wave and reflected wave are mixed in the mixer to generate an intermediate frequency signal in the millimeter wave sensor.

[0080] Specifically, the intermediate frequency signal is an electrical signal having a frequency and an intensity (e.g., an amplitude). The frequency of the intermediate frequency signal ranges from several-hundred Hz to about a few KHz. The frequency of the intermediate frequency signal has a mathematical relationship with a distance between the sensor and the object (e.g., users or urine steams). The frequency of the intermediate frequency signal also has a mathematical relationship with a velocity of the motion of the object based on the Principle of Doppler (e.g., the Doppler shift). The object in motion with respect to the sensor 592 results in a change in the frequency of the waves generated by the sensor 592. In some examples, the raised hinge 525 also includes a battery for operation of the sensor 592. The sensor 592 may receive power from battery 556.

[0081] The sensor data may be descriptive of a user in proximity to the toilet 500. The sensor 592 may detect when a user is in a distance range. As described above, the distance range may depend on the state of the sensor 592 and the motion of the user. The sensor 592 may detect gestures of the user. The sensor 592 may detect the position of the user such as standing versus sitting. The microcontroller configured to receive sensor data from the microwave sensors and generate a control signal response for the toilet in response to the sensor data from the microwave sensors.

[0082] The control signal may be configured to actuate a valve. As described above, the toilet 540 may include a valve configured to selectively provide water at the toilet. The valve may include a fill valve that provides water from a water supply. The valve may provide water to a rim outlet for rinsing the bowl. The valve may provide water to a sump jet (e.g., sump jet 558).

[0083] The control signal may be configured to open or close the seat or cover 590. In this way, when the user approaches the toilet 540 the seat and/or lid is opened. Similarly, when the user walks away from the toilet 540 the seat and/or lid is closed. In some examples, the controller 100 may instruct the motor 593 or otherwise cause the seat and/or lid to remain closed when small children or pets approach the seat. When the sensor data indicates a first body size or shape, the control signal and motor 593 causes the toilet seat or lid to open, and when the sensor data indicates a second body size or shape, the toilet seat or lid remains closed. Similarly, in some examples when the sensor data indicates a first body size or shape, the motor 593 causes the toilet seat or lid to remain open, and when the sensor data indicates a second body size or shape, the toilet seat or lid is closed. As shown in FIG. 28, separate motors may be used such that motor 593a corresponds to the toilet seat and motor 593b corresponds to the lid. The motor 593a is connected via shaft 596a to the toilet seat, and motor 593b is connected via shaft 596b to the lid. A wiring harness 589a may connect the motor 593a to the power supply, and a wiring harness 589b may connect the motor 593b to the power supply. The wiring harness 589a and 589b may be located below the motors or elsewhere within the housing but are shown above the hinge for purposes of illustration.

[0084] As shown in FIG. 29B, the housing of the seat hinge assembly may include an inner housing (motor housing 693), an intermediate housing 694, and an outer housing 695. The intermediate housing 694 may be a water barrier preventing all water from entering the chamber having the motor 593a and electronics. The outer housing 695 may be integrated with the cowling 501.

[0085] FIG. 25 illustrates an example controller for operation of the toilet. The controller 100 may include a processor 300, a memory 352, and a communication interface 353 for interfacing with devices or to the internet and/or other networks 346. In addition to the communication interface 353, a sensor interface may be configured to receive data from sensors (e.g., proximity sensors to trigger the operation of the toilet 520).

[0086] The controller 100 may include various inputs or interfaces for receiving electrical signals. A first interface may be connected to a manual input. A second interface (e.g., communication interface 353) may be connected to a wireless input (e.g., Bluetooth or Wifi). The controller 100 is configured to generate a valve command in response to the manual input or the wireless input. In addition, a third interface may be connected to a sensor configured to detect presence of a user or motion of the user.

[0087] The components of the control system may communicate using bus 348. The control system may be connected to a workstation or another external device (e.g., control panel) and/or a database for receiving user inputs, system characteristics, and any of the values described herein.

[0088] FIG. 26 illustrates an example flow chart for the operation of controller 100 to initialize or configured the toilet 500. Additional, different or fewer acts may be included.

[0089] FIG. 27 illustrates modular seat assemblies and bidet modules for the toilet 500. The toilet 500 includes a cowling 501, at least one side panel 502, at least one skirt 504, a flush engine 620, and at least one rear panel 423. These components along with other described herein may be consistent among various embodiments of the toilet 500.

[0090] As shown in FIG. 29A, the cowling 501 may be connected to the vitreous that extends from the flush engine and/or toilet bowl (e.g., rear vitreous extension 692) using one or more connectors. For example, a grommet 691 may be mounted in the vitreous opposite a hole or slot 791 in the cowling 501. A connector such as a bolt or screw may be placed into the hole or slot 791 and into the grommet 691 to secure the cowling 501 to the flush engine.

[0091] The various types of bidet modules may be

mounted to the toilet 500 at least one seating surface 538 configured to support and fasten the bidet module to the toilet 500. The toilet 500 is configured to receive, support, provide electrical power to, and provide water to various types of bidet modules described herein including power bidet 620. The toilet 500 is configured to receive, support, and provide water to various types of bidet modules described herein including manual bidet 600 (non-powered bidet). When no bidet is included, a bidet blank 640 is a structure that is received by and supported by the at least one seating surface 538. The bidet blank 640 is not a bidet but rather takes the space and provides a seal for the toilet 500 in place of the bidet option.

[0092] The various types of seat modules may be mounted to the toilet 500 at at least one pocket 539, also including a seating surface, to support and fasten the seat modules and control panel 595 to the toilet 500. The toilet 500 is configured to receive, support, and provide electrical power to powered and motorized seat 660 having at least one motor for operating the seat and/or lid and at least one heater for heating the toilet seat. The toilet 500 is configured to receive and support a non-powered seat 650.

[0093] When the seat assembly and bidet module are installed to the toilet 500, one or more configuration or initialization processes are performed.

[0094] At act S301, the bidet module is connected to the controller 100. This may involve connecting a wire from the bidet module to the printed circuit board of the controller 100. There may be multiple connectors on the circuit board of the controller 100 such that each connector corresponds to a different type of bidet module.

[0095] At act S303, the controller 100 detects a type for the bidet module (e.g., based on which connector has continuity). The controller 100 access a first set of values or program code in response to the type of bidet module. When the power bidet 620 is detected, the processor 300 selects from memory 352, setting values or programming code for operating the sprayer, a heater, and one or more bidet sequences. When the manual bidet 600 is detected, the processor 300 selects from memory 352 setting values or programming code for operating the heater. If no bidet module is detected, the processor 300 may select no programming code and set one or more values to zero or OFF.

[0096] At act S305, the seat assembly is connected to the controller 100. This may involve connected a wire from the bidet module to the printed circuit board of the controller 100. A different connector may be included on the circuit board of the controller 100 for each type of seat assembly.

[0097] At act S307, the controller 100 detected a type for the seat assembly (e.g., based on which connector has continuity). The controller 100 access a first set of values or program code in response to the type of seat assembly. When the motorized seat 660 is detected, the processor 300 selects from memory 352 setting values or programming code for operation of the one or more motors for raising and lower the seat and lid. When the non-powered seat 650 is detected, the processor 300 may select no programming code and set one or more values to zero or OFF.

[0098] At act S309, the controller 100 receives at least one additional configuration setting. The additional configuration settings may include a default water temperature, a default seat height, a valve timing, or other setting.

[0099] At act S311, the controller 100 may be disconnected from the power source for transportation.

[0100] Optionally, the control system may include an input device 355 and/or a sensing circuit S. The sensors may detect the assembly, or correct assembly, of the toilet. The sensors may detect the presence of the user, the identity of the user, or gestures from the user. The input device may include any of the user inputs such as buttons, touchscreen, a keyboard, a microphone for voice inputs, a camera for gesture inputs, and/or another mechanism.

[0101] Optionally, the control system may include a drive unit 340 for receiving and reading non-transitory computer media 341 having instructions 342. Additional, different, or fewer components may be included. The processor 300 is configured to perform instructions 342 stored in memory 352 for executing the algorithms described herein. A display 350 may be an indicator or other screen output device. The display 350 may be combined with the user input device 355.

[0102] Processor 300 may be a general purpose or specific purpose processor, an application specific integrated circuit (ASIC), one or more programmable logic controllers (PLCs), one or more field programmable gate arrays (FPGAs), a group of processing components, or other suitable processing components. Processor 300 is configured to execute computer code or instructions stored in memory 352 or received from other computer readable media (e.g., embedded flash memory, local hard disk storage, local ROM, network storage, a remote server, etc.). The processor 300 may be a single device or combinations of devices, such as associated with a network, distributed processing, or cloud computing.

[0103] Memory 352 may include one or more devices (e.g., memory units, memory devices, storage devices, etc.) for storing data and/or computer code for completing and/or facilitating the various processes described in the present disclosure. Memory 352 may include random access memory (RAM), read-only memory (ROM), hard drive storage, temporary storage, non-volatile memory, flash memory, optical memory, or any other suitable memory for storing software objects and/or computer instructions. Memory 352 may include database components, object code components, script components, or any other type of information structure for supporting the various activities and information structures described in the present disclosure. Memory 352 may be communicably connected to processor 300 via a processing circuit and may include computer code for executing (e.g., by processor 300) one or more processes described herein.

For example, memory 298 may include graphics, web pages, HTML files, XML files, script code, shower configuration files, or other resources for use in generating graphical user interfaces for display and/or for use in interpreting user interface inputs to make command, control, or communication decisions.

[0104] In addition to ingress ports and egress ports, the communication interface 353 may include any operable connection. An operable connection may be one in which signals, physical communications, and/or logical communications may be sent and/or received. An operable connection may include a physical interface, an electrical interface, and/or a data interface. The communication interface 353 may be connected to a network. The network may include wired networks (e.g., Ethernet), wireless networks, or combinations thereof. The wireless network may be a cellular telephone network, an 802.11, 802.16, 802.20, or WiMax network, a Bluetooth pairing of devices, or a Bluetooth mesh network. Further, the network may be a public network, such as the Internet, a private network, such as an intranet, or combinations thereof, and may utilize a variety of networking protocols now available or later developed including, but not limited to TCP/IP based networking protocols.

[0105] While the computer-readable medium (e.g., memory 352) is shown to be a single medium, the term "computer-readable medium" includes a single medium or multiple media, such as a centralized or distributed database, and/or associated caches and servers that store one or more sets of instructions. The term "computer-readable medium" shall also include any medium that is capable of storing, encoding or carrying a set of instructions for execution by a processor or that cause a computer system to perform any one or more of the methods or operations disclosed herein.

[0106] In a particular non-limiting, exemplary embodiment, the computer-readable medium can include a solid-state memory such as a memory card or other package that houses one or more non-volatile read-only memories. Further, the computer-readable medium can be a random access memory or other volatile rewritable memory. Additionally, the computer-readable medium can include a magneto-optical or optical medium, such as a disk or tapes or other storage device to capture carrier wave signals such as a signal communicated over a transmission medium. A digital file attachment to an e-mail or other self-contained information archive or set of archives may be considered a distribution medium that is a tangible storage medium. Accordingly, the disclosure is considered to include any one or more of a computer-readable medium or a distribution medium and other equivalents and successor media, in which data or instructions may be stored. The computer-readable medium may be non-transitory, which includes all tangible computer-readable media.

[0107] In an alternative embodiment, dedicated hardware implementations, such as application specific integrated circuits, programmable logic arrays and other hardware devices, can be constructed to implement one or more of the methods described herein. Applications that may include the apparatus and systems of various embodiments can broadly include a variety of electronic and computer systems. One or more embodiments described herein may implement functions using two or more specific interconnected hardware modules or devices with related control and data signals that can be communicated between and through the modules, or as portions of an application-specific integrated circuit. Accordingly, the present system encompasses software, firmware, and hardware implementations.

[0108] The illustrations of the embodiments described herein are intended to provide a general understanding of the structure of the various embodiments. The illustrations are not intended to serve as a complete description of all of the elements and features of apparatus and systems that utilize the structures or methods described herein. Many other embodiments may be apparent to those of skill in the art upon reviewing the disclosure. Other embodiments may be utilized and derived from the disclosure, such that structural and logical substitutions and changes may be made without departing from the scope of the disclosure. Additionally, the illustrations are merely representational and may not be drawn to scale. Certain proportions within the illustrations may be exaggerated, while other proportions may be minimized. Accordingly, the disclosure and the figures are to be regarded as illustrative rather than restrictive.

[0109] While this specification contains many specifics, these should not be construed as limitations on the scope of the invention or of what may be claimed, but rather as descriptions of features specific to particular embodiments of the invention. Certain features that are described in this specification in the context of separate embodiments can also be implemented in combination in a single embodiment. Conversely, various features that are described in the context of a single embodiment can also be implemented in multiple embodiments separately or in any suitable sub-combination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a sub-combination or variation of a sub-combination.

[0110] One or more embodiments of the disclosure may be referred to herein, individually and/or collectively, by the term "invention" merely for convenience and without intending to voluntarily limit the scope of this application to any particular invention or inventive concept. Moreover, although specific embodiments have been illustrated and described herein, it should be appreciated that any subsequent arrangement designed to achieve the same or similar purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all subsequent adaptations or variations of various embodiments. Combinations of the above

embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the description.

[0111] It is intended that the foregoing detailed description be regarded as illustrative rather than limiting and that it is understood that the following claims including all equivalents are intended to define the scope of the invention. The claims should not be read as limited to the described order or elements unless stated to that effect. Therefore, all embodiments that come within the scope and spirit of the following claims and equivalents thereto are claimed as the invention.

[0112] An aspect provides a network of pressurized pathways for a toilet comprising:

a pressurized water supply;
a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;
a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet; and
a third valve configured to open at least a portion of a water path to a drain valve,
wherein the first valve, the second valve, and the third valve are arranged substantially vertically.

[0113] The network of pressurized pathways may comprise: an electrical generator configured to generate electrical power in response to the pressurized water supply.

[0114] The electrical generator may be connected to the second valve and connected to the rim jet. The electrical generator may be upstream of the rim jet.

[0115] The network of pressurized pathways may comprise: a battery electrically connected to the electrical generator and configured to be charged by the electrical generator.

[0116] The network of pressurized pathways may comprise: a vacuum breaker configured to prevent back flow into the water supply.

[0117] The network of pressurized pathways may comprise: a connector configured to divide the water flow upstream of the first valve, the second valve, and the third valve, to a bidet.

[0118] The network of pressurized pathways may comprise: a pressure regulator configured to set the pressurized water supply to a predetermined pressure.

[0119] The network of pressurized pathways may comprise: a controller configured to activate and deactivate the first valve, the second valve, and the third valve.

[0120] The controller may be configured to operate the second valve and third valve in at least a first time period, the first valve and third valve in at least a second time period, and the second valve in at least a third time period.

[0121] The controller may be configured to activate the second valve in response to a recharge mode. The recharge mode may be triggered in response to a predetermined time of day or a user input.

[0122] The network of pressurized pathways may comprise: a bidet valve, wherein the controller is configured to open at least a portion of a water path from the pressurized water supply to a bidet sprayer via the bidet valve.

[0123] The controller may be configured to generate electrical pulses for a first solenoid corresponding to the first valve, a second solenoid corresponding to the second valve, and a third solenoid corresponding to the third valve.

[0124] The network of pressurized pathways may comprise: a drain valve configured to selectively open and close a drain of the toilet.

[0125] The valve may be water driven.

[0126] An aspect provides a method for providing a pressurized water supply to a toilet, the method comprising:

opening a rim valve and an auxiliary valve at a first time period;
opening a sump valve at a second time period;
closing the rim valve at a third time period; and
closing the auxiliary valve and the sump valve at a fourth time period.

[0127] The method may comprise: opening the rim valve at a fifth time period; and closing the rim valve a sixth time period.

[0128] The method may comprise: opening a bidet valve at a seventh time period; and closing the bidet valve at an eighth time period.

[0129] An aspect provides a toilet comprising:

a pressurized water supply;
a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;
a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet; and
an electrical generator configured to generate electrical power in response to the water path from the pressurized water supply to the rim jet.

[0130] An aspect provides a toilet including a rim comprising:

a floor anchor configured to couple the toilet to a floor;
a toilet base configured to couple to the floor anchor;
a toilet height adapter having a height that defines a distance from the floor to the rim of the toilet;
a toilet housing configured to enclose the toilet base; and
at least one connector on the toilet housing configured to couple to the toilet base at a plurality of positions on the toilet housing.

[0131] The toilet height adapter may include a height corresponding to one of the plurality of positions on the toilet housing.

[0132] The at least one connector may include a slot on the toilet housing and a hole in the toilet base, wherein a fastener connects the toilet housing and the toilet base using the slot on the toilet housing and the hole in the toilet base.

[0133] The at least one connector may include a slot on the toilet base and a hole in the toilet housing, wherein a fastener connects the toilet housing and the toilet base using the slot on the toilet base and the hole in the toilet housing.

[0134] The toilet may comprise: a plurality of nonvariable connectors on the toilet base configured to couple the toilet base to the floor anchor.

[0135] The toilet may comprise: a flexible seal housed in the floor anchor.

[0136] The toilet may comprise: a gate valve configured to selectively open a drain of the toilet.

[0137] The toilet may comprise: a tube that extends from the toilet through the flexible seal and is configured to mate with the floor anchor. The tube may extend from the gate valve.

[0138] The toilet may comprise: a plurality of sensor cavities in the toilet housing.

[0139] The toilet may comprise: a top cover coupled to the toilet housing, wherein the top cover defines the rim of the toilet.

[0140] The toilet may comprise: a toilet hinge configured to rotatably attach a toilet seat to the toilet and provide at least one user input to the toilet.

[0141] An aspect provides a method of manufacturing a toilet, the method comprising:

coupling a toilet height adapter to a toilet base, the toilet height adapter having a height that defines a distance from a floor to a rim of the toilet;
variably coupling the toilet base to a toilet body at a position corresponding to the toilet height adapter;
attaching a toilet skin around the toilet body; and
sliding a skirt along the toilet base over at least a portion of the toilet skin.

[0142] Attaching the toilet skin may comprise:

placing a first side skin on a first side of the toilet body;
placing a second side skin on a second side of the toilet body; and
placing a cover on top of the first sided skin and second side skin.

[0143] The method may comprise: attaching the cover to the toilet body with at least one cover fastener within a toilet hinge; and placing a hinge cover over the toilet hinge.

[0144] The method may comprise: coupling a toilet seat to the toilet hinge.

[0145] The method may comprise: selecting the toilet height adapter according to a model of the toilet.

[0146] The skirt may correspond to the toilet height adapter.

[0147] An aspect provides a toilet comprising:

a floor anchor configured to couple the toilet to a floor;
a toilet base configured to couple to the floor anchor;
a toilet height adapter coupled to the toilet base having a height that defines a distance from the floor to a rim of the toilet;
a bidet coupled to the toilet base; and
a toilet housing configured to enclose the floor anchor, the toilet base, the toilet height adapter and the bidet.

[0148] The toilet may comprise: at least one variable connector on the toilet housing configured to couple to the toilet base at a plurality of positions on the toilet housing.

[0149] An aspect provides a toilet comprising:

a toilet base;
a toilet seat; and
a hinge body coupled to the toilet base and configured to rotatable connect to the toilet seat,
wherein the hinge body includes at least one button facing to a rear of the toilet and hidden from view at a front of the toilet.

[0150] The toilet may comprise: a cover coupled to the toilet base and configured to rotatable connect to the toilet seat, wherein when the cover is raised the at least one button is visible in a reflection provided by the cover.

[0151] The toilet may comprise: a bidet; and a dial coupled to a rear of the toilet and configured to adjust a pressure for the bidet.

[0152] A rod may extend from the bidet to the dial such that the dial rotates the rod to adjust the pressure for the bidet.

[0153] An aspect provides a toilet comprising:

a toilet base;
a hinge body coupled to the toilet base and configured to rotatably connect a toilet seat to the toilet base; and
a sensor supported within the hinge body and configured to detect a user.

[0154] The toilet may comprise: a motor supported within the hinge body and configured to rotate the toilet seat with respect to the toilet base. The motor may raise or lower the toilet seat with respect to the toilet base.

[0155] The sensor may be a millimeter wave sensor.

[0156] The hinge body may include at least one button facing to a rear of the toilet and hidden from view at a front

of the toilet.

Claims

1. A network of pressurized pathways for a toilet comprising:

   a pressurized water supply;
   a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;
   a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet; and
   a third valve configured to open at least a portion of a water path to a drain valve,
   wherein the first valve, the second valve, and the third valve are arranged substantially vertically.

2. The network of pressurized pathways of claim 1, further comprising:
   an electrical generator configured to generate electrical power in response to the pressurized water supply, and, optionally, a battery electrically connected to the electrical generator and configured to be charged by the electrical generator.

3. The network of pressurized pathways of claim 2, wherein the electrical generator is connected to the second valve and connected to the rim jet, optionally wherein the electrical generator is upstream of the rim jet.

4. The network of pressurized pathways of claim 1, claim 2 or claim 3, further comprising:
   a vacuum breaker configured to prevent back flow into the water supply.

5. The network of pressurized pathways of any one of the preceding claims, further comprising:
   a connector configured to divide the water flow upstream of the first valve, the second valve, and the third valve, to a bidet.

6. The network of pressurized pathways of any one of the preceding claims, further comprising:
   a pressure regulator configured to set the pressurized water supply to a predetermined pressure.

7. The network of pressurized pathways of any one of the preceding claims, further comprising:
   a controller configured to activate and deactivate the first valve, the second valve, and the third valve, optionally wherein the controller is configured to operate the second valve and third valve in at least a first time period, the first valve and third valve in at least a second time period, and the second valve in at least a third time period.

8. The network of pressurized pathways of claim 7, wherein the controller is configured to activate the second valve in response to a recharge mode, optionally wherein the recharge mode is triggered in response to a predetermined time of day or a user input.

9. The network of pressurized pathways of claim 7 or claim 8, further comprising:
   a bidet valve, wherein the controller is configured to open at least a portion of a water path from the pressurized water supply to a bidet sprayer via the bidet valve.

10. The network of pressurized pathways of claim 7, claim 8 or claim 9, wherein the controller is configured to generate electrical pulses for a first solenoid corresponding to the first valve, a second solenoid corresponding to the second valve, and a third solenoid corresponding to the third valve.

11. The network of pressurized pathways of any one of the preceding claims, further comprising:
    a drain valve configured to selectively open and close a drain of the toilet, optionally wherein the valve is water driven.

12. A method for providing a pressurized water supply to a toilet, the method comprising:

    opening a rim valve and an auxiliary valve at a first time period;
    opening a sump valve at a second time period;
    closing the rim valve at a third time period; and
    closing the auxiliary valve and the sump valve at a fourth time period.

13. The method of claim 12, further comprising:

    opening the rim valve at a fifth time period; and
    closing the rim valve a sixth time period.

14. The method of claim 12 or claim 13, further comprising:

    opening a bidet valve at a seventh time period; and
    closing the bidet valve at an eighth time period.

15. A toilet comprising:

    a pressurized water supply;
    a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;
    a second valve configured to open at least a

portion of a water path from the pressurized water supply to a rim jet; and

an electrical generator configured to generate electrical power in response to the water path from the pressurized water supply to the rim jet.

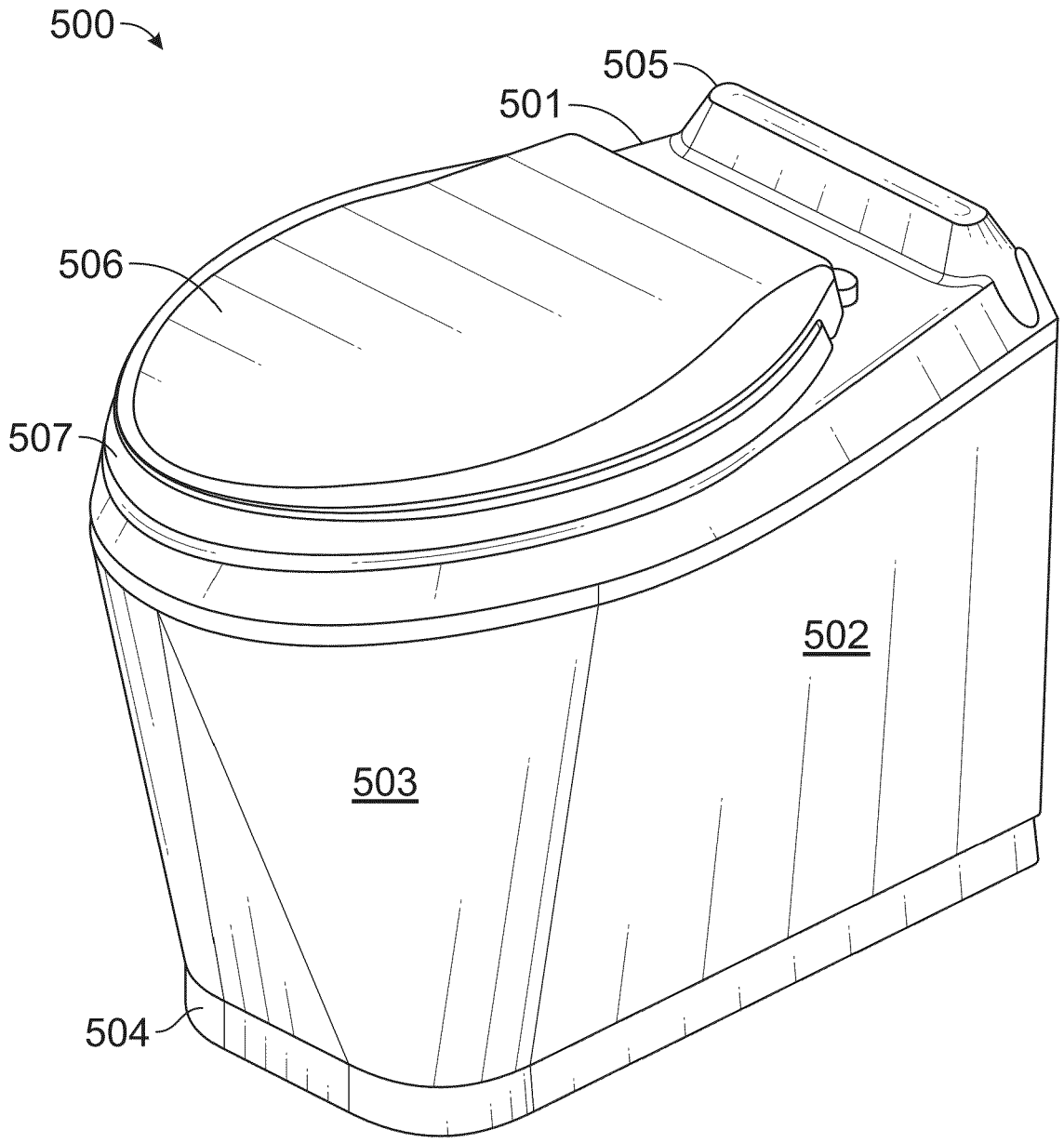


FIG. 1

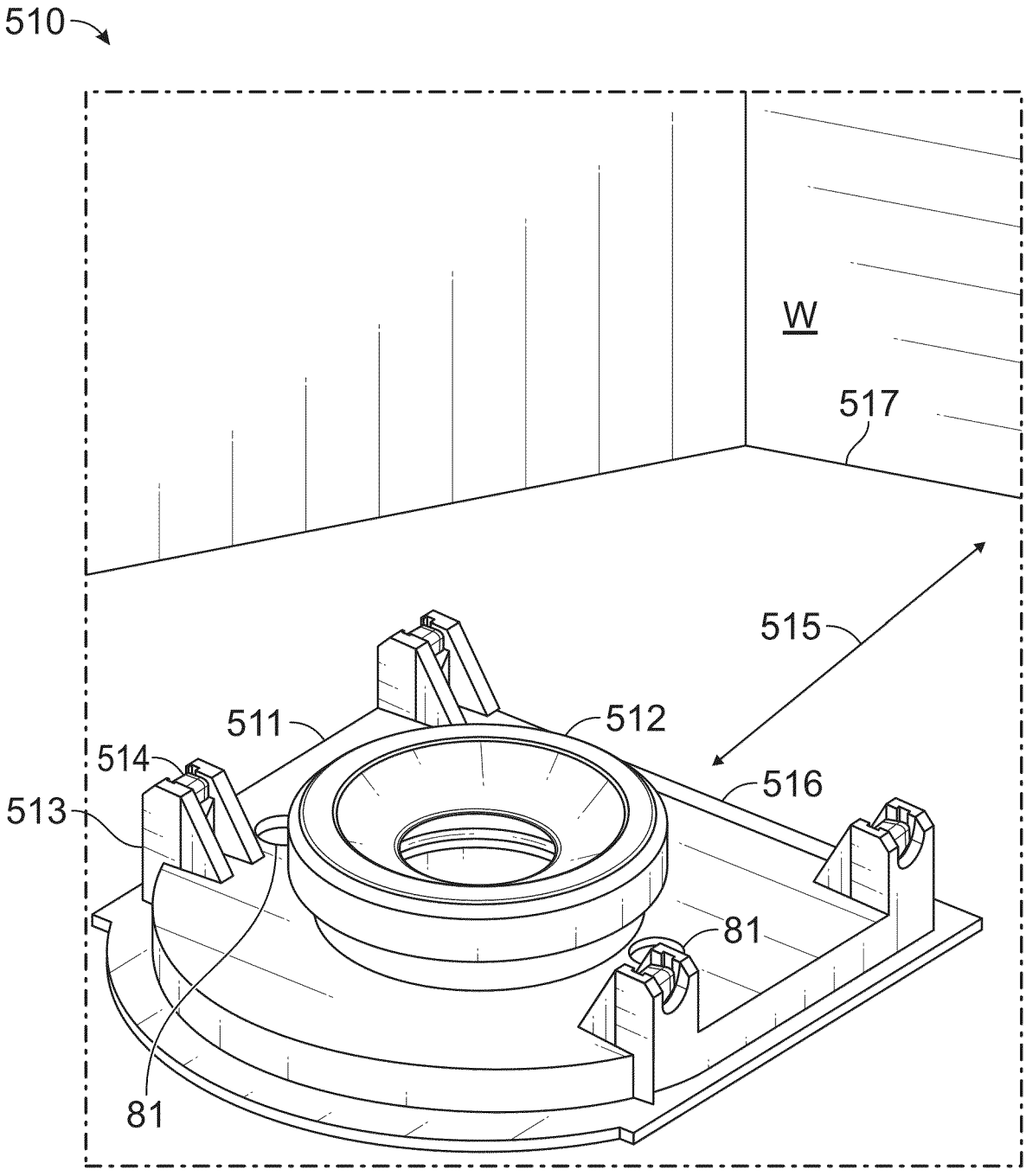


FIG. 2

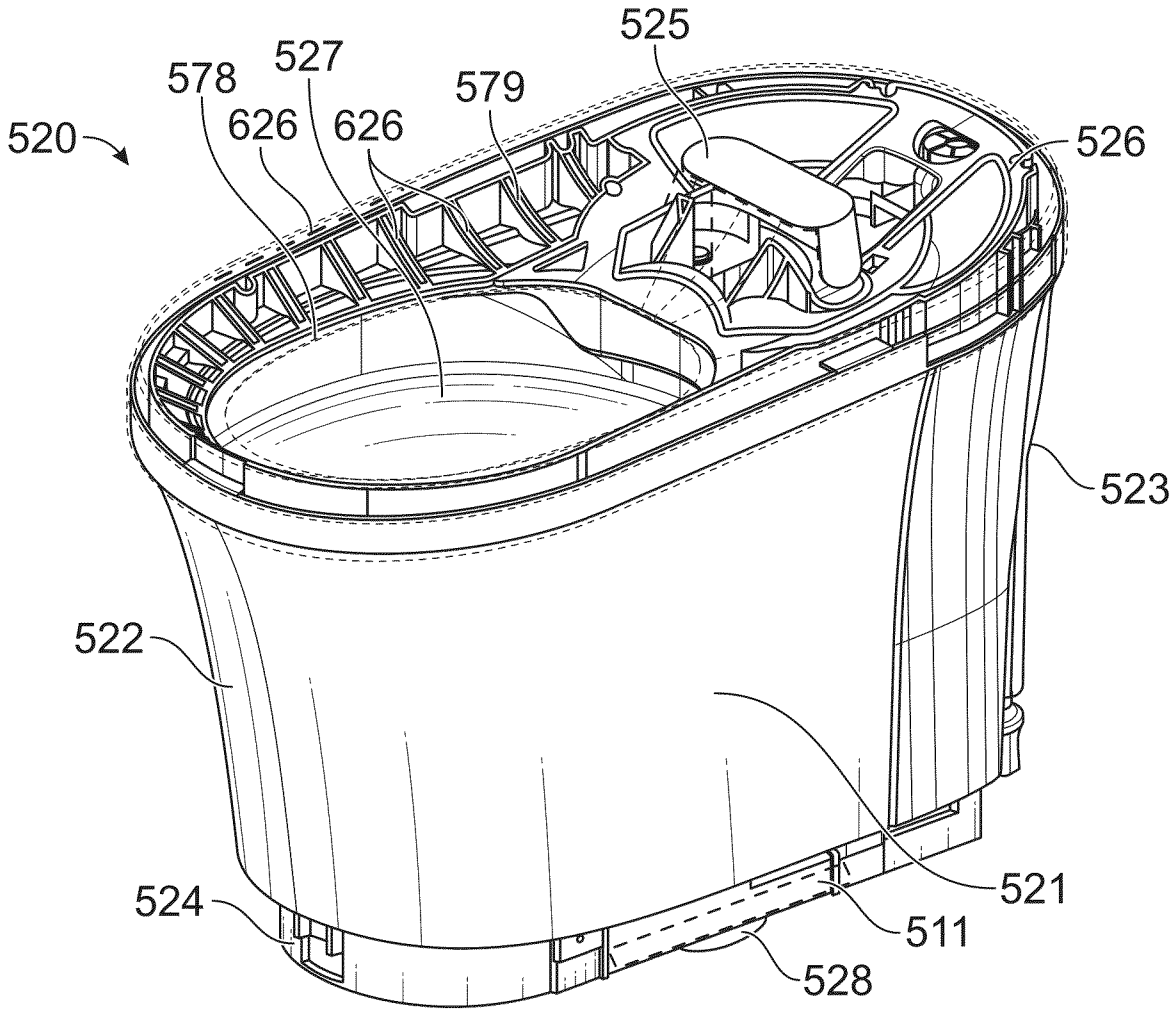


FIG. 3

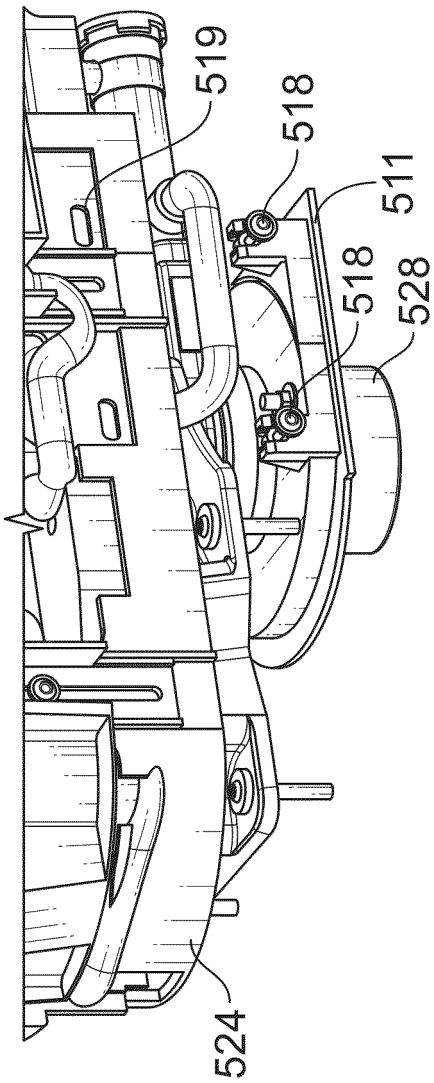


FIG. 4A

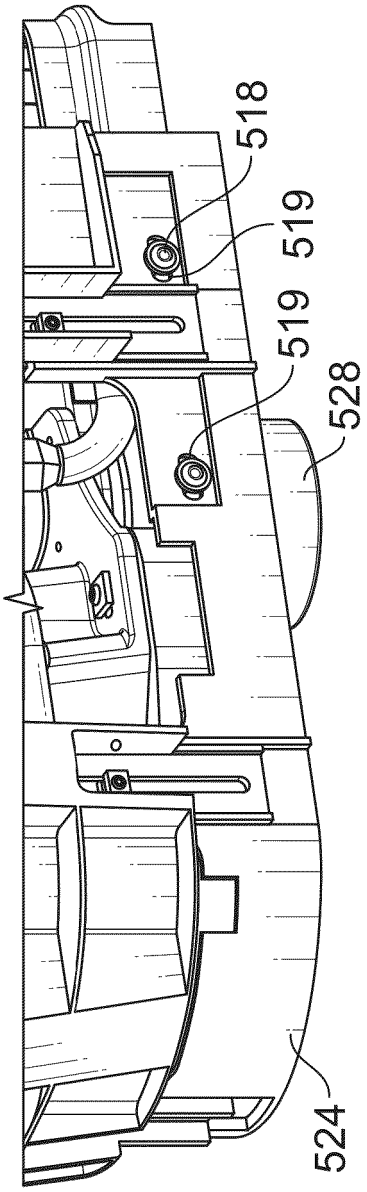


FIG. 4B

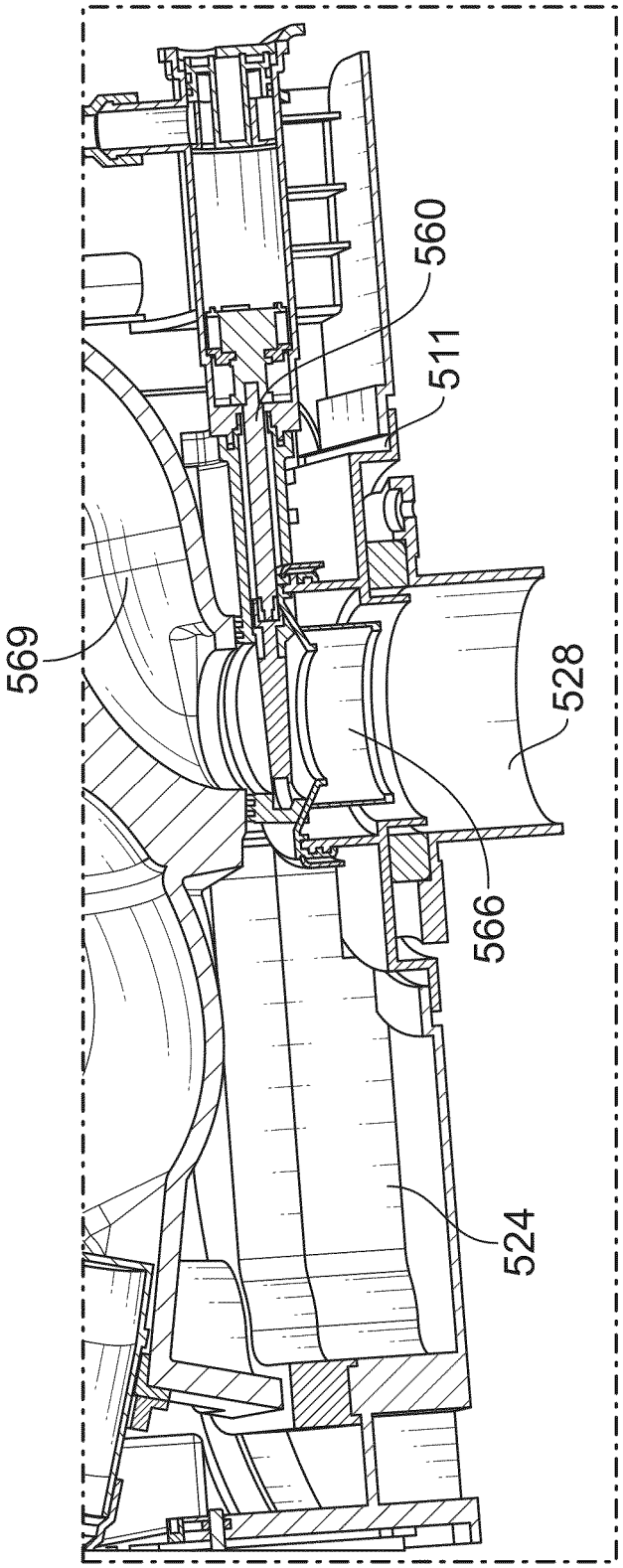


FIG. 4C

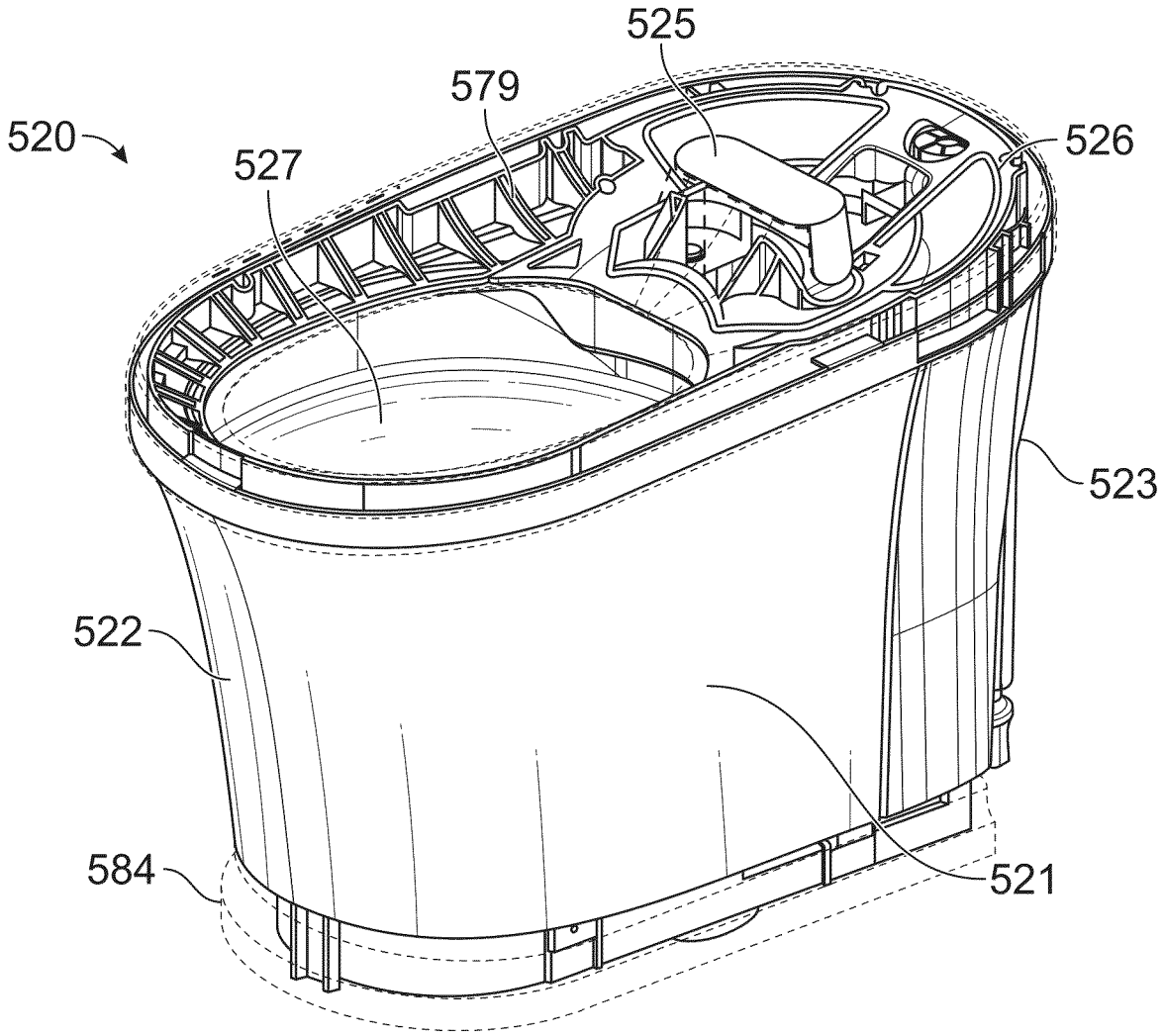


FIG. 5

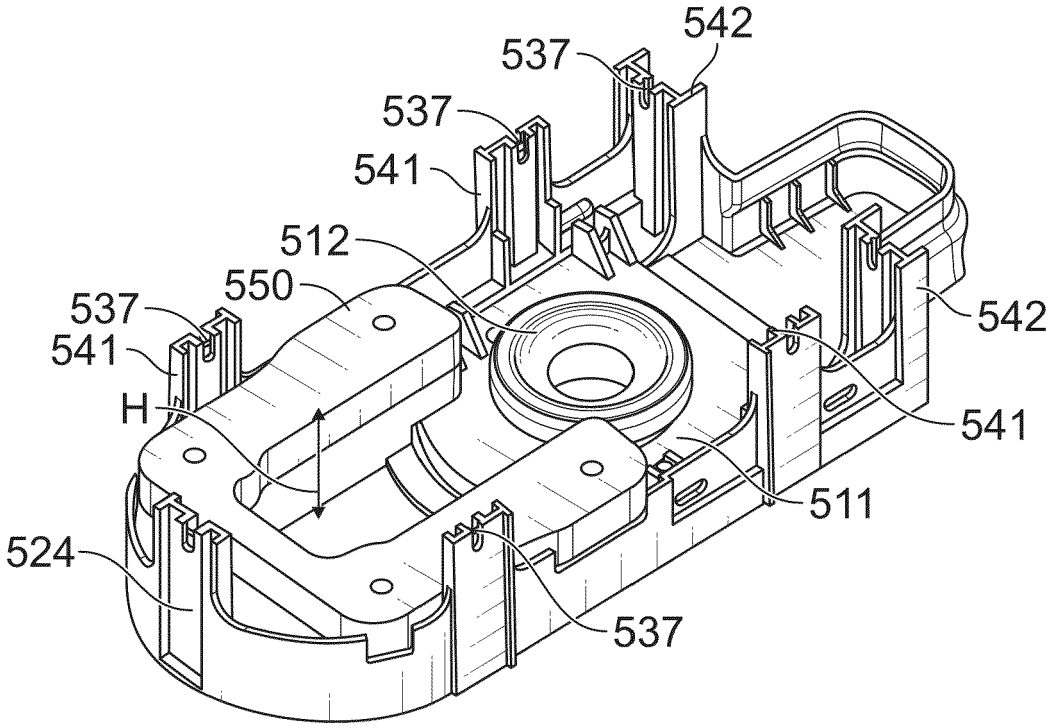


FIG. 6A

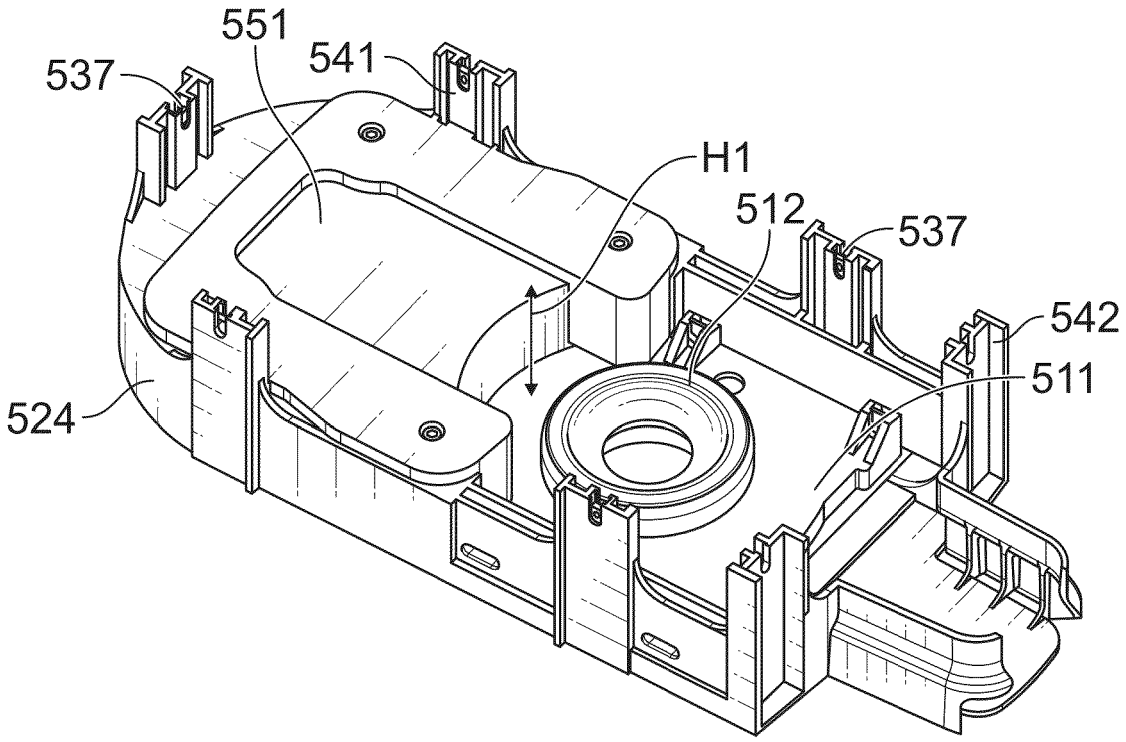

551
541
537
H1
512
537
542
511
524

FIG. 6B

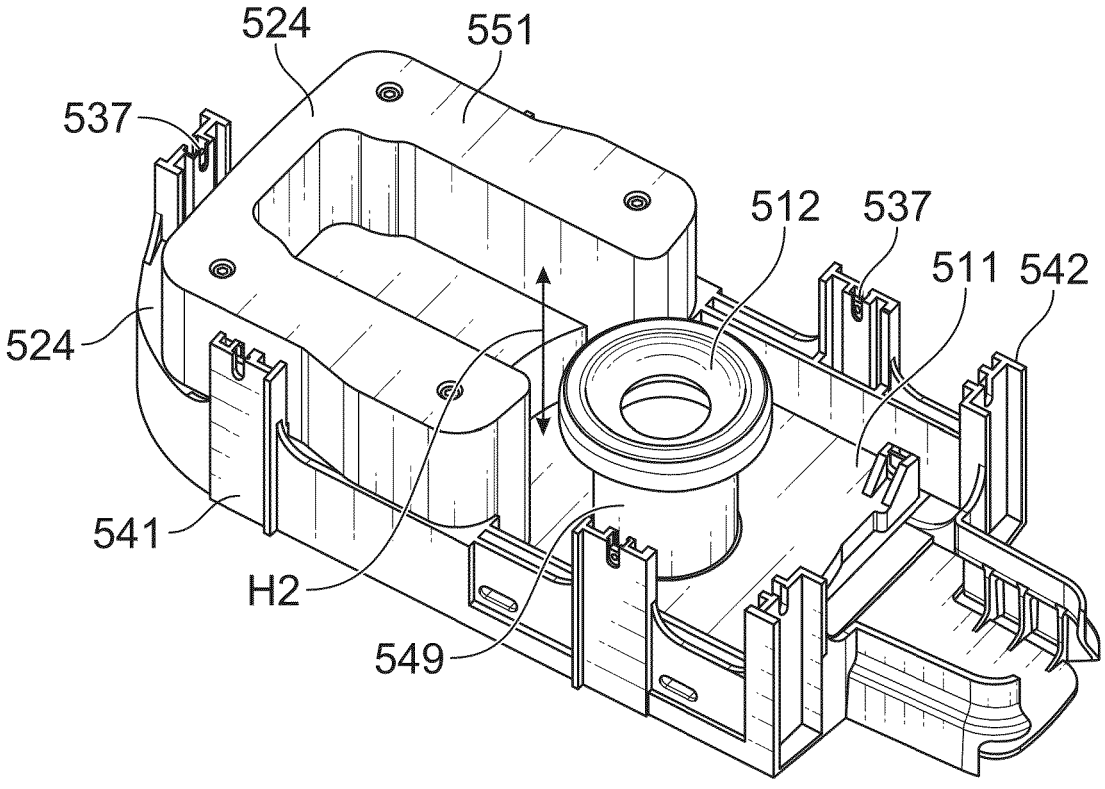

524
551
537
512
537
511
542
524
541
H2
549

FIG. 6C

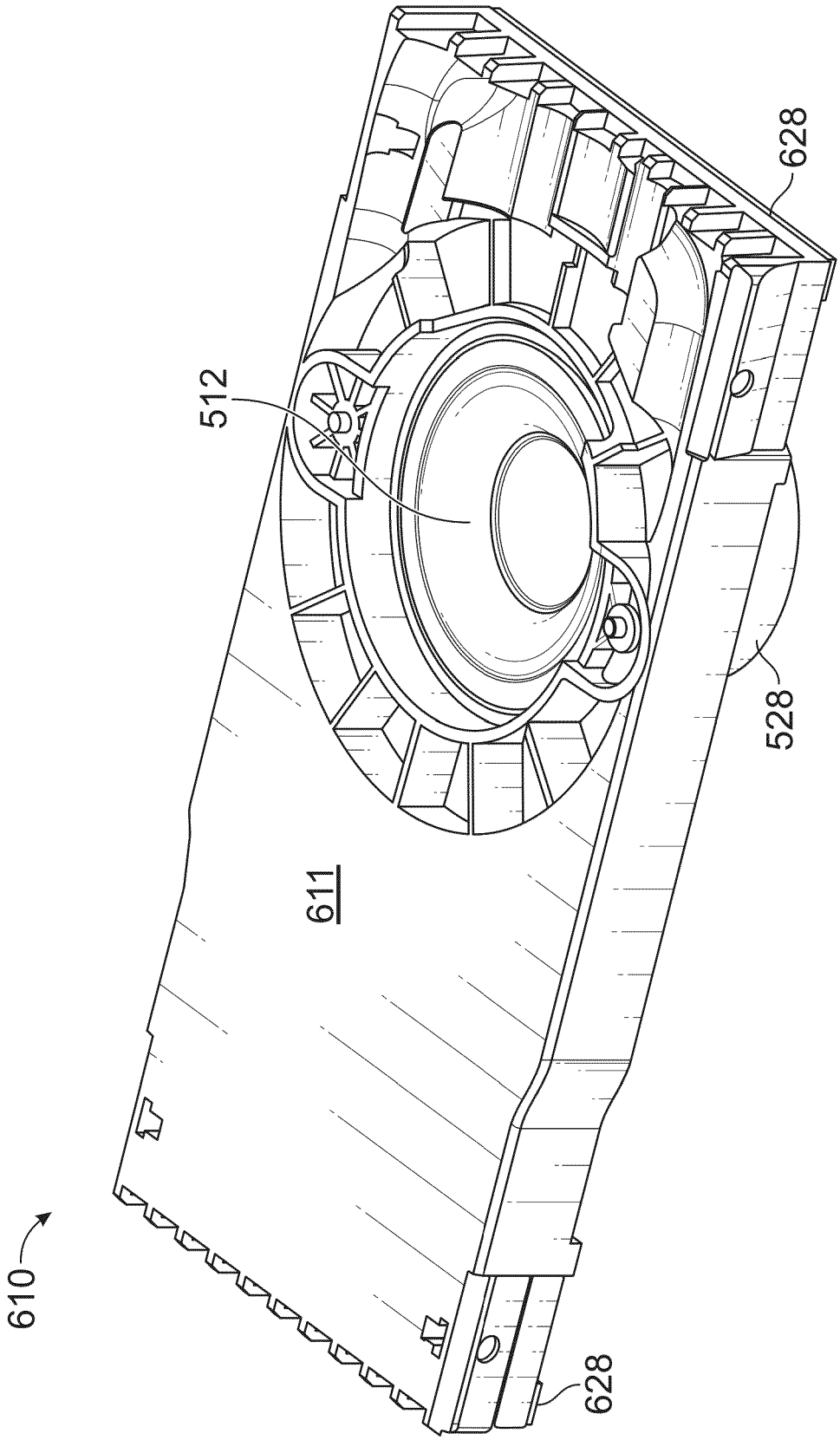


FIG. 7

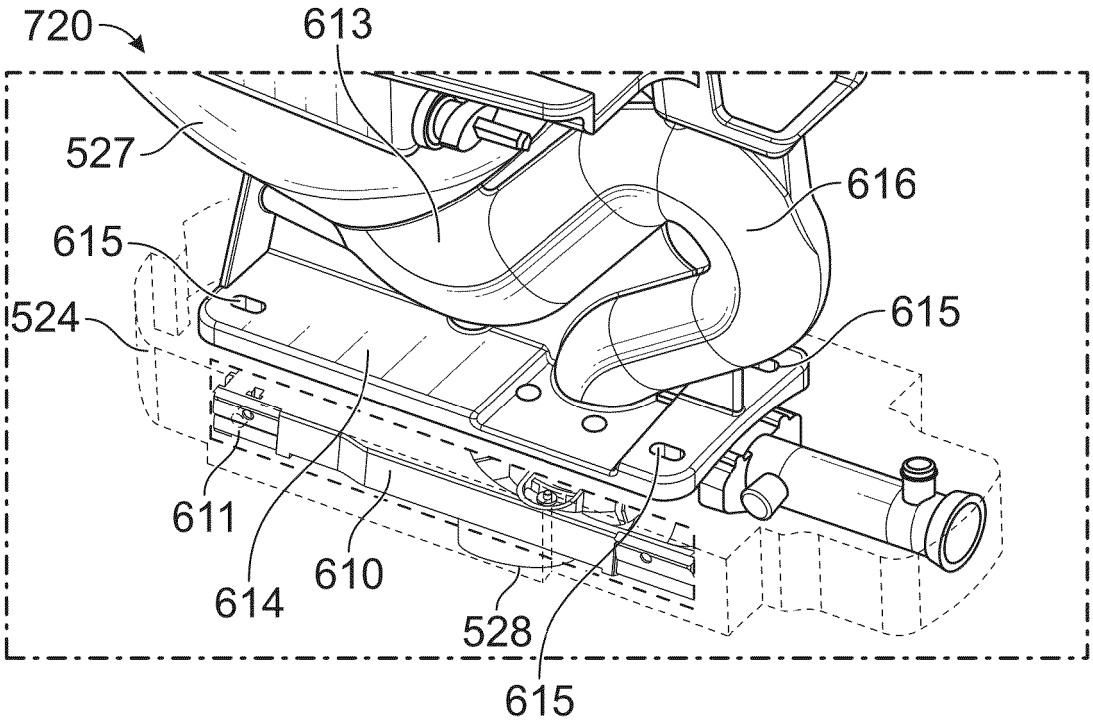


FIG. 8

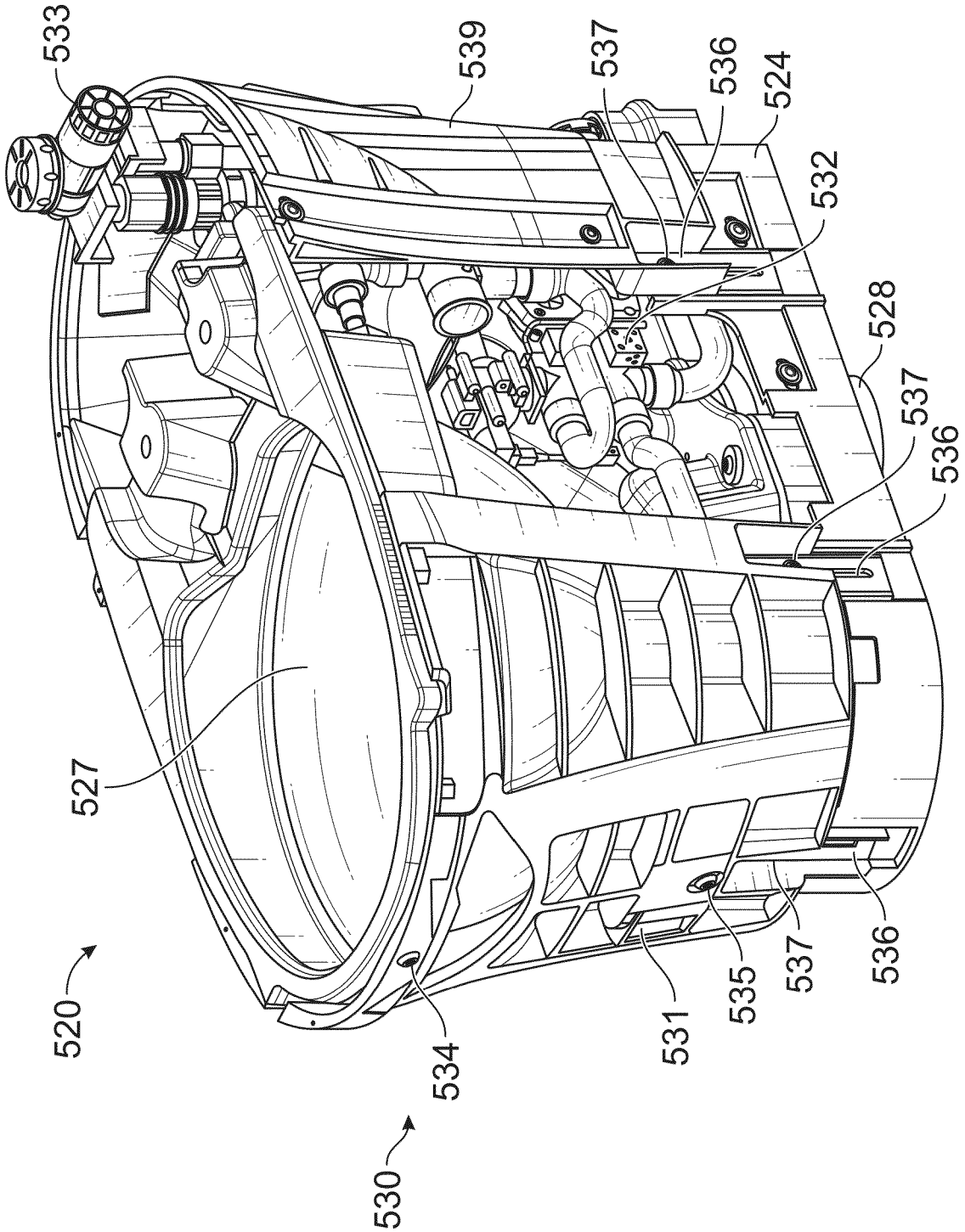

533
539
537
536
524
532
528
537
536
527
520
534
530
531
535
537
536

FIG. 9

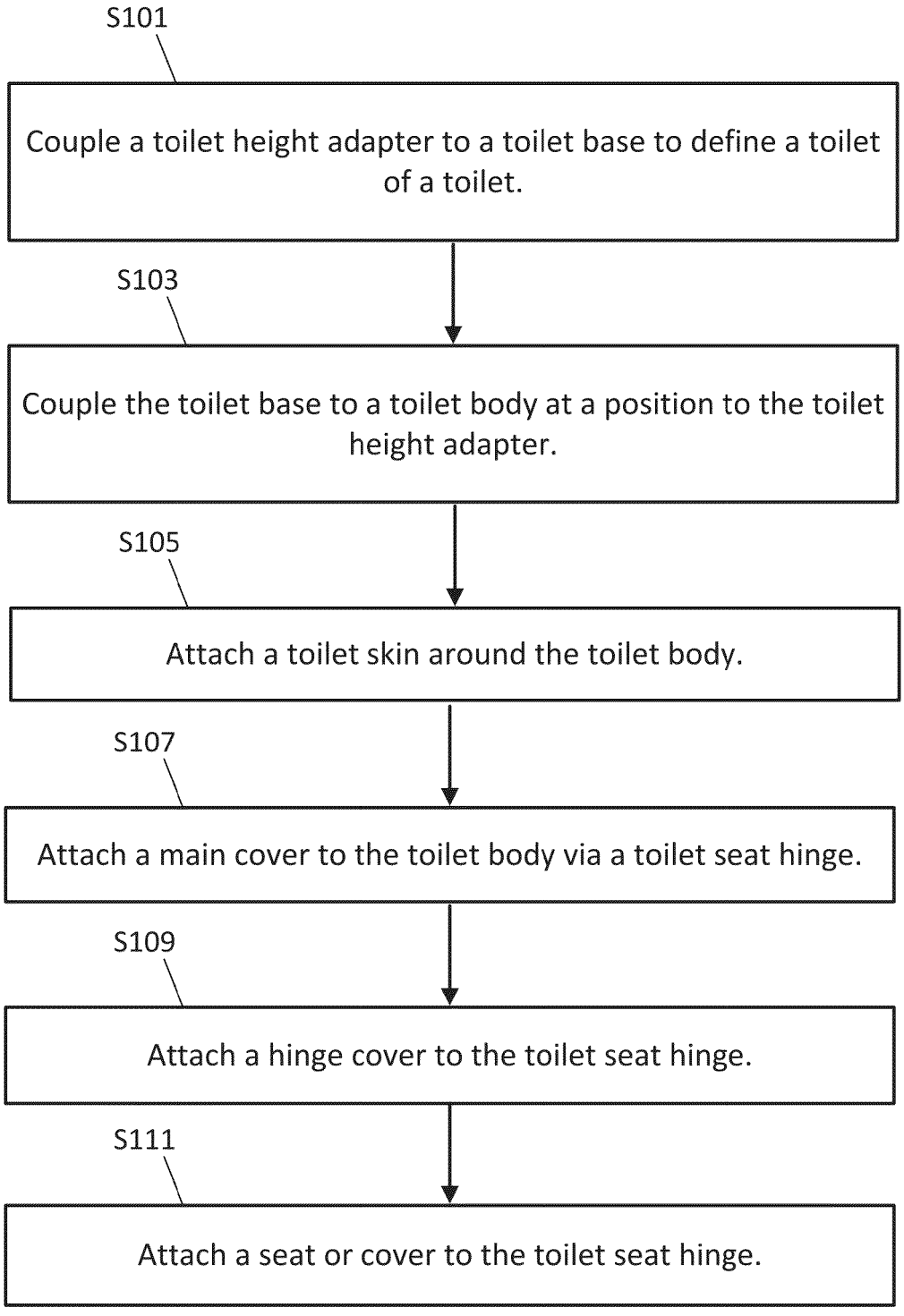

S101
Couple a toilet height adapter to a toilet base to define a toilet of a toilet.
S103
Couple the toilet base to a toilet body at a position to the toilet height adapter.
S105
Attach a toilet skin around the toilet body.
S107
Attach a main cover to the toilet body via a toilet seat hinge.
S109
Attach a hinge cover to the toilet seat hinge.
S111
Attach a seat or cover to the toilet seat hinge.

FIG. 10

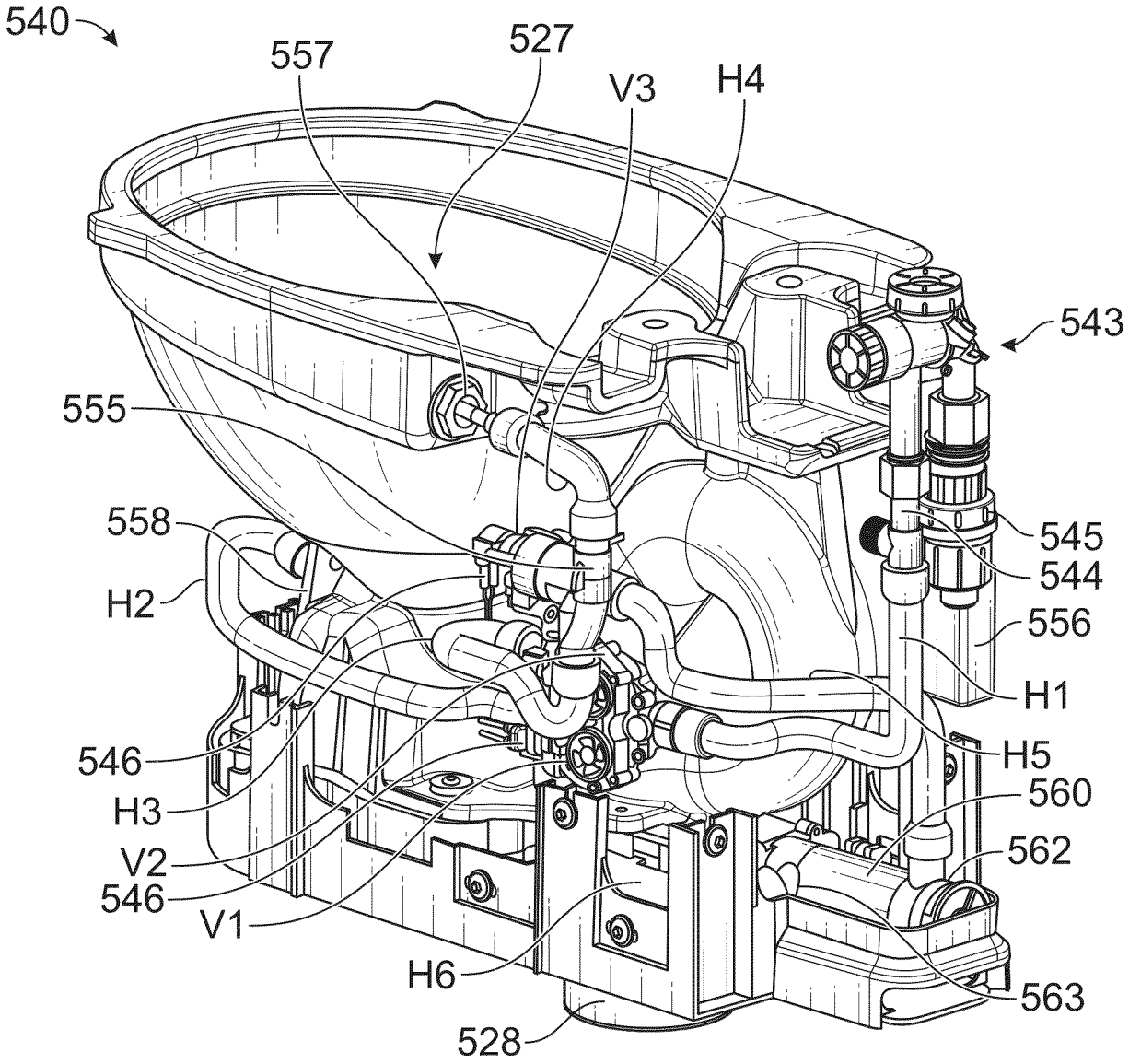

540
557
527
V3
H4
543
555
558
H2
545
544
556
H1
546
H5
H3
560
V2
562
546
V1
H6
563
528

FIG. 11

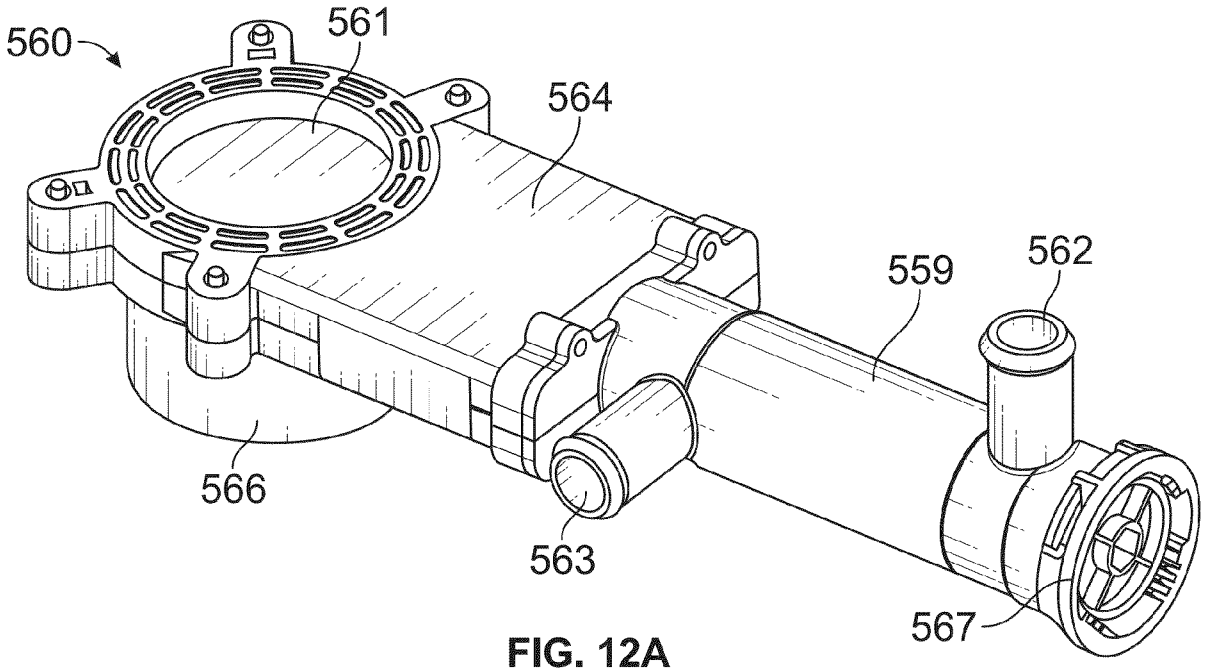


FIG. 12A

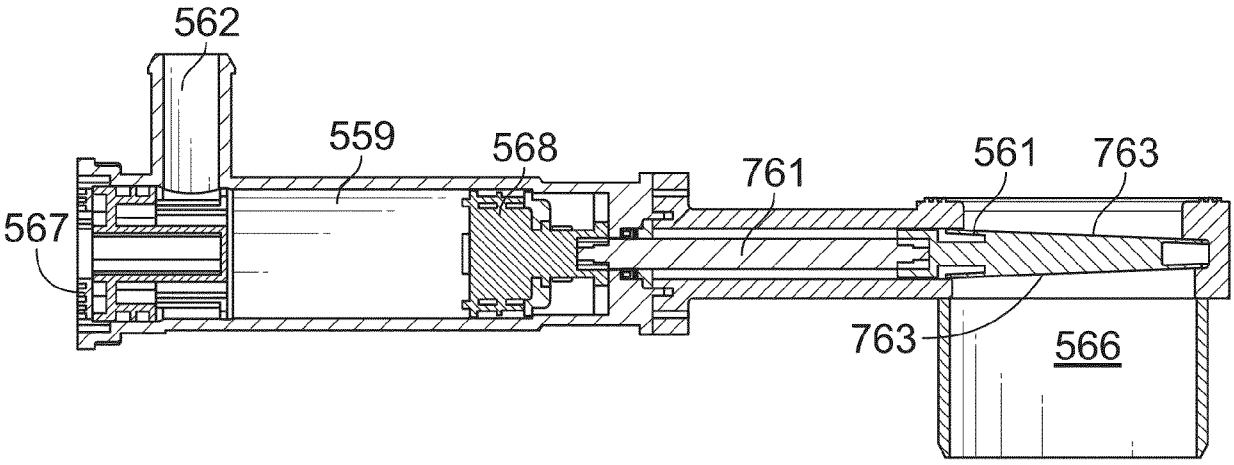


FIG. 12B

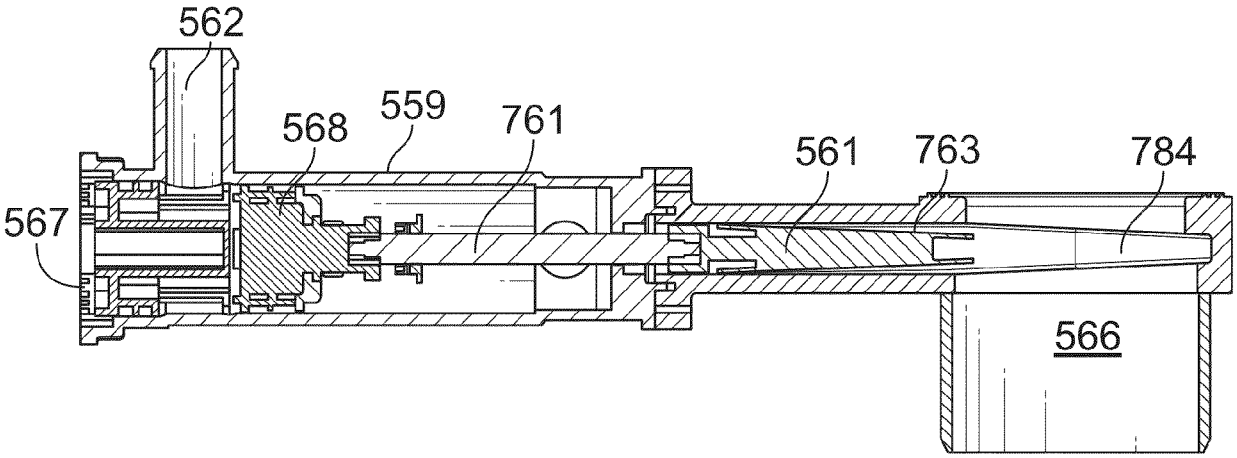


FIG. 12C

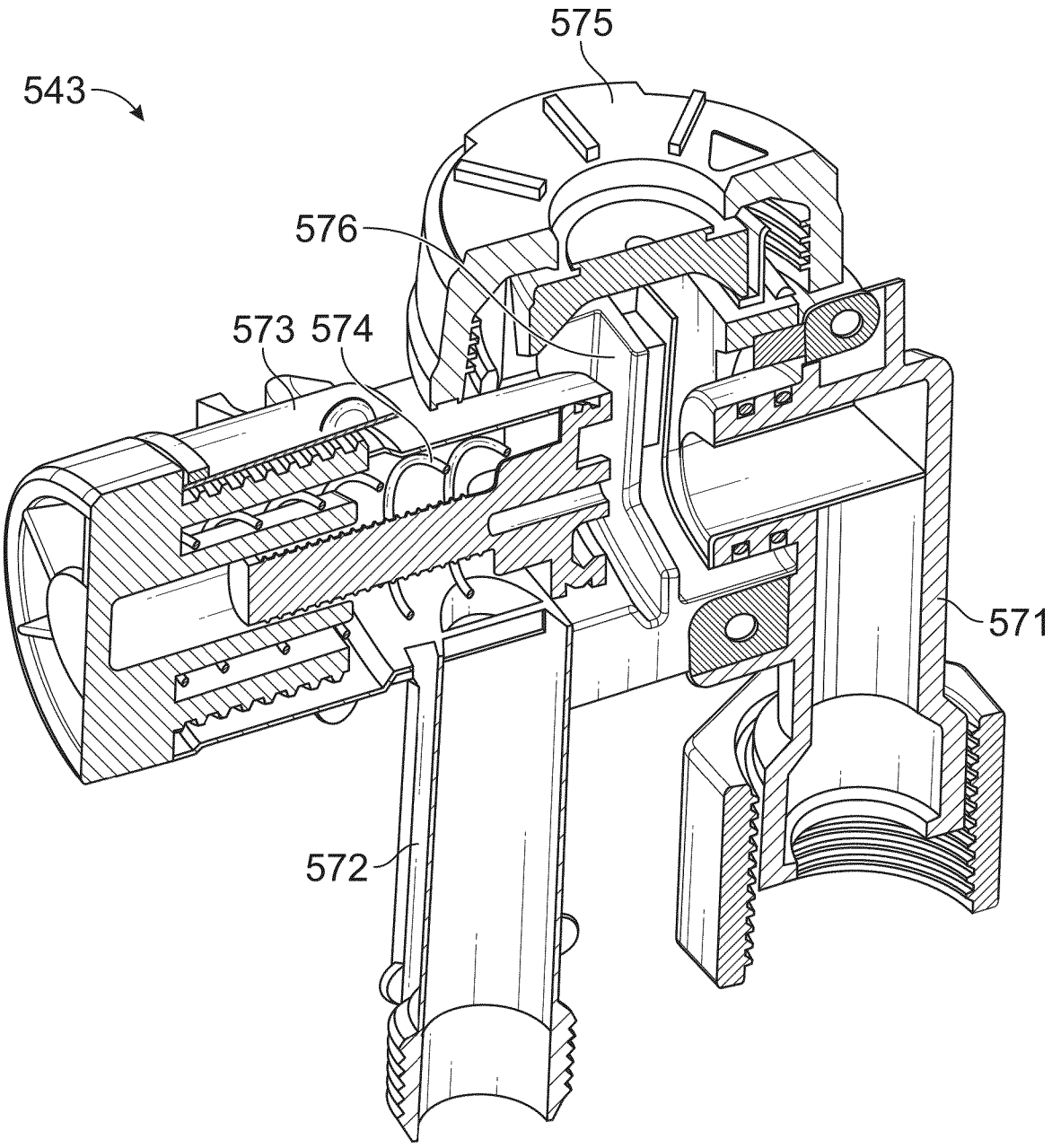


FIG. 13

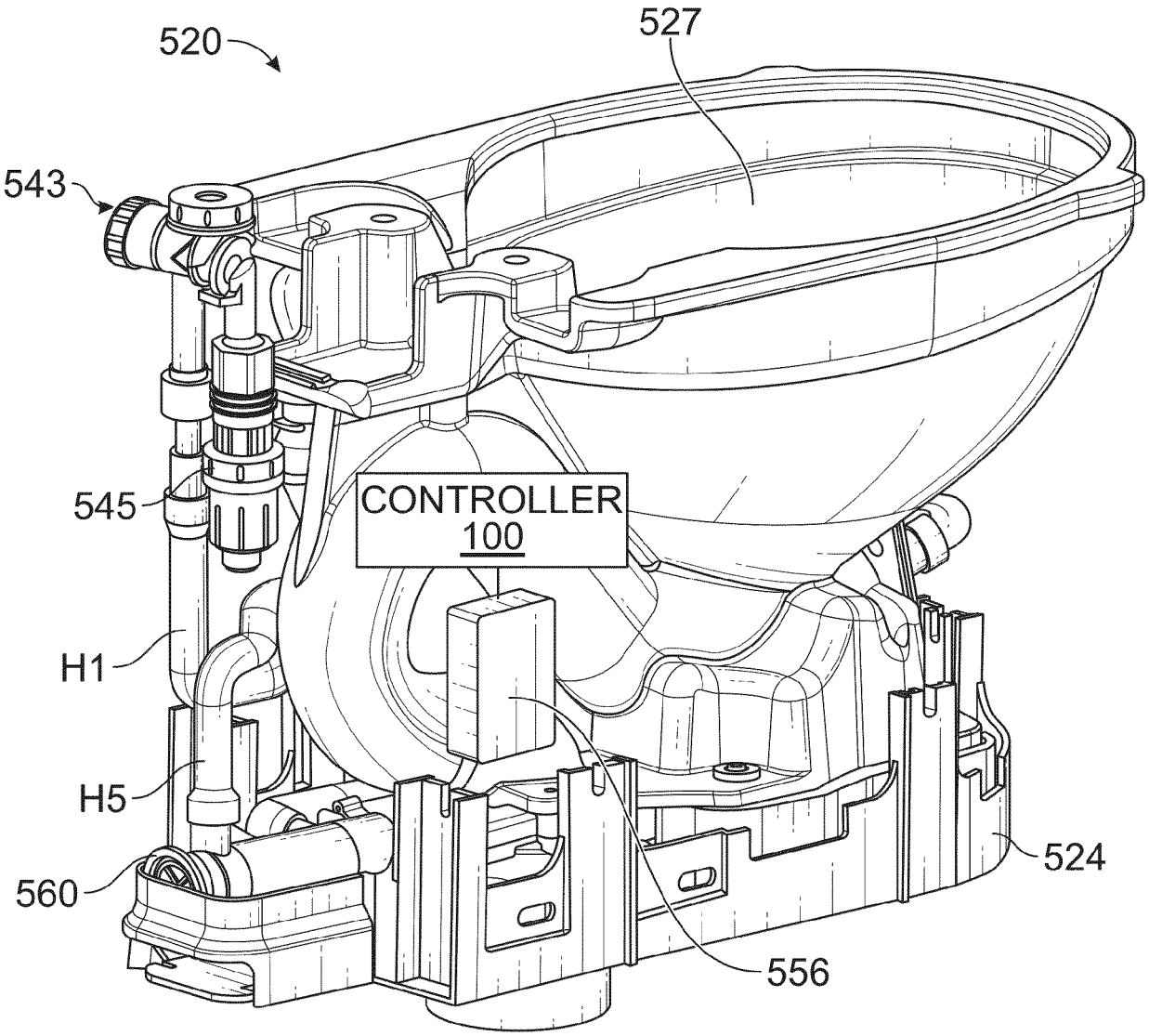


FIG. 14

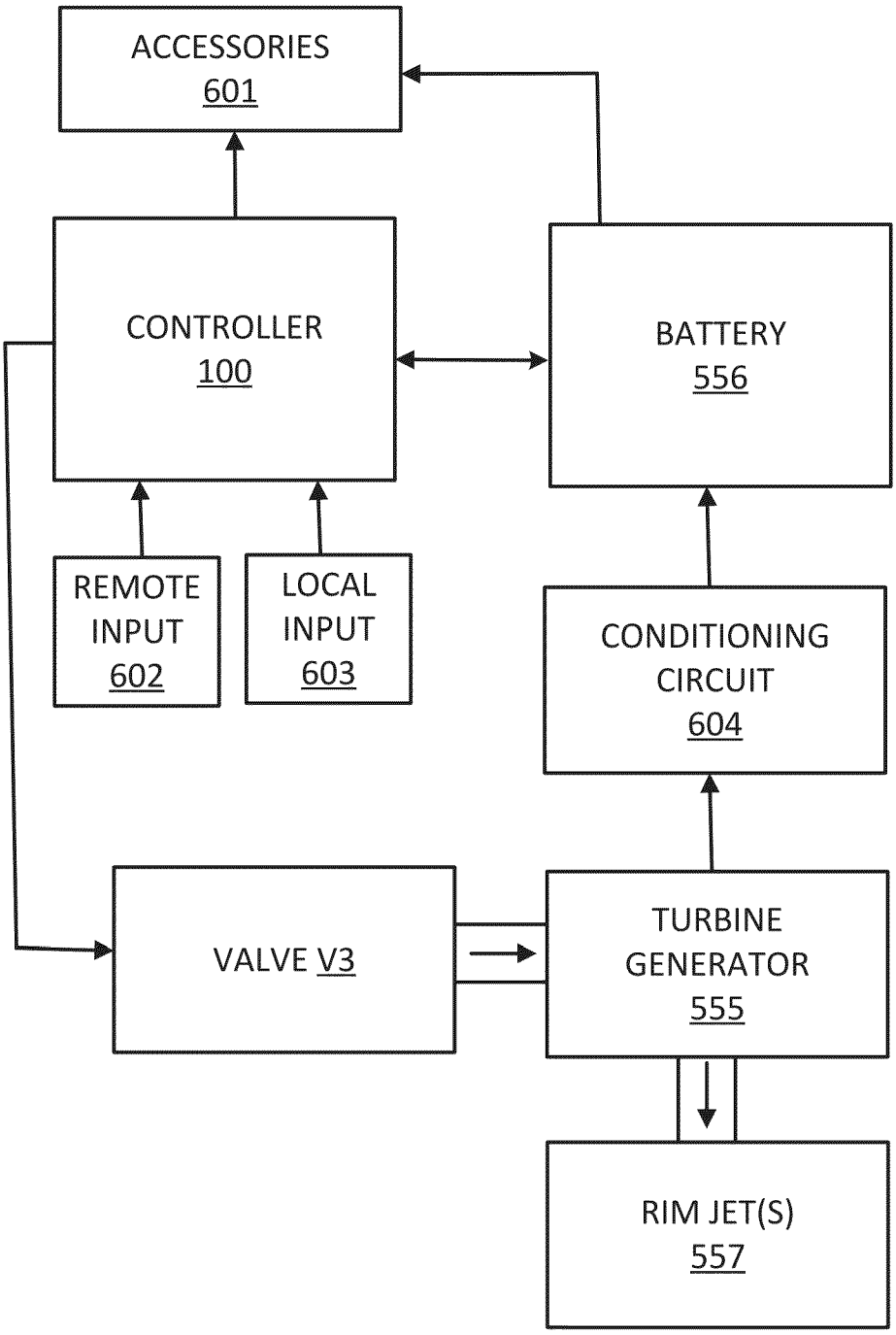

ACCESSORIES
601
CONTROLLER
100
BATTERY
556
REMOTE
INPUT
602
LOCAL
INPUT
603
CONDITIONING
CIRCUIT
604
VALVE V3
TURBINE
GENERATOR
555
RIM JET(S)
557

FIG. 15

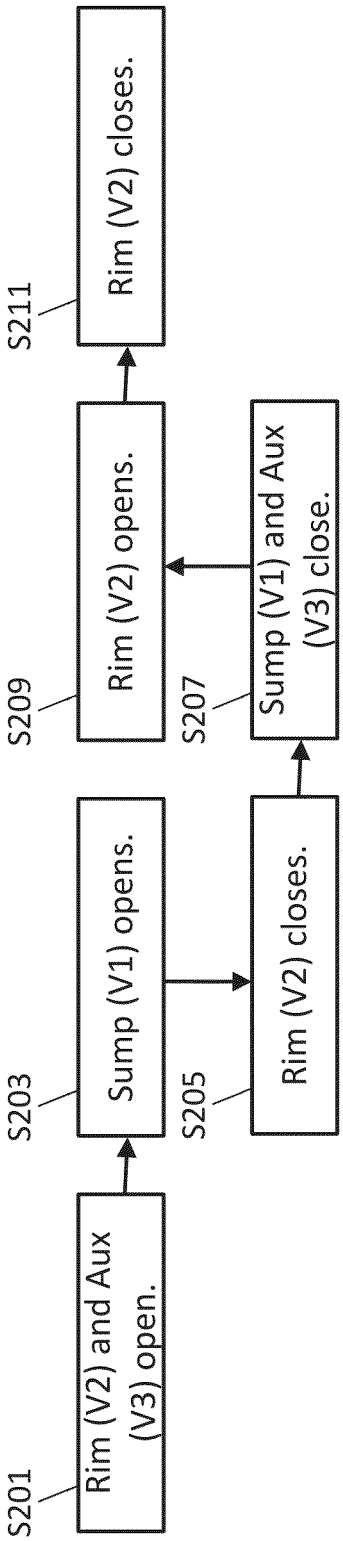


FIG. 16A

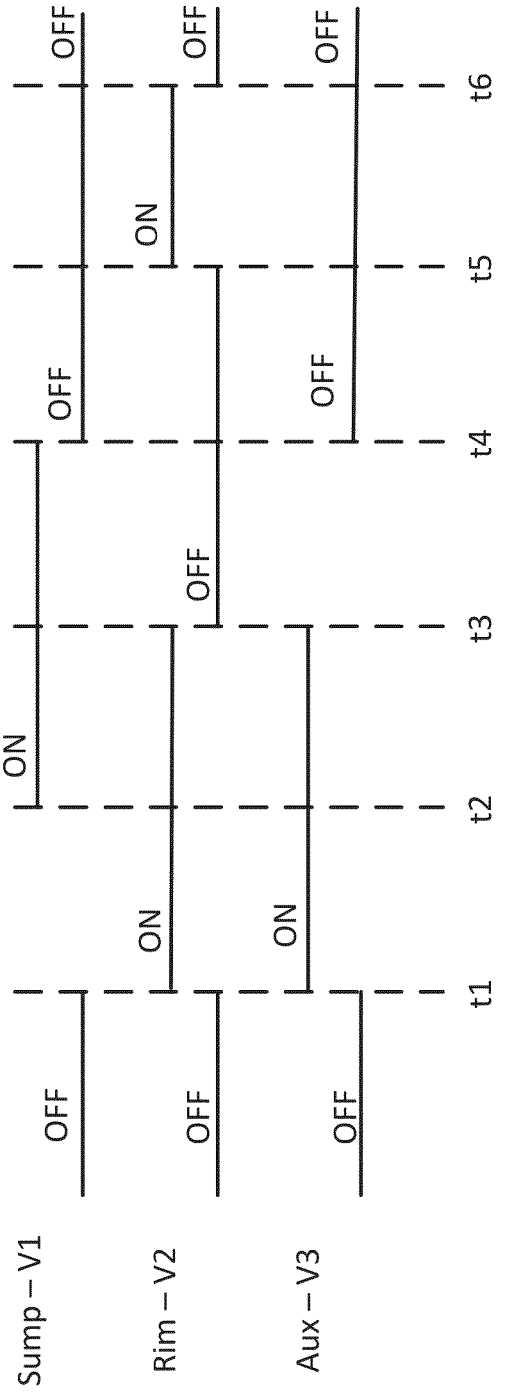


FIG. 16B

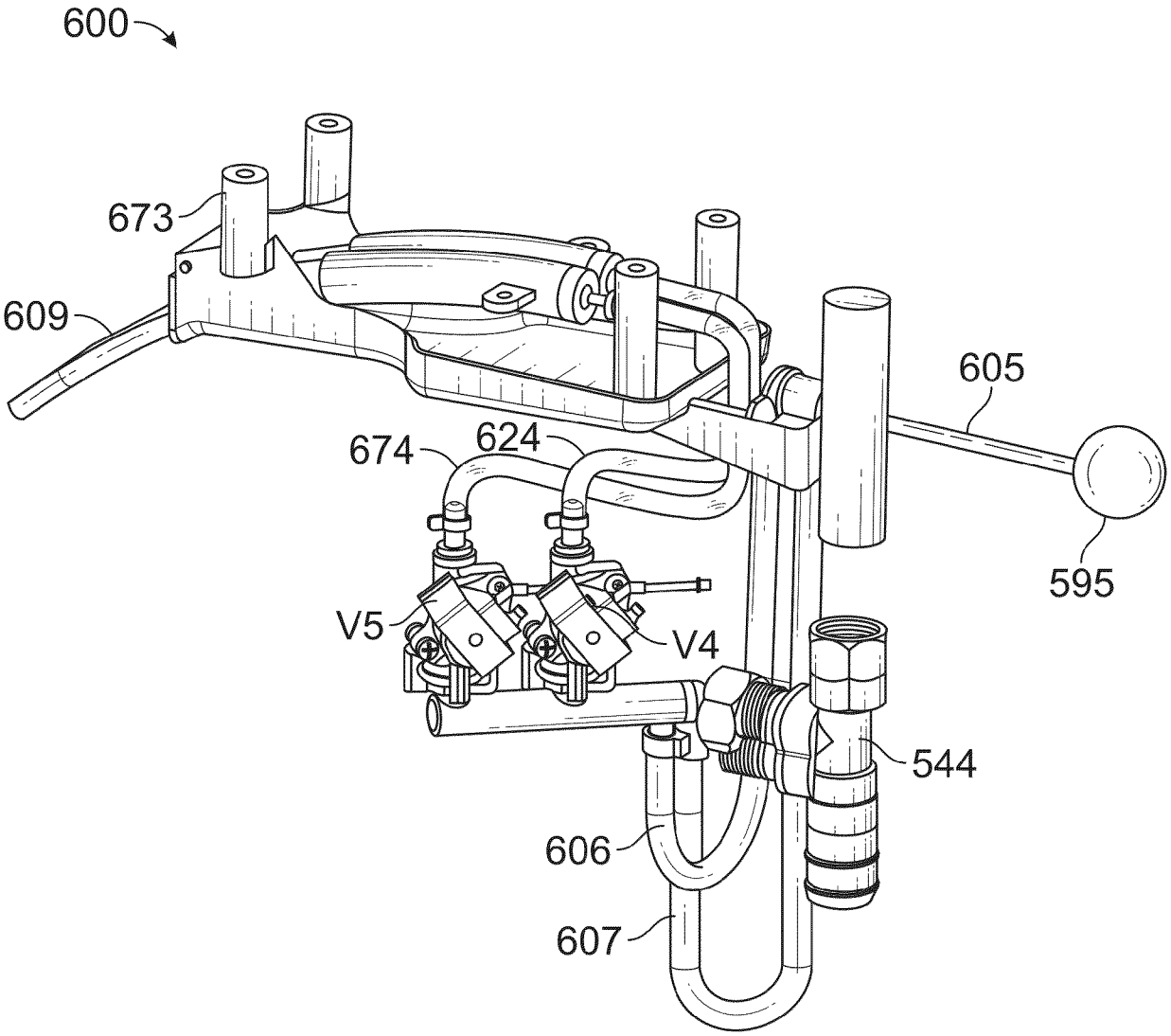


FIG. 17

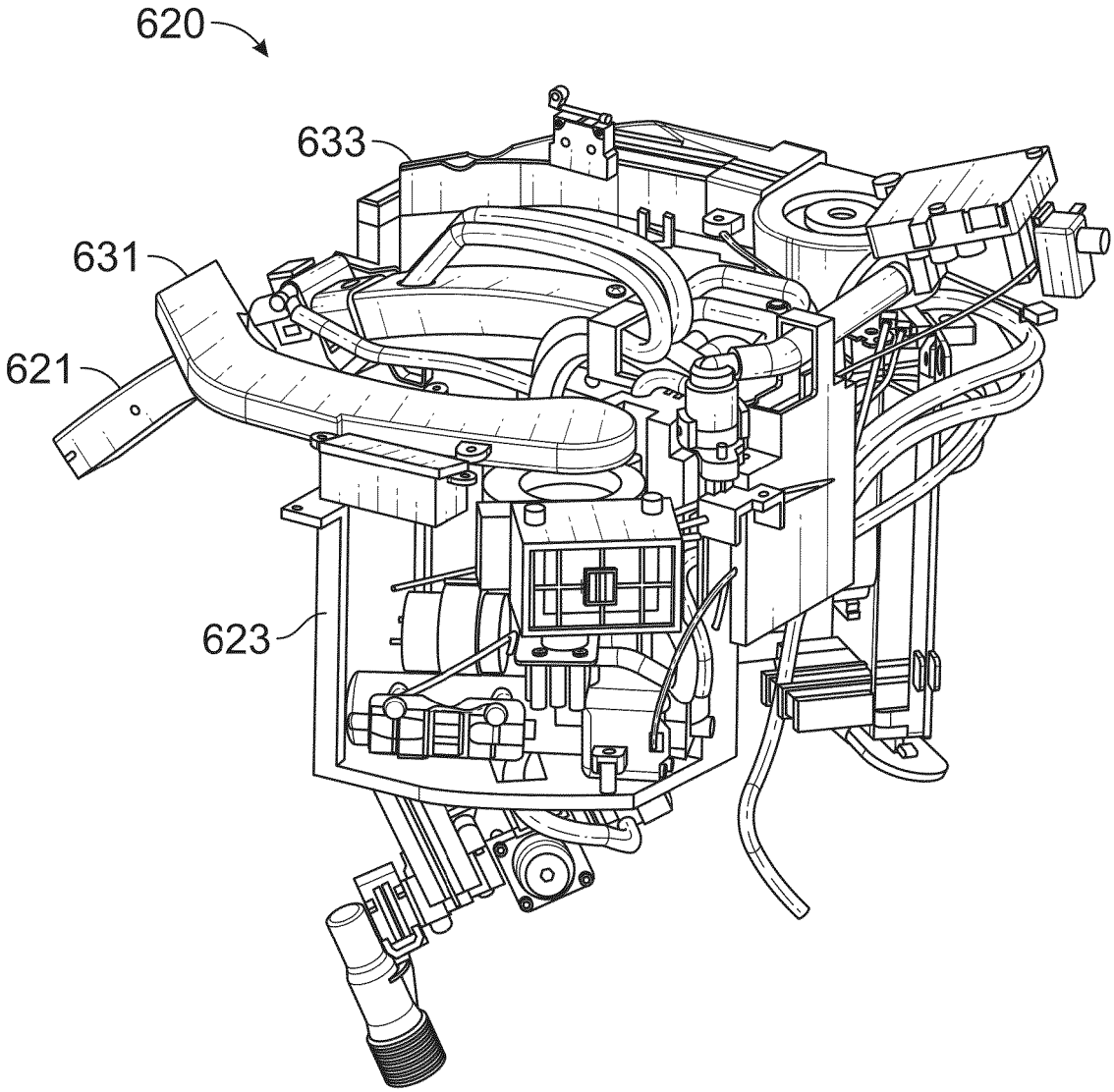


FIG. 18

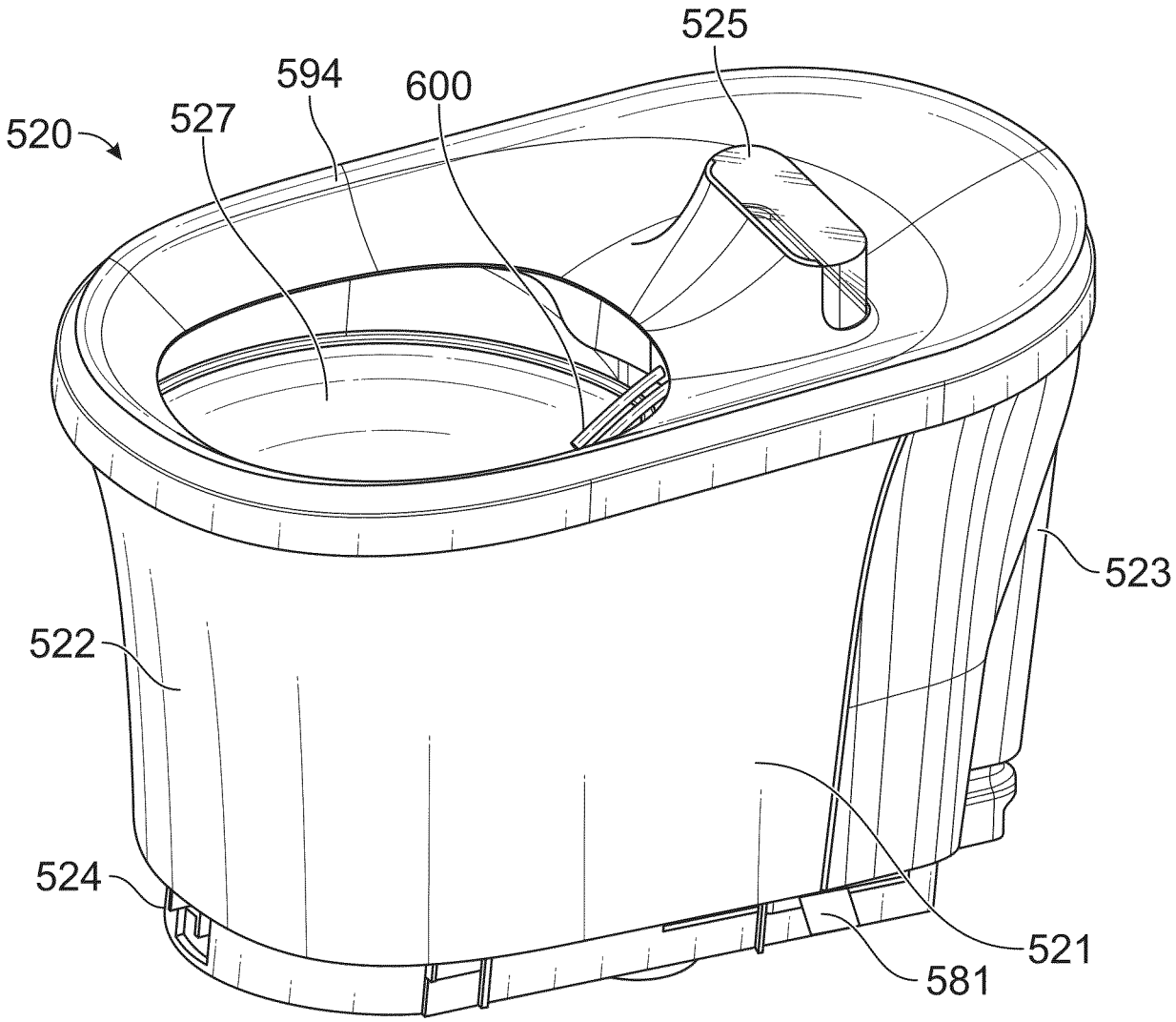


FIG. 19

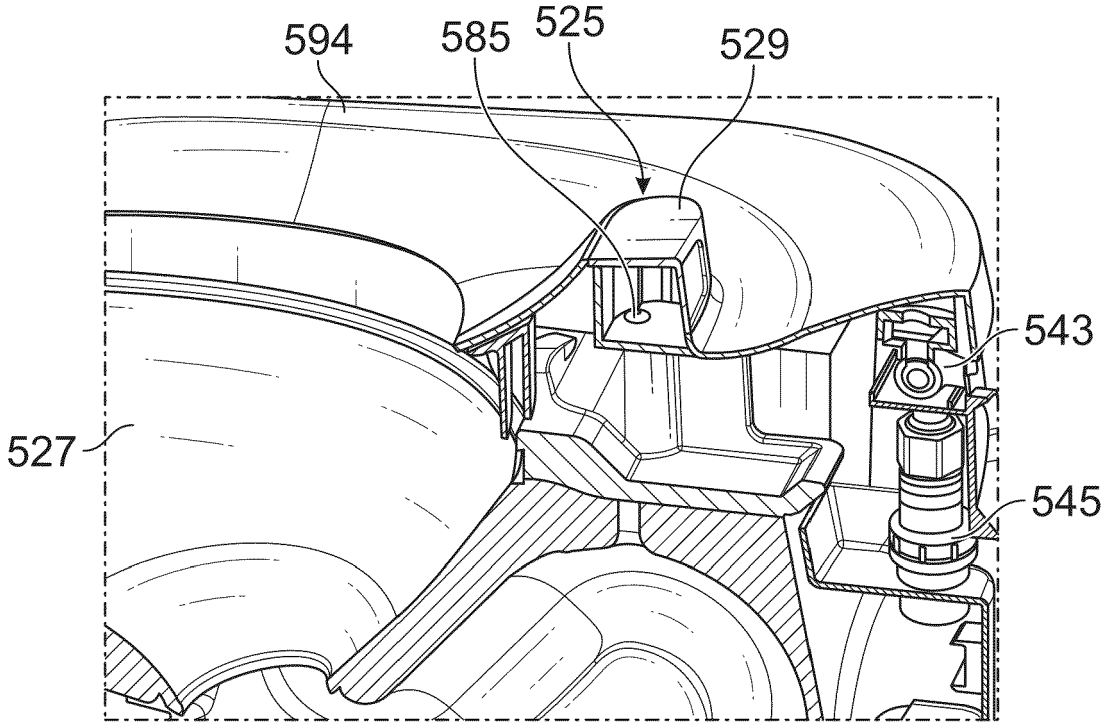


FIG. 20

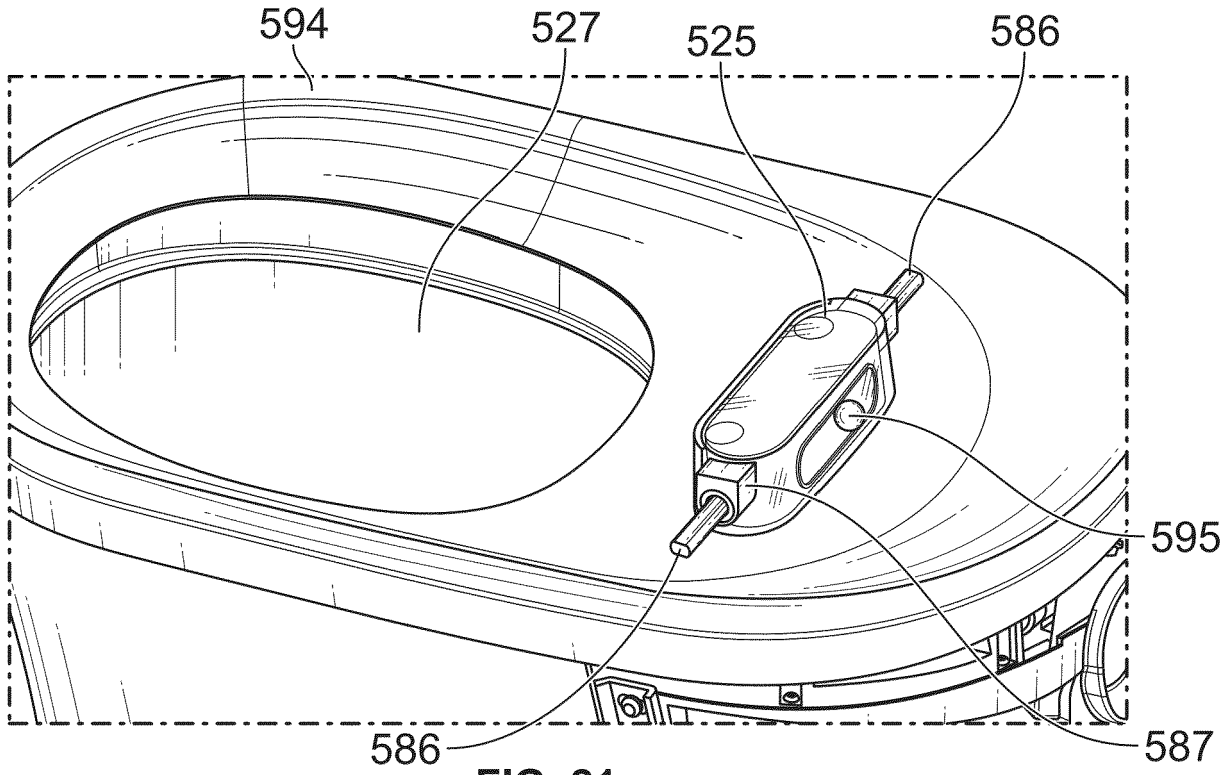


FIG. 21

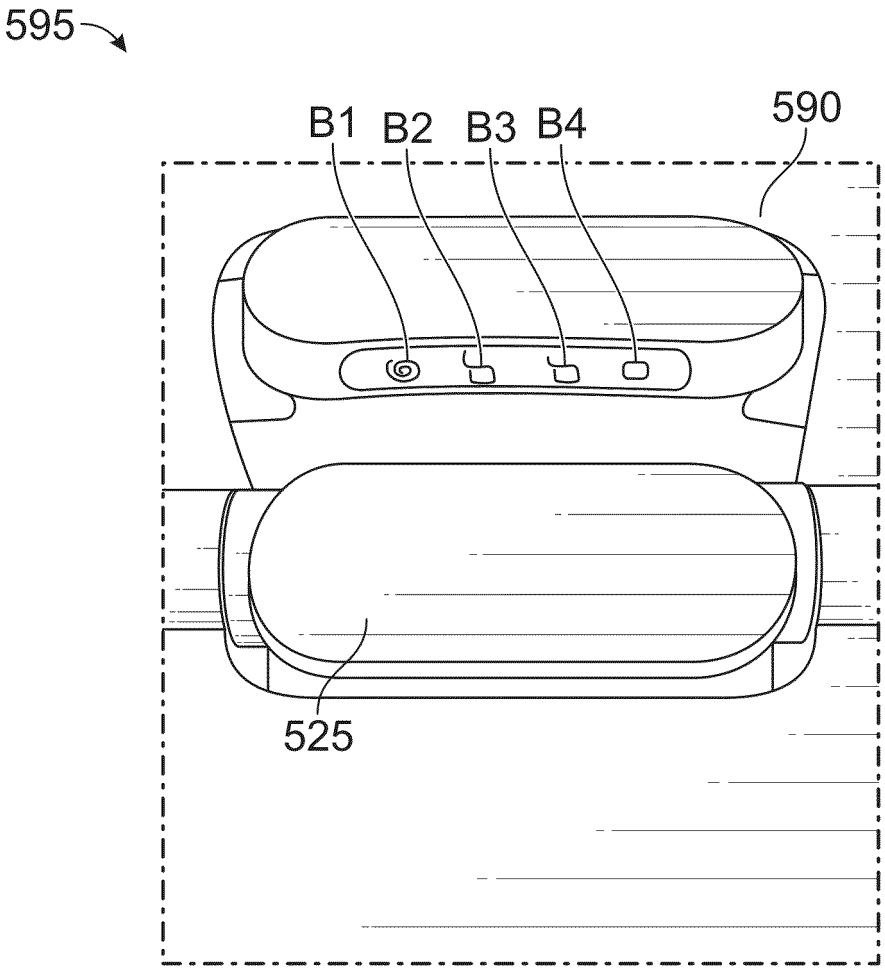


FIG. 22

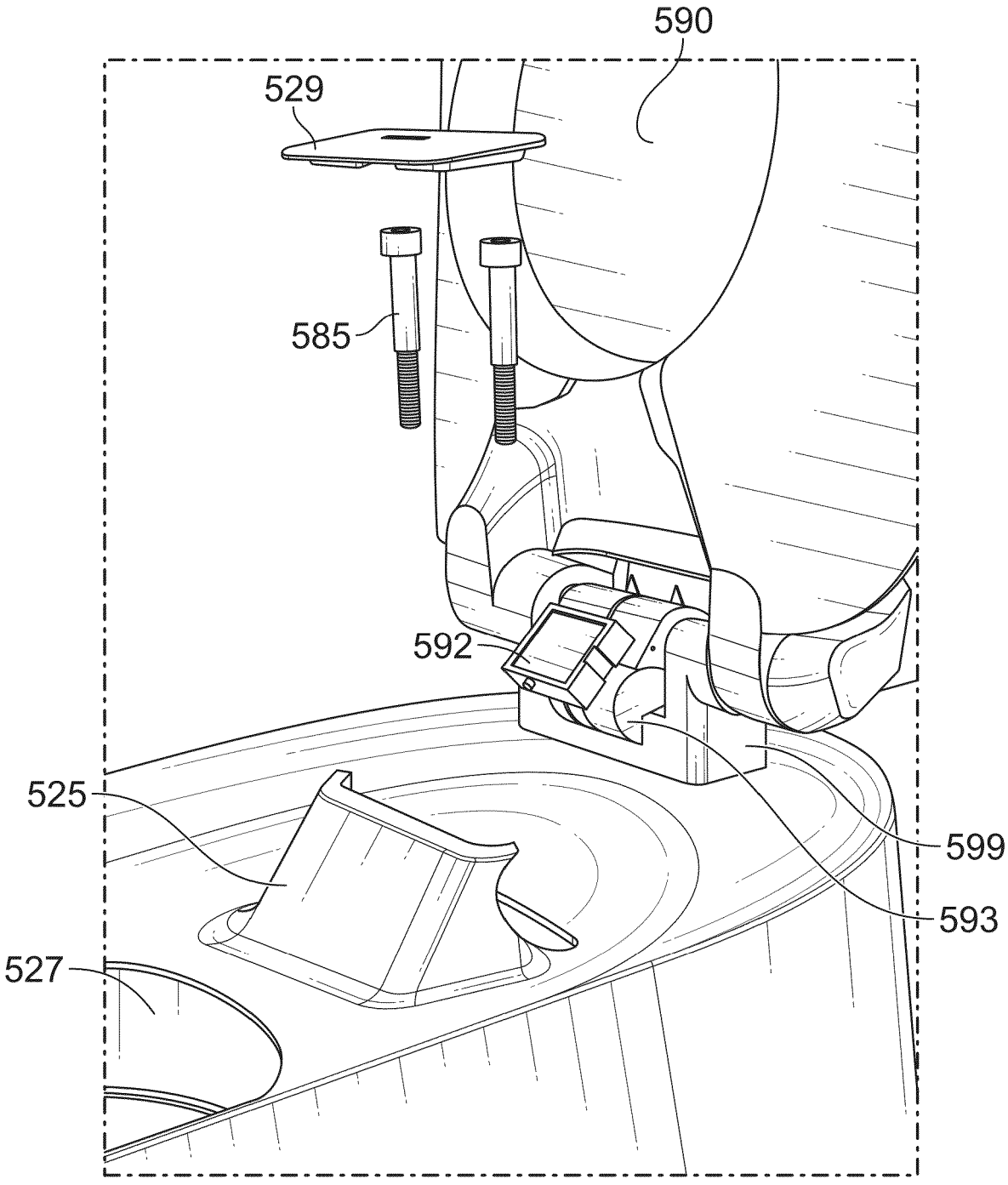


FIG. 23

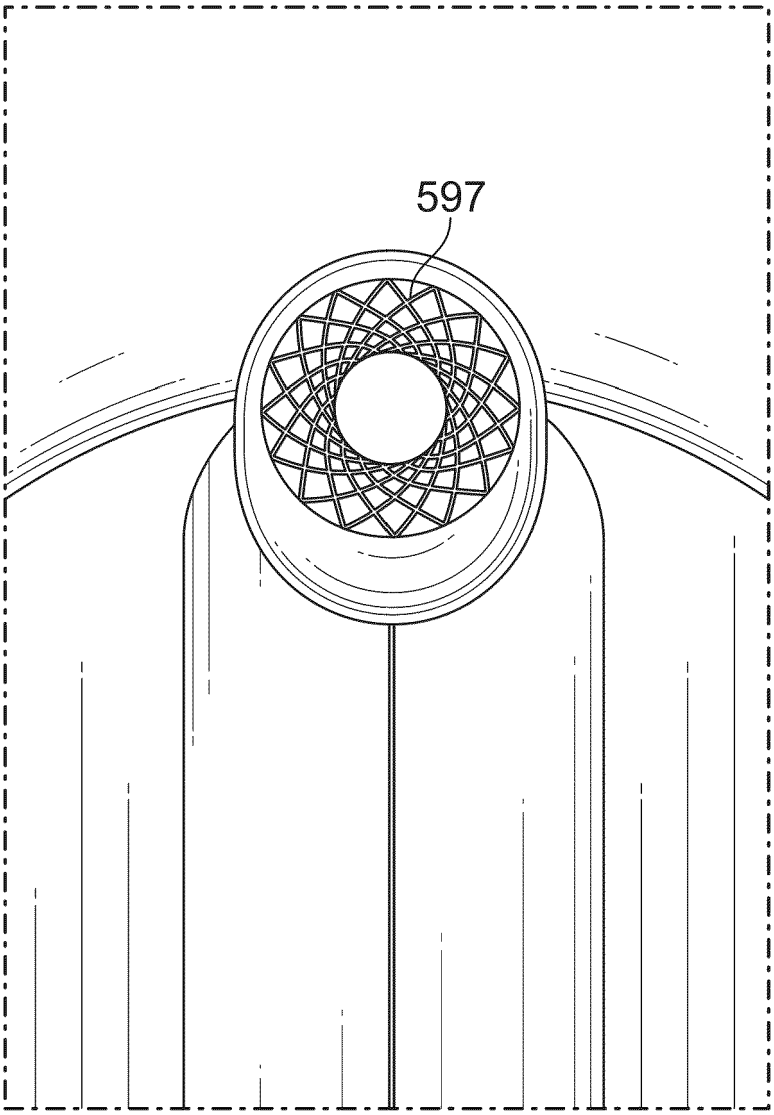


FIG. 24

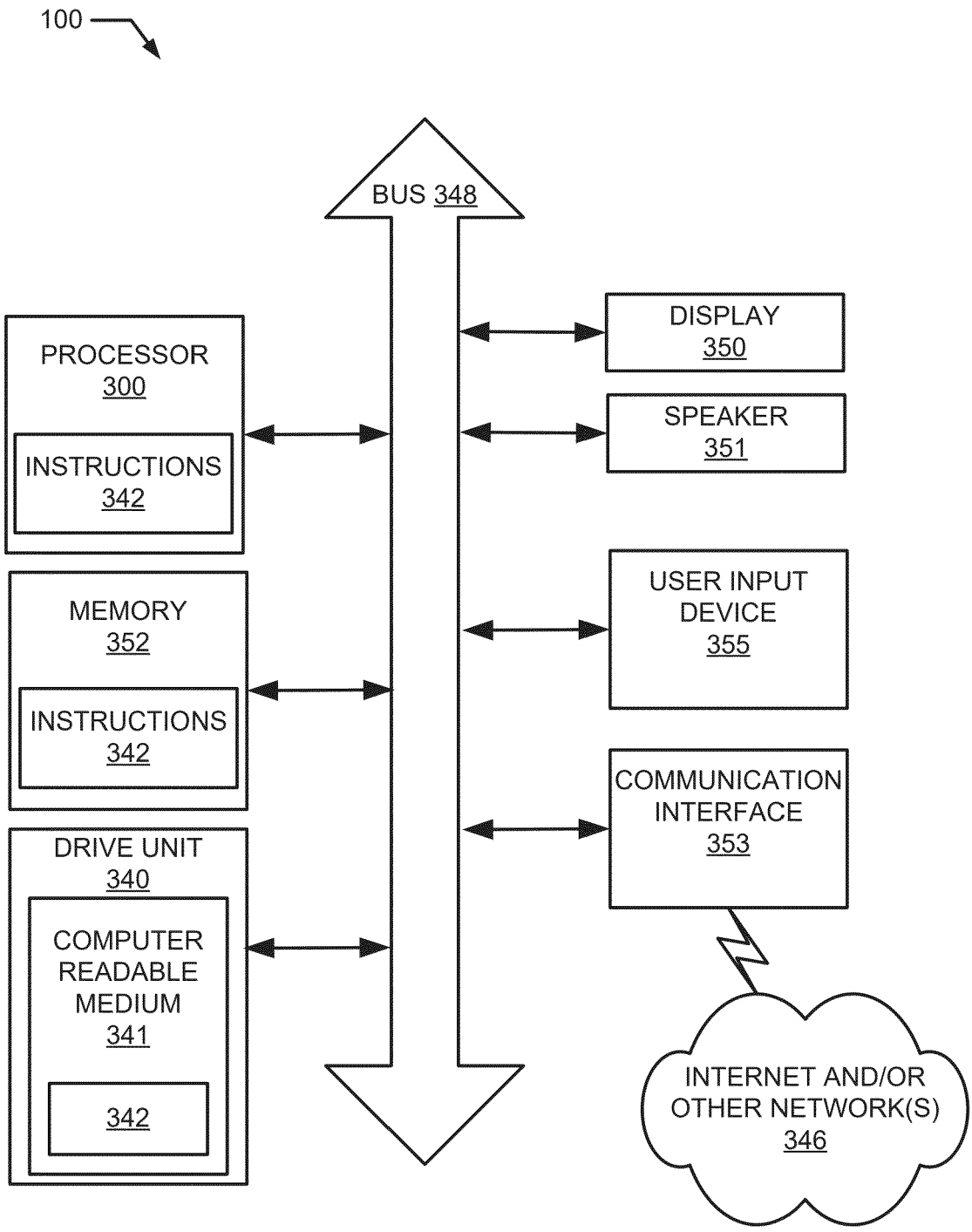

100
BUS 348
PROCESSOR
300
INSTRUCTIONS
342
MEMORY
352
INSTRUCTIONS
342
DRIVE UNIT
340
COMPUTER
READABLE
MEDIUM
341
342
DISPLAY
350
SPEAKER
351
USER INPUT
DEVICE
355
COMMUNICATION
INTERFACE
353
INTERNET AND/OR
OTHER NETWORK(S)
346

FIG. 25

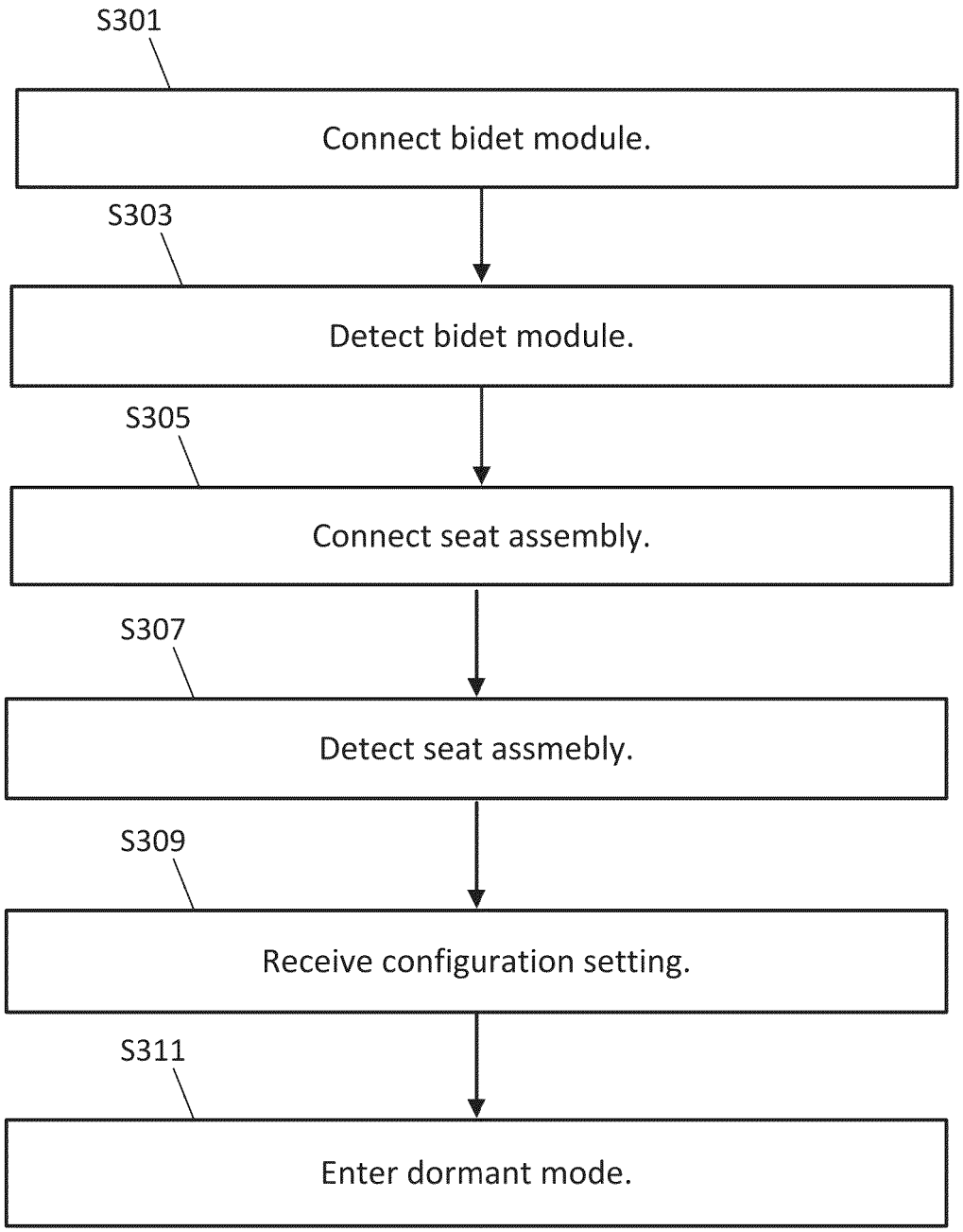

S301
Connect bidet module.
S303
Detect bidet module.
S305
Connect seat assembly.
S307
Detect seat assmebly.
S309
Receive configuration setting.
S311
Enter dormant mode.

FIG. 26

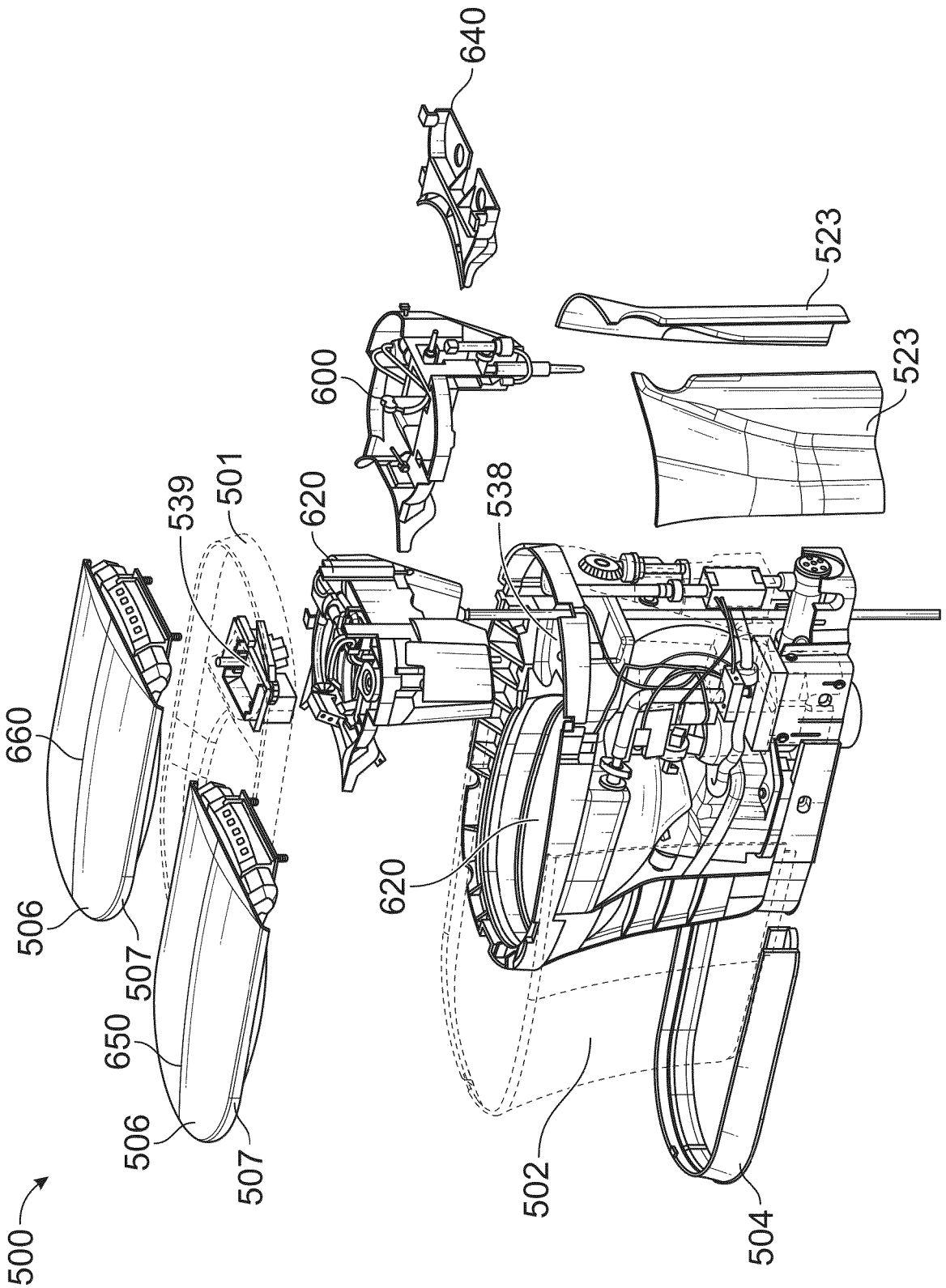

640
523
523
600
501
539
620
538
660
620
506
507
650
506
507
502
504
500

FIG. 27

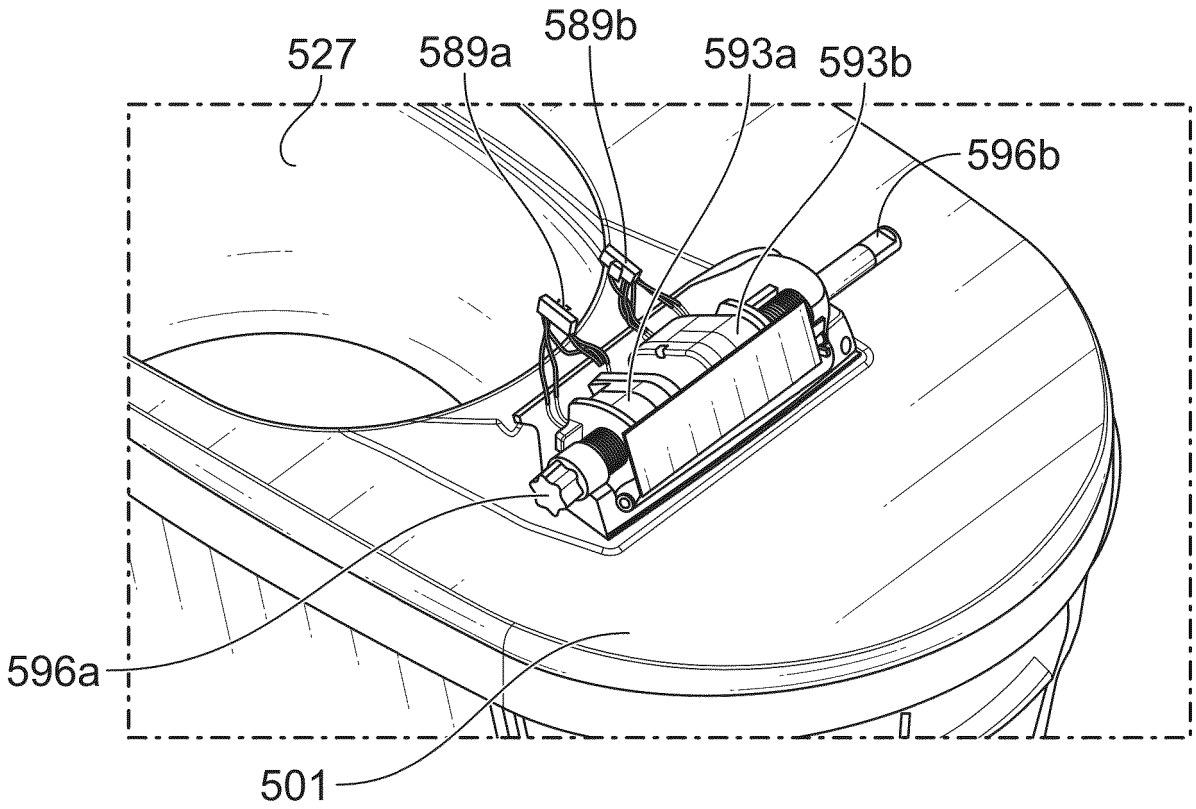


FIG. 28

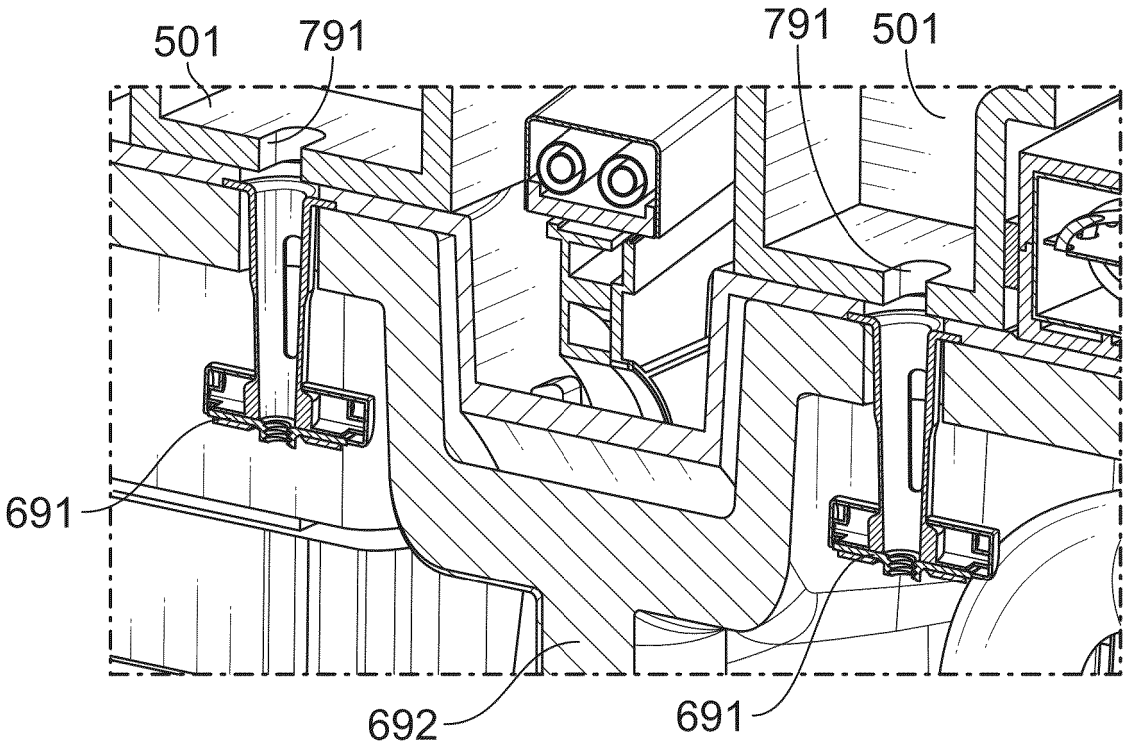


FIG. 29A

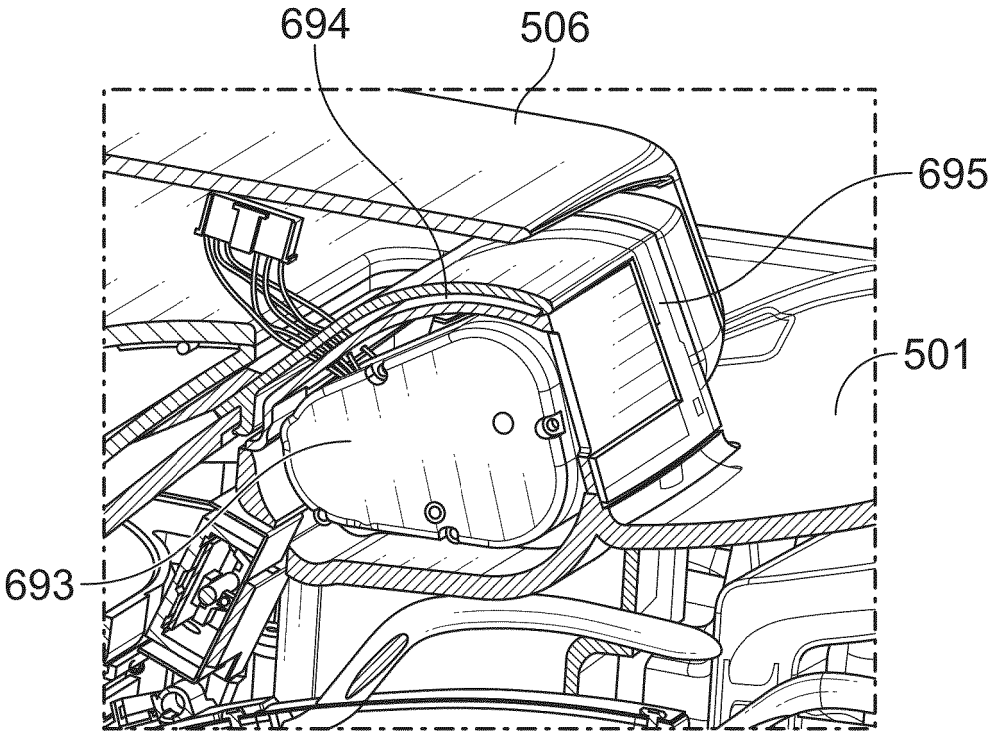


FIG. 29B

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 26 16 5990

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	EP 4 497 882 A1 (KOHLER CO [US]) 29 January 2025 (2025-01-29) * paragraphs [0098] - [0124]; figures 15-17 * -----	1-4,6-8, 10-13,15 5,9,14	INV. E03D5/012 E03C1/10 E03D3/00 E03D5/10
Y	JP 2011 188190 A (LIXIL CORP) 22 September 2011 (2011-09-22) * paragraphs [0026] - [0029]; figure 4 * -----	5,9,14	ADD. E03D9/08

TECHNICAL FIELDS SEARCHED (IPC)

E03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 August 2026	Posavec, Daniel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

Application Number
EP 26 16 5990

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

Europäisches Patentamt
European Patent Office
Office européen des brevets

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 26 16 5990

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-15

A network of pressurized pathways for a toilet comprising:a pressurized water supply;a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet; anda third valve configured to open at least a portion of a water path to a drain valve,wherein the first valve, the second valve, and the third valve are arranged substantially vertically.

1.1. claim: 15

A toilet comprising:a pressurized water supply;a first valve configured to open at least a portion of a water path from the pressurized water supply to a sump jet;a second valve configured to open at least a portion of a water path from the pressurized water supply to a rim jet; andan electrical generator configured to generate electrical power in response to the water path from the pressurized water supply to the rim jet.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 26 16 5990

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-08-2026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 4497882 A1	29-01-2025	CN 119434405 A	14-02-2025
		EP 4497882 A1	29-01-2025
		US 2025034853 A1	30-01-2025
JP 2011188190 A	22-09-2011	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 63775090 **[0001]**
- US 63961999 **[0001]**
- US 55947126 **[0001]**