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COVER SYSTEM FOR A TOILET TANK

- (57)

A toilet comprising:
a toilet tank;
a cover for the toilet tank;
a receptacle formed in the cover for the toilet tank and
configured to receive a cartridge including a chemical
- compound,
wherein the receptacle is fluidly connected to the toilet
tank and/or a toilet bowl.
To be accompanied, when published, by Figure 1.

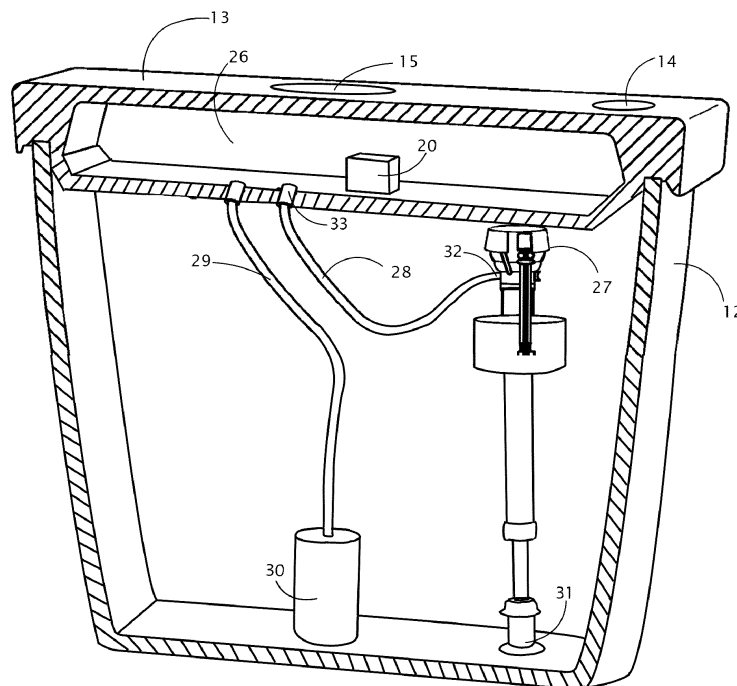


FIG. 3

Description

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to Provisional Application No. 63/526,799 filed July 14, 2023, and Application No. 18/761,212 filed July 2, 2024, which are hereby incorporated by reference in their entirety.

BACKGROUND

[0002] This application relates generally to the field of cleaning systems for use with toilets, accessibility of toilets, installations of toilets and accessories thereof. More specifically, this application relates to cleaning systems configured to dispense cleaning compounds for use in and around toilets and accessories thereof to improve the cleanliness in and around the toilets.

[0003] Over time from use, scale (e.g., urine scale), minerals, bacteria, and other undesirable deposits (e.g., biofilm) build-up on the surfaces of toilets and, in particular, on the inner surfaces of the bowl and trapway. Moreover, these deposits may become lodged in small imperfections in the inner surfaces of the toilet, which may be a vitreous material. These built-up deposits can lead to undesirable odors and stains, as well as harbor germs and bacteria. It would be advantageous to provide a toilet having cleaning systems (e.g., internal, external) that provide improved cleanliness to address the aforementioned problems, such as prohibiting or reducing scale and/or providing odor abatement.

[0004] Additionally, external surfaces of toilets and users of toilets come into contact with germs and bacteria, such as through contact with the toilet and use thereof. It would be advantageous to provide a toilet that includes a cleaning system to provide improved cleanliness for the toilet, accessory, and/or user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Objects, features, and advantages of the present disclosure should become more apparent upon reading the following detailed description in conjunction with the drawing figures, in which:

FIG. 1 illustrates a perspective view of an exemplary embodiment of a toilet tank according to the present disclosure.

FIG. 2 illustrates a perspective view of a toilet tank and cover member according to an exemplary embodiment of the present disclosure.

FIG. 3 illustrates a receptacle connected to a toilet tank and a toilet bowl with a flush valve to initiate an operational cycle.

FIG. 4 illustrates a flowchart of the dispensing system.

FIG. 5 illustrates a controller for the dispensing system.

FIG. 6 illustrates a flowchart of the controller.

[0006] The figures illustrate certain exemplary embodiments of the present disclosure in detail. It should be understood that the present disclosure is not limited to the details and methodology set forth in the detailed description or illustrated in the figures. It should be understood that the terminology used herein is for the purposes of description only and should not be regarded as limiting.

DETAILED DESCRIPTION

[0007] One embodiment relates to a cover system for a toilet tank including a receptacle and a lid. The receptacle is configured to receive a cartridge. The lid is configured to cover a rim portion of the receptacle. The receptacle is fluidly connected to the toilet tank and a toilet bowl. A flush valve is configured to initiate an operational cycle including dispensing water into the toilet bowl from the receptacle and dispensing water into the receptacle from the toilet tank. The receptacle is integrally formed with a cover for the toilet tank.

[0008] One embodiment relates to a toilet that includes a bowl, a tank configured to hold water, and a flush valve within the tank. The flush valve includes a valve body fluidly connecting the tank and the bowl, a float moveable relative to the valve body to open and close the flush valve, and a guide member coupled to the valve body for guiding movement of the float. The tank is covered by a lid (or cover) that includes one or more cleaning compound containers to hold a cleaning compound and water, which may be referred to together as a cleaning mixture or cleaning solution. The lid is also configured to release the cleaning compound and water into the tank or directly into a bowl through a flush valve and a rim jet. The cleaning compound is configured to be dispensed into the tank or into the bowl through the valve body with the flush valve open.

[0009] The cleaning compound dispenser may be fluidly connected to the tank to selectively dispense the cleaning compound toward the bowl through the valve body. The dispenser may include a body, at least one nozzle through which the cleaning compound is dispensed, and a fluid passage through the body fluidly connecting the at least one nozzle.

[0010] The toilet may include a fill valve that is disposed in the tank. The fill valve may include an inlet for receiving water from a source and a fluid conduit supplying water to the cleaning compound dispenser in the tank lid.

[0011] The toilet may include a sensor, which may be disposed in the cleaning compound dispenser in the tank lid, to measure a concentration of the cleaning compound and communicates the measured concentration to a controller. The toilet may include an indicator having a light source, where the light source is illuminated by a signal from the controller based on the concentration of the cleaning compound. The light source may be illuminated upon the concentration of the cleaning compound

falling below a threshold concentration. The toilet may include a lid that is configured to be removably coupled to the tank for concealing the contents of the tank. The light source may be disposed on the lid. The controller may be coupled to the lid and may communicate with the sensor wirelessly. The lid may include a user interface for adjusting the concentration of the cleaning compound.

[0012] The toilet may include a controller that is configured to control the volume of the cleaning compound. The controller may be configured to control a concentration of the cleaning compound by controlling at least one of a volume in a reservoir of the container, a flow rate of the chemical compound and the water from the container, or a volume of the chemical compound in the reservoir.

[0013] As non-limiting examples, the systems and methods, as disclosed herein, may be configured to influence scale, slippery, and/or sanitation to thereby have improved cleanliness. For example, the systems and methods of this application may reduce scale, increase slippery, and/or increase sanitation. As used herein, the term "scale" generally refers to mineral deposits (e.g., calcium carbonate, magnesium carbonate, etc.), that collect or build-up on the surfaces of the components of systems, such as toilets. As used herein, the term "slippery" generally refers to coating(s) that may be applied to the surfaces of the components of the systems to influence the coefficient of friction of the surfaces. For example, a non-stick coating, may be applied to surfaces of the components to reduce the coefficient of friction of the surfaces to which the coating is applied. As used herein, the term "sanitation" generally refers to the application (e.g., introduction, etc.) of anti-microbial chemicals.

[0014] One such application for the systems and methods are for use with toilets in order to provide improved cleanliness of the toilet, the area around the toilet, and/or for the user of the toilet. The toilets may be configured to include a delivery system for introducing a chemistry (e.g., a cleaning compound) to thereby reduce, scale, slippery, and/or sanitation. The systems and methods of this application may influence other aspects related to cleanliness or perceived cleanliness of the components. For example, scent(s) related to the systems (and the use thereof) may be influenced (e.g., masked, ameliorated, reduced, etc.) by the systems and methods of this application, such as, but not limited to the use of active filters (e.g., hydroxyl, etc.), passive filters (e.g., carbon, gas, etc.), and/or scent(s) applied to or contained within components of the system. Also for example, the shape of the components of the system may be configured to influence the cleanliness of the systems, such as, but not limited to, the use of rimless bowls, skirting (e.g., around the bowl/pedestal), the reduction in the number of surfaces, improved hinges, tankless water systems, the smoothing of surfaces, as well as other examples disclosed herein. The various aspects (e.g., chemistry, configuration, etc.) are disclosed in greater detail below and the improved delivery systems are disclosed in greater

detail below.

[0015] FIG. 1 illustrates toilets according to exemplary embodiments of the present disclosure. FIG. 1 illustrates an exemplary embodiment of a skirted toilet 10 that includes a toilet tank 11, a pedestal 21 (or base) supporting a toilet bowl 23, a seat assembly 17 and a coupling or mounting assembly. The seat assembly 17 includes a cover 18 and a seat ring 19 that rests on a rim 24 of the toilet bowl 23. The toilet tank 11 may include a reservoir 12 for storing the water used during operational (or flushing) cycles, a cover member 13 for providing selective access into the reservoir 12, and an actuator (flush mechanism) 14 that is configured to initiate an operational cycle when activated. The cover member 13 may include a chemical dispensing system 20. The cover member 13 may include an opening 16 for a lid 15. Additional, different or fewer components may be included.

[0016] The actuator 14 or flush mechanism may include a button configured to activate when depressed (or pulled) a predetermined distance or when touched, a lever configured to activate when rotated a predetermined angular travel, or any suitable device configured to activate based upon an input manipulation by a user. The systems (e.g., toilets, dispensers, etc.) described in this application may be configured to utilize chemistry in the chemical dispensing system 20 to advantageously help clean or help maintain the cleanliness longer than toilets not having the improved chemistry. As non-limiting examples, the chemistries disclosed herein may advantageously help prevent the formation of scale, remove scale that has formed, prevent or remove biofilm, prevent or mask odors, and/or sanitize components of toilets or other devices disclosed in this application. The toilets utilizing the improved chemistry may be able to go for one to six months (e.g., eight weeks) or longer without having to be cleaned (e.g., before the build-up of deposits). More specific examples of chemistry/cleaning compounds are described below in greater detail.

[0017] The chemistry/cleaning compounds may be delivered to specific components of the systems such as the toilet tank 11 alone or mixed with another compound or element. The compounds may be provided into the toilet tank 11, such as prepared within the cover member 13 introduced into the toilet for use therein.

[0018] The systems (e.g., toilets, etc.) and methods of this application may be configured to utilize one or more than one compound/chemistry to improve the cleanliness of the system. In this application, the terms "chemistry," "compound," and "cleaning compound" are used interchangeably to connote the use of a chemical, chemical compound, chemical element, or any combination thereof that is beyond that of mere water. Thus, while the systems described in this application may use water (e.g., to dilute a cleaning compound, for flushing, etc.) and the cleaning compounds may include water, the chemistry/ compounds/cleaning compounds include at least one additional chemical (e.g., elements, com-

pounds, etc.) other than water.

[0019] The systems may introduce one or more cleaning compounds into or onto a component (e.g., element), surface, and/or feature of the system or another system. For example, toilets may be configured to introduce one or more cleaning compounds into or onto a bowl, a valve, a tank, a trap or trapway, and/or any other part of the toilet. As one such example, a toilet may be configured to introduce hydrogen peroxide (HO) into the bowl of the toilet to help clean the internal surfaces that come into contact with liquid and solid waste. Other examples are discussed in this application regarding toilets, as well as other systems, such as standalone dispensers, paper dispenser, and so forth.

[0020] In addition to H₂O₂, chlorines and peracetic acid (PAA) are additional non-limiting examples of chemicals/compounds that may be used with the systems and methods of this application. Some additional non-limiting examples of chemicals/compounds that may be used with the systems and methods of this application include (but are not limited to) polyphosphates (e.g., sodium hexametaphosphate (SHMP), tetrapotassium pyrophosphate (TKPP), etc.), low pH acids (e.g., hydrogen chloride (HCL), dihydrogen phosphate (HPO), trisodium phosphate (TSP), ethylenediaminetetraacetic acid (EDTA), and compounds thereof, as well as other acids and/or sequestering agents. These chemicals/compounds may be most beneficial in, for example, preventing and/or removing scale. Yet other examples of chemicals/compounds that may be used with the systems of this application include (but are not limited to) didecyldimethyl ammonium chloride (DDAC), H₂O, sodium hypochlorite (NaOCl) such as bleach, PAA, triclosan, formic acid, TSP and compounds thereof, as well as other disinfectants (e.g., quaternary disinfectants) and biocides. These chemicals/compounds may be most beneficial in, for example, preventing and/or removing biofilm. It is noted that other chemicals/compounds may be used in the systems and methods disclosed in this application, and any such chemical/compound disclosed may be used with any system and/or method disclosed.

[0021] The chemicals/compounds can take various forms, such as liquids or solids. One example is in the form of phosphate beads, which may be spherical (e.g., 12.7-25.4 mm in diameter) or may have any suitable shape. Another example includes a shell (e.g., glass shell) that houses a chemical (e.g., phosphate) inside and is released or brought into contact with a diluent, such as through an opening. The concentration of the chemical may be relatively high, so that it can last over a long period of time (e.g., about one year) without having to be replaced.

[0022] The chemical dispensing system 20 may include a system that generates a chemical/compound, such as one of those disclosed above. For example, the system 20 may include a generator that produces H₂O, such as from oxygen (e.g., in air) and water from a water source. Thus, a chemical/compound generator may be

provided within the system 20 to produce the cleaning compound. According to one example, a generator may be configured to produce a chemical (e.g., H₂O) that is diluted to 30 ppm (parts per million), such as with water or another suitable diluent. According to one example, a generator is configured to produce a chemical that is diluted to 100 ppm.

[0023] The system 20 for introducing a cleaning compound may be built into the toilet 10 or may be an add-on system that can be installed onto a traditional system and/or toilet 10 (after its manufacturing, such as an after-market system or assembly) to improve the cleanliness of the toilet 10.

[0024] The systems and methods described in this application may include an electrochemical generator or method of electrochemical generation, which may involve using oxygen, water, and an electrical current to generate a chemical/compound.

[0025] A non-chemical approach to mitigating (e.g., reducing, removing, etc.) scale and other contaminants may be employed. One such example is the use of beads. Certain minerals (e.g., calcium, magnesium, etc.) when in an ionic form (e.g., state) may attach to surfaces (e.g., inner surface of the bowl of a toilet), but do not attach to surfaces when crystalized (i.e., in a crystalline form). The beads change the mineral(s) from their ionic form to their crystalline form to prevent the minerals from attaching to surfaces of the systems and/or induce the in minerals to become detached from the surfaces. Thus, flow beads can utilize chemical interaction and/or friction to help clean surfaces of a system by preventing mineral deposits from attaching to the Surfaces and/or knocking off mineral deposits attached to the surfaces. The beads may be template assisted crystallization or TAC beads.

[0026] Beads may be used in the system 20 to reduce or prohibit the build-up of scale and other contaminants on the surfaces of the toilet 10. By way of example, flow beads can be used to clean a bowl, a trap, a tank, as well as other surfaces/elements of the toilet. Accordingly, beads may break up the agglomeration of scale on the inside surfaces of the components of the toilet, such as the tank, bowl, etc. By reducing the amount of scale on the surfaces of the toilet, biofilm and other contaminants have less potential of attaching to the surfaces/scale. The flow beads, therefore, may advantageously increase the slippery and/or sanitation of the toilet. The beads may be configured to attach to the deposits (e.g., urine scale) on surfaces of the system to be cleaned (e.g., toilets) then crystallize to increase in size to thereby allow the bead and attached deposit to be knocked off by a fluid passing over the bead and deposit, such as from the fluidized stream of fluid flowing through the toilet or from a flow of fluid from a dispenser described in this application.

[0027] The beads may be configured having any suitable size. According to one non-limiting example, the beads have a diameter of about 0.5 to 1.0 mm. However, the size of the beads can be larger or smaller than 0.5 to 1.0 mm.

[0028] One exemplary use for flow beads is for cleaning a toilet, such as the surfaces exposed to water and/or waste. The chemicals and compounds provided by the beads may be introduced into the toilet in different ways. As non-limiting examples, beads may be utilized with any fluid line of the toilet, such as a water inlet line (e.g., line that introduces water into the toilet), inside a tank of the toilet (e.g., exposed directly or indirectly to the water in the tank), inside a valve of the toilet (e.g., fill valve, flush valve, etc.), or in other suitable ways.

[0029] FIG. 2 illustrates a toilet tank 11 having reservoir 12 according to an exemplary embodiment of the present disclosure. FIG. 2 illustrates an exemplary embodiment of a toilet 10 that includes a cover member 13, a receptacle 26 (as shown in FIG. 3) within the cover member 13, an opening 16 of the receptacle 26, a lid 15 for the opening 16 of the cover member 13, and a flush mechanism 14. The cover member 2 may be provided for selective access into the reservoir 12. The flush mechanism 14 may be a button configured to activate when depressed (or pulled) a predetermined distance or when touched, a lever configured to activate when rotated a predetermined angular travel, or any suitable device configured to activate based upon an input manipulation by a user. Additional, different or fewer components may be included.

[0030] It should be noted that the shapes and configurations of the tank, pedestal, seat assembly, and the internal components (including the trapway and other features) may vary from the embodiments shown and described herein, and that the embodiments disclosed herein are not intended as limitations. It should be noted that various components of the toilet may be made of vitreous china. It should be noted that various components of the toilet may be polymeric and/or over molded or otherwise fixed to the toilet. It should be noted, for example, that although the exemplary embodiment of the toilet 10 is shown configured with the toilet tank 11 formed separately from the pedestal and later coupled to the pedestal, the tank may be integrally formed with the pedestal as a one-piece design. In other words, the toilet may be a one-piece design, a two-piece design, or have any suitable configuration.

[0031] Referring to FIG. 3 illustrates an exemplary embodiment of a toilet 10 having a chemical dispensing system 20 integrated with a tank 11 (reservoir 12) and a lid 15. The chemical dispensing system 20 may include any of the system described herein to generate and/or release chemical from the chemical dispensing system 20 into the receptacle 26.

[0032] The receptacle 26 is integral within the cover member 13. That is the receptacle 26 is a cavity having a volume within the cover member 13. The cover member 13 includes a top wall (top surface) above the receptacle 26 and a bottom wall (bottom surface) below the receptacle 26. The cover member 13 includes side walls on four sides of the receptacle 26. The top wall, bottom walls, and side walls enclose the receptacle 26 and the chemi-

cal dispensing system 20 as well as the cleaning solution. In addition or in the alternatives to the walls, the receptacle 26 may include a bladder to house the chemical dispensing system 20.

[0033] The cover member 13 includes an opening 16 having a rim portion that receives a lid 15 of the system. The lid 15 is separate from the rim portion of the receptacle 26. The lid 15 may be coupled or connected to the rim portion of the receptacle 26 with a hinge. When the lid 15 is closed, the lid 15 the cover member 13 are flush with each other when the lid 15 is covering the receptacle 26.

[0034] The lid 15 of the receptacle 26 is removed allowing access to the receptacle opening 16. In other words, the user has access to replenish chemicals to the chemical dispensing system 20 through the lid 15. The receptacle 26 may be cleaning or rinsed through the receptacle opening 16 when the lid 15 is removed. The chemical dispensing system 20 may be replaced or services through the receptacle opening 16 when the lid 15 is removed.

[0035] A fill valve 27 is in the tank 11 and supplies water to the system through an inlet line 31. As shown, the cover member 13 includes a fill valve line 28 with an inlet 32 at one end, an outlet 33 at the other end. The inlet 32 is fluidly connected to the inlet line 31 connected to the water supply (e.g., supply line from the utility). Water received through the inlet 32 can flow into the receptacle 26 of cover member 13 to mix with the cleaning compound in the chemical dispensing system 20.

[0036] The cleaning compound may flow into the outlet line 29, such as during a flush cycle or cleaning cycle. As shown, the system supplies cleaning compound (e.g., including a chemical compound and water) to a flush valve 30 through an outlet line 29, so that the cleaning compound can be used to clean the toilet 10 such as during a flush cycle and/or a cleaning cycle.

[0037] An operational cycle may start when a flush valve 30 is opened. Various triggering mechanism are possible such as a manual lever and flapper, or a push button and an electronic solenoid. The trigger corresponds to the first part of the flush cycle. As the flush valve 30 is opened water from the tank 11 is provided to the bowl through a rim jet or another opening. The flush valve 30 may also include an internal chemical dispensing valve that opens the outlet line 29 to the bowl through the rim jet. As a result, chemical compound from the receptacle 26 is provided to the bowl. A siphon effect and/or gravity pulls water from the receptacle 26 into the toilet bowl 23 via a tube during the operational cycle. The tube may include the outlet line 29. The water may also pass through a rim passage into one or more rim opening that dispense the cleaning solution into the toilet bowl 23.

[0038] Alternatively, the internal chemical dispensing valve may be opened after the tank 11 has been emptied into the bowl for rinsing and/or flushing. After the flush valve 30 is closed, the internal chemical dispensing valve releases the chemical compound from the receptacle 26 is provided to the tank 11 for the subsequent flush cycle.

That is, when the flush valve 30 is next opened, the chemical compound in the tank 11 is released to the bowl.

[0039] In either example, the fill valve 27 provides new water to the receptacle 26 and the chemical dispensing system 20. That is, after the tank 11 drains to the bowl 23, the tank is refilled by the fill valve 27 and at the same time or substantially the same time, fresh water is provided to the receptacle 26 where it is mixed with cleaning compound by the chemical dispensing system 20. Upon the next flush cycle, as described above, the chemical compound is dispensed into the tank 11 and/or bowl.

[0040] The water may be replenished to the receptacle 26 under water pressure from the water supply. Alternatively, the water may be provided through a siphon effect through the water line 28.

[0041] As an alternative to the embodiment shown in FIG. 3, the chemical compound solution from the receptacle 26 may be dispensed to the tank 11 through a capillary channel. That is, the outlet line 29 may be omitted as an opening and/or a capillary channel may connect the receptacle tank 26 to the tank 11.

[0042] Referring to FIG. 4, a process of the cover system is shown.

[0043] In step S 1, the lid 15 may be removed and a cleaning cartridge (e.g., chemical dispensing system 20) may be placed in the receptacle 26. The cartridge may include a chemical compound that is mixed with water in the receptacle 26. The cartridge may include one or more openings to allow water to flow in and the chemical solution to flow out. The cartridge may include a capillary tube for the flow of water through the cartridge. The cartridge may include a pump. In one example, the pump is provided on a circuit board having one or more electrodes or membranes that facilitate the flow of water through the cartridge in response to an electrical current. In any of these examples, the receptacle 26 stores a cleaning solution.

[0044] In step S2, a flush valve 30 causes the cleaning solution to be dispensed from the receptacle 26 into the toilet bowl 23. For example, a flush trigger may include a button configured to activate the flush valve 30 mechanically through a drive mechanism (e.g., rod, pulley, lever, etc.). The flush trigger may alternatively be electronic such that a motor or solenoid is caused to move the flush valve in response to a button pressure or signal received from a wire or wirelessly.

[0045] In step S3, water in the tank empties and a float of the flush valve 30 lowers (e.g., moves in a first direction). The water emptying from the tank may induce a siphoning of water (e.g., drain) from the receptacle 26 into the toilet bowl 23.

[0046] Finally, at S4, the toilet tank 11 refills and the float of the flush valve 30 rises (e.g., moves in a second direction) The rise of the flush valve 30 may cause water to be dispensed provided to the receptacle 26.

[0047] FIG. 5 is an example block diagram for a controller 100 configured to operate the chemical dispensing system 20. 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 the sensors described herein or data from any source. The controller 100 may include an integrated indicator (e.g., display, LED, speaker, or other output devices). 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, durations and any of the thresholds described herein.

[0048] The control system may include an input device 355 and/or a sensing circuit. It should be noted that sensor 356 in FIG. 5 may represent both the sensor at the toilet 10 and the corresponding circuitry at the controller 100 to communicate with the sensor. The sensing circuit receives sensor measurements from sensors as described above. The input device 355 may alternatively include one or more user inputs such as buttons, touchscreen, a keyboard, a microphone or other mechanism for calibrated any of the system characteristics, durations and any of the thresholds described herein.

[0049] 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.

[0050] FIG. 6 illustrates an example flow chart for the operation of the controller 100 for the control system for the chemical dispensing system 20. Additional, different or fewer acts may be included.

[0051] At act S 101, the controller 100 (e.g., processor 300) receives sensor data from the sensor 356. The sensor 356 may be mounted within the receptacle 26. The sensor 356 may be integrated with the outlet line 29 and/or flush valve 30. In one embodiment, the sensor data describes a concentration of the chemical compound in the receptacle 26.

[0052] The sensor 356 may alternatively include a timer that measures an amount of time since the last flush (i.e., when the flush valve 30 was actuated). The chemical dispensing system 20 may be reactivated after a predetermined amount of time has elapsed.

[0053] The user input device 355 is configured to receive calibration data from the user. The calibration data may include a value for the target concentration of the chemical solution in the receptacle 26. The calibration data may specify a time of chemical or compound in the chemical dispensing unit 20. The calibration data may define a time interval for replenishment of the cleaning compound or other maintenance of the chemical dispensing unit 20.

[0054] At act S 103, the controller 100 (e.g., processor 300) compares the sensor data to a threshold for a target

operation of the chemical dispensing system 20. The target operation may be a target concentration for the chemical solution in the receptacle.

[0055] At act S 105, the controller 100 (e.g., processor 300) sends a command to the chemical dispensing system 20 in response to the comparison. The command may cause the chemical dispensing system 20 to start and/or continue releasing the chemical into the receptacle when the concentration is below the target. The command may cause the chemical dispensing system 20 to stop releasing the chemical into the receptacle when the concentration is above the target.

[0056] At act S107, the controller 100 (e.g., processor 300) provides an indication of the status or operation of the chemical dispensing system 20. The controller 100 may send a control signal to the indicator 350, which is a light, a display, or other device configured to inform the user of the status or operation. The indicator 350 may communicate that the chemical dispensing system 20 is ready. The ready status may be represented by a green light and correspond to the determination by the controller 100 that the chemical solution is add the target concentration. The indicator 350 may communicate that the chemical dispensing system 20 is dispensing (i.e., not yet ready). The ready status may be represented by a red light and correspond to the determination by the controller 100 that the chemical solution is below the target concentration. The controller 100 may disable the flush actuator 14 until the chemical dispensing system 20 is ready and the indicator 350 is green.

[0057] 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.

[0058] 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, the memory 352 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.

[0059] 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.

[0060] 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.

[0061] 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.

[0062] 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.

[0063] 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.

[0064] 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.

[0065] 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.

[0066] When a component, device, element, or the like

of the present disclosure is described as having a purpose or performing an operation, function, or the like, the component, device, or element should be considered herein as being "configured to" meet that purpose or to perform that operation or function.

[0067] As utilized herein, the terms "approximately," "about," "substantially", and similar terms are intended to have a broad meaning in harmony with the common and accepted usage by those of ordinary skill in the art to which the subject matter of this disclosure pertains. It should be understood by those of skill in the art who review this disclosure that these terms are intended to allow a description of certain features described and claimed without restricting the scope of these features to the precise numerical ranges provided. Accordingly, these terms should be interpreted as indicating that insubstantial or inconsequential modifications or alterations of the subject matter described and claimed are considered to be within the scope of the disclosure as recited in the appended claims.

[0068] It should be noted that the term "exemplary" and variations thereof, as used herein to describe various embodiments, are intended to indicate that such embodiments are possible examples, representations, or illustrations of possible embodiments (and such terms are not intended to connote that such embodiments are necessarily extraordinary or superlative examples).

[0069] The term "coupled" and variations thereof, as used herein, means the joining of two members directly or indirectly to one another. Such joining may be stationary (e.g., permanent or fixed) or moveable (e.g., removable or releasable). Such joining may be achieved with the two members coupled directly to each other, with the two members coupled to each other using a separate intervening member and any additional intermediate members coupled with one another, or with the two members coupled to each other using an intervening member that is integrally formed as a single unitary body with one of the two members. If "coupled" or variations thereof are modified by an additional term (e.g., directly coupled), the generic definition of "coupled" provided above is modified by the plain language meaning of the additional term (e.g., "directly coupled" means the joining of two members without any separate intervening member), resulting in a narrower definition than the generic definition of "coupled" provided above. Such coupling may be mechanical, electrical, or fluidic.

[0070] The term "or," as used herein, is used in its inclusive sense (and not in its exclusive sense) so that when used to connect a list of elements, the term "or" means one, some, or all of the elements in the list. Conjunctive language such as the phrase "at least one of X, Y, and Z," unless specifically stated otherwise, is understood to convey that an element may be either X, Y, Z; X and Y; X and Z; Y and Z; or X, Y, and Z (i.e., any combination of X, Y, and Z). Thus, such conjunctive language is not generally intended to imply that certain embodiments require at least one of X, at least one of Y,

and at least one of Z to each be present, unless otherwise indicated.

[0071] References herein to the positions of elements (e.g., "top," "bottom," "above," "below") are merely used to describe the orientation of various elements in the figures. It should be noted that the orientation of various elements may differ according to other exemplary embodiments, and that such variations are intended to be encompassed by the present disclosure.

[0072] Although the figures and description may illustrate a specific order of method steps, the order of such steps may differ from what is depicted and described, unless specified differently above. Also, two or more steps may be performed concurrently or with partial concurrence, unless specified differently above. Such variation may depend, for example, on the software and hardware systems chosen and on designer choice. All such variations are within the scope of the disclosure. Likewise, software implementations of the described methods could be accomplished with standard programming techniques with rule-based logic and other logic to accomplish the various connection steps, processing steps, comparison steps, and decision steps.

[0073] It is important to note that the construction and arrangement of the system as shown in the various exemplary embodiments is illustrative only. Additionally, any element disclosed in one embodiment may be incorporated or utilized with any other embodiment disclosed herein. Although only one example of an element from one embodiment that can be incorporated or utilized in another embodiment has been described above, it should be appreciated that other elements of the various embodiments may be incorporated or utilized with any of the other embodiments disclosed herein.

Claims

1. A toilet comprising:

a toilet tank;
a cover for the toilet tank;
a receptacle formed in the cover for the toilet tank and configured to receive a cartridge including a chemical compound,
wherein the receptacle is fluidly connected to the toilet tank and/or a toilet bowl.

2. The toilet of claim 1, further comprising:

a lid configured to cover a rim portion of the receptacle and provide access to the cartridge, optionally wherein the lid and the cover are flush with each other when the lid is covering the receptacle.

3. The toilet of any one of the preceding claims, further comprising:

a flush valve configured to initiate an operational cycle including dispensing water into the toilet bowl

and/or toilet tank from the receptacle.

4. The toilet of claim 3, wherein the operational cycle includes dispensing water into the receptacle, optionally wherein water is dispensed into the receptacle from a fill valve.

5. The toilet of claim 3 or claim 4, wherein the operational cycle is initiated when a float in the toilet tank moves in a first direction and ends when the float in the toilet tank moves in a second direction and/or wherein the operational cycle stops after a predetermined period of time.

6. The toilet of any one of claims 3 to 5, further comprising:
an outlet line coupled between the receptacle and the flush valve.

7. The toilet of any one of claims 1 to 6, wherein a siphon pulls water from the receptacle into the toilet bowl via a tube.

8. The toilet of any one of claims 1 to 7, further comprising:

a fill valve; and
a supply line coupled between the receptacle and the fill valve.

9. A toilet assembly, comprising:

a toilet tank;
a cover for the toilet tank;
a receptacle integrated in the cover configured to receive a cartridge; and
a lid configured to cover a rim portion of the receptacle;
wherein the receptacle is fluidly connected with the toilet tank and a toilet bowl,
wherein a flush valve is configured to initiate an operational cycle including:

dispensing water into the toilet bowl from the receptacle; and
dispensing water to the receptacle,

wherein the receptacle is integrally formed with the cover for the toilet tank.

10. The toilet assembly of claim 12, wherein the lid is separate from the rim portion of the receptacle and/or wherein the lid is connected to the rim portion of the receptacle with a hinge.

11. The toilet assembly of claim 9 or claim 10, wherein the lid and the cover are flush with each other when the lid is covering the receptacle.

12. The toilet assembly of claim 9, claim 10 or claim 11,
wherein the operational cycle is initiated when a float
in the toilet tank lowers and/or is concluded when a
float in the toilet tank rises. 5
13. The toilet assembly of any one of claims 9 to 12,
wherein a siphon pulls water from the receptacle into
the toilet bowl via a tube during the operational cycle.
14. A method comprising: 10
- providing a chemical dispensing system in a
receptacle within a cover of a toilet tank;
initiate a flush cycle in response to a flush trigger;
dispensing water into a toilet bowl from the 15
receptacle; and
dispensing water to the receptacle.
15. The method of claim 14, wherein water is dispensed
into the toilet bowl from the receptacle by a flush 20
valve and/or wherein water is dispensed into the
receptacle by a fill valve.

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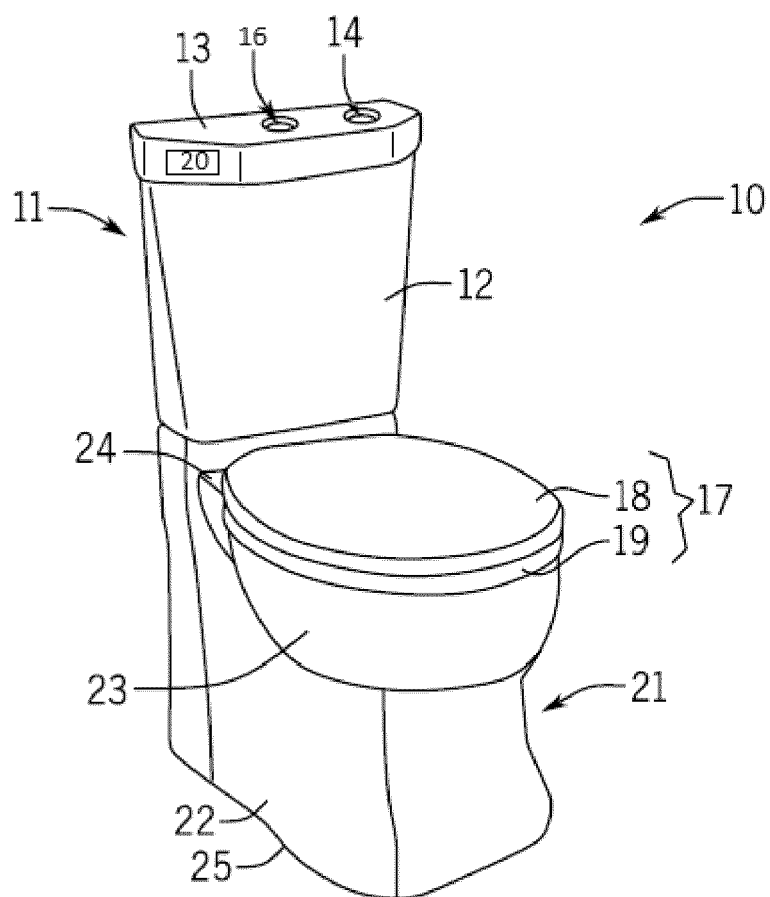


FIG. 1

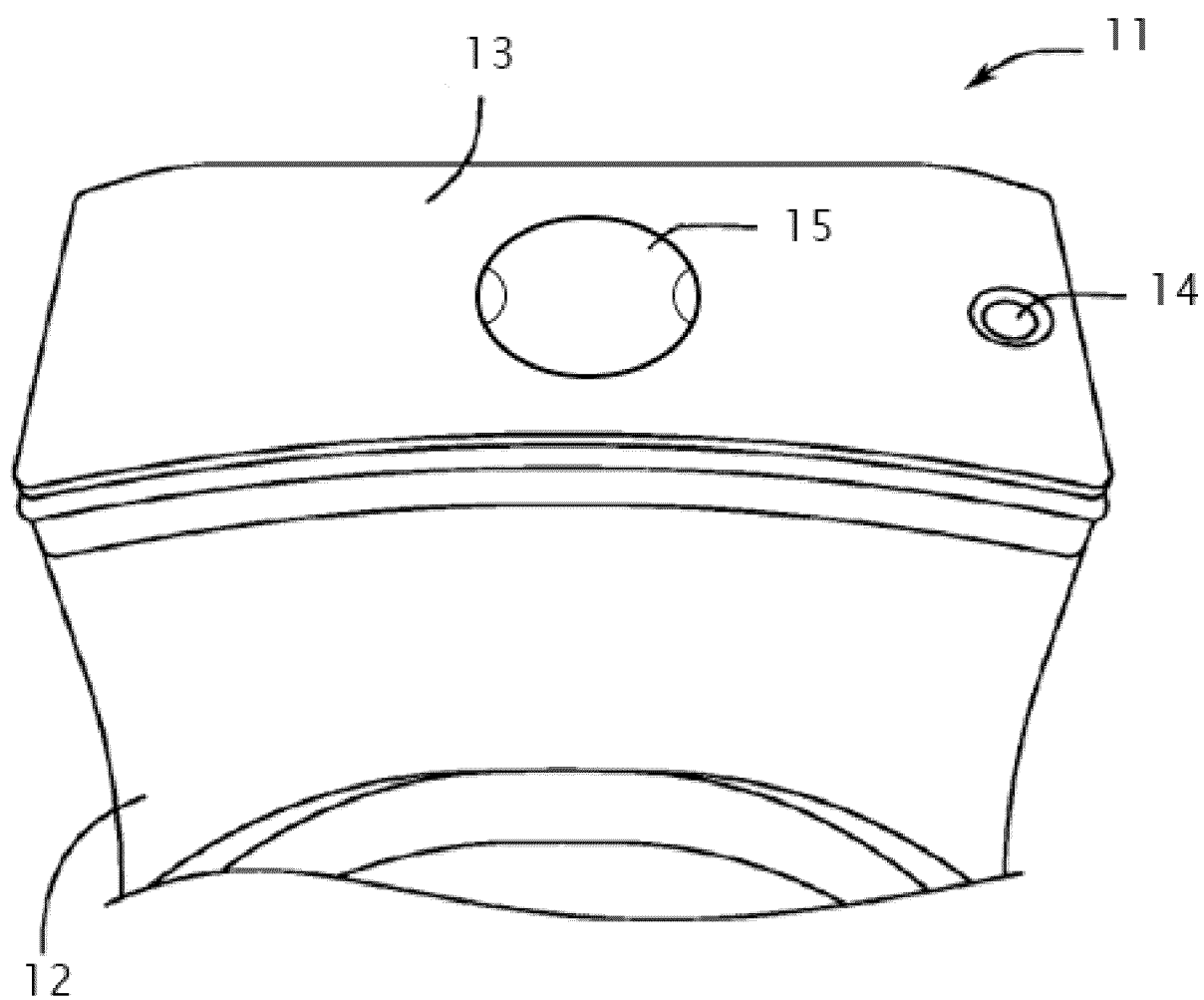


FIG. 2

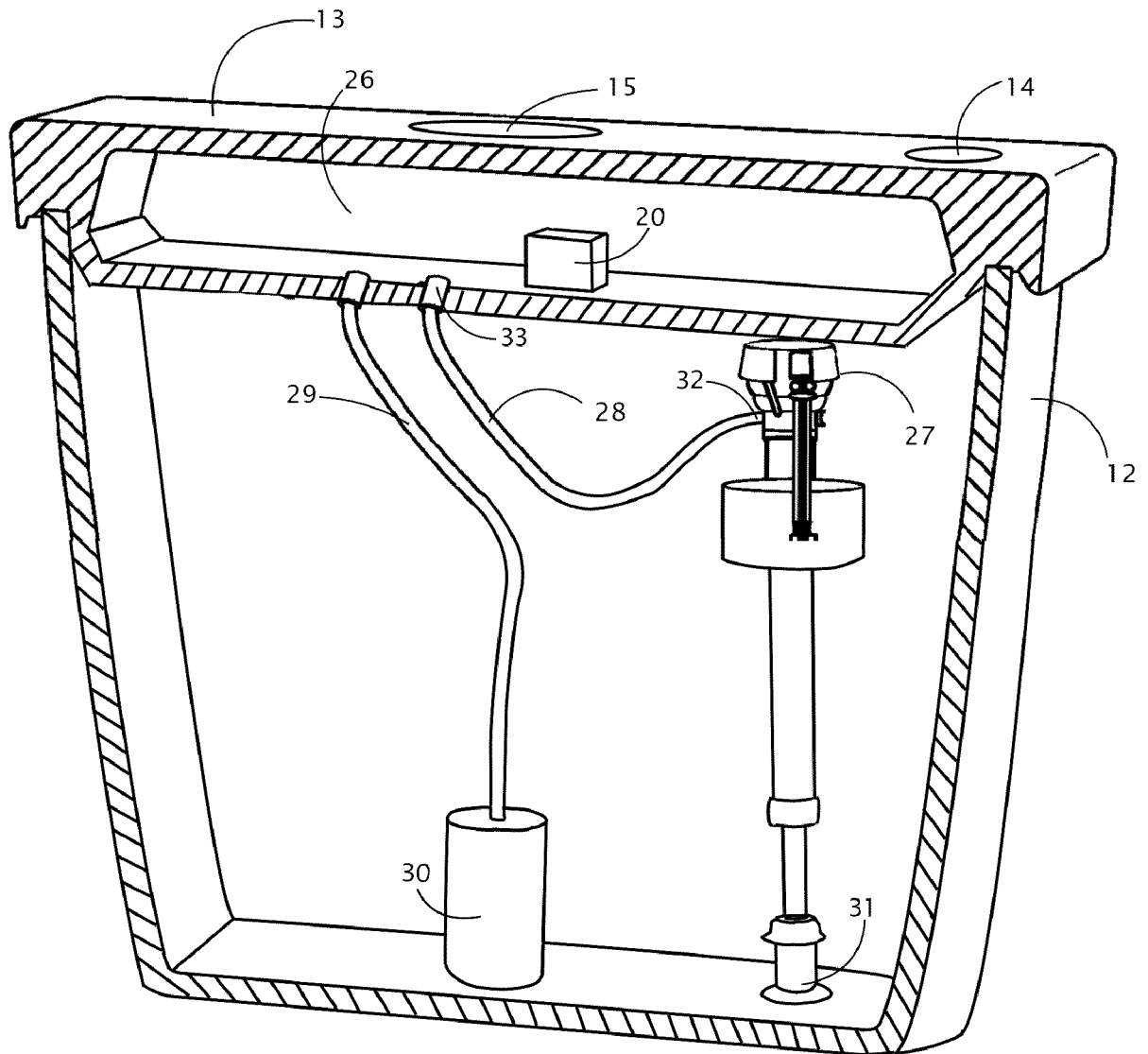


FIG. 3

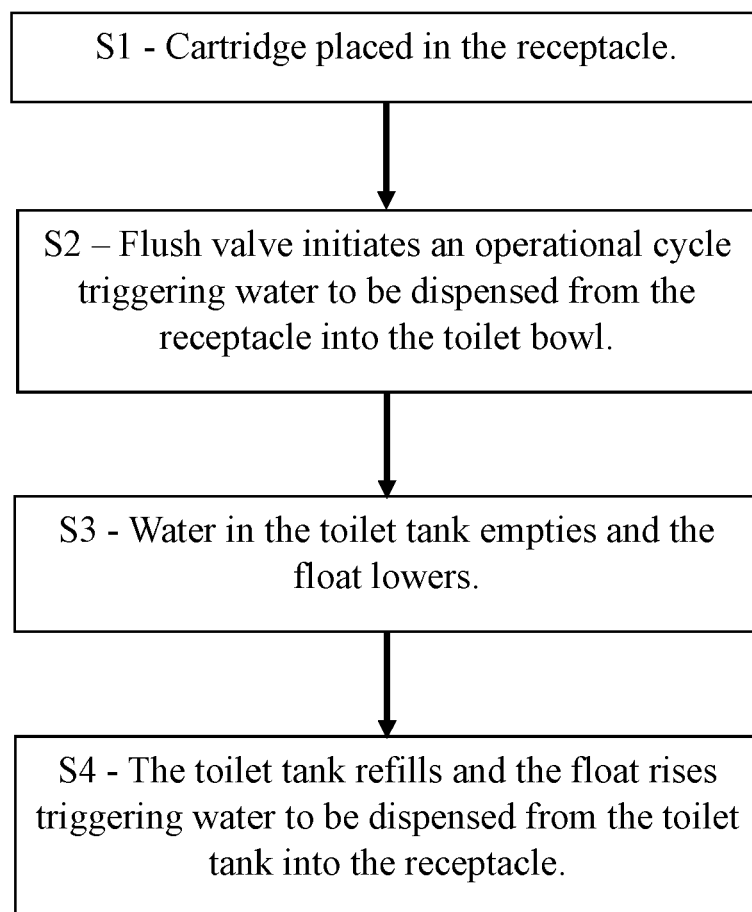


FIG. 4

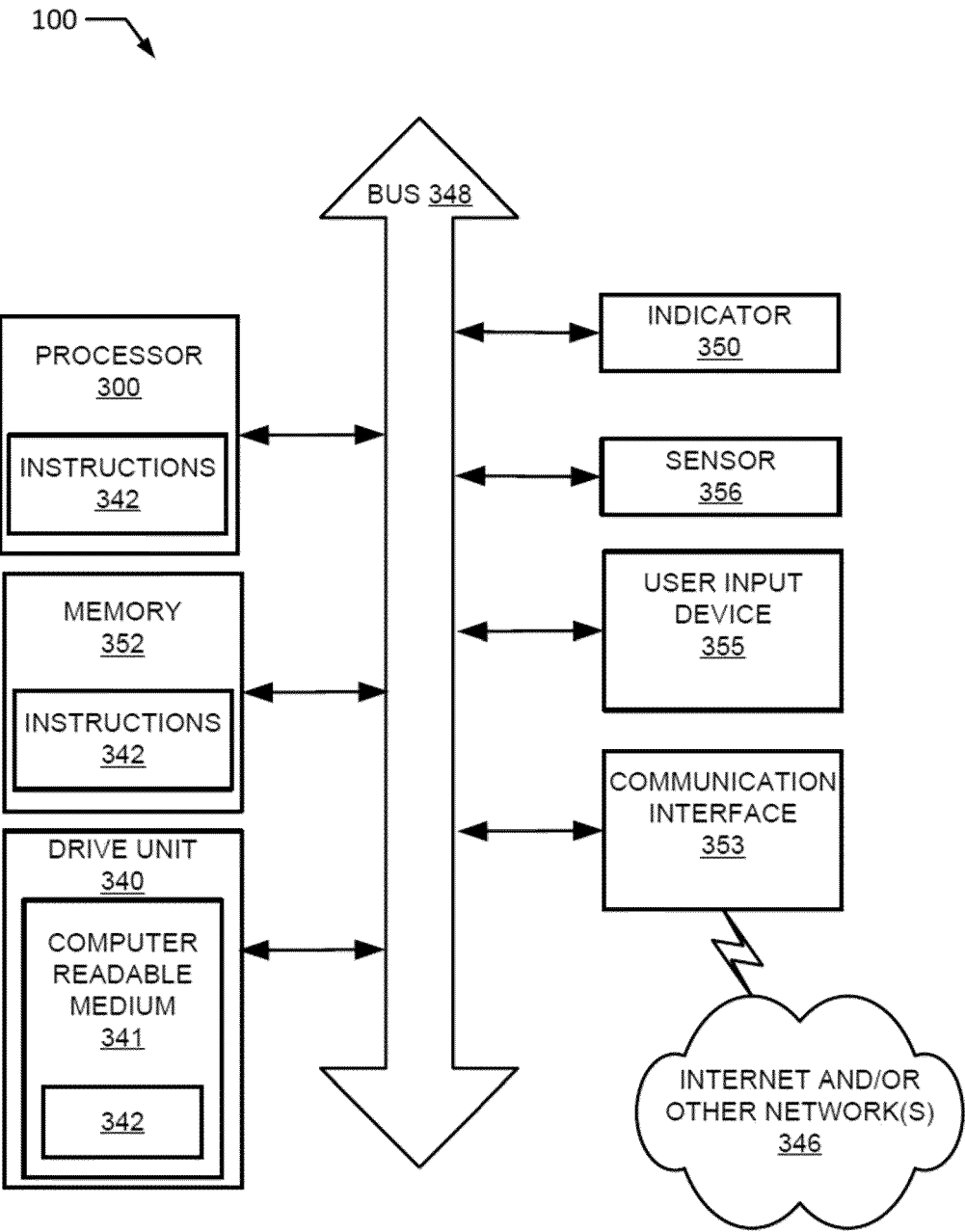


FIG. 5

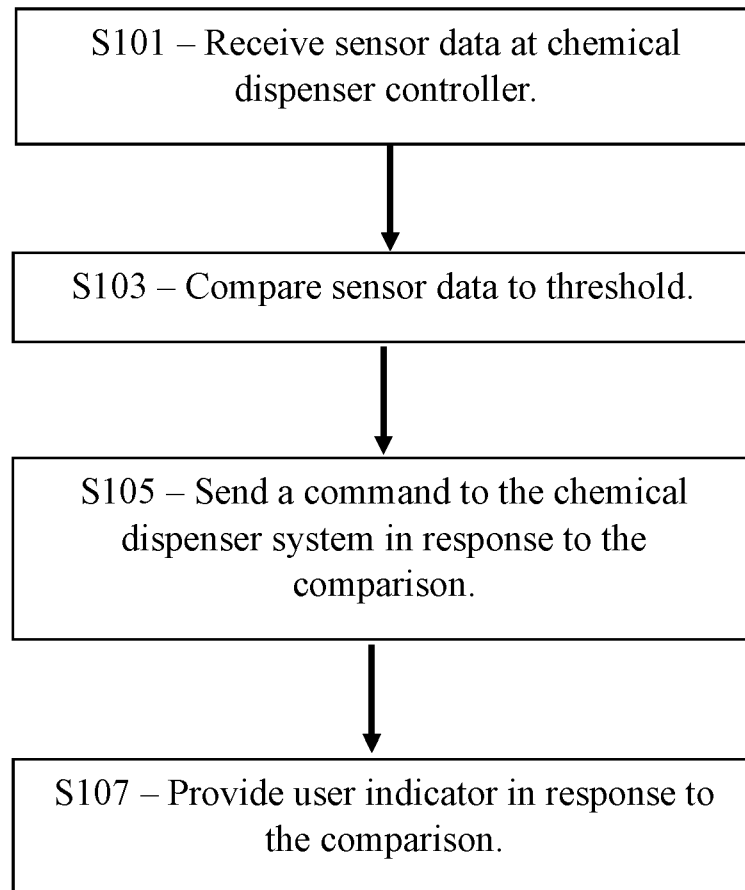


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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