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(54)

MODULAR PANEL TOILET

(57)

A method of manufacturing a toilet includes lowering a toilet engine guide in a manufacturing support, aligning a plurality of frame members with the manufacturing support, installing at least one toilet engine com-

ponent in the toilet engine guide, coupling a toilet seat assembly to the toilet, and coupling a plurality of panels to the plurality of frame members.

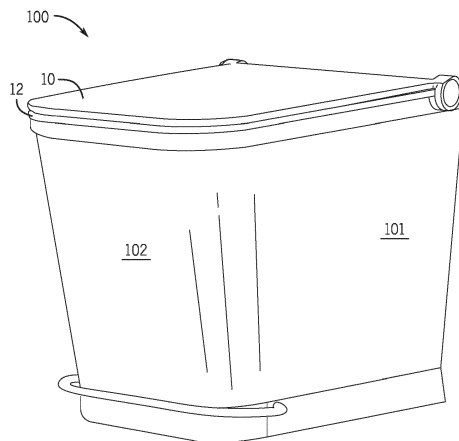


FIG. 1

Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of and priority to U.S. Provisional Patent Application No. 63/452,225, filed March 15, 2023, and U.S. Patent Application No. 18/597,663, filed March 6, 2024, which are incorporated herein by reference.

FIELD

[0002] The present disclosure relates generally to toilets. More specifically, the present disclosure relates to a toilet having modular features and/or features that improve manufacturing of the toilet.

BACKGROUND

[0003] Conventional toilets may be formed nearly entirely from porcelain or other ceramic materials. The porcelain may be treated or coated with vitreous china. As part of the manufacturing process, the toilet is fired at a high temperature until it is hardened.

[0004] One challenge relates to the fact that each time a new toilet design is created (e.g., a new design for the base), the entire flush engine for the toilet (i.e., the bowl, sump, and trapway) must be re-engineered and validated to ensure that it provides desired flow and other performance characteristics. One consequence of this is that it may take a relatively significant amount of time and cost to bring a new toilet design to final state because of the engineering time and effort involved. This may also result in toilets of various aesthetic designs having different performance characteristics.

[0005] It would be advantageous to reduce the amount of time and effort required to design and manufacture a new toilet design. It would also be advantageous to provide an improved toilet design that may be produced in a more energy efficient manner than conventional toilets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] 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 exploded view of the toilet of FIG. 1.

FIG. 3 is an example manufacturing setting for the toilet of FIG. 1.

FIG. 4 is a flow chart for an example manufacturing process for the toilet of FIG. 1.

FIGS. 5A and 5B illustrate a support structure for the manufacturing process.

FIGS. 6A and 6B illustrate toilet engine installation during the manufacturing process.

FIG. 7A illustrates rim channel installation during the manufacturing process.

FIG. 7B illustrates toilet seat installation during the manufacturing process.

FIG. 8A illustrates removal of the support structure during the manufacturing process.

FIG. 8B illustrates modular panel installation during the manufacturing process.

FIGS. 9A-9C illustrate foot pedal operation for the toilet of FIG. 1.

FIG. 10 is an example remote control for the toilet of FIG. 1.

FIG. 11 is an example local control for the toilet of FIG. 1.

FIG. 12 is an example foot control for the toilet of FIG. 1.

FIG. 13 is an example bidet for the toilet of FIG. 1.

FIG. 14 is an example light for the toilet of FIG. 1.

FIG. 15 is an example open/close mechanism for the toilet of FIG. 1.

FIGS. 16A-C illustrates a sequence for the open/close mechanism.

FIG. 17 illustrates an example controller for the examples of FIGS. 1-16.

FIG. 18 illustrates a flow chart for the controller of FIG. 17.

DETAILED DESCRIPTION

[0007] As shown in the exemplary embodiment of FIGS. 1, the toilet 100 includes a cover and seat opening mechanism that allows both a cover 10 and a seat 12 to be easily moved relative to the toilet 100 and to maintain the cleanliness and appearance of the toilet 100. Modular panels (e.g., front panel 102 and one or more side panels 101) may be coupled to an internal frame of the toilet 100. Various colors, textures, designs, artwork, images, patterns, photographs, or combinations thereof may be added to the modular panels. The modular panels may be removed and replaced with other panels with different aesthetics.

[0008] Generally, tankless toilets are illustrated. The flush is powered by line pressure of the water source (e.g., municipal water line) or an auxiliary pump. However, certain aspects may be applied to a toilet with a tank formed separately from a pedestal and later coupled to the pedestal, or applied to a toilet in which 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. The toilet disclosed herein may have a wide variety of skirted toilet configurations, and all such configurations are intended to be encompassed herein. The following description of various toilet features is therefore intended as illustration only of one possible embodiment, and it should be understood by those reviewing the present description that similar concepts or features may be included in various other embodiments.

[0009] 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.

[0010] FIG. 2 is an exploded view of the toilet 100 of FIG. 1. The toilet 100 may include the lid 10, a lid housing 11, the seat 12, a seat housing 13, a rim channel assembly 14, a rim water supply 24, a bowl 15, a trapway 16, a frame (e.g., horizontal frame 17 and vertical frame 103), a front lift plate 19, and a side lift plate 18. The bowl 15 may include assembly fixtures or grips 25. The trapway 16 may include assembly fixtures or grips 26. These components of the toilet 100 may be enclosed by the modular panels including the front panel 102 and the side panel 101. Additional, different, or fewer components may be included. For example, hand rests or assist rails may be installed on the sides of the toilet 100. The lid housing 11 may include an aperture 111 to rotatably support the local control 110 (e.g., push button). The seat 12 may include a mating cylinder 112 configured to couple to the aperture 111 and the local control 110. The local control 110 or push button may be aligned with a rotation axis of the lid housing 10, the seat 12, the lid housing 11 and/or the seat housing 13. The push button may be operable to move in a path along a line of the axis of the lid housing 10, the seat 12, the lid housing 11 and/or the seat housing 13.

[0011] FIG. 3 is an example manufacturing setting for the toilet of FIG. 1. A robot 80 may be controlled by a remote user, a stored series of commands or instructions, or data feedback from one or more sensors. The sensors may include position sensors, optical sensors, or other sensors to detect the relative location of parts of the toilet 100 and the robot 80 (e.g., robot arm including one or more motors and actuators to move to any position and grip objects with grippers). The robot 80 is configured to pick up and assemble the parts of the toilet 100.

[0012] FIG. 4 is a flow chart for an example manufacturing process for the toilet of FIG. 1. Additional, different, or fewer acts may be included. Each of the parts for the toilet 100 may be selected by the robot according to an order or user specification. For example, various colors and designs may be available for the trim (e.g., frame members, panels, etc.) and the robot 80 selects the corresponding parts based on the user selections.

[0013] At act S101, the robot 80 lowers a toilet engine guide 72 into a manufacturing support 70. As shown in FIG. 5A, the manufacturing support 70 includes at least one stand 73 configured to support the toilet engine guide 72. The manufacturing support 70 includes at least one guide member 74 that aligns with the frame members 103 when the toilet engine guide 72 rests on the stand 73.

[0014] At act S103, the robot 80 aligns the frame members 103 with the manufacturing support 70. The frame members 103 may be rotatably connected to the toilet engine guide 72 such that the frame members 103 rotate with the frame members 103 contact the manufacturing support 70. As shown in FIG. 5B, each of the frame members 103 contacts one of the guide members 74. The guide members 74 each include an angled surface having a slope equivalent to the desired angle for the guide members 74 to construct the toilet 100. As the toilet engine guide 72 and frame members 103 are lowered in to the manufacturing support 70, the frame members 103 contact the guide members 74, and in response, rotate to become aligned with the guide members 74.

[0015] At act S105, the robot 80 installs at least one toilet engine component in the toilet engine guide 72. The toilet engine component may include a valve assembly including at least one valve for providing water to a rim channel and/or at least one valve for providing water to a sump jet.

[0016] As shown in FIG. 6A, the at least one toilet engine component may include a trapway 15. The trapway 16 may include assembly fixtures or grips 26 configured for the robot 80 to lift and place the trapway 16. The grips 26 may include a keyed mechanism that identifies to the robot the type of part (e.g., model number) or classification of the trapway 16. Alternatively, a bar code, radio frequency identification (RFID) code, AR code, can be read by a scanner or antenna for classification of the part. The grips 26 may be grooves or channel spaced apart by a predetermined distance. The grips 26 may include an opening or protrusion that mates with a corresponding portion of an arm of the robot 80. The grips 26 may connect to the arm of the robot 80 in only one orientation or angle.

[0017] At act S107, the robot 80 installs at least one toilet engine component in the toilet engine guide 72. As shown in FIG. 6B, the at least one toilet engine component may include a toilet bowl 15. The toilet bowl 15 may include assembly fixtures or grips 25 configured for the robot 80 to lift and place the toilet bowl 15. The grips 25 may include a keyed mechanism, code, or wireless identifier that identifies to the robot the type of part (e.g., model number) or classification of the toilet bowl 15. The grips 25 may be grooves or channel spaced apart by a predetermined distance. The grips 25 may include an opening or protrusion that mates with a corresponding portion the arm of the robot 80 in a predetermined orientation.

[0018] At act S109, the robot 80 attaches a rim channel assembly 14 to at least one of the toilet bowl 16 or the frame members 103. As shown in FIG. 7A, the rim channel assembly 14 may be placed directly on the toilet bowl 16. The rim channel assembly 14 may snap around the rim of the toilet bowl 16. The rim channel assembly 14 may be secured by one or more fasteners to the frame members 103. The rim channel assembly 14 may be a plastic frame that includes one or more hoses, tubes, or water channels to transport water from a water source

or valve assembly to nozzles positioned near the toilet bowl 16.

[0019] At act S111, the robot 80 attaches a toilet seat assembly 13 to at least one of the toilet bowl 16 or the frame members 103. As shown in FIG. 7B, the toilet seat assembly 13 may be placed directly onto the rim channel assembly 14 or the toilet bowl 16. The toilet seat assembly 13 may snap around the rim of the toilet bowl 16. The toilet seat assembly 13 may be secured by one or more fasteners to the frame members 103.

[0020] At act S113, the robot 80 removes the toilet 100 from the manufacturing support 70. The robot 80 may trip a mechanism to release the toilet 100 from the manufacturing support 70. In one example, the trip mechanism may be triggered by gravity such that lifting the toilet 100 causes the manufacturing support 70 to release the toilet 100. FIG. 8A illustrates removal of the support structure 70 during the manufacturing process.

[0021] FIG. 8B illustrates placement of panels (front panel 102 and one or more side panels 101) and cover 10 on the vertical frame 103 of toilet 100. In one option, the robot 80 couples at least one panel (e.g., front panel 102 and side panel 101) to the toilet 100. In addition or in the alternative, a lid panel 10 may be coupled to toilet seat assembly 13.

[0022] In one option, the robot 80 installs the front lift plate 19 and the side lift plate 18 after removing the support structure 70. The robot 80 may turn the toilet 100 over (e.g., facing downward) then secure the front lift plate 19 and the side lift plate 18 using one or more fasteners. The front lift plate 19 and the side lift plate 18 may have various sizes (e.g., short, medium, or tall) in order to place the toilet 100 (e.g., seat 12) at a specific height. Various users may be comfortable at different sitting heights.

[0023] The robot 80 may also attach a foot lever (e.g., foot pedal 29) to the toilet 100. The foot lever may include protrusion that are aligned with opening on the frame 103. The foot lever may be held in place by tension.

[0024] The panels may couple to the toilet 100 in a variety of techniques. The panels may snap fit to the frame members 103. For example, the panels may each include one or more tapered beams that mate with an opening of the frame members 103. The panels may each include a cavity with a pull perimeter snap ridge that mates with a protrusion or snap-in mound of the frame members 103. The panels may be fastened to the frame members 103 using a screw or bolt. The panels may be secured to the frame using magnets (i.e., each panel may include one or more magnets that align with one or more magnets of the frame members 103). The robot 80 may press the panels into the toilet 100 in order to connect the panels to the frame members 103.

[0025] Alternatively, the panels may be attached and removed by the user. The user may press the panels to the toilet 100 in order to connect the panels to the frame members 103. The user may thread a fastener from the panels to the frame members 103.

[0026] The panels may be swapped out by the user. That is, the user may remove one set of panels and install another set of panels. The panels may be formed of plastic or metal. An example plastic may be acrylonitrile butadiene styrene. An example metal may be aluminum. The panels may be formed using a 3D printer. The panels may include decals or stickers. The panels may be printed on using ink, paint, toner, or another substance that is applied on the panels from a nozzle.

[0027] FIGS. 9A-9C illustrate a foot pedal 29 for the toilet 100. The foot pedal 29 controls the operation of the lid 10 and seat 12. The foot pedal 29 may be connected to the lid 10 with a first drive train and connected to the seat 12 with a second drive train. As shown in FIG. 9A, a first press on the foot pedal 29 opens the lid 10 to a first angle. As shown in FIG. 9B, a second press opens the seat 12. As shown in FIG. 9C, a third press returns to lid 10 and the seat 12 to a closed position. A ratcheting mechanism may translate the vertical motion of the foot pedal 29 to rotational lift of the lid 10 and seat 12. The ratcheting mechanism is released by the third press to release the lid 10 and seat 12.

[0028] FIG. 10 is an example remote control 120 for the toilet 100 of FIG. 1 and FIGS 9A-9C. The remote control 120 may include one or more buttons that cause a wireless signal (e.g. radio frequency signal) to the toilet 100 (e.g., remote control interface of the controller). The remote control 120 may include a first button, or first button position, for a partial flush or a half flush and a second button, or second button position, for a full flush. Additional buttons may be included for bidet operation, cleaning cycles, sleep (e.g., battery conservation) mode, or other features.

[0029] FIG. 11 is an example local control 110 for the toilet 100 of FIG. 1. The local control 110 may include one or more buttons that cause an electrical signal to the toilet 100 (e.g., local control interface of the controller). The local control 110 may include a first button position (e.g., halfway depressed) for a partial flush or a half flush and a second button position (e.g., substantially fully depressed) for a full flush. Alternatively, the local control 110 may generate a wireless signal that is transmitted to the controller of the toilet 100.

[0030] FIG. 12 is an example foot control (e.g., kick input 20) for the toilet of FIG. 1. The kick input 20 may include one or more buttons that cause an electrical signal (e.g. radio frequency signal) to the toilet 100 (e.g., controller). The kick input 10 may include a first button, or first button position, for a partial flush or a half flush and a second button, or second button position, for a full flush. Additional buttons may be included for cleaning cycles, sleep (e.g., battery conservation) mode, or other features. Alternatively, the kick input 20 may generate a wireless signal that is transmitted to the controller of the toilet 100.

[0031] FIG. 13 is an example bidet 21 for the toilet 100 of FIG. 1. The bidet 21 may spray water in response to a valve setting of the toilet 100. The bidet 21 may be

actuated or spray water in response to any of the user inputs described above. The bidet 21 may be actuated on spray water in response to a flush cycle.

[0032] FIG. 14 is an example light 22 for the toilet of FIG. 1. The light 22 may be turned on in response to a light setting of the toilet 100. The light setting may indicate the light 22 is illuminated in response to any of the user inputs described above. The light 22 may be illuminated in response to a flush cycle. The light 22 may be illuminated in response to sensor data (e.g., a light sensor). The light 22 may be illuminated as a nightlight when the ambient light, or nearby lights, are turned off or below a predetermined threshold.

[0033] FIG. 15 is an example open/close mechanism 200 for the lid 10 and seat 12 of the toilet 100. The open/close mechanism 200 may include a hook member 131 attached to the lid 10, a lock 134, and a release mechanism 135. The hook member 131 includes a pawl 132 engageable with the lock 134. The lock 134 is configured to hold the release mechanism 135. Additional, different, or fewer components may be included.

[0034] FIGS. 16A-C illustrates a sequence for the open/close mechanism 200. As shown in FIG. 16A in lid open position 211, as the lid 10 is opened, the hook member 131 rotates until it makes contact with lock 134 at the guide surface 139 at a first angle. The lock 134 cannot rotate under the force from the hook member 131 because the lock 134 is pressed against the abutment surface 136 of the release mechanism 135, which is in the first position.

[0035] As shown in FIG. 16B at seat open first position 212, when the seat 12 is opened, the release mechanism 135 is rotated to a second position. The second position allows the lock 134 to rotate about its pivot point under force from the hook member 131. When the lock 134 rotates, the pawl 132 moves along the lock 134 until a second surface of the pawl 132 meets the guide surface 139 of the lock 134, which moves the lid 10 toward a second angle. As shown in FIG. 16C at a seat open second position 213, the seat 12 is at the second angle.

[0036] FIG. 17 illustrates an example controller 301 for operation of the drive mechanism for seat 12 and lid 10. The controller 301 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 seat 12 and/or lid 10; position sensors to detect the position of the seat 50 and/or cover).

[0037] The controller 301 may include various inputs or interfaces for receiving electrical signals. A first interface may be connected to a foot input (e.g., kick panel 20). A second interface may be connected to a manual input (e.g., local control 110). A third interface (e.g., communication interface 353) may be connected to a wireless input (e.g., Bluetooth or Wifi). The controller 301 is configured to generate a valve command in response to the

foot input, the manual input, or the wireless input. In addition, a fourth interface may be connected to a sensor configured to detect presence of a user or motion of the user.

[0038] 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.

[0039] Optionally, the control system may include an input device 355 and/or a sensing circuit 356 in communication with any of the sensors. The sensing circuit receives sensor measurements from sensors as described above. 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.

[0040] 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.

[0041] FIG. 18 illustrates a flow chart for the apparatus of FIG. 17. The acts of the flow chart may be performed by the controller 301. Additional, different of fewer acts may be included.

[0042] At act S201, the controller 301 (e.g., processor 300) identifies a presence or absence of a command signal from a remote control 120. The remote control 120 may send a wireless signal to the controller 301. The wireless signal may be in response to a button depressed or voice command announced by the user. The wireless signal may be in response to a sensor included on the remote control 120. Other sensors may be used. The sensor may include any type of sensor configured to detect certain conditions and/or to provide functionality. Odor sensors, proximity sensors, and motion sensors are non-limiting examples of sensors that may be employed with the systems of this application. Proximity sensors may be employed to detect the presence of an object within a zone of detection without physical contact between the object and the sensor. Electric potential sensors, capacitance sensors, projected capacitance sensors, and infrared sensors (e.g., projected infrared sensors, passive infrared sensors) are non-limiting examples of proximity sensors that may be employed with the systems of this application. Motion sensors may be employed to detect motion (e.g., a change in position of an object relative to the objects surroundings).

[0043] At act S203, the controller 301 (e.g., processor 300) identifies a presence or absence of a command sig-

nal from a local hand control 110. The user may press in the hand control 110 to cause generation and transmission of the command signal to the controller 301. Alternatively, the local hand control 110 may include a touch-screen, touch sensor, capacitive sensor, electric potential sensors, optic sensors, radio-frequency (RF) sensors, sound sensors, magnetic sensors (e.g., magnetometers), vibration sensors, and/or infrared sensors (e.g., projected infrared sensors, passive infrared sensors).

[0044] At act S205, the controller 301 (e.g., processor 300) identifies a presence or absence of a command signal from a local foot control 29. The foot pedal 29 may be connected to a pressure sensor that generates the command signal for the controller 301.

[0045] The controller 301 may process the command signal from the remote control 120, the command signal from the local hand control 110, and/or the command signal from the local foot control 29. For example, when signals are received from any two devices, the controller 301 selects one command signal to override the second and/or third other command signals. The controller 301 may rank the foot control 29 to override the remote controller 120. The controller 301 may rank the local hand control 110 to override the remote controller 120 and the foot control 29. Other ranking techniques may be used.

[0046] At act S207, the controller 301 (e.g., processor 300) determines a motor command for a motor coupled to the lid 10 in response to one or more of the command signals. The motor command for the motor may indicate a preset level for lifting the lid 10. The lid 10 may be lifted the command signal from the remote control 120, the command signal from the local hand control 110, or the command signal from the local foot control 29. In other words, any user inputs or detection may cause the lid 10 to open.

[0047] At act S209, the controller 301 (e.g., processor 300) determines a motor command for a motor coupled to the seat 12 in response to one or more of the command signals. The controller 301 may cause the seat 12 to be opened when a user input, rather than sensor data alone, is received at the controller 301. The user input may be a keypress at the remote control 120, a touch at the local hand control 110, or a kick at the local foot control 29. The motor command for the motor may indicate a preset level for lifting the seat 12.

[0048] 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.

[0049] 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.

[0050] 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.

[0051] 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.

[0052] 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 re-writable

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.

[0053] 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.

[0054] 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.

[0055] 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.

[0056] 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.

[0057] 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.

Claims

1. A method of manufacturing a toilet, the method comprising:

lowering a toilet engine guide in a manufacturing support;
aligning a plurality of frame members with the manufacturing support;
installing at least one toilet engine component in the toilet engine guide;
coupling a toilet seat assembly to the toilet; and
coupling a plurality of panels to the plurality of frame members.

2. The method of claim 1, wherein installing at least one toilet engine component in the toilet engine guide further comprises:

installing a trapway in the toilet engine guide;
and
installing a toilet bowl in the toilet engine guide.

3. The method of claim 1 or claim 2, further comprising:

mounting a rim channel assembly on the toilet;
and/or

- removing the toilet from the manufacturing support.
4. The method of any one of the preceding claims, further comprising: 5
- coupling a lid panel to the toilet seat assembly; and/or
attaching a foot lever to the toilet. 10
5. The method of any one of the preceding claims, wherein the toilet seat assembly includes a push button. 15
6. The method of claim 5, wherein the push button is configured to move in a path along a line of an axis of a lid or a seat of the toilet seat assembly and/or wherein the push button includes a partial flush position and a full flush position. 20
7. The method of any one of the preceding claims, wherein the toilet seat assembly is operable to open at a first angle based on a first lock position and a second angle based on a second lock position. 25
8. The method of claim 2, or any one of claims 3 to 7 when dependent on claim 2, wherein at least one of the plurality of frame members is rotatably coupled to the toilet engine guide and rotates in response aligning the plurality of frame members with the manufacturing support. 30
9. An apparatus for raising and lowering a toilet seat and a toilet lid, the apparatus comprising: 35
- a hooking member coupled to the toilet lid and configured to rotate with the toilet lid;
a release mechanism coupled to the toilet seat and configured to rotate with the toilet seat; and
a lock configured to actuate in response to the hooking member of the toilet lid to engage or disengage the release mechanism of the toilet seat. 40
10. The apparatus of claim 9, wherein the hooking member includes a park engageable with the lock. 45
11. The apparatus of claim 9 or claim 10, wherein a guide surface of the lock corresponds to a first angle of the toilet lid at a first position of the lock and a second angle of the toilet lid at a second position of the lock. 50
12. The apparatus of claim 9, claim 10 or claim 11, wherein the lock is disengaged in response to opening the toilet seat and/or wherein closing the toilet seat resets the lock. 55
13. A controller for a toilet, the controller comprising:
- a first interface connected to a foot input;
a second interface connect to a manual input;
a third interface connected to a wireless input; and
a controller configured to generate a valve command in response to the foot input, the manual input, or the wireless input.
14. The controller of claim 13, further comprising:
a fourth interface connected to a sensor configured to detect presence of a user or motion of the user.
15. The controller of claim 13 or claim 14, wherein: the foot input, the manual input, or the wireless input indicates a volume of water; and/or the foot input, the manual input, or the wireless input indicates a partial flush.

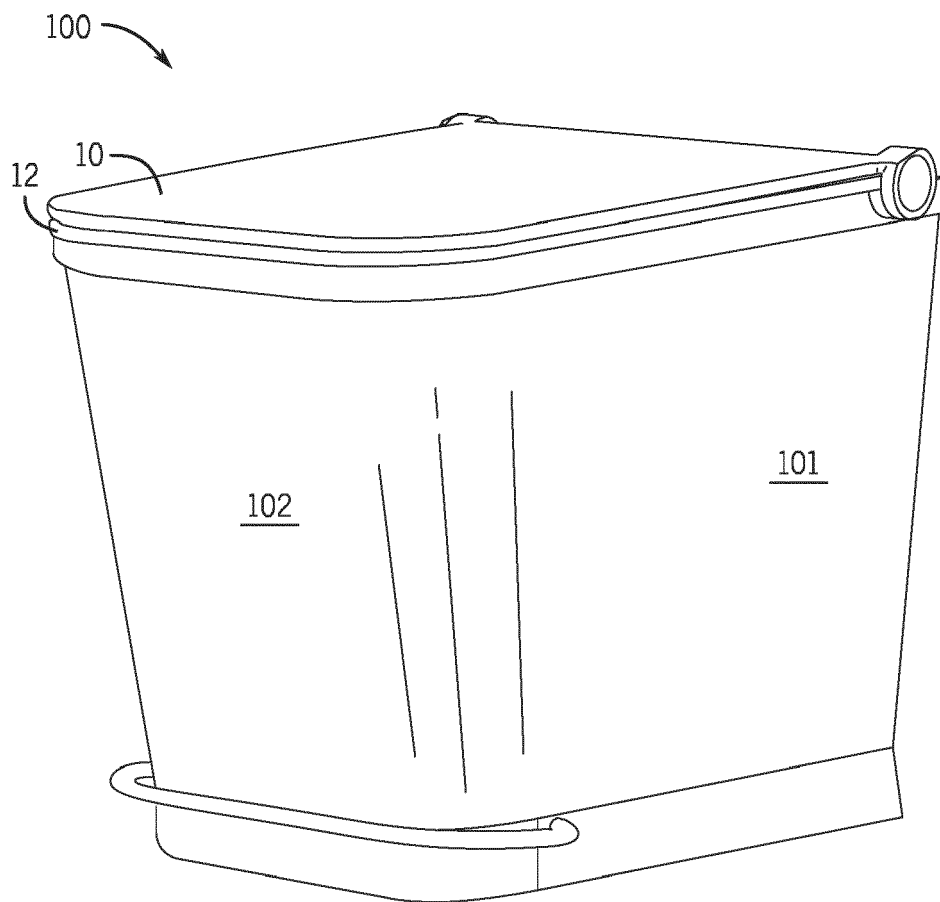


FIG. 1

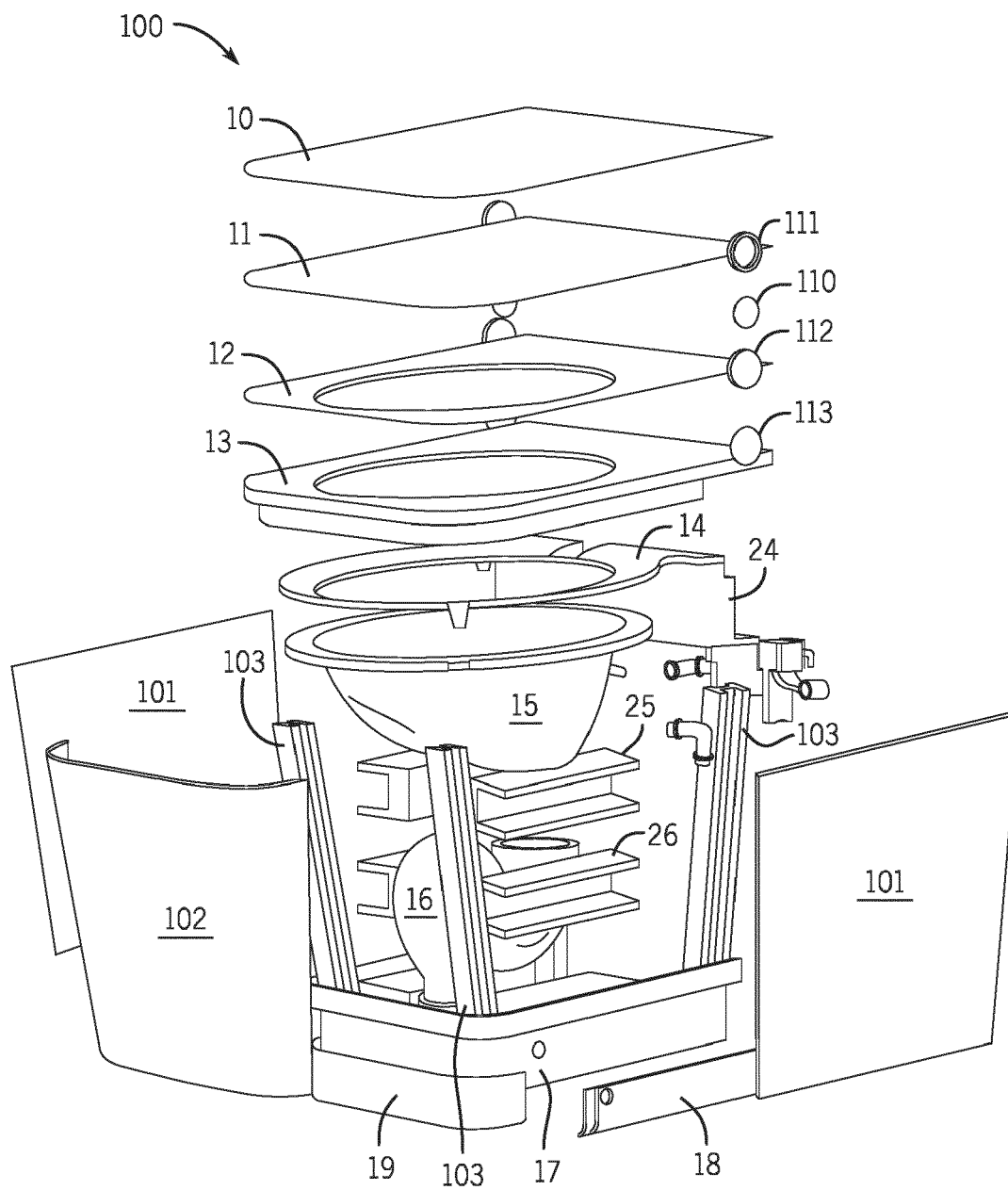


FIG. 2

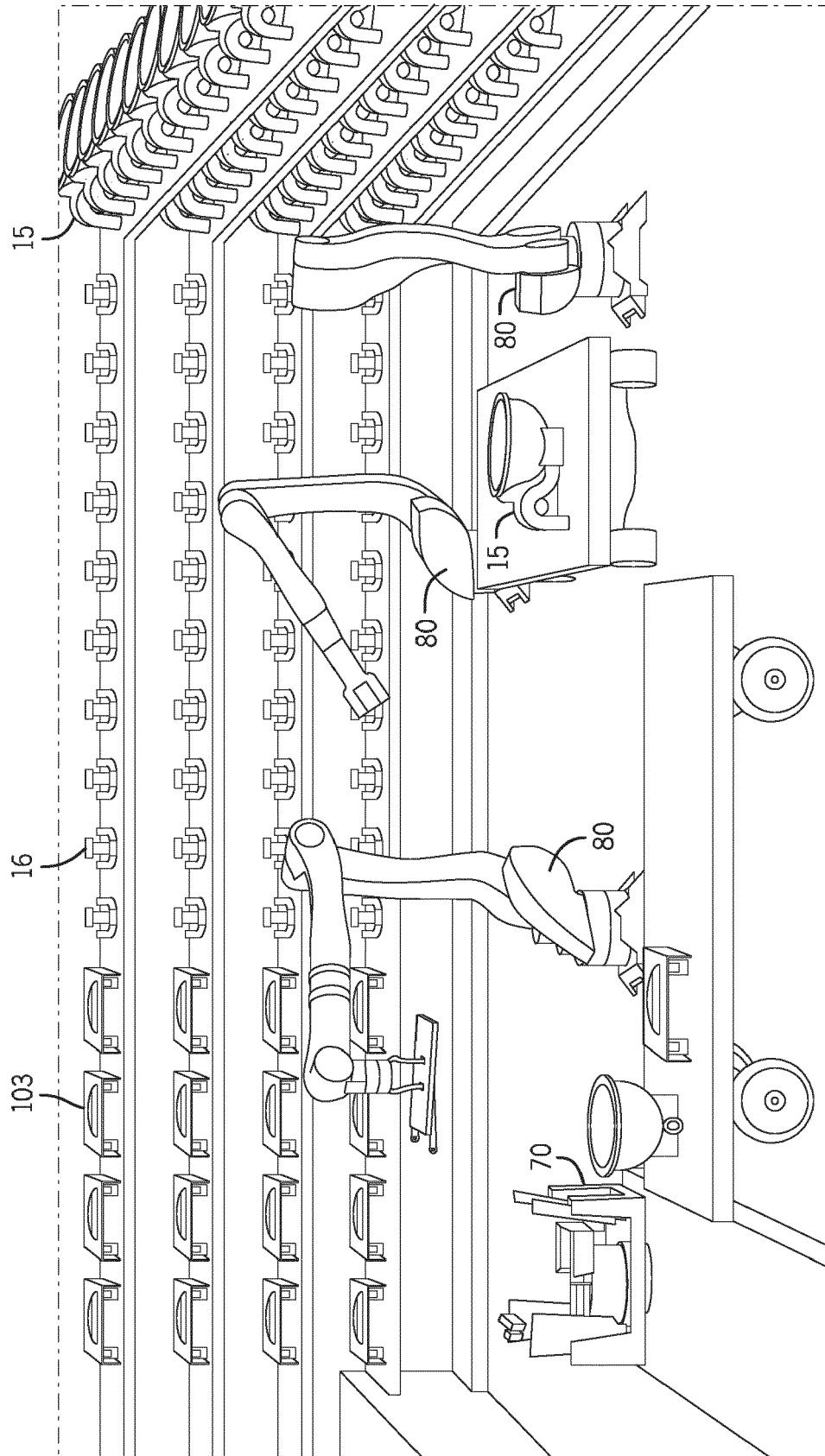


FIG. 3

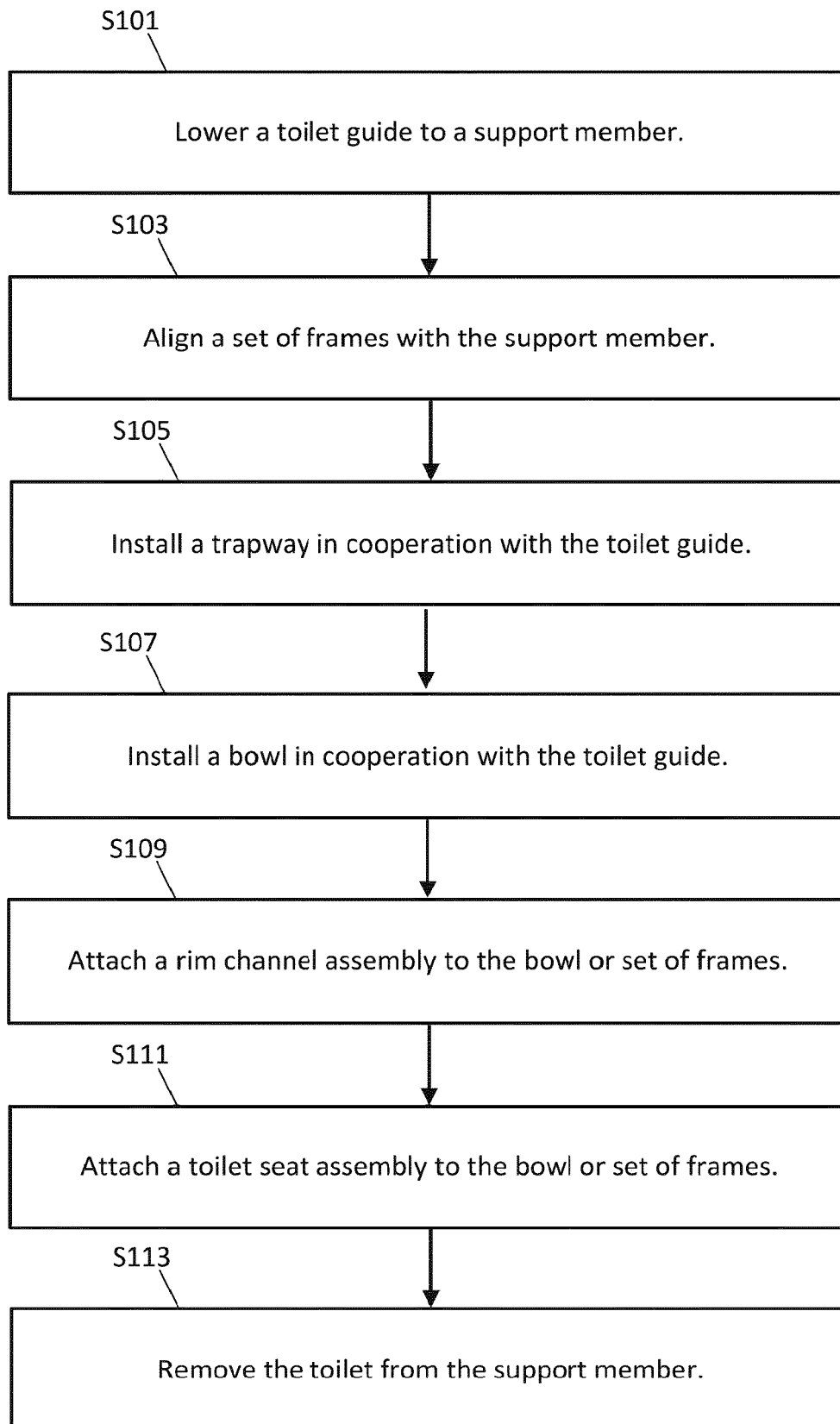


FIG. 4

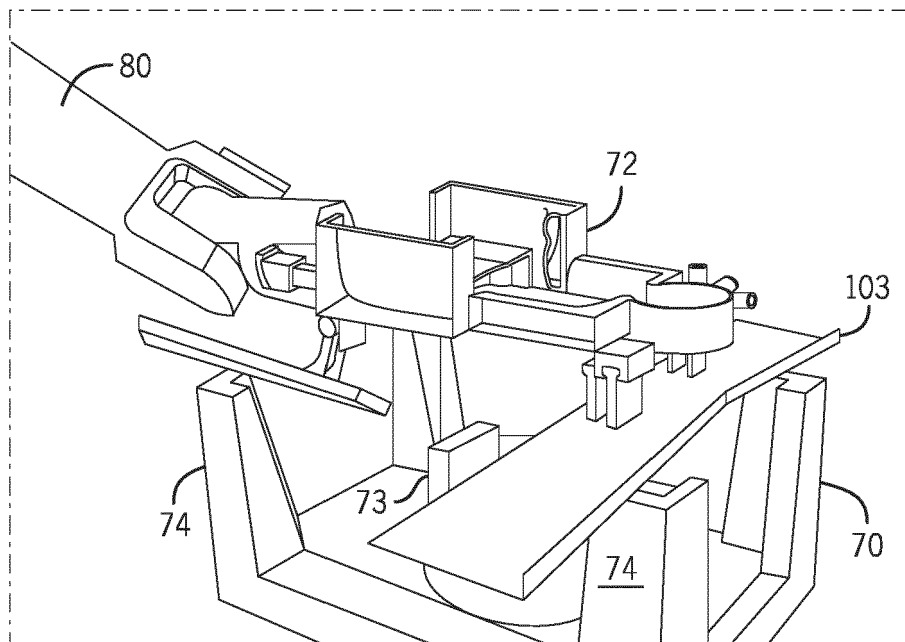


FIG. 5A

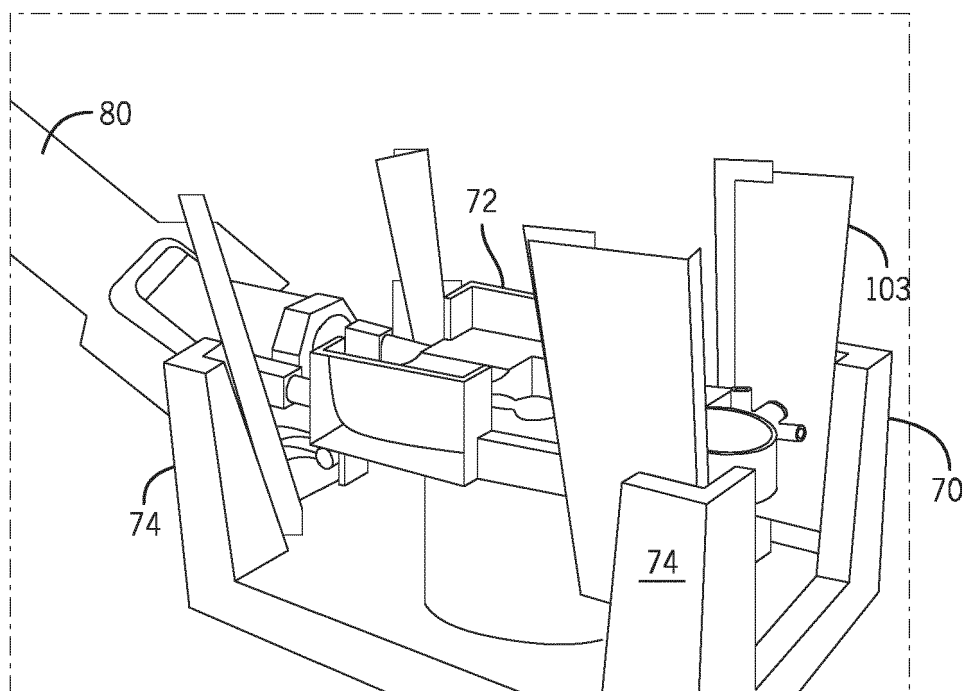


FIG. 5B

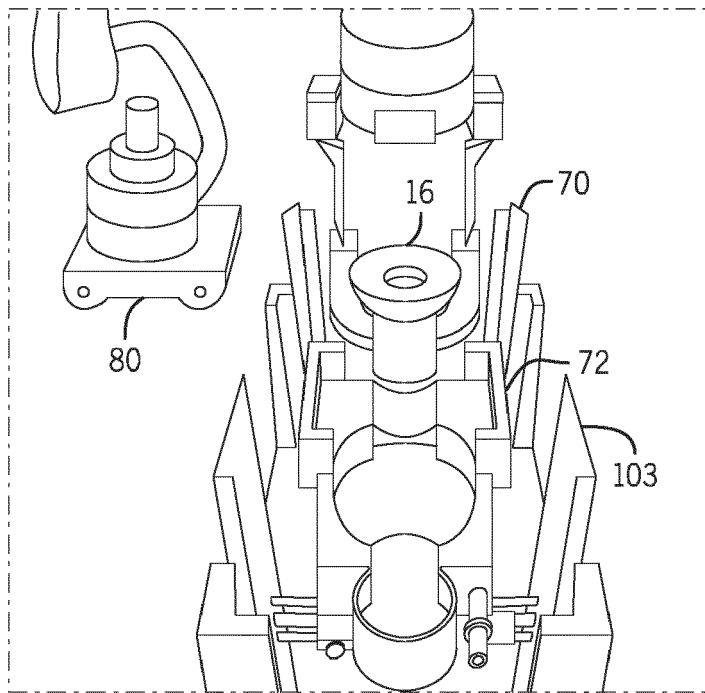


FIG. 6A

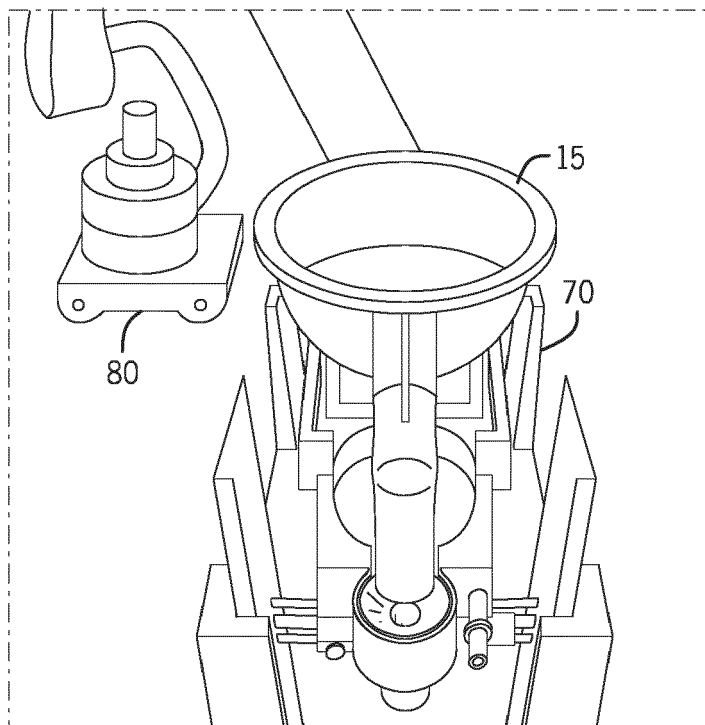


FIG. 6B

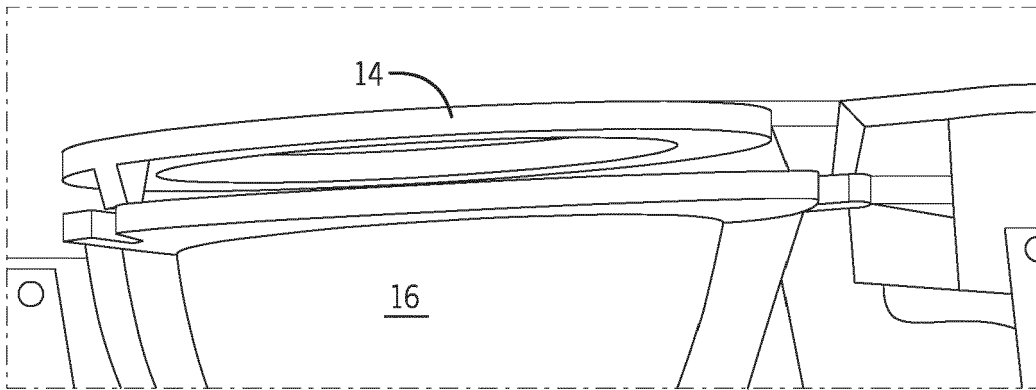


FIG. 7A

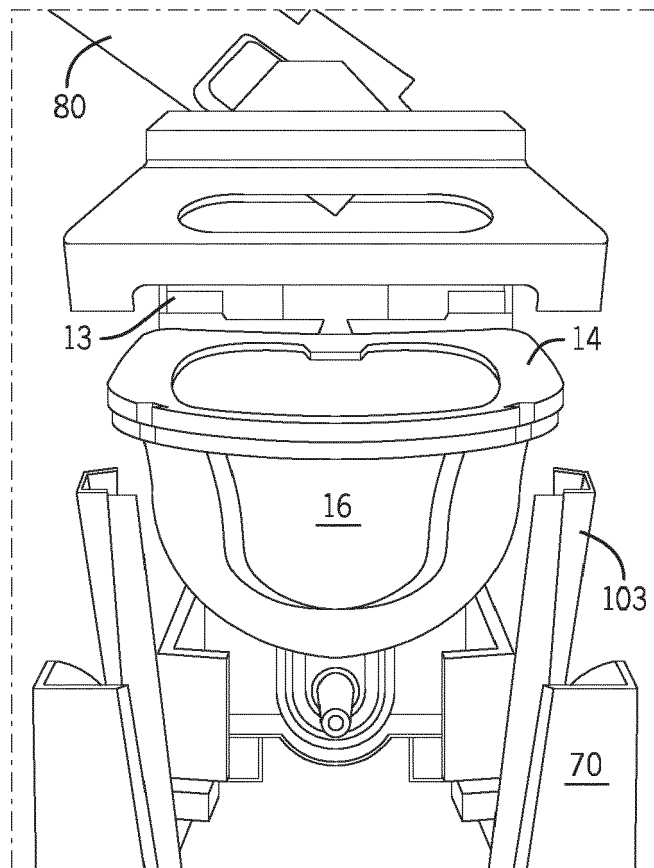


FIG. 7B

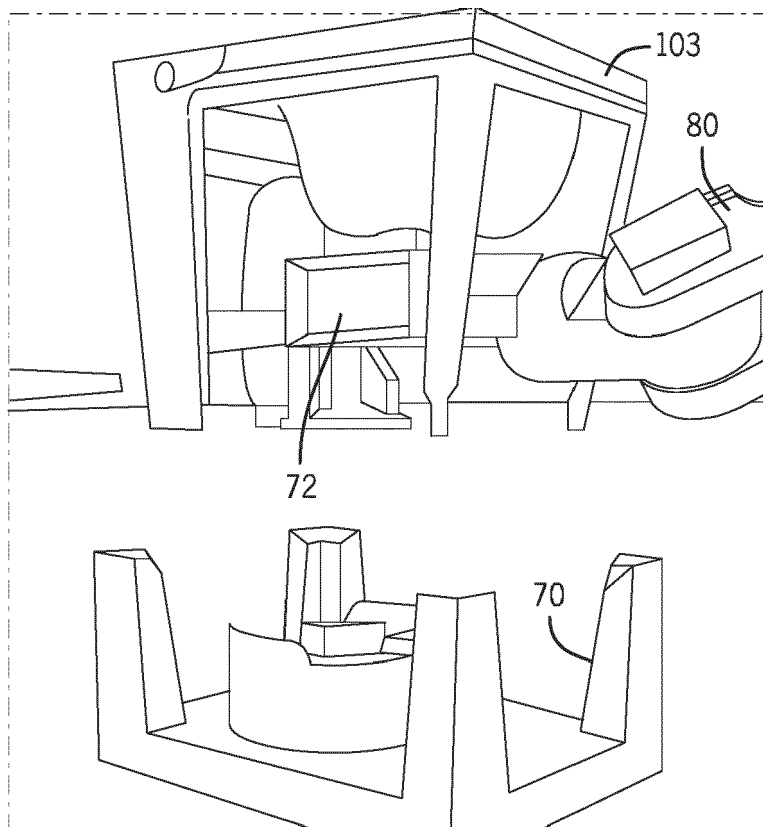


FIG. 8A

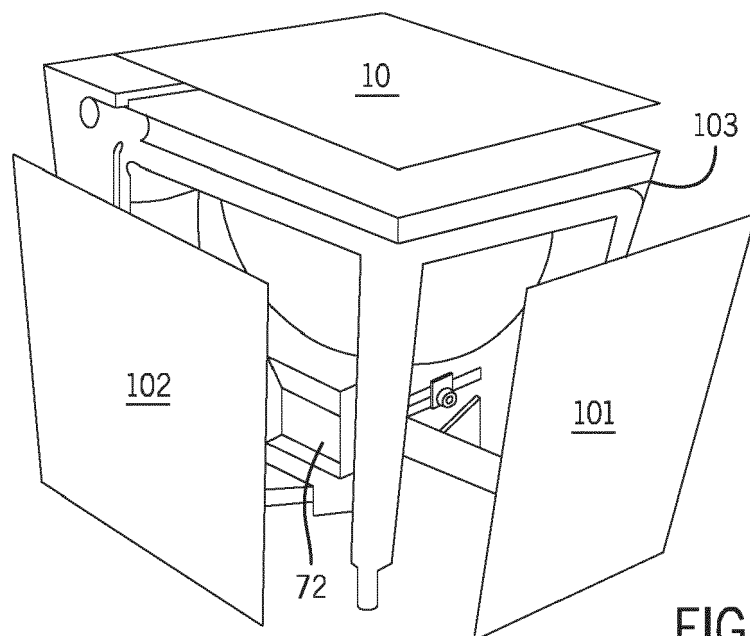
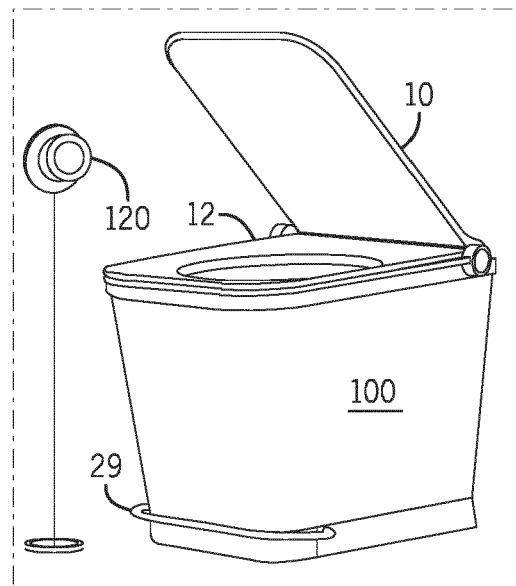


FIG. 8B

FIG. 9A

201



202

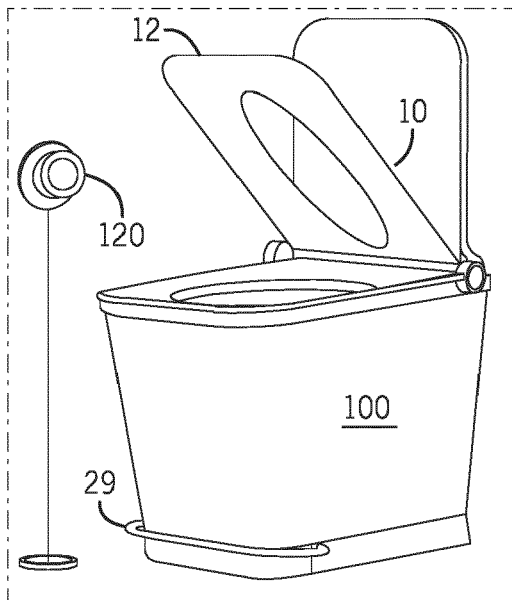
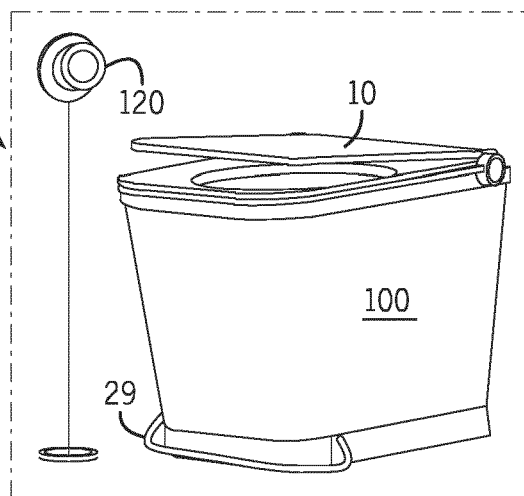


FIG. 9B

203

FIG. 9C



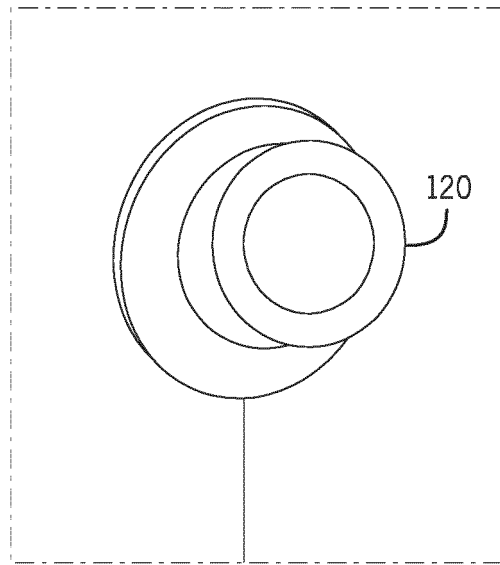


FIG. 10

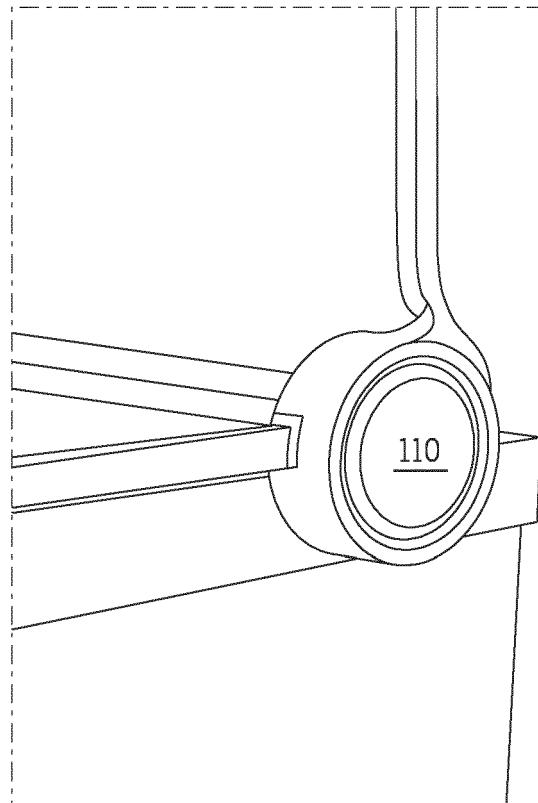


FIG. 11

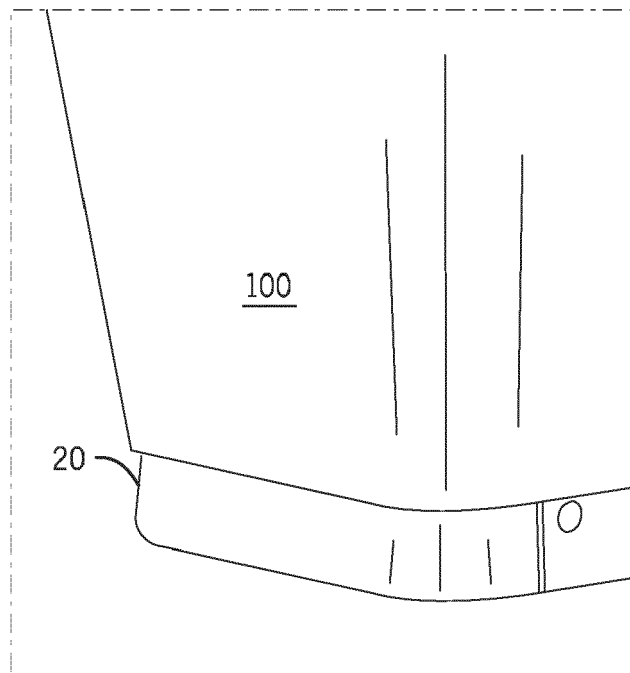


FIG. 12

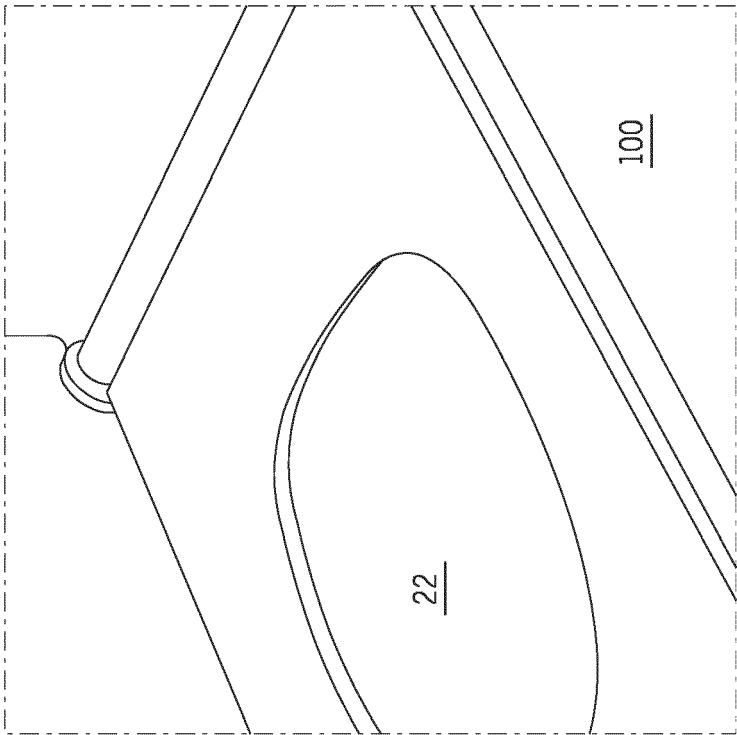


FIG. 14

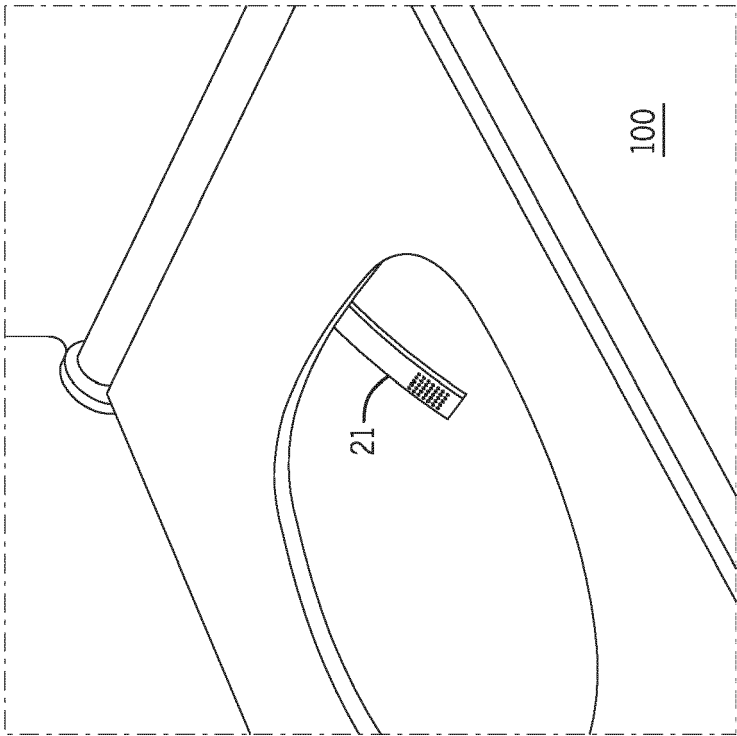


FIG. 13

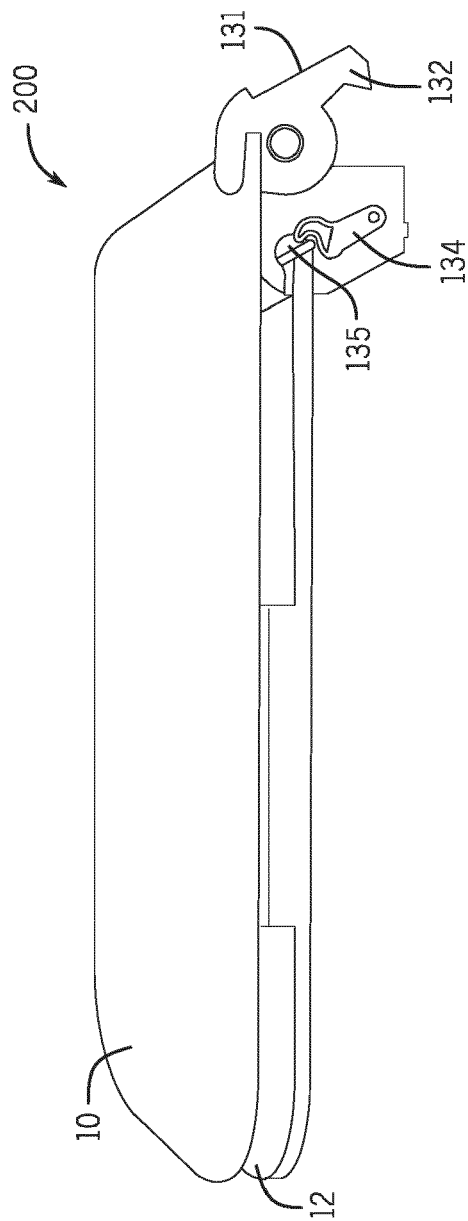


FIG. 15

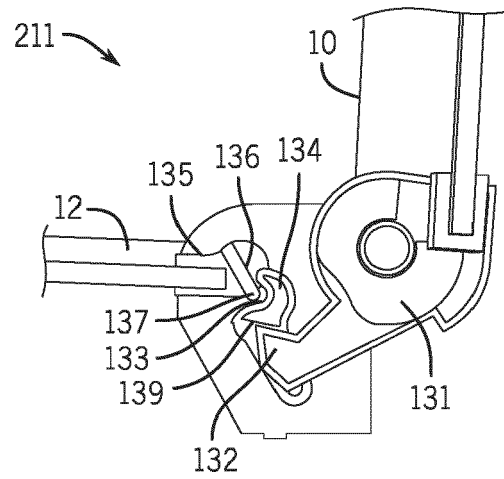


FIG. 16A

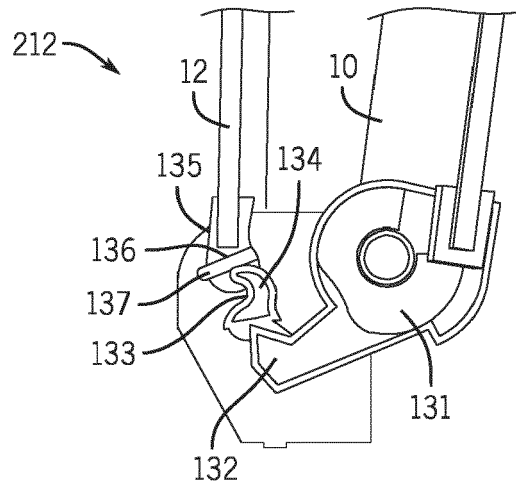


FIG. 16B

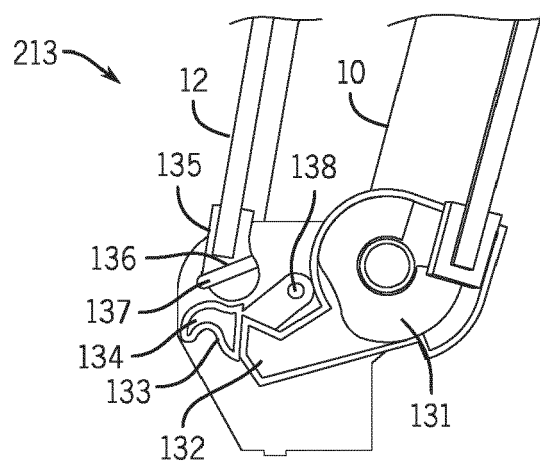


FIG. 16C

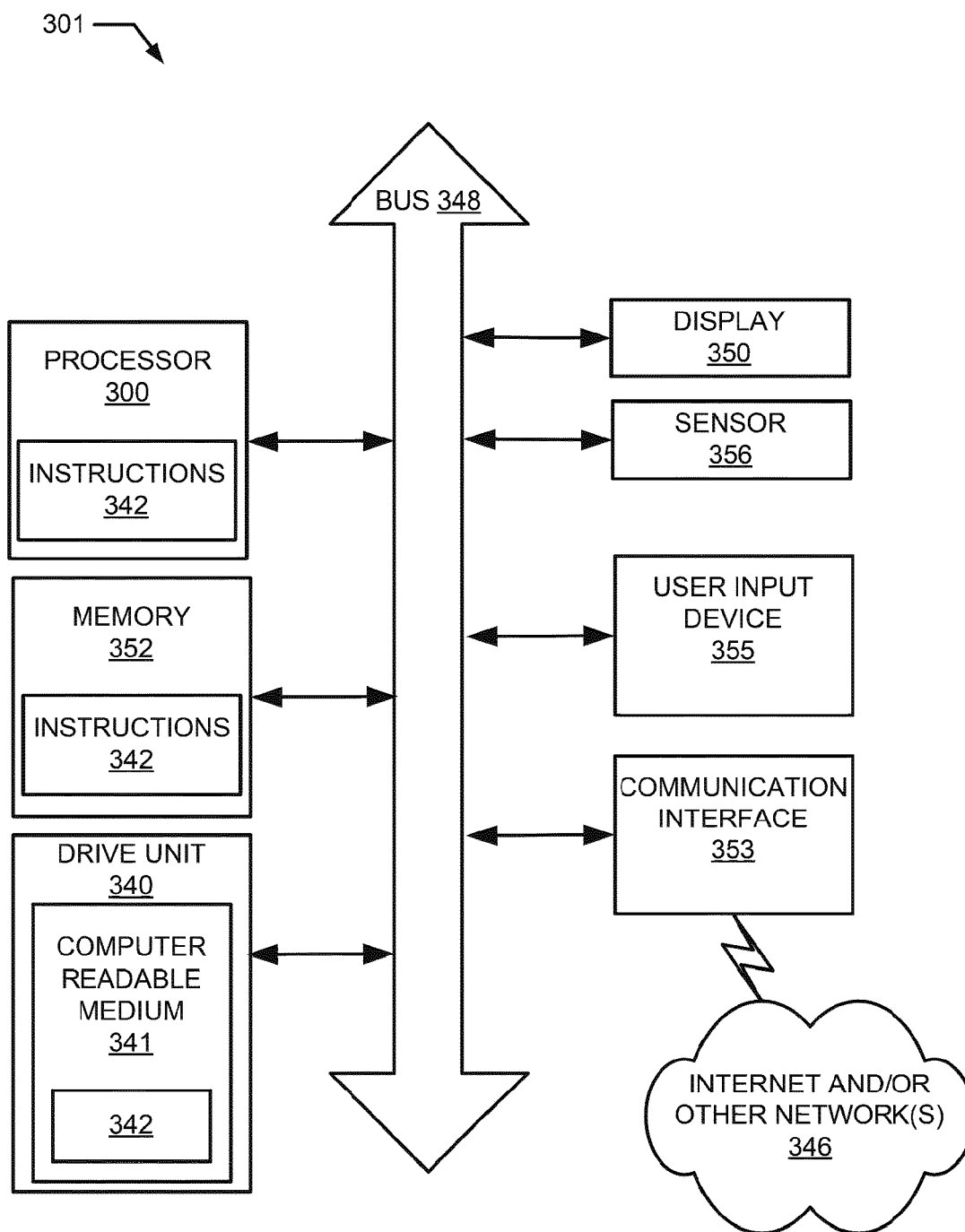


FIG. 17

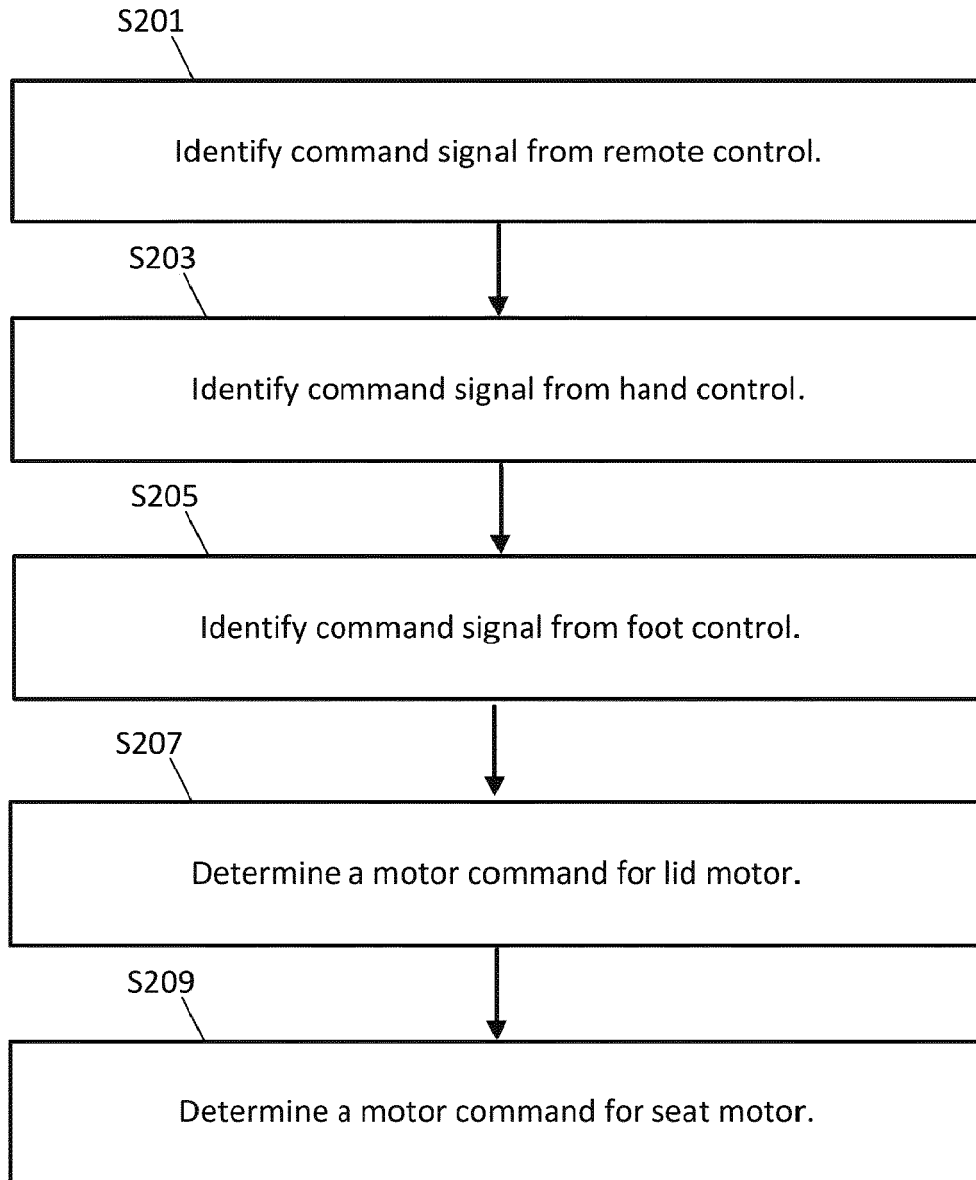


FIG. 18

REFERENCES CITED IN THE DESCRIPTION

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- US 63452225 [0001]
- US 59766324 [0001]