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(71) Applicant *(for all designated States except US)*: **SAFLUSHMYSS LIMITED** [GB/GB]; 38 Broad Street, Earls Barton, Northamptonshire NN6 0ND (GB).

(72) Inventor; and
(71) Applicant : **WHITE, Grahame** [GB/GB]; 38 Broad street, Earls Barton, Northamptonshire NN6 0ND (GB).

(74) Agent: **FOX-MALE, Nicholas**; 1 King Street, Bakewell, Derbyshire DE45 1DZ (GB).

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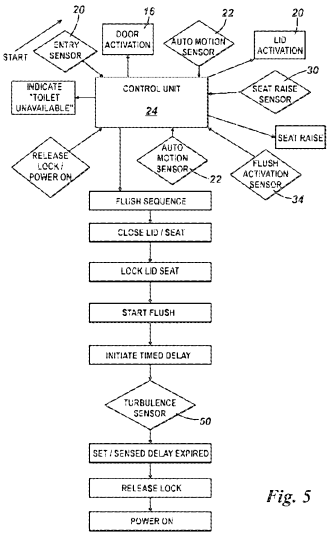

Fig. 5

(57) Abstract: Toilet unit (10) is located in a hospital room (12) and display (18) indicates whether occupied and if "*available for use*". When the person wants to initiate the flush operation to begin, waving a hand in front of a flush-actuation sensor (34) instructs control unit (26) to start a sequence of actions including locking seat (28) and lid (26) together on the cistern, and simultaneously a delay timer (48) is initiated, set for a delay of 16 seconds being based on a flush duration of 8 seconds for a 4.5 litre flush and (8) further seconds for the miasma, generated by the flush, to subside completely. Accordingly, there is effectively or actually no risk of any contaminated or infected liquid or "miasma" water droplets exiting the cistern.

WO 2011/015848 A1

TOILET

FIELD OF THE INVENTION

The present invention relates to a toilet, for example one comprising a motorised toilet assembly.

BACKGROUND OF THE INVENTION

For a considerable number of years, there has been great concern about the possible risk of the spread of infection when using toilets, particularly public toilets for example in hospitals, airports and the food industry.

International Patent Publication No WO 2004/100745 discloses a motorised toilet seat assembly with a motor and drive for the raising and/or lowering of a hinged lid and seat in relation to user request and it describes a large number of automated features and options which can be operated on request or in response to other actions or sensors.

SUMMARY OF THE INVENTION

The present invention provides a toilet assembly having means to maintain the assembly enclosed during, and a period thereafter, the flushing operation.

According to another aspect, the present invention provides a toilet assembly comprising a hinged lid securable for a predetermined period of time during, and extending beyond, the flushing operation.

According to another aspect, the present invention provides a toilet assembly comprising a hinged lid and means to secure the lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.

According to another aspect, the present invention provides a toilet assembly comprising a hinged lid, means to secure the lid in a closed position for release at a predetermined time period after the start of the flushing operation.

The inventor has now appreciated that when the downward flow of flushing water impinges on the static water and waste materials (whether urine, faeces, vomit or blood) in the toilet bowl, there results a significant return flow of liquid and miasma of water droplets, both of which include probably infected micro-organisms and waste materials, being a cloud of infected material, which can travel up to 2 metres and so infect public areas, objects (for example toothbrushes, spectacles, worn belts in domestic bathrooms) and door handles and light switches generally, and so he has incorporated a technical feature whereby the toilet is rendered inoperable for a period until this miasma has settled such that the risk of it passing outside the toilet assembly and so contaminating surfaces and objects and transmitting infection is effectively removed.

In this way, the present invention ensures that the toilet assembly is inoperable until any miasma generated in the flushing operation has subsided.

Thus, the assembly is operable to maintain it enclosed for a period of time extending from the start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation.

For example, the toilet may be operable to effect power-off of part or all the assembly during the flushing operation and the specified period there after.

Additionally or alternatively, there may be provided a lock operable to secure closed a lid at the start of the flushing operation and means to release the lid from the lock mode

after a time period in the range of 5 to 20 seconds after the end of the flushing operation.

The toilet assembly may have a turbulence sensor for monitoring of the flushing operation operable to determine the end of the flushing operation, and the assembly is operable to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor.

Furthermore, the toilet assembly may have an indicator operable to show when the assembly is enclosed and/or a lid is closed/locked, and a motion sensor operable to detect the presence of a person in the vicinity of the toilet assembly. The indicator is operable to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor.

Additionally, the lid and seat may have co-operable surfaces to effect a sealing engagement therebetween and/or with a surface region of the toilet assembly.

According to another form, the present invention provides a control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to maintain the assembly enclosed during, and a period thereafter, the flushing operation.

According to another form, the present invention provides a control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to maintain a hinged lid securable for a predetermined period of time during, and extending beyond, the flushing operation.

According to another form, the present invention provides a control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to secure a hinged lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.

According to another form, the present invention provides a control unit for the operation of a toilet assembly, the unit comprising means to operate securing of a hinged lid in a closed position for release at a predetermined time period after the start of the flushing operation.

The control unit may have any one or more of the following features:-

- the control unit is operable to maintain the assembly enclosed for a period of time extending from the start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation;
- the control unit is operable to effect power-off of part or all the assembly during the flushing operation and the specified period thereafter;
- the control unit is operable with a lock to secure closed a lid at the start of the flushing operation and to release the lid from the lock mode after a time period in the range of 5 to 20 seconds after the end of the flushing operation;
- the unit is operable with a turbulence sensor for monitoring of the flushing operation operable to determine the end of the flushing operation;
- the unit is operable to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor;
- the unit is operable with an indicator to show when the assembly is enclosed and/or a lid is closed/locked;
- the unit is operable with a motion sensor operable to detect the presence of a person in the vicinity of the toilet assembly;
- wherein the unit is operable with an indicator to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor;

According to another form, the present invention provides a method of operating a toilet assembly, the method comprising maintaining the assembly enclosed during, and a period thereafter, the flushing operation.

According to another form, the present invention provides a method of operating a toilet assembly comprising securing a hinged lid for a predetermined period of time during, and extending beyond, the flushing operation.

According to another form the present invention provides a method of operating a toilet assembly comprising securing a hinged lid the lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.

According to another form, the present invention provides a method of operating a toilet assembly comprising securing a hinged lid in a closed position for release at a predetermined time period after the start of the flushing operation.

The method may include any one or more of the following features:-

- the assembly is maintained enclosed for a period of time extending from the start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation;
- effecting power-off of part or all the assembly during the flushing operation and the specified period thereafter;
- operating a lock to secure closed a lid at the start of the flushing operation and means to release the lid from the lock mode after a time period in the range of 5 to 20 seconds after the end of the flushing operation;
- operating a turbulence sensor to monitor of the flushing operation operable to determine the end of the flushing operation;
- operating the assembly to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor;
- operating an indicator operable to show when the assembly is enclosed and/or a lid is closed/locked;
- operating a motion sensor to detect the presence of a person in the vicinity of the toilet assembly;
- operating an indicator to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor.

The present invention provides also an override system for cleaning and maintenance to allow the seat to be manually adjusted.

While WO 2004/100745 refers briefly at page 11 line 31 and page 19 line 9 to a delay circuit merely to introduce additional time delay after flushing only to allow for residual draining of the cistern, this is done while the lid and seat are in raised positions and this document does not suggest or disclose the distinctive claimed features of the present invention, nor the problems, objectives, solutions, benefits and results associated with the present invention.

ADVANTAGES OF THE PRESENT INVENTION

The present invention may provide a toilet assembly, control unit and method of operating a toilet assembly which ensures that the risk of proliferating infection immediately upon the flushing of a toilet is removed or significantly reduced, and likewise the possibility of adjacent surfaces being covered by material which can later degenerate into an infected and contaminated state.

The present invention may provide a combination of control system, sensors, auto-flushing & motorisation of seat & lid to ensure that user hand contact with the WC is not necessary, and with correct use hand contact contamination is eliminated.

The present invention may provide locking systems, related sensors & time delays ensuring elimination of airborne contamination.

The present invention may provide a slotted bolt and stud head (to accommodate the DC power cable) ensuring a simple and practical, effective, and robust way of cable management without altering existing WC pan designs.

The present invention may provide a high functioning display to both prompt and inform the user with simple graphical symbols to prevent unnecessary contact with the WC.

The present invention may provide additional control capability to alternate seat and lid positions at rest between uses or at times of low usage levels to enable 'line of sight' UV sterilisation of seat top, lid underside & bowl interior is an important claim.

The present invention may provide lid or hinge mounted UV lamps for in- bowl UV sterilisation.

The present invention may provide wired or wireless telecoms capability for facilities management and patient monitoring.

The present invention may provide seals between the toilet lid and pan for additional secondary security against contamination.

The present invention may provide anti-bacterial agents in the seat & lid for comprehensive protection possible against contamination from a WC.

APPLICATIONS OF THE PRESENT INVENTION

The present invention is applicable to a toilet assembly which has one or more motorised functions for example including lowering/raising of seat and/or lid, and/or the assembly may have automated operations for example including flushing of the toilet or washing/drying/cleaning/warming of surfaces or the toilet itself. The present invention is likewise applicable to a conventional basic standard toilet without any such additional features.

The present invention is also particularly applicable to toilet assemblies for use in circumstances in which there is large public usage and hygiene is of primary concern

and importance, for example hospitals, care homes, airports and other travel terminals, food preparation, manufacture, retailing and hospitality, and also for use in environments in which toilet assemblies are susceptible to accidental or intentional damage, for example prisons, sports stadiums, bars, public houses, nightclubs.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may more readily understood, a description is now given, by way of example only, reference being made to various embodiments of the present invention, in which:-

FIGURE 1 is a view of a room containing a toilet unit of the present invention;

FIGURE 2 is a perspective view of the toilet unit of Figure 1 in the closed mode;

FIGURE 3 is a perspective view of the toilet unit of Figure 1 with the lid in the raised position;

FIGURE 4 is a perspective view of the toilet unit of Figure 1 with the lid and seat in the raised position;

FIGURE 5 is a schematic block diagram of operations of the control unit of the toilet unit of Figure 1;

FIGURE 6 shows a display unit of the present invention;

FIGURE 7A shows a hinge design of the present invention;

FIGURE 7B shows the hinge of Figure 7A fitted with a nut and cable for use;

FIGURES 8A and **8B** are side and top views respectively of a fixing arrangement of the present invention;

FIGURE 9 shows an electro-magnet lock of the present invention;

FIGURE 10 shows another lock of the present invention;

FIGURE 11 shows a sterilisation function of the present invention; and

FIGURES 12A and **12B** show alternative sealing arrangements of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

There is illustrated in Figures 1 to 3 a toilet unit 10 for use in a hospital. The toilet unit 10 is located in a room 12 off a hospital ward 14 and accessible by a door 16 beside which is a display 17 with one section 18 which indicates whether the room 12 is occupied (by a panel which is red to indicate when it is occupied and green when it is empty), and another section 19 with a "toilet" symbol selectively (i) green to indicate the toilet unit 10 is "*available for use*", and (ii) red to indicate it is "*not presently available for use*". When the toilet symbol is red, section 19 has a digital display of the number of seconds before the toilet unit 10 will be available for use. In a variant, the toilet symbol is replaced with the International symbol for "*Stop*", a pictogram of a raised hand. A similar display 21 is provided on the wall within room 12 to indicate whether the toilet is available for use and, if isn't presently available, when it will be so.

When the toilet unit 10 is not in use but is ready for use, as shown in Figure 1, the unit forms a sealed unit with a continuous smoothed exterior surface with no recesses, indents or protrusions which might otherwise harbour or retain dirt, grease, dust or waste materials. Such a surface allows quick and easy hygienic cleaning and maintenance of the unit.

When display 18 indicates that room 12 is empty and the toilet unit is available for use, in order to enter the room 12, a person waves a hand in front of an entry sensor 20 on the wall of the hospital ward 14 near door 16 in order to open the door. Entry sensor 20 cannot be activated unless room 12 is empty and toilet unit 10 is available for use.

Upon entry to room 12, toilet unit 10 is in the mode as shown in Figure 2. When the person enters room 12, a motion sensor 22 detects their presence, sending a signal to

control unit 24 of the toilet unit 10 to actuate lifting of toilet lid 26 to the position in Figure 3. If the person requires toilet seat 28 to be raised, this is done by waving a hand in front of seat-raising sensor 30.

When seat 28 is in the lowered position, seat 28 lies on and sealingly engages with the upper surface 32 of the toilet bowl to provide a barrier against ingress therebetween of liquids, water droplets and miasma. Likewise, when lid 26 is in the lowered position (i.e. as shown in Figure 2, lid 26 similarly sealingly engages with upper surface 32, with seat enclosed between lid 26 and upper surface 32.

When lid 26 and seat 28 are both in the raised position, they sealingly engage together once again to prevent liquid/droplet/miasma ingress. All these sealing engagements are achieved by completely sealing the gap between the seat and the toilet pan, and completely sealing the aperture in the seat with a "hubcap" moulding on the underside of the lid such that the seat is wholly contained within the lid with the lid being a hubcap-style moulding with an exact fit into the seat aperture, as seen in Figure 4.

When the person wants to initiate the flush operation to begin, this is done by waving a hand in front of a flush-actuation sensor 34 which instructs control unit 24 to start a sequence of actions being:

ACTION	PRODUCED BY
1. Closing of lid/seat or lid	(i) hand signal, or (ii) sensing departure of person;
2. Locking of lid	sensing closure of lid;
3. Start flushing operation	sensing completion of locking of lid;
4. Initiate release delay	sensing start of flushing operation.
5. Release lid	expiry of set period of release delay"
6. Indicator shows that toilet is ready for next use	sensing that lid is released.

If the person leaves the room 14 without activating the flush-actuation sensor 34, motion sensor 22 notes their absence and automatically starts the above appropriate sequence of actions.

Each of upper surface 32 of the toilet bowl and lower surface 36 of seat 28 have enclosed embedded magneto-solenoid contacts or strips 38, 40 (see Figure 4) just below the surface of the respective component and electrically actuable by control unit 24 to sealingly lock seat 28 onto upper surface 32 as the first step of the flush sequence, likewise equivalent strips 42 embedded within the upper surface 38 of seat 28 are sealingly locked with strips 44 embedded within lower surface 46 of lid 26 (see Figure 3).

Additionally or alternatively to the locking operation, part or all of the motorisation operations of toilet unit 10 are powered off such that the lid and seat are securely held in position in the sealed engagement of cistern, seat and lid against any forced movement until re-energisation.

Control unit 24 senses when locking of seat 28 and lid 26 together on the cistern has been completed, whereupon the actual flushing in the cistern is begun, and simultaneously a delay timer 48 is initiated, set for a delay of 16 seconds being based on a flush duration of 8 seconds for a 4.5 litre flush and 8 further seconds for the miasma, generated by the flush, to subside completely. Accordingly, by the time that the lid is able to open again, there is effectively or actually no risk of any contaminated or infected liquid or vapour/gases exiting the cistern.

In cisterns with a flush capacity of 6 litres, an appropriate time delay would be a total of 20 seconds based on 12 seconds for the flush and 8 seconds for miasma settlement.

In a modification, toilet unit 10 has a turbulence sensor 50 and/or a sound sensor 52 within the toilet bowl to monitor for the end of the flush operation, and when control unit 24 detects that end, it starts another delay period being now for miasma settlement

only, so 8 seconds. This variation can be used as an alternative, and/or in addition, to the basic form.

At the end of the respective delay, the locking actions on the lid and/or seat, and/or the power-off of the appropriate part or all of toilet unit 10 are released or de-activated, and the indication on display 18 is appropriately changed.

Toilet seat 28 is of U-shape with no forward central section bridging the two side arms, to inhibit the possibility of vandalism by application of moment forces against the hinge at the back of the seat.

The 'timed delay' proposal of the present invention prevents the opening of the seat & lid until after the miasma has settled, and is dependent on the effective interaction of an electronic control, an auto-flushing device, a motorised seat/lid assembly and possibly the addition of a locking feature to provide further security against premature lifting of the lid by the user. An objective of 'elimination of dispersal risk' can be achieved with the described combination of an electronic control, an auto-flushing device, a motorised seat/lid assembly and possibly the addition of a locking feature.

Figure 6 shows details of the display including the combination of the graphic symbols described. A long range sensor 102 detects a new occupant and lid 26 is raised, with an "**UP**" arrow 104 also being illuminated. The **"UP"** arrow 104 is illuminated when the seat/ lid 26 is about to or is going up or down – the "**DOWN**" arrow 105 is illuminated when the seat/lid 26 is about to or is going down. Also, '**LIFT**" and **"LOWER"** signs are illuminated separately as appropriate, so that the message is specific to the action required. The "**WC graphic**" 108 with the two position seat/lid 26 may be illuminated in white or in green according to operator choice.

The **"UP"** and **"DOWN**" arrows 104, 105 are lit separately so that the image reflects what the WC is about to do. The Countdown display 110 starts when the lid has actually closed and the flush has just commenced. The short-range sensor 112 detects a hand wave to lift/lower the seat. The "**UP"** and "**DOWN**" arrows 104 and 105 also light.

The Countdown display 110 shows a digital countdown from "**9**" to "**0**". The Countdown speed (and therefore overall time) may be varied depending on whether the flush is short or long, and also takes into account the settling period. The total Countdown sequence typically lasts 15 to 30 seconds (includes flush time) depending on the length of flush and the time required to allow the miasma to settle. The control will not allow the lid to be operated until the countdown is complete, minimising risk of airborne contamination from the WC.

The "**HAND**" symbol has two positions 114, 116. When it flicks between the two positions, illuminated green, this indicates that the occupant should wave at the sensor if they wish to lift/lower the seat. The message '**TO LIFT-LOWER SEAT WAVE HERE ↑' 118** also flashes, pointing towards the short range sensor 112. Either the **"UP"** 104 or "**DOWN** " 105 arrows light to indicate what the WC is about to do.

The upright "**HAND**" 116 symbol flashes in red light when the system requires the user to stop. This may be in response to the user forcing the lid or seat. The "**HAND**" symbol 116 is illuminated in red continuously with the '**OUT OF ORDER**" sign 120 when the system detects a fault. If any sensor is activated (typically by a new user) then the "**OUT OF ORDER**" sign may flash to attract the attention of the new user.

Figures 7A and 7B show a motorised hinge design being a 2-piece (or split) hinge construction in stainless steel, utilising 'top fixing' technology that can be used on both top and bottom fixing WC pans, the two parts being identical, and are not differently handed. In a variant, there is a one-piece hinge with two motors built-in.

In Figures 7A and 7B, there is a slotted fixing head 120 and stud 122 with longitudinal slot 124 to accommodate cabling126, and motorised hinge pivot 128 (on seat 28 or lid 26) inside which (nit visible in the Figure) is a microdrive, with drive shaft 130 extending outwards.

Management of the motor cables utilises the fixing studs, with the slotted bolt and slotted, waisted head that form the top-fixing stud (see Figure 7). In both parts, there is a 'U' shaped slot that runs longitudinally. The DC motor cable runs in the slot and passes from the motor hinge assembly through the ceramic WC pan via the slotted fixing stud to the underside (or inside rear) of the WC pan where it can then be connected to the electronic control mounted in the flush panel of the WC housing.

An alternative arrangement for cable management is the 'live' fixing as shown in Figures 8A and 8B, in which the 12v DC power is supplied through the fixing stud 140 itself. The fixing stud is designed rather like a 'phono' plug. The 2 part stud carries +ve and –ve DC power on separate insulated terminals 142, 144. This design is particularly suitable for bottom fixing.

An alternative arrangement for introducing a locking feature as shown in Figure 9 is a DC electro-magnet 150 embedded in the moulded lid 26 that interacts with a metal plate bonded to the WC pan front outer face, where the greatest force can be created when the electro-magnet is energised. In the leading edge 152 of lid 26, there are embedded leads 154 to an embedded, flat electro-magnet (moulded-in) to interact with a plate 156 bonded to WC pan. When energized, the electro-magnet 150 and the plate 156 are attracted creating a locking force.

This idea is simple, and there are no moving parts. It can be activated for a short period during flush & settlement to lock the lid using minimum of electrical energy.

A variant locking mechanism is a DC solenoid operable to move a locking pin 160. This pin can inter-lock directly with a suitable feature in the WC pan or it could work with an elastomeric expansion block 162 that would be forced out by the pin and 'wedge' with a suitable feature in the WC pan (Figure 10). An advantage of the elastomeric block concept is that the whole device could be sealed by the elastomeric block 162 to prevent fluid ingress leading to corrosion, shorting etc.

The solenoid-powered pin arrangement has a recess in the WC pan outer face, and an elastomer locking block – when the pin is pushed down by the solenoid, the elastomer block is pushed out into the pan recess.

One way to incorporate UV sterilisation technology is to incorporate a high intensity UV lamp 170 into the toilet lid 26 (see Figure 11) with a reflector 172, a clear cover 174 sealed to rim 176 of lamp housing 178.

Another practical and cost-effective means of incorporating UV sterilisation technology into the system is to use low intensity (human safe), constant emission UV lamps as used in operating rooms (dual intensity), on wards, food prep & service areas etc. These lamps are standard mains powered and can be fitted as would normal lights with certain installation height and angle restrictions. Each cubicle may have a lamp mounted on the ceiling or back panel to provide UV sterilisation.

This would provide background sterilisation of all surfaces that are 'line of sight' exposed (with some reflective exposure) ensuring that micro-organism levels are kept low.

To allow sterilisation of the seat, lid and bowl, the system may have a 'normally open' condition for the lid. This can be easily selected by a simple switch on the side of the control box. Then, with correct positioning of the overhead 'human safe' UV lamp it is possible to sterilise the seat top, the lid underside and most of the bowl. It is also possible to sterilise the rim by using this method, by programming the controller to alternate its 'normally open' condition to include 'seat up' condition so that the rim is exposed say every other use cycle. This arrangement compliments the use of anti-bacterial agents in the seat & lid components, the internal surfaces of which would receive little exposure to the steady UV source as the seat & lid are designed to remain closed when not in use.

In an alternative lid-rim design, the opportunity for the user to open the lid while the flush-settle cycle is underway is reduced. Mechanical lock designs are possible but may be expensive to implement and may provide crevices to harbour micro-organisms. Two

alternative designs for lid lip and rim are shown in Figures 12 A and 12B. The first one (Figure 12A) requires that the ceramic WC pan profile is modified to provide a step 190 onto which the edge of the lid lip 192 can close. This could provide an alternative location for a seal 194 and greatly reduce the opportunity for the user to force open the lid. Similarly, (in Figure 12B) the lip 196 of the lid 26 is tapered and may even incorporate a finger seal and again reducing the opportunity for the user to force open the lid.

The electronic control system operates to control, co-ordinate and provide DC power for lid & seat motors, flushing valve (short & long flush), and locking device. It also controls duration of flush/settle delay and all display functions. The control system determines whether short or long flush is required by the duration of use from sensor signals. A usage duration of greater than say 40 seconds determines that a long flush is required. The control will also enable the 'facilities manager' to select from several specific system start position options. For example, in a female facility it may be preferred to have a start condition where the seat & lid are lowered, whereas in a male facility it may be preferred to have a lid & seat up start condition. A third option would be to have lid up and seat down. In addition, it may be required to control the seat & lid position for sterilisation procedures as outlined above.

A hard-wired, or wireless connection may be provided to enable data transmission. Valuable information on usage (number, frequency, water volume etc) and current condition (operational or shut down) can be transmitted to a remote facilities management terminal. This may allow facilities managers to make decisions and potentially even take direct action from the remote terminal. (e.g. shut-down a unit that has been used excessively; initiate a sterilisation sequence; advise maintenance staff by SMS text message to service units based on usage level or operational status). It is possible to automate such decisions at the device. The decision criteria can be programmed into the device controller and the same decisions made automatically by the controller, including sending out SMS text message to the mobile phone of the on duty maintenance personnel.

In order to cut the cost of home care and health visits, computer technology and telecommunications are being used increasingly to monitor patient condition and relay this to a remote location where a health worker can monitor many patients with ease. A 'telecom transmitter' chip may be incorporated into the control board that may transmit data on facility use (such as time of usage, frequency, short & long flush etc). In future it may be even possible to provide in bowl 'analysis' and to transmit this data to a remote health worker.

Claims

1. A toilet assembly having means to maintain the assembly enclosed during, and a period thereafter, the flushing operation.
2. A toilet assembly comprising a hinged lid securable for a predetermined period of time during, and extending beyond, the flushing operation.
3. A toilet assembly comprising a hinged lid and means to secure the lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.
4. A toilet assembly comprising a hinged lid, means to secure the lid in a closed position for release at a predetermined time period after the start of the flushing operation.
5. A toilet assembly as in any preceding Claim wherein the assembly is operable to maintain it enclosed for a period of time extending from the start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation.
6. A toilet assembly as in any preceding claim wherein the toilet assembly is operable to effect power-off of part or all the assembly during the flushing operation and the specified period thereafter.
7. A toilet assembly as in any preceding claim comprising a lock operable to secure closed a lid at the start of the flushing operation and means to release the lid from the lock mode after a time period in the range of 5 to 20 seconds after the end of the flushing operation.
8. A toilet assembly as in any preceding claim comprising a turbulence sensor for monitoring of the flushing operation operable to determine the end of the flushing operation.
9. A toilet assembly as in claim 7 wherein the assembly is operable to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor.
10. A toilet assembly as in any preceding claim comprising an indicator operable to show when the assembly is enclosed and/or a lid is closed/locked.

11. A toilet assembly as in any preceding claim comprising a motion sensor operable to detect the presence of a person in the vicinity of the toilet assembly.

12. A toilet assembly as in any preceding claim comprising an indicator operable to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor.

13. A toilet assembly as in any preceding claim wherein a lid and a seat have co-operable surfaces to effect a sealing engagement therebetween and/or with a surface region of the toilet assembly.

14. A control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to maintain the assembly enclosed during, and a period thereafter, the flushing operation.

15. A control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to maintain a hinged lid securable for a predetermined period of time during, and extending beyond, the flushing operation.

16. A control unit for the operation of a toilet assembly, the unit comprising means to operate the assembly to secure a hinged lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.

17. A control unit for the operation of a toilet assembly, the unit comprising means to operate securing of a hinged lid in a closed position for release at a predetermined time period after the start of the flushing operation.

18. A control unit as in any of Claims 14 to 17 wherein the control unit is operable to maintain the assembly enclosed for a period of time extending from the start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation.

19. A control unit as in any of claims 14 to 18 wherein the control unit is operable to effect power-off of part or all the assembly during the flushing operation and the specified period thereafter.

20. A control unit as in any of claims 14 to 19 wherein the control unit is operable with a lock to secure closed a lid at the start of the flushing operation and to

release the lid from the lock mode after a time period in the range of 5 to 20 seconds after the end of the flushing operation.

21. A control unit as in any of claims 14 to 20, wherein the unit is operable with a turbulence sensor for monitoring of the flushing operation operable to determine the end of the flushing operation.

22. A control unit as in any of claims 14 to 21, wherein the unit is operable to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor.

23. A control unit as in any of claims 14 to 22, wherein the unit is operable with an indicator to show when the assembly is enclosed and/or a lid is closed/locked.

24. A control unit as in any of claims 14 to 23, wherein the unit is operable with a motion sensor operable to detect the presence of a person in the vicinity of the toilet assembly.

25. A control unit as in any of claims 14 to 24, wherein the unit is operable with an indicator to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor.

26. A method of operating a toilet assembly, the method comprising maintaining the assembly enclosed during, and a period thereafter, the flushing operation.

27. A method of operating a toilet assembly comprising securing a hinged lid for a predetermined period of time during, and extending beyond, the flushing operation.

28. A method of operating a toilet assembly comprising securing a hinged lid the lid in a closed position for a period extending from the start of, to beyond the end of, the flushing operation.

29. A method of operating a toilet assembly comprising securing a hinged lid in a closed position for release at a predetermined time period after the start of the flushing operation.

30. A method of operating a toilet assembly as in any of Claims 26 to 29 wherein the assembly is maintained enclosed for a period of time extending from the

start of the flushing operation and terminating in the range of 5 to 20 seconds after the end of the flushing operation.

31. A method of operating a toilet assembly as in any of Claims 26 to 30 comprising effecting power-off of part or all the assembly during the flushing operation and the specified period thereafter.

32. A method of operating a toilet assembly as in any of claims 26 to 31 comprising operating a lock to secure closed a lid at the start of the flushing operation and means to release the lid from the lock mode after a time period in the range of 5 to 20 seconds after the end of the flushing operation.

33. A method of operating a toilet assembly as in any of claims 26 to 32 comprising operating a turbulence sensor to monitor of the flushing operation operable to determine the end of the flushing operation.

34. A method of operating a toilet assembly as in claim 33 comprising operating the assembly to terminate the assembly-enclosing or lid-closure/locking in dependence of an output from the turbulence sensor.

35. A method of operating a toilet assembly as in any of claims 26 to 34 comprising operating an indicator operable to show when the assembly is enclosed and/or a lid is closed/locked.

36. A method of operating a toilet assembly as in any of claims 26 to 35 comprising operating a motion sensor to detect the presence of a person in the vicinity of the toilet assembly.

37. A method of operating a toilet assembly as in any of claims 26 to 36 comprising operating an indicator to show the remaining time before termination of the assembly-enclosing or lid-closure/locking and in dependence of an output from a motion sensor.

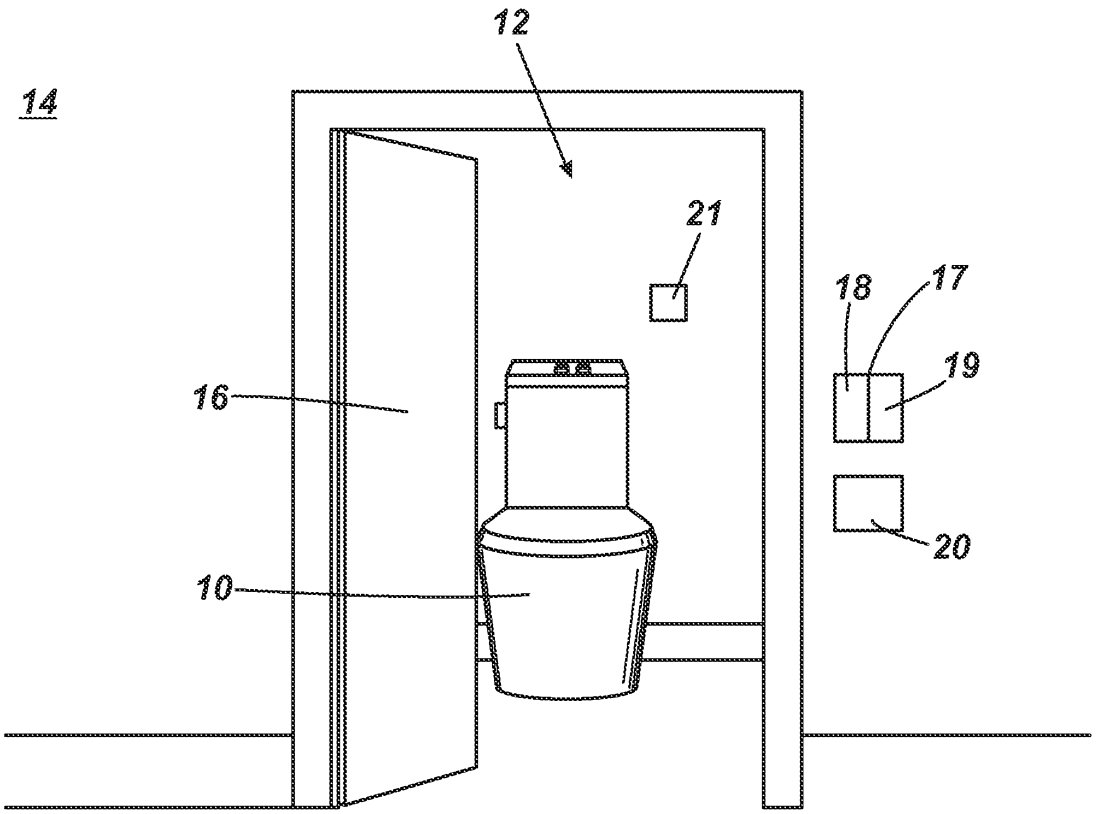

Fig. 1

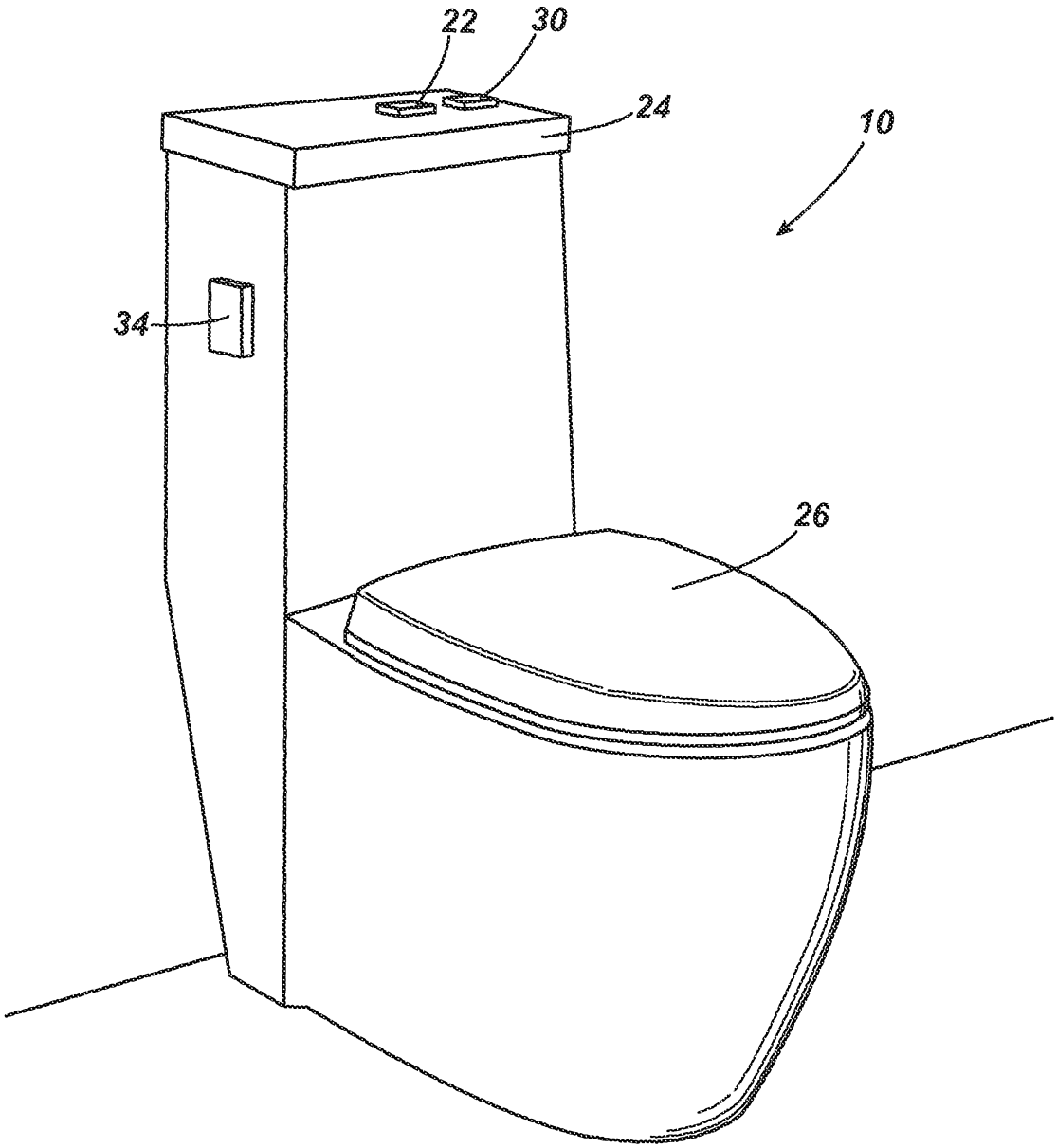

Fig. 2

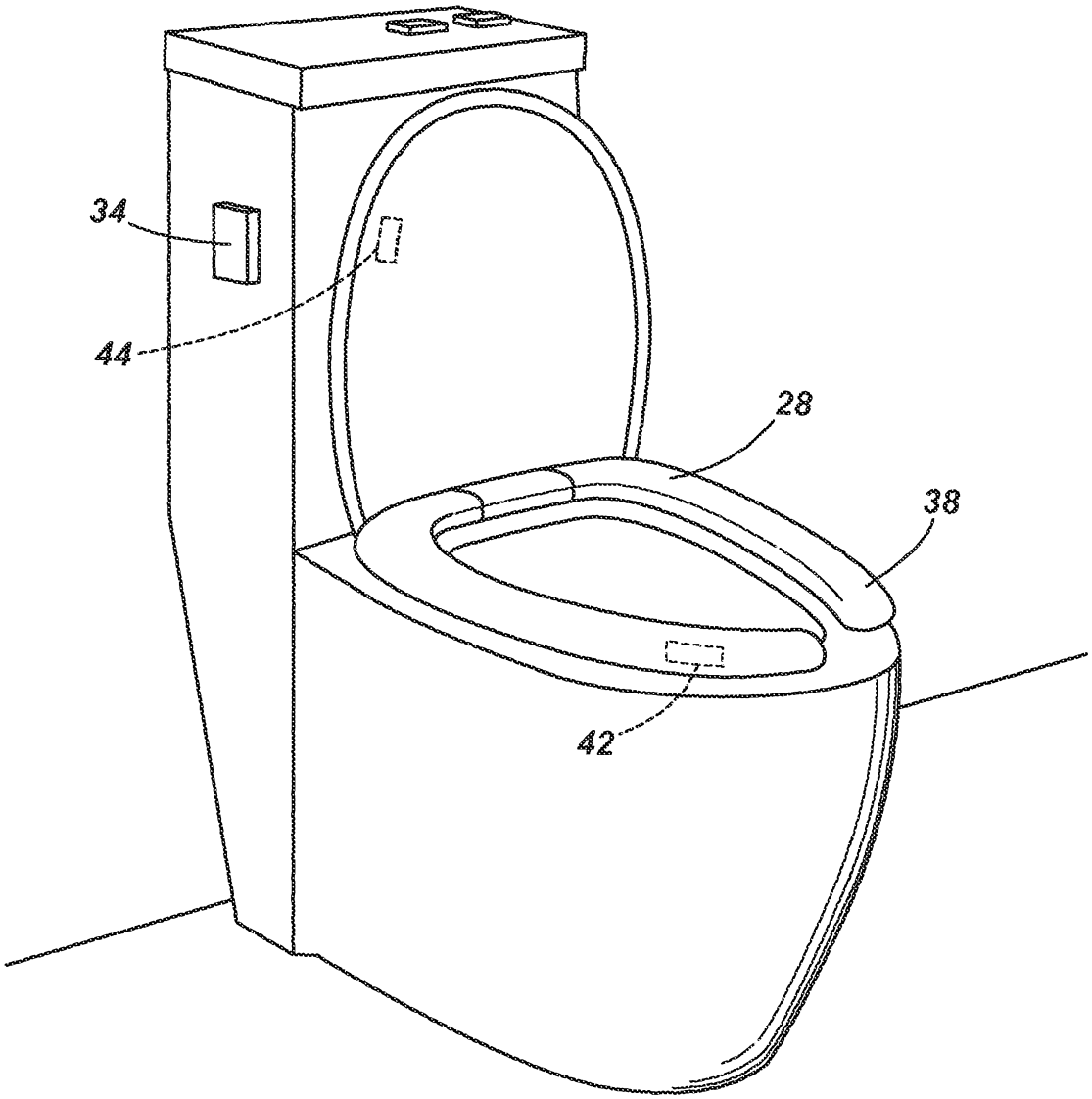

Fig. 3

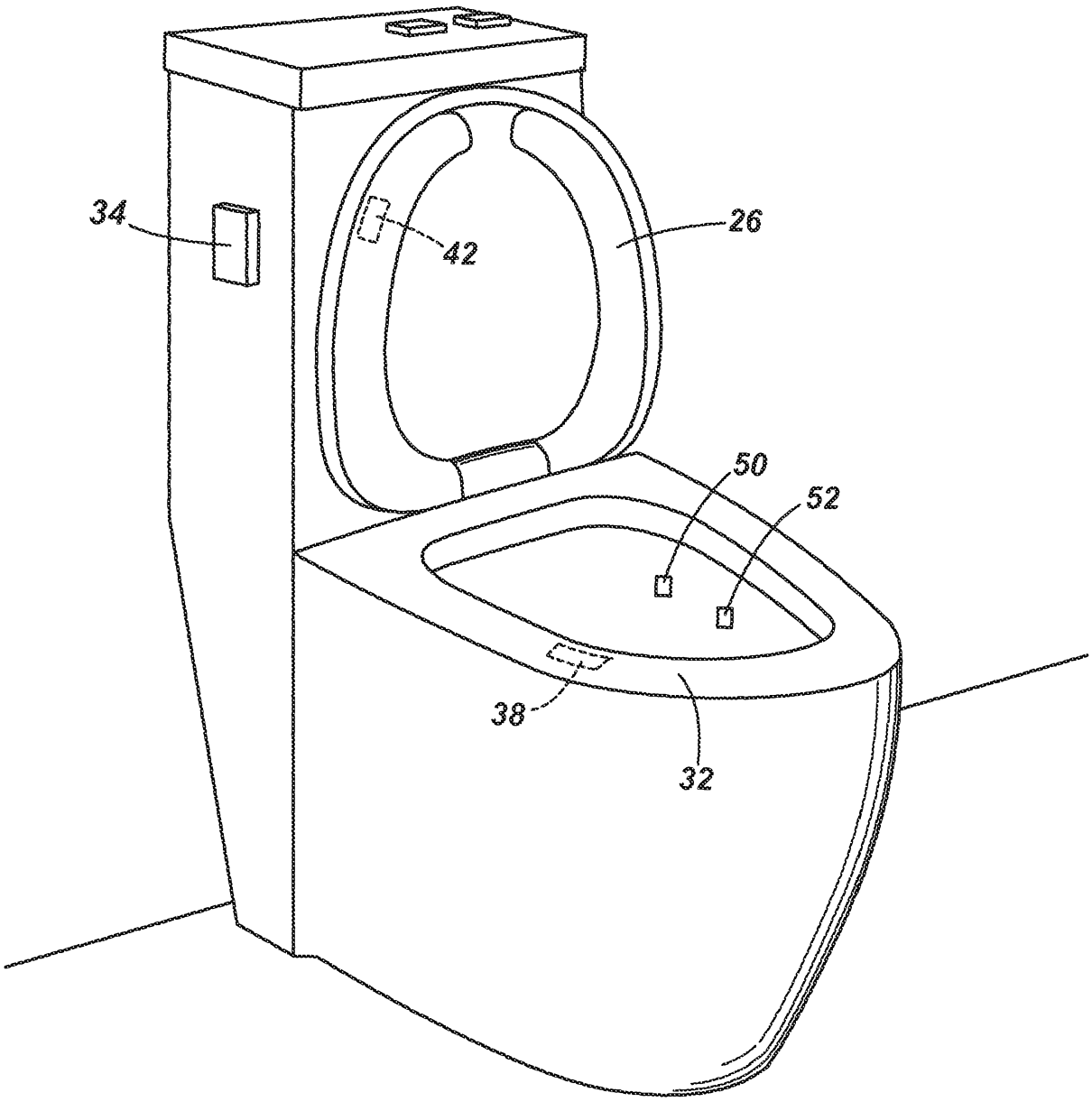

Fig. 4

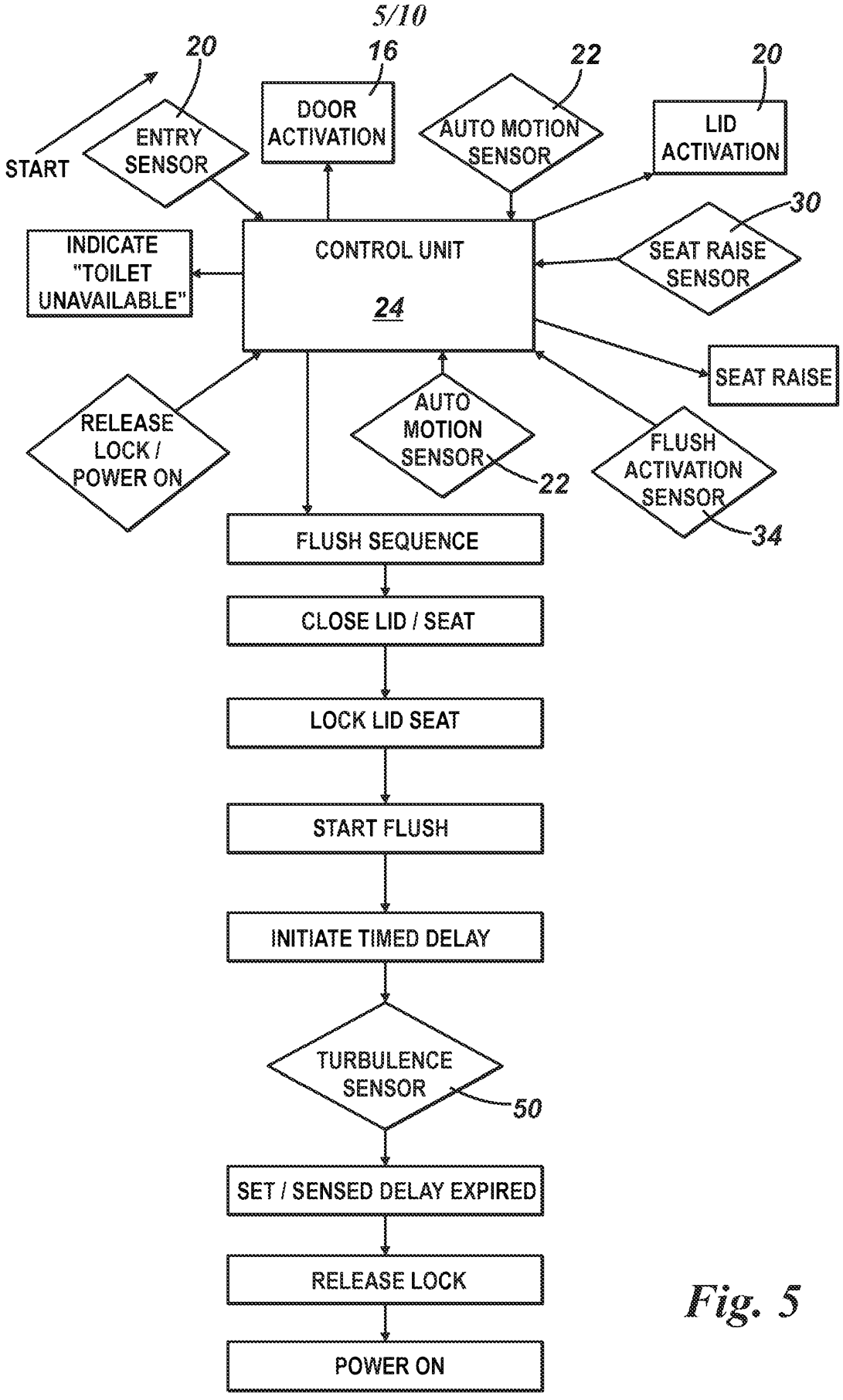
START
20
ENTRY SENSOR
16
DOOR ACTIVATION
22
AUTO MOTION SENSOR
20
LID ACTIVATION
INDICATE "TOILET UNAVAILABLE"
CONTROL UNIT
24
30
SEAT RAISE SENSOR
SEAT RAISE
RELEASE LOCK / POWER ON
AUTO MOTION SENSOR
22
FLUSH ACTIVATION SENSOR
34
FLUSH SEQUENCE
CLOSE LID / SEAT
LOCK LID SEAT
START FLUSH
INITIATE TIMED DELAY
TURBULENCE SENSOR
50
SET / SENSED DELAY EXPIRED
RELEASE LOCK
POWER ON

Fig. 5

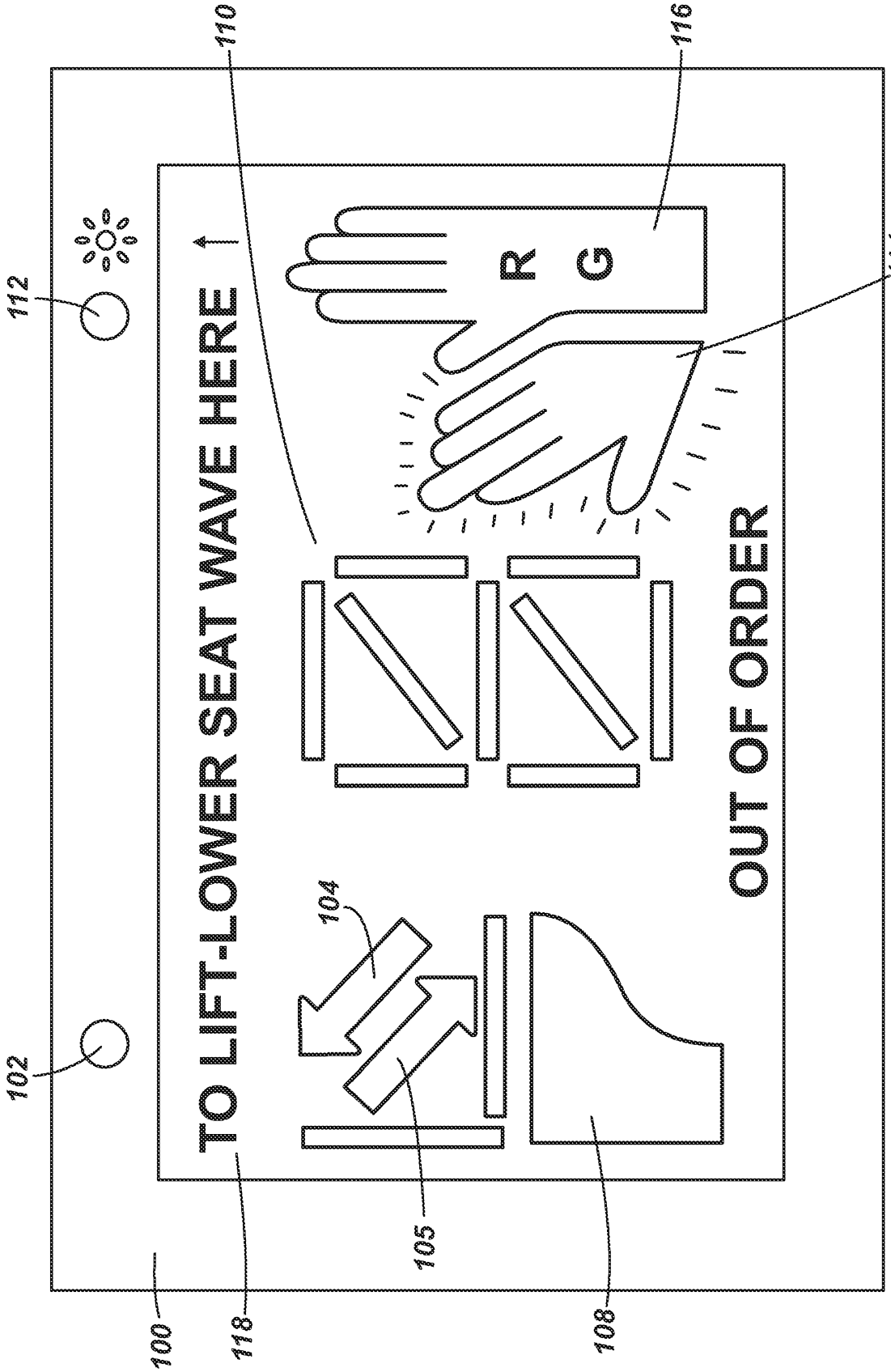
110
116
112
114
TO LIFT-LOWER SEAT WAVE HERE
R G
OUT OF ORDER
104
102
105
100
118
108

Fig. 6

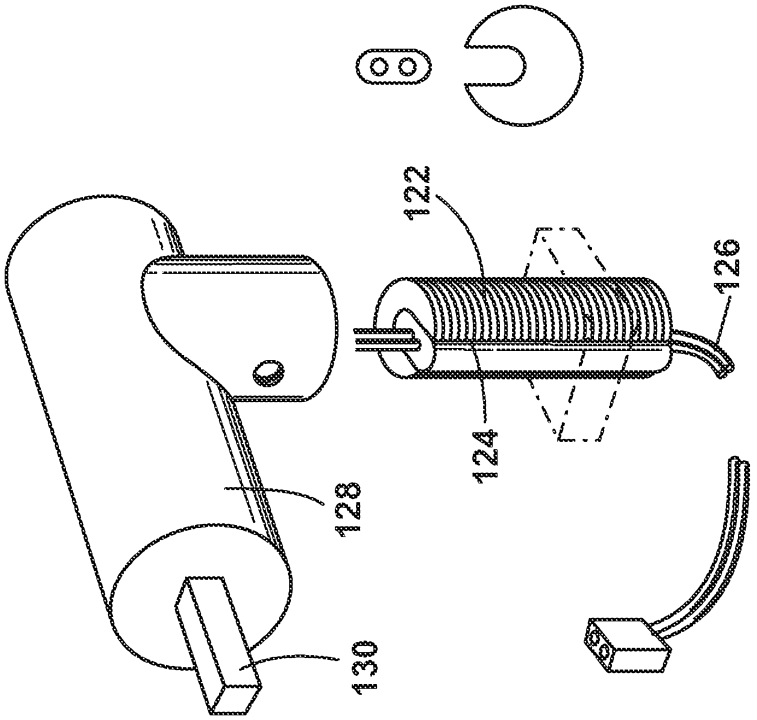

Fig. 7b

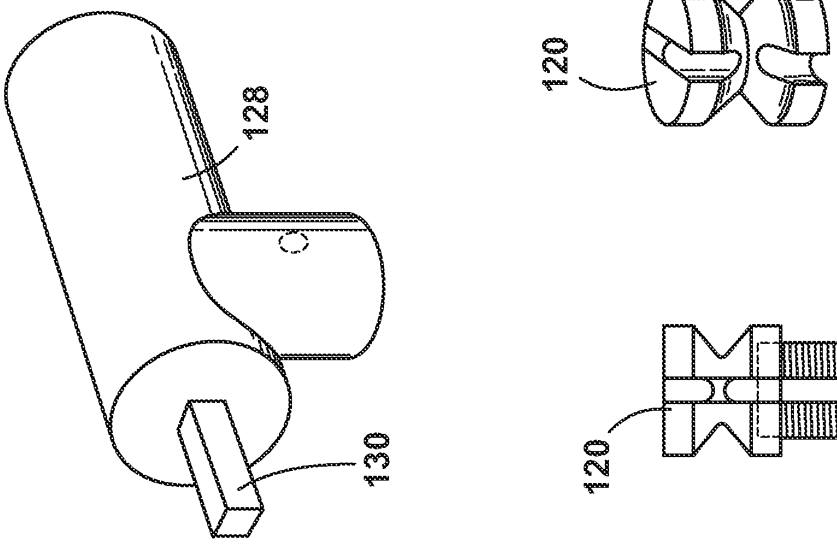

Fig. 7a

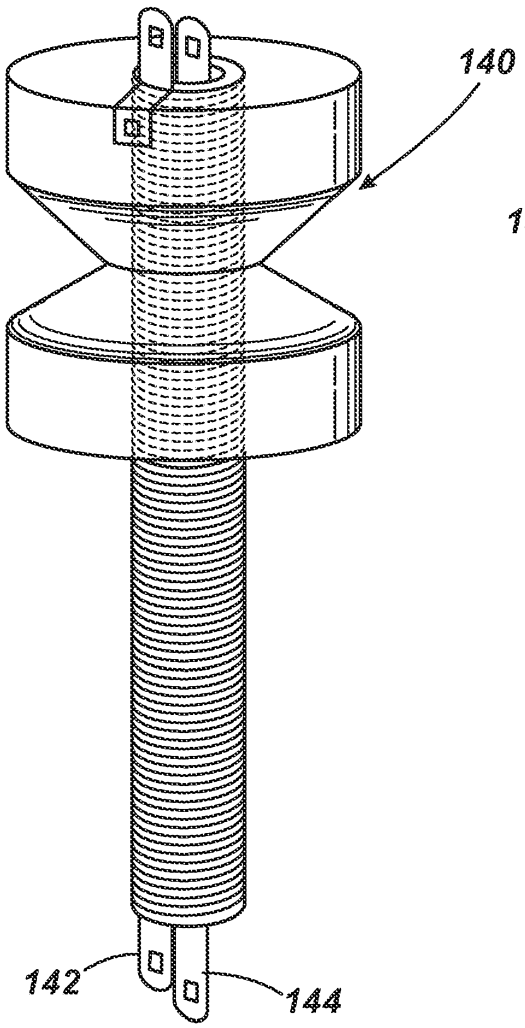

Fig. 8A

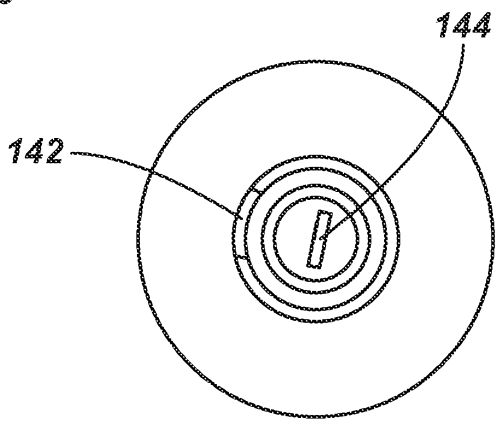

Fig. 8B

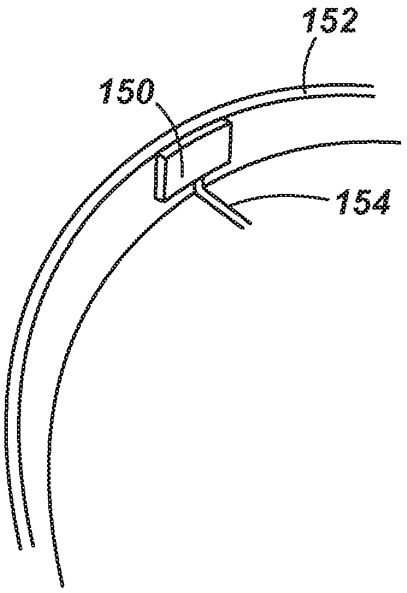

Fig. 9

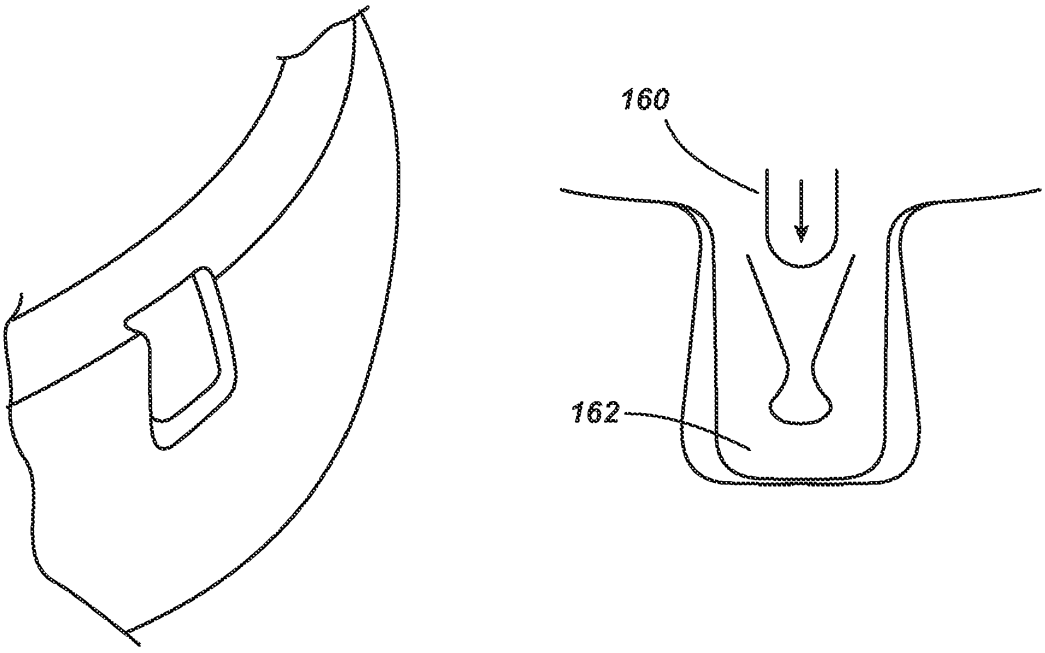

Fig. 10

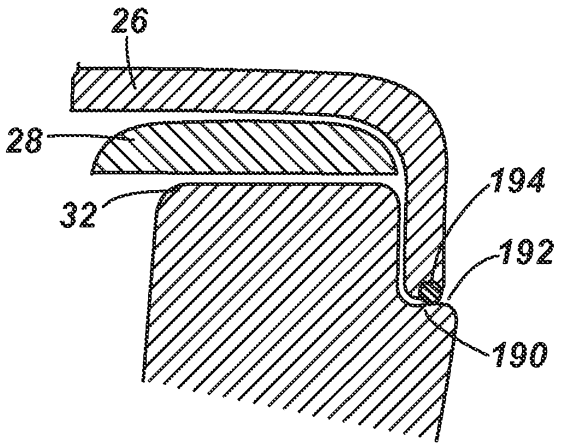

Fig. 12A

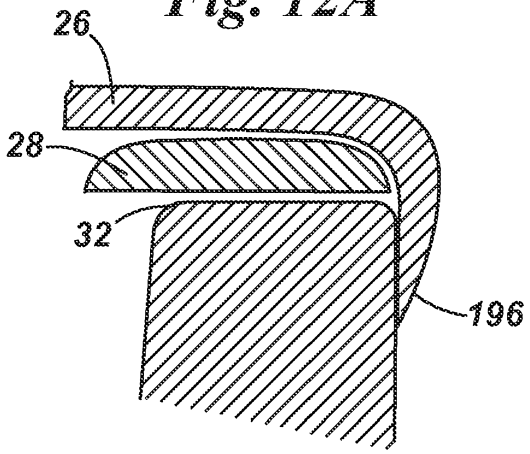

Fig. 12B

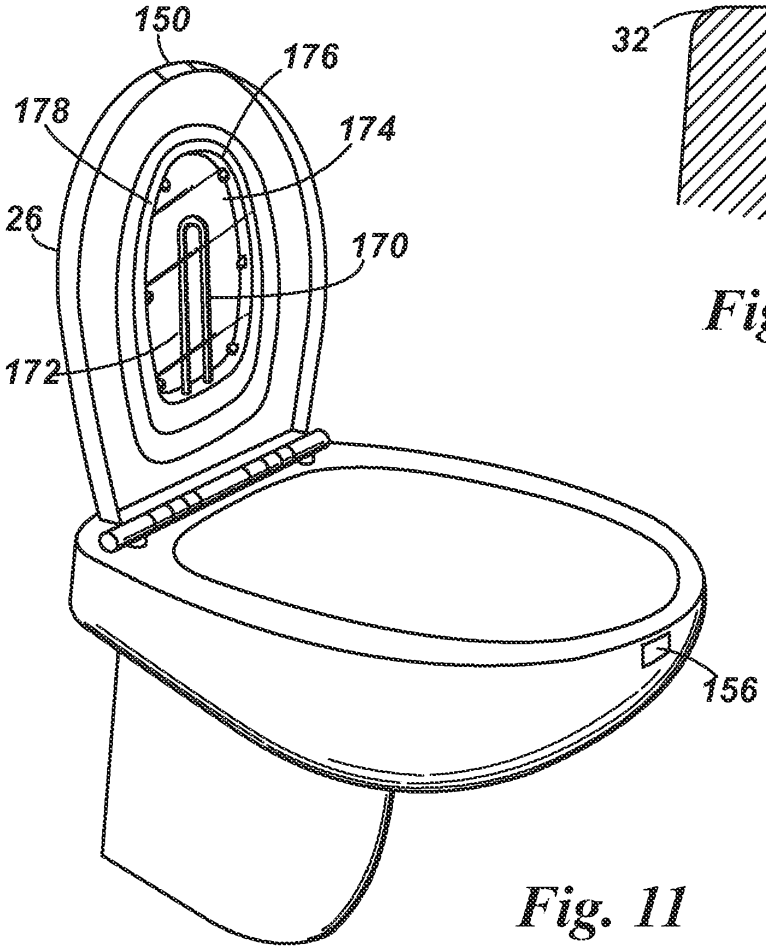

Fig. 11