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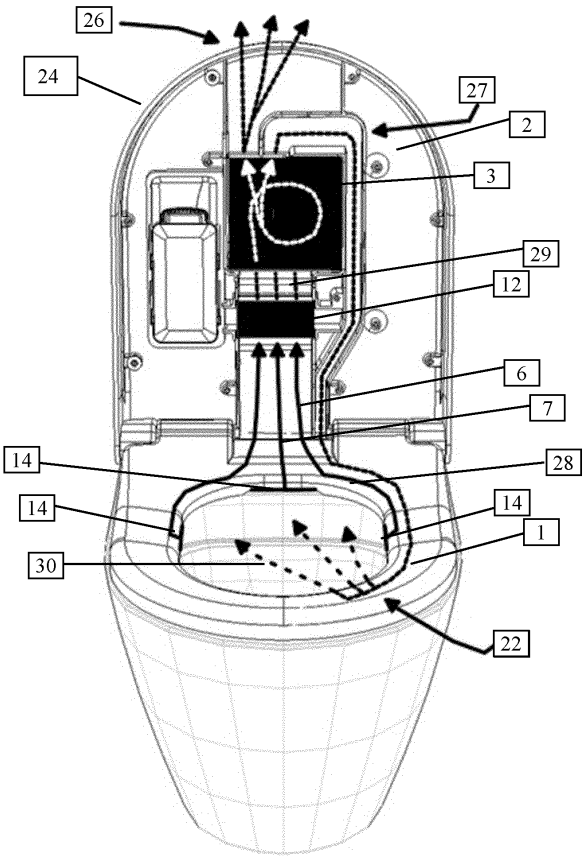
(54) **TOILET SEAT VENTILATION SYSTEM**

(57) The present invention relates to the field of toilet seats. More specifically it concerns a replacement to a conventional toilet seat with enhanced functionalities. The toilet seat has an odor processing unit (24) integrated in the toilet lid, with suction points and exhausts in the toilet seat.

FIG. 4



EP 3 903 656 A1

Description

Field of the invention

[0001] The present invention relates to the field of toilet seats. More specifically it concerns a replacement to a conventional toilet seat with enhanced functionalities.

Background of the invention

[0002] The present invention relates to the field of toilet seats and more specifically, toilet seats comprising a ventilation system to remove noxious odors or vapors from the toilet bowl areas.

[0003] In the past a number of systems have been proposed for tackling at least some of the noxious vapors emanating from the toilet and the room in which the toilet is housed. Modern building codes require that rooms housing toilets should be provided with an exhaust system vented to the atmosphere. This is especially so when it concerns small rooms without any openings (e.g. windows) in any of the exterior wall, which could allow fresh air to enter the room.

Many of the prior art devices, such as for example described in US Patent US 5,355,536 utilize vents and other apertures in the toilet seat and toilet lid communicating with passageways adjacent to the rear of the toilet seat and connected to one or more exhaust lines to the source of suction or vacuum present within the room exhaust system. Other devices require adding extra parts to the toilet seat assembly to provide the venting passageways, and its connection with the room exhaust system. None of said systems provide for an integrated solution for the removal of noxious odors or vapors.

In an effort to simply these ventilated seats, further prior art devices, such as disclosed in US 2008/0256692 or US 7,614,092, comprise seats with ventilations systems inside the seat and relying on the water suction when the toilet is flushed to remove the noxious vapors from the toilet bowl. Other prior art devices such as US 9,924,841 only use the toilet seat to incorporate the ventilation system. However, these seat integrated ventilation systems have some disadvantages, such as the lack of sufficient power to approach the level of extraction of systems connected to external room exhaust systems. Other prior art devices are disclosed in US 4,853,981, GB 2 366 604 and US20 19063054.

[0004] There is accordingly still a desire for integrated toilet seat ventilation systems relying solely on the toilet seat and toilet lid whilst providing for a high performance.

[0005] The current invention provides for a compact integrated toilet seat ventilation system comprising a toilet seat and a toilet lid, being both sufficiently powerful and placeable on existing toilet bowls (i.e. retrofit systems).

Summary of the invention

[0006] In a first aspect, the present invention relates to a toilet seat ventilation system configured to be mounted on a toilet bowl, said toilet seat ventilation system comprising a toilet seat, a toilet lid and an odor processing unit, wherein the toilet seat comprises an extraction channel pivotably connected with an odor processing unit integrated in the toilet lid, wherein the odor processing unit comprises at least one filter and a fan configured to couple in air seal communication with the extraction channel and to draw bad odors from the toilet bowl via the filter into an exhaust, wherein the toilet seat of the toilet seat ventilation system further comprising at least one suction point and at least one exhaust mouth in air seal communication with the exhaust, characterized in that the locations of both the at least one suction point and the exhaust mouth are configured to create an airflow within the toilet bowl that keeps the bad odors within the toilet bowl.

[0007] In a next aspect, said exhaust mouth is located at the bottom side of the toilet seat, in particular, at the front of the toilet seat; more in particular at the bottom side and at the front of the toilet seat.

[0008] In a next aspect, said exhaust mouth is located at the bottom side of the toilet seat and oriented inward to the toilet bowl.

[0009] In a following aspect, said at least one suction points are located at the bottom side of the toilet seat, in particular at the back of the toilet seat; more in particular at the bottom side and at the back of the toilet seat.

[0010] In a second aspect, said at least one suction points are located at the bottom side of the toilet seat and oriented inward to the toilet bowl.

[0011] In a following aspect, the at least one exhaust mouths and the at least one suction points are located opposite one another in the toilet seat.

[0012] In yet another aspect, a plurality of suction points and a plurality of exhaust mouths are located opposite one another, with the exhaust mouths in the front of the toilet seat and the suction points in the back of the toilet seat; more in particular said exhaust mouths and suction points are located at the bottom of the toilet seat and oriented inward to the toilet bowl.

[0013] In a following aspect, said at least one filter is housed within a filter chamber.

[0014] In yet another aspect, said filter is interchangeable.

[0015] In a fourth aspect, said odor processing unit comprises an antimicrobial means.

[0016] In a following aspect, the toilet seat ventilation system as defined herein further comprises an odor sensor, in particular present in the toilet seat.

[0017] In yet another aspect, the toilet seat ventilation system as defined herein further comprises a pressure sensor, more specifically positioned in the toilet seat.

[0018] In a following aspect, the toilet seat ventilation system as defined herein further comprises a ball sensor configured to detect whether the toilet lid and/or the toilet seat is open or closed.

[0019] In a next aspect, said odor processing unit is battery operated and wherein the battery is integrated in the toilet lid and/or wherein the battery is interchangeable.

[0020] In a following aspect, the toilet seat ventilation system as defined herein further comprises a central processing unit.

[0021] In a next aspect, the toilet seat ventilation system as defined herein further comprises at least one light source, more in particular configured for diagnostic purposes.

[0022] In yet another aspect, the toilet seat ventilation as defined herein further comprises a communication module.

Brief description of the drawings

[0023] The accompanying drawings, which are included to provide a further understanding of the invention are incorporated in and constitute a part of this specification, illustrate an embodiment of the invention and together with the description serve to explain the principles of the invention. They are meant to be exemplary illustrations provided to enable persons skilled in the art to practice the disclosure and are not intended to limit the scope of the appended claims.

Fig. 1 is a top view of a toilet seat ventilation system according to an embodiment of the present invention, comprising a toilet lid of which the upper side is removed in order to show the elements integrated therein.

Fig. 2 is a bottom view of a toilet seat of a toilet seat ventilation system according to an embodiment of the present invention, wherein the toilet seat is in a closed position.

Fig. 3A and 3B together form a decision tree regarding the operation of a toilet seat ventilation system according to an embodiment of the present invention.

Fig. 4 is a front view of a toilet seat ventilation system according to an embodiment of the present invention.

Fig. 5 is a side view of an occupied toilet seat comprising a toilet seat ventilation system according to an embodiment of the present invention, wherein the toilet seat is in an open position.

Detailed description

[0024] The present invention will be described with respect to particular embodiments and with reference to certain drawings, but the invention is not limited thereto. The drawings, as further described, are only schematic and non-limiting.

[0025] Furthermore, the terms first, second, further and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for describing a sequence, either temporally, spatially, in ranking or in any other manner. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0026] It is to be noticed that the term "comprising", used in the claims, should not be interpreted as being restricted to the means listed thereafter; it does not exclude other elements or steps. It is thus to be interpreted as specifying the presence of the stated features, integers, steps or components as referred to, but does not preclude the presence or addition of one or more other features, integers, steps or components, or groups thereof. Thus, the scope of the expression "a product comprising A and B" should not be limited to products consisting only of elements A and B. It means that, with respect to the present invention, the relevant elements of the product are A and B and that further components such as C may be present.

[0027] Reference throughout this specification to "one embodiment" or "an embodiment" means that a particular feature, structure or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "in one embodiment" or "in an embodiment" in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures or characteristics may be combined in any suitable manner, as would be apparent to one of ordinary skill in the art from this disclosure, in one or more embodiments.

[0028] Similarly, it should be appreciated that in the description of exemplary embodiments of the invention, various

features of the invention are sometimes grouped together in a single embodiment, figure, or description thereof for the purpose of streamlining the disclosure and aiding in the understanding of one or more of the various inventive aspects. This method of disclosure, however, is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment. Thus, the claims following the detailed description are hereby expressly incorporated into this detailed description, with each claim standing on its own as a separate embodiment of this invention.

[0029] Furthermore, while some embodiments described herein include some, but not other features included in other embodiments, combinations of features of different embodiments are meant to be within the scope of the invention, and form different embodiments, as would be understood by those in the art. For example, in the following claims, any of the claimed embodiments can be used in any combination.

[0030] In the description provided herein, numerous specific details are set forth. However, it is understood that embodiments of the invention may be practiced without these specific details. In other instances, well-known methods, structures and techniques have not been shown in detail in order not to obscure an understanding of this description.

[0031] As used herein and unless provided otherwise, the term "odors" should be understood as a plurality of different types/groups of molecules which can be perceived as a distinctive smell, especially an unpleasant one. A number of types/groups of molecules may be selected from the group comprising: hydrogen sulfide, methyl sulfides, methanethiol, dimethyl disulfide, dimethyl trisulfide, skatole and indole.

[0032] in a first aspect, the present invention relates to a toilet seat ventilation system configured to be mounted on a toilet bowl, said toilet seat ventilation system comprising a toilet seat, a toilet lid and an odor processing unit, wherein the toilet seat comprises an extraction channel pivotably connected with the odor processing unit and characterized in that said odor processing unit is integrated in the toilet lid.

[0033] As used herein and unless provided otherwise, the term "toilet seat ventilation system" should be understood as a system providing for adequate ventilation of the toilet bowl area utilizing both the toilet seat and the toilet lid as a housing.

[0034] As used herein and unless provided otherwise, the term "integrated" should be understood as a first element being at least partially contained within a second element.

For example, when the odor processing unit is integrated within the toilet lid, it is meant that this odor processing unit will at least partially be contained within the toilet lid. In some cases, the possibility exists for example that (certain parts of the) odor processing unit may protrude towards either side (e.g. top side or bottom side) of the toilet lid. In other cases, the odor processing unit may be fully contained within the toilet lid. All in all, the term "integrated" should be understood broader than a total incorporation of a first element in a second element.

[0035] The toilet seat ventilation system as provided herein, can be mounted on a toilet bowl without the need of any modification of the toilet bowl. This can be generally described as a retro fit system.

[0036] In some embodiments, different variants of said toilet seat ventilation system may be available in order to meet the specific dimensions of the toilet bowl (e.g. squared, rectangular, oval or circular).

[0037] In yet another aspect, said odor processing unit comprises at least one filter and a fan configured to couple in air seal communication with the extraction channel and to draw air from the toilet bowl via the filter into an exhaust.

[0038] In some embodiments, the exhaust may be a channel-like structure having the ability to transport at least part of the purified air into the toilet bowl. In other embodiments, the exhaust may transport the purified air outside the toilet bowl. In another embodiment, the exhaust may transport part of the purified air into the toilet bowl and part of the purified air outside the toilet bowl. The exhaust can be a single channel-like structure or a combination of a plurality of channel-like structures.

[0039] In a following aspect, said exhaust or part of the exhaust transporting purified air into the toilet bowl is configured to couple in air seal communication with an exhaust mouth 22 in the toilet seat, in particular at the front of the toilet seat, preferably oriented inward to the toilet bowl. In some embodiments, said exhaust mouth may be located at the bottom side of the toilet seat. In other embodiments, the exhaust mouth may be located at a side rim of the toilet seat. When mentioning orientational elements like 'front', 'back', 'bottom' and 'top', in relation to the toilet ventilation system or elements thereof, it corresponds to the common application of said terms for a toilet seat and lid when installed on a toilet bowl.

[0040] In a next aspect, the extraction channel 6 of the toilet seat ventilation system as defined herein further comprises at least one suction point 14, in particular located at the bottom side of the toilet seat, and preferably oriented inward to the toilet bowl. In a preferred embodiment the extraction channel 6 comprises a plurality of suction points 14, in particular located at the bottom side of the toilet seat, and preferably oriented inward to the toilet bowl.

[0041] It has been observed that the specific locations of both said at least one suction point 14 and said exhaust mouth 22 within the toilet seat ventilation system as defined herein allow for an optimized circulation of air, more specifically within the toilet bowl. In one embodiment the exhaust mouth 22 and the at least one of the suction point 14 are located opposite one another in the toilet seat, preferably with the exhaust mouth 22 at the front and the suction point 14 at the

back. In case of a plurality of suction points 14 and/or a plurality of exhaust mouths 22, again in one embodiment these are place opposite one another, alternatively the exhaust mouth(s) 22 in the front section and the suction point(s) 14 in the back section of the toilet seat 1. In each of said embodiments, the suction points 14 and the exhaust mouths 22 are configured to respectively draw air from and blow air into the toilet bowl, creating such optimized air circulation wherein air is drawn via the extraction channel 6 through a filter 12 into the exhaust 8.

[0042] In some embodiments, said at least one filter 12 is able to remove at least some of the main (types of) components responsible for the odor within the odorous air.

[0043] In a next aspect, said at least one filter is housed within a filter chamber 11. In one embodiment the at least one filter is replaceable, implying that the toilet lid is configured to provide access to either the filter(s) directly or indirectly through the filter chamber. In some embodiments, multiple filter chambers are air seal interconnected, each comprising at least one filter.

[0044] In some embodiments, the filter chamber may be removably coupled to the toilet lid. This may allow the filter chamber to be replaced in its entirety. This may be useful for example when the at least one filter is an integrated part of the filter chamber and cannot be removed from said filter chamber. In some embodiments, multiple filters may be used within a single filter chamber. This way, multiple filters, each with specific properties, may be used within the same toilet ventilation system

[0045] In one embodiment the filter(s) and/or filtration chamber(s) are exchangeable. Interchangeability and replaceability of the filter(s) and/or filtration chamber(s) give flexibility and future adjustability of the toilet ventilation systems on available filters.

[0046] In some embodiments, at least two different types of filters are used to capture at least two different types of molecules, effectuating a synergistic effect.

[0047] In some embodiments, the filters may comprise active carbon. Activated carbon is perfectly capable of removing odors by acting as an adsorbent in order to trap molecules and retain them, enabled among others by the large surface area of the activated carbon. Example sources of activated carbon may be for example selected from the list comprising: activated coconut and coal carbon.

[0048] In a following aspect, said odor processing unit comprises an antimicrobial means.

[0049] In some embodiments, said antimicrobial means may be at least one UV-LED, more specifically a UV-C LED. In this regard, Ultraviolet C (or UV-C) irradiation is able to reduce or even cease the growth of microorganisms or completely inactivate certain microorganisms such as e.g. bacteria and viruses. It should be mentioned that certain microorganisms (e.g. within human feces) are responsible for specific smells which are generally perceived as being unpleasant (hereinafter also called: odors). For example, certain Lactobacilli within human feces at least partially contribute to the odorous air which are released when a person uses the toilet.

[0050] In a following aspect, the toilet seat ventilation system as defined herein further comprises an odor sensor, in particular present in the toilet seat. The odor sensor may be able to detect at least some of the aforementioned (types of) molecules responsible for the odor.

[0051] In some embodiments, the intensity of the measured odor by the odor sensor may influence the level of performance of the toilet seat ventilation system. As such, the system may be more energy efficient.

[0052] In yet another aspect, the toilet seat ventilation system as defined herein further comprises a pressure sensor.

[0053] In some embodiments, said pressure sensor may be located within the toilet seat, more specifically the bottom side of the toilet seat.

[0054] In some embodiments, multiple pressure sensors may be located in within the toilet seat.

[0055] In some embodiments, said pressure sensor may influence the performance of the system by, for example, turning on the system only when a certain threshold value is measured by said pressure sensor.

[0056] In another aspect, the toilet seat ventilation system as defined herein further comprises a ball sensor configured to detect whether the toilet lid and/or the toilet seat is open or closed. In one embodiment a first ball sensor is configured to detect whether the toilet lid is open or closed and a second ball sensor is configured to detect whether the toilet seat is open or closed. Such configuration enables for example that, the ball sensor(s) only sends a signal to active the system when the toilet lid is open and the toilet seat is closed.

[0057] The system needs a power source to be operational. In a particular embodiment said odor processing unit is battery operated. In a further aspect, said battery is interchangeable and/or integrated in the toilet lid.

[0058] In some embodiments, a number of batteries are used to power different parts of the toilet ventilation system (e.g. fan and pressure sensor)

[0059] In some embodiments, the battery may be removed from the toilet ventilation system for recharging or replacement reasons. In some embodiments, the toilet lid may comprise a cover which can be opened in order to remove the battery from the system.

[0060] In some embodiments, the battery may be rechargeable when inserted within the toilet seat ventilation system by means of a power plug which is integrated within said system.

[0061] In a following aspect, the toilet seat ventilation system as defined herein further comprises a central processing

unit (hereinafter also called: CPU). This CPU may execute a number of different instructions and may enable at least some of the different components within the toilet seat ventilation system to communicate or interact in any other way.

[0062] In some embodiments, the CPU may be connected with an external device (e.g. cellular device, smartphone). Because said CPU is able to control multiple parts of the system (e.g. pressure sensor, odor sensor), the connection with an external device may allow to regulate certain settings/parameters of the entire system by means of said external device.

[0063] In some embodiments, a speaker may be connected with the CPU. Optionally, said speaker may be integrated within the system (e.g. within the toilet lid or toilet seat). In some embodiments, said speaker may be operated using the external device. In some embodiments, said speaker may be used for diagnostic purposes. In other embodiments, said speaker may be used to play music.

[0064] In some embodiments, said CPU enables the system to be equipped with different types of programs. For instance, in some embodiments, said CPU may be programmed with a timer functionality. This way, the toilet seat ventilation system may be programmed (e.g. by means of an external device) in order to be only operational for a predetermined time frame. In other embodiments, said CPU may be programmed with a calibration program, allowing the entire system to be calibrated (e.g. calibrations related to odor, pressure, level of performance).

[0065] In a next aspect, the toilet seat ventilation system as defined herein further comprises at least one light source, more in particular configured for diagnostic purposes.

[0066] In yet another aspect, the toilet seat ventilation as defined herein further comprises a communication module. This module may allow the system to be wirelessly connected with external devices via Wi-FI and/or Bluetooth. This connection may be controlled via the CPU.

[0067] FIG. 1 and FIG. 2 disclose a toilet seat ventilation system (may also be referred to as: system) comprising a toilet seat that can be placed on a toilet bowl. The system comprises a toilet seat 1, a toilet lid 2 and an odor processing unit 24 (may also be referred to as: internal technical part). The odor processing unit 24 is located within the toilet lid 2.

[0068] As seen on FIG. 2, a number of components are incorporated within system. The toilet seat 1 comprises a number of bumpers 15 on the bottom side 100 ensuring a tight contact between the toilet seat 1 and the toilet bowl, thereby minimizing the backlash. A pressure sensor 18 is visible on the bottom side 100 of the toilet seat 1 which works as an on/off switch, switching the toilet seat ventilation system to an activated position (i.e. "on position") for example whenever the user is sitting on the toilet seat 1 and deactivating the same system whenever the user stands up.

[0069] The pressure sensor 18 is connected to a CPU 17 that controls all components of the system. The components which are connected to this CPU 17 deliver at least some of the measured data to the CPU 17, which will on its turn process this data. The CPU 17 is connected to a battery 9 that provides the necessary power. The battery 9 is located within the toilet lid 2. The battery 9 is housed within a battery compartment. This battery compartment is covered by a compartment lid which may be accessible from all sides (e.g. top side 100 or bottom side 200) of the toilet lid 2 in order to access the battery 9 when the system is in a closed position, because the top side 100 of the toilet lid 2 is only accessible in a closed position. This enables a simple replacement of said battery 9 when the battery 9 needs to be recharged or replaced for example. In some embodiments, the battery compartment, wherein said battery 9 is housed, may house more than one battery 9. The ability of the system to be powered by a battery 9 is an important advantage, which makes external power supplies superfluous.

[0070] As seen on the example in FIG.2, the toilet seat 1 further comprises an odor sensor 13, which is located on the bottom side 200 of the toilet seat 1. The odor sensor 13 is also connected to the CPU 17. This odor sensor 13 may be configured to deliver a signal to the CPU 17 only when a predetermined default value and/or a certain type of odors are measured. Said default value may be measured when the system is turned on. Any change of this default value afterwards may result in a signal triggering of the CPU 17. This signal can then be processed by the CPU 17 in order to perform certain actions, such as for example activating and/or changing the performance of the system. In some cases, said activation and/or change of the performance may be related to the amount and/or level of measured odors within the room wherein the toilet is placed.

[0071] Further, the toilet seat 1 may contain a ball sensor 21 for detecting whether the toilet lid 2 is being opened or closed. The ball sensor 21 may be incorporated within the toilet seat 1 or the toilet lid 2 of the toilet seat ventilation system. The ball sensor 21 is also connected to the CPU 17. The sensor 21 may send a signal to the CPU 17 when the toilet lid 2 is in an open position, in order to activate the system. The reason being that only when the lid 2 is in an open position, a person is able to use the toilet.

[0072] The ball sensor 21 and/or the odor sensor 13 and/or the pressure sensor 18 may simultaneously provide information to the CPU 17 in order to regulate the activity of the system. In this respect, at least one of the sensors as disclosed herein may be fine-tuned in terms of e.g. threshold values in order to fit specific needs.

[0073] The system needs a power source to be operational. The system can be battery operated and/or powered by a second power source. This power source can be a battery 9 and/or a power plug 20 (hereinafter also called: power connector), the power plug 20 may be provided in the seat 1. This plug 20 is also connected to the CPU 17. If necessary, the system may be (also) powered using an external power source. This might be useful when the battery 9 cannot be

charged and/or replaced. In some embodiments, the system may be powered both by an external power source and a battery 9.

The system may be fully operational when at least one of the battery 9 and/or the power plug 20 is powering the system.

[0074] Furthermore, an extraction channel 6 is present within the toilet seat 1. Odorous air is drawn in from the toilet bowl using the force of a fan 3, connected to the CPU 17, and enters the extraction channel 6 of the toilet seat 1 via at least one suction point 14. The suction point 14 is located in the bottom side 200 of the toilet seat 1. In this example, multiple suction points 14 are present in order to increase the volume of odorous air which can be sucked in. Then, the odorous air travels from the extraction channel 6 via a pivot point 7 to an odor processing unit 24 within the toilet lid 2. The pivot point 7 can be regarded as a connection means for transporting odorous air from the toilet seat 1 to the toilet lid 2.

[0075] This odor processing unit 24 comprises among other things the fan 3 and a filter chamber 11. The positioning of the odor processing unit 24 within the lid 2 allows for sufficient space for larger components, such as a large fan 3 and a large filter chamber 11. This enables the use of among others a larger fan 3 and a larger filter chamber 11 compared to systems which merely use the space within the toilet seat 1.

[0076] Also, there is enough room for a relatively large battery 9. Ultimately, the use of the space within the toilet lid 2 as a complement to the toilet seat 1 space results in a powerful system in terms of odorous air circulation, purification and odor elimination with a high performance duration in terms of battery life.

[0077] The filter chamber 11 comprises at least one filter 12. The filter 12 is interchangeable and can be reached via a cover within the toilet lid 2. The odorous air thus travels through the fan 3 to the filter chamber 11, where the odorous air is purified. In some embodiments, the fan 3 may be placed behind the filter chamber 11, which equally allows the odorous air to be drawn into the filter chamber 11 by the fan 3. The filter chamber 11 provides sufficient space for a second filter 12 if necessary. At least part of the purified air is then transported via an exhaust channel 8 to an exhaust mouth 22. The exhaust mouth 22 is located within the toilet seat 1, more specifically at the front side, and ejects the purified air back into the toilet bowl in order to create an airflow within the toilet bowl. The specific locations of both the exhaust mouth 22 and the suction points 14, as seen on FIG. 2, allow for an optimized circulation of air within the toilet bowl.

[0078] The optimized circulation and the fact that the air is able to circulate through both the toilet seat 1 and toilet lid 2 are important advantages, which enable the system to sufficiently reduce the odors from the toilet bowl when the toilet is being used. Because of that, there is no need to use any additional fragrance addition (e.g. by using fragrance dispensers).

[0079] In order to further enhance the ability of the system to purify odorous air, the system may comprise antimicrobial means 10. In the example as shown in FIG. 1, a UV-C LED is used as antimicrobial means 10 and is located within the toilet lid 2. The UV-C Led is also connected to the CPU 17. It has antimicrobial properties which have its effect upon the odorous air that passes the LED 10 when being transported to the filter chamber 11. This way, the (amount of) micro-organisms within the odorous air can be reduced, before reaching the filter 12 within the filter chamber 11. The fact that the odorous air is treated by the UV-C LED 10 has a positive effect upon the odor reduction and, therefore, upon the longevity of the odor processing unit 24 and more specifically the filter 12 and fan 3.

[0080] Besides that, the toilet lid 2 may contain one or more of the first light sources 16, being connected to the CPU 17 and being mounted in the toilet seat 1 and/or the toilet lid 2 for illumination purposes. This illumination may allow the toilet bowl to become visible even when the room is otherwise completely dark. In other embodiments, at least one of the first light sources 16 may serve as decorative lighting, of which the color could be selected for example. Furthermore, in some embodiments, at least one of the first light sources 16 may only be activated when the toilet lid 2 is being opened and/or in an open position. At least one of the first light source 16 and/or the second light source 19 may be LED lighting.

[0081] The toilet lid 2 may further contain a second light source 19. This light source 19 may also be connected to the CPU 17. The second light source 19 may be used for diagnostic purposes, indicating for example whenever the battery 9 is empty and/or whenever the fan 3 is malfunctioning. Furthermore, it may indicate if any of the sensors are malfunctioning. In some embodiments, one or more of these light sources 19 may be incorporated within the same toilet lid 2 in order to indicate any of the mentioned parameters.

[0082] The lid 2 may further contain at least one speaker 23. This speaker 23 can be connected to the CPU 17. The speaker 23 may for example be connected to a sound system (e.g. radio transmitter) of the room wherein the toilet is located in order to enhance the volume of this sound system. The speaker 23 may also be wirelessly operable by an external device. In this case, the external device may interact with the CPU 17 in order to receive a set of instructions and the CPU 17 will then send this set of instructions to the speaker 23. The system may further be equipped with a communication module 25. The communication module 25 provides the system with additional wireless communication functionality, such as Bluetooth and/or Wi-Fi functionality, thereby allowing for example wireless interaction between an external device and the system.

[0083] In some embodiments, this communication module 25 will interact with the CPU 17 in order to allow anyone (e.g. the user) to connect with the speaker 23 via the CPU 17, using for instance a cellular device (e.g. a smartphone).

[0084] Fig. 3A and 3B disclose a decision tree explaining the operation of a toilet seat ventilation system according to an embodiment of the present invention. The status and/or signal of the specific system components as disclosed in

these figures will serve as cumulative checkpoints. Only when the desired statuses and/or signals are achieved, the system will be able to start working.

[0085] As seen in fig. 3A, the CPU 17 may receive information from the powerbank 9 and/or the power connector 20 according to the power status. Only when at least one of both elements is plugged in, a powered connection with the CPU 17 can be realized. If not, the system will not work. A powered connection will cause the CPU 17 to generate a warmup signal to the system and the system will proceed with a power level control. In case of a power level above 10% is measured, the system will continue to check the ball sensor 21 signal. In case of a power level equal or below 10%, the system will not be able to generate sufficient power to operate sufficiently and, consequently, the system will stop working. The ball sensor 21 should indicate an open status of the lid 2. If not, the lid 2 is closed making it unable for the system to be used by a person. In this case, the system will stop working. Next, the ball sensor 21 of the seat 1 should indicate a closed status. If not, the system cannot proceed to an operational state of the odor processing unit.

[0086] Then, as disclosed within fig. 3B, the pressure sensor 18 should measure a certain threshold force related to a person sitting upon the toilet seat 1, optionally a delay loop between the ball sensor 21 of the seat 1 and the pressure sensors allows some time between a user activating the pressure senor and a start of the odor processing unit 24. If no such force is measured, eventually after the delay loop has lapsed, the system will shut down, else the system will perform an error check of the fan 3 (i.e. measure a drop in amperage upon fan startup) and check if a filter 12 is placed within the system. If so, the odor processing unit 24 is activated and, consequently, also the fan 3. If not, the system will shut down. The activation of the fan 3 realizes a fully functional system, optionally starting a timer in the CPU to have the fan run for 100% at the start and lowering its performance for example to 50% after a preset time. As mentioned above, such settings as the delay loop of the pressure sensor or the run times of the fan could be based on preset factory settings, or can be user adjusted, such as for example by means of an external device (e.g. app in a mobile device).

[0087] Fig. 4 shows a front view of a toilet seat ventilation system according to an embodiment of the present invention. The system comprises a toilet seat 1, a toilet lid 2, an odor processing unit 24 (may also be referred to as: internal technical part). The odor processing unit 24 is located within the toilet lid 2. The toilet seat 1 comprises among other things an extraction channel 6, an exhaust mouth 22 and at least one of the suction point 14. This odor processing unit 24 comprises among other things a fan 3, a filter 12. The suction point 14 is located in the bottom side 200 of the toilet seat 1 and directed (oriented) inward to the toilet bowl. In this example, multiple suction points 14 are present in order to increase the volume of odorous (bad) air which can be sucked in. Solid arrows 28 show the direction of odorous air. The odorous air travels from the extraction channel 6 via the pivot point 7 to the odor processing unit 24 within the toilet lid 2. Odorous air is drawn in from the toilet bowl using the force of a fan 3 travels through the filter 12, where the odorous air is purified. Dotted arrow 29 shows the direction of clean, filtered air. After the fan 3, the filtered air is divided into two streams. At least part of the clean, filtered air 26 is exhausted into the environment. At least part of the purified air 27 is transported via the exhaust channel 8 to the exhaust mouth 22. The exhaust mouth 22 is located within the toilet seat 1, more specifically at the front side, and ejects the purified air back into the toilet bowl in order to create an airflow 30 within the toilet bowl. Thereto the exhaust mouth is located at the bottom of the toilet seat and configured to orient the purified airflow 30 inward into the toilet bowl. The exhaust mouth 22 and the at least one of the suction points 14 are located opposite one another in the toilet seat 1, preferably with the exhaust mouth 22 at the front and the suction point 14 at the back, such configuration allows for an optimized circulation of air within the toilet bowl. At the exhaust mouth 22 an exhaust of clean, filtered air 27 is blown into the toilet bowl. Due to the fact that the exhaust mouth 22 is located in the bottom side 200 of the toilet seat 1 and is oriented inward to the toilet bowl, the purified air creates an airflow 30, shown on fig. 4 by dashed arrows. The airflow 30 keeps the bad odors to rise up in the toilet bowl when a person sits down or stands up.

When mentioning orientational elements like 'front', 'back', 'bottom' and 'top', in relation to the toilet ventilation system or elements thereof, it corresponds to the common application of said terms for a toilet seat and lid when installed on a toilet bowl.

[0088] Fig. 5 is a side view of a toilet seat of a toilet seat ventilation system according to an embodiment of the present invention, wherein the toilet seat is in an open position. The fig. 5 clearly shows the work of the toilet seat ventilation system by the directions of the air when the system is used by a person. The system comprises a toilet seat 1, a toilet lid 2, an odor processing unit 24. The odor processing unit 24 is located within the toilet lid 2. The toilet seat 1 comprises among other things an extraction channel 6, an exhaust mouth 22 and at least one of the suction point 14. This odor processing unit 24 comprises among other things a fan 3, a filter 12. The odorous air which are released when a person uses the toilet is sucked in at multiple suction points 14, which are located in the bottom side 200 of the toilet seat 1. Solid arrows 28 show the direction of odorous air. The odorous air travels from the extraction channel 6 via the pivot point 7 to the odor processing unit 24 within the toilet lid 2. The odorous air travels using the force of a fan 3 through the filter 12, where the odorous air is purified. Dotted arrow 29 shows the direction of clean, filtered air. At the outlet of the fan 3, the filtered air is divided at least into two streams. At least part of the purified air 26 is exhaust ed into the environment. At least part of the purified air 27 is transported via the exhaust channel 8 to an exhaust mouth 22. The exhaust mouth 22 is located within the toilet seat 1, more specifically at the front side, and ejects the purified air 27 back

into the toilet bowl in order to create an airflow 30 within the toilet bowl. The exhaust mouth is located in the bottom side 200 of the toilet seat 1 and oriented inward to the toilet bowl. The airflow 30 keeps the bad odors 28 to rise up in the toilet bowl when a person sits down or stands up, and guides the bad odors to the suction points 14 .

Cross-Reference Table

1	Toilet seat	17	Central processing unit
2	Toilet lid	18	Pressure sensor
3	Fan	19	Second light source
4	Cable channel	20	Power connector
5	Softclose hinges	21	Ball sensor
6	Extraction channel	22	exhaust mouth
7	Pivot point	23	Speaker
8	Exhaust	24	Odor processing unit
9	battery	25	communication module
10	antimicrobial means	26	Exhaust of clean, filtered air
11	Filter chamber	27	Retour of clean, filtered air
12	Filter	28	Direction of bad air
13	Odor sensor	29	Direction of clean, filtered air
14	Suction points	30	Airflow
15	Bumpers	100	Top side
16	first light source	200	Bottom side

Claims

1. A toilet seat ventilation system configured to be mounted on a toilet bowl, said toilet seat ventilation system comprising a toilet seat (1), a toilet lid (2) and an odor processing unit (24),
wherein the toilet seat (1) comprises an extraction channel (6) pivotably connected with an odor processing unit (24) integrated in the toilet lid (2), wherein the odor processing unit (24) comprises at least one filter (12) and a fan (3) configured to couple in air seal communication with the extraction channel (6) and to draw bad odors (28) from the toilet bowl via the filter (12) into an exhaust (8), wherein the toilet seat of the toilet seat ventilation system further comprising at least one suction point (14) and at least one exhaust mouth (22) in air seal communication with the exhaust (8);
characterized in that the locations of both the at least one suction point (14) and the exhaust mouth (22) are configured to create an airflow (30) within the toilet bowl that keeps the bad odors (28) within the toilet bowl.

2. The toilet seat ventilation system according to claim 1, wherein the exhaust mouth (22) is located at the bottom side (200) of the toilet seat (1); in particular at the front of the toilet seat (1).

3. The toilet seat ventilation system according to claims 1 or 2, wherein the exhaust mouth (22) is located at the bottom side (200) of the toilet seat (1) and oriented inward to the toilet bowl.

4. The toilet seat ventilation system according to anyone of claims 1 to 3, wherein the at least one suction points (14) are located at the bottom side (200) of the toilet seat (1); in particular at the back of the toilet seat (1).

5. The toilet seat ventilation system according to anyone of claims 1 to 4, wherein the at least one suction points (14) are located at the bottom side (200) of the toilet seat (1) and oriented inward to the toilet bowl.

6. The toilet seat ventilation system according to anyone of claims 1 to 5, wherein the at least one exhaust mouths (22) and the at least one suction points (14) are located opposite one another in the toilet seat (1.

7. The toilet seat ventilation system according to anyone of claims 1 to 6, wherein a plurality of suction points (14) and a plurality of exhaust mouths (22) are located opposite one another, with the exhaust mouths (22) in the front of the toilet seat (1) and the suction points (14) in the back of the toilet seat (1).

8. The toilet seat ventilation system according to anyone of claims 1 to 3, wherein the odor processing unit (24) comprises an antimicrobial means (10).

9. The toilet seat ventilation system according to anyone of claims 1 to 4, further comprising an odor sensor (13); in particular present in the toilet seat (1).

10. The toilet seat ventilation system according to anyone of claims 1 to 5, further comprising a pressure sensor (18).

11. The toilet seat ventilation system according to anyone of claims 1 to 6, further comprising a ball sensor (21) configured to detect whether the toilet lid (2) and/or the toilet seat (1) is open or closed.

12. The toilet seat ventilation system according to claim 1, wherein the odor processing unit (24) is battery (9) operated and wherein the battery (9) is integrated in the toilet lid (2) and/or wherein the battery (9) is interchangeable.

13. The toilet seat ventilation system according to anyone of claims 1 to 10, further comprising a central processing unit (17).

14. The toilet seat ventilation system according to anyone of claims 1 to 11, further comprising at least one second light source (19), more in particular configured for diagnostic purposes.

15. The toilet seat ventilation system according to anyone of claims 1 to 12, further comprising a communication module (25).

FIG. 1

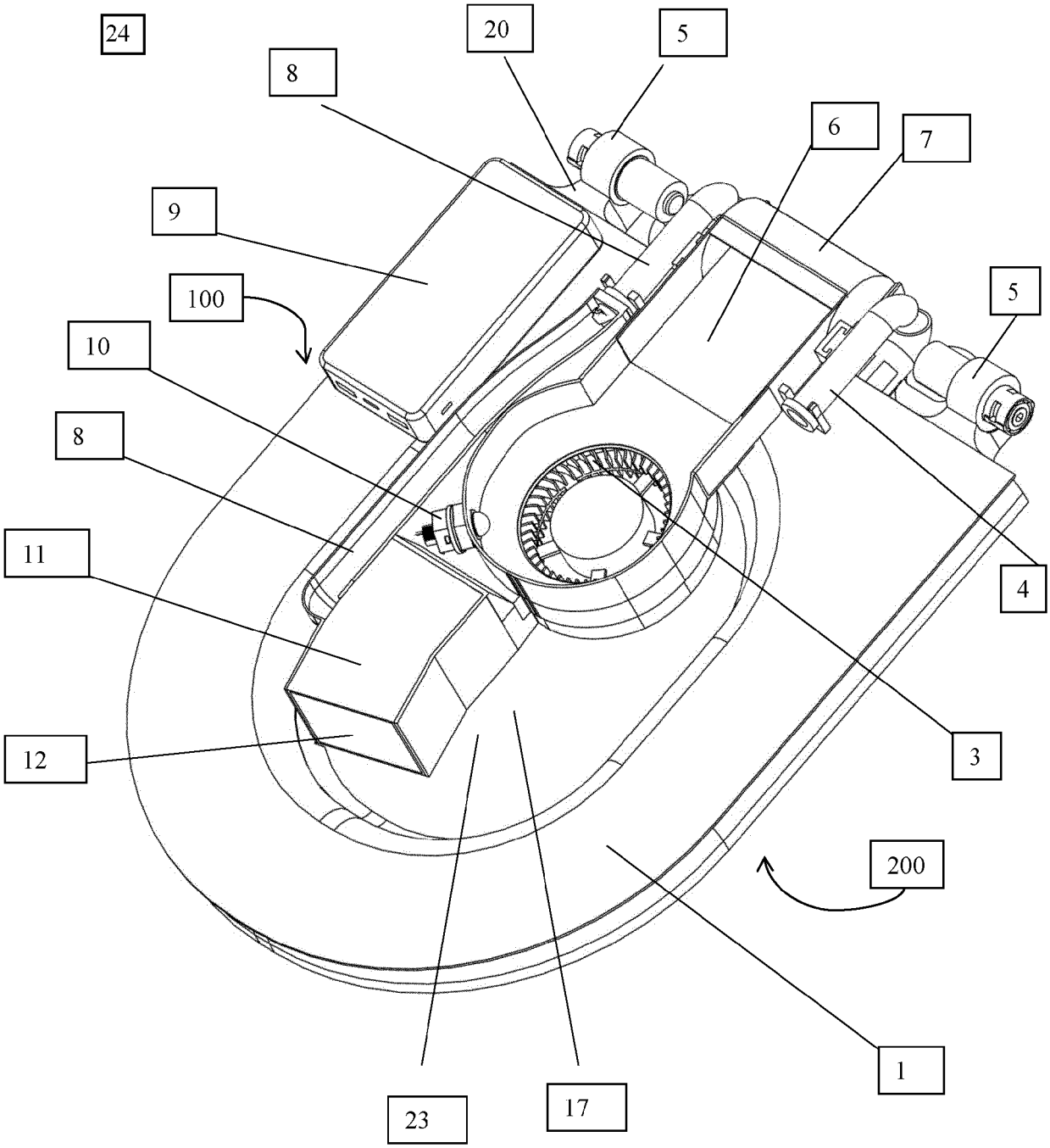


FIG. 2

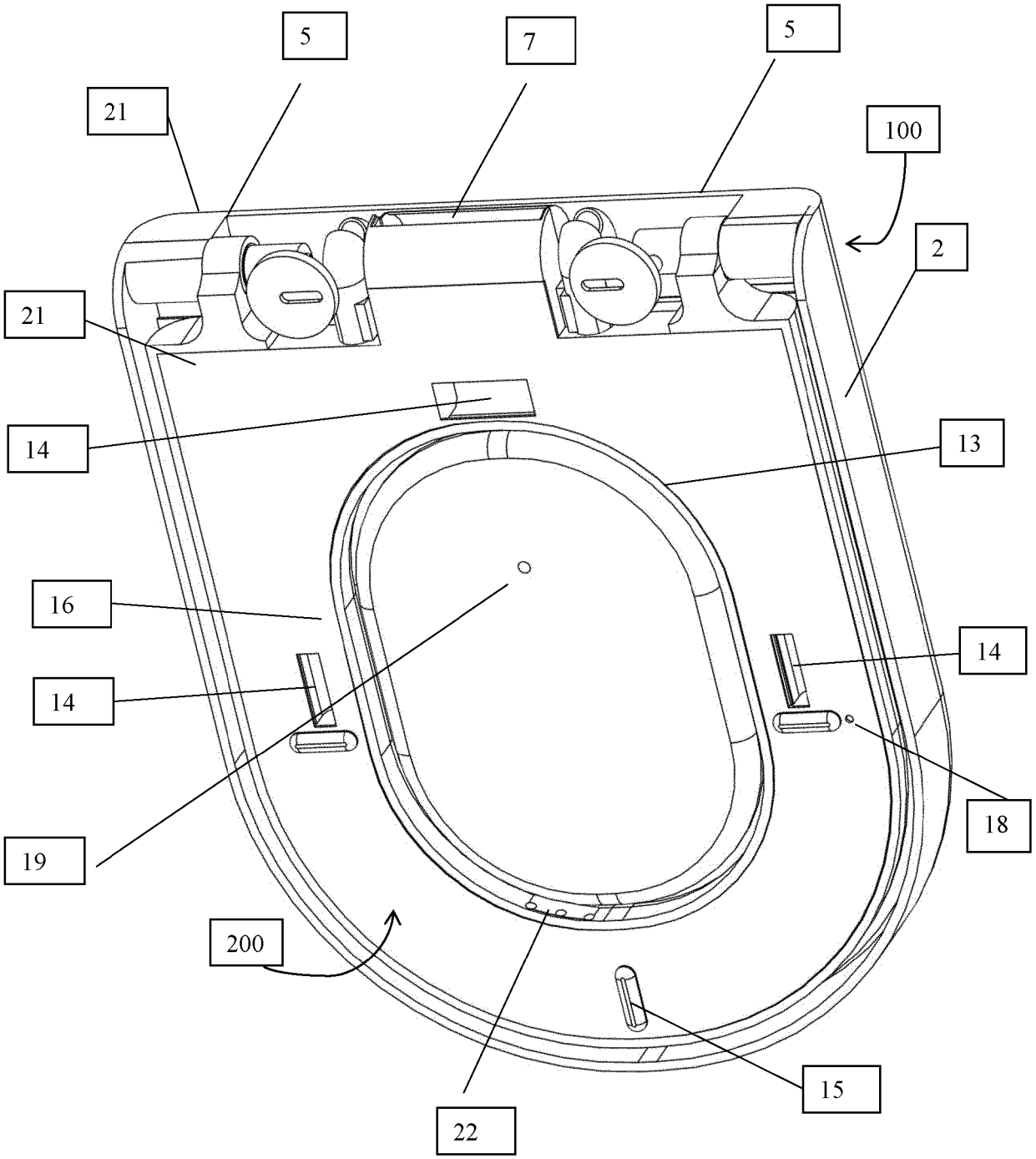


FIG. 3A

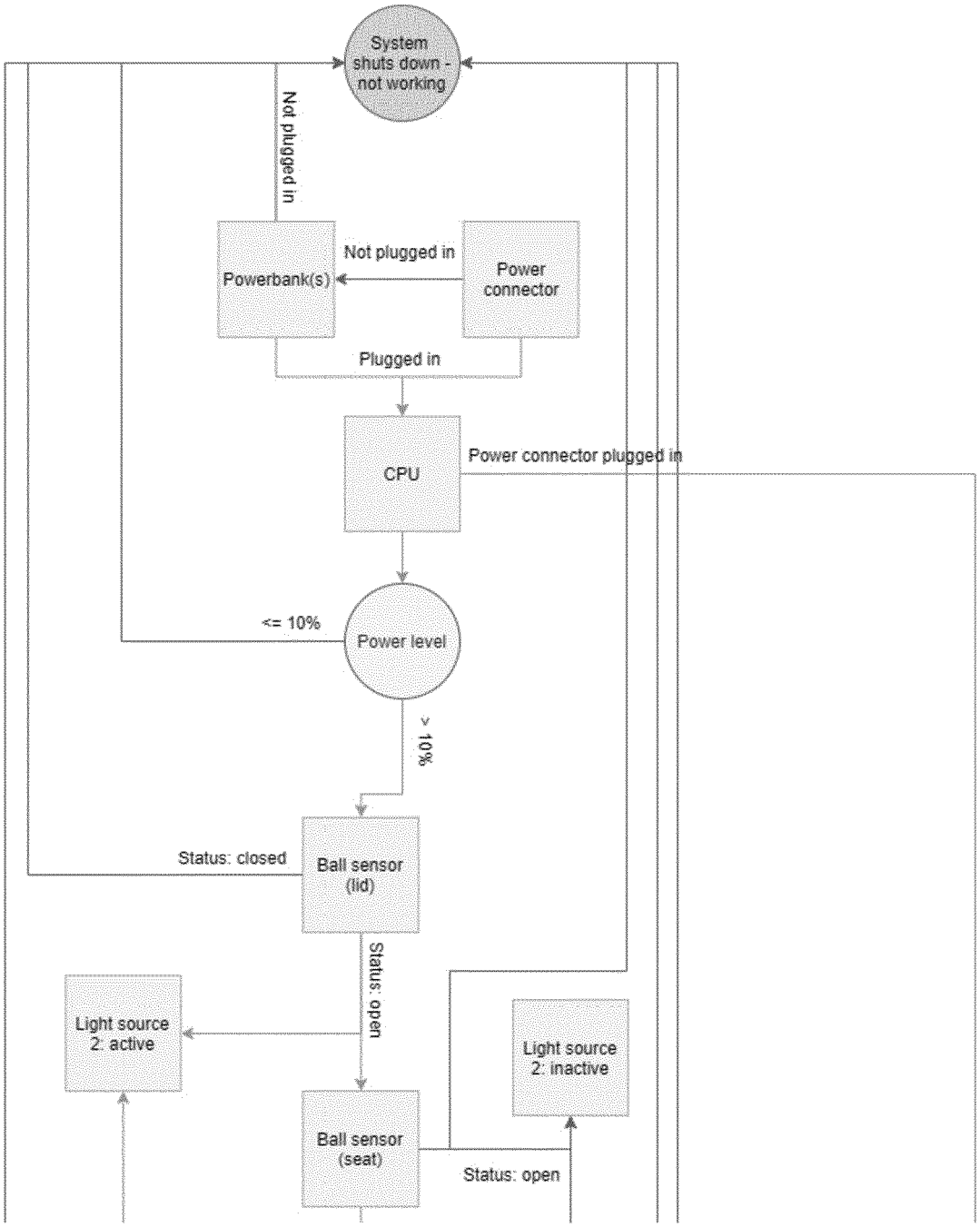

System shuts down - not working
Not plugged in
Powerbank(s)
Not plugged in
Power connector
Plugged in
CPU
Power connector plugged in
<= 10%
Power level
> 10%
Status: closed
Ball sensor (lid)
Status: open
Light source 2: active
Light source 2: inactive
Ball sensor (seat)
Status: open

FIG. 3B

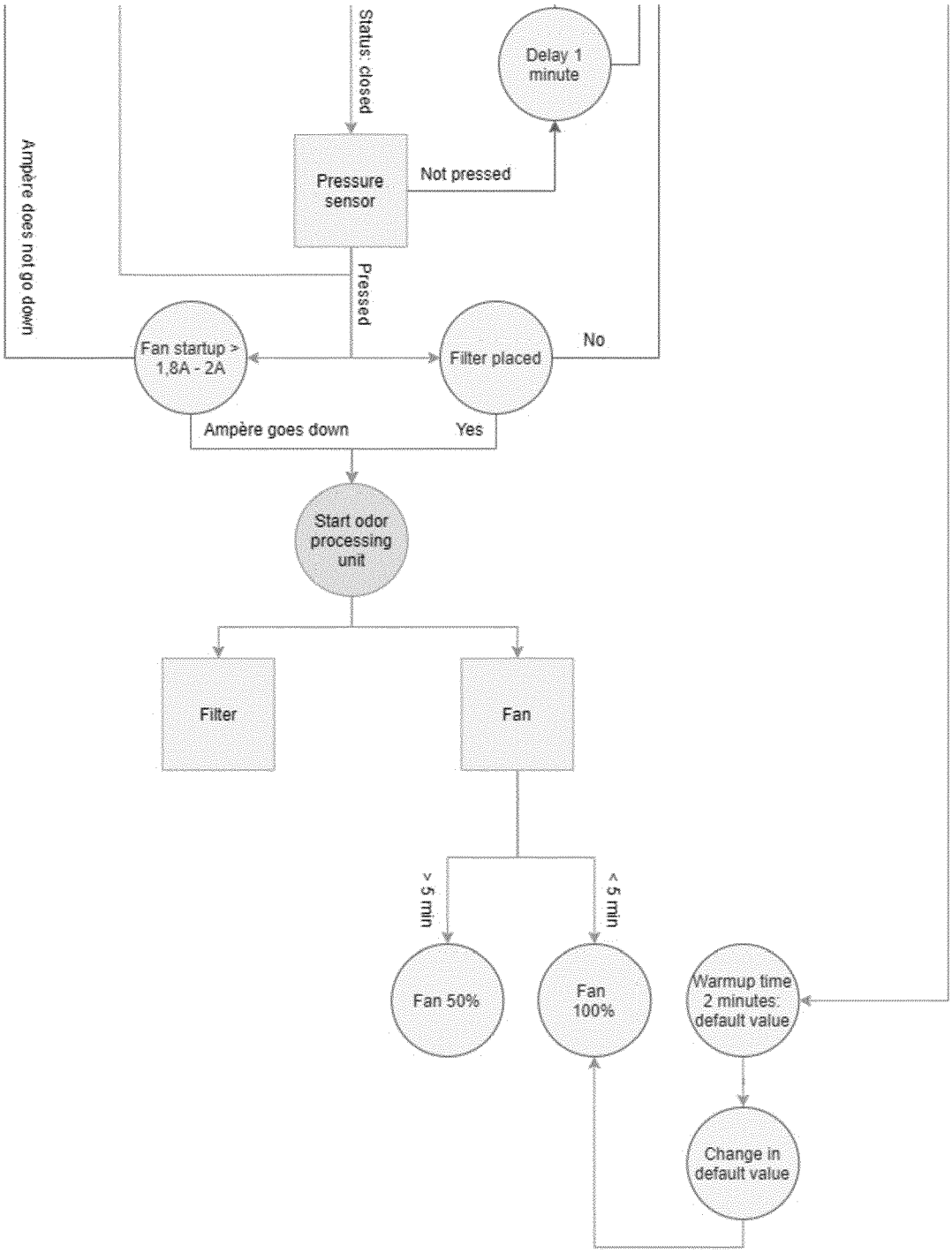

Status: closed
Delay 1 minute
Pressure sensor
Not pressed
Ampère does not go down
Pressed
Fan startup > 1,8A - 2A
Filter placed
No
Ampère goes down
Yes
Start odor processing unit
Filter
Fan
> 5 min
< 5 min
Fan 50%
Fan 100%
Warmup time 2 minutes: default value
Change in default value

FIG. 4

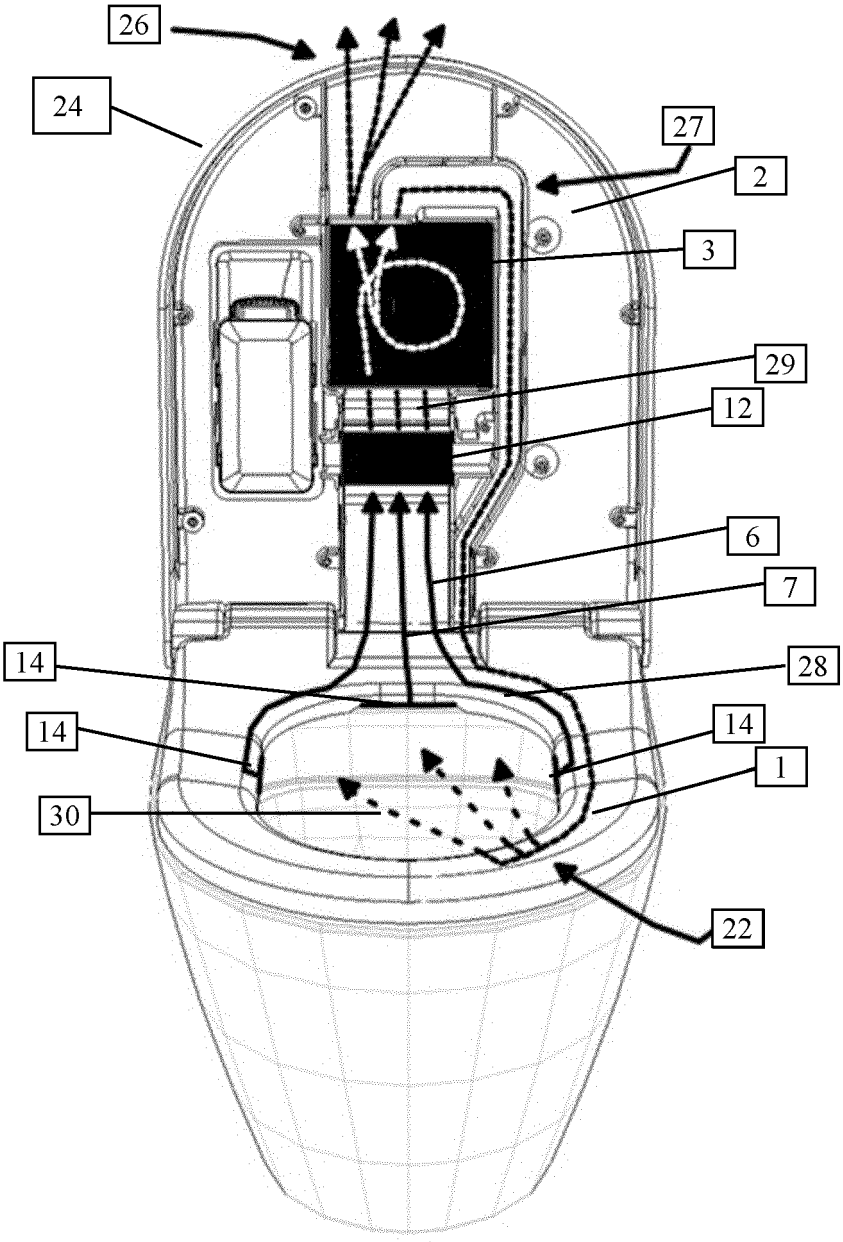
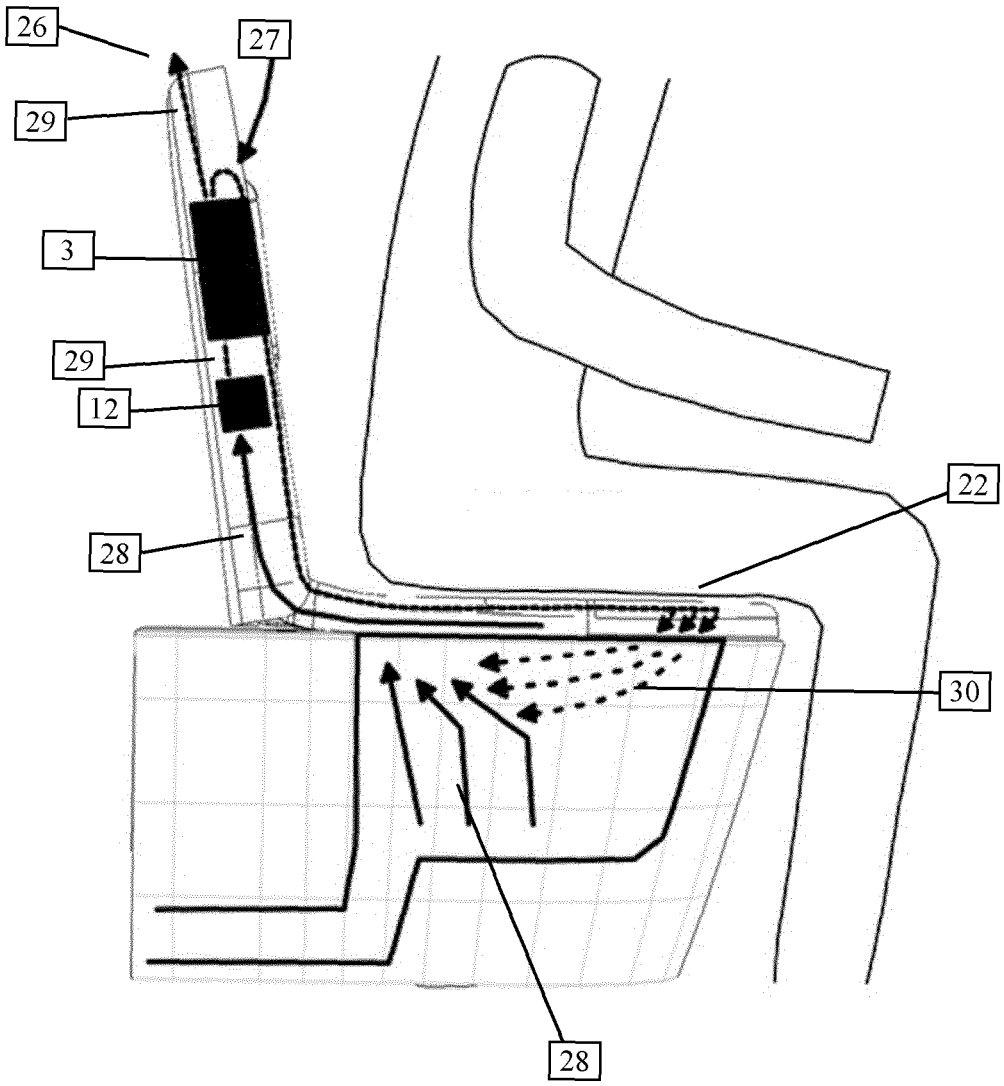


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 21 17 0496

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 539 937 A (BAREFOOT RUSSELL E [CA]) 30 July 1996 (1996-07-30) * column 8, line 54 - column 11, line 41; figures 1-8 *	1-15	INV. A47K13/30 E03D9/05 E03D9/052
X	US 2017/107709 A1 (KAUSCH MARVIN L [US] ET AL) 20 April 2017 (2017-04-20) * paragraphs [0035], [0036], [0057] - [0064]; figures 1-13 *	1-15	
A,D	US 4 853 981 A (HUNNICUTT JR CLYDE J [US]) 8 August 1989 (1989-08-08) * column 6, lines 35-36; figures 6,7,16,21,22 * * column 7, lines 8-26 *	1,8-15	
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			TECHNICAL FIELDS SEARCHED (IPC) A47K E03D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 August 2021	Zuurveld, Gerben

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		WO 2008131087 A1	30-10-2008

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