

TOILET SEAT AND COVER

TECHNICAL FIELD

5 **[0001]** The present disclosure relates to a toilet seat and seat cover assembly.

BACKGROUND

[0002] The following discussion of the background is intended to facilitate an understanding of the present disclosure only. It should be appreciated that the
10 discussion is not an acknowledgement or admission that any of the material referred to was published, known or is part of the common general knowledge of the person skilled in the art in any jurisdiction as of the priority date of the invention.

[0003] Some toilet seats may include mechanisms such as robotic arms to clean the seat after use. However, such mechanisms are typically cumbersome and bulky.
15 In addition, maintenance costs associated with such toilet seats may be high.

[0004] There thus exists a need for an improved device to alleviate one or more of the aforementioned problems.

SUMMARY

[0005] The disclosure was conceptualized to provide a toilet seat cover with self-
20 activation and cleaning functions. In particular, the toilet seat includes an automated or self-cleaning mechanism.

[0006] According to an aspect of the disclosure there is a toilet seat comprising a cover having at least one sensor positioned to detect at least one of an approaching user and a departing user; a cleaning assembly; and a seat portion shaped and
25 dimensioned to rest on a toilet bowl; wherein the cover is configured to move between a first state and a second state, such that in the first state the seat portion is exposed to an approaching user, and in the second state the cleaning assembly is arranged to clean the seat portion.

[0007] In some embodiments, at least one portion of the cleaning assembly is

housed within the cover. The at least one portion of the cleaning assembly may comprise a plurality of nozzles disposed around a periphery or perimeter of the cover.

5 [0008] In some embodiments, the cover is joined (e.g. hingedly connected) to the seat portion via a shoulder portion, the shoulder portion shaped and dimensioned to house a control mechanism to effect the movement of the cover between the first state and the second state, and to control the cleaning assembly in the second state.

10 [0009] In some embodiments, the control mechanism comprises a liquid inlet to introduce pressurized liquid through the plurality of nozzles. The control mechanism may further comprise an air turbine to introduce pressurized air through the plurality of nozzles.

[0010] In some embodiments, the cover comprises a seal gasket for sealing any gap(s) between the cover and the seat portion when the cover is in the second state.

15 [0011] In some embodiments, the at least one sensor is a time-of-flight infrared laser sensor. The toilet seat may comprise another time-of-flight infrared laser sensor positioned on the seat portion.

[0012] Other aspects and features of the present invention will become apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

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BRIEF DESCRIPTION OF DRAWINGS

[0013] Fig. 1a is a perspective side view of a toilet seat according to an embodiment;

[0014] Fig. 1b is a perspective front view of the toilet seat of Fig. 1a;

25 [0015] Fig. 1c is a perspective rear view of the toilet seat of Fig. 1a; and

[0016] Fig. 2 is a flow chart of the use of the toilet seat according to some embodiments.

DESCRIPTION OF EMBODIMENTS

[0017] In order to illustrate the technical solutions to the embodiments of the present disclosure, introduction of the drawings referred to in the description of the embodiment is provided below. The drawings described below are only some examples or embodiments of the present disclosure. A person having ordinary skill in the art, without further creative effort, may apply the present disclosure to other scenarios according to these drawings.

[0018] Throughout the description, the term 'user' refers to a living being, such as a human being.

[0019] Throughout the description, the term 'sensor' can include both hardware and software sensors, and can include active and passive sensors.

[0020] Throughout the description, the term 'electrical system' can include electrical and electronic components such as resistor(s), capacitor(s), inductor(s), integrated circuit chip(s) ICs, application specification ICs (ASICs). The electrical system may include components or algorithms installed to effect logical operations for automatically expose or close a toilet seat and/or effect operations in relation to one or more cleaning assemblies associated with the toilet seat.

[0021] Throughout the description, the term 'drive' includes different mechanical and/or electrical mechanisms, such as one or more electric motors for effecting the movement of a toilet seat cover(s).

[0022] With reference to Fig. 1a, 1b and 1c there is a toilet seat comprising a cover (3) having at least one sensor (1) positioned to detect at least one of an approaching user and a departing user; a cleaning assembly 130; and a seat portion (4) shaped and dimensioned to rest on a toilet bowl; wherein the cover (3) is configured to move between a first state and a second state, such that in the first state the seat portion (4) is exposed to an approaching user, and in the second state the cleaning assembly 130 is arranged to clean the seat portion.

[0023] The toilet seat may also be referred to as an automatic self-cleaning toilet seat system. In an exemplary embodiment, the automatic self-cleaning toilet seat

system comprises two time-of-flight infrared laser sensors (1) and (2). The first time-of-flight sensor (1) is positioned on the cover (3) so as to detect an approaching user when the cover (3) is in a position corresponding to a closed or partially closed position. The second time-of-flight sensor (2) may be positioned on the seat portion
5 (4) so as to detect a departing user when the cover is in a position that may correspond to an open or partially opened position. In this manner, the first time-of-flight sensor (1) and the second time-of-flight sensor (2) may work co-operatively to send data to the control mechanism so as to move the cover (3) between the first state and the second state, as well as to activate the cleaning assembly. Additional
10 sensors may be contemplated to detect the movement, posture and position of a user.

[0024] In addition, other sensors such as hall sensor(s) to detect a magnetic field, and other components such as an electrical system, a microcomputer (12), one or more drive motors (5), solenoid (7), valves (8), air turbine (9), speed reducing gear
15 train mechanisms (6), seal gasket (11) and adjustable retractable bidet may be arranged in data communication and/or in mechanical cooperation to achieve the overall objective of automated detection and cleaning. A water inlet (13) may be provided for to receive a cleaning liquid (for example water) so as to direct the water as pressured jets to suitable outlets.

20 **[0025]** At least one portion of the cleaning assembly 130 is housed within the cover (3). In the embodiment shown in Fig. 1a to 1c, the cleaning assembly comprises a plurality of outlets, for example nozzles (10), disposed around the periphery or perimeter of the cover (3) to direct the liquid to the surface of the seat portion (4) when the cover (3) is in the second state.

25 **[0026]** The cover (3) can be joined to the seat portion (4) via a shoulder portion 150, the shoulder portion 150 shaped and dimensioned to house a control mechanism to effect the movement of the cover between the first state and the second state, and to control the cleaning assembly in the second state. The shoulder portion 150 may also house part of the cleaning assembly 130 such as one or more
30 liquid inlets (13). The one or more liquid inlets (13) may be arranged to introduce pressurized liquid through the plurality of nozzles (10).

[0027] The shoulder portion 150 may also comprise an air turbine (9) arranged or configured to introduce pressurized air through the plurality of nozzles (10).

[0028] The cover (3) may comprise a seal gasket (11) for sealing any gap between the cover (3) and the seat portion (4) when the cover (3) is in the second state for cleaning. The seal gasket (11) may be mounted at a suitable position, for example underneath the seat cover (3) to form a liquid and air barrier to minimise or prevent air and liquid from escaping or leaking out of the seal (11) when liquid or air is discharged from the toilet seat cover (3) whilst in the cleaning state, i.e. when the cover (3) is urged against the seat portion (4). It is contemplated that the seal gasket may be suitably formed from resilient material such as rubber or silicone.

[0029] In one example, the combination of the sensors, microcomputer, drive motors and speed reducing gear train may be arranged to allow the toilet seat system to make smart logical operations to open or close the seat cover (3) when the user is sitting or in close proximity.

[0030] In some embodiments, the toilet seat may form part of a larger system comprising a plurality of toilet seats. The larger system can include at least one of a central monitoring system, a maintenance scheduling system, and a fault/failure detection system. One or more user interface may be provided, via mobile devices such as mobile phones and tablet PCs to different groups of users, such as general or authorized users. Authorized users may include maintenance engineers/technicians and cleaners.

[0031] In some embodiments, the larger system may comprise a remote or offsite processor. The remote processor may include one or more database(s) for storing data relating to the toilet seat. The data may include at least one of the following data: location data, inventory data, environmental data, and component operation data associated with each component of the toilet seat. Environmental data can include temperature, pressure and ambient lighting.

[0032] In some embodiments, a user interface may be sent to a user in the form of a survey interface configured to obtain feedback from a general user of the toilet seat.

[0033] In some embodiments, the remote or offsite processor may include an analytics engine, such as, but not limited to, an artificial intelligence engine arranged or configured to receive input from the toilet seat so as to fine tune aspects of automation such as cleaning duration, pressure of cleaning water jets etc.

5 **[0034]** The disclosure will next be described in the context of its normal operation and with reference to Fig. 2. When deployed, the seat cover (3) will be in the ready-for-use position. The seat cover (3) is closed and the first time-of-flight sensor (1) is positioned to detect an approaching user. Upon detecting a user, the first time-of-flight sensor (1) sends a signal to the control mechanism to open the seat cover (3)
10 to expose the seat portion (4). The seat portion (4) is exposed to be used by the user. The second time-of-flight sensor (2) that is positioned on the seat portion (4) operates to detect if the user is departing from the seat.

[0035] After the user departs, the seat cover (3) moves into the second state which may correspond to a closed position. In the second state, the seal gasket (11)
15 is urged towards the self-cleaning assembly 130 so as to provide an effective seal between the cover (3) and seat portion (4) during the cleaning operation. The cleaning assembly then operates to disperse pressurized liquid through a series of miniature apertures acting as nozzles (10) built into the cover (3) to direct the liquid to the surface of the seat portion (4).

20 **[0036]** After the cleaning operation is completed, an air turbine (9) is then operated to dry the seat portion (4) by blowing an air stream through the nozzles (10) built on to the seat cover (3). After drying, the seat cover move back to a ready-for-use state or position for detecting an approaching user. In the position, the seal gasket may or may not be urged against the seat portion (4).

25 **[0037]** Advantageously, the disclosure above provides for a contactless solution for opening and closing the seat cover (3) by sensor detection. In some embodiments, the opening of the seat cover (3) may be detected by a motion, for example a hand wave gesture. The disclosure also provides for an auto seat-washing and drying after user moves or walks away from the toilet seat, presumably
30 after use.

[0038] In some embodiments, a top lid may be provided in addition with the seal

gasket (11) to prevent cleansing liquid (e.g. water) from splashing in the second state corresponding to the cleaning of the seat portion.

[0039] In some embodiments, the mechanical bidet may be provided as a detachable attachment for washing at least one part of the user during use.

- 5 **[0040]** In some embodiments, the toilet cover and/or seat portion may include fasteners/hinges such as to achieve soft-closing.

[0041] It will now be apparent that a new, improved toilet seat and cover have been described in the specification with sufficient particularity as to be understood by one of ordinary skill in the art. Moreover, it will be apparent to those skilled in the art
10 that various modifications, variations, substitutions and equivalents exist for features of the apparatus and system which do not materially depart from the scope of the invention.

[0042] It should be further appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or
15 substitutes, may be combined to form yet further embodiments falling within the intended scope of the invention.

CLAIMS

1. A toilet seat comprising
 - a cover having
 - at least one sensor positioned to detect at least one of an approaching user and a departing user;
 - a cleaning assembly; and
 - a seat portion shaped and dimensioned to rest on a toilet bowl;
- wherein the cover is configured to move between a first state and a second state, such that in the first state the seat portion is exposed to an approaching user, and in the second state the cleaning assembly is arranged to clean the seat portion.
2. The toilet seat according to claim 1, wherein at least a portion of the cleaning assembly is housed within the cover.
3. The toilet seat according to claim 2, wherein the cleaning assembly comprises a plurality of nozzles disposed around the periphery or perimeter of the cover.
4. The toilet seat according to any one of the preceding claims, wherein the cover is joined to the seat portion via a shoulder portion, the shoulder portion shaped and dimensioned to house a control mechanism to effect the movement of the cover between the first state and the second state, and to control the cleaning assembly in the second state.
5. The toilet seat according to claims 3 and 4, wherein the control mechanism comprises a liquid inlet to introduce pressurized liquid through the plurality of nozzles.
6. The toilet seat according to claim 5, wherein the control mechanism comprises an air turbine to introduce pressurized air through the plurality of nozzles.
7. The toilet seat according to any one of the preceding claims, wherein the cover comprises a seal gasket for sealing any gap between the cover and the seat portion when the cover is in the second state.

8. The toilet seat according to any one of the preceding claims, wherein the at least one sensor is a time-of-flight infrared laser sensor.

9. The toilet seat according to claim 8, further comprises another time-of-flight infrared laser sensor positioned on the seat portion.

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