A Contactless Flushing System and a Method of Installation Of A Flushing System

Field of Invention

[0001] The present invention relates to a contactless flushing system for use in a water closet and a method of installation of the same.

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 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] Conventional water closets are operated manually using a button or a lever. Upon actuation of the button or lever, a volume of water is released to flush the water closet. To conserve water and to enhance water efficiency, improvements have been made over the years to conventional water closets to allow users to choose between a full flush or a reduced flush with reduced water usage. Such improvements involve the use of a dual button, in which a user manually presses a first button to activate a full flush, and/or a second button to activate a reduced flush.

[0004] However, manual flushing can be unhygienic and unsanitary, facilitating cross-contamination and transfer of diseases between users. This can be dangerous in a highly infectious environment and situation, for example, COVID-19. It will also be laborious to hire manpower to disinfect or sanitize such buttons periodically.

[0005] Sensor-based products have also been introduced. For example, US Patent No. 7,797,769, discloses a flushing system with a touchless system, with sensor modules customized to manage a full flush or a reduced flush, respectively. However, such sensor modules require the use of at least two separate sensors in the system to manage a full and a reduced flush, which makes the installation process

complicated and the overall flushing system costly. This means that the full flush volume control and reduced flush volume control are operated with different sensing mechanisms in the water closet. Moreover, such sensor-based systems are usually concealed in the wall closest to the water closet and can only be deployed in commercial or public areas, such as malls and airports. Such complicated and costly installation and systems cannot be efficiently used in hotels and residential homes.

[0006] There is therefore a need for a flushing system to alleviate one or more of the abovementioned problems.

Summary of Invention

[0007] The disclosure was conceptualized to provide a contactless flushing system that may be installed with an existing water closet. The flushing system may be provided with a sensor configured to detect gestural movements from a user and thereby activate one of a full flush volume or a reduce flush volume. Such a flushing system is more cost effective and with a more simplified design with fewer components, it is much easier to manufacture and install in water closets.

[0008] In an aspect of the invention, there is provided a flushing system for use in a water closet. The flushing system comprises a sensor configured for gestural detection from a user, a motor operatively connected to a flush valve of the water closet and a controller for activating the motor to trigger the flush valve. The sensor is configured to detect a first gesture in a first direction and to send a first signal to the controller to activate the motor for a first predetermined period. The sensor is further configured to detect a second gesture in a second direction opposite of the first direction, and to send a second signal to the controller to activate the motor for a second predetermined period, the second predetermined period being longer than the first predetermined period.

[0009] In some embodiments, the flushing system comprises a flush button assembly operatively connected to the flush valve, the flush button assembly being configured to trigger the flush valve when a button of the flush button assembly is actuated.

[0010] In some embodiments, the flushing system comprises a rod mechanism configured to trigger the flush valve, the rod mechanism comprising a first rod connected to and operable by the motor.

[0011] In some embodiments, the rod mechanism comprises a second rod connected to the flush button assembly and is operable to trigger the flush valve when the button is actuated.

[0012] In some embodiments, the first rod and the second rod each has an adjusting mechanism for adjusting a respective length of the first and second rod.

[0013] In some embodiments, the adjusting mechanism comprises means to connect the first and/or second rods to one or more extension rods.

[0014] In some embodiments, the sensor is mounted within the flush button assembly.

[0015] In some embodiments, the flush button assembly comprises a first ring disposed at a first end of the flush button assembly, proximal to the button to facilitate the fitting of the flush button assembly to a lid cover of the water closet.

[0016] In some embodiments, the flush button assembly comprises a second ring spaced apart from the first ring along a longitudinal axis of the flush button assembly to secure the flush button assembly to the lid cover.

[0017] In some embodiments, the sensor is operable by battery or by AC power.

[0018] In some embodiments, the flushing system further comprises a waterproof casing for housing at least the motor.

[0019] In some embodiments, the waterproof casing has an IPX68 rating.

[0020] In some embodiments, the flush button assembly is mountable on the lid cover.

[0021] According to another aspect of the disclosure, there is provided a water closet comprising the flushing system as described above.

[0022] According to another aspect of the disclosure , there is provided a method of installing a flushing system on a water closet, comprising the steps of fitting a flush button assembly of a flushing system within a recess of a lid cover of the water closet, wherein the flush button assembly comprises a sensor configured for gestural detection from a user, adjusting a length of a rod mechanism such that one or more ends of the rod mechanism is in contact with a top end of a flush valve of the water closet, wherein the flushing system comprises a motor operatively connected to the flush valve, and a controller for activating the motor to trigger the flush valve, wherein the sensor is configured to detect a first gesture in a first direction and to send a first signal to the controller to activate the motor for a first predetermined period and wherein the sensor is configured to detect a second gesture in a second direction opposite of the first direction, and to send a second signal to the controller to activate the motor for a second predetermined period, the second predetermined period being longer than the first predetermined period.

[0023] In some embodiments, the step of fitting the flush button assembly within the recess of the lid cover comprises fitting one or more rings of the push button assembly on a corresponding slot of the lid cover.

[0024] 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.

Brief Description of the Drawings

[0025] The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

[0026] FIGs 1A to 1C are various views of a flushing system of the invention installed on a water closet, in which FIG. 1A is a front side view, FIG. 1B is a top side view and FIG. 1C is a side view;

[0027] FIG. 2 is a perspective view of the flushing system of the invention when connected to a flush valve of a water closet;

[0028] FIGs 3A to 3H show closed up views of various components of the flushing system of FIG. 2;

[0029] FIG. 4 is a flowchart illustrating the operation of the flushing system of the invention via gestural movement; and

[0030] FIG.5 is a flowchart illustrating the manual operation of the flushing system of the invention.

Description of Embodiments

[0031] In order to illustrate the technical solution(s) to the embodiments of the present disclosure, embodiments of the present disclosure are described with reference to the drawings. It is appreciable that the drawings referred to are some examples or embodiments of the present disclosure. A person having ordinary skill in the art, without further creative efforts, may apply the present disclosure to other scenarios according to these drawings.

[0032] In various embodiments of the invention, there is disclosed a contactless flushing system for use in a water closet. The flushing system comprises a sensor configured for gestural detection from a user; a motor operatively connected to a flush valve of the water closet; and a controller for activating the motor to trigger the flush valve, wherein the sensor is configured to detect a first gesture in a first direction and to send a first signal to the controller to activate the motor for a first predetermined period and wherein the sensor is configured to detect a second gesture in a second direction opposite of the first direction, and to send a second signal to the controller to activate the motor for a second predetermined period, the second predetermined period being longer than the first predetermined period. It will be appreciated that a single sensor may be used to control both a full flush and a reduced flush. A simpler

flushing system may therefore be provided with reduced components, and at a lower cost. Touch-free flushing by hand-wave activation or gestural operation may thus be provided for optimum personal hygiene.

[0033] FIG. 1A shows a front view of a flushing system of the invention fitted in a tank of a water closet. Corresponding top and side views are shown in FIGs. 1B and 1C, respectively. The water closet 10 of the present invention, generally comprises a flushing system 20 and a water tank or cistern 30. The flushing system 20 may be installed within the water tank 30 and fitted to a lid of the water tank 30, as illustrated in FIGs. 1A to 1C.

[0034] Referring to FIG.2, the flushing system 20 comprises a flush button assembly 40 operatively connected to a flush valve 24 of the water closet. The flush valve 24 may be an existing flush valve installed previously in the water closet 10. As shown in FIG. 3E, the flush button assembly 40 has a first face 52 and a second face 54, and a generally cylindrical body 50 extending between the first and second faces 52, 54. A flush button 42 is disposed at the first face 52. At the opposite second face 54, a push rod 22 extends from the body 50 (as shown in FIG. 3C) and is configured to contact a top face of the flush valve 24, as illustrated in FIG. 3A. The push rod 22 may be adjustable in length so that it can contact flush valves of different heights. As exemplified in FIG. 2, the push rod 22 may have an adjusting mechanism for adjusting a length of the push rod 22, for example, by telescopic extension. The adjusting mechanism may also comprise means to connect the push rod 22 to one or more extension rods (as shown in FIG. 3D). This allows the flushing system of the present invention to be installed and fitted into various water closets having different dimensioned flush valves. The flush button 42 may be operatively or directly connected to the push rod 22, such that when a user pushes the flush button 42, the push rod 22 is pushed down towards the flush valve 24, thereby activating the flushing system. As shown in FIG. 3F, the flush button 42 may be provided with a LED indicator, for example to indicate detection of the user's first and/or second gesture, or to indicate the battery power or AC source. Different colors of LED light may be selected to indicate a detection of a different direction of gestural motion. The flush button 42 may also be marked by arrows to direct a user to wave in a particular direction for a full or reduced flush. It is contemplated that the sensing range of the sensor may be in the

range of 50-450mm. The flush button assembly 40 may be fitted into a lid cover of the water closet having an opening hole of 45-52mm.

[0035] The flushing system 20 also comprises a housing 34. The flush button assembly 40 may be attached to the housing 34 via a bracket 26. As illustrated in FIG. 2, the bracket 26 may have a recess 47 so sized and shaped to receive the body 50 of the flush button assembly 40. The bracket 26 may have one or more arms 25 extending away from the recess 47. The one or more arms 25 may each be provided with a flange 28 on either side of the one or more arms 25. Each flange 28 may have a plurality of slots 29 spaced apart from one another and located along a periphery of the flange 28. The body 50 may be provided with threads circumferentially surrounding the body 50. The recess 47 may similarly be provided with threads on the inner walls of the recess, such that the body 50 may be screwed into the recess. The housing 34 may be covered by a lid 36. The lid 36 may have a plurality of fastening means, such as threaded bolts 32, spaced apart from one another, as illustrated in FIG.2. The threaded bolts 32 may be arranged in a manner to be received in corresponding slots 29 of the flange 28. The tightening of the threaded bolts 32 onto the respective slots 29 anchors the flush button assembly 40 to the housing 34.

[0036] The flush button assembly 40 may be adapted to fit into a hole of an existing lid of a water tank or cistern. For instance, if the diameter of the hole of an existing lid is larger than a diameter of the body 50, the flush button assembly 40 may be provided with a first support ring 46. As illustrated in FIG. 3E, the first support ring 46 may be sized and shaped to fit the diameter of the hole of an existing lid of the water tank and is disposed around the first face 52 of the flush button assembly 40, proximal to the button 42 to facilitate the fitting of the flush button assembly 40 to the lid of an existing water closet. Optionally, the flush button assembly 40 may also be provided with a second support ring 48 spaced apart from the first ring along a longitudinal axis of the flush button assembly 40 to further anchor and secure the flush button assembly 40 to the lid of an existing water closet. The second support ring 48 may be arranged such that the bracket 26 is positioned between the first and second support rings 46, 48.

[0037] The flush button assembly 40 has a sensor 44 mounted within the body 50 proximal the first face 52. The sensor 44 may be a gestural sensor or any other sensors that can detect gestural motion. The sensor 44 is operatively connected to a motor (described later) and may be concealed by the button 42 as illustrated in FIG. 3F. The flushing system 20 also comprises a trigger rod 31. The trigger rod 31 may be disposed within the housing 34 and extends at least partially outside of an opening in the base of the housing 34, as shown in FIG. 3B. The trigger rod 31 may be arranged such that a tip of the trigger rod 31 is at a predetermined distance away from a top surface of the flush valve 24, when in a non-activated state, as shown in FIG. 3A. Like the push rod 22, the trigger rod 31 may be adjustable in length so that it can contact flush valves of different heights. For instance, the trigger rod 31 may have an adjusting mechanism for adjusting a length of the trigger rod 31, for example, by telescopic extension. The adjusting mechanism may also comprise means to connect the trigger rod 31 to one or more extension rods (as shown in FIG. 3D). This allows the flushing system of the present invention to be installed and fitted into various water closets having different dimensioned flush valves.

[0038] Referring now to FIG. 3G, the housing 34 may comprise and house a motor 60, a compartment 38 for storing a battery 37, such as a Lithium battery pack and a controller 35. The battery 37 provides electrical power to the controller 35 and the motor 60. The controller 35 is configured to activate the motor 60 to trigger the flush valve 24. The motor 60 is operatively connected to the flush valve 24. The housing 34 may be made of waterproof materials and sealed to prevent water from the cistern from seeping into the housing 34. For example, the housing 34 may be made of a material with an IPX68 rating. The housing 34 may comprise an outlet 39 for receiving AC power. Hence, it may be contemplated that the flushing system may be powered by battery or AC power.

[0039] Figure 4 is a flowchart illustrating an operation of the flushing system of the invention via gestural movement. The sensor 44 may be configured for gestural detection (for example a hand wave) from a user. Upon successful detection of a gesture by the sensor 44, a first signal is sent to the controller 35, which then activates the motor 60 to operate for a first predetermined period. The motor 60 which is

operatively connected to the trigger rod 31 causes the trigger rod 31 to be pushed in a direction towards the flush valve 24. The trigger rod 31 which is initially housed partially or fully within the housing 34, then contacts a top button of the flush valve 24, thus activating the flush valve 24 to operate for a first predetermined period, resulting in a first volume of flush, for example, a full flush. Once the predetermined period has expired, the motor 60 causes the trigger rod 31 to retract away from the flush valve 24 towards the housing 34.

[0040] If a user makes a second gesture in an opposite direction from the first gesture, the sensor 44 detects such second gesture and sends a second signal to the controller 35. The controller 35 then activates the motor 60 to operate for a second predetermined period, which may be shorter than a first period. The motor 60 causes the trigger rod 31 to be pushed in a direction towards the flush valve 24. The trigger rod 31 then contacts a top button of the flush valve 24, thus activating the flush valve 24 to operate for a second predetermined period, resulting in a second volume of flush, for example, a reduced flush. Once the second predetermined period has expired, the motor 60 causes the trigger rod 31 to retract away from the lush valve 24 towards the housing 34. The usage of gestural sensors to operate the flushing system improves detection accuracy by recognizing directional motion as compared to known infrared sensor products, which only detect the presence or absence of an object. Increased accuracy reduces water wastage from incorrect sensing of an object or user.

[0041] Figure 5 is a flowchart illustrating a manual operation of the flushing system of the invention. A user may execute the gestural operation of the flushing system as outlined above, or alternatively; the user may instead choose to press the flush button 42 to activate a manual operation of the flushing system. In the latter case, the sensor 44 will not sense any movement from the user’s hand, and thus would not activate the motor 60. The push rod 22 which is connected to the flush button 42, is pushed further towards the flush valve 24 to activate the flushing. The flushing will stop once the user removes his finger from the flush button 42, in which case, the push rod 22 is retracted back to its original position.

[0042] It will be appreciated that the invention may also be provided as a water closet comprising the flushing system as described above.

[0043] A method of installing a flushing system on an existing water closet will now be described. The flushing system 20, comprising the housing 34 and the flush button assembly 40 will first be lowered into a recess of the water tank. As described earlier, the housing 34 and the flush button assembly 40 may be attached to one another via fastening means 32 to one or more flanges 28 of a bracket 26. The flush button assembly 40 is aligned to a hole on the lid cover of the water tank. In the case where the diameter of the hole on the lid cover is larger than the diameter of the body 50 of the flush button assembly 40, one or more support rings 46, 48 may be selected according to their sizes to fit the flush button assembly 40 through the hole of the lid cover. Preferably, the support rings 46, 48 are fitted on either side of the bracket 26. The support rings provide structural support to the flush button assembly 40 and assist to keep the flush button assembly 40 firmly in place with respect to the housing 34, when installed. The adjustable mechanism on the push rod 22, which extends from a second face 54 of the body 50, is then operated to adjust a length of the push rod 22 such that a tip of the push rod 22 is at a predetermined distance away from a top surface of the flush valve 24 (as shown in FIG. 3A). Similarly, the adjustable mechanism of the trigger rod 31 is operated to adjust a length of the trigger rod 31 such that a tip of the trigger rod 31 is at a predetermined distance away from a top surface of the flush valve 24 (as shown in FIG. 3A).

[0044] It is contemplated that the flushing system of the present invention may be universally applied to most flush valves used in water closets (for example, WDI4920 and GEBERIT 250s flush valves.

[0045] With the aforementioned disclosure, it will be apparent that the present invention provides a simple flushing system that can be easily manufactured and installed with most existing water closets, since it uses fewer components and only one sensor. This allows the flushing system of the present invention to be more economical and easily installed in hotels, commercial buildings, offices and residential homes. The contactless control of the flushing system also improves sanitary and hygiene conditions by reducing the spread of diseases. Water wastage will also be reduced since the flushing system of the present invention efficiently allows a full or reduced flush.

[0046] It will be apparent to those skilled in the art that various modifications, variations, substitutions, and equivalents exist for features of the system which do not materially depart from the scope of the invention.

[0047] It should be further appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments falling within the intended scope of the invention.

Claims

1. A flushing system for use in a water closet, comprising:

a sensor configured for gestural detection from a user;

a motor operatively connected to a flush valve of the water closet; and

a controller for activating the motor to trigger the flush valve,

wherein the sensor is configured to detect a first gesture in a first direction and to send a first signal to the controller to activate the motor for a first predetermined period and wherein the sensor is configured to detect a second gesture in a second direction opposite of the first direction, and to send a second signal to the controller to activate the motor for a second predetermined period, the second predetermined period being longer than the first predetermined period.

2. The flushing system of claim 1, further comprising a flush button assembly operatively connected to the flush valve, the flush button assembly being configured to trigger the flush valve when a button of the flush button assembly is actuated.

3. The flushing system of claim 1 or claim 2, further comprising a rod mechanism configured to trigger the flush valve, the rod mechanism comprising a first rod connected to and operable by the motor.

4. The flushing system of claim 3, wherein the rod mechanism further comprises a second rod connected to the flush button assembly and operable to trigger the flush valve when the button is actuated.

5. The flushing system of claim 3 or claim 4, wherein the first rod and the second rod each has an adjusting mechanism for adjusting a respective length of the first and second rod.

6. The flushing system of claim 5, wherein the adjusting mechanism comprises means to connect the first and/or second rods to one or more extension rods.

7. The flushing system of any one of claims 2 to 6, wherein the sensor is mounted within the flush button assembly.

8. The flushing system of any one of claims 2 to 7, wherein the flush button assembly comprises a first ring disposed at a first end of the flush button assembly, proximal to the button to facilitate the fitting of the flush button assembly to a lid cover of the water closet.

9. The flushing system of claim 8, wherein the flush button assembly comprises a second ring spaced apart from the first ring along a longitudinal axis of the flush button assembly to secure the flush button assembly to the lid cover.

10. The flushing system of any of the preceding claims, wherein the sensor is operable by battery or by AC power.

11. The flushing system of any of the preceding claims, further comprising a waterproof casing for housing at least the motor.

12. The flushing system of claim 11, wherein the waterproof casing has an IPX68 rating.

13. The flushing system of any one of claims 8-11, wherein the flush button assembly is mountable on the lid cover.

14. A water closet comprising the flushing system of any of the preceding claims.

15. A method of installing a flushing system on a water closet, the method comprising the steps of:

fitting a flush button assembly of a flushing system within a recess of a lid cover of the water closet, wherein the flush button assembly comprises a sensor configured for gestural detection from a user;

adjusting a length of a rod mechanism such that one or more ends of the rod mechanism is in contact with a top end of a flush valve of the water closet;

wherein the flushing system comprises:

a motor operatively connected to the flush valve; and

a controller for activating the motor to trigger the flush valve,

wherein the sensor is configured to detect a first gesture in a first direction and to send a first signal to the controller to activate the motor for a first predetermined period and wherein the sensor is configured to detect a second gesture in a second direction opposite of the first direction, and to send a second signal to the controller to activate the motor for a second predetermined period, the second predetermined period being longer than the first predetermined period.

16. The method of claim 15, wherein the step of fitting the flush button assembly within the recess of the lid cover comprises fitting one or more rings of the push button assembly on a corresponding slot of the lid cover.