**Title:** CONTROL DEVICE FOR A TOILET

A toilet control device, characterised by comprising: at least one sensor (7, 10) for sensing the presence of a person within the toilet (2) in a standing position, at least one sensor (8, 9) for sensing the presence of said person when seated on the bowl (6) seating portion, a control unit, at least one alarm indicator (16, 18) powered by said control unit and activated by the absence of signals from both said sensors (7, 8, 9, 10) for a predetermined maximum of time.
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CONTROL DEVICE FOR A TOILET

This invention relates to a control device for a toilet.

An object of the invention is to provide a control device for a toilet with regard both to the presence of a user within the toilet and to his psycho-physical condition.

A further object of the invention is to provide a control device which enables a user overcome with sudden illness to indicate his condition to the outside.

A further object of the invention is to provide a control device which indicates the occurrence of conditions dangerous for the user (commencement of fire, gas leak, etc.) within the toilet.

A further object of the invention is to provide a control device which ensures very hygienic conditions within the toilet with regard both to the water closet bowl and to the floor.

A further object of the invention is to provide a control device which enables this hygienic condition to be achieved without wastage of the material used to achieve this condition.

All these and further objects which will be apparent from the ensuing description are attained according to the invention by a control device as claimed in claim 1.

A preferred embodiment of this invention is described in detail hereinafter by way of non-limiting example with reference to the accompanying drawings, on which:

Figure 1 is a schematic plan view of a toilet provided with the control device,

Figure 2 is perspective view of a water closet bowl,

Figure 3 is a plan view thereof,
Figure 4 is a perspective view of a hygienic foot rest, and
Figure 5 is a front view thereof.

As can be seen from the figures the control device of the invention is
installed within a toilet 2 and comprises substantially a control unit housed in
a box structure 4 positioned in a region above the bowl 6, for controlling a
plurality of sensors, actuators, optical and acoustic indicators etc. described
hereinafter.

Specifically, the control unit 4 controls:
- a sensor 7 housed in the box structure 4 for sensing the presence of a
  person in the toilet,
- an infrared proximity sensor 8 positioned to one side of the bowl at a height
  such as to sense the presence of the head of a person seated on the bowl,
- a pressure sensor 9 positioned on the upper side of the bowl,
- an infrared proximity sensor 10 positioned on the ceiling, its range of action
  embracing the space below the bowl,
- a smoke sensor 12,
- a CO sensor 14 if a gas burner is present in the toilet,
- an internal alphanumerical information display 16 for the user,
- an external alphanumerical information display 18 for the toilet cleaning
  personnel.

In the toilet there is applied to the bowl seat a box structure 20
housing in its interior a first winding reel 22 for a renewable tubular web 24
providing hygienic protection to the seating portion. Said first reel is mounted
on the shaft of an electric motor 26 provided with an encoder and powered
with direct current via a mains voltage transformer. The electric motor is
controlled by the control unit.
The other end of the web is wound on a further idle unwinding reel 28. A buffer battery 30 is connected to the motor to operate in the absence of the mains supply.

To the cover of the compartment housing the control unit there is applied:

- a push bottom 48 for the temporary advancement of the tubular web 24 along the bowl seat,
- an optical and/or acoustic alarm 49 which warns of the imminent emptying of the unwinding reel 28,
- an alphanumerical display 50 indicating the number of renewal feeds of the tubular web 24 available,
- a light emitting indicator 51 actuated when the number of renewal feeds of the tubular web is below a prefixed minimum number,
- a device for preventing the advancement of the tubular web if the sensor for sensing the presence of a person seated on the bowl seating portion is actuated,
- an indicator 52 indicating that a person has remained within the toilet beyond a predetermined maximum time period,
- an emergency call push bottom 53.

The ring-shaped seating portion is engaged between the arms 32 of a fork lever 34 rigid with the shaft of an electric motor (not shown on the drawings) which when operated causes the seat to rotate from the raised vertical configuration to the lowered horizontal configuration and vice versa. The arms 32 of the fork lever may be operated through the same elective motor 36.
The seating portion is also provided with a resistance element 36 for seat heating.

In a position to the front of the bowl there is provided a foot rest 38 consisting of two parallel hollow containers 39 positioned to the sides of the bowl. Each container is formed from two half-shells hinged along one longitudinal edge and comprising a slot along the other facing edge. One of the two containers houses an idle longitudinal shaft 40 for engaging a reel of film material 42, of which one surface is water-absorbent and the other surface is plastic-coated and hence impermeable.

The other end of the reel is wound on a shaft 44 of a motor 46 housed in a watertight housing provided within the container. Two idle rollers 47 are positioned in correspondence with the facing slots of the two containers and are secured to the toilet floor.

The control device is also provided with a plurality of LEDs which indicate the various states such as activation of the winding reel, activation of the resistance element, commencement of the reserve stock of tubular web, and a plurality of automatic safety devices which act if the tubular web jams or tears or which halt any repeated malicious advancement of the web.

The invention also uses a plurality of limit sensors, switches and change-over switches providing correct execution of the various operations.

The control unit also comprises a device for preventing the advancement of the tubular web if the sensor for sensing the presence of a person seated on the bowl seating portion is actuated and control means for preventing the advancement of the tubular web for a predetermined minimum time period from the preceding advancement.

The control device of the invention is used as follows.
At the moment in which the user enters the toilet and closes the door, a sensor connected to it causes the control unit to activate the timer which monitors the time for which the user remains in the toilet. This time is related to the position which the user assumes relative to the bowl, i.e. whether he sits on it or remains standing, this situation being determined by pressure sensor 9 and/or presence sensors 7 and 10.

If the user is to sit on the bowl 6, he operates a pushbutton (not shown) which simultaneously activates the motor which moves the bowl seat into the horizontal configuration, and the motor 26 which rotates a film portion 24 sufficient to cover the bowl seat.

After a certain time period, if the user has not yet left the toilet, a digitalized sound signal informs him that the time allotted to him is about to expire, on which if the user wishes to prolong his presence in the toilet he merely has to operate an appropriate confirmation pushbutton.

If having suffered sudden illness the user is unable to operate this pushbutton, on termination of the allotted time an audible and light-emitting alarm inform external personnel of an abnormal situation within the toilet. At the same time the control unit unlocks the door to enable rescuers to enter the toilet.

Further monitoring of the psycho-physical condition of the user is provided by the pressure sensor 9 which, if it no longer senses the person seated on the bowl, indicates this situation to the outside in the case the user has not come out from the toilet within a prefixed time.

In the case the user falls to the floor, the pressure 9 and proximity 7 sensors detect in very close time the absence of the person and inform the control unit of this anomaly.
At the moment in which the user rises from the bowl 6, the pressure sensor 9 informs the control unit to rotate the motor in order to move the seating portion into the vertical configuration, to activate the flush and to spray the environment with perfume contained in a suitable container applicable to the outside of the bowl.

When the user opens the door to leave the toilet, the control unit activates the motor 46, which rotates its shaft in the sense of winding film 42 onto the spool until a decoder senses a length of film corresponding to the distance between the two rollers 27.
CLAIMS

1. A toilet control device, characterised by comprising:
   - at least one sensor (7,10) for sensing the presence of a person within the toilet in a standing position,
   - at least one sensor (8,9) for sensing the presence of said person when seated on the bowl seating portion,
   - a control unit,
   - at least one alarm indicator (16,18) powered by said control unit and activated by the absence of signals from both said sensors for a predetermined maximum of time.

2. A device as claimed in claim 1 characterised in that one sensor (8) senses the presence of the person seated on the bowl seating portion with the head erect.

3. A device as claimed in claim 1 with, for protecting said seating portion, a renewable tubular web (24) slidable along it from an unwinding reel (28) to a rewinding reel (22), characterised in that the drive motor for said rewinding reel is controlled by said control unit, which is housed in a compartment (4) positioned in a region overlying said bowl (6).

4. A device as claimed in claim 3, characterised in that members for commanding and controlling the functions which said control unit performs are applied to the cover of the compartment (4) housing said control unit.

5. A device as claimed in claim 3, characterised in that at least one pushbutton (48) for the temporary advancement of said tubular web along said seating portion is applied to the cover of the compartment (4) housing said control unit.
6. A device as claimed in claim 3, characterised in that said control unit comprises at least one optical and/or acoustic alarm which warns of the imminent emptying of said unwinding reel.

7. A device as claimed in claim 4, characterised by comprising means (36) for heating said seating portion.

8. A device as claimed in claim 4, characterised in that an alphanumeric display (50) indicating the number of renewal feeds of the tubular hygienic protection web for said seating portion still available is applied to the cover of the compartment housing said control unit.

9. A device as claimed in claim 8, characterised in that a light-emitting indicator (51) activated when the number of renewal feeds of the tubular hygienic protection is below a prefixed minimum number is applied to the cover of the compartment housing said control unit.

10. A device as claimed in claim 4, characterised in that said control unit is provided with an indicator (52) indicating that said person has remained within the toilet beyond a predetermined maximum time period.

11. A device as claimed in claim 4, characterised in that said control unit is provided with malfunction indicators.

12. A device as claimed in claim 1, characterised by comprising means for deodorizing and/or perfuming the toilet.

13. A device as claimed in claim 1, characterised in that said deodorizing and/or perfuming means consist of a container of a deodorant and/or perfume applicable to the outside of said bowl.

14. A device as claimed in claim 1, characterised by comprising at least one smoke detector (12).
15. A device as claimed in claim 1, characterised by comprising at least one
gas sensor (14).

16. A device as claimed in claim 1, characterised in that person presence
sensor consists of a proximity sensor (8).

17. A device as claimed in claim 1, characterised in that said sensor for
sensing the presence of a person seated on the bowl seating portion consists
of a pressure sensor (9).

18. A device as claimed in claim 1, characterised by comprising at least one
emergency call pushbutton (53).

19. A device as claimed in claim 1, characterised in that at least part of the
optical and/or acoustic (16) indicating devices are positioned outside said
toilet.

20. A device as claimed in claim 3, characterised by comprising a device for
preventing the advancement of said tubular web if the sensor for sensing the
presence of a person seated on the bowl seating portion is activated.

21. A device as claimed in claim 4, characterised by comprising means (52)
for preventing the advancement of said tubular web for a predetermined
minimum time period from the preceding advancement.

22. A device as claimed in claim 1, characterised in that said person
presence sensors comprise at least one photoelectric cell detector and an
optical and/or acoustic indicator associated with said detector.

23. A device as claimed in claim 1 characterised in that to the control unit
unlocking means of the door are associated.

24. A device as claimed in claim 1 characterised in that the seat (20) is
provided with means (33,34) for its automatic rotation.
25. A device as claimed in claim 1 characterised in that the control unit controls a motor (46) for winding a foot rest (38) placed in the front of the bowl.

26. A device as claimed in claim 25 characterised in that the foot rest (38) is formed from a film material (52) of which one surface is water-absorbent and the other surface is plastic-cooled.