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(54) Method and device for flushing a urinal

(57) The invention relates to a method and a device for flushing a urinal (1). In accordance with the invention, a vibration in the urinal or the liquid (4) contained in it generated by the use of the urinal is detected by a vibration transducer, such as a piezoelectric transducer (9), after which flushing is started by an electric signal emitted by the transducer. The transducer (9) may be located on the outer surface of the wall (10) of a trough-shaped urinal vessel (2), or the transducer (9", 9"') may be located on the outer surface of the urinal wall at the urinal bottom or in the water seal (5), or the transducer (9", 9"") may be located in the liquid (4) provided at the urinal bottom or in the water seal (5).

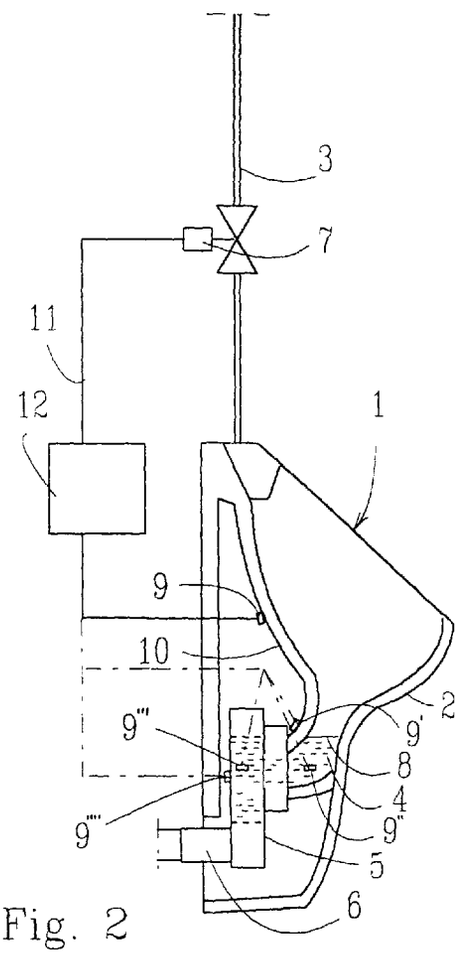

Fig. 2

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Description

This invention relates to a method for flushing a urinal and to a urinal flushing device for implementing the method.

Most frequently urinals are equipped with a mechanic tap or push-button, with which the user flushes the urinal after use. In this connection, the problem is that the user may leave the tap open partly or completely, so that there will be a waste of water, or he may fail to flush the urinal altogether.

Especially in public toilets, solutions have been applied, in which the urinal is automatically flushed, regardless of the user's actions. One solution consists in photocells and detectors which detect the presence of a user and start the flushing with a certain delay after the user has intercepted the light beam. However, such devices are expensive and apt to be exposed to vandalism if placed at visible spots. Moreover, slow users will cause over-dimensioned flushing, which involves a waste of flushing water.

As an optional solution, transducers have been used, which are activated and start the flushing of the urinal under the action of urea entering the urinal. Thus, it is known to mount transducers in urinals to react on the heat content in the urea or on a change in the electric conductivity generated by the urea in the urinal liquid. Electrically operating transducers start the urinal flushing automatically with a specific delay from the moment the transducer has detected a temperature exceeding a set threshold value or a change in the electric conductivity. An advantage of these sensors over optic solutions is that they can be adjusted so as to perform flushing in a single operation and only when flushing is required.

The limitation of a transducer observing changes in the electric conductivity brought about by urea is that, in order to be operational, it has to be located in the liquid contained in the urinal or in its water seal, inside the urinal wall. Fitting such a transducer into position, particularly retrofitted in the urinal, is awkward. A sensor which observes the liquid temperature is also most effective when fitted in the liquid contained in the urinal liquid space or in the water seal, though it is also possible to place a sensitive temperature sensor on the outer surface of the urinal wall. In this case, the sensor must still be located at the liquid space or the water seal, and may require a reduction of the urinal wall thickness at the sensor. For known conductivity and temperature sensors, there may also be problems in obtaining a sufficiently low release threshold, i.e. the change causing the sensor to activate the flush.

The purpose of this invention is to provide a new solution for stating the need of flushing in a urinal and for starting the flushing, based on the detection of urea in the urinal by means of an electrically operating sensor. The invention consists essentially in that a vibration in the urinal or the liquid contained in it caused by the use of the urinal, i.e. urea entering the urinal, is detected with a vibration transducer, and in that flushing is started with a signal emitted by the transducer.

The benefit of using mechanical vibration as a ground for flushing of the urinal is that the vibration can be detected on the wall of the urinal or its water seal as readily as in the liquid contained in the urinal or its water seal, and that even minor, momentary vibrations can be identified for instance by using a piezoelectric transducer. In this case, activation of the flushing hardly at all depends on the amount of urea entering the urinal, and thus, in practical operation, there will be no threshold for the amount to be exceeded in order to cause flushing. Activation of the flushing may relate with a specific delay to an abatening or disappearing vibration detected by the transducer, and in this manner optimal flushing timing is achieved with regard to the use of the urinal.

Beside a method for flushing a urinal, the invention relates to a device for flushing a urinal, comprising a transducer fitted in connection with the urinal and detecting the need for flushing, disposed to start a water flush steered to the urinal, and characterised in accordance with the invention in that the transducer is a vibration transducer, which detects a vibration caused by use in the urinal and/or the liquid contained in this.

In accordance with the invention, the position of the vibration transducer in the urinal may vary, however, most preferably the transducer is placed at an appropriate spot outside the wall of the urinal or of its water seal. The transducer may be fitted on the outer surface of the rear wall of the urinal, even considerably higher than the liquid level in the urinal. Optionally, the transducer may be located in the area of the urinal bottom or of the water seal, on the outer surface of the urinal wall. It is also possible to place the transducer in the liquid space at the urinal bottom or in the water seal inside the wall defining the urinal or the water discharge duct in the water seal.

The invention will be described below by means of examples and with reference to the accompanying drawing, in which

figure 1 is a front view of a urinal in accordance with the invention, and

figure 2 is a lateral view of the urinal of figure 1, indicating optional positions for the vibration transducer.

Urinal 1 shown in the drawing consists of trough-like vessel 2 of ceramic material, equipped with an inlet duct 3 for flushing water, with a channel-like space starting from its bottom, containing liquid 4 and leading over a helical water seal 5 to liquid outlet duct 6. Duct 3 is provided with a magnetic valve 7 which can be opened and closed to control the supply of flushing water. Flushing water is supplied from a tank (not illustrated) above the urinal acting as an accumulator. A liquid amount equalling the supplied amount of flushing water is dis-

charged from the urinal bottom as an overflow via water seal 5 to outlet duct 6 in a manner such that the level of the liquid surface 8 remains constant at the urinal bottom.

The flushing of urinal 1 illustrated in the drawing is controlled by a piezoelectric transducer 9 sensitive to vibrations, fitted in the urinal. When the urinal is being used, entering urea will generate mechanical vibrations not only in the ceramic material of the urinal walls and the water seal but also in the liquid contained in the urinal water space 4 and the water seal 5, and an adequately positioned sensitive piezoelectric transducer 9 will immediately detect such a vibration. The piezoelectric transducer 9 illustrated in figures 1 and 2 is fitted on the outer surface of the rear wall 10 of the urinal trough 2 and connected over conductor 11 to an electronic control unit 12 regulating the flushing, and from here on to a magnetic valve 7 in the flushing water duct 3. Thus, the piezoelectric transducer 9 will immediately detect the use of urinal 1, i.e. urea entering urinal trough 2, and the electric signal emitted by the transducer is arranged to start the flushing by opening magnetic valve 7 e.g. with a specific, set delay after the vibration caused by the use of the urinal has stopped. When the set amount of flushing water has flowed into urinal 1, the magnetic valve 7 will close automatically.

The preferred, or at all feasible locations of vibration transducer 9 in urinal 1 depend on one hand of the design of urinal trough 2 and water seal 5 and on the other hand on the sensitivity of the transducer. The location 9 of the transducer illustrated in figures 1 and 2 on the rear wall 10 of the urinal trough is advantageous especially in the urinal model shown in the drawing. Appropriate positions for the transducer in other types of urinals are obvious to those skilled in the art.

Alongside location 9 on the rear wall 10 of the urinal trough, figure 2 shows a number of optional positions for the vibration transducer. Thus, the transducer may be located at point 9' on the outer surface of the liquid space 4 starting from the urinal bottom, at point 9" inside the liquid space 4, where the transducer detects a vibration generated by the use of the urinal in the liquid at the urinal bottom, at point 9"' on the outer surface of the wall defining water seal 5, or at point 9"" in the liquid contained in water seal 5.

It is obvious to those skilled in the art that the various embodiments of the invention are not confined to the examples above, but may vary within the scope of the accompanying claims. Thus, the shape of the urinal may be different from the one illustrated in the drawing, and instead of a helical water seal, it may include a conventional S-shaped water seal, and then the vibration transducer may be fitted either on the outer surface of the water seal wall or in the liquid contained in the water seal.

Claims

1. A method for flushing a urinal (1), **characterised** in that a vibration in the urinal or the liquid (4) contained in it generated by the use of the urinal (1) is detected with a vibration transducer (9) and that flushing is started by a signal emitted by the transducer.

2. A method as claimed in claim 1, **characterised** in that the vibration is detected with a piezoelectric transducer (9).

3. A method as claimed in claim 1 or 2, **characterised** in that the vibration is detected in the urinal wall (10).

4. A method as claimed in claim 1 or 2, **characterised** in that the vibration is detected in the liquid (4) contained in the urinal (1) or its water seal (5).

5. A urinal flushing device comprising a transducer (9) placed in connection with the urinal (1) to detect the need for flushing and disposed to start the flushing flow to be steered to the urinal, **characterised** in that the transducer is a vibration transducer (9), which detects a vibration in the urinal (1) and/or the liquid (4) contained in it generated by the use of the urinal.

6. A device as claimed in claim 5, **characterised** in that the transducer is a piezoelectric transducer (9).

7. A device as claimed in claim 5 or 6, **characterised** in that the transducer (9) is located on the outer surface of the rear wall (10) of the urinal.

8. A device as claimed in claim 5 or 6, **characterised** in that the transducer (9', 9"') is located in the area of the urinal bottom or the water seal (5), on the outer surface of the urinal wall.

9. A device as claimed in claim 5 or 6, **characterised** in that the transducer (9") is located in the liquid space (4) at the urinal bottom, inside the urinal wall.

10. A device as claimed in claim 5 or 6, **characterised** in that the transducer (9"") is located in the urinal water seal (5), inside its wall.

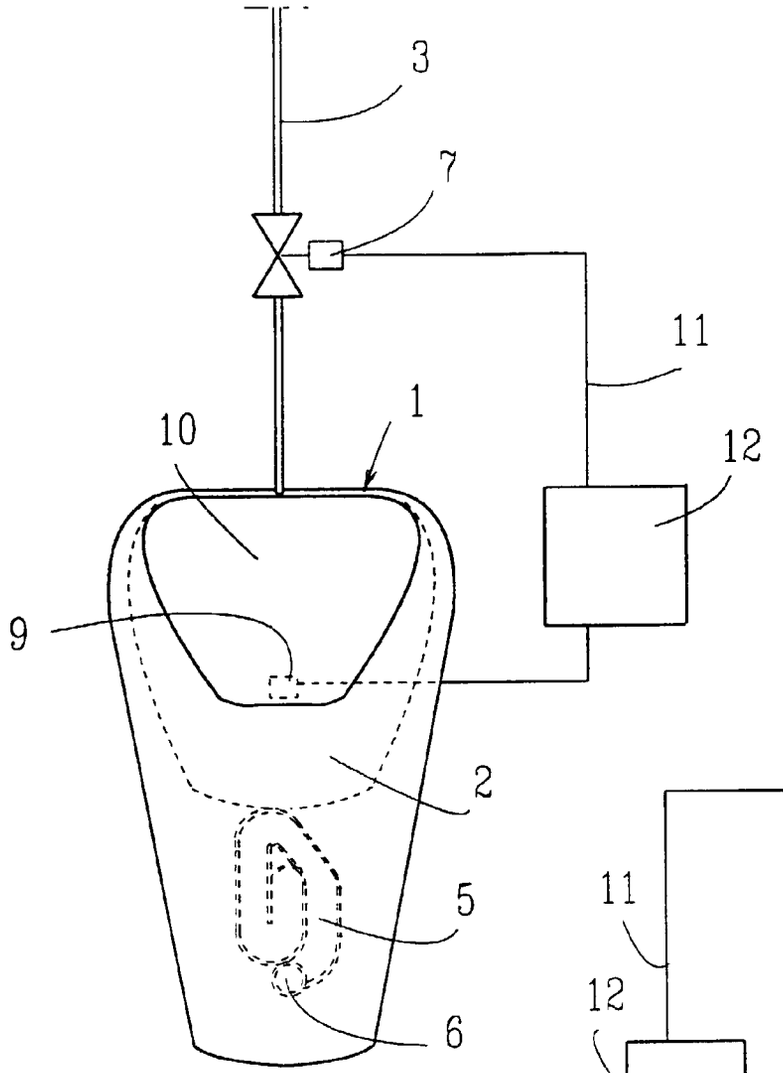

Fig. 1

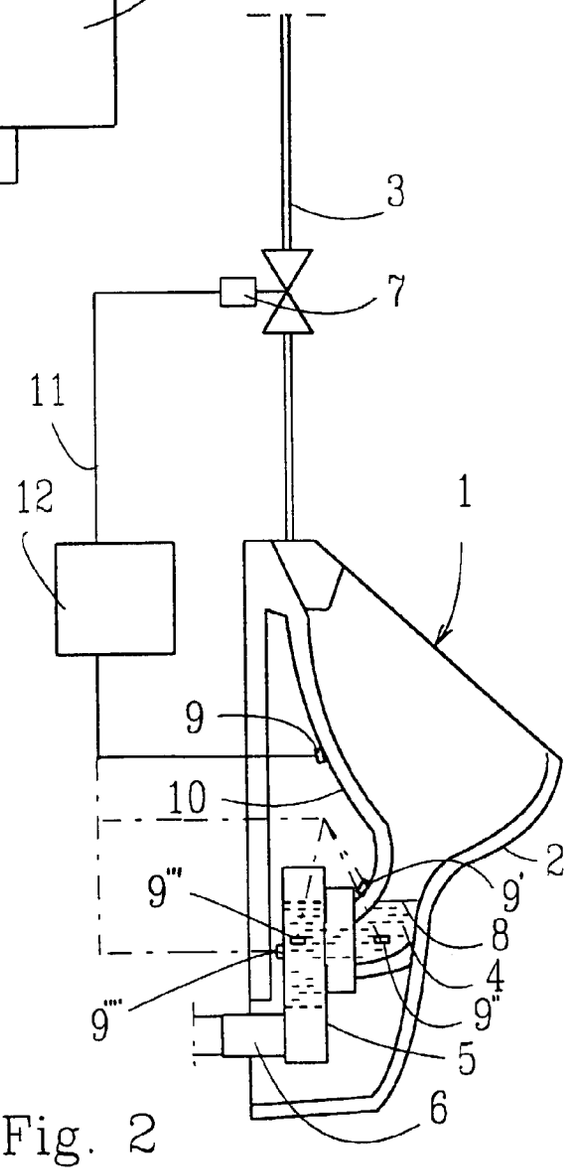

Fig. 2