

Method of, and apparatus for, introducing a cleaning agent
and/or disinfectant into sanitary facilities

The present invention relates to a method according to
5 claim 1 and to an apparatus according to claim 6.

In addition to disinfectant blocks positioned in the flush-
ing-water inflow of WCs, units which add a cleaning and/or
disinfecting liquid to the flushing water at a certain
point in time, or continuously, are also known.

10 A unit which can be suspended on a toilet is known, inter
alia, from WO 93/03232, said unit spraying an oily liquid
into the toilet by way of a straightforward hose pump and
is actuated when someone sits on the seat surface (toilet
seat). This type of pretreatment is intended to reduce dirt
15 deposits.

A self-cleaning toilet (US-A-4,183,105) has, in the flush-
ing cistern, a separate container with a cleaning agent
which, distributed via the pressure of the water line and
via spray nozzles, cleans the walls of the toilet bowl.

20 The disadvantage with these known devices is that both the
point in time at which the liquid is introduced and the
quantity of said liquid can only be adapted to a very lim-
ited extent to the prevailing conditions. The effect is
consequently insufficient and the consumption of cleaning
25 agent is high, as a result of which, if used widely, these
units are extremely harmful to the environment.

The object of the invention is thus to provide an efficient means of controlling and feeding the liquid in dependence on requirements which results in only a minimal, negligible level of harm to the environment, requires minimum maintenance and supplies the liquid such that it has already been provided in the urinal or the toilet before soiling or odor takes hold. The liquid is intended to be distributed uniformly here and to reach all parts which are soiled during normal use.

10 This object is achieved by the features of claim 1.

The operation of monitoring the pressure of the incoming flushing water which is mentioned in the patent claim and the significant drop in pressure which can be detected at the end of each flushing operation allow the liquid supply to be optimized, with correct timing, while the harmful effects produced by the active agents are kept minimal.

The subject matter of the invention makes use of the finding that each non-stationary operation has to have its own characteristics, which, in the case of reproducible operations, can also generate reproducible signals.

Taking this as the departure point, it is possible to determine the ideal point in time for adding a liquid such that it is still distributed in the installation, but is not unnecessarily diluted and/or flushed away by water flowing in after it. The effects, of oily emulsions in particular, is thus maintained until the installation is next used and prevents, or at least reduces, the subsequent soiling of the same to a quite considerable extent.

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allows particularly efficient metering of the quantity of liquid. In this case, the last time interval with already reduced water pressure is preferably determined in order in the next flushing operation, in the stored interval, to add
5 the liquid with the correct timing.

This apparatus is advantageous in comparison with the single determination of the drop in pressure, in particular, when pressure fluctuations or effects of the building (structure-borne sound, etc.) are to be expected. In addition,
10 tion, it is thus possible for the metering quantity of the liquid to be coordinated empirically with the local requirements.

Arranging the pressure sensor in an intermediate container according to claim 7 has proven successful and results in
15 reproducible and easily further processible signal profiles.

A very effective and easy-to-realize way of mixing the liquid in the flushing water is achieved by an ejector, according to claim 8.

20 The design according to claim 9 is favorable in terms of flow and energy and is additionally very cost-effective to produce and to maintain, since it does not require any auxiliary energy.

The configuration according to claim 10 does not require
25 commercially available flushing cisterns to be changed in any way and is thus suitable, and easy to implement, in particular for subsequent installations.

Advantageous developments of the invention are described in the following dependent claims.

A mixing section is particularly favorable for installation in existing facilities since such a mixing section can
5 easily be integrated in the flushing line, and adapted, as a type of intermediate element.

The embodiment according to claim 2 ensures good mixing of the liquid with the flushing water, even with the pressure decreasing.

10 The variant according to claim 3 is particularly cost-effective and largely maintenance-free.

Monitoring the usage according to claim 4 helps to reduce the need for suitable liquid, the maintenance intervals (replacement of the liquid containers) and to reduce fur-
15 ther the harmful effects to the water.

The apparatus according to claim 5 is used for straightforward pressure monitoring of the flushing operation and allows particularly efficient metering of the quantity of liquid. In this case, the last time interval with already
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Fig. 2 is depicted analogously, in conjunction with a likewise conventional toilet bowl 70; once again, the branch lines 5 serve for directing the liquid in.

Figs 1 and 2 show, by way of example, how the subject matter of the invention can be used universally.

An apparatus, which can likewise be used universally, for implementing the method claimed can be gathered from fig. 3.

The storage container 2, which is closed off by a stub 2a and is filled with a suitable liquid 3 up to the level N1, is connected to the atmosphere via an air duct 2'.

Terminating above the closure stub 2a is a suction line 4a which is present beneath said stub and to which there is connected a connecting hose 10, which terminates at a connection nipple 44 on the top flange 42 of a pump 40 with electric motor 41 attached.

At a further connection nipple 45, a pressure hose 46 is plugged on the pump body 43 and leads to an intermediate container 20, which forms the housing for a pressure-monitoring means.

This intermediate container 20 is filled with the liquid 3 up to a level N2; located above this is an air cushion 9 which is closed off by a silicone diaphragm 7, on which, on a substrate 8 (thin laminate) made of epoxy resin, a pressure sensor 6, a commercially available piezo element (disk of 20 mm diameter printed with piezo silver), is adhesively bonded. Two electric lines 22 are routed out through a top

Fig. 4 shows a further-developed ejector for introducing a cleaning and/or deodorizing liquid, installed in a mixing section, and

Fig. 5 shows the typical signal profile during a flushing operation, measured over a column of liquid.

The three illustrations of fig. 1, depicted one beside the other, each show a well-known urinal 60 which is fastened on a wall W and provided with a supply means 1 for flushing water and a metering unit 100, with a storage container 2 for a suitable liquid.

The first illustration from fig. 1 shows how the liquid is added to the supply means 1 downstream of a flushing cistern 50 by a branch line 5; the second illustration has a conventional, automatic flushing valve 80 instead of the flushing cistern. According to the third drawing, the liquid is directed into the supply means 1 via the flushing cistern, while the flushing operation is initiated manually via a flushing button 90.

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flushing operation, the control signal ST which is necessary for controlling the pump 40.

It would be possible, in principle, to prepare the end of the flushing operation directly as a control signal ST by way of the drop in pressure at the air cushion 9.

By way of measuring the overall signal profile s , amplitude A of the function of the time t in seconds, according to fig. 5; establishing the flushing time Δt_1 and measuring the last time interval Δt_2 , during which the pressure P dissipates to a significant extent, it is possible to calculate, and/or set experimentally, the ideal point in time for the metering operation $Met.$ in order to use this in the next flushing operation. In practical usage, it has been found that the interval Δt_3 expediently commences approximately 1 second before the end of the flushing operation. The point in time of the metering operation $Met.$ may be further optimized in that, in the previously determined time interval Δt_2 , the currently measured drop in pressure (gradient) is utilized for this purpose.

It is, of course, possible, by virtue of the abovedescribed learning function, to allow and compensate, within wide limits, for fluctuations in the flushing operation and in the pressure P of the supply means 1.

While fig. 3 shows the simplest configuration of an ejector 16 in conjunction with a pump 40, fig. 4 illustrates further developments which make it possible to use a weaker pump or to replace the pump altogether by a straightforward shut-off value 18.

Via the ejector 16, it is possible for the pressure p in the supply means 1 to be monitored and evaluated and for the results to be utilized for the next flushing operation, for optimum addition of the liquid 3.

5 This takes place as follows:

Following installation of the metering unit 100 above the supply means 1, the pump 40 is switched on via a control line ST until the liquid 3 passes out of the ejector 16 at a pressure p . The air cushion 9 forms in the intermediate
10 container 20 in the process, with the result that fluctuations in the pressure P in the supply means 1 are detected by the sensor 6, via the column of liquid in the pressure line 4b, and can be registered as a signal s in the electronic control unit 30, which is supplied with power by way
15 of a battery 31. The signal s , which is compared, in an analogous comparator C, with an internal reference signal in a manner known per se and then amplified, is evaluated in a microprocessor μP , and the signal profile is standardized over time and stored in order to provide, in the next
20 flushing operation, the control signal ST which is necessary for controlling the pump 40.

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25 By way of measuring the overall signal profile s , amplitude A of the function of the time t in seconds, according to fig. 5; establishing the flushing time Δt_1 and measuring the last time interval Δt_2 , during which the pressure P dissipates to a significant extent, it is possible to cal-

metered amounts of from 0.1 to 0.2 ml for a urinal and in
metered amounts of 0.1 to 0.3 ml for a WC. In order to en-
sure toilet-usage-dependent dilution and a uniform cleaning
and protective action of the active ingredient, along with
5 minimal consumption, it is recommended to vary the pumping
capacity and/or the quantity of active ingredient pumped.
This can take place, for example in the case of flushing
cisterns with an "economy button", by a microswitch which
switches over the rotational speed of the pump motor or
10 preferably by the evaluation of the flushing time for the
purpose of determining the running time of the pump.

The measures illustrated make it possible to limit the con-
sumption of active ingredient to an absolute minimum, with
the result that, even in the case of a multiplicity of in-
15 stalled units with frequently used toilets, there are no
additional harmful effects to the central sewage clarifica-
tion plant.

The subject matter of the invention, discussed here as a
separate unit, can easily be integrated in refurbished
20 sanitary installations, with the result that there is a re-
duction in the risk of damage caused by vandalism etc., in
particular in public restrooms.

The shape of the head of the nozzle 17 is designed in a manner known per se such that a negative pressure $-p$ relative to the pressure P of the flushing water is established at the nozzle bore, with result that the liquid 3 - even
5 without a pump - is drawn in and mixed.

In cases where the drop in pressure which can be achieved at the nozzle 17 results in an insufficient suction action, a venturi insert 11 is provided, either in a fixed manner in the mixing section 13 or such that it can be pushed into
10 the same.

The pressure line 4b is screwed into the mixing section 13 in a pressure-tight manner by sealing nipples 4'; the shut-off valve 18 is provided, in a well-known manner, with a solenoid 19 and is likewise activated by the control signal
15 ST, or the corresponding valve tappet, in order to allow throughflow of the liquid 3.

It has been found that it is sufficient to add active-ingredient containing liquid according to the invention in metered amounts of from 0.1 to 0.2 ml for a urinal and in
20 metered amounts of 0.1 to 0.3 ml for a WC. In order to ensure toilet-usage-dependent dilution and a uniform cleaning and protective action of the active ingredient, along with minimal consumption, it is recommended to vary the pumping capacity and/or the quantity of active ingredient pumped.
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The measures illustrated make it possible to limit the consumption of active ingredient to an absolute minimum, with the result that, even in the case of a multiplicity of installed units with frequently used toilets, there are no
5 additional harmful effects to the central sewage clarification plant.

The subject matter of the invention, discussed here as a separate unit, can easily be integrated in refurbished sanitary installations, with the result that there is a reduction in the risk of damage caused by vandalism etc., in
10 particular in public restrooms.

Patent Claims

1. A method of introducing a cleaning, disinfecting
and/or deodorizing liquid into sanitary facilities,
5 in particular into sanitary installations such as a
urinal or WC, the liquid being mixed with the incom-
ing flushing water with the water pressure already
reduced, and the individual flushing operations being
detected, characterized in that the pressure of the
10 flushing water is monitored, in that a minimal quan-
tity of the liquid is only added to the flushing wa-
ter in a final time interval such that those regions
of the sanitary facility which are to be kept clean
are wetted as completely as possible with the mixed
15 liquid, with the lowest possible level of dilution,
and in that the liquid is mixed and/or vortexed in
the incoming flushing water in a mixing section ar-
ranged upstream of the sanitary installation.
2. The method as claimed in claim 1, characterized in
20 that the liquid is added to the incoming flushing wa-
ter at a positive pressure.
3. The method as claimed in claim 1, characterized in
that the liquid is taken in by suction by the flush-
ing water itself.
- 25 4. The method as claimed in claim 1, characterized in
that, in the case of flushing water flowing into the
installation repeatedly at short time intervals, the
liquid is added in an alternating manner or periodi-
cally and, in the case of flushing water flowing in

at longer time intervals, the liquid is added to each individual flushing operation.

5. An apparatus for implementing the method as claimed in one of claims 1 to 4, having a supply means for flushing water and a storage container for the liquid and a line connected to said container, characterized in that connected to the supply means (1) is a branch line (5) which is provided with a pressure sensor (6), in that the pressure sensor (6) detects the entire flushing duration (Δt_1) and stores it in an electronic control unit (30), and in that, measured as from the drop in pressure which occurs in the last time interval (Δt_2), said electronic control unit activates during the next-following and/or further flushing operations, in a preselected metering interval (Δt_3), a pump (40) connected to the storage container and/or a shut-off valve (18), which deliver the liquid (3) and/or allow it to flow into the flushing water.
6. The apparatus as claimed in claim 5, characterized in that the pressure sensor (6) is contained in an intermediate container (20) for the liquid (3), and above the liquid level (N2), in the intermediate container (20), a diaphragm (7) is arranged parallel to said level (N2).
7. The apparatus as claimed in claim 5, characterized in that provided in the supply means (1) is an ejector (16; 16') which is connected to the pump (40) or has the shut-off valve (18) arranged upstream of it.

8. The apparatus as claimed in claim 5, characterized in that the ejector (16') and/or an insert (11) are/is designed in accordance with the venturi principle and draw/draws the liquid (3) from the container (2) by suction.
- 5
9. The apparatus as claimed in claim 7, characterized in that the ejector (16, 16') is introduced in a flushing cistern (50) as a coaxial, inner line through the guide tube of a float or the supply means (1) for the flushing water and/or through the outflow of the
- 10
- flushing cistern (50).