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54 **Recirculation shower system**

57 A computer-controlled shower system is described wherein the shower system comprises: a water collection reservoir arranged to collect water dispensed by a shower head; a first pump for circulating water from the water collection reservoir to the shower head via a recirculation line; one or more fresh water taps, preferably one or more cold and hot fresh water taps, for supplying fresh water to the water collection reservoir; a cleaning liquid dispenser for dispensing a cleaning liquid into the water collection reservoir and/or recirculation line; and, a computer system arranged to execute one or more cleaning processes of the shower system by controlling at least the first pump, the one or more fresh water taps and the cleaning dispenser.

Recirculation shower system

Field of the invention

5 The invention relates to recirculation showering, and, in particular, though not exclusively, to a recirculation shower system, a computer-controlled recirculation shower system and a network-controlled shower system comprising a plurality of recirculation shower systems.

10

Background of the invention

 Recirculation showers are mainly used as wellness showers. With a limited amount of water, a much higher water flow rate can be dispensed via the shower head. Usually, the wellness showers also comprise a conventional shower, so a user may first wash himself and then, after the used soapy water has been rinsed away, the user can switch over to the recirculation shower for enjoying the comfort of a wellness shower. An example of such a wellness shower is disclosed in WO 2014/206685.

 A user may want to mix the recirculated water with fresh water, for example to keep the water at a comfortable temperature. Mixing in fresh water should not result in frothing and inclusion of air in the recycled water. Also, official regulations exist requiring constructional measures to avoid contamination of fresh water supply by used, recycled water.

 Additionally, the use of recycled water may increase the risk of contamination and/or clogging of filters that are used in such shower system. Hence, care is required in order to keep the shower system clean and free of contaminants. Especially, in use cases involving a large amount of shower

systems (e.g. in a hotel or a hospital), a part of the showers may not be active during a substantial time period so that under certain conditions the risk of legionella contamination may be considerable. Hence, from the above it follows that there is a need in the art for improved recirculation showers.

Summary of the invention

10 It is an object of the present invention to provide a recirculation shower system that is capable of cleaning interior parts of the recirculation shower after usages of the recirculation shower. Further, it is an object of the present invention to provide a recirculation shower system
15 that complies with official regulations for avoiding contamination of water supply lines and recirculation lines of the shower system.

In an aspect, the invention may relate to a recirculation shower system comprising: a water collection reservoir
20 arranged to collect water dispensed by a shower head; a first pump for circulating water from the water collection reservoir to the shower head via a recirculation line; one or more fresh water taps, preferably one or more cold and hot fresh water taps, for supplying fresh water to the water
25 collection reservoir; and, a computer system arranged to execute one or more cleaning processes of the shower system by controlling at least the first pump and the one or more fresh water taps. Hence, the recirculation shower is
30 connected to a computer systems that controls the shower, in particular the recirculation pump and the fresh water tap so that the shower, in particular the supply lines of the fresh water taps and/or the recirculation line can be cleaned with fresh water.

In an embodiment the shower system may further comprise:
one or more flow sensors and/or temperature sensors in the
recirculation line and/or in the supply lines of the one or
more fresh water taps. In an embodiment, the computer system
5 may use sensor information generated by the one or more flow
sensors and/or temperature sensors for executing the one or
more cleaning processes. Hence, the computer may use the
input of sensors. Such sensors may include temperature
sensors in the lines, e.g. fresh water lines and/or
10 circulation line, or a temperature sensor for measuring the
ambient temperature. For example, if the temperate of water
in the supply lines of the fresh water tap is above a certain
temperature, the computer may start a clean process that
includes flushing the supply lines in order to avoid
15 legionella contamination.

Other sensors include flow sensors for measuring the flow
in the fresh water lines and/or circulation line. For
example, the computer may determine that the flow in the
recirculation line is decreasing over time. This information
20 may be an indication that the filter in the pump is clogging
so that the computer may start a cleaning process by filling
the reservoir, the pump and the recirculation line with a
cleaning liquid that is suitable for cleaning the filters.

In an embodiment, the shower system may further comprise
25 a cleaning liquid dispenser for dispensing a cleaning liquid
into the water collection reservoir and/or recirculation
line.

In an embodiment, the computer system may be further
arranged to execute one or more cleaning processes of the
30 shower system by controlling at least the first pump, the one
or more fresh water taps and the cleaning liquid dispenser.

In an embodiment, the computer system may be further arranged to: dispense a predetermined amount of fresh water and cleaning liquid into the water collection reservoir.

5 In an embodiment, the computer system may be further arranged instruct the pump to pump water comprising the cleaning liquid into the recirculation line for cleaning the recirculation line.

10 In an embodiment, the cleaning liquid may be arranged to decalcify the water collection reservoir, pump parts and/or the recirculation line.

15 In an embodiment, the computer system may be further arranged to: control the temperature of the dispensed amount of fresh water by mixing cold and hot fresh water by controlling the fresh water taps and measuring the temperature using a temperature sensor. Hence, during the cleaning process, water of elevated temperatures may be used in order to accelerate the cleaning process.

20 In an embodiment, the computer system may be further arranged to: monitor the use of the shower and the temperature of water in the supply lines of the one or more fresh water taps

25 In an embodiment, the computer system may be further arranged to flush the supply lines with fresh water if the shower has not been used for a predetermined period and the temperature of the water in the supply lines is above a predetermined temperature.

In an embodiment, the computer system may be further arranged to:

30 receive a user signal from a user interface, preferably a graphical user interface, the user signal triggering at least one cleaning process of the one or more cleaning processes.

In an embodiment, the computer system may be further arranged to: receive a server signal from network server, the

server signal triggering at least one cleaning process of the one or more cleaning processes.

In an embodiment, the one or more fresh water taps is arranged above a predetermined height above the maximum
5 water level of the water collection reservoir.

In an embodiment, the cleaning liquid may be arranged to decalcify the water collection reservoir, pump parts and/or the recirculation line.

In another aspect, the invention may relate to a shower
10 system comprising: a water collection reservoir arranged to collect water dispensed by a shower head; a first pump for circulating water from the water collection reservoir to the shower head via a recirculation line; one or more fresh water taps, preferably one or more cold and hot fresh water taps,
15 for supplying fresh water to the water collection reservoir; and, a cleaning liquid dispenser for dispensing a cleaning liquid into the water collection reservoir and/or recirculation line.

In a further aspect, the invention may relate to a
20 network-controlled shower system comprising: a network server communicatively connected to a plurality of computer-controlled shower systems as described above, wherein the network server may comprise a server application configured to: monitor sensor information and/or usage information of
25 each of the computer-controlled shower systems; and, on the basis of the sensor information and/or usage information instructing one or more computer-controlled shower systems to start one of the one or more cleaning processes.

30 Brief description of the drawings

Fig. 1 schematically depicts a shower system according to an embodiment of the present invention;

Fig. 2A and **2B** show at least part of a shower system according to an embodiment of the invention.

Fig. 3A and **3B** depict flow diagrams of cleaning processes according to various embodiments of the invention;

5 **Fig. 4** depicts a schematic of a plurality of computer controlled shower systems connected to a server according to an embodiment of the invention.

Fig. 5 is a block diagram illustrating an exemplary computer system that may be used in as described in this
10 disclosure.

Detailed description

Fig. 1 shows a computer-controlled shower system **100**
15 according to an embodiment of the invention. The shower system may include a recirculation shower **102** and a separate conventional shower **104**, both having shower heads **106, 108** arranged above a water collection reservoir **110**. The water collection reservoir **110** is provided with an overflow outlet
20 (not shown). A recirculation line **112** fluidly connects the water collection reservoir **110** to the shower head **108** of the recirculation shower. A first pump **114** (a recirculation pump) may be arranged in the recirculation line **112** to circulate water from the water collection reservoir **110** to the shower
25 head **108** of the recirculation shower.

The shower system **100** may comprise a computer controlled hot and cold water mixing tap **126** connected to a supply line **118** for hot tap water and a supply line **120** for cold tap water. Proportional valves **122, 124** in the supply lines **118, 120** are configured to regulate the flows in the supply lines
30 to obtain tap water of a desired temperature. To that end, the hot and cold water supply lines may include temperature and flow sensors **119**. The cold and hot water taps **126** of the

supply lines may have an outlet comprising an airgap of at least a predetermined height, preferably at least 2 cm, above the highest possible water level in the water collection reservoir **110** (e.g. the water level in the water collection reservoir when the drains **116** would be clogged). The airgap prevents possible backflow of contaminated water into the fresh water supply lines.

Although not shown in **Fig. 1**, the tap may be hidden from view, e.g., by a front panel. The front panel may comprise a user interface **127**, e.g. a graphical user interface, for user control of the shower. Processes for controlling the shower system will be described hereunder in more detail.

The conventional shower **104** may be operatively connected to the public water supply network with hot and cold water supply lines **128,130** which are strictly separated from the recirculation flow. A (motorized) thermostat **132** allows a user to maintain the shower water at a desired temperature selected via a user interface at the front panel.

The user interface communicates with a control unit allowing a user to switch between a circulation flow via the recirculation shower **102** and a drained shower flow via the conventional shower **104**.

The wellness shower system further comprises a drain **116** comprising a controllable drain valve for selectively closing or opening the drain (not shown). When using the conventional shower **104**, the drain valve activated to open the drain **116**. The user can wash himself with soap and the spent soapy water is drained via the open drain **116**. The water temperature of the conventional shower can be monitored using first temperature sensor **134**. Further, the water flow of the conventional shower can be controlled using a first valve **136**.

When using the recirculation shower **102** the drain valve is closed mixing tap **126** is open. Water is collected in the water collection reservoir **110** until a level sensor in the water collection reservoir (not shown) detects that the water level in the water collection reservoir has reached a desired minimum level. At that moment the pump **114** is activated and the circulation flow starts directly. The flow rate through the recirculation line may be controlled by second valve **140**, which may be controlled via the user interface so that a user can set a desired flow rate.

The user can select and set the water temperature via the user interface. During circulation flow the recirculated water tends to cool down. To maintain the water temperature at the selected level, the water taps **126** are adapted to mix hot water into the water collected in the water collection reservoir **110**, e.g., continuously or intermittently. A temperature sensor and a flow sensor **138** may be provided in the recirculation line **112**. The flow rate and/or temperature of the water from the tap **126** may be adjusted in response to signals from the flow rate and/or temperature sensor **138**.

During circulation flow, excess water is discharged from the water collection reservoir via the overflow outlet (not shown) with a flow rate approximately corresponding to the flow rate of the tap **126**.

A replaceable filter **146** in the water collection reservoir and positioned at the inlet of the pump may filter water entering the inlet of the pump **114**. A proximity sensor **148** may detect if the filter is correctly installed before the pump inlet. A UV-source **142** is integrated in the circulation line **112** to clean the circulated water from contaminates, e.g. microorganisms.

All the sensors, the valves, the UV source and the user interface of the shower system may be connected to a computer

system **150** that is configured to receive sensor signals (temperature, flow rates, pressure, valve settings, etc.), store the sensor signals in a memory **152**. The memory may comprise one or more executable computer programs comprising executable program code that can be executed by a processor **153** in the computer system. The computer programs may be configured to control the recirculation process.

For example, in case, a user interacts with the user interface to set the water temperature of the recirculation shower at a predetermined temperature, the processor may receive the user temperature from the user interface **127**. Based on these temperature settings, the processor may adjust the flow rate and/or temperature of the water from the tap **126** until the temperature sensor **138** in the recirculation line indicates that the desired temperature has been reached.

The shower system may further comprise a cleaning system that is configured to clean the shower system or parts thereof. The cleaning system may include a container **154** for containing a cleaning liquid. A second pump **156** (a dispensing pump) in a cleaning liquid supply line **158** that is connected to the container may be arranged to controllably dispense predetermined amount of a cleaning liquid into water collection reservoir and/or the recirculation line. The second pump may be connected to the computer system so that it can be controlled during a cleaning process.

In an embodiment, the computer system may execute a cleaning process which may include the steps of: filling the water collection reservoir **110** with water of a predetermined temperature by controlling the water taps **126**; dispensing a predetermined amount of a cleaning liquid to the water in the water collection reservoir by controlling the second pump; and, filling the recirculation line **112** with the cleaning liquid containing water by controlling the recirculation pump

114. This way, the recirculation line **112** and the filter **146** can be cleaned by the cleaning action of the cleaning liquid, the temperature and/or by pumping cleaning liquid containing water in and out of the recirculation line.

5 In another cleaning process, the computer may execute the steps of: filling the water collection reservoir **110** with water of a predetermined temperature by controlling the water taps **126**, filling the recirculation line **112** with the cleaning liquid containing water by controlling the
10 recirculation pump **114**; releasing the water from the recirculation line and, optionally, repeating the filling and the release of the water into and out of the recirculation line a predetermined number of times. This way, the shower may flush the reservoir, pump and recirculation line with
15 fresh water.

 In an embodiment, the cleaning action may be enhanced by increasing the temperature of the water and/or by activating the UV source during the cleaning process.

 Various cleaning programs may be executed by the computer
20 system. The computer system may start a cleaning process in response to a signal of a user. For example, when a user is finished, he may turn of the shower by interacting with the user interface. In response to the user signal to stop the shower session, the computer system may start a cleaning
25 program, wherein (parts of) the shower system, such as the recirculation line **112** is flushed with fresh water, water comprising a cleaning liquid or a cleaning liquid.

 Alternatively, a clean process may start in response to a sensor signal and/or an external signal received by the
30 computer system. For example, the computer system may monitor the use of the shower system. In case it signals and/or the shower has not be used for a predetermined time and the temperature of the cold water tap is over a predetermined

temperature, the computer system may start flushing the cold water tap with fresh water and, optionally, to flush the recirculation line with a cleaning liquid in order to avoid legionella contamination.

5 In an embodiment, the computer system **150** may be communicatively connected to the network, e.g. a network server. The computer system of the shower system may transmit sensor information and/or usage information to the server which may monitor and store the sensor and/or usage
10 information. Further, the computer system may be arranged to receive instructions from the server. For example, a server application that is running on the server may instruct the computer system of the shower system to start a cleaning process. The server application may determine to start such
15 cleaning process on the basis of the monitored information.

Fig. 2A and **2B** show at least part of a shower system according to an embodiment of the invention. In particular, **Fig. 2A** and **2B** illustrate a cross-sectional front-view and cross-sectional side view of at least part of a shower system
20 as for example described with reference to **Fig. 1**. The recirculation shower comprises a shower head (not shown) and a water collection reservoir **210** arranged to collect water dispensed by the shower head. The water collection reservoir **210** has an upper edge **211** defining a maximum water level. A
25 pump **214** (see **Fig. 2B**) circulates water from the water collection reservoir to the shower head via a recirculation line **212**. To mixing of the recycled water flow with fresh water, the recirculation shower is provided with cold and hot water taps **226_{1,2}**, for supplying hot and cold fresh water
30 respectively.

Water flowing from the taps flows via a funnel **213** into a chamber **233** with an open side. The chamber **233** has an outlet opening **235** below the maximum water level of the water

collection reservoir **210**. The chamber **233** has an inclined bottom **237**, inclining downward towards the outlet opening **235** in order to guide the water flow gently into the water collection reservoir 3 without frothing.

5 The chamber **233** may be part of a removable filter housing **245** comprising a filter **246** crossing a flow between the water collection reservoir **210** and the recirculation pump **214**. In the shown embodiment, the filter **246** may form a horizontal bottom side of the filter housing, attached to the rest of
10 the filter housing by means of a magnet (not shown). The filter is spaced from the bottom of the water collection reservoir in order to allow water to flow via the filter to an opening **247** in the backside of the filter housing, which may form the input of the recirculation pump **214**.

15 The filter housing **246** is removable, so it can easily be cleaned. To allow easy removal and replacing the filter housing is provided with a handle **260**.

 As shown in **Fig. 2A** and **2B**, the shower may further a cleaning system including a container **254** for containing a
20 cleaning liquid **255**. A second pump **256** in a cleaning liquid supply line **258_{1,2}** that is connected to the container may be arranged to controllably dispense a cleaning liquid into the lines of the shower system. The cleaning liquid supply line may dispense the cleaning liquid into the funnel **213** together
25 with water from the cold and hot water taps **235_{1,2}** so that the cleaning liquid is well mixed with the water before it is released into the water collection reservoir **210**.

Fig. 3A and **3B** depict flow diagrams of cleaning processes according to various embodiments of the invention. **Fig. 3A**
30 depicts a flow diagram wherein in a first step **302** the computer system of the shower system receives a trigger signal for starting a cleaning process. The trigger signal may be a user signal, e.g. a signal associated with the user

interacting with a user interface of the shower system. The user interface may be a graphical user interface including a touch screen that is integrated in the housing of the shower and connected to the computer system of the shower system.

5 Alternatively, the user interface may be a graphical user interface on a mobile phone or an electronic tablet that is connected to the computer system of the shower using a known wireless protocol including e.g. Bluetooth or Wi-Fi.

If for example, the user interacts with the user interface in order to stop the shower session, the computer system may automatically start a short cleaning cycle.

The cleaning process may start with the computer system dispensing a predetermined amount of fresh water and cleaning liquid into the water collection reservoir while the drain of the water collection reservoir is closed (step **304**). The cleaning liquid may e.g. include a cleaning vinegar for cleaning and decalcify lime scale in the water collection reservoir, the pump parts and the recirculation line. The computer system may use the cold and hot fresh water taps and a temperature sensor in order to fill the water collection reservoir with water of a predetermined temperature. For example, in order to accelerate the cleaning action of the cleaning liquid the computer system may fill the water collection reservoir with water of an elevated temperature.

25 Then, in the second step **304**, the computer system may turn on the recirculation pump in order to fill the recirculation line with the cleaning liquid containing water. If the recirculation line is filled with the cleaning liquid, the pump may be turned off for a predetermined time in order to allow the cleaning liquid to clean and/or decalcify parts of the pump, the filter and the recirculation line.

30 Thereafter, the recirculation line may be opened at the bottom side so that the cleaning liquid containing water can

flow back into the water collection reservoir (step **306**). The process of filling the recirculation line with the cleaning liquid and releasing it back into the water collection reservoir (a cleaning cycle) may be repeated a number of
5 times until the desired cleaning action has been achieved. The number of cleaning cycles may depend on external parameters such as the temperature of the surroundings, the hardness of the water and user settings.

In an embodiment, during the flushing of the
10 recirculation with the cleaning liquid containing water, the computer system may turn on the UV source in order to kill and/or pacify micro-organisms that may have entered the water.

Thereafter, the computer system may open the drain of the
15 water collection reservoir in order to release the water with the cleaning liquid (step **308**). Thereafter, the computer system may fill the water collection reservoir with fresh water in order to flush the recirculation line with fresh water by filling it with water using the recirculation pump,
20 releasing it back into the water collection reservoir and open the drain of the water collection reservoir in order to remove the water (step **310**).

Fig. 3B depicts another a flow diagram wherein in a first step **312** the computer system of the shower system may monitor
25 the use of the shower system (e.g. the usage of the shower in predetermined time periods). The computer system may monitor the use on the basis of sensor information generated by flow and temperature sensors in the lines of the shower system (step **312**). Furthermore, the computer system may monitor the
30 temperature of the water in the supply lines of the freshwater taps (step **314**).

In case the computer system determines that the shower has not be used for a predetermined time and/or the

temperature of the cold water tap is higher than a predetermined temperature, the computer system may start flushing the fresh water supply lines with fresh water by opening the fresh water taps while the drain of the water collection reservoir is open (step **316**).

Hence, this way the computer system eliminates or at least substantially reduces the risk that the water becomes contaminated with legionella. In an embodiment, the process described in **Fig. 3B** may be combined with the process in **Fig. 3A**.

Fig. 4 depicts a schematic of a plurality of computer controlled shower systems **402₁₋₄** connected to a server system **406** according to an embodiment of the invention. In this embodiment, a client application **404₁₋₄** in the computer system of each of the shower systems may communicate with server application **408** that runs on the server system in the network **412**. In an embodiment, the server application may be part of a hotel management system. The server system is configured to receive, monitor and store information, e.g. sensor information and usage information, from each shower system in a database **410**. Based on this information the server application may control individual shower systems, e.g. initiate a cleaning process such as e.g. described with reference to **Fig. 3A** and **3B**. This way, the server applications allows central control and monitoring of a large number of shower systems, e.g. in a hotel or a hospital. It is submitted that part of functionality of the computer system of a shower system as described e.g. with reference to **Fig. 1** may implemented in the network, e.g. the functionality may be part of the server application **408**.

Fig. 5 is a block diagram illustrating an exemplary computer system that may be used in as described in this disclosure. Computer system **500** may include at least one

processor **502** coupled to memory elements **504** through a system bus **506**. As such, the computer system may store program code within memory elements **504**. Further, processor **502** may execute the program code accessed from memory elements **504** via system bus 506. The computer system may be implemented as a computer that is suitable for storing and/or executing program code.

It should be appreciated, however, that computer system **500** may be implemented in the form of any system including a processor and memory that is capable of performing the functions described within this specification. Memory elements **504** may include one or more physical memory devices such as, for example, local memory **508** and one or more bulk storage devices **510**. Local memory may refer to random access memory or other non-persistent memory device(s) generally used during actual execution of the program code. A bulk storage device may be implemented as a hard drive or other persistent data storage device.

The computer system **500** may also include one or more cache memories (not shown) that provide temporary storage of at least some program code in order to reduce the number of times program code must be retrieved from bulk storage device **510** during execution.

Input/output (I/O) devices depicted as input device **512** and output device **514** optionally can be coupled to the data processing system. Examples of input device may include, but are not limited to, for example, a keyboard, a pointing device such as a mouse, or the like. Examples of output device may include, but are not limited to, for example, a monitor or display, speakers, or the like. Input device and/or output device may be coupled to computer system either directly or through intervening I/O controllers. A network adapter 516 may also be coupled to computer system to enable

it to become coupled to other systems, computer systems, remote network devices, and/or remote storage devices through intervening private or public networks. The network adapter may comprise a data receiver for receiving data that is transmitted by the systems, devices and/or networks to the data and a data transmitter for transmitting data to the systems, devices and/or networks. Modems, cable modems, and Ethernet cards are examples of different types of network adapter that may be used with data processing system **550**.

As pictured in **Fig. 5**, memory elements **504** may store an application **518**. It should be appreciated that computer system **500** may further execute an operating system (not shown) that can facilitate execution of the application. Application, being implemented in the form of executable program code, can be executed by data processing system **500**, e.g., by processor **502**. Responsive to executing application, the computer system may be configured to perform one or more operations to be described herein in further detail.

In one aspect, for example, computer system **500** may represent a client computer system. In that case, application **518** may represent a client application that, when executed, configures data processing system **500** to perform the various functions described herein with reference to a "client" or "a client device". Examples of a client (device) can include, but are not limited to, a personal computer, a portable computer, a mobile phone, or the like.

In another aspect, the computer system may represent a server. For example, data processing system may represent an (HTTP) server in which case application **518**, when executed, may configure computer system to perform (HTTP) server operations. In another aspect, data processing system may represent a module, unit or function as referred to in this specification.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises" and/or "comprising," when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

The corresponding structures, materials, acts, and equivalents of all means or step plus function elements in the claims below are intended to include any structure, material, or act for performing the function in combination with other claimed elements as specifically claimed. The description of the present invention has been presented for purposes of illustration and description, but is not intended to be exhaustive or limited to the invention in the form disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the invention. The embodiment was chosen and described in order to best explain the principles of the invention and the practical application, and to enable others of ordinary skill in the art to understand the invention for various embodiments with various modifications as are suited to the particular use contemplated.

CONCLUSIES

1. Recirculatie-douchesysteem, omvattende:
5 een wateropvangbak voor het opvangen van uit een douchekop afkomstig water;
een eerste pomp voor het via een recirculatieleiding circuleren van water uit de wateropvangbak naar de douchekop;
één of meer verswatertappen, bij voorkeur één of meerdere koud en warm verswatertappen, voor het toevoeren van vers water naar de wateropvangbak; en,
10 een computersysteem voor het uitvoeren van één of meer schoonmaakprocessen van het douchesysteem door het regelen van ten minste de eerste pomp en de één of meer verswatertappen.
- 15 2. Douchesysteem volgens conclusie 1, waarbij het douchesysteem verder omvat:
één of meer stromingssensoren en/of temperatuursensoren in de recirculatieleiding en/of in de toevoerleidingen van de één of meer verswatertappen,
20 waarbij het computersysteem door de één of meer stromingssensoren en/of temperatuursensoren gegenereerde sensorinformatie gebruikt voor het uitvoeren van de één of meer schoonmaakprocessen.
- 25 3. Douchesysteem volgens conclusie 1 of 2, verder omvattende:
een schoonmaakvloestofuitgifte-inrichting voor het toevoeren van een schoonmaakvloestof in de wateropvangbak en/of recirculatieleiding;
waarbij het computersysteem verder is ingericht om één of
30 meer schoonmaakprocessen van het douchesysteem uit te voeren door het regelen van ten minste de eerste pomp, de één of meer verswatertappen en de schoonmaakvloestofuitgifte-inrichting.

4. Douchesysteem volgens conclusie 3, waarbij het computersysteem verder is ingericht om:

een voorafbepaalde hoeveelheid vers water en schoonmaakvloeistof in de wateropvangbak toe te voeren; en,

5 de schoonmaakvloeistof bevattend water in de recirculatieleiding te pompen om de recirculatieleiding schoon te maken.

5. Douchesysteem volgens conclusie 3 of 4, waarbij de schoonmaakvloeistof is geconfigureerd om de wateropvangbak, pompdelen en/of de recirculatieleiding te
10 ontkalken.

6. Douchesysteem volgens één van de conclusies 1-5, waarbij het computersysteem verder is ingericht om:

de temperatuur van de toegevoerde hoeveelheid vers water te regelen door het mengen van koud en warm vers water door het
15 regelen van de verswatertappen en het meten van de temperatuur door gebruik te maken van een temperatuursensor.

7. Douchesysteem volgens één van de conclusies 1-6, waarbij het computersysteem verder is ingericht om:

20 het gebruik van de douche en de watertemperatuur in de toevoerleidingen van de één of meer verswatertappen te monitoren; en,

de toevoerleidingen met vers water te spoelen indien de douche niet gebruikt is gedurende een voorafbepaalde periode en de watertemperatuur in de toevoerleidingen boven een vooraf-
25 bepaalde temperatuur is.

8. Douchesysteem volgens één van de conclusies 1-7, waarbij het computersysteem verder is ingericht om:

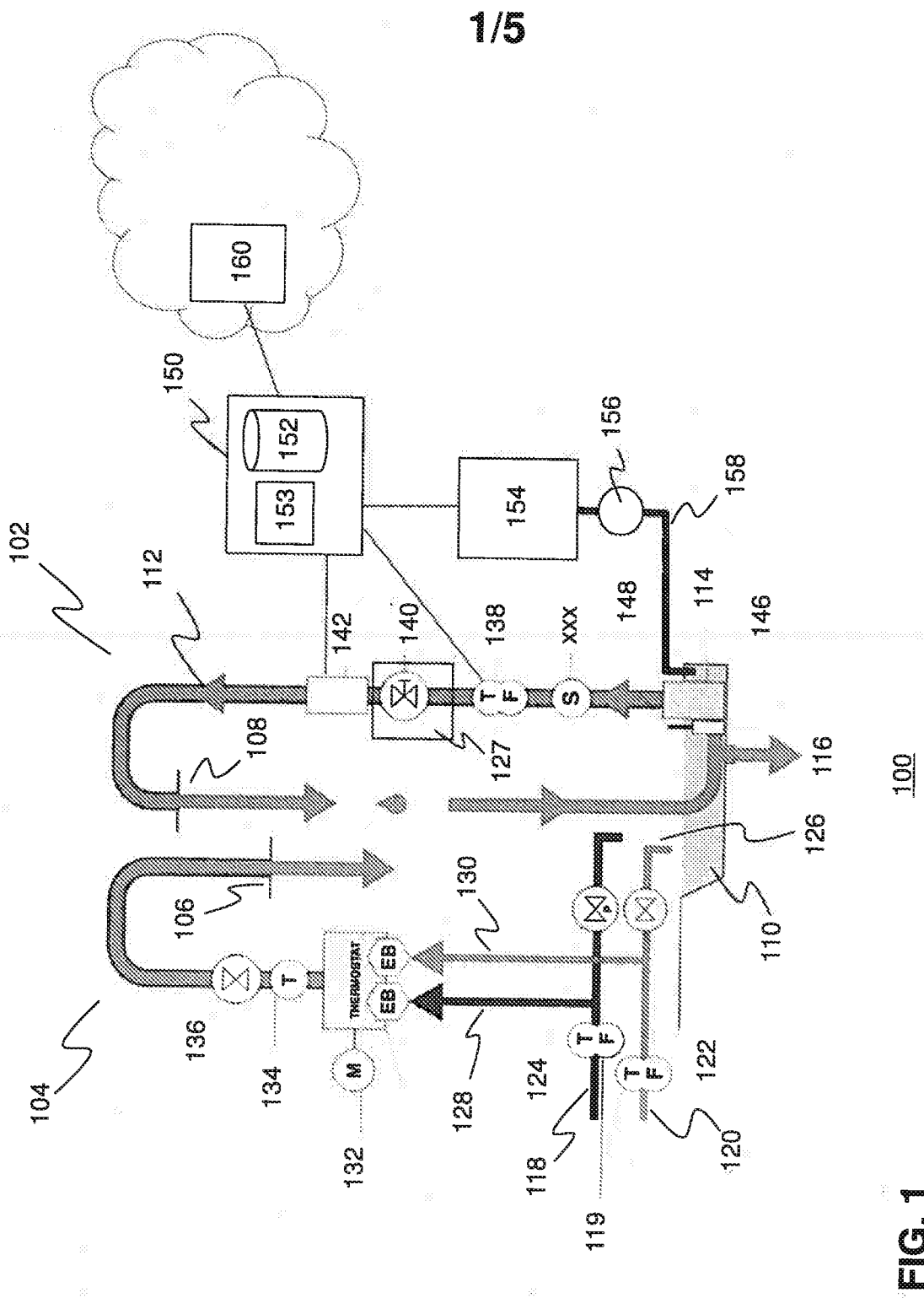
een gebruikerssignaal van een gebruikersinterface te ontvangen, bij voorkeur een grafische gebruikersinterface, waarbij
30 het gebruikerssignaal ten minste één schoonmaakproces van de één of meer schoonmaakprocessen activeert.

9. Douchesysteem volgens één van de conclusies 1-8, waarbij het computersysteem verder is ingericht om:

een serversignaal van een netwerkserver te ontvangen, waarbij het serversignaal ten minste één schoonmaakproces van de één of meer schoonmaakprocessen activeert.

5 10. Douchesysteem volgens één van de conclusies 1-9, waarbij de één of meer verswatertappen boven een vooraf bepaalde hoogte boven het maximale waterniveau van de wateropvangbak zijn geplaatst.

10 11. Een netwerkgestuurd douchesysteem, omvattende: een netwerkserver die communicatief verbonden is met een aantal recirculatie-douchesystemen volgens één van de conclusies 1-10, waarbij de netwerkserver een serverapplicatie omvat die is geconfigureerd om:
sensorinformatie en/of gebruiksinformatie van door computer
gestuurde met de netwerkserver verbonden douchesystemen te
15 monitoren; en,
op basis van de sensorinformatie en/of gebruiksinformatie één of meer recirculatie-douchesystemen te instrueren om één of meer schoonmaakprocessen te starten.



1/5

FIG. 1

100

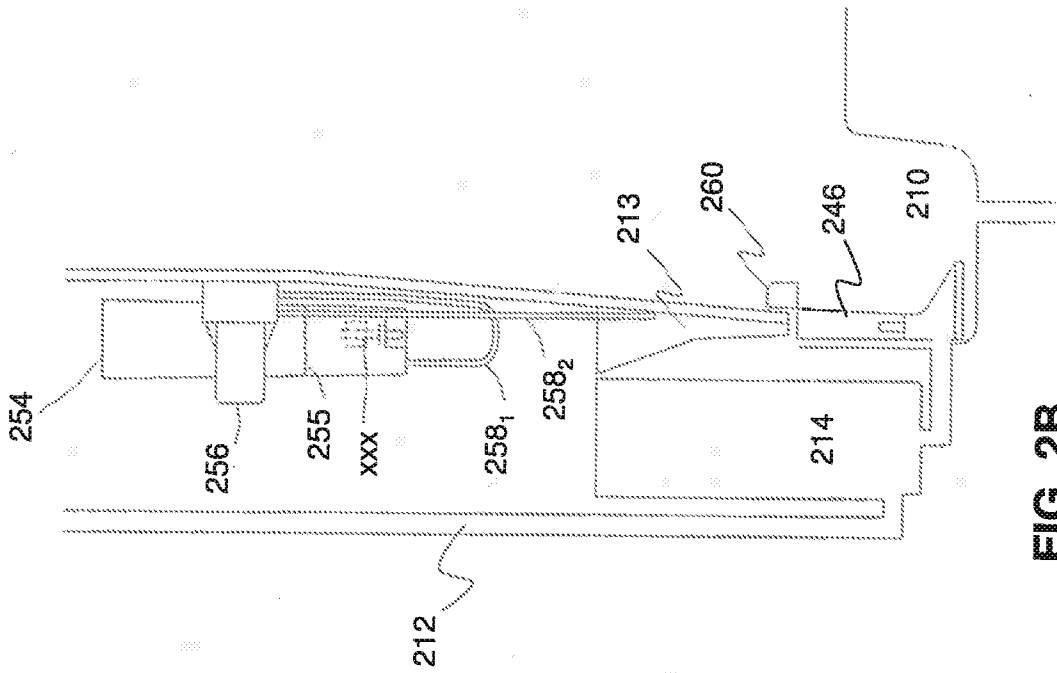


FIG. 2B

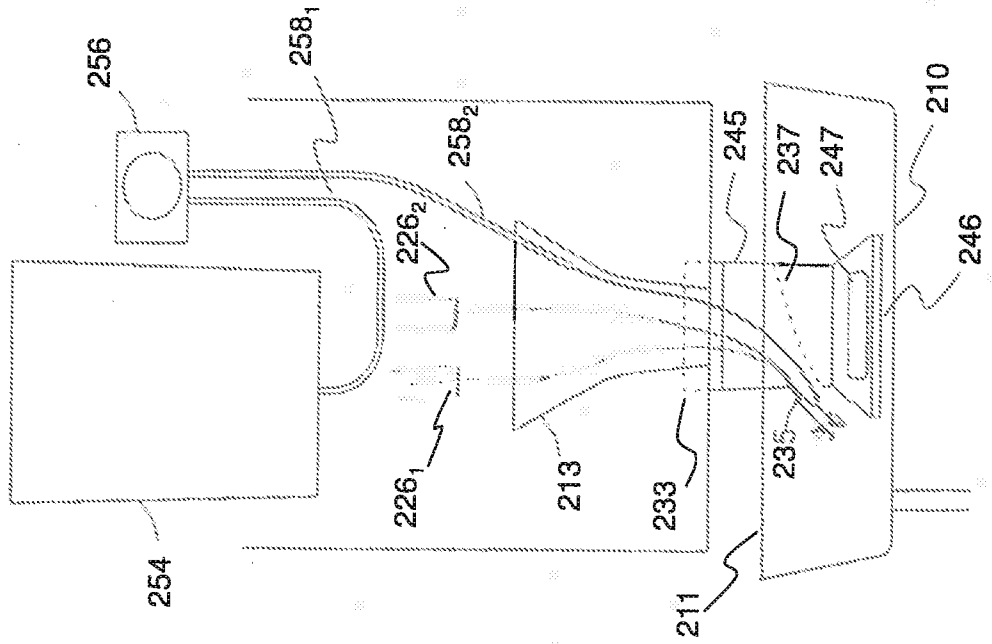


FIG. 2A

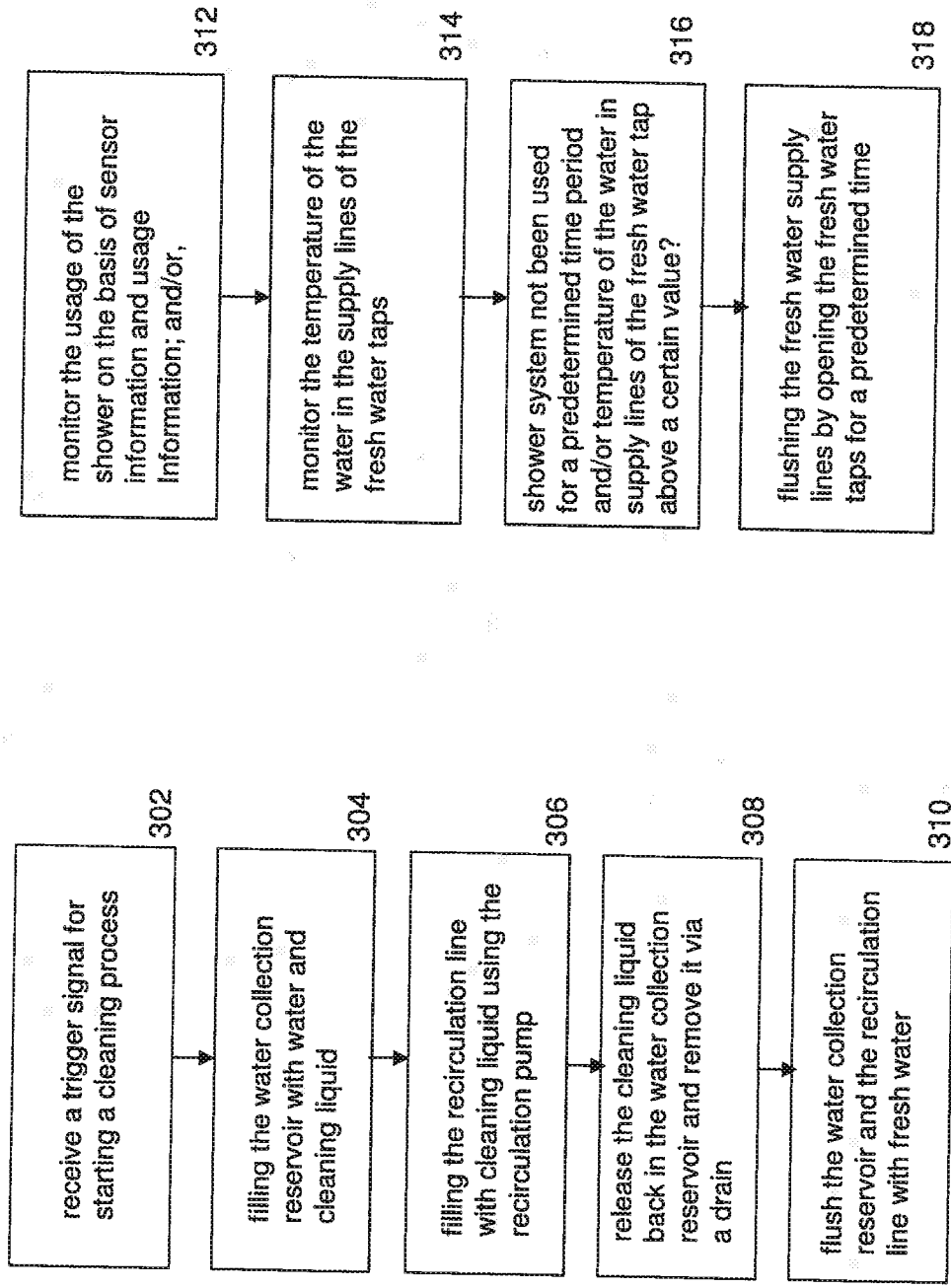


FIG. 3B

FIG. 3A

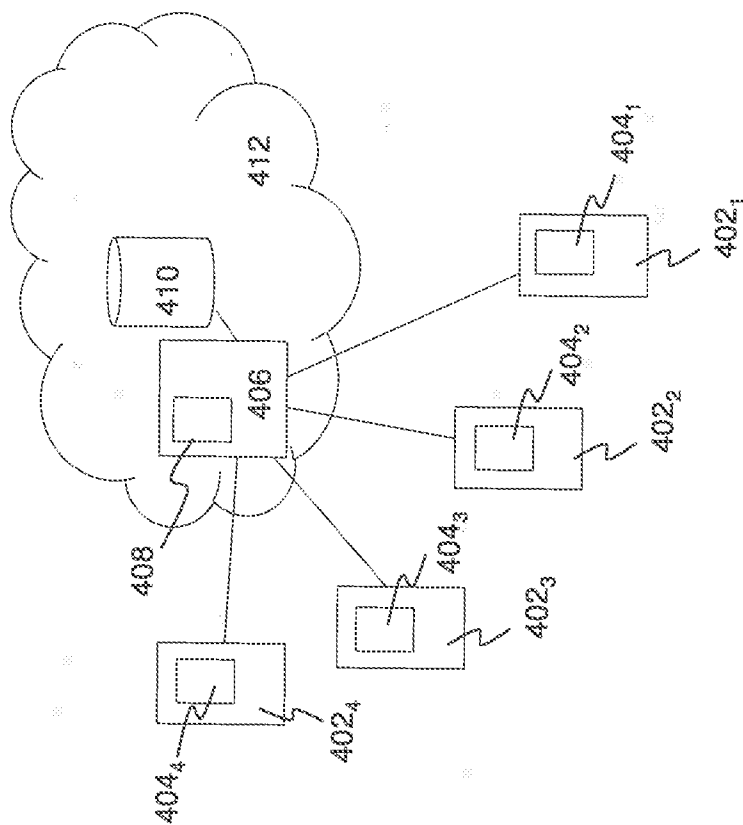


FIG. 4

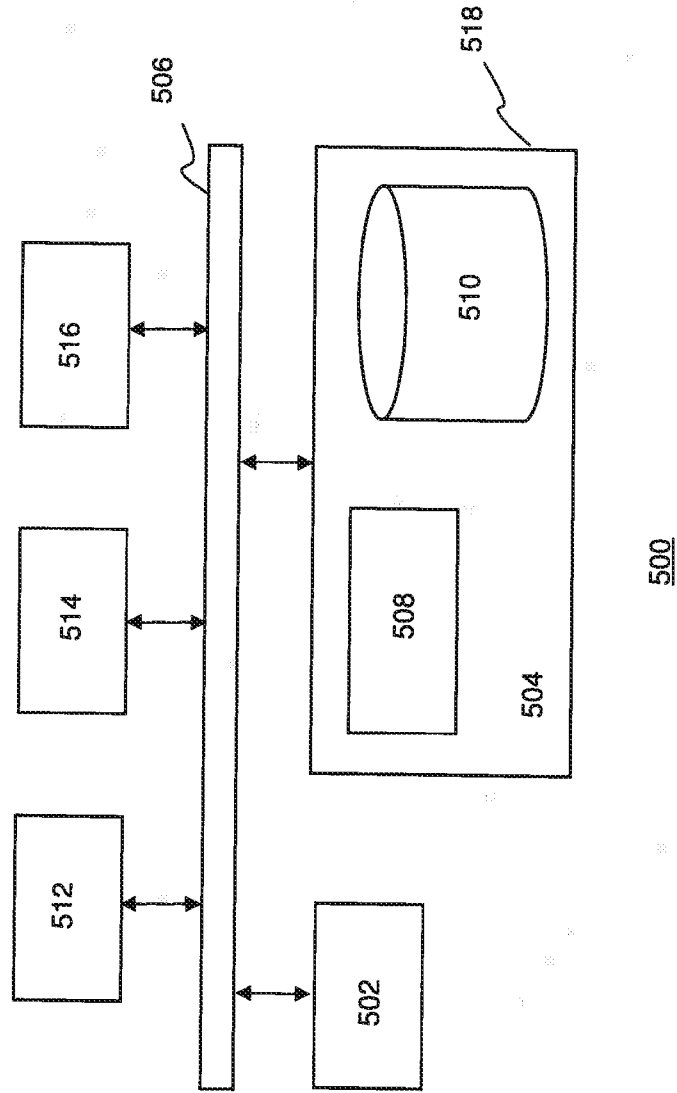


FIG. 5

ABSTRACT

A computer-controlled shower system is described wherein the shower system comprises: a water collection reservoir
5 arranged to collect water dispensed by a shower head; a first pump for circulating water from the water collection reservoir to the shower head via a recirculation line; one or more fresh water taps, preferably one or more cold and hot
10 fresh water taps, for supplying fresh water to the water collection reservoir; a cleaning liquid dispenser for dispensing a cleaning liquid into the water collection reservoir and/or recirculation line; and, a computer system arranged to execute one or more cleaning processes of the shower system by controlling at least the first pump, the one
15 or more fresh water taps and the cleaning dispenser.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	NL24431-Vi/td
Nederlands aanvraag nr.	Indieningsdatum
2017516	22-09-2016
	Ingeroepen voorrangsdatum
Aanvrager (Naam)	
Hamwells Holding BV	
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
07-01-2017	SN68085
I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)	
A47K3/258;A47K3/40;E03B1/04;E03C1/00;E03C1/04	
II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
IPC	A47K;E03B;E03C
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III.	<input type="checkbox"/> GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES (opmerkingen op aanvullingsblad)
IV.	<input type="checkbox"/> GEBREK AAN EENHEID VAN UITVINDING (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2017516

A. CLASSIFICATIE VAN HET ONDERWERP		
INV. A47K3/28	A47K3/40	E03B1/04 E03C1/00 E03C1/04
ADD.		
Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.		
B. ONDERZOCHE TE GEBIEDEN VAN DE TECHNIEK		
Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)		
A47K E03B E03C		
Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen		
Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)		
EPO-Internal, WPI Data		
C. VAN BELANG GEACHTE DOCUMENTEN		
Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 2013/212800 A1 (KALER STUART [US] ET AL) 22 augustus 2013 (2013-08-22) * alinea [0032] * * figuren 3, 6 *	1-11
X	WO 2008/031139 A1 (QUENCH SOLUTIONS PTY LTD [AU]; GAY BRIAN [AU]) 20 maart 2008 (2008-03-20) * bladzijden 10, 11 * * figuur 4 *	1-11
X	WO 2009/147647 A1 (REVEECO INC [CA]; JALLON ROMAIN [CA]; BLAIS-OUELETTE SEBASTIEN [CA]; V) 10 december 2009 (2009-12-10) * bladzijden 13, 14 * * figuur 1 *	1,3-9,11
	-/--	
<input checked="" type="checkbox"/>	Verdere documenten worden vermeld in het vervolg van vak C.	<input checked="" type="checkbox"/>
	Leden van dezelfde octrooifamilie zijn vermeld in een bijlage	
* Speciale categorieën van aangehaalde documenten		
A niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft		*T* na de indieningsdatum of de voorrangdatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding
D in de octrooiaanvraag vermeld		*X* de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur
E eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven		*Y* de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht
L om andere redenen vermelde literatuur		*Z* lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie
O niet-schriftelijke stand van de techniek		
P tussen de voorrangdatum en de indieningsdatum gepubliceerde literatuur		
Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type	
17 februari 2017		
Naam en adres van de instantie	De bevoegde ambtenaar	
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016	Schikhof, Arnout	

**ONDERZOEKSRAPPORT BETREFFENDE HET
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar
 de stand van de techniek

NL 2017516

C. (Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 2016/146376 A1 (PEEL KEVIN T [GB]) 26 mei 2016 (2016-05-26) * figuren 10, 11 * * conclusie 2 *	4,9,11
X	----- EP 2 962 612 A1 (BETGEM HOLDING B V [NL]) 6 januari 2016 (2016-01-06) * figuur 2 * -----	1

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2017516

In het rapport genoemd octrooigeeschrift	Datum van publicatie	Overeenkomst(e) geschrift(en)	Datum van publicatie
US 2013212800	A1	22-08-2013	GEEN
WO 2008031139	A1	20-03-2008	AU 2007295930 A1 20-03-2008 CA 2663223 A1 20-03-2008 EP 2066207 A1 10-06-2009 US 2009300839 A1 10-12-2009 WO 2008031139 A1 20-03-2008
WO 2009147647	A1	10-12-2009	CA 2727150 A1 10-12-2009 EP 2297407 A1 23-03-2011 US 2011146800 A1 23-06-2011 WO 2009147647 A1 10-12-2009
US 2016146376	A1	26-05-2016	CN 103511660 A 15-01-2014 CN 103511665 A 15-01-2014 CN 103511667 A 15-01-2014 CN 103511668 A 15-01-2014 CN 103511669 A 15-01-2014 CN 103511670 A 15-01-2014 CN 103511671 A 15-01-2014 CN 103511672 A 15-01-2014 CN 103511673 A 15-01-2014 CN 103511674 A 15-01-2014 CN 103511675 A 15-01-2014 CN 103511676 A 15-01-2014 CN 103511677 A 15-01-2014 CN 103511725 A 15-01-2014 CN 103511731 A 15-01-2014 CN 103511732 A 15-01-2014 CN 203384478 U 08-01-2014 CN 203384479 U 08-01-2014 CN 203549002 U 16-04-2014 CN 203585430 U 07-05-2014 CN 203585432 U 07-05-2014 CN 203585433 U 07-05-2014 CN 203585434 U 07-05-2014 CN 203585439 U 07-05-2014 CN 203585440 U 07-05-2014 CN 203585531 U 07-05-2014 CN 203718044 U 16-07-2014 EP 2864677 A1 29-04-2015 EP 2864680 A1 29-04-2015 US 2013340162 A1 26-12-2013 US 2013340831 A1 26-12-2013 US 2013340835 A1 26-12-2013 US 2013340839 A1 26-12-2013 US 2013340846 A1 26-12-2013 US 2013340847 A1 26-12-2013 US 2013340848 A1 26-12-2013 US 2013340849 A1 26-12-2013 US 2013340850 A1 26-12-2013 US 2013340851 A1 26-12-2013 US 2013340852 A1 26-12-2013 US 2013340853 A1 26-12-2013 US 2013340863 A1 26-12-2013 US 2013340869 A1 26-12-2013 US 2013341418 A1 26-12-2013 US 2013341425 A1 26-12-2013

**ONDERZOEKSRAPPORT BETREFFENDE HET
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar
de stand van de techniek

NL 2017516

In het rapport genoemd octrooigescrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
		US 2016146375 A1	26-05-2016
		US 2016146376 A1	26-05-2016
		US 2016158773 A1	09-06-2016
		US 2016160480 A1	09-06-2016
		US 2016238144 A1	18-08-2016
		US 2016238147 A1	18-08-2016
		US 2016252915 A1	01-09-2016
		US 2016274602 A1	22-09-2016
		US 2017009434 A1	12-01-2017
		WO 2013190381 A1	27-12-2013
		WO 2013190382 A1	27-12-2013
EP 2962612	A1	06-01-2016	GEEN

WRITTEN OPINION

File No. SN68085	Filing date (day/month/year) 22.09.2016	Priority date (day/month/year)	Application No. NL2017516
International Patent Classification (IPC) INV. A47K3/28 A47K3/40 E03B1/04 E03C1/00 E03C1/04			
Applicant Hamwells Holding BV			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Schikhof, Arnout
--	------------------------------

WRITTEN OPINION

Application number
NL2017516

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - a sequence listing
 - table(s) related to the sequence listing
 - b. format of material:
 - on paper
 - in electronic form
 - c. time of filing/furnishing:
 - contained in the application as filed.
 - filed together with the application in electronic form.
 - furnished subsequently for the purposes of search.
3. In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes: Claims	2, 5, 7, 9, 11
	No: Claims	1, 3, 4, 6, 8, 10
Inventive step	Yes: Claims	
	No: Claims	1-11
Industrial applicability	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 US 2013/212800 A1 (KALER STUART [US] ET AL) 22 augustus 2013 (2013-08-22)
- D2 WO 2008/031139 A1 (QUENCH SOLUTIONS PTY LTD [AU]; GAY BRIAN [AU]) 20 maart 2008 (2008-03-20)
- D3 WO 2009/147647 A1 (REVEECO INC [CA]; JALLON ROMAIN [CA]; BLAIS-OUELETTE SEBASTIEN [CA]; V) 10 december 2009 (2009-12-10)
- D4 US 2016/146376 A1 (PEEL KEVIN T [GB]) 26 mei 2016 (2016-05-26)
- D5 EP 2 962 612 A1 (BETGEM HOLDING B V [NL]) 6 januari 2016 (2016-01-06)

1 INDEPENDENT CLAIM 1

- 1.1 According to D1, fig. 3 and 6, with references relating to this document: recirculatie-douchesysteem (see fig. 3), omvattende: een wateropvangbak 212 voor het opvangen van uit een douchekop 302 afkomstig water; een eerste pomp 220 voor het via een recirculatieleiding circuleren van water uit de wateropvangbak naar de douchekop (see fig. 3); één of meer verswatertappen¹ 222, bij voorkeur één of meerdere koud en warm verswatertappen, voor het toevoeren van vers water naar de wateropvangbak²; en, een computersysteem 214 voor het uitvoeren van één of meer schoonmaakprocessen van het douchesysteem (see par. 0032) door het regelen van ten minste de eerste pomp³ en de één of meer verswatertappen (par. 0032).

¹ the feature 'verswatertappen' is understood as a controlled hot and cold water mixing tap coupled to an outlet line,

² via shower head,

³ implicit when the recycling pipes are cleaned.

Therefore D1 is anticipating the subject-matter of claim 1.

- 1.2 According to D2, fig. 4, with references relating to this document: recirculatie-douchesysteem (see fig. 4), omfattende: een wateropvangbak 2 voor het opvangen van uit een douchekop 12 afkomstig water; een eerste pomp 10 voor het via een recirculatieleiding circuleren van water uit de wateropvangbak naar de douchekop (see fig. 4); één of meer verswatertappen¹ 26, bij voorkeur één of meerdere koud en warm verswatertappen, voor het toevoeren van vers water naar de wateropvangbak²; en, een computersysteem 38 voor het uitvoeren van één of meer schoonmaakprocessen van het douchesysteem (see p. 10, l. 34 to p.11, l. 2) door het regelen van ten minste de eerste pomp⁴ en de één of meer verswatertappen⁵.

⁴ pump 10 is implicitly switched on, in order to pump the cleaning liquid,

⁵ implicitly used for rinsing the recirculation pipes. In case the applicant provides convincing arguments to encounter this, it should be noted that the skilled person does not need inventive skill to rinse the recirculation pipes.

- 1.3 According to D3, fig. 1, with references relating to this document: recirculatie-douchesysteem (see fig. 1), omfattende: een wateropvangbak voor het opvangen van uit een douchekop 10 afkomstig water; een eerste pomp 15 voor het via een recirculatieleiding circuleren van water uit de wateropvangbak naar de douchekop (see fig. 1); één of meer verswatertappen¹ 18, bij voorkeur één of meerdere koud en warm verswatertappen, voor het toevoeren van vers water naar de wateropvangbak²; en, een computersysteem 27 voor het uitvoeren van één of meer schoonmaakprocessen van het douchesysteem (see p. 13, l. 23 to p.14, l. 6) door het regelen van ten minste de eerste pomp en de één of meer verswatertappen⁶.

⁶ implicitly used see also p. 13, l. 26.

- 1.4 Document D5 discloses a shower recirculation system (fig. 2) with a pump 8 without a integrated cleaning system. It would however not require inventive skill to use the cleaning systems from D1-D4 in the system of D5. Therefore the subject-matter of claim 1 is not considered inventive in view of D5.

2 DEPENDING CLAIMS 2-11

The depending claims do not appear to contain any additional features which, in combination with the features of any other claim to which they refer, are novel resp. involve an inventive step:

- 2.1 Known from D1, fig. 3: subject-matter of claims 3: par. 0032, 6: normal non-recycling shower process, controlled with 'verswatertap' 222, 10: see fig. 3 with 'verswatertap'¹ 222.

The subject-matter of the following claims is considered not inventive: 2: with sensor 224, furthermore the use of sensor information for cleaning purposes is considered commonly known, see e.g. D4, e.g. claim 2, 4: it is not considered inventive to clean the shower head by injecting agents into a port 305 (see par. 0032), 5, 7: considered obvious and well known features, 8: manual activation of a cleaning cycle is not considered inventive, 9 and 11: not considered inventive, see D4, claim 2 and fig. 10, 11.

- 2.2 Known from D2, subject-matter of claims: 3: part 30 and part 29 is assumed to be a valve to supply cold water, it is considered implicit that this is used for cleaning purposes as well (rinsing the circulation lines), 4: cleaning liquid from tank 30 will flow into the 'wateropvangbak', 6: normal non-recycling shower process, controlled with 'verswatertap' 26, 8: by switch 40, 10: see fig. 4 with 'verswatertap'¹ 26.

The subject-matter of the following claims is considered not inventive: 2: with sensor 16, furthermore the use of sensor information for cleaning purposes is considered commonly known, see e.g. D4, e.g. claim 2.

5, 7: considered obvious and well known features, 9 and 11: not considered inventive, see D4, claim 2 and fig. 10, 11.

- 2.3 Known from D3: 3, 4, 6.

The subject-matter of the following claims is considered not inventive: 2: e.g. automatic filter cleaning initiated by a flow sensor is not considered inventive, 5, 7, 8, 9, 11.

- 2.4 Novelty and inventive step

The embodiment of the invention that is described with reference to the figure 1, seems not to be disclosed in the cited prior art (e.g. the feature 'the cold and hot water taps 126 of the supply lines have an outlet comprising an airgap of at least a predetermined height, preferably at least 2 cm, above the highest possible water level in the water collection reservoir 110'). Should the applicant regard this specific embodiment with the above feature as patentable, an independent claim comprising the features of said embodiment could be filed.

The applicant is in that case requested to indicate in the letter of reply the inventive concept (using the **problem-solution approach**) for which patent

**WRITTEN OPINION
(SEPARATE SHEET)**

Application number
NL2017516

protection is sought, the difference vis-à-vis the state of the art and the significance thereof. It is noted that this suggestion is only for assisting the applicant in his decision on how to proceed.