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(54) **Device for and method of fluid flow monitoring.**

(57) A fluid flow monitoring method and a fluid flow monitoring device comprising a fluid passage having a fluid input and a fluid output, a fluid flow detection device arranged for detecting fluid flow through the passage, and an electronic control circuit. The electronic control circuit operatively connects to the fluid flow detection means. The fluid flow detection means are arranged for establishing absence of fluid flow through the fluid passage and providing signalling of a duration of the absence of fluid flow.

Title

Device for and method of fluid flow monitoring.

Field of the invention

The invention generally relates to fluid flow monitoring. More particularly, the invention relates to a fluid flow monitoring device and a method of fluid flow monitoring for indicating that a hazardous situation may occur in relation to a pathogen infection such as a Legionella infection.

Background

Aquatic systems, like hot-water tanks inside or outside a building, cooling towers, and evaporative condensers of large air-conditioning systems, such as those commonly found in hotels and large office buildings, thermal water systems including hot tubs and spas but also water supply pipes at home, pipework of water distribution systems in apartment buildings, hotels and other public buildings, for example, are sources that allow Legionella bacteria to thrive.

Legionella are natural inhabitants of water found in both potable and non-potable water systems and may cause the so-called Legionnaires' disease or Legionellosis which is a severe, often lethal, form of pneumonia. Pathogenic Legionella species thrive at water temperatures between 25 and 42°C with an optimum temperature of 35°C.

To prevent Legionella infection, the recommended temperature for storage and distribution of cold water is below 25°C, and ideally below 20°C. However, Legionella may survive for long periods at low temperatures and may proliferate when the temperature increases, if other conditions allow. As 20°C is at room temperature, there is a risk of Legionella proliferation in cold water supply pipes that remain stagnant at ambient temperatures in the room temperature range or above. A substantial risk of Legionella growth is found, however, in hot water pipes, the temperature of which may drop to about 40°C due to non-use during a longer period of time. Such as, for example, while being absent from home during holidays or in hotel rooms that are not booked for a longer period of time.

Legionella transmission is thought to occur via inhalation of aerosolized mist produced from Legionella contaminated water of the above-mentioned sources, for example, such as by showers, decorative fountains, humidifiers, respiratory therapy equipment, whirlpool spas, and the like.

Risk factors that may promote the proliferation of Legionellae include temperature, water quality, design of and the material used in construction of pipework and the presence of biofilms inside the pipes. Design, i.e. minimizing areas of stagnation and low flow, installation, management and maintenance of these water systems must be undertaken with control of microbial growth in mind. Disinfection, cleaning, monitoring and regular service and maintenance are key factors in controlling Legionella.

Besides disinfection of the water and water pipes, for example, Legionella pathogens are sensitive for temperatures above about 50°C . According to publications issued by the World Health Organization, temperature affects the survival of Legionella in that at temperatures above 70°C Legionella dies almost instantly and at 60°C 90% of the population die in 2 minutes. Accordingly, in the case of water systems at risk from stagnation, flushing the system with hot water at 55–60°C before use thereof, may be effective to substantially kill the lethal pathogens.

As a precautionary manner, before taking a shower, for example, it is recommended to flush the shower for a few minutes, such that hot water of a sufficient high temperature, preferably at or about 60°C, flows through the hot water pipe and thereby kills the pathogens. Flushing of the cold water pipe at the same time may reduce the amount of possible Legionella bacteria in the cold water tube. During flushing, one should avoid to inhale Legionella from the flushing water.

In many cases, such as a hotel room, the user normally does not know for how long the room has not been occupied, for example. Although it may become a habit to first flush the shower or bath before using same, many people are still not aware of the risks of legionella or simply may forget to flush the shower first.

Summary

It is an object of the invention to provide a device that assists users in determining whether to take precautionary measures to avoid becoming at risk of Legionella bacteria, such as when using aquatic systems producing aerosolized mist.

According to the invention, in a first aspect thereof, there is provided a fluid flow monitoring device, comprising a fluid passage having a fluid input and a fluid output, a fluid flow detection device arranged for detecting fluid flow through the passage, and an electronic control circuit, operatively connected to the fluid flow detection device, wherein the control circuit is arranged for establishing absence of fluid flow through the fluid passage and providing signalling of a duration of the absence of fluid flow.

The fluid flow monitoring device according to the invention, when installed in a fluid supply pipe or between a fluid supply pipe and a device producing aerosolized fluid mist, such that in use fluid flows through the fluid passage of the fluid monitoring device from its fluid input to its fluid output, provides signalling based on the time period that no fluid flow through the device is monitored.

Absence of fluid flow through the fluid flow monitoring device provides an objective indication of stagnant fluid in the fluid source and/or the fluid supply pipe to which the fluid flow monitoring device connects, and thereby an indication of the risk of Legionella growth in the stagnant fluid.

In an embodiment, in particular for use with showers at home or in a hotel bathroom, for example, the fluid flow monitoring device comprises a water tight housing, a first end of which comprising the fluid input and an opposite second end of which comprising the fluid output, wherein the fluid input is arranged for connecting an output of a water tap or the terminating end of a water pipe and the fluid output is arranged for directly connecting a shower head or a water hose terminating in a shower head, for example.

Although the risk of becoming infected increases with the growth of the Legionella population, in an embodiment of the fluid flow monitoring device, the control circuit comprises a timing circuit arranged for providing signalling after lapse of a set or settable time period from detecting the absence of fluid flow. That is, signalling is provided when a Legionella population of a certain size providing a safety risk is assumed to have been built up, in the present embodiment expressed as an amount of time lapsed from detecting absence of fluid flow and during which fluid flow is continuously or substantially continuously absent, that is a maximum allowable stagnant fluid time.

This maximum allowable stagnant fluid time, i.e. this threshold, can be set by factory settings, for example, or being user settable. The term user also

implies a skilled person certified for installing the fluid flow monitoring device, for example. The actual amount of the allowable maximum fluid stagnant time depends, inter alia, on the risk factors that promote the proliferation of Legionellae in the fluid source or aquatic system to which the fluid flow monitoring device connects, as mentioned in the introductory part.

The signalling provided assists users objectively in determining whether to take precautionary measures to avoid becoming at risk of Legionella bacteria, such as flushing fluid for a period of time through a drain before producing aerosolized mist from the fluid. In an embodiment of the invention, signalling is interrupted by the control circuit from detecting presence of fluid flow through the passage of the fluid flow monitoring device.

To assist users in determining the time during which flushing should be performed, for example, in an embodiment of the fluid flow monitoring device according to the invention, the control circuit is arranged for establishing presence of fluid flow through the fluid passage and interrupting the signalling after lapse of a set or settable delay period. The duration of this delay period may be set by factory settings or being user settable. Again, the term user also implies a skilled person certified for installing the fluid flow monitoring device, for example.

The actual duration of the delay period depends, inter alia, on the type of the fluid source or aquatic system to which the fluid flow monitoring device connects, the total duration of continued absence of fluid flow, and the temperature of the fluid while flushing, for example. It will be appreciated that both the allowable maximum fluid stagnant time and the length of the delay period after monitoring presence of fluid flow by the fluid flow monitoring device may be set with a safety margin.

In a further embodiment of the invention the fluid flow monitoring device comprises at least one of a fluid temperature sensor and an ambient temperature sensor, operatively connected to the control circuit, wherein the electronic control circuit is arranged for providing the signalling based on an output of a respective sensor.

The provision of such sensors assists in providing a more precise signalling, that is a more precise determination of the conditions leading to Legionella contamination. As explained in the background part, Legionella bacteria thrive dependent on the ambient temperature. Measuring the ambient temperature

therefore may directly influence the signalling provided, such as determining the allowable maximum fluid stagnant time. Measuring of the fluid temperature assists in determining the length of the delay period, i.e. the flushing period after monitoring presence of fluid flow by the fluid flow monitoring device. As indicated in the background part, the time needed to substantially kill the lethal Legionella pathogens in the fluid decreases with increase of the fluid temperature above about 60°C. The control circuit may be arranged to set or adapt set time periods automatically dependent on the measured ambient and fluid temperatures as explained above.

The fluid flow monitoring device in a further embodiment of the invention comprises at least one of optical, acoustical and mechanical presentation means, operatively connected to the control circuit, wherein the control circuit is arranged for controlling the presentation means for presenting absence of fluid flow based on the signalling.

In an electric power consumption efficient embodiment of the invention, the optical presentation means comprise Light Emitting Diode (LED) means, arranged for emitting light externally from an outer circumference of the housing. An example of acoustical presentation means is a buzzer arranged in the housing of the flow monitoring device, such as an electromechanical or piezoelectric beeper. An other example of acoustic presentation means are loudspeaker means for providing a recorded spoken message, such as an instruction, or a spoken alert, preferably in different languages, for example. Mechanical presentation means may comprise, for example, a mechanically operated flag or shutter exposing or hiding a safety mark at the circumference of the housing of the fluid flow monitoring device. LED lighting is most versatile and preferred for signalling purposes.

In order to signal whenever it is safe to use the fluid, for example after flushing the fluid through the drain, the control circuit is arranged for controlling the presentation means for presenting the presence of the fluid flow based on interruption of the signalling. That is, after a delay time sufficient for flushing the Legionella contaminated fluid, the signalling may be interrupted, for example by switching off the LED lighting or by first changing colour of the lighting thereof, for example from Red to Green, before switching off the signalling.

In an advanced embodiment of the invention, the control circuit of the fluid flow monitoring device comprises a programmable digital data processing circuit, having a data processing algorithm arranged for providing signalling based on

establishing absence of fluid flow and control signals received by at least one control input of the control circuit, in particular control signals provided by any of the sensors mentioned above.

The provision of digital data processing circuitry allows for further functionally and customization in controlling the signalling provided by the fluid flow monitoring device. In particular in combination with circuitry arranged for remote communication, such as a signal transmission circuit, operatively connected to the control circuit, for remote signalling of the duration of absence of fluid flow, and a signal reception circuit arranged for receiving remote control signals for controlling the control circuit.

It will be appreciated that the signalling provided, besides signalling in the form of user perceptible signals, may comprise electric pulses or other electric signals radiographically or optically transmitted by the fluid flow monitoring device based on the absence of fluid flow through its passage, which signalling is received and processed by a remote device and converted into user perceptible signals.

In an embodiment the fluid flow monitoring device comprises a remote module or gateway having transceiver circuitry, arranged for being communicatively connected to the signal transmission and/or signal reception circuit, and further comprising data processing circuitry and input/output circuitry arranged for presenting the absence of fluid flow based on the signalling and at least one of optical, acoustical and mechanical presentation means, and for controlling the control circuit based on control signals received by the remote module.

In an embodiment the remote module or gateway is provided with at least one of an ambient temperature sensor, an ambient motion sensor, an ambient light sensor and an ambient proximity sensor. Any or all of an ambient motion sensor, an ambient light sensor, an ambient proximity sensor and an ambient noise sensor may assist in an efficient signalling by the fluid flow monitoring device and the remote module, for example only when user presence in the vicinity of the fluid flow monitoring device, i.e. an aerosolized mist producing device, is detected. User presence may be detected from motion of the user, igniting the lighting in a room where the fluid flow monitoring device is installed, such as a bathroom, and/or by noise produced by a user.

The remote module or gateway may be arranged at a distance from the fluid flow monitoring device, for example outside a bathroom in an apartment or

hotel room equipped with at least one fluid flow monitoring device according to the invention. This allows, for example, flushing of a shower without requiring the presence of the user in the bathroom to watch the signalling provided. In the case of a hospital, a nursing home or a retirement home, or similar, the remote module may be located at a central control location, for example. The remote module may comprise a personal computer or laptop computer or tablet, for control and operational settings purposes.

The transceiver circuitry of the remote module may be arranged for being communicatively connected to a data communication network, for exchanging operational data based on the signalling of the fluid flow monitoring device. This provides, for example, central registration and watching services for alerting users whenever a hazardous situation may occur in relation to Legionella infection.

A suitable fluid flow detection device comprises at least one of:

- a magnetic sensor arranged along the fluid passage and a fluid-moveable magnetic plunger arranged in the fluid passage, for detecting absence or presence of fluid flow through the passage based on a relative position of the sensor and plunger,

- an acoustic sensor arranged along the fluid passage, for detecting absence or presence of fluid flow through the passage based on acoustic flow noise caused by the fluid flow,

- a temperature sensor, arranged along the fluid passage, for detecting absence or presence of fluid flow through the passage based on a change in temperature caused by the fluid flow,

- an optical gate arranged along the fluid passage, for detecting absence or presence of fluid flow through the passage based on interruption or scattering of light in the optical gate caused by the fluid flow,

- a capacitive or inductive sensor arranged along the fluid passage, for detecting absence or presence of fluid flow through the passage based on detuning of a tuned capacitively or inductively coupled circuit caused by the fluid flow, and

- a propeller driven electric generator, the propeller arranged in the fluid passage, for detecting absence or presence of fluid flow through the passage based on electric signal generated by rotation of the propeller caused by the fluid flow.

Detection means of the type mentioned above are known to a skilled person and, accordingly, need no detailed explanation.

The fluid flow monitoring device may comprise an on-board power supply, such as a battery, for supplying electric power to the control circuit and possible sensors, and arranged for controlling the supply of electric power to minimise power consumption by the fluid flow monitoring device. In the case of a fluid flow detection device comprising a propeller driven electric generator, the electric power of the generator produced during fluid flow may be used for charging the on-board power supply, such as a rechargeable battery.

In a second aspect, the invention provides a method of fluid flow monitoring by a fluid flow monitoring device, such as a fluid flow monitoring device disclosed above, the method comprising the steps of:

- detecting absence of fluid flow;
- calculating a fluid flow absent time;
- if the calculated fluid flow absent time is longer than a maximum allowable stagnant fluid time:
    - providing an alarm signal;
- detecting presence of the fluid flow;
- calculating a fluid flow present time;
- if the calculated fluid flow present time is longer than a delay period:
    - providing a safe signal.

The alarm signal and the safe signal may be provided as any type of signal, such as but not limited to an optically, acoustically or mechanically presented signal. The signalling may also be provided as a wireless radio signal, an infrared signal or the like, for remote signalling.

As explained above, the duration of the maximum fluid stagnant time and the delay period may be set by factory settings or being user settable. The actual amount of the allowable maximum fluid stagnant time and the delay period depends, inter alia, on the risk factors that promote the proliferation of pathogens, such as Legionellae, in the fluid source or aquatic system to which the fluid flow monitoring device connects. In particular the ambient temperature and the fluid temperature of the fluid while flushing are important parameters.

In an embodiment of the method, at least one of the maximum allowable stagnant fluid time and the delay period are calculated based on at least one of a fluid temperature measurement and an ambient temperature measurement. It will be appreciated that both the allowable maximum fluid stagnant time and the length of the delay period after monitoring presence of fluid flow by the fluid flow monitoring device may be calculated with a safety margin.

In a further embodiment of the method, the alarm signal is provided based on at least one of an ambient motion measurement, an ambient light measurement, an ambient proximity measurement and an ambient noise measurement. That is, the alarm signal is only provided when a person enters a room in which the fluid flow monitoring device is installed, this to minimize power consumption of the fluid monitoring device.

In another embodiment of the method, the invention provides for remote signalling of alarm signal and the safe signal, for example accessible outside a room where the fluid flow monitoring device is installed and/or at a central monitoring facility.

The invention will now be explained in more detail with reference to the appended figures, which merely serve by way of illustration of the invention and which may not be construed as being limitative thereto.

Brief Description of the Drawings

Fig. 1 shows, in a schematic and perspective view, an embodiment of a fluid flow monitoring device according to the invention.

Fig. 2 shows, in a schematic and perspective view, the fluid flow monitoring device of Fig. 1, the housing of which being partly broken away.

Fig. 3 shows, in a schematic and perspective view, a section of the fluid flow monitoring device of Fig. 1 taken along the line III-III.

Fig. 4 sows an electric block circuit diagram of electronic control circuitry of an advanced embodiment of the fluid flow monitoring device according to the invention.

Fig. 5 shows a simplified flow chart diagram of the operation of a basic embodiment of the fluid flow monitoring device and method according to the invention.

Detailed description

Fig. 1 shows an embodiment of the fluid flow monitoring device 10 according to the invention, in particular for use with showers at home or in a hotel bathroom, for example. The fluid flow monitoring device 10 comprises a water tight cylindrical housing having an upper or first housing part 11 and a lower or second housing part 12. A first end of the housing forms the fluid input 13 and an opposite second end of the housing comprises the fluid output 15. The fluid input 13 comprises an inner threading 14, arranged for connecting to an output of a water tap or the terminating end of a water pipe of shower or bath, for example. The fluid output 15 comprises an outer threading 16, arranged for directly connecting a shower head or a water hose terminating in a shower head, for example.

The fluid flow monitoring device 10 is of the type having an on-board signalling device. In the embodiment shown, the signalling device comprise a transparent ring 17, arranged between the first housing part 11 and the second housing part 12. The transparent ring 17 cooperates with a plurality of Light Emitting Diodes, LED (not shown). The housing can be manufactured partly or as whole of a plastic material or metal, such stainless steel, for example.

Fig. 2 shows the fluid flow monitoring device of Fig. 1, in which the housing parts 11, 12 are partly broken away. The fluid input 13 and the fluid output 15 connect by a cylindrical fluid channel or passage 18. For detecting fluid flow through the fluid passage 18, in the embodiment shown, an elongated piston or plunger 19 is moveably arranged inside the fluid passage 18. That is the plunger 19 is moveable in longitudinal direction of the of the fluid passage 18 between the fluid input 13 and the fluid output 15 thereof. The plunger 19 may be manufactured from a suitable fluid resistant plastic or the like.

Between the fluid output 15 and an opposite end of the plunger 19 a helical spring 20 is arranged. The weight of the plunger 19 and the spring action of this helical spring 20 are designed such that in the absence of a fluid flow through the fluid passage 18, the plunger 19 is forced in a position at or near the fluid input 13 of the fluid flow monitoring device 10. The spring action of the helical spring 20 is further dimensioned such that when a fluid, such as water, flows through the fluid passage 18, the spring force acting on the plunger 19 by the helical spring 20 is counteracted, such that the plunger 19 is forced to be at or near the fluid output 15 of

the fluid flow monitoring device 10, however not blocking the flow of fluid through the fluid passage 18. The helical spring 20 is manufactured from a material that is resistant to a particular fluid. In the case of potable water, for example, the spring 20 may be manufactured from stainless steel, for example.

The LEDs cooperating with the transparent ring 17 electrically connect to a printed circuit board, PCB, 23 mounted in the second part 12 of the housing. In the embodiment shown, the PCB 23 comprises two battery holders 21, each containing a battery 22, such as a button-type or coin-type battery, for example, for powering electronic control circuitry for controlling the signalling LEDs (not shown) and a magnetic sensor 24 mounted at the PCB 23.

Fig. 3 shows a section through the fluid flow monitoring device 10 in longitudinal direction thereof, along the line III-III in Fig. 1. The helical spring 20 is supported at one end thereof by a spring holder 26 mounted in the fluid passage 18 at the fluid output 15. With its other end the helical spring 20 is fixed to the plunger 19. The movement of the plunger 19 in the fluid passage 18 is limited by the spring holder 26.

The magnetic sensor 24 cooperates with a permanent magnet 25 arranged inside the plunger 19. The magnetic sensor 24 and the permanent magnet 25 form one of many possible arrangements of a fluid flow detection device for establishing absence of fluid flow through the fluid passage 18.

A known type of magnetic sensor is, for example, a so-called reed switch. The reed switch is an electrical switch operated by an applied magnetic field. In its most common form, it consists of a pair of contacts on ferrous metal reeds in a hermetically sealed glass envelope. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied. The reed switch may be actuated by bringing a magnet in the vicinity of the switch. Once the magnet is pulled away from the switch, the reed switch will go back to its original position.

A so-called digital version of the reed switch are the MagnetoResistive sensor, MR, Integrated Circuits, ICs. MR ICs are ultra-sensitive devices that respond to either a magnetic North pole or South pole applied in a certain direction to the sensor and use a very low average current in the nano-Ampére range.

In the embodiment of the fluid monitoring device 10 shown in Figs. 2 and 3, the plunger 19 is in the vicinity of the magnetic sensor 24 when no fluid flows through the passage 18, for example when a shower tap, to which the fluid monitoring device 10 is mounted, is closed. In this position the magnetic sensor 24 senses the presence of the permanent magnet 25, as schematically illustrated by the dashed magnetic filed line 27 in Fig. 3. In the case of a reed switch or MR IC, the switch may be opened or inactive, providing a logical “zero” signal, for example.

When the tap to which the fluid monitoring device 10 connects is opened, by the fluid pressure acting on the plunger 19 from the fluid input 13 of the fluid flow monitoring device 10, the plunger 19 will be forced in the direction of the fluid output 15 and comes to rest at the stop element 26. The plunger 19 remains in this position as long as fluid flows through the passage 18. In this position, the permanent magnet 25 is away from, i.e. no longer in the vicinity of, the magnetic sensor 24, which sensor senses the absence of the permanent magnetic 25. In the case of a reed switch or MR IC, the switch may be closed or active, for example. When the fluid flow through the passage 18 stops, under the force of the spring 20, the plunger 19 returns to its position near the magnetic sensor 24, which as a result detects again the presence of the permanent magnet 25.

Accordingly, the magnetic sensor 24 is able to detect absence of fluid flow through the passage 18 based on the relative position of the sensor 24 and the plunger 19. In the present embodiment, the magnetic sensor 24 likewise senses presence of fluid flow in the passage 18 based on the relative position of the sensor 24 and the plunger 19. The absence and/or presence of a fluid flow may be measured electronically, i.e. the magnetic sensor 24 may trigger an electronic control circuit.

An other known type of magnetic sensor for proximity switching suitable for the purpose of the present invention is, for example, a micro-electromechanical based magnetic field sensor, MEMS. This is a small-scale device for detecting and measuring magnetic fields. Many of these operate by detecting effects of the Lorentz force. A change in voltage or resonant frequency may be measured electronically, for example. An other type of magnetic sensor is a so-called Hall-effect sensor. A Hall-effect sensor is a transducer that varies its output voltage in response to a magnetic field, which voltage variation is used to trigger an electronic control circuit.

Those skilled in the art will appreciate that other than a magnetic sensor type fluid flow detection may be used for the purpose of the present invention. In the fluid flow monitoring device 10 shown in Fig. 2, for example, the magnetic sensor 24 may be replaced by an optical gate sensor mounted at the PCB 23 and operating across, for example in radial direction, through an optical transparent window in the passage 18. Such that presence of the plunger 19 near the flow input 13 interrupts the optical gate, thereby indicating absence of fluid flow, while when the plunger 19 is at its position near the flow output 15, in the case of a fluid flow through the passage 18, the optical gate is no longer blocked, thereby detecting presence of fluid flow in the passage 18. Instead of interrupting an optical ray, the plunger 19 may operate to scatter light back to the optical sensor.

A capacitive sensor or inductive sensor may operate for proximity detecting of the plunger 19, in that the plunger triggers the capacitive or inductive sensor arranged along or across the fluid passage 18. For example, wherein the plunger 19 is made of or comprises a metal part that, dependent on the position of the plunger 19 in the passage 18, detunes a capacitively or inductively coupled circuit mounted at the PCB 23.

Other types of fluid flow detection devices may operate as an acoustic sensor mounted at the PCB 23, for example, and arranged along the fluid passage 18, for detecting absence or presence of fluid flow through the passage 18 based on acoustic flow noise caused by the fluid flow. A temperature sensor, mounted at the PCB 23 and arranged along the fluid passage 18, may detect absence or presence of fluid flow through the passage 18 based on a change in temperature caused by the fluid flow.

In another embodiment of the invention, a propeller driven electric generator is arranged in the fluid passage 18, for detecting absence or presence of fluid flow through the passage 18 based on electric signal generated by rotation of the propeller caused by the fluid flow. It will be appreciated that such a propeller driven electric generator may be used for charging the batteries 22, for example, when driven by a fluid flow.

Fig. 4 sows an electric block diagram of electronic control circuitry 30 of an advanced embodiment of the invention. The circuitry 30 comprises an electronic control circuit 31; a fluid flow detection device 32, operatively electrically connected to a control input 33 of the electronic control circuit 31; presentation

means 35, operatively electrically connected to a control output 34 of the electronic control circuit 31; a timing circuit 36, such as an accurate and stable oscillator circuit, operatively electrically connected to a control input 37 of the electronic control circuit 31; an electric fluid temperature sensor 38 and an electric ambient temperature sensor 39, both operatively electrically connected to a respective control input 40, 41 of the electronic control circuit 31. The circuitry 30 is powered by a battery or batteries 22 electrically connected at a power input 42 of the electronic control circuit 31.

The sensors 38, 39 may be of any commercially available type. The fluid flow detection device 32 may be of the type described above in connection with any of the Figures 1-3, for example, such as the magnetic sensor 24 cooperating with a permanent magnet 25 arranged inside the plunger 19 and spring 20.The electronic control circuit 31 may comprise a digital processing circuit, such as microprocessor, µP, and program memory storing program code for operating the processing circuit.

The electronic control circuitry 30, in the advanced embodiment shown in Fig. 4 further comprises a wireless transceiver circuit 45, comprising a transmitter, Tx, and a receiver, Rx, circuit for data exchange through any of a radio protocol, such as a short range radio communication protocol known as IEEE 802.11 WiFi or Bluetooth®, for example, or an Infrared or any other optical transmission technology. The wireless transceiver circuit 45 connects to a communication input/output 46 of the electronic control circuit 31 and is arranged for being communicatively connected 47 to a transceiver circuit 51, Rx/Tx, of a remote module or gateway 50.

The remote module or gateway 50 further comprises a data processing circuit 52, such as a microprocessor µP and program memory storing program code for operating the data processing circuit 52, and input/output circuitry 53, operatively connected to the data processing circuit 52, and arranged for presenting absence of fluid flow signalled by the fluid flow monitoring device 10. The input/output circuitry 53 may comprise optical, acoustical and mechanical presentation means. The transceiver circuit 51 likewise may operate in accordance with a short range radio communication protocol known as IEEE 802.11 WiFi or Bluetooth®, for example, or an Infrared or any other optical transmission technology.

The remote module or gateway 50 may further comprise a transceiver circuit 54, operatively connected to the data processing circuit 52 and arranged for operating a communication link 55, for example a WiFi or other wired and/or wireless communication link, among which a radio communication link of a commercial available cellular communication technology, for distance communication of the signalling provided by the fluid flow monitoring device 10 with remote control equipment 56. In this way, the remote module 50 may operate as an intelligent gateway en may be used to program the electronic control circuit 31, for example.

The remote module 50, when arranged geographically in the vicinity of the fluid flow monitoring device 10, may instead of or in addition to the fluid flow monitoring device comprise an electric ambient temperature sensor 57, an electric ambient motion sensor 59, an electric ambient light sensor 61, an electric ambient proximity sensor 63 and an electric ambient noise or acoustic sensor 65, all operatively electrically connected to a control input 58, 60, 62, 64, 66, respectively, of the data processing circuit 52. The sensors 57, 59, 61, 63, 65 may be of any commercially available type.

Reference numerals 43 and 44 indicate control settings which may be set at the fluid flow monitoring device 10 or by the remote module 50, for example. The control settings 43, 44 may be arranged such that same are only accessible to a service person.

The circuitry 30 enclosed by the box drawn in broken lines, may all be mounted inside the fluid flow monitoring device 10 at the PCB 23 thereof, for example. In an embodiment all or part of the circuitry 30 inside the box may be provided by a so-called Application Specific Integrated Circuit, ASIC, for example.

It is noted that in a basic embodiment of the invention, the fluid flow monitoring device 10 essentially comprises the control circuit 31, the fluid flow detection device 32, the presentation means 35 and the battery or batteries 22.

The presentation means 35, 53 may comprise one or a plurality of optical presentation means, such as LED 48, arranged for emitting light externally from an outer circumference of the device 10 or the remote module 50. Other optical presentation means include displays for displaying messages, notifications, warnings and instructions, for example. The acoustical presentation means may also comprise buzzer arranged in the housing of the flow monitoring device, such as an electromechanical or piezoelectric beeper, or a loudspeaker, for providing spoken

messages, such as an instruction, or a spoken alert, preferably in different languages, whether or not pre-recorded. Mechanical presentation means may comprise, for example, a mechanically operated flag or shutter exposing or hiding a safety mark at the circumference of the housing of the fluid flow monitoring device.

The principal operation of the circuitry 30 will now be explained with the aid of a flow chart diagram illustrating the operation of a basic embodiment of the fluid flow monitoring device and the method according to the invention. In the flow chart diagram 70 shown in Fig. 5, the direction of the flow is from the top to the bottom of the drawing. A different flow direction is indicated by a respective arrow.

The operation is assumed to start with block 71, “Start”. In decision block 72, “Fluid flow absent?”, the control circuit 31 detects whether or not the fluid flow detection device 32 detects a fluid flow through the fluid passage 18 of the fluid flow detection device 10. While no fluid flow is detected, i.e. decision “Yes” of decision block 72, a fluid flow absent time is calculated in block 73, “Calculate fluid flow absent time”. This fluid flow absent time may be calculated by the control circuit 31 from time pulses provided by the timing circuit 36, for example.

As long as the calculated fluid flow absent time does not pass a maximum allowable stagnant fluid time, i.e. decision “No” of decision block 74, “Fluid flow absent time > maximum allowable stagnant fluid time?“ and fluid flow remains absent, the fluid flow absent time is continuously aggregated by the control circuit 31. Once the calculated fluid flow absent time is larger than the maximum allowable stagnant time, i.e. decision “Yes” of decision block 74, there may occur a potential hazardous situation as to the concentration of pathogens in the fluid source connecting to the fluid flow monitoring device 10. Such as a risk of a hazardous Legionella population in the fluid source. Accordingly, the control circuit provides an alarm signal as indicated by block 75, “Provide alarm signalling”.

This alarm signal may be provided by the presentation means 35, under the control of the control circuit 31, such as by making one or a plurality of LED 48 emitting light in the colour red. This light emission may be a flash lighting, a running light, or other. Instead or in addition of the signalling by the presentation means 35, the alarm signalling may be transmitted by the Tx/Rx circuitry 45 to the remote module 50 and signalled by the circuitry 53 thereof and/or forwarded to a remote monitoring facility 56 for registration and alarming purposes, for example.

As long as fluid flow remains absent, i.e. decision “No” by decision block 76, “Fluid flow present?”, the alarm signalling remains. One may appreciate that for minimizing power consumption of the battery 22 of the fluid flow monitoring device, the alarm signal may only be shown by the presentation means 35, 53 when there is a person in the room where the fluid flow monitoring device 10 is installed. This to be detected, for example, by any of the sensors 57, 59, 61, 63, 65.

When fluid flow in the passage 18 of the fluid flow monitoring device is detected by the fluid flow detection device 32, i.e. decision “Yes” by decision block 76 or decision “No” by decision block 72, a fluid flow present time is determined by the control circuit 31 as indicated by block 77, “Determine fluid flow present time”. This fluid flow present time may likewise be calculated by the control circuit 31 from time pulses provided by the timing circuit 36, for example.

During this phase of the procedure, the fluid flow is not safe to use and need to be flushed, for example. In the case of a showerhead that connects directly or indirectly by a hose to the fluid flow monitoring device 10, the user may drop the showerhead at or near the drain to flush the contaminated water. Otherwise the user has to leave the bathroom during the flushing, for example. One may also appreciate that the contaminated water may be directly flushed in that the control unit 31 controls a valve for directly flushing the contaminated fluid flow to the drain (not shown).

If the calculated fluid flow present time exceeds a delay period, i.e. decision “Yes” by decision block 78, “Fluid flow present time > delay period?”, it is safe to use the fluid flow which is indicated by a safe signalling provide by the control circuit 31, block 79 “Provide safe signalling”. The safe signalling may be provided, for example, by having the LED 48 of the presentation means 35 emitting green light. Likewise, the safe signalling may be communicated to the remote module 50 inside or outside a bathroom, such that a user gets an indication when sufficient water has been flushed. For energy saving reasons, the safe signalling may be switched off after a while or only be provided when a user is in the vicinity of the fluid flow monitoring device 10, for example. At this stage of the flow diagram, in block 79 the fluid flow absent time may be reset for a new cycle, i.e. “Reset fluid flow absent time”.

In the flow chart 70, as a precautionary measure, when the fluid flow becomes present while there is no alarm signal, the safe signalling is only provided

after the delay period has lapsed, such as with the decision “No” by decision block 62. In block 73, when fluid flow is again absent, the delay period is reset, i.e. “Reset delay period”.

Those skilled in the art will appreciate that the control circuit may operate in different modes for signalling the alarm or safe signals. When operating with a remote module 50, the steps of the flow chart 70 may be performed in the remote module 50, such that the fluid flow monitoring device 10 just needs to signal the detection of absent of fluid flow without means for stand alone signalling, such as the presentation means 35. This will render the fluid flow monitoring device 10 electrically energy efficient.

In the basic embodiment, wherein the fluid flow monitoring device 10 essentially comprises the control circuit 31, the fluid flow detection device 32 in the form of a reed relay or MR IC sensor 24 co-operating with the permanent magnet 25 and LED presentation means 48, a single lithium coin battery may power the fluid flow monitoring device 10 for about 3-5 years. Using two batteries 22, this power lifetime will double. With special batteries, the battery lifetime of the fluid flow monitoring device 10 may be increased to about 15 years, for example.

The invention is not limited to the embodiments disclosed and may be practiced in many other ways, without departing from the novel and inventive teachings as outlined in the appended claims.

CONCLUSIES

1. Fluïdumstromingsbewakingsinrichting, omvattende een fluïdumdoorgang welke een fluïduminlaat en een fluïdumuitlaat heeft, een fluïdumstromingsdetectie-inrichting ingericht voor het detecteren van fluïdumstroming door de doorgang en een elektronische stuurschakeling, werkzaam verbonden met de fluïdumstromingsdetectie-inrichting, waarin de stuurschakeling is ingericht voor het vaststellen van afwezigheid van fluïdumstroming door de fluïdumdoorgang en het verschaffen van een signalering van de duur van de afwezigheid van fluïdumstroming.

2. Fluïdumstromingsbewakingsinrichting volgens conclusie 1, waarin de stuurschakeling een timingschakeling omvat ingericht voor het verschaffen van de signalering na afloop van een ingestelde of in te stellen tijdsperiode vanaf het detecteren van de afwezigheid van fluïdumstroming.

3. Fluïdumstromingsbewakingsinrichting volgens conclusie 2, waarin de stuurschakeling is ingericht voor het vaststellen van aanwezigheid van fluïdumstroming door de fluïdumdoorgang en het onderbreken van de signalering vanaf het detecteren van de aanwezigheid van de fluïdumstroming.

4. Fluïdumstromingsbewakingsinrichting volgens conclusie 3, waarin de stuurschakeling is ingericht voor het onderbreken van de signalering na afloop van een ingestelde of in te stellen vertragingsperiode.

5. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, verder omvattende ten minste een van optische, akoestische en mechanische presentatiemiddelen, werkzaam verbonden met de stuurschakeling, waarin de stuurschakeling is ingericht voor het sturen van de presentatiemiddelen voor het presenteren van de afwezigheid van fluïdumstroming op basis van de signalering.

6. Fluïdumstromingsbewakingsinrichting volgens conclusie 5 en een van de conclusies 3 of 4, waarin de stuurschakeling is ingericht voor het sturen van de presentatiemiddelen voor het presenteren van de aanwezigheid van de fluïdumstroming op basis van het onderbreken van de signalering.

7. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, omvattende tenminste een van een fluïdumtemperatuursensor en een omgevingstemperatuursensor, werkzaam verbonden met de stuurschakeling, waarin de

elektronische stuurschakeling is ingericht voor het verschaffen van de signalering op basis van een uitgangssignaal van een betreffende sensor.

8. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, waarin de stuurschakeling een programmeerbare digitale dataverwerkingsschakeling omvat, omvattende een dataverwerkingsalgoritme ingericht voor het verschaffen van de signalering op basis van het vaststellen van afwezigheid van fluïdumstroming en door ten minste een stuuringang van de stuurschakeling ontvangen stuursignalen, in het bijzonder stuursignalen verschaft door een van de sensoren volgens conclusie 7.

9. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, omvattende een voedingsbron voor het aan de fluïdumbewakingsinrichting toevoeren van elektrische energie, waarin de stuurschakeling is ingericht voor het sturen van de toevoer van elektrische energie voor het minimaliseren van het energieverbruik door de fluïdumstromingsbewakingsinrichting.

10. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, omvattende een signaaltransmissieschakeling, werkzaam verbonden met de stuurschakeling, voor het op afstand signaleren van de duur van de afwezigheid van fluïdumstroming.

11. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, omvattende een signaalontvangschakeling ingericht voor het ontvangen van stuursignalen op afstand voor het sturen van de stuurschakeling.

12. Fluïdumstromingsbewakingsinrichting volgens conclusie 10 of 11, omvattende een op afstand gelegen module omvattende zendontvangschakelingen ingericht om communicatief verbonden te zijn met de signaaltransmissie- en/of signaalontvangschakeling en verder omvattende dataverwerkingsschakelingen en ingangs/uitgangsschakelingen ingericht voor het presenteren van de afwezigheid van fluïdumstroming op basis van de signalering en ten minste een van optische, akoestische en mechanische presentatiemiddelen en voor het sturen van de stuurschakeling op basis van ten minste een van door de op afstand gelegen module ontvangen stuursignalen en verschaft door ten minste een van een omgevingstemperatuursensor, een omgevingsbewegingssensor, een omgevingslichtsensor en een omgevingsnaderingssensor, werkzaam verbonden met de dataverwerkingsschakelingen.

13. Fluïdumstromingsbewakingsinrichting volgens conclusie 12, waarin de zendontvangschakelingen van de op afstand gelegen module zijn ingericht om communicatief te zijn verbonden met een datacommunicatienetwerk, voor het uitwisselen van operationele data op basis van de signalering van de fluïdumstromings-bewakingsinrichting.

14. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, waarin de fluïdumstromingsdetectie-inrichting ten minste een omvat van:

- een magnetische sensor opgesteld langs de fluïdumdoorgang en een door fluïdum beweegbare magnetische zuiger aangebracht in de fluïdumdoorgang, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van een relatieve positie van de sensor en zuiger,

- een akoestische sensor opgesteld langs de fluïdumdoorgang, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van door de fluïdumstroming veroorzaakte akoestische stromingsruis,

- een temperatuursensor, opgesteld langs de fluïdumdoorgang, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van een verandering in de door de fluïdumstroming veroorzaakte temperatuur,

- een optische poort opgesteld langs de fluïdumdoorgang, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van een door de fluïdumstroming veroorzaakte onderbreking of verstrooiing van licht in de optische poort,

- een capacitieve of inductieve sensor opgesteld langs de fluïdumdoorgang, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van een door de fluïdumstroming veroorzaakte verstemming van een afgestemde capacitief of inductief gekoppelde schakeling, en

- een door een propeller aangedreven elektrische generator, welke propeller in de fluïdumdoorgang is aangebracht, voor het detecteren van afwezigheid of aanwezigheid van fluïdumstroming door de doorgang op basis van een elektrisch signaal gegenereerd door een door de fluïdumstroming veroorzaakte rotatie van de propeller.

15. Fluïdumstromingsbewakingsinrichting volgens een van de voorgaande conclusies, omvattende een waterdichte behuizing, een eerste einde waarvan de fluïduminlaat omvat en een tegenoverliggend tweede einde waarvan de fluïdumuitlaat omvat, waarin de fluïduminlaat is ingericht voor aansluiting op een uitlaat van een

waterkraan of een aansluiteinde van een waterleiding en de fluïdumuitlaat is ingericht voor het direct aansluiten van een douchekop of bijvoorbeeld een waterslang welke in een douchekop eindigt.

16. Fluïdumstromingsbewakingsinrichting volgens conclusie 15, omvattende optische presentatiemiddelen in overeenstemming met conclusie 5, welke optische presentatiemiddelen licht-emitterende diode- ("Light Emitting Diode") (LED) middelen omvat, ingericht voor het extern emitteren van licht vanaf een buitenomtrek van de behuizing.

17. Werkwijze voor fluïdumstromingsbewaking door een fluïdumstromings-bewakingsinrichting, welke werkwijze de stappen omvat van het:

- detecteren van afwezigheid van fluïdumstroming;
- berekenen van een fluïdumstromingsafwezigheidstijd;
- indien de berekende fluïdumstromingsafwezigheidstijd langer is dan een maximum toelaatbare fluïdumstilstandstijd:
  - verschaffen van een alarmsignaal;
- detecteren van aanwezigheid van fluïdumstroming;
- berekenen van een fluïdumstromingsaanwezigheidstijd;
- indien de berekende fluïdumstromingsaanwezigheidstijd langer is dan een vertragingsperiode:
  - verschaffen van een veilig signaal.

18. Werkwijze volgens conclusie 17, waarin ten minste een van de maximum toelaatbare fluïdumstilstandstijd en de vertragingsperiode worden berekend op basis van ten minste één van een fluïdumtemperatuurmeting en een omgevingstemperatuurmeting.

19. Werkwijze volgens conclusie 17 of 18, waarin het alarmsignaal wordt verschaft op basis van ten minste één van een omgevingsbewegingsmeting, een omgevingslichtmeting, een omgevingsnaderingsmeting en een omgevingsgeluidsmeting.

20. Werkwijze volgens conclusie 17, 18 of 19, waarin het alarmsignaal en het veiligsignaal op afstand van de fluïdumstromingsbewakingsinrichting worden verschaft.

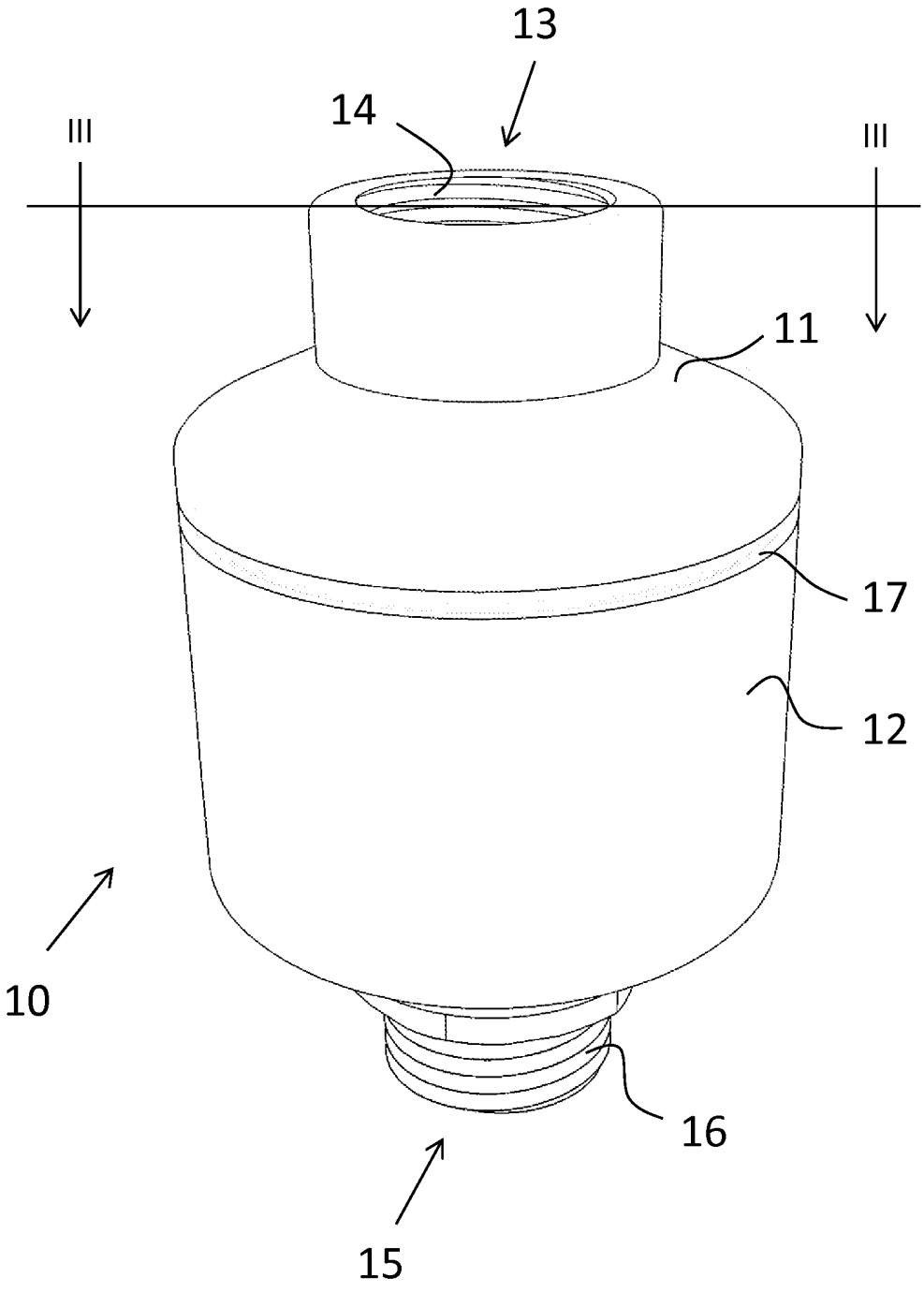


Fig. 1

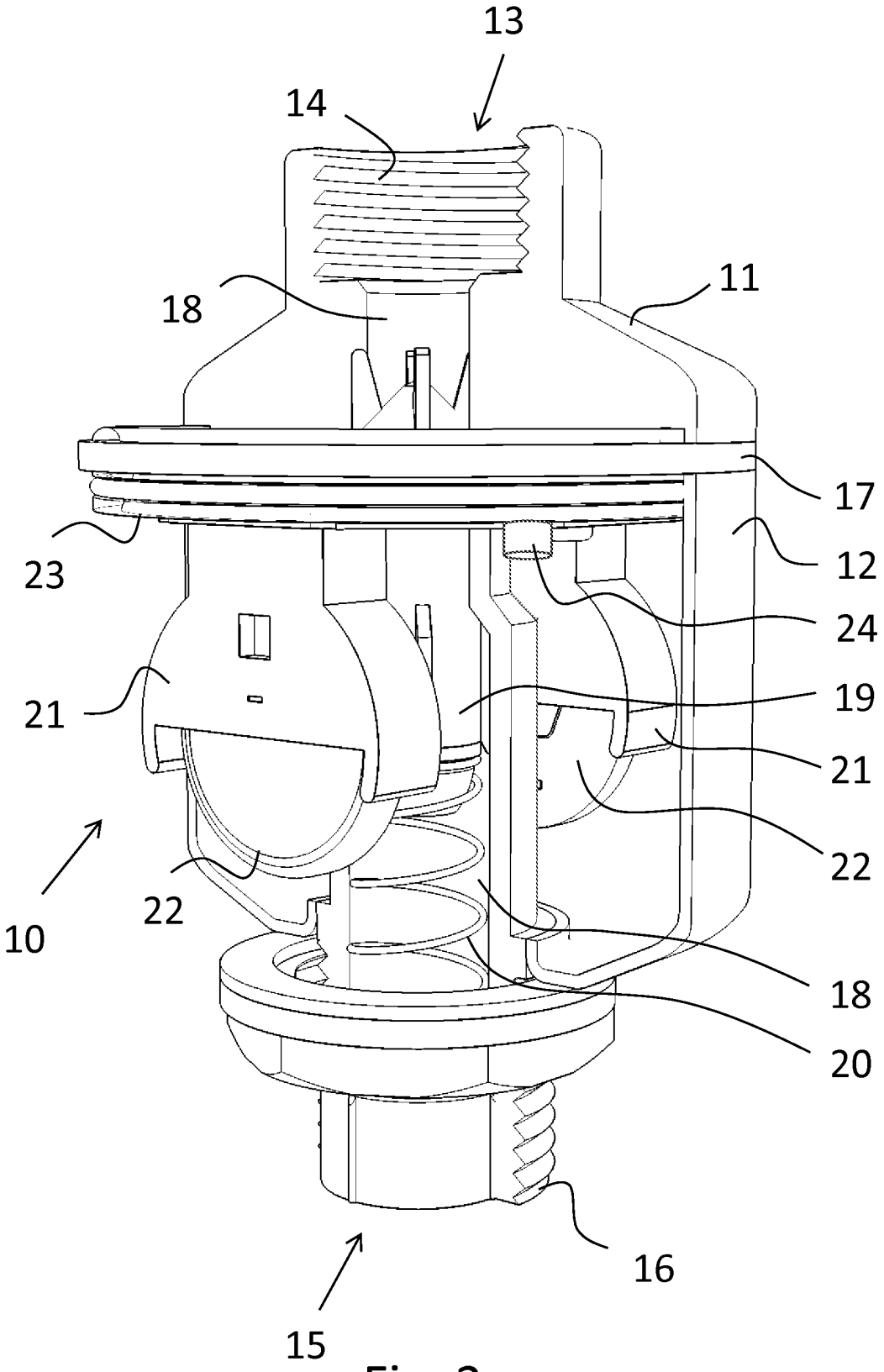


Fig. 2

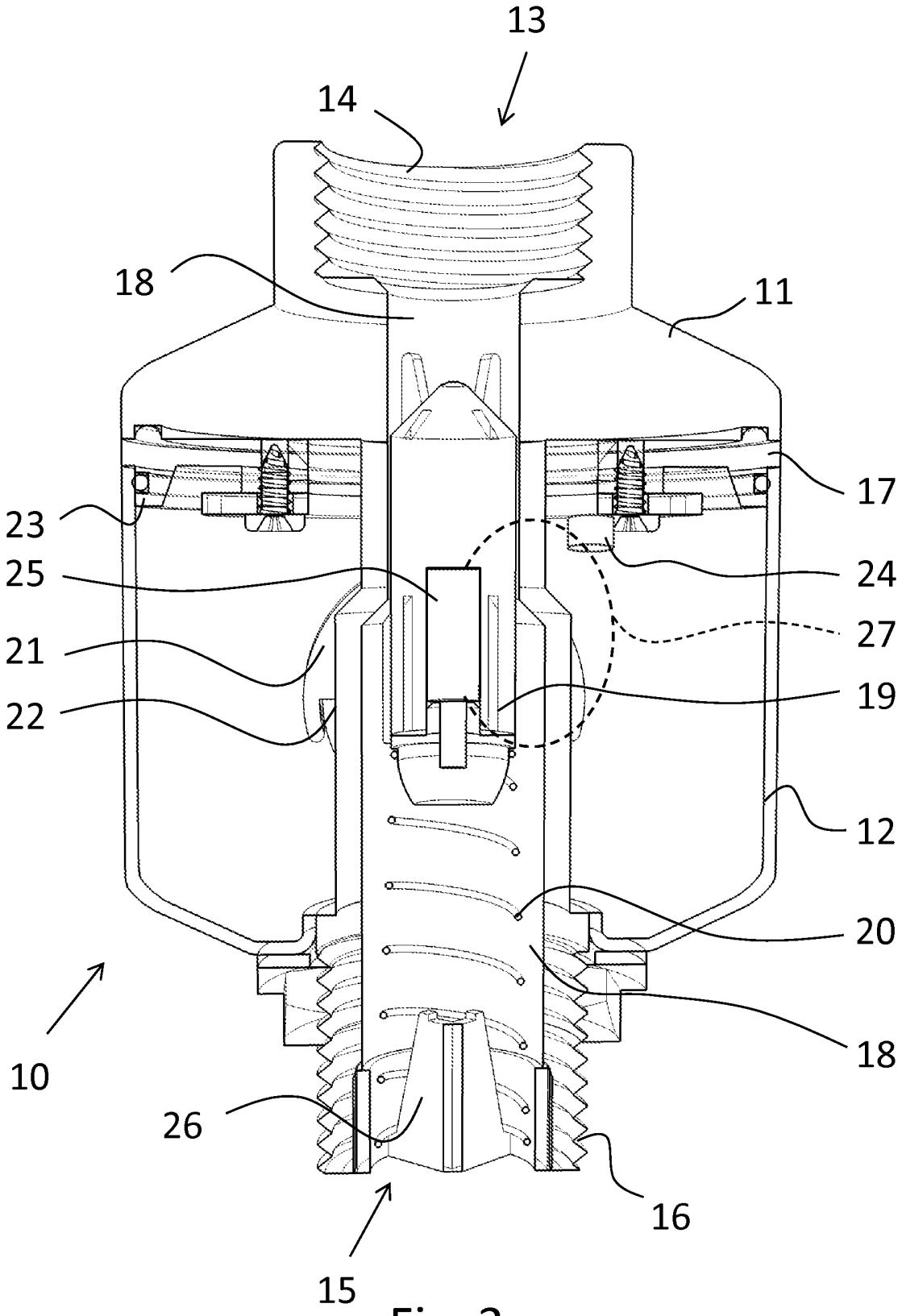
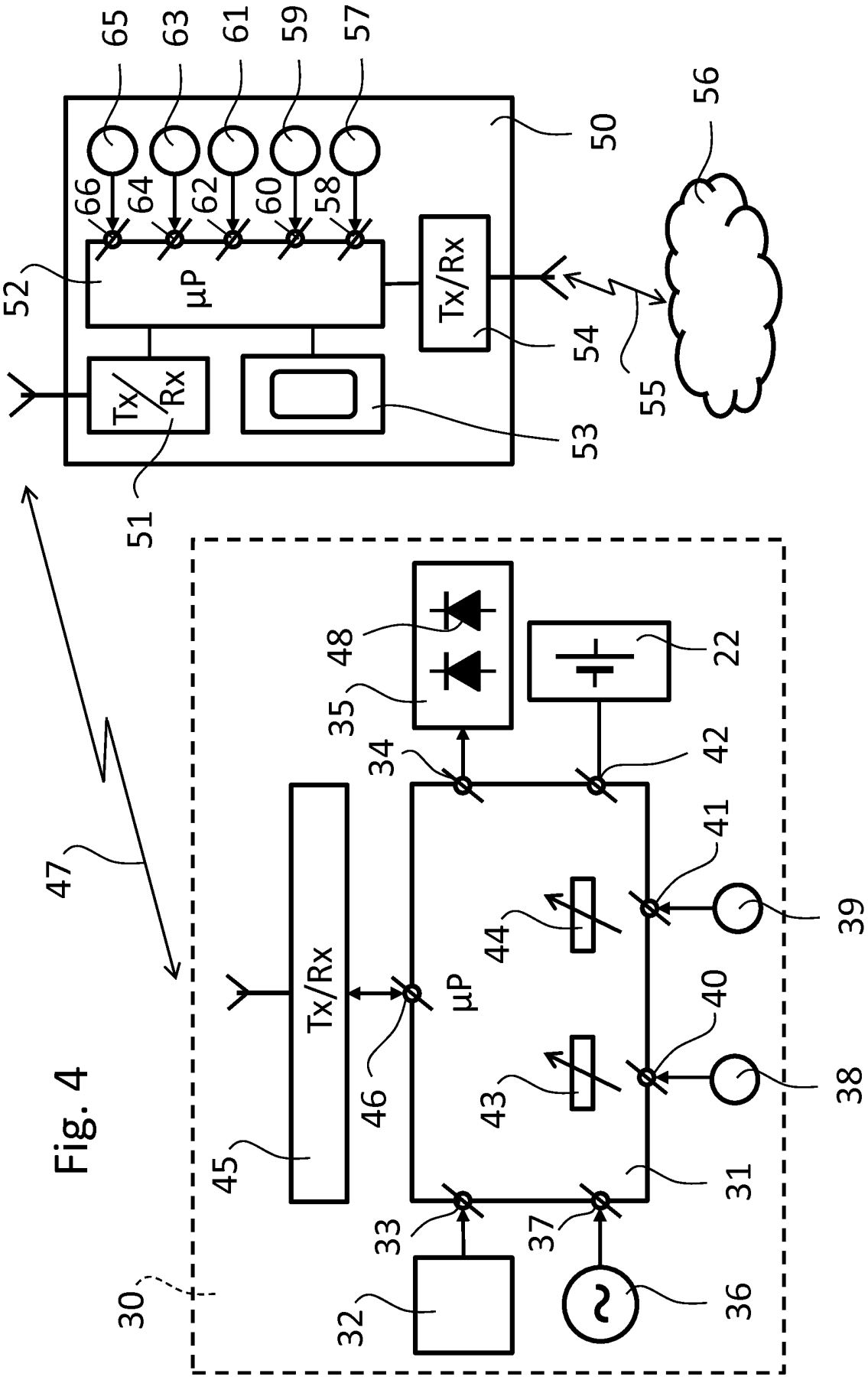


Fig. 3


65
63
61
59
57
66
64
62
60
58
50
56
52
μP
Tx/Rx
54
55
Tx/
Rx
53
51
48
22
35
34
42
47
41
39
44
Tx/Rx
μP
40
38
43
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45
31
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37
30
32
36

Fig. 4

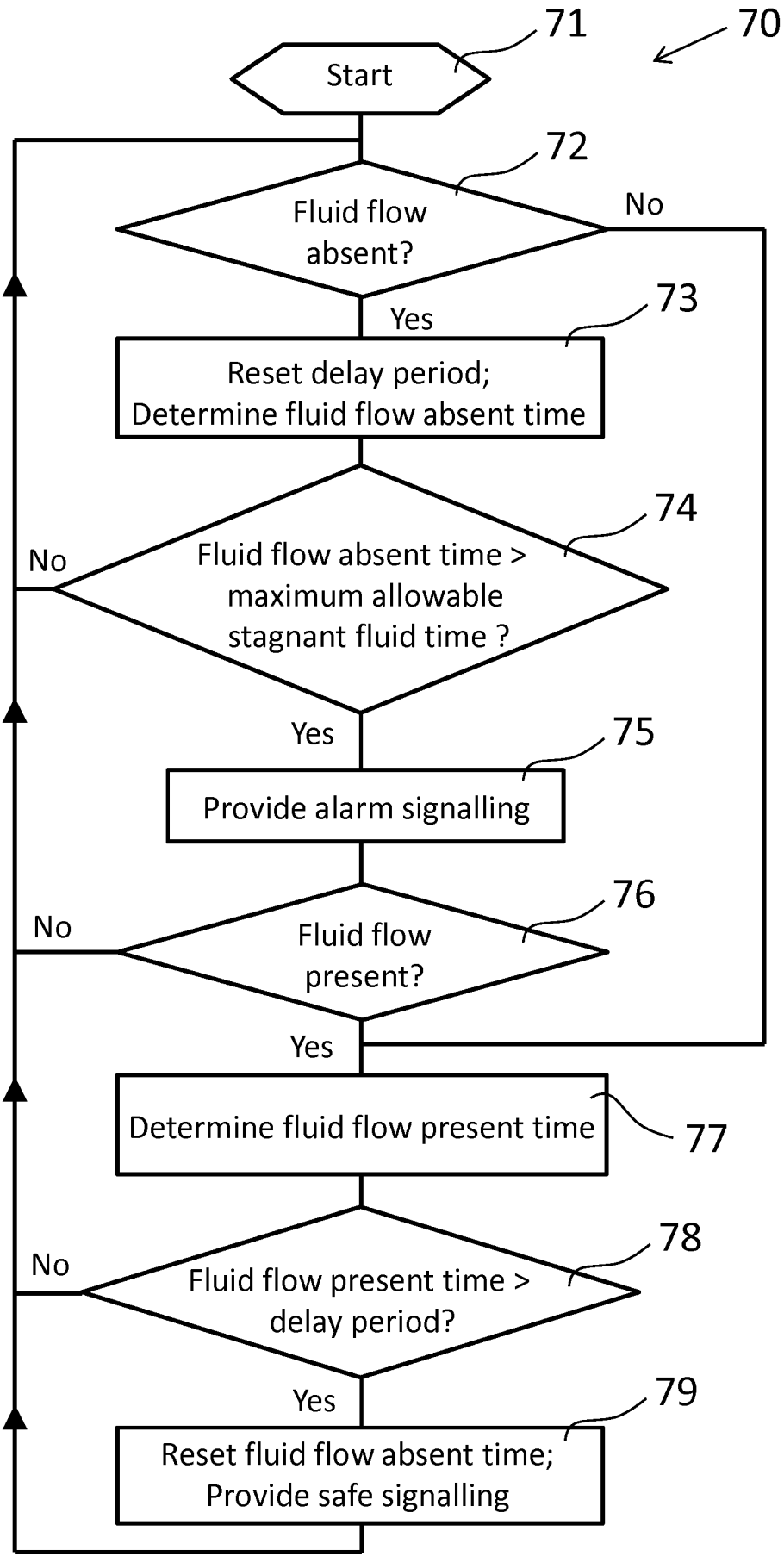
70
71
Start
72
Fluid flow absent?
No
Yes
73
Reset delay period; Determine fluid flow absent time
74
Fluid flow absent time > maximum allowable stagnant fluid time ?
No
Yes
75
Provide alarm signalling
76
Fluid flow present?
No
Yes
Determine fluid flow present time
77
78
Fluid flow present time > delay period?
No
Yes
79
Reset fluid flow absent time; Provide safe signalling

Fig. 5

A B S T R A C T

A fluid flow monitoring method and a fluid flow monitoring device comprising a fluid passage having a fluid input and a fluid output, a fluid flow detection device arranged for detecting fluid flow through the passage, and an electronic control circuit. The electronic control circuit operatively connects to the fluid flow detection means. The fluid flow detection means are arranged for establishing absence of fluid flow through the fluid passage and providing signalling of a duration of the absence of fluid flow.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	65584NL
Nederlands aanvraag nr. **2015496**	Indieningsdatum **23-09-2015**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **STN B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **12-03-2016**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN65883**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

F24D17/00

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**F24D**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐	**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 2015496

A. CLASSIFICATIE VAN HET ONDERWERP
INV. F24D17/00
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen)
F24D

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	EP 2 439 174 A1 (SOEMA SRL [IT]) 11 april 2012 (2012-04-11) * alinea [0028] - alinea [0051]; figuren 1-4 * -----	1-15, 17-20
X	EP 2 293 027 A1 (HYDROMETER GMBH [DE]) 9 maart 2011 (2011-03-09) * alinea [0026] - alinea [0041]; conclusies 1-8; figuren 1-2 * -----	1-15, 17-20
X	DE 10 2007 009007 A1 (JOBST FRANK [DE]) 28 augustus 2008 (2008-08-28) * alinea [0021] - alinea [0026]; figuren 1-2 * -----	1-20
A	EP 2 886 965 A1 (STIEBEL ELTRON GMBH & CO KG [DE]) 24 juni 2015 (2015-06-24) * het gehele document * -----	1-20

-/--

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] 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

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"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

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

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
9 juni 2016	

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	Riesen, Jörg

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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 2015496

C. (Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	GB 2 496 640 A (SAINT WILLIAM HENRY [GB]) 22 mei 2013 (2013-05-22) * het gehele document *	1-20
A	EP 1 544 552 A2 (BUCK ROBERT [DE]) 22 juni 2005 (2005-06-22) * het gehele document *	1-20
A	NL 1 011 883 C1 (ZOWEL ENERGY TECHNOLOGIES B V [NL]) 24 oktober 2000 (2000-10-24) * het gehele document *	1-20
A	DE 10 2010 009215 A1 (GUZMAN CRISTOBAL [DE]) 25 augustus 2011 (2011-08-25) * het gehele document *	1-20
A	WO 2010/026071 A1 (STAAKE THORSTEN [DE]; STIEFMEIER THOMAS [DE]; AMPHIRO AG [CH]) 11 maart 2010 (2010-03-11) * het gehele document *	1-20
A	DE 10 2014 104393 A1 (WIMBERGER HERBERT [AT]) 9 oktober 2014 (2014-10-09) * het gehele document *	1-20
A	GB 2 502 165 A (FLUID COHESION LTD [GB]) 20 november 2013 (2013-11-20) * het gehele document *	1-20

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 2015496

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
EP 2439174 A1	11-04-2012	EP 2439174 A1	11-04-2012
		IT 1401893 B1	28-08-2013
EP 2293027 A1	09-03-2011	DE 102009040261 A1	24-03-2011
		DK 2293027 T3	01-10-2012
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		DE 112011100668 A5	07-03-2013
		EP 2539577 A2	02-01-2013
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		WO 2011103863 A2	01-09-2011
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		DE 102008064677 A1	02-12-2010
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		US 2011203364 A1	25-08-2011
		WO 2010026071 A1	11-03-2010
DE 102014104393 A1	09-10-2014	AT 514157 A2	15-10-2014
		AT 514160 A2	15-10-2014
		DE 102014104393 A1	09-10-2014
		DE 102014104395 A1	09-10-2014
GB 2502165 A	20-11-2013	GEEN	

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN65883	23.09.2015		NL2015496

International Patent Classification (IPC)
INV. F24D17/00

Applicant
STN B.V.

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
Riesen, Jörg

Application number

WRITTEN OPINION

NL2015496

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	16
	No:	Claims	1-15, 17-20
Inventive step	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Application number

WRITTEN OPINION

NL2015496

Box No. VII Certain defects in the application

see separate sheet

Re Item V

Reference is made to the following documents:

D1 EP 2 439 174 A1 (SOEMA SRL [IT]) 11 april 2012 (2012-04-11)

D2 EP 2 293 027 A1 (HYDROMETER GMBH [DE]) 9 maart 2011 (2011-03-09)

D3 DE 10 2007 009007 A1 (JOBST FRANK [DE]) 28 augustus 2008 (2008-08-28)

1 Independent claims

1.1 Claim 1 - Novelty

The present application does not meet the criteria of patentability, because the subject-matter of claim 1 is not new.

Document D1 discloses (References in parentheses apply to this document, in particular [0025-0026] and figure 1) a

Fluidumstromingsbewakingsinrichting, omvattende

een fluidumdoorgang welke een fluiduminlaat en een fluidumuitlaat heeft,

een fluidumstromingsdetectieinrichting (2) *ingericht voor het detecteren van fluidumstroming door de doorgang en*

een elektronische stuurschakeling (3), *werkzaam verbonden met de fluidumstromingsdetectieinrichting,*

waarin

de stuurschakeling is ingericht voor het vaststellen van afwezigheid van fluidumstroming door de fluidumdoorgang en

het verschaffen van een signalering van de duur van de afwezigheid van fluidumstroming ([0026]).

The subject-matter of claim 1 is further not new with respect to the disclosure of document D2. See the search report for the relevant passages.

1.2 Claim 17 - Novelty

The present application does not meet the criteria of patentability, because the subject-matter of claim 17 is not new.

Document D1 discloses (References in parentheses apply to this document, in particular paragraphs [0025-0026]) a

Werkwijze voor fluidumstromingsbewaking door een fluidumstromingsbewakingsinrichting, welke werkwijze de stappen omvat van het:
- detecteren van afwezigheid van fluidumstroming;
- berekenen van een fluidumstromingsafwezigheidstijd;
- indien de berekende fluidumstromingsafwezigheidstijd langer is dan een maximum toelaatbare fluidumstilstandstijd:
- verschaffen van een alarmsignaal;
- detecteren van aanwezigheid van fluidumstroming;
- berekenen van een fluidumstromingsaanwezigheidstijd;
- indien de berekende fluidumstromingsaanwezigheidstijd langer is dan een vertragingsperiode:
- verschaffen van een veilig signaal.

The subject-matter of claim 17 is further not new with respect to the disclosure of document D2. See the search report for the relevant passages.

2 Dependent claims

2.1 Novelty

The subject-matter of claims 2-15 and 18-20 is not new with respect to the disclosure of documents D1 or D2.

2.2 Inventive step

The subject-matter of claim 16 is not supposed to involve an inventive step with respect to the disclosure of document D3.

See the search report for the relevant passages.

Re Item VII

The relevant background art disclosed in documents D1-D3 is not mentioned in the description, nor is this document identified therein.

The features of claims 1-20 are not provided with reference signs placed in parentheses.