(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 679 918 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
28.01.2015 Bulletin 2015/05

(51) Int Cl.:
F24D 19/10 *(2006.01)*

(21) Application number: **12174271.2**

(22) Date of filing: **29.06.2012**

(54) **A method for determining connections in a mixing valve, and a actuator therefor**

Verfahren zum Bestimmen der Verbindungen in einem Mischventil und Betätiger dafür

Procédé de détermination des connexions dans une vanne de mélange et actuateur pour ce procédé

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(43) Date of publication of application:
01.01.2014 Bulletin 2014/01

(73) Proprietor: **LK Armatur AB**
254 66 Helsingborg (SE)

(72) Inventor: **Lif, Pär-Olof**
247 50 Dalby (SE)

(74) Representative: **Åkesson, Sten Jan-Åke**
Awapatent AB
Box 1066
251 10 Helsingborg (SE)

(56) References cited:
GB-A- 2 127 529 **US-A1- 2011 162 742**

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 2 679 918 B1

Description

TECHNICAL FI ELD

[0001] The present application relates to the field of heating systems, and in particular to the field of waterborne heating systems comprising mixing valves and the configuration thereof.

BACKGROUND OF THE INVENTION

[0002] Mixing valves are well established in the technical field of waterborne heating systems and serve to provide a fluid, typically water, at a desired temperature.

[0003] Mixing valves are used for applications for providing water to a user, such as by water taps and showers. Mixing valves are also commonly used as part of heating systems which are based on waterborne heating. Examples of such heating systems are waterborne floor heating systems, also known as underfloor heating systems, and waterborne radiator heating systems. The systems comprise a heating source, such as a heating boiler or a heat pump, a mixing valve, pipes for carrying the water, and heaters, such as radiators.

[0004] The mixing valve has an obturator to control the relative proportions between fluids which are passed into the mixing valve through inlets. The obturator may be automatically operated, by being motorized, or be manually operable. In the mixing valve, the fluids are mixed with each other, and passed out of the mixing valve through an outlet.

[0005] The mixed water are circulated in the system from the outlet of the mixing valve to the one or more heat dissipating elements, and circulated back partly into one of the inlets of the mixing valve and partly into the heater for reheating. The heated water is provided to the other inlet of the mixing valve, where it is mixed with the unheated recirculated water. Thus, the system is a closed heating system where the circulating water is reheated.

[0006] When installing the mixing valve in the heating system, the two inlets of the mixing valve are thus connected to the reheated fluid inlet and a recirculation fluid inlet, respectively. The outlet is connected to an outgoing fluid pipe. Depending on e.g. model or manufacturer, mixing valves are differently arranged in terms of which inlet of the mixing valve that is to be connected to which fluid inlet.

[0007] Thus, when the mixing valve has been installed, it is often not clear in which direction to operate the obturator in order to obtain a desired increase or decrease of the temperature in the outgoing water. It is typically predetermined in which way the obturator should be operated in order to increase or decrease the temperature, however this may not correspond to the actual result if the water inlets have been connected in the opposite way than the predetermined way. A possible reason for an incorrect installation is that it may not be known at the time of the installation which incoming water inlet that corresponds to heated water and directly circulated water, respectively, since the water is not running at that time. Thus, it is not straightforward how to connect the water inlets to the mixing valve.

[0008] As a result, an incorrect installation leads to an incorrect indication of the temperature modes. Further, a temperature set based on an incorrect indication of the obturator may lead to problems such as damaged floor material due to overheating in case of an underfloor heating application..

[0009] Thus, there is a need for an improved method for the installation of a mixing valve in a heating system, in particular in terms of configuring the mixing valve. The configuration should preferably be so simple that it may be made without prior installation experience.

SUMMARY OF THE INVENTION

[0010] An object of the present invention is to alleviate the above mentioned drawbacks and problems. A further object is to provide a method for an improved configuration of a mixing valve, and an actuator thereof, especially in view of the connections of the inlets of the mixing valve.

[0011] According to a first aspect of the invention, this and other objects are achieved by a method for automatically determining the connection of a first inlet and a second inlet of a mixing valve in view of a low temperature fluid inlet and a high temperature fluid inlet, wherein the mixing valve further comprises an outlet, and an obturator arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet; wherein the mixing valve is part of a system further comprising: a motor for operating the obturator; a controller; and a temperature sensor arranged to sense a temperature of the fluid in or downstream of the outlet of the mixing valve; the method comprising: operating, by the motor, the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet; providing, by the temperature sensor, at least a first temperature value to the controller; operating, by the motor, the obturator to a second position, in which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet; providing, by the temperature sensor, at least a second temperature value to the controller; determining, by the controller, a mutual relationship between at least two of the provided temperature values; and determining, by the controller and based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively.

[0012] The high temperature fluid inlet may correspond to the fluid inlet from the heater and may comprise reheated fluid from the system. The low temperature fluid inlet may correspond to the fluid inlet from the system comprising directly circulated fluid.

[0013] The purpose of the method is to determine

which position of the obturator that corresponds to which fluid inlet. Typically, the two end positions of the obturator correspond to the first inlet and the second inlet, respectively, being in a fully opened state. By the method, it is automatically determined which end position of the obturator that correspond to the fully opened state of which inlet. This is achieved by operating the obturator to two different positions, in which the inlets are differently proportioned in relation to each other. In the first position the first inlet is more open than the second inlet, and vice versa. At this stage of the method, it is not known which inlet that corresponds to which incoming fluid inlet. By providing temperature values, by the temperature sensor, at each position, the provided temperature values correspond substantially to each of the fluid inlets.

[0014] In one embodiment, the step of determining the mutual relationship comprises determining the mutual size relationship between the first temperature value and the second temperature value.

[0015] By determining the mutual size relationship of the provided temperature values is meant determining which of the temperature values that is higher than the other temperature value. It is not necessary to determine the difference between the temperature values, however it may be advantageous as will be disclosed later on.

[0016] By the determined mutual size relationship, the connections between the inlets of the mixing valve and the incoming fluid inlets are determined. Thereby, it is also determined which end position of the obturator that corresponds to which incoming fluid, and in particular to which temperature magnitude - high or low. In an alternative embodiment, a plurality of first temperature values or a plurality of second temperature values is provided, the method further comprising generating a temperature curve over a measuring time based on the provided plurality of first or second temperature values, and wherein the step of determining the mutual relationship comprises determining a gradient of the generated temperature curve. By determining a gradient of the generated temperature curve, it may be determined if the temperature of the outlet fluid is increasing or decreasing. If the temperature gradient is increasing in a temperature curve, it may be determined that the inlet which is most open in the current obturator position, which corresponds to that temperature curve, is connected to the high temperature fluid inlet. If the temperature gradient is decreasing, the corresponding discussion applies, vice versa. Preferably, both a plurality of first temperature values and a plurality of second temperature values are provided. Thus, a first temperature curve based on the plurality of first temperature values and a second temperature curve based on the plurality of second temperature values may be generated. A first gradient and a second gradient may be generated for the first temperature curve and second temperature curve, respectively. A more accurate method of determining the connection of the mixing valve may thus be provided, since two gradients may be utilized for the determination.

[0017] Thus, a relation between the end positions of the obturator and the inlets of the mixing valve is not determined and configured on beforehand, as conventional, but instead after the mixing valve has been connected to the inlets, and independently of which inlet is connected to which incoming fluid. The installation procedure may thus be simplified.

[0018] By the automatic determination, utilizing a motor and a controller, the installation may be performed without any required interaction with the user, and further without any specific knowledge of the user. Thus, the method is both user-friendly and time-efficient. It is also less prone to human error during commissioning.

[0019] In order to determine whether heating of fluid in the high temperature fluid inlet is activated in the system, the method may further comprise:

determining, by the controller, whether any of the first temperature value and the second temperature value exceeds a minimum temperature value.

[0020] If the minimum temperature value is not exceeded, the method may further comprise: operating, by the motor, the obturator to an intermediate position in which each of the first inlet and the second inlet is at least partly open; providing, by the temperature sensor, a test temperature value; determining, by the controller, whether the test temperature value exceeds the minimum temperature value. If the test temperature value exceeds the minimum temperature value, the method may further comprise: restarting the method from the step of operating the obturator to the first position. If the test temperature value does not exceed the minimum temperature value, the method may further comprise: restarting the method from the step of providing a test temperature value.

[0021] By determining whether at least one of the fluid inlets exceeds a minimum temperature value, it is checked whether the heating of the system is activated in a sufficient manner. The check makes sure that the determination of the connections of the first and second inlets is performed when the system is up and running, i.e. when the heater is activated, which provides for a more accurate determination.

[0022] The obturator is operated to an intermediate position, such that the temperature of a mix of fluids from the two fluid inlets is measured. By this feature, it is ensured that the temperature sensor does not measure on only the low temperature fluid, which temperature is not depending on the heater of the system.

[0023] Advantageously, the intermediate position is the substantial central position between the two end positions of the obturator. By this feature, the temperature sensor measures on a fluid which is a mix of substantially equal proportions of the low temperature fluid and the high temperature fluid. It is thus ensured that the high temperature fluid constitutes substantially half the amount of the mix of fluids from the two fluid inlets.

[0024] It is continuously evaluated if the test temperature value exceeds the minimum temperature value. When the test temperature value is exceeded, the method is restarted from the beginning.

[0025] Advantageously, the minimum temperature value lies in a range of 30-50°C.

[0026] Advantageously, the method further comprises: initiating a timer by the step of operating the obturator to an intermediate position; and restarting, if the timer reaches a timeout period of time, the method from the step of operating the obturator to the first position.

[0027] By the timer, the continuous evaluation of the test temperature value is ended after a timeout period of time. By this feature, the method does not get stuck in a continuous evaluation. Preferably, the timeout period of time is in a range of 5-90 minutes.

[0028] The method may further comprise: determining, by the controller, the difference between the first temperature value and the second temperature value; and, if the difference does not exceed a threshold temperature value, restarting the method from the step of operating the obturator to the first position.

[0029] By this feature, the risk of a non-accurate determination of the connection of the mixing valve to the inlets is alleviated. A higher difference provides for a more certain determination of which of the inlets is a high temperature inlet or low temperature inlet. Thus, a more fail-safe determination may be achieved by use of the threshold temperature value.

[0030] Preferably, the threshold temperature difference value lies in a range of 1-10°C, preferably in a range of 3-6°C.

[0031] In an alternative embodiment, the determination of the connection of the inlets of the mixing valve may be based both on a determined gradient of a generated temperature curve and on a determined mutual size relationship between the provided first and second temperature values. In such an embodiment, the threshold temperature value may lie in the lower range of the preferred interval, and still provide an accurate determination.

[0032] The method may further comprise: waiting a period of time before the step of providing the first temperature value and/or the second temperature value, preferably before both. By this feature, the output of fluid mixed according to the proportions of the first or second positions of the obturator may flow out in the system for a while before measuring on the mixed fluid by the temperature sensor. Thus, the provided temperature value corresponds more accurately to the actual temperature of the mixed fluid corresponding to the first and second positions.

[0033] If the waiting period is too short, the difference between the first and second temperature values may be too small, thus resulting in that the method is restarted. It is therefore advantageous that the method further comprises that the period of time is extended if the method is restarted due to that the determined temperature difference does not exceed the threshold value. By this feature, the problem of not being able to determine the connection of mixing valve due to a too short waiting period is taken care of during the exercising of the method.

[0034] The method may further comprise: indicating the position, of the first and second positions, corresponding to the lower temperature value as a low temperature mode position; and indicating the position, of the first and second positions, corresponding to the higher temperature value as a high temperature mode position.

[0035] By this feature, the first and second positions are correlated to a high temperature mode and a low temperature mode, i.e. the high temperature position and the low temperature position, respectively, of the obturator. The indication is preferably a digital indication which is achieved by saving, in e.g. a memory, the correlation between the end positions of the obturator and the high temperature mode and the low temperature mode, respectively, such that the controller knows which way to operate the obturator in order to increase or decrease the temperature of the outgoing fluid. The digital indication may be supplemented by a visual indication in connection to a manual actuating element, in order to inform the user of in which direction to operate the manual actuating element in order to achieve a desired change in temperature.

[0036] The first and second positions may be predetermined positions. Further, the method may comprise: setting the first position to the position of the predetermined positions being closest to a current position of the obturator.

[0037] By operating the obturator to the closest position, the method may be performed in a quicker manner. The obturator's current position may be kept track on by the controller, and thereby the controller may also determine which position of the predetermined positions that is the closest. By closest is meant which position that it takes the least time to operate the obturator to. The two positions which are going to be the first and second positions are predetermined on beforehand, however which position that is the first is determined based on the current position of the obturator.

[0038] Advantageously, the first inlet is closed when the obturator is arranged in the first position, and the second inlet is closed when the obturator is arranged in the second position. By closed is meant that the inlet is substantially closed, i.e. the inlet does not need to be absolutely closed in the meaning that there does not exists any smaller leaks or similar.

[0039] Thus, the first temperature value is provided by measuring substantially only on fluid from the second inlet and the second temperature value is provided by measuring substantially only on fluid from the first inlet. Thereby, the first temperature value and second temperature value more distinctly represent the respective inlets, and thus a more accurate and quick determination of the connections may be achieved.

[0040] Advantageously, the temperature sensor is arranged within 3 meters, preferably within 1 meter, downstream of the outlet. Thus, the first and second temperature values are measured close to the outlet, by which it has not changed much in temperature and thus correspond well to the actual temperatures of the fluids at the respective inlets. Further, a waiting period of time before providing a temperature value which should correspond to a certain position of the mixing valve, may be shorter with a sensor arranged closer to the outlet.

[0041] The motor may be a variable speed motor. By this feature, the obturator may be operated sufficiently fast such that the method may be performed within a reasonable time, making the method very time-efficient.

[0042] According to a second aspect of the invention, the above mentioned and other objects are achieved by an actuator for automatically determining the connection of a first inlet and a second inlet of a mixing valve in view of a low temperature fluid inlet and a high temperature fluid inlet, wherein the mixing valve further comprises an outlet, and an obturator arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet; the actuator comprising: a motor for operating the obturator; a connector for connecting the motor to the obturator; a controller; and a temperature sensor adapted to be arranged in or downstream of the outlet of the mixing valve; wherein the motor is arranged to operate the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet; wherein the temperature sensor is arranged to provide at least a first temperature value to the controller; wherein the motor is further arranged to operate the obturator to a second position, in which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet; wherein the temperature sensor is further arranged to provide at least a second temperature value to the controller; wherein the controller is arranged to determine the mutual relationship between at least two of the provided temperature values; and wherein the controller is further arranged to determine, based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively. The actuator is designed to operate using motive energy which may be electrical, pneumatic, hydraulic, etc, or a combination of these. The movement is limited by travel, torque or thrust.

[0043] The actuator may further comprise a manual actuating element, which is arranged to be operable connected to the obturator of the mixing valve. By turning the manual actuating element, the obturator of the mixing valve is turned correspondingly. The manual actuating element may be operated by a user who desires to increase or decrease the temperature of the outgoing fluid into the heating system.

[0044] Which positions of the mixing valve that the end positions of the manual actuating element corresponds to may be indicated on the actuator by the manual actuating element, i.e. that one of the end positions corresponds to the high temperature mode and the other of the end positions corresponds to the low temperature mode. In that way, the user knows in which direction the manual actuating element is to be operated in view of the desired temperature. The indication may be achieved by way of light emitting diodes (LEDs) which are set to a color indicative of the temperature mode. The colors of the LEDs are set when the connection of the inlets of the mixing valve in view of the fluid inlets are determined, i.e. not before the method for determining the connection of the first and second inlet of the mixing valve has been performed.

[0045] Advantageously, the actuator is arranged to be removable connected to the obturator of the mixing valve. The removable connection is achieved by the motor being operable connected to the obturator. The connection between the motor and the obturator is achieved by the connector of the actuator.

[0046] By the removable connection, the actuator may be temporarily connected to a mixing valve in order to determine the connections of the inlets to the mixing valve to the fluid inlets. Thereafter, the actuator may be removed, and possible replaced by another more permanent actuator. The actuator may thus function as e.g. a transportable diagnostics tool for determining the connection of already installed mixing valves. The tool may be useful for e.g. an installation engineer. Further, the actuator may replace an existing actuator in a heating system. Thus, a heating system may be upgraded by only replacing the actuator connected to the mixing valve.

[0047] The above disclosed features and corresponding advantages of the first aspect is also applicable to this second aspect. To avoid undue repetition, reference is made to the discussion above.

[0048] According to third aspect of the invention, the above mentioned and other objects are achieved by a system for mixing fluids, comprising: a mixing valve comprising a first inlet and a second inlet being connected to a low temperature fluid inlet and a high temperature fluid inlet, an outlet, and an obturator arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet; and an actuator for automatically determining the connection of the first inlet and the second inlet of the mixing valve in view of the low temperature fluid inlet and the high temperature fluid inlet, the actuator comprising: a motor for operating the obturator; a connector for connecting the motor to the obturator; a controller; and a temperature sensor adapted to be arranged in or downstream of the outlet of the mixing valve; wherein the motor is arranged to operate the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet; wherein the temperature sensor is arranged to provide at least a first temperature value to the controller; wherein the motor is further arranged to operate the obturator to a second position, in

which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet; wherein the temperature sensor is further arranged to provide at least a second temperature value to the controller; wherein the controller is arranged to determine the mutual relationship between at least two of the provided temperature values; and wherein the controller is further arranged to determine, based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively.

[0049] The above disclosed features and corresponding advantages of the first and second aspects are also applicable to this third aspect. To avoid undue repetition, reference is made to the discussion above.

[0050] It is noted that the invention relates to all possible combinations of features recited in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] This and other aspects of the present invention will now be described in more detail, with reference to the enclosed drawings showing embodiments of the invention.

Figure 1 illustrates an example of a heating system in a building.

Figure 2 is a schematic view of a mixing valve and an actuator for operating the mixing valve.

Figure 3 illustrates an embodiment of the method for determining the connection of a mixing valve to fluid inlets.

Figure 4 illustrates another embodiment of the method for determining the connection of a mixing valve to fluid inlets.

Figure 5 illustrates an embodiment of the actuator in figure 2.

[0052] The figures are adapted for illustrative purposes and, thus, they are provided to illustrate the general concept of embodiments of the present invention. Like reference numerals refer to like elements throughout.

DETAILED DESCRIPTION

[0053] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which currently preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness, and for fully conveying the scope of the invention to the skilled person.

[0054] A heating system for a building is illustrated in figure 1, which provides an example of a system in which the method and actuator of the present application may be utilized. The heating system comprises a heater 15, a heat dissipating element 16, and a mixing valve 10. The heating system is typically waterborne, i.e. the heat carrier in the heating system is water. It is understood that other heat carrying fluids are also feasible within the scope of the present invention. However, in the embodiments disclosed in the following, water is used as heat carrier.

[0055] The water is passed around in the system in pipes, which connect the different elements of the system together. The water is re-circulated in the system, i.e. essentially the same water is passed around in the system.

[0056] From the heat dissipating element 16, which may be e.g. a radiator, the water is passed directly or indirectly to the mixing valve 10. One amount of water is passed directly to the mixing valve 10. The other amount of water is passed through the heater 15 in which it is reheated. The reheated water is passed further to the mixing valve 10.

[0057] The mixing valve 10 has two inlets: a first inlet 11 and a second inlet 12. Further, the mixing valve 10 has an outlet 13. The mixing valve may optionally also comprise a further outlet (not shown) and/or a further inlet (not shown). In one embodiment (not disclosed), the mixing valve 10 may comprise three inlets and one outlet. Two of the inlets are high temperature inlets from two different heaters, and the third inlet is a low temperature inlet comprising re-circulated water from the heating system. It is understood that also such configured mixing valve 10 may also be utilized for the present invention and fall within the scope of the present claims.

[0058] The directly circulated water is passed into the first inlet 11, and the reheated water is passed into the second inlet 12. When the heater 15 is running, i.e. when the heating system is active, the reheated water typically has a higher temperature than the directly circulated water.

[0059] The mixing valve 10 is connected to an actuator 20 for controlling the function of the mixing valve 10. The actuator 20 is designed to operate using motive energy which may be electrical, pneumatic, hydraulic, etc or a combination of these. Movement is limited by travel, torque or thrust. The actuator 20 and its connection to the mixing valve 10 is illustrated in figure 2.

[0060] An obturator 25 in the mixing valve 10 is arranged to be operated so as to vary the proportion between the water passed into the first inlet 11 and the water passed into the second inlet 12. The obturator 25 controls the proportion by controlling how much the respective inlet is open. By varying the proportion between the inlets, the temperature of the mixed water is varied. The mixed water of a desired temperature is passed out of the mixing valve 10 through the outlet 13 and further to the heat dissipating element 16, in which the heat of the water is heating the environment.

[0061] The obturator 25 is not limited to any particular obturator type. Nonlimiting examples of feasible obtura-

tor types include obturators with linear movement and obturators with turning movement.

[0062] The obturator 25 may be operated either by a motor 21 or a by a manual actuating element 23. The motor 21 is operable connected to the obturator 25 by a connector (not illustrated). The connector may be an adaptor. The connector may be a separate part in view of the actuator 20.

[0063] In a preferred embodiment, the motor 21 is a variable speed motor which may be operated with a higher speed than conventional motors used for motorized actuators. By this feature, the obturator 25 may be operated sufficiently fast such that the method may be performed within a reasonable time, making the method very time-efficient and usable.

[0064] A controller 22 is arranged to operate the motor 21. The controller 22 may be connected to a memory 24, in which settings, modes, positions, etc. may be saved. The controller 22 may be a microprocessor, or any other suitable type of controller.

[0065] The temperature sensor 14 is arranged to sense a temperature of the water in or downstream the outlet 13. Preferably the temperature sensor 14 is arranged within 3 meter, in particular within 1 meter, of the outlet 13. The temperature sensor 14 may be arranged in direct or indirect connection with the water which temperature is to be sensed.

[0066] The temperature sensor 14 is connected to the controller 22, such that the temperature sensor 14 is arranged to provide a temperature value, representing the measured temperature, to the controller 22. The connection between the temperature sensor 14 and the controller 22 may be a cable connection or a wireless connection.

[0067] By the present invention a simple and time-efficient determination of the connection to the mixing valve to the water inlets is achieved. The determination is performed automatically, i.e. without the requirement of any interaction with a user. In figure 3, such a method for automatically determining the connection of the first inlet 11 and the second inlet 12 to the mixing valve 10 is disclosed. The following description is based on that, after the installation of the mixing valve 10 in a heating system, such as in figure 1, it is not defined to which of the reheated water inlet and the directly circulated water inlet that the first inlet 11 and the second inlet 12, respectively, are connected.

[0068] A first embodiment will now be described with reference to figure 3.

[0069] According to a first step 301, the obturator 25 is operated to a first position. In the first position, the obturator 25 is arranged such that the second inlet 12 is more open than the first inlet 11. In a preferred embodiment, the obturator 25 is arranged such that the first inlet 11 is substantially closed, i.e. that the obturator 25 is set to one of its end positions.

[0070] According to a following step 302, a first temperature value is provided by the temperature sensor 14 to the controller 22. The controller 22 saves the temperature value in the memory 24.

[0071] According to a following step 303, the obturator 25 is operated to a second position. In the second position, the obturator 25 is arranged such that the first inlet 11 is more open than the second inlet 12. In a preferred embodiment, the obturator 25 is arranged such that the second inlet 12 is substantially closed, i.e. that the obturator 25 is set to the other of its end positions.

[0072] According to a following step 304, a second temperature value is provided by the temperature sensor 14 to the controller 22. The controller 22 saves the temperature value in the memory 24.

[0073] At this point, the controller 22 has been provided with two temperature values, which are accessible via the memory 24. The first temperature value corresponds to the temperature of output water substantially from the second inlet; and the second temperature value corresponds to the temperature of the output water substantially from the first inlet.

[0074] According to a following step 305, a mutual relationship between the two provided temperature values is determined by determining the mutual size relationship of the first temperature value and the second temperature value is determined. This step is performed by the controller 22. By mutual size relationship is meant that it is determined which of the first temperature value and the second temperature value that is higher than the other.

[0075] According to a following step 306, the connection of the inlets of the mixing valve 10 to the first inlet 11 and second inlet 12 is determined, by the controller 22, based on the determined mutual relationship, i.e. the mutual size relationship in this embodiment. If the first temperature value is higher than the second temperature value, the second inlet 12 is determined to be connected to the high temperature water inlet, i.e. the water inlet providing reheated water from the heater 15. Consequently, the first inlet 11 is determined to be connected to the low temperature water inlet, i.e. the water inlet providing directly circulated water from the heating system. The opposite determination is realized if the second temperature value is higher than the first temperature value.

[0076] Alternatively, the steps 301-306 may be performed according to a second embodiment, which will now be described with reference to figure 3.

[0077] According to a first step 301, the obturator 25 is operated to a first position. In the first position, the obturator 25 is arranged such that the second inlet 12 is more open than the first inlet 11. In a preferred embodiment, the obturator 25 is arranged such that the first inlet 11 is substantially closed, i.e. that the obturator 25 is set to one of its end positions, i.e. a fully closed or a fully opened position.

[0078] According to a following step 302, a plurality of first temperature values is provided by the temperature sensor 14 to the controller 22. The plurality of first temperature values is provided over a first period of time. The controller 22 saves the plurality of first temperature

values in the memory 24. Further, a first temperature curve over the first period of time is generated based on the provided plurality of first temperature values.

[0079] According to a following step 303, the obturator 25 is operated to a second position. In the second position, the obturator 25 is arranged such that the first inlet 11 is more open than the second inlet 12. In a preferred embodiment, the obturator 25 is arranged such that the second inlet 12 is substantially closed, i.e. that the obturator 25 is set to the other of its end positions.

[0080] According to a following step 304, a plurality of second temperature values is provided by the temperature sensor 14 to the controller 22. The plurality of second temperature values is provided over a second period of time. The controller 22 saves the plurality of second temperature values in the memory 24. Further, a second temperature curve over the second period of time is generated based on the provided plurality of first temperature values.

[0081] At this point, the controller 22 has been provided with two pluralities of temperature values, which each are accessible via the memory 24. The plurality of first temperature values corresponds to the temperature of output water, substantially from the second inlet; and the plurality of second temperature values corresponds to the temperature of the output water substantially from the first inlet. The controller 22 may also generate a first temperature curve and a second temperature curve.

[0082] According to a following step 305, a mutual relationship between at least two of the provided temperature values is determined by determining a gradient for each of the generated temperature curves.

[0083] By determining a gradient of a temperature curve, it is determined if the temperature is increasing or decreasing. The gradient may be determined at any point of the temperature curve. Alternatively, the gradient may be determined as a mean value of a number of gradients for a temperature curve. In this embodiment, a first gradient is determined for the first temperature curve, and a second gradient is determined for the second temperature curve.

[0084] According to a following step 306, the connection of the inlets of the mixing valve 10 to the first inlet 11 and second inlet 12 is determined, by the controller 22, based on the determined mutual relationship, i.e. the determined gradients. It may be sufficient to determine the connection based on one of the first gradient and the second gradient. However, it is preferred that both the first and the second gradients are utilized in the determination.

[0085] The gradient provides an indication of the slope of the temperature curve, i.e. if the temperature is increasing or decreasing. If the temperature curve is increasing, this is an indication that the inlet which is currently most open, e.g. the second inlet 12 when the obturator is arranged in the first position, corresponds to the low temperature water inlet. Correspondingly, if the temperature curve is decreasing, this is an indication that the inlet which is currently most open corresponds to the high temperature water inlet.

[0086] According to any of the above disclosed embodiments, the first position and second position may be determined to correlate to a high temperature mode and a low temperature mode, respectively. If the first inlet is determined to be connected to the low temperature water inlet, consequently the second position, in which the first inlet is more open than the second inlet, is determined to correspond to the low temperature mode. In this preferred embodiment, where the second position is one of the end positions of the obturator 25, that end position is determined to corresponds to the low temperature mode. Thus, in order to achieve a lower temperature of the output water, the obturator 25 shall be operated towards the low temperature mode position.

[0087] The correlation between the obturator positions and temperature modes is saved as a digital indication in the memory 24, and is accessible to the controller 22, such that the controller 22 thereafter knows in which direction to operate the obturator 25 in order to achieve an increase or decrease of the temperature of the output water.

[0088] The temperature modes may further be indicated by the manual actuating element 23, such that it is indicated to a user in which direction to operate the manual actuating element 23 in order to increase or decrease the temperature. The indication may be achieved by visual indicators, such as by LEDs, which are disposed at or in connection to the manual actuating element 23. At one end position of the manual actuating element 23, a LED of a particular color such as blue, may indicate a low temperature mode. At the other end position, a LED of another particular color such as red, may indicate a high temperature mode. Thus, an intuitive indication of in which direction to actuate the manual actuating element 23 is provided.

[0089] The visual indicators are configured by the controller 22 after the connection of the inlets to the mixing valve 10 has been determined.

[0090] Another embodiment of the method is illustrated in figure 4. This method includes all steps of the preceding method, i.e. operating 301 the obturator 25 to a first position; providing 302 at least a first temperature value; operating 303 the obturator 25 to a second position; providing 304 at least a second temperature value; determining 305 the mutual relationship between at least two of the provided temperature values; and determining 306, based on the determined mutual relationship, the connection of the inlets of the mixing valve 10 to the fluid inlets.

[0091] Additionally, the method comprises a number of steps for providing a more failsafe and accurate method.

[0092] Preceding the step 302 of providing a first temperature value is a step 401 of waiting a period of time. By waiting the period of time, outlet water mixed according to the proportions of the first position of the obturator

25 may flow downstream of the outlet 13 for a while before the first temperature value is provided. Depending on the arrangement and configuration of the temperature sensor, it may take a while before the temperature sensor has thermally adjusted to the temperature of the outlet water being the mix of fluids from the first and second inlets corresponding to the first position of the obturator 25. The period of time is preferably within a range of 40-400 seconds.

[0093] For the same reason, preceding the step 304 of providing a second temperature value is a step 402 of waiting a period of time. The period of time preceding the steps of providing the first and second temperature values may be of the same length or be of different lengths.

[0094] The periods of time is controlled by the controller 22.

[0095] Following the step 304 of providing a second temperature value is a step 403 of determining whether any of the first temperature value and the second temperature value exceeds a minimum temperature value. The determination is performed by the controller 22. This step 403 is provided in order to ensure that the heating system is active when the determination is performed, and thus has reached the minimum temperature value. By active is meant that the heater 15 is running and heating the water provided through the high temperature inlet. Since this is the normal mode of the heating system, it is advantageous that the determination is performed with the system in this mode. Thus, a more accurate determination may be achieved. The minimum temperature value lies preferably in a range of 30-50°C.

[0096] If any of the first temperature value and second temperature value exceeds the minimum temperature value, the method is continued without any particular measures.

[0097] If not any of the first temperature value and second temperature value exceed the minimum temperature value, the method goes into a standby mode in which a sufficient temperature of the output water is awaited.

[0098] The standby mode comprises a first step 404 of operating the obturator 25 to an intermediate position in which each of the first inlet 11 and the second inlet 12 is at least partly open. In this preferred embodiment, the intermediate position is the central position of the obturator 25, i.e. between the two end positions of the obturator 25. Hence, the first inlet 11 and second inlet 12 is open to substantially the same degree.

[0099] Following the step 404 is a step 405 of providing a test temperature value by the temperature sensor 14 to the controller 22. In a following step 406, the controller 22 determines if the test temperature value exceeds the minimum temperature value. If it does not, the step 405 of providing a test temperature value and the step 405 of evaluating the test temperature value is repeated. Thus, the steps 405 and 406 of providing and evaluating a test temperature value is repeated in a loop until the test temperature value exceeds the minimum temperature value. When it does, i.e. when the heater 15 is running, the method is restarted from the step 301 of operating the obturator 25 to the first position.

[0100] In order for the method not to get stuck in an endless loop, a timer is initiated by the step 404 of operating the obturator 25 to an intermediate position. If the timer reaches a timeout period of time, the method is restarted from the step 301 of operating the obturator 25 to the first position, regardless of if the test temperature value has exceeded the minimum temperature value. The timeout period of time is preferably in a range of 5-90 minutes,. The timer is set and controlled by the controller 22.

[0101] Following the step 403 of determining whether any of the provided temperature values exceeds the minimum temperature value is a step 407 of determining the difference between the first temperature value and the second temperature value. According to a following step 408, it is determined, by the controller 22, whether the difference exceeds a threshold temperature value. These steps 407 and 408 are provided in order to more accurately determine the connection of the mixing valve 10. A smaller difference provides a higher risk of inaccurate determination of the connection of the inlets of the mixing valve 10. By setting a threshold differential temperature value, the risk is at least alleviated. The threshold temperature value lies preferably in a range of 1-10°C, more preferably in a range of 3-6°C.

[0102] If the determined difference does not exceed the threshold temperature value, the method is restarted from the beginning, i.e. from the step 301 of operating the obturator 25 to the first position.

[0103] The method may further comprise that the period of times of steps 401 and 402 are extended if the method is restarted due to that the difference does not exceed the threshold temperature value. Thus, the temperature sensor gets more time to thermally adjust to and measure on the output water corresponding to the present position of the obturator 25. Thus, the provided temperature value may become more accurate.

[0104] It is understood that the step 407 of determining the difference and the step 305 of determining the mutual size relationship may be performed as one step and thus does not need to be performed separately.

[0105] Returning to figure 2, it is clear that the mixing valve 10 and the actuator 20 may be, but does not have to be, two separate elements. In a preferred embodiment, the actuator 20 is removable connected to the mixing valve 10. Thus, the actuator 20, including the temperature sensor 14, may be attached to and removed from the mixing valve 10.

[0106] The actuator 20 may be used during the installation of the mixing valve 10, and then be replaced by a permanent actuator. The actuator 20 may be used as a diagnostic tool for determining the connections of a mixing valve 10 which has been previously installed.

[0107] The actuator 20 may alternatively be a replacement actuator for a present actuating device in a mixing valve 10. Thus, a user may replace an e.g. old or mal-

functioning actuator with the actuator 20 according to the present invention, in an already installed heating system. Hence, it is possible to upgrade the heating system by only replacing the actuating device.

[0108] According to the present method, the actuator 20 configures automatically and functions independent of how the connection to the mixing valve 10 is arranged.

[0109] The actuator 20 is illustrated in figure 5. In this figure, the user interface is illustrated. The connection, which provides the connection between the actuator 20 and the mixing valve 10, is arranged on the opposite side of the actuator 20. Inside the actuator 20, the motor 21 and controller 22 are provided.

[0110] By the manual actuating element 23, the user may set a desired increase or decrease of the temperature. Visual indicators 50, 50' are provided for indicating the determined high temperature mode and low temperature mode, as previously disclosed. In this preferred embodiment, the visual indicators 50, 50' are LEDs which each is set to a color depending on which temperature mode it indicates.

[0111] A display 52 is provided in order to indicate e.g. a current temperature of the outgoing water in the system. The current temperature may be measured by the temperature sensor 14. The display 52 may also be used for indicating a desired target temperature, set by the user. The increase button 53 or decrease button 53' may be used for setting the target temperature. The controller 22 may adjust the system such that the target temperature is achieved, using the motorized obturator 25 and the temperature feedback provided by the temperature sensor 14.

[0112] In summary, the present application discloses a method for automatically determining the connection of inlets of a mixing valve in view of a low temperature fluid inlet and a high temperature fluid inlet. The method comprises: operating, by a motor, an actuator to a first position; providing, by a temperature sensor, at least a first temperature value to a controller; operating, by the motor, the actuator to a second position; providing, by the temperature sensor, at least a second temperature value to the controller; determining, by the controller, a mutual relationship between at least two of the provided temperature values; and determining, by the controller and based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively. The present application also discloses an actuator for performing the method, and a system.

[0113] It is understood that the above disclosed embodiments may be combined or altered within the scope of the claims. For example, the minimum temperature value may be a fixed and predetermined value, or be altered during the course of the method. It is also understood that embodiments within the scope of the present application may be achieved by a combination of herein disclosed embodiments. As an example, in such a combined embodiment, the step of determining the mutual relationship may comprise both determining the mutual size relationship between the first temperature value and the second temperature value, and comprise determining a gradient of a generated temperature curve for a provided plurality of temperatures.

[0114] It is also understood that the method, actuator and system disclosed in this application may be utilized in any heating system based on the same principle as in figure 1, such as underfloor heating systems.

Claims

1. A method for automatically determining the connection of a first inlet (11) and a second inlet (12) of a mixing valve (10) in view of a low temperature fluid inlet and a high temperature fluid inlet, wherein the mixing valve further comprises an outlet (13), and an obturator (25) arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet;
wherein the mixing valve is part of a system further comprising:

a motor (21) for operating the obturator;
a controller (22); and
a temperature sensor (14) arranged to sense a temperature of the fluid in or downstream of the outlet of the mixing valve;

the method comprising:

operating (301), by the motor, the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet;
providing (302), by the temperature sensor, at least a first temperature value to the controller;
operating (303), by the motor, the obturator to a second position, in which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet;
providing (304), by the temperature sensor, at least a second temperature value to the controller;
determining (305), by the controller, a mutual relationship between at least two of the provided temperature values; and
determining (306), by the controller and based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively.

2. The method according to claim 1, wherein the step

of determining the mutual relationship comprises determining the mutual size relationship between the first temperature value and the second temperature value.

3. The method according to claim 1, wherein a plurality of first temperature values or a plurality of second temperature values is provided, the method further comprising generating a temperature curve over a measuring time based on the provided plurality of first or second temperature values, and wherein the step of determining the mutual relationship comprises determining a gradient of the generated temperature curve.

4. The method according to any of the claims 1-3, further comprising, in order to determine whether heating of fluid in the high temperature fluid inlet is activated in the system:

determining (403), by the controller, whether any of the first temperature value and the second temperature value exceeds a minimum temperature value; and, if the minimum temperature value is not exceeded:

operating (404), by the motor, the obturator to an intermediate position in which each of the first inlet and the second inlet is at least partly open;
providing (405), by the temperature sensor, a test temperature value;
determining (406), by the controller, whether the test temperature value exceeds the minimum temperature value;
restarting, if the test temperature value exceeds the minimum temperature value, the method from the step of operating the obturator to the first position; and
restarting, if the test temperature value does not exceed the minimum temperature value, the method from the step of providing a test temperature value.

5. The method according to claim 4, further comprising the steps of:

initiating a timer by the step of operating the obturator to an intermediate position; and
restarting, if the timer reaches a timeout period of time, the method from the step of operating the obturator to the first position.

6. The method according any of the preceding claims, further comprising:

determining (407), by the controller, the difference between the first temperature value and the second temperature value; and, if the difference does not exceed a threshold temperature value,
restarting the method from the step of operating the obturator to the first position.

7. The method according to claim 6, wherein the threshold temperature value lies in a range of 1-10°C, preferably in a range of 3-6°C.

8. The method according to any of the preceding claims, further comprising the step of:

waiting (401, 402) a period of time before providing a temperature value from the temperature sensor.

9. The method according to any of the preceding claims, further comprising:

indicating the position, of the first and second positions, corresponding to the lower temperature value as a low temperature mode position; and
indicating the position, of the first and second positions, corresponding to the higher temperature value as a high temperature mode position.

10. The method according to any of the preceding claims, wherein the first and second positions are predetermined positions; and wherein the method further comprises:

setting the first position to the position of the predetermined positions being closest to a current position of the actuator.

11. The method according to any of the preceding claims, wherein the first inlet is closed when the obturator is arranged in the first position, and wherein the second inlet is closed when the obturator is arranged in the second position.

12. The method according to any of the preceding claims, wherein the motor is a variable speed motor.

13. An actuator (20) for automatically determining the connection of a first inlet (11) and a second inlet (12) of a mixing valve (10) in view of a low temperature fluid inlet and a high temperature fluid inlet, wherein the mixing valve further comprises an outlet (13), and an obturator (25) arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet; the actuator comprising:

a motor (21) for operating the obturator;
a connector for connecting the motor to the ob-

turator;
a controller (22); and
a temperature sensor (14) adapted to be arranged in or downstream of the outlet of the mixing valve;
wherein the motor is arranged to operate the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet;
wherein the temperature sensor is arranged to provide at least a first temperature value to the controller;
wherein the motor is further arranged to operate the obturator to a second position, in which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet;
wherein the temperature sensor is further arranged to provide at least a second temperature value to the controller;
wherein the controller is arranged to determine a mutual relationship between at least two of the provided temperature values; and
wherein the controller is further arranged to determine, based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively.

14. The actuator according to claim 13, wherein the actuator is arranged to be removable connected to the obturator of the mixing valve.

15. A system for mixing fluids, comprising:

a mixing valve (10) comprising a first inlet (11) and a second inlet (12) being connected to a low temperature fluid inlet and a high temperature fluid inlet, an outlet (13), and an obturator (25) arranged to set the mixing valve to allow a fluid flow between the first and second inlets and the outlet; and
an actuator (20) for automatically determining the connection of the first inlet and the second inlet of the mixing valve in view of the low temperature fluid inlet and the high temperature fluid inlet, the actuator comprising:

a motor (21) for operating the obturator;
a connector for connecting the motor to the obturator;
a controller (22); and
a temperature sensor (14) adapted to be arranged in or downstream of the outlet of the mixing valve;
wherein the motor is arranged to operate the obturator to a first position in which the second inlet is more open than the first inlet, thereby allowing a fluid flow between at least the second inlet and the outlet;
wherein the temperature sensor is arranged to provide at least a first temperature value to the controller;
wherein the motor is further arranged to operate the obturator to a second position, in which the first inlet is more open than the second inlet, thereby allowing a fluid flow between at least the first inlet and the outlet;
wherein the temperature sensor is further arranged to provide at least a second temperature value to the controller;
wherein the controller is arranged to determine a mutual relationship between at least two of the provided temperature values; and
wherein the controller is further arranged to determine, based on the determined mutual relationship, which of the first inlet and the second inlet being connected to the low temperature fluid inlet and the high temperature fluid inlet, respectively.

Patentansprüche

1. Verfahren zum automatischen Bestimmen der Verbindung eines ersten Einlasses (11) und eines zweiten Einlasses (12) eines Mischventils (10) im Hinblick auf einen Niedrigtemperatur-Fluideinlass und einen Hochtemperatur-Fluideinlass, wobei das Mischventil ferner einen Auslass (13) und einen Obturator (25), der zum Einstellen des Mischventils zum Ermöglichen eines Fluidvolumenstroms zwischen den ersten und zweiten Einlässen und dem Auslass angeordnet ist, aufweist;
wobei das Mischventil Teil eines Systems ist, das ferner Folgendes aufweist:

einen Motor (21) zum Betätigen des Obturators;
ein Steuergerät (22); und
einen Temperatursensor (14), der zum Erfassen einer Temperatur des Fluids im Auslass oder stromabwärts des Auslasses des Mischventils angeordnet ist;

wobei das Verfahren Folgendes aufweist:

Betätigen (301), durch den Motor, des Obturators in eine erste Position, in der der zweite Einlass mehr geöffnet ist als der erste Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem zweiten Einlass und dem Auslass ermöglicht ist;
Bereitstellen (302), durch den Temperatursensor, mindestens eines ersten Temperaturwerts

an das Steuergerät;
Betätigen (303), durch den Motor, des Obturators in eine zweite Position, in der der erste Einlass mehr geöffnet ist als der zweite Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem ersten Einlass und dem Auslass ermöglicht ist;
Bereitstellen (304), durch den Temperatursensor, mindestens eines zweiten Temperaturwerts an das Steuergerät;
Bestimmen (305), durch das Steuergerät, einer gegenseitigen Beziehung zwischen mindestens zwei der bereitgestellten Temperaturwerte; und
Bestimmen (306), durch das Steuergerät und auf Basis der bestimmten gegenseitigen Beziehung, welcher des ersten Einlasses und des zweiten Einlasses mit dem Niedrigtemperatur-Fluideinlass beziehungsweise dem Hochtemperatur-Fluideinlass verbunden ist.

2. Verfahren nach Anspruch 1, wobei der Schritt des Bestimmens der gegenseitigen Beziehung ein Bestimmen der gegenseitigen Größenbeziehung des ersten Temperaturwerts zum zweiten Temperaturwert umfasst.

3. Verfahren nach Anspruch 1, wobei mehrere der ersten Temperaturwerte oder mehrere der zweiten Temperaturwerte bereitgestellt sind, wobei das Verfahren ferner ein Erzeugen einer Temperaturkurve über eine Messzeit auf Basis der bereitgestellten ersten oder zweiten Temperaturwerte umfasst, und wobei der Schritt des Bestimmens der gegenseitigen Beziehung ein Bestimmen eines Gradienten der erzeugten Temperaturkurve umfasst.

4. Verfahren nach einem der Ansprüche 1 bis 3, ferner aufweisend zum Bestimmen ob ein Erhitzen des Fluids im Hochtemperatur-Fluideinlass im System aktiviert ist:

Bestimmen (403), durch das Steuergerät, ob einer des ersten Temperaturwerts und des zweiten Temperaturwerts einen Mindesttemperaturwert überschreitet; und wenn der Mindesttemperaturwert nicht überschritten ist:

Betätigen (404), durch den Motor, des Obturators in eine Zwischenposition, in der jeder des ersten Einlasses und des zweiten Einlasses mindestens teilweise geöffnet sind;
Bereitstellen (405), durch den Temperatursensor, eines Testtemperaturwerts;
Bestimmen (406), durch das Steuergerät, ob der Testtemperaturwert den Mindesttemperaturwert überschreitet;
Neustart, wenn der Testtemperaturwert den Mindesttemperaturwert überschreitet, des Verfahrens ab dem Schritt des Betätigens des Obturators in die erste Position; und
Neustart, wenn der Testtemperaturwert den Mindesttemperaturwert nicht überschreitet, des Verfahrens ab dem Schritt des Bereitstellens eines Testtemperaturwerts.

5. Verfahren nach Anspruch 4, ferner aufweisend die folgenden Schritte:

Auslösen eines Timers durch den Schritt des Betätigens des Obturators in die Zwischenposition; und
Neustart, wenn der Timer eine Zeitablaufperiode erreicht, des Verfahrens ab dem Schritt des Betätigens des Obturators in die erste Position.

6. Verfahren nach einem der vorhergehenden Ansprüche, ferner aufweisend:

Bestimmen (407), durch das Steuergerät, der Differenz zwischen dem ersten Temperaturwert und den zweiten Temperaturwert; und, wenn die Differenz einen Temperatur-Schwellenwert nicht überschreitet,
Neustart des Verfahrens ab dem Schritt des Betätigens des Obturators in die erste Position.

7. Verfahren nach Anspruch 6, wobei der Temperatur-Schwellenwert in einem Bereich von 1-10 °C, bevorzugt in einem Bereich von 3-6 °C liegt.

8. Verfahren nach einem der vorhergehenden Ansprüche, ferner aufweisend den folgenden Schritt:

Warten (401, 402) während eines Zeitraums vor dem Bereitstellen eines Temperaturwerts vom Temperatursensor.

9. Verfahren nach einem der vorhergehenden Ansprüche, ferner aufweisend:

Anzeigen der Position von den ersten und zweiten Positionen, die dem niedrigeren Temperaturwert entspricht, als eine Niedrigtemperatur-Modus-Position; und
Anzeigen der Position von den ersten und zweiten Positionen, die dem höheren Temperaturwert entspricht, als eine Hochtemperatur-Modus-Position.

10. Verfahren nach einem der vorhergehenden Ansprüche, wobei die ersten und zweiten Positionen vorbestimmte Positionen sind; und wobei das Verfahren ferner Folgendes aufweist:

Einstellen der ersten Position der vorbestimmten Positionen als die am nächsten einer gegenwärtigen Position des Betätigers liegende.

11. Verfahren nach einem der vorhergehenden Ansprüche, wobei der erste Einlass geschlossen ist, wenn der Obturator in der ersten Position angeordnet ist, und wobei der zweite Einlass geschlossen ist, wenn der Obturator in der zweiten Position angeordnet ist.

12. Verfahren nach einem der vorhergehenden Ansprüche, wobei der Motor ein Motor mit regelbarer Drehzahl ist.

13. Betätiger (20) zum automatischen Bestimmen der Verbindung eines ersten Einlasses (11) und eines zweiten Einlasses (12) eines Mischventils (10) im Hinblick auf einen Niedrigtemperatur-Fluideinlass und einen Hochtemperatur-Fluideinlass, wobei das Mischventil ferner einen Auslass (13) und einen Obturator (25), der zum Einstellen des Mischventils zum Ermöglichen eines Fluidvolumenstroms zwischen den ersten und zweiten Einlässen und dem Auslass angeordnet ist, aufweist; wobei der Betätiger Folgendes aufweist:

einen Motor (21) zum Betätigen des Obturators;
einen Verbinder zum Verbinden des Motors mit dem Obturator;
ein Steuergerät (22); und
einen Temperatursensor (14), der zum Anordnen im Auslass oder stromabwärts des Auslasses des Mischventils angepasst ist;
wobei der Motor angeordnet ist zum Betätigen des Obturators in eine erste Position, in der der zweite Einlass mehr geöffnet ist als der erste Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem zweiten Einlass und dem Auslass ermöglicht ist;
wobei der Temperatursensor angeordnet ist zum Bereitstellen mindestens eines ersten Temperaturwerts an das Steuergerät;
wobei der Motor ferner angeordnet ist zum Betätigen des Obturators in eine zweite Position, in der der erste Einlass mehr geöffnet ist als der zweite Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem ersten Einlass und dem Auslass ermöglicht ist;
wobei der Temperatursensor ferner angeordnet ist zum Bereitstellen mindestens eines zweiten Temperaturwerts an das Steuergerät;
wobei das Steuergerät zum Bestimmen einer gegenseitigen Beziehung zwischen mindestens zwei der bereitgestellten Temperaturwerte angeordnet ist; und
wobei das Steuergerät ferner angeordnet ist zum Bestimmen, auf Basis der bestimmten gegenseitigen Beziehung, welcher des ersten Einlasses und des zweiten Einlasses mit dem Niedrigtemperatur-Fluideinlass beziehungsweise dem Hochtemperatur-Fluideinlass verbunden ist.

14. Betätiger nach Anspruch 13, wobei der Betätiger für ein entfernbares Verbinden mit dem Obturator des Mischventils angeordnet ist.

15. System zum Mischen von Fluiden, aufweisend:

ein Mischventil (10), aufweisend einen ersten Einlass (11) und einen zweiten Einlass (12), die verbunden sind mit einem Niedrigtemperatur-Fluideinlass und einem Hochtemperatur-Fluideinlass, einem Auslass (13) und einem Obturator (25), der angeordnet ist zum Einstellen des Mischventils zum Ermöglichen eines Fluidvolumenstroms zwischen den ersten und zweiten Einlässen und dem Auslass angeordnet ist; und einen Betätiger (20) zum automatischen Bestimmen der Verbindung des ersten Einlasses und des zweiten Einlasses des Mischventils im Hinblick auf den Niedrigtemperatur-Fluideinlass und den Hochtemperatur-Fluideinlass, wobei de Betätiger Folgendes aufweist:

einen Motor (21) zum Betätigen des Obturators;
einen Verbinder zum Verbinden des Motors mit dem Obturator;
ein Steuergerät (22); und
einen Temperatursensor (14), der zum Anordnen im Auslass oder stromabwärts des Auslasses des Mischventils angepasst ist;
wobei der Motor angeordnet ist zum Betätigen des Obturators in eine erste Position, in der der zweite Einlass mehr geöffnet ist als der erste Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem zweiten Einlass und dem Auslass ermöglicht ist;
wobei der Temperatursensor angeordnet ist zum Bereitstellen mindestens eines ersten Temperaturwerts an das Steuergerät;
wobei der Motor ferner angeordnet ist zum Betätigen des Obturators in eine zweite Position, in der der erste Einlass mehr geöffnet ist als der zweite Einlass, wobei ein Fluidvolumenstrom zwischen mindestens dem ersten Einlass und dem Auslass ermöglicht ist;
wobei der Temperatursensor ferner angeordnet ist zum Bereitstellen mindestens eines zweiten Temperaturwerts an das Steuergerät;
wobei das Steuergerät zum Bestimmen einer gegenseitigen Beziehung zwischen mindestens zwei der bereitgestellten Tem-

peraturwerte angeordnet ist; und
wobei das Steuergerät ferner angeordnet ist zum Bestimmen, auf Basis der bestimmten gegenseitigen Beziehung, welcher des ersten Einlasses und des zweiten Einlasses mit dem Niedrigtemperatur-Fluideinlass beziehungsweise dem Hochtemperatur-Fluideinlass verbunden ist.

Revendications

1. Procédé de détermination automatique de la connexion d'une première entrée (11) et d'une seconde entrée (12) d'une vanne de mélange (10) en vue d'une entrée de fluide à basse température et d'une entrée de fluide à haute température, dans lequel la vanne de mélange comprend en outre une sortie (13) et un obturateur (25) conçu pour amener la vanne de mélange à permettre un écoulement de fluide entre les première et seconde entrées et la sortie ;
dans lequel la vanne de mélange fait partie d'un système comprenant en outre :

un moteur (12) pour actionner l'obturateur ;
un contrôleur (22) ; et
un capteur de température (14) conçu pour détecter une température du fluide dans ou en aval de la sortie de la vanne de mélange ;

ce procédé comprenant :

l'actionnement (301) par le moteur de l'obturateur jusqu'à une première position dans laquelle la seconde entrée est plus ouverte que la première entrée, en permettant ainsi un écoulement de fluide entre au moins la seconde entrée et la sortie ;
la fourniture (302) par le capteur de température d'au moins une première valeur de température au contrôleur ;
l'actionnement (303) par le moteur de l'obturateur jusqu'à une seconde position dans laquelle la première entrée est plus ouverte que la seconde entrée, en permettant ainsi un écoulement de fluide entre au moins la première entrée et la sortie ;
la fourniture (304) par le capteur de température d'au moins une seconde valeur de température au contrôleur ;
la détermination (305) par le contrôleur d'une relation mutuelle entre au moins deux des valeurs de température fournies ; et
la détermination (306) par le contrôleur et à partir de la relation mutuelle déterminée respectivement de laquelle de la première entrée et de la seconde entrée est connectée à l'entrée de fluide à basse température et l'entrée de fluide à haute température.

2. Procédé selon la revendication 1, dans lequel l'étape de détermination de la relation mutuelle comprend la détermination de la relation de taille mutuelle entre la première valeur de température et la seconde valeur de température.

3. Procédé selon la revendication 1, dans lequel une pluralité de premières valeurs de température ou une pluralité de secondes valeurs de température est fournie, ce procédé comprenant en outre la génération d'une courbe de température pendant un temps de mesure en se basant sur la pluralité fournie de premières et secondes valeurs de température et dans lequel l'étape de détermination de la relation mutuelle comprend la détermination d'un gradient de la courbe de température générée.

4. Procédé selon l'une quelconque des revendications 1 à 3, comprenant en outre, afin de déterminer si le chauffage de fluide dans l'entrée de fluide à haute température est activé dans le système :

la détermination (403) par le contrôleur si l'une quelconque de la première valeur de température et la seconde valeur de température excède une valeur de température minimale ; et, si la valeur de température minimale n'est pas excédée :

l'actionnement (404) par le moteur de l'obturateur jusqu'à une position intermédiaire dans laquelle chacune de la première entrée et de la seconde entrée est au moins partiellement ouverte ;
la fourniture (405) par le capteur de température d'une valeur de température de test ;
la détermination (406) par le contrôleur si la valeur de température de test excède la valeur de température minimale ;
le redémarrage, si la valeur de température de test excède la valeur de température minimale, du procédé depuis l'étape d'actionnement de l'obturateur jusqu'à la première position ; et
le redémarrage, si la valeur de température de test n'excède pas la valeur de température minimale, du procédé depuis l'étape de fourniture d'une valeur de température de test.

5. Procédé selon la revendication 4, comprenant en outre les étapes
d'initiation d'un temporisateur par l'étape d'actionnement de l'obturateur jusqu'à une position intermédiaire ; et
le redémarrage, si le temporisateur atteint une pé-

riode de temps limite, du procédé depuis l'étape d'actionnement de l'obturateur jusqu'à la première position.

6. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre :

la détermination (407) par le contrôleur de la différence entre la première valeur de température et la seconde valeur de température ; et, si la différence n'excède pas une valeur de température seuil,
le redémarrage du procédé depuis l'étape d'actionnement de l'obturateur jusqu'à la première position.

7. Procédé selon la revendication 6, dans lequel la valeur de température seuil se situe dans une plage de 1 à 10 °C, de préférence situe dans une plage de 3 à 6 °C.

8. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre l'étape :

d'attente (401, 402) pendant un laps de temps avant de fournir une valeur de température provenant du capteur de température.

9. Procédé selon l'une quelconque des revendications précédentes, comprenant :

l'indication de la position, des première et seconde positions, correspondant à la valeur de température la plus basse comme position du mode basse température ; et
l'indication de la position, des première et seconde positions, correspondant à la valeur de température la plus haute comme position du mode haute température.

10. Procédé selon l'une quelconque des revendications précédentes, dans lequel les première et seconde positions sont des positions prédéterminées ; et dans lequel le procédé comprend en outre :

la définition de la première position pour la position des positions prédéterminées qui est la plus proche d'une position momentanée de l'actionneur.

11. Procédé selon l'une quelconque des revendications précédentes, dans lequel la première entrée se ferme lorsque l'obturateur est mis dans la première position et dans lequel la seconde entrée se ferme lorsque l'obturateur est mis dans la seconde position.

12. Procédé selon l'une quelconque des revendications précédentes, dans lequel le moteur est un moteur à vitesse variable.

13. Actionneur (20) pour la détermination automatique de la connexion d'une première entrée (11) et d'une seconde entrée (12) d'une vanne de mélange (10) en vue d'une entrée de fluide à basse température et d'une entrée de fluide à haute température, dans lequel la vanne de mélange comprend en outre une sortie (13) et un obturateur (25) conçu pour amener la vanne de mélange à permettre un écoulement de fluide entre les première et seconde entrées et la sortie ; l'actionneur comprenant :

un moteur (21) pour actionner l'obturateur ;
un connecteur pour connecter le moteur à l'obturateur ;
un contrôleur (22) ; et
un capteur de température (14) conçu pour être disposé dans ou en aval de la sortie de la vanne de mélange ;
dans lequel le moteur est conçu pour actionner l'obturateur jusqu'à une première position dans laquelle la seconde entrée est plus ouverte que la première entrée, en permettant ainsi un écoulement de fluide entre au moins la seconde entrée et la sortie ;
dans lequel le capteur de température est conçu pour fournir au moins une première valeur de température au contrôleur ;
dans lequel le moteur est en outre conçu pour actionner l'obturateur jusqu'à une seconde position dans laquelle la première entrée est plus ouverte que la seconde entrée, en permettant ainsi un écoulement de fluide entre au moins la première entrée et la sortie ;
dans lequel le capteur de température est en outre conçu pour fournir au moins une seconde valeur de température au contrôleur ;
dans lequel le contrôleur est conçu pour déterminer une relation mutuelle entre au moins deux des valeurs de température fournies ; et
dans lequel le contrôleur est en outre conçu pour déterminer, à partir de la relation mutuelle déterminée respectivement laquelle de la première entrée et de la seconde entrée est respectivement connectée à l'entrée de fluide à basse température et l'entrée de fluide à haute température.

14. Actionneur selon la revendication 13, dans lequel l'actionneur est conçu pour être connecté de manière amovible à l'obturateur de la vanne de mélange.

15. Système de mélange de fluides, comprenant :

une vanne de mélange (10) comprenant une première entrée (11) et une seconde entrée (12) connectées à une entrée de fluide à basse tem-

pérature et une entrée de fluide à haute température, une sortie (13) et un obturateur (25) conçu pour amener la vanne de mélange à permettre un écoulement de fluide entre les première et seconde entrées et la sortie ; et
un actionneur (20) pour déterminer automatiquement la connexion de la première entrée et de la seconde entrée de la vanne de mélange en vue de l'entrée de fluide à basse température et de l'entrée de fluide à haute température, l'actionneur comprenant :

un moteur (21) pour actionner l'obturateur ;
un connecteur pour connecter le moteur à l'obturateur ;
un contrôleur (22) ; et
un capteur de température (14) apte à être disposé dans ou en aval de la sortie de la vanne de mélange ;
dans lequel le moteur est conçu pour actionner l'obturateur jusqu'à une première position dans laquelle la seconde entrée est plus ouverte que la première entrée, en permettant ainsi un écoulement de fluide entre au moins la seconde entrée et la sortie ;
dans lequel le capteur de température est conçu pour fournir au moins une première valeur de température au contrôleur ;
dans lequel le moteur est en outre conçu pour actionner l'obturateur jusqu'à une seconde position dans laquelle la première entrée est plus ouverte que la seconde entrée, en permettant ainsi un écoulement de fluide entre au moins la première entrée et la sortie ;
dans lequel le capteur de température est en outre conçu pour fournir au moins une seconde valeur de température au contrôleur ;
dans lequel le contrôleur est conçu pour déterminer une relation mutuelle entre au moins deux des valeurs de température fournies ; et
dans lequel le contrôleur est en outre conçu pour déterminer, à partir de la relation mutuelle déterminée, respectivement laquelle de la première entrée et de la seconde entrée est connectée à l'entrée de fluide à basse température et l'entrée de fluide à haute température.

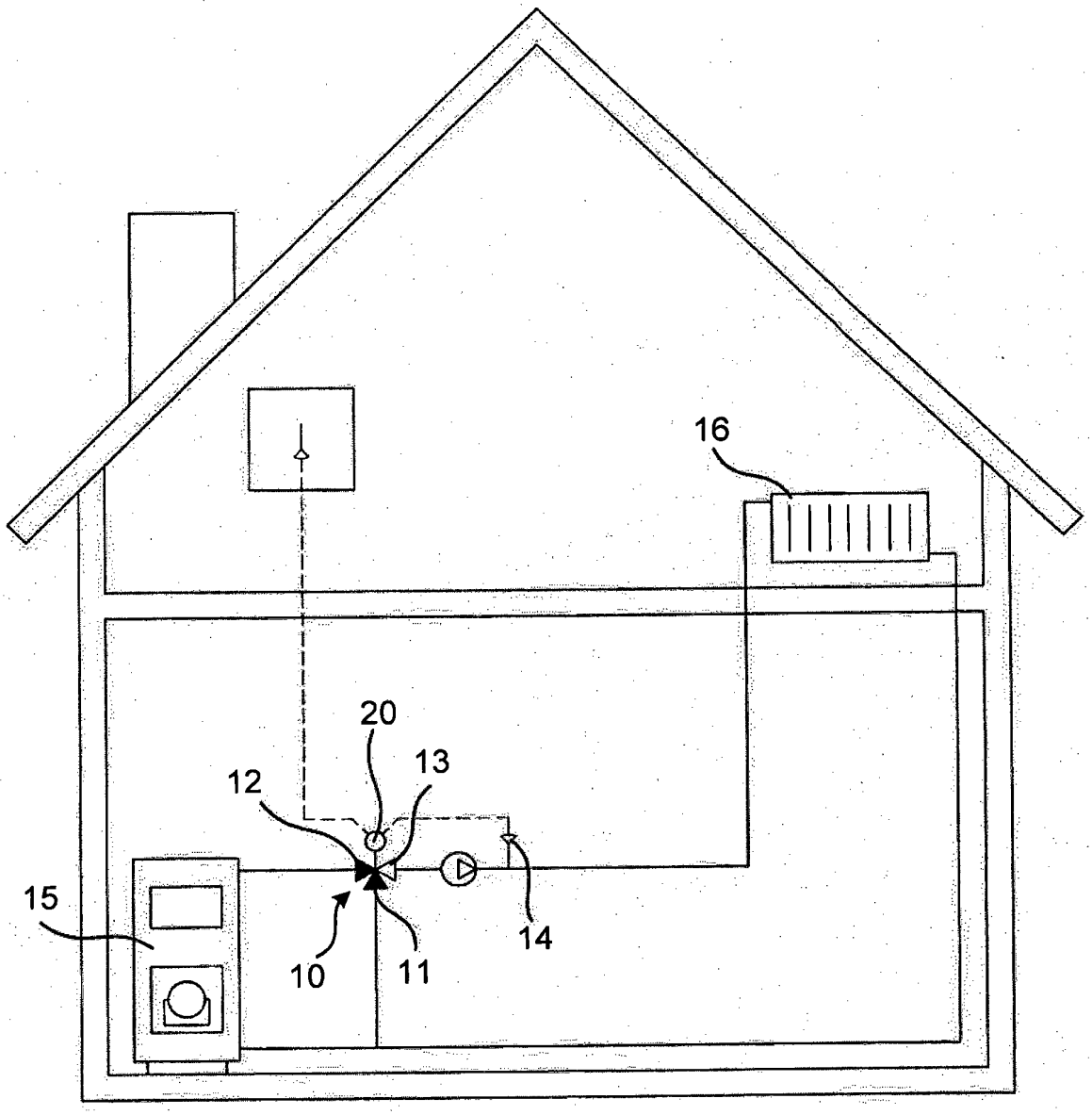


Fig. 1

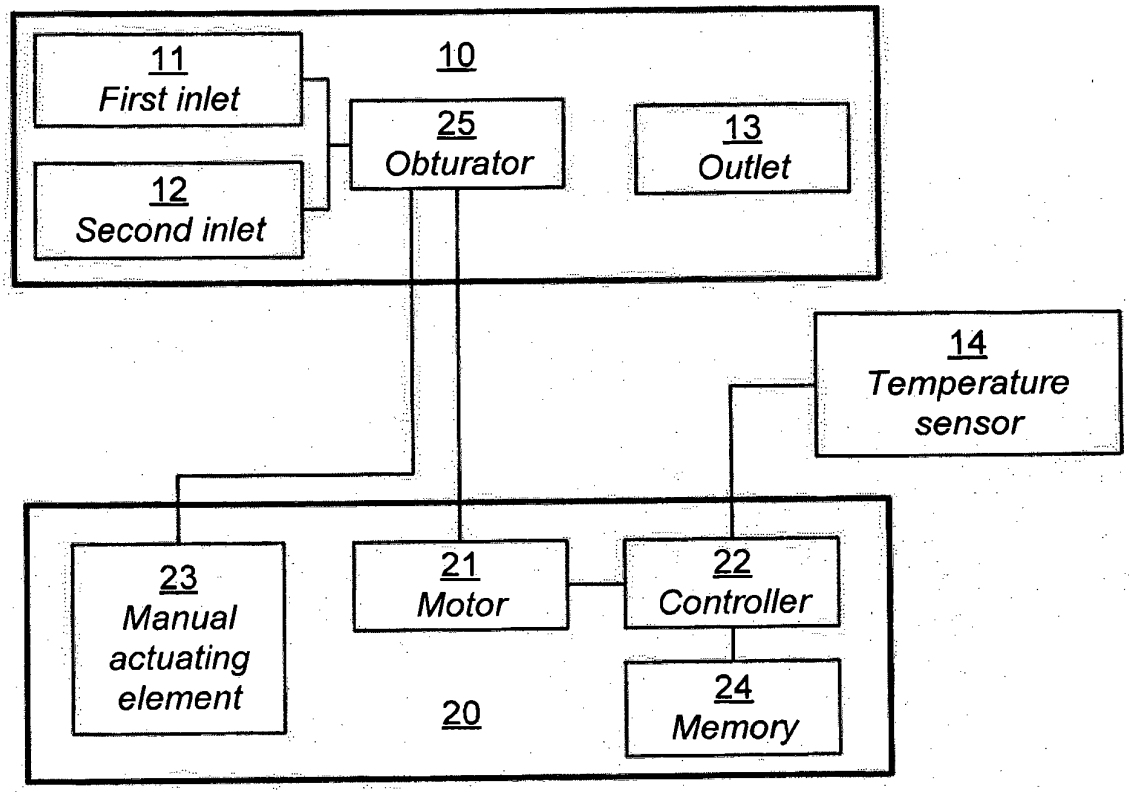

11
First inlet
12
Second inlet
10
25
Obturator
13
Outlet
14
Temperature sensor
23
Manual actuating element
21
Motor
22
Controller
24
Memory
20

Fig. 2

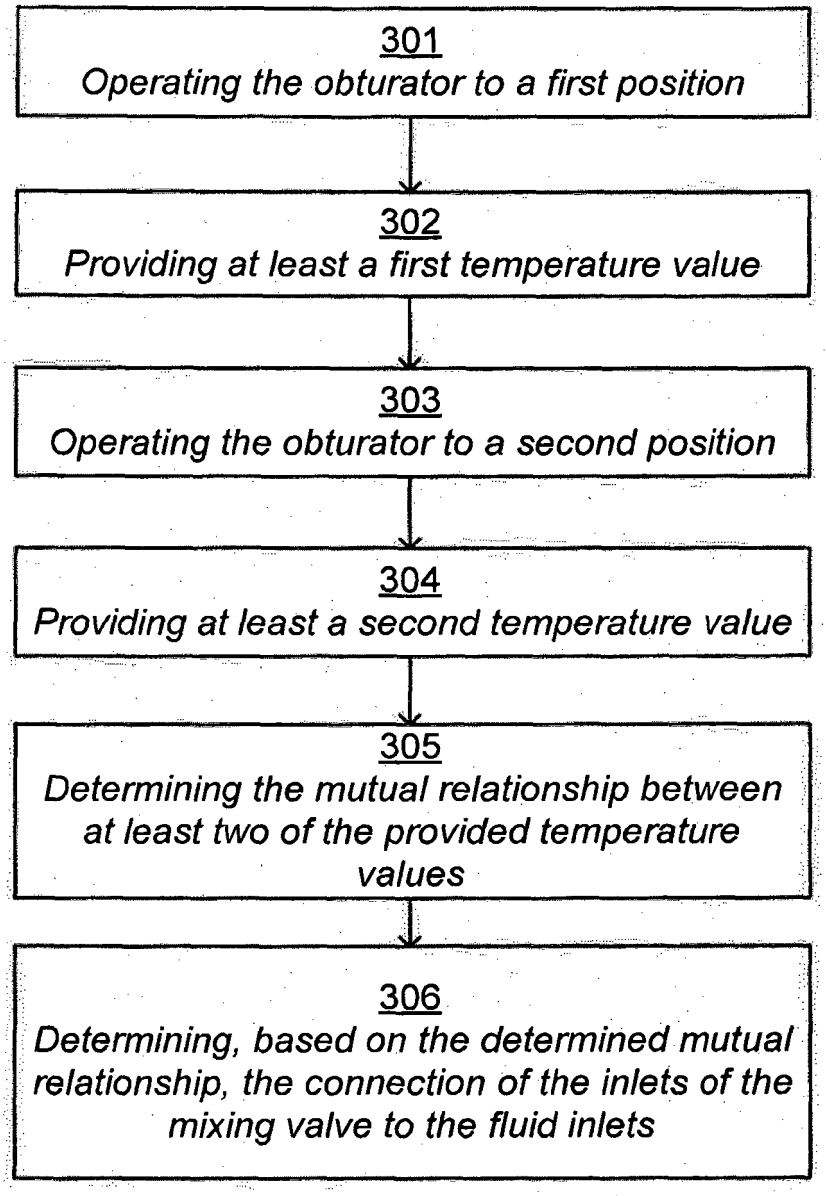

301
Operating the obturator to a first position
302
Providing at least a first temperature value
303
Operating the obturator to a second position
304
Providing at least a second temperature value
305
Determining the mutual relationship between at least two of the provided temperature values
306
Determining, based on the determined mutual relationship, the connection of the inlets of the mixing valve to the fluid inlets

Fig. 3

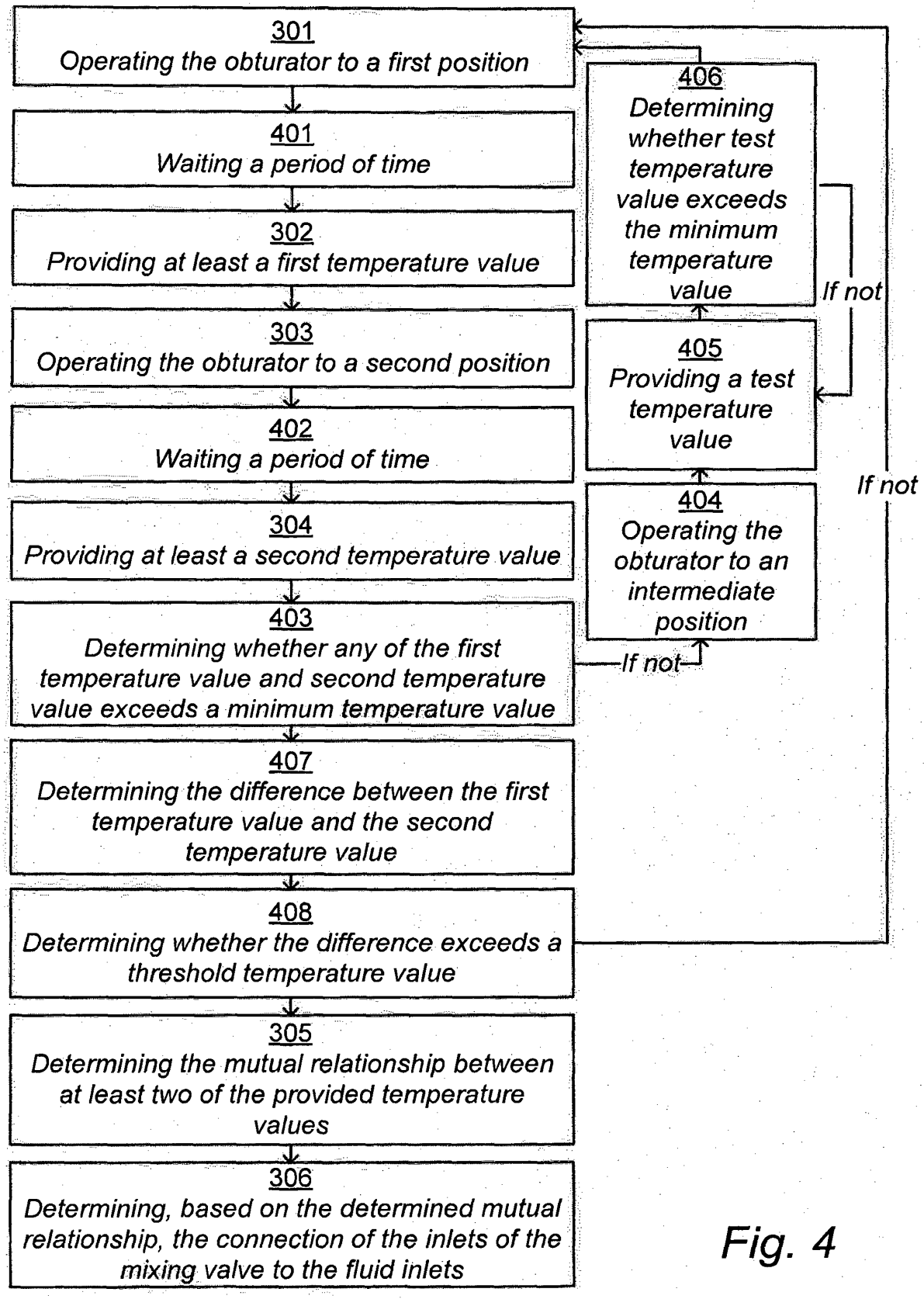

301
Operating the obturator to a first position
401
Waiting a period of time
302
Providing at least a first temperature value
303
Operating the obturator to a second position
402
Waiting a period of time
304
Providing at least a second temperature value
403
Determining whether any of the first temperature value and second temperature value exceeds a minimum temperature value
If not
404
Operating the obturator to an intermediate position
405
Providing a test temperature value
406
Determining whether test temperature value exceeds the minimum temperature value
If not
If not
407
Determining the difference between the first temperature value and the second temperature value
408
Determining whether the difference exceeds a threshold temperature value
305
Determining the mutual relationship between at least two of the provided temperature values
306
Determining, based on the determined mutual relationship, the connection of the inlets of the mixing valve to the fluid inlets

Fig. 4

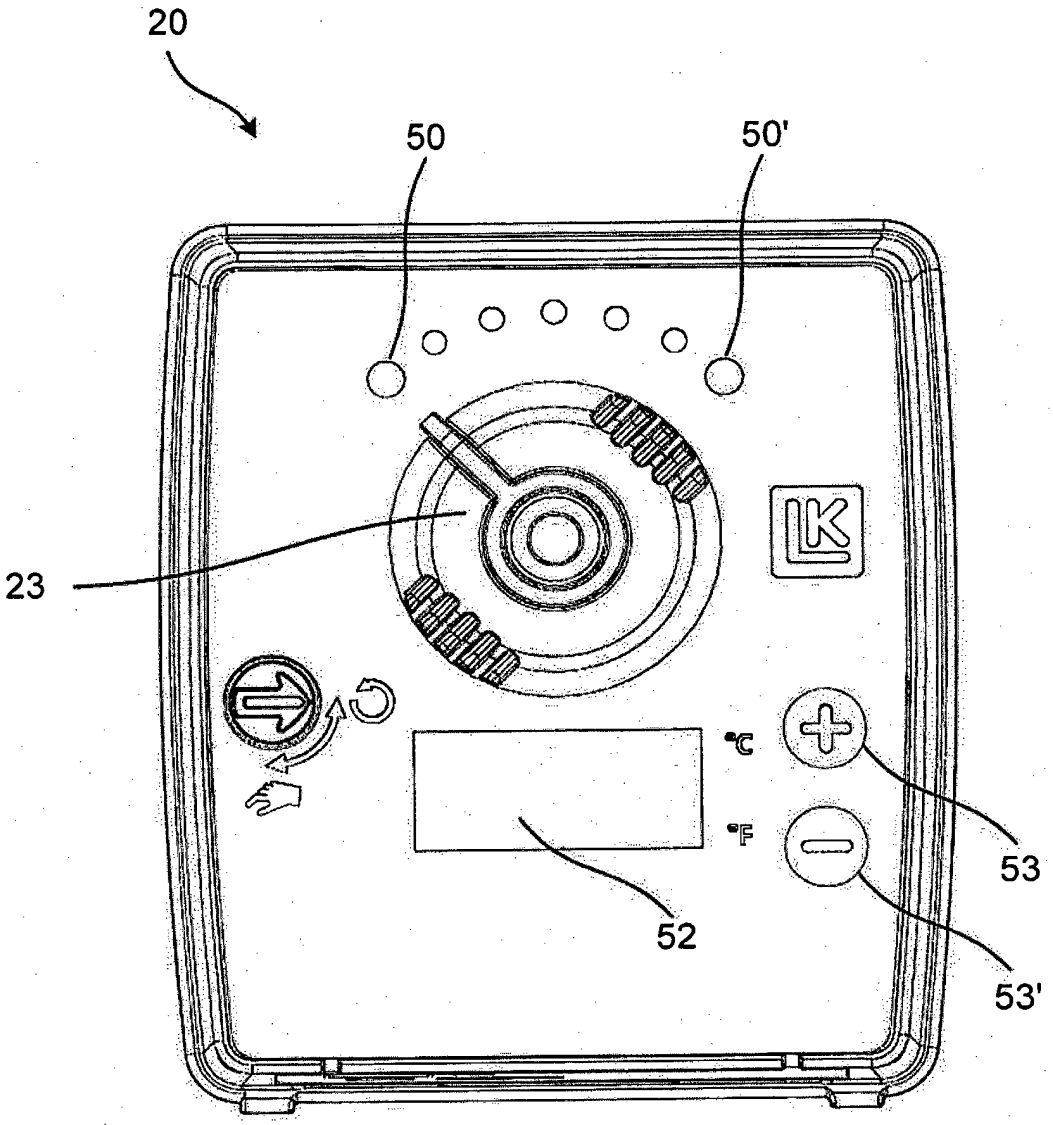


Fig. 5