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(54) DEVICE FOR SANITARY HOT WATER MANAGEMENT

(57) DHW management device in an installation with a heater connected to the supply line (25) through a first input line (1) and a second output line (2) connected to the supply point, comprising a third line (3) between the two lines that provides cold water to the second line (2); at least one solenoid valve (SV1) connected to it; a control module (5) with software connected to the solenoid valve and remote actuation means of the control module.

Operating procedure for the DHW management device comprising a first stage (6) in which obtaining at least one sweep time is obtained and a second stage (7) comprising at least one opening of the tap (8), use of hot water (9) and regulation of injection (11) of cold water to the second line (2) during the sweep time and; the closing of the first solenoid valve (14), after sweep time.

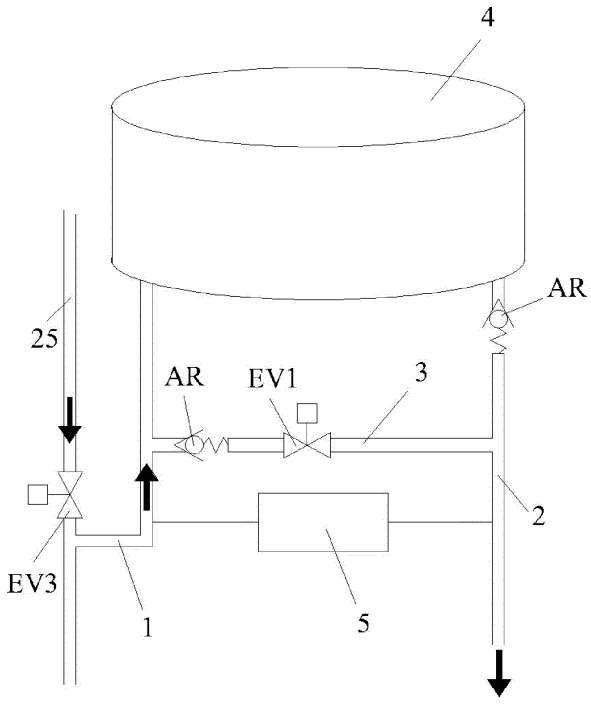

Fig. 1

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Description

Technical field of invention

[0001] The following invention corresponds to the technical field of domestic hot water installations, featuring a heater connected to a domestic hot water distribution network with a supply conduit, by means of a first cold water inlet conduit to the heater and a second hot water outlet conduit to at least one supply point, and particularly to a domestic hot water management device connected to said installation and the mode of operation thereof.

Invention Background

[0002] Nowadays, there is a daily use of energy in homes that irremediably and unconsciously generates a waste of energy in each use.

[0003] This is the case of domestic hot water supply facilities. These facilities have a heater to heat the water. Thus, when a user uses hot water for showering or any other purpose, he opens the hot water tap at the supply point and the heater is activated, so that the cold water from the supply network is introduced into the heater which, using different energy sources, which can be natural gas, butane gas, electricity, etc., heats the water flow and sends it through a conduit to the supply point.

[0004] However, the problem arises when the user has finished using the domestic hot water and decides to close the tap. At this point, there is a volume of hot water contained in the conduction section between the heater and the supply point, ready for use and when closing the shutoff valve, will no longer be supplied and therefore the temperature will drop and cool down. The volume of hot water contained in that section of the pipeline has consumed energy in the heater that, if known in advance that the user intended to stop using hot water, could have been saved.

[0005] Therefore, there is a need to find a way to foresee the use of invested energy consumption in obtaining domestic hot water before the user shuts off the supply point, being able to use the hot water from the pipeline for the final stretch of use, without overheating the water. However, no mechanism or device has been found in the state of the art that manages to control this forecast of hot water use termination.

Invention Description

[0006] The domestic hot water (DHW) management device, for a domestic hot water installation comprising a heater connected to a water distribution network having a supply pipe, by means of a first cold water inlet pipe to and a second hot water outlet pipe to at least one supply point shown here, The heater comprises a third connection pipe between the first and second pipes, connected to them externally to the heater, which allows a cold water flow to the second pipe and at least a first solenoid valve of at least two ways, connected to the third pipe, which allows to regulate the cold water supply to the second pipe for a reduction or elimination of hot water flow to the supply point.

[0007] Furthermore, this device has a control module arranged outside the heater, attached to the first and second pipes, comprising control means consisting of software connected to at least one solenoid valve and power supply means connected to said control means and at least one solenoid or electro valve, and means for remote actuation of the control module.

[0008] The control module, on the other hand, comprises means of wireless communication with said means of remote actuation of the device.

[0009] This report also presents a first operating procedure of an DHW management device, such as the one defined herein, which includes a first stage of obtaining at least one scanning time for at least one supply point, corresponding to the time in seconds it takes the cold water to circulate from the first conduction to that point of supply, and a second stage of use, where the device comprises a first electro valve in closed position.

[0010] This second stage of use comprises a first phase of opening the tap at a hot water supply point followed by a second phase of hot water use.

[0011] Then, the third phase of opening the first solenoid valve takes place by means of a first activation of the actuating means, which is carried out by the user when ending the use of hot water.

[0012] The fourth phase consists of injecting cold water to the second conduction and simultaneously starting a countdown of the scanning time on the control media.

[0013] Then a fifth phase of sending a warning signal to the electronic device of the means of actuation takes place, the start of the flushing time, so that the user is aware that the injection of cold water is starting and in a time equal to the flushing time it reaches the point of supply.

[0014] Then, once the sweep time (ST) countdown reaches the warning time, a sixth phase is carried out consisting of sending a second warning signal to the electronic device by the control means.

[0015] After this sweep time has elapsed, a seventh phase of closing of the first electro valve is carried out by the control means and, finally, an eighth phase of closing the tap at the point of supply.

[0016] A second procedure for operating a DHW management device is proposed herein, with a device as presented herein, featuring a first stage of obtaining at least one sweep time for at least one supply point, and a second stage of use, wherein the device comprises a first and a second solenoid valve in closed position, and a thermostatic valve.

[0017] The second stage of use in this case comprises a first stage of opening the first and second solenoid valves by means of a first activation of the actuating means, while the second stage consists of opening the tap at a hot water supply point.

[0018] Then the third phase is the use of hot water at the temperature set in the thermostatic valve.

[0019] Then, a fourth phase of closure of the second electro valve takes place, by means of a second activation of the means of action and simultaneously start of a countdown of the time of sweep in the means of control.

[0020] The fifth phase consists of sending a warning signal to the electronic device of the means of action, of the beginning of the scanning time and, once the sweep time has elapsed, the sixth phase of closure of the first electro valve takes place.

[0021] Finally, a seventh phase consists of sending an end-of-use time warning signal by the control means to an electronic device of the means of activation.

[0022] A third procedure is presented in this report comprising a first stage of obtaining at least one sweep time for at least one supply point and a second stage of use, where the device comprises a first solenoid valve in the open position and a three-way mixing valve.

[0023] In this case the second stage of use comprises a first phase of opening the position of the hot mixing valve by means of a first activation of the means of action.

[0024] The second phase consists of opening the tap at a hot water supply point, followed by the third phase of using hot water at the temperature set on the mixing valve.

[0025] This is followed by the fourth phase of closing the hot position of the mixing valve and opening the cold position of the mixing valve by a second activation of the actuating means and simultaneous start of a countdown of the sweep time in the control media.

[0026] The fifth phase consists of sending a warning signal of the beginning of the sweep time to the electronic device of the means of action and, after this sweep time, the sixth phase of closure of the first electro valve takes place.

[0027] Finally, a last phase consists of sending an end of use time warning signal by the control means to an electronic device of the means of activation.

[0028] With the DHW management device and the DHW operation procedure proposed herein, a significant improvement over the technique is obtained.

[0029] This is because it is a simple device that is installed externally to the heater and has an additional conduction and means of controlling the water flow in the existing pipes, so that it is possible to inject a regulated flow of cold water to the hot water conduction at a certain time prior to the cessation of the use of hot water by the user, so that when the cold water reaches the supply point is just at the moment when the user ends the use of hot water and therefore, the conduction section between the heater and the supply point does not contain hot water but the injected cold water. This means that since there is no remaining hot water in the pipeline, no energy has been consumed in heating a volume of water that will not be used and therefore energy consumption is optimized.

[0030] This is achieved through the collaboration of the user who must activate the means of control through the actuators of the same and a very practical and completely effective device that is easy to install and with which a significant saving of energy consumption in the heater is obtained.

[0031] As the device is external to the heater, it is easily serviced and repairs and maintenance are easy to perform.

Brief description of the drawings

[0032] In order to help better understand the characteristics of the invention, in accordance with a preferred example of practical realization thereof, a series of drawings have been provided, with illustrative and not limiting character, the following has been represented:

Figure 1.- Shows a schematic view of the DHW management device, for a first preferred embodiment of the invention.

Figure 2.- Shows a block diagram of the operating procedure of the DHW management device, for a first preferred embodiment of the invention.

Figure 3.- Shows a schematic view of the DHW management device, for a second preferred embodiment of the invention.

Figure 4.- Shows a block diagram of the operating procedure of the DHW management device, for a second preferred embodiment of the invention.

Figure 5.- Shows a schematic view of the DHW management device, for a third preferred embodiment of the invention.

Figure 6.- Shows a block diagram of the operating procedure of the DHW management device, for a third preferred embodiment of the invention.

Figure 7.- Shows a schematic view of the DHW management device, for a fourth preferred embodiment of the invention.

Figure 8.- Shows a block diagram of the operating procedure of the DHW management device, for a fourth preferred embodiment of the invention.

Detailed description of a preferred embodiment of the invention

[0033] Per the images provided, one can see how in a first preferred embodiment of the invention, the DHW management device proposed herein is intended for a domestic hot water installation comprising a heater (4) connected to a water distribution network featuring a supply conduit (25), by means of a first conduit (1) for cold

water inlet thereto and a second conduit (2) for hot water outlet to at least one supply point.

[0034] This device comprises a third conduction (3) of connection between the first and the second conduction (1, 2), connected to them externally to the heater (4), which allows a contribution of cold water flow to the second conduction (2) and a first electro valve (SV1) of at least two ways, connected to the third conduction (3), which allows to regulate the contribution of cold water to the second conduction (2) for a reduction or elimination of hot water flow to the point of supply.

[0035] In this way, by controlling the opening of this first solenoid valve (SV1), it is possible to regulate a supply of cold water to the second hot water pipe (2), starting at a certain time so that the cold water reaches the supply point when the user intends to stop the use of hot water.

[0036] The device also comprises a control module (5) arranged externally to the heater, attached to the first and second pipes (1, 2), comprising control media consisting of software connected to the first electro valve (SV1) and means of electrical supply connected to these control media and to said first electro valve (RV1). It is also equipped with one or more elements that can be by Bluetooth, Wi-Fi, or radio frequency modules and in other configurations can comprise a physical interface. These modules provide you with IOT connectivity for remote control. The basic software allows remote operation and configuration of different variables, other software versions allow control by IOT home automation, data logger and Big data.

[0037] On the other hand, in this first preferred embodiment of the invention, the power supply means are formed by a cable for connection to the electrical network. In other embodiments, they can be formed by a manual mechanism with thermoelectric or piezoelectric materials or by a battery.

[0038] The device also includes all the plumbing elements necessary for assembly, as well as elements for connection to the installation.

[0039] It comprises in turn some means of remote actuation of the control module, which in this first embodiment is a radio frequency control, but in other embodiments may consist of a Bluetooth or Wi-Fi cell phone, or other associated system that depends on the communications systems that have the control module incorporated with a power supply, a signal transmitter-receiver. In other embodiments, it may have a warning means, at least one sensor, an electronic control means, a communication interface and a power supply. These means of action are located next to the faucets or showers.

[0040] On the other hand, in this first preferred embodiment of the invention, the power supply means are formed by thermoelectric or piezoelectric materials, while in other embodiments they may be formed by batteries or a mains connection cable.

[0041] As shown in Figure 1, in this first preferred embodiment of the invention the second and third conduits (2, 3) comprise a non-return valve (AR) respectively.

[0042] In this report, a procedure for the operation of a DHW management device for this first embodiment is also presented. As shown in Figure 2, said procedure comprises a first and a second stage.

[0043] The first stage (6) is to obtain at least one sweep time (ST) for at least one supply point, a warning time (WT) and a cut-off time (CT). The sweep time (ST) corresponds to the time in seconds that the cold water takes to circulate from the first conduit (1) to the supply point, while the warning time (WT) is of a lower value than the sweep time (ST), such that it serves as a warning to the user that the sweep time (ST) will soon be over and therefore the hot water will be finished. On the other hand, the cut-off time (CT) is a value set by the user for cutting off the water supply from a third solenoid valve after the end of the sweep time (ST).

[0044] In this first embodiment, the warning time (WT) has a value such as to give the user a certain amount of advance warning that the sweep time (ST) is almost over and in this case it has a value of 5 seconds less than the sweep time (ST), but in other embodiments it may have a different value, since it is a value adjustable according to the user's preferences. The cutting time (CT) in this first mode of realization is considered to be 5 seconds equally, but in other modes of realization different cutting times may be considered, since again it is an adjustable value.

[0045] The second stage (7) is the stage corresponding to the use of the device. This device in this first embodiment comprises a first electro valve (SV1) in closed position.

[0046] In this first embodiment, as shown in Figure 1, the device further comprises a third electro valve (SV3) of at least two ways, connected to the supply line (25), which allows to control the existence or absence of cold water supply to the network. In other modes this third electro valve (SV3) may not be available.

[0047] The second stage (7), as shown in Figure 2, comprises a first stage of opening the tap (8) at a hot water supply point, when the user wishes for example to take a shower. The second phase corresponds precisely to the use of hot water (9) by the user.

[0048] When the user intends to terminate the use of water because he is about to finish his shower, the third phase takes place consisting in the opening of the first solenoid valve (10) by means of a first activation (A1) of the actuation means by the user.

[0049] When the actuating means are activated, the fourth phase of cold water injection (11) into the second conduit (2) is performed and simultaneously a countdown (12) of the flushing time is started in the control means. That is to say, as the first electro valve (SV1) has been opened, it lets a volume of cold water flow to the second hot water pipe (2), so that in this second pipe (2) there is now a mixture of cold and hot water.

[0050] Then a fifth phase of sending a warning signal (13) to the electronic device of the actuating means of the start of the sweep time takes place. Thus, when this

signal is sent, the user receives it in the electronic device and already knows that the sweep time has started, so he can continue showering at the desired temperature, but knowing that once the sweep time is over, the water that starts to reach the supply point is colder mixed water.

[0051] In this first embodiment mode once the sweep time countdown (ST) reaches the warning time (WT), the control means send a second warning signal (18) to the electronic device, in this case five seconds before the end of the sweep time, to warn the user of the end of the sweep time.

[0052] Then a sixth phase of closing the first solenoid valve (14) and closing the third solenoid valve (19) is carried out simultaneously, after the sweep time has elapsed. The third solenoid valve is closed for a period of time equal to the cut-off time (CT) set in the first stage.

[0053] Finally, there is a seventh phase of closing the tap (15), i.e., the user is required to close the tap, otherwise the water would continue to flow.

[0054] The third solenoid valve (SV3), once the cut-off time (CT) has elapsed, returns to an open position to service the network and be ready for a new cycle.

[0055] In this report a second preferred embodiment of the invention is proposed in which the DHW management device comprises a second solenoid valve (SV2) with at least two ways, connected to the second pipe (2), which allows to control the existence or absence of hot water supply to the supply point.

[0056] In this second embodiment, as shown in Figure 3, the device further comprises a third solenoid valve (SV3) of at least two ways, connected to the supply line (25), which allows to control the existence or absence of cold water supply to the network. In other modes this third electro valve (SV3) may not be available.

[0057] As in the first embodiment, the second and third conduits (2, 3) comprise a non-return valve (AR) and the means of remote actuation of the control module and the electronic device thereof are similar to those of the first embodiment.

[0058] A procedure for operating an DHW management device is also proposed for this second embodiment. In this second mode, as already indicated, the device comprises in addition to the first solenoid valve (SV1) in closed position, a second solenoid valve (SV2) also in closed position.

[0059] The procedure for this second embodiment is similar to that described for the first embodiment, except for the second stage of use, which in this case comprises a phase prior to the opening of the tap (8) consisting of an opening of the second solenoid valve (16) by means of a first activation (A1) of the actuation means. In doing so, the passage of hot water from the heater (4) to the second conduit (2) is allowed, in order to supply hot water to the supply point when the tap is opened.

[0060] As shown in Figure 4, the procedure in this second embodiment further comprises an intermediate closing phase of the second solenoid valve (17) by means of a second activation (A2) of the actuating means simultaneously with the opening phase of the first solenoid valve (10). Thus, at the same time that the cold water supply to the second pipe (2) is started, the hot water supply to it is cut off and therefore, during the sweep time (ST) the user continues to shower at the desired temperature, but hot water is no longer entering the second pipe (2), so that the energy consumption in the production of the same has ceased.

[0061] Given the possibility of a second activation of the actuating means, for the closing of the second solenoid valve (SV2), an additional saving is possible, since normally the second electro valve (SV2) arranged in the second pipe will be closed and thus it is avoided that with the opening of a tap for a quick use, the hot water is opened unintentionally and the second pipe (2) is filled with hot water without having time to reach the supply point and therefore remains inside the second pipe (2), the hot water is opened unintentionally and the second conduction (2) is filled with it without having time to reach the supply point and therefore remains inside the second conduction (2) wasting the energy used to heat it.

[0062] Likewise, in this second embodiment, as in the first embodiment described above, the procedure includes a phase prior to closing the first solenoid valve (14) and in this case to closing the third solenoid valve (19), once the sweep time countdown (ST) reaches the warning time (WT), consisting in sending a second warning signal (18) of end of use time to the electronic device of the actuating means.

[0063] Thus, and as shown in Figure 4, below, the device of the second preferred embodiment of the invention comprising a third electro valve (SV3) which is in an open position, comprises in the second stage (7) of the procedure the closing of said third electro valve (19) simultaneously with the closing of the first solenoid valve (14) after the sweep time (ST) has elapsed. The third electro valve is closed for a period of time equal to the cut-off time (CT) set in the first stage, after which the third solenoid valve (SV3) returns to an open position.

[0064] Moreover, in this second embodiment, the first stage (6) of the procedure comprises the setting of a maximum time value (MT) of hot water use and the second stage (7) of the procedure comprises after the tap opening phase (8), a control of the hot water use time.

[0065] Thus, if it exceeds (21.1) the maximum time of use (MT), the device, automatically and without the possibility of user intervention, performs the automatic closing (20) of the second solenoid valve (SV2) and the simultaneous opening of the first solenoid valve (SV1).

[0066] If time does not exceed the maximum time of use (MT), the user continues the use of water until he decides to finish and activates himself the closing of the second solenoid valve (17) simultaneously with the opening of the first solenoid valve (10), to start the sweep time (ST).

[0067] Likewise, in this second embodiment, the first stage (6) of the procedure comprises the setting of a value of available time (AT) of hot water corresponding to

the time in seconds that the closing of the second solenoid valve (SV2) in the second hot water pipe (2) is delayed once the closing of the same is activated and in the second stage (7) the closing of said second solenoid valve (17) by the control means takes place with a delay from the activation of the same equal to said available time (AT) of hot water.

[0068] Thus, if the user is showering and the value of the sweep time (ST), which depends on the distance between the supply point and the heater, is insufficient to allow the shower to be properly finished in that interval, the delay in closing the second solenoid valve (SV2) gives more peace of mind to allow the shower to be finished comfortably.

[0069] In this report, a third preferred embodiment of the invention is proposed, in which the device, in addition to the first and second solenoid valves (SV1, SV2) with at least two ways, comprises a thermostatic valve (TV), which in the third embodiment includes a temperature sensor and a flow meter.

[0070] As shown in Figure 5, this thermostatic valve (TV) is placed in the second line (2) before the second solenoid valve (SV2) in such a way that it allows controlling the temperature of the water brought to the supply point. In this point, the third line (3) has a first branch (3.1) connected to the thermostatic valve (TV), which supplies cold water to it, and a second branch (3.2) connected to the second line (2), which injects cold water and generates energy savings. In such a way, the first solenoid valve (SV1) is connected to the second branch (3.2) of the third line (3).

[0071] The thermostatic valve in the third embodiment provides water temperature optimization. The use of mixed water reduces the volume of water consumed in the heater, so its temperature drops more slowly, and therefore the ignition moment to reheat the water is delayed.

[0072] In the third embodiment, the device comprises a third solenoid valve (SV3) with at least two ways, connected to the first line (1), which makes it possible to control the existence or absence of cold-water supply to the system. This third solenoid valve (SV3) is optional, so the device may not have it in other embodiments.

[0073] Likewise, as in the first and second embodiments, the second and third lines (2, 3) contain a non-return valve (NR), and the remote actuation devices of the control module and its electronic device are similar to those of the first embodiment.

[0074] An operating procedure is also proposed for the device of the third embodiment. As shown in Figure 6, it comprises a first stage (6) of obtaining at least one sweep time (ST) with at least one supply point, corresponding to the time in seconds that the cold water takes to circulate from the first line (1) to the supply point; a warning time (WT); and a second stage (7) of use.

[0075] In this case, the second stage (7) of the procedure comprises a first phase in which the second solenoid valve (16) is opened through a first activation (A1) of the actuation means, followed by a second phase in which a tap (8) at a hot water supply point is opened.

[0076] In the third phase, hot water (9) is used at the temperature set in the thermostatic valve (TV). In this third embodiment, the user only needs to open the hot water tap at the point of supply; that is, it is not necessary to open the cold water tap or manipulate the mixer tap to mix hot and cold water since the water reaches the supply point at the temperature previously selected by the user and perfectly mixed by the thermostatic valve (TV).

[0077] The fourth phase consists of the closing of the second electro valve (17), and the opening of the first solenoid valve (10) through a second activation (A2) of the actuation means and simultaneously the beginning of a countdown (12) of the sweep time (ST) on the control means. This fourth phase takes place when the user wishes to end the use of hot water. At that moment, the second solenoid valve (SV2) is closed, and the hot-water flow to the supply point is cut off so that, when the sweep time (ST) ends, only cold water reaches it.

[0078] Next, there is a fifth phase in which a warning signal (13) indicating the start of the sweep time is sent to the electronic device of the actuation means.

[0079] Next, the sixth phase is carried out once the sweep time (ST) countdown reaches the warning time (WT). The control means send a warning signal indicating the end of use time (18) to an electronic device of the activation means.

[0080] Finally, the seventh phase takes place, in which the first solenoid valve (14) is closed after the sweep time (ST) has elapsed, thus cutting off the flow of cold water to the supply point. The eighth phase corresponds to the tap closing (15).

[0081] This device comprises a third solenoid valve (SV3) that is in the open position, but in this third embodiment, the second stage (7) of the procedure does not require a closing phase of this third solenoid valve (19) since there is no risk of cold water coming out of the tap. In this third mode, the third solenoid valve (SV3) allows closing the supply line (25), thus preventing water entry into the distribution network. In some situations, this may be useful, for example, when the user is not at home and wants to avoid dripping taps or water leaks. Thus, the user may close this third solenoid valve remotely when a flow meter installed in the network indicates unwanted consumption, a leak, or any other situation that would advise a network supply cut-off.

[0082] Thus, in this case, the procedure presents a third stage (27) after the first stage (6) that takes place alternatively with the second stage (7), when the user wishes to close the water inlet (22.1) from the network remotely through the electronic device. The user may activate the closing (19) of this third solenoid valve (SV3) during a certain time of non-use of the distribution network, for example, when there is no one at home. The user must re-activate the opening (23) of the third solenoid valve (SV3) to connect (22.2) to the network again,

thus allowing the flowing of water to the device.

[0083] As shown in Figure 6, in the third embodiment, the method also comprises setting a maximum time (MT) value for the use of hot water in the first stage (6). The second stage (7) comprises an automatic closing phase (20) of the second solenoid valve (SV2) employing the control means if the maximum time (TM) is exceeded (21.1) during the use of hot water (9). If this maximum time is not exceeded (21.2), the user must activate the closing to terminate use.

[0084] In the third embodiment, in the first stage (6), the procedure also comprises setting a value of hot water available time (AT). It corresponds to the time in seconds of delay in closing the second solenoid valve (17) in the second hot water line (2) once its closure has been activated. In the second stage (7), the closing of the thermostatic valve (17) by the control means occurs with a delay from their activation equal to the available time. Since the sweep time (ST) value depends on the distance between the supply point and the heater (4), this value may be too small and not give enough time to use hot water. In this case, the delay in closing the second solenoid valve (SV2) allows greater comfort and calm to finish the use.

[0085] In this third embodiment, the device has a first activation for opening the first and second solenoid valves (SV1, SV2) and a second activation for closing the second solenoid valve and starting the sweep time (ST). This allows additional savings by avoiding the unwanted energy consumption that occurs in installations with a mixer tap when the hot water is turned on by mistake, for example, when washing hands. If this device is not present, the second line is filled with hot water that will not be used since consumption is short. However, with this device, the second solenoid valve placed in the second line is closed, not allowing the line to be filled with unwanted hot water.

[0086] The process starts through the first activation that opens the second valve, but it only starts when the user consciously wants to use hot water for a long time.

[0087] In this report, a fourth embodiment of the DHW management device is also presented, in which, in addition to the first solenoid valve (SV1) placed in the third line (3), there is a three-way mixing valve (MV) that has a temperature sensor and a flow meter. As shown in Figure 7, the mixing valve (MV) is in the second line (2), allowing controlling the supply of hot water to the supply point and regulating its temperature.

[0088] The mixing valve has the same advantage as the thermostatic valve of the third embodiment. In other words, it provides water temperature optimization through the use of mixed water, thereby reducing the volume of water consumed in the heater.

[0089] As in the second and third proposed embodiments, in this case, the device contains a third solenoid valve (SV3) with at least two ways, connected to the first line (1), which allows controlling the supply of cold water to the system. Likewise, the second and third lines (2, 3) have a non-return valve (NR).

[0090] An operating method for the device is also proposed in the fourth embodiment. It comprises a first stage (6) in which at least one sweep time (ST) for at least one supply point and a warning time (WT) are obtained. The second stage (7) comprises a first phase in which the position of the hot mixing valve (28) is opened, through a first activation (A1) of the actuation means, followed by a second phase in which a tap (8) at a hot water supply point is opened and a third phase in which hot water is used (9) at the temperature set on the mixing valve.

[0091] As shown in Figure 8, in the fourth embodiment, when the user wants to end the use of hot water, a fourth phase takes place in which the hot position (24) of the mixing valve is closed, and the cold position is opened, through a second activation (A2) of the actuation means. Simultaneously, a countdown (12) of the sweep time (ST) is started in the control means.

[0092] Next, the fifth phase is carried out, in which the warning signal (13) of the start of the sweep time is sent to the electronic device of the actuation means.

[0093] When the sweep time (ST) countdown reaches the warning time (WT), the sixth phase takes place, in which the control means send a warning signal of the end of use time (18) to an electronic device of the activation means. Finally, the seventh phase occurs, in which the first solenoid valve (14) is closed after the sweep time has elapsed, cutting off the passage of cold water to the supply point. Finally, the user closes the tap, and the first solenoid valve (10) is opened for the next cycle.

[0094] In the fourth embodiment, as in the third embodiment, the third solenoid valve (SV3) is in the open position. The second stage (7) does not require a closing phase of the third solenoid valve (19) since there is no risk of cold water coming out of the tap. The third solenoid valve (SV3) allows the supply line (25) to be closed when required or when the supply network will not be used. Thus, the procedure presents a third stage (27) alternative to the second stage (7), in which, when the user wishes to close the water inlet (22.1) from the network, employing the electronic device and remotely, the closing (19) of this third solenoid valve (SV3) must be activated. When the user wants to reconnect to the network (22.2), the opening (23) of the third solenoid valve (SV3) must be activated. From that moment on, the second stage (7) may take place.

[0095] Likewise, the first stage (6) comprises setting a maximum time (MT) value for hot water use. The second stage (7) comprises an automatic phase (26) for closing the hot position of the mixing valve placed in the second line (2) and opening its cold position using the control means if the maximum time (MT) for hot water use is exceeded (21.1).

[0096] If the maximum time of use (MT) is not exceeded, the user activates the closure by the control means to terminate the use.

[0097] The described embodiments constitute only examples of this invention. Therefore, the specific details,

terms, and sentences used in this specification are not to be considered as limiting but are to be understood only as a basis for the claims and as a representative basis that provides an understandable description as well as sufficient information to a skilled person to carry out this invention.

Claims

1. 1- DHW management device for domestic hot water installations comprising a heater (4) connected to a water distribution network, which has a supply line (25), through a first cold water inlet line (1) and a second hot water outlet line (2) to at least one supply point comprising:

- a third connection line (3) between the first and second lines (1, 2), connected to it externally and to the heater (4), which allows a flow of cold water to the second line (2);
- at least one first solenoid valve (SV1) with at least two ways, connected to the third line (3), which allows regulating the supply of cold water to the second line (2) to reduce or eliminate the flow of hot water to the point of supply;
- a control module (5) placed outside the heater (4), attached to the first and second lines (1, 2), comprising control means formed by software connected to at least one solenoid valve and some electrical supply means connected to the control means and the solenoid valves, and;
- remote actuation means for the control module (5);
- the control module (5) comprises means of wireless communication with the remote actuation means of the device.

2. DHW management device, according to claim 1, **characterized by** comprising a second solenoid valve (SV2) with at least two ways, connected to the second line (2), which allows controlling the existence or absence of hot water supply to the supply point.

3. DHW management device, according to claim 2, **characterized by** comprising a thermostatic valve (TV) placed in the second line (2) before the second solenoid valve (SV2), which allows regulating the temperature of the water provided to the supply point; in which the third line (3) has a first branch (3.1) connected to the thermostatic valve (TV) and a second branch (3.2) connected to the second line (2), in such a way that the first solenoid valve (SV1) is connected to the second branch (3.2) of the third line (3).

4. DHW management device, according to claim 1, **characterized by** comprising a three-way mixing valve (MV), placed in the second line (2), which allows controlling the existence or absence of hot water supply to the point of supply and regulating its temperature.

5. DHW management device, according to any of the preceding claims, **characterized by** comprising a third solenoid valve (SV3) with at least two ways, connected to the supply line (25) that allows controlling the existence or absence of cold-water supply to the network.

6. DHW management device, according to any of the preceding claims, **characterized in that** the means of remote actuation of the control module (5) are formed by an electronic device comprising wireless communication means, a power supply, and a signal transm itter-receiver.

7. Operating procedure for a DHW management device, as defined in claims 1 to 6, **characterized by** comprising a first stage (6) in which at least one sweep time (ST) is obtained for at least one supply point, corresponding to the time in seconds that the cold water takes to circulate from the first line (1) to the supply point; a warning time (WT), inferior to the sweep time (ST), is also obtained; and a second stage (7) of use in which the device has a first solenoid valve (SV1) in the closed position, comprising:

- opening the tap (8) at a hot water supply point;
- use of hot water (9);
- opening of the first solenoid valve (10) through a first activation (A1) of the actuation means;
- injection of cold water (11) to the second line (2) and simultaneously starting a countdown (12) of the sweep time (ST) in the control means;
- sending of a warning signal (13) indicating the start of the sweep time to the electronic device of the actuation means;
- sending of a second warning signal (18) to the electronic device, by the control means, after the warning time (WT) has elapsed;
- closing of the first solenoid valve (14), after the sweep time (ST), and;
- closing the tap (15) at the point of supply.

8. Operating procedure for a DHW management device, according to claim 7, **characterized in that** the device also has a second solenoid valve (SV2) in the closed position; the second stage (7) of use comprises a phase before the opening of the tap (8), consisting of opening the second solenoid valve (16) through a first activation (A1) of the actuation means and an intermediate phase of closing of the second solenoid valve (17) through a second activation (A2) of the actuation means simultaneously with the

opening phase of the first solenoid valve (10).

9. Operating procedure for a DHW management device, according to any of claims 7 and 8, **characterized in that** the first stage (6) comprises obtaining a cut-off time value (CT) for the supply of water to the network once the sweep time (ST) has ended. The device comprises a third solenoid valve (SV3) in the open position in the first line (1), and the second stage (7) comprises the closing of the third solenoid valve (19) simultaneously with the closing of the first solenoid valve (14) after the sweep time (ST). The closing of the third solenoid valve (19) is carried out for a period equal to the cut-off time (TC) set in the first stage.

10. Operating procedure for a DHW management device, as defined in claims 1 to 6, **characterized by** comprising a first stage (6) in which at least one sweep time (ST) is obtained for at least one supply point, corresponding to the time in seconds that the cold water takes to circulate from the first line (1) to the supply point; and a warning time (WT), inferior to the sweep time (ST), is also obtained; and a second stage (7) of use, in which the device comprises a first and a second solenoid valve (SV1, SV2) in the closed position and a thermostatic valve (TV). This second stage (7) of use comprises:

- opening the second solenoid valve (16) through a first activation (A1) of the actuation means;
- opening the tap (8) at a hot water supply point;
- use of hot water (9) at the temperature set on the thermostatic valve;
- closing the second solenoid valve (17) through a second activation (A2) of the actuation means. Simultaneously opening the first solenoid valve (10) and starting a countdown (12) of the sweep time in the control means;
- sending of a warning signal (13) indicating the start of the sweep time to the electronic device of the actuation means;
- sending a warning signal (13) to the electronic device of the actuation means indicating the start of the sweep time;
- closing of the first solenoid valve (14), after the sweep time (ST), and;
- closing the tap (15) at the point of supply.

11. Operating procedure for a DHW management device, according to one of the claims 8 or 10, **characterized in that** the first stage (6) comprises the set of hot water available time (AT) value, corresponding to the delay time in seconds to close a second solenoid valve (SV2) or a thermostatic valve (TV) in the second hot water line (2) after its closing is activated; in the second stage (7), the closing of the second solenoid valve (SV2) or the thermostatic valve (TV) by the control means takes place after a delay from their activation equal to the hot water available time.

12. Operating procedure for a DHW management device, as defined in claims 1 to 6, **characterized by** comprising a first stage (6) in which at least one sweep time (ST) is obtained for at least one supply point; and a warning time (WT) inferior to the sweep time (ST), is also obtained; and a second stage (7) of use, in which the device comprises a first solenoid valve (SV1) in the open position and a three-way mixing valve (MV). The second stage (7) of use comprises:

- opening the position of the hot mixing valve (28) through a first activation (A1) of the actuation means;
- opening the tap (8) at a hot water supply point;
- use of hot water (9) at the temperature set in the mixing valve;
- closing of the hot position (24) of the mixing valve and opening of its cold position, through a second activation (A2) of the actuation means and simultaneously starting a countdown (12) of the sweep time in the control means;
- sending of a warning signal (13) indicating the start of the sweep time to the electronic device of the actuation means;
- Sending a warning signal indicating the end of use time (18) by the control means to an electronic device of the activation means, after the warning time (WT) has elapsed, and;
- closing of the first solenoid valve (14), after the sweep time (ST), and;
- closing the tap (15) at the point of supply.

13. Operating procedure for a DHW management device, according to claims 10 or 12, **characterized by** comprising a third stage (27) after the first stage (6) and alternative to the second stage (7), in which the device comprises a third solenoid valve (SV3) in the open position in the first line (1); and the third stage (27) comprises the closing of the third solenoid valve (19) during a determined period of non-use of the distribution network and its opening (23) for the start of the second stage.

14. Operating procedure for a DHW management device, according to claims 8 or 10, **characterized in that** the first step (7) comprises setting a maximum time value (MT) for hot water use; and the second stage (7) comprises an automatic closing phase (20) of the second solenoid valve (SV2), placed on the second line (2), through the control means after the maximum time (MT) of hot water use has elapsed.

15. Operating procedure for a DHW management device, according to claims 8 and 14, **characterized in that**, in the automatic closing phase (20) of the second solenoid valve (SV2), the opening of the first solenoid valve (SV1) placed in the third line (3) is performed simultaneously.

16. Operating procedure for a DHW management device, according to claim 12, **characterized in that** the first stage (7) comprises setting a maximum time (MT) value for hot water use and the second stage (7) comprises a phase in which the hot way of a mixing valve (MV) placed in the second line (2) is closed automatically (26), and its cold way is opened, through the control means, after the maximum time (MT) of hot water use has elapsed.

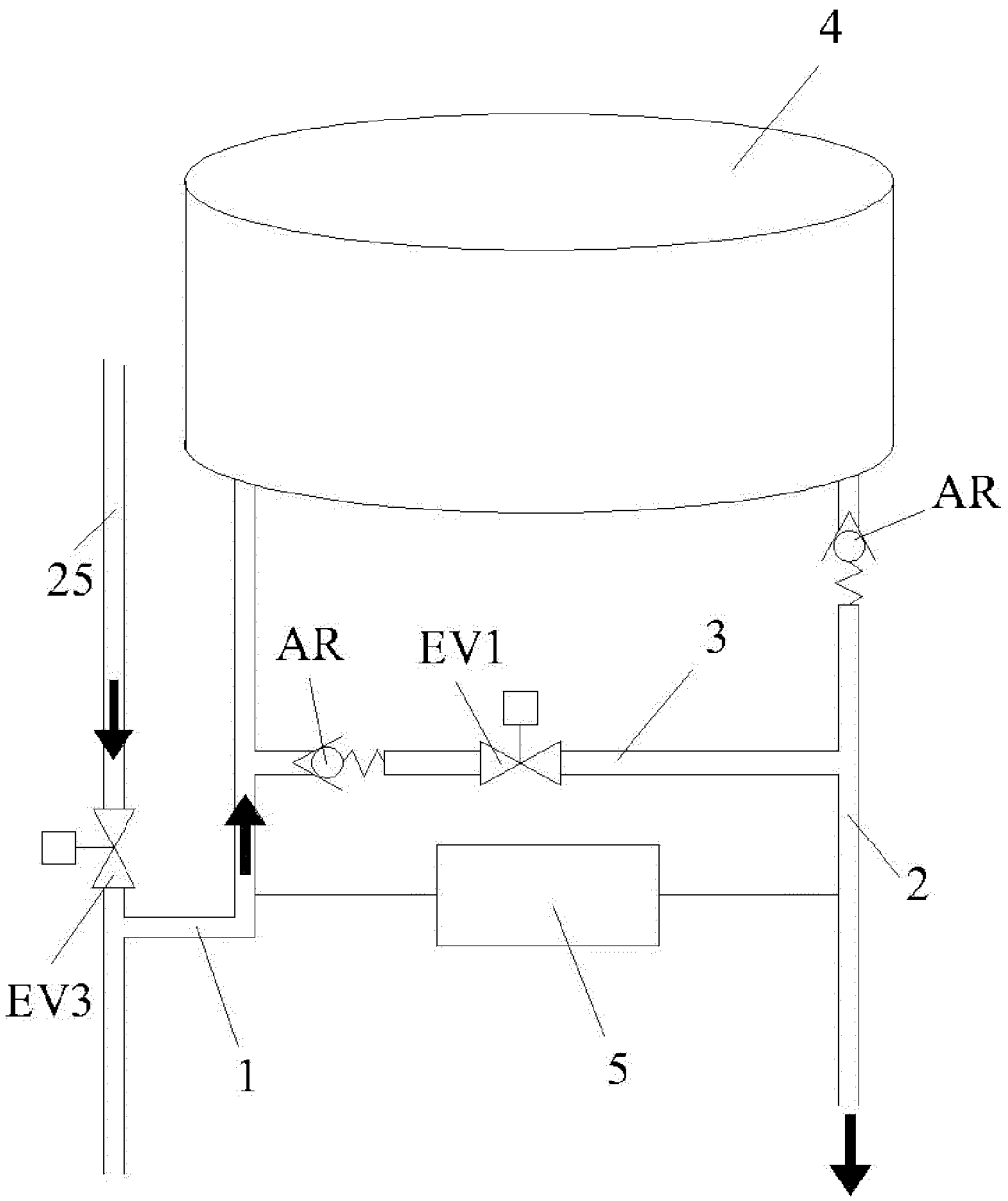


Fig. 1

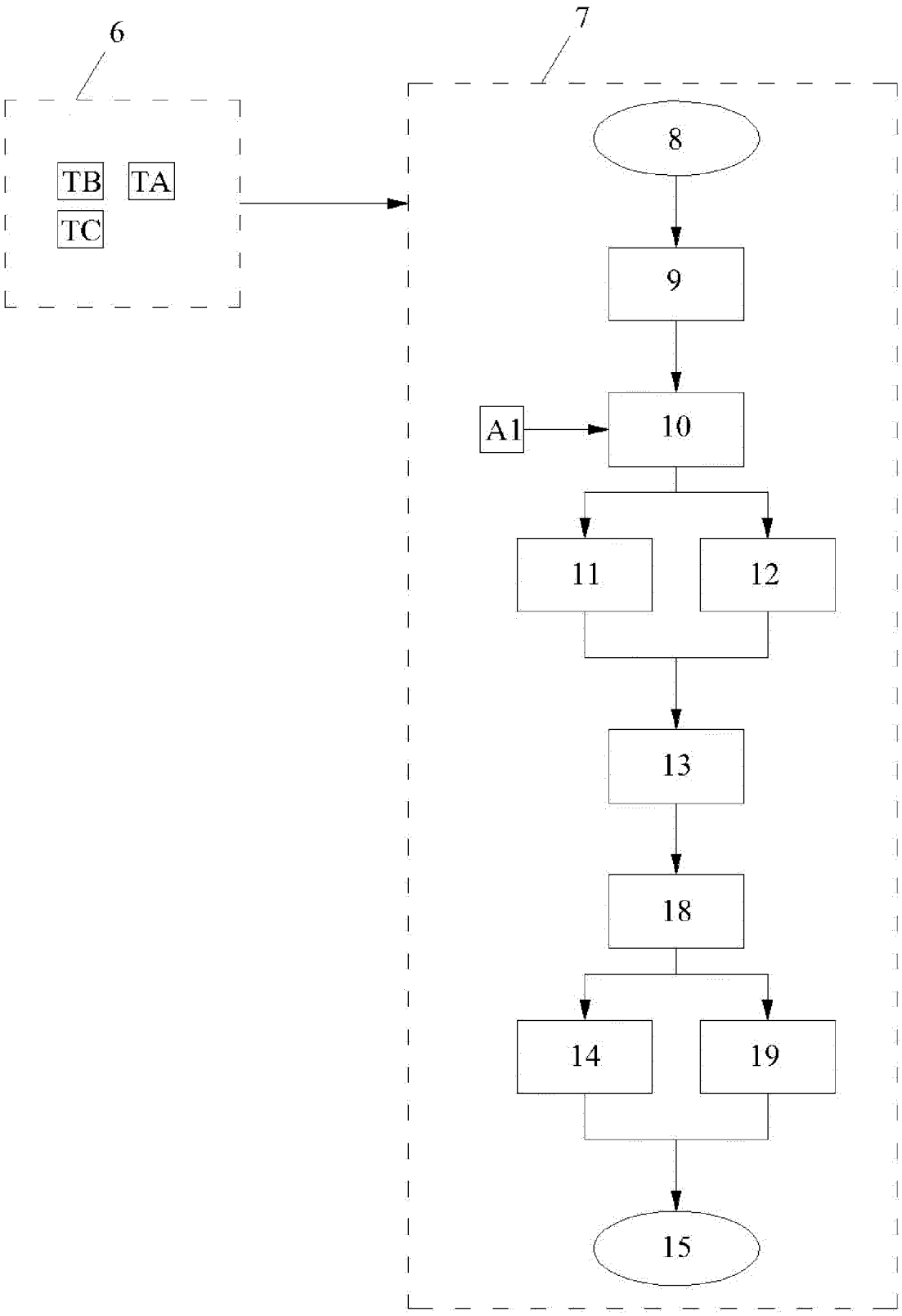
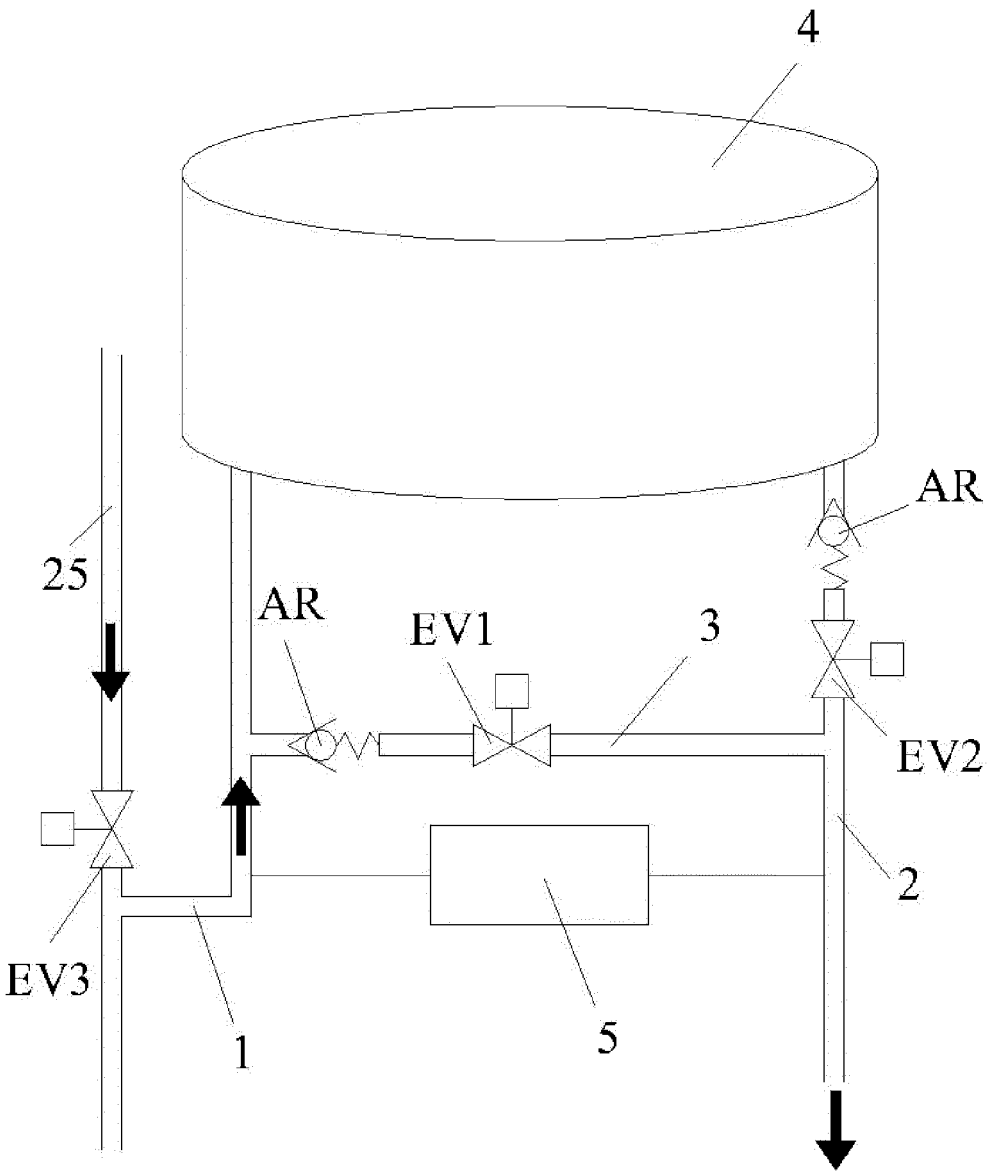


Fig. 2



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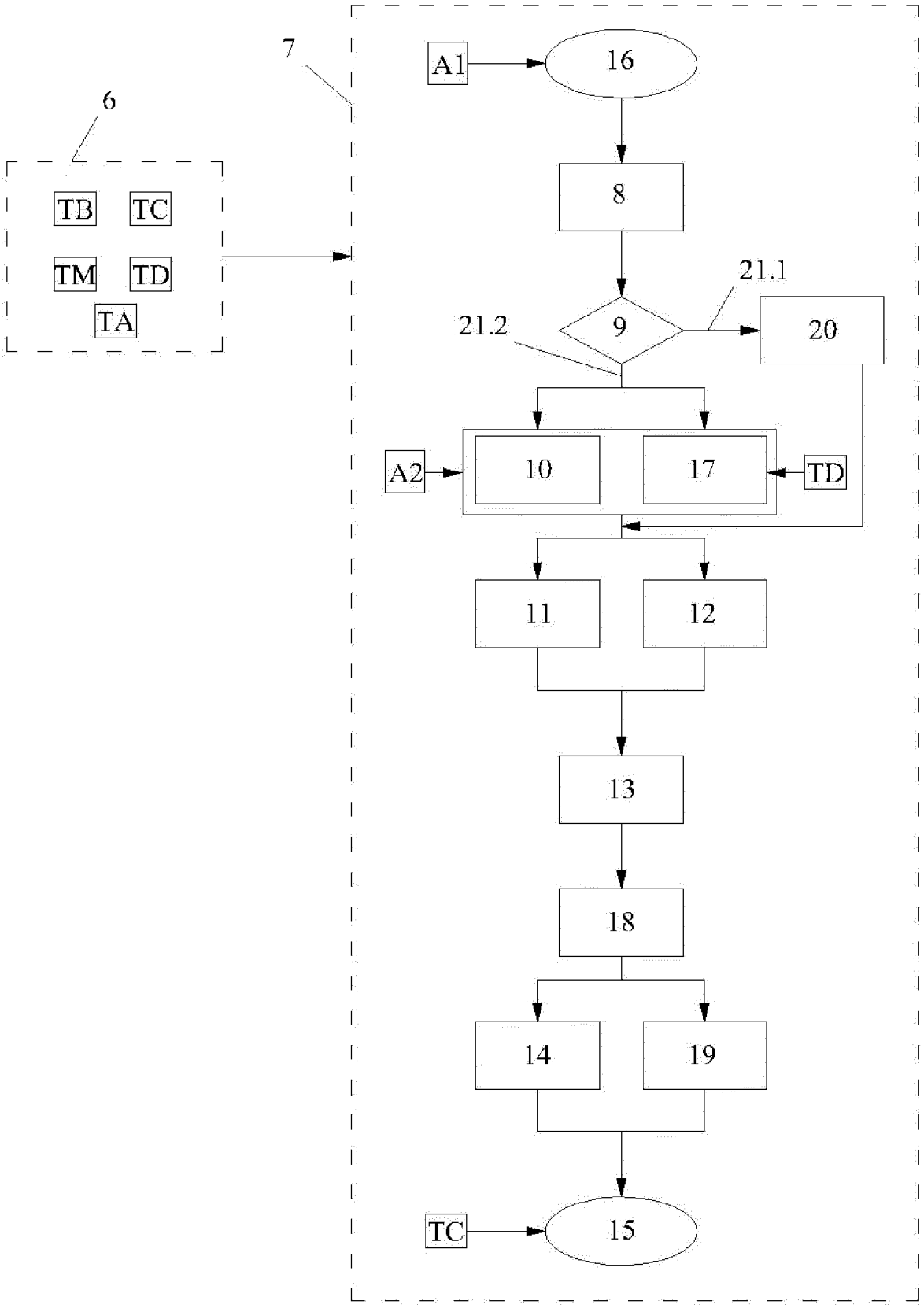
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Fig. 4

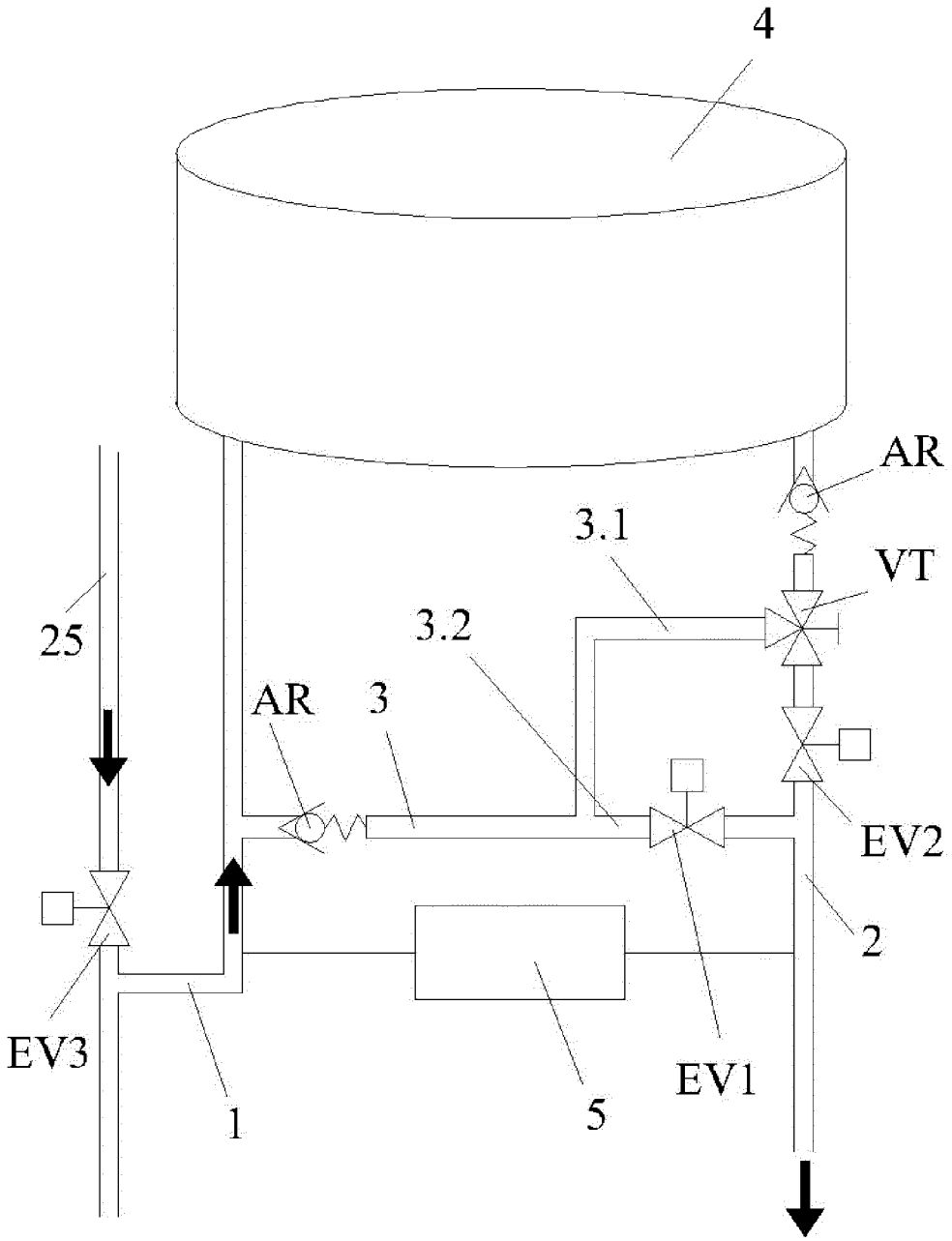

Fig. 5

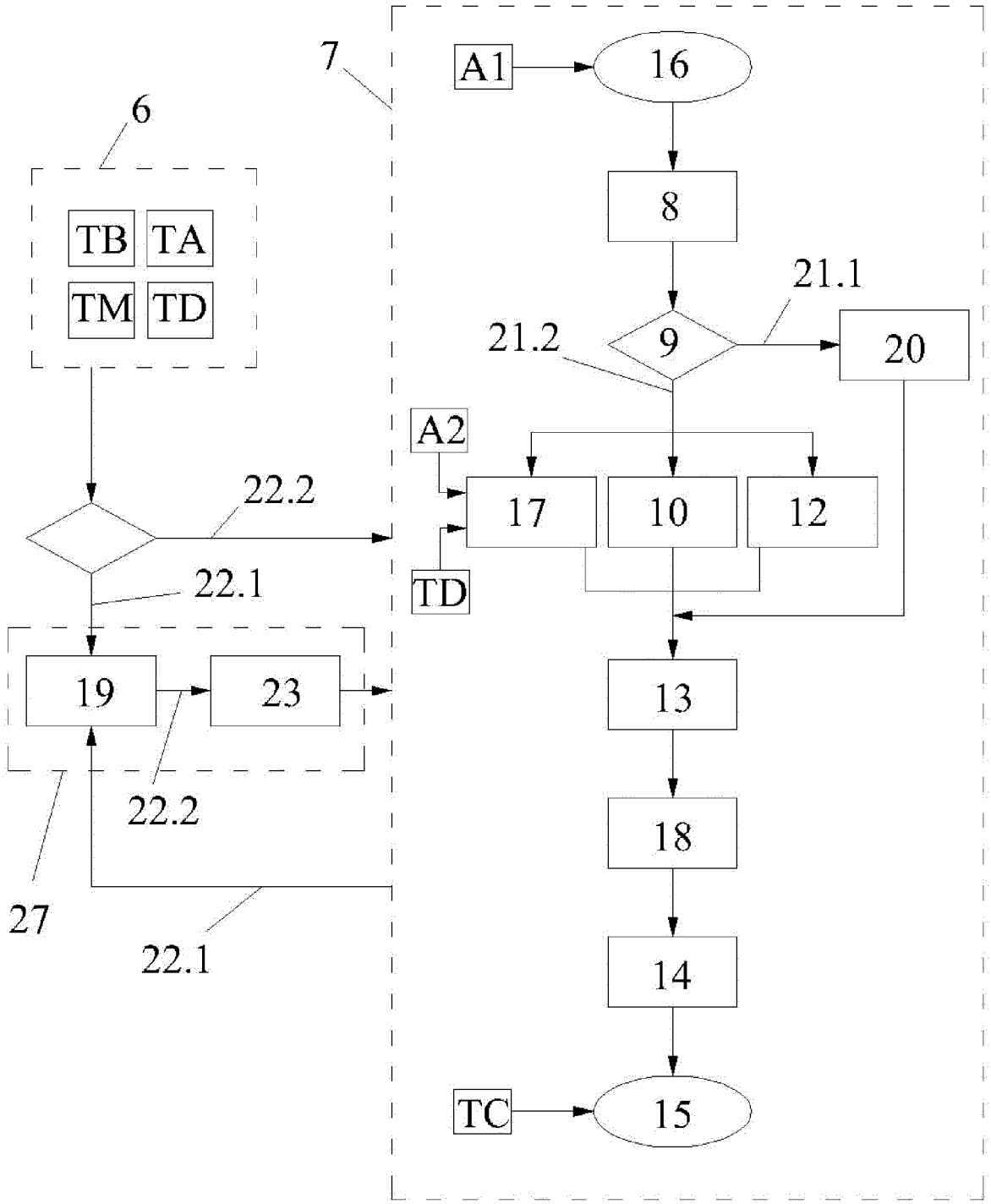
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Fig. 6

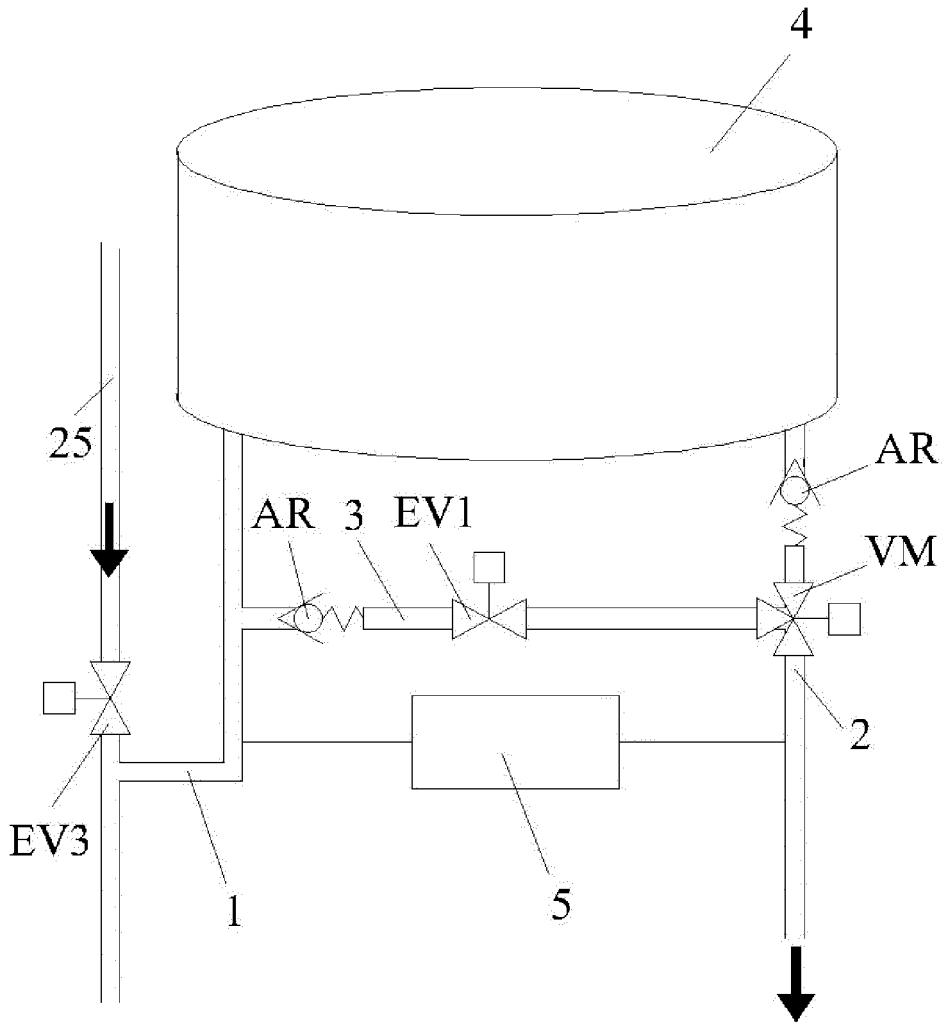

Fig. 7

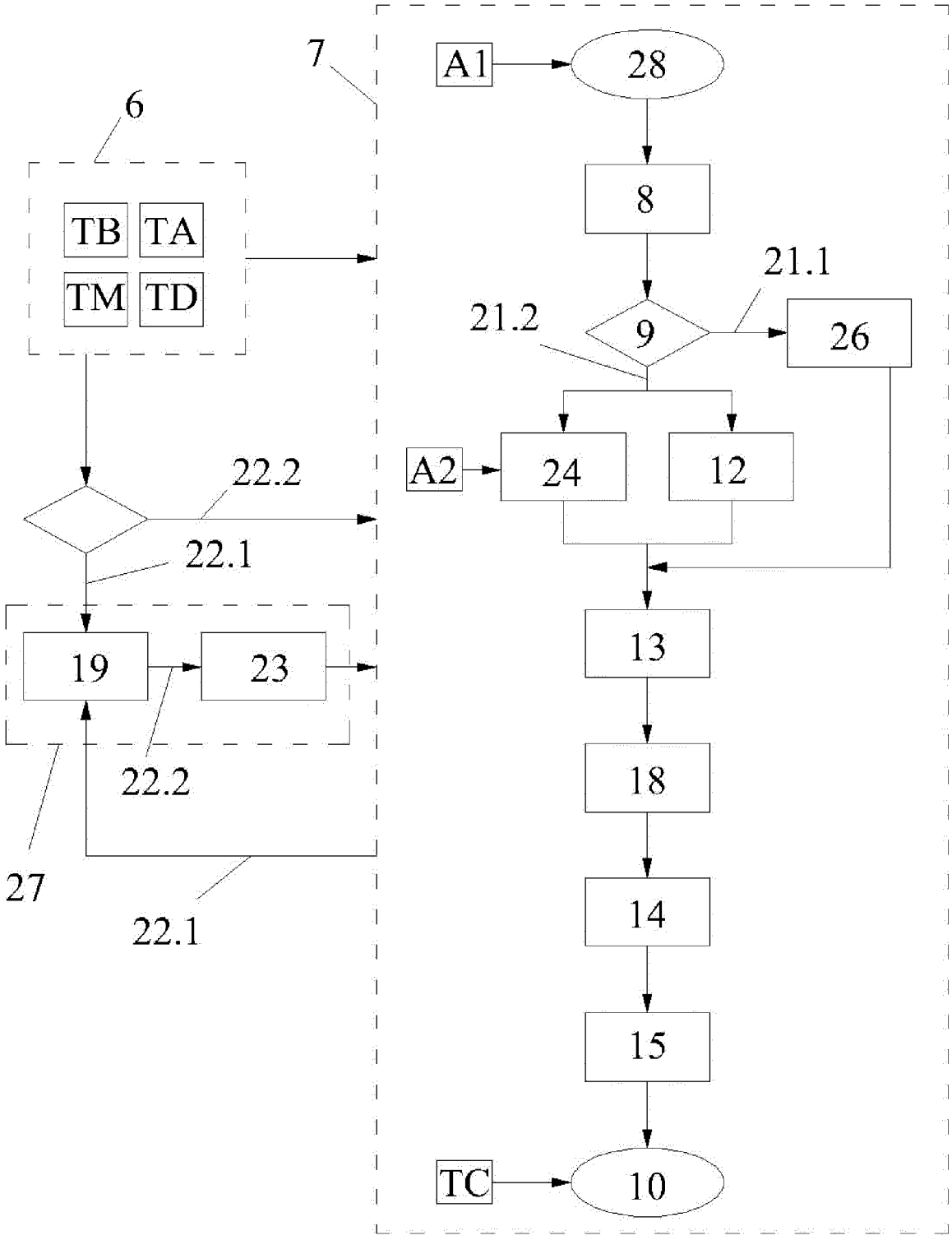
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Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2020/070073

A. CLASSIFICATION OF SUBJECT MATTER

F24D17/00 (2006.01)
F24D19/10 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	column 3, lines 23 - 30; figures 1, 2.	7-16
A	US 2013228233 A1 (HAWS SPENCER KIM) 05/09/2013, paragraphs [0002], [0012], [0017], [0018]; figure 1.	1-16
A	WO 2004088051 A1 (WILLSFORD ANDREW DONALD ET AL.) 14/10/2004, page 1, lines 8 - 16; page 10, line 24 - page 11, line 31; figure 1.	1-16

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure use, exhibition, or other means.
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11/06/2020	**(12/06/2020)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer A. Rodríguez Cogolludo Telephone No. 91 3498534

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2020/070073

C (continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of documents, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2020/070073

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