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(54) **A CIRCULATING SYSTEM FOR DOMESTIC HOT WATER**

(57) A circulating system for heating domestic hot water, specifically a circulating system for heating domestic hot water, which includes a tank (1) with a means (10) for central heating of domestic hot water, which is connected to at least one distribution circuit (6) of domestic hot water containing a supply pipeline (4) of domestic hot water connected to the tank, with at least one consumption point (3), on which a return line (5) of domestic hot water is joined connected back to the tank (1), and at least one means (2) for circulation of domestic hot water, where on the distribution circuit (6) of domestic hot water, beyond the last consumption point (3) is arranged a means (9) for blocking the circulation of domestic hot water.

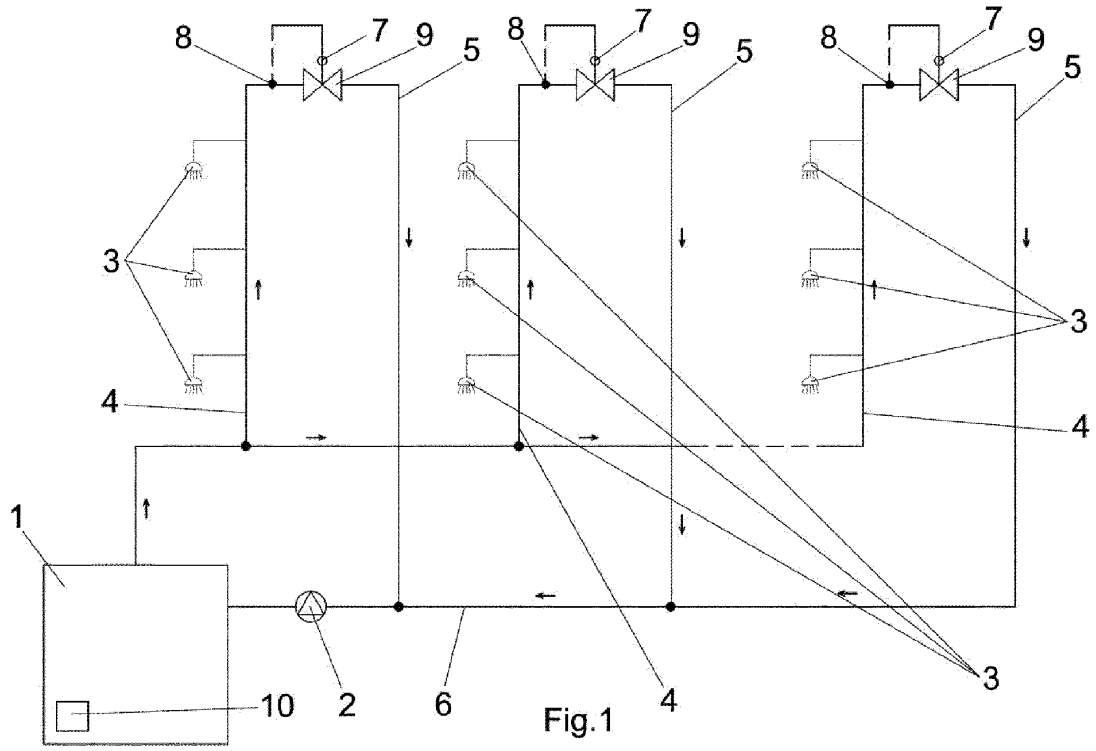

Fig.1

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Description

Technical Field

[0001] The invention concerns circulating systems for heating domestic water, specifically to circulating systems for heating domestic water in blocks of flats and industrial buildings, which contain a tank with a means for the central heating of domestic water which is connected to at least one domestic water distribution circuit to at least one consumption point.

State of the Art

[0002] In buildings as well as industrial solutions, the central heating of domestic hot water (hereinafter DHW) is used to reduce the cost of the heating system. It is then one for the whole building (system). The centrally prepared hot water is distributed to individual consumption points (users). However, this solution brings an increase in heating costs, because the DHW line is burdened with losses, which represent a 60% increase in the heating costs of the whole of the DHW.

[0003] Timed cycling is used to reduce energy demand, but this reduces comfort and is not precise, because the temperature may be unstable even in the supply pipe and thus the sense of this is lost. Because water is transported to the entire pipeline when the circulation is engaged, losses and costs are increased, and the consumption of hot water from the system, which can partially replace the circulation, is also not taken into account.

[0004] From current technology the design solution is known where the DHW distribution is carried out so that the primary pipeline with DHW to the appliances is led from the central consumption boiler, which contains the DHW tank, primarily led to the lowest floor, which is connected by vertical pipes branches to individual discharge points. At the highest point of the primary rising pipe the circulatory, secondary pipeline turns, which leads first parallel to the rising vertical and then with the horizontal primary pipe, drains a certain amount of cooled hot water back to the central heating boiler room. This circulation is carried out by a pump located on the secondary pipe in the central heating boiler room. In this design for solving the transportation of domestic hot water from the central heating boiler room to consumption discharge points, the amount of water required for discharge is transported by the primary pipeline as well as the amount of water required for circulation. This is for returning for re-heating, which is taken from this system by a pump using a secondary, circulation pipe. Thus, the primary pipes must therefore be sized for the entire amount needed for consumption discharge points and further for the amount needed for circulation. The whole system consists of a primary pipeline used for supplying domestic hot water, which means coverage of hot water consumption, and further from the secondary, circulatory pipelines, serving permanently to return part of the water cooled for re - heating. This pipe is inherently redundant and its function is only to ensure temperature in the primary pipe. Because it is burdened with losses, its temperature is a disadvantage for the entire system.

[0005] From the patent document CS 205823 is known the central distribution of domestic hot water for the supply of domestic hot water, consisting of hot water tanks, pumps, return valves, safety valves, reduction valves, flowmeters, manometers, connecting pipes and domestic hot water outflows. The hot water tank is connected to the public water supply network and is connected to the first return valve to the horizontal secondary pipe and through the second return valve to the third pipeline, connected with the primary pipe by means of the fourth pipe to the second pipeline by the second pipeline. at least one circulation pump. The tank is also equipped with a safety valve and at the point designated for consumption of hot water, is connected to the primary pipe, equipped with a third return valve and possibly a flow meter, which follows the fourth pipeline connected via the fourth return valves to the discharge side of the circulation pump and the horizontal primary pipe. Between the horizontal primary pipes and between the horizontal secondary pipes there are vertical consumption pipes, equipped at levels with domestic hot water outflow points and possibly resistance inserts.

[0006] From the above-mentioned known technology, it is clear that the current state of the art has quite a number of disadvantages, with the biggest disadvantage of the known heating systems being that they are very energy-intensive, and due to the way they function, have large energy losses.

[0007] The goal of the invention is a design solution, which will be simple and thus cheap, while enabling significant energy savings.

Principle of the Invention

[0008] The stated shortcomings are largely eliminated and the goals of the invention are fulfilled by a circulating system for heating of domestic hot water, specifically by a circulating system for heating of domestic hot water, which contains a heating source, or a tank with a means for the central heating of domestic hot water, which is connected to at least one distribution circuit of domestic hot water containing a domestic hot water supply pipe connected to the tank, with at least one consumption point connected to the domestic hot water return line leading back to the tank, and at least one means for domestic hot water circulation, according to the invention, characterised by that, on the domestic hot water distribution circuit beyond the last consumption point. a device is arranged for blocking the circulation of domestic hot water. The advantage is that, due to a closing element being installed at the beginning of each branch of the return pipe, which closes the constant flow of liquid in the pipe, the temperature loss of the domestic hot water in the return pipe will be measured. Lowering the temper-

ature will reduce heat losses in a significant part of the system. Water consumptions also help to maintain the temperature in the supply pipe, meaning the more hot water is consumed, the more is saved. The goal is to maintain the required temperature in the supply pipe, and the lowest possible temperature in the return pipe.

[0009] According to the first variant, it is to advantage if a device for measuring the temperature of domestic hot water is arranged beyond the last consumption point. The advantage is that by measuring the temperature it is possible to ensure the exact temperature in the supply pipe, without reducing comfort for the user.

[0010] According to the second variant, it is to advantage if, on the domestic hot water distribution circuit between the last consumption point and the means for blocking the domestic hot water circulation, a device for measuring the temperature of the domestic hot water is arranged. The advantage is that maximum temperature accuracy can be achieved in this way.

[0011] It is also to advantage if the means for measuring the temperature of domestic hot water is a switching thermostat connected to a means for blocking the circulation of domestic hot water. The advantage is that the closing element is thus independent of the control element (computer, PLC, etc.), which is unnecessary in this arrangement, indeed the control will not be as accurate, because the temperature cannot be changed and you cannot use, for example, the function of heating against legionella bacteria.

[0012] Furthermore, it is advantageous if the means for measuring the temperature of domestic hot water is connected to the control unit of the means for blocking the circulation of domestic hot water. According to the measured temperature, the closing element then blocks the water circulation. The advantage is that it is possible to change the temperature operationally, for example according to the request of the users, or the temperature can be temporarily set to eliminate legionella bacteria, or the temperature can be set with regard to the time of day, thereby further increasing savings.

[0013] To advantage, the means for blocking the domestic hot water circulation is a shut-off valve. The advantage is that this valve is a commonly used element and there is no need to provide any special equipment.

[0014] It is also to advantage if the means for the circulation of domestic hot water is an automatic pressure circulation pump. It is to advantage that the automatic pressure circulation pump can gradually reduce its output when the individual branches are gradually closed. There is then no need to additionally control the pump's output according to the number of closed branches, because this is done automatically according to the pressure in the pipeline, and ordinary manufactured pumps can be used.

[0015] The main advantage of the invention is that due to the blocking of the accelerated circulation of domestic hot water at the end of the supply pipe, where the temperature of the domestic hot water is at the level required for the last consumption point, a large saving of energy for heating of domestic hot water is achieved. Specifically, this is done by means for blocking the circulation of domestic hot water, which closes the return branch when the required temperature is reached just beyond the last consumption point. By closing and opening the device for blocking the domestic hot water circulation, a constant temperature is maintained at the end of the pipe. The result is that the temperature in the return pipe is reduced and losses are then minimised. Closing the circulation is especially advantageous for systems that have more than one return branch, because with a single return branch it could be problematic to block the water circulation by stopping the pump.

Overview of the Figures

[0016] The invention will be explained in more detail with the help of a drawing, in which fig. 1 schematically shows the connection of the circulation system for heating of domestic hot water.

Example of the Performance of the Invention

[0017] A circulating system for heating domestic hot water (fig. 1) contains a tank 1 with a means 10 for the central heating of domestic hot water, which is connected to three distribution circuits 6 of domestic hot water. The tank 1 is connected to three domestic hot water supply pipes 4, where each of these domestic hot water supply pipes 4 contains three consumption points 3, on which are connected three domestic hot water return lines 5 connected back to the tank 1. On the domestic hot water return line 5 there is, before the tank 1, arranged a means 2 for the circulation of domestic hot water, which is an automatic pressure circulation pump.

[0018] Alternatively, the circulating system may contain only one distribution circuit 6 of domestic hot water, or possibly even more than three distribution circuits 6 of domestic hot water.

[0019] On each domestic hot water distribution circuit 6, beyond the last consumption point 3, a means 9 for blocking the domestic hot water circulation is arranged, which is a shut-off valve.

[0020] Furthermore, on the domestic hot water distribution circuit 6 between the last consumption point 3 and the means 9 for blocking the domestic hot water circulation, a means 8 for measuring the domestic hot water temperature is arranged, which is a switching thermostat connected to the means 9 for blocking the domestic hot water circulation.

[0021] The means 8 for measuring the temperature of domestic hot water can alternatively be connected to the control unit 7 of the means 9 for blocking domestic hot water circulation.

[0022] Furthermore, as a variant, the means 8 for measuring the temperature of domestic hot water can be arranged directly at the last consumption point 3.

[0023] Tests have shown that the solution according to the invention reduces the energy requirements for the operation of the circulation system for heating domestic hot water, and according to calculations, the savings are:
Calculation for one branch of the circulation system for heating domestic hot water:
Savings calculation for DN20 pipes:

Standard for water temperature:

55°C, U = 0.18W/m2K
40°C, U = 0.174W/m2K
30°C, U = 0.172W/m2K

Savings calculation for DN40 pipes:
Standard

55°C, U = 0.27W/m2K
40°C, U = 0.262W/m2K
30°C, U = 0.258W/m2K

Loss in the DN20 pipeline

Q = U . I. (tpotr - tint)
Q55 = 0.18.1.(55-20) = 6.3W/m
Q40 = 0.174.1.(40-20) = 3.48W/m
Q30 = 0.18.1.(30-20) = 1.72W/m

Loss in the DN40 pipeline

Q = U . I. (tpotr - tint)
Q55 = 0.27.1.(55-20) = 9.45W/m
Q40 = 0.262.1.(40-20) = 5.24W/m
Q30 = 0.258.1.(30-20) = 2.58W/m

[0024] If the temperature in the pipeline is 55°C in 1/3 of the length, 40°C in the next 1/3 and 30°C in the next 1/3, the total savings will be:

Q55 = 0.27.1.(55-20) = 9.45W/m 9.45-9.45 = 0w/m
Q40 = 0.262.1.(40-20) = 5.24W/m 9.45-5.24 = 4.21w/m
Q30 = 0.258.1.(30-20) = 2.58W/m 9.45-2.58 = 6.87w/m

[0025] This results in a saving of 11.08w/m, which is a savings of 40%.
[0026] For a house that needs 1000 litres of DHW per day are:

annual costs for domestic hot water heating according to the standard: 15,975 kWh annual costs for of domestic hot water heating with circulation according to the standard: 25,560 kWh
annual cost of domestic hot water heating with circulation using the invention: 21,726kWh

[0027] For the given house, at an energy price of CZK 8/kWh, the invention represents a saving of CZK 30,600/year.

Industrial Application

[0028] The circulating system for heating domestic hot water, according to the invention, can be used for heating domestic hot water in blocks of flats and industrial buildings with at least one distribution circuit of domestic hot water, which contains consumption points.

List of Reference Marks

[0029]

1 tank
2 means for circulating of domestic hot water
3 consumption point
4 domestic hot water supply pipe
5 domestic hot water return line
6 domestic hot water distribution circuit
7 control unit
8 device for measuring the temperature oof domestic hot water
9 means for blocking the circulation of domestic hot water
10 means for central heating of domestic hot water

Claims

1. A circulating system for heating domestic hot water, specifically a circulating system for heating domestic hot water, which includes a tank (1) with means (10) for central heating of domestic hot water, which is connected to at least one distribution circuit (6) of domestic hot water containing, connected to the tank, a supply pipe (4) of domestic hot water, with at least one consumption point (3), which is followed by a return line (5) of domestic hot water connected back to the storage tank (1), and at least one means (2) for the circulation of domestic hot water, **characterised by that** on the domestic hot water distribution circuit (6) beyond the last consumption point (3), a means (9) for blocking domestic hot water circulation is arranged.

2. The circulating system for heating domestic hot water, according to claim 1, **characterised by that** at the last consumption point (3), a device (8) for measuring the temperature of domestic hot water is arranged.

3. The circulating system for heating domestic hot water, according to claim 1, **characterised by that** there is between the last consumption point (3) and the means (9) on the distribution circuit (6) of domestic hot water a means (8) for measuring the temper-

ature of the domestic hot water is arranged to block the domestic hot water circulation.

4. The circulating system for heating domestic hot water, according to either one of claims 2 and 3, **characterised by that** the means (8) for measuring the temperature of domestic hot water is a switching thermostat connected to the means (9) for blocking the domestic hot water circulation.

5. The circulating system for heating domestic hot water, according to either one of claims 2 and 4, **characterised by that** the means (8) for measuring the temperature of domestic hot water is connected to the control unit (7) via the means (9) for blocking the domestic hot water circulation.

6. The circulating system for heating domestic hot water, according to any one of claims 1 to 5, **characterised by that** the means (9) for blocking the circulation of domestic hot water is a shut-off valve.

7. The circulating system for heating domestic hot water, according to any one of claims 1 to 6, **characterised by that** the means (2) for circulating domestic hot water is an automatic pressure circulation pump.

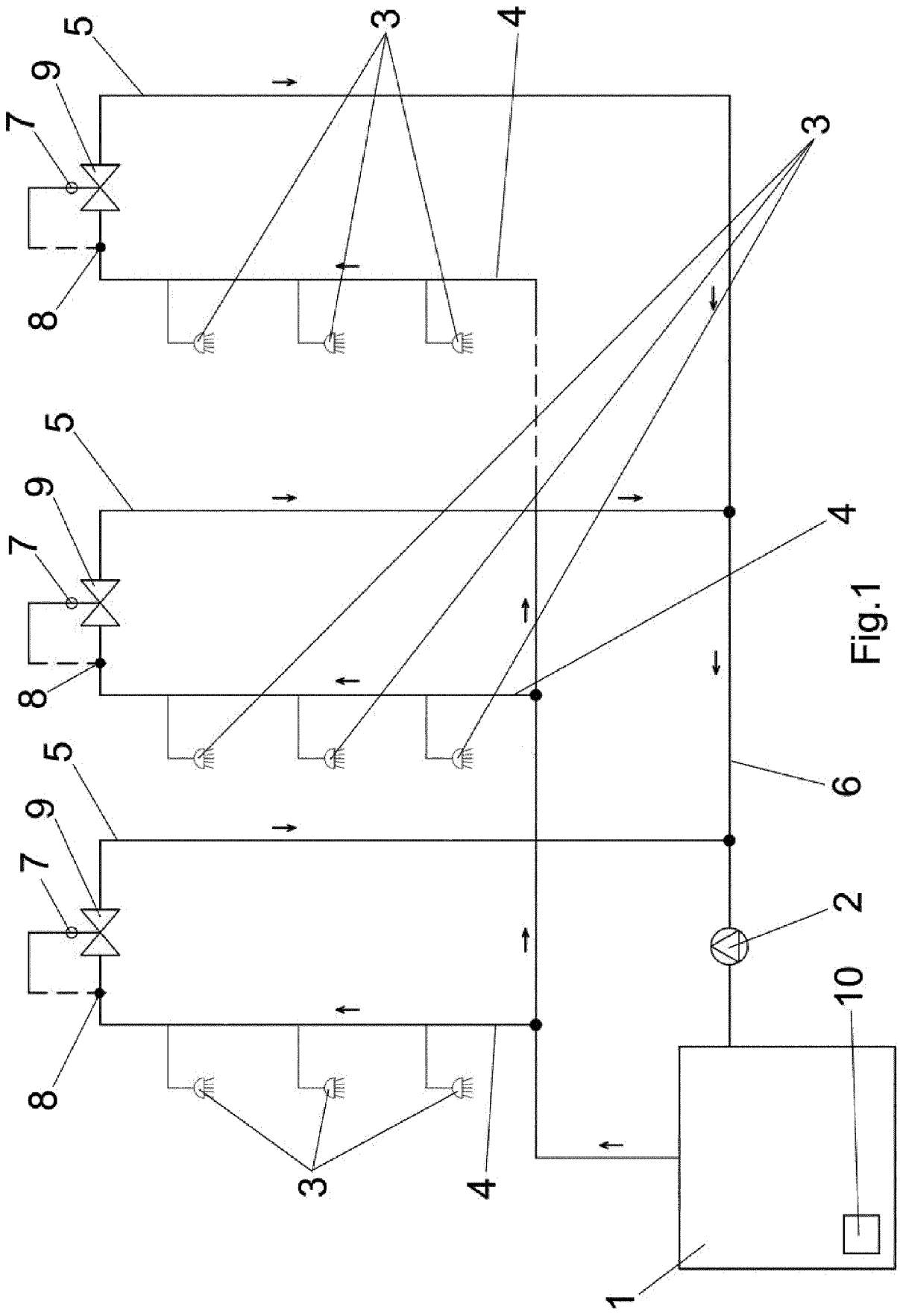

Fig.1

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EUROPEAN SEARCH REPORT

Application Number
EP 24 02 0009

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F24D
E03B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 May 2024	Schwaiger, Bernd

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X : particularly relevant if taken alone
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