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(54) **ARRANGEMENT FOR HEAT EXCHANGERS OF A DISTRICT-HEATING SYSTEM OF A BUILDING
AND CORRESPONDING METHOD**

ANORDNUNG FÜR WÄRMETAUSCHER EINES FERNWÄRMESYSTEMS EINES GEBÄUDES UND
ENTSPRECHENDES VERFAHREN

AGENCEMENT POUR ÉCHANGEURS DE CHALEUR D'UN SYSTÈME DE CHAUFFAGE URBAIN
D'UN BÂTIMENT ET PROCÉDÉ CORRESPONDANT

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(73) Proprietor: **Insinööritoimisto Mittatyö Timo**
Holopainen Ky
40250 Jyväskylä (FI)

(72) Inventor: **HOLOPAINEN, Timo**
40250 JYVÄSKYLÄ (FI)

(74) Representative: **Kespat Oy**
Vasarakatu 23a
40320 Jyväskylä (FI)

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Description

[0001] The invention relates to an arrangement for heat exchangers of a district-heating system of a building, wherein the arrangement includes

- a domestic-water heat exchanger, through which district-heating water is conducted and which is configured to deliver heat to domestic water, and which is dimensioned for a selected rated inlet temperature of the district-heating water,
- a control valve or control valves of the domestic-water heat exchanger for controlling the flow rate of the district-heating water conducted to the domestic-water heat exchanger,
- a circuit piping system for circulating domestic hot water, wherein hot water entering the circuit piping system is heated by means of the domestic-water heat exchanger and hot circuit water returning from the circuit piping system is conducted to the domestic-water heat exchanger,
- a separate circuit-water heat exchanger, through which district-heating water is conducted and which is configured to deliver heat to the hot circuit water, and which is dimensioned for a selected rated inlet temperature of the district-heating water,
- a control valve of the circuit-water heat exchanger for controlling the flow rate of the district-heating water conducted to the circuit-water heat exchanger,
- control devices for controlling the flow rate of district-heating water in a selected part of the arrangement according to a pre-set program, which control devices are configured at least to control an opening degree of the control valve of the domestic-water heat exchanger and an opening degree of the control valve of the circuit-water heat exchanger on the basis of readings of a temperature sensor for hot circuit water and of a temperature sensor for hot water.

The invention also relates to a corresponding method.

[0002] Typically, domestic hot water of a building is circulated continuously in a piping system, so that domestic hot water is available to a user almost immediately upon turning on a domestic water tap. Domestic hot water must also be constantly kept hot enough to avoid the growth of harmful microbial in the circuit water. Harmful *Legionella* bacteria can proliferate in warm water below 50°C. According to effective regulations of the Finnish Ministry of the Environment and recommendations of the Finnish Institute for Health and Welfare, the temperature of domestic hot water must be between + 55 °C ... + 65 °C throughout the circuit piping system. The stipulated upper limit was chosen based on safety considerations (burn injuries). In Sweden, the recommended temperature range for hot water is + 50 °C to + 60 °C. According to current stipulations and energy industry regulations and guidelines, the established rated temperature for domestic hot water in Finland is + 58 °C and the return

temperature of the circuit-water piping system is + 55 °C. The domestic water circulating in the pipe system cools down, so that it must be constantly heated. Typically, the outgoing temperature of domestic hot water leaving a domestic-water heat exchanger is set at 58 °C, so that the returning hot circuit water remains above a temperature of 55 °C. Most of the time, however, domestic water consumption is very low or non-existent.

[0003] In a heat distribution centre of a building, heat is typically transferred from the district-heating water to the domestic water by means of a single high-power domestic-water heat exchanger. In Finland, the primary side of domestic-water heat exchangers is dimensioned according to a summertime inlet temperature of district-heating water of 70 °C. The design flow rate for the domestic hot water is calculated using a probability formula based on the number of water points and standard flow rates. In Sweden, a rated value for a summertime inlet temperature of district-heating water of + 65 °C is used. The pursuit of lower temperatures for the outgoing water of a district-heating system may lower the summertime rated temperature to + 65 °C in Finland as well. Domestic-water heat exchangers are also clearly oversized in terms of their power in the heating season. An oversized heat exchanger and a control valve designed according to a rated water flow rate of domestic water both render control difficult. The consumption of domestic hot water is characterized by large and rapid fluctuations. The power demand of a heat exchanger is not linear, but varies randomly according to daily and weekly rhythms. A control system that controls the flow rate of district heat to a heat exchanger according to a setpoint value for domestic hot water, which seems simple in principle, is thus difficult. Control is non-linear and causes strong fluctuations, especially at low flow rates of domestic water. The flow rate of the circuit line is normally approximately 30% of the design flow rate.

[0004] An attempt at solving the problem described in the foregoing was made in Finnish patent publication FI 110027 B, which discloses a system for heating domestic hot water in which a configuration of heat exchangers of a district-heating system of a building includes a separate heat exchanger for heating returning circuit water. The solution disclosed in this publication is, however, problematic in that it is not possible to control the temperature of the circuit water with accuracy and the control valve of the high-power domestic-water heat exchanger opens and closes continuously when domestic water is not being used. A precise control of the temperature of the circuit water in the form of a separate control loop is a prerequisite in order to ensure that the circuit water remains at the right temperature and free of harmful microbial growths.

[0005] Further prior art can be found in documents EP 2 426 420 B1, FI 20 215 097 A1, EP 2 154 436 B1, DE 203 16 161 U1, and DE 10 2014 116368 A1.

[0006] It is an object of the invention to provide an improved arrangement for heat exchangers of a district-

heating system of a building, wherein the arrangement enables a more precise control of a domestic water circuit and of a temperature of domestic water heated from domestic cold water as well as, at the same time, an improvement in the cooling of district-heating water. The characteristic features of this invention are indicated in the attached patent claim 1. A further object of the invention is to provide an improved method using heat exchangers of a district-heating system of a building, wherein the method enables a more precise control of a domestic water circuit and of a temperature of domestic water heated from domestic cold water as well as an improvement in the cooling of district-heating water. The characteristic features of this invention are indicated in the attached patent claim 9.

[0007] In the arrangement according to the invention, the building has two separate heat exchangers connected to a network for domestic hot water. One heat exchanger is a conventional high-power domestic-water exchanger, which heats domestic cold water to a desired temperature, such as 58 °C (the setpoint value can vary between 55 and 58 °C depending on the building). A second, lower-power heat exchanger is connected to the return pipe of the domestic hot water circuit between the hot circuit water pump and the actual domestic-water exchanger. This heat exchanger of the domestic water circuit raises a setpoint value of the control loop of the domestic-water heat exchanger for the domestic water returning in the circuit line. The circuit piping system thus always remains at a safe temperature when domestic water is not being used and the control valves of the domestic-water exchanger are not opened.

[0008] The circuit-water heat exchanger is configured to heat the domestic water to a setpoint temperature 1 - 5 °C, advantageously 2 - 4 °C, higher than the domestic-water heat exchanger, and the rated inlet temperature of district-heating water for the circuit-water heat exchanger is 2 - 10 °C, advantageously 4 - 6 °C, lower than the rated inlet temperature of district-heating water for the domestic-water heat exchanger. The temperature of the domestic water circuit can thus be kept precisely at a setpoint temperature, so that the domestic water circuit remains free of harmful microbes such as Legionella bacteria. The heating of the domestic water is thus also energy efficient and the cooling of the district-heating water can be improved by conducting heating water of a heat exchanger of the domestic water circuit to an outlet side of heating exchangers.

[0009] In this context, adapting a setpoint temperature of the circuit-water heat exchanger is understood to mean that control devices are configured to control the flow rate of the district-heating water to the domestic-water heat exchanger and to the circuit-water heat exchanger by controlling an opening degree of a control valve of the domestic-water heat exchanger and an opening degree of a control valve of the circuit-water heat exchanger in such a manner that a reading of a temperature sensor for hot circuit water ideally remains 1 - 5 °C, advantageously 2 - 4 °C, higher than a reading of a temperature sensor for hot water.

geously 2 - 4 °C, higher than a reading of a temperature sensor for hot water.

[0010] The design of the circuit-water heat exchanger, in turn, is understood to mean that the geometric parameters of the heat exchanger, such as the surface area of the heat-exchanging surface, are configured for a design flow rate so that the domestic water is heated to a setpoint temperature at a rated inlet temperature of district-heating water. In a plate heat exchanger, a design can be achieved, for example, by adding heat-exchanging plates in order to increase the surface area of the heat-exchanging surface. The domestic-water heat exchanger can be designed for a rated inlet temperature of district-heating water of, for example, 70 °C, and the circuit-water heat exchanger can be designed for a rated inlet temperature of district-heating water of, for example, 65 °C.

[0011] Advantageously, the nominal power of the circuit-water heat exchanger is significantly lower than the nominal power of the domestic-water heat exchanger. Reducing the rated inlet temperature of the district-heating water for the circuit-water heat exchanger by increasing a surface area of a heat-exchanging surface is more cost-effective than a high-power domestic-water heat exchanger.

[0012] For example, in an apartment building containing 40 small apartments, a domestic-hot-water exchanger compliant with Finnish regulations with a power of 252 kW (design flow rate 1.25 l/s) and the domestic water circuit generally constitute at least 30% of the design flow rate. In this case, depending on heat losses of the circuit piping system, the power of the heat exchanger of the domestic water circuit can be merely 5 - 20 kW.

[0013] On the other hand, the rated temperature of the secondary side of the domestic-water exchanger is normally 10 °C - 58 °, in which case the rated temperature of the circuit-water heating exchanger is 55 °C - 60 °C or 57 °C - 60 °C, depending on losses in the circuit line.

[0014] This configuration makes it possible to heat bathrooms safely and economically according to a separate patented method (European patent no. 3746711) (200 - 250 W/bathroom).

[0015] The arrangement according to the invention advantageously further provides a temperature monitoring of the circuit piping system and a monitoring of temperatures of the domestic hot water and a measuring of the power consumption of the domestic water circuit.

[0016] The arrangement according to the invention can be implemented in an existing, older heat distribution system, in which case it is not absolutely necessary to replace a high-power and expensive domestic-water heat exchanger, but rather a low-power circuit-water heat exchanger according to the invention that has been optimized with respect to its rated temperatures can be added to the heat distribution system by simultaneously making the necessary changes and additions to the control devices of the arrangement. An older heat distribution system can thus be modernized so as to become more energy efficient and more functional in terms of its control.

Cooling of the district-heating water can be improved at a low cost while ensuring a microbe-free domestic-water system. In addition, this low-power heat exchanger can be fully exploited when the system is upgraded.

[0017] The circuit-water heat exchanger can be configured to produce domestic hot water with a setpoint temperature of 60-63 °C, advantageously 60 °C, and the domestic-water heat exchanger can be configured to produce domestic hot water with a setpoint temperature of 55-59 °C, advantageously 58 °C. The control valve of the domestic-water heat exchanger is thus not opened when a domestic water tap is opened slightly, so that district-heating water is not needlessly conducted through the domestic-water heat exchanger. A domestic water circuit can thereby be kept at a target temperature alone by means of a separate circuit-water heat exchanger. Only when the consumption of domestic hot water increases markedly and the exchanger cools down is a use of the domestic-water heat exchanger initiated to heat domestic water.

[0018] In one embodiment of the invention, the domestic-water heat exchanger is either a two-pass domestic-water heat exchanger, comprising a first portion at a higher temperature for producing hot water and a second portion at a lower temperature for preheating cold water, wherein the hot circuit water is conducted between the first portion and the second portion, or an analogously arranged whole formed by two single-inlet heat exchangers and interconnecting piping systems. A cooling of district-heating water can thus be improved in conjunction with a heating of domestic water.

[0019] In another embodiment of the invention, the domestic-water heat exchanger is a single-inlet heat exchanger. In this case, the hot circuit water is conducted from the circuit-water heat exchanger to a cold water line that leads to the single-inlet domestic-water heat exchanger. The system according to the invention does not depend *per se* on the structure of the actual domestic-water heat exchanger.

[0020] Advantageously, a domestic-water return pipe of the circuit-water heat exchanger is connected to the domestic-water heat exchanger in order to conduct heated circuit water to the domestic-water heat exchanger. The hot water of the domestic water circuit can thereby be heated with precision to a desired setpoint temperature.

[0021] Advantageously, the arrangement includes at least one heating-circuit loop and one heat exchanger of the heating circuit, and a return pipe for returning district-heating water that heats the circuit-water heat exchanger is connected to a district-heating water pipe that leads to the heat exchanger of the heating circuit. This allows a very efficient cooling of the district-heating water used in the building via the circulation of the district-heating water through both the circuit-water heat exchanger and a heat exchanger of a heating circuit. Advantageously, a return pipe for returning district-heating water of the heat exchanger is connected directly to a return line of the dis-

trict-heating system of the building in such a manner that the district-heating water returning from the heat exchanger of the heating circuit no longer passes through the domestic-water heat exchanger. The district-heating water used in the building can thus be cooled to a temperature so low that it can no longer be utilized to preheat cold water. Especially in summertime, when there is no significant demand for heating, yet still a demand for domestic hot water, the district-heating water can be conducted solely through the circuit-water heat exchanger to a heat exchanger of a heating circuit. The heat of the district-heating water arriving from the circuit-water heat exchanger is thereby transferred very efficiently to the heating circuit, where the water is continuously circulated even when there is no actual demand for heating.

[0022] In another embodiment according to the invention, the district-heating water leaving a heat exchanger of a heating circuit is conducted to an intermediate feed of the domestic-water heat exchanger to heat cold water.

[0023] Advantageously, a control of the domestic-water heat exchanger is provided using two separate control valves connected in parallel. This allows a very precise control of the flow rate and the temperature of the district-heating water conducted to the domestic-water heat exchanger.

[0024] The circuit-water heat exchanger can have a nominal power of 2-20 kW, advantageously 5-15 kW, and the domestic-water heat exchanger can have a nominal power of 65-600 kW, advantageously 150-400 kW. When consumption of domestic water is low, this allows heating of the domestic water to be provided by means of a low-power heat exchanger, so that a cooling of the district-heating water can be significantly improved when domestic water is not being consumed.

[0025] In a method according to the invention for heat exchangers of a district-heating system of a building, heat is transferred from district-heating water to domestic water by means of a domestic-water heat exchanger dimensioned for a selected rated inlet temperature of district-heating water, a flow rate of district-heating water flowing to the domestic-water heat exchanger is set by controlling an opening degree of a control valve of the domestic-water heat exchanger, domestic water is circulated in a domestic water circuit, in which outgoing hot water is heated by the domestic-water heat exchanger and hot circuit water returning from the domestic water circuit is conducted to the domestic-water heat exchanger, heat is additionally transferred from district-heating water to the hot circuit water by means of a separate circuit-water heat exchanger dimensioned for a selected rated inlet temperature of district-heating water, the flow rate of the district-heating water flowing to the circuit-water heat exchanger is set by controlling an opening degree of a control valve of the circuit-water heat exchanger, the flow rate of the district-heating water is controlled in a selected method step by means of control devices according to a preset criterion, which control devices at least control an opening degree of the control valve of the domestic-water

heat exchanger and of the control valve of the circuit-water heat exchanger based on readings of a temperature sensor for hot circuit water and of a temperature sensor for hot water. The circuit-water heat exchanger is set to heat domestic water to a setpoint temperature 1 - 5 °C, advantageously 2 - 4 °C, higher than the domestic-water heat exchanger, and the circuit-water heat exchanger is dimensioned for a rated inlet temperature of district-heating water that is 2 - 10 °C, advantageously 4 - 6 °C, lower than the domestic-water heat exchanger. This allows the temperature of the domestic water circuit to be maintained precisely at a setpoint temperature, so that the domestic water circuit remains free of harmful microbes such as Legionella bacteria. This also allows a more energy-efficient heating of the domestic water while improving the cooling of the district-heating water. According to the regulations of the Finnish Ministry of the Environment currently in effect, a setpoint temperature of a circuit-water heat exchanger can be set to 60-63 °C, advantageously 60 °C, and a setpoint temperature of a domestic-water heat exchanger can be set to 57-59 °C, advantageously 58 °C. The control valve of the domestic-water heat exchanger thus does not open when a domestic water tap is opened slightly.

[0026] At least for the time being, the temperatures used in Sweden for circuit water are 5°C lower than those just mentioned. The arrangement is also suitable for use with lower temperatures. A text of the Finnish Institute for Health and Welfare on water temperature published in English reads:

"Temperature is an important factor in the growth of legionellae. Legionellae can multiply when a temperature is between 20 °C and 45 °C. Above this temperature, the legionellae will begin to be damaged and, at 50 °C, the majority of legionellae will be destroyed within a few hours. Water at a constant temperature of 60 °C no longer contains living Legionella bacteria."

[0027] Advantageously, the district-heating water is conducted to the domestic-water heat exchanger via a two-part control valve comprising two separate control valves connected in parallel. This allows the flow rate of district-heating water conducted to the domestic-water heat exchanger to be controlled very precisely.

[0028] Advantageously, the district-heating water that has passed through the circuit-water heat exchanger is conducted into a district-heating water pipe that leads to a heat exchanger of a heating circuit. This allows a very efficient cooling of the district-heating water used in the building via the circulation of the district-heating water through both the circuit-water heat exchanger and the heat exchanger of the heating circuit.

[0029] Advantageously, the district-heating water returning from the heat exchanger of the heating circuit is conducted directly into a return line of the district-heating system of the building. This allows the district-heating water used in the building to be cooled to a very low temperature.

[0030] Advantageously, water is circulated continu-

ously in the heating circuit even when there is no demand for heating. This allows heat of the district-heating water returning from the circuit-water heat exchanger to be transferred efficiently to water of the heating circuit when the district-heating water returning from the circuit-water heat exchanger is conducted through the heat exchanger of the heating circuit.

[0031] The invention is described in detail in the following with reference to the attached Figure 1 illustrating an embodiment of the invention, Figure 1 illustrating a configuration of a heat distribution system according to the invention.

[0032] Figure 1 illustrates an arrangement according to the invention, which is based on a conventional heat distribution centre of a district-heating system. Domestic hot water is circulated in a domestic water circuit 15 of a building by means of a hot circuit water pump 24. The heating of the domestic water is implemented in such a manner that the temperature of the domestic water in the domestic water circuit 15 remains continuously at a temperature of at least 55 °C.

[0033] In order to heat the domestic water of the building, district-heating water is conducted from an inlet line 17 of a district-heating DH system via a control valve 12 to a domestic-water heat exchanger 10. In this embodiment, the control valve 12 is a two-part control valve comprising two separate control valves 12.1, 12.2 connected in parallel.

[0034] In the domestic-water heat exchanger 10, heat is transferred from the district-heating water to the domestic water. In this embodiment, the domestic-water heat exchanger 10 is a two-part or so-called two-pass heat exchanger comprising a first portion 10.1 at a higher temperature for producing hot water HW and a second portion 10.2 at a lower temperature for preheating cold water CW. Cold water CW is thus first conducted to the second portion 10.2 of the domestic-water heat exchanger 10. Hot circuit water is conducted to the domestic-water heat exchanger 10 between the first portion 10.1 and the second portion 10.2.

[0035] The hot circuit water HWC and preheated cold water CW are thus conducted for heating to the first portion 10.1 of the domestic-water heat exchanger 10, wherein the domestic water returning from the first portion 10.1 is hot water HW.

[0036] The hot circuit water HWC returning from the domestic water circuit 15 is mainly heated by means of a separate circuit-water heat exchanger 20. The circuit-water heat exchanger 20 is a low-power heat exchanger (e.g. 6 kW) compared to the actual domestic-water heat exchanger 10 (e.g. 200 kW). Hot district-heating water is conducted to the circuit-water heat exchanger 20 from the inlet line 17 of the district-heating DH system of the building via a control valve 22. The circuit-water heat exchanger 20 transfers heat from the district-heating water to the hot circuit water HWC, which is conducted after the circuit-water heat exchanger 20 to the actual domestic-water heat exchanger 10 in a return pipe 54.

[0037] The arrangement includes a temperature sensor 41 for hot circuit water HWC and a temperature sensor 42 for hot water HW. The arrangement also includes control devices which read readings of the temperature sensor 41 for hot circuit water HWC and of the temperature sensor 42 for hot water HW and control the opening degrees of the control valves 22, 12.1 and 12.2 based on the readings and setpoint values. For example, by opening the control valve 22, more hot district-heating water can be conducted to the circuit-water heat exchanger 20, whereby more heat is transferred to the hot circuit water HWC.

[0038] In the arrangement shown in Figure 1, the temperatures of the circuit water and heating circuits 30, 40 are measured continuously by means of temperature sensors 41, 42, 43, 44, 45, 46, 47, and the power consumption is measured continuously by means of energy meters 61, 62, 63. This makes it possible to monitor the temperatures of the circuit piping system for circulating domestic hot water and the power consumption of operating the circuit.

[0039] The circuit-water heat exchanger 20 is configured to heat domestic water to a higher setpoint temperature than the actual domestic-water heat exchanger 10. In this embodiment, the setpoint temperature of the low-power circuit-water heat exchanger 20 is 60 °C and the setpoint temperature of the oversized domestic-water heat exchanger 10 is 58 °C. In other words, the reading of the temperature sensor 41 for hot circuit water HWC is ideally kept at 60 °C and the reading of the temperature sensor 42 for hot water HW is ideally kept at 58 °C. The control valves 12.1, 12.2 of the domestic-water heat exchanger 10 thus do not open when a domestic-water tap is opened slightly. In this embodiment, the rated inlet temperature of district-heating water for the circuit-water heat exchanger 20 is also 65 °C, which is lower than the rated inlet temperature of district-heating water for the domestic-water heat exchanger 10, which is 70 °C in this embodiment.

[0040] The arrangement illustrated in Figure 1 further includes two heating circuits 30, 40. These can be intended to heat, for example, a floor-heating network and a ventilation. In the heating circuit 30, water is circulated by a pump 35 and heat is transferred from district-heating water to the heating circuit 30 by means of a heat exchanger 31 of the heating circuit, the district-heating water being conducted into the heat exchanger 31 from the inlet line 17 of the district-heating DH system of the building via a control valve 33. Analogously, in the heating circuit 40, water is circulated by a pump 36 and heat is transferred from district-heating water to the heating circuit 40 by means of a heat exchanger 32 of the heating circuit, the district-heating water being conducted into the heat exchanger 32 from the inlet line 17 of the district-heating DH system of the building via a control valve 34.

[0041] In the arrangement, a return pipe 51 for returning the district-heating water of the circuit-water heat exchanger 20 is connected to a district-heating water pipe

52 that leads to the heat exchanger 31 of the heating circuit 30. Analogously, a return pipe 51 for returning the district-heating water from the circuit-water heat exchanger 20 is also connected to a district-heating water pipe 53 that leads to the heat exchanger 32 of the heating circuit 40. In this embodiment, a so-called intermediate feed connection is not used, but rather the district-heating water returning from the heat exchangers 31, 32 of the heating circuits 30, 40 is conducted to a return line 18 of the district-heating DH system of the building. In other words, a return pipe 55 for returning district-heating water of the heat exchanger 31 of the heating circuit 30 is connected directly to the return line 18 of the district-heating DH system of the building. Analogously, a return pipe 56 for returning district-heating water of the heat exchanger 32 of the heating circuit 40 is connected directly to the return line 18 of the district-heating DH system of the building. When the district-heating water leaving the circuit-water heat exchanger 20 is conducted via the heat exchangers 31, 32 of the heating circuits 30, 40, the district-heating water is cooled very efficiently in the heat distribution centre of the building. The district-heating water returning from the heat exchangers 31, 32 of the heating circuits 30, 40 is thus too cold to be used for preheating cold water CW.

[0042] In summertime, when there is no demand for heating, but still a demand for domestic hot water, the control valve 33 of the heat exchanger 31 of the heating circuit 30 and the control valve 34 of the heat exchanger 32 of the heating circuit 40 are kept closed, while the water of the heating circuits 30, 40 is circulated by means of the pumps 35, 36. The district-heating water returning from the circuit-water heat exchanger 20 can thus be cooled to a very low temperature when the district-heating water is circulated via the heat exchangers 31, 32 of the heating circuits 30, 40 instead of using a so-called intermediate feed connection.

[0043] An intermediate feed connection of the domestic-water heat exchanger is used when the return temperature of the district-heating system in a heating dimensioning situation can be utilized in the domestic-water exchanger to improve cooling. According to Finnish regulations, an intermediate feed connection can be used in the following cases:

- the power of the domestic-water exchanger is at least 120 kW and the temperature of the district-heating water returning from a heating or ventilation exchanger is over 45 °C.
- the power of the domestic-water exchanger is at least 300 kW and the temperature of the district-heating water returning from a heating or ventilation exchanger is 40 ... 45 °C.

Claims

1. An arrangement for heat exchangers of a district-heating system of a building, wherein the arrangement includes
 - a domestic-water heat exchanger (10), through which district-heating water is conducted and which is configured to deliver heat to domestic water, and which is dimensioned for a selected rated inlet temperature of the district-heating water,
 - a control valve (12) of the domestic-water heat exchanger (10) for controlling the flow rate of the district-heating water to the domestic-water heat exchanger (10),
 - a domestic water circuit (15), wherein hot water (HW) entering the circuit (15) is heated by means of the domestic-water heat exchanger (10) and hot circuit water (HWC) returning from the circuit (15) is conducted to the domestic-water heat exchanger (10),
 - a separate circuit-water heat exchanger (20), through which district-heating water is conducted and which is configured to deliver heat to heat the hot circuit water (HWC), and which is dimensioned for a selected rated inlet temperature of the district-heating water,
 - a control valve (22) of the circuit-water heat exchanger (20) for controlling the flow rate of district-heating water conducted to the circuit-water heat exchanger (20),
 - a temperature sensor (41) for hot circuit water (HWC) and a temperature sensor (42) for hot water (HW),
 - control devices for controlling the flow rate of district-heating water in a selected part of the arrangement according to a pre-set program, which control devices are configured at least to control an opening degree of the control valve (12) of the domestic-water heat exchanger (10) and an opening degree of the control valve (22) of the circuit-water heat exchanger (20) on the basis of readings of the temperature sensor (41) for hot circuit water (HWC) and of the temperature sensor (42) for hot water (HW),

characterized in that

 - the circuit-water heat exchanger (20) is of lower power than the domestic-water heat exchanger (10),
 - the control devices are configured to heat the domestic water in the circuit-water heat exchanger (20) to a setpoint temperature 1 - 5 °C, advantageously 2 - 4 °C, higher than the domestic-water heat exchanger (10) preventing the control valve (12) of the domestic-water heat exchanger (10) to open when domestic water is not being used, and
 - the geometric parameters of the heat exchanger (20) are so configured that the rated inlet temperature of district-heating water for the circuit-water heat exchanger (20) is 2 - 10 °C, advantageously 4 - 6 °C, lower than the rated inlet temperature of district-heating water for the domestic-water heat exchanger (10).
2. The arrangement according to claim 1, **characterized in that** the circuit-water heat exchanger (20) is configured to produce domestic hot water with a set-point temperature of 60-63 °C, advantageously 60 °C, and the domestic-water heat exchanger (10) is configured to produce domestic hot water with a set-point temperature of 55-59 °C, advantageously 58 °C.
3. The arrangement according to claim 1 or 2, **characterized in that** the domestic-water heat exchanger (10) is
 - either a two-pass domestic-water heat exchanger, comprising a first portion (10.1) at a higher temperature for producing hot water (HW) and a second portion (10.2) at a lower temperature for preheating cold water (CW), wherein the hot circuit water (HWC) is conducted between the first portion (10.1) and the second portion (10.2),
 - or an analogously arranged whole formed by two single-inlet heat exchangers and interconnecting piping systems.
4. The arrangement according to any of claims 1-3, **characterized in that** a domestic-water return pipe (54) of the circuit-water heat exchanger (20) is connected to the domestic-water heat exchanger (10) for conducting heated circuit water to the domestic-water heat exchanger (10).
5. The arrangement according to any of claims 1-4, **characterized in that** the arrangement includes at least one heating circuit (30) and a heat exchanger (31) of the heating circuit (30), and a return pipe (51) for returning district-heating water that heats the circuit-water heat exchanger (20) is connected to a district-heating water pipe (52) that leads to the heat exchanger (31) of the heating circuit (30).
6. The arrangement according to claim 5, **characterized in that** a return pipe (55) for returning district-heating water of the heat exchanger (31) of the heating circuit (30) is connected directly to a return line (18) of the district-heating (DH) system of the building in such a manner that the district-heating water returning from the heat exchanger (31) of the heating circuit (30) no longer passes through the domestic-water heat exchanger (10).

7. The arrangement according to any of claims 1-6, **characterized in that** the control valve (12) of the domestic-water heat exchanger (10) is a two-part control valve comprising two separate control valves (12.1, 12.2) connected in parallel. 5
8. The arrangement according to any of claims 1-7, **characterized in that** the circuit-water heat exchanger (20) has a nominal power of 2-20 kW, advantageously 5-15 kW, and the domestic-water heat exchanger (10) has a nominal power of 65-600 kW, advantageously 150-400 kW. 10
9. A method for heat exchangers of a district-heating system of a building, in which method 15
- heat is transferred from district-heating water to domestic water by means of a domestic-water heat exchanger (10) dimensioned for a selected rated inlet temperature of district-heating water, 20
 - a flow rate of district-heating water flowing to the domestic-water heat exchanger (10) is set by controlling an opening degree of a control valve (12) of the domestic-water heat exchanger (10), 25
 - domestic water is circulated in a domestic water circuit (15), in which outgoing hot water (HW) is heated by the domestic-water heat exchanger (10) and hot circuit water (HWC) returning from the domestic water circuit (15) is conducted to the domestic-water heat exchanger (10), 30
 - heat is additionally transferred from district-heating water to the hot circuit water (HWC) by means of a separate circuit-water heat exchanger (20) dimensioned for a selected rated inlet temperature of district-heating water, 35
 - the flow rate of the district-heating water flowing to the circuit-water heat exchanger (20) is set by controlling an opening degree of a control valve (22) of the circuit-water heat exchanger (20), 40
 - temperature of hot circuit water (HWC) is measured with a temperature sensor (41) and temperature of hot water (HW) is measured with a temperature sensor (42), 45
 - the flow rate of the district-heating water is controlled in a selected method step by means of control devices according to a preset criterion, which control devices at least control an opening degree of the control valve (12) of the domestic-water heat exchanger (10) and of the control valve (22) of the circuit-water heat exchanger (20) based on readings of the temperature sensor (41) for hot circuit water (HWC) and of the temperature sensor (42) for hot water (HW), 50
- characterized in that**
- the circuit-water heat exchanger (20) is of lower power than the domestic-water heat exchanger 55

- (10),
- the control devices are set to heat the domestic water in the circuit-water heat exchanger (20) to a setpoint temperature 1 - 5 °C, advantageously 2 - 4 °C, higher than the domestic-water heat exchanger (10) preventing the control valve (12) of the domestic-water heat exchanger (10) to open when domestic water is not being used, and
 - the circuit-water heat exchanger (20) is dimensioned for a rated inlet temperature of district-heating water that is 2 - 10 °C, advantageously 4 - 6 °C, lower than the domestic-water heat exchanger (10).

10. The method according to claim 9, **characterized in that** a setpoint temperature of the circuit-water heat exchanger (20) is set to 60-63 °C, advantageously 60 °C, and a setpoint temperature of the domestic-water heat exchanger (10) is set to 55-59 °C, advantageously 58 °C.
11. The method according to claim 9 or 10, **characterized in that** the district-heating water is conducted to the domestic-water heat exchanger (10) via a two-part control valve (12) comprising two separate control valves (12.1, 12.2) connected in parallel.
12. The method according to any of claims 9-11, **characterized in that** the district-heating water that has passed through the circuit-water heat exchanger (20) is conducted into a district-heating water pipe (52) that leads to a heat exchanger (31) of a heating circuit (30).
13. The method according to claim 12, **characterized in that** the district-heating water returning from the heat exchanger (31) of the heating circuit (30) is conducted directly to a return line (18) of the district-heating (DH) system of the building.
14. The method according to any of claims 9-13, **characterized in that** water is continuously circulated in the heating circuit (30) even when there is no demand for heating.

Patentansprüche

1. Anordnung für Wärmetauscher eines Fernwärmesystems eines Gebäudes, wobei die Anordnung Folgendes einschließt
- einen Haushaltswasser-Wärmetauscher (10), durch den Fernwärmewasser geleitet wird und der so konfiguriert ist, dass er Wärme an das Haushaltswasser abgibt, und der für eine ausgewählte Nenneingangstemperatur des Fern-

wärmewassers dimensioniert ist,

- einen Steuerventil (12) des Haushaltswasser-Wärmetauschers (10) zur Steuerung des Durchflusses des Fernwärmewassers zum Haushaltswasser-Wärmetauscher (10),
 - einen Haushaltswasser-Kreislauf (15), wobei in den Kreislauf (15) eintretendes Warmwasser (HW) mittels des Haushaltswasser-Wärmetauschers (10) erwärmt wird und aus dem Kreislauf (15) zurückkehrendes heißes Kreislaufwasser (HWC) zum Haushaltswasser-Wärmetauscher (10) geleitet wird,
 - einen separaten Wärmetauscher (20), durch den Fernwärmewasser geleitet wird und der so konfiguriert ist, dass er Wärme zur Erwärmung des heißen Kreislaufwassers (HWC) abgibt, und der für eine ausgewählte Nenneingangstemperatur des Fernwärmewassers dimensioniert ist,
 - einen Steuerventil (22) zur Steuerung des Durchflusses des dem Kreislaufwasser-Wärmetauscher (20) zugeführten Fernwärmewassers,
 - einen Temperatursensor (41) für das heiße Kreislaufwasser (HWC) und einen Temperatursensor (42) für das Warmwasser (HW),
 - Steuervorrichtungen zum Steuern des Durchflusses von Fernwärmewasser in einem ausgewählten Teil der Anordnung gemäß einem voreingestellten Programm, wobei die Steuervorrichtungen mindestens so konfiguriert sind, dass sie einen Öffnungsgrad des Steuerventils (12) des Haushaltswasser-Wärmetauschers (10) und einen Öffnungsgrad des Steuerventils (22) des Kreislaufwasser-Wärmetauschers (20) auf der Grundlage von Ablesungen des Temperatursensors (41) für heißes Kreislaufwasser (HWC) und des Temperatursensors (42) für Warmwasser (HW) steuern,
- dadurch gekennzeichnet, dass**
- der Kreislaufwasser-Wärmetauscher (20) eine geringere Leistung hat als der Haushaltswasser-Wärmetauscher (10),
 - die Steuervorrichtungen so konfiguriert sind, dass sie das Haushaltswasser im Kreislaufwasser-Wärmetauscher (20) auf eine um 1-5 °C, vorteilhafterweise 2-4 °C, höhere Solltemperatur als der Haushaltswasser-Wärmetauscher (10) erwärmen, wodurch verhindert wird, dass das Steuerventil (12) des Haushaltswasser-Wärmetauschers (10) geöffnet wird, wenn das Haushaltswasser nicht verwendet wird, und
 - die geometrischen Parameter des Wärmetauschers (20) so ausgelegt sind, dass die Nenneingangstemperatur des Fernwärmewassers für den Kreislaufwasser-Wärmetauscher (20) 2-10 °C, vorteilhafterweise 4-6 °C, niedriger ist als die Nenneingangstemperatur des Fernwärmewassers für den Haushaltswasser-Wärme-

tauscher (10).

2. Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Kreislaufwasser-Wärmetauscher (20) zur Erzeugung von Haushaltswasser mit einer Solltemperatur von 60-63 °C, vorteilhafterweise 60 °C, und der Haushaltswasser-Wärmetauscher (10) zur Erzeugung von Haushaltswasser mit einer Solltemperatur von 55-59 °C, vorteilhafterweise 58 °C, ausgelegt ist.
3. Anordnung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Haushaltswasser-Wärmetauscher (10)
 - entweder einen Haushaltswasser-Wärmetauscher mit zwei Durchgängen ist, umfassend einen ersten Abschnitt (10.1) mit einer höheren Temperatur zur Erzeugung von Warmwasser (HW) und einen zweiten Abschnitt (10.2) mit einer niedrigeren Temperatur zur Vorwärmung von Kaltwasser (CW), wobei das heiße Kreislaufwasser (HWC) zwischen dem ersten Abschnitt (10.1) und dem zweiten Abschnitt (10.2) geleitet wird,
 - oder ein analog angeordnetes Ganzes ist, das aus zwei Wärmetauschern mit einem Eingang und verbindenden Rohrsystemen besteht.
4. Anordnung nach einem der Ansprüche 1-3, **dadurch gekennzeichnet, dass** eine Haushaltswasser-Rücklaufleitung (54) des Kreislaufwasser-Wärmetauschers (20) mit dem Haushaltswasser-Wärmetauscher (10) verbunden ist, um erwärmtes Kreislaufwasser zum Haushaltswasser-Wärmetauscher (10) zu führen.
5. Anordnung nach einem der Ansprüche 1-4, **dadurch gekennzeichnet, dass** die Anordnung mindestens einen Wärmekreislauf (30) und einen Wärmetauscher (31) des Wärmekreislaufs (30) einschließt und eine Rücklaufleitung (51) für die Rückführung von Fernwärmewasser, das den Kreislaufwasser-Wärmetauscher (20) erwärmt, mit einer Fernwärmewasserleitung (52) verbunden ist, die zum Wärmetauscher (31) des Wärmekreislaufs (30) führt.
6. Anordnung nach Anspruch 5, **dadurch gekennzeichnet, dass** eine Rücklaufleitung (55) zur Rückführung von Fernwärmewasser des Wärmetauschers (31) des Wärmekreislaufs (30) direkt an eine Rücklaufleitung (18) des Fernwärmesystems (DH) des Gebäudes angeschlossen ist, sodass das aus dem Wärmetauscher (31) des Wärmekreislaufs (30) zurückfließende Fernwärmewasser nicht mehr durch den Haushaltswasser-Wärmetauscher (10) läuft.

7. Anordnung nach einem der Ansprüche 1-6, **dadurch gekennzeichnet, dass** das Steuerventil (12) des Haushaltswasser-Wärmetauschers (10) ein zweiteiliges Steuerventil ist, umfassend zwei separate, parallel geschaltete Steuerventile (12.1, 12.2). 5
8. Anordnung nach einem der Ansprüche 1-7, **dadurch gekennzeichnet, dass** der Kreislaufwasser-Wärmetauscher (20) eine Nennleistung von 2-20 kW, vorteilhafterweise 5-15 kW, und der Haushaltswasser-Wärmetauscher (10) eine Nennleistung von 65-600 kW, vorteilhafterweise 150-400 kW, aufweist. 10
9. Verfahren für Wärmetauscher eines Fernwärmesystems eines Gebäudes, bei diesem Verfahren 15
- Wärme vom Fernwärmewasser auf das Haushaltswasser mittels eines Haushaltswasser-Wärmetauschers (10) übertragen wird, der für eine ausgewählte Nenneingangstemperatur des Fernwärmewassers ausgelegt ist, 20
 - eine Durchflussmenge des zum Haushaltswasser-Wärmetauscher (10) fließenden Fernwärmewassers durch Steuerung eines Öffnungsgrades eines Steuerventils (12) des Haushaltswasser-Wärmetauschers (10) eingestellt wird, 25
 - Haushaltswasser in einem Haushaltswasser-Kreislauf (15) zirkuliert, in dem ausgehendes Warmwasser (HW) durch den Haushaltswasser-Wärmetauscher (10) erwärmt wird und aus dem Haushaltswasser-Kreislauf (15) zurückfließendes heißes Kreislaufwasser (HWC) dem Haushaltswasser-Wärmetauscher (10) zugeführt wird, 30
 - Wärme zusätzlich vom Fernwärmewasser auf den heißen Kreislaufwasser (HWC) mittels eines separaten Wärmetauschers (20) übertragen wird, der für eine ausgewählte Nenneingangstemperatur des Fernwärmewassers ausgelegt ist, 35
 - die Durchflussmenge des Fernwärmewassers, das zum Wärmetauscher (20) fließt, durch die Steuerung eines Öffnungsgrades eines Steuerventils (22) des Wärmetauschers (20) eingestellt wird, 40
 - die Temperatur des heißen Kreislaufwassers (HWC) mit einem Temperatursensor (41) und die Temperatur des Warmwassers (HW) mit einem Temperatursensor (42) gemessen wird, 45
 - die Durchflussmenge des Fernwärmewassers in einem ausgewählten Verfahrensschritt mittels Steuervorrichtungen nach einem vorgegebenen Kriterium gesteuert wird, wobei die Steuervorrichtungen mindestens einen Öffnungsgrad des Steuerventils (12) des Haushaltswasser-Wärmetauschers (10) und des Steuerventils (22) des Kreislaufwasser-Wärmetauschers (20) basierend auf Messwerten des Temperatursensors (41) für heißes Kreislaufwasser (HWC) und des Temperatursensors (42) für Warmwasser (HW) steuern, 50
- dadurch gekennzeichnet, dass**
- der Kreislaufwasser-Wärmetauscher (20) eine geringere Leistung hat als der Haushaltswasser-Wärmetauscher (10),
 - die Steuervorrichtungen so eingestellt sind, dass sie das Haushaltswasser im Kreislaufwasser-Wärmetauscher (20) auf eine um 1-5 °C, vorteilhafterweise 2-4 °C, höhere Solltemperatur als der Haushaltswasser-Wärmetauscher (10) erwärmen, verhindern, dass das Steuerventil (12) des Haushaltswasser-Wärmetauschers (10) geöffnet wird, wenn kein Haushaltswasser verwendet wird, und
 - der Kreislaufwasser-Wärmetauscher (20) für eine Nenneingangstemperatur des Fernwärmewassers ausgelegt ist, die 2-10 °C, vorteilhafterweise 4-6 °C, niedriger ist als die des Haushaltswasser-Wärmetauschers (10).
10. Verfahren nach Anspruch 9, **dadurch gekennzeichnet, dass** eine Solltemperatur des Kreislaufwasser-Wärmetauschers (20) auf 60-63 °C, vorteilhaft 60 °C, und eine Solltemperatur des Haushaltswasser-Wärmetauschers (10) auf 55-59 °C, vorteilhaft 58 °C, eingestellt wird. 55
11. Verfahren nach Anspruch 9 oder 10, **dadurch gekennzeichnet, dass** das Fernwärmewasser über ein zweiteiliges Steuerventil (12) zum Haushaltswasser-Wärmetauscher (10) geleitet wird, umfassend zwei separate, parallel geschaltete Steuerventile (12.1, 12.2).
12. Verfahren nach einem der Ansprüche 9-11, **dadurch gekennzeichnet, dass** das Fernwärmewasser, das den Kreislaufwasser-Wärmetauscher (20) durchlaufen hat, in eine Fernwärmewasserleitung (52) geleitet wird, die zu einem Wärmetauscher (31) eines Wärmekreislaufs (30) führt.
13. Verfahren nach Anspruch 12, **dadurch gekennzeichnet, dass** das aus dem Wärmetauscher (31) des Wärmekreislaufs (30) zurückfließende Fernwärmewasser direkt in eine Rücklaufleitung (18) des Fernwärmesystems (DH) des Gebäudes geleitet wird.
14. Verfahren nach einem der Ansprüche 9-13, **dadurch gekennzeichnet, dass** im Wärmekreislauf (30) kontinuierlich Wasser zirkuliert wird, auch wenn kein Wärmebedarf besteht.

Revendications

1. Agencement pour échangeurs de chaleur d'un système de chauffage urbain d'un bâtiment, ledit agencement comprenant

• un échangeur de chaleur pour l'eau domestique (10), par lequel l'eau de chauffage urbain est conduite et qui est configuré pour produire de la chaleur pour l'eau domestique, et qui est dimensionné pour une température d'entrée maximale sélectionnée de l'eau de chauffage urbain,

• une vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) pour réguler le débit de l'eau de chauffage urbain vers l'échangeur de chaleur pour l'eau domestique (10),

• un circuit d'eau domestique (15), dans lequel l'eau chaude (HW) qui entre dans le circuit (15) est chauffée au moyen de l'échangeur de chaleur pour l'eau domestique (10) et l'eau chaude du circuit (HWC) revenant du circuit (15) est conduite vers l'échangeur de chaleur pour l'eau domestique (10),

• un échangeur de chaleur distinct pour l'eau du circuit (20), par lequel l'eau de chauffage urbain est conduite et qui est configuré pour produire de la chaleur pour chauffer l'eau chaude du circuit (HWC), et qui est dimensionné pour une température d'entrée maximale sélectionnée de l'eau de chauffage urbain,

• une vanne de régulation (22) de l'échangeur de chaleur pour l'eau du circuit (20) permettant de réguler le débit de l'eau de chauffage urbain conduite vers l'échangeur de chaleur pour l'eau du circuit (20),

• un capteur de température (41) pour l'eau chaude du circuit (HWC) et un capteur de température (42) pour l'eau chaude (HW),

• des dispositifs de commande pour contrôler le débit de l'eau de chauffage urbain dans une partie sélectionnée de l'agencement conformément à un programme prédéfini, lesdits dispositifs de commande étant configurés au moins pour contrôler le degré d'ouverture de la vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) et le degré d'ouverture de la vanne de régulation (22) de l'échangeur de chaleur de l'eau du circuit (20) en fonction des lectures du capteur de température (41) pour l'eau chaude du circuit (HWC) et du capteur de température (42) de l'eau chaude (HW),

caractérisé en ce que

• l'échangeur de chaleur pour l'eau du circuit (20) présente une puissance plus faible que l'échangeur de chaleur pour l'eau domestique (10),

• les dispositifs de commande sont configurés pour chauffer l'eau domestique dans l'échangeur de chaleur pour l'eau du circuit (20) jusqu'à une température de référence supérieure de 1 °C à 5 °C, avantageusement de 2 °C à 4 °C, à celle de l'échangeur de chaleur pour l'eau domestique (10), ce qui empêche la vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) de s'ouvrir lorsque l'eau domestique n'est pas utilisée, et

• les paramètres géométriques de l'échangeur de chaleur (20) sont configurés de façon à ce que la température d'entrée maximale de l'eau de chauffage urbain pour l'échangeur de chaleur pour l'eau du circuit (20) est inférieure de 2 °C à 10 °C, avantageusement de 4 °C à 6 °C, à celle de la température d'entrée maximale de l'eau de chauffage urbain pour l'échangeur de chaleur pour l'eau domestique (10).

2. Agencement conformément à la revendication 1, **caractérisé en ce que** l'échangeur de chaleur de l'eau du circuit (20) est configuré pour produire de l'eau chaude domestique à une température de référence comprise entre 60 °C et 63 °C, avantageusement de 60 °C, et l'échangeur de chaleur pour l'eau domestique (10) est configuré pour produire de l'eau chaude domestique à une température de référence comprise entre 55 °C et 59 °C, avantageusement à 58 °C.
3. Agencement conformément à la revendication 1 ou 2, **caractérisé en ce que** l'échangeur de chaleur pour l'eau domestique (10) est
- soit un échangeur de chaleur pour l'eau domestique à deux passes, comprenant une première partie (10.1) à une température plus élevée pour produire de l'eau chaude (HW) et une deuxième partie (10.2) à une température moins élevée pour préchauffer l'eau froide (CW), dans lequel l'eau chaude du circuit (HWC) est conduite entre la première partie (10.1) et la deuxième partie (10.2),
 - ou un ensemble agencé de façon analogue formé par deux échangeurs de chaleur à une seule entrée et des systèmes de canalisations interconnectés.
4. Agencement conformément à l'une quelconque des revendications 1 à 3, **caractérisé en ce qu'un** tuyau de retour pour l'eau domestique (54) de l'échangeur de chaleur pour l'eau du circuit (20) est raccordé à l'échangeur de chaleur pour l'eau domestique (10) afin de conduire l'eau du circuit chauffée vers l'échangeur de chaleur de l'eau domestique (10).
5. Agencement conformément à l'une quelconque des revendications 1 à 4, **caractérisé en ce que** l'agen-

- cement comprend au moins un circuit de chauffage (30) et un échangeur de chaleur (31) du circuit de chauffage (30), et **en ce qu'un** tuyau de retour (51) pour renvoyer l'eau de chauffage urbain qui chauffe l'échangeur de chaleur pour l'eau du circuit (20) est raccordé à un tuyau de chauffage urbain (52) qui mène à l'échangeur de chaleur (31) du circuit de chauffage (30). 5
6. Agencement conformément à la revendication 5, **caractérisé en ce qu'un** tuyau de retour (55) pour renvoyer l'eau de chauffage urbain de l'échangeur de chaleur (31) du circuit de chauffage (30) est raccordé directement à une conduite de retour (18) du système de chauffage urbain (DH) du bâtiment de manière à ce que l'eau de chauffage urbain qui revient de l'échangeur de chaleur (31) du circuit de chauffage (30) ne passe plus par l'échangeur de chaleur pour l'eau domestique (10). 10
7. Agencement conformément à l'une quelconque des revendications 1 à 6, **caractérisé en ce que** la vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) est une vanne de régulation en deux parties composée de deux vannes de régulation distinctes (12.1, 12.2) raccordées en parallèle. 15
8. Agencement conformément à l'une quelconque des revendications 1 à 7, **caractérisé en ce que** l'échangeur de chaleur pour l'eau du circuit (20) présente une puissance nominale comprise entre 2 kW et 20 kW, avantageusement entre 5 kW et 15 kW, et l'échangeur de chaleur pour l'eau domestique (10) présente une puissance nominale comprise entre 65 kW et 600 kW, avantageusement entre 150 kW et 400 kW. 20
9. Procédé pour échangeurs de chaleur d'un système de chauffage urbain d'un bâtiment, dans lequel 25
- la chaleur est transférée de l'eau de chauffage urbain à l'eau de chauffage domestique au moyen d'un échangeur de chaleur pour l'eau domestique (10) dimensionné pour une température d'entrée maximale sélectionnée de l'eau de chauffage urbain, 30
 - le débit de l'eau de chauffage urbain vers l'échangeur de chaleur pour l'eau domestique (10) est régulé en contrôlant le degré d'ouverture d'une vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10), 35
 - l'eau domestique circule dans un circuit d'eau domestique (15), dans lequel l'eau chaude sortante (HW) est chauffée par l'échangeur de chaleur de l'eau domestique (10) et l'eau chaude du circuit (HWC) revenant du circuit d'eau domestique (15) est conduite jusqu'à l'échangeur de chaleur pour l'eau domestique (10), 40
10. Procédé conformément à la revendication 9, **caractérisé en ce que** la température de référence de l'échangeur de chaleur de l'eau du circuit (20) est définie sur 60 °C à 63 °C, avantageusement sur 60 °C, et **en ce que** la température de référence de l'échangeur de chaleur pour l'eau domestique (10) est définie sur 55 °C à 59 °C, avantageusement sur 58 °C. 45
- la chaleur est en plus transférée de l'eau de chauffage urbain à l'eau chaude du circuit (HWC) au moyen d'un échangeur de chaleur distinct pour l'eau du circuit (20) dimensionné pour une température d'entrée maximale sélectionnée de l'eau de chauffage urbain, 50
 - le débit de l'eau de chauffage urbain vers l'échangeur de chaleur pour l'eau de circuit (20) est régulé en contrôlant le degré d'ouverture d'une vanne de régulation (22) de l'échangeur de chaleur pour l'eau de circuit (20), 55
 - la température de l'eau chaude du circuit (HWC) est mesurée par un capteur de température (41), et la température de l'eau chaude (HW) est mesurée par un capteur de température (42),
 - le débit de l'eau de chauffage urbain est régulé dans une étape de méthode sélectionnée au moyen de dispositifs de commande conformément à un critère prédéfini, lesdits dispositifs de commande contrôlent au moins le degré d'ouverture de la vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) et de la vanne de régulation (22) de l'échangeur de chaleur de l'eau du circuit (20) en fonction des lectures du capteur de température (41) pour l'eau chaude du circuit (HWC) et du capteur de température (42) de l'eau chaude (HW),
- caractérisé en ce que**
- l'échangeur de chaleur pour l'eau du circuit (20) présente une puissance plus faible que l'échangeur de chaleur pour l'eau domestique (10),
 - les dispositifs de commande sont prévus pour chauffer l'eau domestique dans l'échangeur de chaleur pour l'eau du circuit (20) jusqu'à une température de référence supérieure de 1 °C à 5 °C, avantageusement de 2 °C à 4 °C, à celle de l'échangeur de chaleur pour l'eau domestique (10), ce qui empêche la vanne de régulation (12) de l'échangeur de chaleur pour l'eau domestique (10) de s'ouvrir lorsque l'eau domestique n'est pas utilisée, et
 - l'échangeur de chaleur de l'eau de circuit (20) est dimensionné pour une température d'entrée maximale sélectionnée de l'eau de chauffage urbain inférieure de 2 °C à 10 °C, avantageusement de 4 °C à 6 °C, à celle de l'échangeur de chaleur pour l'eau domestique (10).

11. Procédé conformément à la revendication 9 ou 10, **caractérisé en ce que** l'eau de chauffage urbain est conduite vers l'échangeur de chaleur pour l'eau domestique (10) via une vanne de régulation en deux parties (12) composée de deux vannes de régulation distinctes (12.1, 12.2) raccordées en parallèle. 5
12. Procédé conformément à l'une quelconque des revendications 9 à 11, **caractérisé en ce que** l'eau de chauffage urbain qui a traversé l'échangeur de chaleur de l'eau du circuit (20) est conduite dans un tuyau d'eau pour le chauffage urbain (52) qui mène à un échangeur de chaleur (31) d'un circuit de chauffage (30). 10 15
13. Procédé conformément à la revendication 12, **caractérisé en ce que** l'eau de chauffage urbain revenant de l'échangeur de chaleur (31) du circuit de chauffage (30) est menée directement dans une conduite de retour (18) du système de chauffage urbain (DH) du bâtiment. 20
14. Procédé conformément à l'une quelconque des revendications 9 à 13, **caractérisé en ce que** l'eau circule en continu dans le circuit de chauffage (30) même lorsqu'il n'y a pas de demande de chauffage. 25

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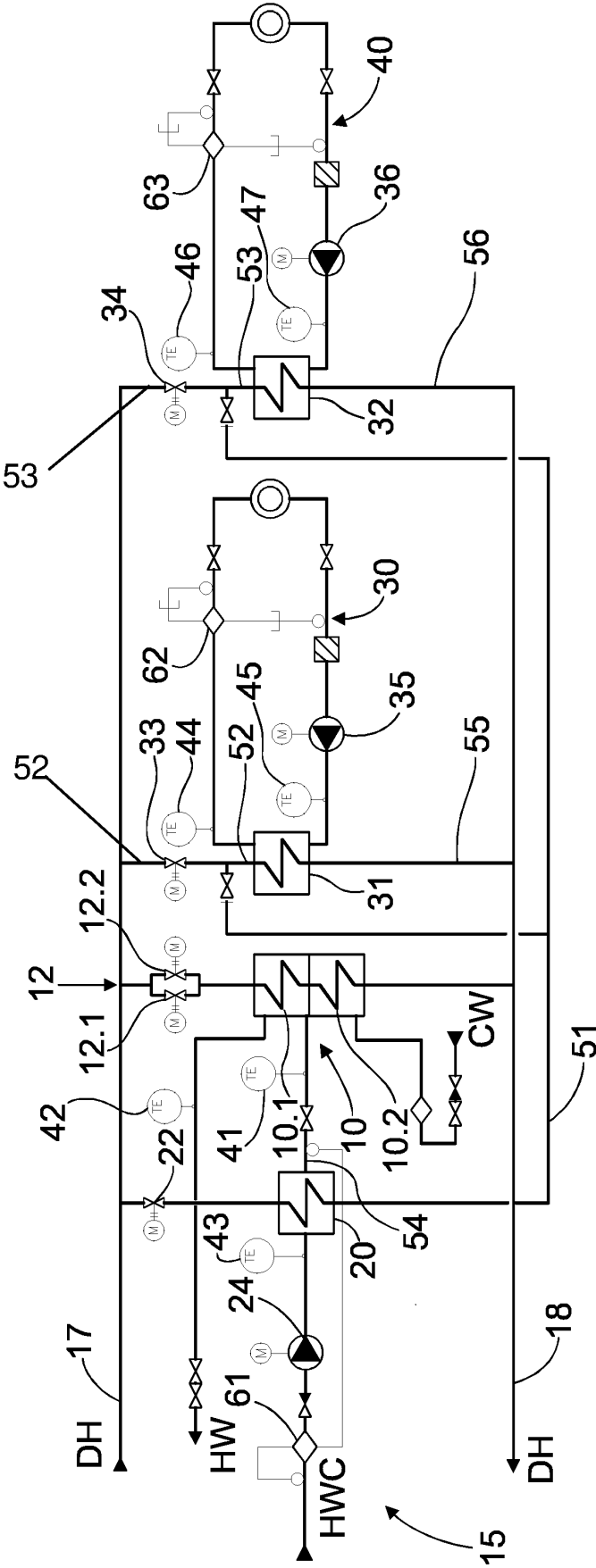


Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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