

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 159 567 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

25.02.2004 Bulletin 2004/09

(21) Application number: **99958591.2**

(22) Date of filing: **11.11.1999**

(51) Int Cl.7: **F24D 3/08**, F24D 3/18

(86) International application number:
PCT/SE1999/002045

(87) International publication number:
WO 2000/032992 (08.06.2000 Gazette 2000/23)

(54) **HEATING PLANT**

HEIZANLAGE

CHAUFFERIE

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

(30) Priority: **16.11.1998 SE 9803892**

(43) Date of publication of application:
05.12.2001 Bulletin 2001/49

(73) Proprietor: **Första Närvärmeverket AB
161 11 Bromma (SE)**

(72) Inventor: **GÖRANSSON, Hans-Göran
S-821 94 Bollnäs (SE)**

(74) Representative: **Olsson, Jan et al
Bjerkéns Patentbyrå KB
P.O.Box 1274
801 37 Gävle (SE)**

(56) References cited:
**CH-A5- 623 915 DE-A1- 2 637 209
FR-A1- 2 557 274**

EP 1 159 567 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

FIELD OF THE INVENTION AND PRIOR ART

[0001] The present invention relates to a heating plant for transferring heat from a first medium to a second medium, for example hot tap-water, and to a third medium, for example the surrounding air, said plant comprising at least one first heat generating arrangement and one second heat generating arrangement at a first circuit containing the first medium, at least two heat transferring devices arranged in series at a second circuit containing the second medium, and at least one heat emitting device for emitting heat to the third medium, wherein a feeding conduit connects the outlet of the first heat generating arrangement with the inlet of the heat emitting device and a return conduit connects the outlet of the heat emitting device with the inlet of the second heat generating arrangement and the outlet of the second heat generating arrangement with the inlet of the first heat generating arrangement, and a first connection conduit, from a first point located between the outlet of the second heat generating arrangement and the inlet of the first heat generating arrangement to a second point located at the feeding conduit, connects the return conduit and the feeding conduit.

[0002] Furthermore, the invention relates to a method for heat transferring according to the preamble of claim 46.

[0003] In the following, with the purpose of illuminating the invention, but not in any way restricting the invention, it will be described a plant including a heating boiler, a heating pump, heat exchangers and radiators, said plant being intended for use in heating of buildings and the tap hot-water associated therewith.

[0004] The largest disadvantage of the heating systems of today for houses comprising the use of a heating pump is the poor utilisation of the heating pump. The integration of the heating pump in a conventional heating system leads among other things to that the heating pump has to work at unfavourable temperatures and flows. Undesired rises of temperature and variations in flow in the system at the side of condensation of the heating pump leads to a low efficiency of the heating pump and therefor also to higher energy costs. Furthermore, these heating systems are designed in such a way that they do not enable that the heating pump primarily is utilised for covering the present need of heating, i. e. they are not able to first totally use energy supplied by the heating pump for heating and then, only if necessary because the need of heat is larger than the capacity of the heating pump, supply energy by another heating source, for example by a heating boiler.

[0005] The Swedish patent number 436 518 describes a heating plant with a heating boiler and a heating pump, which plant in some extent corresponds to the preamble of the claim 1 in the present application. This document has the purpose to provide a heating

plant that ensures a better utilisation and longer life for the heating pump in combination with lower costs. This is achieved in the first place by a special controlling of the heating pump and of the heating boiler based upon the return conduit temperature and the outdoor temperature. However, the plant according to 436 518 has large deficiencies by being totally without means to simultaneously provide for heating of the tap hot-water required. Thus, the document indeed describes a way to use a heating pump more efficient but without considering the difficulty to do the same during simultaneously heating of the tap hot-water required in houses and other buildings. It is just the demand for heating of the tap hot-water to sufficient high temperatures, among other things for avoiding increase of bacteria of the legionaries disease, which makes it difficult to use the heating pump in an optimum way and thereby in a cost efficient way.

[0006] In the Swiss document 623 915 it is described in two different variants of a system that includes a heating boiler, heating pump, radiator, water heater and valves. However, in the both cases transferring of heat to the tap hot-water is performed in a circuit parallel to the radiators in one single step, which leads to an inefficient heating of the tap hot-water and a poor degree of utilisation of the heating pump.

[0007] The German document 2 637 209 relates to a system that includes a heating pump, a gas heating device, water heaters, radiators and control valves. This document shows a system which is intended for both heating of radiators and of water heating. The system uses two control valves for regulating a primary and a secondary circuit. The system, in the same way that the above mentioned Swiss document, has large disadvantages, among other things by that the tap hot-water is heated in one single step and that the system not enable to achieve a heating of the tap hot-water to high temperatures with the gas heater without effecting the operation temperature of the heating pump at the inlet side, which results in that the heating pump may not be used in an optimum way for heating either the tap hot-water or the radiators.

[0008] The applicant is also aware of the French document 2 557 274 that describes a system comprising a heating device, a heating pump, control valves, radiator and water heater. This system enables heating of tap hot-water in two steps, namely a first time in a water heater connected to a heating pump and then by means of a second heating device, which may be a heating boiler, or alternatively with a third electrical heating device. Further, the heating pump may be used for heating of a radiator, which radiator also may be provided for by the said second heating device. However, this system too has important disadvantages. In addition to the very extensive and price increasing laying of conduits of the system it provides small flexibility and requires an advanced control system. By example it may be said that when the total power required is less than the capacity of the heating pump and the largest heat quantity is con-

sumed for tap hot-water, there is not any possibility to step by step heat the tap hot-water without starting up the heating device and there is nor any possibility to use return water from the water heater for heating the radiator.

THE OBJECTS OF THE INVENTION

[0009] The object of the present invention is to provide a heating plant of the type referred to in the introduction, in which the disadvantages of the heating systems already known have been reduced to a large extent, i.e. to provide a heating system in which the heating pump works at such an uniform and such a low temperature as possible at the inlet side (condensation side) and with insignificant variations of flow.

[0010] Another object is that the heating pump is used in largest possible extent as primary source of energy in the heating system for both heating of tap hot-water and radiators, which means that as long as the total need of heat quantity of the system is less than the heat quantity producing capacity of the heating pump the heating pump by itself provides the energy required in form of heat and consequently the heating boiler is in operation only at fairly high load to reduce the energy costs to the largest possible extent.

[0011] A further object is to provide a method which enables that an energy source such as for example a heating pump or a solar heating system, together with proportionately low operation costs, may be used in an optimum way to provide energy for heating of houses for instance and the tap hot-water associated thereto and thus provide a method that enables a minimal use of the more expensive energy source being for example a heating boiler.

SUMMARY OF THE INVENTION

[0012] The objects above are reached by providing a heating plant in which the plant comprises means for enabling a flow of the first medium from the outlet of the first heat generating arrangement to a first heat transferring device and further to the return conduit and/or to the feeding conduit.

[0013] According a preferred embodiment of the invention, in which a second connection conduit, from a third point located between the outlet of the first heat generating arrangement and said second point to the inlet of the said first heat transferring device and further from the outlet of this heat transferring device to a fourth point located at the return conduit, connects the feeding conduit and the return conduit, and in which a parallel conduit, from a fifth point located between the outlet of said first heat transferring device and said fourth point to a sixth point located at the feeding conduit, connects said first heat transferring device and the feeding conduit in parallel, and especially in combination with another embodiment, in which the fourth point is located

between said first point and the inlet of the first heat generating arrangement, and in combination with a further embodiment, in which the sixth point is located between said third point and said second point, the second heat generating arrangement may independently emit the heat quantity required to the first medium as long as the total need of heat quantity of the plant is less than said heat quantity production capacity of the second arrangement and if the heat quantity required would exceed said production capacity the first heat generating arrangement may supply the need of heat quantity required in addition to that, for example by further heating of the second medium through the first medium at the first heat transferring device, while the second heat generating arrangement at its inlet side will receive the first medium at a temperature which is the lowest possible temperature of the first medium present in the plant.

[0014] Another preferred embodiment of the invention, in which at least a second heat transferring device is arranged at the feeding conduit, and especially in combination with another embodiment, in which the said second heat transferring device is arranged between said second point and the inlet of the heat emitting device, results in the possibility to. heat a second medium in at least two steps which for example may be performed by that the second heat generating arrangement is used to supply the second heat transferring device with heat through the first connection conduit while the first heat generating arrangement is used to further heat the second medium at the first heat transferring device.

[0015] Another preferred embodiment of the invention, in which at least a third heat transferring device is arranged at the return conduit, and especially together with another embodiment, in which said third heat transferring device is arranged between the outlet of the heat emitting device and the inlet of the second heat generating arrangement, results in the possibility to heat the second medium by utilising the remaining heat energy in the first medium after that it has passed the heat emitting device and thus further has reduced the temperature of the first medium before it reaches the inlet of the second heat generating arrangement.

[0016] Another preferred embodiment, in which the plant comprises three heat transferring devices arranged in series at said second circuit, namely said first heat transferring device arranged at the second connection conduit of the first circuit, said second heat transferring device arranged at the feeding conduit of the first circuit and said third heat transferring device at the return conduit of the first circuit, results in a very energy efficient heating of the second medium by a first heating at the third heat transferring device, a second heating at the second heat transferring device and a third heating at the first heat transferring device.

[0017] Another preferred embodiment of the invention, in which the second heat generating arrangement includes at least one heating pump, results in a very economic heating plant by the fact that the heating pump to

a large extent may provide the heat energy required to low operation costs.

[0018] In another preferred embodiment of the invention, in which the second heat generating arrangement includes at least one solar heating system, the costs of heating may be further reduced by the fact that heat energy may be obtained and utilised in an effective way to very low operation costs.

[0019] In another preferred embodiment of the invention, in which the plant includes a third connection conduit arranged from a seventh point located between said second point and the inlet of the heat emitting device to a eighth point located between the outlet of the heat emitting device and the inlet of the second heat generating arrangement, and especially in combination with another embodiment, in which the plant includes a fourth connection conduit arranged from a ninth point located between said second point and the inlet of the heat emitting device to a tenth point located between the outlet of the heat emitting device and the inlet of the second heat generating arrangement, at least one part of the first medium may be led from the feeding conduit to the return conduit without passing the heat emitting device and if desired a part of the first medium may be circulated in a secondary circuit including the heat emitting device/devices.

[0020] Another preferred embodiment of the invention, in which at least one valve is arranged at said second point, results in a very efficient way to regulate the flow of the first medium from both the second heat generating arrangement and from the first heat generating arrangement into an intermediate circuit including the second heat transferring device and/or further to the secondary circuit including the heat emitting device/devices.

[0021] Another preferred embodiment of the invention, in which at least one valve is arranged at said fifth point, results in an efficient way to regulate the flow of the part of the first medium inflowing from the feeding conduit to a primary circuit including the first heat transferring device, from the outlet of the first heat transferring device through the second connection conduit to the return conduit and/or through the parallel conduit back to the feeding conduit.

[0022] In another preferred embodiment of the invention, in which at least one pump is arranged at the second connection conduit, it is possible in an efficient way to pump at least a part of the flow of the first medium through the second connection conduit and/or through the parallel conduit.

[0023] A further preferred embodiment of the invention, in which the plant includes means for bypassing the second heat generating arrangement and especially together with another embodiment, in which at least one pump is arranged at the second heat generating arrangement, and particularly together with a further embodiment, in which the bypassing means comprises a valve, results in the possibility to in an efficient way reg-

ulate the magnitude of the part of the first medium, flowing in the return conduit, that will pass through the second heat generating arrangement.

[0024] The characteristics of the method according to the invention are defined closer in the detailed description and in the accompanying claims.

[0025] Further characteristics and advantages of the invention will be described more in detail in the following.

10 BRIEF DESCRIPTION OF THE DRAWINGS

[0026] In the drawings

Fig 1 is a schematic illustration of the heating plant according to the invention showing a heating boiler, a heating pump, a first heat exchanger at a connection conduit connecting the feeding conduit and the return conduit, a second heat exchanger at the feeding conduit and a third heat exchanger at the return conduit, and radiators, valves, pumps and temperature sensors,

Fig 2 is a schematic illustration of the plant according to the invention in Fig 1 with an alternative embodiment regarding the first heat exchanger and the connection conduit, and

Fig 3 is a schematic illustration of the plant according to the invention in Fig 2 with a further alternative embodiment regarding the first heat exchanger.

[0027] In the drawings the used notations have the meaning as follows:

Vx1 Heat exchanger in primary circuit
Vx2 Heat exchanger at feeding conduit
Vx3 Heat exchanger at return conduit

P1 Primary circuit pump
P2 Pump at the heating pump
P3 Secondary circuit pump
P4 Pump at Vx2
P5 Pump at Vx3

Sv1 Control valve in primary circuit
Sv2 Control valve in intermediate circuit
Sv3 Control valve in the secondary circuit

B1 Non return valve at the connection conduit
B2 Non return valve at the heating pump

G1-G16 Temperature sensors, and in the description as follows the used notations

T1-T16 are the temperature at respective sensor.

KV Cold water

W Hot water

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0028] In Fig. 1 a heating plant according to the invention for heating of a house or other building and of the tap hot-water associated therewith is schematically illustrated. The plant comprises two circuits 11, 12 for two separate mediums, namely a first circuit 11 containing first medium, for example water, and a second circuit 12 containing a second medium, for example tap hot-water.

[0029] At the first circuit 11 a first heat generating arrangement 13, for example a conventional oil and/or wood heating boiler, which also may include means for heating by so called electric cartridge, and a second heat generating arrangement 14, for example a heating pump and/or a solar heating system for utilising of earth heat and/or solar heat, are arranged in series to supply heat to the first medium.

[0030] By means of a feeding conduit 16 the outlet 15 of the heating boiler 13 is connected with the inlet 17 of one or more heat emitting devices 18. These devices are utilised for heating of a third medium, namely the air inside the building, and are in the embodiment example conventional radiators 18 intended for hot water or another medium. The outlet 19 of the heat emitting devices is connected with the inlet 21 of the second heat generating arrangement 14 by means of a return conduit 20 and the outlet 22 of the second heat generating arrangement is connected with the inlet 23 of the first heat generating arrangement by means of the return conduit 20.

[0031] Further, the return conduit 20 and the feeding conduit 16 are connected through a first connection conduit 24 arranged from a first point 1, located between the outlet 22 of the heating pump and the inlet 23 of the heating boiler, to a second point 2 located at the feeding conduit 16.

[0032] With the purpose to transfer heat from the first medium to the second medium heat transferring devices 25 are used, preferably heat exchangers. Two or more heat exchangers are suitably arranged in series at the other circuit 12 for step by step heating of the tap hot-water. In the embodiment example three heat exchangers Vx1, Vx2 and Vx3 are arranged.

[0033] The plant according to the invention has means 26 for enabling a flow of the first medium from the outlet 15 of the heating boiler to a first heat exchanger Vx1 and further to the return conduit 20 and/or to the feeding conduit 16. This is achieved by that a second connection conduit 26, from a third point 3 located between the outlet 15 of the heating boiler and said second point 2 to the inlet 27 of the first heat exchanger Vx1 and further from the outlet 28 of this heat exchanger to a fourth point 4 located at the return conduit 20, connects the feeding conduit 16 and the return conduit 20, and by that a parallel conduit 29, from a fifth point 5 located between the outlet 28 of the heat exchanger and said

fourth point 4 to a sixth point 6 located at the feeding conduit 16, connects the heat exchanger Vx1 and the feeding conduit 16 in parallel. In the embodiment example the fourth point 4 is located between said first point 1 and the inlet 23 of the heating boiler, and the sixth point 6 is located between said third point 3 and said second point 2. The part circuit above from the outlet 15 of the boiler and further via the second connection conduit 26 to the return conduit 20 and to the inlet 23 of the boiler will be called primary circuit 30 in the following.

[0034] At the feeding conduit 16 a second heat exchanger Vx2 is arranged between said second point 2 and the inlet 17 of the radiators 18. A third heat exchanger Vx3 is arranged at the return conduit 20 between the outlet 19 of the radiators 18 and the inlet 21 of the heating pump 14. It is to be noted that the direction of flow for the second medium through the heat exchangers designated first, second and third heat exchanger, is such that the unheated tap hot-water (KV) is led into the third heat exchanger Vx3 and further through the second heat exchanger Vx2 to the first heat exchanger Vx1 and thereafter the heated tap hot-water (W) is led to a place of consumption. Thus, the heating of the tap hot-water is performed step by step to the temperature desired.

[0035] Further the plant includes a third connection conduit 31 arranged from a seventh point 7 located between said second point 2 and the inlet 17 of the radiators 18 to an eighth point 8 located between the outlet 19 of the radiators 18 and the inlet 21 of the heating pump 14 and a fourth connection conduit 32 arranged from a ninth point 9 located between said second point 2 and said seventh point 7 to a tenth point 10 located between said eighth point 8 and the inlet 21 of the heating pump 14. At the first connection conduit 24 and the feeding conduit 16 a control valve Sv2 is arranged at said second point 2 and further a control valve Sv1 is arranged at the second connection conduit 26 at said fifth point 5, and at the third connection conduit 31 and the feeding conduit 16 a control valve Sv3 is arranged at said seventh point 7. A non return valve B1 is arranged at the fourth connection conduit 32 and a non return valve B2 at the return conduit 20 at a position where the return conduit 20 also constitute means 33 for bypassing of the second heat generating arrangement, i.e. a conduit 33 for bypassing of the heating pump 14. The part circuit from the outlet 22 of the heating pump 14 via the first connection conduit 24 and further via the feeding conduit 16 and the fourth connection conduit 32 to the inlet 21 of the heating pump 14 is denoted intermediate circuit 34 below while the part circuit from the outlet 19 of the radiator/radiators 18 via the third connection conduit 31 to the inlet 17 of the radiator/radiators 18 constitutes a secondary circuit 35.

[0036] The heat exchanger Vx2 at the feeding conduit 16 as well as the heat exchanger Vx3 at the return conduit 20 has means 39, 40 for bypassing the respective heat exchanger with the purpose to be able to effect a

desired part flow of the first medium to flow via respective heat exchanger Vx2, Vx3 by means of pumps required. In another simpler embodiment the heat exchanger Vx2 and/or the heat exchanger Vx3 certainly may be connected without bypassing and thus the hole flow of the first medium present at respective inlet of the heat exchangers would always flow via respective heat exchanger.

[0037] Pumps P1, P3 are arranged at the primary and the secondary circuit, and further a pump P2 is arranged at the heating pump and a pump P4 at the second heat exchanger Vx2 and a pump P5 at the third heat exchanger Vx3.

[0038] In Fig 2 and 3 it is illustrated alternative embodiments of the heating plant according to the invention, in which the heat exchanger Vx1 is arranged at the feeding conduit between the outlet 15 of the heating boiler 13 and said second point 2 and the second connection conduit 26b connects the feeding conduit and the return conduit from said third point 3, located between the outlet 28 of the heat exchanger Vx1 and said second point 2, to said fourth point 4, located between said first point 1 and the inlet 23 of the heating boiler 13. Suitably, the primary circuit pump P1 is arranged at the connection conduit 26b. The heat exchanger Vx1 as illustrated in Fig 2 may be possible to be bypassed by means 41 for bypassing and may include a pump P6 or alternatively be arranged directly on the feeding conduit as illustrated in Fig 3.

[0039] In addition to the components above the heating plant according to the invention comprises also a control system (not illustrated) and several sensors. In the following it will be described how the first embodiment of the plant works and is controlled by means of the control system and by temperature sensors G1-G16 placed in the plant in the three different operation modes low load, medium load and high load. In connection with the operation modes some of the sensors are mentioned to broadly describe the function of the plant. However, the sensors not mentioned may also be important parts for receiving input to the control system of the plant.

Low load

[0040] The main need of energy consists of heating of tap hot-water and only as an exception of a smaller amount energy for the need of heat of the building. By that it follows that the capacity of the heating pump 14 in most cases exceeds the present need of power and thus the heating pump is able to independently supply the system with the energy quantity required. The most of the flow is led through the non return valve B1 arranged in the intermediate circuit 34 to the return conduit 20.

[0041] When the outdoor temperature is above circa 15°C the valve Sv3 is closed to stop the inflow of the first medium to the secondary circuit 35 and the pump

P3 of the secondary circuit is stopped. If the temperature of the tap hot-water after the first heat exchanger Vx1 decreases under a given set point the heating pump 14 is started. The control valve Sv2 is completely opened between the primary circuit 30 and the intermediate circuit 34 while the flow through the first connection conduit 24 is throttled. The valve Sv1 is closed against the return conduit 20 and is opened to lead the first medium through the parallel conduit 29 to the feeding conduit 16. When the temperature T1 at G1 is higher than the temperature T16 at G16 the pump P1 is started with the purpose to lead at least a part of the flow via the first heat exchanger Vx1 and further through the parallel conduit 29 back to the feeding conduit 16.

[0042] If the temperature T16 at G16 decreases below a critical value, i.e. if the heating pump 14 is not able to rise the temperature of the tap hot-water to the temperature desired, the heating boiler 13 is started. The valve Sv2 is then closed to prevent flow from the primary circuit 30 to the intermediate circuit 34 and the valve Sv1 is opened against the return conduit 20. The set point at G2 in the primary circuit 30 is approximately 55-60°C. When the temperature T10 alternatively the temperature T4 in the intermediate circuit has reached approximately 55°C by means of the heating pump 14 the heating boiler 13 is stopped.

[0043] When the temperature T10 at G10 is higher than the temperature T11 at G11 the valve Sv2 is completely opened between the primary circuit 30 and the intermediate circuit 34 and the valve Sv1 is effected to guide the flow to the feeding conduit 16. When the supply of tap hot-water is satisfied, i.e. the temperatures T16 and T15 are on level with their set points, the valve Sv2 is closed between the primary circuit 30 and the intermediate circuit 34 and the valve Sv1 is open against the return conduit 20. The heating pump 14 is started when the temperature at T9 has decreased below approximately 35°C and is stopped when the temperature T10, T4 has exceeded 55°C at G10 alternatively at G4. If the outdoor temperature T13 decreases and occasions a need of heating of the building by means of the radiator 18 then the pump P3 is started and the valve Sv3 is effected to let a flow of the first medium in for reaching a temperature at G6 on level with a given set point.

Medium load

[0044] In this operation mode a fairly great need of heating of the building is present and the heating pump 14 is not always able to independently supply the heating plant with the heat energy required. If a need of heating is present the valve Sv2 is controlled so that the temperature T4 in the intermediate circuit 34 is on level with a set point that is circa 5°C higher than the set point of the temperature at G6. Suppose first that the power of the heating pump 14 exceeds the present need of power. In such case the temperature of the intermediate cir-

circuit 34 will increase in relation to the present need of temperature at G6. The heating pump is stopped when the temperature exceeds circa 50°C at G10 alternatively at G4. When the temperature T9 at G9 has decreased below a given set point, which set point is equal to the set point at G6, or alternatively is a function of the same, the heating pump is started. If the set point at G16 is not reached and the heating pump 14 still is able to provide the need of power the operation according to the low load case already described is utilised in the first place.

[0045] If instead the heating pump 14 is not able to independently maintain a temperature in the intermediate circuit 34 at G4 in level with the set point the heating boiler 13 is started. The valve Sv2 is then effected to allow flowing of a part flow from the heating boiler 13 to the intermediate circuit 34 to secure the need of power, at the same time as a flow from the heating pump 14 through the first connection conduit 24 to the intermediate circuit 34 is present. This is performed by that the valve Sv2 is effected to regulate the flow of the first medium so the temperature T4 at G4 is in level with a set point which is a few degrees higher than the set point of the temperature T6 in secondary circuit 35 at G6.

High load

[0046] The operation in high load is almost identical with the operation in medium load in the case when the need of power is higher than the capacity of the heating pump 14. In this case it is ensured that the set point of the temperature at G1 always is circa 5° higher than the set point of the temperature at G6.

[0047] if the power of the boiler 13 is required in its entirety to provide the need of power of the plant the hole flow is led through the valve Sv2 via the heat exchanger Vx2 and then through the valve Sv3 to the secondary circuit 35. In this case the heating pump 14 is totally utilised to increase the temperature at the inlet side 23 of the boiler 13 and the flow from the return conduit 20 through the first connection conduit 24 to the feeding conduit 16 at the valve Sv2 is throttled.

[0048] Obviously the described heating plant according to the invention may be modified in several ways within the scope of the idea of the invention. As an example it may be mentioned that the heating plant may be operated with two heat exchangers only, i.e. without the second heat exchanger alternatively without the third heat exchanger. In another embodiment, with a further valve, for example a control valve of three way type arranged between the heat exchangers Vx1 and Vx2 at the second circuit containing the tap hot-water, and with a conduit from this valve to the consumption and/or back to the tap hot-water conduit at a position located after the heat exchanger Vx1 with respect to the direction of flow, one would receive the tap hot-water directly after the heat exchanger Vx2 in such a case when no further heating is required and thus by that avoid possibly loss of heat otherwise caused when passing of Vx1. In addition,

the heat boiler for instance would be able to be bypassed in the same way as the heating pump, which would mean that the first medium not needs to flow through the boiler, which is not in operation during certain periods, with the purpose to reduce the losses of the plant.

Claims

1. A heating plant for transferring heat from a first medium to a second medium, for example tap hot-water, and to a third medium, for example the surrounding air, said plant comprising at least one first heat generating arrangement (13) and one second heat generating arrangement (14) at a first circuit (11) containing the first medium, at least two heat transferring devices (25) arranged in series at a second circuit (12) containing the second medium, and at least one heat emitting device (18) for emitting heat to the third medium, wherein a feeding conduit (16) connects the outlet (15) of the first heat generating arrangement with the inlet (17) of the heat emitting device and a return conduit (20) connects the outlet (19) of the heat emitting device (18) with the inlet (21) of the second heat generating arrangement (14) and the outlet (22) of the second heat generating arrangement (14) with the inlet (23) of the first heat generating arrangement (13), and a first connection conduit (24), from a first point (1) located between the outlet (22) of the second heat generating arrangement (14) and the inlet (23) of the first heat generating arrangement (13) to a second point (2) located at the feeding conduit, connects the return conduit and the feeding conduit, **characterized in that** the plant comprises means (26) for enabling a flow of the first medium from the outlet of the first heat generating arrangement (13) to the first one (Vx1) of said at least two heat transferring devices and further to the return conduit (20) and/or to the feeding conduit (16).
2. A plant according to claim 1, **characterized in that** a second connection conduit (26), from a third point (3) located between the outlet (15) of the first heat generating arrangement (13) and said second point (2) to the inlet (27) of the said first heat transferring device (Vx1) and further from the outlet (28) of this heat transferring device to a fourth point (4) located at the return conduit (20), connects the feeding conduit (16) and the return conduit, and a parallel conduit (29), from a fifth point (5) located between the outlet (28) of said first heat transferring device and said fourth point (4) to a sixth point (6) located at the feeding conduit, connects said first heat transferring device (Vx1) and the feeding conduit (16) in parallel.

3. A plant according to claim 2, **characterized in that** the fourth point 4 is located between said first point 1 and the inlet (23) of the first heat generating arrangement.
4. A plant according to claim 2 or 3, **characterized in that** the sixth point (6) is located between said third point (3) and said second point (2).
5. A plant according to any previous claim, **characterized in that** at least a second heat transferring device (Vx2) is arranged at the feeding conduit (16).
6. A plant according to claim 5, **characterized in that** said second heat transferring device (Vx2) is arranged between said second point (2) and the inlet (17) of the heat emitting device (18).
7. A plant according to any previous claim, **characterized in that** at least a third heat transferring device (Vx3) is arranged at the return conduit (20).
8. A plant according to claim 7, **characterized in that** said third heat transferring device (Vx3) is arranged between the outlet (19) of the heat emitting device (18) and the inlet (21) of the second heat generating arrangement (14).
9. A plant according to claim 2, 5 and 7, or according to claim 2, 5 and 7 and any further claim, **characterized in that** the plant comprises three heat transferring devices arranged in series at said second circuit, namely said first heat transferring device (Vx1) arranged at the second connection conduit (26) of the first circuit (11), said second heat transferring device (Vx2) arranged at the feeding conduit (16) of the first circuit and said third heat transferring device (Vx3) at the return conduit (20) of the first circuit.
10. A plant according to any previous claim, **characterized in that** the first heat generating arrangement (13) includes at least one heating boiler.
11. A plant according to any previous claim, **characterized in that** the second heat generating arrangement (16) includes at least one heating pump.
12. A plant according to any previous claim, **characterized in that** the second heat generating arrangement (14) includes at least one solar heating system.
13. A plant according to any previous claim, **characterized in that** the plant comprises at least two heat emitting devices (18) connected parallel to each other.
14. A plant according to any previous claim, **characterized in that** the plant includes at least three connection conduits (24, 26, 31, 32) connecting the feeding conduit (16) and the return conduit (20).
15. A plant according to claim 14, **characterized in that** the plant includes a third connection conduit (31) arranged from a seventh point (7) located between said second point (2) and the inlet (17) of the heat emitting device (18) to a eighth point (8) located between the outlet (19) of the heat emitting device and the inlet (21) of the second heat generating arrangement (14).
16. A plant according to claim 15, **characterized in that** the plant includes a fourth connection conduit (32) arranged from a ninth point (9) located between said second point (2) and the inlet (17) of the heat emitting device (18) to a tenth point (10) located between the outlet (19) of the heat emitting device and the inlet (21) of the second heat generating arrangement (14).
17. A plant according to any of the claims 5 or 6 and the claim 15, or according to any of the claims 5 or 6 and the claim 15 and any further claim, **characterized in that** said seventh point (7) is located between the outlet (36) of the second heat transferring device (Vx2) and the inlet (17) of the heat emitting device (18).
18. A plant according to any of the claims 7 or 8 and the claim 15, or according to any of the claims 7 or 8 and the claim 15 and any further claim, **characterized in that** said eighth point (8) is located between the outlet (19) of the heat emitting device (18) and the inlet (37) of the third heat transferring device (Vx3).
19. A plant according to any of the claims 5 or 6 and the claim 16, or according to any of the claims 5 or 6 and the claim 16 and any further claim, **characterized in that** said ninth point (9) is located between the outlet (36) of the second heat transferring device (Vx2) and the inlet (17) of the heat emitting device (18).
20. A plant according to any of the claims 7 or 8 and the claim 16, or according to any of the claims 7 or 8 and the claim 16 and any further claim, **characterized in that** said tenth point (10) is located between the outlet of the heat emitting device (18) and the inlet (37) of the third heat transferring device (Vx3).
21. A plant according to the claims 17, 18, 19 and 20, **characterized in that** said ninth point (9) is located between the outlet (36) of the second heat transferring device (Vx2) and said seventh point (7) and in

that said ninth point (9) is located between said eighth point (8) and the inlet (37) of the third heat transferring device (Vx3).

22. A plant according to any previous claim, **characterized in that** at least one valve (Sv2) is arranged at the first connection conduit (24).
23. A plant according to claim 22, **characterized in that** at least one valve (Sv2) is arranged at said second point (2).
24. A plant according to any of the claims 2-23, **characterized in that** at least one valve (Sv1) is arranged at the second connection conduit (26).
25. A plant according to claim 24, **characterized in that** at least one valve (Sv1) is arranged at said fifth point (5).
26. A plant according to claim 14, or according to claim 14 and any further claim, **characterized in that** at least one valve (Sv3) is arranged at a third connection conduit (31).
27. A plant according to claim 15 and 26, or according to claim 15 and 26 and any further claim, **characterized in that** at least one valve (Sv3) is arranged at said seventh point (7).
28. A plant according to claim 14 or 16, or according to claim 14 or 16 and any further claim, **characterized in that** at least one valve (B1) is arranged at a fourth connection conduit (32).
29. A plant according to any previous claim, **characterized in that** the respective heat emitting device (18) includes at least one radiator.
30. A plant according to any previous claim, **characterized in that** the respective heat transferring device (Vx1, Vx2, Vx3) includes at least one heat exchanger.
31. A plant according to any of the claims 2-30, **characterized in that** at least one pump (P1) is arranged at the second connection conduit (26).
32. A plant according to any previous claim, **characterized in that** at least one pump (P2) is arranged at the return conduit (20).
33. A plant according to claim 32, **characterized in that** at least one pump (P2) is arranged at the second heat generating arrangement (14).
34. A plant according to any previous claim, **characterized in that** at least one pump (P3) is arranged at

the feeding conduit (16).

35. A plant according to claim 34, **characterized in that** at least one pump (P3) is arranged at the inlet (17) of the heat emitting device (18).
36. A plant according to any previous claim, **characterized in that** at least one pump is arranged at the first heat generating arrangement.
37. A plant according to any previous claim, **characterized in that** it includes means for bypassing the first heat generating arrangement.
38. A plant according to any previous claim, **characterized in that** it includes means (33) for bypassing the second heat generating arrangement (14).
39. A plant according to claim 38, **characterized in that** said bypassing means (33) comprise a valve (B2).
40. A plant according to any previous claim, **characterized in that** it includes means (41) for bypassing the first heat transferring device (Vx1).
41. A plant according to claim 5, or according to claim 5 and any further claim, **characterized in that** it includes means (39) for bypassing the second heat transferring device (Vx2).
42. A plant according to claim 7, or according to claim 7 and any further claim, **characterized in that** it includes means (40) for bypassing the third heat transferring device (Vx3).
43. A plant according to claim 5, or according to claim 5 and any further claim, **characterized in that** a pump (P4) is arranged at the second heat transferring device (Vx2).
44. A plant according to claim 7, or according to claim 7 and any further claim, **characterized in that** a pump (P5) is arranged at the third heat transferring device (Vx3).
45. A plant according to any previous claim, **characterized in that** a pump (P6) is arranged at the first heat transferring device (Vx1).
46. A method for transferring heat from a first medium to a second medium, for example tap hot-water, and to a third medium, for example the surrounding air, wherein heat generation to the first medium is performed by at least two heat generating arrangements (13, 14) connected to a first circuit (11) containing the first medium, which arrangements are connected with a feeding conduit (16) and a return conduit (20), wherein said heat transferring to the

second medium is performed by at least two heat transferring devices (25) connected to the first circuit (11) and to a second circuit (12) containing the second medium, and heat transferring to the third medium is performed by at least one heat emitting device (18) connected to the first circuit, **characterized in that** at least a part of the flow of the first medium is conducted from the outlet (15) of the first heat generating arrangement (13) at the feeding conduit (16) to a first one (Vx1) of said at least two heat transferring devices and further, in one operational state, to the return conduit (20) and, in another operational state, to the feeding conduit (16).

47. A method according to claim 46, **characterized in that** a second heat transferring device (Vx2) arranged at the feeding conduit (16) receives the first medium by the fact that this first medium is brought to flow from the outlet (22) of the second heat generating arrangement (14) at the return conduit (20) and via a connection conduit (24) to the feeding conduit (16) and further to said second heat transferring device (Vx2) and/or by the fact that the first medium is brought to flow from the outlet (15) of the first heat generating arrangement (13), and possibly via a parallel connection (29) to the feeding conduit (16), and further via the feeding conduit to said second heat transferring device (Vx2).

Patentansprüche

1. Heizanlage zur Übertragung von Wärme von einem ersten Medium auf ein zweites Medium, zum Beispiel Warmwasser, und auf ein drittes Medium, zum Beispiel Umgebungsluft, wobei die Anlage Folgendes aufweist: mindestens eine erste Wärmeerzeugungsanordnung (13) und eine zweite Wärmeerzeugungsanordnung (14) in einem das erste Medium enthaltenden ersten Kreis (11), mindestens zwei Wärmeübertragungsvorrichtungen (25), die in einem das zweite Medium enthaltenden zweiten Kreis (12) in Reihe geschaltet sind, und mindestens eine Wärmeabgabevorrichtung (18) zum Abgeben von Wärme an ein drittes Medium, wobei eine Zufuhr-Rohrleitung (16) den Auslass (15) der ersten Wärmeerzeugungsanordnung mit dem Einlass (17) der Wärmeabgabevorrichtung verbindet und eine Rück-Rohrleitung (20) den Auslass (19) der Wärmeabgabevorrichtung (18) mit dem Einlass (21) der zweiten Wärmeerzeugungsanordnung (14) und den Auslass (22) der zweiten Wärmeerzeugungsanordnung (14) mit dem Einlass (23) der ersten Wärmeerzeugungsanordnung (13) verbindet, und eine erste Verbindungs-Rohrleitung (24) von einem ersten Punkt (1), der zwischen dem Auslass (22) der zweiten Wärmeerzeugungsanordnung (14) und dem Einlass (23) der ersten Wärmeerzeugungsan-

ordnung (13) zu einem zweiten Punkt (2) führt, der an der Zufuhr-Rohrleitung liegt, die Rück-Rohrleitung und die Zufuhr-Rohrleitung verbindet, **dadurch gekennzeichnet, dass** die Anlage eine Einrichtung (26) zur Ermöglichung eines Flusses des ersten Mediums vom Auslass der ersten Wärmeerzeugungsanordnung (13) zur ersten (Vx1) der mindestens zwei Wärmeübertragungsvorrichtungen und weiter zur Rück-Rohrleitung (20) und/oder zur Zufuhr-Rohrleitung (16) aufweist.

2. Anlage nach Anspruch 1, **dadurch gekennzeichnet, dass** eine zweite Verbindungs-Rohrleitung (26) von einem dritten Punkt (3), der zwischen dem Auslass (15) der ersten Wärmeerzeugungsanordnung (13) und dem zweiten Punkt (2) liegt, zum Einlass (27) der ersten Wärmeübertragungsvorrichtung (Vx1) und weiter vom Auslass (28) dieser Wärmeübertragungsvorrichtung zu einem vierten Punkt (4), der an der Rück-Rohrleitung (20) liegt, die Zufuhr-Rohrleitung (16) und die Rück-Rohrleitung verbindet, und eine Parallel-Rohrleitung (29) von einem fünften Punkt (5), der zwischen dem Auslass (28) der ersten Wärmeübertragungsvorrichtung und dem vierten Punkt (4) liegt, zu einem sechsten Punkt (6), der an der Zufuhr-Rohrleitung liegt, die erste Wärmeübertragungsvorrichtung (Vx1) und die Zufuhr-Rohrleitung (16) parallel verbindet.

3. Anlage nach Anspruch 2, **dadurch gekennzeichnet, dass** der vierte Punkt (4) zwischen dem ersten Punkt (1) und dem Einlass (23) der ersten Wärmeerzeugungsanordnung liegt.

4. Anlage nach Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** der sechste Punkt (6) zwischen dem dritten Punkt (3) und dem zweiten Punkt (2) liegt.

5. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine zweite Wärmeübertragungsvorrichtung (Vx2) an der Zufuhr-Rohrleitung (16) angeordnet ist.

6. Anlage nach Anspruch 5, **dadurch gekennzeichnet, dass** die zweite Wärmeübertragungsvorrichtung (Vx2) zwischen dem zweiten Punkt (2) und dem Einlass (17) der Wärmeabgabevorrichtung (18) angeordnet ist.

7. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine dritte Wärmeübertragungsvorrichtung (Vx3) an der Rück-Rohrleitung (20) angeordnet ist.

8. Anlage nach Anspruch 7, **dadurch gekennzeichnet, dass** die dritte Wärmeübertragungsvorrichtung (Vx3) zwischen dem Auslass (19) der Wärme-

abgabevorrichtung (18) und dem Einlass (21) der zweiten Wärmeerzeugungsanordnung (14) angeordnet ist.

9. Anlage nach Anspruch 2, 5 und 7, oder nach Anspruch 2, 5 und 7 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** die Anlage drei Wärmeübertragungsvorrichtungen aufweist, die im zweiten Kreis in Reihe angeordnet sind, nämlich die erste Wärmeübertragungsvorrichtung (Vx1), die an der zweiten Verbindungs-Rohrleitung (26) des ersten Kreises (11) angeordnet ist, die zweite Wärmeübertragungsvorrichtung (Vx2), die an der Zufuhr-Rohrleitung (16) des ersten Kreises angeordnet ist, und die dritte Wärmeübertragungsvorrichtung (Vx3), die an der Rück-Rohrleitung (20) des ersten Kreises angeordnet ist. 5
10. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die erste Wärmeerzeugungsanordnung (13) mindestens einen Heizboiler enthält. 10
11. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Wärmeerzeugungsanordnung (16) mindestens eine Wärmepumpe enthält. 15
12. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die zweite Wärmeerzeugungsanordnung (14) mindestens ein Sonnenenergie-Heizsystem aufweist. 20
13. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Anlage mindestens zwei Wärmeabgabevorrichtungen (18) aufweist, die parallel zueinander geschaltet sind. 25
14. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Anlage mindestens drei Verbindungs-Rohrleitungen (24, 26, 31, 32) enthält, welche die Zufuhr-Rohrleitung (16) und die Rück-Rohrleitung (20) verbinden. 30
15. Anlage nach Anspruch (14), **dadurch gekennzeichnet, dass** die Anlage eine dritte Verbindungs-Rohrleitung (31) aufweist, die von einem siebten Punkt (7), der zwischen dem zweiten Punkt (2) und dem Einlass (17) der Wärmeabgabevorrichtung (18) liegt, zu einem achten Punkt (8) führt, der zwischen dem Auslass (19) der Wärmeabgabevorrichtung und dem Einlass (21) der zweiten Wärmeerzeugungsanordnung (14) liegt. 35
16. Anlage nach Anspruch (15), **dadurch gekennzeichnet, dass** die Anlage eine vierte Verbindungs-Rohrleitung (32) aufweist, die von einem neunten Punkt (9), der zwischen dem zweiten Punkt (2) und 40

dem Einlass (17) der Wärmeabgabevorrichtung (18) liegt, zu einem zehnten Punkt (10) führt, der zwischen dem Auslass (19) der Wärmeabgabevorrichtung und dem Einlass (21) der zweiten Wärmeerzeugungsanordnung (14) liegt.

17. Anlage nach einem der Ansprüche 5 oder 6 und Anspruch 15 oder nach einem der Ansprüche 5 oder 6 und Anspruch 15 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** der siebte Punkt (7) zwischen dem Auslass (36) der zweiten Wärmeübertragungsvorrichtung (Vx2) und dem Einlass (17) der Wärmeabgabevorrichtung (18) liegt. 45
18. Anlage nach einem der Ansprüche 7 oder 8 und dem Anspruch 15 oder nach einem der Ansprüche 7 oder 8 und dem Anspruch 15 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** der achte Punkt (8) zwischen dem Auslass (19) der Wärmeabgabevorrichtung (18) und dem Einlass (37) der dritten Wärmeübertragungsvorrichtung (Vx3) liegt. 50
19. Anlage nach einem der Ansprüche 5 oder 6 und Anspruch 16 oder einem der Ansprüche 5 oder 6 und Anspruch 16 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** der neunte Punkt (9) zwischen dem Auslass (36) der zweiten Wärmeübertragungsvorrichtung (Vx2) und dem Einlass (17) der Wärmeabgabevorrichtung (18) liegt. 55
20. Anlage nach einem der Ansprüche 7 oder 8 und Anspruch 16 oder nach einem der Ansprüche 7 oder 8 und Anspruch 16 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** der zehnte Punkt (10) zwischen dem Auslass der Wärmeabgabevorrichtung (18) und dem Einlass (37) der dritten Wärmeübertragungsvorrichtung (Vx3) liegt.
21. Anlage nach einem der Ansprüche 17, 18, 19 und 20, **dadurch gekennzeichnet, dass** der neunte Punkt (9) zwischen dem Auslass (36) der zweiten Wärmeübertragungsvorrichtung (Vx2) und dem siebten Punkt (7) liegt und der neunte Punkt (9) zwischen dem achten Punkt (8) und dem Einlass (37) der dritten Wärmeübertragungsvorrichtung (Vx3) liegt.
22. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv2) an der ersten Verbindungs-Rohrleitung (24) angeordnet ist.
23. Anlage nach Anspruch 22, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv2) am zweiten

Punkt (2) angeordnet ist.

24. Anlage nach einem der Ansprüche 2 - 23, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv1) an der zweiten Verbindungs-Rohrleitung (26) angeordnet ist. 5
25. Anlage nach Anspruch 24, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv1) am fünften Punkt (5) angeordnet ist. 10
26. Anlage nach Anspruch 14 oder nach Anspruch 14 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv3) an einer dritten Verbindungs-Rohrleitung (31) angeordnet ist. 15
27. Anlage nach Anspruch 15 und 26 oder nach Anspruch 15 und 26 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** mindestens ein Ventil (Sv3) am siebten Punkt (7) angeordnet ist. 20
28. Anlage nach Anspruch 14 oder 16 oder nach Anspruch 14 oder 16 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** mindestens ein Ventil (B1) an einer vierten Verbindungs-Rohrleitung (32) angeordnet ist. 25
29. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die entsprechende Wärmeabgabevorrichtung (18) mindestens einen Heizkörper aufweist. 30
30. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die entsprechende Wärmeübertragungsvorrichtung (Vx1, Vx2, Vx3) mindestens einen Wärmetauscher aufweist. 35
31. Anlage nach einem der Ansprüche 2 - 30, **dadurch gekennzeichnet, dass** mindestens eine Pumpe (P1) an der zweiten Verbindungs-Rohrleitung (26) angeordnet ist. 40
32. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine Pumpe P2 an der Rück-Rohrleitung (20) angeordnet ist. 45
33. Anlage nach Anspruch 32, **dadurch gekennzeichnet, dass** mindestens eine Pumpe (P2) an der zweiten Wärmeerzeugungsanordnung (14) angeordnet ist. 50
34. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine Pumpe (P3) an der Zufuhr-Rohrleitung (16) angeordnet ist. 55

35. Anlage nach Anspruch 34, **dadurch gekennzeichnet, dass** mindestens eine Pumpe (P3) am Einlass (17) der Wärmeabgabevorrichtung (18) angeordnet ist.
36. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine Pumpe an der ersten Wärmeerzeugungsanordnung angeordnet ist.
37. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine Einrichtung zur Umgehung der ersten Wärmeerzeugungsanordnung aufweist.
38. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine Einrichtung (33) zur Umgehung der zweiten Wärmeerzeugungsanordnung (14) aufweist.
39. Anlage nach Anspruch 38, **dadurch gekennzeichnet, dass** die Umgehungseinrichtung (33) ein Ventil (B2) aufweist.
40. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie eine Einrichtung (41) zur Umgehung der ersten Wärmeübertragungsvorrichtung (Vx1) aufweist.
41. Anlage nach Anspruch 5 oder nach Anspruch 5 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** sie eine Einrichtung (39) zur Umgehung der zweiten Wärmeübertragungsvorrichtung (Vx2) aufweist.
42. Anlage nach Anspruch 7 oder nach Anspruch 7 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** sie eine Einrichtung (40) zur Umgehung der dritten Wärmeübertragungsvorrichtung (Vx3) aufweist.
43. Anlage nach Anspruch 5 oder nach Anspruch 5 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** eine Pumpe (P4) an der zweiten Wärmeübertragungsvorrichtung (Vx2) angeordnet ist.
44. Anlage nach Anspruch 7 oder nach Anspruch 7 und einem beliebigen weiteren Anspruch, **dadurch gekennzeichnet, dass** eine Pumpe (P5) an der dritten Wärmeübertragungsvorrichtung (Vx3) angeordnet ist.
45. Anlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** eine Pumpe (P6) an der ersten Wärmeübertragungsvorrichtung (Vx1) angeordnet ist.

46. Verfahren zum Übertragen von Wärme von einem ersten Medium auf ein zweites Medium, zum Beispiel Warmwasser, und auf ein drittes Medium, zum Beispiel Umgebungsluft, bei dem eine Wärmeerzeugung für das erste Medium von mindestens zwei Wärmeerzeugungsanordnungen (13, 14) durchgeführt wird, die an einen das erste Medium enthaltenden ersten Kreis (11) angeschlossen sind, wobei die Anordnungen mit einer Zufuhr-Rohrleitung (16) und einer Rück-Rohrleitung (20) verbunden sind, wobei die Wärmeübertragung an das zweite Medium durch mindestens zwei Wärmeübertragungsvorrichtungen (25) durchgeführt wird, die an den ersten Kreis (11) und einen das zweite Medium enthaltenden zweiten Kreis (12) angeschlossen sind, und die Wärmeübertragung an das dritte Medium durch mindestens eine Wärmeabgabevorrichtung (18) durchgeführt wird, die an den ersten Kreis angeschlossen ist, **dadurch gekennzeichnet, dass** mindestens ein Teil des Flusses des ersten Mediums vom Auslass (15) der ersten Wärmeerzeugungsanordnung (13) an der Zufuhr-Rohrleitung (16) zu einer ersten (Vx1) der mindestens zwei Wärmeübertragungsvorrichtungen und in einem Betriebszustand weiter an die Rück-Rohrleitung (20) und in einem anderen Betriebszustand weiter an die Zufuhr-Rohrleitung (16) geleitet wird.
47. Verfahren nach Anspruch 46, **dadurch gekennzeichnet, dass** eine an der Zufuhr-Rohrleitung (16) angeordnete zweite Wärmeübertragungsvorrichtung (Vx2) das erste Medium dadurch erhält, dass dieses erste Medium veranlasst wird, vom Auslass (22) der zweiten Wärmeerzeugungsanordnung (14) an der Rück-Rohrleitung (20) und über eine Verbindungs-Rohrleitung (24) zur Zufuhr-Rohrleitung (16) und weiter zur zweiten Wärmeübertragungsvorrichtung (Vx2) zu fließen und/oder dadurch, dass das erste Medium dazu veranlasst wird, vom Auslass (15) der ersten Wärmeerzeugungsanordnung (13) und möglicherweise über eine Parallelverbindung (29) zur Zufuhr-Rohrleitung (16) und weiter über die Zufuhr-Rohrleitung zur zweiten Wärmeübertragungsvorrichtung (Vx2) zu fließen.

Revendications

1. Installation de chauffage pour transférer de la chaleur d'un premier milieu à un deuxième milieu, par exemple de l'eau chaude sanitaire, et à un troisième milieu, par exemple l'air ambiant, ladite installation comportant au moins un premier générateur de chaleur (13) et un second générateur de chaleur (14) sur un premier circuit (11) contenant le premier milieu, au moins deux dispositifs de transfert de chaleur (25) disposés en série sur un deuxième circuit (12) contenant le deuxième milieu, et au moins

un dispositif émetteur de chaleur (18) pour émettre la chaleur vers le troisième milieu, installation dans laquelle un conduit d'alimentation (16) relie la sortie (15) du premier générateur de chaleur à l'entrée (17) du dispositif émetteur de chaleur, et un conduit de retour (20) relie la sortie (19) du dispositif émetteur de chaleur (18) à l'entrée (21) du deuxième générateur de chaleur (14) et la sortie (22) du deuxième générateur de chaleur (14) avec l'entrée (23) du premier générateur de chaleur (13), et un premier conduit de raccordement (24), allant d'un premier point (1) situé entre la sortie (22) du deuxième générateur de chaleur (14) et l'entrée (23) du premier générateur de chaleur (13) à un second point (2) situé sur ledit conduit d'alimentation, relie ledit conduit de retour audit conduit d'alimentation, installation **caractérisée en ce qu'elle** comprend des moyens (26) pour permettre à un flux dudit premier milieu d'aller de ladite sortie du premier générateur de chaleur (13) au premier (Vx1) desdits au moins deux dispositifs de transfert de chaleur et ensuite au conduit de retour (20) et/ou au conduit d'alimentation (16).

2. Installation selon la revendication 1, **caractérisée en ce qu'un** deuxième conduit de raccordement (26), allant d'un troisième point (3), situé entre la sortie (15) du premier générateur de chaleur (13) et ledit second point (2), à l'entrée (27) dudit premier dispositif de transfert de chaleur (Vx1) et allant ensuite de la sortie (28) de ce dispositif de transfert de chaleur (Vx1) à un quatrième point (4) situé sur le conduit de retour (20), relie le conduit d'alimentation (16) et ledit conduit de retour, et **en ce que** un conduit parallèle (29), allant d'un cinquième point (5), situé entre la sortie (28) du premier dispositif de transfert de chaleur et ledit quatrième point (4), à un sixième point (6) situé sur le conduit d'alimentation, relie ledit premier générateur de chaleur (Vx1) et le conduit d'alimentation (16) en parallèle.
3. Installation selon la revendication 2, **caractérisée en ce que** le quatrième point (4) est situé entre ledit premier point (1) et l'entrée (23) du premier générateur de chaleur.
4. Installation selon la revendication 2 ou 3, **caractérisée en ce que** le sixième point (6) est situé entre ledit troisième point (3) et ledit deuxième point (2).
5. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'au** moins un deuxième dispositif de transfert de chaleur (Vx2) est disposé sur le conduit d'alimentation (16).
6. Installation selon la revendication 5, **caractérisée en ce que** ledit deuxième dispositif de transfert de chaleur (Vx2) est disposé entre ledit deuxième point

- (2) et l'entrée (17) du dispositif d'émission de chaleur (18).
7. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**au moins un troisième dispositif de transfert de chaleur (Vx3) est disposé sur le conduit de retour (20). 5
 8. Installation selon la revendication 7, **caractérisée en ce que** ledit troisième dispositif de transfert de chaleur (Vx3) est disposé entre la sortie (19) du dispositif émetteur de chaleur (18) et l'entrée (21) du deuxième générateur de chaleur (14). 10
 9. Installation selon les revendications 2, 5 et 7, ou selon les revendications 2, 5 et 7 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**elle comprend trois dispositifs de transfert de chaleur disposés en série sur ledit deuxième circuit, ledit premier dispositif de transfert de chaleur (Vx1) étant disposé sur le deuxième conduit de raccordement (26) du premier circuit (11), ledit deuxième dispositif de transfert de chaleur (Vx2) étant disposé sur le conduit d'alimentation (16) du premier circuit et ledit troisième dispositif de transfert de chaleur (Vx3) étant disposé sur le conduit de retour (20) du premier circuit. 15 20 25
 10. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le premier générateur de chaleur (13) comprend au moins une chaudière. 30
 11. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le deuxième générateur de chaleur (14) comprend au moins une pompe à chaleur. 35
 12. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le deuxième générateur de chaleur (14) comprend au moins un système de chauffage solaire. 40
 13. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comporte au moins deux dispositifs émetteurs de chaleur (18) reliés l'un à l'autre en parallèle. 45
 14. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend au moins trois conduits de raccordement (24, 26, 31, 32) reliant le conduit d'alimentation (16) et le conduit de retour (20). 50
 15. Installation selon la revendication 14, **caractérisée en ce qu'**elle comprend un troisième conduit de raccordement (31) allant d'un septième point (7) situé entre ledit deuxième point (2) et l'entrée (17) du dispositif émetteur de chaleur (18) à un huitième point (8) situé entre la sortie (19) dudit dispositif émetteur de chaleur et l'entrée (21) du deuxième générateur de chaleur (14).
 16. Installation selon la revendication 15, **caractérisée en ce qu'**elle inclut un quatrième conduit de raccordement (32) allant d'un neuvième point (9) situé entre ledit deuxième point (2) et l'entrée (17) du dispositif émetteur de chaleur (18) à un dixième point (10) situé entre la sortie (19) dudit dispositif émetteur de chaleur et l'entrée (21) du deuxième générateur de chaleur (14).
 17. Installation selon la revendication 5 ou 6 et la revendication 15, ou selon la revendication 5 ou 6 et la revendication 15 et l'une quelconque des revendications suivantes, **caractérisée en ce que** ledit septième point (7) est situé entre la sortie (36) du second dispositif de transfert de chaleur (Vx2) et l'entrée (17) du dispositif émetteur de chaleur (18).
 18. Installation selon la revendication 7 ou 8 et la revendication 15, ou selon la revendication 7 ou 8 et la revendication 15 et l'une quelconque des revendications suivantes, **caractérisée en ce que** ledit huitième point (8) est situé entre la sortie (19) du dispositif émetteur de chaleur (18) et l'entrée (37) du troisième dispositif de transfert de chaleur (Vx3).
 19. Installation selon la revendication 5 ou 6 et la revendication 16, ou selon la revendication 5 ou 6 et la revendication 16 et l'une quelconque des revendications suivantes, **caractérisée en ce que** ledit neuvième point (9) est situé entre la sortie (36) du second dispositif de transfert de chaleur (Vx2) et l'entrée (17) du dispositif émetteur de chaleur (18).
 20. Installation selon la revendication 7 ou 8 et la revendication 16, ou selon la revendication 7 ou 8 et la revendication 16 et l'une quelconque des revendications suivantes, **caractérisée en ce que** ledit dixième point (10) est situé entre la sortie du dispositif émetteur de chaleur (18) et l'entrée (37) du troisième dispositif de transfert de chaleur (Vx3).
 21. Installation selon les revendications 17, 18, 19 et 20, **caractérisée en ce que** ledit neuvième point (9) est situé entre la sortie (36) du second dispositif de transfert de chaleur (Vx2) et ledit septième point (7) et **en ce que** ledit dixième point (10) est situé entre ledit huitième point (8) et l'entrée (37) du troisième dispositif de transfert de chaleur (Vx3).
 22. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**au moins une valve (Sv2) est disposée sur le premier conduit de raccordement (24).

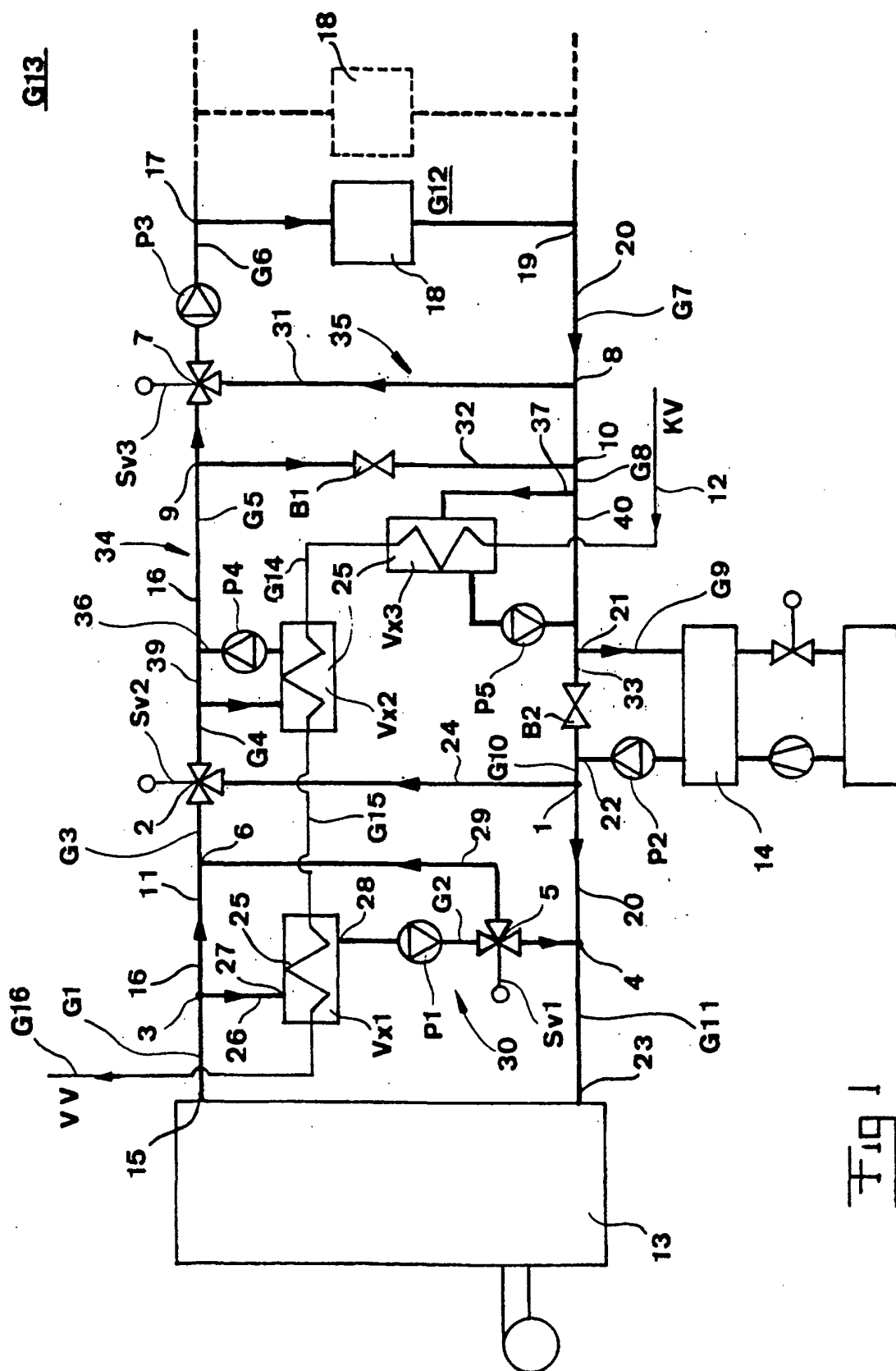
23. Installation selon la revendication 22, **caractérisée en ce qu'**au moins une valve (Sv2) est disposée sur ledit deuxième point (2).
24. Installation selon l'une quelconque des revendications 2 à 23, **caractérisée en ce qu'**au moins une valve (Sv1) est disposée sur le deuxième conduit de raccordement (26). 5
25. Installation selon la revendication 24, **caractérisée en ce qu'**au moins une valve (Sv1) est disposée audit cinquième point (5). 10
26. Installation selon la revendication 14, ou selon la revendication 14 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**au moins une valve (Sv3) est disposée sur un troisième conduit de raccordement (31). 15
27. Installation selon la revendication 15 et 26, ou selon la revendication 15 et 26 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**au moins une valve (Sv3) est disposée sur ledit septième point (7). 20
28. Installation selon la revendication 14 ou 16, ou selon la revendication 14 ou 16 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**au moins une valve (B1) est disposée sur un quatrième conduit de raccordement (32). 25
29. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le dispositif émetteur de chaleur (18) inclut au moins un radiateur. 30
30. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le dispositif de transfert de chaleur (Vx1, Vx2, Vx3) inclut au moins un échangeur de chaleur. 35
31. Installation selon l'une quelconque des revendications 2 à 30, **caractérisée en ce qu'**au moins une pompe (P1) est disposée sur le deuxième conduit de raccordement (26). 40
32. Installation selon l'une quelconque des revendications précédentes précédente, **caractérisée en ce qu'**au moins une pompe (P2) est disposée sur le conduit de retour (20). 45
33. Installation selon la revendication 32, **caractérisée en ce qu'**au moins une pompe (P2) est disposée sur le deuxième générateur de chaleur (14). 50
34. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**au moins une pompe (P3) est disposée sur le conduit d'alimentation (16). 55
35. Installation selon la revendication 34, **caractérisée en ce qu'**au moins une pompe (P3) est disposée sur l'entrée (17) du dispositif émetteur de chaleur (18).
36. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**au moins une pompe est disposée sur le premier générateur de chaleur.
37. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle inclut des moyens de dérivation du premier générateur de chaleur.
38. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle inclut des moyens (33) de dérivation du deuxième générateur de chaleur (14).
39. Installation selon la revendication 38, **caractérisée en ce que** lesdits moyens de dérivation (33) comprennent une valve (B2).
40. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle inclut des moyens (41) de dérivation du premier dispositif de transfert de chaleur (Vx1).
41. Installation selon la revendication 5, ou selon la revendication 5 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**elle inclut des moyens (39) de dérivation du deuxième dispositif de transfert de chaleur (Vx2).
42. Installation selon la revendication 7, ou selon la revendication 7 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**elle inclut des moyens (40) de dérivation du troisième dispositif de transfert de chaleur (Vx3).
43. Installation selon la revendication 5, ou selon la revendication 5 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**une pompe (P4) est disposée sur le deuxième dispositif de transfert de chaleur (Vx2).
44. Installation selon la revendication 7, ou selon la revendication 7 et l'une quelconque des revendications suivantes, **caractérisée en ce qu'**une pompe (P5) est disposée sur le troisième dispositif de transfert de chaleur (Vx3).
45. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**une pompe (P6) est disposée sur le premier dispositif

de transfert de chaleur (Vx1).

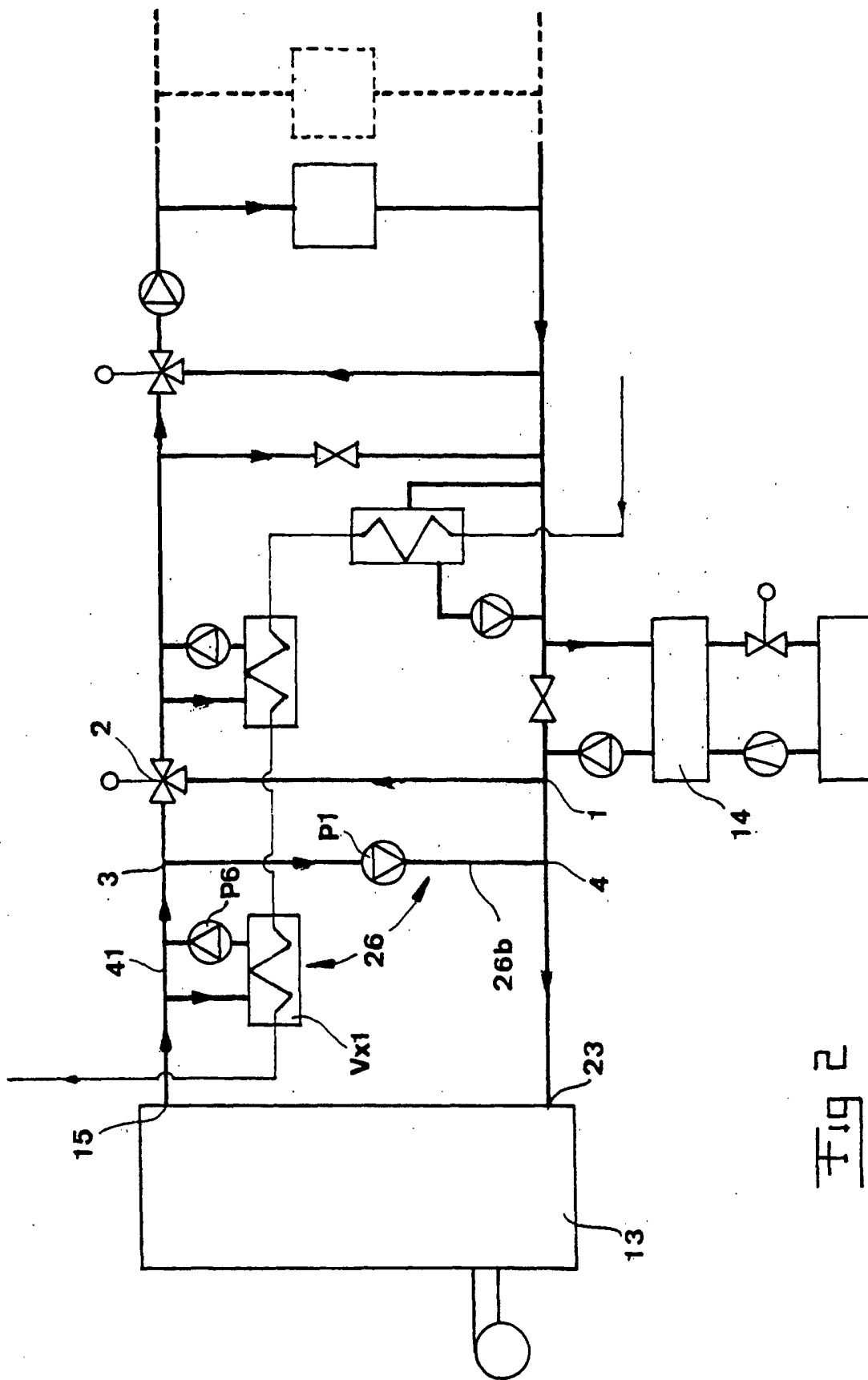
46. Méthode pour transférer de la chaleur d'un premier milieu à un deuxième milieu, par exemple de l'eau chaude sanitaire, et à un troisième milieu, par exemple l'air ambiant, par laquelle un apport de chaleur au premier milieu est réalisée par au moins deux générateurs de chaleur (13, 14) reliés à un premier circuit (11) contenant le premier milieu, lesquels générateurs sont reliés par un conduit d'alimentation (16) et par un conduit de retour (20), et par laquelle ladite chaleur est transférée vers le deuxième milieu par au moins deux dispositifs de transfert de la chaleur (25) reliés au premier circuit (11) et à un deuxième circuit (12) contenant le deuxième milieu, et un transfert de chaleur vers le troisième milieu est réalisé par au moins un dispositif émetteur de chaleur (18) relié au premier circuit, **caractérisée en ce qu'**au moins une partie du flux du premier milieu est conduite depuis la sortie (15) du premier agencement générateur de chaleur (13) jusqu'au conduit d'alimentation (16) vers le premier (Vx1) desdits au moins deux dispositifs de transfert de chaleur et ensuite, dans un mode opérationnel, jusqu'au conduit de retour (20) et, dans un autre mode opérationnel, jusqu'au conduit d'alimentation (16).
47. Méthode selon la revendication 46, **caractérisée en ce que** le second dispositif de transfert de chaleur (Vx2) disposé sur le conduit d'alimentation (16) reçoit le premier milieu par le fait que ce premier milieu est apporté pour s'écouler depuis la sortie (22) du second générateur de chaleur (14) jusqu'au conduit de retour (20) et, par l'intermédiaire d'un conduit de raccordement (24), jusqu'au conduit d'alimentation (16), et ensuite jusqu'au dit deuxième dispositif de transfert de chaleur (Vx2), et/ou par le fait que le premier milieu est apporté pour s'écouler depuis la sortie (15) du premier générateur de chaleur (13) et, éventuellement par l'intermédiaire d'un raccordement parallèle (29), jusqu'au conduit d'alimentation (16), et ensuite, par l'intermédiaire dudit conduit d'alimentation, jusqu'au dit deuxième agencement de transfert de chaleur (Vx2).

50

55



G13



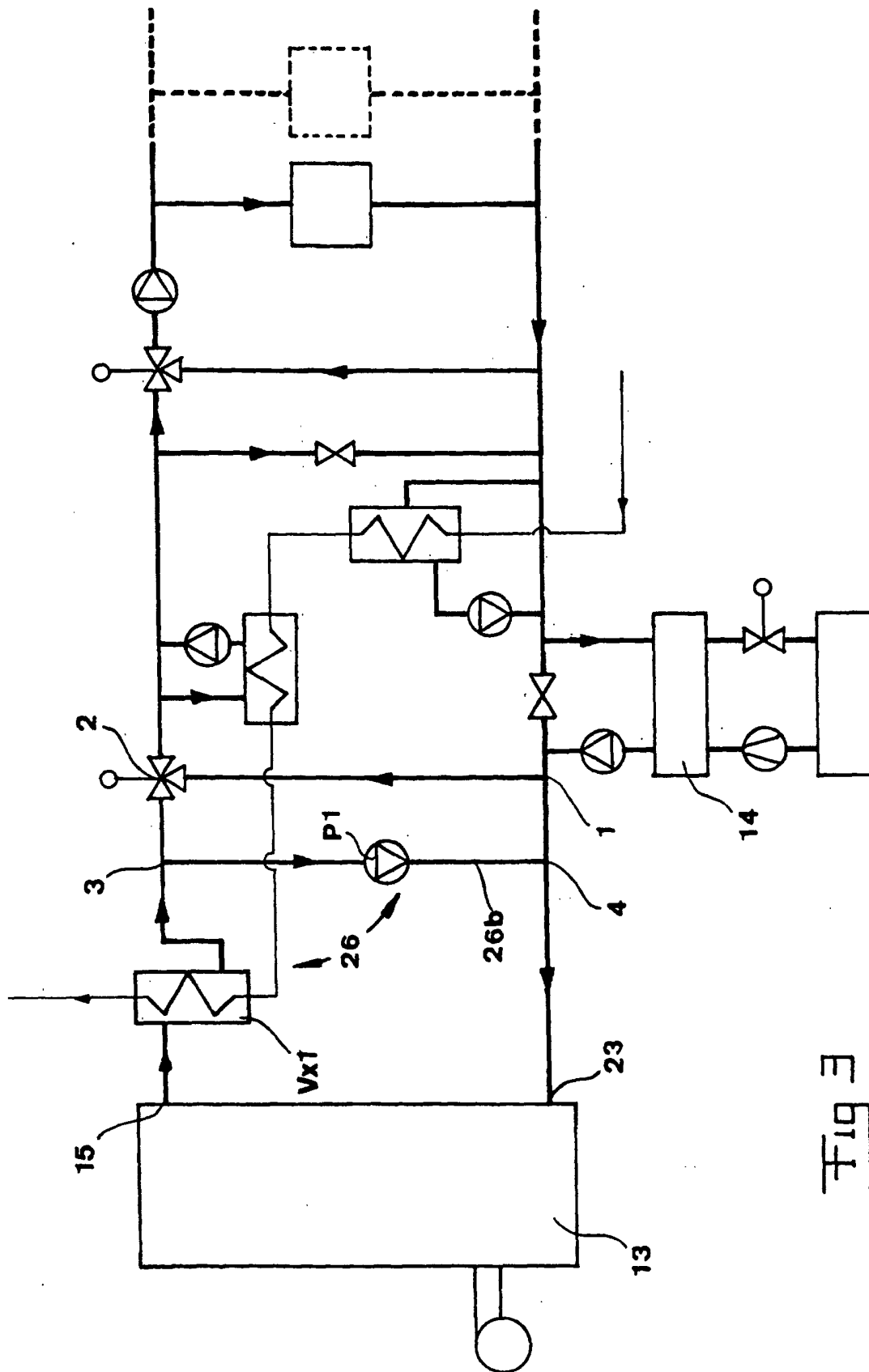


Fig. 3