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(54) Benævnelse: **Fremgangsmåde til tilvejebringelse af et sekundært medium**

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DESCRIPTION

[0001] The invention relates to a control system for providing a heated secondary medium at a tap, a control heat exchanger, a method for providing a heated secondary medium at a tap and a method for retrofitting an apartment with a control heat exchanger.

[0002] On a regular basis, the task is presented to heat a cooler medium with a warmer medium without mixing of the two media. For example, this is known for heating drinking water in a house or apartment. There are various taps at which heated drinking water is to be made available, for example at a tap or shower.

[0003] The drinking water can be heated, for example, with an electric flow water heater. However, this requires a large number of such devices, and will often be classified as uneconomical.

[0004] More efficient systems employ a hot primary medium and heat a secondary medium, i.e. the drinking water, in a heat exchanger, to the desired tap temperature at the tapping location.

[0005] The heating water from the heating flow can be used as the hot primary medium. This is usually warmer than the temperature at the tap. A typical constellation may provide that the heating flow has a temperature of about 65 ° C, whereas the hot water should be heated to, for example, 45 ° C.

[0006] If only a small amount of hot water is requested at the tap, then it is economical to pass only a small amount of the primary medium through the heat exchanger to heat the drinking water which is fed cold into the controlled system.

[0007] The amount of the primary medium for heating this secondary medium is determined by a regulator unit.

[0008] From DE 20 2008 006 054 U1, a regulator is known which performs the control via a mechanical coupling of two flow paths, namely on the one hand a flow path for the primary medium and on the other hand a flow path for the secondary medium. As soon as the heated secondary medium is requested at the tap, it starts to flow due to the supply pressure provided by waterworks. Here, a pressure builds up in the flow path of the secondary medium in the controller. This opens a slide, which can continuously open or close the flow path for the primary medium. If a large amount of warm secondary medium is requested at the tap, the controller allows a correspondingly large flow for the hot primary medium. If, on the other hand, only a smaller amount of warm secondary medium is requested at the tap, the controller only allows a small flow of the hot primary medium to flow. A sophisticated sealing system prevents mixing of primary medium and secondary medium.

[0009] It is also known in the prior art to provide a plate heat exchanger with a throttle for the heating water. The heating water is fed through the heat exchanger until the temperature in the heat exchanger is reached that is expected at the tap, for example 45 ° C. Then the primary medium, i.e. the heating water, is closed off. The supply line for the heating water is only opened again when the tap is tapped again.

[0010] In practice, however, this leads to some unpleasant effects: even in the ideal case, it can be expected that the temperature from the heat exchanger will reach the tap, namely the desired 45 ° C. After that, however, if the tap is opened further, a temperature drop arrive first, because new heating water is only at this point in time again fed through the heat exchanger. The desired temperature is only available again after this drop. In addition, and more important than the problem described above, is the fact that the heat exchanger itself can heat up to excessive temperatures when left at rest for a long time. In practice, it can be regularly observed with specific temperature examples that heating water at 65 ° C heats the entire heat exchanger to, for example, 60 ° C. At the start of the tapping process, the amount of water that was already present in the heat exchanger, and possibly also the amount of water that subsequently runs through the heat exchanger, can then arrive at the tap at a temperature of, for example, 60 ° C. This is not only problematic in terms of ease of use but can even pose a risk of scalding for the user.

[0011] Another controller for the primary medium was introduced by Gemina Termix A/S, 7451 Sunds, Denmark, under the local product name "Termix One", cf. www.termix.dk.

[0012] A further heat exchanger is known from DE 10 2007 007 975 B4.

[0013] The objective of the invention is to provide an improved control system.

[0014] According to a first aspect of the invention, this object is achieved by a control system for providing a secondary medium heated by means of a primary medium at a tap, with a main heat exchanger and a throttle, a control heat exchanger being provided in addition to the main heat exchanger and arranged in series with the main heat exchanger, wherein the throttle is set up to act on an actuator for the primary medium as a function of a temperature sensor on the secondary medium and / or in a return flow of the primary medium.

[0015] Conceptually, it should first be explained that a "control system" is understood to mean all components that are necessary or expedient within the hot water, hot water, and cold water system. In particular, a heat exchanger is part of the control system, but also the measuring and actuating devices and, if appropriate, a computer for evaluating the measurement data and for generating actuating pulses for the actuating device.

[0016] In the control system proposed here, there are at least two heat exchangers, namely the "main heat exchanger" and the "control heat exchanger".

The main heat exchanger distinguishes itself from the control heat exchanger in that it can deliver significantly more heat exchange performance.

The control heat exchanger, on the other hand, is either used exclusively or in any case primarily to be part of the actual control.

[0017] An “arrangement in series” is to be understood within the scope of the invention that either a flow channel for the primary medium or for the secondary medium or for both leads first through one of the two heat exchangers and then through the other heat exchanger.

[0018] The invention makes use of the knowledge that the control heat exchanger is significantly less sluggish due to its smaller size than the main heat exchanger.

The temperature measurement is therefore carried out on the control heat exchanger.

The actuator can then influence the actual temperature conditions in the inlet to the tap significantly better.

[0019] With a suitable configuration, the proposed control system is able, for example, to ensure that no temperature peak can be measured when tapping hot water. With the same or a different suitable design, the control system can also be used very variably for different heat exchangers.

[0020] It is proposed that the control heat exchanger for the primary medium be arranged upstream of the main heat exchanger, preferably on a heating flow. In such a constellation, the hot primary medium first flows through the control heat exchanger and only then through the main heat exchanger. However, this has little influence on the heat exchange in the main heat exchanger, since the control heat exchanger has significantly less heat exchange performance as compared to the main heat exchanger. Advantageously, the control heat exchanger can be connected directly to the heating flow as the incoming primary medium.

[0021] Independently of this, but preferably in addition to this, it is proposed that the main heat exchanger for the secondary medium be arranged upstream of the control heat exchanger, specifically at a drinking water inlet. In such a constellation, the secondary medium to be heated flows in the form of the drinking water inlet first through the main heat exchanger and only then through the control heat exchanger. The control heat exchanger is therefore in the flow path of the heated drinking water from the main heat exchanger to the tap. The control heat exchanger can therefore rely on very accurate measured values for the temperature.

[0022] The primary medium and the secondary medium preferably flow through the two heat exchangers connected in series in a counterflow direction.

[0023] It has already been pointed out that the main heat exchanger should have a significantly greater heat exchange capacity than the standard heat exchanger. Specifically, it is proposed that the heat exchange capacity of the main heat exchanger should be more than 5, 10, 50, 100 or 500 times as large as that of the control heat exchanger.

[0024] The volumes that are made available for the medium for heat exchange also offer a good measure of the comparability of the two heat exchange performances. It is proposed that a main heat exchanger volume for the secondary medium in the main heat exchanger is also larger than a control heat exchanger volume for the secondary medium in the control heat exchanger, preferably more than 5, 10 or 50 times as large.

[0025] The control heat exchanger can be connected to a heating flow in order to provide the primary medium. Residential or commercial buildings are usually heated. Hot water is transported from a central boiler to the radiators. The path from the boiler to these radiators is called the "heating flow". If the control heat exchanger is connected to the heating flow, it can not only fall back on the primary medium heating device on the central heating boiler, which makes an additional heating device superfluous, but the hot primary medium will usually always be in contact with the control heat exchanger.

[0026] The control heat exchanger preferably feeds an apartment heating circuit flow. The heating flow from the boiler usually leads to the radiators in a building. For example, there may be several apartments there. Each apartment has its own heating circuit, i.e. the heating water supply system, which leads to the individual radiators in the apartment and back from there. The same naturally also applies to single-family houses, parts of houses, offices and other buildings or parts of buildings. When the control heat exchanger feeds a heating circuit flow, it at least partly leads the hot primary medium further into the heating line system, which leads to the individual units, that is to say to a heating circuit flow or to different heating circuit flows.

[0027] The control heat exchanger can easily branch off from the heating flow of hot water as the primary medium precisely when hot water is requested at a tap. A heating system is very sluggish. This is mainly because the radiators are warming up. If there is a drop in temperature for a short period of time in the inflowing heating water to the heating circuit flow, i.e. in principle to the individual radiators, this will normally not be detectable on the radiators. During a dispensing process, it can therefore be easily tolerated if the heating circuit flow is provided at a lower speed and / or at a a slightly lower temperature is passed through the heating circuit.

[0028] If hot primary medium is anyway present at the control system proposed herein, then it is proposed that a bypass be provided for the primary medium so that a leakage current can flow through the control heat exchanger from the primary medium even when the actuator is closed. While hot water is not being drawn off at the tap, the hot water is normally present at the control heat exchanger. If there is no flow of the hot water as the primary medium through the control heat exchanger, it can either heat up too much or even cool down too much, including the water directly in front of it. A bypass for the hot primary medium provides help. A bypass allows a leakage current to flow even when the control heat exchanger is closed, or when the actuator is closed. The negative effects of the standing primary medium on the control heat exchanger are therefore either not to be expected or at least only to a limited extent.

[0029] A leakage current can be passed through the control heat exchanger, for example. Alternatively or cumulatively, it is conceivable for a leakage current to be bypassed around the control heat exchanger. This would at least lead to the primary medium being present at the temperature to be expected at the inlet of the control heat exchanger.

[0030] In a preferred embodiment of the proposed control system, the primary medium and the secondary medium are connected in counter current to one another both in the main and in the control heat exchanger. Both in the main and in the control heat exchanger, the greatest temperature differences between the two media, occur both at the inlet and at the outlet, supporting the heat exchange.

[0031] In purely constructive terms, it is proposed that the control heat exchanger be designed coaxially. This means that in any case two flow channels are formed in the control heat exchanger, namely a first flow channel for the primary medium and a second flow channel for the secondary medium. These are at least partially led around each other so that both have an axis. An axis can arise not only in the case of a linear flow guide, but also in the case of a spiral-like flow guide, for example.

[0032] With regard to the axes of the two flow channels, it is proposed that these are coaxial. In a simplest design example, the two flow guides are each designed as a straight cylindrical tube, one tube being arranged inside the other tube. In this case, if the inner, smaller pipe runs in the larger pipe, ideally in the middle, the two flow guides are coaxial.

[0033] It should be expressly pointed out that even a mathematically not exact coaxial arrangement realizes this inventive concept, provided that only one tube runs inside the other tube. The heat exchanger then may be built very compact and at the same time highly efficient.

[0034] A separation of primary to secondary medium within the control heat exchanger can be single or multi-walled.

[0035] Also in purely constructive terms, it is proposed that a primary medium connection and / or a secondary medium connection be designed to be adjustable in their orientation on the control heat exchanger, preferably rotatable.

It has already been mentioned that the control system proposed here can be used very variably for different heating and water systems if suitably designed. If the connections on the control heat exchanger can be adjusted in their orientation, even the smallest installation spaces are sufficient to mount the control heat exchanger, even if a main heat exchanger was already available in the system. It is then also possible to effect the connection with as few additional line pieces as possible.

[0036] The "rotatable" configuration is particularly useful when the control heat exchanger essentially has a cylindrical body.

[0037] With regard to the temperature measurement in the control system, it is proposed that the temperature sensor be arranged in a secondary medium guide, preferably in the control heat exchanger, and that - in any case - the throttle is set up to open the actuator when a lower hysteresis temperature is reached, and the actuator is closed close when an upper hysteresis temperature is reached.

[0038] The temperature sensor makes sense in the secondary medium guide simply because the control system has the task of ensuring a uniform temperature at the tap, the tap representing an end of the secondary medium guide. When measuring the temperature in the secondary medium guide, the water that flows to the tap is measured.

[0039] This is preferably done in the control heat exchanger. The control heat exchanger is set up so that the secondary medium flows through it. It has already been explained that the control heat exchanger is preferably arranged downstream of the main heat exchanger for the secondary medium, so that the water has already passed through the main heat exchanger on the way to the tap. The temperature to which the main heat exchanger has brought the secondary medium can thus be measured. The heat exchanger performance of the control heat exchanger is clearly subordinate to that of the main heat exchanger. The control heat exchanger will therefore no longer have any notable influence on the temperature generated by the main heat exchanger in the secondary medium. Therefore, in a compact and very robust embodiment, the temperature of the secondary medium can be measured in the control heat exchanger.

[0040] Depending on the constellation of the entire control system, the temperature deviation by which the secondary medium leaves the control heat exchanger after the temperature measurement can be set.

[0041] The control heat exchanger preferably has an adjustable thermostat device. Such a thermostat device should be attached to an outlet on the control heat exchanger for the secondary medium, so that the temperature at which the secondary medium normally leaves the control heat exchanger and thus the entire control system can be adjusted with simple means.

[0042] It is proposed that the control heat exchanger be insulated, while the main heat exchanger is preferably not insulated.

[0043] The control heat exchanger should preferably be housed in a large insulating block together with pipe sections and the actuator for the main heat exchanger.

In a compact embodiment, this can be placed as a whole on the main heat exchanger and then connected to it.

[0044] The main heat exchanger itself is preferably not insulated. Due to the combination with the control heat exchanger, insulation is not particularly necessary if the hot primary medium only flows through the heat exchanger when the secondary medium is actually being drawn off.

[0045] In addition, heat radiation after the end of the plug may be desirable so that the primary medium and secondary medium can cool down quickly in the main heat exchanger, because this reduces calcification of the exchanger surfaces. With a constantly elevated temperature, the risk of rapid calcification of exchanger surfaces in the main heat exchanger increases.

[0046] According to a second aspect of the present invention, the object is achieved by a control heat exchanger for a control system as described above.

[0047] The control heat exchanger as such already represents an embodiment of the invention. In particular, it is possible to distribute and install the control heat exchanger even for existing domestic water systems for retrofitting.

[0048] In the case of an existing main heat exchanger, a control system as described above is obtained by skilful addition of a suitable control heat exchanger.

[0049] Accordingly, according to a third aspect of the invention, the objective is achieved by a method for retrofitting a building and / or an apartment with a control heat exchanger, a suitable control heat exchanger being connected in addition to a main heat exchanger, namely upstream with respect to a primary medium at the heating flow and downstream with regard to one secondary medium to be heated upstream of a tap.

[0050] The "main heat exchanger" may previously have been the only heat exchanger. However, it is also conceivable that several heat exchangers were already present.

Finally, the object is achieved according to a fourth aspect of the invention, a method for providing a secondary medium heated by means of a primary medium at a tap, with a main heat exchanger, a control heat exchanger and with a throttle with a temperature sensor and an actuator, wherein

a. before a dispensing process, i.e. with the secondary medium stationary,

i. in the control heat exchanger a control heat exchanger volume of the secondary medium is kept between a lower and an upper hysteresis temperature by means of the primary medium,

ii. while preferably no flow through the main heat exchanger is permitted,

b. and / or at the beginning and during the dispensing process, that is to say at a volume flow of secondary medium predetermined by a dispensing point,

i. first the control heat exchanger volume of the secondary medium is led to the tap, followed by a secondary medium flow first through the main heat exchanger and then through the control heat exchanger,

ii. the lower hysteresis temperature is detected on the control heat exchanger by the temperature sensor with a generally cooler secondary medium flowing in,

iii. then the throttle opens the actuator until the upper hysteresis temperature is measured, iv. then the actuator closes the actuator until the lower hysteresis temperature is measured, v. Steps iii and iv are followed continuously for control purposes,

c. and / or at the end of the dispensing process, ie when the secondary medium is stopped, i. the controller heat exchange volume of the secondary medium is heated to the upper hysteresis temperature within a few seconds when the primary medium flows,

ii. whereupon the throttle prevents the primary volume flow through the main heat exchanger via the actuator.

[0051] The invention is explained below using exemplary embodiments with reference to the drawing. It should be expressly pointed out that the exemplary embodiments described are only exemplary embodiments of the invention, in particular this applies to the embodiments in the drawing. The invention can also be implemented with small or large deviations from the exemplary embodiments described and in particular from the embodiments in the drawing. In addition, it is expressly pointed out that both in the above description text and in the example description, an indefinite article "a" is not to be understood as limiting in the sense of "exclusively one", but normally as "at least one", unless it is clear from the context shows that only "exactly one" object or step should actually be provided. In the drawing, the figures show:

Figure 1: a schematic section of a control heat exchanger,

Figure 2: a schematic circuit diagram shows the control heat exchanger of Figure 1 in a set-up as a control system, together with a shower as a tap, a boiler, a radiator and pipes,

Figure 3: the control heat exchanger from Figure 1 in a second, modified installation situation as a control system, in a schematic spatial view,

Figure 4: a control heat exchanger with fluid lines, mounted on a main heat exchanger, and

Figure 5: in a schematic circuit diagram - similar to the illustration in Figure 2 - one double-walled control heat exchanger in a third, further modified installation situation as a control system, the double-walled control heat exchanger being arranged in a bypass of a primary medium;

Figure 6: in a greatly simplified, schematic circuit diagram - in the form of a section similar to the illustration in Figure 2 - the control heat exchanger from Figure 1 in a fourth, differently modified installation situation, with a temperature measurement in a return of a primary medium,

Figure 7: in a schematic circuit diagram of a control heat exchanger in a fifth installation situation, with a temperature measurement in a return of the primary medium; and

Figure 8: in a schematic circuit diagram, a sixth installation situation in which an electrical after-heating is provided.

[0052] The control heat exchanger 1 in Figures 1, 2, 3, 4, 6, 7 and 8 has an outer shape which extends essentially along an axis 2. It is essentially cylindrical around axis 2.

[0053] A central duct 3 runs along axis 2 along control heat exchanger 1. This has a first opening 4a and a second opening 4b and an access opening 5.

[0054] An annular channel 6 runs around the central channel 3. The ring channel 6 has an upper opening 7a and a first lower opening 7b and a second lower opening 7c.

[0055] All openings are provided with pipe threads 8 (marked by way of example) for tightly screwing on connecting pieces (not shown).

[0056] The housing parts with the openings around the central axis 2 can be rotated via housing separations 9 (identified by way of example). In particular, the connections of an upper housing half 10 can be rotated relative to the connections of a lower housing half 11 about the central axis 2. Adequate sealing between the central channel 3 and the ring channel 6 is ensured at the housing separations 9 between the housing parts.

[0057] In the exemplary embodiment shown, the control heat exchanger consists of gunmetal with a wall thickness of approximately 3 mm. Alternatively, plug-in parts are conceivable, for example made of plastic, brass, stainless steel or gunmetal. The wall thickness is preferably less than 3 mm. Such a small wall thickness can best be achieved with plug-in parts.

[0058] An internal dimension of the central channel 3 is, for example, 18.3 mm.

[0059] An outer cylinder diameter 12 can be 50.3 mm, for example.

[0060] For example, all openings can have an inner diameter of 16 mm.

[0061] For the pipe thread 8, a size of ¾ "AG (preferably flat sealing) is suggested, i.e. a ¾ inch connection thread.

[0062] In the installation situation of the control heat exchanger 1 in Figure 2, it is the objective of the control system 13 to heat water from a drinking water inlet 14 on the way to a tap in the form of the shower 15.

[0063] For this purpose, the control system 13 accesses the boiler 16, which can also be regarded as belonging to the control system 13, because the boiler 16 generates a heating flow 17 for a heating system with a temperature of approximately 65 ° C. The heating flow 17 should lead to a heating circuit flow 18 to an apartment 19a with a radiator 19b. This is followed by a heating return line 20.

[0064] However, the control system 13 is essentially composed of the control heat exchanger 1 and a main heat exchanger 21 in the form of a plate heat exchanger.

[0065] A temperature sensor 23 is inserted in the control heat exchanger 1 with a screw cap 22, so that the temperature sensor 23 projects into the central channel 3 of the control heat exchanger 1. The measured temperature is sent to a throttle computer 25 via a data line 24. The throttle computer 25 has direct control access to an actuator (not shown).

[0066] During operation, no flow is initially observed when the tap 15 is closed. Since no hot water is requested from the shower 15, the throttle computer 25 does not allow any heating water to run through the main heat exchanger 21 via its actuator. The actuator can be attached to a first return 26. An actuator can connect to the heating return 20.

[0067] Heating water can flow on the way from the boiler 16 through the heating flow 17 to the upper opening 7a of the control heat exchanger 1. There it enters the ring channel 6 and flows through the control heat exchanger 1 from top to bottom. Since the throttle computer 25 keeps the first return 26 closed via the actuator, the heating water only exits into the heating circuit flow 18 to the apartment 19a, passes through the heating element 19b there and then again via the heating return 20 into the boiler 16 (last path section not shown).

[0068] Although the path via the main heat exchanger 21 is closed, hot heating water from the heating flow 17 flows through the control heat exchanger 1 if a radiator is in the heating circuit of the apartment 19a or any other apartment is in operation which is connected to the heating circuit after the control heat exchanger 1 at its second lower opening. The control heat exchanger 1 always remains heated in this way. In particular, the heating water present at it from the heating flow does not cool down.

[0069] The line system for the secondary medium, that is to say for the drinking water from the drinking water inlet 14 to the shower 15, however, contains the drinking water to be heated. It is not heated in the main heat exchanger because there is no hot heating water passing through the latter.

[0070] In the control heat exchanger 1, however, standing drinking water is heated within the central channel 3 by means of the heating water flowing in the ring channel 6. Since the central channel 3 is only very narrow and accordingly is filled with little drinking water, this drinking water volume heats up within a few seconds.

[0071] The temperature sensor 23 detects that the drinking water standing there has assumed a temperature of, for example, 47 ° C. If - for example via a thermostat adjuster (not shown) on the control heat exchanger 1 - a temperature of 45 ° C is desired for the drinking water, the throttle computer 25 can also prevent the flow of the heating water from the heating course 17 through the control heat exchanger 1.

[0072] If the heating element 19b requests heating water from the boiler 16 at the same time, a connecting pipe (not shown) is provided which ensures the flow of heating water directly from the heating flow to the heating circuit flow 18.

[0073] During this phase, i.e. while the drinking water is standing in the secondary medium circuit, the control system 13 ensures that the drinking water does not heat up above 47 ° C, even in the control heat exchanger 1 if a temperature of 45 ° C, is desired.

[0074] It goes without saying that these temperature values are only examples. A temperature other than the desired temperature can easily be set on the thermostat.

[0075] Regardless of this, the size of the control hysteresis can be set to a value other than +/- 2 °C.

[0076] As soon as the drinking water in the central duct 3 of the control heat exchanger 1 cools down when the heating water is at a standstill, it deviates from a temperature of 47 ° C and surpasses the actually desired temperature of 45 ° C. At, for example, 43 ° C, the throttle computer 25 can again allow a heating water flow through the ring channel 6. Within a few seconds, the drinking water in the volume there is then warmed up again to the upper control hysteresis value, and the throttle computer 25 closes the flow of heating water again.

[0077] If water is now drawn off from the shower 15, it flows from the drinking water inlet 14 through the main heat exchanger 21 and the control heat exchanger 1 to the shower 15. However, the shower 15 is first reached by the water that was already in the control heat exchanger 1, more precisely in its central channel 3, the heat also extending to adjacent areas 27, 28. Warm water therefore arrives at the shower 15 at a very precise temperature. Ideally, the temperature is hit exactly. However, the user at the tap will not be able to notice a very slight difference in temperature.

[0078] In any case, it is ensured that an excessive hot water temperature peak when tapping - combined with the risk of scalding - is avoided.

[0079] After the drinking water which has already been heated when standing in the control heat exchanger 1 has flown off to the shower 15, a very small amount of cooler water is initially fed in by the main heat exchanger 21. However, this is remedied immediately because the temperature sensor 23 detects this drop in temperature and the throttle computer 25 then permits the passage of the heating water through the main heat exchanger 21 to the required extent. The inflowing drinking water is therefore very quickly heated to the temperature desired in the shower 15. The heating takes place to a very substantial extent in the main heat exchanger 21. Because the heating water initially flows through the control heat exchanger 1, very little reheating takes place in the control heat exchanger 1. However, the drinking water has a very high flow rate there because the central channel 3 is quite small. The reheating in the control heat exchanger 1 is therefore practically negligible, and it is also detected by the temperature sensor 23, because this is exactly located in that area in the control heat exchanger 1.

[0080] As soon as hot water is no longer drawn off in the shower 15, the drinking water stands again in the control heat exchanger 1, and as a result heats up to the upper control hysteresis value within a few seconds. The throttle computer 25 then closes the flow of the heating water through the control heat exchanger 1 and the main heat exchanger 21. This means that the originally described state is reached again.

[0081] In the alternative control system 29 in Figure 3, the same control takes place as described above. However, while in the control system 13 described initially, the primary medium (heating water) and the secondary medium (drinking water to be heated) run in counter-current both in the control heat exchanger 1 and in the main heat exchanger 21, the alternative control system 29 for the control heat exchanger 1 runs through in the same direction, namely from top to bottom in the examples shown. Nevertheless, the control heat exchanger 1 can be constructed identically.

[0082] A controller 30 can be attached directly to the control heat exchanger 1, specifically to the temperature sensor 23 there. The control hysteresis or the detection accuracy of the controller 30 can be, for example, +/- 2 ° C.

[0083] A thermostat insert 31 can be provided, for example, at a lower end of the control heat exchanger 1. In any case, it makes sense to place the thermostat insert where a pipe leads the drinking water to be heated to the tap. A thermostat insert can, for example, specify a control range from 35 ° C to 60 ° C. In the installation situation in Figure 4, an exemplary control heat exchanger 32 is provided with thermal insulation 33.

[0084] A heat insulation shell 35 is placed on a main heat exchanger 34. Connections for drinking water 36 and for a primary heating flow 37 are present as well as a ZL connection 38 and connections for a primary heating return 39, a secondary heating flow 40 for an apartment heating circuit and a continuation 41 of the primary heating flow 37 after passing through the exemplary control heat exchanger 32 to the main heat exchanger 34 and from there via a line 42, on which an actuator 43 takes action, to the primary heating return.

[0085] In the installation shown, the heating water is essentially guided on a left side 44. This increases the clarity when connecting the control system.

[0086] In the installation shown, tapping is carried out via an outlet 45 for hot drinking water.

[0087] A control heat exchanger can, for example, be mounted directly on the heat exchanger, as shown in Figure 4. Alternatively, it is readily conceivable for the control heat exchanger to be mounted elsewhere or on a base plate.

[0088] It is expressly emphasized that the flow can also flow through the control heat exchanger in the opposite direction, and thus also realizes the invention.

[0089] The double-walled control heat exchanger 50 in the third, further modified installation situation 51 in Figure 5 essentially consists of a housing 52 with a central channel 53, a safety ring channel 54 arranged around it and a media ring channel 55 surrounding it radially on the outside. A first connection 56 lies in an upper region of the housing 52, a second connection 57 lies in a lower region of the housing 52. The first connection 56 and the second connection 57 are connected directly to the outer media ring channel 55 by a housing wall 58.

[0090] An end cover 59 seals the central channel 53, the safety ring channel 54 and the media ring channel 55 downward. For this purpose, O-ring-shaped seals 60 (identified by way of example) are provided between the housing 52 and the end cover 59.

[0091] The end cover 59 is pulled tightly against the seals 60 and the housing 52 by means of a thread (not shown) when the end cover 59 is screwed on.

[0092] Connection piece 61 is provided for the central channel 53. This offers a feed 62.

[0093] At an upper end of the housing 52, the central channel 53 is sealed by a T-shaped connection piece 63, which is also connected to the housing 52 by a screw thread.

[0094] The T-shaped connecting piece 63 has a screw cap 65 at a straight end 64, which holds a temperature sensor 67 via a fixation 66, which runs through the entire central channel 53 to the lower end of the double-walled control heat exchanger 50. Its temperature measuring point 68 is located at its tip.

[0095] The safety ring channel 54 is provided between the central channel 53 and the outer media ring channel 55. This is open to the outside axially via a leak hole 69.

[0096] A primary heating flow 70 is divided at a T-piece 71 and leads from there on the one hand to a main heat exchanger 72, on the other hand the heating flow after a further division 73 is continued on the one hand as a divided primary heating flow 74 and on the other hand as a secondary heating flow 75.

[0097] A first capillary tube 76 is led from the divided primary heating flow 74 to the double-walled control heat exchanger 50. It opens into the media ring channel 55 via the first connection 56.

[0098] On the other side of the double-walled control heat exchanger 50, a second capillary tube 77 is led from the second connection 57 to a thermostatically controlled valve 78. This contains data about the temperature at the tip 68 of the temperature sensor 67 via a data line 79.

[0099] Downstream of the thermostatically controlled valve 78, a secondary heating return 80 is fed in again, so that ultimately a primary heating return 81 can be returned as a counterpart to the primary heating supply 70.

[0100] Finally, a drain connection 82 for hot drinking water to a tap 83 is provided from the T-shaped nozzle.

[0101] The principle of the double-walled control heat exchanger 50 in the third installation situation 51 is essentially comparable to the installation situation from Figure 2.

[0102] However, the double-walled design of the double-walled control heat exchanger 50 increases the drinking water safety, since there is not only one partition between the drinking water and the heating water.

[0103] In addition, the double-walled control heat exchanger - regardless of the increased safety for the drinking water - is connected to a bypass consisting of the first capillary tube 76 and the second capillary tube 77, so that the double-walled control heat exchanger 50 does not have to be flowed through with a full volume flow.

[0104] In the greatly simplified installation diagram in the fourth installation situation 90 in Figure 6, a single-walled control heat exchanger 91 is connected in such a way that a drinking water inlet 92 opens into an annular channel 93 at the top and is then guided to a main heat exchanger 95 at a drinking water outlet 94. There it can be routed to a tap 96 for hot drinking water.

[0105] A primary flow 97 leads in counter-current through the main heat exchanger 95 and then likewise in counter-current through a central duct 98 in the control heat exchanger 91.

[0106] A temperature measuring tip 99 for a thermostatically controlled valve 100 is arranged in the central channel 98.

[0107] If, during operation of the fourth installation situation 90, the drinking water flows through the control heat exchanger 91, for example at a temperature of about 10 ° C, this interacts in a known manner with the water from the primary flow 97, which, for example, can reach the main heat exchanger 95 at a temperature of 65 ° C.

[0108] In the main heat exchanger 95, for example, it can lose 30 ° C of its temperature during the heat exchange with the drinking water.

[0109] For example, only 30 ° C or 35 ° C can be measured at the temperature measuring tip. In the fourth installation situation 90, the temperature measurement takes place in a return of the primary heating flow.

[0110] Ideally, the primary hydraulic network may only break down when the set return temperature is differentiated. For example, this can be set to 30 ° C.

[0111] The fourth installation situation offers very high security for the hydraulic network in the primary system. There the exact temperature is measured.

[0112] In order to obtain reliable access to the hot water temperature at the tap 96, a mixing valve or a combination controller with two capillary tubes is preferably provided there and is automatically regulated. The capillary pipes can be connected to the hot drinking water and the primary return.

[0113] The control heat exchanger 1 in the fifth installation situation 110 in Figure 7 is in turn connected to a main heat exchanger 111.

[0114] A primary heating flow 112 initially leads through a first dirt trap 113 to a flow branch 114 with a first ventilation 115.

[0115] There, the primary heating flow 112 branches on the one hand into a secondary heating circuit 116, and on the other hand into a control and heating circuit 117.

[0116] The hot heating water from the primary heating flow 112, which is fed into the secondary heating circuit 116, feeds a secondary heating flow 118 there in a conventional manner and, after flowing through the radiators, which are kept in an apartment, for example, through a secondary heating return 119 through a second strainer 120 on one zone valve 121 on a second ventilation 122 via a fitting piece 123 back to a primary heating return 124.

[0117] Two ball valves 125 (numbered as an example) are shown as examples of the radiators.

[0118] The zone valve 121 has, for example, an adjustable Kvs value in the range between 0.06 and 0.9. For example, it is preset to 0.5.

[0119] The adapter 123 is designed, for example, as an adapter WMZ 110 mm x ¾".

[0120] Within the control and heating circuit 117, the primary heating flow 112 is initially guided along a corner valve 126. The corner valve 126 is not a mandatory part of the invention in other installation situations, but is provided here in terms of construction.
For example, it is a corner valve 126 with a TM insert and a Kvs value of 3.5.

[0121] After the corner valve 126, the primary heating flow 112 is led to the main heat exchanger 111. This can be, for example, a copper-brazed stainless steel plate heat exchanger with an insulating shell (not shown).

[0122] After passing through the main heat exchanger 111, the primary heating flow 112 becomes the primary heating return 124. As such, it first flows through a first connecting line 127, which leads from an outlet of the main heat exchanger 111 to a heating return inlet connection 128. This merges into a central channel 129. A temperature sensor 130 with a measuring tip 131 is provided therein. The measuring tip 131 is located approximately in the middle of the central channel 129. It therefore measures the temperature of the primary heating return 124 within the control heat exchanger 1.

[0123] The corner valve 126 is regulated via the temperature sensor 130.

For example, it can have a control range from 20 ° C to 50 ° C and, in the present example, can be set to a control temperature of 28 ° C. The control temperature can be adjustable.

[0124] A first capillary tube 132 connects the temperature sensor 130 to the actual controller at the corner valve 126, whereby either the data from the temperature measuring tip 131 or, for example, only a control current is passed through the first capillary tube 132.

[0125] After passing through the central channel 129 in the control heat exchanger 1, the primary heating return 124 passes through a thermosiphon 133 and is guided from there to the secondary heating return 119 flowing back and to the adapter 123.

[0126] Cold drinking water 134 from a drinking water supply flows into the control and heating circuit 117 initially along an optional second fitting piece 135, for example designed as a fitting piece KWZ 110 mm x ¾".

[0127] At a drinking water branch 136, a line 137 to be heated leads to the control heat exchanger 1 and there to a first connection 138.

The first connection 138 is located at a lower end of the control heat exchanger 1, near the outlet of the central channel 129, opposite to the tap water inlet connection 128 of the primary heating return 124.

[0128] At the same end 139 of the control heat exchanger 1 there is a first outlet 140 for the drinking water 134, from where the drinking water 134 leads directly to a cold-water supply 141 to, for example, an apartment without heating.

[0129] At the opposite end of the control heat exchanger 1 there is a second outlet 142, from which a second connecting line 143 leads to the main heat exchanger 111.

After passing through the main heat exchanger 111, there is a hot water line 144 for the drinking water to be heated from the second connecting line 143, which leads to a temperature mixing agent 145. The temperature mixing agent 145 can be, for example, a T-Mix valve, with a Kvs value of 1.2 m 3 / h, for a range from 35 ° C to 60 ° C.

[0130] The temperature mixing means 145 can mix water from the hot water line 144 or directly from the drinking water branch 136 in any ratio and feed into a drinking hot water line 146.

[0131] The supply line for drinking water 134, the cold water supply 141 for, for example, an apartment and the drinking hot water line 146 for the same apartment are each preferably connected via a ball valve with a DVGW certificate.

[0132] In operation of the fifth installation situation 110, the hot heating flow medium first flows through the main heat exchanger 111 and only then through the control heat exchanger 1, so that the return temperature for the hydraulic network can be measured very precisely in the control heat exchanger 1. This leads to the greatest possible security in the hydraulic network.

[0133] If, due to the heat transfer between the primary heating circuit flow 112 and the drinking water to be heated from the second connecting line 143, the hot water in the hot water line 144 is generated too warm, the desired temperature can be generated in the drinking hot water line 146 via the temperature mixing means 145.

[0134] A differential pressure controller 147 with, for example, a Kvs value of 2.5 / 0.1 bkr connects the control and heating circuit 117, which may be located in a home station, for example, to the secondary heating circuit 116. Such a constellation is also independent, but in particular in addition to the other features of an invention presented, is advantageous and is considered inventive. On the installation side, the differential pressure regulator 147, which has a second capillary tube 148, can be used to ensure that an unnecessarily high amount of heating water is not fed into a secondary circuit by manual intervention.

This means that manual incorrect operation can be anticipated on site and the hydraulic network is stabilized during operation.

[0135] The sixth installation situation 150 in Figure 8 is structured essentially like the fifth installation situation from Figure 7. However, an electrical post-heating station 151 is additionally provided on the way from the main heat exchanger 111 to the hot drinking water line 146.

[0136] General considerations, concrete descriptions and inventive approaches to an electrical station in the form of a hybrid heater can be found in the unpublished European patent application 11002499.9, filed on 25. March 2011 in the name of the same applicant. The entire disclosure content of this patent application is referred to here by way of referencing in such a way that the disclosure content there should also apply here as the content of the patent application.

[0137] A copy of the application documents is also submitted, whereby the "patent claims" there have been renamed "preferred collections of characteristics" in order to make it clear which claim version the local patent application is to use to begin the process.

[0138] The following temperature values can occur during operation of installation situation 150 as an example:

[0139] The cold drinking water has a temperature of 10 ° C. However, the construction variant presented also works with temperatures of up to 20 ° C or even 25 ° C.

[0140] Temperatures of approx. 50 ° C are entirely sufficient for the heating flow. The return flow from the secondary heating circuit is then approx. 30 ° C.

[0141] In the main heat exchanger 111, the primary heating flow gives off almost half of its approximately 50 ° C, for example the temperature in the primary heating return is 25 ° C to 28 ° C. This can be measured in the control heat exchanger 1.

[0142] The amount of energy given off by the primary heating flow in the main heat exchanger 111 can, for example, lead to a warming of the originally 10 ° C drinking water to about 40 ° C. The electric post-heater 151 can, for example, reheat the hot water to 60 ° C.

For example, one may consider a version with a throughput between 6 and 12 litres per minute. Exemplary electrical outputs for reheating would be as follows:

at 6 l / min approx. 8,0 KW

at 8 l / min approx. 11 KW

at 10 l / min approx. 13 KW

from 12 l / min approx. 16 KW

[0143] In other words, an exemplary aspect of the invention relates to a heat exchanger combination of a main heat exchanger and a control heat exchanger.

[0144] The main heat exchanger and the control heat exchanger have flow channels for a primary medium and a secondary medium, and these flow channels are connected in series. The control heat exchanger has a temperature sensor which is coupled via a control line to an actuator of the flow channel in the main heat exchanger. The control heat exchanger has a much lower inertia than the main heat exchanger.

[0145] As soon as primary medium is passed through the control heat exchanger and a switching point of the temperature sensor, the temperature sensor causes the control medium to open in the main heat exchanger via the control line. This means that the primary medium flows through both the main heat exchanger and the control heat exchanger connected in series. Thermal energy is transferred from the primary medium to the secondary medium. The secondary medium in the control heat exchanger is heated or cooled and the switching threshold of the temperature sensor is reversed. The control element in the main heat exchanger is now closed or throttled via the control line until a steady state occurs.

[0146] The actuator in the main heat exchanger is located on the outlet side of the primary medium. If the primary medium is a heating medium, it flows through the main heat exchanger from bottom to top. Surrendered, it flows through the control heat exchanger from top to bottom. The control heat exchanger is connected upstream of the main heat exchanger with regard to the primary medium, so that warm primary medium first reaches the control heat exchanger. Regarding the secondary medium, the control heat exchanger is arranged in series behind the main heat exchanger.

[0147] When a tap for primary medium is opened, cold secondary medium flows from the main heat exchanger through the control heat exchanger. Since the heat transfer in the control heat exchanger in the flowing secondary medium is not sufficient to heat the secondary medium, the temperature sensor detects that the set temperature has fallen below and controls the actuator in the primary channel of the main heat exchanger. The secondary medium flowing through the main heat exchanger is then heated. If the tap is closed, the primary medium heats the secondary medium in the control heat exchanger above the set target value, whereupon a temperature sensor closes the actuator of the primary medium channel.

[0148] According to a further development, the bypass heat exchanger can run a bypass parallel to the main heat exchanger, which allows a very low primary medium flow. This measure serves to keep the control heat exchanger at a temperature when the tap in the secondary circuit is closed, without the actuator in the main heat exchanger for the primary duct having to be opened again and again.

[0149] The control heat exchanger may be coaxial. The housing parts can be rotated in such a way that the inlets and outlets for the primary medium can be rotated in different directions to facilitate connection to different lines. The primary medium-carrying pipe can also be provided with outer ribs for better heat transfer, so that a larger area is available for the heat transfer.

[0150] In addition, the two other drawings show two further circuit diagrams which may be within the scope of the invention. It is disclosed as an independent aspect that a cold-water return is always routed through the controller heat exchanger, preferably only through a small path there, so that there is regularly a short start-up.

Appendix:

[0151] Other aspects that can be combined with the aspects of the invention described above relate to a method for heating drinking water and making it available as hot drinking water, a building services system, set up to carry out such a method, a home station and a building or a multi-building complex.

[0152] Depending on the location and the season, drinking water can be drawn from a building at a temperature of usually between 10 ° C and 15 ° C.

[0153] Various measures are known for heating the cold drinking water to hot drinking water so that it has hot drinking water temperature.

[0154] Central heating systems are also known as part of building technology. Starting with central heating, a primary heating flow leads to the individual apartments. There, the heating water from the primary heating flow is used in a primary heating temperature to feed a secondary heating flow, i.e. the flow through the radiators in the apartment. When used, the heating water emits thermal energy and flows back to the central heating in a cooler primary heating return temperature via the primary heating return.

[0155] The objective of the invention described below is to develop a very effective system for heating drinking water.

[0156] According to a first aspect of the invention, this objective is achieved by a method for heating drinking water and providing it as hot drinking water with a hot drinking water temperature in an apartment, using a primary heating flow and a primary heating return, heating water being conveyed from a central heating system via the primary heating flow in a primary heating flow temperature to the apartment and after Use in a cooler primary heating return temperature is conveyed back to the central heating via the primary heating return, whereby the heating water and the heating of the drinking water take place in a home station, whereby two complementary heating levels of different principles for heating the drinking water are provided in the home station, namely one using water -Water heat exchanger and one using an electric reheater.

[0157] The term is first to be explained that in the context of the present invention described here and from here on, an “apartment” does not necessarily have to be a building unit that is actually used for living by one or more people. Rather, an apartment is understood to be a building unit that is individually delimited from a central building structure. So it may be an apartment, but just as well may be an office or a shop or even an independent building, which is combined with other parts of the building to form a multi-building complex with regard to building services.

[0158] For the sake of simplicity, the term "apartment" is used throughout in the following description, without listing the other variants in each case.

[0159] A "home station" refers to a related house technology installation area, for example at a location provided for this purpose for merging the installations within an apartment with the installation outside the apartment for central heating.

[0160] If there are several apartments, there will usually be several home stations, namely exactly one per apartment.

[0161] The inventor has recognized that a method as proposed in the first aspect of the invention can result in a very efficient use of energy. The desired hot drinking water temperature can always be reliably provided from variable conditions, for example from sliding heating flow temperatures, because of the electrical post-heater.

[0162] Also, by means of the electrical post-heating, especially in the case of a control or regulation, whereby for the sake of simplicity only one “control” is spoken of in the context of the description here, but both should be understood to mean the possibly otherwise missing energy when the heating flow temperatures are too low especially in the transition period or in summer.

[0163] In order to heat the drinking water to hot drinking water temperature, it is conceivable that, as the first heating stage, the drinking water in the water-water heat exchanger is partially heated, and as the second heating stage on the sanitary side of the water-water heat exchanger, the partially heated drinking water is reheated to hot drinking water temperature by means of the electric reheater.

[0164] A part of the building services installation which is directed from the water-water heat exchanger to the apartment, that is on the opposite side of the central heating, is to be understood as "sanitary side".

[0165] Alternatively, to heat the drinking water, it is possible to reheat the heating water from the primary heating flow using the electric post-heater as the first heating stage and to heat the drinking water in the water-water heat exchanger to the hot drinking water temperature in the water-water heat exchanger using the reheated heating water as the second heating stage.

[0166] Alternatively, it is also conceivable to heat the drinking water by heating the heating water originating from the primary heating flow as the first heating stage by means of the electric post-heater, then partially heating the drinking water on the sanitary side of the electric post-heater in the water-water heat exchanger by means of the post-heated heating water and as a third Heating level, the partially heated drinking water on the sanitary side of the water-water heat exchanger is reheated to drinking water temperature by means of an additional electric post-heater.

[0167] It should be expressly emphasized that in the context of the present application, undefined numbers are to be understood as "at least" data, unless it is found in individual cases "exactly" this number is meant. A number mentioned "exactly" is to be understood in each case as a preferred embodiment.

[0168] As an example of this, the required number of two heating levels also includes the variant with three heating levels presented here.

[0169] The above exemplary embodiment variants of the first aspect of the invention all enable optimized energy supply from the heating side in order to achieve heating return temperatures that are as cold as possible. This is not only advantageous because little heat energy is then released in the heating return. An existing heat pump also works particularly well if the temperature in the heating return is as low as possible.

[0170] At the same time, the energy supply from the electrical side to the after-heating can be optimized in order to reheat only at the amount of energy that is really required to achieve the desired hot drinking water temperature.

[0171] As a result of the fact that an electric reheater is available, energy can be made available for hot water preparation without a lead time.

[0172] In all design variants and in further design variants of the invention according to the first aspect mentioned here which are not expressly mentioned, hot waste water can be passed through a recovery heat exchanger in order to recover thermal energy from the hot waste water and to contribute with the recovered thermal energy to heating the drinking water, the hot waste water in particular by mentioned water-water heat exchanger can be performed in the home station.

[0173] In such an embodiment of the method or a home technology system corresponding to it, the heat which otherwise flows unused is at least partially recovered and used again.
Such a method is particularly useful when hot waste water from a shower or sink is used. Alternatively or cumulatively, washing machines, washer-dryers, water drains from roofs that heat up under the sun or dishwashers, etc., can each provide warm waste water for heat recovery.

[0174] The primary heating flow temperature can preferably be kept between approximately 38 ° C and a maximum of approximately 60 ° C, in particular at a constant temperature. However, the system is particularly good at handling shifting primary heating flow temperatures. Above all, these can be within the temperature range mentioned.

[0175] The primary heating return temperature is preferably as low as possible, especially between 20 ° C and 45 ° C, in particular between about 25 ° C and about 35 ° C, whereby the primary heating return temperature can be variable. The proposed method and the corresponding house technology system are so flexible that they can easily deal with a variable primary heating return temperature. It therefore makes little sense to use an excessive, complex control system in order to achieve the most uniform possible primary heating return temperature.

[0176] It is proposed that while the method described above is being carried out, a consumption and status variable is carried out, the determined consumption and status variables being transmitted from the home station to a controller for the central heating.

[0177] With such a feedback, the control of the central heating can adapt all values as best they can be calculated from the determined consumption and state variables. The control can iterate itself to an ideal value because it can compare the set target values with measured actual values.

[0178] In addition, hot drinking water, cold drinking water and heating consumption can be easily recorded in a central control. This simplifies billing with the owners of the individual home stations.

[0179] The decentralized stations can be linked to the heating central by means of a data exchanger with regard to the consumption of hot drinking water, drinking water, heating flow temperature, heating return temperature, electrical post-heating, volume flows, etc.

[0180] The final energy consumption for each individual apartment can also be determined quite easily from these values.

[0181] Overall, the network connection to the central heating system enables a self-adapting building. The control technology can be programmed intelligently so that it can learn under certain given conditions, especially with regard to the outside temperature and the season. In addition, the controller can preferably access energy prices, for example for oil or gas prices and, for example, for the current feed-in prices for electricity obtained from solar cells into the power grid.

[0182] The controller can decide how it generates or supplies locally regenerated electricity or locally regenerated hot water. In this way, regenerative technologies are combined in a previously unknown advantageous manner.

[0183] In addition to the electrical post-heater, another post-heater can be connected to the home station. In this way, different performance classes for hot water production can be generated modularly.

[0184] If a servomotor is used in front of a controller, hydraulic balancing can be influenced very well. This makes it possible to have only a maximum envisaged amount of energy fed into the apartment. Even if - as is often the case in the case of private apartments - a resident asks a technically responsible person, for example the caretaker, to increase the quantity, he cannot override the electronic regulation.

[0185] This also applies if the proportion of solar power is increased anyway and sufficient energy is available. Because the heating flow due to the multi-stage heating of the drinking water can be low, for example at 45 ° C, a fairly high proportion of solar power can be used. For example, temperatures around 40 ° C can be provided quite regularly by a solar collector.

[0186] As an alternative or cumulatively to the first aspect of the invention described above, the objective set here, according to a second aspect of the invention described here, solves a method for heating drinking water and providing it as hot drinking water with a hot drinking water temperature in an apartment, warm water being taken up and discharged below a tap for hot drinking water where two complementary heating stages of different principles are provided for heating the drinking water, namely one by means of a recovery heat exchanger and one by means of an electric post-heater, with the discharged hot waste water being used for use by the recovery heat exchanger as the first heating stage for thermal energy to recover the hot waste water and to partially heat the hot drinking water with the recovered thermal energy, whereupon the second heating stage on the sanitary side of the recovery heat exchanger the partially heated drinking water is reheated to the hot drinking water temperature using the electric reheater.

[0187] Conceptually, with regard to this aspect, it is explained that instead of the heating water or in addition to the heating water, hot waste water collected below a tap is used as an energy source, for example shower waste water.

[0188] Both heating stages are preferably carried out in one home station.

[0189] In a preferred embodiment, the hot waste water is conducted through the water-water heat exchanger already described in the first aspect of the invention in the home station.

[0190] It is then proposed that the hot waste water be given preference over other flow. Hot waste water is not always produced. Whenever it arises, the inflow of heating water can therefore be reduced or stopped as long as energy can be recovered from the discharged hot waste water.

[0191] According to a third aspect of the invention, the object is achieved by a domestic (house) technology system which is set up to carry out one of the above-described methods or more of the above methods and further - sometimes also one-stage - heating methods, the home station being able to be arranged in the apartment on the residential side or on the heating side of a transfer point.

[0192] In both cases, the home station can be made very compact and, for example, can be accommodated in an existing shaft.

[0193] The home station can be surrounded by a housing. This is the preferred design. In this case, the connections can be labelled very well, and the entire system can be installed and maintained in a very compact manner.

[0194] A connection option for a secondary heating circuit can be provided at the home station, in particular leading through the home.

[0195] It is proposed that a controller capable of learning be provided in the building services system, preferably also within the housing.

[0196] In a house technology system with several apartments, it is proposed that a plurality of decentralized home stations be provided, preferably one home station per apartment.

[0197] According to a fourth aspect of the invention, the objective is achieved by a home station with a housing, a water-water heat exchanger, an electrical reheater, a controller and with connections, so that the house technology system described above can be set up.

[0198] According to a fifth aspect of the invention, the object is achieved in a residential, office and / or commercial building or multi-building complex with a house technology system described above and / or with a plurality of home stations as described above, the apartments being either uniform or non-uniform as private inhabited apartments, can be set up as offices or as shops.

[0199] Finally, it is proposed to retrofit a residential, office and / or commercial building or a building complex with a building services system as described above, a circulation line provided on site being used and converted for retrofitting.

[0200] The invention described here is explained in more detail below on the basis of some exemplary embodiments with reference to the drawings. Therein is shown:

Figure 9: a table with exemplary values,

Figure 10 schematically a home station in a first variant,

Figure 11 schematically a home station in a second variant,

Figure 12 schematically a home station in a third variant,

Figure 13 schematically a home station in a fourth variant and

Figure 14a, 14b schematically a home station in a fifth variant with a small modification.

[0201] The table in Figure 9 shows the proportions of thermal and electrical components that can be used for hot drinking water preparation in summer and in winter. A trend over the months with the shifting heating flow temperature was not taken into account in order to simplify the representation.

[0202] The first column describes the line content. The second column describes the units.

[0203] A small dispensing quantity is requested in each column, namely, for example, 12 l / min. In the 4th and 6th column, on the other hand, a higher dispensing volume, namely 15 l / min, is required.

[0204] In the 3rd and 5th column, the hot drinking water should be heated to 42 °C, in the 5th and 6th column however to 45 °C.

[0205] The heating flow in summer was assumed to be 38 ° C, the heating flow in winter was 56 ° C.

[0206] Mathematically, the invention shows that there is no need for electric heating in winter because the primary heating flow is set at 56 ° C in winter. This is true even though a very high hot drinking water temperature is required.

[0207] In summer, however, the rather low hot drinking water temperature of 35 ° C is reached with the two-stage heating. It is heated electrically.

[0208] The domestic technology system is set up for both DHW (domestic hot water, i.e. hot dirnking water) heating with one stage and DHW heating with two stages. The control switches the heating levels as required.

[0209] The lowest desired buffer temperature should be between 20 ° C and 35 ° C. This value can normally only be reached reliably in summer. With increasing heating load requirements, the return temperature is largely dependent on the design of the heating surfaces. Further, the hydraulic adjustment can be carried out optimally and monitored via the hybrid home station and, if necessary, closed via an actuator.

[0210] The best possible thermal insulation of the flow line should be provided to prevent undesired cooling.

[0211] An exemplary calculation method for determining the table in Figure 9 is added as Figure 9 '.

[0212] In the home station shown schematically in Figure 10, a plurality of connections is present in a housing (not shown).

[0213] A primary heating flow 1 leads to a distribution line 2 within the home station 3. On the one hand, this leads to a secondary heating flow 4, which can feed heating water that has been used again into the home station 3 via a secondary heating return 5.

[0214] The secondary heating circuit can be connected optionally. It is designed as an injection circuit 6 and has a pump 7, a two-way valve 8 and a bypass 9 with a check valve 10.

[0215] All controllable components of the home station 3 and all sensors are connected to an electrical controller 11 via electrical cables 12 (identified by way of example).

[0216] Among other things, temperature sensors 13 (identified by way of example) are arranged in the inlet from the primary heating flow 1 to the home station 3.

[0217] A volume flow meter 15 is arranged in the primary heating return 14.

[0218] The inflow to the primary heating return 14 is determined by a three-way valve 16.

[0219] A voltage source (17, 18) is connected on the one hand to the controller 11 and on the other hand to an electric instantaneous water heater 19.

[0220] A drinking water source 20 leads along a volume flow meter or flow switch 21 to a heat exchanger 22.

[0221] From there, a line 23 for partially heated drinking water leads through the electric instantaneous water heater 19 to a hot drinking water tap 24.

[0222] A circulation pump 25 with a check valve 26 is optionally connected.

[0223] In the operation of the home station 3, a decentralized hot water preheating in the flow via the central heating and the heating water originating from the primary heating flow 1 is achieved in the water-water heat exchanger 22. The heating water used and cooled in this way then flows - regulated by the three-way valve 16 - back to the primary heating return 14.

[0224] For this purpose, the water is fed from the secondary heating return 5 when the secondary heating circuit is connected.

[0225] The cold drinking water from the drinking water source 20 is thus partially heated in the water-water heat exchanger 22 and is then passed through the line 23 for the partially heated drinking water through the electric water heater 19. There it can be electrically heated and then removed at the tap 24 for hot drinking water at the desired temperature.

[0226] In the second variant shown in Figure 11, decentralized hot water production takes place in the flow through the central heating. The central heating temperature for hot water preparation or for higher heating operation is reheated via an electric instantaneous water heater 19 on the heating side 30 of the water-water heat exchanger 22. In the second embodiment variant, heating on an apartment side 31 of the water-water heat exchanger 22 is no longer electrical. Rather, the heating water in the primary heating flow 1 is brought to such a high temperature by the electrical instantaneous heater 19 arranged there, which then functions as an electrical reheater, that the heat transfer performance in the water-water heat exchanger 22 is already sufficient to remove the cold drinking water from the drinking water source 20 without further electrical reheating to the desired temperature at the tap 24 for hot drinking water.

[0227] The increase in temperature in the primary heating flow 1 is followed by two temperature sensors 13 (numbered only as an example in all figures). If necessary, the electrical instantaneous water heater 19 is regulated higher or lower.

[0228] The controller 11 also knows the temperature of the drinking water via temperature sensors 13 arranged there both in front of the water-water heat exchanger 22 and afterwards, that is to say in the direct feed to the tap 24.

[0229] The instantaneous water heater 19 can also be used to achieve a higher secondary flow temperature in the apartment if higher room temperatures are to be achieved there than would be achievable with the predetermined primary flow temperature.

[0230] The third variant of the home station shown in Figure 12 likewise brings about decentralized hot water preparation in the flow via a central heating. The central heating temperature for hot water preparation or for higher heating operation is reheated via an electric instantaneous water heater 19 on the heating side 30. In addition, on the apartment side 31, the partially heated drinking water is still reheated on the way from the water-water heat exchanger 22 to the tap 24 for hot drinking water with a supplementary electric instantaneous water heater 32.

[0231] Here too, the temperatures in the primary line flow 1 before and after the first electric instantaneous water heater 19 and the temperatures in the drinking water upstream of the water-water heat exchanger 22, after the water-water heat exchanger 22 and after the additional, additional instantaneous water heater 32 are measured the way directly to the tap 24.

[0232] The fourth variant of the home station in Figure 13 likewise brings about decentralized hot water preparation in the flow via a central heating. The warm water temperature is preheated via heat recovery from waste water from a shower or, for example, a washstand. In addition, the hot water temperature is preheated via the central heating temperature. Finally, the hot water temperature is reheated electrically using a water heater or a small electrical storage tank.

[0233] In the first heating step, the cold drinking water originating from the drinking water source 20 is partially heated in the water-water heat exchanger 22. The water-water heat exchanger 22 is fed on the one hand from the primary heating flow 1, and on the other hand via a recovery pump 34 and a return line 35 additionally from hot water 36 which has already been drawn, which is received at a collection point 37 at a shower or a washstand 38 below a recovery tap 39.

[0234] Whenever the recovery pump 34 can provide hot waste water 36 via the recovery line 35 on the water-water heat exchanger, the controller 11 preferably lets the hot waste water 36 through the water-water heat exchanger 22.

[0235] In the line 23 for partially heated drinking water, this is then passed through the electric instantaneous water heater 19 or a system provided there for an electrical small store to the tap 24 for hot water and / or to the recovery tap 39.

[0236] Cold drinking water can be added via an admixing line 40 shortly before a recovery tap 39, if this is desired. This will be the case, for example, in showers or washstands using a fitting 41 there.

[0237] In the fifth variant of a home station in FIGS. 14a and 14b, decentralized hot water preparation is carried out independently. The hot water temperature is preheated via heat recovery from hot waste water from a shower or, for example, a washstand. The hot water temperature is reheated using an electrical instantaneous water heater or an electrical small storage tank.

[0238] If water is conducted from the electric instantaneous water heater 19 or the small store there without a previous fitting 41 to the tap 24 for hot drinking water, a relatively large number of temperature sensors 13 are present, in particular directly from the instantaneous heater 19 to the tap 24 for hot drinking water.

[0239] If - as shown in Figure 14b - the residual heated drinking water 42 is still passed through a fitting 41 after the electric instantaneous water heater 19, these temperature sensors can be dispensed with.

[0240] An electrically controlled heat exchanger - or the reheater in general - can also directly heat to the desired temperature.

[0241] It is even possible to dispense with regulation of the instantaneous water heater 19 or the small store there by the controller 11.

[0242] In other words, the following can be explained across the examples:

[0243] The drinking cold water is preheated in variants 1 to 4 or directly heated to the corresponding hot water temperature.

[0244] If the heating temperature provided by the heating centre is not sufficient, either the heating water in the decentralized home station is raised to the required temperature using an electric instantaneous water heater on the heating side in order to then reach the desired hot water temperature, or only so much is transferred that the rest of the required energy is reheated by the electric instantaneous water heater on the sanitary side, or it can be that - as for example in variant 4 - the wastewater from the shower, washstand or the like is preheated, regulated and reheated via the central heating system, and only the remaining remainder via the electrical instantaneous water heater.

[0245] In such a constellation, wastewater should always have priority because as much heat as possible should be recovered.

[0246] Only then is the heating used for reheating.

[0247] Finally, the electric instantaneous water heater is used.

[0248] If you want to work independently according to variant 5, then energy must always be fed in via the electric instantaneous water heater or the small electrical storage tank in order to have sufficiently heated waste water. The heat invested can be recovered by about 70% to 80%.

[0249] All systems can be carried out via an electronic controller, but in some cases also mechanically. Variants 1, 2 and 3 can operate without an electronically controlled valve and can be operated, for example, via a mechanical controller, which allows hot water to pass through a heat exchanger when hot water is required. An exemplary controller can be found in DE 20 2008 006 054 U1.

[0250] The keep-warm function for mechanical variants is preferably carried out in summer via a pulsating bypass valve, so that heating heat is always available up to the home station and energy is therefore immediately available for hot water preparation.

[0251] Advantageous collections of features which can be combined with the aspects of the invention initially described in the present application:

1. Process for heating drinking water and making it available as hot drinking water with a hot drinking water temperature in an apartment, using a primary heating flow and return, whereby heating water is conveyed from a central heating system via the primary heating flow in a primary heating flow temperature to the apartment and after use in a cooler primary heating return temperature via the primary heating return is conveyed back to the central heating system, characterized in that the use of the heating water and the heating of the drinking water take place in a home station, with two complementary heating levels of different principles for heating the drinking water being provided in the home station, namely one using a water-water heat exchanger and one by means of an electric after heater.

2. Method according to feature collection 1, characterized in that the drinking water in the water-water heat exchanger is partially heated as the first heating stage and the partially heated drinking water is reheated to the hot drinking water temperature by means of the electric reheater on the sanitary side of the water-water heat exchanger;

3. Method according to feature collection 1, characterized in that the heating water originating from the primary heating flow is reheated as the first heating stage and the drinking water in the water-water heat exchanger is heated to drinking water temperature by means of the reheated heating water as the second heating stage on the sanitary side of the electric reheater;

4. Method according to feature collection 1, characterized in that the heating water originating from the primary heating flow is reheated as the first heating stage and the drinking water on the sanitary side of the electric reheater in the water-water heat exchanger is partially heated by means of the reheated heating water as the second heating stage and the partially heated as the third heating stage Drinking water on the sanitary side of the water-water heat exchanger is reheated to drinking water temperature by means of an additional electrical post-heater.

5. Method according to one of the preceding collections of features, characterized in that hot waste water is passed through a recovery heat exchanger in order to recover thermal energy from the hot waste water and to contribute to the heating of the drinking water with the recovered thermal energy, the hot waste water in particular through the said water-water heat exchanger in the home station can be managed.

6. Method according to one of the above collections of features, characterized in that a primary heating flow temperature between 38 ° C and a maximum of 60 ° C is maintained, in particular sliding.

7. Method according to one of the above collections of features, characterized in that a primary heating return temperature between 25 ° C and a maximum of 45 ° C is maintained, in particular variable.

8. Method according to one of the above collections of features, characterized in that a consumption and state variable detection is carried out, wherein determined consumption and state variables are transmitted from the home station to a controller for central heating.

9. Method according to feature collection 8, characterized in that the central heating is controlled on the basis of the transmitted consumption and state variables.

10. Method according to one of the above collections of features, characterized in that a further post-heater is connected modularly to the home station for the electrical post-heater.

11. Method according to one of the above collections of features, characterized in that a servomotor is used in front of a controller in order to influence a hydraulic balancing and to only feed a maximum envisaged amount of energy into the apartment.

12. Method for heating drinking water and making it available as hot drinking water with a hot drinking water temperature in an apartment, warm water being taken up and discharged below a tap for hot drinking water, in particular according to one of the above feature collections, characterized in that two complementary heating levels provide different principles for heating the drinking water are, namely by means of a recovery heat exchanger and one by means of an electric post-heater, the first heating stage being the hot water discharged for use by the recovery heat exchanger in order to recover thermal energy from the hot waste water and to partially heat the drinking water with the recovered thermal energy, and as second heating stage on the sanitary side of the recovery heat exchanger, the partially heated drinking water is reheated to the hot drinking water temperature by means of the electric reheater; wherein both heating stages can be carried out in a home station, and / or wherein the hot waste water can be led in particular through the water-water heat exchanger mentioned in the home station, in particular with preference over other flow.

13. Home automation system, set up to carry out a method according to one or more of the collections of features 1 to 12, characterized in that the home station is arranged on the home side of a transfer point into the home.

14. Home automation system, set up to carry out a method according to one or more of the collections of features 1 to 12, characterized in that the home station is arranged on the heating side of a transfer point in the apartment.

15. Building services system according to feature collection 13 or 14, characterized in that the home station is surrounded by a housing.

16. Building services system according to one of the feature collections 13 to 15, characterized in that a learning control is provided.

17. Building services system according to one of the feature collections 13 to 16, characterized in that a plurality of decentralized home stations is provided for a plurality of homes.

18. Home station with a housing, a water-water heat exchanger, an electrical re-heater, a controller and connections, for setting up a home automation system according to one of the feature collections 13 to 17.

LIST OF REFERENCE NUMBERS

[0252] 1 : Control heat exchanger

2: central axis
3: central channel
4a: first opening
4b: second opening
5: access opening
6: ring channel
7a: upper opening
7b: first lower opening
7c: second lower opening
8: pipe thread
9: housing separation
10: upper housing half
11: lower housing half
12: cylinder diameter
13: control system
14: drinking water supply
15: shower
16: boiler
17: heating flow
18: heating circuit flow
19a: apartment
19b: radiator
20: heating return
21: main heat exchanger
22: screw cap
23: temperature sensor
25: throttle calculator
29: control system
30: controller
31: Thermostat insert
32: Control heat exchanger
33: Thermal insulation
34: Main heat exchanger

35: Heat insulation shell

36: Drinking water

37: Heating flow

38: ZL connection

39: primary heating return

40: secondary heating flow

41: Continuation

42: Line

43: Actuator

45: Outlet

50: double-walled control heat exchanger

51: third installation situation

52: housing

53: central channel

54: safety ring channel

55: media ring channel

56: first connection

57: second connection

58: housing wall

59: end cover

60: seal

61: connecting piece

62: feed

63: T-shaped connecting piece

64: straight end

65: screw cap

66: fixing

67: Temperature sensor

68: tip

69: leakage hole

70: primary heating flow

71: T-piece

72: main heat exchanger

73: further distribution

74: split primary heating flow

75: secondary heating flow

76: first capillary tube

77: second capillary tube

78: thermostatically controlled valve

79: data line

80: secondary heating return

81: primary heating return

82: drain connection

83: tap

90: fourth installation situation

91: standard heat exchanger

92: drinking water inlet

93: ring channel

94: drinking water outlet

95: main heat exchanger

96: tap

97: primary flow

98: central channel

99: temperature measuring tip

100: thermostatically controlled valve

110 : Fifth installation situation

111: Main heat exchanger

112: primary heating flow

113: first dirt trap (strainer)

114: flow branch

115: first ventilation

116: secondary heating circuit

117: control and heating circuit

118: secondary heating flow

119: secondary heating return

120: second dirt trap

121: zone valve

122: second ventilation

123: adapter

124: primary heating return

125: ball valve

126: angle valve

127: first connection line

128: heating water inlet connection

129: central duct

130: temperature sensor

131: measuring tip

132: first capillary tube

133: thermosiphon

134: drinking water

135: second adapter

136: drinking water branch

137: closed heating strand

138: first connection

139: end of control heat exchanger

140: first outlet

141: cold water supply

142: second outlet

143: second connecting line

144: hot water line

145: temperature mixing agent

146: hot drinking water line

147: differential pressure regulator

148: Second capillary pipeline

150: Sixth installation situation

151: Electric post-heating station

Patentkrav

1. Fremgangsmåde til tilvejebringelse af et sekundært medium opvarmet ved hjælp af et primært medium på et tappested (83, 96) i en bygning,

ved hjælp af et styringssystem (13, 29) til tilvejebringelse af det sekundære medium opvarmet ved hjælp af et primært medium på tappestedet (83, 96) i bygningen, med en hovedvarmeveksler (21, 34, 72, 95, 111), en drosselventil med en temperaturmåler (23,67) og en aktuator (43), samt - under drift - et primært medium og et sekundært medium, hvor der ud over hovedvarmeveksleren (21, 34, 72, 95, 111) er tilvejebragt en kredsløbsvarmeveksler (1, 32, 50, 91), som er anbragt i serie med hovedvarmeveksleren (21, 34, 72, 95, 111), og at drosselventilen er indrettet til at indvirke på en aktuator (43) for det primære medium, afhængigt af en temperaturmåler (23, 67) på det sekundære medium og/eller en temperaturmåler (23, 67) i et returløb af det primære medium, hvor kredsløbsvarmeveksleren (1, 32, 50, 91) for det primære medium er anbragt opstrøms i forhold til hovedvarmeveksleren (21, 34, 72, 95, 111), nemlig på et varmefremløb (17, 37), og hvor hovedvarmeveksleren (21, 34, 72, 95, 111) for det sekundære medium er anbragt opstrøms i forhold til kredsløbsvarmeveksleren (1, 32, 50, 91), nemlig på en drikkevandstilledning (14, 92), hvor anbringelsen i serie omfatter en strømningskanal, der både for det primære medium og det sekundære medium først leder gennem en af de to varmevekslere og herefter gennem den anden varmeveksler, hvor det primære medium og det sekundære medium både i hoved- (21, 34, 72, 95, 111) og i kredsløbsvarmeveksleren (1, 32, 50, 91) er forbundet med hinanden i modstrøm,

hvor en hovedvarmevekslervolumen for det sekundære medium i hovedvarmeveksleren (21, 34, 72, 95, 111) er større end en kredsløbsvarmevekslervolumen for det sekundære medium i kredsløbsvarmeveksleren (1, 32, 50, 91), foretrukket over 5, 10, 50, 100 eller 500 gange så stor,

hvor

d. før en tappeproces, dvs. ved et stående sekundært medium,

i. i kredsløbsvarmeveksleren (1, 32, 50, 91) en kredsløbsvarmevekslervolumen af det sekundære medium ved hjælp af det primære medium holdes mellem en nedre og en øvre hysteresetemperatur,

hvortil temperaturen måles ved hjælp af temperaturmåleren (23, 67),

ii. mens der foretrukket ikke tillades strømning gennem hovedvarmeveksleren (21, 34, 72, 95, 111),

e. og der i starten og under tappeprocessen, dvs. ved en volumenstrøm af et sekundært medium defineret af et tappested (83, 96),

i. først føres kredsløbsvarmevekslervolumen af det sekundære medium til tappestedet (83, 96), efterfulgt af en sekundær mediestrøm først gennem hovedvarmeveksleren (21, 34, 72, 95, 111) og dernæst gennem kredsløbsvarmeveksleren (1, 32, 50, 91),

ii. den nedre hysteresetemperatur detekteres på kredsløbsvarmeveksleren (1, 32, 50, 91) via temperaturmåleren (23, 67) i tilfælde af det som regel køligere efterstrømmende sekundære medium,

iii. derefter åbner drosselventilen aktuatoren (43), indtil den øvre hysteresetemperatur måles,

iv. derefter lukker drosselventilen aktuatoren (43), indtil den nedre hysteresetemperatur måles,

v. hvor trin iii og iv gennemføres permanent med henblik på kredsløbsstyring,

f. og ved afslutning af tappeprocessen, dvs. ved standset sekundært medium,

i. kredsløbsvarmevekslervolumen af det sekundære medium ved strømmende primært medium opvarmes til den øvre hysteresetemperatur inden for få sekunder,

ii. hvorefter drosselventilen afskærer den primære volumenstrøm gennem hovedvarmeveksleren (21, 34, 72, 95, 111) ved hjælp af aktuatoren (43).

2. Fremgangsmåde ifølge krav 1, ***kendetegnet ved, at*** kredsløbsvarmeveksleren (1, 32, 50, 91) til tilvejebringelse af det primære medium er forbundet med et varmefremløb (17, 37).

3. Fremgangsmåde ifølge krav 1 eller 2, ***kendetegnet ved, at*** kredsløbsvarmeveksleren (1, 32, 50, 91) forsyner et varmekredsløbsfremløb (18).

4. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at, der er tilvejebragt et bypass-system for det primære medium, således at der også ved lukket aktuator (43) kan strømme en lækstrøm af det primære medium til og/eller gennem kredsløbsvarmeveksleren (1, 32, 50, 91).

5. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at

kredsløbsvarmeveksleren (1, 32, 50, 91) er udført koaksialt.

6. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at en primærmedie- og/eller en sekundærmedieforbindelse er udført indstilleligt, foretrukket drejeligt i deres orientering på kredsløbsvarmeveksleren (1, 32, 50, 91).

7. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at temperaturmåleren udfører målinger i en sekundærmedieledning, foretrukket i kredsløbsvarmeveksleren (1, 32, 50, 91), og drosselventilen åbner aktuatoren (43), når en nedre hysteresetemperatur er nået, og lukker aktuatoren (43), når en øvre hysteresetemperatur er nået.

8. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at
kredsløbsvarmeveksleren (1, 32, 50, 91) har en indstillelig termostatanordning.

9. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at kredsløbsvarmeveksleren (1, 32, 50, 91) er isoleret, mens hovedvarmeveksleren (21, 34, 72, 95, 111) foretrukket ikke er isoleret.

10. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at drosselventilen er i måleforbindelse med to temperaturmålere (23, 67), særligt med en første temperaturmåler (23, 67) i det sekundære medium og med en anden temperaturmåler (23, 67) i et returløb af det primære medium, og temperaturmålerne (23, 67) måler temperaturer.

11. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at det primære medium og/eller det sekundære medium føres til en hovedledning gennem kredsløbsvarmeveksleren (1, 32, 50, 91) i et bypass-system.

12. Fremgangsmåde ifølge et af de foregående krav,
kendetegnet ved, at temperaturmåleren (23, 67) er anbragt på et bypass-system for det

sekundære medium og/eller på et bypass-system for det primære medium på dets returløb og foretager målinger dér.

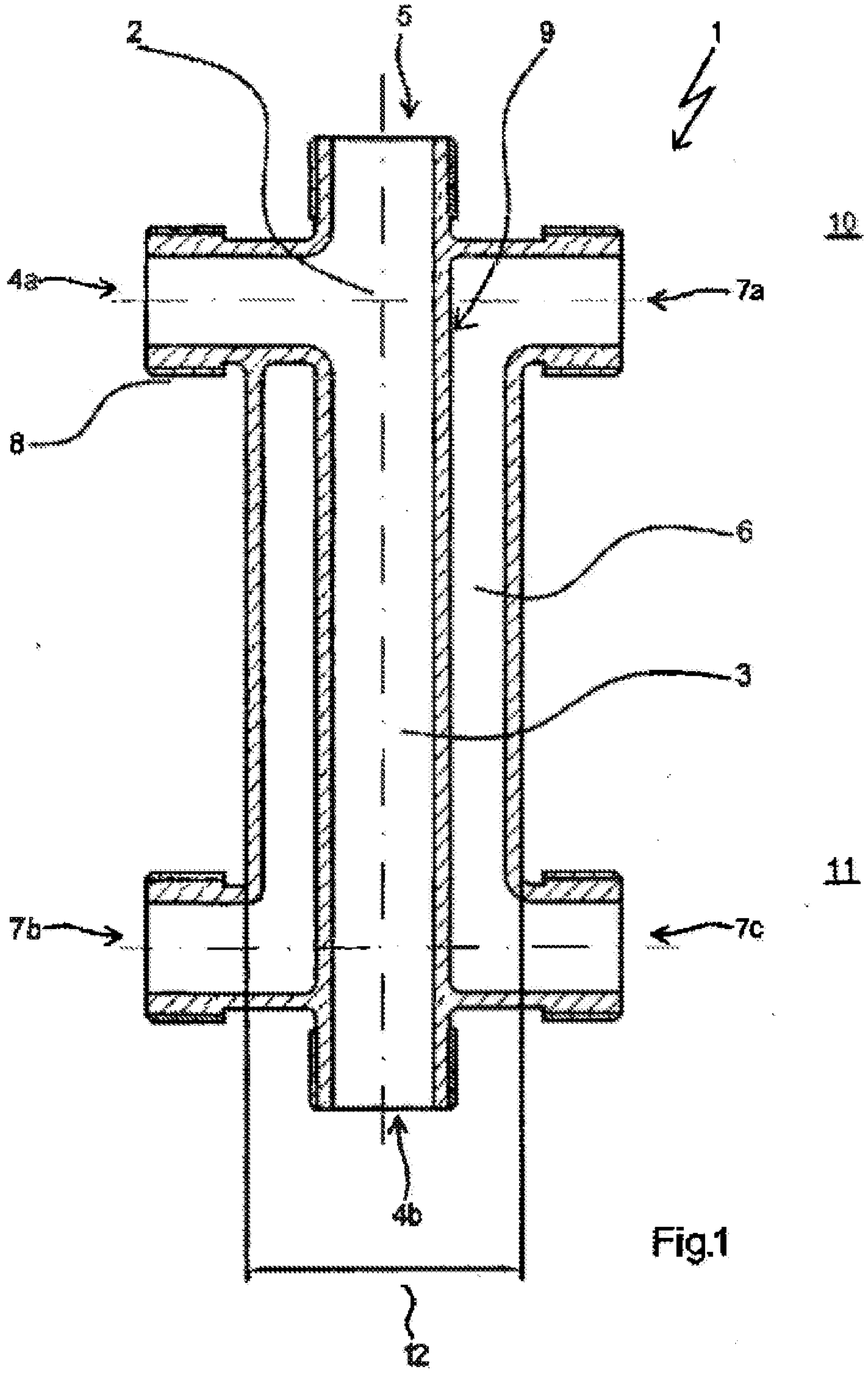

Fig.1

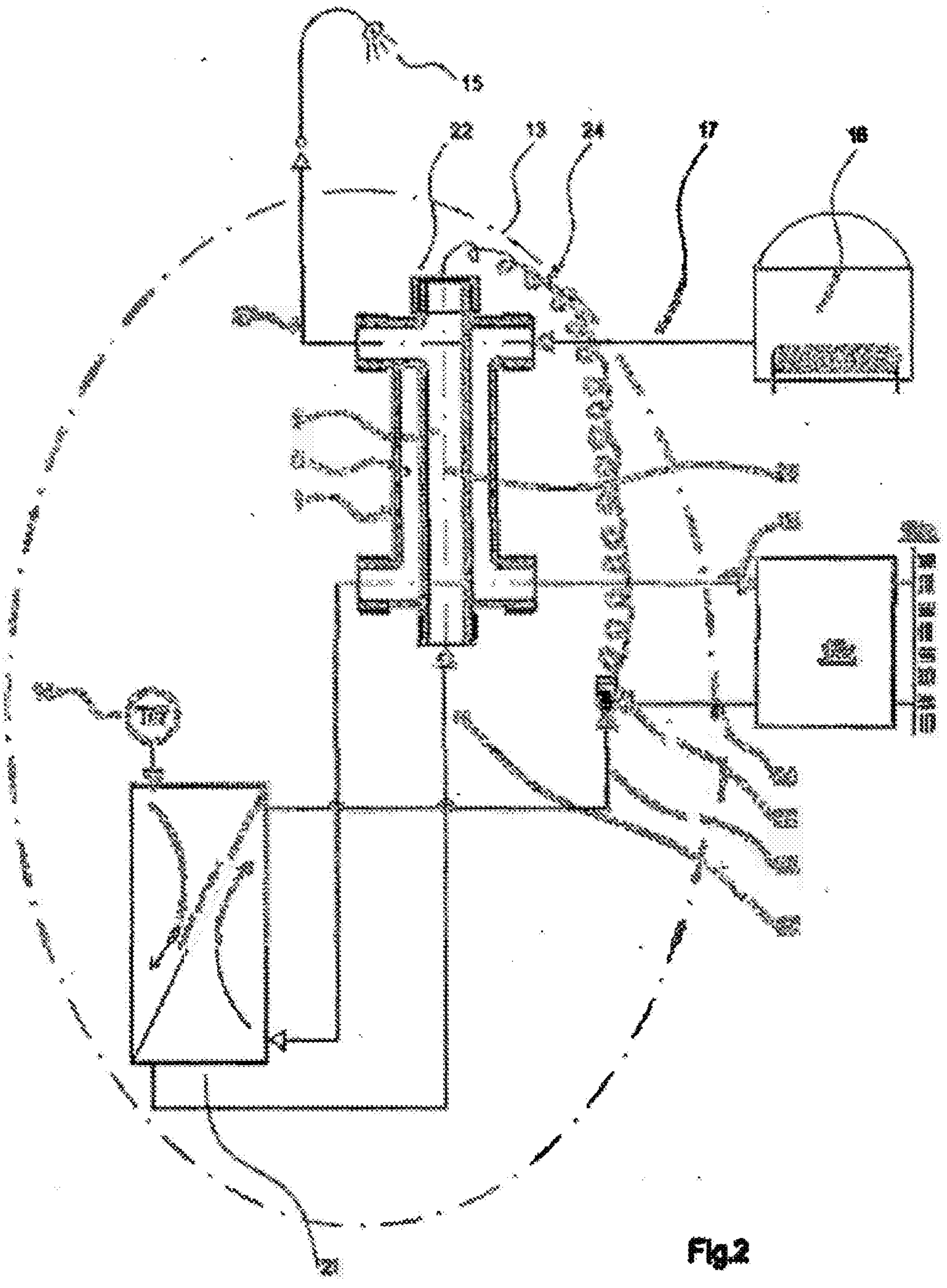

Fig.2

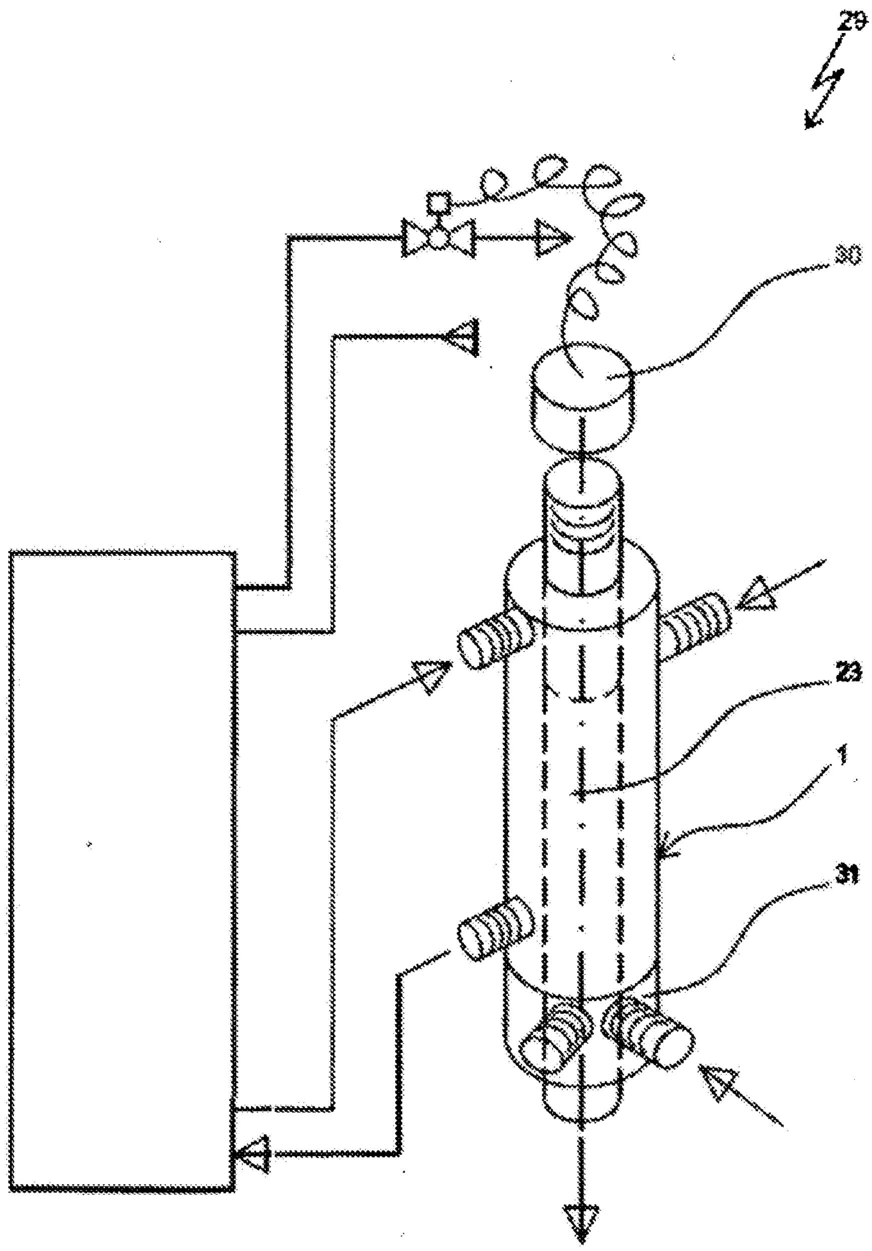

Fig.3

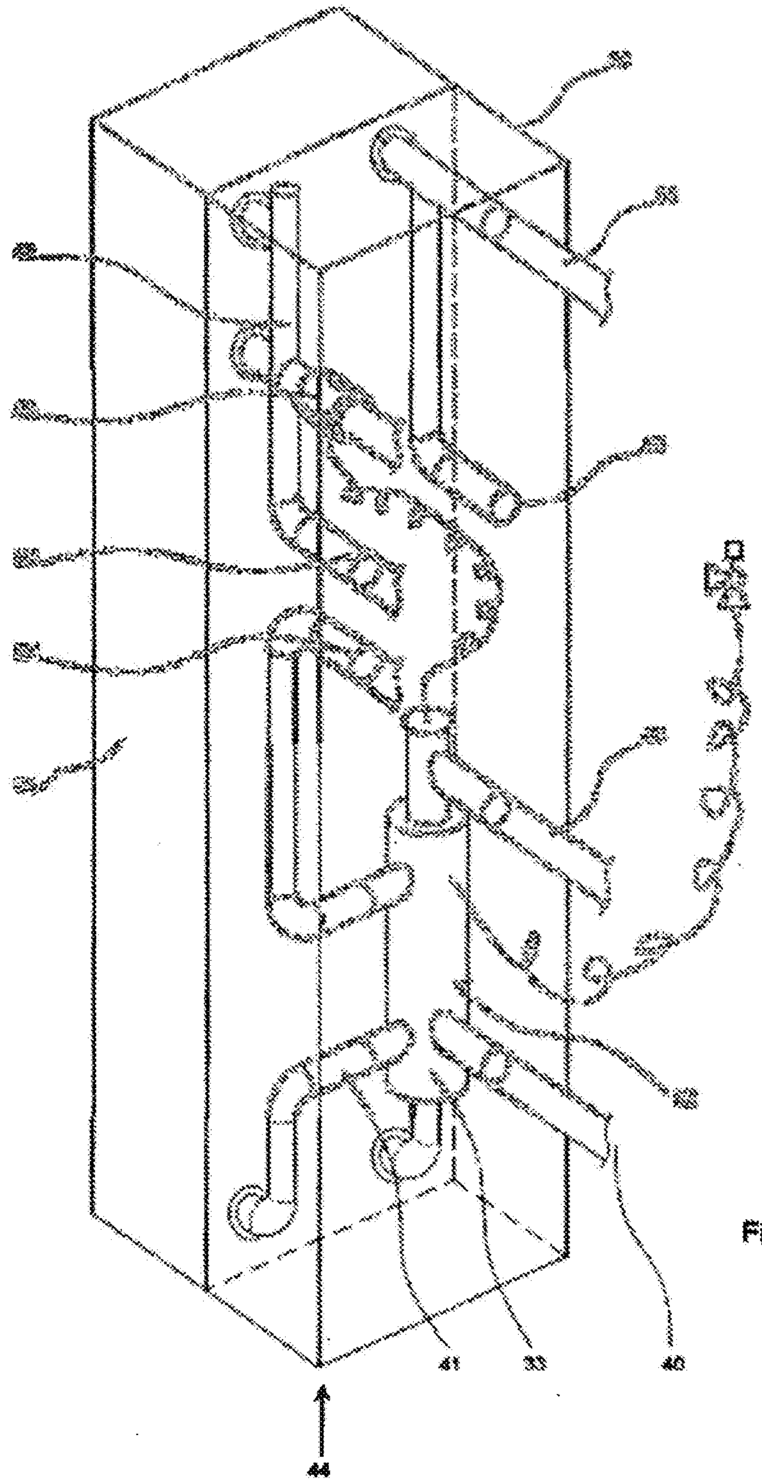

Fig. 4

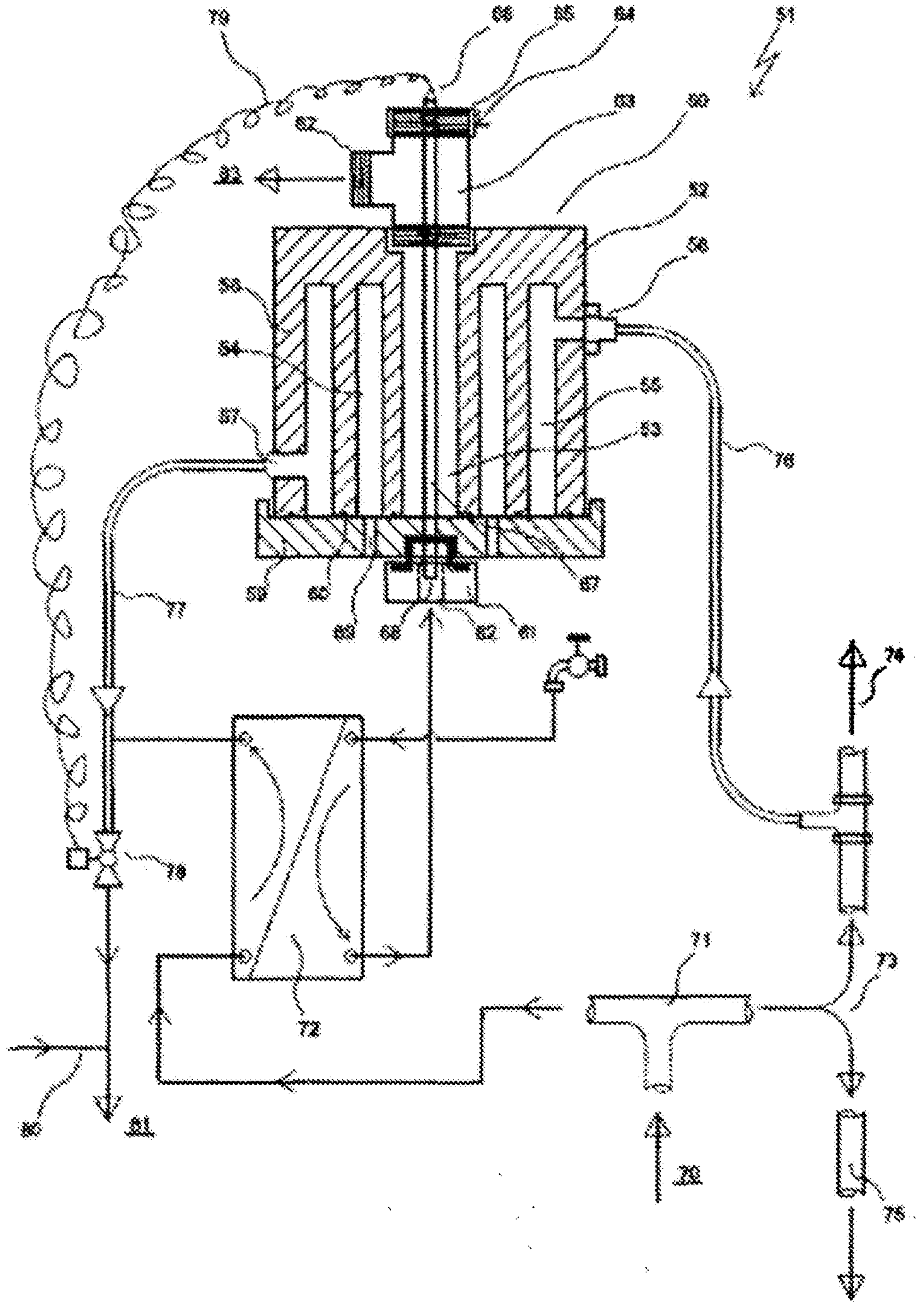

Fig.5

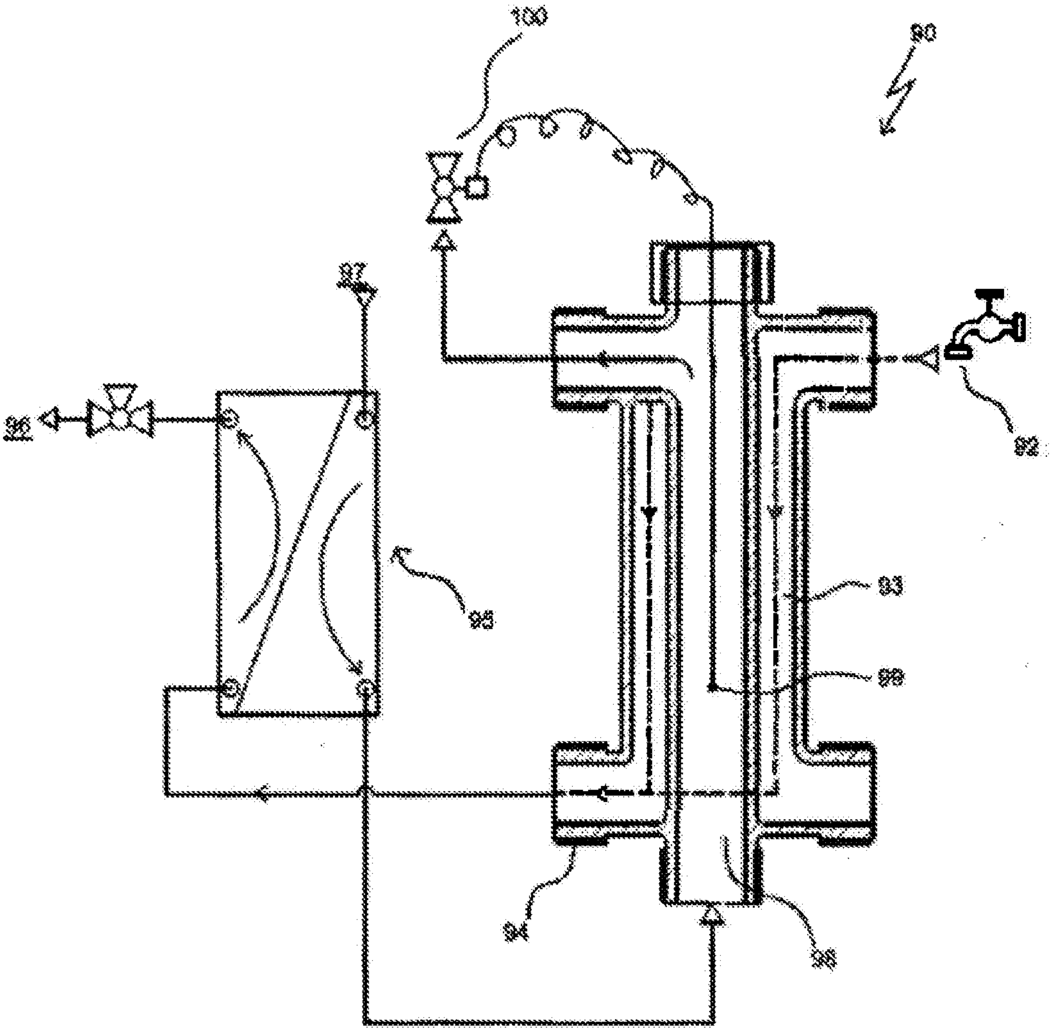

Fig.6

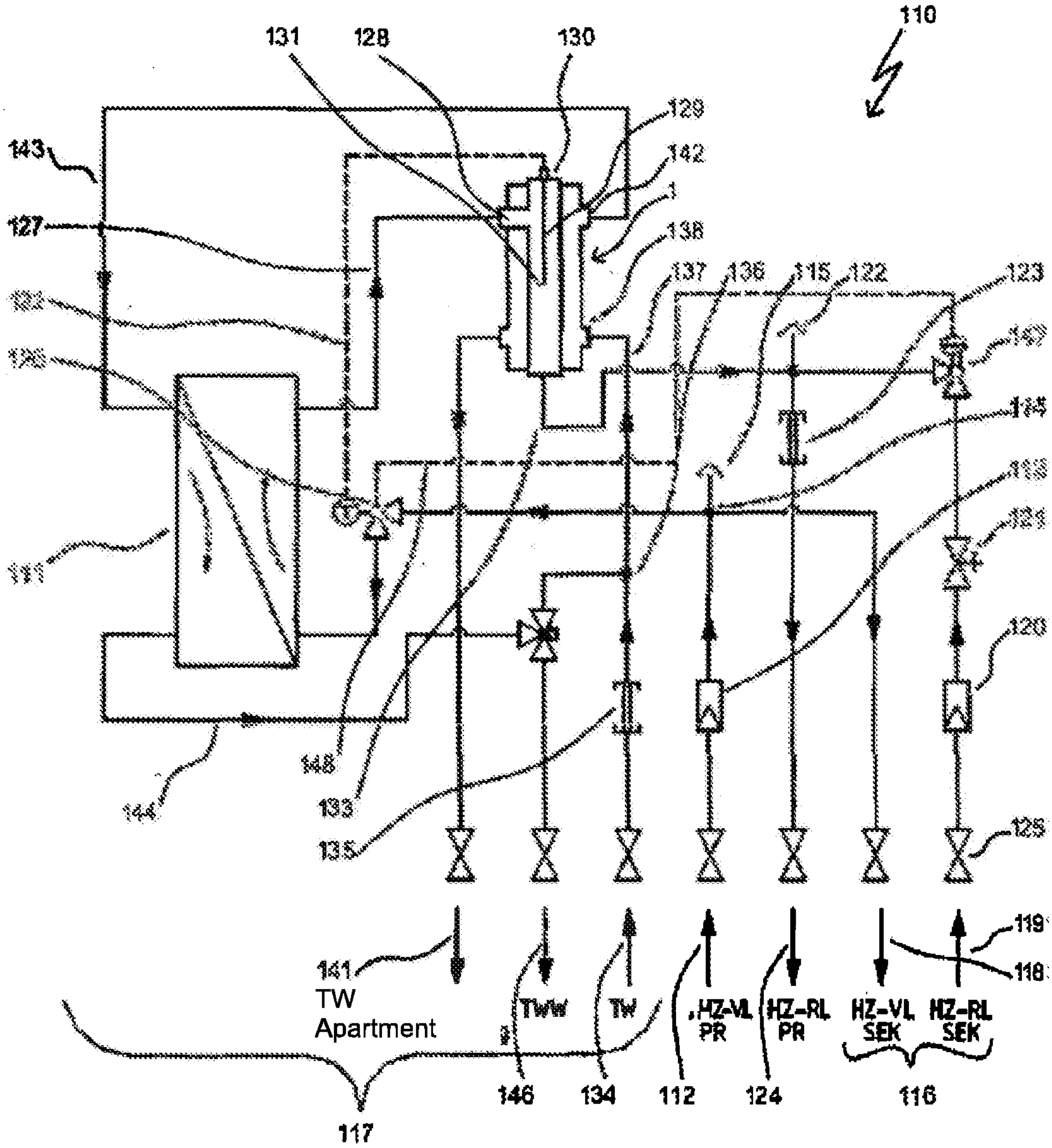
110
131
128
130
129
142
1
138
143
127
137
136
115
122
123
147
114
113
121
120
111
148
133
144
135
125
119
118
141
TW
Apartment
TWW
TW
HZ-VL
PR
HZ-RL
PR
HZ-VL
SEK
HZ-RL
SEK
146
134
112
124
116
117

Fig.7

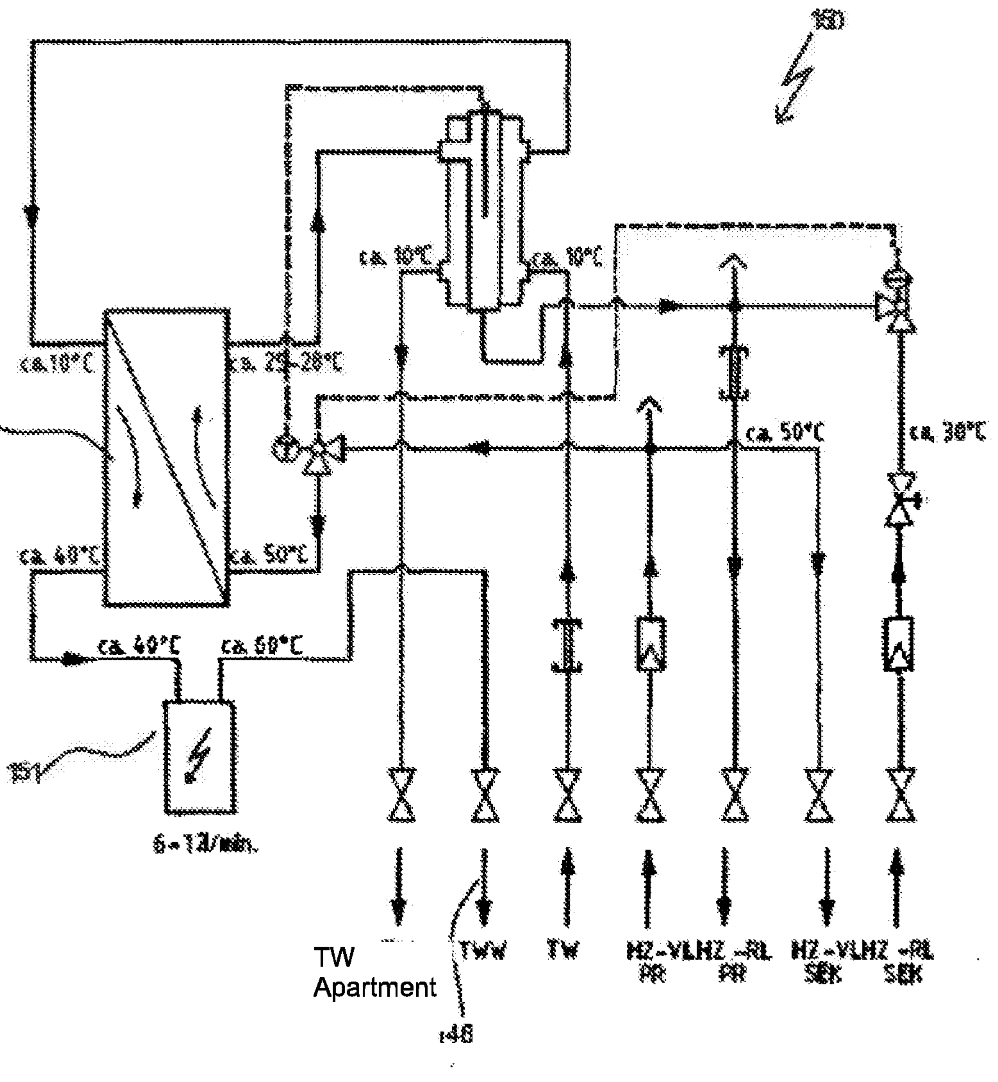
150
ca. 10°C
ca. 10°C
ca. 10°C
ca. 25-28°C
111
ca. 50°C
ca. 30°C
ca. 40°C
ca. 50°C
ca. 40°C
ca. 60°C
151
6-12l/min.
TW
Apartment
TWW
TW
HZ-VL
PR
HZ-RL
PR
HZ-VL
SEK
HZ-RL
SEK
148

Fig.8

Presentation of the Share of thermal electric warm water preparation in Summer and Winter. The difference over the months with changing Heating pre-flow temperature has not been depicted.					
Amount tapped	l/min	12	15	12	15
Warm Drinking water	°C	42	42	45	45
Water Temperature in Winter (10-12°C)	°C	12	12	12	12
Water Temperature in Summer (14-18°C)	°C	15	15	15	15
Heating pre-flow Summer	°C	38	38	38	38
Heating pre-flow Winter	°C	56	56	56	56
Complete Power	KW	25,12	31,40	27,63	34,54
Maximum share electrical in Summer					
Warm Drinking Water Temperature thermic	°C	35,00	35,00	35,00	35,00
Share power thermic	KW	19,26	24,07	19,26	24,07
Share power electric	KW	5,86	7,33	8,37	10,47
Maximum share electrical in Winter					
Warm Drinking Water Temperature thermic	°C	42,00	42,00	45,00	45,00
Share power thermic	KW	25,12	31,40	27,63	34,54
Share power electric	KW	0,00	0,00	0,00	0,00

Fig.9

$$Q'_{TWW} = V_{TWW} \times c_p \times (T_{TWWw} - T_{TWWk})$$

$$W = kg/h \times Wh/(kg \times K) \times K$$

$$= 12 \times kg/Min \times 60 \times Min/h \times 1,16 \times Wh/(kg \times K) \times (42\text{-}12) \times K$$

$$= 12 \times 60 \times 1,16 \times 30 \times W$$

$$= 25056 \times W = 25,1\ kW$$

Fig.10

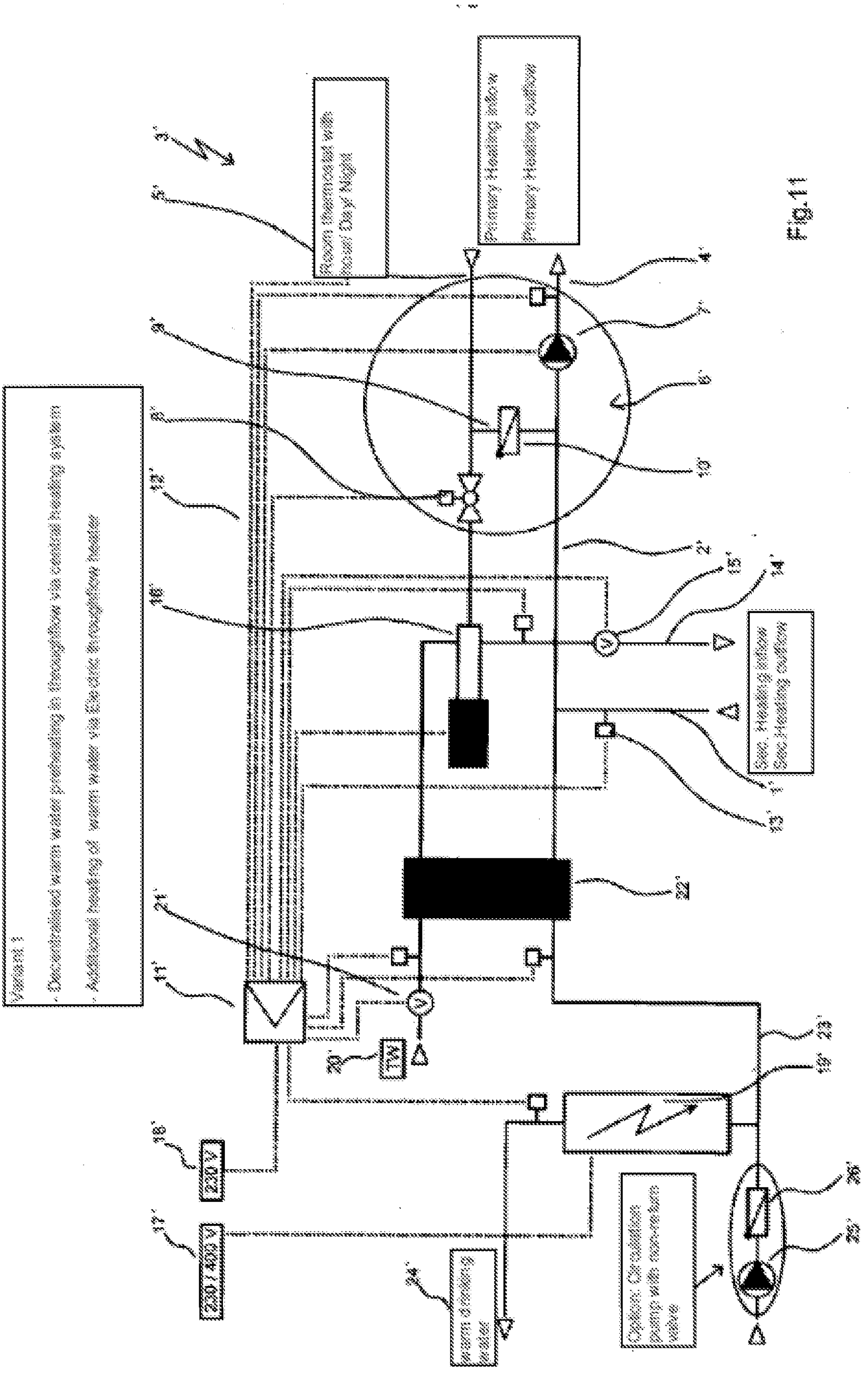
Room thermostat with Auto/ Day/ Night
Primary Heating inflow
Primary Heating outflow
Sec. Heating inflow
Sec. Heating outflow
Variant 1
- Decentralised warm water preheating in throughflow via central heating system
- Additional heating of warm water via Electric throughflow heater
230 V
230 / 400 V
TW
Option: Circulation pump with non-return valve

Fig.11

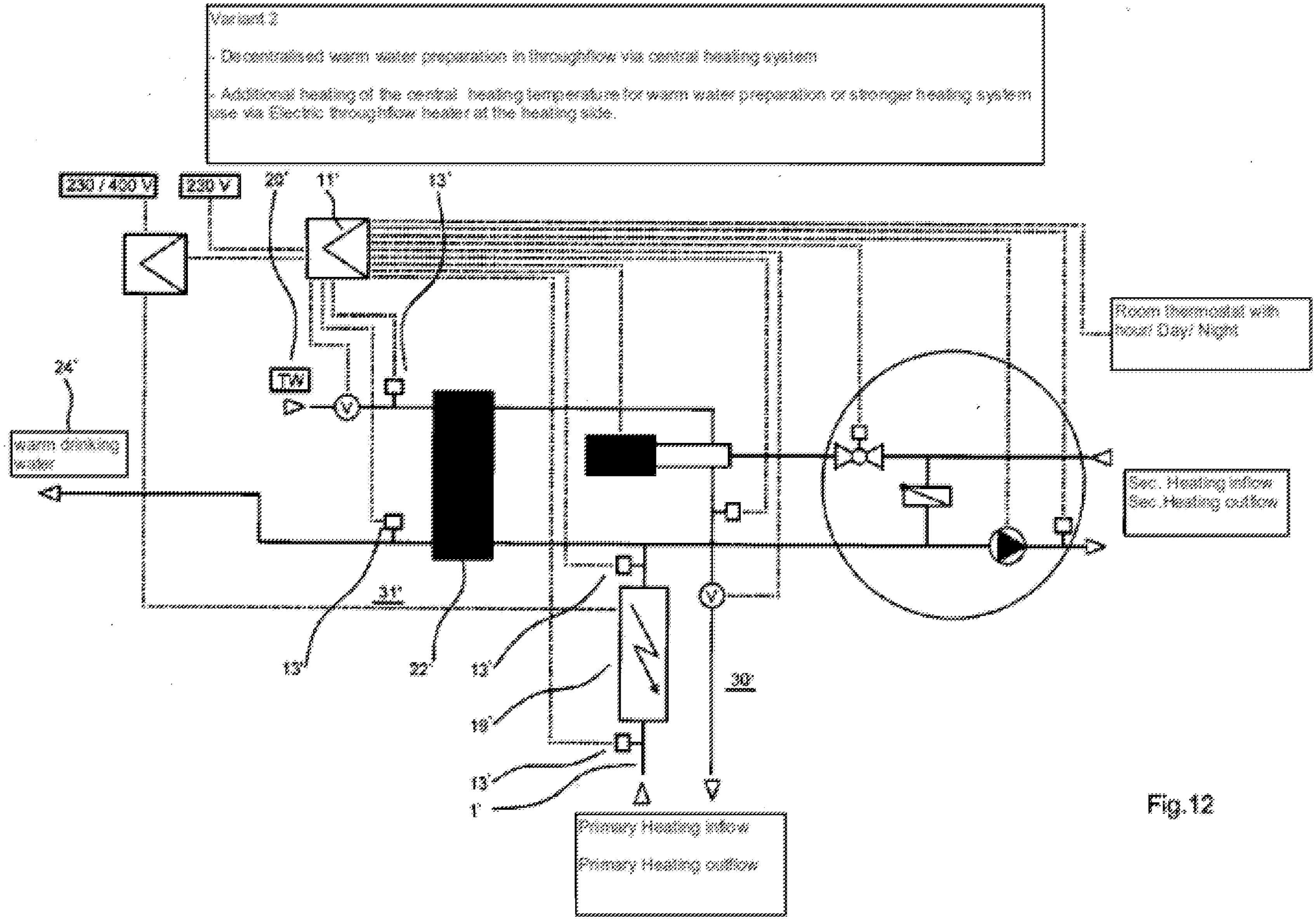
Variant 3
- Decentralised warm water preparation in throughflow via central heating system
- Additional heating of the central heating temperature for warm water preparation or stronger heating system use via Electric throughflow heater at the heating side.
230 / 400 V
230 V
23'
11'
13'
TW
24'
warm drinking water
Room thermostat with hour/ Day/ Night
Sec. Heating inflow
Sec. Heating outflow
31'
13'
22'
13'
10'
13'
1'
30'
Primary Heating inflow
Primary Heating outflow

Fig.12

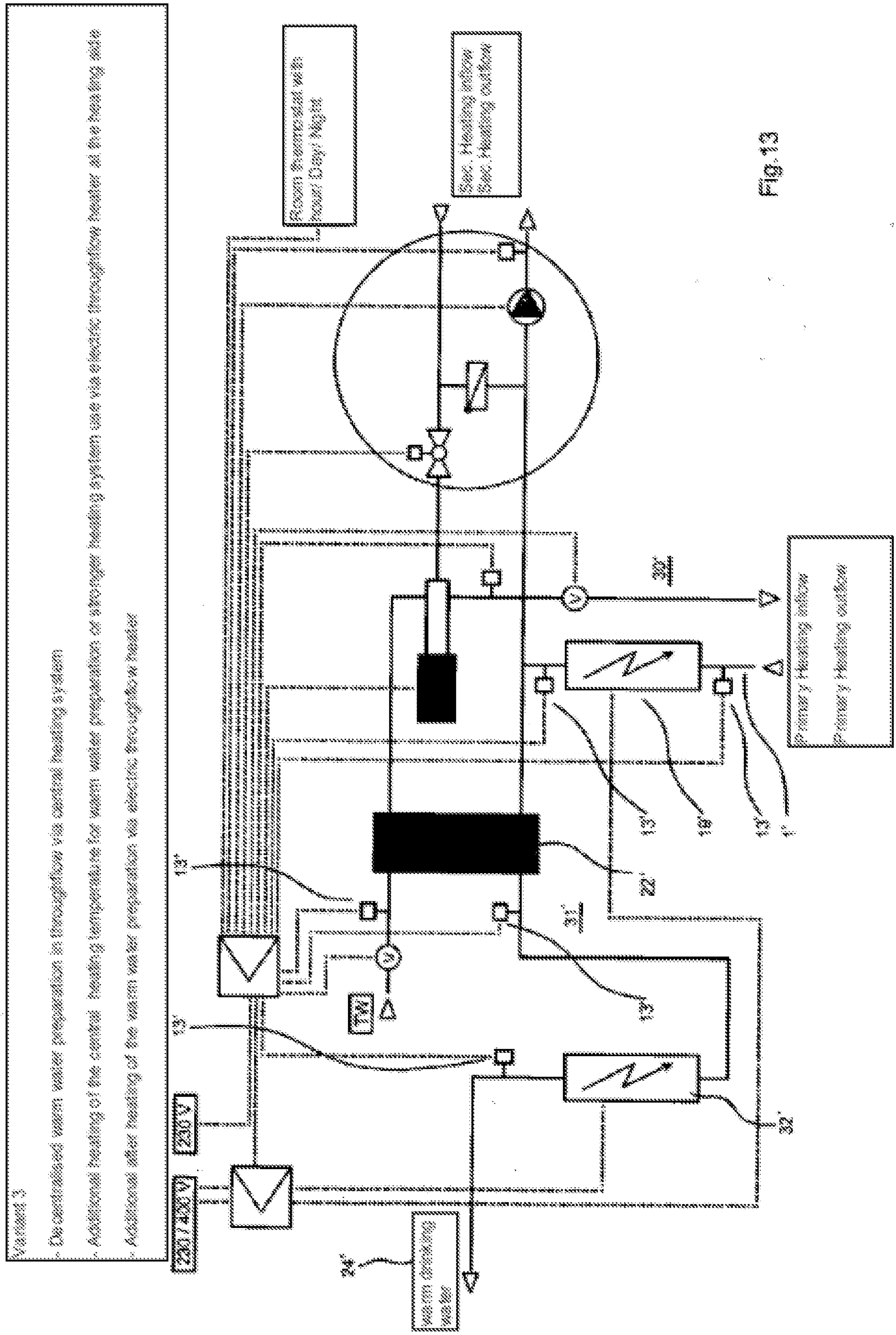
Primary Heating inflow
Primary Heating outflow
Sec. Heating inflow
Sec. Heating outflow
230 V
230 / 400 V
TW
warm drinking water
13'
18'
11'
22'
31'
32'
24'

Fig.13

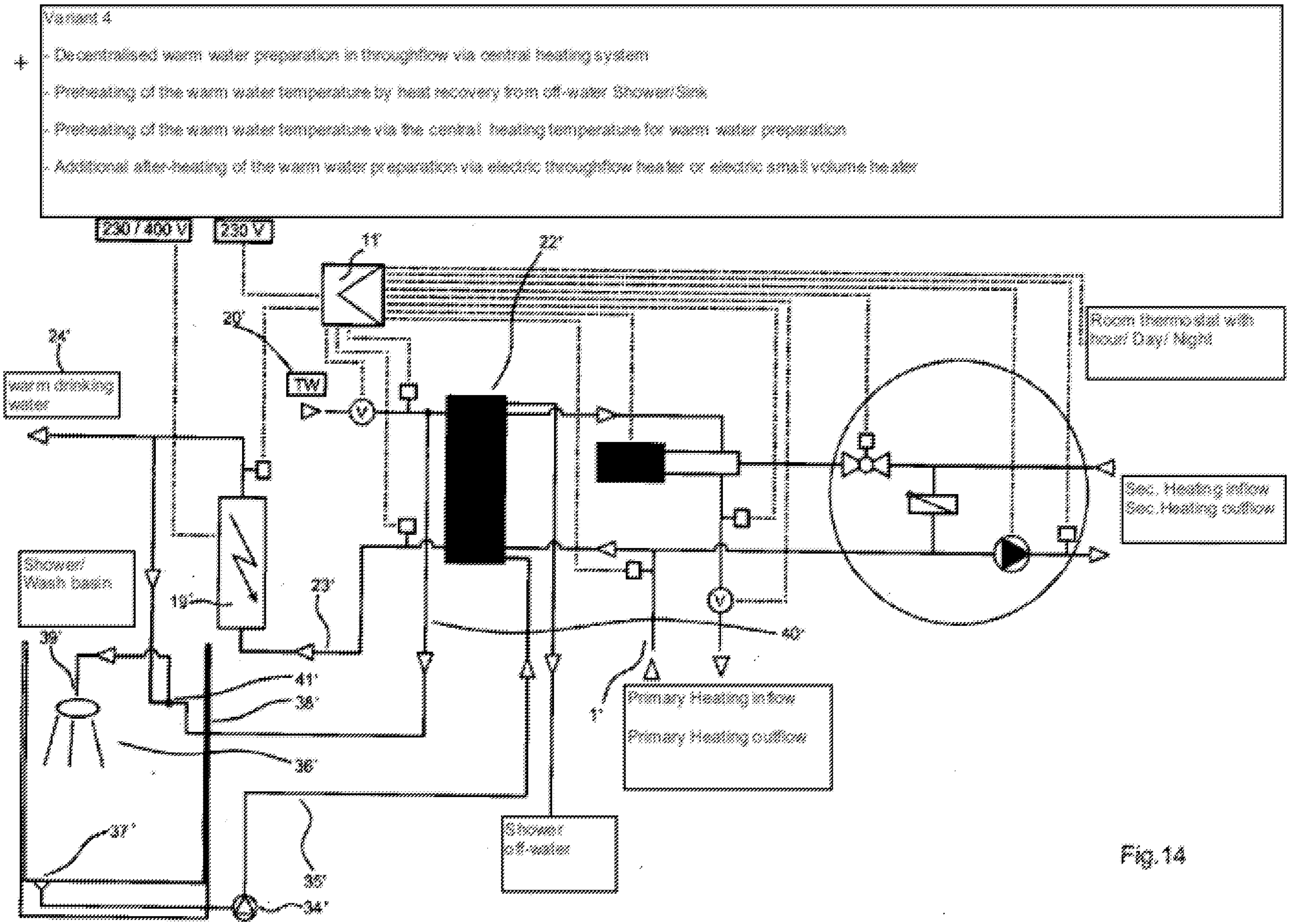
Variant 4
- Decentralised warm water preparation in throughflow via central heating system
- Preheating of the warm water temperature by heat recovery from off-water Shower/Sink
- Preheating of the warm water temperature via the central heating temperature for warm water preparation
- Additional after-heating of the warm water preparation via electric throughflow heater or electric small volume heater
230 / 400 V
230 V
11'
22'
20'
24'
TW
warm drinking water
Room thermostat with hour/ Day/ Night
Sec. Heating inflow
Sec. Heating outflow
Shower/ Wash basin
19'
23'
40'
39'
41'
38'
36'
1'
Primary Heating inflow
Primary Heating outflow
37'
35'
34'
Shower off-water

Fig.14

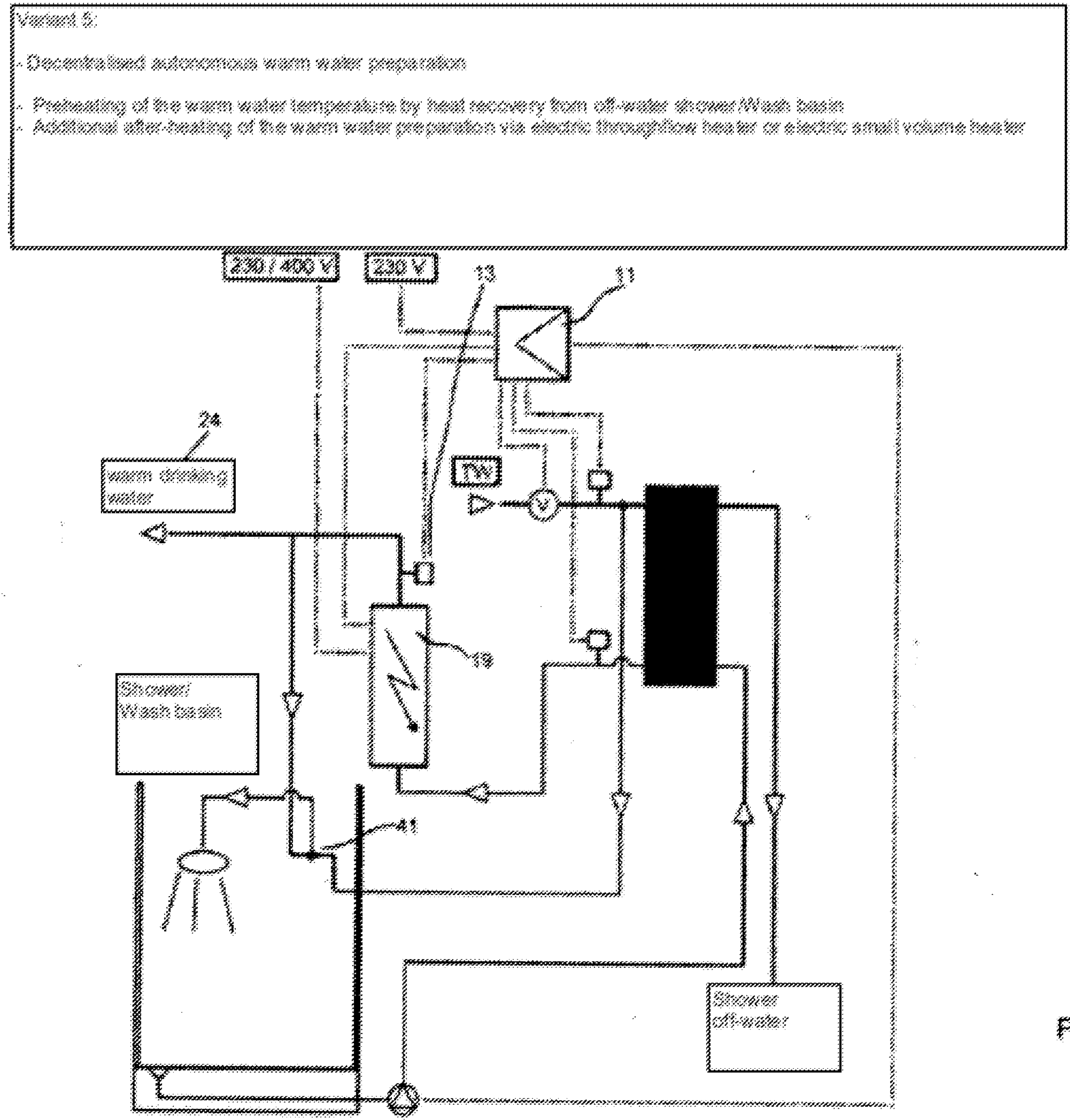
Variant 5:
- Decentralised autonomous warm water preparation
- Preheating of the warm water temperature by heat recovery from off-water shower/Wash basin
- Additional after-heating of the warm water preparation via electric throughflow heater or electric small volume heater
230 / 400 V
230 V
13
11
24
warm drinking water
TW
19
Shower/ Wash basin
41
Shower off-water

Fig.14 a

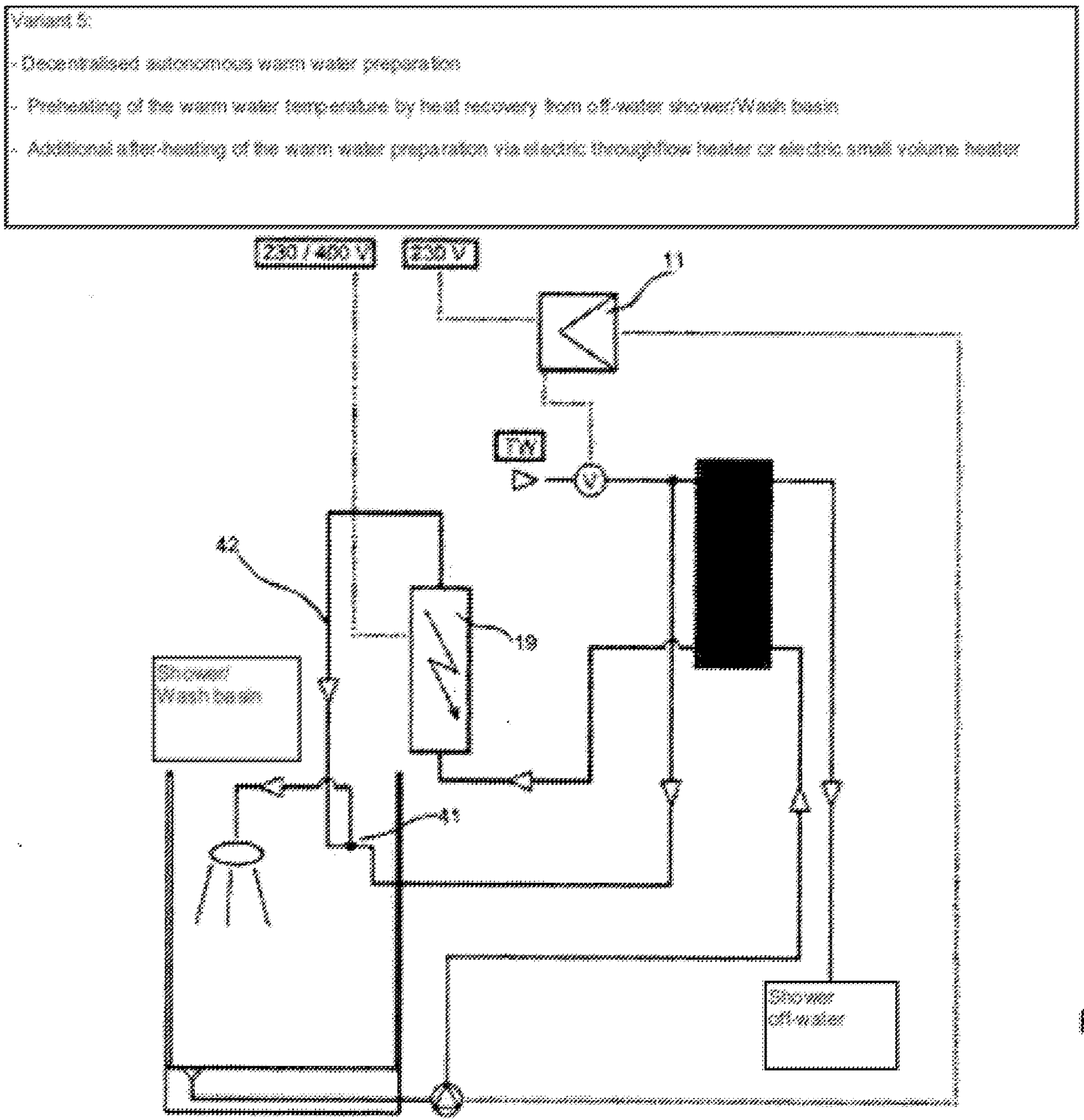
Variant 5:
- Decentralised autonomous warm water preparation
- Preheating of the warm water temperature by heat recovery from off-water shower/Wash basin
- Additional after-heating of the warm water preparation via electric throughflow heater or electric small volume heater
230 / 400 V
230 V
11
TW
V
42
19
Shower/
Wash basin
41
Shower
off-water

Fig.14 b