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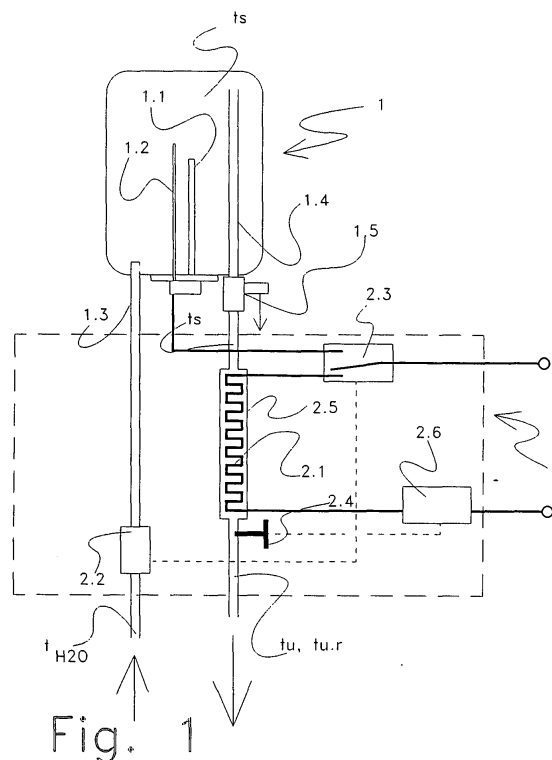
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(54) **Post heating device for accumulator electric water heaters**

(57) This relates to an additional heater (2; 3; 4; 5) associated with an accumulator water heater (1) which, according to the variants, is able to pre-heat the water introduced into said accumulator water heater (1) or post-heat the water delivered to the user.

In the first case, the negative effects of the so-called "mixing" operation are reduced or eliminated; in the second case the heat dispersion in accumulator water heater (1) is reduced because the water can be maintained at a temperature lower than that required by the user.

The additional heater (2; 3; 4; 5) is suitable for construction in the form of an accessory kit for retrofitting assembly on accumulator water heater (1) normally already in operation.



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Description

[0001] The present invention relates to an electric heating device aimed at improving accumulator water heater performance.

[0002] There are two types of common electrical water heaters for domestic sanitary use: accumulator and instant water heaters.

[0003] Both types are used because each one has certain advantages and disadvantages.

[0004] The advantage of accumulator water heaters is the fact that they are able to distribute large quantities of water at a pre-set temperature, well over that normally required from taps in hand basins or showers, and therefore they are also able to satisfy several users' needs while using a relatively low energy consumption; in Italy this is generally 1200W for the more common models. However, the disadvantage is that these models require many hours to top up the hot water supply once it has been used, and in spite of tanks being insulated, they also suffer from strong heat dispersion.

[0005] The great advantage of instant water heaters is that they are able to supply an unlimited amount of hot water with practically no heat dispersion, but they use very high power consumption to satisfy each individual use each time.

[0006] The application for Italian patent MO2000A001122 of 8.6.2000 relates various methods for using so-called "printed" electric resistors, printed on various surfaces of the water heater; among these it suggests how to use an electric resistor printed on the outlet pipe of an accumulator water heater, both for pre-heating the accumulated water, controlling the electric resistor by means of a thermostat emerged inside the accumulator itself, which in order to complete the heating of the distributed water while it passes through the outlet pipe, then controls the same electric resistor using a flow meter that reads the amount of the water used.

[0007] The advantage of this variant proposed in patent MO2000A001122 is the fact that the water can be maintained inside the accumulator at a temperature lower than the water actually used, in this way limiting heat dispersion, and then raised to the required temperature only at the actual moment of use, practically without any further heat dispersion. However the limits of this proposal lie in the fact that while the water is drawn off, not all the distributed heat from the electric resistor is supplied to the drawn-off water, but partly used to heat the remaining water in the accumulator, and therefore these advantages are applicable only in specifically constructed water heaters.

[0008] A further problem linked with accumulator heaters is that of the so-called "mixing": each time water is drawn off, the cold water introduced mixes with the part of the hot water contained in the tank, lowering the temperature to below the temperature required by the user; this results in a reduction of the amount of water that can be used without further heating and therefore

a reduction in performance as well as an increase in the time required for the mixed water to heat up again with consequential further heat dispersion. This problem can be improved but with scarce results, by introducing the cold water with the least turbulence possible and into the bottom part of the tank. Naturally these problems do not exist with instant water heaters.

[0009] The main aim of the present invention is to create a device and a method that permit the advantages of the accumulator water heater with those of the instant heater while limiting the respective disadvantages, at least within the limits of a determined quantity of drawn hot water.

[0010] In particular, the aim of certain variants of the present invention is to indicate a device and method that permit the reduction of the water temperature in the accumulator water heater, with a consequential reduction in heat dispersion, while guaranteeing the user with the same performance, at least as far as standard service requirements are concerned, such as the amount of hot water required for one hot shower at a time.

[0011] Another particular aim of certain variants of the present invention is to reduce the negative effects caused by mixing, by reducing the amount of water which, in the accumulator water heater, drops below the temperatures required by the user each time water is drawn off.

[0012] Yet another aim of the present invention is to extend the above-described advantages to all types of traditional accumulator water heaters already installed and in use, by the simple addition of an accessory device, without modifying the existing accumulator water heater.

[0013] This and other aims are achieved by using an additional electrical heating device and an additional heating method, that will be described with reference to certain preferred, but by no means exclusive embodiments, as well as in the appended drawings and in the following claims, which are an integral part of the present description.

[0014] According to the invention variants, said additional heating method is composed of an additional post-heating and/or pre-heating of the heated water in the accumulator water heater, and the corresponding additional electrical device, which basically acts like an instant water heater, which will be described in more detail and which will hereafter be referred to briefly as additional heater, post-heater or pre-heater according to its function.

[0015] Figure 1 shows a traditional accumulator water heater according to known state of the art, having an additional heater being mounted downstream according to the invention. More precisely, the figure shows which of the two basic heater applications will be destined to act as the post-heater.

[0016] Figures 2.a, 2.b, 2.c, 2.d show certain possible embodiments of any one type of an additional heater according to the invention.

[0017] Figure 3 shows a traditional accumulator water heater according to state of the art, having an additional heater being mounted downstream according to the invention, using the second of the two basic applications, and destined to act as pre-heater.

[0018] Figures 4 and 5 show two variants of an accumulator water heater that are functionally equivalent according to known state of the art, an additional heater being mounted downstream according to the invention adapted to act separately and/or simultaneously in both functions as post-heater and/or pre-heater.

[0019] To explain more clearly, a single variant will be described showing the function as post-heater according to the invention.

[0020] With reference to figure 1, 1 indicates an accumulator water heater powered either by gas or electricity, although this particular invention permits greater energy savings in economical terms, for electrical water heaters. Said accumulator water heater 1 is composed of heating means 1.1 (naturally electric resistors, if the accumulator water heater 1 is electrical); the control means 1.2 of the accumulated water temperature (generally a thermostat); the intake pipe 1.3 and the outlet pipe 1.4; and the safety valve 1.5.

[0021] The control means 1.2 are programmed to maintain the water at a stored temperature t_s , which is deliberately lower than the required temperature for use $t_{u.r.}$

[0022] The dotted perimeter in figure 1 shows an additional heater 2 as a whole, composed of a post-heater according to the invention; this is basically composed of an instant electric water heater except for the fact that the electrical power available is not sufficient to heat the water as it arrives at main line temperature t_{H_2O} , (estimated at approximately 15 °C) as high as the required temperature for use, $t_{u.r.}$ (that is estimated as being approximately 40 - 45 °C) when the outflow drawn off corresponds to the maximum calculated distribution for a shower or hand basin tap (equal to about 0,07 litres/second).

[0023] The figure schematically shows a pipe 2.5 from the post-heater 2, mounted downstream of the accumulator water heater 1, that is, connected immediately after the safety valve 1.5, downstream of the outlet pipe 1.4. Groups of electric resistors 2.1 are associated with said pipe 2.5 to heat the inflow water raising the temperature by a quantity Δt_u . The group of electric resistors 2.1 during water intake is activated by a flow meter 2.2. If the accumulator water heater 1 is electrical, while the flow meter 2.2 is activating the said group of electric resistors, it could be useful that it deactivates the electric resistors 1.1, by means of a switch 2.3, to prevent excessive power absorption. A possible thermostat 2.4 is also shown which, according to the most appropriate type of method or means already in existence for instant water heaters, signals the measured temperature to a power modulator 2.6, which is able to vary the distributed electrical power by deactivating/activating one or more re-

sistors 2.1 in sequence, or by modulating the electrical power; in the first case, said power modulator 2.6 acts to limit the maximum temperature, and in the second case, it acts as an actual temperature adjustment system for the water as it exits, maintaining the water at an established temperature $t_{u.r.}$ and equal to that required even though the flow rate may change.

[0024] The aforesaid description is already sufficient to illustrate the advantages of the invention if the combination of the accumulator water heater 1 and the post-heater 2 electrical device according to the invention are used to heat the water according to the following methods which also form part of the present invention.

[0025] The numerical example provided below refers to the capacity of accumulator bathroom water heaters run on electrical power typically available in all Southern European countries, and Italy in particular, but also indicates methods that are advantageously applicable in any country.

[0026] Under consideration is an 80-litre water heater, which, if electrically run, would have an installed power of 1200 W. If the water in this heater is heated and maintained at a temperature t_s equal to approximately 75 °C, it is simply sufficient to fill a bath tub by mixing the hot water with main line water at a temperature t_{H_2O} to obtain a pleasant temperature of about 40 °C. However in recent years there has been an upsurge in preference for showers, and bathtub use has been reduced. If the same aforesaid water heater maintains the water at a storage temperature t_s equal to that required for use - $t_{u.r.}$, which is in turn equal to a maximum of approximately 45 °C, the available water is sufficient for two showers and the advantage of storing the water at this lesser temperature to reduce heat dispersion as described earlier, is obvious.

[0027] On the other hand, according to the method of the present invention the water is maintained at temperature t_s , lower than the temperature $t_{u.r.}$ required for use, thus needing heating completion by post-heater 2 only at the moment the water is drawn off. Since, like Italy, in many countries the electrical power installed in domestic homes is fairly limited, generally about 3 - 4 kW, said post-heater 2 will also have similar installed electrical power to that of accumulator electrical bathroom water heaters (in Italy, as stated previously, rarely over 1200 W) in order to prevent electrical absorption overload, the accumulator water heater 1, where electrical, is deactivated when the post-heater 2 is switched on.

[0028] It has been stated that the maximum required flow for a shower is estimated at 0,07 litres/second; at this rate, and with only 1200 W available, the post-heater 2 is able to heat the water that crosses it with a Δt_u value of just over 4 °C. However, this apparently insignificant temperature increase can maintain the storage temperature at a value $t_s = t_{u.r.} - \Delta t_u = 41$ °C. Considering that the temperature in a bathroom in winter is approximately 22 °C and that the heat dispersion of an accumulator water heater is proportional with the differ-

ences - ta, by using the heating method described here, the difference is reduced from 23 to 19°C, and consequently the heat dispersion is reduced at a ratio of 19/23, in other words, reduced to 82% of the dispersion that occurs without using said method. These calculations have been performed using a certain precaution since in reality a t_{u.r} temperature of only 40°C is actually needed and the flow rate of 0,07 litres/second is a project parameter higher than the rate actually used.

[0029] In reference to pipe 2.5 and the group of one or more resistors associated with said pipe, there are many known methods and means for the realisation, and any one of the models used for instant electric water heaters is appropriate. However, on observing figure 2, the reduced power used preferably by post-heater 2 suggests very simple and compact devices. Again with reference to Italian patent application MO2000A001122, said group of electric resistors 2.1 can be the type printed on the surface of the pipes 2.5, or on equivalent pipes 2.7 or 2.8, crossed by the outflow water to be drawn off. To reduce the length of post-heater 2, as an alternative to a pipe 2.5 basically composed of a truncated pipe, several truncated smaller pipes 2.7, could be used arranged appropriately and connected in a row or in parallel mode for the water path; a further alternative aimed at reducing the length of said pipes even more, while guaranteeing a sufficient surface for the group of printed resistors 2.1, these could be composed of one or more barrels 2.8, also connected either in a row or in parallel mode.

[0030] The use of an additional heater very similar in construction to post-heater 2 can prove very useful even acting as a pre-heater for the water taken in from the main line and introduced into the accumulator water heater 1 through the intake pipe 1.3. In fact the introduction of pre-heated water into the said accumulator water heater 1 reduces the negative mixing effects.

[0031] The dotted perimeter in figure 3 globally shows a pre-heater 3 according to the invention; this is basically composed of an instant electric water heater with low electrical power, not necessarily sufficient to heat the main line water t_{H2O}, to the required temperature for use t_{u.r} or accumulated temperature t_s. when the drawn-off flow rate corresponds with the maximum calculated distribution for a shower or hand basin tap.

[0032] The figure schematically shows a pipe 3.5 from the pre-heater 3, mounted upstream of the accumulator water heater 1, that is, connected immediately before the intake pipe 1.3.

[0033] Groups of electric resistors 3.1 are associated with said pipe 3.5 to heat the inflow water raising the temperature by a quantity Δt_i .

[0034] A possible thermostat 3.4, mounted immediately downstream of pipe 3.5 acts at least to prevent the outflow water temperature at pipe 3.5 from exceeding acceptable limits. As well as the other elements with the same identification numerals as in figure 1, the aforesaid elements described in figure 3, are identical or equivalent

to those in figure 1 and can perform the same functions (including adjustment settings, switch-over, or cut-off of the electric resistors 3.1) with the only difference that in this case, instead of completing the heating action of the water destined for the user, they act to introduce pre-heated water into the accumulator water heater 1, naturally at a temperature that is lower than the temperature t_s at which it is maintained inside the same accumulator water heater 1. The beneficial effect on the aforesaid mixing phenomena occurs because of the fact that the water already present in said accumulator water heater is subject to a lesser cooling action, mixing with the inflow water so that it will cool much less, or even not at all and will therefore not reduce the temperature to lower than that required for use.

[0035] As far as the power for the said pre-heater 3 is concerned, lower limits cannot be indicated; naturally the higher the electrical power used, the higher the increase in temperature Δt_i and therefore the greater the reduction of negative mixing effects; those skilled in the art can run tests to establish what power to be assigned in order to create a positive effect for the user according to the type of accumulator water heater. The term 'positive effect' refers to the increase in the amount of water that can be obtained continuously from an accumulator water heater 1 at a temperature that is higher or equal to that required by the user.

[0036] With sufficient power available, the said post-heater 2 and pre-heater 3 can be combined in a single heater device 4 to serve the same accumulator water heater 1. This is illustrated in figure 4 where the means previously described (flow meter 2.2 and switch 2.3) are programmed to control both resistor groups 2.1 and 3.1, while each of the temperature limit systems 2.4 and 3.4, if present, can control and possibly modulate the resistor groups 2.1 and 3.1 separately and respectively using the adjustment regulator 2.6.

[0037] Since both the pre-heater and post-heater are activated only at the actual moment when water is drawn, and therefore at the same time, as can be seen in figure 5, an additional heater 5 can be provided mounted with a single group of resistors 5.1, adapted to supply heating energy simultaneously to both the introduced water as well as that drawn off the accumulator water heater 1. This can be obtained by foreseeing that said group of resistors, a "printed" type for example, release heat to a lapped metal wall on the opposite side to the said inflow and outflow water that are naturally separated from each other. In figure 5 for example, this is created using a group of printed resistors 5.1 applied to the surface of an internal pipe 5.5, inside which the water flows towards the exterior, whereas the water flowing towards the interior passes on the outside through an external pipe 5.6. Naturally, in this manner it is not possible to separate the modulation of the heat for the pre and post heater moment by moment, however, it is possible to modulate the heat of the temperatures of both the inflow into the accumulator water heater 1 or

the outflow delivery to the user, an aspect that is considered more important. On the other hand it is always possible to interrupt or reduce the electrical power distribution if one of the aforesaid temperatures exceeds the limits individually set for each system. It is also possible to establish the power fractions to be assigned to the two functions previously by simply inserting a layer of insulation between at least part of the group of resistors 5.1 and the fluid that must receive less heat energy (this variant is not illustrated in figure 5), or by constructing (as shown in fig. 5) the external pipe 5.6 shorter than the portion of internal piping 5.5 along which the group of resistors 5.1 are applied. Obviously, if the inflow water requires a larger area of heat contact with said group of resistors 5.1, the in-flow will run through the inside of the internal pipe 5.5, while the out-flow will pass through the external pipe 5.6.

[0038] So that all said advantages can benefit all users who already possess an accumulator water heater, the additional heater, according to any of the variants 2, 3, 4 or 5 illustrated up to this point, must be suitable for retrofitting assembly on all models of previously installed accumulator bathroom water heaters. Therefore it is advisable that said additional heaters 2, 3, 4 or 5 be also available in an accessory kit form that can be installed in proximity to or on the back of said accumulator water heater 1, and that they be functionally integrated. Retrofitting is very easy, as can be noted in figures 1, 3, 4 and 5, consisting simply of a plumbing connection that leaves the function of the accumulator water heater 1 completely unchanged, except for one aspect. If the accumulator heater is the electrical type, it may be advisable to supply electricity through a switch 2.3 for the reasons explained previously.

[0039] In conclusion, it has been demonstrated how an additional heater of the type 2, 3, 4 or 5, associated with an accumulator water heater 1 and used to apply the methods described above, can correct implicit defects in the water heating method used on accumulator systems, while maintaining the advantages at the same time.

Claims

1. Additional heater (2; 3; 4; 5) for heating the water of an accumulator water heater (1), said accumulator water heater (1) being mounted with heating means (1.1) for the accumulated water and of means of control (1.2) for the accumulated water temperature
characterised in that said additional heater (2; 3; 4; 5) is composed of an instant electrical water heater (2, 3, 4, 5)
 - that it is installed downstream and/or upstream of said accumulator water heater (1)
 - and equipped with one or more groups of elec-

tric resistors (2.1; 3.1; 5.1) activated by a flow meter (2.2) each time the meter reads that water is being drawn off.

2. Additional heater (2; 3; 4; 5) according to the previous claim
characterised in that
 - said accumulator water heater (1) is of the electrical type, and said heating means (1.1) comprise electrical heating resistors (1.1)
 - and that when said flow meter (2.2), activates said one or more groups of electrical resistors (2.1; 3.1; 5.1) mounted on said additional heater (2; 3; 4; 5), it simultaneously deactivates said electrical heating resistors (1.1) mounted on said accumulator water heater (1) by means of a switch (2.3).
3. Additional heater (2; 3; 4; 5) according to any previous claim
characterised in that
 a thermostat (2.4; 3.4) can be associated with each group of electrical resistors (2.1; 3.1; 5.1) to signal the measured temperature to a modulator (2.6) adapted to deactivate said one or more electrical resistors (2.1; 3.1; 5.1), if the measured temperature in exit from the same additional heater (2; 3; 4; 5) exceeds a limit that is considered unacceptable.
4. Additional heater (2; 3; 4; 5) according to the previous claim
characterised in that
 said power modulator (2.6) is also adapted to modulate the power of said one or more groups of electrical resistors (2.1; 3.1; 5.1) until the temperature measured at the outlet is equal to a pre-established value.
5. Additional heater (2; 3; 4; 5) according to any of the previous claims
characterised in that
 the heater is configured to be retrofitted as an accessory device, up or downstream of the accumulator water heater (1) already installed and operating.
6. Additional heater (2; 3; 4; 5) according to any of the previous claims
characterised in that
 said one or more groups of electrical resistors (2.1; 3.1; 5.1) are composed of electrical resistors printed on the surface of one or more pipes (2.5; 2.7, 2.8) crossed by the water delivered for use and /or to the accumulator water heater (1).
7. Accumulator water heater (1) according to the previous claim

characterised in that

said one or more pipes (2.5; 2.7, 2.8) are composed of one or more truncated pipes (2.5; 2.7) arranged in a row or in parallel mode.

8. Accumulator water heater (1) according to claim 6 **characterised in that**

said one or more pipes (2.5; 2.7, 2.8) are composed of one or more barrels (2.8) arranged in a row or in parallel mode.

9. Additional heater (2; 3; 4; 5) according to one or more claims from 1 to 8

characterised in that

this is composed of a post-heater (2)

- installed downstream of the said accumulator water heater (1)

where

- said means (1.2) controls the accumulated water temperature set at a storage value (ts) lower than the value of the temperature (tu) of the water required for use
- and the power of said groups of electrical resistors (2.1) with a value sufficient to raise the distribution water flow temperature from the lower storage temperature (ts) at which it is maintained inside the water heater (1) to the higher temperature required by the user. (tu.r) .

10. Additional heater (2; 3; 4; 5) according to one or more claims from 1 to 8

characterised in that

this is composed of a pre-heater (3)

- installed upstream of said accumulator water heater (1)
- and equipped with said electrical resistors (3.1) with sufficient power to provide the pre-heating of the water from the main line in order to reduce the negative effects of the so-called mixing phenomena.

11. Additional heater (2; 3; 4; 5) according to one or more of the previous claims

characterised in that

it is mounted with groups of electrical resistors (2.1) adapted to post-heat the water delivered to the user, and with groups of electrical resistors (3.1) adapted to pre-heat the identical amount of water simultaneously as it is introduced into the said accumulator water heater (1).

12. Additional heater (2; 3; 4; 5) according to the previous claim

characterised in that

the temperatures of said water delivered to the user and the identical amount of water simultaneously introduced in to said water heater are separately controllable and can be adjusted by means composed of thermostats (3.4; 2.4) and a modulator (2.6) adapted to deactivate said one or more groups of electrical resistors (2.1; 3.1).

13. Additional heater (2; 3; 4; 5) according to one or more claims from 1 to 10

characterised in that

it is mounted with groups of electrical resistors (5.1) adapted to simultaneously post-heat the water delivered to the user and to pre-heat an identical amount of water simultaneously introduced into said accumulator water heater (1), said groups of electrical resistors (5.1) being in thermal contact with a metal separating wall (5.5) between said water entering and in exit from said accumulator water heater (1).

14. Additional heater (2; 3; 4; 5) according to the previous claim

characterised in that

said metal separation wall (5.5) between said water entering and said water in exit from the said accumulator water heater (1) is composed of the surface of an internal pipe (5.5) inside which flows the delivery water, and between an external pipe (5.6) inside which flows the intake water into said accumulator water heater (1).

15. Additional heater (2; 3; 4; 5) according to the previous claims 13 or 14

characterised in that

means are envisaged composed of thermostats (3.4; 2.4) and a modulator (2.6) adapted to interrupt or reduce the distribution of the electrical power if at least one of the two aforesaid temperatures exceeds the limit pre-set for each of the two temperatures.

16. Additional heater (2; 3; 4; 5) according to any or the previous claims from 13 to 15

characterised in that

means are envisaged composed of thermostats (3.4; 2.4) and a modulator (2.6) adapted to interrupt or reduce the distribution of the electrical power to maintain at a pre-established temperature, either the water delivered to the user, or the identical amount of water simultaneously introduced into the said accumulator water heater (1), according to which of the two temperatures is considered more useful to be maintained at the pre-established value.

17. Additional heater (2; 3; 4; 5) according to any or the previous claims from 13 to 16

characterised in that

means are envisaged to fraction the power of said groups of electrical resistors (5.1) in a pre-established manner in order to distribute the water delivered to the user and to the identical amount of water simultaneously introduced into said accumulator water heater (1). 5

adapted to implement said methods according to one or more claims from 20 to 22.

18. Additional heater (2; 3; 4; 5) according to the previous claim 10

characterised in that

said means comprise an insulating layer positioned between at least part of the group of resistors (5.1) and the fluid that is destined to receive less thermal energy. 15

19. Additional heater (2; 3; 4; 5) according to claim 17 **characterised in that** said means comprise the fact that 20

- said external pipe (5.6) is shorter than the portion of said internal pipe (5.5) along which are applied said groups of (5.1)
- and that the water that receives the lesser thermal power flows through the said external pipe (5.6). 25

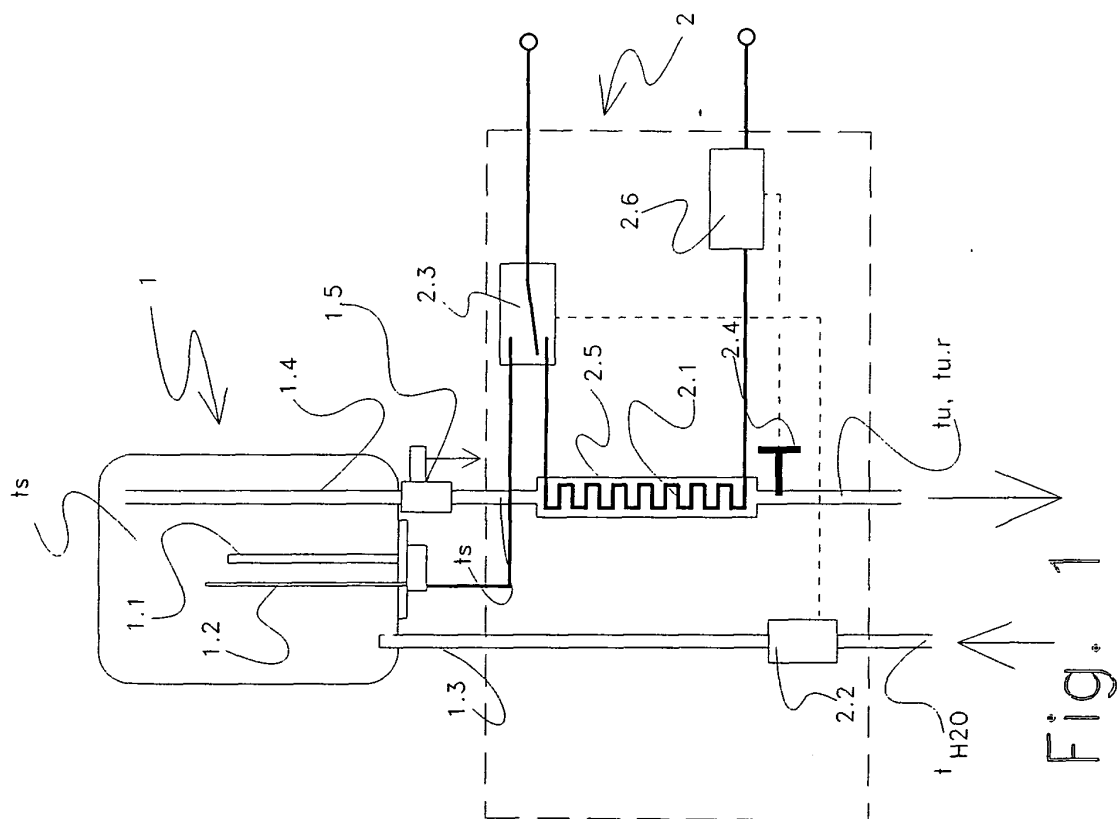
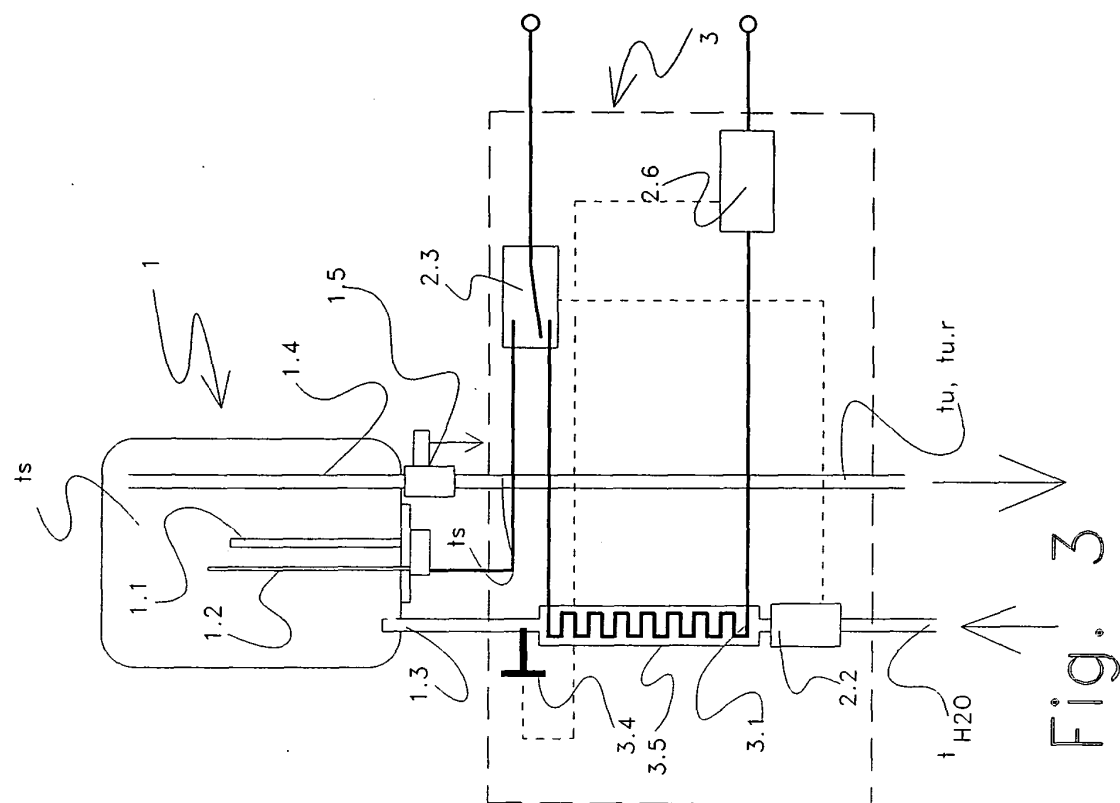
20. Method for the post-heating of pre-heated water from an accumulator water heater (1) **characterised in that** 30
- the water is pre-heated to a storage value (t_s) lower than the value of the temperature (t_u) of the water required for use, and, only at the actual moment of use, the water is instantly raised to the value (t_u) of the temperature required for use. 35

21. Method for the pre-heating of main line water before its entry into an accumulator water heater (1) **characterised in that** 40
- the water is pre-heated to an intermediate value between the main line temperature (t_{H_2O}) and the storage temperature (t_s) in a manner to considerably reduce the negative effects caused by mixing. 45

22. Method for the additional heating of water at the inlet and outlet of an accumulator water heater (1) **characterised in that** 50
- it is composed of a post-heating operation according to claim 20 and a pre-heating operation according to claim 21.

23. Accumulator water heater (1) comprising an additional heater (2; 3; 4; 5) according to one or more of the claims from 1 to 19. 55

24. Accumulator water heater (1) equipped with means



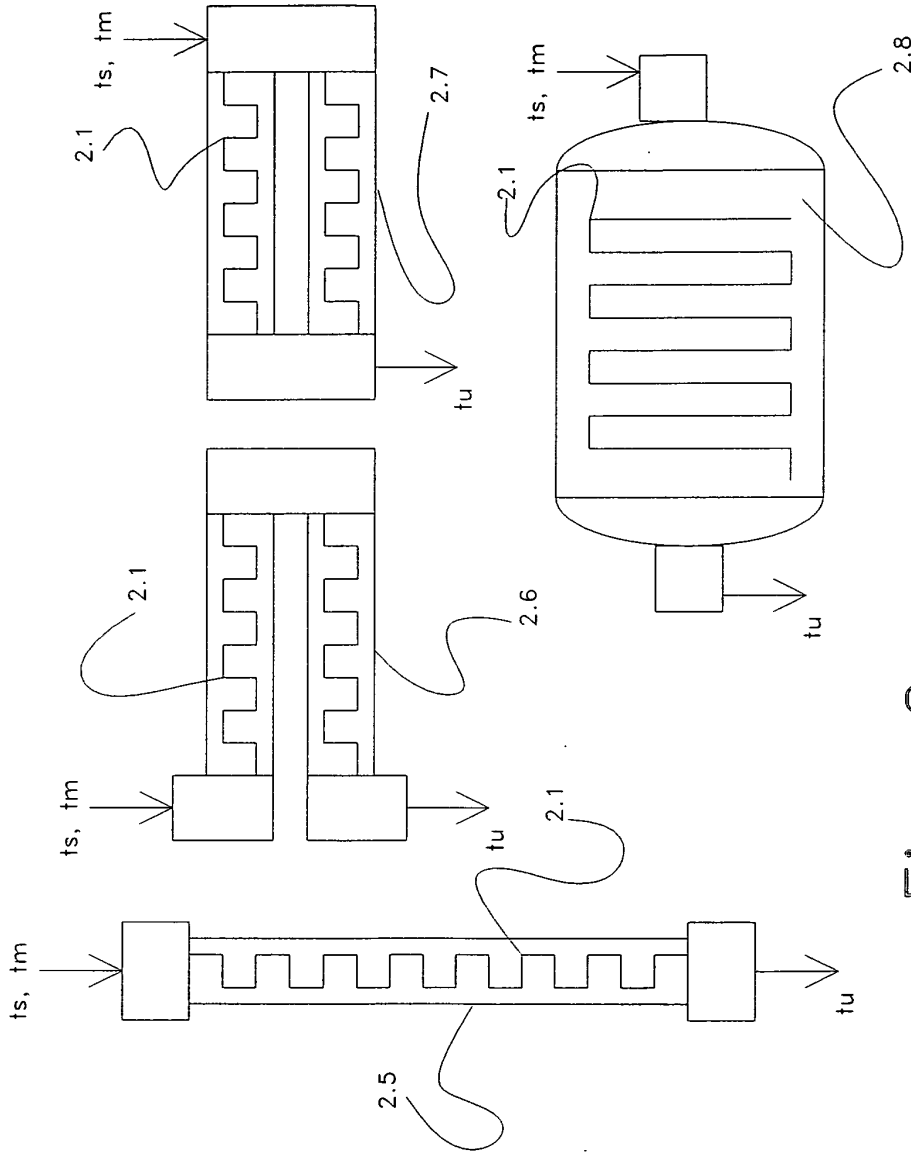
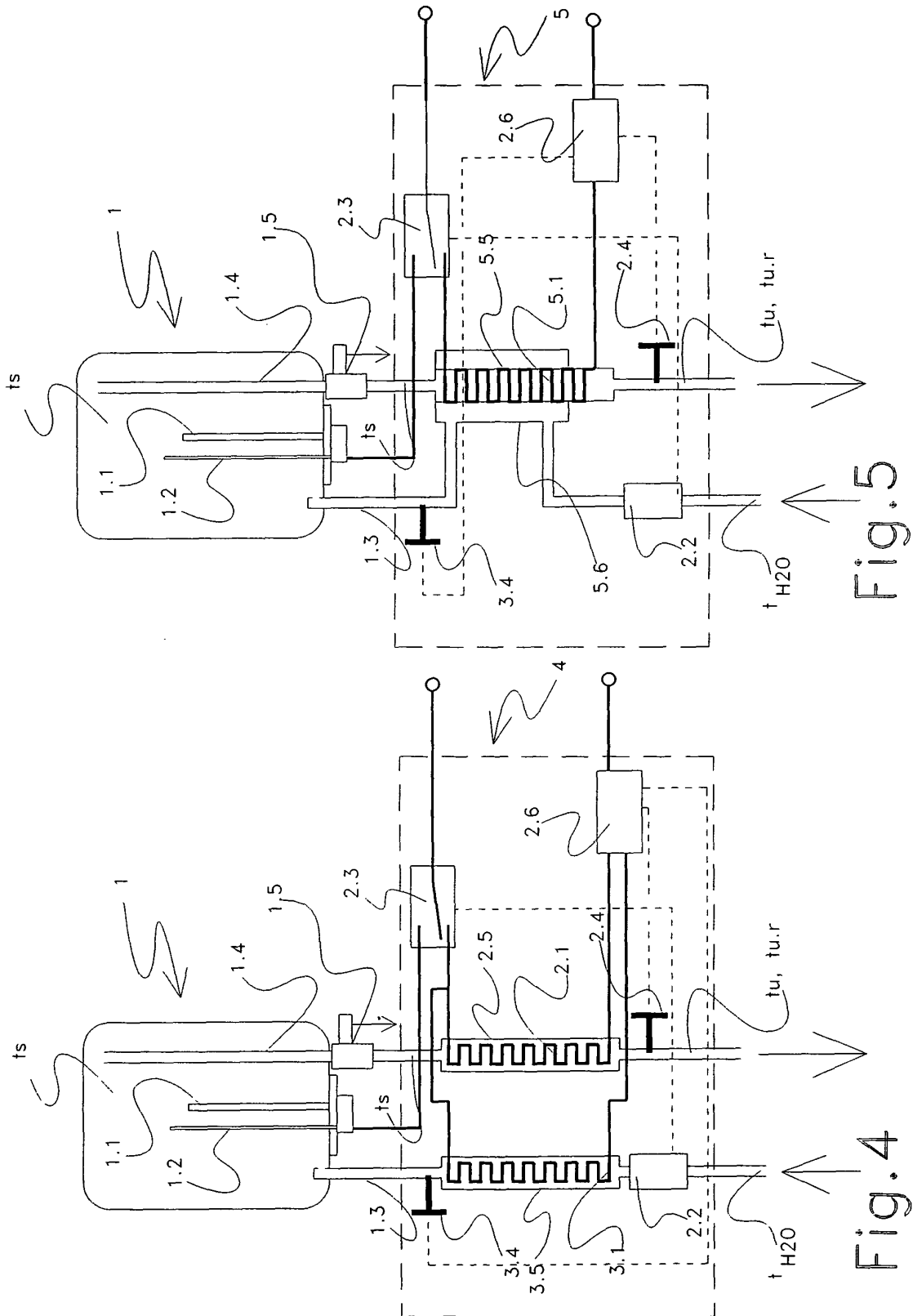


Fig. 2





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 02 8554

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 32 43 845 A1 (JOH.VAILLANT GMBH U. CO) 16 June 1983 (1983-06-16)	1,3-5,9, 20,23,24	F24H1/12 F24H1/20
Y	* abstract; figures 1,2 *	6-8	

X	DE 30 40 288 A1 (HOLZER,WALTER,ING) 3 June 1982 (1982-06-03)	1,2,8,9, 12,20, 23,24	
	* page 3 - page 5; figures 1-6 *		

X	DE 89 03 652 U1 (BOSCH-SIEMENS HAUSGERAETE GMBH, 8000 MUENCHEN, DE) 11 May 1989 (1989-05-11)	1,3-5, 8-10,16, 17,20, 21,23,24	
	* page 4, paragraph 1; figure 1 *		
	* page 5, paragraph 2 *		
	* page 8 - page 10 *		

X	DE 89 03 651 U1 (BOSCH-SIEMENS HAUSGERAETE GMBH, 8000 MUENCHEN, DE) 11 May 1989 (1989-05-11)	1,3,4,7, 9,20, 22-24	
	* page 2 - page 6; figure 1 *		

Y	GB 2 324 014 A (* CARADON MIRA LIMITED) 7 October 1998 (1998-10-07)	6-8	
A	* abstract; figures 1,2,6,14 *	3-5	

A	PATENT ABSTRACTS OF JAPAN vol. 007, no. 227 (M-248), 7 October 1983 (1983-10-07) & JP 58 120043 A (MATSUSHITA DENKI SANGYO KK), 16 July 1983 (1983-07-16) * abstract; figure 1 *	10	

The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 March 2005	Examiner García Moncayo, 0
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

3
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 02 8554

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-03-2005

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
DE 3243845	A1	16-06-1983	NONE	
DE 3040288	A1	03-06-1982	NONE	
DE 8903652	U1	11-05-1989	NONE	
DE 8903651	U1	11-05-1989	NONE	
GB 2324014	A	07-10-1998	NONE	
JP 58120043	A	16-07-1983	NONE	