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(54) **HOT WATER INSTALLATION AND METHOD FOR HEATING WATER**

(57) The invention relates to a hot water installation and method, the installation comprising:

- a feed for supplying a liquid flow to be heated;
- a burner configured to combust a gas (mixture) for the purpose of heating the liquid flow;
- a discharge for discharging the heated liquid flow;
- a gas feed connected operatively to the burner;
- a gas mixer configured to mix a supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen;
- an electrolysis system connected operatively to the gas mixer and configured to produce the gas mixture of oxygen and hydrogen,

further comprising:

- a dehumidifier configured to dehumidify the gas mixture of oxygen and hydrogen produced with the electrolysis system; and
- a heat exchanger connected operatively to the electrolysis system and the feed of the liquid flow to be heated, and configured to preheat the liquid flow to be heated.

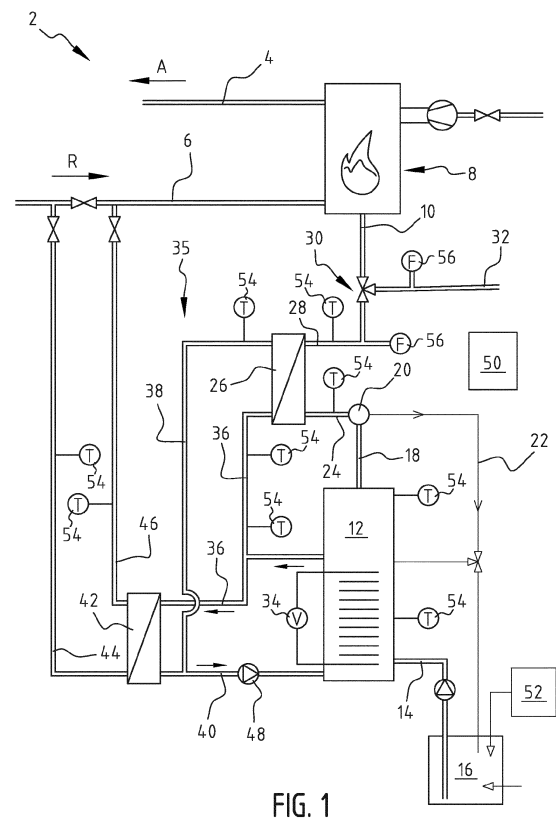


FIG. 1

Description

[0001] The invention relates to a hot water installation, a method for heating water with such a hot water installation, and to a gas dosing installation for admixing of a gas mixture in such a hot water installation.

[0002] Hot water installations, such as a central heating boiler, boiler, steam boiler or geyser or process heat from a burner of a cooking device, are known in practice and are configured to heat water by combusting a combustible gas. The combustible gas is usually natural gas, however, other hydrocarbon gases can also be applied.

[0003] When a hydrocarbon gas such as natural gas is combusted, the greenhouse gas CO₂ is emitted. The worldwide emission of CO₂ causes an increase in the greenhouse effect. It is therefore generally considered desirable to reduce the emission of CO₂.

[0004] WO 2017/196174 A1 shows a gas mixer for a hot water installation in which a mixture of oxygen, hydrogen and hydrocarbon is combusted, as well as a hot water installation provided with such a gas mixer. Admixing of hydrogen into the gas mixture results in a reduction of the CO₂ emission in that the combustion of hydrogen does not result in CO₂. The emission of CO₂ per unit of produced water, for instance the amount of CO₂ per unit of hot water, for instance measured in grams of CO₂/litre of produced hot water, actually decreases thereby.

[0005] A drawback of said (or a similar) gas mixer and hot water installation is that an increase in nitrogen oxides (NO_x) may occur during the combustion due to the addition of hydrogen because the stability of the burner flame is reduced. The emission of NO_x has a (harmful) effect on nature and the environment, including nature reserves, which is deemed unacceptable under international agreements. A reduction of the NO_x emission is therefore desirable.

[0006] An object of the invention is therefore to increase the stability of the burner flame and correspondingly therewith reducing the NO_x emission of hot water installations.

[0007] This object is achieved with a hot water installation for providing a hot liquid flow according to the invention, the installation comprising:

- a feed for supplying a liquid flow to be heated;
- a burner configured to combust a gas or gas mixture for the purpose of heating the liquid flow;
- a discharge for discharging the heated liquid flow;
- a gas feed connected operatively to the burner;
- a gas mixer configured to mix a supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen;
- an electrolysis system connected operatively to the gas mixer and configured to produce the gas mixture of oxygen and hydrogen,

further comprising:

- a dehumidifier configured to dehumidify the gas mixture of oxygen and hydrogen produced with the electrolysis system; and
- a heat exchanger connected operatively to the electrolysis system and the feed of the liquid flow to be heated, and configured to preheat the liquid flow to be heated.

[0008] By applying a dehumidifier to dehumidify the produced gas mixture of oxygen and hydrogen prior to it being mixed with a hydrocarbon, such as natural gas, a stable burner flame is achieved, while a greater proportion of oxygen and hydrogen can simultaneously be applied in the gas mixture in the burner. A hot water installation with both a reduced CO₂ emission and a reduced NO_x emission is hereby realized.

[0009] A further advantage of the hot water installation according to the invention is that the heat produced by the electrolysis cell can be transferred to the water to be heated. It is hereby achieved that the electrolysis cell can be kept at the correct operating temperature while the amount of gas mixture required for heating the water to be heated can simultaneously be reduced. This further increases the efficiency of the hot water installation, and also reduces CO₂ emission and NO_x emission still further.

[0010] Yet another advantage of the hot water installation according to the invention is that application of the dehumidifier results in cooling of the produced gas mixture of oxygen and hydrogen and in cooled discharge liquid being delivered. In order to heat the cooled produced gas mixture use can be made of residual heat from the electrolysis system, whereby the electrolysis system can be cooled in an effective manner and can be kept at a desired or even optimal operating temperature. This residual heat is preferably a maximum of 70°C. The cooled discharge water from the dehumidifier can additionally or alternatively be utilized for (further) cooling of the electrolysis system.

[0011] In an embodiment the required hydrocarbon in the gas mixture is one or more of natural gas, biogas, methane, propane or butane, wherein the gas mixture preferably comprises natural gas.

[0012] In an embodiment the heat exchanger is a plate heat exchanger.

[0013] The advantage of applying a plate heat exchanger is that a relatively large heat-exchanging surface is thereby realized with the smallest possible dimensions of the heat exchanger.

[0014] In an embodiment of the hot water installation according to the invention the gas mixer can be configured to reduce the proportion of hydrocarbon from about 100% by weight when the hot water installation is started to a proportion in the range of 3 to 20% by weight, preferably in the range of 5 to 15% by weight, and most preferably in the range of 10 to 12% by weight.

[0015] An advantage of this embodiment is that an efficient start of the installation is realized in this way, after

which the proportion of hydrocarbon can (most preferably) be reduced to only 10 to 12% by weight in order to thus realize a reduction in the emission of CO₂ and NO_x.

[0016] The gas mixer is preferably provided with a control device or adjusting device for controlling the gas mixer in order to deliver an optimal gas mixture to the burner. This further reduces the amount of NO_x emitted.

[0017] In a further embodiment the gas mixer can further be configured, preferably by means of a control device or adjusting device, to control the ratio between hydrogen and oxygen in the produced mixture of hydrogen and oxygen, wherein this ratio preferably lies in the range of 4:1, and more preferably lies in the range of 2:1.

[0018] An advantage of this specific ratio is that it can be produced in relatively simple manner without additional processing steps, whereby the costs of the installation decrease. A more compact installation is also realized.

[0019] In an embodiment of the hot water installation according to the invention it can further comprise a flow meter connected operatively to the gas mixer for the purpose of measuring the quantity of gas produced by the electrolysis system.

[0020] An advantage of applying a flow meter for the produced gas is that an optimal gas mixture can be realized, preferably via a control and/or adjusting device, whereby a maximum reduction of the CO₂ and NO_x emission can be realized.

[0021] Use can here optionally also be made of a temperature sensor for measuring the temperature of the produced hydrogen and/or oxygen gas in order to achieve an optimal mixture. In an embodiment according to the invention the temperature of the hydrogen and/or oxygen gas can also be reduced by extracting heat from the gas prior to mixing it with the hydrocarbon.

[0022] In an embodiment of the hot water installation according to the invention it further comprises a second heat exchanger which is configured to heat the gas mixture produced with the electrolysis system and dehumidifying with the dehumidifier.

[0023] As already stated above, an advantage of the hot water installation according to the invention is that application of the dehumidifier results in cooling of the produced gas mixture of oxygen and hydrogen and in cooled discharge liquid being delivered. In order to heat the cooled produced gas mixture use can be made of residual heat from the electrolysis system, whereby the electrolysis system can be cooled in an effective manner and can be kept at the ideal operating temperature. To transfer the residual heat from the electrolysis system to the produced gas mixture of hydrogen and oxygen use is preferably made of a (second) heat exchanger. The heat can hereby be transferred in efficient manner. The second heat exchanger is preferably a plate heat exchanger, since these are efficient and simple in use.

[0024] In an embodiment of the hot water installation according to the invention the first and second heat exchanger can be provided in a combined circuit for the purpose of transferring heat from the electrolysis system

to the liquid flow to be heated and the gas mixture dehumidified with the dehumidifier.

[0025] An advantage of a combined circuit for both heat exchangers is that an even more effective heat exchange circuit is realized. This is realized inter alia in that fewer components are necessary, such as for instance only one pump for circulation through both heat exchangers.

[0026] In an embodiment of the hot water installation according to the invention it can further comprise a power controller connected operatively to the electrolysis system and configured to supply power to the electrolysis system.

[0027] An advantage of a power controller is that the required amount of power can be supplied to the electrolysis system hereby while, at the same time, continuous power need not be supplied. This achieves an efficient supply of power and reduces unnecessary losses.

[0028] In an embodiment of the hot water installation according to the invention the power controller can be provided with an optimizer configured to vary the supplied power in time.

[0029] An advantage of applying an optimizer in the power controller is that the power supplied can be adapted to the demand for hydrogen and/or oxygen gas, or that it is additionally or alternatively possible to opt to adapt the supplied power to the optimal production conditions of the electrolysis system. This can be done by taking into consideration a temperature measured in the electrolysis system, so that the heat can be discharged optimally and the system can be utilized in an optimal production state.

[0030] In an embodiment of the hot water installation according to the invention it can further comprise a return for returning liquid from the dehumidifier to the electrolysis system.

[0031] An advantage of returning liquid extracted from the dehumidifier is that no water flow loss occurs, this lowering the costs of operating the hot water installation.

[0032] A further advantage is that the extracted liquid is (partially) prepared for use in the electrolysis system, for instance owing to the presence of (residues of) an electrolyte.

[0033] Yet another advantage is that the extracted liquid has a relatively low temperature, whereby it has a cooling effect when fed into the electrolysis system. This has a positive effect on the efficiency of the electrolysis system.

[0034] In an embodiment of the hot water installation according to the invention the electrolysis system can be provided in use with an electrolyte for the purpose of improving the conduction.

[0035] An advantage of adding an electrolyte is that the efficiency of the production of hydrogen and/or oxygen can be increased. The electrolyte can for instance comprise one or more salts and/or seawater.

[0036] In an embodiment of the hot water installation according to the invention it can further comprise a dosing device for adding electrolyte.

[0037] Applying a dosing device, preferably provided with a sensor and/or a controller, enables the amount of electrolyte to be optimized for the amount of hydrogen and oxygen to be produced. This further increases the efficiency of the electrolysis system and thereby the hot water installation.

[0038] In an embodiment of the hot water installation according to the invention the electrolysis system can be provided with a number of electrodes, comprising one or more of: palladium, iridium and platinum.

[0039] Applying electrodes with palladium and/or iridium and/or platinum can realize a more effective production of the produced mixture of hydrogen and oxygen.

[0040] The invention further also relates to a method for heating a liquid flow, the method comprising the steps of:

- providing a hot water installation according to an embodiment of the invention;
- starting up the hot water installation by means of the combustion of a supply of a hydrocarbon gas;
- activating the electrolysis system and producing the gas mixture of oxygen and hydrogen;
- mixing the supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen;
- optimizing the combustion with the burner; and
- heating the liquid flow to be heated,

further comprising of:

- dehumidifying the gas mixture of oxygen and hydrogen produced with the electrolysis system using a dehumidifier; and
- preheating the liquid flow to be heated with heat produced by the electrolysis system using a heat exchanger.

[0041] The method according to the invention has similar effects and advantages as the hot water installation according to the invention.

[0042] An advantage of the method according to the invention is that dehumidifying the produced gas mixture of oxygen and hydrogen prior to mixing it with a hydrocarbon, such as natural gas, achieves that a greater proportion of oxygen and hydrogen can be applied in the gas mixture while a stable burner flame is simultaneously realized. A hot water installation with both a reduced CO₂ emission and a reduced NO_x emission is hereby realized.

[0043] A further advantage of the method according to the invention is that the heat produced by the electrolysis cell can be transferred to the water to be heated. It is hereby achieved that the electrolysis cell can be kept at the correct operating temperature while the amount of gas mixture required for heating the water to be heated can simultaneously be reduced.

[0044] In an embodiment of the method according to the invention the method can further comprise the step of reducing the proportion of hydrocarbon from about

100% by weight when the hot water installation is started to a proportion in the range of 3 to 20% by weight, preferably in the range of 5 to 15% by weight, and most preferably in the range of 10 to 12% by weight during operation of the hot water installation.

[0045] An advantage of this embodiment is that an efficient start of the installation is realized in this way, after which the proportion of hydrocarbon can (most preferably) be reduced to only 10 to 12% by weight in order to thus realize a reduction of the CO₂ and NO_x emission.

[0046] This method step preferably also comprises of controlling the gas mixer in order to deliver an optimal gas mixture to the burner. This reduces the amount of NO_x emitted (still) further.

[0047] In an embodiment of the method according to the invention the method can further comprise of controlling the temperature in the electrolysis system, wherein the operating temperature lies in the range of 60 to 95°C, preferably in the range of 70 to 85°C, and most preferably in the range of 77 to 82°C.

[0048] Controlling the temperature in the electrolysis system ensures that an optimal production of hydrogen and oxygen is achieved in order to further limit the emission of CO₂ and NO_x. Controlling the temperature can comprise, among other things, one or more of actively extracting heat from the electrolysis system by cooling the system, decreasing the power supplied to the electrolysis system and/or feeding liquid extracted from the humidifier back to the electrolysis system.

[0049] In an embodiment of the method according to the invention the method can further comprise of controlling the power supplied to the electrolysis system in time using a power controller.

[0050] An advantage of controlling the supplied power in time is that an efficient production of hydrogen and oxygen is achieved. The greatest possible amount of hydrogen and oxygen is hereby produced with the lowest possible amount of power. The power controller can be configured to control one or more of voltage, amperage and/or frequency of the supplied power, in relation to the conduction.

[0051] In an embodiment of the method according to the invention the power can be adapted such that the operating temperature of the electrolysis system is kept in the desired range during use.

[0052] Adapting the amount of power supplied to the electrolysis system enables the electrolysis system to be kept in the desired temperature range, whereby an optimal production of hydrogen and oxygen is achieved.

[0053] The invention further relates to a gas dosing installation for admixing of a gas mixture in a hot water installation, the gas dosing installation comprising:

- a feed coupling for coupling to a feed for the purpose of supplying a liquid flow to be heated;
- a discharge coupling for coupling to a discharge for the purpose of discharging the heated liquid flow;
- a gas mixer configured to mix a supply of a hydro-

carbon gas with a gas mixture of oxygen and hydrogen and provided with a gas coupling for coupling to a gas feed;

- an electrolysis system connected operatively to the gas mixer and configured to produce the gas mixture of oxygen and hydrogen,

further comprising:

- a dehumidifier configured to dehumidify the gas mixture of oxygen and hydrogen produced with the electrolysis system; and
- a heat exchanger connected operatively to the electrolysis system and the feed of the liquid flow to be heated, and configured to preheat the liquid flow to be heated.

[0054] The gas dosing installation according to the invention has similar effects and advantages as the above stated hot water installation according to the invention and the method for heating a liquid according to the invention.

[0055] The gas dosing installation according to the invention has the advantage that it can also be applied to convert an existing burner and/or hot water installation into a hot water installation according to the invention. A reduction of the emission of CO₂ and NO_x is thereby achieved in simple and cost-efficient manner. This is realized in that no new hot water installation need be installed, while the more inefficient existing hot water installation can be improved by converting it into a hot water installation according to the invention.

[0056] It is noted that the gas dosing installation according to the invention can also be applied in combination with the above stated other components and embodiments of the hot water installation and/or the method according to the invention.

[0057] Further advantages, features and details of the invention are elucidated on the basis of exemplary embodiments thereof, wherein reference is made to the accompanying figures.

- Figure 1 shows schematically an example of a first embodiment of a hot water installation according to the invention; and
- Figure 2 shows a block diagram of an example of an embodiment of the method according to the invention.

[0058] In an example of hot water installation 2 (figure 1) it is provided with return 6 for supplying a liquid flow (R) to be heated and hot water feed 4 for discharging the heated liquid flow (A). In this example the liquid flow (A, R) is water for heating a building, such as a home or a residential complex. The liquid flow (A, R) can also be utilized in or for a heat process. Hot water installation 2 is further provided with a burner 8 and, connected thereto, gas feed 10 for supplying a gas mixture to be combusted.

[0059] The hot water installation can optionally also be provided with a buffer vessel (not shown) which is connected to hot water installation 2, such as for instance feed 4 or return 6.

[0060] Hot water installation 2 is further provided with electrolysis system 12 which is configured to produce hydrogen and oxygen. In this example feed 14 of electrolysis system 12 is coupled to liquid reservoir 16 for supplying liquid to be electrolyzed, such as water. Alternatively, it is also possible to opt to connect feed 14 directly to an external liquid source (not shown). In electrolysis system 12 a liquid, in this case water, is converted into hydrogen gas and oxygen gas by means of electricity. The produced mixture of hydrogen and oxygen is carried via discharge 18 from electrolysis system 12 to dehumidifier 20. Dehumidifier 20 is configured to extract water from the produced mixture of hydrogen and oxygen. The extracted water is discharged via conduit 22 or, in this example, fed back to reservoir 16. Dehumidifier 20 is further connected via conduit 24 to heat exchanger 26 for the purpose of supplying heat to the produced mixture of hydrogen and oxygen. Conduit 28 is connected to heat exchanger 26 on one side and to gas mixer 30 on the other for the purpose of transporting the heated gas mixture of oxygen and hydrogen from heat exchanger 26 to gas mixer 30. Gas mixer 30 is further connected to hydrocarbon conduit 32 for the purpose of supplying hydrocarbon gas and, on a downstream side, to gas feed 10 for supplying the gas mixture to burner 8. Gas mixer 30 is configured to mix the produced mixture of hydrogen and oxygen with hydrocarbon gas from hydrocarbon conduit 32 and to guide it via gas feed 10 to burner 8 for combustion.

[0061] Electrolysis system 12 is further provided with voltage source 34 for supplying electricity for the electrolysis. Electrolysis system 12 is further provided with heat discharge circuit 35 which is formed by conduits 36, 38, 40 and by heat exchangers 26, 42 and pump 48. Residual heat is transported via conduit 36 to one or both heat exchangers 26, 42. Heat exchanger 26 is configured to transfer heat to the gas mixture of oxygen and hydrogen which is supplied through conduit 24. Heat exchanger 26 is further connected on the downstream side to conduit 38 which debouches in conduit 40. Conduit 36 is further connected to an inlet side of heat exchanger 42. Heat exchanger 42 is configured to transfer heat to liquid (R) from conduit 6. An outlet side of heat exchanger 42 is connected to conduit 40 for the purpose of transporting the cooled liquid to electrolysis system 12. Conduit 40 is provided with pump 48 for transporting the liquid from and to electrolysis system 12 through conduits 36, 38, 40 of heat discharge circuit 35.

[0062] In this example hot water installation 2 is further likewise provided with controller 50 which is configured to control one or more parameters of hot water installation 2. Controller 50 can take the form of a control and/or adjusting system. Controller 50 can for instance be configured to control the power to be supplied to the elec-

trollysis system (power control) by means of frequency, voltage or resistance control. Controller 50 can also be configured to control dosing system 52 for the purpose of dosing electrolyte to reservoir 16 of system 12.

[0063] In this example hot water installation 2 is further provided with various temperature (T) and flow (F) sensors 54, 56 which are connected operatively to controller 50 for the purpose of supplying respectively temperature and flow data. The sensors F, T can be used by controller 50 for controlling and/or adjusting one or more of the hydrocarbon gas supply via conduit 32, the hydrogen and oxygen production by electrolysis system 12 and/or the power supply to electrolysis system 12 for controlling hot water installation 2. Other control options for optimizing the hot water installation in terms of reducing CO₂ and NO_x and (further) increasing the operational safety on the basis of sensors F, T by controller 50 are however also possible.

[0064] In an example of the method 1000 (figure 2) according to the invention it comprises the step of providing 1002 hot water installation 2 according to the invention. The providing 1002 can also comprise the steps of providing an existing hot water installation and converting 1018 it into hot water installation 2 by replacing 1020 the existing burner with gas mixer 8 and arranging 1022 electrolysis system 12, a dehumidifier 20 and heat exchanger 42. It is optionally possible to opt to arrange 1024 heat exchanger 26 for the purpose of transferring residual heat to the produced mixture of oxygen and hydrogen.

[0065] In this example method 1000 further comprises of starting up 1004 the hot water installation using the combustion of a supply of a hydrocarbon gas, and of activating 1006 the electrolysis system and of producing the gas mixture of oxygen and hydrogen. The method 1000 in this example further comprises of mixing 1008 the supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen and optimizing 1010 the combustion with the burner. In this example method 1000 also comprises of heating 1012 the liquid flow to be heated and, using a dehumidifier, dehumidifying 1014 the gas mixture of oxygen and hydrogen produced with the electrolysis system and preheating 1016 the liquid flow to be heated with the heat produced by the electrolysis system using a heat exchanger.

[0066] During operation of hot water installation 2 starting up of hot water installation 2 is carried out by supplying hydrocarbon gas via conduit 32 and gas mixer 30, which gas is carried via gas feed 10 to burner 8 and is there combusted. Electrolysis system 12 is started up after or at the same time as burner 8 is started up. Liquid, in this example in the form of water, is for this purpose supplied from reservoir 16, via conduit 14 to electrolysis system 12 so as to be electrolyzed. In this example the water is provided with electrolyte from dosing system 52 which is controlled by controller 50. The produced mixture of oxygen and hydrogen is carried via conduit 18 to dehumidifier 20, where it is dehumidified. In this case the temper-

ature of the mixture amounts to between 70°C and 80°C when it enters dehumidifier 20. In this example the extracted water is fed back to reservoir 16 in liquid form via conduit 22. This water can also be discharged or fed back to electrolysis system 12.

[0067] The temperature of the dehumidified mixture of oxygen and hydrogen from dehumidifier 20 has decreased due to the dehumidification. In this example it is possible for this temperature to have decreased to around 10°C. The cooled mixture of oxygen and hydrogen is carried through conduit 24 to heat exchanger 26, where it absorbs heat from residual heat circuit 35. The heated mixture of oxygen and hydrogen, in this example having a temperature of around 20°C, is sent via conduit 28 to gas mixer 30, where it is mixed with hydrocarbon gas from conduit 32. In this example the ratio between the mixture of oxygen and hydrogen and the hydrocarbon gas is controlled by controller 50 controlling gas mixer 30.

[0068] The resulting gas mixture is carried via gas feed 10 to burner 8 for combustion and heat production.

[0069] During operation, electrolysis system 12 also produces (residual) heat which, in part for a good operation of electrolysis system 12, must be discharged. For this purpose hot water installation 2 has residual heat circuit 35. Residual heat is discharged via conduit 36 from electrolysis system 12 to heat exchangers 26 and 24. From heat exchangers 26, 42 the cooled liquid is fed via respective conduits 38 and 40 back to electrolysis system 12 by pump 48 for reabsorption of residual heat. The residual heat is transferred in heat exchanger 26 to the mixture of oxygen and hydrogen which is being transported via conduit 24 and 28. On the other hand residual heat is transferred via heat exchanger 42 to return conduit 6 which supplies the liquid to be heated. For this purpose heat exchanger 42 is connected via intermediate feed conduit 44 and intermediate discharge conduit 46 to return conduit 6. In this way the liquid supplied in return conduit 6 is therefore preheated, whereby a smaller amount of heat is required to bring the liquid to be heated to the desired starting temperature in feed conduit 4.

[0070] In this example flow and/or temperature sensors are arranged at various locations for the purpose of measuring the flux and/or temperature as input for controller 50. These sensors can all be arranged, or be arranged only partially, or not at all, since they are not fundamentally essential to the operation of hot water installation 2.

[0071] The present invention is by no means limited to the above described embodiments thereof. The rights sought are defined by the following claims, within the scope of which modifications can be envisaged.

Claims

1. Hot water installation for providing a hot liquid flow, the installation comprising:

- a feed for supplying a liquid flow to be heated;
- a burner configured to combust a gas or gas mixture for the purpose of heating the liquid flow;
- a discharge for discharging the heated liquid flow;
- a gas feed connected operatively to the burner;
- a gas mixer configured to mix a supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen;
- an electrolysis system connected operatively to the gas mixer and configured to produce the gas mixture of oxygen and hydrogen,

further comprising:

- a dehumidifier configured to dehumidify the gas mixture of oxygen and hydrogen produced with the electrolysis system; and
- a heat exchanger connected operatively to the electrolysis system and the feed of the liquid flow to be heated, and configured to preheat the liquid flow to be heated.

2. Hot water installation according to claim 1, wherein the gas mixer is configured to reduce the proportion of hydrocarbon from about 100% by weight when the hot water installation is started to a proportion in the range of 3 to 20% by weight, preferably in the range of 5 to 15% by weight, and most preferably in the range of 10 to 12% by weight.
3. Hot water installation according to claim 2, further comprising a flow meter connected operatively to the gas mixer for the purpose of measuring the quantity of gas produced by the electrolysis system.
4. Hot water installation according to claim 1, 2 or 3, further comprising a second heat exchanger configured to heat the gas mixture produced with the electrolysis system and dehumidifying with the dehumidifier.
5. Hot water installation according to claim 4, wherein the first and second heat exchanger are provided in a combined circuit for the purpose of transferring heat from the electrolysis system to the liquid flow to be heated and the gas mixture dehumidified with the dehumidifier.
6. Hot water installation according to any one of the foregoing claims, further comprising a power controller connected operatively to the electrolysis system and configured to supply power to the electrolysis system.
7. Hot water installation according to claim 6, wherein the power controller is provided with an optimizer configured to vary the supplied power in time.

8. Hot water installation according to any one of the foregoing claims, further comprising a return for returning liquid from the dehumidifier to the electrolysis system.

9. Hot water installation according to any one of the foregoing claims, wherein the electrolysis system is provided in use with an electrolyte for the purpose of improving the conduction, preferably further comprising a dosing device for adding electrolyte.

10. Hot water installation according to any one of the foregoing claims, wherein the electrolysis system is provided with a number of electrodes, comprising one or more of: palladium, iridium and platinum.

11. Method for heating a liquid flow, the method comprising the steps of:

- providing a hot water installation according to any one of the foregoing claims;
- starting up the hot water installation by means of the combustion of a supply of a hydrocarbon gas;
- activating the electrolysis system and producing the gas mixture of oxygen and hydrogen;
- mixing the supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen;
- optimizing the combustion with the burner; and
- heating the liquid flow to be heated,

further comprising of:

- dehumidifying the gas mixture of oxygen and hydrogen produced with the electrolysis system using a dehumidifier; and
- preheating the liquid flow to be heated with heat produced by the electrolysis system using a heat exchanger.

12. Method according to claim 11, further comprising the step of reducing the proportion of hydrocarbon from about 100% by weight when the hot water installation is started to a proportion in the range of 3 to 20% by weight, preferably in the range of 5 to 15% by weight, and most preferably in the range of 10 to 12% by weight during operation of the hot water installation.

13. Method according to claim 11 or 12, further comprising of controlling the temperature in the electrolysis system, wherein the operating temperature lies in the range of 60 to 95°C, preferably in the range of 70 to 85°C, and most preferably in the range of 77 to 82°C.

14. Method according to claim 11, 12 or 13, further comprising of controlling the power supplied to the electrolysis system in time using a power controller,

wherein the power is preferably adapted such that the operating temperature of the electrolysis system is kept in the desired range during use.

15. Gas dosing installation for admixing of a gas mixture in a hot water installation, the gas dosing installation comprising:

- a feed coupling for coupling to a feed for the purpose of supplying a liquid flow to be heated;
- a discharge coupling for coupling to a discharge for the purpose of discharging the heated liquid flow;
- a gas mixer configured to mix a supply of a hydrocarbon gas with a gas mixture of oxygen and hydrogen and provided with a gas coupling for coupling to a gas feed;
- an electrolysis system connected operatively to the gas mixer and configured to produce the gas mixture of oxygen and hydrogen,

further comprising:

- a dehumidifier configured to dehumidify the gas mixture of oxygen and hydrogen produced with the electrolysis system; and
- a heat exchanger connected operatively to the electrolysis system and the feed of the liquid flow to be heated, and configured to preheat the liquid flow to be heated.

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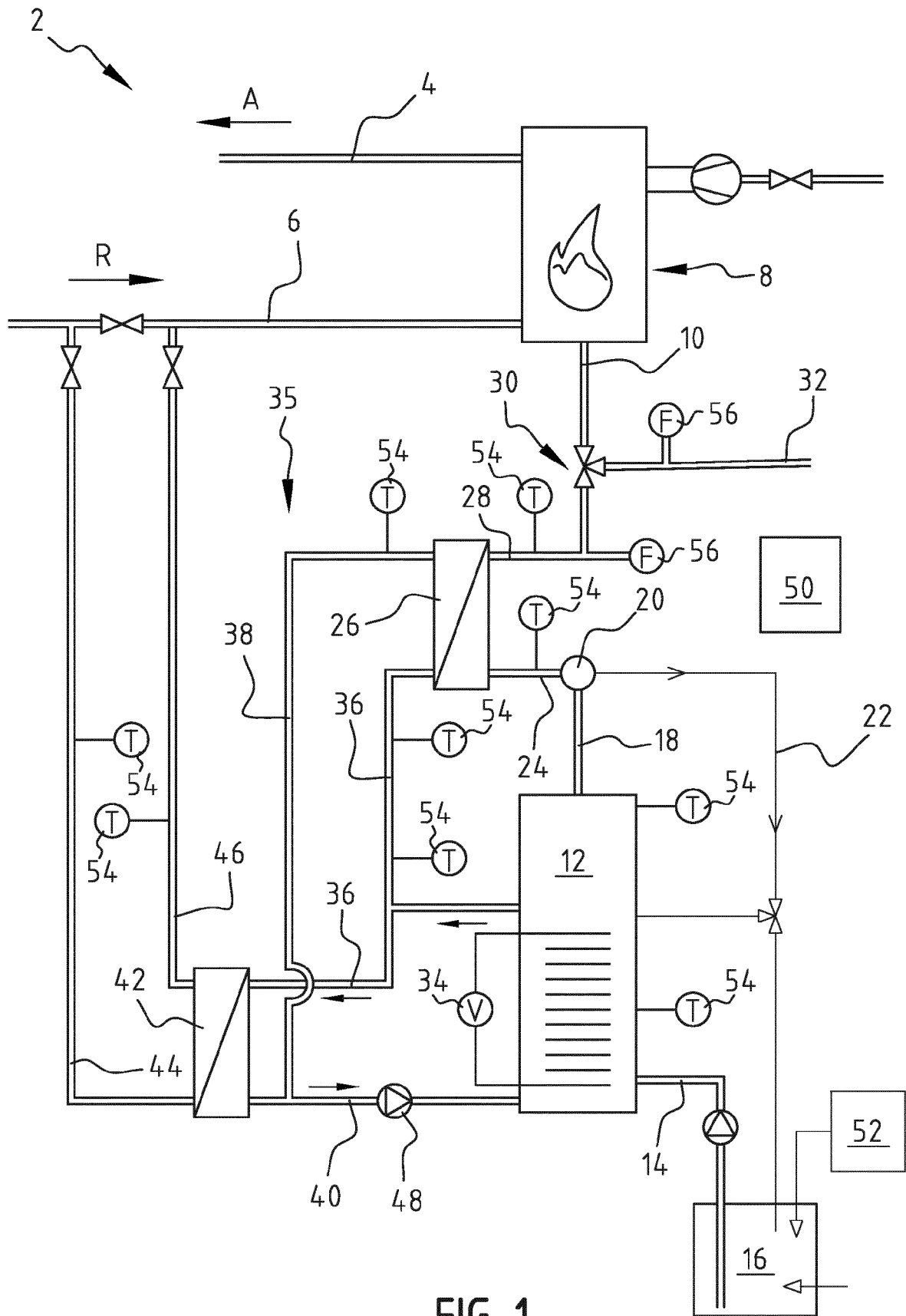
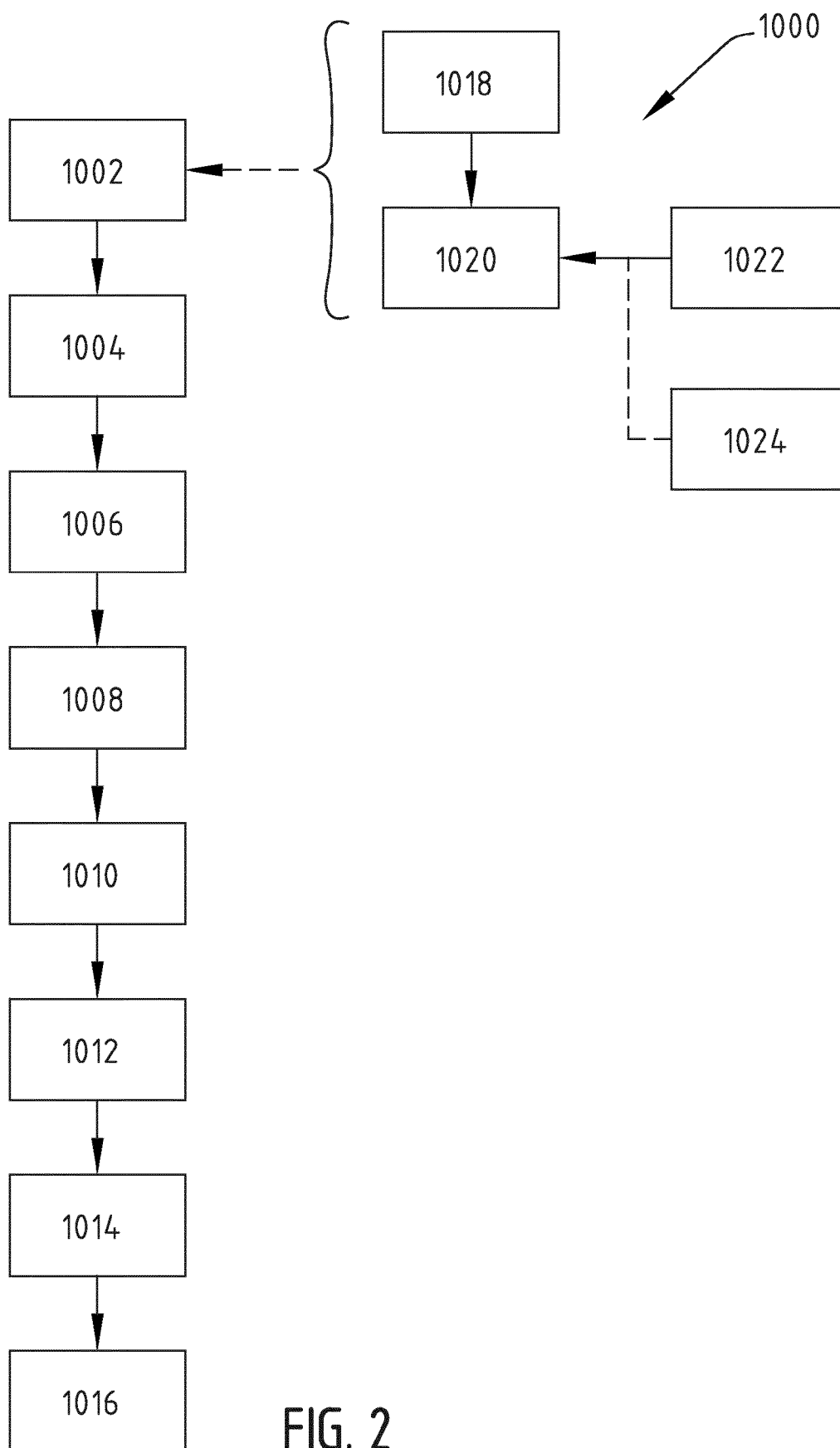


FIG. 1





EUROPEAN SEARCH REPORT

Application Number

EP 21 19 7397

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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