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(54) **Modular heating apparatus for heating spaces and tap water**

(57) The invention relates to a heating apparatus for heating water for space heating, comprising at least two substantially identical heating units which each comprise a heat source and at least one heat exchanger thermally coupled to the heat source, wherein the heating units are divided into a first group for space heating and into a second group for tap water heating, and that the heating apparatus comprises a regulating device for simultaneously regulating the temperature of the heating units of the first group and the temperature of the heating units of the second group independently of each

other.

As a result of these measures the advantages of a modular construction are retained, while the advantages of a combined apparatus, such as a smaller and a cheaper apparatus, are also retained.

It is pointed out here that heating apparatuses for heating tap water and for heating water for the purpose of space heating are of course per se known. Simultaneously heating water to different temperatures for the purpose of tap water and space heating is however not possible herewith.

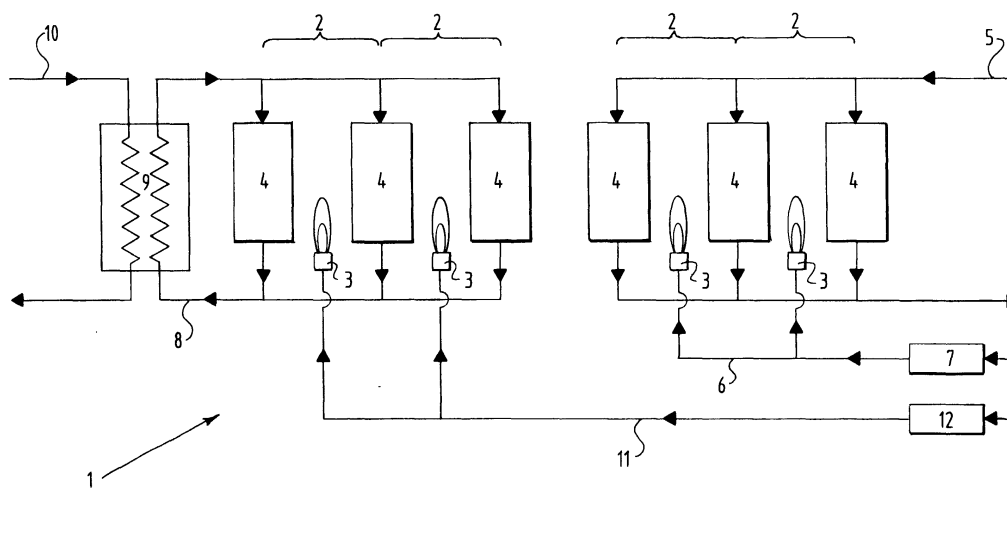


FIG. 1

Description

[0001] The present invention relates to a heating apparatus for heating water for space heating, comprising at least two substantially identical heating units which each comprise a heat source and at least one heat exchanger thermally coupled to the heat source.

[0002] Such heating apparatuses are known from NL-A-1003624.

[0003] This relates to a number of substantially identical heating units which are combined subject to the output required from the heating apparatus. This form of modular construction results in a simplification of production, design and logistics. The heating device known from this publication is only suitable for heating water for a single purpose, in this case space heating.

[0004] The present invention has for its object to provide such a heating apparatus which is also suitable for simultaneous indirect heating of tap water and wherein the advantages of a modular construction are retained.

[0005] This objective is achieved in that the heating units are divided into a first group for space heating and into a second group for tap water heating, and in that the heating apparatus comprises a regulating device for regulating the temperature of the heating units of the first group and the temperature of the heating units of the second group independently of each other.

[0006] As a result of these measures the advantages of a modular construction are retained, while the advantages of a combined apparatus, such as a smaller and a cheaper apparatus, are also retained.

[0007] It is pointed out herein that heating apparatuses for heating tap water and for heating water for the purpose of space heating are of course per se known. Simultaneously heating water to different temperatures for the purpose of tap water and space heating is however not possible herewith.

[0008] In the heating of water for two different purposes, when the regulation of the temperature is optimized for one purpose the optimization will not be complete for the other purpose. With the partial measure that the heating apparatus comprises a regulating device for regulating the temperature of the heating units of the first group and the temperature of the heating units of the second group independently of each other, an optimization can be obtained for both purposes, in this case space heating and tap water heating. The efficiency of the total apparatus is hereby greatly increased.

[0009] This regulation has the result that the temperature of the units associated with diverse groups can differ considerably. This can result in situations in which the warmer unit supplies so much heat to an adjoining unit forming part of another group and having a lower temperature that the water present in the colder unit will begin to boil.

[0010] This is avoided in that the heating units forming part of the first group are thermally insulated relative to the heating units forming part of the second group.

[0011] Disruptive heat flow is hereby prevented.

[0012] According to a preferred embodiment at least one of the heating units associated with the first group is adapted to selectively heat water for heating tap water or to heat water for space heating. This measure provides the option of temporarily increasing the capacity of the heating device for space heating, for instance during heating of an office building after the weekend.

[0013] It is also possible in principle to apply the reverse measure, although the practical benefit hereof is not great. For tap water heating a buffer supply is in any case usually present to offset peak loads.

[0014] It also possible in principle to temporarily use only one of the heating units of the first group to heat tap water. This requires many valves however, and associated regulation, so that this is less attractive in terms of cost.

[0015] It is however attractive to adapt all heating units forming part of the first group to selectively heat water for heating tap water or to heat water for space heating.

[0016] Only little extra equipment is necessary for this purpose, while flexibility greatly increases.

[0017] According to another preferred embodiment the regulating device is adapted to assign priority to the demand for water for tap water heating over the demand for water for space heating. It is here also the case that for the space heating a low output is usually required for a long time, while the provision of tap water is maintained by a buffer supply which is heated in a short time with a great output.

[0018] According to yet another embodiment the heating units are disposed adjacently of each other and each of the heating units comprises two heat exchangers disposed on either side of the heat source. This results in a space-saving and flexible arrangement.

[0019] According to another embodiment the heat exchangers of adjacent heating units forming part of the same group are combined. This saves space.

[0020] According to a final embodiment a secondary heat exchanger is connected between the heat exchangers of the units associated with the first group and the tap water circuit. This offers the possibility of a free choice of the material for the primary heat exchangers, since the tap water requirements no longer have to be taken into account.

[0021] The present invention will be elucidated hereinbelow with reference to the annexed drawings, in which:

figure 1 shows a diagram explaining a first embodiment of the present invention;

figure 2 shows a diagram explaining a second embodiment of the present invention; and

figure 3 shows a diagram explaining a third embodiment of the present invention.

[0022] Figure 1 shows the diagram of a heating appa-

ratus designated in its entirety with "1". The heating apparatus is formed by a number of substantially identical heating units 2 disposed adjacently of each other. Each heating unit 2 is formed by a heat source in the form of a burner 3 and a heat exchanger 4 arranged on either side thereof.

[0023] In the heating apparatuses according to the present invention the heating units 2 are divided into different groups; i.e. a first group, shown on the right in figure 1, which is adapted for space heating, and the second group, placed on the left in figure 1, which is adapted to heat tap water.

[0024] For this purpose heat exchangers 4 of the right-hand group of heating units are connected to a water circuit 5 which forms part of a usual central heating installation.

[0025] Gas, or possibly another fuel, is herein supplied by means of a gas feed pipe 6 to burners 3, which heat the heating units in question. In order to regulate the gas supply a regulating device 7 is received in pipe 6. A plurality of regulators is of course possible here, such as with thermostats which are arranged in diverse spaces, and combinations hereof.

[0026] The left-hand part of the array of heating units 4 is connected to a circulation water pipe system 8. This circulation water pipe system 8 leads to a secondary heat exchanger 9, through the other side of which runs the tap water pipe system 10. This construction provides the option of manufacturing the heat exchangers 4 from aluminium or an alloy containing aluminium, which is attractive from a production viewpoint. Since tap water may not run directly through such heat exchangers, separate additional heat exchangers 9, manufactured from for instance copper, must be applied.

[0027] It is otherwise possible to manufacture the heat exchangers which serve to heat tap water from a material which is suitable for passage of tap water without toxic or hygienic problems. The separating heat exchanger is then omitted.

[0028] The burners 3 in question are connected to a gas feed pipe 11, in which is received a regulating device 12 which is controlled by means of classic control parameters.

[0029] It will be apparent that as a consequence of this configuration the advantages of a modular structure can be combined with the advantages of a separated, relatively simple regulation which is controlled by a higher level main control.

[0030] These advantages are likewise obtained in the configuration shown in figure 2. The components are designated herein with the same reference numerals as the components in figure 1. The difference from the configuration shown in figure 1 is here there is a specific separating heat exchanger 13. This separating heat exchanger 13 is assembled from two halves 4a, which otherwise correspond with heat exchangers 4a, which are otherwise also disposed in figure 1 on the ends of the array of heating units. These "half" heat exchangers

herein correspond to half the structure of the normal, full heat exchangers 4. This configuration prevents a space for a unit remaining unused, as can be seen in figure 1.

[0031] Figure 3 shows a final configuration which otherwise corresponds with the configuration shown in figure 2, but wherein the two left-hand heating units 2 can be used selectively for space heating or for tap water heating. The choice hereof depends on the demand for both types of heating, wherein normally these left-hand units are connected for tap water heating, but when the demand for space heating is greater than can be generated by the right-hand heating units, the space heating capacity can be increased temporarily, albeit by decreasing the tap water heating capacity. For regulation use is made of a three-way valve 15 which is controlled by a central control device 14, which otherwise also controls regulating devices 7 and 12.

[0032] The demand for tap water however generally has a higher priority than the demand for space heating.

[0033] Finally, it is pointed out that in the configuration shown in figure 3 all heating units adapted to heat tap water can be used selectively for heating spaces. It is however also possible to make only a part of the total number of heating units originally suitable for heating tap water, switchable between both types of heating. This results however in an even more complicated regulating and pipe structure.

Claims

1. Heating apparatus for heating water for space heating, comprising at least two substantially identical heating units which each comprise a heat source and at least one heat exchanger thermally coupled to the heat source, **characterized in that** the heating units are divided into a first group for space heating and into a second group for tap water heating, and that the heating apparatus comprises a regulating device for simultaneously regulating the temperature of the heating units of the first group and the temperature of the heating units of the second group independently of each other.
2. Heating apparatus as claimed in claim 1, **characterized in that** the heating units forming part of the first group are thermally insulated relative to the heating units forming part of the second group.
3. Heating apparatus as claimed in claim 2, **characterized in that** at least one of the heating units associated with the first group is adapted to selectively heat water for heating tap water or to heat water for space heating.
4. Heating apparatus as claimed in claim 3, **characterized in that** all heating units forming part of the first group are adapted to selectively heat water for

heating tap water or to heat water for space heating.

5. Heating apparatus as claimed in claim 3 or 4, **characterized in that** the regulating device is adapted to assign priority to the demand for water for tap water heating over the demand for water for space heating. 5
6. Heating apparatus as claimed in any of the foregoing claims, **characterized in that** the heating units are disposed adjacently of each other and that each of the heating units comprises two heat exchangers disposed on either side of the heat source. 10
7. Heating apparatus as claimed in claim 6, **characterized in that** the heat exchangers of adjacent heating units forming part of the same group are combined. 15
8. Heating apparatus as claimed in any of the foregoing claims, **characterized in that** a secondary heat exchanger is connected between the heat exchangers of the units associated with the first group and the tap water circuit. 20

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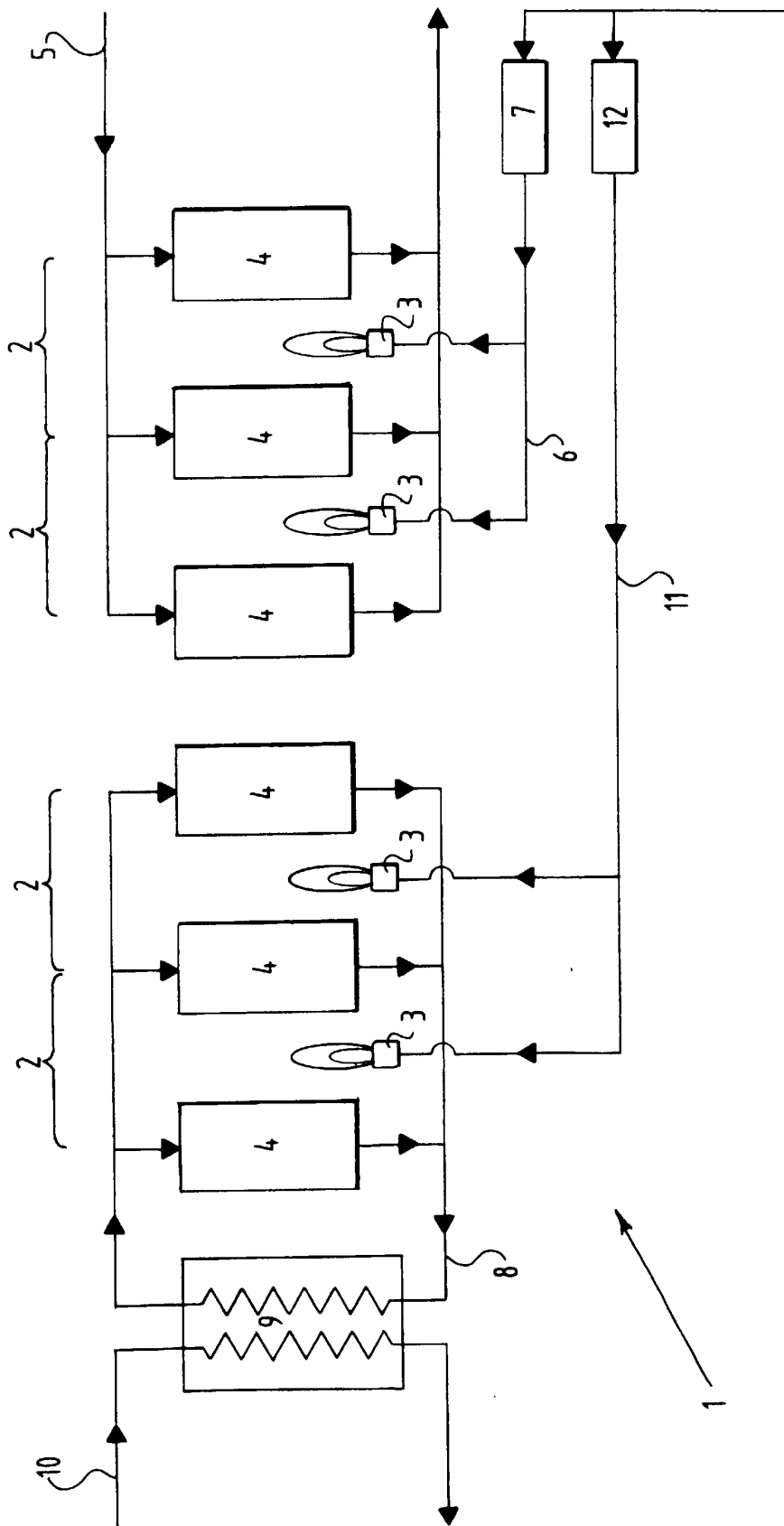
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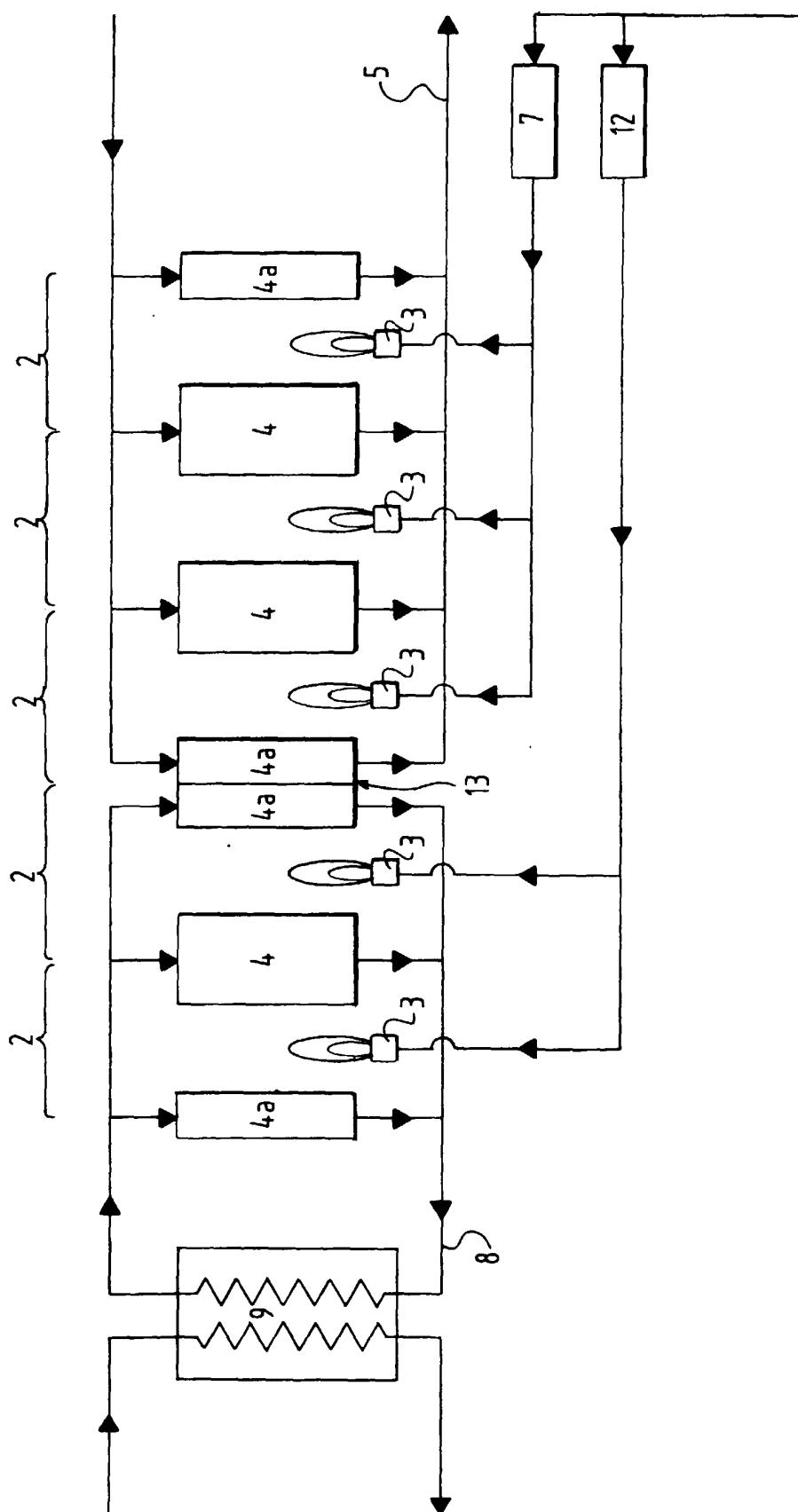


FIG. 2

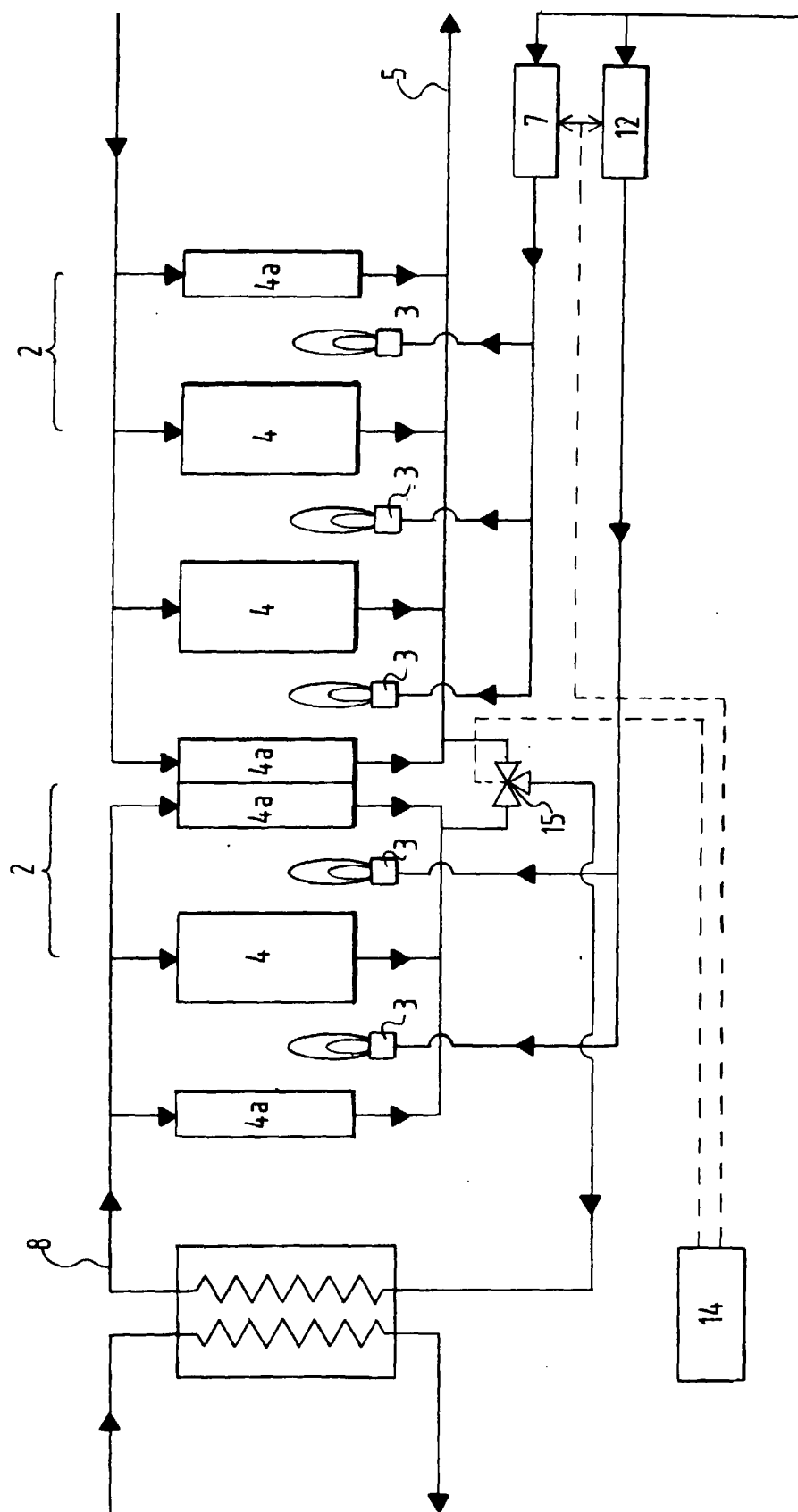


FIG. 3



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 00 20 2470

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 34 09 213 A (VAILLANT JOH GMBH & CO) 20 September 1984 (1984-09-20) * abstract *	1-6	F24H1/48
A	EP 0 404 259 A (NEFIT NV) 27 December 1990 (1990-12-27)		
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F24H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 6 October 2000	Examiner Van Gestel, H
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			

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

EP 00 20 2470

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
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06-10-2000

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