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(54) **Modular heating apparatus for space-heating and tap-water heating**

Modulare Vorrichtung für Raumheizung und Brauchwassererhitzung

Appareil de chauffage modulaire pour le chauffage d'espaces et de l'eau du robinet

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Description

[0001] The present invention relates to a heating apparatus according to the preamble of claim 1.

[0002] Such a heating apparatus is known from DE 197 22 822, which discloses one single heating apparatus for heating tap water and water for space heating.

[0003] The present invention has for its object to provide a heating apparatus suitable for simultaneous indirect heating of tap water and water for space heating wherein the costs for manufacture have been reduced.

[0004] This objective is achieved according to the invention as set out in claim 1. As a result of these measures the advantages of a combined apparatus, such as a smaller and a cheaper apparatus, are retained, while the advantages of a modular construction are obtained.

[0005] It is pointed out herein that a modular construction of heating units is known per se e.g. from EP-A-0 843 135.

[0006] This document 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.

[0007] However this prior art apparatus (DE 197 22 822) comprises only a single heat source for heating tap water and a single heat source for heating water for space heating so that its control possibilities are limited, while the modular construction of EP-A-0 843 135 delivers hot water only to a space-heating circuit or only to a sanitary-water heating circuit, not to both circuits simultaneously.

[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 second group is adapted to selectively heat water for heating tap water or to heat water for space heating. This meas-

ure 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 second 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 apparatus 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 (1), comprising

- heating units (2) formed by a heat source (3) and a heat exchanger (4,4a) thermally coupled to a heat source (3),
- at least first group with at least one heating unit (2) for heating water for space heating,
- at least second group with at least one heating unit (2) for heating tap water,
- at least a first regulating device (12) for regulating the temperature of the heating unit (2) of the first group, and
- at least a second regulating device (7) for independently regulating the temperature of the heating unit (2) of the second group, **characterized in that** the first and second groups comprise a modular structure of at least two substantially identical heating units (2).

2. Heating apparatus as claimed in claim 1, **characterized in that** at least one of the heating units (2) associated with the second group is adapted to selectively heat water for heating tap water or to heat water for space heating.

3. Heating apparatus as claimed in claim 2, **characterized in that** all heating units (2) forming part of the first group are adapted to selectively heat water for heating tap water or to heat water for space heating.

4. Heating apparatus as claimed in claim 2 or 3, **characterized in that** the regulating device (14) is adapted to assign priority to the demand for water for tap water heating over the demand for water for space heating.

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5. Heating apparatus as claimed in any of the foregoing claims, **characterized in that** the heating units (2) are disposed adjacently of each other and that each of the heating units (2) comprises two heat exchangers (4,4a) disposed on either side of the heat source (3).

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6. Heating apparatus as claimed in claim 5, **characterized in that** the heat exchangers (4) of adjacent heating units forming part of the same group are combined.

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7. Heating apparatus as claimed in any of the foregoing claims, **characterized in that** a secondary heat exchanger (9) is connected between the heat exchangers (4,4a) of the units (2) associated with the second group and the tap water circuit.

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Patentansprüche

1. Heizgerät (1) mit Heizeinheiten (2), bestehend aus einer Wärmequelle (3) und einem mit einer Wärmequelle (3) thermisch gekoppelten Wärmetauscher (4, 4a),

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- mindestens einer ersten Gruppe mit mindestens einer Heizeinheit (2) zum Heizen von Wasser zur Raumheizung,
- mindestens einer zweiten Gruppe mit mindestens einer Heizeinheit (2) zum Heizen von Leitungswasser,
- mindestens einer ersten Reglervorrichtung (12) zur Regelung der Temperatur der Heizeinheit (2) der ersten Gruppe und
- mindestens einer zweiten Reglervorrichtung (7) zur unabhängigen Regelung der Temperatur der Heizeinheit (2) der zweiten Gruppe,

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dadurch gekennzeichnet, dass die erste und zweite Gruppe jeweils einen modularen Aufbau von mindestens zwei im Wesentlichen identischen Heizeinheiten (2) umfassen.

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2. Heizgerät gemäß Anspruch 1, **dadurch gekennzeichnet, dass** mindestens eine der zur zweiten Gruppe gehörigen Heizeinheiten (2) so eingerichtet ist, dass sie wahlweise Wasser zur Heizung von Leitungswasser oder Wasser zur Raumheizung heizen kann.

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3. Heizgerät gemäß Anspruch 2, **dadurch gekennzeichnet,**

dass sämtliche zur ersten Gruppe gehörigen Heizeinheiten (2)) so eingerichtet sind, dass sie wahlweise Wasser zur Heizung von Leitungswasser oder Wasser zur Raumheizung heizen können.

4. Heizgerät gemäß Anspruch 2 oder 3, **dadurch gekennzeichnet, dass** die Reglervorrichtung (14) so eingerichtet ist, dass sie der Anforderung von Wasser für die Heizung von Leitungswasser Vorrang einräumen kann vor der Anforderung von Wasser zur Raumheizung.

5. Heizgerät gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** die Heizeinheiten (2) nebeneinander angeordnet sind und dass jede der Heizeinheiten (2) zwei Wärmetauscher (4, 4a) umfasst, die auf je einer Seite der Wärmequelle (3) angeordnet sind.

6. Heizgerät gemäß Anspruch 5, **dadurch gekennzeichnet, dass** die Wärmetauscher (4) nebeneinander liegender Heizeinheiten, die Teile derselben Gruppe bilden, jeweils zusammengefasst sind.

7. Heizgerät gemäß einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** zwischen den zur zweiten Gruppe gehörigen Wärmetauschern (4, 4a) der Einheiten (2) und dem Leitungswasserkreislauf ein Sekundärwärmetauscher (9) zwischengeschaltet ist.

Revendications

1. Appareil de chauffage (1) avec des éléments chauffants (2) comprenant une source calorifique (3) et un échangeur de chaleur (4, 4a) relié thermiquement à une source calorifique (3),

- d'au moins un premier groupe comprenant au moins un élément chauffant (2) pour l'eau servant au chauffage de locaux,
- d'au moins un deuxième groupe comprenant au moins un élément chauffant (2) pour l'eau de distribution,
- d'au moins un premier régulateur (12) pour la température de l'élément chauffant (2) du premier groupe, et
- d'au moins un deuxième régulateur (7) pour le réglage indépendant de la température de l'élément chauffant (2) du deuxième groupe,

appareil caractérisé par le fait que le premier et le deuxième groupe comprennent chacun une conception modulaire d'au moins deux éléments chauffants (2) essentiellement identiques.

2. Appareil de chauffage suivant la revendication 1, **caractérisé par le fait qu'**au moins l'un des éléments chauffants (2) faisant partie du deuxième groupe est conçu de sorte à pouvoir chauffer au choix l'eau de distribution ou l'eau servant au chauffage de locaux. 5
3. Appareil de chauffage suivant la revendication 2, **caractérisé par le fait que** tous les éléments chauffants (2) faisant partie du premier groupe sont conçus pour chauffer au choix l'eau de distribution ou l'eau servant au chauffage de locaux. 10
4. Appareil de chauffage suivant la revendication 2 ou 3, **caractérisé par le fait que** le régulateur (14) est conçu de sorte à pouvoir accorder la priorité à la demande d'eau pour le chauffage d'eau de distribution au lieu de l'eau servant au chauffage de locaux. 15
5. Appareil de chauffage suivant l'une des revendications précédentes, **caractérisé par le fait que** les éléments chauffants (2) sont posés l'un à côté de l'autre et que chacun des éléments chauffants (2) comprend deux échangeurs de chaleur (4, 4a) installés de part et d'autre de la source calorifique (3). 20 25
6. Appareil de chauffage suivant la revendication 5, **caractérisé par le fait que** les échangeurs de chaleur (4) d'éléments chauffants posés côte à côte, qui constituent des parties du même groupe, sont réunis. 30
7. Appareil de chauffage suivant l'une des revendications précédentes, **caractérisé par le fait qu'**entre les échangeurs de chaleur (4, 4a) des éléments chauffants (2) faisant partie du deuxième groupe, et le circuit d'eau de distribution est posé un échangeur de chaleur secondaire (9). 35

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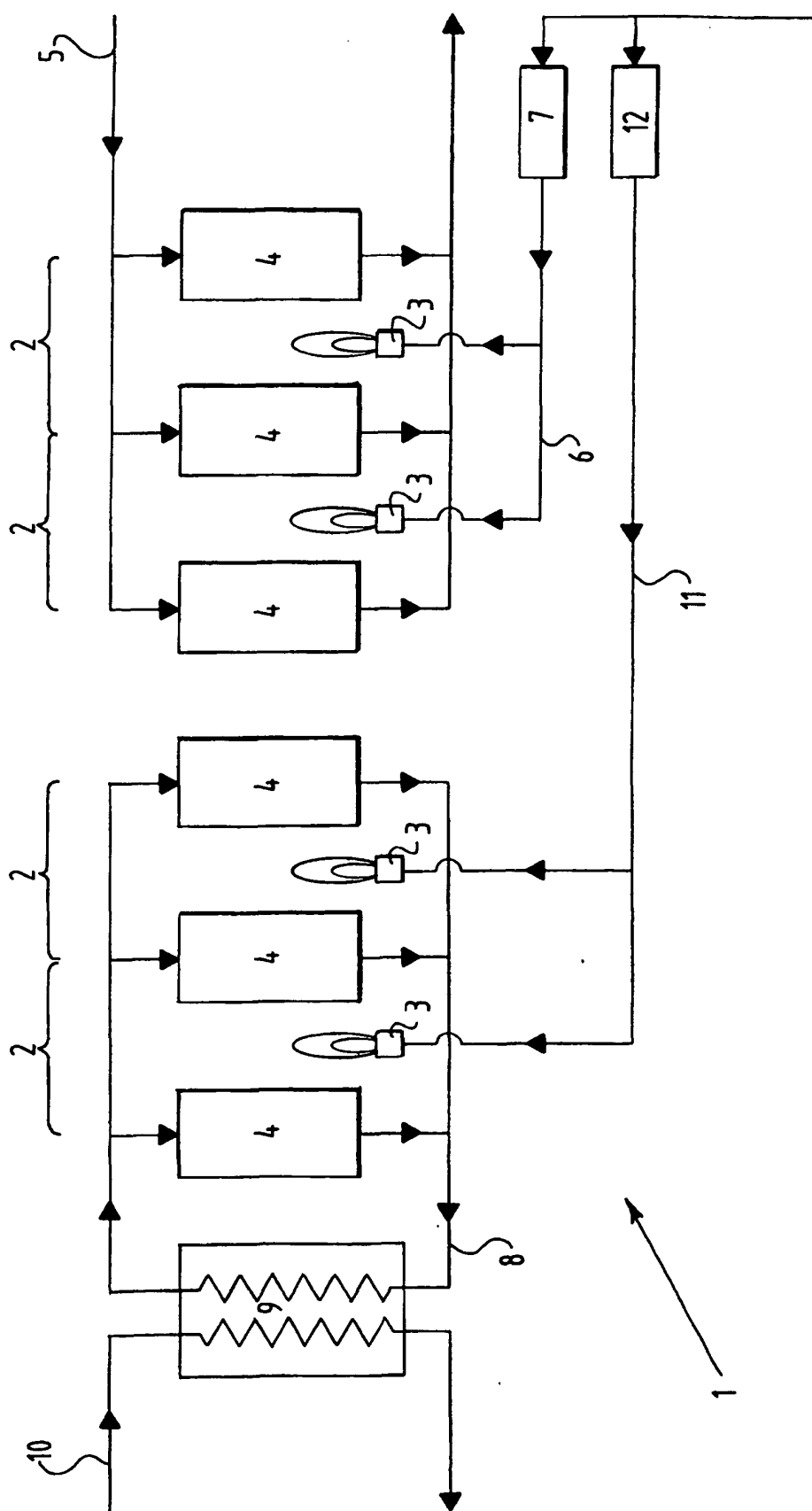
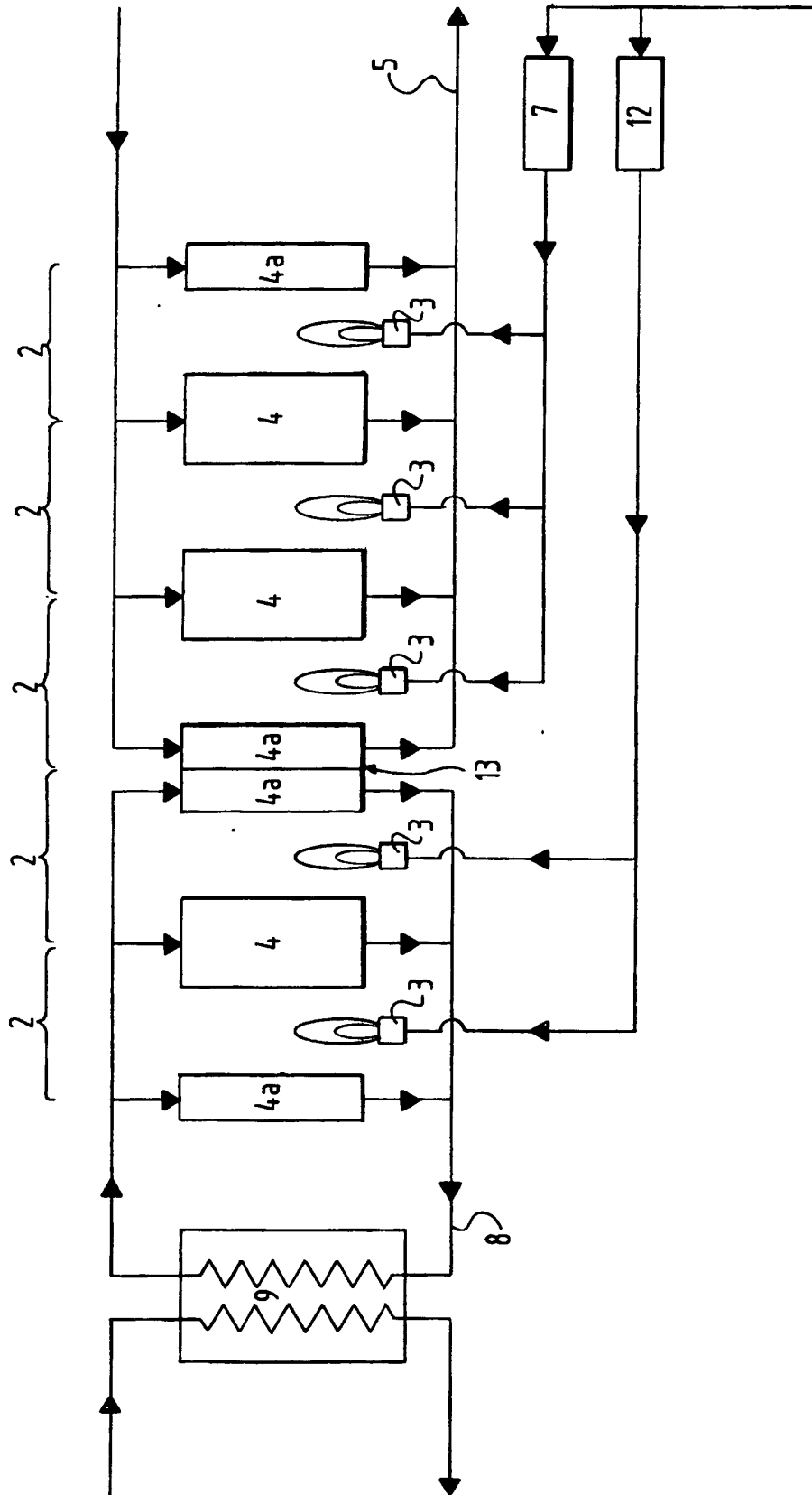


FIG. 1



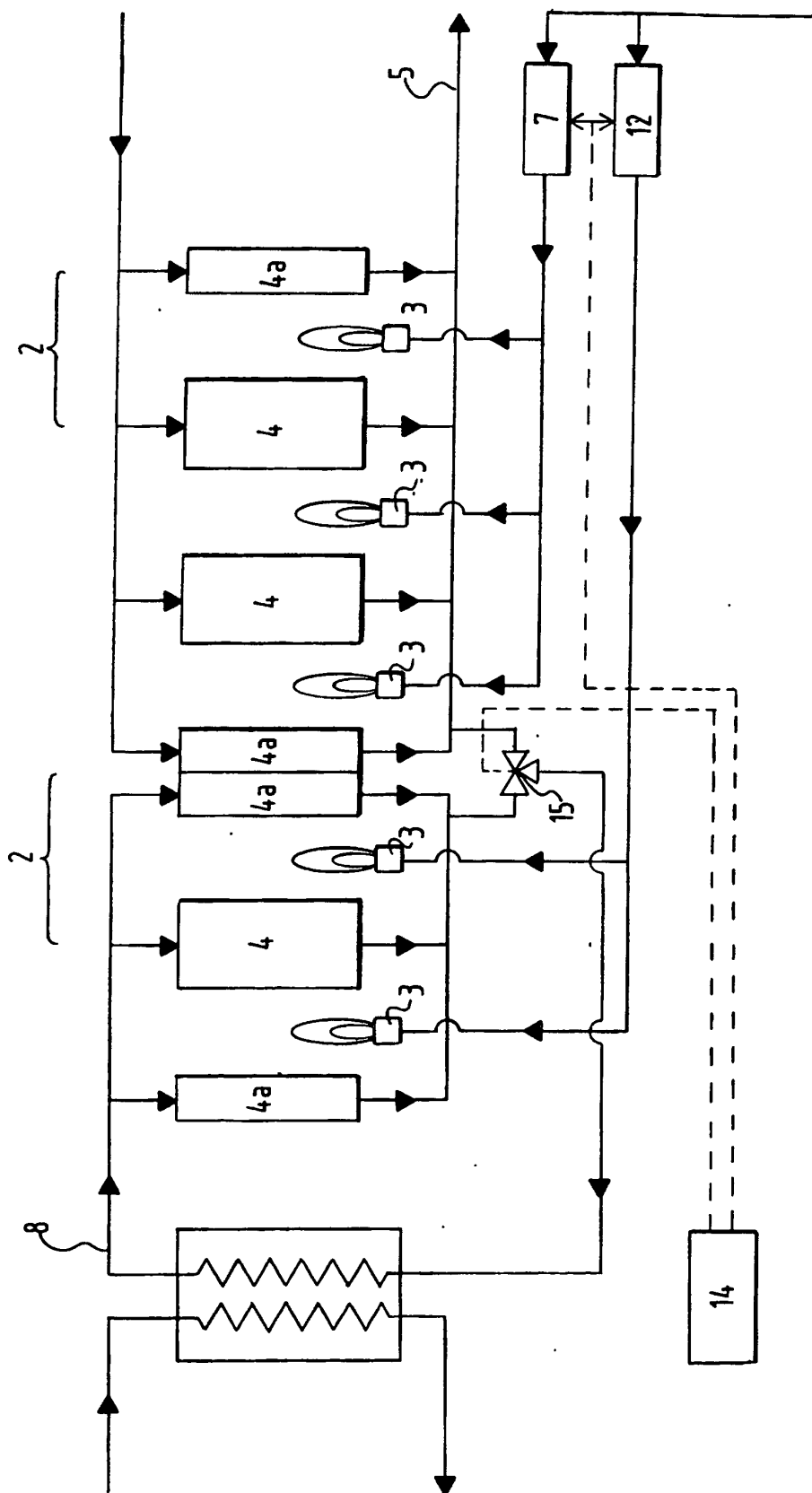


FIG. 3