



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**03.09.2008 Bulletin 2008/36**

(51) Int Cl.:  
**F24D 3/08 (2006.01)**

(21) Application number: **08101969.7**

(22) Date of filing: **25.02.2008**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL BA MK RS**

(30) Priority: **27.02.2007 IT MI20070370**

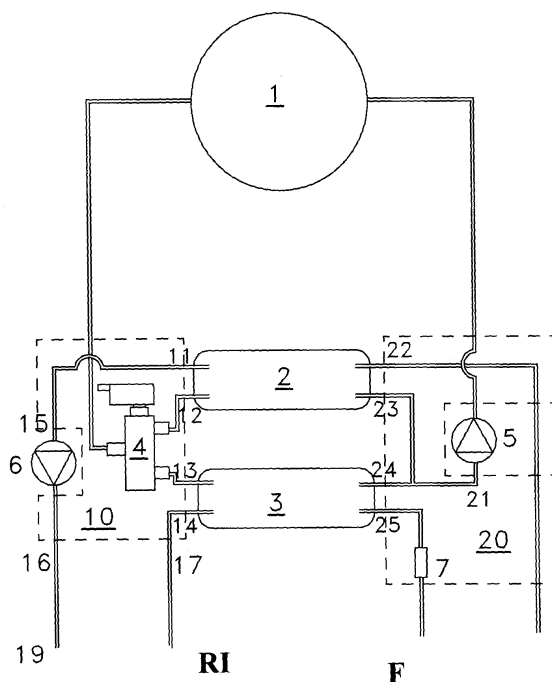
(71) Applicant: **FUGAS SPA**  
**20090 Trezzano sul Naviglio (Milan) (IT)**

(72) Inventor: **Fugazza, Giuseppe**  
**20090, Trezzano sul Naviglio (IT)**

(74) Representative: **Robba, Pierpaolo**  
**Interpatent S.R.L.**  
**Via Caboto No. 35**  
**I-10129 Torino (IT)**

(54) **A hydraulic group with two secondary heat-exchangers for gas boiler systems**

(57) A hydraulic group for a combined plant for domestic heating and production of sanitary warm water, which plant comprises a primary heat-exchanger (1) and a pump (5) for circulating the primary liquid heated in said primary heat-exchanger (1). The hydraulic group comprises a routing device (4) of the heated primary liquid controlled by a sensor (7) of the flow of sanitary water and a secondary heat-exchanger (3), the secondary circuit of which is connected to the water networks and supplies the sanitary warm water. The hydraulic group provides for a second secondary heat-exchanger (2), the primary of which receives said heated primary liquid, and the secondary circuit of which is connected to elements of domestic heating (19) through a second pump (6).



**Fig. 1**

## Description

**[0001]** The present invention concerns a hydraulic group for gas boilers, particularly wall-mounted boilers, for mixed plants of domestic heating and production of sanitary warm water.

**[0002]** The known boilers of this type comprise a primary heat-exchanger through which the water of the domestic heating circuit circulates and is heated by a gas burner. Through the use of a three-way valve or other routing device, the water that has been heated in the primary heat-exchanger is carried either to the domestic heating circuit (i.e. to the radiators) or to a secondary heat-exchanger in case there is a request to draw sanitary warm water. The secondary heat-exchanger is typically a plate heat-exchanger through which sanitary warm water is obtained.

**[0003]** Devices of this type are known for example from DE 19912284 B1. Moreover, EP 396627 discloses an arrangement for heat transfer heat to a remote heating system comprising two parallelly connected heat-exchangers.

**[0004]** These known systems have nevertheless some drawbacks.

**[0005]** Namely, the water circulating through the primary heat-exchanger is the same water circulating through the domestic heating plant and is subject to contain impurities coming from the radiators, the pipelines or other components of the circuit. Such impurities can cause a clogging in the primary heat-exchanger (particularly when this latter is a condensation heat-exchanger) and in other components inside the boiler.

**[0006]** Moreover, particularly in heating systems operating at low temperature such as those using a condensing boiler, a large water flow rate in the domestic heating plant is compulsory in order to achieve a thermal exchange capable of ensuring a comfortable heating level of the dwelling. To this aim the prior art provided for an additional large head height pump, but large head height pumps have the same sizes as the conventional pumps and generally a higher cost. Another solution, involving still higher expenses, provides for using an additional pump outside of the boiler. This last mentioned solution involves further costs and needs additional space and works.

**[0007]** It is an object of the present invention to overcome the limitations of the known devices, and particularly to realize an improved hydraulic group that overcomes the above drawbacks with reduced costs and limited space.

**[0008]** In accordance with the invention, these objects are achieved through a hydraulic group as claimed in claim 1. Further advantageous characteristics are recited in the dependent claims.

**[0009]** In accordance with the invention an additional (or second) secondary heat-exchanger and an additional pump are employed, so as to form two independent separate (unconnected) circuits, one located in the wall-

mounted boiler and the other comprising the domestic heating elements (radiators).

**[0010]** By using a second secondary heat-exchanger (preferably a plate heat-exchanger) and an additional pump as provided for by the present invention, the heating circuit can be split into two independent circuits that are not connected to one another, one circuit extending inside the wall-mounted boiler and a second one in the domestic heating plant (radiators).

**[0011]** The invention will now be described with reference to the attached Fig. 1 showing a diagram of a preferred but not limiting embodiment of the invention,

**[0012]** In the following description and claims, with reference to a heat-exchanger, the expressions "primary circuit" and "secondary circuit", are to be meant as the part of the heat-exchanger in which circulates the heat transferring liquid, and the part of the heat-exchanger in which circulates the liquid being heated, respectively.

**[0013]** Fig. 1 is a circuit diagram of a boiler heating system incorporating a hydraulic group as claimed in invention.

**[0014]** Such system includes a gas burner (not shown), a primary heat-exchanger 1 and a pump 5 supplying the head height required for circulating water or another liquid to be heated by the burner in the primary heat-exchanger 1. This circuit is the so-called inner circuit of the wall-mounted boiler.

**[0015]** The primary heat-exchanger 1 is connected, through a three-way valve 4 to the inlets of two secondary heat-exchangers 2 and 3 that can be substantially equal to one another. The pump 5 connects the two outlets of the heat-exchangers 2 and 3 to the primary heat-exchanger 1.

**[0016]** The "secondary" circuit of secondary heat-exchanger 2, where as explained above the term "secondary" indicates the circuit of the liquid that is being heated, is connected to the radiators or other elements of the domestic heating system, generically shown by the reference 19, through an additional pump 6 on the delivery side.

**[0017]** The "secondary" circuit of secondary heat-exchanger 3 is connected to the inlet and to the outlet of the sanitary water, and more precisely its inlet 17 is connected to the water supply networks RI, while the outlet 25 is connected to the tap F delivering the sanitary warm water. A sensor 7 of the flow of sanitary water controls the switching of the three-way valve 4 (either directly or indirectly through an electronic card).

**[0018]** During the operation of the boiler as a dwelling heating device (that is a heating system through the domestic radiators), the heated liquid is diverted by the three-way valve 4 toward the secondary heat-exchanger 2. Inside the secondary heat-exchanger 2 the heated liquid transfers heat to the liquid (or fluid) circulating in the secondary circuit and this liquid is circulated through the domestic heating plant 19 and through the associated radiators (or through a floor heating system) thanks to the head delivered by the pump 6.

[0019] When an amount of sanitary warm water is being requested through a user's domestic device (such as a domestic water mixer), the operation of the boiler is switched to a condition delivering sanitary warm water. This is obtained thanks to the flow sensor 7 detecting the warm water request and switching the three-way valve 4 to divert the warm liquid from the primary heat-exchanger 1 of the circuit, to the secondary heat-exchanger 3 (which is typically a plate heat-exchanger) dedicated to the production of sanitary warm water.

[0020] From the above description it is evident that the liquid in the secondary circuit is completely separate from the primary heating liquid.

[0021] According to a preferred embodiment, the group of the present invention is formed as a hydraulic group comprising two hydraulic sub-groups, respectively a delivery sub-group 10 and a return sub-group 20.

[0022] The delivery sub-group 10 comprises:

- an integrated three-way valve 4 (either electrically or hydraulically driven),
- connections 11, 12, 13, 14 for the connection to the two secondary heat-exchangers 2 and 3,
- a connection 15 to the additional pump 6,
- a connection 16 for the connection of the delivery side of the heating circuit,
- a connection 17 for the connection of the sanitary warm water outlet,
- additional connections, if required and not shown in Fig. 1, such as for instance connections for an off-load valve (or pressure switch), for temperature sensors, for a bypass device, for a valve to drain the circuits, etc...

[0023] The return subgroup 20 comprises:

- a connection 21 for the pump 5 circulating the liquid to be heated by the burner in the primary heat-exchanger 1,
- the flow sensor 7 for detecting a user's request of sanitary warm water,
- connections 22, 23, 24, 25 for the connection to the two secondary heat-exchangers 2 and 3;
- additional connections, if required and not shown in Fig. 1, such as for instance connections to a safety drain valve, to temperature sensors, to a device for filling the two circuits, to an expansion tank, to a bypass device, etc.

[0024] Each subgroup 10, 20 can be built either as a single one-piece block or from several parts assembled together in various way, without prejudice for their overall specific function as above described.

[0025] The material from which said subgroups are made can typically be brass or a composite plastics.

[0026] Advantageously, the second pump 6 can be integrated by providing for a dedicated connection in the delivery subgroup, in order to increase the flow rate of

the domestic heating plant and improving its heat-exchange capabilities.

[0027] By separating the heating circuit into two unconnected sub-circuits, i.e. one for heating purpose and one for the production of sanitary warm water, the invention achieves several advantages.

[0028] First of all, it becomes possible to have two different fluids - with different properties - circulating in the two sub-circuits, whereby the fluid circulating within the boiler is always clean and this leads to less clogging of the boiler components and to a reduced need of maintenance.

[0029] In the boiler sub-circuit a cheaper pump with a smaller head can be used, and since the air bleed can be achieved quicker and more easily, thus bringing about an improved efficiency and less noise in the operation of the boiler.

[0030] The hydraulic group can be made as a quite compact, small size group, so as to be integrated within the standard dimensions of the today's boilers without the need to add devices outside of the boiler, and this would help to limit the costs and the space required for the installation.

[0031] Although the invention has been illustrated with reference to a preferred embodiment, the same is susceptible in general of other applications and changes falling within its scope, as will be evident to the skilled of the art.

## Claims

1. A hydraulic group for a combined plant for domestic heating and production of sanitary warm water, said plant comprising a primary heat-exchanger (1) and a pump (5) for circulating a primary liquid being heated in said primary heat-exchanger (1); said group comprising a routing device (4) of said heated primary liquid controlled by a sensor (7) of the flow of sanitary water and a secondary heat-exchanger (3), the secondary circuit of which is connected to the water networks (RI) and supplies the sanitary warm water,

said hydraulic group being **characterized by** comprising a second secondary heat-exchanger (2), the primary of which receives said heated primary liquid, and the secondary circuit of which is connected to elements (19) of domestic heating through a second pump (6).

2. A hydraulic group as claimed in claim 1, **characterized by** comprising two subgroups, a delivery subgroup (10) and a return subgroup (20), respectively.
3. A hydraulic group as claimed in claim 2, **characterized in that** said delivery subgroup (10) comprises:

- a three-way valve (4),
- four connections (11, 12, 13, 14) for the connection to said two secondary heat-exchangers (2, 3),
- a connection (15) to said additional pump (6), 5
- a connection (16) for the connection to the delivery side of said domestic heating circuit,
- a connection (17) for the connection of the outlet of the sanitary warm water. 10

4. A hydraulic group as claimed in claim 2, **characterized in that** said return subgroup (20) comprises:

- a connection (21) for the pump (5) that circulates said primary liquid being heated through said primary heat-exchanger (1), 15
- said flow sensor (7) for detecting a user's request of sanitary warm water,
- four connections (22, 23, 24, 25) for the connection to said two secondary heat-exchangers (2, 3). 20

5. A hydraulic group as claimed in the preceding claims 1 - 4, **characterized in that** it is be made of metal. 25

6. A hydraulic group as claimed in the preceding claims 1 - 4, **characterized in that** it is made of composite plastics. 30

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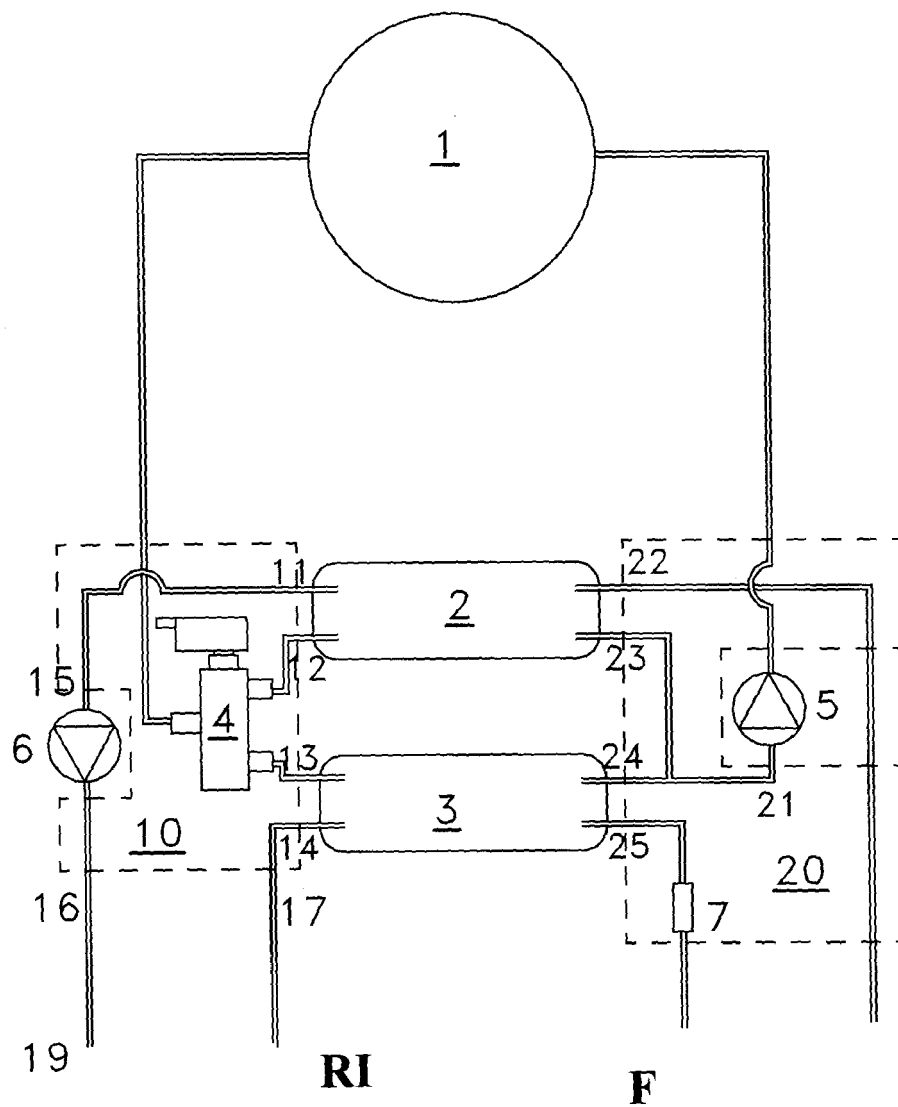
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**Fig. 1**

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- DE 19912284 B1 [0003]
- EP 396627 A [0003]