

19



Europäisches Patentamt
European Patent Office
Office européen des brevets



11 Publication number:

0 652 408 A1

12

EUROPEAN PATENT APPLICATION

21 Application number: **94117592.9**

51 Int. Cl.⁶: **F24H 9/14**

22 Date of filing: **08.11.94**

30 Priority: **10.11.93 IT MI930870 U**

43 Date of publication of application:
10.05.95 Bulletin 95/19

84 Designated Contracting States:
ES FR GB NL

71 Applicant: **ING. A. BERETTA S.p.A.**
Via Risorgimento, 13
I-22053 Lecco
Como (IT)

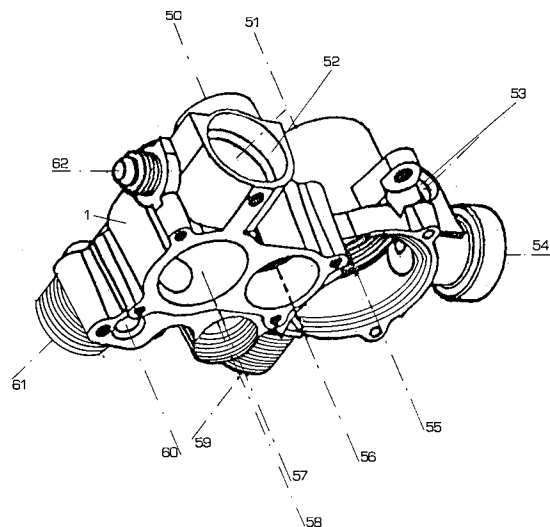
72 Inventor: **Pastorino, Giorgio**
Via Carlo Cattaneo, 31
I-22053 Lecco (Como) (IT)

74 Representative: **Carloni, Franco**
c/o Calvani, Salvi & Veronelli S.r.l.,
Piazza Duca d'Aosta, 4
I-20124 Milano (IT)

54 **Very compact hydraulic assembly for wall gas-fired boilers.**

57 The very compact hydraulic assembly (1) for wall gas-fired boilers provided with a main heat exchanger (7), a secondary heat exchanger (10), a three-way valve (4), a differential manostat (3) for the three-way valve (4), a by-pass valve (5), a safety manostat (2), a safety valve, a plurality of connectors (12,13,14A,15A,16,17,18,19) for connecting external pipes of the main circuit (24,25,28,29) intended for heating purposes and the secondary circuit (23,26,27) intended for sanitary water is comprised of a single block (1) making possible the compact interconnection of said components without the use of intermediate pipes. The differential manostat (3) comprises a venturi (34), a connecting element (36) to the secondary heat exchanger (10) and a connecting element (15A) to the single block (1), integrally formed therein.

FIG. 3



EP 0 652 408 A1

The present invention generally relates to wall gas-fired boilers and, more particularly, to an improved hydraulic assembly to be used in wall gas-fired boilers for the production of hot water for sanitary purposes and for environmental heating purposes.

It is known that the use of the wall gas-fired boilers in autonomous heating systems for the combined production of hot water for sanitary and heating purposes is more and more diffusing due to the advantages obtainable both from the economic and environmental standpoints. In these boilers there are typically two separate hydraulic circuits, i.e. a main circuit in which water heated by the combustion of gas in burners located below a first air-water heat exchanger flows and a secondary circuit in which water heated in a second water-water heat exchanger, typically a plate-type heat exchanger flows.

In the main circuit, the thermal carrier transports the heat directly to the heating system comprising, for example radiating elements, and indirectly to the water circuit for sanitary purposes through a second water-water heat exchanger in which the heat exchange with the sanitary water occurs. For the correct and safe operation of such boilers a plurality of valves and interconnected control means are necessary.

One of the critical factors of these wall gas-fired boilers is the limited space available inside thereof which requires the design of well precise dimensions of the hydraulic components intended to be arranged therein. It is therefore very important to design the overall dimensions of the various components of the hydraulic assembly so that it can be easily contained in the inside of the boiler, to optimize the arrangement of said components for maintaining low costs and to carry out an easy maintenance of said components while maintaining high safety standards.

One of the most serious disadvantages of the new gas-fired boilers is given by the hydraulic connections among the various necessary control components which often cause cumbersome and irrational arrangements. The necessary connecting pipes cause often difficulties in the assembling and maintenance operations and also very high manufacturing costs.

The aim of the present invention is to overcome the above disadvantages and limitations by providing a hydraulic connection among the valves and/or the various control means which minimizes the overall dimensions and the costs while maintaining a good assembly facility.

Efforts made for the same purpose are already known. In particular the Italian patent application No. MI92A 000575 discloses an improved hydraulic assembly in which the connection means are re-

duced to two separated single blocks in each of which some controlling means are arranged. The two single blocks are in turn interconnected by three external pipes. This arrangement considerably improves the overall dimensions of the interconnections, but does not minimize the cumbersomeness and the overall dimensions.

The object of the present invention is to minimize the overall dimensions of the interconnections by providing a very compact hydraulic assembly, which is easy to be mounted and maintained and in which the connection of the valves and the various control means is obtained without the use of intermediate pipes.

More particularly, the very compact hydraulic assembly for wall gas-fired boilers of the type comprising two separate hydraulic circuits, i.e. a main circuit for the heating system and a secondary circuit for heating the sanitary water, a gas burner, a main gas-water heat exchanger, a circulation pump, a secondary water-water plate-type heat exchanger, a three-way valve for switching the hot water flow coming from the main heat exchanger to the secondary heat exchanger and control means, such as a manostat, a by-pass valve, a safety valve and a differential manostat is characterized according to the present invention in that it comprises a single block provided with seats for:

- the three-way valve,
- the differential manostat for controlling said three-way valve,
- the by-pass valve,
- the safety manostat,
- the safety valve,
- the plurality of connectors for connecting external pipes belonging to the main and secondary circuits,

said single block making possible the very compact interconnection of said components without the use of intermediate pipes.

Advantageously, the control of said three-way valve for switching the hot water flow in the secondary heat exchanger is obtained by an external lever operated by said differential manostat.

Preferably, the hydraulic assembly has the three-way valve located in the return pipe of the main circuit in order to avoid undesirable water hammering effects.

Suitably, said differential manostat comprises a venturi, a connecting element to the plate-type heat exchanger and a connecting element to the single block, integrally formed therein.

In alternative, the hydraulic assembly is provided with a connector for the connection to a hydraulic accumulator.

This invention will be described in connection with the accompanying drawings, wherein:

Fig. 1 diagrammatically shows the design upon which the present invention is based;

Fig 2A shows the hydraulic diagram of the hydraulic assembly in the condition relating to the production of hot water for environment heating purposes only;

Fig. 2B shows the hydraulic diagram of the hydraulic assembly in the operation condition relating to the production of hot water for sanitary purposes;

Fig. 3 is a perspective view of the single block belonging to the hydraulic assembly;

Fig 4A is a front view of the hydraulic assembly pre-assembled and ready to be integrated in the boiler;

Fig. 4B is a perspective view of the hydraulic assembly of Fig. 4A;

Fig. 5 is a front view of the single block of Fig.3;

Fig. 6 is a sectional side view taken along the line A-A of Fig, 5.

Fig. 1 diagrammatically shows the gas-fired boiler together with the hydraulic assembly according to the present invention.

As already said, the wall gas-fired boilers herein contemplated comprise a main circuit for the flow of the hot water intended for the heating system, a secondary circuit for the flow of the hot water intended for sanitary purposes, a main heat exchanger 7 connected to the main circuit, a secondary heat exchanger 10 connected to the secondary circuit, a three-way valve 4, a differential manostat 3 for controlling the three-way valve 4, a by-pass valve 5, a safety manostat 2, a safety valve and a plurality of connectors for connecting external pipes of the main circuit and the secondary circuit.

The main part of the hydraulic assembly according to the present invention is formed by a single block 1 which has been designed for receiving all the main components of the boiler hydraulic circuit. Connected to the single block 1 are the differential manostat 3 for controlling the three-way valve 4, the safety manostat 2, the by-pass valve 5 and the connectors 12,13,14A, 15A,16,17,18 and 19 to which the return pipe 24 of the main circuit, the delivery pipe 25 of the main circuit, the inlet connector 14B of the plate-type secondary heat exchanger 10, the outlet connector 15B of the latter, the return pipe 29 of the heating circuit, the delivery pipe 28 of the heating circuit, the connecting pipe 20 to the hydraulic accumulator 21 and the delivery pipe 26 of the sanitary water circuit are connected.

In the same Figure, there are shown also the circulation pump 6, the main heat exchanger 7 of air-water type, provided with burners 8 and the fume collecting hood 9; there is also shown the return pipe 27 of the sanitary circuit connected to

the connector 22 of the plate-type heat exchanger 10 and the connector 23 for the connection of the delivery pipe 25. Furthermore, to the single block 1 the heating circuit 11 provided with radiating elements R, the hydraulic accumulator 21, the plate-type heat exchanger 10, the delivery and return pipes 25 and 24 of the main circuit and the delivery and return pipes 27 and 26 of the secondary circuit for heating the sanitary water are connected. As can be seen, in this case, the differential manostat 3 controls the three-way valve 4 by means of an external lever 30 which permits an easy regulation and maintenance thereof. Also, the circulation pump 6 in this case can be located in the return pipe 29 of the heating circuit, what permits undesirable water hammering effects to be avoided.

Fig. 2A diagrammatically shows the interconnections in the inner portion of the single block 1, here shown in dotted lines. The conduct 31 interconnects the three-way valve 4 and the plate-type secondary heat exchanger 10, the conducts 39,40 interconnect the safety manostat 2 provided with electric switch 38 and the three-way valve 4, the conduct 37 provided with the by-pass valve 5 interconnects the differential manostat 3 to the three-way valve 4. A lever 30 (outside the single block 1) with pivot F is provided for transmitting the control movement given by the differential manostat 3 to the three-way valve 4. A microswitch 32 is operated by the manostat 3 and the conducts 33,35 and 36 interconnect the differential manostat 3. In the same Figure also designated by 41 is the by-pass valve.

It is to be noted that in Fig. 2A the condition of heating only is shown since, because no flow passes in the pipes 26 and 27 of the sanitary water, the differential manostat 3 remains in a lowered position because there is pressure balance between the upper chamber and the lower chamber thereof and the spring 42 assures therefore the lowered steady position of the lever. In this case, the lever 30 maintains the three-way valve 4 closed and this position is assured by the preloaded spring 44 located within said valve 4. The single active circuit is therefore the heating circuit only wherein the water, after being heated in the main heat exchanger 7, flows through the pipe 25, enters the conduct 31 but does not flow therein, flows in the delivery pipe 28, reaches the radiating elements R (not shown in Figure) and then returns through the return pipe 29. Once the water is come within the hydraulic assembly 1, it flows through the three-way valve 4 which switches then it in the return pipe 24 to which the circulation pump 6 is connected. The safety manostat 2 is connected to the three-way valve 4 by means of the pipes 39 and 40 in order to confirm the presence of pressurized water in the main circuit; on the contrary (lack

of water in the main circuit and/or in the not operated circulation pump), a microswitch 38 connected thereto by means of the stem 47, disables the pump 6 and the burners 8.

In Fig. 2B is represented the condition in which the sanitary hot water is required. This requirement causes a sanitary water flow through the pipes 26 and 35 in which the venturi 34 causes a vacuum in the upper chamber of the manostat 3 through the conduct 46; this vacuum causes the stem 43 of the manostat 3 to lift and to simultaneously change the condition of the microswitch 32 and the control lever 30 to rotate. The lever 30 switches the three-way valve 4 so as to connect the sanitary water circuit and to disconnect the heating circuit by closing the return pipe 29 and permits the flow of the water through the conduct 31. This flow of hot water is compelled by the pump 6 to pass through the main heat exchanger 7, the delivery pipe 25, the plate-type secondary heat exchanger 10 which indirectly transmits heat to the sanitary water secondary circuit, and directly in the return pipe 31 through the three-way valve which now closes the return pipe 29 of the heating circuit. In this condition the circulation pump is disconnected from the heating circuit and therefore through the latter the hot water no longer can pass.

In Figs. 3,5 and 6 the single block 1 is represented in a perspective view, in elevational view and in cross section, respectively. As already said, this single block is provided with the various seats for housing, mounting and connecting the various components and pipes of the boiler. The pre-assembling operation of the various components is usually carried out in the shop so as to form, as better shown in Fig. 4B, a very compact structure which is then integrated into the boiler.

Fig. 3 shows the single block 1 provided with the seat 50 for the connector of the plate-type heat exchanger 10 of Fig. 2A, the seat 51 for the bypass valve 5, the seat 52 for the connector of the pipe 24 of Fig. 2A, the seat 53 for the connection of the differential manostat 3 of Fig. 2A, the seat 54 for the connector of the pipe 25 of Fig. 2A, the seat 55 for the safety manostat 2 of Fig. 2A to which the safety switch 38 of Fig. 2A is usually connected, the seat 56 for facilitating the access of the wrench necessary for connecting the plate-type heat exchanger 10, the seat 57 for the three-way valve 4 of fig. 2A, the seat 58 for a safety valve, the seat 59 for the pipe 28 of Fig. 2A, the seat 60 for a flowmeter, the seat 61 for the pipe 29 of Fig. 2A and finally the seat 62 for the pipe 20 of Fig. 2A.

According to a feature of the present invention, the differential manostat 3 is designed so as to contain the venturi 34 and a tube for the connection to the pipe 26 of Fig. 2A, said venturi 34 and said tube being integrally formed in the differential

manostat.

In Fig. 6 there are shown in cross section some internal conducts interconnecting the various above mentioned seats; for example the conduct 63 interconnecting the seats 51,55,58 and 61 of Fig. 5.

Fig. 4A is a front view of all the hydraulic assembly obtained after that all the necessary components have been mounted in the single block, wherein all the seats cited in the description of Fig. 3 are shown with the exception of the seat 64 usually present in the differential manostat 3 in turn integrated in the seat 53 of Fig. 3.

Fig. 4B shows in a perspective view the hydraulic assembly. In this Figure there are shown two electric switches 63A and 63B corresponding to the switches 32 and 38, respectively shown in Fig. 2A and the external lever 65 by means of which the differential manostat 3 controls the switching operation of the three-way valve 4. The lever corresponds to the lever 30 in Figure 2A and in Fig. 1.

Of course, the illustrated arrangement is given by way of example only, since a different location of the same components within a single block can be used without departing from the scope and the spirit of the present invention.

Claims

1. Very compact hydraulic assembly for wall gas-fired boilers of the type comprising two separate hydraulic circuits, i.e. a main circuit (24,25,28,29) for the heating system and a secondary circuit (24,25,27,28,31) for heating the sanitary water, a gas burner (8), a main gas-water heat exchanger (7), a circulation pump (6), a secondary water-water plate-type heat exchanger (10), a three-way valve (4) for switching the hot water flow coming from the main heat exchanger (7) to the secondary heat exchanger (10) and control means, such as a manostat (2), a by-pass valve (5), a safety valve and a differential manostat (3), characterized in that it comprises a single block (1) provided with seats (50,51,52,53,54,55,56,57,58,59,60,61,62) for:
 - the three-way valve (4),
 - the differential manostat (3) for controlling said three-way valve (4),
 - the by-pass valve (5),
 - the safety manostat (2),
 - the safety valve,
 - the plurality of connectors for connecting external pipes belonging to the main (24,25,28,29) and the secondary (23,26,27) circuits, said single block (1) making possible the very compact interconnection of said components without

the use of intermediate pipes.

2. Hydraulic assembly according to claim 1, characterized in that the control of said three-way valve (4) for switching the hot water flow in the secondary heat exchanger (10) is obtained by an external lever (30,65) operated by said differential manostat (3). 5
3. Hydraulic assembly according to claim 1, characterized in that the three-way valve (4) is located in the return pipe (24) of the main circuit in order to avoid undesirable water hammering effects. 10
4. Hydraulic assembly according to the preceding claims, characterized in that said differential manostat (3) comprises a venturi (34), a connecting element (36) to the plate-type heat exchanger (10) and a connecting element (15A) to the single block (1), integrally formed therein. 15 20
5. Hydraulic assembly according to the preceding claims, characterized in that it is provided with a connector (19) for the connection to a hydraulic accumulator (21). 25

30

35

40

45

50

55

5

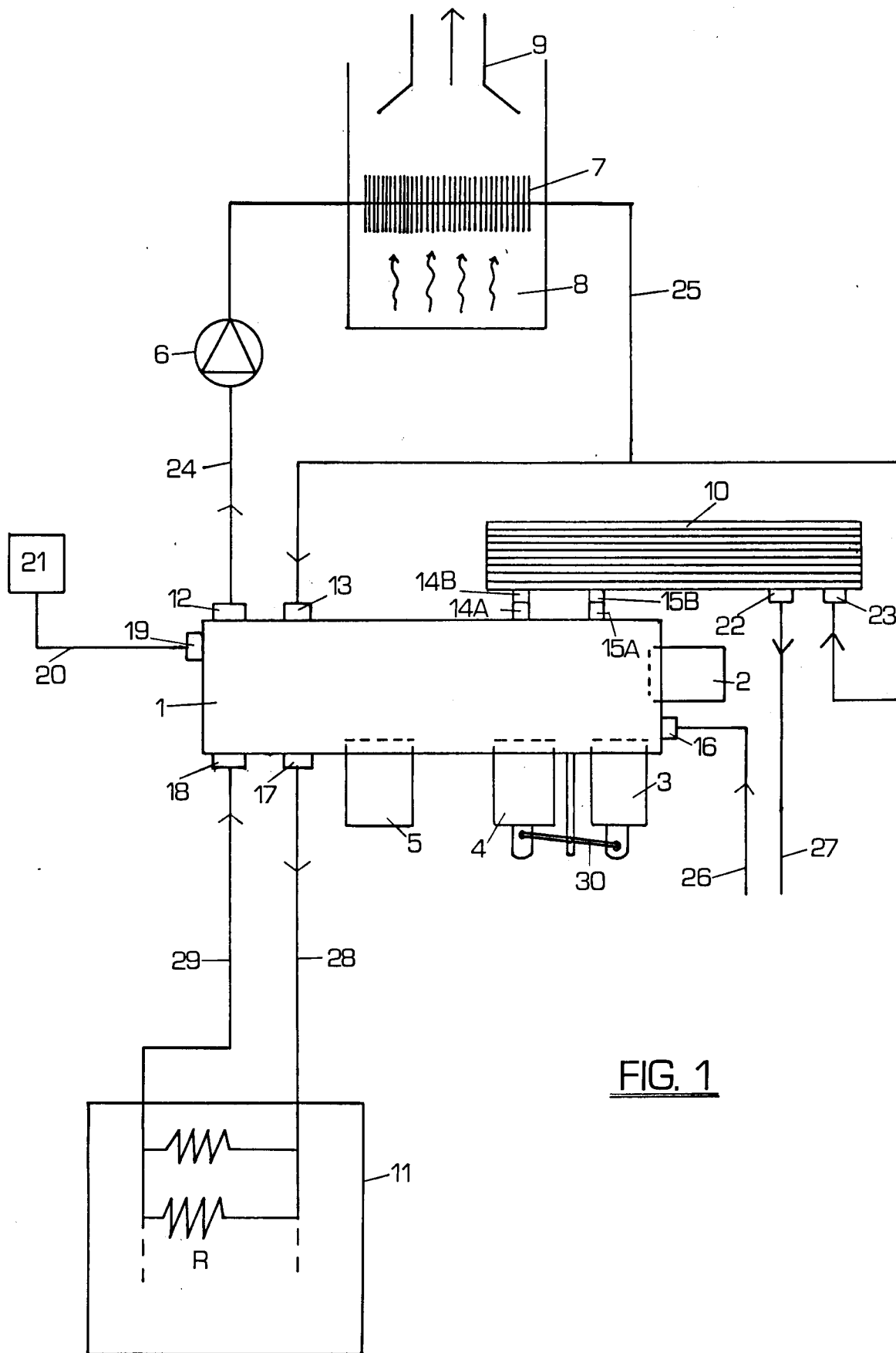


FIG. 1

FIG. 2B

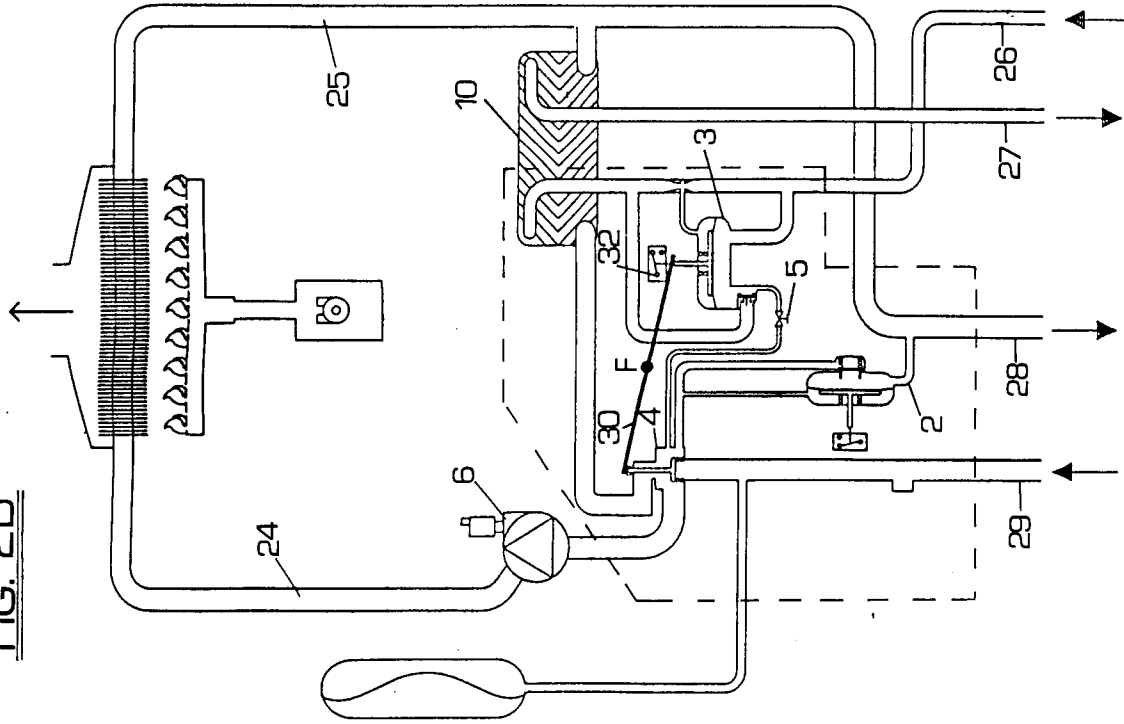


FIG. 2A

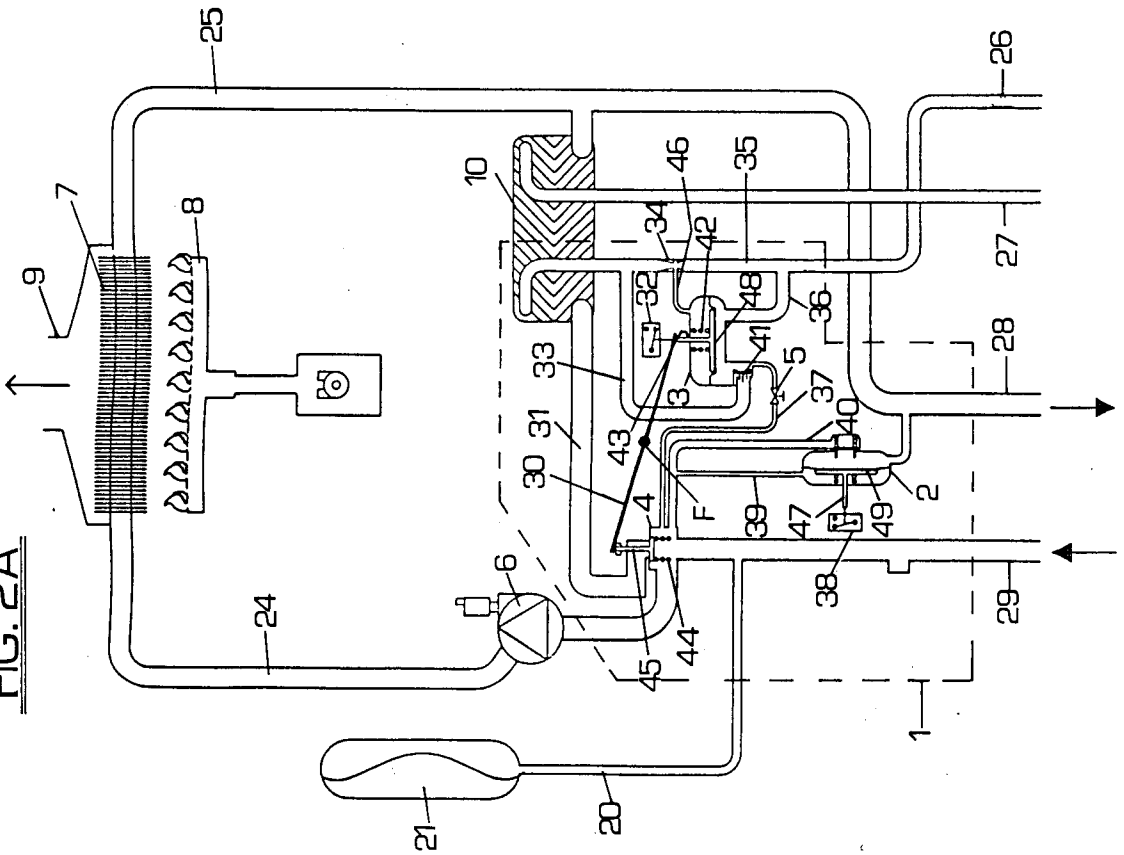
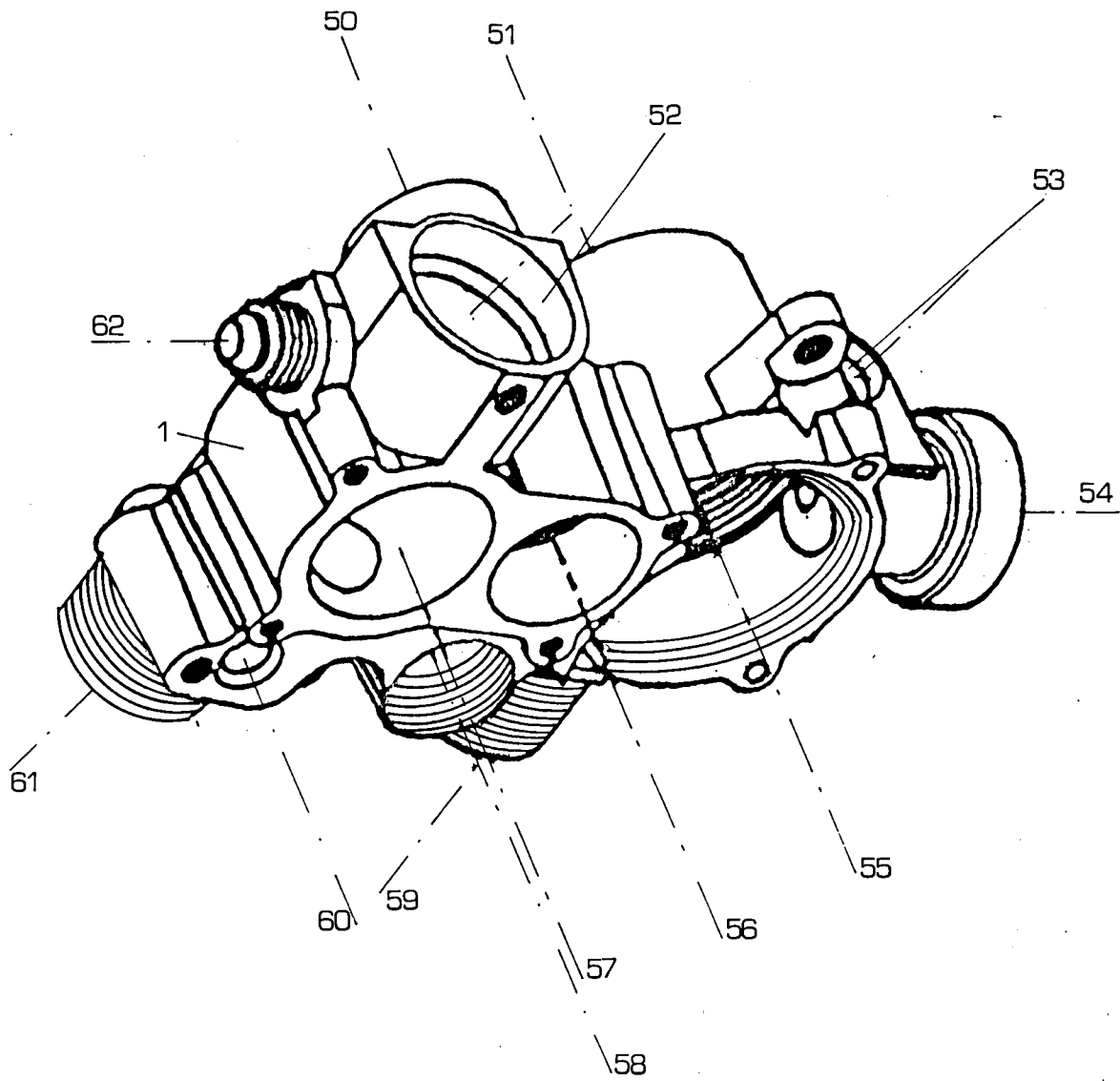
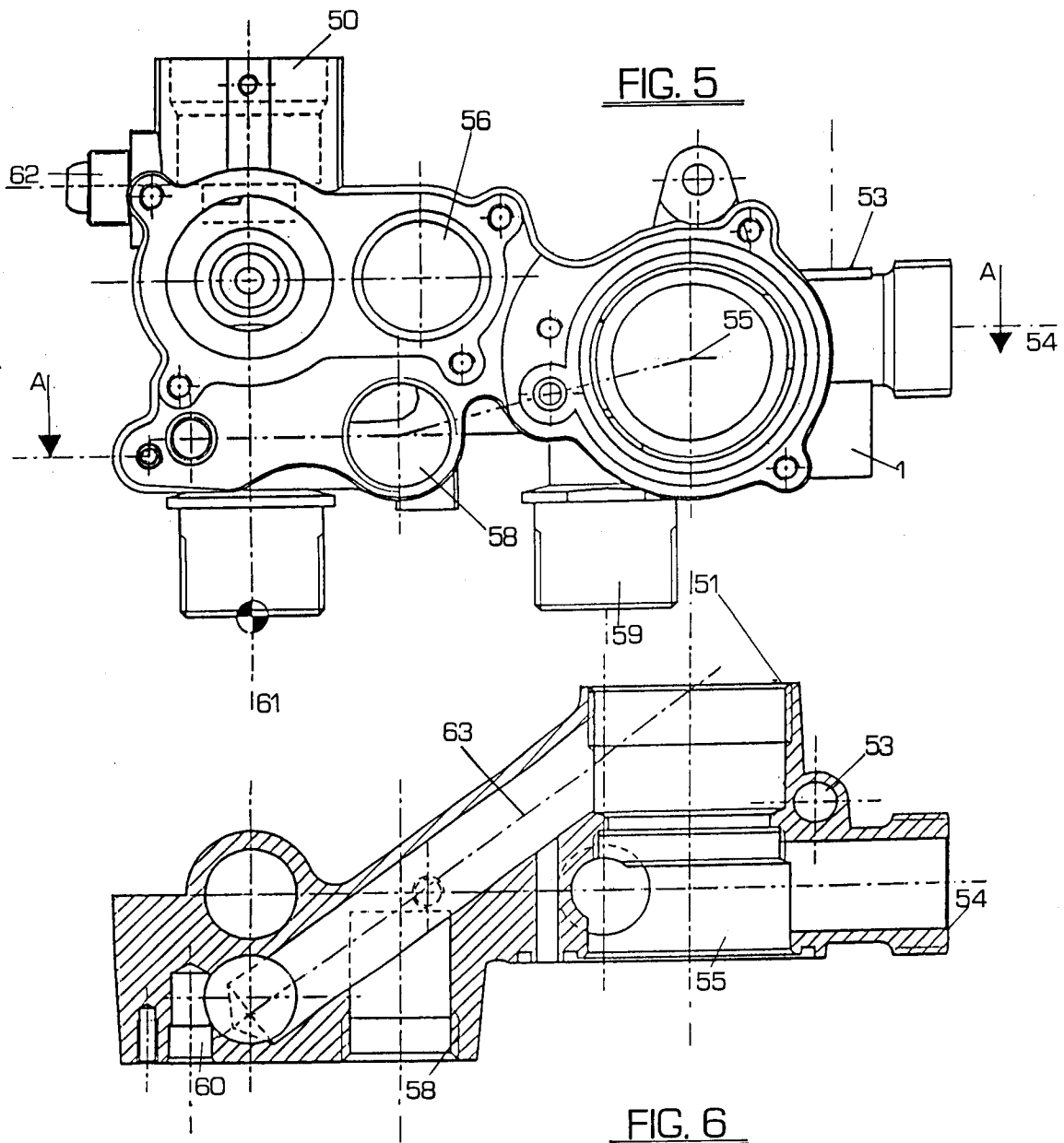


FIG. 3







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.6)
X	EP-A-0 236 235 (ELETTRO TERMICA SUD S.P.A.) * the whole document * -----	1-4	F24H9/14
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F24H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		22 February 1995	Van Gestel, H
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p> <p>..... & : member of the same patent family, corresponding document</p>			