



(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.01.1996 Bulletin 1996/01

(51) Int. Cl.⁶: F24D 17/00, F24H 1/28

(21) Application number: 94401479.4

(22) Date of filing: 29.06.1994

(84) Designated Contracting States:
CH DE FR GB LI

(72) Inventor: Maruyama, Noboru
Nakano-ku, Tokyo (JP)

(71) Applicant: Maruyama, Noboru
Nakano-ku, Tokyo (JP)

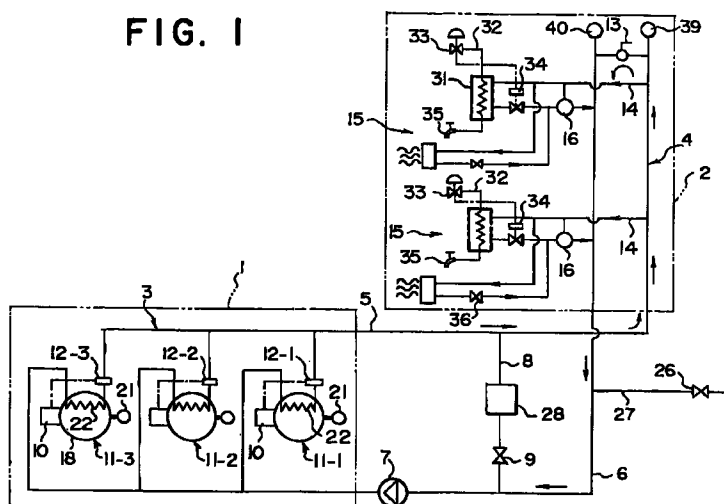
(74) Representative: Lemoine, Robert et al
F-75116 Paris (FR)

(54) Hot water supplying apparatus

(57) The hot water supplying apparatus including a hot water generating section (1) having a flow generating path and a load section (2) having a load flow path with the flow generating path (3) and the load flow path (4) connected with a connection flow path and a circulating flow path having a circulation pump (7) therein being formed with these flow paths, in which heat exchangers (11) each having a heater (10) therein and a heat sensor (12) provided in the flow generating path (3) and controlling operations of the heaters (10) are provided in the hot

water generating section (1), a temperature insulating/adjusting valve (13) is provided in the load path (4), a branch flow path connecting with the upstream side of the temperature insulating/adjusting valve (13) to the downstream side thereof is provided in the load flow path (4), a load member (15) is provided in the branch flow path, and a bypass flow path (8) having a flow rate control valve (9) connecting with the upstream side from the heat exchanger to the downstream side thereof is provided in the connection flow path (8).

FIG. 1



Description

BACKGROUND OF THE INVENTION

5 The present invention relates to a hot water supplying apparatus for houses, collective houses such as apartment houses, hotels, ordinary buildings, and other types of architecture having a number of living rooms therein such as plants.

As the hot water supplying apparatus as described above, for instance there are types established as shown in Fig.3 and Fig.4, and the hot water supplying apparatus has a hot water generating section 1 and a load section 2, and in the hot water generating section 1 and the load section 2 are formed a flow generating path 3 and a load flow path 4 respectively, an exit of the flow generating path 3 is connected to an entrance of the load flow path 4 with an outward flow path 4 with an exit of the load flow path 4 connected to an entrance of the flow generating path 3 with an inward flow path 6 having a circulation pump 7 to form a circulating flow path with these flow paths, and also a water supplying path 27 having a valve 26 is connected to the inward flow path 6.

15 In the hot water generating section 1 are provided a plurality of heat exchangers 11'-1,2,3 (3 units in this embodiment) each having a heater 10 therein and heat sensors 12-1,2,3 each provided in the downstream therefrom in the flow generating path 3 and controlling operations of the heater 10. In the load flow path in the load section 2 is provided a temperature insulating/adjusting valve 13, upstream and downstream sections thereof and a plurality of (2 in this embodiment) load members 15 are connected with a branch flow path 14 with a calorimeter 16 provided in an inward flow section of the branch flow path 14.

20 Fig.4 shows details of a portion of the hot water generating section 1, and the heat exchanges 11'-1,2,3 have a heating can 18 respectively, and in this heating can 18 are provided a high limit sensor 17 and a water supply section 21 with a heating chamber 19' arranged therein, this heating chamber 19' is hollow and cylindrical, a flame supply port 23 of the heater 10 comprising a burner is opened in one side lower section thereof with an air exhaust port 24 provided in the upper section in another side, an air exhaust pipe 20 is connected to this air exhaust port 24, and also a heat exchanging section 22 of the outward flow path 12 are located inside and in the upper section of the heating can 18. In the load member 15 are provided a hot water supplier 31, a warmer and other load equipment not shown herein respectively, while a clear water path 30 having a water cleaner 28 and a clear water pump 29 is connected to the inward flow path 6.

30 In the conventional type of hot water supplying apparatus as described above, the temperature insulating/adjusting valve 13 is fully opened with the valve 26 closed to supply water via the water supply path 27 into the circulating flow path until the circulating flow path is filled with water, then the valve 26 is closed, the circulation pump 7 and the clear water pump 29 are actuated to circulate water inside said circulating flow path, and at the same time the heater 10 in each of the heat exchangers 11'-1,2,3 is actuated to start heating the water.

35 When temperature of the water reaches a specified level after heating as described above, the temperature insulating/adjusting valve 13 is fully closed once, and then the temperature insulating/adjusting valve 13 is opened to an opening degree where temperature/pressure gauges 39, 40 located before and after the temperature insulating/adjusting valve 13 show a pressure difference across and a temperature in the temperature insulating/adjusting valve 13 indicate a preset minimum flow rate. This operation is required for the following reasons; namely although circulation of hot water is necessary even in no load condition where no hot water is consumed in the load member 15 in the load section 2, as a length of the entire circulating flow path including flow paths in the hot water generating section and the load section 2 is very large, if the circulation flow rate is too high, heat loss due to heat emission to outside of the pipe increases in proportion to the circulation flow rate, and for this reason also heat loss due to heat emission by hot water flowing therein becomes larger, so that a flow rate of hot water flowing during no load condition must be suppressed to as low level as possible by way of prevention of heat loss, and furthermore this operation is required to generate a large pressure difference between the upstream side and the downstream side of the temperature insulating/adjusting valve 13 for the purpose to quickly supply hot water to the load member 15 in no load condition.

45 If a hot water supply valve 35 is opened in the hot water supplier 31 and hot water is consumed therein, a signal from a pressure switch 33 is sent to a motor valve 34 simultaneously when tap water is supplied from a water supply pipe 32 through the pressure switch 33, this motor valve 34 is opened, hot water is supplied to the hot water supplier 31, heat is exchanged instantly between this hot water and the supplied tap water, and hot water is supplied from the hot water supply valve 35. On the other hand, when the warmer is in service, the valve 36 is opened with hot water flowing thereinto, while when the warmer is not in service, the valve 36 is closed to prevent the hot water from flowing thereinto.

55 The hot water harnessed as described above passes through the calorimeter 16, and is detected as a spent heat value in the load section 2. A prescribed temperature level is fixed in each of the heat sensors 12-1,2,3, and when temperature of a liquid in the generating flow path 3 goes down to below the prescribed temperature, the heater 10 is actuated according to a signal from the heat sensors 12-1,2,3 to heat the liquid supplied from the water supply section 21 into the heat exchangers 11'-1,2,3, heat exchange is performed between this heated liquid and liquid flowing in the heat exchange section 22 in the flow generating path 3 with the liquid becomes hot, and on the contrary when temperature

of a liquid in the flow generating path 3 becomes higher than the prescribed level, operation of the heater 10 is stopped according to a signal from the high limit sensor 17, and heating the liquid supplied from the water supply section 21 into the heat exchangers 11'-1,2,3 is stopped. During these operations, the circulation pump 7 continues to work for circulating the hot water in the circulating flow path.

In the conventional type of hot water supplying apparatus as described above, temperature of hot water is maintained at a prescribed level by adjusting a flow rate in the temperature insulating/adjusting valve 13, and hot water can instantly be flown into the load member 15, but on the other hand, as the heat exchangers 11'-1,2,3 are located off from the circulation pump 7 by degrees, the pipe resistance becomes larger by and by, and a flow rate of hot water flowing through the heat exchangers becomes smaller proportionately, and (1) if temperature of hot water flowing in the flow generating path 3 provided therein the heat sensor 12-3 attached to the heat exchanger 11'-3 of the minimum flux becomes lower due to natural heat emission to outside of the pipe because of the extreme lowering of the flowing speed, thereon the heat sensor 12-3 outputs a signal irrespective of the fact that temperature of heated water inside the heating can 18 is not too low, and operation of the heater 10 is unnecessary, and (2) when a flow rate in the heat exchanger 22 becomes lower, hot water moves to nearer an entrance of the heat exchanger 22 as indicated by a dotted line in Fig.4 due to a liquid supplied from the water supply section 21 into the heating can 18 and circulating the hot water by convection, and the hot water inside the flow generating path 3 flows in the reverse direction, thereupon the heat sensor 12-3 outputs a signal. And the signal generated by the heat sensor 12-3 is inputted into the heater 10, and the heater 10 is actuated, consequently, temperature of the hot water in the heating can 18 becomes abnormally high, which may give damages to the heat exchanger 11-3 besides it causes idling and troubles in the circulation pump 7, and for this reason sometimes the high limit sensor may make a decision that the temperature is abnormally high, and provokes to stop operation of the heat exchanger 11-3 which should not be necessary to stop.

SUMMARY OF THE INVENTION

The present invention was made in the light of the circumstances as described above, and it is an object of the present invention to provide for solving the foregoing problems involved in existing hot water supplying apparatus, that is flux of a fluid flowing in the generation flow path is not limited to a minimum flow rate, no damage is given to the heat exchanger because temperature of a hot water in the heating can does not go abnormally high, there is no need for stopping operation of the heat exchanger avoiding unnecessary stopping, thus no trouble is generated due to idling of the circulation pump.

Furthermore, the invention of Claim 2 is to provide a hot water supplying apparatus having the following characteristics. While combustion gas generated in the combustion chamber after actuation of the heat exchanger, goes up in the heating chamber and then goes down and is exhausted from the exhaust port to outside, heat exchange is performed between the combustion gas and a liquid in the heating can installed on the external surface of the heating chamber, the combustion gas gives its heat to the liquid through this heat exchange, the downward flowability becomes higher thereupon the combustion efficiency raised and incomplete combustion prevented, and also the liquid in the heating can generates convection and goes up and down in the heating can, thus the heat exchange efficiency between the combustion gas and the liquid being improved and temperature of the liquid being raised within a short period of time.

In order to achieve the objects as described above, the present invention provides a hot water supplying apparatus having a hot water generating section with a flow generating path and a load section with a load flow path in which a connection flow path connecting with said flow generating path to said load flow path is provided with a circulating flow path having a circulation pump therein formed by these flow paths, a heat exchanger having a heater therein and a heat sensor provided in the flow generating path and controlling operations of the heater are provided in the hot water generating section, a temperature insulating/adjusting valve is provided in the load flow path, a branch flow path connecting with the upstream side from the temperature insulating valve to the downstream side therefrom in said load flow path is provided, and a load member is located in this branch flow path; wherein a bypath pipe having a flux control valve connecting with the upstream side from the heat exchanger to the downstream side therefrom is provided in the connection flow path described above.

Also the present invention provides a hot water supplying apparatus having, in addition to those described above, the feature that a heating chamber provided in the heat exchanger has a flame supply port of a heater opened in the lower section in one side and an exhaust port provided in the lower section in the opposite side thereof and the intermediate section between the flame supply port and the exhaust port has an inverted U-shaped form.

Furthermore the present invention provides a hot water supplying apparatus in which a flame supply port of the heater in the heating chamber is located above the exhaust port and the flame supply port is sealed by the heater.

In the hot water supplying apparatus according to the present invention as described above, after the temperature insulating/adjusting valve is fully opened and the entire circulating flow path including the bypath flow path is completely filled with water, the circulation pump is actuated to circulate water in the circulating flow path, at the same time the heat exchanger is actuated to heat water, and when temperature of the water heated as described above goes up to a prescribed level, the temperature insulating/adjusting valve is opened to a prescribed angle so that the pressure difference

between hot water before and after the temperature insulating/adjusting valve as well as temperature therein indicate a minimum flux previously prescribed and when temperature of a liquid in the flow generating path goes down below the prescribed level, the heat exchange is actuated to heat water, and on the contrary when temperature of the liquid in the flow generating path becomes higher than the prescribed level, operation of the heat exchanger is stopped, thus the operation for heating water being stopped.

During these steps, the circulation pump is always working so as to circulate hot water between outward flow paths and inward flow paths as well as to make hot water flow through the bypath flow path, and with these operations flux of hot water flowing into the heat exchanger in the hot water generating section is increased. In this step, when the heater in the heat exchanger is actuated, combustion gas generated in the heating chamber goes up and then goes down in the heating chamber and is exhausted via the exhaust port through the exhaust pipe to the outside. Thus during the period when the combustion gas goes up and goes down in the heating chamber, heat exchange is performed between the combustion gas and the liquid in the heating can on the external surface of the heating chamber, and because of this heat exchange the combustion gas especially in the downflow section supplies heat to the liquid inside and outside thereof, the downflow flowability being raised, and during this step, the liquid in the heating can generates convection, going up and down in the heating can, thus the heat exchange efficiency between the combustion gas and the liquid being raised, and furthermore the combustion gas stays inside the heat exchanger even when operation of the heat exchanger is down, thus permeation of cool air from outside being prevented.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

Fig.1 is a piping diagram illustrating an embodiment of the present invention;

Fig.2 is a vertical cross sectional view illustrating a portion of the hot water generating section in the embodiment above;

Fig.3 is a diagram illustrating the state of heat exchange generated by the combustion gas in the heating chamber of the above;

Fig.4 is a vertical cross sectional view illustrating a portion of the hot water generating section in other embodiment;

Fig.5 is a vertical cross sectional view illustrating other embodiment of the present invention;

Fig.6 is a diagram illustrating the state of heat exchange generated by the combustion gas in the heating chamber of the above;

Fig.7 is a piping diagram for a conventional type of hot water supplying apparatus belonging to the same type as that according to the present invention; and

Fig.8 is a vertical cross sectional view illustrating a portion of the hot water generating section above.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The embodiments of the present invention shown in Fig.1 and Fig.2 have, in most portions thereof, almost the same configuration as that of the conventional type of hot water supplying apparatus as described above, so that the same reference numerals are assigned to such portions and description concerning the portions is omitted herein, and description is made mainly for the different portions. Between the outward flow path 5 and the inward flow path 6 is provided a bypath flow path 8 having a flux control valve 9 connecting with the upstream side from the heat exchangers 11-1,2,3 to the downstream side therefrom. Furthermore inside the heating can 18 of the heat exchangers 11-1,2,3 is opened a flame supply port of the heater 10 in the lower section in one side thereof, while the exhaust port 24 is provided in the lower section in another side thereof, and the intermediate section between the flame support port and the exhaust port has an inverted U-shaped form to form the heating chamber 19.

In the hot water supply apparatus as described above, like in the conventional type, after the temperature insulating/adjusting valve is fully opened and the entire circulating flow path is completely filled with water, the circulation pump 7 is actuated to circulate water in the circulating flow path therethrough, at the same time the heat exchangers 11-1,2,3 are actuated to heat water, and when temperature of the water heated as described above goes up to a prescribed level, the temperature insulating/adjusting valve 13 is opened to a prescribed angle where the pressure difference of the hot water in front and rear of the valve 13, and temperature in the temperature insulating/adjusting valve 13 indicates a prescribed minimum flow rate. Thus, when temperature of a liquid in the flow generating path 3 becomes lower than the prescribed level, the heat exchangers 11-1,2,3 are actuated to heat water, and on the contrary when temperature of a liquid in the flow generating path 3 becomes higher than the prescribed level, operation of the heat exchangers 11-1,2,3 are stopped, thus operation for heating water being stopped.

During these steps, the circulation pump 7 is always working to circulate hot water through the outward flow path 5 and inward flow path 6 and also through the bypath flow path 8, and with this operation flux of water flown into the hot water generating section 1 increases, which in turn makes it possible to prevent heated water in the heating cans from

being heated to an abnormal high degree due to shortage of the flux, and for this reason there is no possibility that any damage is given to the heat exchanges, the necessity to stop operation of the heat exchangers is eliminated when it is unnecessary, and also troubles due to idling of the circulation pump is prevented.

If the heater 10 of the heat exchangers 11-1,2,3 showing in Fig.2 are actuated in the step described above, combustion gas generated in the heating chamber 19 goes up through the upflow section 41, enters the upper distribution section 43, then turns around and goes down through the downflow section 42, and is exhausted via the exhaust port 24 through the exhaust pipe to the outside. The heat exchanger proposed by the present applicant and disclosed in Japanese Utility Model No.55-42216 is similar to the heat exchanger 11, and in this type of heat exchanger a phenomenon called up/down flow of combustion gas occurs, so that description is made below for this phenomenon referring to Fig.3.

It is known that combustion gas generated after actuation of the heater 10 generates the internal aeration force Pch shown by the following equations (1) and (2) irrespective of the state of peripheral air in a gas combustion path having the upflow section 41 as well as the downflow section 42 with the same height H as that of the upflow section 41 in the heating chamber 19:

$$Pch = (\gamma_d - \gamma_u) \cdot H \quad (1)$$

$$Pch = PH/R (1/T_d - 1/T_u) \quad (2)$$

herein

γ_d : Specific weight of combustion gas in the downflow section 42
 γ_u : Specific weight of combustion gas in the upflow section 41
H: Height H from the heat generating point U at the middle point M
P: Pressure of combustion gas
R: Combustion gas constant
 T_d : Temperature of combustion gas in the downflow section 42
 T_u : Combustion gas temperature in the upflow gas section 41.

When the heat exchanger 11 is working, in other words when the heater 10 is working, always the relation of $T_u > T_d$ is satisfied, so that $(1/T_d - 1/T_u) > 0$, and the combustion gas flows from the heat generating point U to the middle point M and then to the exhaust point D. In contrast to it, when operation of the heat exchanger 11 is down, T_u is equal to T_d as well as to temperature of the peripheral water, and for this reason the internal aeration force Pch becomes 0 (zero) with the combustion gas flow in the combustion gas flow path stopped, which prevents permeation of cool air from outside to maintain the internal temperature.

Fig.4 and Fig.5 show other 2 examples of the heat exchanger 11 (called Example 2 and Example 3 respectively), and in these examples as the exhaust point D is located at a position lower by h than the heat generating point because of the construction of the architecture in which the hot water supplying point is installed as shown in Fig.6, the exhaust point D is located at a position by h lower than the heat generating point U as shown in Fig.9, and for this reason, pressure at points U, M and D are P_u, P_m , and P_d respectively, the following equations are provided:

$$P_d = P_m + \int \gamma_d \cdot dh \quad (3)$$

$$P_u = P_m + \int \gamma_u \cdot dH = P_m + \gamma_u \cdot H \quad (4)$$

and herein P_d is released to the atmosphere, so that P_d is equal to P_o (Atmospheric pressure). Accordingly also the following equations are provided:

$$P_o = P_m + \gamma_d \cdot H + \gamma_d \cdot h \quad (5)$$

$$P_m = P_o - \gamma_d \cdot H - \gamma_d \cdot h \quad (6)$$

By substituting equations (5) and (6) into equation (4), the following equation is obtained:

$$P_u = P_o - \gamma_d \cdot H - \gamma_d \cdot h + \gamma_u \cdot H = P_o - \gamma_d \cdot h \quad (7)$$

Herein when operation of the heat exchanger 21 is down, γ_d is equal to γ_u , so that $P_u = P_o - \gamma_d \cdot h$, namely $P_u - P_o = -\gamma_d \cdot h < 0$, and for this reason the relation of $P_u < P_o$ is always satisfied, and the combustion gas in the combustion gas flow path always flows from the exhaust point D to the middle point M and then to the heat generating point U without staying in the combustion gas flow path, so that permeation of external air can not be prevented and

heat of hot water in the heating can 18 is disadvantageously emitted to outside. In other words, when operation of the heater 10 is stopped, theoretically the internal combustion gas tries to flow from the exhaust point D to the middle pint M and then to the heat generating point U, namely in the direction contrary to that when the heat exchanger 2 is working, for going out of the apparatus, like in the conventional type of hot water supplying apparatus. In these 2 examples, however, the heater 10 is located at the flame supply port 23 to prevent gas distribution therethrough, so that the combustion gas stagnates inside the heating chamber 19, which prevents permeation of external cool air and maintains the internal temperature, thus temperature of hot water in the heating can 18 not being emitted to outside. It should be noted that, in Example 3, the downflow section 42 is located outside the heating can 18 and this downflow section 42 is covered by a heat insulating material 44.

The present invention is as described above, and in the hot water supplying apparatus according to Claim 1, a generating flow path in a heat generating section is connected with a load flowpath in a load section with a connection flow path, a circulating flow path having a circulation pump therein is formed by these flow paths, heat exchangers each having a heater therein and a heat sensor provided in the flow generating path and controlling operation of the heaters are provided in the hot water generating section, a temperature insulating/adjusting valve is provided in the load flow path, a branch flow path connecting with the upstream side from the temperature insulating/adjusting valve to the downstream side therefrom is provided in the load flow path, a load member is provided in this branch flow path, and a bypass pipe having a flow rate control valve connecting with the upstream side from the heat exchanger to the downstream side therefrom is provided in the connection flow path, so that flux of a fluid flowing in the flow generating path is not limited to the minimum flux and any damage due to abnormally high temperature of hot water in the heating can is not given to the heat exchanger, thereon the necessity of stopping operation of the heat exchanger is eliminated when it is not required, and also troubles due to idling of the circulation pump can be prevented.

The hot water supplying apparatus according to Claim 2 or Claim 3 has, in addition to the features of the hot water supplying apparatus according to Claim 1, a feature that a heating chamber provided in the heat exchange has a flame supply port of a heater opened in the lower section in one side thereof and an exhaust port in the lower section in another side thereof and the intermediate section between the flame supply port and the exhaust port has an inverted U-shaped form, and for this reason the hot water supplying apparatus has, in addition to effects provided by the invention as claimed in Claim 1, the merits that, while combustion gas generated in the combustion chamber after actuation of the heat exchanger goes up and then goes down in the heating chamber and is exhausted from the exhaust port to the outside, heat exchange is performed between the combustion gas and a liquid in the heating can on the external surface of the heating chamber, the combustion gas in the heating chamber supplied heat to a liquid inside and outside thereof through the heat exchange, the downward flowability is improved with the combustion efficiency raised and also incomplete combustion prevented, in addition to a liquid in the heating chamber circulates upflow/downflow convection therein to raise the heat exchange efficiency between the combustion gas and the liquid with temperature of the liquid raised quickly, and also that, even when operation of the heat exchanger is stopped and the combustion gas tries to flow outward, a combustion apparatus provided in the flame supply part prevents distribution of the combustion gas, and the combustion gas stays inside the heat exchanger, thus permeation of cool air from outside being prevented and the internal temperature being maintained at a constant level.

Claims

1. A hot water supplying apparatus including a hot water generating section having a flow generating path and a Load section having a load flow path, wherein a connection flow path connecting with said flow generating path to said load flow path is provided, a circulating flow path having a circulation pump therein is formed by these flow paths, heat exchangers each having a heater and a heat sensor provided in the flow generating path and controlling operation of the heaters are provided in the hot water generating section, a temperature insulating/adjusting valve is provided in said load flow path, a branch flow path connecting with the upstream side from the temperature insulating/adjusting valve to the downstream side therefrom is provided in said load flow path, a load member is provided in this branch flow path, and furthermore a bypass flow path having a flux control valve connecting with the upstream side from the heat exchangers to the downstream side therefrom is provided in the connection flow path.
2. A hot water supplying apparatus according to Claim 1, wherein a heating chamber provided inside the heat exchanger has a flame supply port of a heater opened in the lower section in one side thereof and an exhaust port provided in the lower section another side, and the intermediate portion between the flame supply port and the exhaust port has an inverted U-shaped form.
3. A hot water supplying apparatus according to Claim 2, wherein a flame supply port of a heater of a heating chamber is located above an exhaust port and this flame supply port is sealed by a heater.

FIG. 1

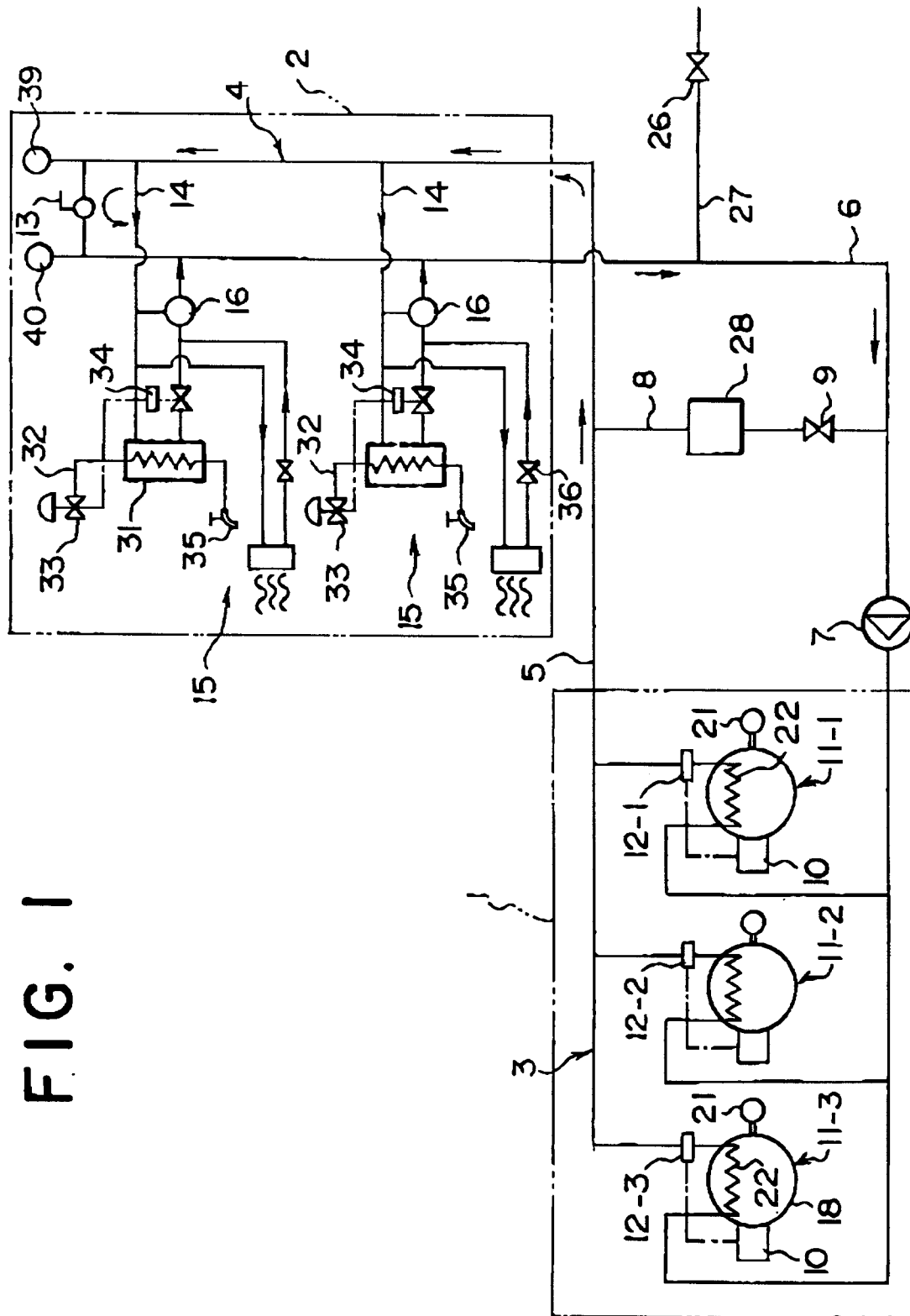


FIG. 2

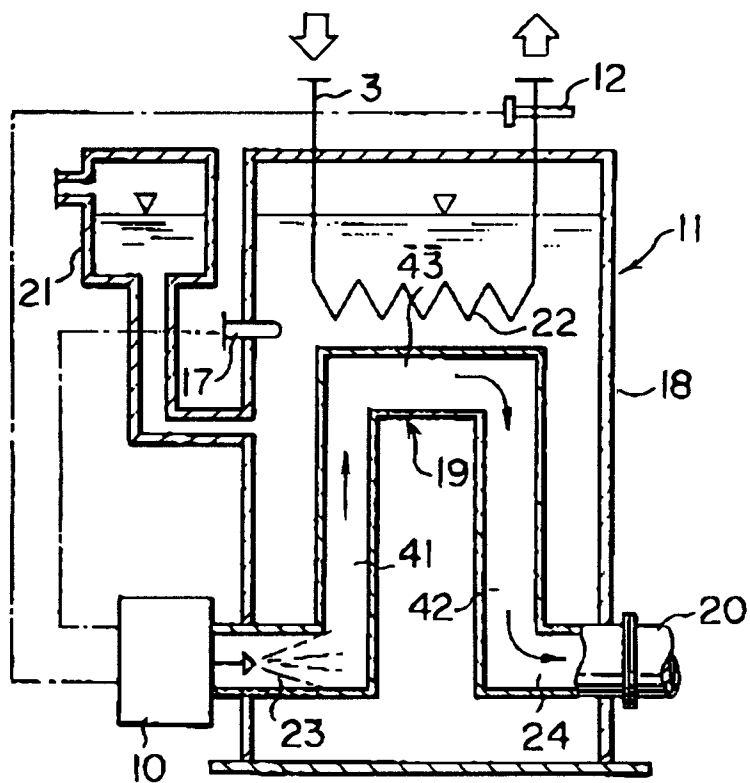


FIG. 3

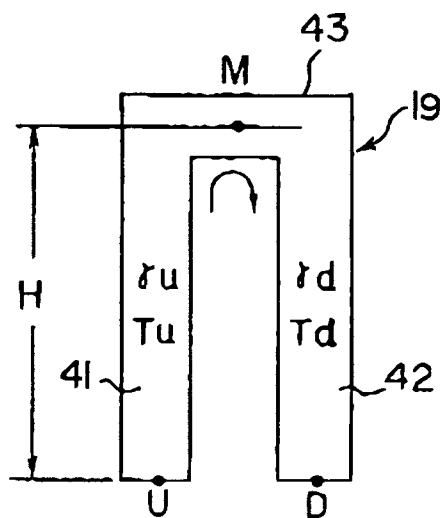


FIG. 4

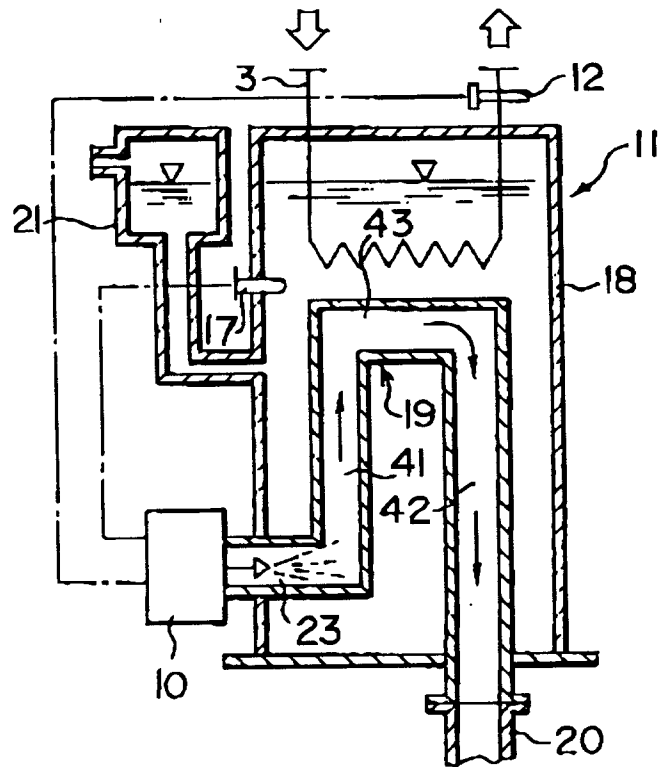


FIG. 5

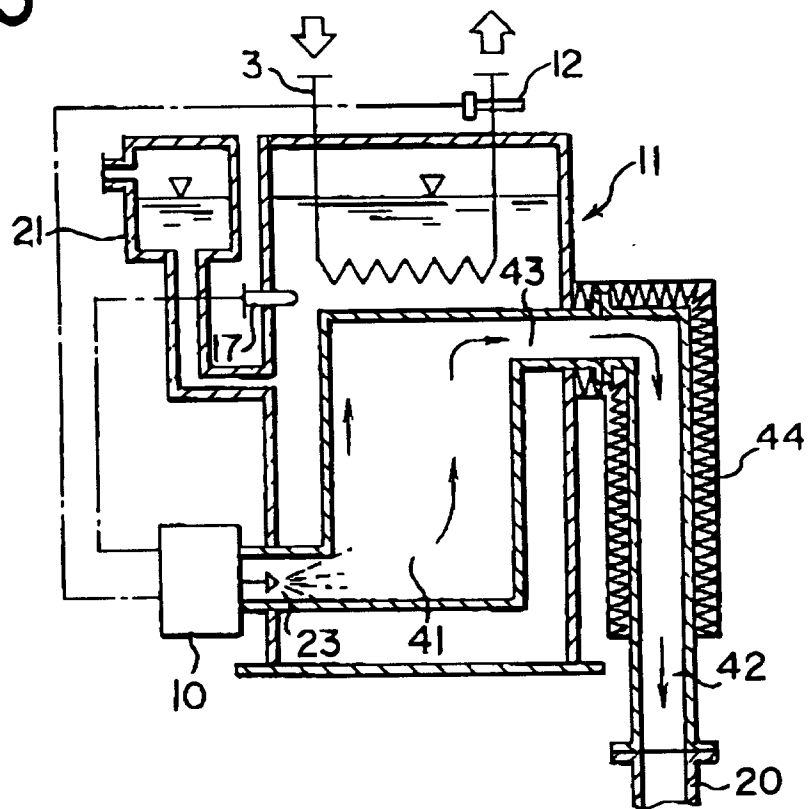


FIG. 6

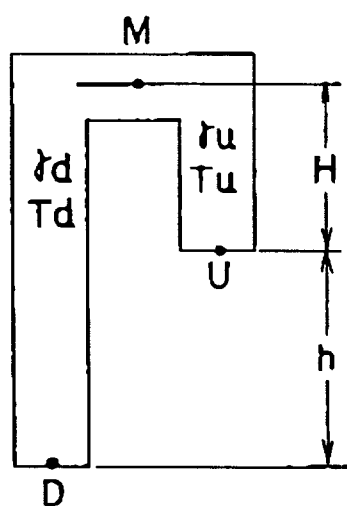


FIG. 7

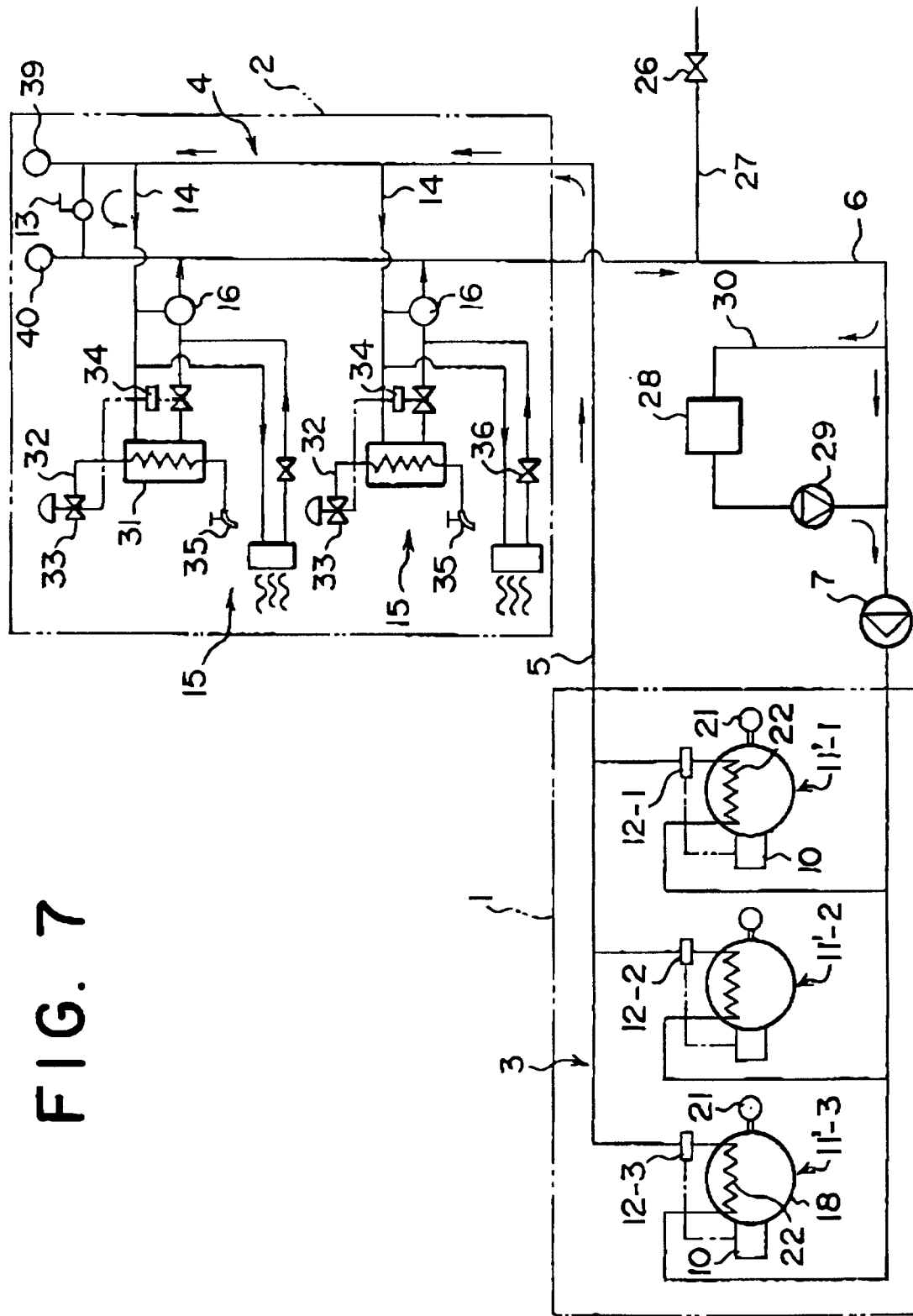
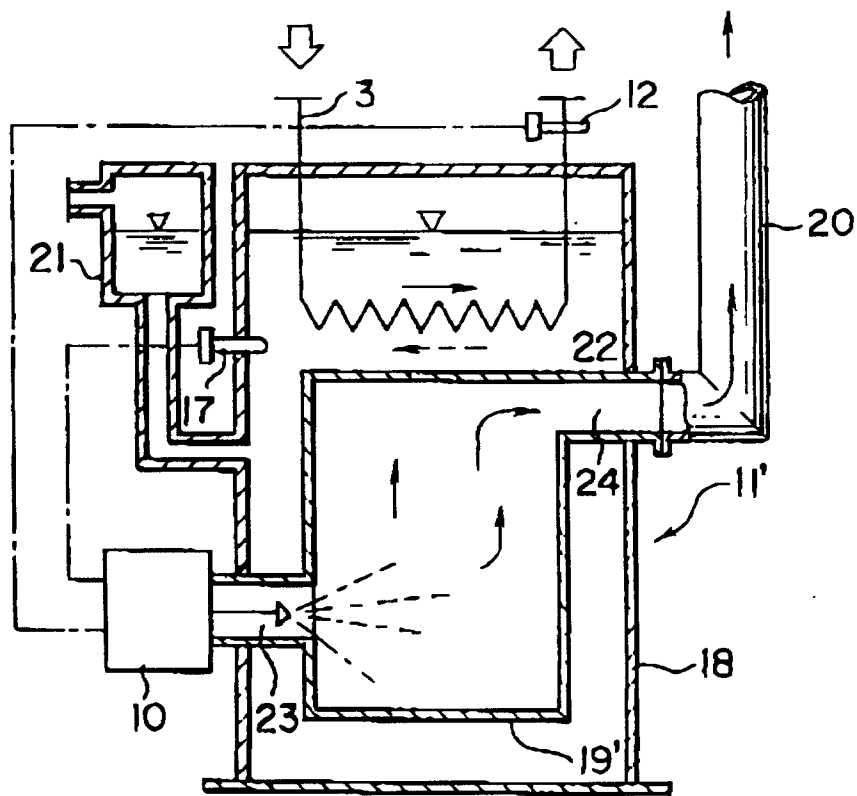


FIG. 8





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 40 1479

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)
A	PATENT ABSTRACTS OF JAPAN vol. 014, no. 335 (M-1000) 19 July 1990 & JP-A-02 115 627 (NOBORU MARUYAMA) 27 April 1990 * abstract *	1,2	F24D17/00 F24H1/28
A	DE-A-40 41 183 (BUDERUS HEIZTECHNIK GMBH) * abstract *	1	
A	EP-A-0 249 070 (DEUTSCHE VORTEX GMBH) * abstract *	1	
A	DE-B-28 52 895 (HELMUT BÄLZ GMBH) * claims; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			F24D F24H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 November 1994	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			

EPO FORM 1503 03.92 (P04C01)