(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 260 242**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **87850274.9**

(51) Int. Cl.[4]: **F 24 H 1/06**

(22) Date of filing: **08.09.87**

(30) Priority: **10.09.86 FI 863669**

(43) Date of publication of application:
16.03.88 Bulletin 88/11

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **Scan Development Oy**
Tupalantie 7 a
SF-04400 Järvenpää (FI)

(72) Inventor: **Ekman, Heinz**
Pippurn
SF-02400 Kirkkonummi (FI)

(74) Representative: **Wibom, Hans Sven Erik et al**
Dr. Ludwig Brann Patentbyra AB Box 7524 Kungsgatan 3
S-103 92 Stockholm (SE)

(54) Apparatus to circulate and heat liquid.

(57) Apparatus to circulate and heat liquid, such as water, which apparatus includes an incorporated or separate source of heat (2) and a liquid inlet pipe (10) and a liquid outlet pipe (12), and inside which apparatus is arranged, connected to the outlet pipe (12), a preferably spiral pipe (11) for heating the liquid to its final temperature. In known heating systems, it is not enough to heat the water, also a circulation water pump is needed. With this invention, the need for a circulation water pump is eliminated by that the inlet pipe (10) and the outlet pipe (12) are each equipped with a back-pressure valve (13, 14), and that inside the apparatus, between the inlet pipe (10) and the spiral pipe (11) is installed an element (7) comprising a liquid space (8) with a direct connection to the inlet pipe (10) and the spiral pipe (11) and, connected with said space, a vaporizing space (9) which quickly vaporizes the liquid.

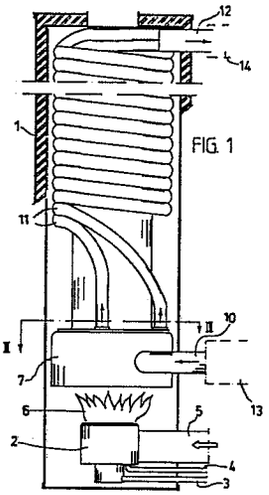

FIG. 1

EP 0 260 242 A2

Description

APPARATUS TO CIRCULATE AND HEAT LIQUID

This invention relates to an apparatus to circulate and heat liquid, such as water, which apparatus includes an incorporated or separate source of heat and a liquid inlet pipe and a liquid outlet pipe, and inside which apparatus is arranged, connected to the outlet pipe, a preferably spiral pipe for heating the liquid to its final temperature.

This kind of apparatus can be used for the heating of water circulated for example through radiators. The water circulated can give off its heat direct to the heat-transmission surfaces of the radiator or be used for heating some other heat-transmission medium possibly contained in the radiator, such as freon. Water leaves the apparatus through the outlet pipe at a desired temperature and returns, cooled, through the inlet pipe. Countless apparatuses (boilers) are known with which to heat circulation water. All known apparatuses, however, include a circulation water pump, with which the water is made to circulate in the system.

The object of this invention is to create an apparatus which not only heats the circulation water, but also makes it circulate without a circulation water pump or any other device needing additional energy. An apparatus according to the invention is characterized by that the inlet pipe and the outlet pipe are each equipped with a back-pressure valve, and that inside the apparatus, between the inlet pipe and the spiral pipe is installed an element comprising a liquid space with a direct connection to the inlet pipe and the spiral pipe and, connected with said space, a vaporizing space which quickly vaporizes the liquid.

An advantageous application of the invention is characterized by that both the liquid space and the vaporizing space are ringlike in cross-section, and that the liquid space is wider and lower than the vaporizing space.

Another advantageous application of the invention is characterized by that the liquid space and the vaporizing space are positioned partly side by side, separated from each other by a wall, and that the connection between them has been effected by forming an opening at the bottom of the wall.

A third application of the invention is characterized by that the inlet pipe is tangentially connected to the ringlike liquid space.

Still another application of the invention is characterized by that the connection between the liquid space and the spiral pipe has been made at the top of the liquid space, at one or several places.

In an apparatus according to the invention no circulation water pump is needed, as the vapour pressure formed in the vaporizing space effects the circulation of the water.

In the following, the invention is explained in detail by referring to the enclosed drawings, in which

Fig. 1 shows from the side, partly cut open, an apparatus according to the invention.

Fig. 2 shows magnified the element in an apparatus according to the invention that comprises the liquid space and the vaporizing space.

Fig. 3 shows the section along the line III-III in Fig. 1.

Fig. 4 shows diagrammatically a circulation system in which the invention can be applied.

Figure 1 shows an apparatus according to the invention throughout isolated by an isolation layer 1. At the bottom of the apparatus is arranged a heating device 2, which in this embodiment is an oil burner. Fuel oil is fed into the oil burner through pipes 3 and 4, and air for burning is blown into it with a blower 21 (Fig. 4) though a channel 5. The flame 6 of the burner 2 heats the metal element 7 arranged over it. Inside the element is formed a liquid space 8 ringlike in cross-section and a vaporizing space 9, which is connected with the former, positioned partly side by side with it, separated from it by a wall 22, and also ringlike in cross-section (See Fig. 2). To the liquid space 8 inside the element 7 is tangentially connected a liquid inlet pipe 10. The arrow in the inlet pipe shows the liquid's direction of motion in the pipe. To the top of the ringlike liquid space are in this embodiment attached at different places two pipes 11, which in a spiral-like manner run to the top of the apparatus, where they are connected to a common outlet pipe 12, in which again the liquid moves in the direction indicated by another arrow. The inlet pipe 10 and the outlet pipe 12 are each equipped with a back-pressure valve 13, 14 for preventing the liquid from moving in any other direction than that indicated by the respective arrow. Most advantageously, an apparatus according to the invention is used for the circulation of water in radiators and comparable means, with the liquid circulating for example in the manner shown in Fig. 4 from the outlet pipe back to the inlet pipe and from there again into the apparatus, and so on.

Figure 2 shows the most essential part of the invention: the element 7, in which the ringlike spaces 8,9 have been formed. To illustrate the working of the apparatus it is assumed that the wide liquid space and the vaporizing space, which is narrower, are full of water. At the same time the flame 6 of the burner 2 heats the inner walls 15 of the element 7. Thereby the water in the narrow but comparatively high vaporizing space gets quickly vaporized. Because of its pressure, the vapour begins to discharge itself out of the space 9 into the liquid space 8 through an opening 16 at the bottom of the wall 22, pushing before it the water contained in the liquid space 8. Because the inlet pipe 10 is equipped with a back-pressure valve 13, the water cannot push its way back into the inlet pipe, and so the only escape route are the pipes 11 (Figures 1 and 3) connected to the top of the ringlike liquid space 8. When the vapour has pushed the water contained in the ringlike space into the pipes 11, there arises in the vaporizing space 9 a vacuum, which sucks new water into the vaporizing space and the liquid space. Because the outlet pipe 12 too is equipped with a back-pressure valve 14 and the system is airtight,

water cannot return to the liquid space through the pipes 11; instead, the water comes through the inlet pipe 10. After the spaces 8 and 9 have been filled, the water in the vaporizing space 9 begins to vaporize again, and then the cycle described above is repeated. The apparatus continuously circulates water forward in an impuls-like manner without a circulation water pump or any comparable means.

The water will not necessarily have time to reach a high enough temperature in the liquid space 8 before being pushed into the pipes 11. For this reason the pipes 11 are wound in a spiral-like manner round the wall 15, which is heated by the burner 2. Consequently, the water gets heated to a suitable temperature in the pipes 11 before leaving through the outlet pipe 12 into radiators or for some comparable purpose. Figure 4 shows a possible heating system with an apparatus according to the invention depicted on the left. The hot water leaves the apparatus through an outlet pipe 12 and flows into an expansion tank 17, which is equipped with an overflow pipe 18. From the expansion tank the water flows through a pipe into radiators 20, where it gives off its heat. From the radiators the water, now cooled, returns through an inlet pipe 10 into said apparatus. The circulation continues as long as the heating device 2 shown in Figure 1 is in operation.

It is obvious to a person skilled in the art that the invention is not restricted to the embodiments described above, but can be varied within the scope of the following patent claims.

Claims

1. Apparatus to circulate and heat liquid, such as water, which apparatus includes an incorporated or separate source of heat (2) and a liquid inlet pipe (10) and a liquid outlet pipe (12), and inside which apparatus is arranged, connected to the outlet pipe (12), a preferably spiral pipe (11) for heating the liquid to its final temperature, **characterized** by that the inlet pipe (10) and the outlet pipe (12) are each equipped with a back-pressure valve (13, 14), and that inside the apparatus, between the inlet pipe (10) and the spiral pipe (11) is installed an element (7) comprising a liquid space (8) with a direct connection to the inlet pipe (10) and the spiral pipe (11) and, connected with said space, a vaporizing space (9) which quickly vaporizes the liquid.

2. Apparatus in accordance with Claim 1, **characterized** by that both the liquid space (8) and the vaporizing space (9) are ringlike in cross-section, and that the liquid space (8) is wider and lower than the vaporizing space (9).

3. Apparatus in accordance with any of the Claims 1 and 2, **characterized** by that the liquid space (8) and the vaporizing space (9) are positioned partly side by side, separated from each other by a wall (22), and that the connection between them has been effected by forming an opening (16) at the bottom of the wall (22).

4. Apparatus in accordance with any of the Claims 1-3, **characterized** by that the inlet pipe (10) is tangentially connected to the ringlike liquid space (8).

5. Apparatus in accordance with any of the Claims 1-4, **characterized** by that the connection between the liquid space (8) and the spiral pipe (11) has been made at the top of the liquid space (8), at one or several places.

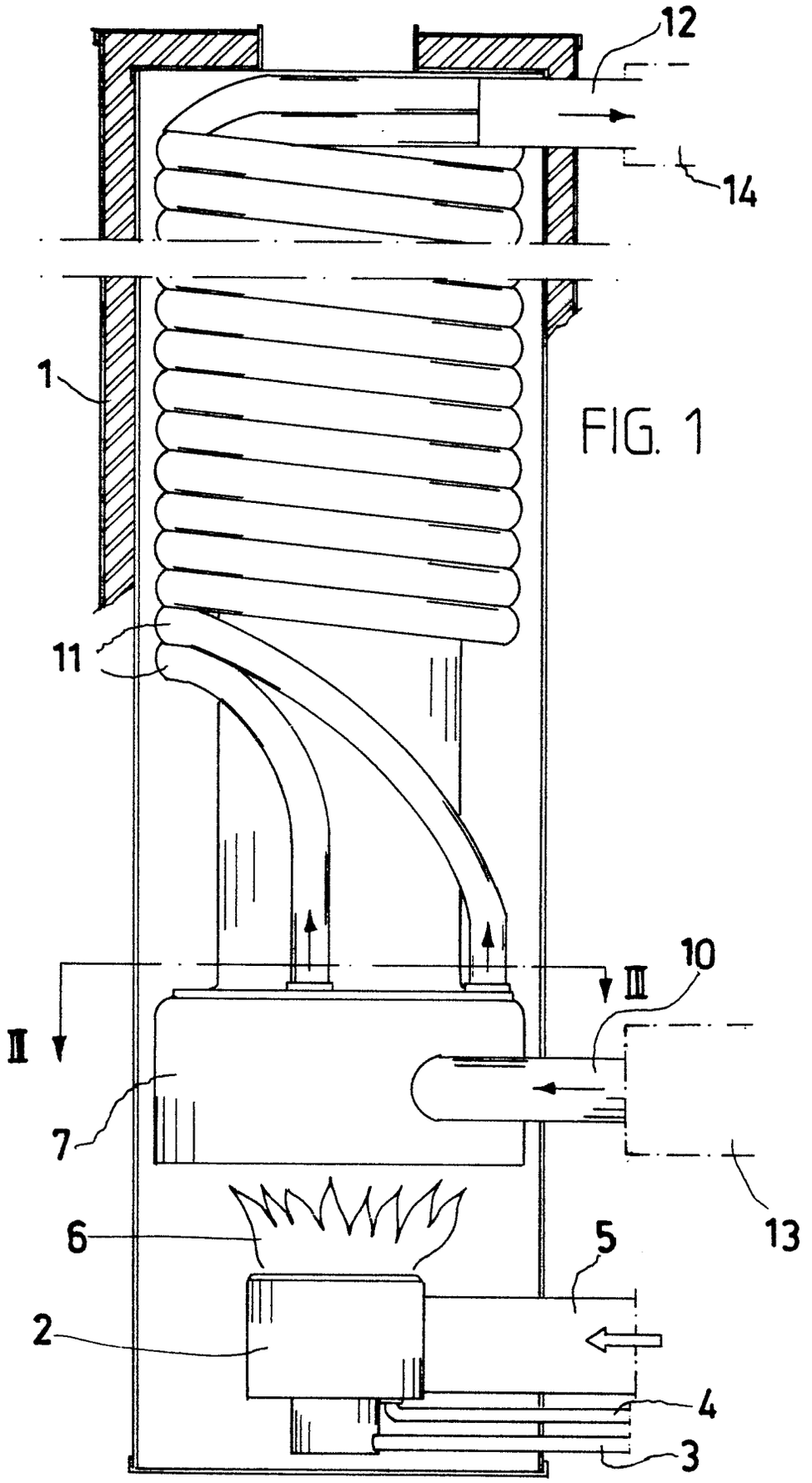

FIG. 1

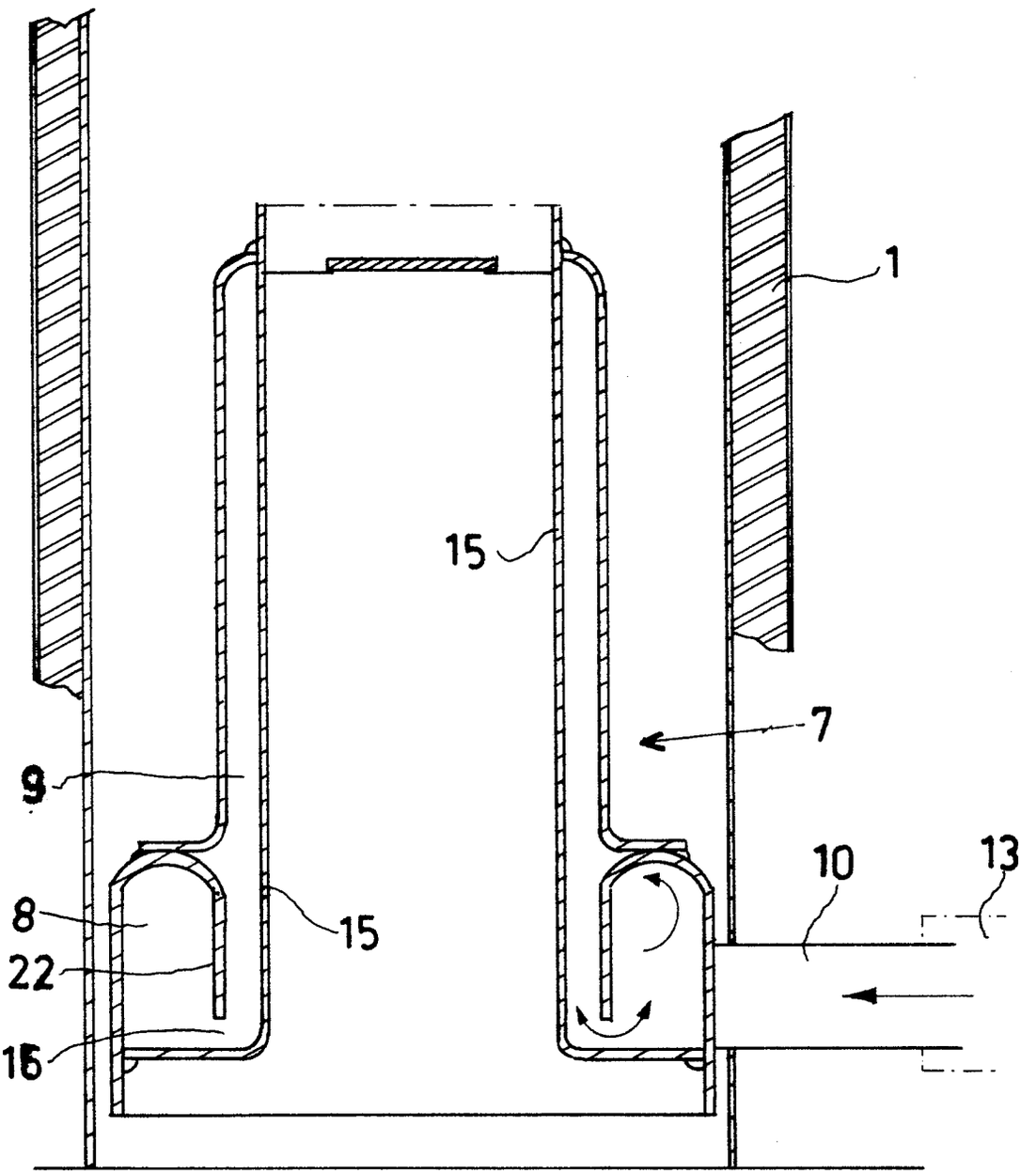

FIG. 2

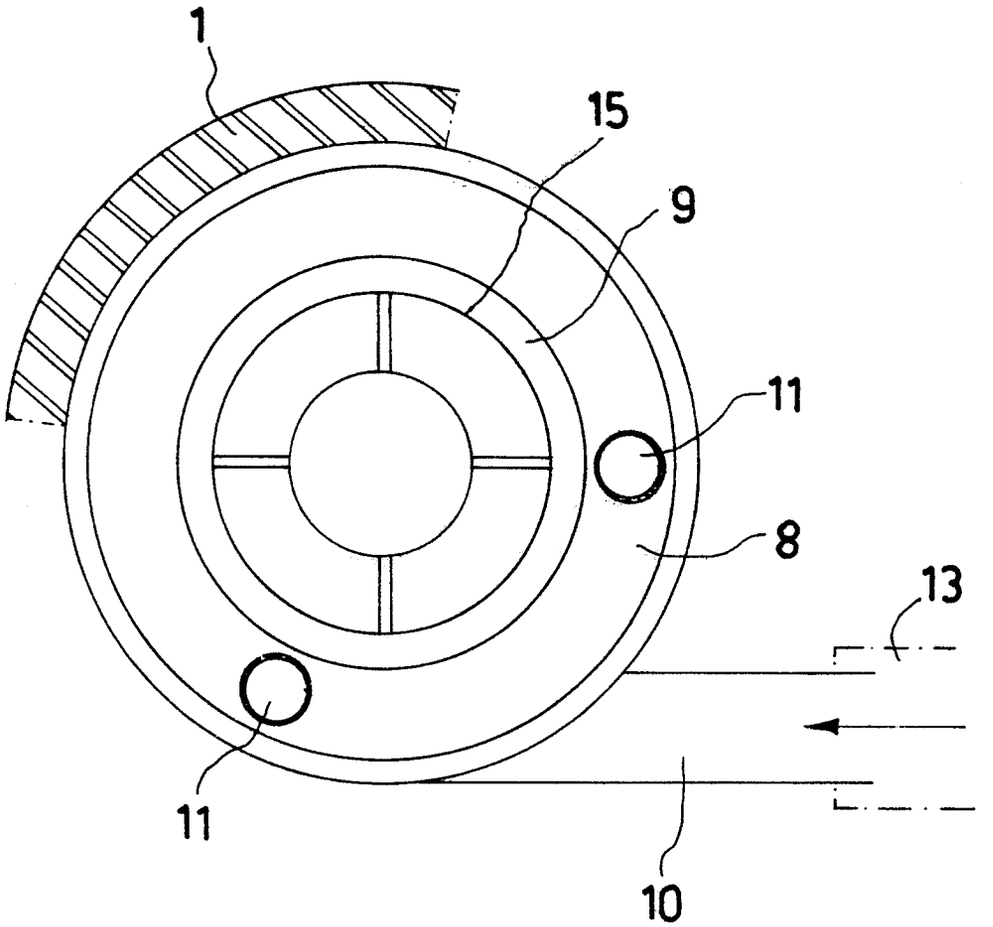

FIG. 3

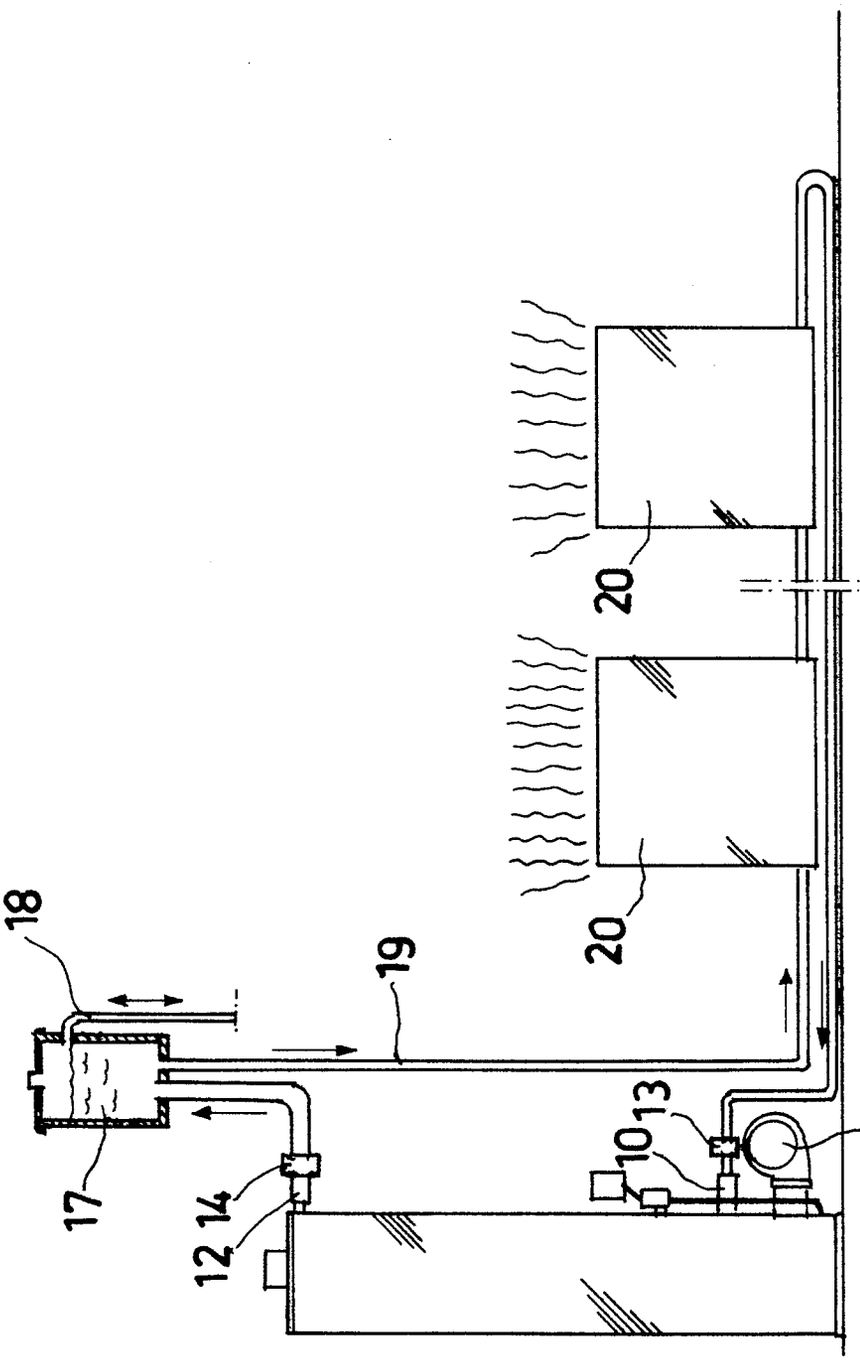

FIG. 4