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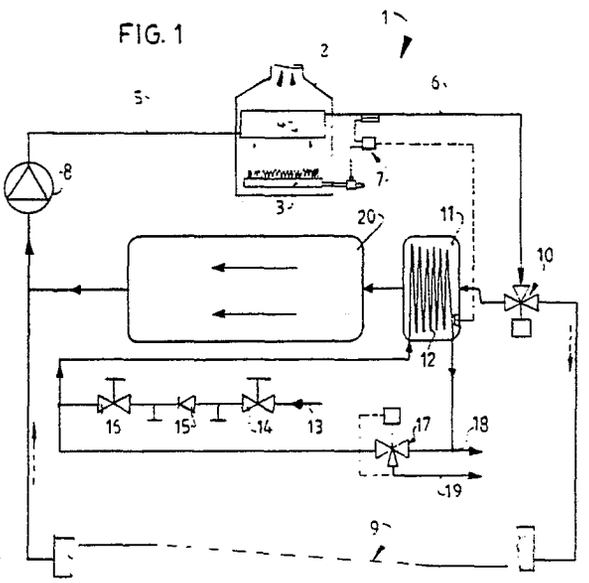
(54) Tap-water heating device.

(57) Device for heating tap-water in a central heating device comprising a central heating boiler (2) with an outlet heating water pipe (6) and an incoming return pipe (5), heating radiators and/or convectors (9) and a tap-water heat exchanger (11) arranged between these pipes and a circulation pump (8) arranged in one of these pipes. A hot water reservoir (20) is arranged between the tap-water heat exchanger (11) and the return pipe (5).

FIG. 1



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TAP-WATER HEATING DEVICE

The invention relates to a device as described in the heading of claim 1.

When hot tap-water is required in such a device, the heating water coming from the central heating boiler is carried via the tap-water heat exchanger, where incoming cold mains water is heated to hot tap-water.

When the central heating boiler is at the required temperature hot water can be supplied very quickly. However, when the boiler is not at the required temperature at the moment when hot tap-water is required, as happens particularly in the summer, it takes a long time before hot tap-water is available, since the central heating boiler and the heating water must first be brought up to operating temperature.

In order to obviate this drawback it is known to give the tap-water heat exchanger a relatively large capacity and to insulate it well, so that a buffer supply of hot heating water remains in the heat exchanger. With such a system hot water is supplied directly the hot water tap is turned on. However, since in the circumstances described the heating water is at first still cold, the temperature of the heating water present in the heat exchanger falls and thus also the temperature of the tap-water. Only after considerable time, when the central heating boiler is at the required temperature and has supplied hot heating water for a period of time such that the entire content of the heat exchanger has been brought once again up to temperature, is the temperature of the tap-water finally at the desired level.

Another improvement of this system is described in the European patent 0.178.351. Provisions have been hereby made in the tap-water heat exchanger which ensure that the initially incoming cold water does not mix with the hot water already present in the exchanger. This system thus supplies hot water at the desired temperature very rapidly. However, after some time, depending on the capacity of the heat exchanger, the cold boiler water which entered initially and which is only partially mixed with later supplied hot water will come into contact with the actual heat exchanging coil, so that the hot tap-wa ter, after initially having had the desired temperature, suddenly falls slightly in temperature, to then again definitively reach the desired high temperature shortly afterward. Such temperature behaviour, whereby some time after the hot water tap has been turned on a "dip" occurs in the temperature of the water, is extremely undesirable, especially in the case the hot water is being used to have a shower.

The invention therefore has for its object to provide a device of the type described in the preamble which has none of the above named drawbacks and which is able to supply tap-water that is rapidly at the desired temperature, even when the central heating boiler is not at operational temperature at the moment hot water is required, and that afterward retains this temperature.

This object is attained with a device according to the invention in that a hot water reservoir is arranged between the tap-water heat exchanger and the return pipe. When the hot water tap is opened the water is at first still cold. Through simultaneous switching on of the central heating boiler and the associated circulation pump hot water is carried from the hot water reservoir via the return pipe to the central heating boiler. The latter is immediately heated up by the hot water from the hot water reservoir, so that it very rapidly begins to supply hot heating water and therefore also rapidly begins to heat up the cold mains water in the tap-water heat exchanger. It has been found that with a normal central heating installation and with a hot water reservoir of a capacity of 10 litres, the tap-water reaches the required temperature within half a minute.

An economical embodiment of the device according to the invention is characterized in claim 2.

An especially favourable construction of this embodiment is characterized in claim 3.

It is noted that a tap-water heat exchanger consisting of an outer tank, an inner tank arranged therein and having one closed end wall and a tap coil arranged around the inner tank is per se known from the above-mentioned European patent specification 0.178.351. As already described the function of this unit differs from that according to the invention. The heating water supply hereby runs out into the inner tank, while the heating water outlet debouches outside the inner tank.

With the embodiment as characterized in claim 4 is achieved that a minimum amount of hot water can be present between the inner tank and the outer tank and therefore a maximum amount of hot water is available for the heating up of the central heating boiler. In this embodiment a helical channel for the heating water is moreover created in a favourable manner between the helical windings of the tap-water coil, which is favourable for good heat transfer.

The invention will be further elucidated in the following description with reference to the embodiments shown in the figures.

Fig. 1 shows schematically a device according to a first embodiment of the invention.

Fig. 2 shows a diagram of a preferred em-

bodiment of the invention corresponding with fig. 1.

Fig. 3 shows a partially broken away and partially sectional tap-water heat exchanger and hot water reservoir combined into one unit according to the preferred embodiment of the invention.

The device 1 in fig. 1 is a combined central heating device and tap-water heating device. In the usual manner the heat source is a central heating boiler 2 which comprises a burner 3 and a heat exchanger 4 in which heating water from a return pipe 5 is heated and after heating is carried away via an outlet heating water pipe 6. The central heating boiler 2 is provided with a control device 7 which controls the burner 3 and has as entrance quantity in the case shown the temperature of the heating water in the heating water pipe 6 and the temperature of the heating water in a tap-water heat exchanger 11. Arranged in the return pipe 5 is a circulation pump 8.

As shown schematically in fig. 1, radiators and/or convectors 9 are connected between the heating water pipe 6 and the return pipe 5. These generate heat from the heating water in the space in which they are disposed.

In addition to these radiators and convectors 9 a tap-water heat exchanger 11 is arranged between the heating water pipe 6 and the return pipe 5. Mounted for this purpose in the heating water pipe 6 is a three-way valve 10, which can carry the heating water at choice to the tap-water heat exchanger 11 or to the radiators 9.

Arranged in the tap-water heat exchanger 11 is a tap-water coil 12 through which water from the mains water supply 13 can flow. The feed connection of the tap coil 12 is connected to this mains water supply via respectively a main cock 14, a non return valve 15 and an adjusting tap 16.

The hot water from the tap coil 12 can be discharged directly via the connection 18. The hot water connection of the tap coil 12 is likewise connected to a control valve 17, which is connected at a second inlet to the mains water supply 13, and which can deliver hot water at a controlled temperature via connection 19.

In the situation where the central heating boiler 2 is at operating temperature, that is, usually during the winter period, as soon as hot tap-water is required, for instance through opening of a draw-off tap in the connecting pipe 18 or 19, the three-way valve 10 is switched over in order to send hot water from the pipe 6 to the tap-water heat exchanger 11. Hot water can then be drawn immediately from the connection 18 or 19.

In the situation where the central heating boiler is not at operating temperature, as is usual in the summer period, hot tap-water is not immediately available. As soon as hot tap-water is again required, the central heating boiler 2 is switched on. The control device which provides this switch-on is per se commonly known and will consequently not be further described here.

In this situation, after the central heating boiler 2 has been switched on, the water leaving the heat exchanger 4 is initially cold. The cold mains water is therefore not yet heated.

According to the invention however a hot water reservoir 20 is arranged between the tap-water heat exchanger 11 and the return pipe 5. This hot water reservoir 20 is filled with hot heating water. When the central heating boiler 2 and the circulation pump 8 are switched on, this hot water comes out of the hot water reservoir 20 via the return pipe 5 into the central heating boiler 2, which results in it being rapidly heated and moreover in the temperature of the water in the outlet pipe 6 increasing rapidly. The hot water from the pipe 6 flows to the tap-water heat exchanger 11 and can thus heat the tap-water rapidly.

An important aspect of the invention is therefore that a quantity of hot water is stored in the hot water reservoir 20 and is used to bring the installation quickly up to operating temperature, this instead of the usual practice of generating heat directly to the water in the water pipe. The installation and the tap-water thus reach the operating temperature rapidly, and this operating temperature, particularly of the tap-water, remains high for unlimited time afterward.

Fig. 2 shows a device 25 which largely corresponds with the device 1 in fig. 1. The tap-water heat exchanger 11 and the hot water reservoir 20 shown in fig. 1 are combined in the device 25 into a heat exchanger unit 26. The other elements of the device are designated with the same reference numerals as in fig. 1 and do not require further description.

The heat exchanger unit 26 comprises a closed outer tank 27 in which is arranged an inner tank 28 with one closed end wall 29. A helically wound tube forming the tap coil 32 is arranged around the inner tank 28. The ends of the tap coil 32 are guided in sealed manner through the wall of the outer tank 27.

As shown in fig. 2, near to the closed end wall 26 of the inner tank 28, the heating water outlet 31 is located in the inner tank 28 and the heating water feed 30 outside this inner tank.

After the central heating boiler 2 has been switched on, because hot tap-water is required, the hot water present in the inner tank 28 flows via the outlet 31 to the return pipe 5 and the central heating boiler 2 to heat up the latter. The water from the pipe 6, at this moment cold, flows via the feed 30 into the space between the outer tank 26 and the inner tank 28, along the tap coil 32.

It will be apparent that the cold water supplied

via the feed 30 can mix with the initially hot water in the space between the outer tank 27 and the inner tank 28. As a result the average temperature of this water falls, rendering it no longer effective in heating up the central heating boiler 2.

Fig. 3 shows a further developed embodiment of the heat exchanger unit in which this disadvantageous effect is minimalised. This heat exchanger unit 35 comprises in the manner already described an outer tank 36 assembled from a tubular wall closed off with end covers 37 and 38, in which is arranged an inner tank 39 likewise comprising a cylindrical wall, which however is only closed off at one end, in fig. 3 the upper end, with an end wall 40. The lower end of the inner tank 39 is entirely open. Close to the closed end wall 40 the feed 41 runs into the outer tank 36, and the outlet 42 into the inner tank 39. This outlet 42 leads through the end cover 38 to a connection 43 with the return pipe, onto which also runs out a connection 44 which is connected to the outlet of the radiators.

The diameter of the inner tank 39 is such that the space between the inner tank 39 and the outer tank 36 has a breadth substantially equal to the diameter of the tube of the tap coil 45. The helically wound tube of the tap coil 45 therefore lies substantially against both the outer wall of the inner tank 39 and the inner wall of the outer tank 36. A similarly helical space 46 is thus separated off between the successive windings, through which space the heating water from the feed 41 is constrained to flow.

The heat exchanger unit 35 according to the invention shown in fig. 3 has on the one hand the advantage that the effective quantity of hot water it can contain is maximal while on the other a very good heat transfer results from the hot water supplied via the feed 41 to the water in the tap coil 45, so that a pure counterflow heat exchange takes place. The hot water leaving the tap coil 45 at the upper side therefore has practically the same temperature as the heating water supplied via the feed 41, so that with this embodiment the heating speed is optimal.

The heat exchanger unit according to the invention can be applied in both lying and standing position. In the latter case the closed end wall of the inner tank can be situated at the top or at the bottom. Because when the central heating boiler 2 and the circulation pump 8 are switched on the contents of the unit 45 are renewed very rapidly, the effects of the force of gravity on the mixing of the supplied cold water and the hot water present in the inner tank are relatively insignificant. It has been found that a capacity for the unit of approximately 10 litres is optimal for a domestic central heating installation.

Claims

1. Device for heating tap-water in a central heating device comprising a central heating boiler with an outlet heating water pipe and an incoming return pipe, heating radiators and/or convectors and a tap-water heat exchanger arranged between these pipes and a circulation pump arranged in one of these pipes, **characterized in that** a hot water reservoir is arranged between said tap-water heat exchanger and said return pipe.

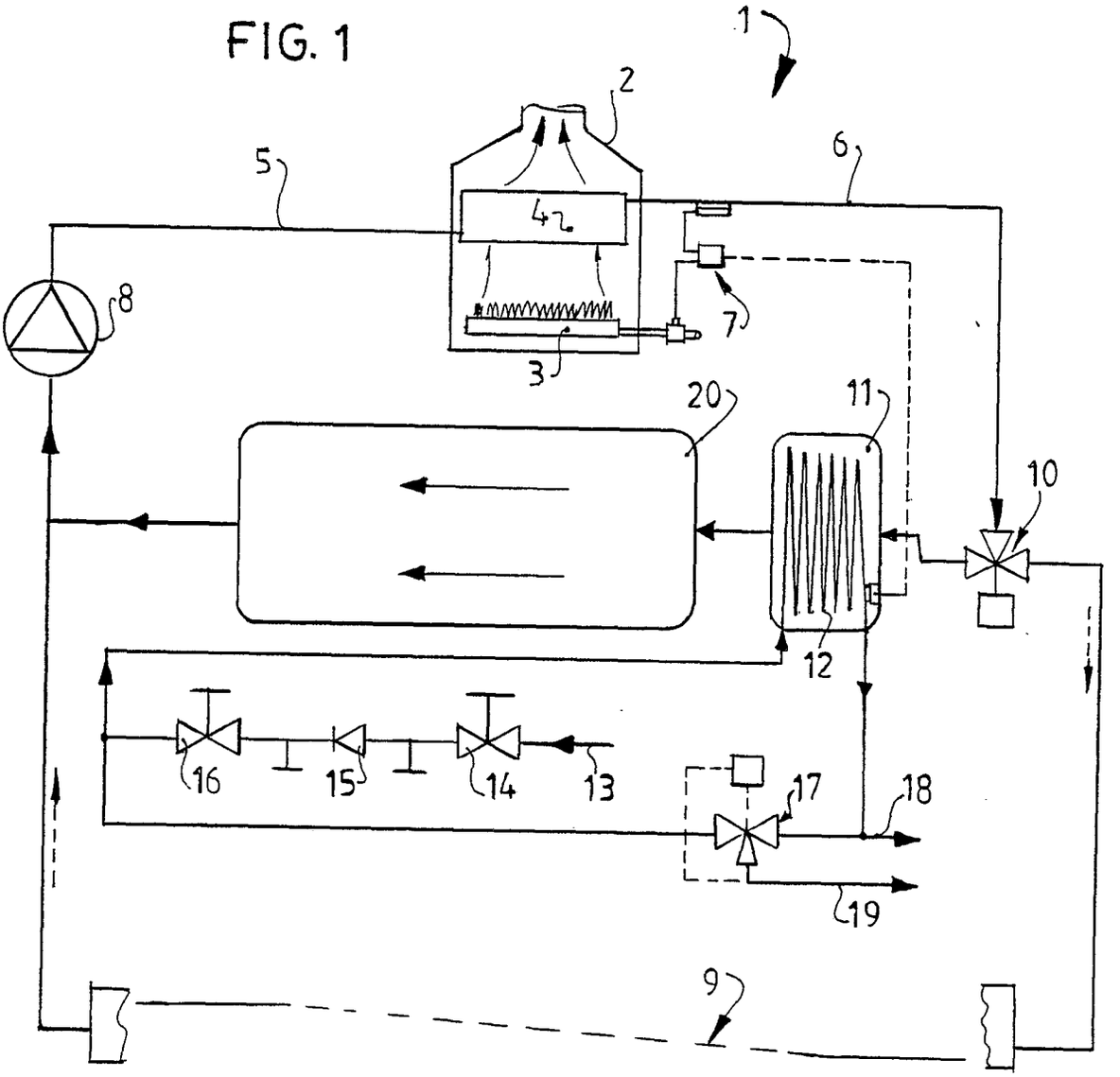
2. Device as claimed in claim 1, **characterized in that** the tap-water heat exchanger and the hot water reservoir are integrated into a unit.

3. Device as claimed in claim 2, **characterized in that** said unit comprises an outer tank with closed end walls, an inner tank arranged therein having one closed end wall, a helically wound tube arranged around said inner tank and forming a tap coil, the ends of which tube are guided in sealed manner through the wall of said outer tank and whereby close to the closed end wall of said inner tank, a heating water outlet runs out into said inner tank and a heating water feed debouches outside said inner tank.

4. Device as claimed in claim 3, **characterized in that** side walls of the outer tank and the inner tank are coaxially cylindrical and have an intermediate space corresponding substantially with the thickness of the helically wound tube, so that the tube lies substantially against said inner tank and said outer tank.

5. Device as claimed in any of the foregoing claims, **characterized in that** the capacity of the hot water reservoir or the outer tank amounts to less than 10 litres.

FIG. 1



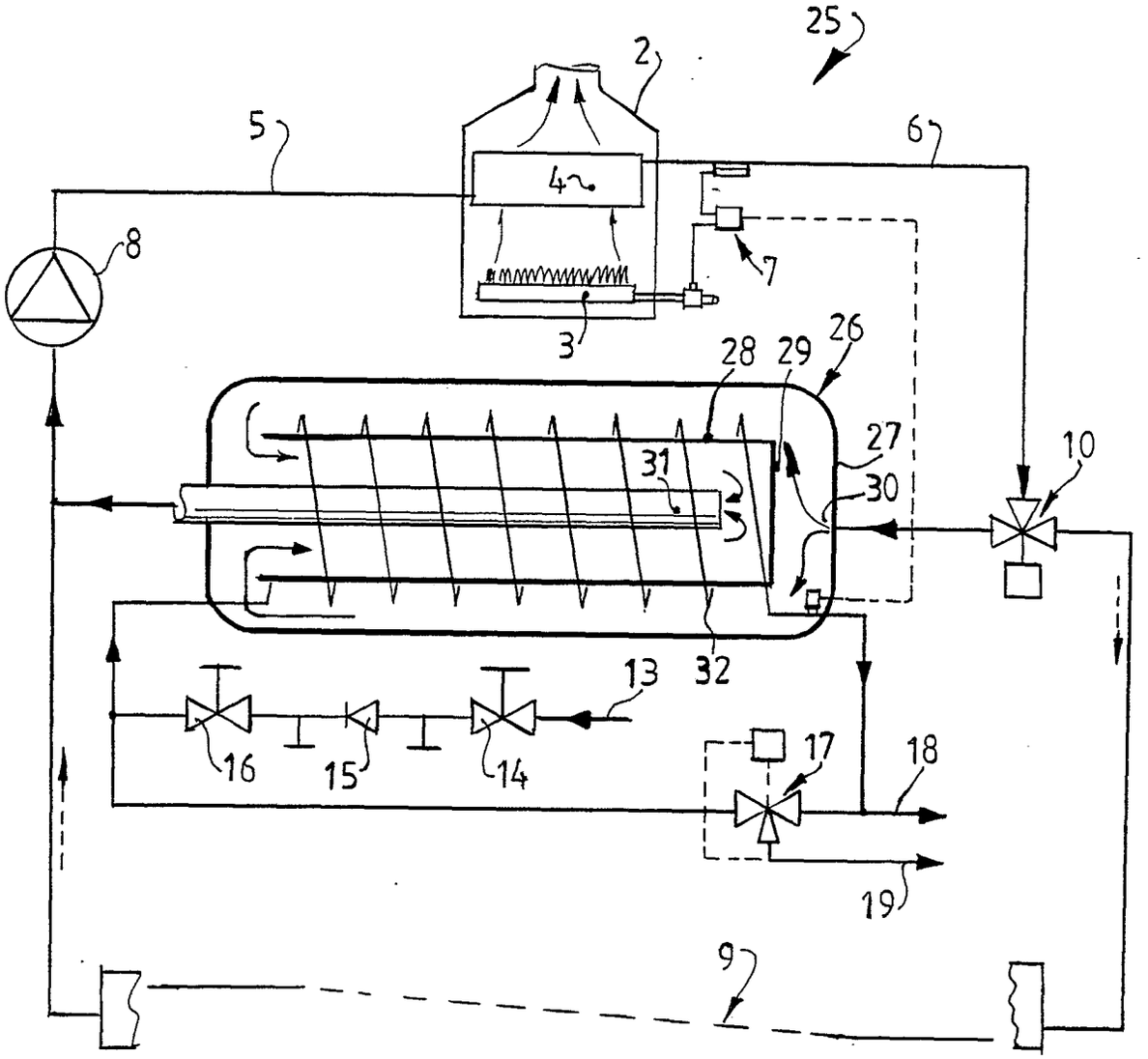
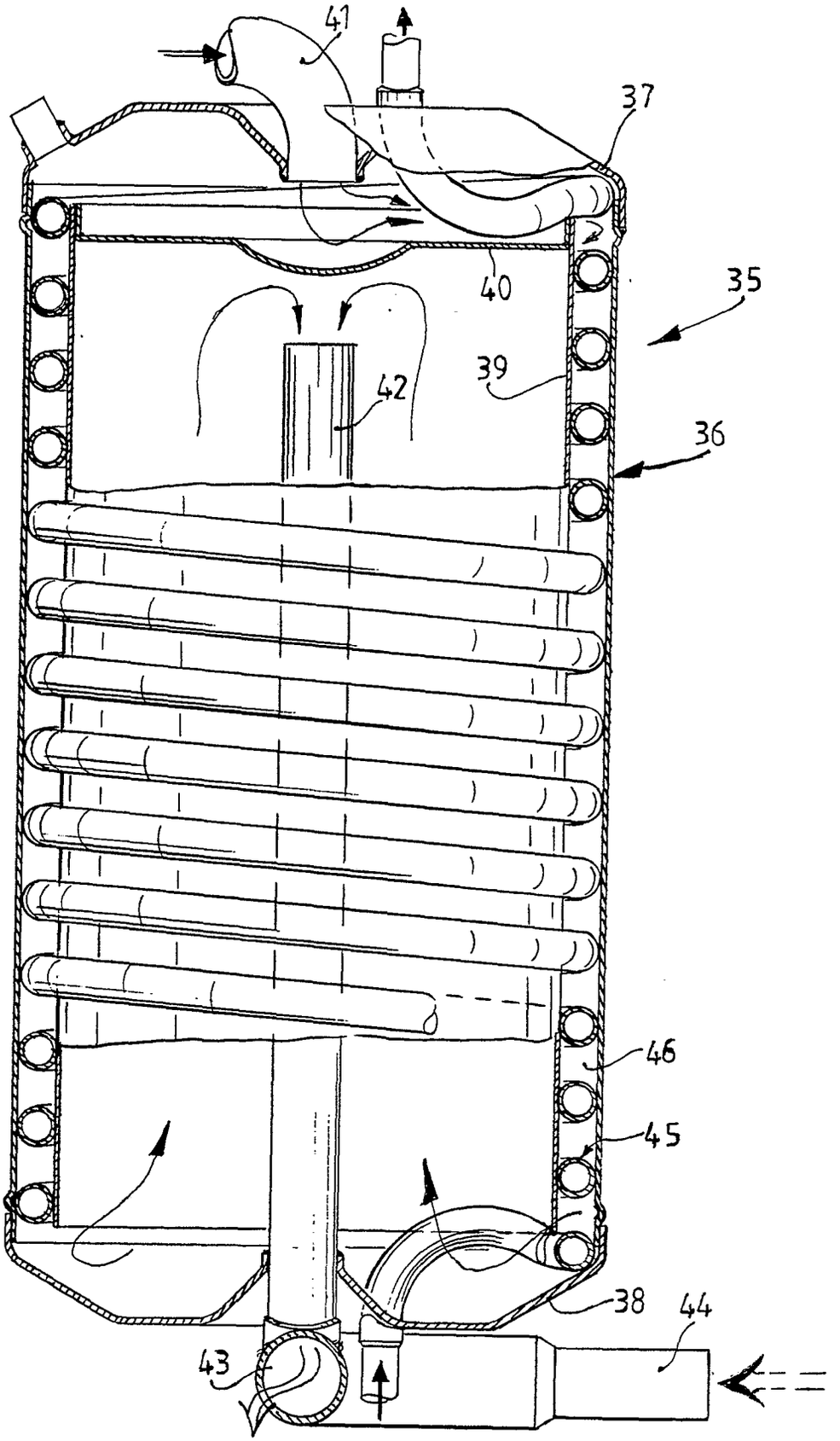


FIG. 2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EUROPEAN SEARCH REPORT

Application Number

EP 89 20 1863

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.5)
A,D	EP-A-0 178 351 (PLAATVERWERKENDE INDUSTRIE VAN WIJK EN BOERMA B.V.) * Abstract * ---	1	F 24 D 3/08
A	FR-A-2 557 685 (LE MER) * Abstract * ---	1-3	
A	DE-A-1 751 291 (GALLOMETER MESSGERÄTE-VERTRIEBSGESELLSCHAFT GmbH) * Figures * -----	4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 24 D
F 24 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27-10-1989	VAN GESTEL H.M.

CATEGORY OF CITED DOCUMENTS

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