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(54) **Water heater with high performance heat exchanger**

(57) The present invention refers to a high performance water heater constituted by means of a tank (1) having adiabatic walls that makes use of a double coaxial pipe coil (4) that increases the flow of heat and

allows the storage and production of domestic hot water. This double coaxial pipe coil has an external tube (4.2) pertaining to the primary circuit or hot source and an internal tube (4.1) pertaining to the secondary or domestic water circuit.

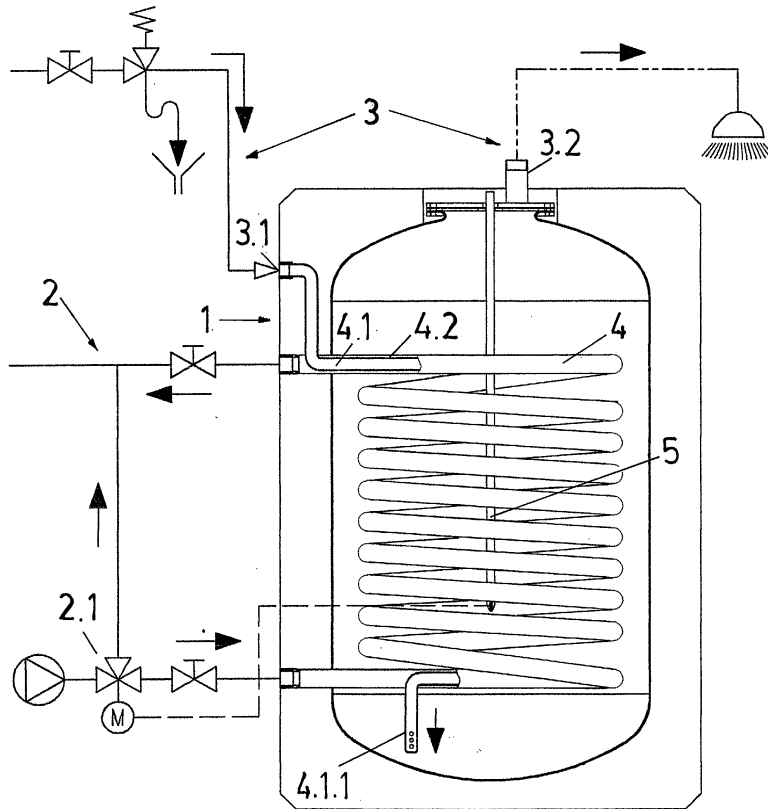


FIG.1

Description**OBJECT OF THE INVENTION**

[0001] The present invention refers to a high performance calorifier-heat exchanger constituted by means of a tank having adiabatic walls that makes use of a double coaxial pipe coil that increases the flow of heat and allows the storage and production of domestic hot water.

[0002] It is characterised in the use of a double pipe coil, coaxial, with the external tube belonging to the primary circuit or heat source and the internal tube belonging to the secondary or domestic water circuit.

[0003] It is characterised in that the end of the pipe coil of the secondary circuit is finished in a diffuser located in the low part of the tank.

[0004] It is this tank, having adiabatic walls, which serves as means of storage of domestic hot water.

BACKGROUND OF THE INVENTION

[0005] Diverse systems are known for heating domestic water by means of the use of heat exchangers.

[0006] These heat exchangers employ of two circuits, the primary one through which the hot water circulates and another secondary one through which the water to be heated circulates.

[0007] In particular, a type of exchanger widely used to heat domestic water makes use of a pipe coil mounted internally in a tank with heat-lagged walls.

[0008] through the pipe coil hot water is made to flow that transfers its heat to the water stored inside the tank.

[0009] On one hand, the efficiency of heat transfer depends on the exchange area, directly proportional to the length of the pipe coil and the diameter of the pipe as well as to the conductivity of the material; and on the other hand, on the thermal gradients that are established in the fluid particles adjacent to the exchange surface.

[0010] Since the tank has a large capacity, the appearance of hot areas and others that are cold favour internal movements of flotation that generate transport phenomena by advection that favour the mixing phenomena.

[0011] However, the flotation movements are small in comparison with the velocities that an incoming or outgoing stream of water can acquire under consumption conditions.

[0012] Another additional drawback is the time of heating since, to reach the supply temperature it is necessary to heat the entire volume of the tank.

[0013] The present invention proposes a special configuration of the pipe coil that resolves the previous problems.

DESCRIPTION OF THE INVENTION

[0014] The present invention relates to a calorifier-

heat exchanger to heat domestic water in production and storage conditions.

[0015] The present calorifier-exchanger consists of a tank having adiabatic walls, mounted vertically or horizontally which includes a double coaxial pipe coil in its interior.

[0016] This double coaxial pipe coil is constituted mainly by two tubes, one internal and another external.

[0017] The external tube is that which corresponds to the primary hot water circuit serving to transfer its thermal energy to the water for domestic use.

[0018] This circuit enters through one of the walls of the adiabatic tank and connects with the hot water supply source.

[0019] This source of hot water can come from any external generator (e.g. boilers, solar panels, etc.) or it can even make use of a heating circuit with over-dimensioned means of heating.

[0020] Before entering the adiabatic tank, a second tube corresponding to the secondary or domestic water circuit penetrates inside the tube of the primary circuit which is of larger diameter, after which point both are coaxial there being between the two an annular section.

[0021] It is through this annular space that the water of the primary circuit passes that serves to heat the domestic water that circulates through its interior.

[0022] Thus, the domestic water enters through the secondary circuit, this secondary circuit penetrates inside the primary circuit, and starting from there both tubes describe a pipe coil that covers a great part of the interior space of the adiabatic tank.

[0023] When the domestic cold water enters in the secondary circuit, it is compelled to flow through the interior part of the pipe coil by the internal tube.

[0024] Thus, over the full length of the pipe coil, the domestic water is heated by the primary circuit.

[0025] When arriving at the end of the pipe coil, the internal tube again traverses the external tube to become independent once more and ends in a free vertical length on the lower part of the adiabatic tank.

[0026] The circulation in the pipe coil is in counter-current so that the final temperature of the domestic water when arriving at the end of the pipe coil is close to the temperature of the incoming hot water of the primary circuit.

[0027] This final length has a plurality of perforations that favour a gradual loss of head, in turn diffusing the heated water.

[0028] Thus, the domestic water, when it enters the tank, already does so practically at working temperature and it has not been necessary to heat the entire tank volume.

[0029] Also, the pipe coil transfers heat through its external face, since the external annular section corresponds to the primary circuit assuring the temperature of the tank at all times with respect to possible heat loss or because the appropriate temperature has not been reached.

[0030] The annular geometry of the primary circuit favours a greater loss of head which is dissipated as heat in the interior of the tank.

[0031] This loss has to be compensated by the circulation pump of the circuit.

[0032] When the secondary circuit injects no flow, the primary circuit transfers all its heat radially toward the tank through the external wall since the little retained water remaining in the secondary circuit is quickly heated and offers hardly no thermal inertia.

[0033] The primary circuit is opened when a drop is detected in the internal temperature of the tank.

[0034] The other eventuality that opens the primary circuit is when domestic hot water is consumed.

[0035] In this case the ingress of cold water to the pipe coil is detected by a sensor that opens the primary circuit.

[0036] Thus the water that enters the tank does so already hot for which reason the tank is instantly topped up with hot water.

[0037] The rest of the hot water offers great thermal inertia in the face of high consumptions so that this system combines a system of production and of storage of domestic hot water.

DESCRIPTION OF THE DRAWINGS

[0038] The present descriptive specification is completed with a set of drawings, by way of illustration of the preferred embodiment and not as a limitation of the invention.

[0039] Figure 1 is a schematic representation of the calorifier-heat exchanger object of the invention.

PREFERRED EMBODIMENT OF THE INVENTION

[0040] In the light of the foregoing, the present invention consists of a calorifier/heat exchanger for production and storage of domestic hot water.

[0041] Figure 1 shows a schematic of an embodiment of the invention in which a tank (1) having adiabatic walls is shown, with inlets for two circuits: a primary circuit (2) for ingress of hot water, and a secondary circuit (3) for domestic water.

[0042] The primary water circuit (2) is that which serves to contribute the thermal energy to the domestic water that circulates through the secondary circuit (3).

[0043] The exchange of heat takes place inside the tank (1) where both circuits coincide in a double coaxial pipe coil (4) constituted by two pipes, one internal (4.1) connected to the secondary circuit (2) and one external (4.2) connected to the primary circuit (1).

[0044] The ends of the external tube (4.2) of the pipe coil (4) connect with the inlet and outlet of the primary circuit (2) feeding hot water into the annular space of the pipe coil (4) existing between the external tube (4.2) and the internal (4.1).

[0045] Furthermore, the internal tube (4.1) is connect-

ed to the secondary circuit (3) constituting the internal length to the exchanger.

[0046] Through the upper inlet (3.1) of the tank (1) of the secondary circuit (3), the cold water enters and after travelling the whole pipe coil (4) wherein the exchange of heat takes place it egresses to the interior of the tank (1), on its lower part, through a diffuser (4.1.1) constituted by means of perforations implemented in the final length.

[0047] The egress of domestic hot water takes place on the upper part of the tank (1) through a coupling (3.2) that connects with the secondary circuit (3) of domestic water in its hot water length.

[0048] The interior of the tank (1) has a heat sensor (5) that opens the primary circuit (2) by means of a valve (2.1) when the temperature is below a certain preset value.

[0049] If there is no consumption of domestic hot water, the hot water that enters the primary circuit (2) transfers heat to the interior of the tank since the water stored inside the internal tube (4.1) has a very reduced thermal inertia.

[0050] If there is consumption of domestic hot water, the circulation with respect to the primary circuit (2) is in counter-current so that the temperature of the domestic water at the end of the pipe coil (4) is close to the ingress temperature of the hot water of the primary circuit (2).

[0051] The loss of head in the primary circuit (2) due to the greater resistance that is offered by the annular section is transformed into heat delivered to the interior of the tank (1) and has to be made up by the circulation pump (6).

[0052] The directions of circulation of the primary circuit (2) and secondary circuit (3) are indicated by arrows.

[0053] This same embodiment includes various manual valves that allow each of the lengths of the different circuits to be closed.

[0054] The essential nature of this invention is not altered by variations in materials, form, size and arrangement of the component elements, described in a non-restrictive manner, this being sufficient for an expert to proceed to its reproduction.

Claims

1. High performance calorifier-heat exchanger, of among the exchangers that incorporate a tank with an internal pipe coil for the heating of domestic water **characterised in that** it is constituted by an adiabatic tank (1) that includes in its interior a pipe coil (4) formed by two coaxial pipes, one external (4.2) connected to the primary circuit (2) of hot water and another internal (4.1) connected to the ingress of domestic cold water of the secondary circuit (3) in the upper end of the pipe coil (4) and finished in the lower part of the interior of the tank in a diffuser

(4.1.1); there also being included inside the tank a heat sensor (5) for activation of a motor-driven valve (2.1) for the opening of the primary circuit (2) in the event of a drop in the interior temperature; and the egress of the domestic hot water established in the upper part of the tank (1). 5

2. Calorifier-heat exchanger according to the first claim **characterised in that** the direction of circulation of the primary circuit (2) with respect to the secondary one (3) in the pipe coil (4) is in counter-current. 10

3. Calorifier-heat exchanger according to the first and second claims **characterised in that** the loss of head of the primary circuit (2) is compensated by the recirculation pump (6). 15

4. Calorifier-heat exchanger according to the first, second and third claims **characterised in that** the diffuser (4.1.1) is constituted by diverse perforations of the final length of the tube corresponding to the outlet of the pipe coil (4) of the tube (4.1). 20

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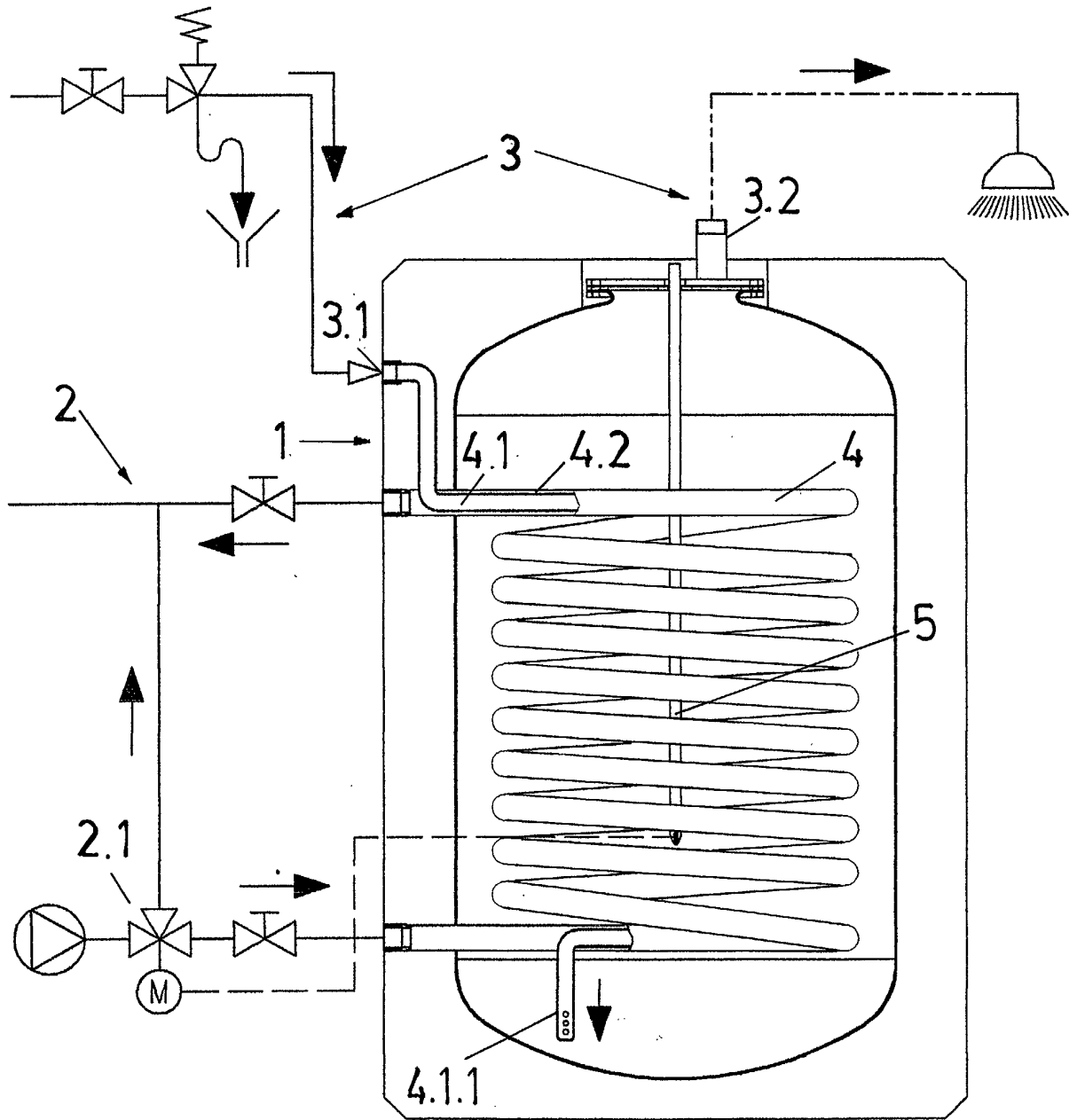


FIG.1



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 02 38 0124

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.7)
X	EP 1 103 775 A (HEATEX BV) 30 May 2001 (2001-05-30) * column 4, line 14 - column 5, line 34 * * column 5, line 45 - line 55; figures 1,10 *	1-4	F24D3/08
X	EP 0 870 993 A (VRIES METAAL BV) 14 October 1998 (1998-10-14) * column 2, line 43 - column 3, line 11; figure 1 *	1,2	
X	US 3 921 708 A (BRENNER LOTHAR P) 25 November 1975 (1975-11-25) * figure 1 *	1,2	
X	AT 368 271 B (AUSTRIA EMAIL AG) 27 September 1982 (1982-09-27) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F24D F28D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		29 October 2002	Coli, E
CATEGORY OF CITED DOCUMENTS			
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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 02 38 0124

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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29-10-2002

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 1103775	A	30-05-2001	NL	1013648 C1	28-05-2001
			DE	29922010 U1	23-03-2000
			EP	1103775 A2	30-05-2001
EP 0870993	A	14-10-1998	NL	1005786 C2	14-10-1998
			EP	0870993 A1	14-10-1998
			NL	1007416 C1	28-11-1997
US 3921708	A	25-11-1975	CH	563561 A5	30-06-1975
			DE	2410722 A1	07-11-1974
			ES	202186 Y	16-02-1976
			JP	50013956 A	13-02-1975
			NL	7405435 A	01-11-1974
			SE	414670 B	11-08-1980
AT 368271	B	27-09-1982	AT	588179 A	15-01-1982