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(11) **EP 1 336 812 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.08.2003 Bulletin 2003/34

(51) Int Cl.7: **F28F 27/02**

(21) Application number: **03000711.6**

(22) Date of filing: **13.01.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT SE SI SK TR**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **15.02.2002 IT PR20020002**

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(54) **Heat exchanger, in particular usable as a towel heater**

(57) Heat exchanger(1) in particular usable as a towel heater, comprising at least a bank (2, 3, 4, 5) of tubular bodies (6) connected to at least a delivery manifold (7) that feeds them with a heating fluid. The manifold (7) is provided in its interior with at least a diffuser conduit (8) to assure a substantially equal distribution of the heating fluid inside the tubular bodies (6). The diffuser conduit (8) has an outlet (9) originally inclined relative to a longitudinal axis of the diffuser conduit (8) itself.

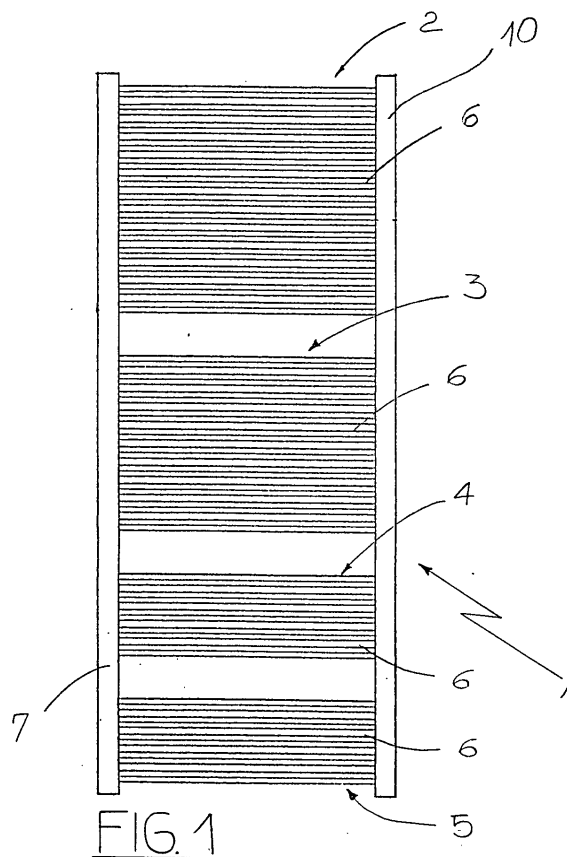


FIG. 1

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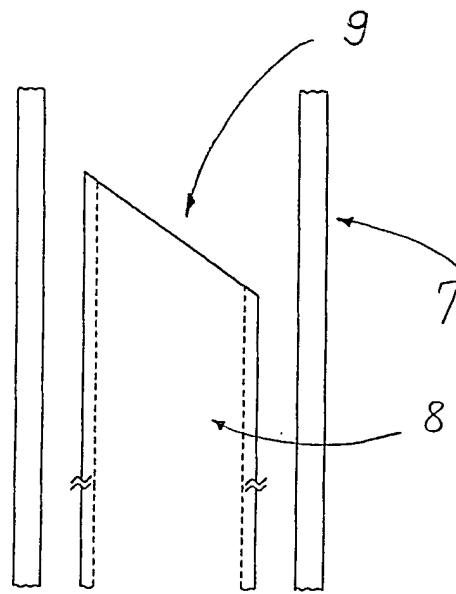


FIG. 2

Description

[0001] The present invention relates to a heat exchanger, in particular usable as a towel heater, comprising at least a bank of tubular bodies connected to a delivery manifold that feeds them with a heating fluid. The manifold is provided in its interior with a diffuser conduit, in order to assure a substantially equal distribution of the heating fluid inside the tubular bodies.

[0002] In the field of thermal and sanitary systems for home use, heat exchangers are known for heating the space and the laundry, constituted metal tubes traversed by a heating fluid, generally hot water.

[0003] The heat transported by the fluid is transferred to the metallic parts of the tubes and subsequently dispersed into the space and/or transferred to the laundry.

[0004] The quantity of the heat exchanged is a function of the temperature difference existing between the heating fluid and the environment, of the nature of the metal, of the motion of the fluid relative to the walls and of the geometry and dimensions of the exchanger.

[0005] The time necessary for the heat exchanger to reach the steady state temperature, as well as the energy efficiency of the exchanger itself, are an essential factor for users' comfort and a determining one for energy conservation.

[0006] Generally, energy efficiency and the speed in reaching the steady state temperature are very limited in the heat exchangers currently available on the market, due to the difficulty in causing a sufficiently turbulent motion of the heating fluid.

[0007] An aim of the present invention is to eliminate the aforesaid drawbacks making available a heat exchanger, in particular usable as a towel heater, with high energy efficiency and able rapidly to reach steady state temperature.

[0008] Another aim of the present invention is to propose a heat exchanger that is economical to produce and can constitute a furnishing element.

[0009] Said aims are fully achieved by the heat exchanger of the present invention, which is characterised by the content of the claims set out below and in particular in that the diffuser conduit has an outlet that is inclined relative to a longitudinal axis of the diffuser conduit itself.

[0010] This and other characteristics shall become more readily apparent from the following description of a preferred embodiment illustrated, purely by way of non limiting example, in the accompanying drawing table, in which:

- Figure 1 shows a global front view of a heat exchanger according to the invention;
- Figures 2 and 3 respectively show a lateral view and a plan view, with some parts removed the better to highlight others, of a detail of a delivery conduit with, in its interior, a diffuser conduit for the heat exchanger shown in Figure 1.

[0011] With reference to the figures, the heat exchanger is globally indicated with the reference number 1 and is preferably made of steel and/or of copper and/or of aluminium.

[0012] In the preferred embodiment, the exchanger 1 comprises four banks 2, 3, 4, 5 of tubular bodies 6 connected to a delivery manifold 7 that feeds them with a pressurised heating fluid, preferably hot water with a delivery pressure in the order to 10 bar. The manifold 7 is provided in its interior with a diffuser conduit 8, in order to assure a substantially equal distribution of the heating fluid within the tubular bodies 6 of the various banks.

[0013] The diffuser conduit 8 has an outflow mouth or outlet 9 originally inclined relative to a longitudinal axis of the diffuser conduit itself. In the illustrated example, the inclination of the outlet 9 is preferably between about 20° and 60° and the diffuser conduit 8 has a thickness preferably between 0.5±0.2 millimetres and 2.5±0.2 millimetres.

[0014] In the preferred embodiment, the diffuser conduit 8 has a substantially circular cross section and therefore the outlet 9, being inclined, assumes a substantially elliptical shape. The manifold 7, instead, has a preferably elliptical cross section.

[0015] The diffuser conduit 8 develops inside the manifold 7 for a sufficient length to assure the circulation of the hot water in all the tubular bodies 6 of each bank. The hot water flows in the diffuser 8 until arriving in correspondence with the outlet 9, wherefrom it exits and enters a terminal portion of the manifold 7, in such a way as to flow in the tubular bodies 6 more distant from the hot water inflow area. The presence of an inclined outlet 9 generates such a fluid dynamic field as to cause the motion of the fluid to transition from laminar to turbulent, thereby allowing a more effective heat exchange between the hot water and the walls of the tubular bodies 6.

[0016] In a second embodiment (not shown herein), the diffuser conduit 8 has a substantially rectangular cross section that maintains said shape, possibly only more elongated, also in correspondence with the outlet 9.

[0017] In a third embodiment (not shown) herein, the outlet 9, seen in a longitudinal plane parallel to the axis of the diffuser conduit 8, has a double inclination and is substantially shaped as an inverse V.

[0018] In a fourth embodiment (not shown), the outlet 9, seen in a longitudinal plane parallel to the axis of the conduit, is substantially W shaped.

[0019] In the preferred embodiment, the four banks 2, 3, 4, 5 are constituted respectively by thirteen, ten, five and five tubular bodies 6.

[0020] Lastly, the banks 2, 3, 4, 5 are connected to a second manifold 10 for the return of the heating fluid.

[0021] The invention achieves important advantages.

[0022] First of all, such a heat exchanger, thanks to the high degree of turbulence generated in the heating fluid by the inclined outlet, has a high energy efficiency and is able rapidly to reach the steady state tempera-

ture.

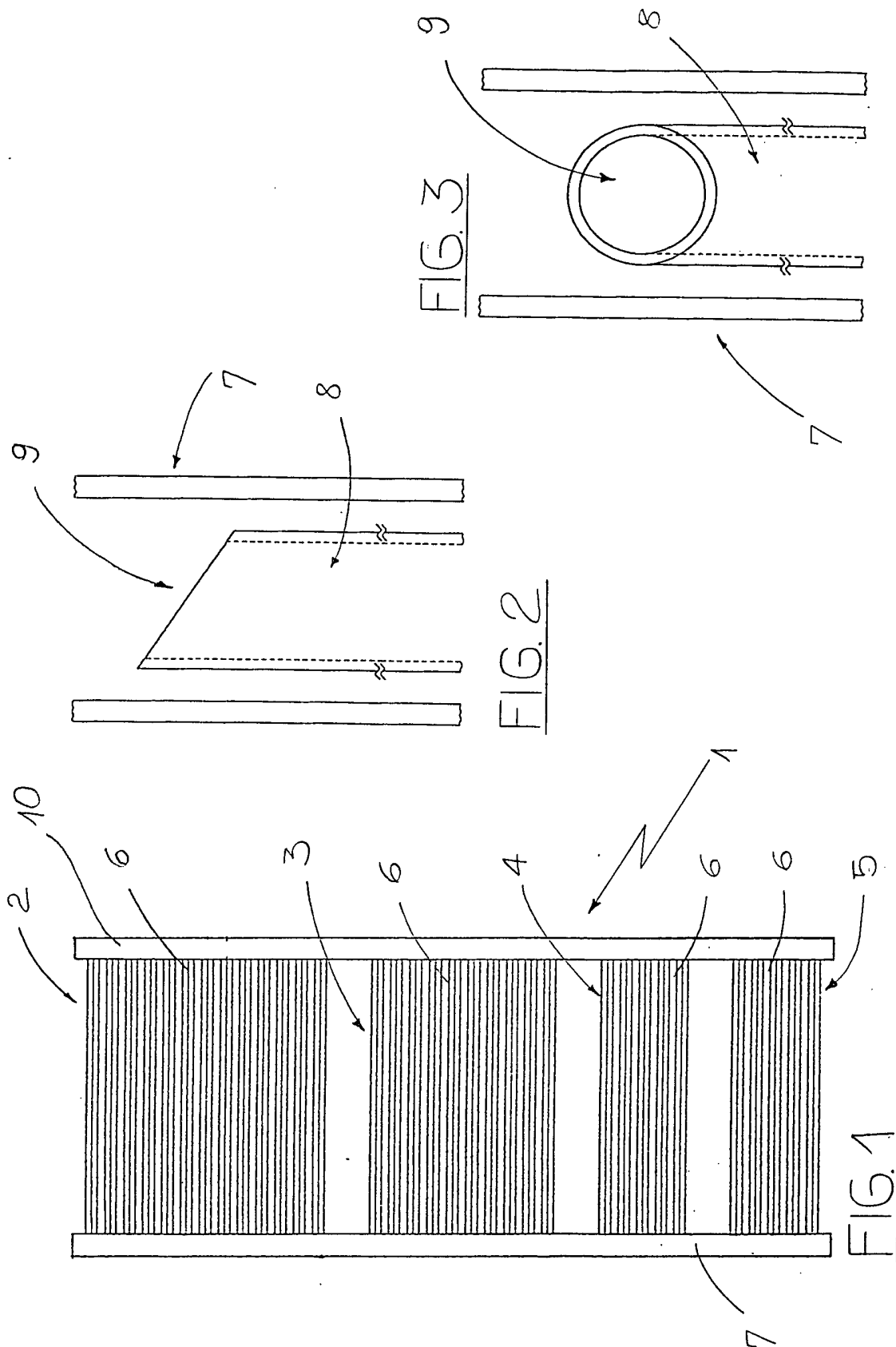
[0023] Advantageously, the heat exchanger of the invention is economical to produce and can constitute a furnishing element.

11. Towel heater, **characterised in that** it is obtained by means of a heat exchanger (1) as claimed in any of the previous claims.

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Claims

1. Heat exchanger(1) in particular usable as a towel heater, comprising at least a bank (2, 3, 4, 5) of tubular bodies (6) connected to at least a delivery manifold (7) that feeds them with a heating fluid, said manifold (7) being provided in its interior with at least a diffuser conduit (8) to assure a substantially equal distribution of the heating fluid inside the tubular bodies (6), **characterised in that** the diffuser conduit (8) has an outlet (9) inclined relative to a longitudinal axis of the diffuser conduit (8) itself. 10
2. Heat exchanger as claimed in claim 1, **characterised in that** the inclination of the outlet (9) is between about 20° and 60° relative to the longitudinal of the diffuser conduit (8). 15
3. Heat exchanger as claimed in claim 1, **characterised in that** the diffuser conduit (8) has a substantially circular cross section. 20
4. Heat exchanger as claimed in claim 3, **characterised in that** the outlet (9) is elliptical. 25
5. Heat exchanger as claimed in claim 1, **characterised in that** the diffuser conduit (8) has a substantially rectangular cross section. 30
6. Heat exchanger as claimed in claim 5, **characterised in that** the outlet (9) is rectangular. 35
7. Heat exchanger as claimed in claim 1, **characterised in that** the outlet (9) has a double inclination and, seen in a longitudinal plane parallel to the axis of the diffuser conduit (8), is substantially shaped as an inverse V. 40
8. Heat exchanger as claimed in claim 1, **characterised in that** the outlet (9), seen in a longitudinal plane parallel to the axis of the diffuser conduit (8), is substantially shaped as a "W". 45
9. Heat exchanger as claimed in claim 1, **characterised in that** it comprises four banks (2, 3, 4, 5) having respectively thirteen, ten, five and five tubular bodies (6) each. 50
10. Heat exchanger as claimed in claim 1, **characterised in that** the delivery manifold (7) has a substantially elliptical cross section. 55





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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 0711

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 16 May 2003	Examiner García Moncayo, O
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 1503.03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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