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(54) A gas-fired heating appliance.

(57) A gas-fired heating appliance comprising a furnace at least partly enclosed by heat exchangers finned at the furnace side and provided with a water space at the other side. The furnace bottom is bounded by one or more burners and its top is provided with an upper wall having a flue. In the furnace, parallel to the heat exchanger walls, there is arranged a radiant heating tube or radiant heating panels. The fins are tapered in such a manner that they are not only readily releasable from the mould during the manufacture of the heat exchangers, but likewise ensure proper transfer of radiant heat from the heating tube or panels to the fins and then to the water.

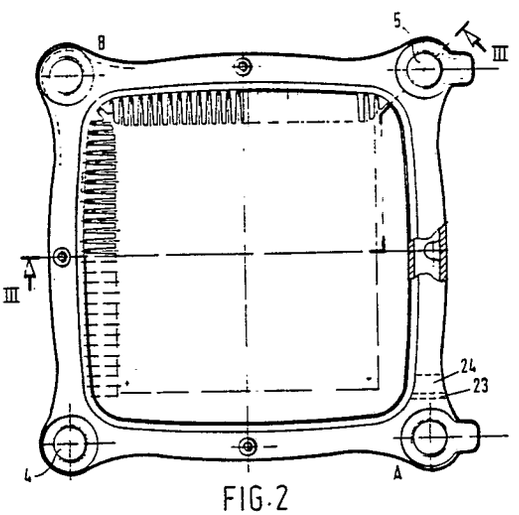

FIG.2

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A gas-fired heating appliance

This invention relates to a gas-fired heating appliance comprising a furnace at least partly enclosed by heat exchangers finned at the furnace side and provided with a water space at the other side, said furnace being bounded at the bottom by one or more burners, and provided at the top with an upper wall furnished with a flue, there being arranged in the furnace, parallel to the heat exchanger walls, a radiant tube or radiant panels consisting of high-grade, heat-resistant material.

It is an object of the present invention to improve such an apparatus, an example of which is disclosed in DE-A-3 546 368.

To that end, the heating appliance is characterized in that the fins taper in such a manner that these are not only readily releasable from the mould during the manufacture of the heat exchangers, but likewise, in operation, ensure effective transfer of radiant heat from the radiant heating tube or panels to the fins and then to the water.

For the sake of completeness, it is observed that German Gebrauchsmuster 85 11 562.2 discloses per se a heating appliance using tapered fins. However, further similarities with the invention are lacking.

In a further elaboration of the present invention, the fins have a thickness varying in the vertical direction to produce effective turbulence of flue gases along the fins and prevent laminar boundary layer flows, thereby effecting maximum heat transfer.

Besides, the cross-sectional shape of the radiant heating tube may be adapted to the inner circumferential shape of the tips of the fins in such a manner that the heating tube touches or substantially touches the tips of the fins, thus ensuring effective heat transfer, as well as a correct flow of gases through the flue.

For the purpose of improving heat transfer, there may be provided in the water space an interrupted, peripherally extending partition.

The effect of the partition can be improved still further by providing a baffle at least in the lower portion of the water space separated by the partition, near the supply inlet, in such a manner that the liquid supplied, in the present case water, is forced to flow in horizontal direction.

The provision of a partition and a transverse baffle results in such a forced-circulation pattern at the location of the largest temperature difference, that maximum heat transfer is ensured.

The partition may be arranged at such a height that, in operation, the water speed in the created space does not show boiling phenomena, so that a maximum temperature difference and hence maximum heat transfer efficiency are ensured.

One embodiment of a heating appliance according to the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic cross-sectional view of a heating appliance according to the invention;

Fig. 2 is a top plan view of the heat exchanger used in the appliance shown in Fig. 1;

Fig. 2a is a diagrammatic illustration of the flow pattern through the water space of the appliance; and

Fig. 3 is a cross-sectional view taken on the line III-III of Fig. 2.

The drawings show a heating appliance which comprises a heat exchanger 1 having fins 2 and a water space 3. Water space 3 has an inlet 4 and a diametrically opposite outlet 5. It is observed in this connection that all of the four corners of the heat exchanger have such openings, but only two thereof are used as an inlet or an outlet, as stated above. The other openings are either covered or used for fitting a temperature sensor or other required control or protection devices.

Arranged unterneath the heat exchanger are a burner 6, an injector 7, a manifold 8 and a gas supply duct 9. Injector 7 and burner 6 are disposed in a housing 10 whose inside is fitted with an insulating liner 11. The bottom of housing 10 is open for the supply of air.

The top of heat exchanger 1 is shut off by a collecting hood 12, having an opening above which there is arranged a blower 13 whose outlet is connected to an exhaust tube or flue 14 for combustion gases. The assembly is accommodated in a casing or housing box 15 having at its top an air supply opening 16. As shown in Fig. 1, there is arranged, inwardly of fins 2, a radiant heating tube 17, which ensures that the fins, in operation, maintain such a high temperature that, in spite of the low temperature of the water supplied, no condensation will occur on the heat exchanger surfaces and the fins, thus preventing corrosion and preserving proper heat transfer.

To ensure an effective sealing between collecting hood 2 and heat exchanger 1, there is provided a resilient, heat resistant sealing ring 21 between them. Such a seal can also be provided between housing 10 and heat exchanger 1. Said collecting hood can be secured to the furnace in a simple manner by means of some bolts (these bolts are omitted in the drawings for the sake of clearness).

As shown in Figs. 2 and 3 (essentially only showing the heat exchanger) fins 2 are all of ta-

pered configuration, so that a ready-release construction is produced. Moreover, such a construction makes for proper heat transfer from the heating sleeve to the fins.

As best seen in the cross-sectional view of Fig. 3, the fins are sinuous in the vertical direction. Moreover, the fins are thicker at the bend portions 18 than at the portions 19 connecting the bends. These last features ensure that no boundary layer can be formed that has an insulating effect. Instead, strong turbulence will occur, thereby producing effective heat transfer.

As further shown in Figs. 2, 2a and 3, the water space is divided into various compartments by baffles. In the first place, a substantially horizontal partition 22 is provided, so that the liquid flowing in through inlet A is forced to flow substantially horizontally. Next to inlet A, there is arranged a baffle 23 in the water space, so that the liquid inflow is only unidirectional.

Near the baffle 23, but on the other side with respect to inlet A, partition 22 has a passageway 24 through which the inflowing liquid can flow along two paths to, and through, the upper compartment to an outlet B.

Fig. 2a shows the flow path of the liquid in solid lines with the direction of flow being indicated by arrows. The walls are indicated in dashed lines.

Claims

1. A gas-fired heating appliance comprising a furnace at least partly enclosed by heat exchangers finned at the furnace side and provided with a water space at the other side, the furnace being bounded at the bottom by one or more burners and at its top being provided with an upper wall furnished with a flue, there being arranged in the furnace, parallel to the heat exchanger walls, a radiant tube or radiant heating panels made from high-grade, heat-resistant material, characterized in that the fins are tapered in such a manner that they are not only readily releasable from the mould during the manufacture of the heat exchangers, but likewise, in operation, ensure proper transfer of radiant heat from the radiant heating tube or panels to the fins and then to the water.

2. A heating appliance as claimed in claim 1, characterized in that the cross-sectional shape of the radiant heating tube is adapted to the inner circumferential shape of the tips of the fins in such a manner that the heating tube touches or substantially touches the tips of the fins.

3. A heating appliance as claimed in claim 1 or 2, characterized in that the fins vary in thickness in the vertical direction.

4. A gas-fired heating appliance as claimed in any one of the preceding claims, characterized in that an interrupted, perhipherally extending partition is provided in the water space.

5. A gas-fired heating appliance as claimed in claim 4, characterized in that at least in the lower portion of the water space separated by the partition, there is provided a baffle near the inlet in such a manner that the water supplied is forced to flow in the horizontal direction.

6. A gas-fired heating appliance as claimed in claim 4 or 5, characterized in that the partition is disposed at such a height that, in operation, the water speed in the space formed does not show boiling phenomena.

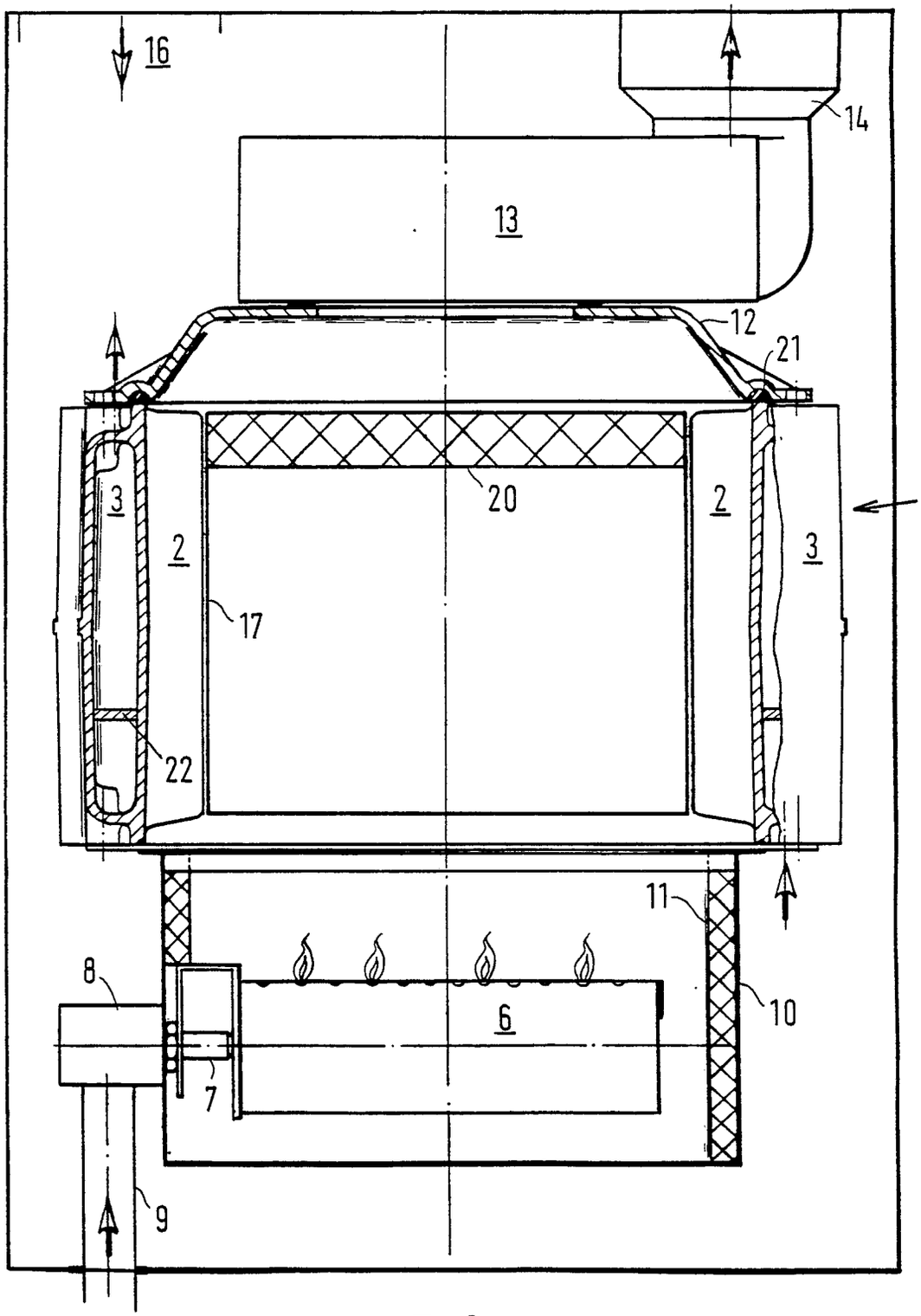

FIG.1

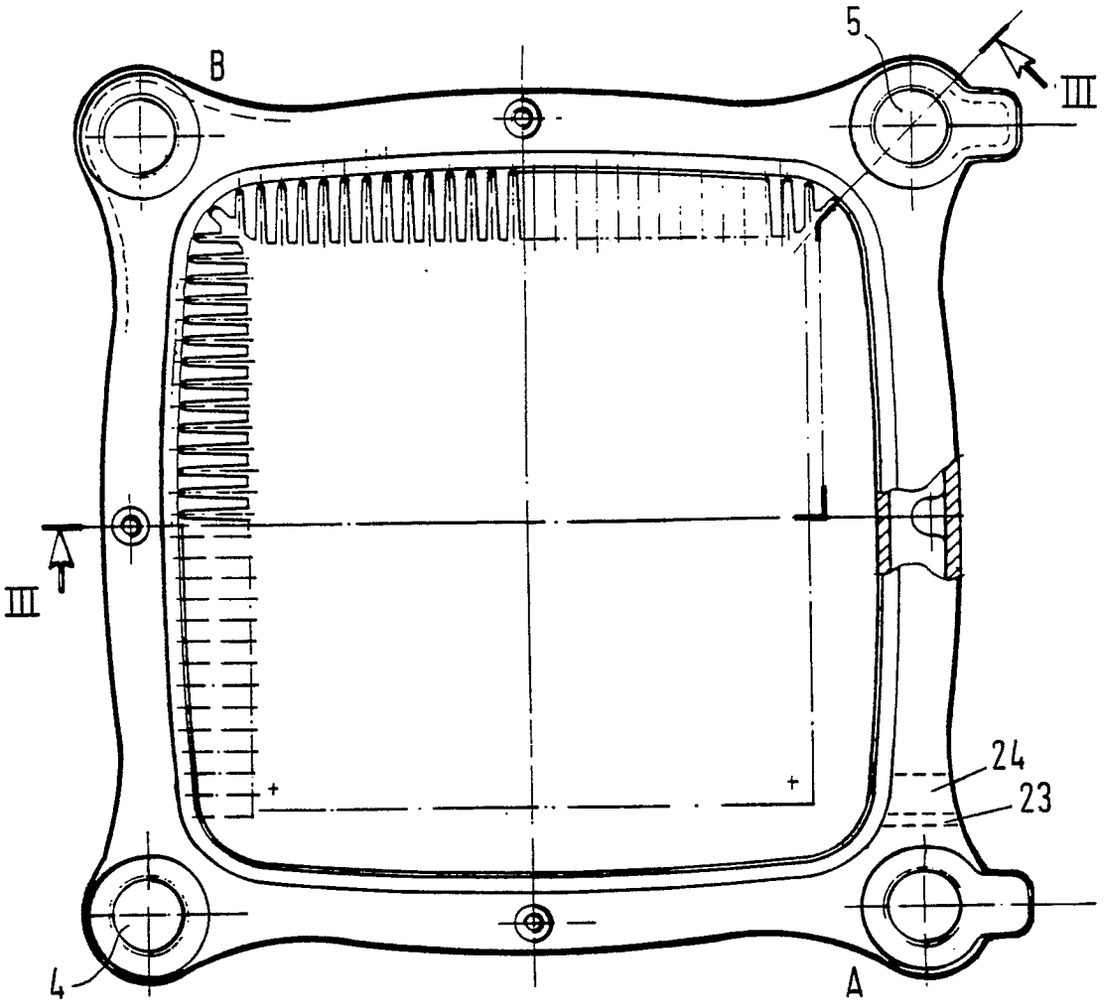

FIG.2

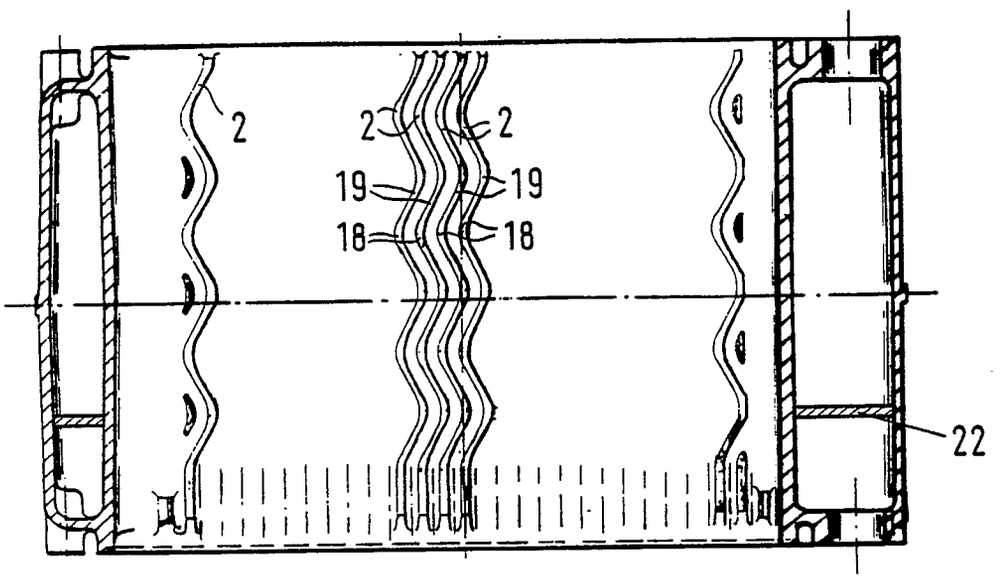

FIG.3

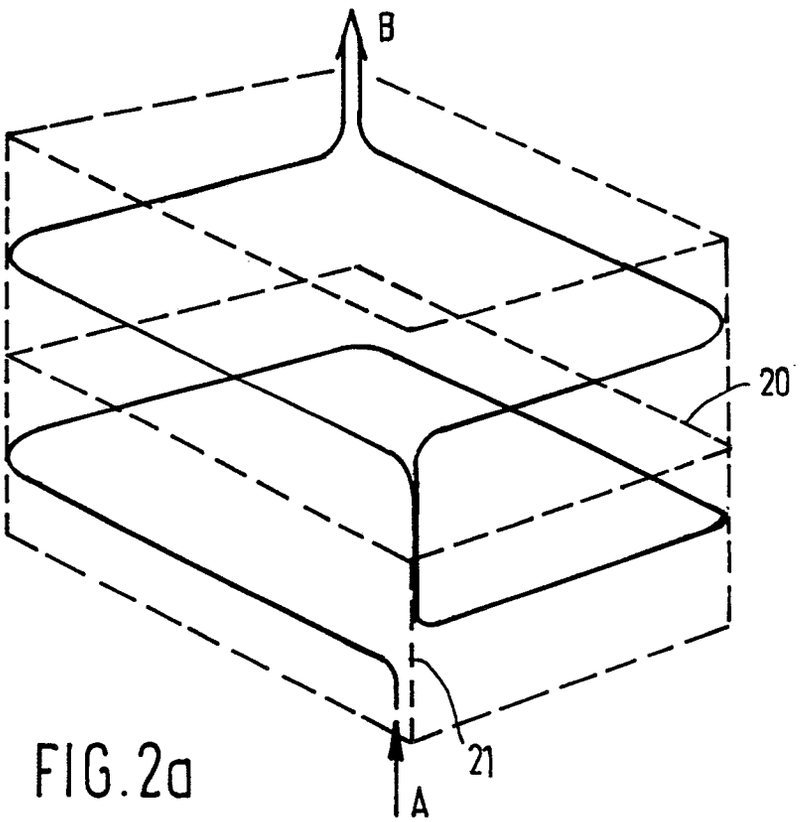

FIG.2a

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 20 0666

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.4)
Y	US-A-4 169 431 (VIESSMANN) * Column 2, lines 20-46; figures *	1,2	F 24 H 1/26 F 24 H 9/00
Y	DE-A-2 920 057 (HEIM) * Pages 1,2, claims; figures *	1,2	
P,Y	DE-A-3 640 503 (SALZMANN) * Column 1, lines 1-18; figure *	1,2	
A	EP-A-0 046 607 (AWB) * Page 6, lines 16-29; figure 1 *	4	
A	DE-A-3 010 078 (MITTMANN) * Page 6, paragraph 3; figure 1 *	4,5	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

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	22-06-1989	VANHEUSDEN J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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