(19) Europäisches Patentamt
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(11) **EP 2 123 991 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.11.2009 Bulletin 2009/48

(51) Int Cl.:
F24H 1/32 *(2006.01)*

(21) Application number: **08009326.3**

(22) Date of filing: **20.05.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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(54) **Fired heat exchanger**

(57) The fired heat exchanger is characterised by the fact that it contains a modular block constituting a set of inseparably interconnected panel plates (1) with a combustion chamber located in its upper internal part (2) ensuring full integration of the combustion chamber (2) with the working heat exchange surface located in the lower part of the panel plates (1). This surface is created by the lower lateral surfaces of the panel plates (1) together with chattered lamella bands mounted on them (3). They expand the working heat exchange surface and the gasses created in the combustion chamber (2) flow around this surface. The circulation of the liquid heated medium in the unit of interconnected panel plates (1) has a medium flow velocity within the range 0.5 - 2 m/s and is of a two-stage type. During the first stage, the main process of heat exchange on the working surface takes place. During the second stage, the combustion chamber (2) is cooled by the water jacket constituting the upper part of the panel plates (1).

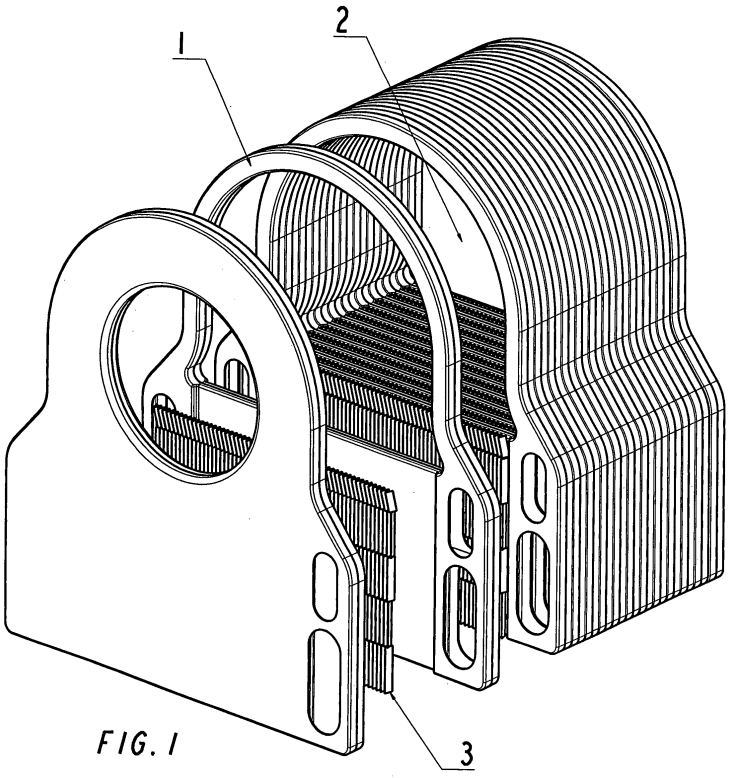

FIG. 1

EP 2 123 991 A1

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Description

[0001] The invention described here is a fired heat exchanger designed to be best used in boilers and preheaters.

[0002] Taking into account the current state of technology, there are well-known and widely utilised fired heat exchanger solutions where the combustion chambers and working surfaces for heat exchange consist of multiple elements, which makes their structure more complicated, rendering their construction and installation difficult. This solution results in a lower heat exchange surface to weight ratio and larger overall dimensions while maintaining the same heat exchanger rate.

[0003] An example of such a solution is a heat exchanger manufactured by the German Viessman company. Its structure features a cylindrical casing combustion chamber to which specially chattered plates have been welded. These plates constitute the working heat exchange surface creating reciprocally parallel layers separated from each other. The media taking part in the heat exchange process flow around the layers in a countercurrent direction.

[0004] Another disadvantage of this current solution is the necessity to weld the plates to the combustion chamber in order to ensure their full integration. Moreover, the whole structure must also be housed in a specially designed casing in order to ensure sealing and properly directed flow of the medium among the plates.

[0005] The invention for a fired heat exchanger described here contains a modular block constituting a set of inseparably interconnected panel plates with a combustion chamber located in its upper internal part. This layout ensures full integration of the combustion chamber with the working heat exchange surface located in the lower part of the panel plates. The working heat exchange surface is created by the lower lateral sides of the panel plates and the chattered lamella bands mounted on them. The bands expand the working heat exchange surface and the gasses created in the combustion chamber flow around this surface. The circulation of the liquid heated medium in the unit of interconnected panel plates has a flow velocity of the medium within the range of 0.5 - 2 m/s and is of a two-stage type. During the first stage, the main process of heat exchange on the working surface takes place. During the second stage, the combustion chamber is cooled by the water jacket, constituting the upper part of panel plates.

[0006] According to the invention, the structure of the fired heat exchanger ensures full integration of the combustion chamber with the working heat exchange surface, which provides effective cooling for the combustion chamber and a simple compact build obviating the need for additional closing elements. High thermal efficiency has been achieved by means of specially shaped chattered lamella bands filling the space between panel plates expanding the working heat exchange surface, which provides the possibility for combustion product condensation and turbulence. The vital advantage of this solution is the high heat exchange surface to weight ratio.

[0007] This new invention facilitates power scaling by adding or removing additional panel plates and utilising a condensation technique enabling the unit to use less fuel and emit smaller amounts of detrimental compounds to the air. Thanks to this, the device is ecologically efficient. Another important advantage of this solution is the simplified production technology with the possibility of using full automation.

[0008] The invention is shown pictorially, where fig. 1 shows the perspective view of the fired heat exchanger with a partial pre-installation setting-up of the heat exchanger part, while Fig. 2 shows the perspective view of the heat exchanger elements set which, having been connected, create a lamella plate together with a chattered lamella band mounted on the lateral surface. Fig. 3 shows the axonometric view of the lamella plate together with the chattered lamella band.

[0009] The invented fired heat exchanger described in this document contains a modular block constituting a set of inseparably interconnected panel plates (1) with a combustion chamber water jacket located in its upper part (2) and the working heat exchange surface in the lower part. These surfaces create the lower lateral surfaces of the panel plates (1) together with the chattered lamella bands mounted on them (3). They expand the working heat exchange surface and the gasses created in the combustion chamber flow around this surface. The circulation of the liquid heated medium in the unit of interconnected panel plates has s flow velocity with a medium within the range 0.5 - 2 m/s. It is a two-stage type: during the first stage, the main process of heat exchange on the working surface takes place, while during the second stage, the combustion chamber (2) is cooled by the water jacket constituting the upper part of the panel plates (1).

Claims

1. The fired heat exchanger is **characterised by** the fact that it contains a modular block constituting a set of inseparably interconnected panel plates (1) with a combustion chamber located in its upper internal part (2) ensuring full integration of the combustion chamber (2) with the working heat exchange surface located in the lower part of the panel plates (1). This surface is created by the lower lateral surfaces of the panel plates (1) together with chattered lamella bands mounted on them (3). They expand the working heat exchange surface and the gasses created in the combustion chamber (2) flow around this surface. The circulation of the liquid heated medium in the unit of interconnected panel plates (1) has a medium flow velocity within the range 0.5 - 2 m/s and is of a two-stage type. During the first stage, the main process of heat exchange on the working

surface takes place. During the second stage, the combustion chamber (2) is cooled by the water jacket constituting the upper part of the panel plates (1).

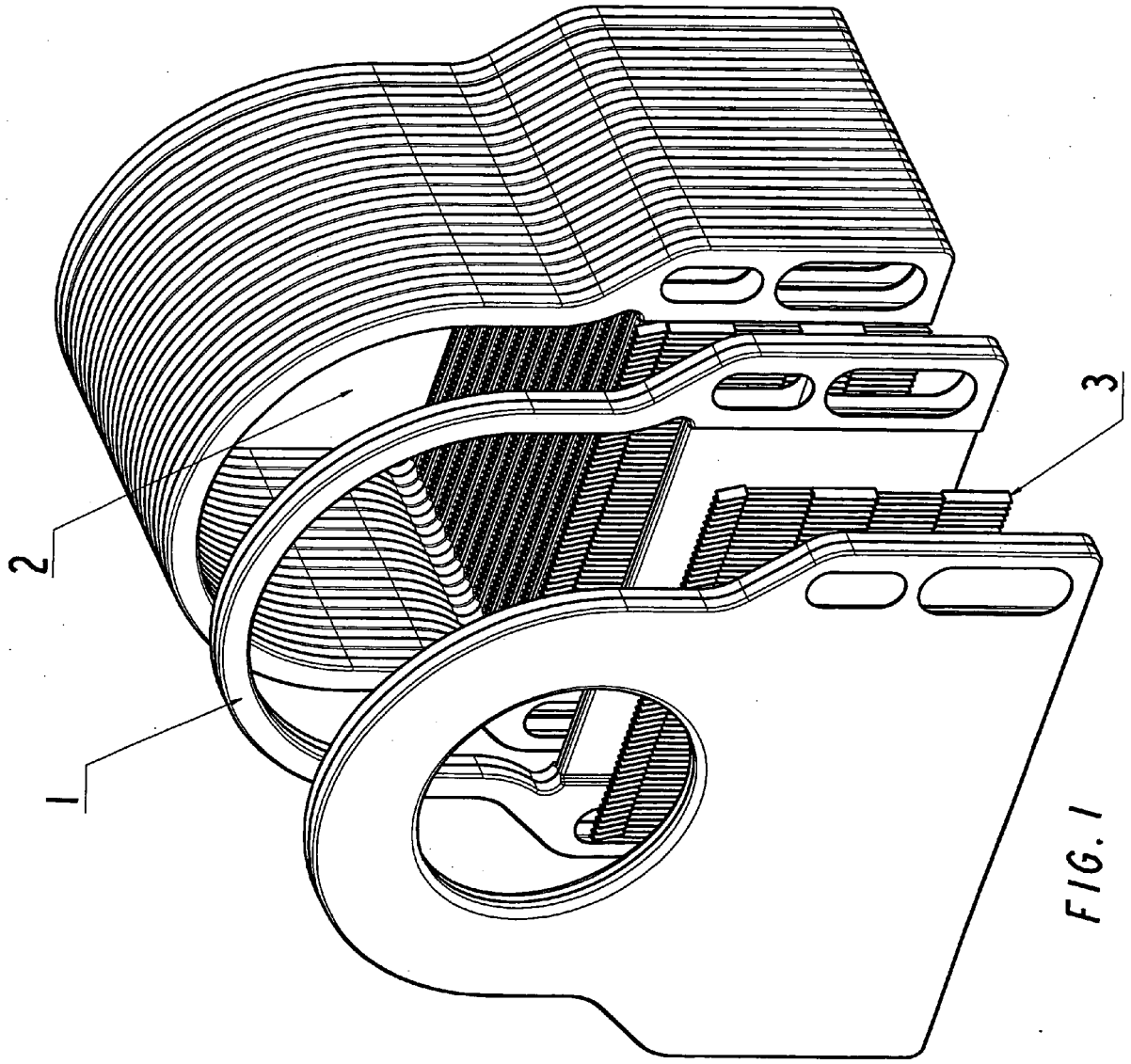

FIG. 1

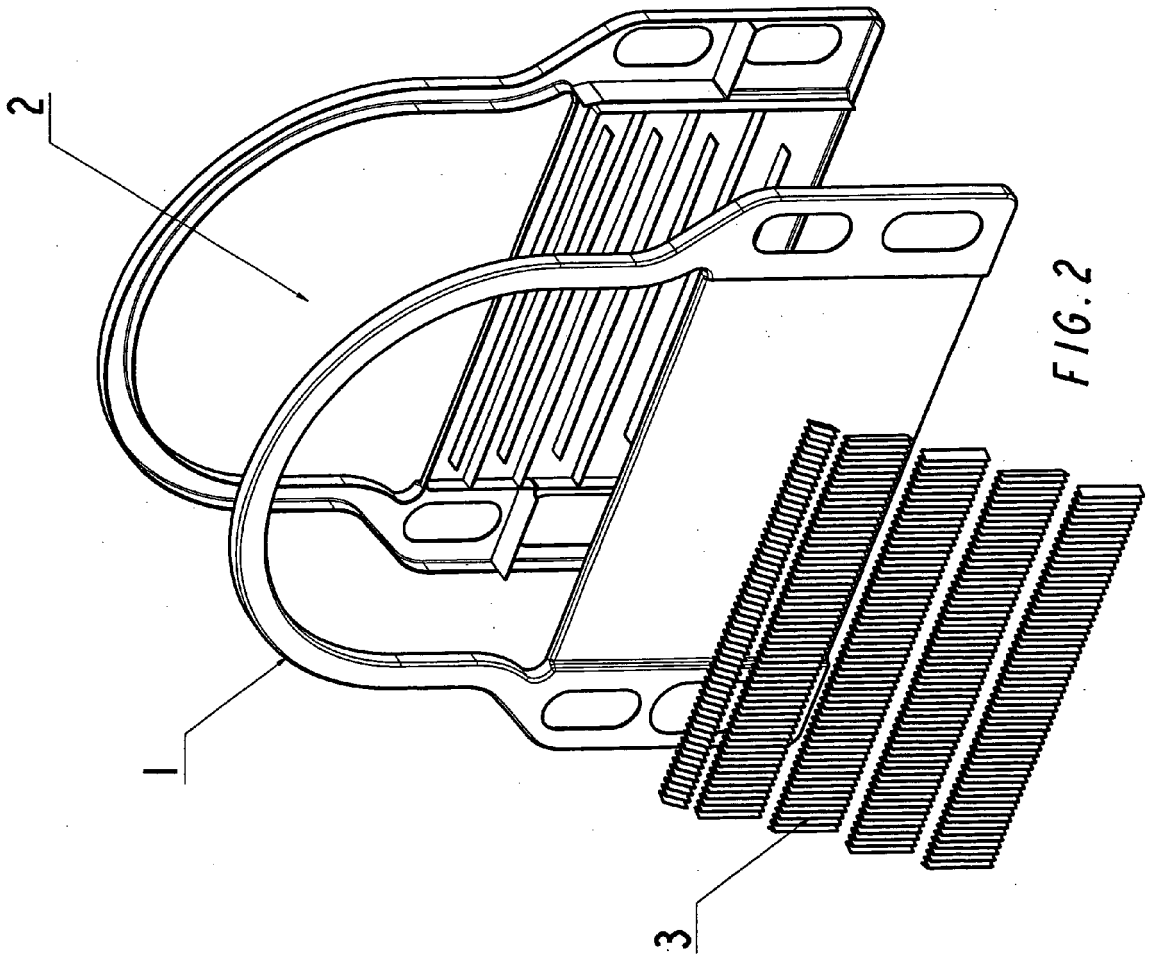

FIG.2

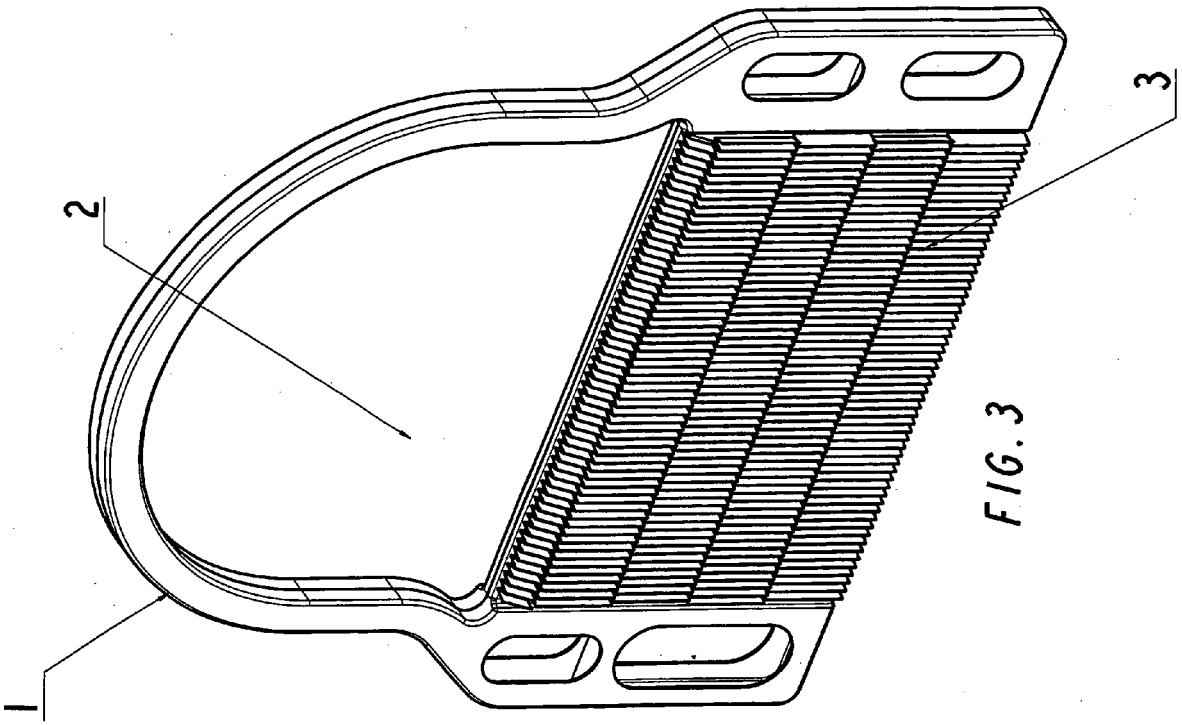

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 08 00 9326

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 184 628 A (BOSCH GMBH ROBERT [DE]) 6 March 2002 (2002-03-06) * figures *	1	INV. F24H1/32
X	NL 8 802 695 A (RENDAMAX BV) 1 June 1990 (1990-06-01) * figure 1 *	1	
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TECHNICAL FIELDS SEARCHED (IPC)

F24H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	2 June 2009	van Gestel, Harrie

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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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 00 9326

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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02-06-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82