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## (54) Heat exchangers.

(57) A cast heat exchanger 1 is provided having a plurality of flueways 4 through it for the passage of hot combustion products, the flueways 4 being provided with overlapping fins 5 along their length which greatly increase the efficiency of the heat exchanger 1.

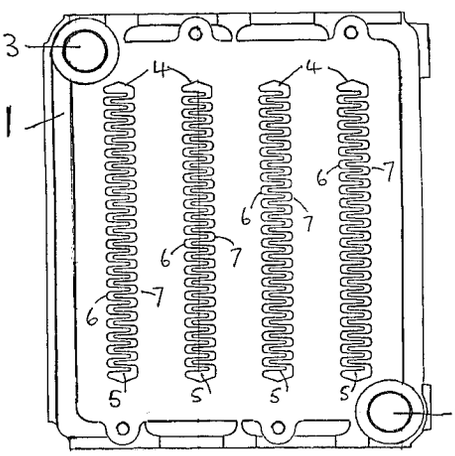


FIG.2

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This invention relates to heat exchangers and more particularly to cast heat exchangers. The invention is especially applicable to such heat exchangers for use in gas or oil burning water heating/central heating appliances.

Typically the hot combustion flue products from a gas or oil burner are passed over flue surfaces of a heat exchanger in which a fluid e.g. water is circulated. Heat is absorbed into the fluid contained in the heat exchanger by radiation, convection and conduction. In order to ensure that heat transfer takes place as efficiently as possible it is common to increase the surface area of the flueway by adding fins or pips which extend into the flueway. In a typical heat exchanger it is usual to provide a flueway of long/narrow rectangular cross-section with a plurality of adjacent fins extending inwards into the flueway from the opposed major surfaces thereof, the oppositely directed fins being staggered relative to one another. In cast heat exchangers due to the constraints of the casting process, and the necessity to provide a core, which is typically sand-based, which corresponds to the finned flueway, it has been the usual practice to provide a gap between the tips of the opposed fins. It has been appreciated that for maximum efficiency it is necessary to ensure that the flue products are in the closest possible contact with the heat exchanger surface and in existing cast iron/cast aluminium heat exchangers this is normally achieved by inserting baffles in or over the flueways.

It is an object of the present invention to provide a cast heat exchanger which has an improved performance over conventional cast heat exchangers and which may or may not be fitted with baffles.

According to the present invention there is provided a cast heat exchanger of monobloc construction comprising a body having at least one flueway through it, a plurality of heat exchange fins extending into and along said flueway from opposed walls of said flueway, the heat exchange fins from one of the opposed walls intermeshing with the heat exchange fins from the other of the opposed walls, whereby they overlap over part of the length which they extend into said flueway.

In carrying out the invention it may be arranged that the heat exchange fins from the opposed walls overlap over the major part of their length.

It may be arranged that the spacing between one of the opposed walls and the fins extending therefrom, and the other of the opposed walls and the fins extending therefrom is substantially constant.

An exemplary embodiment of the invention will now be described reference being made to the accompanying drawings, in which:

Fig. 1 is a plan view of a prior art form of cast heat exchanger; and

Fig. 2 is a plan view of a cast heat exchanger in accordance with the present invention.

In Fig. 1 of the drawings there is depicted a plan view of a prior art form of cast heat exchanger 1 of single-piece i.e. monobloc construction, which is typically of cast iron or cast aluminium, which is of generally hollow construction and has input and output ports 2 and 3 respectively for circulating a fluid e.g. water through it in order for the fluid to be heated, and which is provided with three flueways 4 each having a long/narrow rectangular cross-section, and each of which is provided with a plurality of adjacent heat exchange fins 5 which extend along the length of the flueways 4 and which extend inwards into the flueways from the major sides 6,7 thereof. The fins 5 extending from side 6 of each flueway 4 are staggered relative to the fins 5 extending from the opposed side 7, and a gap 8 is provided between the tips of the opposed rows of fins 5 in order that the core which is typically sand-based, used to form the finned flueways 4 during the casting process can be made robust enough to withstand the pressures placed upon it.

As will be appreciated from the flueways 4 of the cast heat exchanger 1 of Fig. 1, the spaces between the fins 5, especially at the tips thereof, are relatively large and it has been found necessary, in order to increase the efficiency of the heat exchanger 1, to provide a baffle in the form of a metal strip which extends across the top of the flueways 4 adjacent the tips of the fins 5, or alternatively in the form of metal rods which extend upwards through the flueways 4 adjacent the tip of each of the fins 5, as indicated at 9.

These baffles have the effect of ensuring that flue gases passing through the flueways 4 are in the closest possible contact with the heat exchanger surface and thereby increase its efficiency.

The provision of such baffles, however, is not conducive to providing a heat exchanger of minimum cost and weight, and they are themselves wasteful of energy since they are heated by the flue gases but play very little part in heating the liquid being circulated through the heat exchanger.

In Fig. 2 of the drawings there is depicted a cast heat exchanger of single-piece i.e. monobloc construction in accordance with the present invention which is of similar general construction to that of Fig. 1, but in which the input and output ports 2 and 3 are disposed in opposed corners of the heat exchanger 1, in which the flueways 4 are of generally narrower width such that four flueways 4 are provided in Fig. 2 rather than three as in Fig. 1 and in which, most importantly, the heat exchange fins 5 which extend into the flueways 4 from the opposed major surfaces 6 and 7 thereof are intermeshed and adjacent fins 5 overlap one another over the major part of their length which extends into the flueways 4 from the major surfaces 6 and 7. As can be appreciated from the heat exchanger 1 of Fig. 2, the spaces between the fins 5 of the flueways 4 are relatively small thus ensuring that the flue gases passing through them are in very close

contact with the heat exchanger surfaces thereby greatly increasing the efficiency of the heat exchanger. It is envisaged that ideally the gap constituting the actual flueway 4 in Fig. 2 will be substantially constant over its entire length.

In practice it has been found that the heat exchanger 1 of Fig. 2 can be constructed having a height which is about half that of the heat exchanger 1 of Fig. 1 and so has about half the weight and material content of the heat exchanger 1 of Fig. 1 and yet, because of the configuration of the flueways 4 and the fact that four flueways instead of three are provided, has a performance which exceeds that of the heat exchanger of Fig. 1.

The construction of the cast heat exchanger 1 described with reference to Fig. 2 has been made possible by carefully refining the casting process and by the judicious selection of the materials and techniques used therein, for example, in forming the sand-based cores for forming the flueways 4.

The heat exchanger 1 described with reference to Fig. 2 may find general application but is especially suitable for use in gas or oil burning water heating/central heating appliances, and such appliances may be of natural or forced draught operation, and may be gravity fed or pump fed. Although such heat exchangers 1 are generally made of cast iron or cast aluminium, it is envisaged that the heat exchanger 1 of Fig. 2 may be made of any suitable material.

## Claims

1. A cast heat exchanger of monobloc construction comprising a body having at least one flueway through it, a plurality of heat exchange fins extending into and along said flueway from opposed walls of said flueway, the heat exchange fins from one of the opposed walls intermeshing with the heat exchange fins from the other of the opposed walls, whereby they overlap over part of the length which they extend into said flueway.

2. A heat exchanger as claimed in claim 1, in which the heat exchange fins from the opposed walls overlap over the major part of their length.

3. A heat exchanger as claimed in claim 2, in which the spacing between one of the opposed walls and the fins extending therefrom, and the other of the opposed walls and the fins extending therefrom is substantially constant.

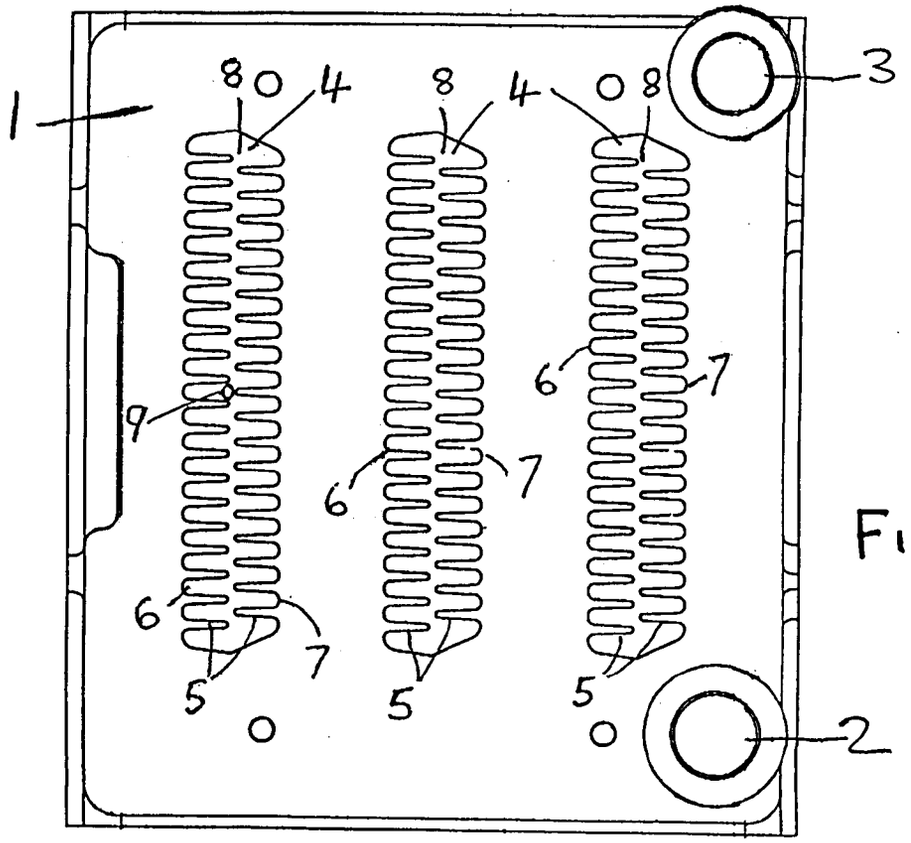


FIG. 1

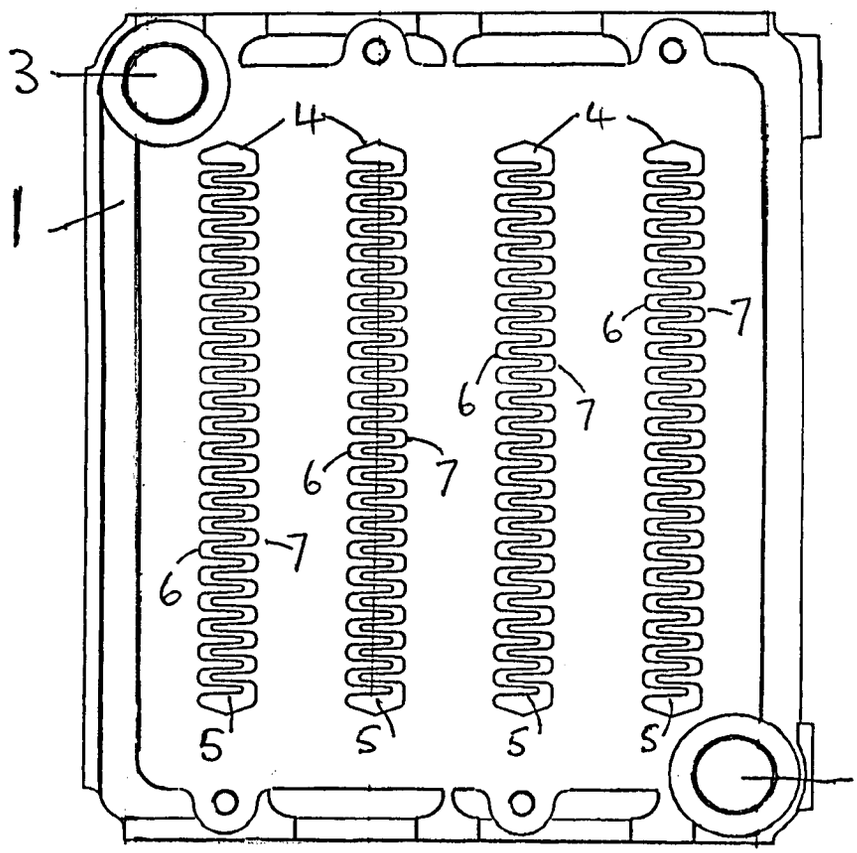


FIG. 2

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 92 30 3104

## 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) |
|---|---|---|---|
| X | DE-U-8 904 487 (BUDERUS HEIZTECHNIK GMBH)<br>* figures *<br>----- | 1,2 | F24H1/32 |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F24H
F28D

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 03 JULY 1992 | VAN GESTEL H.M. |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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