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(71) Applicant and

(72) Inventor: **RIGAMONTI, Angelo** [IT/IT]; Via Puccini, 6,
I-20060 Pessano Con Bornago (MI) (IT).

(74) Agent: **MITTLER, Enrico**; MITTLER & C. s.r.l., Viale
Lombardia, 20, I-20131 Milano (IT).

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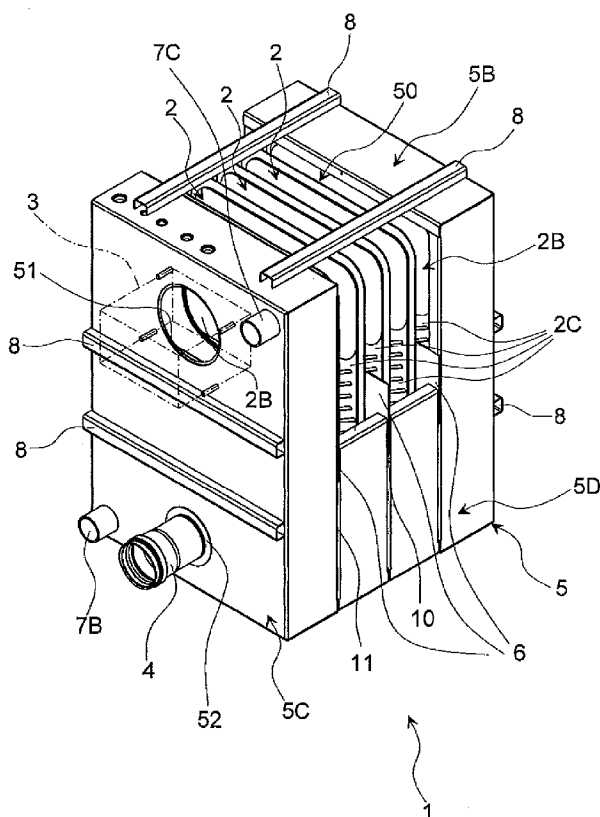


Fig.1

(57) Abstract: There is described a boiler (1) including a burner (3), a heat exchanger (50) adapted to raise the temperature of a working fluid through heat exchange with an exchange fluid, including a plurality of heat exchanger modules (2) placed side by side in order to define a combustion chamber within which the burner (3) for the generation of exchange fluid is inserted, exchange walls (2C) for the passage of exchange fluid, an expulsion chamber (2D) for the exchange fluid fitted with a discharge flue (4) and a substantially parallelepiped casing (5) adapted to be filled with working fluid. The boiler includes side walls (5D) inter-connected by stay-plates (6) placed between the heat exchanger modules (2) and top and bottom walls (5B) and end walls (5C) fitted with reinforcing elements (8) which prevent their deformation due to the pressure of working fluid.

“Boiler with variously-shaped heat exchange elements”

* * *

DESCRIPTION

5 The present invention relates to a boiler with variously-shaped heat exchange elements.

A heat exchanger is a device for changing the temperature of a fluid (“working fluid”) by forcing a heat exchange with another fluid (“exchange fluid”) a large amount of which is available at a temperature sufficient to bring the working fluid to the required temperature. When the heat exchange
10 is over, the working fluid reaches the required temperature, whereas the exchange fluid, which is spent and can no longer sustain the heat exchange, is expelled.

A boiler comprises a heat exchanger fitted with a burner that can generate the exchange fluid (combustion fumes and hot air) within a combustion chamber, in order to heat water or air (the working fluid) within
15 the boiler casing or body.

International Patent Application no. PCT/EP2006/067252 discloses a modular heat exchanger, consisting of exchanger modules, each of which includes:

- 20
- a combustion chamber for the generation of an exchange fluid;
 - an exchange wall for the passage of the exchange fluid;
 - an exchange fluid ejection chamber fitted with a discharge flue.

Each of these exchanger modules is formed by a pair of basic elements, which are reciprocally connected in a facing position so as to form
25 a single block.

Once this heat exchanger is fitted inside a casing to form a boiler, it may happen that the internal pressure is such as to cause the deformation of the internal walls of the casing.

The object of the present invention is to obtain a boiler that can
30 withstand higher pressures than a traditional heat exchanger.

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According to the invention, such an object is achieved by a boiler including a burner, a heat exchanger adapted to raise the temperature of a working fluid through heat exchange with an exchange fluid, including a plurality of heat exchanger modules placed side by side in order to define a combustion chamber within which said burner for the generation of said exchange fluid is inserted, exchange walls for the passage of said exchange fluid, an ejection chamber for said exchange fluid fitted with a discharge flue, and a substantially parallelepiped casing adapted to be filled with working fluid, characterised in that said casing has side walls interconnected by stay-plates placed between said heat exchanger modules, and top and bottom walls and end walls fitted with reinforcing elements to prevent their deformation due to the pressure of said working fluid.

The heat exchanger could be of the same type described in Patent Application PCT/EP2006/067252. The reinforcing elements may be rods applied externally to the walls of the casing. The stay-plates connecting the side walls of the casing may have an area considerably smaller than that of the casing walls, so as not to block the passage of working fluid inside the casing.

These and other features of the present invention will become more apparent from the following detailed description of an embodiment thereof, which is disclosed by no way of limitation in the accompanying drawings, in which:

figure 1 shows a perspective view of a boiler according to the invention;

figure 2 shows a plan view of the boiler in figure 1;

figure 3 shows a side view of the boiler in figure 1;

figure 4 shows a section view along line IV-IV of figure 2;

figure 5 shows a section view along line V-V of figure 3;

figure 6 shows a simplified side view only of the heat exchanger;

figure 7 shows a front view only of the heat exchanger;

figure 8 shows a section view along line VIII-VIII in figure 6.

A boiler 1 according to the present invention is shown in figures 1-5. It can raise the temperature of water or another working fluid through heat exchange with hot air and fumes, which constitute the exchange fluid.

5 The boiler 1 includes a heat exchanger 50 formed by eight exchanger modules 2 adapted to form a combustion chamber 2B, slotted exchange walls 2C and an ejection chamber 2D. A burner 3, shown diagrammatically in figures 1-5, is applied to the combustion chamber 2B at the inlet 51 of the first of the eight heat exchangers 2, while a discharge flue 4 is connected to
10 the outlet 52 of the ejection chamber 2D. The exchange fluid, generated inside the combustion chamber 2B, passes through the exchange walls 2C and then to the expulsion chamber 2D and the discharge flue 4.

 In order to be supported, the modules are built in a substantially parallelepipedal air-tight casing 5, shown in figures 1-5. Such a casing 5 is
15 formed by the following walls:

- a top and bottom wall 5B, parallel to the flow of exchange fluid inside the discharge flue 4;
- two end walls 5C (one at the front and one at the rear), parallel to the exchange walls 2C;
- 20 - two side walls 5D, at right angles to the exchange walls 2C.

 The casing 5 contains the working fluid that exchanges heat with the exchange fluid through the exchange walls 2C. Such a working fluid is introduced through a conduit 7B and is ejected through another conduit 7C; both conduits 7B and 7C are incorporated into the front wall 5C, which also
25 includes the inlet 51, the support means for burner 3 and the outlet 52 leading to the discharge flue 4.

 Three stay-plates or panels 6 structurally connect the side walls 5D, and are positioned so as to be parallel to the exchange walls 2C and the front walls 5C; such panels 6 have welded ends 10, so that they can be securely
30 inserted within cavities 11 between the side walls 5D (in other embodiments,

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other means of attachment may be used, provided that they are adapted to integrally join the panels 6 to the side walls). In the present embodiment, such cavities 11 appear as slots in the metal sheet that forms the side walls 5D.

5 The size of panel 6 is such that its height is considerably shorter than the height of the exchange walls 2C, so as not to block the passage of working fluid.

 The action of the panels 6 is to reciprocally hold the two side walls 5D in place, preventing them from deforming, even when the pressure of the
10 exchange fluid increases to 4.5 bar.

 The reinforcement rods 8 are applied to the front and rear walls 5C and to the top and bottom walls 5B, which structurally reinforce the casing 5, preventing the walls from deforming under high pressures.

CLAIMS

1. A boiler (1) including a burner (3), a heat exchanger (50) adapted to raise the temperature of a working fluid through heat exchange with an exchange fluid, including a plurality of heat exchanger modules (2) placed
5 side by side to define a combustion chamber, within which said burner (3) for the generation of said exchange fluid is inserted, exchange walls (2C) for the passage of said exchange fluid, an ejection chamber (2D) for said exchange fluid fitted with a discharge flue (4) and a substantially parallelepipedal casing (5) adapted be filled with working fluid,
10 characterised in that said casing (5) has side walls (5D) inter-connected by stay-plates (6) placed between said heat exchanger modules (2), and top and bottom walls (5B) and end walls (5C) fitted with reinforcing elements (8) adapted to prevent their deformation due to the pressure of said working fluid.
- 15 2. A boiler according to claim 1, characterised in that said stay-plates (6) are formed by panels (6) with ends (10) securely fitted within cavities (11) between said side walls (5D) of the casing (5).
3. A boiler according to claim 2, characterised in that said panels (6) are parallel to said exchange walls (2C).
- 20 4. A boiler according to claim 3, characterised in that said panels (6) are substantially rectangular and of a height considerably shorter than the height of said exchange walls (2C).
5. A boiler according to any of the previous claims, characterised in that said reinforcing elements (8) include rods applied to said top and bottom
25 walls (5B) and end walls (5C).
6. A boiler according to claim 5, characterised in that said rods (8) are on the outside of said casing (5).

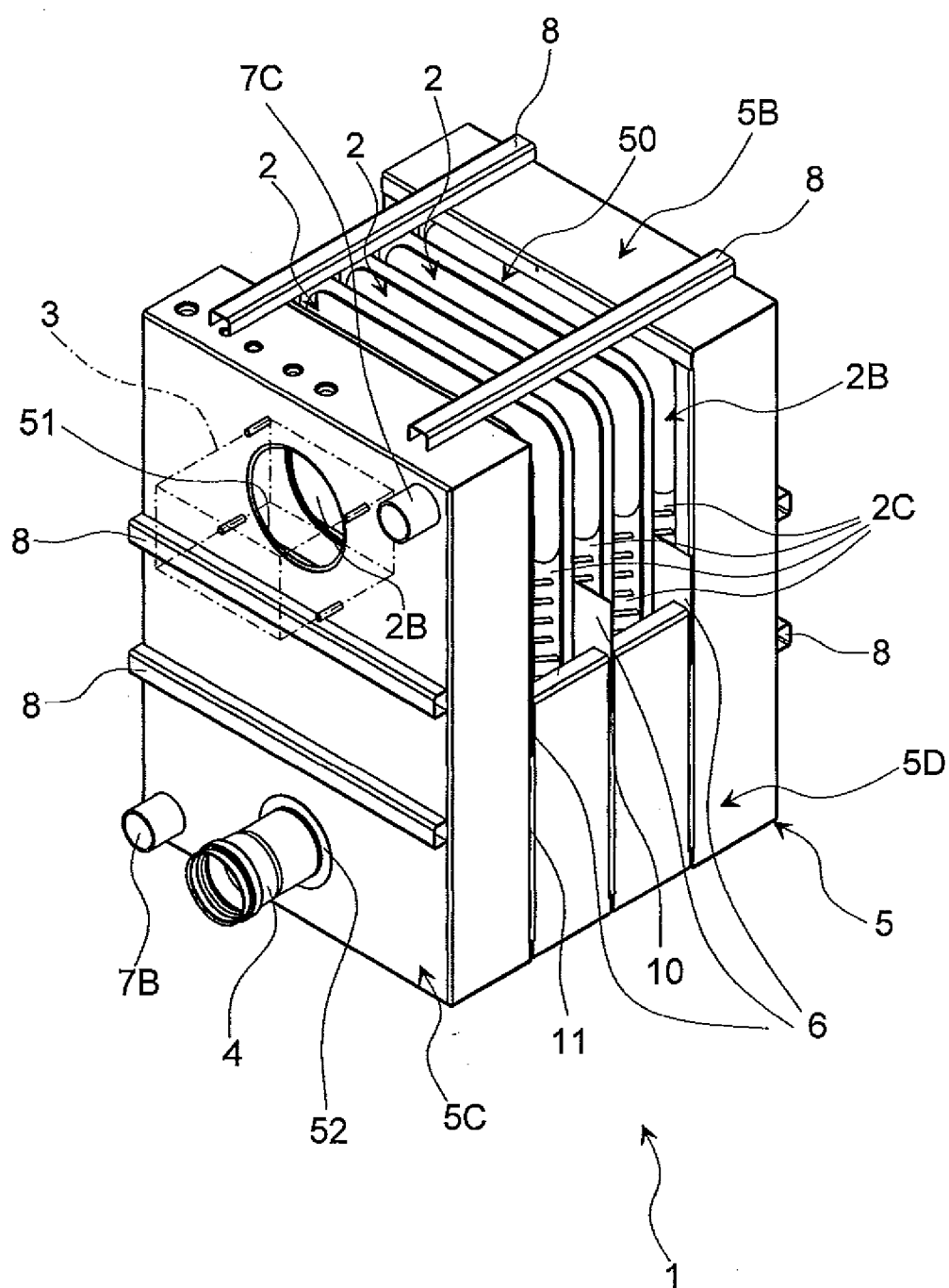


Fig.1

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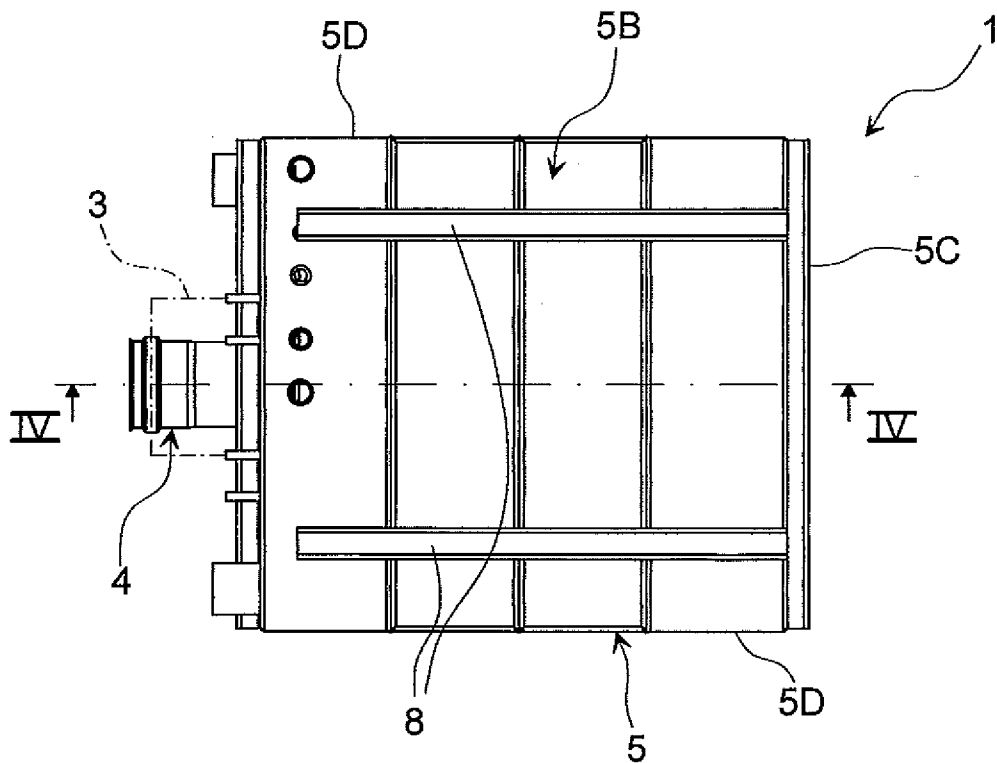


Fig.2

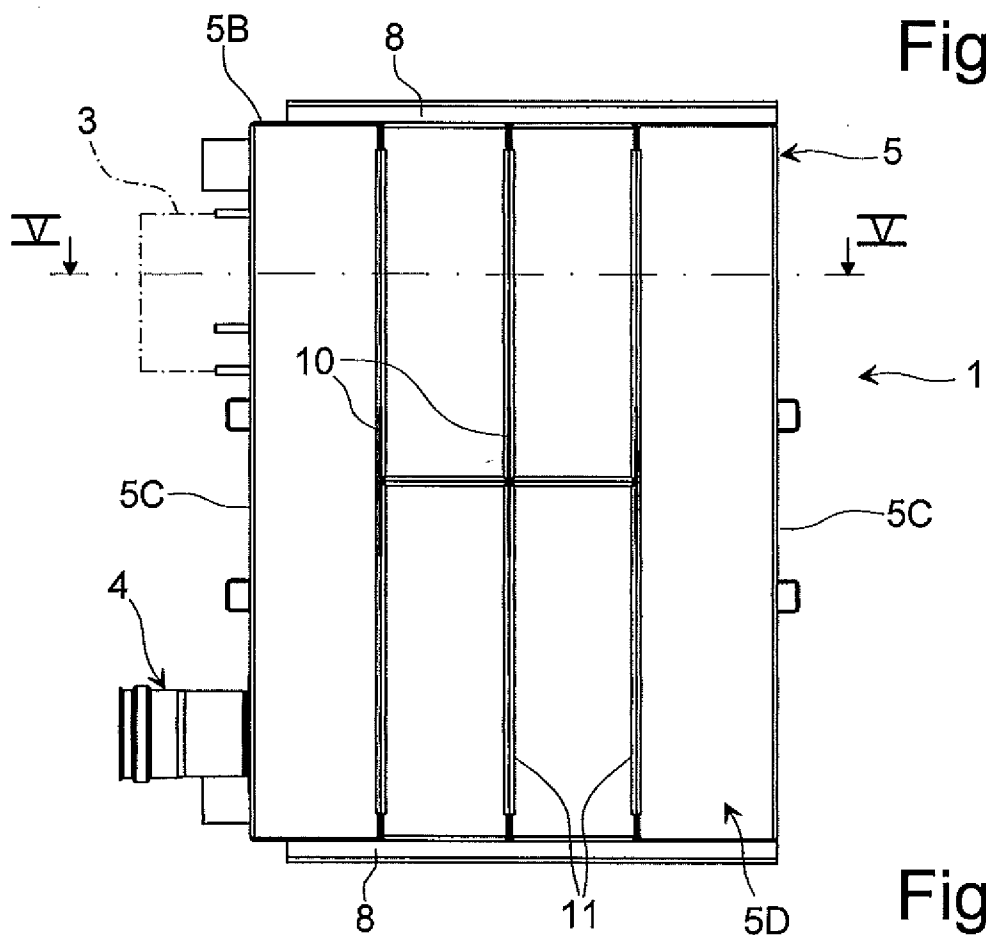


Fig.3

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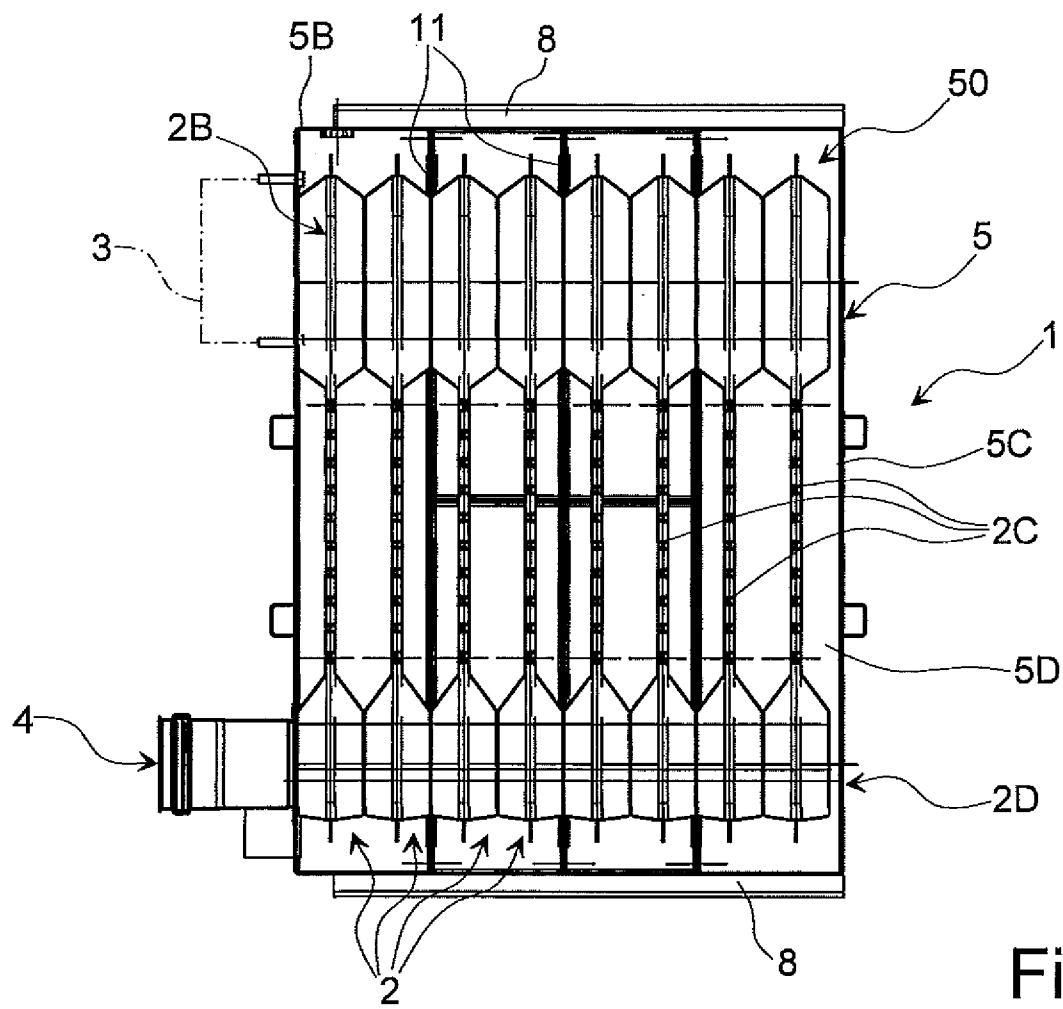


Fig. 4

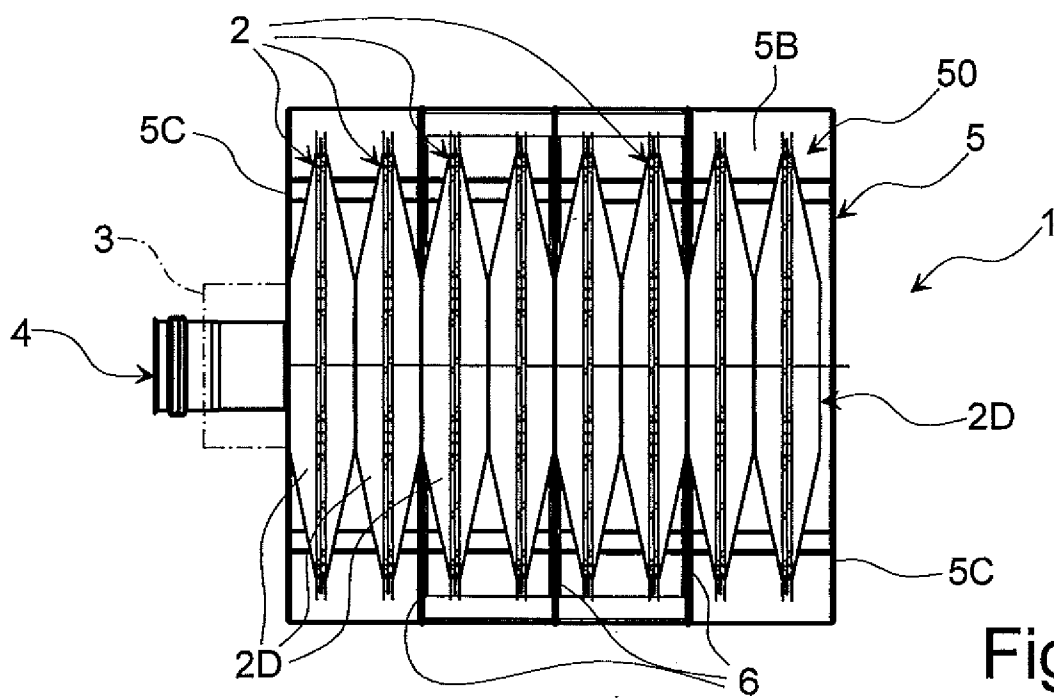


Fig. 5

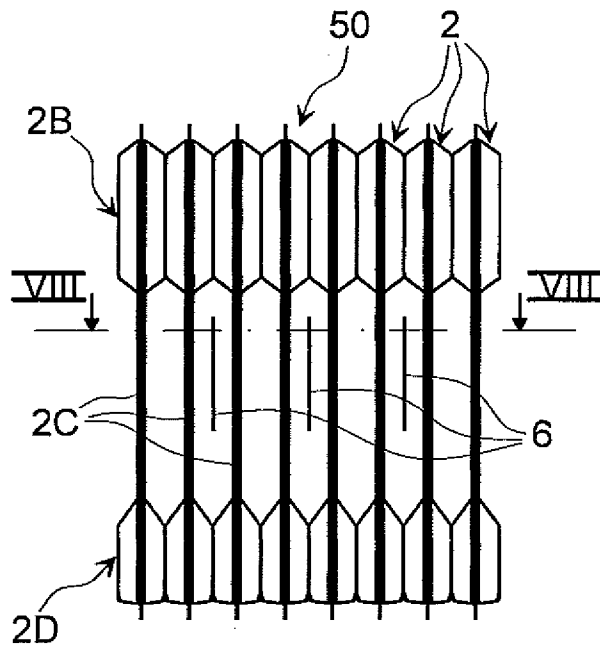


Fig. 6

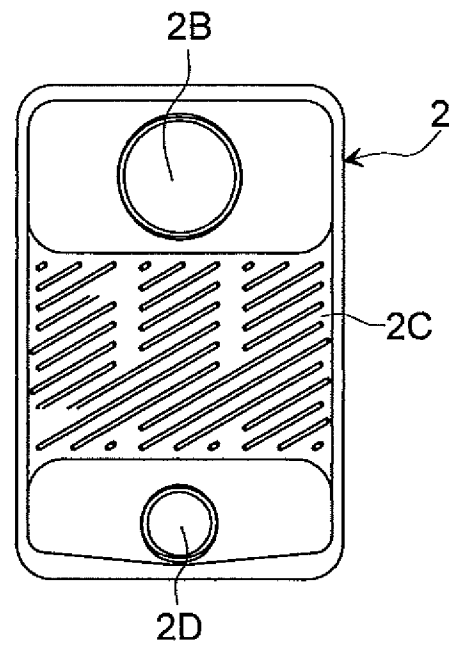


Fig. 7

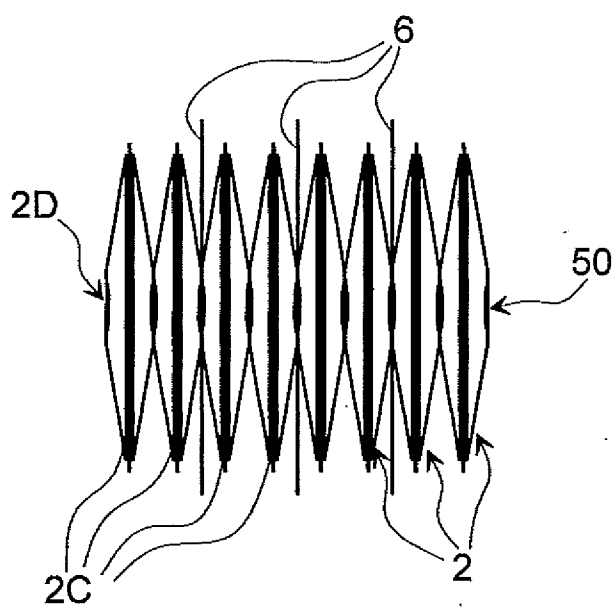


Fig. 8