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(54) Title: BOILER WITH SUBSTANTIALLY VERTICAL FIRE TUBES, PARTICULARLY FOR DOMESTIC HEATING

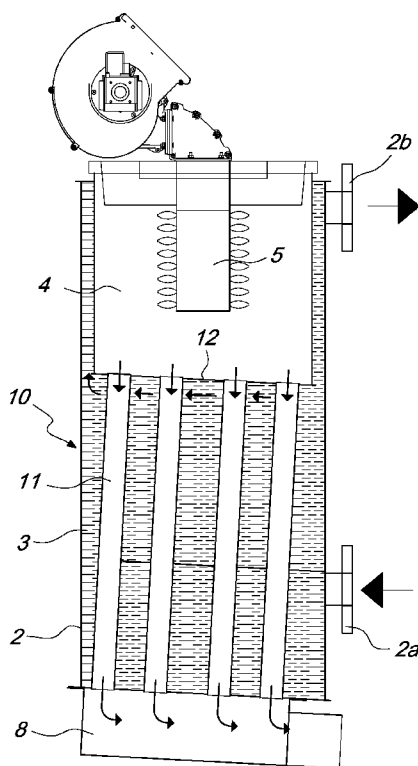


Fig. 2

(57) Abstract: A boiler (10) with substantially vertical fire tubes, particularly for domestic heating, comprising a skirt (2) for containing the water (3) to be heated, which is provided at the top with a furnace (4) which has a base that is shaped so as to define a flat tube plate (12), and a plurality of substantially vertical tubes (1) that extend from said tube plate (12) and convey the exhaust gases produced in the furnace (4) to a collection chamber (8) arranged proximate to the base of the skirt (2), the flat tube plate (12) being inclined sufficiently to allow the natural circulation of the water in contact with it, thus avoiding any possibility of stagnation.



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BOILER WITH SUBSTANTIALLY VERTICAL FIRE TUBES, PARTICULARLY FOR DOMESTIC HEATING

Technical Field

The invention relates to a boiler with substantially vertical fire tubes,
5 particularly for domestic heating.

Background art

It is known that one of the most common constructive forms of
boilers, and particularly of those for heating water intended to supply
domestic sanitary and heating systems, is the one known as "fire tube", and
10 there are two types of said constructive form: a first type, in which the fire
tubes are arranged substantially horizontally, and a second type, in which
said tubes are arranged substantially vertically.

The present invention relates to boilers of the second type, which
comprise a skirt designed to contain the water to be heated, which is
15 provided, at the top, with a furnace whose base is shaped like a flat tube
plate, from which a plurality of substantially vertical tubes extend, such
tubes being immersed in the water to be heated and conveying the exhaust
gases produced in the furnace to a chamber for collection and conveyance to
the stack, which is located at the base of the skirt.

20 In conventional boilers, the flat tube plate that is located at the base of
the furnace is arranged horizontally, and this fact causes a stagnation of the
water in contact with such plate, which causes as a consequence the
presence of bubbles, which form due to localized boiling and are destined to
implode on contact with the incoming cold water, causing unacceptable
25 noise: moreover, difficulties in balancing operation arise, particularly in
case of boilers installed in parallel.

Disclosure of the invention

The aim of the present invention is to provide a boiler with
substantially vertical fire tubes, such as to avoid the formation of bubbles in
30 the water in contact with the tube plate.

This aim is achieved by a boiler with substantially vertical fire tubes, particularly for domestic heating, according to the invention, characterized in that it comprises the features disclosed in the appended claims.

Brief description of the drawings

5 Further characteristics and advantages of the boiler according to the present invention will become better apparent from the description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a sectional view of a boiler according to the background
10 art;

Figure 2 is a similar sectional view of a boiler according to the invention;

Figure 3 is a sectional view of two boilers according to the invention, installed in parallel.

15 Ways of carrying out the invention

With reference to Figure 1, the numeral 1 generally designates a boiler with substantially vertical fire tubes, particularly for domestic heating, manufactured according to the background art, comprising a skirt 2 for containing water 3 to be heated, with connectors 2a, 2b respectively for
20 inflow and outflow, provided at the top with a furnace 4 in which the flame produced by a burner 5 forms.

The furnace 4 has a base that is shaped so as to form a flat tube plate, from which a plurality of substantially vertical tubes (7) extend, such tubes being immersed in the water 3 to be heated and conveying the exhaust gases
25 produced in the furnace 4 to a chamber 8 for collection and conveyance to the stack which is located at the base of the skirt 2.

As mentioned earlier, the tube plate 6 of the background art is arranged horizontally, and this fact causes stagnation of the water in contact with such plate, which causes the formation of bubbles 9.

30 Figure 2 is a sectional view of a boiler 10 according to the invention,

which again comprises the skirt 2 for containing water 3 to be heated, with connectors 2a, 2b respectively for inflow and outflow, which is provided at the top with a furnace 4 with a burner 5.

Substantially vertical tubes 11 designed to convey the exhaust gases produced in the furnace 4 to a collection chamber 8 extend from a flat tube plate 12 which is arranged at the base of the furnace 4 and which, according to an important feature of the invention, is inclined sufficiently to allow the natural circulation of the water in contact with said plate, as indicated by the arrows in Figure 2.

Any possibility of stagnation of the water in contact with the tube plate 12 is thus avoided, and any possibility of bubble formation is consequently excluded; the boiler according to the invention thus no longer has any noise problem typical of the background art, and balancing of operation is facilitated, particularly in case of boilers installed in parallel, such as the ones designated by the reference numerals 13 and 14 in Figure 3.

Finally, it should be noted that the exhaust gas conveyance tubes 11 are fixed to the tube plate 12 so as to be perpendicular thereto.

The described invention is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent elements.

The disclosures in Italian Patent Application No. MI2010A001416 from which this application claims priority are incorporated herein by reference.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

CLAIMS

1. A boiler (10) with substantially vertical fire tubes, particularly for domestic heating, comprising a skirt (2) for containing water (3) to be heated, which is provided at the top with a furnace (4) which has a base that
5 is shaped so as to define a flat tube plate (12), and a plurality of substantially vertical tubes (11) that extend from said tube plate (12) and convey the exhaust gases produced in the furnace (4) to a collection chamber (8) arranged proximate to the base of the skirt (2), characterized in that said flat tube plate (12) is inclined sufficiently to allow the natural
10 circulation of the water in contact with it, thus avoiding any possibility of stagnation.

2. The boiler according to claim 1, characterized in that the exhaust gas conveyance tubes (11) are fixed to the tube plate (12) so as to be perpendicular thereto.

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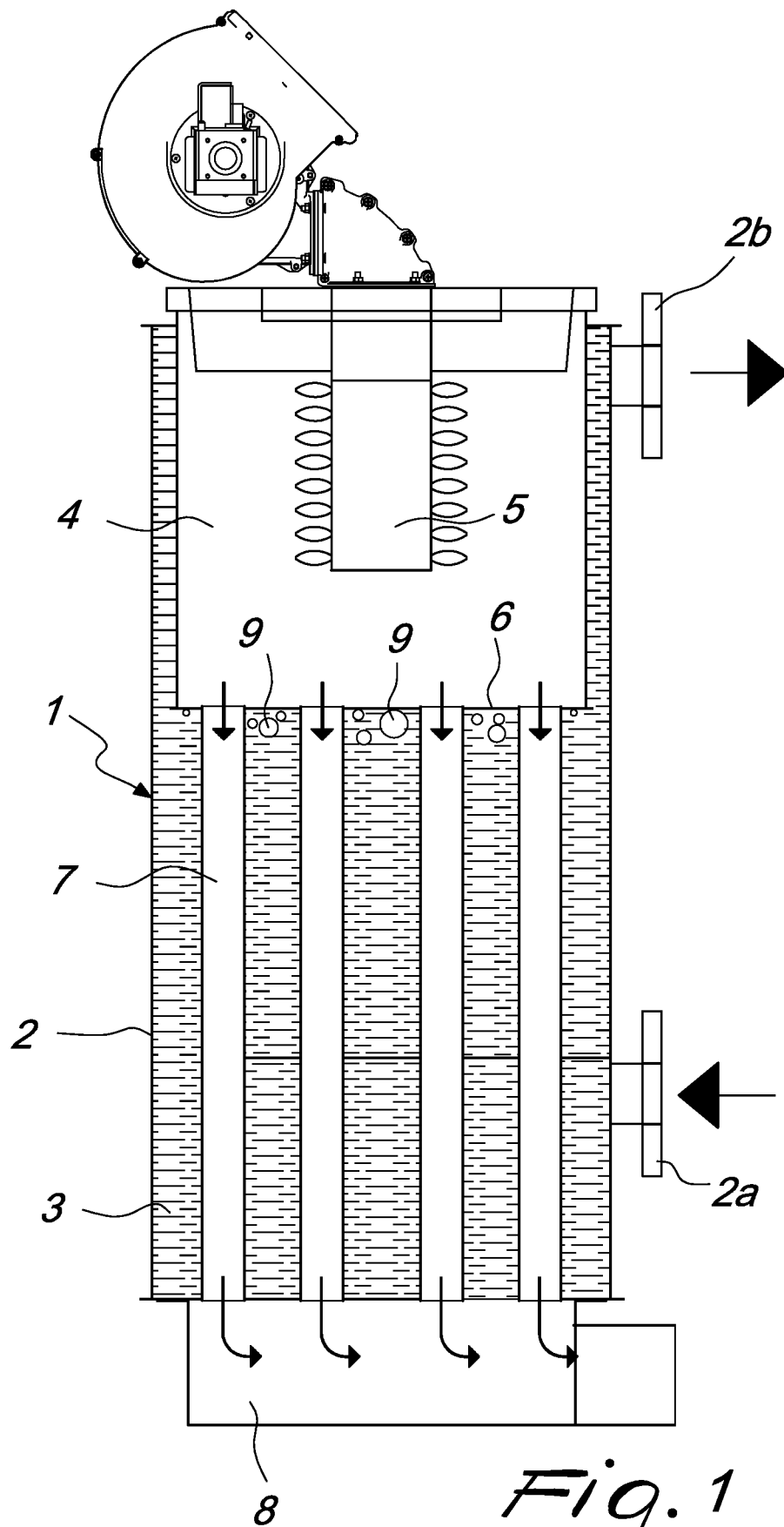


Fig. 1

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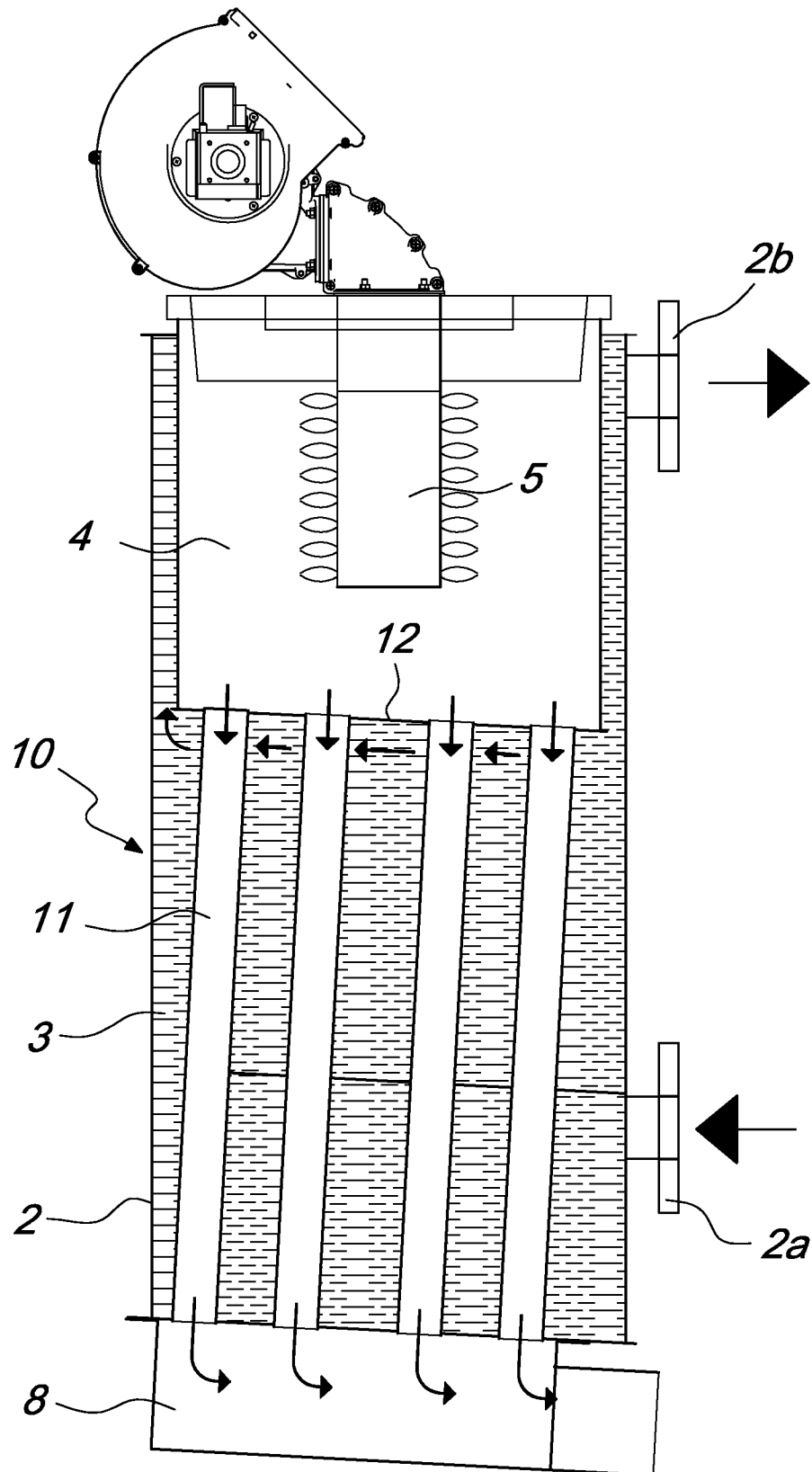


Fig. 2

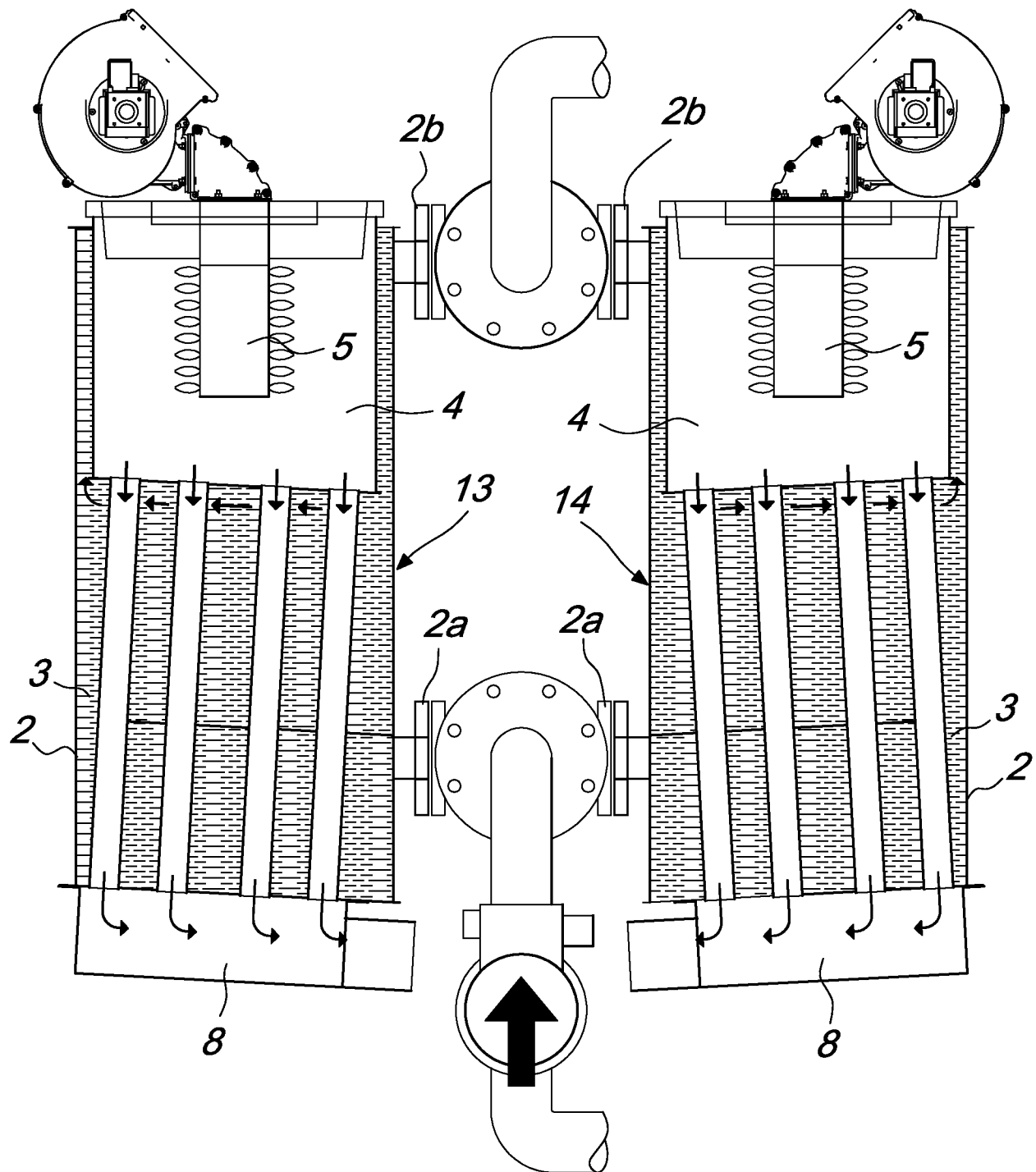


Fig. 3