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(54) **HOT-WATER BOILER INCLUDING A PREHEATER ARRANGED IN THE COMBUSTION CHAMBER**
WASSERHEIZER MIT VORHEIZER IM BRENNRAUM
CHAUFFE-EAU COMPRENANT UN PRECHAUFFEUR PLACE DANS LA CHAMBRE DE
COMBUSTION

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Description

TECHNICAL FIELD

[0001] The present invention relates to a hot water boiler with a flow heater for tap water, comprising a combustion chamber, an outlet for heating water from a gap-shaped passage arranged around the combustion chamber, a tube coil for tap water arranged in said passage, and an inlet for return heating water.

BACKGROUND OF THE INVENTION

[0002] Hot water boilers of the type indicated above are previously known, see for example FR 2121931. Another example of a known boiler is disclosed in FR 1346421.

[0003] Hot water boilers of this type have been developed with a view to achieving the maximum possible efficiency, preferably in excess of 90%.

[0004] One problem of known boilers is the relatively low capacity for flow-heating hot tap water. This may result in the boilers requiring a supplementary hot water container, which is expensive and also takes up a great deal of space.

THE OBJECT OF THE INVENTION

[0005] One main object of the present invention is to produce a hot water boiler with a flow heater for hot tap water, which, while retaining very high efficiency, produces significantly more hot tap water than comparable boilers.

[0006] Another object is to produce such a boiler which is compact in relation to its production capacity for hot tap water.

[0007] The invention is based on the knowledge that the above aim can be achieved by utilizing residual heat in the combustion gases in the combustion chamber for effective preheating of return heating water from a heating system connected to the boiler, and by then, during the main heating of the heating water, utilizing the latter for supplementary heating of the hot tap water.

[0008] In this connection, it is particularly characteristic of a hot water boiler of the type indicated in the first paragraph that it comprises a preheater for return heating water arranged in the combustion chamber, that the preheater has an outlet line which conducts preheated heating water out of the combustion chamber and to the lower part of the boiler, from where the arrangement is such that it can pass upward in the gap-shaped passage surrounding the combustion chamber while being heated by the combustion chamber and transferring heat to the tap water.

[0009] A hot water boiler of this type has been found to be capable of working with very high efficiency and at the same time producing essentially twice as much tap water as the best boilers currently available on the

market.

[0010] It is preferred that the preheater is made in the form of a double-shelled vessel, the inlet of the vessel being connected to an inner chamber in the vessel, which is connected to a gap-shaped space surrounding the chamber, and the outlet of the vessel being connected to the gap-shaped space. The width of this gap-shaped space is very small to obtain effective preheating of the water.

[0011] In a preferred embodiment, the preheater is in the form of a cylindrical vessel, and the outside of the vessel is provided with a large number of essentially radially directed pins. The length of these pins is only slightly shorter than the width of a gap-shaped passage for flue gases, which is formed between the vessel and the inner shell of the combustion chamber.

[0012] Further features of the invention emerge from the patent claims which follow.

[0013] The invention will be described in greater detail below with reference to the embodiment shown by way of example in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

[0014] Fig. 1 shows a first longitudinal section through a hot water boiler according to the invention.

[0015] Fig. 2 shows a second longitudinal section through the boiler along another section line.

[0016] Fig. 3 shows the boiler seen from above.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0017] In the figures, reference number 1 designates the outer shell of the boiler, which is provided with insulation 2. Reference number 3 indicates diagrammatically an oil burner which projects into a combustion chamber 4 which is delimited by an inner shell 5. The bottom of the combustion chamber is covered with a layer 6 of refractory material, such as brick. The upper end of the combustion chamber 4 is connected to a chimney 7. Reference number 8 designates an electric heater arranged in the lower part of the boiler for alternative operation of the boiler or for increasing the power of the boiler. The boiler is provided with an inlet 9 for return heating water from a heating system connected to the boiler. The inlet 9 is connected via a pipe 10 to a preheater 11, arranged in the upper part of the combustion chamber, with an outlet 12 which, via a pipe 13, conducts preheated return heating water down to the bottom of the boiler. Reference number 25 designates a vent duct.

[0018] The preheater consists of a double-shelled vessel with an inlet 14, which is connected to the pipe 10 and opens into an inner chamber 15 in the vessel, and vent openings 26. This chamber communicates, in its lower part, with a gap-shaped space 16 which surrounds the chamber and through which the return heat-

ing water passes up to the outlet 12. The space 16 is very narrow, and the heating water which passes up through the gap is subjected to effective heating by the flue gases in the combustion chamber 4, which sweep over the outer vessel wall. It is preferred that the space has a width of the order of 1-4 mm, preferably roughly 2 mm.

[0019] In order to make the heat transfer from the flue gases to the water in the gap-shaped space 16 more effective, the outer wall of the preheater 11 is provided with a large number of pins 17 which are welded on essentially radially and will be heated by the flue gases and conduct heat to the vessel wall. The pins 17 have a length which is slightly, preferably roughly 2 mm, shorter than the width of the flow duct for the combustion gases, which is formed between the preheater and the inner shell 5 of the combustion chamber.

[0020] By virtue of the positioning and design shown of the preheater, residual heat in the combustion gases will be transferred very effectively to the return heating water for preheating the latter.

[0021] The inner shell 5 of the combustion chamber is surrounded by a tube coil 18, suitably made from a finned tube made of copper. Cold water is supplied to the tube coil at the inlet 19, see Fig. 1, and is heated during passage through the tube coil to an outlet 20, see Fig. 2, for hot water. The tube coil 18 is surrounded by a guide plate 21 which, together with the inner shell 5 of the combustion chamber, forms a gap-shaped passage 22 for the heating water which passes up to a riser vessel 23 which is connected to the outlet 24 of the boiler, via which heating water is intended to be supplied to a heating system connected to the boiler. The guide plate is provided with vent openings 28 in its upper part. The width of the gap-shaped passage 22 is slightly, preferably roughly 4 mm, greater than the outer diameter of the tube in the tube coil 18.

[0022] This provides very good heat transfer from the heating water, which passes up through the passage 22, to the tap water in the tube coil 18, which is also heated directly from the combustion chamber 4. The result is a very high production of hot tap water. This will be due to the effective preheating of the heating water combined with the effective transfer of heat from the latter and the combustion chamber to the tap water in the tube coil.

[0023] Official tests have verified that the boiler has a high efficiency, 91%, which corresponds to the best boilers available on the market. A heating boiler intended for use in the home with a power of the order of 15-20 kW can be made with a diameter of 550 mm and a height of 1100 mm. In this connection, the production of hot tap water has been measured at 21 liters/minute at a temperature of 42°C. This is to be compared with the best boilers of this type currently available on the market, which produce 11 liters/minute and may then require a supplementary hot water container.

[0024] The pins 17 projecting from the preheater 11 will remain essentially soot-free on account of the high

temperature, roughly 300-400°C. When the inner surface of the combustion chamber 4 is coated with soot, heat transfer to the surrounding tube coil 18 is impaired. On the other hand, the "heat losses" in the flue gases are then reduced, as a result of which more heat energy from these will be transferred to the water in the preheater 11. This means that relatively constant efficiency is obtained between soot removal operations.

[0025] Soot removal can also take place at longer intervals than in known boilers.

[0026] The invention has been described above in conjunction with the preferred embodiment shown in the drawings. The principle according to the invention can also be used for larger boilers where higher power is required.

Claims

1. A hot water boiler with a flow heater for tap water, comprising a combustion chamber (4), an outlet (24) for heating water from a gap-shaped passage (22) arranged around the combustion chamber (4), a tube coil (18) for tap water arranged in said passage, and an inlet (9) for return heating water, **characterized in that** it comprises a preheater (11) for return heating water arranged in the combustion chamber (4), **in that** the preheater has an outlet line (13) which conducts preheated heating water out of the combustion chamber (4) and to the lower part of the boiler, from where the arrangement is such that said preheated heating water passes upward in the gap-shaped passage (22) surrounding the combustion chamber (4) while being heated by the combustion chamber (4) and transferring heat to the tap water.
2. The hot water boiler as claimed in claim 1, **characterized in that** the preheater (11) is made in the form of a double-shelled vessel, **in that** the inlet (14) of the vessel is connected to an inner chamber (15) in the vessel, **in that** said chamber (15) is connected to a gap-shaped space (16) surrounding it, and **in that** the outlet (12) of the vessel is connected to this gap-shaped space.
3. The hot water boiler as claimed in claim 2, **characterized in that** the width of the gap-shaped space (16) in said vessel is very small in relation to the diameter of the vessel and has a width of the order of 1-4 mm, preferably roughly 2 mm.
4. The hot water boiler as claimed in any one of claims 1-3, **characterized in that** the preheater (11) is in the form of a cylindrical vessel, and **in that** the outside of the vessel is provided with a large number of essentially radially directed pins (17).

5. The hot water boiler as claimed in claim 4, **characterized in that** the length of said pins (17) is slightly shorter than the width of a flow duct for flue gases, which is formed between the preheater (11) and the inner shell (5) of the combustion chamber. 5
6. The hot water boiler as claimed in any one of claims 1-5, **characterized in that** the gap-shaped passage (22) formed around the combustion chamber (4) is delimited by the inner shell (5) of the combustion chamber and a guide plate (21) surrounding said shell, and **in that** the width of the gap-shaped passage (22) is slightly greater than the outer diameter of the tube in the tube coil (18) for the tap water. 10
7. The hot water boiler as claimed in claim 6, **characterized in that** the tube coil (18) for the tap water is made from a finned tube, and **in that** the width of the gap-shaped passage (22) intended for accommodating said tube coil is slightly greater than the outer diameter of the fins of said tube. 15 20
8. The hot water boiler as claimed in any one of claims 1-7, **characterized in that** the preheater (11) is arranged in the upper part of the combustion chamber (4). 25
9. The hot water boiler as claimed in any one of claims 1-8, **characterized in that** it comprises a burner (3) for oil and/or gas arranged in the lower part of the combustion chamber (4). 30
10. The hot water boiler as claimed in any one of claims 1-9, **characterized in that** an electric heater (8) is arranged close to the bottom of the boiler. 35

Patentansprüche

1. Heißwasserbereiter mit einem Durchlauferhitzer für Leitungswasser, umfassend eine Brennkammer (4), einen Auslass (24) für Heizwasser von einem lückenförmigen Durchgang (22), der um die Brennkammer (4) angeordnet ist, eine Rohrschlange (18) für Leitungswasser, die in dem Durchgang angeordnet ist, und einen Einlass (9) für zurückkehrendes Heizwasser, **dadurch gekennzeichnet, dass** er einen Vorerhitzer (11) für zurückkehrendes Heizwasser umfasst, welcher in der Brennkammer (4) angeordnet ist, dadurch, dass der Vorerhitzer eine Auslassleitung (13) besitzt, welche vorerhitztes Heizwasser aus der Brennkammer (4) heraus und zu dem unteren Bereich des Heißwasserbereiters leitet, von wo die Anordnung so ist, dass das vorerhitzte Heizwasser aufwärts in den lückenförmigen Durchgang (22) durchgeht, welcher die Brennkammer (4) umfasst, während es durch die Brennkammer (4) erhitzt wird und Hitze an das Leitungswas-

ser abgibt.

2. Heißwasserbereiter nach Anspruch 1, **dadurch gekennzeichnet, dass** der Vorerhitzer (11) in Form eines zwei-wandigen Behälters hergestellt ist, dadurch, dass der Einlass (14) des Behälters mit einer inneren Kammer (15) in dem Behälter verbunden ist, dadurch, dass die Kammer (15) mit einem lückenförmigen Raum (16) verbunden ist, welcher sie umgibt, und dadurch, dass der Auslass (12) des Behälters mit diesem lückenförmigen Raum verbunden ist.
3. Heißwasserbereiter nach Anspruch 2, **dadurch gekennzeichnet, dass** die Breite des lückenförmigen Raums (16) in dem Behälter sehr klein im Verhältnis zu dem Durchmesser des Behälters ist und eine Breite in der Ordnung von 1 bis 4 mm besitzt, vorzugsweise grob 2 mm.
4. Heißwasserbereiter nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der Vorerhitzer (11) die Form eines zylindrischen Behälters besitzt und dadurch, dass die Außenseite des Behälters mit einer großen Anzahl von im Wesentlichen radial ausgerichteten Stiften (17) versehen ist.
5. Heißwasserbereiter nach Anspruch 4, **dadurch gekennzeichnet, dass** die Länge der Stifte (17) leicht kürzer als die Breite eines Flusskanals für Rauchgase ist, welcher zwischen dem Vorerhitzer (11) und der inneren Wand (5) der Brennkammer gebildet ist.
6. Heißwasserbereiter nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** der lückenförmige Durchgang (22), der um die Brennkammer (4) gebildet ist, durch eine innere Wand (5) der Brennkammer begrenzt wird und ein Führungsblech (21), welches diese Wand umfasst, und dadurch, dass die Breite des lückenförmigen Durchgangs (22) leicht größer ist als der Durchmesser des Rohrs in der Rohrschlange (18) für das Leitungswasser.
7. Heißwasserbereiter nach Anspruch 6, **dadurch gekennzeichnet, dass** die Rohrschlange (18) für das Leitungswasser aus einem gerippten Rohr hergestellt wird und dadurch, dass die Breite des lückenförmigen Durchgangs (22), der dazu bestimmt ist, die Rohrschlange aufzunehmen, leicht größer als der äußere Durchmesser der Rippen des Rohrs ist.
8. Heißwasserbereiter nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** der Vorerhitzer (11) in dem oberen Bereich der Brennkammer (4) angeordnet ist.

9. Heißwasserbereiter nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** er einen Brenner (3) für Öl und/oder Gas umfasst, der in dem unteren Bereich der Brennkammer (4) angeordnet ist.
10. Heißwasserbereiter nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet, dass** ein elektrischer Erhitzer (8) nahe dem Boden des Heißwasserbereiters angeordnet ist.

Revendications

1. Chauffe-eau doté d'un dispositif de chauffage de fluide destiné à de l'eau courante qui comprend une chambre de combustion (4), une sortie (24) permettant de chauffer l'eau à partir d'un passage en forme d'interstice (22) situé autour de la chambre de combustion (4), un serpentin (18) à eau courante se trouvant dans ledit passage et une entrée (9) pour eau de chauffage de retour, **caractérisé en ce qu'il** comprend un préchauffeur (11) destiné l'eau de chauffage de retour se trouvant dans la chambre de combustion (4), **en ce que** le préchauffeur comporte une conduite de sortie (13) qui guide la sortie d'eau de chauffage de la chambre de combustion (4) et vers la partie inférieure du chauffe-eau, à partir duquel l'agencement est tel que ladite eau de chauffage préchauffée monte dans le passage en forme d'interstice (22) qui entoure la chambre de combustion (4) pendant que la chambre de combustion (4) la chauffe et qu'elle transfère de la chaleur à l'eau courante.
2. Chauffe-eau selon la revendication 1, **caractérisé en ce que** le préchauffeur (11) a la forme d'un récipient à double coque, **en ce que** l'entrée (14) du récipient est reliée à une chambre interne (15) située dans le récipient, **en ce que** ladite chambre (15) est reliée à un espace en forme de fente (16) qui l'entoure, et **en ce que** la sortie (12) du récipient est reliée à cet espace en forme de fente.
3. Chauffe-eau selon la revendication 2, **caractérisé en ce que** la largeur de l'espace en forme de fente (16) situé dans ledit récipient est très petite par rapport au diamètre du récipient et a une valeur de l'ordre de 1 à 4 mm, de préférence 2 mm approximativement.
4. Chauffe-eau selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** le préchauffeur (11) a la forme d'un récipient cylindrique et **en ce que** la partie extérieure du récipient est dotée d'un grand nombre de broches (17) dirigées pratiquement de manière radiale.
5. Chauffe-eau selon la revendication 4, **caractérisé en ce que** la longueur desdites broches (17) est légèrement plus petite que la largeur d'un conduit d'écoulement destiné à des gaz de combustion, lequel se trouve entre le préchauffeur (11) et la coque interne (5) de la chambre de combustion.
6. Chauffe-eau selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** le passage en forme d'interstice (22) formé autour de la chambre de combustion (4) est délimité par la coque interne (5) de la chambre de combustion et par une plaque de guidage (21) entourant ladite coque, et **en ce que** la largeur du passage en forme de fente (22) est légèrement plus grande que le diamètre externe du tube situé dans le serpentin (18) destiné à l'eau courante.
7. Chauffe-eau selon la revendication 6, **caractérisé en ce que** le serpentin (18) destiné à l'eau courante est constitué d'un tube à ailettes et **en ce que** la largeur du passage en forme de fente (22) conçu pour loger ledit serpentin est légèrement plus grande que le diamètre externe des ailettes dudit tube.
8. Chauffe-eau selon l'une quelconque des revendications 1 à 7, **caractérisé en ce que** le préchauffeur (11) se trouve dans la partie supérieure de la chambre de combustion (4).
9. Chauffe-eau selon l'une quelconque des revendications 1 à 8, **caractérisé en ce qu'il** comprend un brûleur (3) à pétrole et/ou à gaz qui se trouve dans la partie inférieure de la chambre de combustion (4).
10. Chauffe-eau selon l'une quelconque des revendications 1 à 9, **caractérisé en ce que** le dispositif de chauffage électrique (8) se trouve à proximité du fond du chauffe-eau.

FIG 1

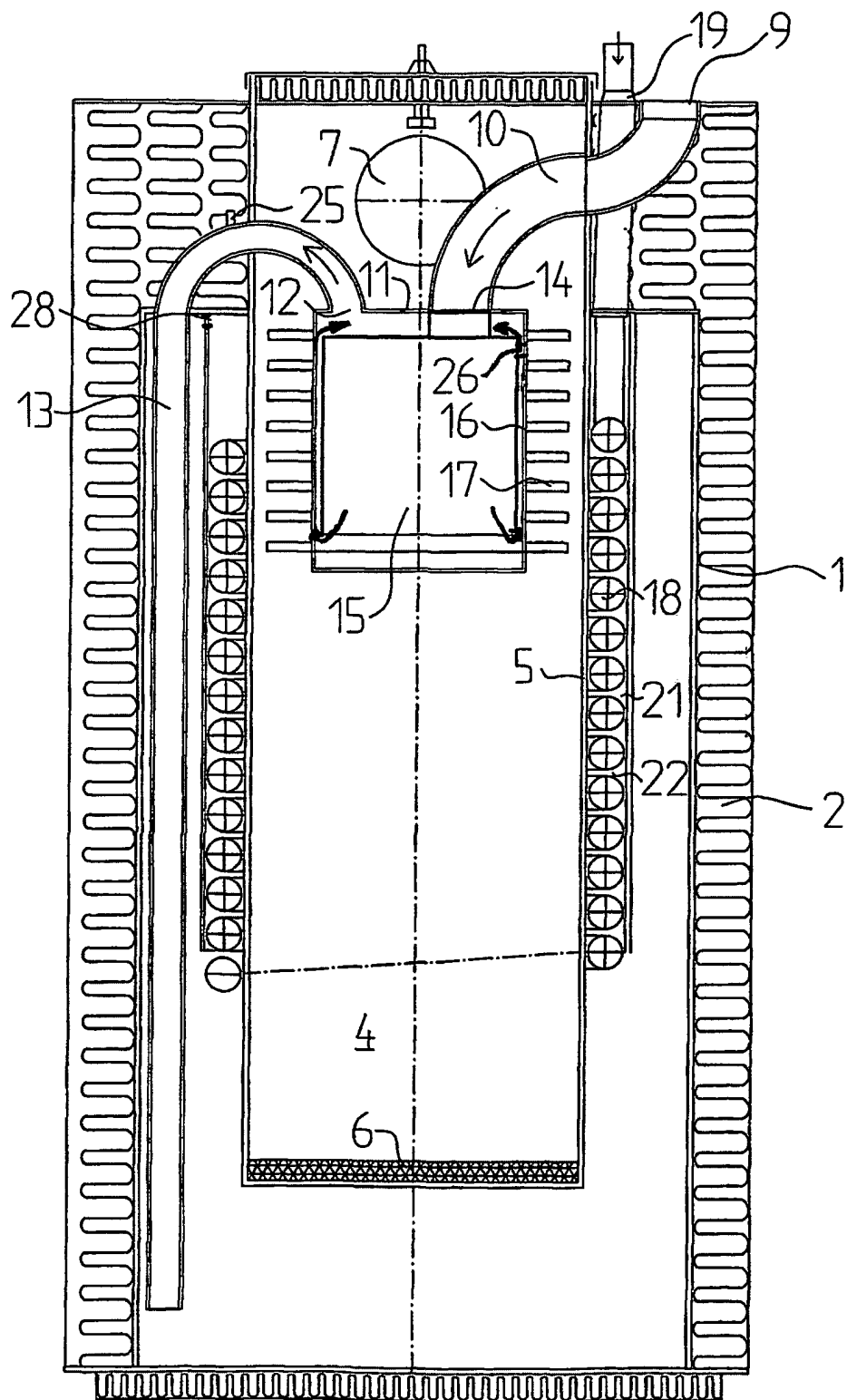


FIG 2

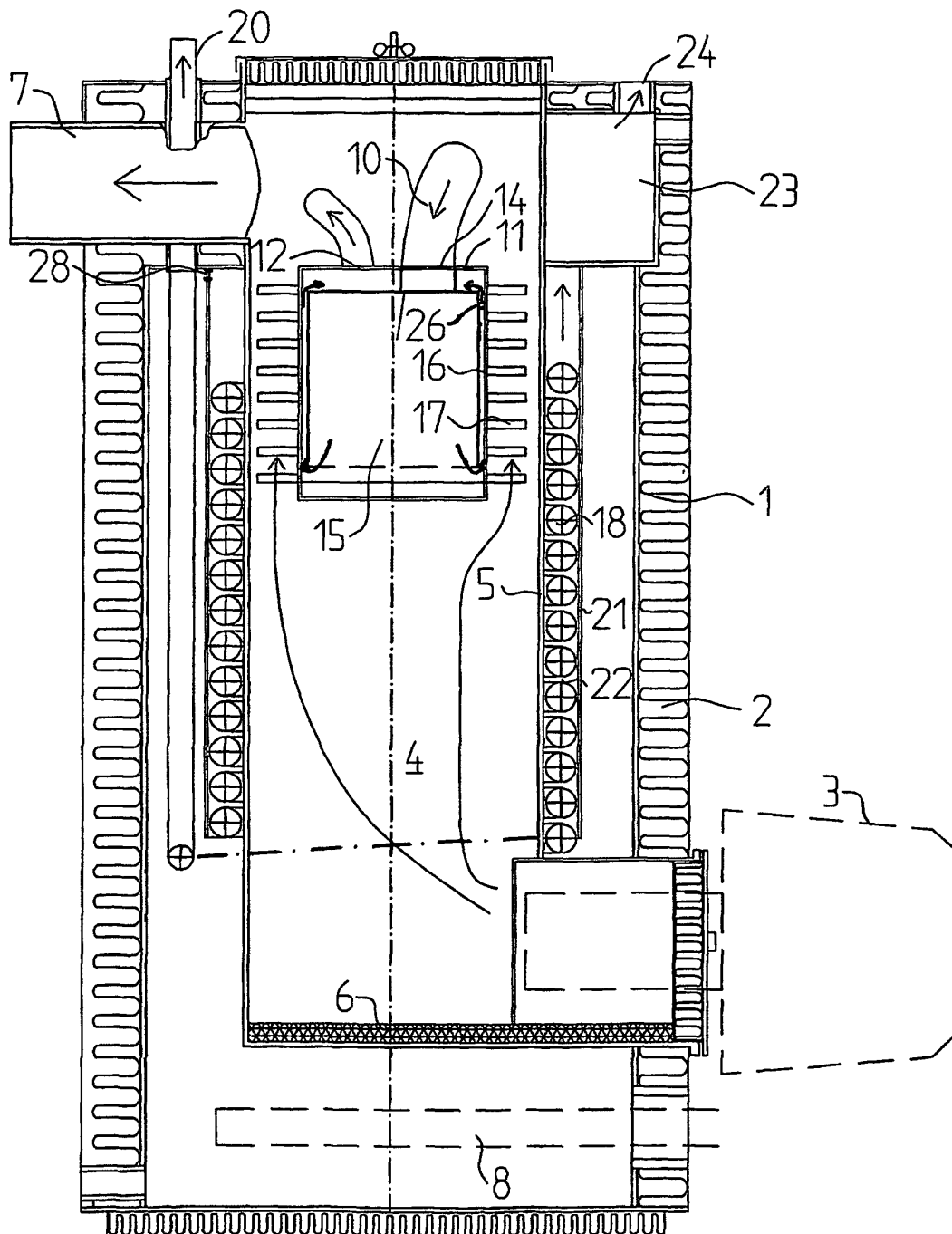


FIG 3

