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(54) **Woodburning stove with glass portion and means for the cleaning thereof.**

(57) With closed woodburning stoves having a glass portion (4) in the stove door (2), there is a great problem that soot and condensate are deposited on the inner surface of the glass portion.

According to the invention, this can be prevented by mounting a heat exchanger directly above the door (2) on the front part (23) inside the fire box (19), and in such a manner that the air intake (21) takes place directly through a slot (7) in the front part (23). The heat exchanger is divided into an upper chamber (13) to which the inlet air (21) is led from outside, and a lower chamber (14) from which the heated and expanded air (24) is led out through a slot (15) at the front over the glass portion, the breadth and direction of flow of said slot (15) being adapted to suit the height of the glass portion (4) and the fire box (19).

The outflowing air is thus heated to a temperature of up to 250°C, and flows out at a speed which holds the glass portion (4) completely free of soot and condensate. It is also led to the combustion zone as heated primary air. This ensures a good combustion and a high degree of efficiency.

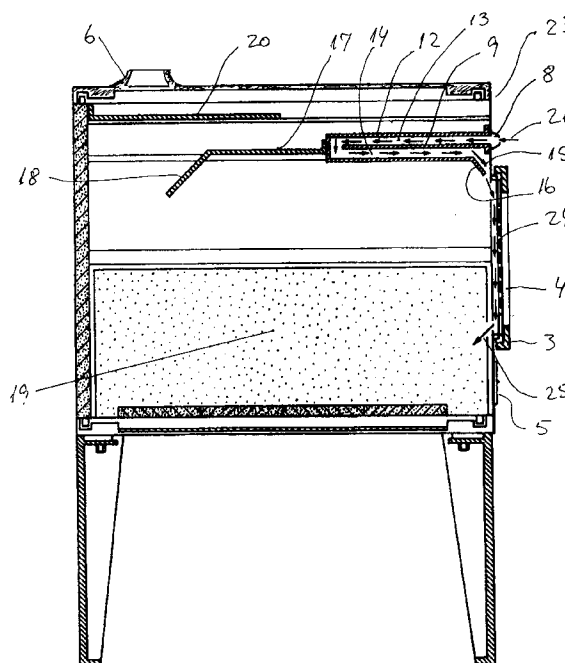


Fig 2

Background of the invention

The invention relates to a woodburning stove with a closed fire box and with a glass portion mounted in the front part of the stove, preferably in the door of the stove, and with a built-in heat exchanger comprising a closed chamber to which air is supplied and led out through a slot at the upper edge of the glass portion to produce a blanket of air which extends along the rear surface of the glass portion.

Stoves with glass portions through which the fire can be observed are very widespread, the reason being that they hereby combine the advantage of the stove's visible fire with the advantages of the closed stove from the point of view of combustion.

However, the glass portion suffers a serious drawback, namely that it has a marked tendency to become sullied by soot and layers of condensate. These can be burned firmly into the glass portion so that dangerously corrosive means have to be used to dissolve and remove them.

Such deposits on the glass portion are practically impossible to avoid, especially when the stove has been lit and for a short time afterwards, when the surface temperature of the glass portion lies below the dewpoint of the condensate, which is around 150°C.

Different constructions are known for the generation of an air flow to prevent these deposits, i.e. a flow of air along the inner side of the glass portion, but these constructions have not proven to function in a satisfactory manner.

From the descriptions of Danish patent application no. 3134/87 and American patent no. 4,941,451, stoves are known wherein preheated air is led down over the glass portion through a gap which extends along the upper edge of the glass portion. The heating of the air is effected by passing it through an opening at the bottom of the stove and leading it up through channels in the sides of the fire box, in which the air is heated, after which it is passed through the gap above the glass portion.

However, these known constructions have a very low degree of efficiency, mainly because of the slow heating of the air. This is due first and foremost to the fact that the hot flue gas sweeps only the inner side of the channels, whereby the heat exchanging becomes inadequate, particularly in the ignition phase when the risk of soot and condensation deposits is at its greatest.

Advantages of the invention

The stove according to the invention, in which the chamber is configured in a closed box which is mounted above the glass portion on the inside of the front part, and wherein the flow of air to the chamber is effected via openings directly through the front part, has first and foremost a hitherto-unknown efficiency

for reasons of the effective heating of the airflow for the cleaning of the glass portion.

This is due first and foremost to the configuration and positioning of the heat exchanger, in that the supply of air takes place directly to the heat exchanger, and because this is placed directly above the bottom of the fire box in the flow of flue gas, thus ensuring that the inflowing air is heated as quickly as possible.

The air is led out via a slot in the front of the box, so that after being being sucked into the box it is heated directly by the flue gases by convection, and is thereby forced out at a considerable rate. When the intake of air through the heat exchanger consists solely of primary and secondary combustion air, the effect of this air flow can be increased, in that there is hereby achieved not only a completely reliable cleaning of the glass portion, but also a perfect combustion due to the pre-heated air.

As disclosed in claim 2, by allowing the heat exchanger box to project freely into the fire box, the flue gases can sweep the box on all sides with the exception of the front, which results in a quick and effective exchange of heat.

As disclosed in claim 3, by providing the box with an internal dividing plate, the path taken by the air through the box can be increased, hereby making the convection heating as efficient as possible.

As disclosed in claim 4, by allowing the heat exchanger to extend for the whole breadth of the fire box and up to a distance from its rear wall, the hot flue gases will be led directly against the bottom of the exchanger box and thereafter pass along the top of the box before they leave the stove, which results in an optimum exchange of heat and utilization of the heat content of the flue gases. This is of particular importance when the stove is being lit.

As disclosed in claim 5, by providing the chamber with a plate, it is a simple matter to fashion the box and the plate in accordance with the conditions in the fire box of the relevant stove.

As disclosed in claim 6, by bending-down the lower part of the plate, the run-off speed of the flue gases under the heat exchanger will be slowed down, which results in an effective convection.

Finally, as disclosed in claim 7, it is expedient to allow the slot to have a relatively small breadth, in that the speed of the air through the slot is hereby considerably increased due to the heating of the air and its subsequent expansion in volume. This provides the strongest possible air flow.

The drawing

An example embodiment according to the invention will be explained in more detail in the following with reference to the drawing, where

fig. 1 shows a stove seen from the front,

fig. 2 shows a section through the stove seen in

the direction II-II in fig. 1, and fig. 3 shows an enlarged section through the heat exchanger.

Description of the example embodiment

Fig. 1 shows a stove 1 seen from the front. The example shown has a door which is provided with a transparent glass portion 4 which is set into a frame 3. The stove door can be opened and closed, and the fire box can be observed through the glass.

Below the door there is mounted an air valve 5, and at the top of the stove can be seen the connection 6 for a not-shown discharge pipe.

Finally, above the door there is an elongated opening 7, behind which lies a sliding damper plate 2 mounted with a handle 8 by which it can be moved.

The heat exchanger is indicated lying behind the opening 7 by stippled lines.

Fig. 2 shows the inside of the stove. In the example shown, the fire box 19, which extends throughout the inside of the stove, is lined with firebricks in a commonly-known manner.

The heat exchanger is also seen in the form of a box 12 which is open to the front and provided with fixing plates 10 around the air supply opening, as indicated in fig. 1

The actual box 12 is secured to the front 23 of the stove by means of bolts or screws 11. The heat exchanger will be described in more detail later.

On the rear wall 26 of the box 12 there is mounted a plate 17 which has a bent-down rear edge to form a baffle 18 for the flow of flue gas. The flue gas is hereby slowed down and also redirected and led upwards towards a turning plate 20 secured to the rear wall of the stove.

This plate leads the upwardly-flowing gases across the upper side of the heat exchanger, and from here back again before they leave the stove through the discharge pipe 6.

The heat exchanger itself will now be described with reference to fig. 3. The box 12 is configured as a rectangular box which is relatively flat and, as shown in the drawing, is made up of a shroud and a bottom.

Inside the box there is secured an intermediate wall 9 which extends from the open front end to a distance from the rear wall 26. The box is thus divided into an upper chamber 13, which opens out directly at the opening 7, so that the flow of the flue gas through the chamber is led down into a lower chamber 14, the front of which opens out into a funnel-like slot 15, in that the front of the plate has a bent-down portion 16 to form an inclined side wall. The angle of the downwardly-bent part 16 will depend on the height of the fire box 19 in the individual stove, in that it is important that that part of the air stream which constitutes the primary air reaches into the stove in sufficient

amounts.

The breadth of the slot 15 is chosen in accordance with the extent of the glass portion 4, and will normally be between 5 and 7 mm, i.e. considerably less than the clearance in the chamber 14.

Between the front piece 23 and the fixing plate 10, a gasket or packing string 27 is inserted to ensure air-tightness.

When the stove is being lit, both the lower air valve 5 and the sliding damper 7 can be fully open, hereby leading an ample amount of primary air to the fire. When the fuel has ignited and is burning, the lower air valve 5 can be closed. The air 25 which is hereafter led through the heat exchanger will be able to deliver the necessary primary and secondary air to the fire.

When the air 21 is sucked in through the opening 7, it first passes through the upper chamber 13, which is swept by the flue gas 28 before this leaves the stove through the discharge pipe.

The air 22 is thus preheated, after which it passes down into the lower chamber 14 where the higher air temperature of up to 250°C is achieved when the stove is in operation.

The volume of air is hereby doubled, and since the outlet slot 15 has a reduced flow clearance in relation to the chamber 14, the flow rate of the hot air 24 becomes very considerable. This results in the effective flow along the rear surface of the glass portion 4, which is hereby heated to more than 150°C, whereby any risk of sooting-up and condensation is excluded.

With the known heat exchangers, it has not hitherto been possible to achieve this high airflow and temperature.

Hereafter, the outflow of hot air 25 is used as primary and secondary air, whereby the complete combustion is achieved and at the same time the glass portion is effectively held clean.

The stove thus has a very high degree of efficiency, while the need for maintenance is minimal.

Claims

1. Woodburning stove with a closed fire box and with a glass portion mounted in the front part of the stove, preferably in the door of the stove, and with a built-in heat exchanger comprising a closed chamber, to which air is supplied and led out through a slot at the upper edge of the glass portion to produce a blanket of air which extends along the rear surface of the glass portion, **characterized** in that the chamber is configured in a closed box (12) which is mounted above the glass portion (4) on the inside of the front part (23), and wherein the flow of air (21) to the chamber (13, 14) is effected via openings (7) directly through

the front part (23).

2. Heat exchanger according to claim 1, **characterized** in that the box (12) extends freely into the fire box (19) above the fireplace. 5
3. Heat exchanger according to claims 1 and 2, **characterized** in that in the chamber (13, 14) there is inserted a plate (9) which extends from the front part (23) up to a distance from the rear wall (26) of the chamber, and in such a manner that the inflowing air (22) passes through the chamber's upper part (13) before being led back through the chamber's lower part (14) for outflow through the slot (15). 10 15
4. Heat exchanger according to claim 2, **characterized** in that the box (12) extends for the full breadth of the fire box (19) and up to a distance from its rear wall, thus leaving a gap for the discharge of the flue gases (28). 20
5. Heat exchanger according to claim 4, **characterized** in that the box (12) is provided with a rearwardly-extending plate (17, 18), so that the box and the plate together extend up to a distance from the rear wall of the fire box (19). 25
6. Heat exchanger according to claim 5, **characterized** in that the rear edge (18) of the plate is bent downwards to form a flue-gas pocket under the heat exchanger. 30
7. Heat exchanger according to claims 1-6, **characterized** in that the slot (15) has a breadth of about 5-7 mm for the whole of its length. 35

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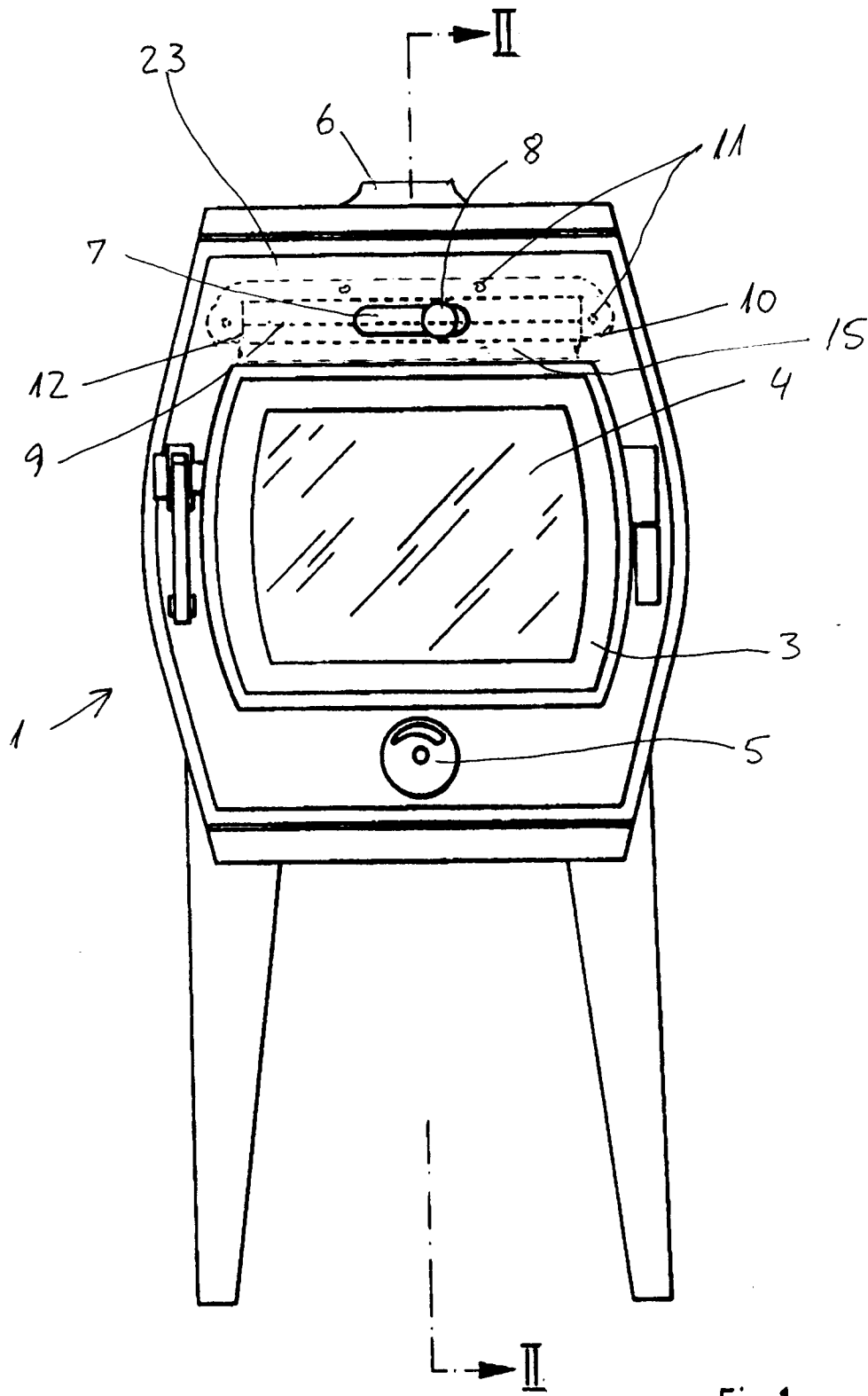


Fig.1

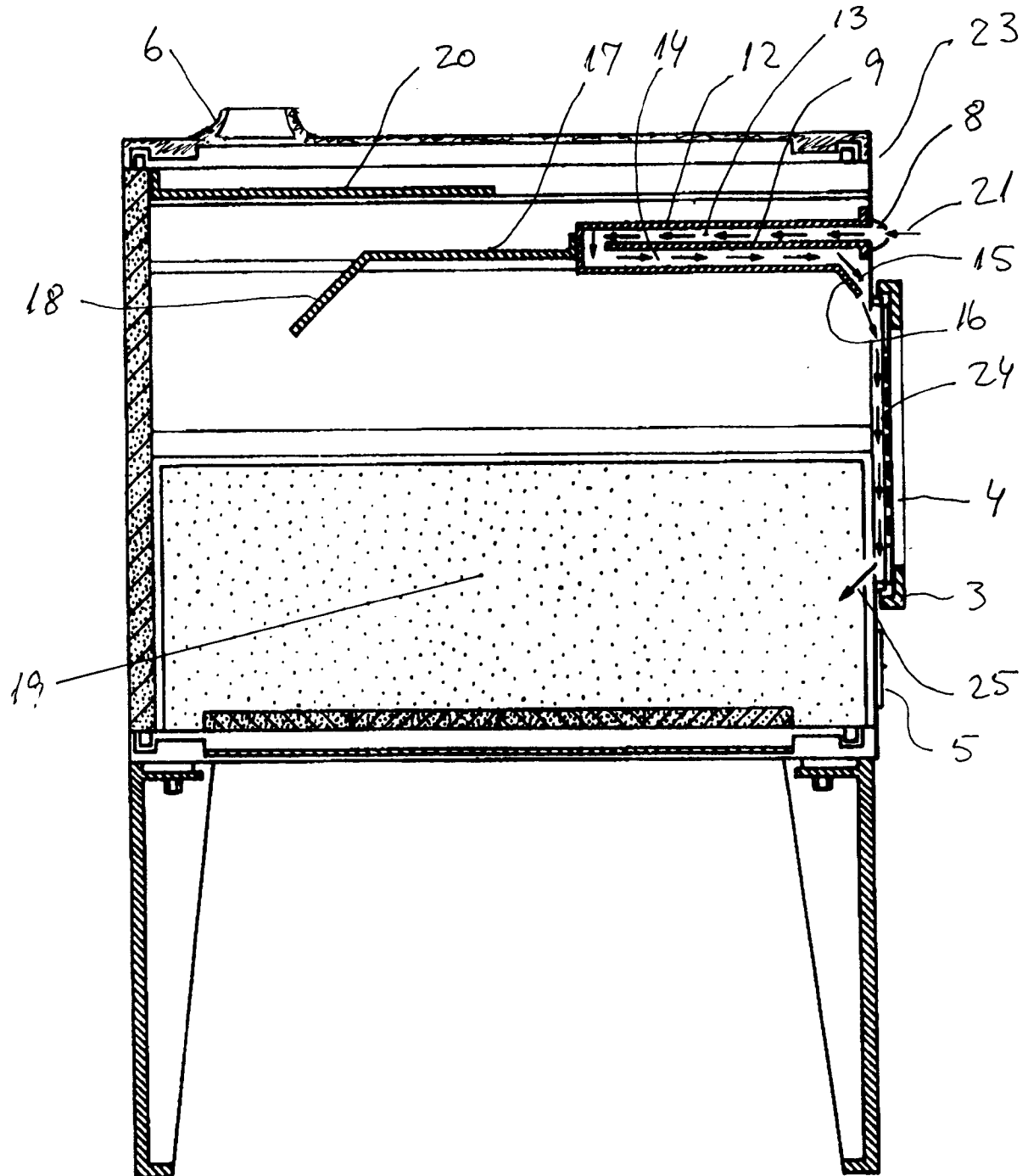


Fig. 2

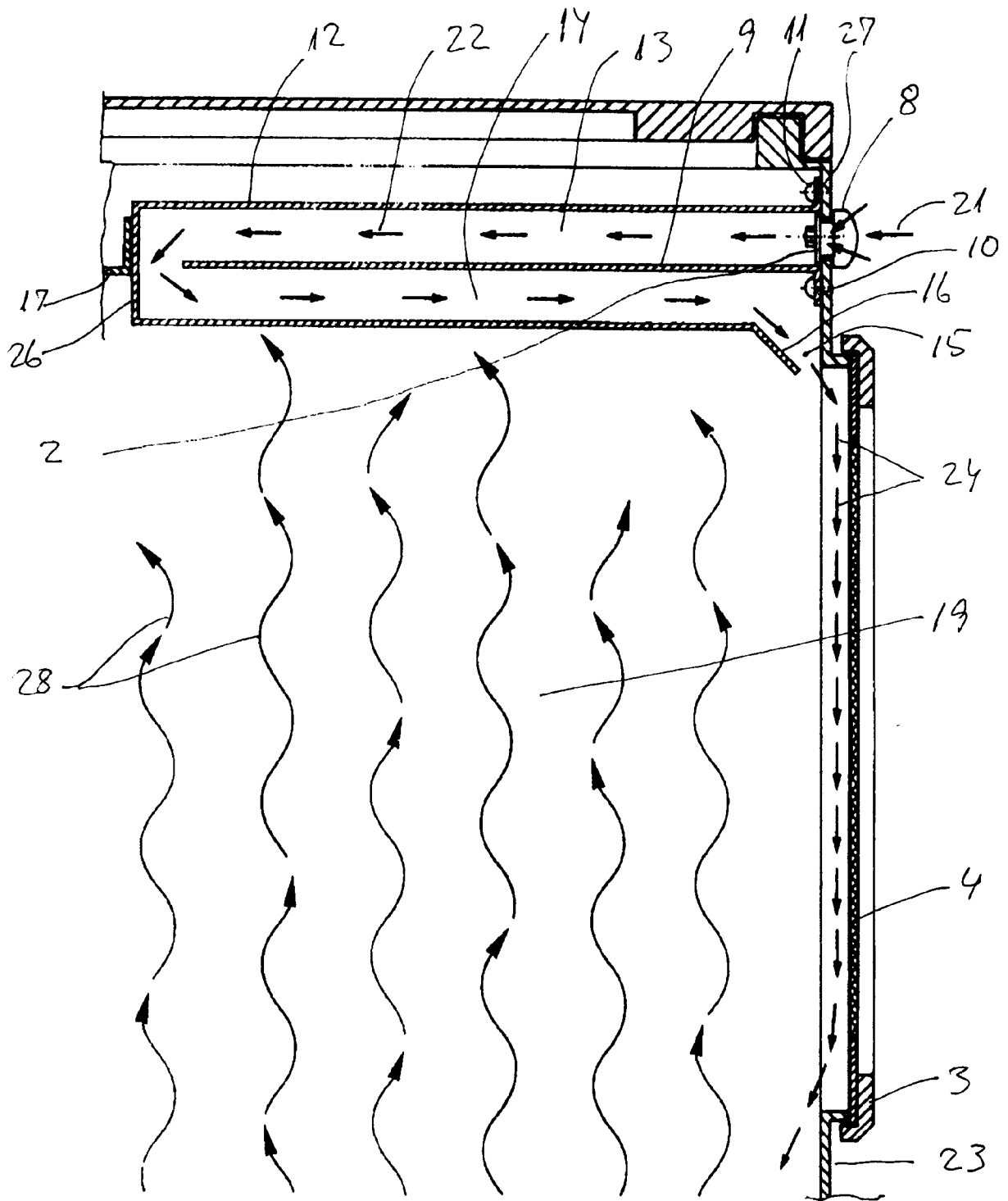


Fig. 3