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(54) **Gas fireplace**

(57) A gas fireplace (1) comprises a support and housing frame (2, 3), a gas combustion chamber (9), at least one chimney duct (23) for releasing flue gases, coming from said combustion chamber (9), at least one inlet duct (21) for external comburent air leading to said combustion chamber (9), a ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32) designed to suck environment

air, and heat and fed it at least partly into the space where the fireplace (1) is located, and at least one motor-driven fan (30) designed to operate in said ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32). The gas fireplace further comprises at least one silencer device (33) provided along said ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32).

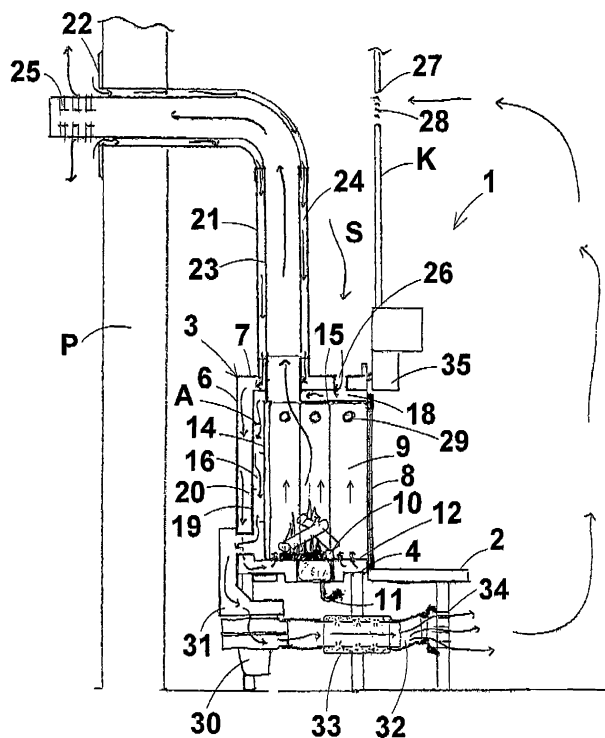


Fig. 2

Description

[0001] The present invention relates to an improved gas fireplace, particularly suitable for heating house spaces.

[0002] Numerous fireplaces have been proposed in the art that are fed with gas, generally methane gas or, more recently, gpl (liquefied petroleum gas).

[0003] Conventional gas fireplaces generally comprise either a frontally closed combustion chamber or a frontally open fireside, a comburent air intake, an exhaust duct for flue gases, and an air circuit designed to suck room air to be heated, to heat the sucked air, and to discharge the heated air into the room where the gas fireplace is located.

[0004] Such fireplaces have a number of serious drawbacks. As a matter of fact, room air is sucked from the room where the fireplace is located, typically through openings or mouths formed in the lower portion of the fireplace, is heated mainly owing to convective heat exchange through metal walls of the combustion chamber or fireside, and is then fed back into the room through one or more warm air delivering mouths formed in the upper front portion of the fireplace.

[0005] Warm air released from the upper front of the fireplace is often a source of nuisance for people standing in front of the fireplace, since they are hit by a warm air flow. In any case, such a fireplace system is unsuitable for quickly heating room air below the warm air delivery level, where instead a quick warming is desirable as warm air flow obviously tends to flow upwards towards the room ceiling, thus resulting in an undesired heat gradient being generated, at least at the initial stage of heating a room, between the air close to the ceiling and the air below the level of the air outlet mouth or mouths, which means uneven heating of the room.

[0006] A conventional fireplace of this type is disclosed in US-6 050 259 patent.

[0007] The operations of sucking room air and feeding it back, once heated, into the same room are carried out by a motor-driven fan generally driven by an electric motor, which is designed to suck relatively cold air from the room and deliver it in a warmed and forced condition back into the same room through the one or more delivery mouths.

[0008] To obtain a good heating efficiency of the fireplace, it is generally necessary, besides providing an efficient heat exchange between flue gases and sucked room air, to keep a relatively high flow of room air through the fireplace,

[0009] For obtaining this desired result, in recent years increasingly more powerful fans have been used, which results in a considerable increase in the noise pollution caused by large amounts of air flowing through the fan and ventilation chambers, and intake and delivery ducts.

[0010] The main object of the present invention is to provide a gas fireplace which makes it possible to eliminate or at least substantially reduce the above men-

tioned drawbacks. Another object of the present invention is to provide a gas fireplace having optimum efficiency, very high yield and autonomy, and suitable for quickly and evenly heating the space where it is located.

[0011] A further object of the present invention is to provide a gas fireplace that can be manufactured at a low production cost and can be easily installed.

[0012] These and other objects, which will better appear below, are attained by a gas fireplace according to the present invention, comprising a support and housing frame, a gas combustion chamber, at least one chimney duct for releasing flue gases coming from said combustion chamber, at least one inlet duct for external comburent air leading to said combustion chamber, a ventilation and heating circuit designed to suck environment air, and to heat and feed it at least partly into the space where the fireplace is located, and at least one motor-driven fan designed to operate in said ventilation and heating circuit, characterized in that at least one silencer device is provided along said ventilation and heating circuit.

[0013] Advantageously, said silencer device is arranged downstream of said motor-driven fan.

[0014] Preferably, said motor-driven fan is arranged downstream of said ventilation and heating circuit, whereby room air is sucked through one or more suction mouths provided at at least one upper portion of the fireplace above said combustion chamber, and fed in a warmer state into the space at at least one delivery mouth provided at at least one lower portion located below said combustion chamber,

[0015] To increase the heat exchange efficiency between the relatively hot flue gases and the external comburent air as well as the relatively cold room air, the external inlet comburent air is pre-heated through heat exchange with the flue gases being discharged along the or each chimney duct, and transfer a portion of its pre-heating heat to the room air to be heated.

[0016] Preferably, pre-heating of external comburent air is carried out by locating the or each chimney duct inside a respective outer comburent air feeding duct so that a gap is formed therebetween through which external comburent air can flow, thereby countercurrent heat exchange is obtained between flue gases and external comburent air.

[0017] Advantageously, said gas fireplace has a hood adapted to delimit a space above said combustion chamber for a desired room air conveyance.

[0018] Preferably, said ventilation and heating circuit comprises at least one humidifier device for the heated air delivered into the room.

[0019] Further aspects and advantages of a gas fireplace according to the present invention will be better apparent from the following detailed description given with reference to the accompanying drawings, in which:

Figure 1 is a front view of a gas fireplace according to the present invention;

Figure 2 shows a side cross sectional view taken

along a vertical line of the fireplace in Figure 1 provided with a hood; and

Figure 3 is a front cross sectional view taken along a vertical line of the fireplace in Figure 2.

[0020] With reference to the above listed Figures, a gas fireplace according to the present invention, generally designed with reference numeral 1, comprises a support and housing frame including a base 2, preferably covered with lining members, e.g. made of marble or ceramic material, from which a substantially parallelepiped housing 3 rectangular in top view rises. The housing 3 delimits a closed inner space and comprises a lower or bottom wall 4, two side walls 5a, 5b, a rear wall 6, an upper or ceiling wall 7, as well as a front door 8, preferably made of glass or, more preferably, ceramic glass, in order to ensure a good heat-tight arrangement.

[0021] The inner space of the housing 3 is subdivided into a number of adjacent chambers, as described below.

[0022] In the innermost portion there is provided a combustion chamber 9, where a gas burner 10 is located, to which fuel gas can be fed through a feeding duct 11 in fluid communication with a suitable fuel gas source (not shown in drawings), e.g. a methane gas pipe network or a gpl feeding tank or even a bottle of another suitable liquefied gas fuel, as it is well known in the art. The combustion chamber 9 is sealed and made of metallic material, preferably cast iron, thereby ensuring an efficient heat exchange between the inner and outer portions of the combustion chamber. If desired, the combustion chamber is internally covered with refractory material. More particularly, the combustion chamber 9 is delimited by a lower or bottom wall 12, two side walls 13a and 13b, a rear wall 14, an upper wall or ceiling 15, and the front door 8.

[0023] Outside the combustion chamber 9 one or more ventilation chambers are delimited, preferably a rear ventilation chamber 16, two side ventilation chambers 17a and 17b, preferably in direct communication with the rear chamber 16, and an upper ventilation chamber 18, owing to the presence of one or more metal partitions 19, which are located in such a manner as to extend around the combustion chamber 9, but at a given distance therefrom.

[0024] Advantageously, the walls of the ventilation chambers 16, 17a, and 17b can have finings A to enhance the heat exchange efficiency between hot flue gases and air to be heated.

[0025] Between the rear wall 6 and the side walls 5a and 5b of the housing 3 and the metal partitions 19 one or more chambers 20 for external comburent air are delimited, which extend at the lower portion thereof below the combustion chamber 9 between bottom wall 12 of the latter and the bottom wall 4 of the housing 3, and lead to the burner 10, whereas at the upper portion thereof the same chambers are in fluid communication with a metal inlet duct 21 for external comburent air.

[0026] Duct 21 has its inlet mouth 22 for external comburent air outside the space or room to be heated where

the gas fireplace 1 is located (Figure 2), and advantageously extends through a wall P of a building,

[0027] The combustion chamber 9 at its ceiling 15 is in communication with a metal chimney duct 23 arranged to exhaust the flue gases and preferably extends inside the inlet duct 21 for external comburent air, thereby delimiting therewith a gap 24 suitable for delimiting a comburent air passage, which passage is in countercurrent heat exchange with the relatively hot flue gases coming from the combustion chamber 9. As known in the art, the chimney duct 23 ends with an exhaust diffuser 25 beyond the inlet mouth 22 for comburent air.

[0028] The upper ventilation chamber 18 is in communication with both the rear and the side ventilation chambers 16, 17a, and 17b, respectively, and a plurality of upper openings 26, only one of which is shown in Figure 2, above which, in the case in which the gas fireplace is equipped with a hood K, there is preferably provided a space S for conveying room air sucked through one or more mouths 27 arranged in the hood K and preferably provided with grid 28, before entering in a ventilation and heating circuit through openings 26.

[0029] The ventilation and heating circuit for room air also comprises, besides the ventilation chambers 16, 17a, 17b, and 18, a motor-driven fan 30, preferably a solenoid valve having a relatively large flow rate, whose suction side is in fluid communication with a lower manifold 31, which is in turn in communication with the ventilation chambers 16, 17a, 17b, and 18, whereas its delivery side is connected to a feeding duct 32 for heated room air located at the base 2 below the combustion chamber 9.

[0030] The delivery duct 32 is intercepted by a silencer device 33 of any suitable type designed to eliminate or substantially deaden noises produced in the forced air flow inside the feeding duct 32. Downstream of the silencer device 33 there is provided a mouth 34 for delivering heated room air into the space to be heated, optionally together with one or more intakes for a duct (not shown in drawings) for heated room air to be supplied to rooms adjacent to the space in which the gas fireplace 1 is located.

[0031] At the front of the gas fireplace 1, preferably above the combustion chamber 9, a humidification device 35 can be provided which comprises a water reservoir, that owing to heat exchange with hot flue gases coming from the combustion chamber, as well as to heat exchange with room air conveyed into the space S, in the case of a gas fireplace provided with a hood K, evaporates, thereby causing heated air delivered into the room in which the gas fireplace 1 is located to become less dry, and thus more pleasant.

[0032] Relatively cold external comburent air enters the fireplace through one or more wall-type or roof-type mouths 23, flows through inlet duct 21 for comburent air, and reaches the comburent air chamber 20, from where it flows below the combustion chamber 9 before entering the same from below to feed the combustion of gas sup-

plied to burner 10 through the gas feeding duct 11.

[0033] Due to the combustion reaction, relatively hot flue gases are generated in the combustion chamber 9, which leave the combustion chamber along the chimney 23, to be thus discharged and dispersed in the environment through diffusor 25.

[0034] Advantageously, since the chimney duct 23 extends into inlet duct 21 for external comburent air, as specified above, inlet air is in convective countercurrent heat exchange relationship with the hot flue gases, which results in comburent air flowing through the gap 24 being progressively pre-heated and the outlet flue gases being consequently cooled.

[0035] On the contrary, room air to be heated enters the ventilation and heating circuit of the gas fireplace 1 at the upper openings 26, or, if the gas fireplace 1 is equipped with a hood K, through mouths 27 provided with grid 28, formed in the hood K. Owing to the motor-driven fan 30, room air sucked into the ventilation and heating circuit is forced to flow through ventilation chambers 16, 17a, and 17b arranged between the combustion chamber 9 and the comburent air chamber or chambers 20. Inside the ventilation chambers 16, 17a, 17b air is heated owing to a double heat exchange, i. e. with the walls 13a, 13b, and 14, respectively, of the combustion chamber 9, which are licked by hot flue gases, and the partitions 19, licked by comburent air which was previously heated due to heat exchange with hot flue gases being discharged through the chimney duct 23.

[0036] The delivery mouth of the fan 30 is connected, through the silencer device 33 for eliminating any tedious noises generated in the heated air delivery flow, to one or more heated air delivery ducts through which heated air is delivered through openings 34 in the room in which the gas fireplace 1 is located, or is also partly supplied through suitable ducts into adjacent rooms.

[0037] The above described invention is susceptible to numerous modifications and variations within the scope as defined by the claims.

[0038] Thus, for example, in the ventilation and heating circuit, side ventilation chambers 17a and 17b can be placed into communication with one another through one or more tubular members 29 extending from one chamber to another through the combustion chamber 9 at the upper wall or ceiling 15 thereof. Moreover, ventilation chambers 16, 17a, 17b can be located outside the comburent air chamber 20, rather than being provided between the external comburent air chamber 20 and the combustion chamber 20.

[0039] Furthermore, although in the above described embodiment a chimney duct 23 for discharging flue gases and an inlet duct 21 for comburent air are arranged so as to delimit a gap 24 therebetween for comburent air flowing through and being preheated, the present invention also relates to an arrangement comprising a direct intake of comburent environment air, i.e. through a comburent air inlet duct 21 for connecting the combustion chamber 9 to the external environment without preheat-

ing the inlet comburent air along the chimney.

[0040] Of course, the silencer device 33 will also be provided upstream of the solenoid valve 30, whereby it can operate both on the intake or delivering side thereof.

Claims

1. A gas fireplace comprising a support and housing frame (2, 3), a gas combustion chamber (9), at least one chimney duct (23) for releasing flue gases coming from said combustion chamber (9), at least one inlet duct (21) for external comburent air leading to said combustion chamber (9), a ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32) designed to suck environment air, and heat and feed it at least partly into the space where the fireplace (1) is located, and at least one motor-driven fan (30) designed to operate in said ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32), **characterized in that** at least one silencer device (33) is provided along said ventilation and heating circuit (16, 17a, 17b, 18, 26, 29, 32).
2. A gas fireplace as claimed in claim 1, **characterized in that** said at least one silencer device (33) is arranged upstream or downstream of a respective motor-driven fan (30).
3. A gas fireplace as claimed in claim 1 or 2, **characterized in that** the or each chimney duct (23) and a respective inlet duct (21) for external comburent air are arranged one inside another thereby delimiting a gap (24) through which a comburent air flow is in countercurrent heat exchange relationship with flue gases flow in said chimney duct (23).
4. A gas fireplace as claimed in claim 1 or 2, **characterized in that** said inlet duct (21) for external comburent air is designed to feed comburent air to said combustion chamber (9) with no pre-heating of the comburent air.
5. A gas fireplace as claimed in any previous claim, **characterized in that** said ventilation and heating circuit comprises at least one ventilation chamber (16, 17a, 17b, 18, 29).
6. A gas fireplace as claimed in any previous claim, **characterized in that** said motor-driven fan (30) has a suction side thereof in fluid communication with at least one ventilation chamber (16, 17a, 17b) and a delivery side thereof in fluid communication with at least one heated room air feeding duct (32).
7. A gas fireplace as claimed in any previous claim, **characterized in that** said at least one ventilation chamber (16, 17a, 17b) is located in heat exchange

relationship between said at least one comburent air chamber (20) and said combustion chamber (9).

8. A gas fireplace as claimed in any previous claim, **characterized in that** said at least one ventilation chamber (16, 17a, 17b) is located outside said at least one comburent air chamber (20) and in heat exchange relationship therewith. 5
9. A gas fireplace as claimed in any previous claim, **characterized in that** it comprises a hood (K) delimiting an upper space (S) for room air to be heated and conveyed to said ventilation and heating circuit (16, 17a, 17b, 18, and 29), 10
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10. A gas fireplace as claimed in any previous claim, **characterized in that** it comprises at least one humidification device (35) for heated air delivered into the room. 20
11. A gas fireplace as claimed in any previous claim, **characterized in that** said at least one combustion chamber (16, 17a, 17b) of said ventilation and heating circuit in heat exchange relationship with said at least one comburent air chamber (20) and said combustion chamber (9) has a plurality of finings (A). 25

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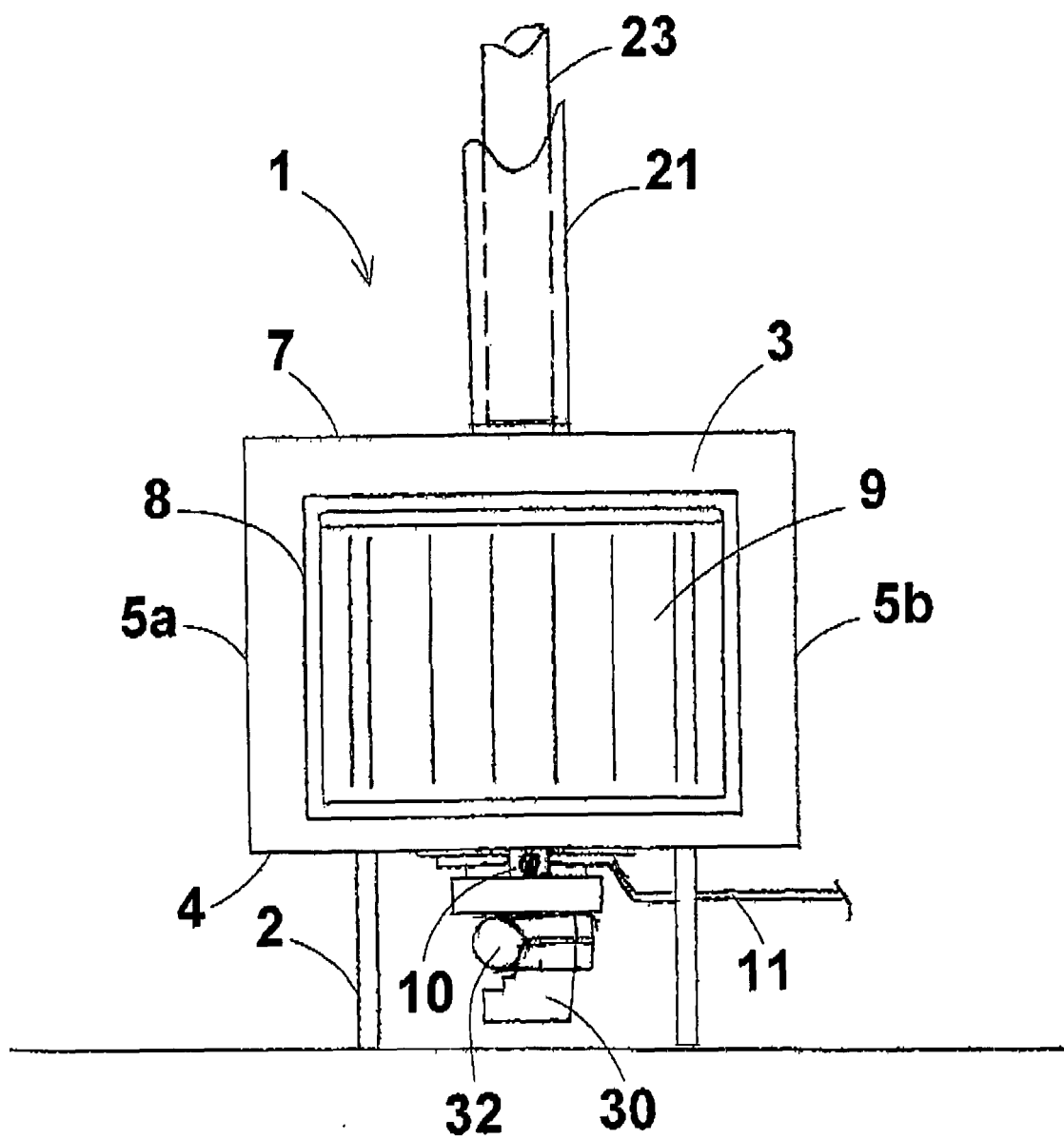


Fig. 1

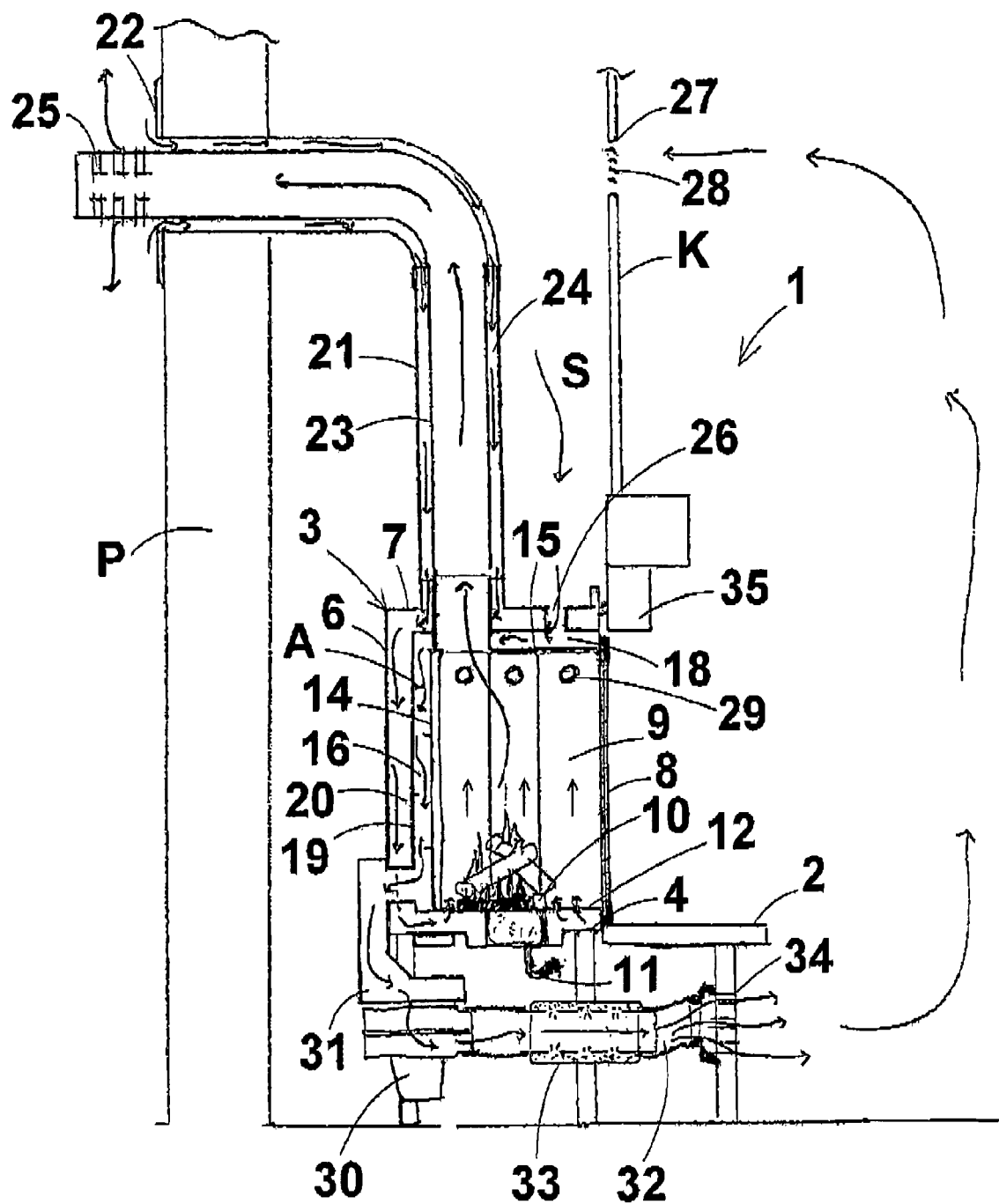


Fig. 2

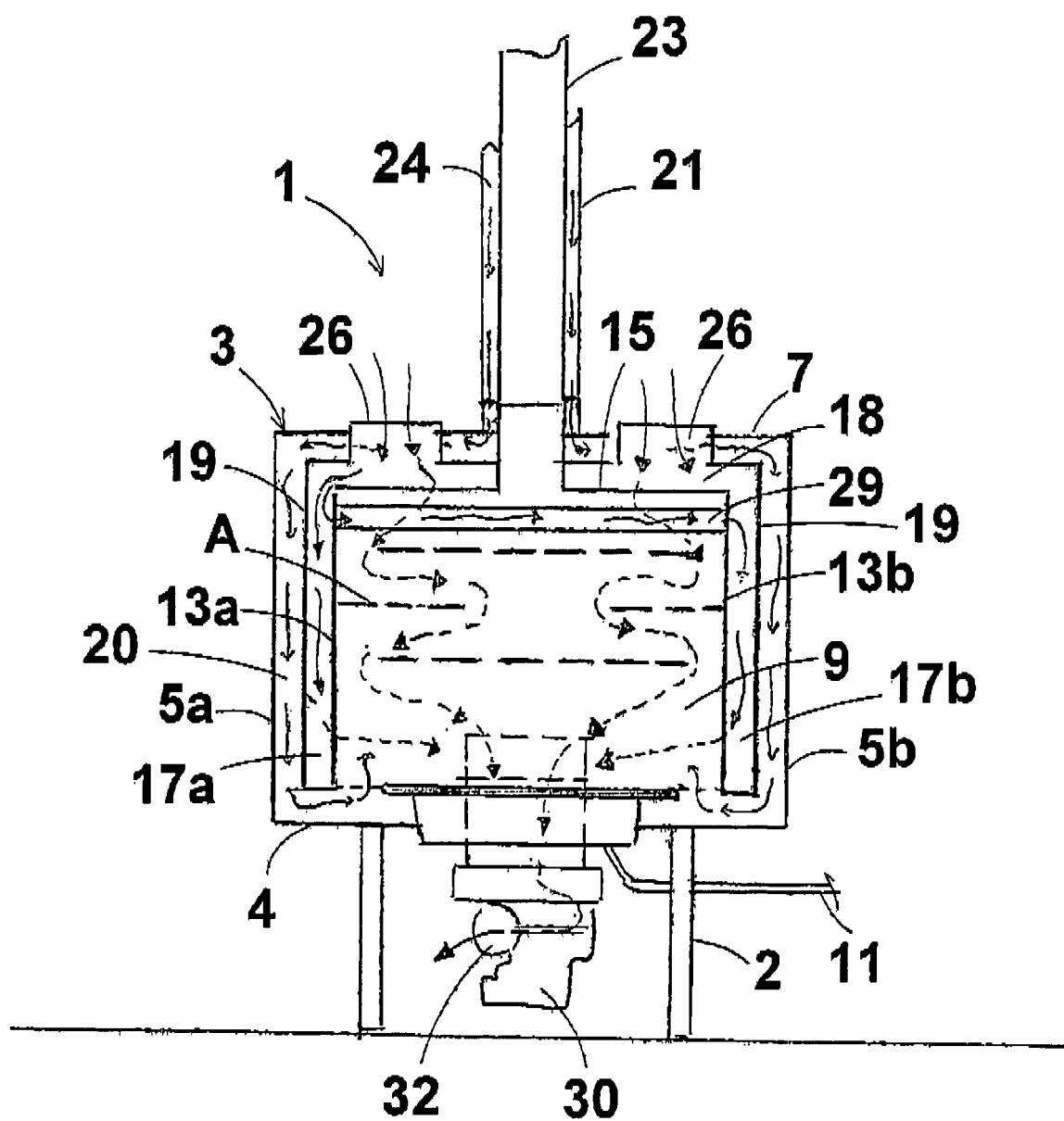


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6050259 A [0006]