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(54) Burner appliance.

(57) Burner appliance with closed housing (2) in which one or more inlets (4) for combustion air are disposed. Within the housing (2) there are a burner unit (8) and the inlet of a flue gas discharge duct (26) in which a heat exchanger (24) is fitted. A fan (22) provides a forced flow of air and flue gases in the burner appliance. Provision is made within the housing (2) for an air flow path from at least one air inlet (4) to the inlet of the flue gas discharge duct (26) outside the combustion zone (30) of the burner unit (8). The space between the combustion zone (30) and the opposite inner wall of the housing (2) next to the combustion surface (20) can be essentially free from obstacles, or the combustion zone (30) can be surrounded at least partially by one or more walls which extend up to a predetermined distance from the inlet of the flue gas discharge duct (26).

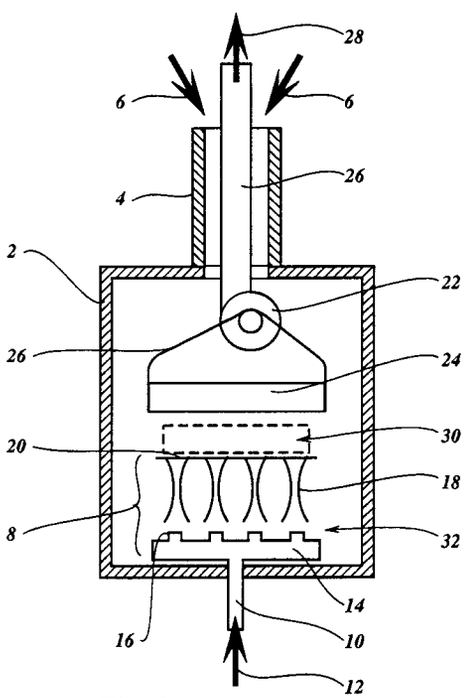

Fig. 1

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The invention relates to a burner appliance comprising: an essentially closed housing having one or more air inlets for admitting air into the housing; a burner unit, disposed within the housing, for mixing the air with a combustible gas supplied under pressure and burning the premixed gas/air mixture from a combustion surface in a combustion zone within and at least locally at a distance from the housing; a flue gas discharge duct having an inlet fitted within the housing; a heat exchanger for the transfer of heat of flue gases to a medium present in the heat exchanger; a fan for forced flow of air and flue gases in the burner appliance; and an air flow path within the housing from at least one air inlet to the inlet of the flue gas discharge duct outside the combustion zone of the burner unit.

Such a burner appliance is known from GB-A-2 255 169, in which a combustion chamber is formed by walls comprising cooling channels and extending from the combustion surface to a heat exchanger. Flue gases from the combustion zone in the combustion chamber pass through the heat exchanger and into the housing, where the flue gases are removed through the flue gas discharge duct of which the inlet is situated above the heat exchanger. An air flow path stretches from the air inlet of the housing to the inlet of the flue gas discharge duct outside the combustion zone of the combustion chamber, also bypassing the heat exchanger. A configuration of this type, in which the air is offered a bypass route through the burner appliance, leads to mixing of the combustible gas and the air in the mixer of the burner unit which is now primarily determined by the configuration of the mixer, since the pressure difference, in operation, between that zone of the burner unit in which mixing of gas and air takes place and the combustion zone of the burner unit can be made very small. This means that the combustion is also virtually independent of variations in the fan flow rate as a result of temperature changes of the air drawn in (in the case of a fan fitted in the air inlet) or temperature changes of the flue gases (in the case of a fan fitted in the flue gas discharge duct), fan tolerances and the chosen length of the flue gas discharge duct (in the case of a fan fitted in the flue gas discharge duct). Protection and monitoring of the burner appliance can therefore be carried out simply and inexpensively.

A drawback of the known burner appliance is the high cost of constructing the combustion chamber using sheet metal work and insulation, while also pressure tight connections for the cooling channels have to be provided, all materials being exposed to very elevated temperatures generated by the combustion of the air/gas mixture in the combustion chamber.

A further drawback of the known device is its poor accessibility of the interior of the combustion chamber for service or maintenance purposes; the interior of the combustion chamber is in fact closed and can only be accessed by removing the heat exchanger or one or more of its walls.

The object of the invention is to reduce significantly the above-mentioned drawbacks, to which end the burner appliance of the abovementioned type, in particular for a burner premixed to 100 % or more, which burners are being used more and more widely because of their low NO_X emissions, is characterized according to the invention in that the space between the combustion zone and the opposite inner side of the wall of the housing next to the combustion surface is essentially free of obstacles. In this arrangement material is saved compared to the prior art, since sheet metal work and insulation around the combustion zone can be dispensed with. In addition, no cooling of walls of a combustion chamber is necessary. In operation, the walls of the housing of the burner appliance stay relatively cool, since they are only exposed to heat radiation, and they are cooled by air flowing along the inner side of the walls. Preferably, these inner sides are made reflecting in order to further reduce the heat load on the walls of the housing. The burner unit of the burner appliance according to the invention is very easily accessible.

Preferably provision is made for the pressure difference, in operation, between that zone of the burner unit in which mixing of gas and air takes place and the combustion zone of the burner unit to be very small, for example less than 0.3 Pa.

In another embodiment built according to the same inventive idea the combustion zone is surrounded at least partially by one or more walls which extend up to a predetermined distance from the inlet of the flue gas discharge duct. The bypass route thus formed for the air near the inlet of the flue gas discharge duct also compensates for virtually any variation in the fan flow rate, without the combustion being affected thereby. Practically the same advantages can be obtained as in the former embodiment according to the invention, the wall or walls keeping the flames in the combustion zone steady.

In a preferred embodiment of the burner appliance according to the invention a low wall extends from the combustion surface for stabilising the flames on the combustion surface. Such a low wall, e.g. only a few cm high, is provided to protect the flame feet from the effects of the air flows in the housing.

The walls surrounding the combustion zone may comprise overlapping plates which are spaced apart from one another at the point of overlap.

Preferably, the fan in the burner appliance is fitted in the flue gas discharge duct, in particular downstream with respect to a heat exchanger which is also fitted in the flue gas discharge duct.

The invention is explained in more detail with reference to the drawing, in which:

Figure 1 schematically shows, in partial cross-section, an embodiment of the burner appliance according to the invention;

Figure 2 illustrates another embodiment of the burner appliance according to the invention; and

Figure 2a illustrates an alternative embodiment of the burner appliance according to Figure 2.

Figure 1 shows a housing 2 which is provided with an inlet 4 for admitting air into the housing 2 in the direction of the arrows 6.

Situated within the housing 2 there is a burner unit which is indicated in its entirety by 8, and which can be supplied, via an inlet 10 and in the direction of arrow 12, with a combustible gas or gas mixture under pressure. The gas flows via the inlet 10 to a manifold 14 which is provided with a number of outflow orifices 16. Gas flowing from the outflow orifices 16 mixes, in a mixer 18, with the air present within the housing 2 and can be ignited on that side of a combustion surface 20 provided with burner ports which faces away from the outflow orifices 16. No secondary air is used in the combustion.

The flue gases produced in the combustion of the combustible gas or gas mixture are discharged by being drawn off through a flue gas discharge duct 26 disposed coaxially within the air inlet 4, with the aid of a fan 22 via a heat exchanger 24, and being pressed in the direction of the arrow 28. The free space next to the combustion surface 20 around the combustion zone 30 is large, and the pressure in the combustion zone, indicated by arrow 30 and denoted by a dashed line, of the burner appliance shown is approximately equal to the pressure in the burner unit 8 at the point indicated by arrow 32. This means that mixing of the combustible gas or gas mixture and the air in the mixer 18 is essentially determined by the configuration of the burner unit 8. Consequently, the combustion in the burner appliance is highly independent of variations of the fan flow rate as a result of temperature changes, tolerances of the fan 22 or the length of the flue gas discharge duct 26. The inlet of the flue gas discharge duct 26 on the intake side of the fan 22 as it were operates in the same way as an exhaust hood.

During testing of a specific burner appliance configured in accordance with Figure 1, the following measurement results were determined. At full output capacity (29 kW) of the burner appliance, the fan flow rate or delivery (in kg/s) is assumed to be 100 %. 84 % of this comes from the combustion zone 30 (and has therefore been drawn in from zone 32 and mixer 18), and 16 % comes from the zone around the combustion zone. If the output capacity of the burner appliance is adjusted downwards to 10 kW, the fan delivery increases, on the basis of the values given above, to 120 %, of which 26 % comes from the combustion zone 30 (via zone 32 and mixer 18) and the remaining 94 % comes from the zone around the combustion zone. This shows that the combustion is virtually unaffected upon modulation of the capacity.

Figure 2 shows a burner appliance which is essentially configured identically to the burner appliance according to Figure 1. In addition, however, there is arranged around the combustion zone 30 above the combustion surface 20 a wall 34 which protects the flame feet from the effects of air flows in the housing. The bypass route for the air, which is indicated at 36, ensures that variations in the delivery of the fan 22 have virtually no effect on the pressure in the burner appliance at the point indicated by the arrow 32. The wall 34 can further be constructed from overlapping plates which are spaced apart from one another at the point of overlap but are otherwise tight.

In the embodiment shown in Figure 2a, the fan 22, for the purpose of forced flow of air and flue gases in the burner appliance according to the invention, is not fitted in the flue gas discharge duct 26, as specified in Figures 1 and 2, but is accommodated in the air inlet 4. Thus air is forced via the air inlet 4 in the direction of the arrow 6 into the housing 2. Apart from this, the configuration of the burner appliance according to Figure 2a corresponds to that of the burner appliance according to Figure 2.

Within the scope of the invention, the embodiment of the burner appliance can be varied. The orientation of the burner appliance shown in the Figures can involve the flue gas discharge duct 26 pointing in an upward direction, but also a sideways or downward direction. The combustion surface 20 likewise can be set up per se at an angle with respect to the orientation shown in the figures. The air inlets can pass through the housing 2 at any other point required, as long as no undesirable interference takes place between air and flue gases. The inner side of the walls of the housing 2 facing the combustion zone 30 may be made reflecting or may be provided with a simple, cheap reflecting plate or sheet material for reducing the temperature of the housing walls by reflecting the heat radiation from the combustion zone.

Claims

1. Burner appliance comprising:

an essentially closed housing (2) having

one or more air inlets (4) for admitting air into the housing;

a burner unit (8), disposed within the housing (2), for mixing the air with a combustible gas supplied under pressure and burning the premixed gas/air mixture from a combustion surface (20) in a combustion zone (30) within and at least locally at a distance from the housing;

a flue gas discharge duct (26) having an inlet fitted within the housing (2);

a heat exchanger (24) for the transfer of heat of flue gases to a medium present in the heat exchanger;

a fan (22) for forced flow of air and flue gases in the burner appliance; and

an air flow path within the housing (2) from at least one air inlet (4) to the inlet of the flue gas discharge duct (26) outside the combustion zone (30) of the burner unit (8), characterized in that the space between the combustion zone (30) and the opposite inner side of the wall of the housing (2) next to the combustion surface (20) is essentially free of obstacles.

2. Burner appliance comprising:

an essentially closed housing (2) having one or more air inlets (4) for admitting air into the housing;

a burner unit (8), disposed within the housing (2), for mixing the air with a combustible gas supplied under pressure and burning the premixed gas/air mixture from a combustion surface (20) in a combustion zone (30) within and at least locally at a distance from the housing;

a flue gas discharge duct (26) having an inlet fitted within the housing (2);

a heat exchanger (24) for the transfer of heat of flue gases to a medium present in the heat exchanger;

a fan (22) for forced flow of air and flue gases in the burner appliance; and

an air flow path within the housing (2) from at least one air inlet (4) to the inlet of the flue gas discharge duct (26) outside the combustion zone (30) of the burner unit (8), characterized in that the combustion zone (30) is surrounded at least partially by one or more walls (34) which extend up to a predetermined distance from the inlet of the flue gas discharge duct (26).

3. Burner appliance according to claim 2, characterized by a low wall (34) extending from the combustion surface (20) for stabilising the flames on the combustion surface.

4. Burner applicance according to claim 2, characterized in that the combustion zone (30) is surrounded by overlapping plates (34) which are spaced apart from one another at the point of overlap.

5. Burner appliance according to any of claims 1-4, characterized in that the heat exchanger (24) is fitted in the flue gas discharge duct (26).

6. Burner appliance according to any of claims 1-5, characterized in that the fan (22) is fitted in the flue gas discharge duct (26).

7. Burner appliance according to claim 5 and 6, characterized in that the fan (22) is fitted downstream with respect to the heat exchanger (24) in the flue gas discharge duct (26).

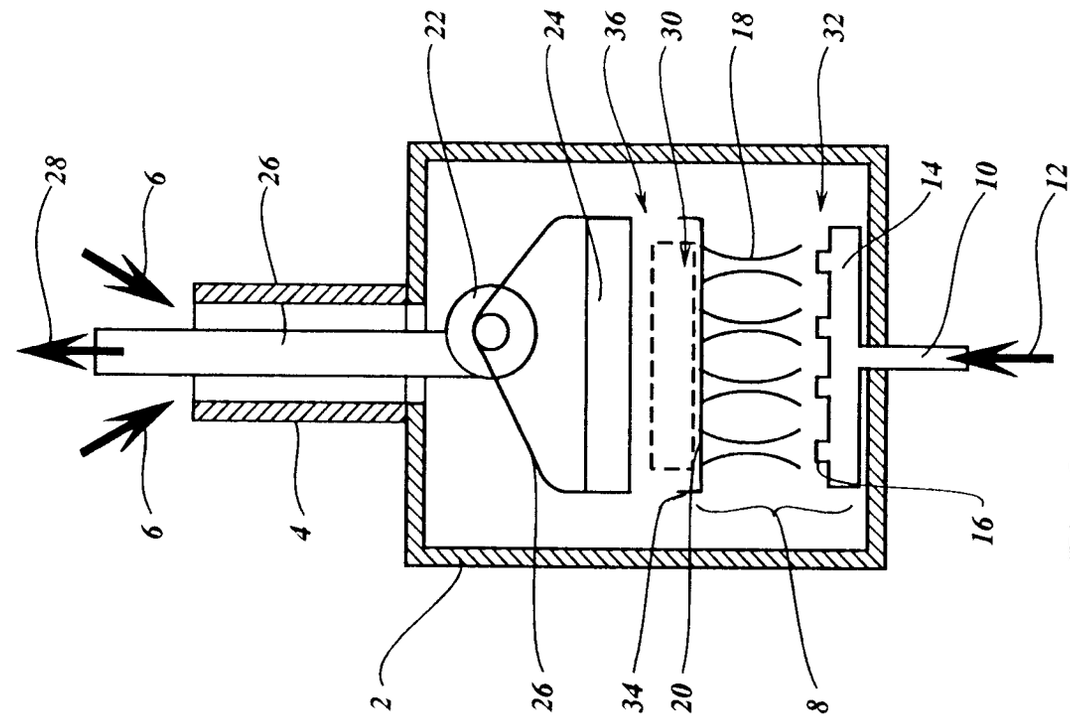
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Fig. 2

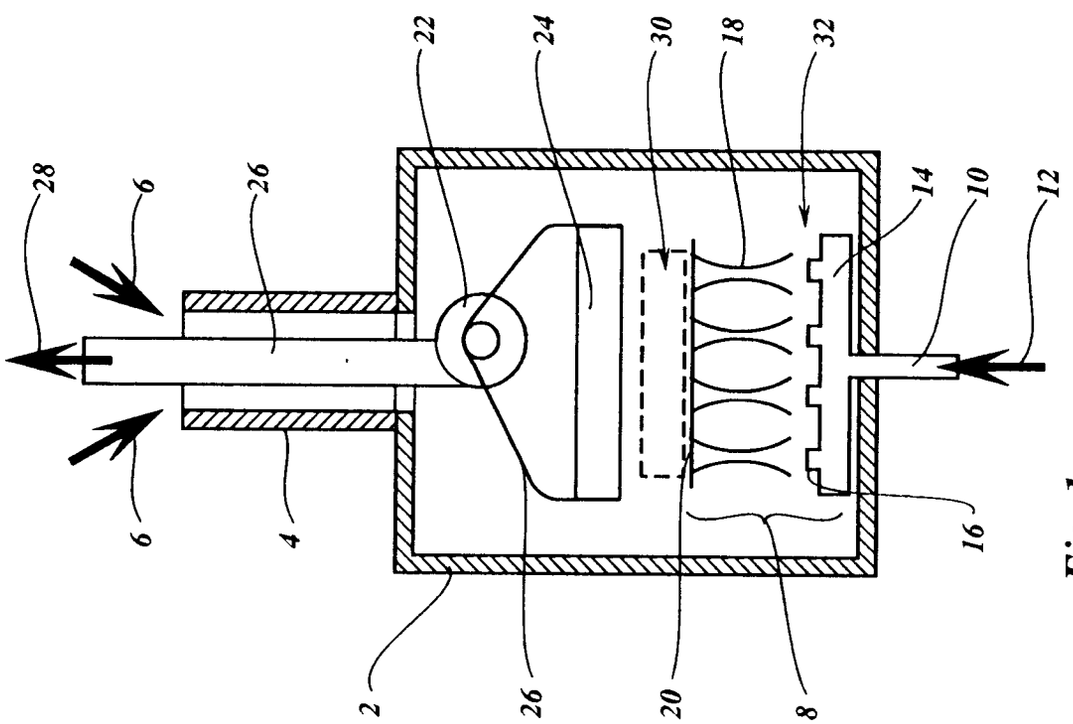
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Fig. 1

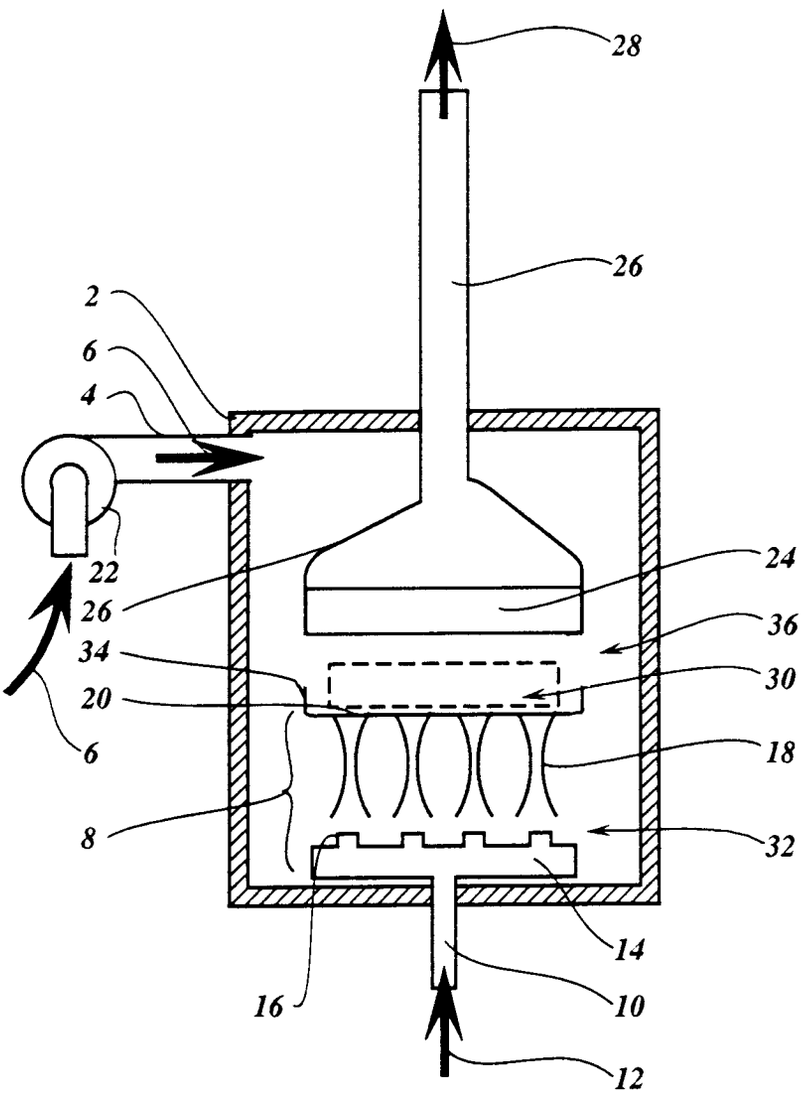

Fig. 2a

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EUROPEAN SEARCH REPORT

Application Number
EP 94 20 3412

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y,D	GB-A-2 255 169 (HEPWORTH HEATING LIMITED) * abstract * * page 6, last paragraph - page 8, paragraph 2 * * figures 1-3 *	1,2,5-7	F23C5/08 F23L9/04 F24H1/12
Y	DE-U-85 20 263 (VAILLANT GMBH) * page 4, paragraph 1 - page 5, paragraph 1; figure 1 *	1,2,5-7	
A	EP-A-0 109 620 (VAILLANT GMBH) * page 5, last paragraph - page 7, last paragraph; figure 2 *	1,2,5-7	
A	DE-U-91 08 632 (JOH. VAILLANT GMBH) * page 2, paragraph 2 - page 2, paragraph 4 * * page 17, paragraph 1 - page 17, paragraph 2 * * figure 1 *	3	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F23C
F23L
F24H
F23N
F23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 March 1995	Phoa, Y

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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