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(54) Low NOx gas burner.

(57) A burner comprising at least one burner tube (1) having a plurality of gas outlet orifices forming a burner bed. A plurality of plates (8) are extending upwards from the sides of the burner tube within the reach of the flames. These plates, which lower the flame temperature, and promote a staged combustion, are arranged parallel to and on opposite sides of the gas outlet orifices and are directly connected to the burner tube mainly through their lower ends. At least one of the upper ends of the plates is bent outwards, which leads to improved cooling, improved mixing of combustion gas and secondary air and hence to improved combustion.

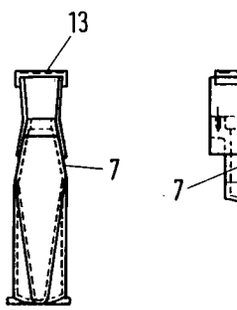

FIG.3

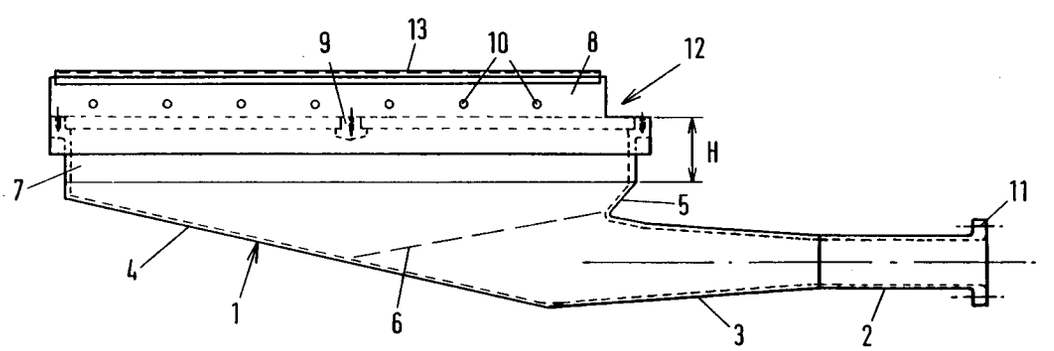

FIG.1

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This invention relates to a low NO_x atmospheric gas burner comprising at least one burner tube having a plurality of gas outlet orifices terminating in a burner bed, while a plurality of plates are arranged above the burner tube within the reach of the flame, which plates lower the temperature, effect a stepped combustion, are arranged parallel to and on opposite sides of the orifices provided in the burner tube and disposed in line parallel to the burner axis, and are connected direct to the burner tube substantially throughout their lower ends.

The object of the present invention is to improve such a burner known from Netherlands patent application 8900030.

To that end, the burner according to the invention is characterized in that at least one of the upper ends of the plates is bent outwards.

The advantage achieved with this feature is not only that the NO_x content is reduced further as a result of improved cooling, but also that better combustion is obtained as a result of improved mixing of the combustion gas and the secondary air supplied owing to the greater turbulence caused in the converging passage between widening pairs of plates, the result being a more stable flame.

Further, by bending the free upper edges of the plates inwards, a local reduced pressure is created, so that greater flame stability is achieved.

To clarify the invention, some embodiments of the gas burner will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic side elevation of a gas burner according to the invention;

Fig. 2 is a top plan view of the apparatus according to the invention as shown in Fig. 1;

Fig. 3 is a left-hand side elevation of the apparatus according to Fig. 1;

Fig. 4 is a right-hand side elevation of the apparatus according to Fig. 1;

Fig. 4A is a variant of the apparatus according to Fig. 4; and

Fig. 5 is a burner block comprising four burner tubes as shown in Figs 1-4.

According to the drawings, a low NO_x atmospheric gas burner comprises a burner tube 1, the inlet portion of which constitutes a mixing tube portion 2 connecting to a diffuser portion 3. The burner tube 1 proper comprises a bottom 4 and a constriction portion 5 opposite therefrom. Extending between these portions is a distributor plate 6. Extending upwards from this burner tube part is a narrowing portion 7 at the top of which are arranged gas outlet orifices consisting of flat strips (not shown) together forming a burner bed. Extending upwards from the walls forming said narrowing portion are two conically flaring plates 8, which lower the temperature and promote a stepped combustion. As will appear from the drawing, the straight and corrugated strips can be supported not only at their ends but also in the middle by means of a support 9.

To ensure proper transfer of the flame upon ignition of the gas burner, apertures 12 are provided in the plates 8.

To improve flame stability, small, regularly spaced air supply holes 10 are provided in the plates 8.

The tapering configuration of the burner tube walls connecting to the bottom 4 (shown in Fig. 3) ensures that the sound produced by the burner will be damped in the burner tube and not be so reflected that the sound vibrations just produced would be amplified.

As will appear from Figs 1, 4, and 4A, the mixing tube portion comprises at its free end two fastening flanges 11 to be connected to a gas supply pipe. It is noted that the distance H (indicated in Fig. 1) from the cross section of equal width up to the top of the burner bed should be so large as to ensure a straight flow of the combustion gas mixture to the burner orifices. This ensures a straight flow of the gas-air mixture to the burner bed and hence a uniform flame height and hence a minimal sound production.

In the variant of the apparatus according to Fig. 4 shown in Fig. 4A, the free edge of the plates 8 is provided with an inward flanged portion 18 which brings about a reduced pressure at that point in the passing gas mixture flow, which leads to greater flame stability.

The embodiment shown in Fig. 5 shows a burner block 17 arranged in a furnace space 15 enclosed by a wall 16. The burner block 17 comprises four burner tubes 1 such as shown in Figs 1-4A in side-by-side arrangement. This construction ensures a minimal NO_x content in the exhaust gas, the conical configuration of the plates 8 leading to an eminent mixing of the combustion gas passing from the burner tube between the plates 8 and the secondary air supplied externally along the plates. Partly as a consequence of the fact that the cross-section between the plates 8 of each burner increases in the direction of discharge, the speed of the passing combustion gas will decrease, which effects not only a better mixture but also a better flame stability.

For the sake of completeness it is observed that instead of a burner bed formed by plane and corrugated plates or strips, a burner bed of ceramic material as is known per se in the art can also be used.

It will be clear that within the concept of the invention further modifications are possible.

Claims

1. A low NO_x atmospheric gas burner comprising at least one burner tube having a plurality of gas outlet orifices terminating in a burner bed, while a plurality of plates are arranged above the burner tube within the reach of the flame, which plates lower the temperature, effect a stepped combustion, are arranged parallel to and on opposite sides of the orifices provided in the burner tube and disposed in line parallel to the burner axis, and are connected direct to the burner tube substantially throughout their lower ends, characterized in that at least one of the upper ends of the plates is bent outwards.

2. A gas burner according to claim 1, characterized in that at least one of a pair of plates widens conically relative to the other plate.

3. A gas burner according to claim 1 or 2, characterized in that both plates widen conically.

4. A gas burner according to claim 1, 2 or 3, characterized by a plurality of burner tubes arranged side by side in a burner bed.

5. A gas burner according to one or more of the preceding claims, characterized in that the free upper edges of the plates are flanged inwards.

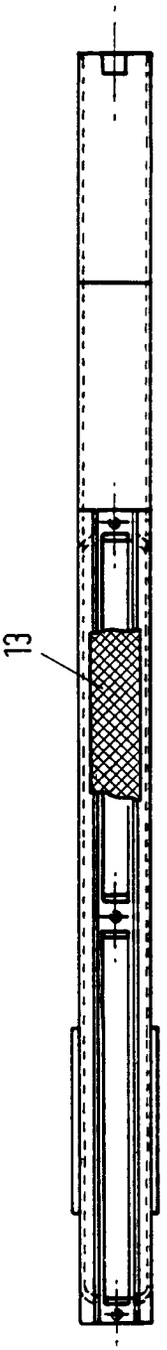

FIG.2

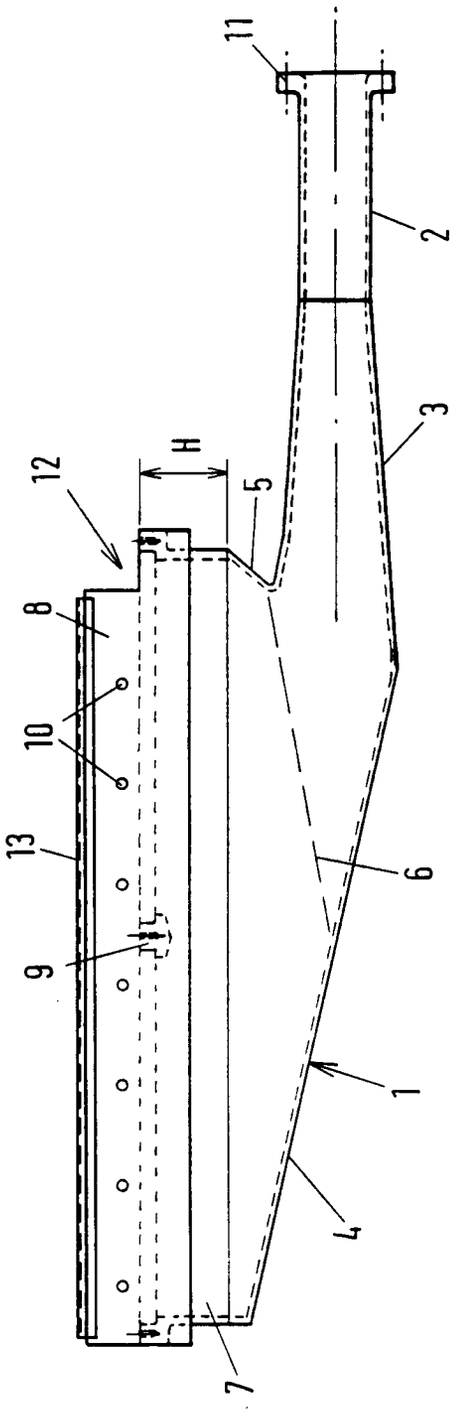

FIG.1

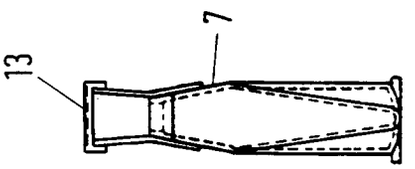

FIG.3

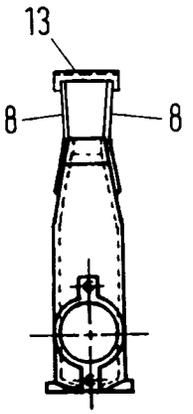

FIG.4

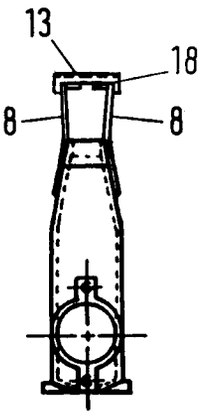

FIG.4A

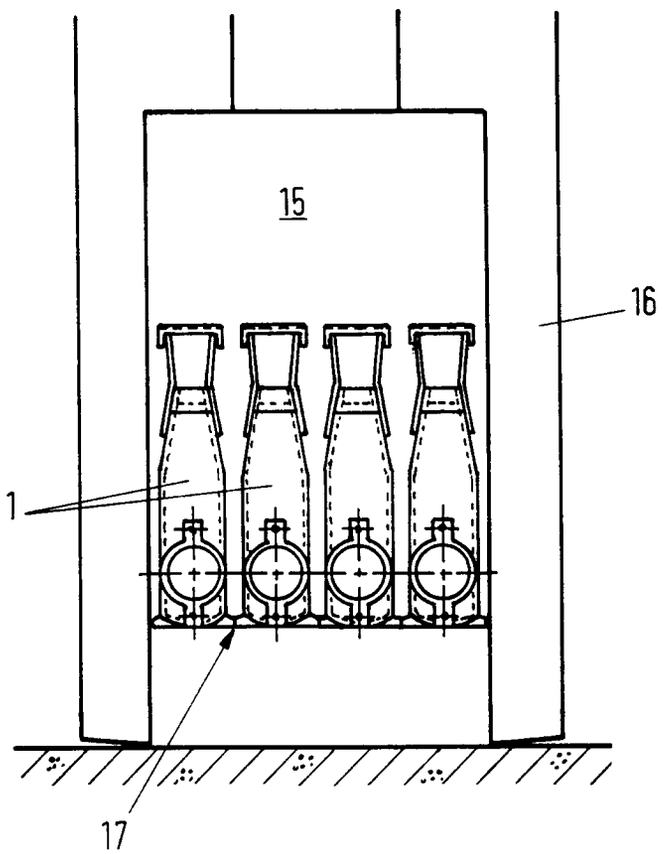

FIG.5

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EUROPEAN SEARCH REPORT

Application Number

EP 91 20 3140

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.5)
Y	EP-A-0 377 233 (REMEHA) * column 4, lines 11 - 23 * * figures 1-8 *	1-3	F23D14/70 F23D14/10
D	& NL-A-8 900 030 (REMEHA)		
Y	DE-U-9 010 640 (BUDERUS HEIZTECHNIK GMBH) * page 2, line 3 - page 3, line 11 * * figures 1-9 *	1-3	
Y	DE-U-8 604 053 (VAILLANT) * page 6, lines 5 - 10 * * figures 2-6 *	1-5	
Y	PATENT ABSTRACTS OF JAPAN vol. 8, no. 112 (M-298)(1549) 25 May 1984 & JP-A-59 021 909 (TOKYO SHIBAURA DENKI K.K.) 4 February 1984 * the whole document *	1-5	
A	DE-U-8 914 576 (GASWÄRME-INSTITUT EV)		TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	US-A-4 767 319 (VOSPER)		
A	AU-B-3 802 368 (RADIATION (AUSTRALIA))		F23D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05 MARCH 1992	PHOA Y.E.

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