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Publication number: **0 594 262 A1**

EUROPEAN PATENT APPLICATION

Application number: **93202971.3**

Int. Cl.⁵: **F23D 14/04, F23D 14/14, F23D 14/82**

Date of filing: **22.10.93**

Priority: **23.10.92 NL 9201847**

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Date of publication of application:
27.04.94 Bulletin 94/17

Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

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Gauze burner.

Gauze burner which can optionally be used as a premix burner, but is intended in particular for use in gas appliances with partially premixed or so-called atmospheric burners, which gauze burner comprises a gas/air mixing chamber (8) arranged above a circular or straight row of fuel injection nozzles (6), this mixing chamber being bounded on one side by a continuous guiding wall element (2) and on the other side by a wall of heat-resistant gauze (3).

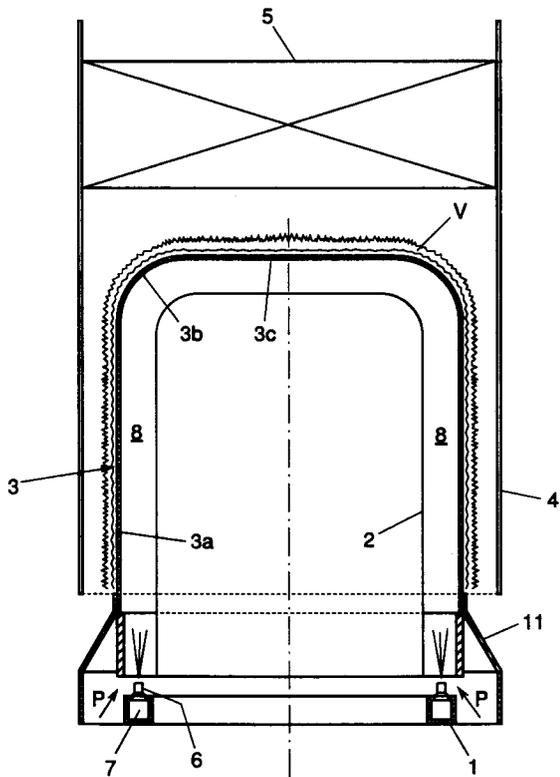


FIG. 1

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This invention relates to a burner which can optionally be used as premix burner, but is intended in particular for use in gas appliances with partly premixed or so-called atmospheric burners.

In atmospheric burners, which are generally cheaper than premix burners with a fan because of their simple construction, the NO_x emission is generally higher than in premix fan burners, which enable emissions of less than 40 ppm NO_x to be achieved for gas appliances up to 35 kW. An exception to these are atmospheric ceramic radiation burners which make NO_x emissions of 10 ppm possible. However, ceramic burners have the drawback that cracking occurs easily in the brittle material, the thick burner plates are difficult to build in and there is a good chance of the porous burner plate becoming soiled.

The following are known measures to obtain a lower NO_x emission in atmospheric burners by keeping the flame temperature relatively low:

- employing heat resistant inserts in the flanks of the flames, which withdraw heat from the flames;
- postponing the access of secondary combustion air and thereby postponing combustion, by means of baffles around the atmospheric burner or in any other manner, so that a longer flame with a greater surface area is formed for giving off heat to the environment;
- applying water cooling at the burner; or
- flat burner nozzles which realize a butterfly-shaped flame with a large surface area for giving off heat to the environment.

With all of these techniques, either insufficient reduction of the NO_x emission is obtained or the measures used are expensive.

The object of the present invention is to provide an atmospheric burner which enables a low NO_x emission and also a low CO production to be obtained without costly measures.

To that end, in the burner according to the invention, above a series of fuel injection nozzles a gas/air mixing chamber is bounded on one side by a continuous guiding wall element and on the other side and at the top by a wall of heat-resistant gauze.

Because of the impulse effect of the gas injection, primary combustion air is entrained into the superadjacent mixing chamber. The combustible mixture is forced in the direction of the gauze by the guiding wall element and evenly distributed over the gauze surface. The gas/air mixture passes through the gauze and flame formation takes place directly on the outside of the gauze at a short distance therefrom. In the process, the flame is maintained at a relatively low temperature because heat of the flame is dissipated through conduction to the gauze and the gauze is continuously cooled

by the mixture flowing through. The guiding wall element further has a cooling effect.

In addition to the function of cooling the flame, the gauze has a flow-control function. By choosing gauze with a relatively high net passage percentage, depending on the type of gas, of the order of magnitude of 27 mesh, the gauze provides sufficient resistance to the mixture flowing through, on the one hand to ensure proper admixture of primary air in the mixing chamber and on the other to prevent flashback of the flame.

In a preferred embodiment of the invention, the burner according to the invention is designed as a cupola burner comprising a base ring which is designed as a substantially circular gas injector, above which a mixing chamber is bounded on the radial inside by a continuous cupola and on the outside by a gauze cupola arranged concentrically around it.

In such a design of the burner, the flame is stabilized at a very short distance from the gauze (order of magnitude of 1 mm) at a burning height of 50 mm and predominantly low NO_x emissions < 20 ppm can be attained by virtue of the flame cooling described.

With regard to the completeness of the combustion it is noted that CO emissions of < 100 ppm were measured in experiments.

In the case of a cupola form consisting of a vertical cylindrical wall section and an end wall section connected thereto via a rounded transition, the height of the cylindrical section being of the same order of magnitude as the diameter of the gauze cupola, the burner according to the invention is eminently suitable for use in flow-through appliances, such as a gas water heater, where the furnace load is relatively high (approx. 3500 kW/m³). By virtue of the cupola form, the specific burner load remains relatively low, viz. approx. 250 kW/m².

The circular gas injector may be designed with a series of fuel injection nozzles uniformly distributed over the base ring, these injection nozzles being fed from a chamber present in the base ring.

To provide for a still higher degree of uniform distribution of injected gas in circumferential direction, an annular gap may be formed by two concentric rings above the fuel injection nozzles, through which annular gap gas is guided into the mixing chamber.

Further, according to the invention, the cupola burner may be provided, at the lower end of the gauze cupola, with an anti-flashback baffle which may have the form of a ring extending laterally around the base ring, downwards from the lower end of the gauze cupola, or may be designed as a gauze wall extending laterally from the lower end of the gauze cupola.

In a variant embodiment of the gauze burner, it can be designed as an in-line burner comprising an elongate burner tube with two parallel rows of fuel injection nozzles, the continuous guiding wall element being designed as an upright wall arranged between, the rows of nozzles and the assembly being surrounded by a rectangular gauze cage.

The burner according to the invention is an atmospheric radiation burner which provides the above-mentioned advantages of a ceramic radiation burner without the above-mentioned disadvantages thereof.

To clarify the invention, two exemplary embodiments of the gauze burner will now be described with reference to the accompanying drawings, wherein:

Fig. 1 is a schematic longitudinal sectional view of a cupola burner;

Fig. 1A is a detail of fig. 1 in a variant embodiment;

Fig. 1B is another detail of Fig. 1 in a variant embodiment; and

Fig. 2 is a schematic perspective view of a bar burner.

Referring to the drawings, in particular Fig. 1, the gauze burner according to the invention in the design of a cupola burner comprises a substantially circular gas injector in the form of a base ring 1 and, above it, a dome-shaped continuous, metal guiding wall element 2 and a dome-shaped gauze cupola 3 arranged around it, concentrically spaced therefrom. The gauze cupola 3 comprises an upright cylindrical section 3a, whose height is of the same order of magnitude as the diameter. The cylindrical cupola section 3a merges into an end wall section 3c via a rounded transition 3b. Fig. 1 further shows a furnace wall 4 and a heat exchanger 5.

The base ring 1 comprises at the top thereof a series of gas blast nozzles 6, which are fed from a chamber 7 present in the ring 1. The ring 1 is located under a space 8, to be designated as mixing chamber, between the continuous metal cupola 2 and the gauze cupola 3.

In operation, gas is blown from the nozzles 6 into the mixing chamber 8, air being thereby entrained with it (see arrows P). By properly adjusting to each other the dimensioning of the burner parts, the net passage percentage of the gauze and the pressure conditions in the furnace and in the parts of the flue gas path, located downstream thereof, a substantially stoichiometric gas/air mixture will flow through the gauze and flame stabilization will take place at a short distance therefrom, as schematically indicated by V.

In Fig. 1A it is indicated that the uniform distribution in circumferential direction of the gas eg-

ressing from the blast nozzles can be further improved by means of two concentric rings 9, 9' defining a passage gap 10.

Fig. 1 further indicates a screen 11, by which flashback in downward direction can be prevented. An alternative is indicated in Fig. 1B, where the screen ring 11 has been replaced with a gauze wall screen 12.

Fig. 2 shows the gauze burner according to the invention in the form of an in-line burner. Equivalent parts are indicated by the same reference numerals as in Fig. 1, but increased by 100.

According to Fig. 2, a bar-shaped gas injector 101 comprises a double row of fuel injection nozzles 106. The nozzles 106 are fed from a chamber 107 present in the bar 101, whilst the chamber 107 is provided halfway with a partition 13 and gas is supplied from two sides (see arrows G), so as to enable all of the nozzles 106 to be supplied as evenly as possible.

Above the gas injection nozzles 106, two mixing chambers 108 are bounded by a continuous metal guiding plate 102 and a wire gauze 103. The operation of the bar burner according to Fig. 2 is comparable to that of the cupola burner according Fig. 1.

Claims

1. An atmospheric gauze burner comprising a gas/air mixing chamber (8,108) arranged above a row of fuel injection nozzles (6,106), said mixing chamber (8,108) being bounded on one side by a continuous guiding wall element (2,102) and on the other side and at the top by a wall (3,103) of heat resistant gauze.
2. A burner according to claim 1, characterized in that the gauze has a relatively high net passage percentage, depending on the type of gas, of the order of magnitude of 27 mesh.
3. A burner according to claim 1 or 2, characterized in that the burner is dome-shaped and comprises a base ring (1) which is designed as a substantially circular gas injector, above which a mixing chamber (8) is bounded on the radial inside by a continuous cupola (2) and on the outside by a gauze cupola (3) arranged concentrically around said continuous cupola (2).
4. A burner according to claim 3, characterized in that the gauze cupola (3) is made up of a vertical cylindrical wall section (3a) and an end wall section (3c) connecting thereto via a rounded transition (3b), the height of the cylindrical section (3a) being of the same order of magnitude as the diameter of the gauze cupola

(3).

5. A burner according to any one of the preceding claims, characterized in that the circular gas injector is designed with a series of fuel injection nozzles (6) uniformly distributed over the base ring (1), said fuel injection nozzles (6) being fed from a chamber (7) present in the base ring. 5
6. A burner according to claim 5, characterized by two concentric rings (9,9') which define an annular gap (10) above the fuel injection nozzles (6), the gas being guided into the mixing chamber (8) through said annular gap (10). 10 15
7. A burner according to any of the preceding claims, characterized in that the cupola burner is provided with an anti-flashback screen (11,12) at the lower end of the gauze cupola (3). 20
8. A burner according to claim 7, characterized in that the screen has the form of a ring extending laterally around the base ring, downwards from the lower end of the gauze cupola. 25
9. A burner according to claim 7, characterized in that the screen is designed as a gauze wall (12) extending laterally from the lower end of the gauze cupola. 30
10. A gauze burner according to claim 1 or 2, characterized in that it is designed as an in-line burner comprising an elongate burner tube (101) with two parallel rows of fuel injection nozzles (106), the continuous guiding wall element being designed as an upright wall (102) arranged between the rows of nozzles and the assembly being surrounded by a rectangular gauze cage (108). 35 40

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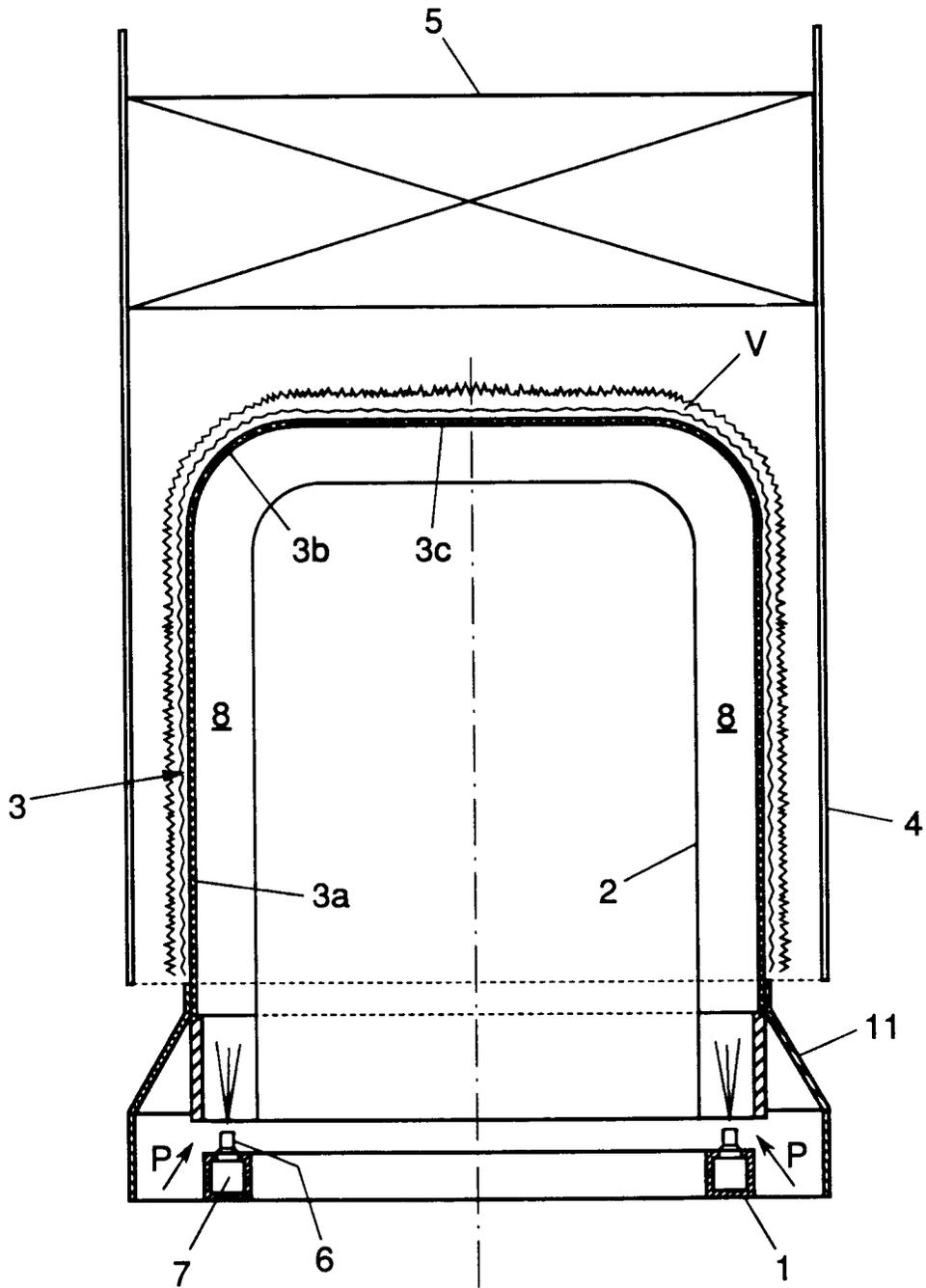


FIG. 1

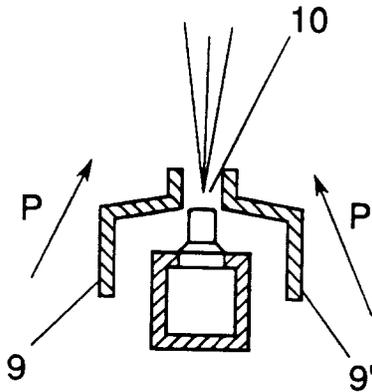


FIG. 1A

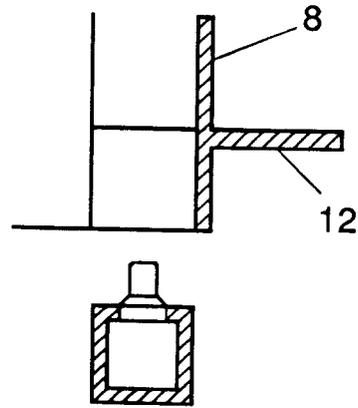


FIG. 1B

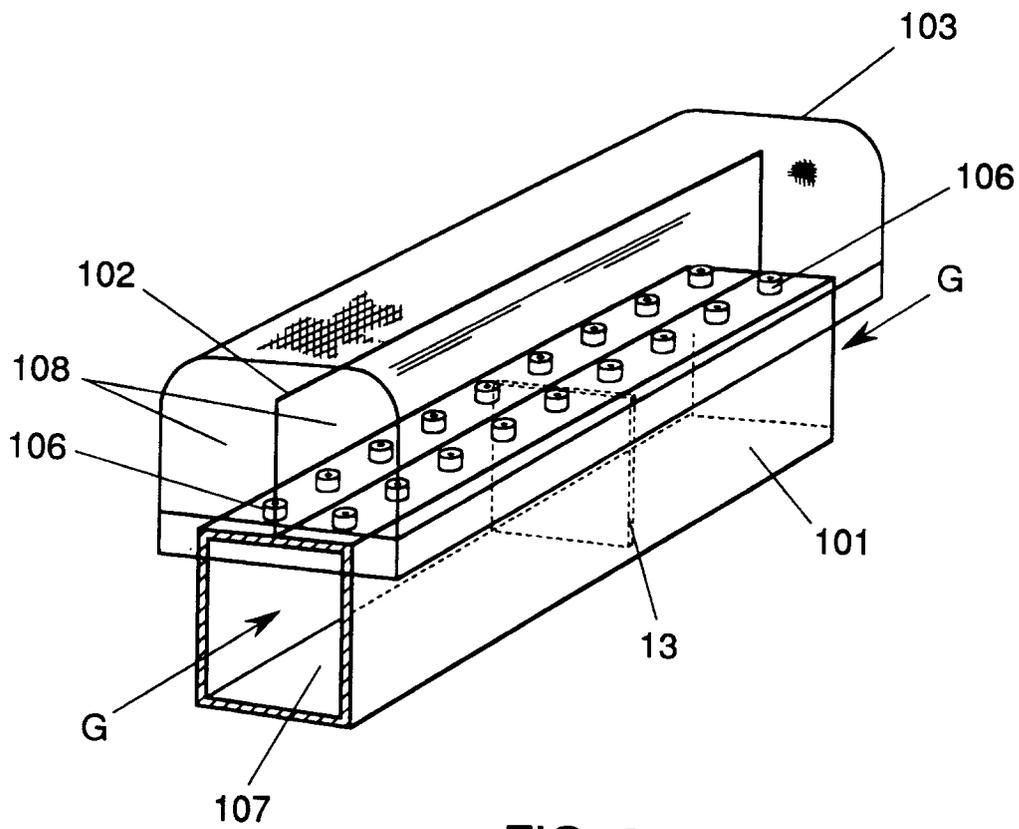


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2971

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)
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 149 (M-390)25 June 1985 & JP-A-60 026 210 (MATSUSHITA DENKI SANGYO) 9 February 1985 * abstract *	1	F23D14/04 F23D14/14 F23D14/82
A	PATENT ABSTRACTS OF JAPAN vol. 9, no. 117 (M-381)22 May 1985 & JP-A-60 004 718 (MATSUSHITA DENKI SANGYO) 11 January 1985 * abstract *	1	
A	US-A-2 597 062 (CARDELLA)		
A	US-A-3 091 284 (BURKLIN)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.5) F23D
Place of search THE HAGUE		Date of completion of the search 12 January 1994	Examiner LEITNER, J
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EPO FORM 1503.03.82 (P04C01)