(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 849 526 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.06.1998 Bulletin 1998/26

(51) Int. Cl.[6]: **F23C 5/06**, F23D 14/20

(21) Application number: **97121553.8**

(22) Date of filing: **08.12.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **20.12.1996 IT MO960168**

(71) Applicant:
IPEG S.p.A. dell'Ing. Mauro Poppi
41014 Castellarano (Reggio Emilia) (IT)

(72) Inventor: **Poppi, Mauro**
41049 Sassuolo (Prov. of Modena) (IT)

(74) Representative:
Modiano, Guido, Dr.-Ing. et al
Modiano Gardi Patents,
Via Meravigli, 16
20123 Milan (IT)

(54) High heat release burner

(57) A high heat release burner (1) having a combustion chamber (2) which is connected to a gaseous-fuel intake (4) and to a comburent intake (5) and inside which there is provided an ignition plug (6). The combustion chamber (2) is internally provided with longitudinally adjustable supporting means (14) for a tubular stem (15) which constitutes a duct for feeding the gaseous fuel and is provided with the ignition plug (6) at its end, the movement of the stem (15) and therefore of the ignition in the chamber (2) varying the outlet speed of the combustion products, the increase of the volume between the ignition and the chamber outlet increasing the speed of the products.

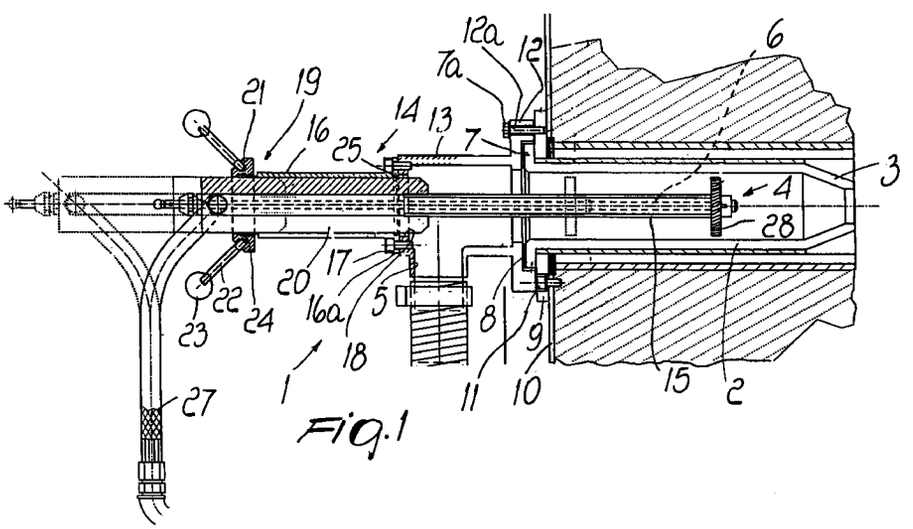

Fig.1

EP 0 849 526 A2

Description

The present invention relates to a high- or low-speed high heat release burner.

High heat release burners are known in which a good fuel-comburent mixing allows to reduce the volume of the combustion chamber to values on the order of 40,000 kcal/dm^{3}hour, which have replaced conventional gaseous-fuel burners, for which said volume had values on the order of 500 kcal/dm^{3}hour. These burners have allowed, for example when used in kilns for ceramic products, to arrange in the kiln a plurality of burners whose selective activation allows to optimize, inside the kiln, the temperature distribution according to the type of product to be fired.

In these conventional burners, the fuel and the comburent are injected in the combustion chamber in a premixed state (or are mixed during injection) and ignited by a specifically provided spark. The ignition point, which substantially coincides with the fuel-air mixing region, is fixed and the combustion products undergo an expansion which is linked to the temperature that develops in the combustion chamber.

If the discharge section of the combustion chamber, which usually has a converging throttling cone at its outlet, and the fuel and comburent intake volumes are equal, the outlet temperature and speed of the combustion products depend on the state of advancement of the combustion in the chamber; in other words, on whether the volume of the chamber is such as to allow to complete combustion inside it or is instead insufficient, causing combustion to also occur after discharge from the chamber: in the first case, one has a high outlet speed of the fumes at high temperature, while in the second case one has a reduced speed of the products of the (partial) combustion at a lower temperature.

In order to manage kilns for manufacturing ceramic products in the optimum manner it is necessary to maintain, inside the kiln, a preset temperature curve that depends strictly on the product to be fired. The different regions of the kiln, depending on the temperature and on the pressure system, must be heated to a greater or smaller extent at the center or on the wall, hence the convenience of having, in certain regions of the kiln, burners with a high fume outlet speed and, in other regions of the kiln, burners having a lower speed.

Each one of the conventional high heat release burners has specific characteristics for the outlet speed of the combustion products which depend on the shape, dimensions and characteristics of the outlet cone and on the location of the ignition-mixing unit. If it is wished to vary the temperature distribution in the kiln in some regions, it is necessary to either act on the fuel and comburent supply or to replace the refractory cone or the burner. All these interventions require rather troublesome operations, sometimes entail the shutdown of the kiln and rather high costs.

The aim of the present invention is to obviate the mentioned drawbacks of conventional devices, i.e., to provide a high heat release burner which allows to control the speed and therefore the temperature of the combustion products in order to solve, with a single kind of burner, the different requirements of the different points of the kiln and to easily and quickly vary, even while the kiln is operating, the outlet speed characteristics of the combustion products, leaving unchanged the fuel and comburent supply.

Within the scope of this aim, an object of the present invention is to devise a structure which is simple, relatively easy to provide in practice, safe in use, effective in operation, and relatively modest in cost.

This aim and this object are all achieved by the present high heat release burner having a combustion chamber which is connected to a gaseous-fuel intake and to a comburent intake and inside which there is provided an ignition plug, characterized in that said combustion chamber is internally provided with longitudinally adjustable supporting means for a tubular stem that constitutes a duct for feeding the gaseous fuel and is provided with said ignition plug at its end, the movement of the stem and therefore of the ignition in the chamber varying the outlet speed and temperature of the combustion products, an increase of the volume between the ignition and the chamber outlet increasing the speed of the products and their temperature.

Further characteristics and advantages of the present invention will become apparent and evident from the detailed description of a preferred but not exclusive embodiment of a high heat release burner according to the invention, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a partially sectional side view of a high heat release burner according to the present invention;
figure 2 is a rear view of the burner of figure 1;
figure 3 is a perspective view of a possible embodiment of the chamber of the burner according to the present invention;
figure 4 is a sectional side view of the chamber of figure 3.

With particular reference to the above figures, the reference numeral 1 generally designates a high heat release burner according to the invention.

The burner 1 is of the type which has a combustion chamber 2 which is advantageously but not exclusively made of refractory material with a frustum-shaped converging outlet end 3 which is connected to a gaseous-fuel intake 4 and to a comburent intake 5 and inside which there is provided an ignition plug 6: the expression "gaseous fuel" also includes liquid fuels that are finely micronized, possibly in air.

The chamber 2 preferably has a substantially longitudinally elongated shape and a flanged mouth 7 for fas-

tening, by means of a plurality of perimetric bolts 7a, with a sealing ring 8 interposed, between a ring 9 which is fixed to the wall 10 of the kiln with screws 11 and a front flange 12, with corresponding pluralities of holes 12a, of a comburent air feed coupling 13.

The chamber 2 is internally provided with longitudinally adjustable supporting means 14 for a tubular stem 15 which constitutes a gaseous-fuel feed duct and is provided, at its end, with the ignition plug 6. By means of the movement of the end of the stem 15 and of the ignition plug 6 along the chamber, the ignition point is shifted and the outlet speed of the combustion products varies. By increasing the volume between the ignition and the outlet of the chamber the outlet speed of the products increases.

The supporting means 14 are constituted by a sleeve 16 which has a flanged end 16a for fixing, by means of bolts 17, at a hole 18 of the coupling 13 which is axially aligned with the chamber 2. The sleeve 16 is provided with locking elements 19 for a body 20 which can move longitudinally in the sleeve 16 and protrudes towards the inside of the chamber with the stem 15.

The supporting means 14 can be constituted by coupled segments of stems 15 equipped with respective and interchangeable ignition plugs 6 of different sizes.

The sleeve 16 and the movable body 20 are cylindrical and the locking elements 19 are of the type constituted by a bush with a tapering hole 21, which is associated, through radial spokes 22, with an annular actuation handwheel 23. The bush 21 is screwed at the mouth of the sleeve 16, which has a profile 24 which can be correspondingly tapered and is adapted to cause, by means of the screwing of the bush 21, the clamping of sectors 24 into which the mouth of the sleeve is divided longitudinally on the movable body 20 in order to lock it.

A seat for mounting a sealing ring 25 is provided between the sleeve 16 and the movable body 20.

The tubular stem 15 is connected, by means of an elbow 26, to a deformable fuel gas feed hose 27 and is centrally crossed, along its entire length, by a rod that supports the ignition plug 6.

Proximate to the end, on the stem 15, there is provided a finned washer 28 which ends at a short distance from the inner wall of the chamber, causes turbulence and facilitates the mixing of air and fuel and the cooling of the inner surface of the refractory cone 3.

Figures 3 and 4 are views of an alternative embodiment of the chamber 2, which has, on two diametrically opposite sides of the end 3, two lateral outlets 29, 30 which are arranged at right angles to the longitudinal axis of the chamber 2.

Advantageously, the lateral outlets are provided at an angle which can vary between 0 and 90 degrees with respect to the longitudinal axis of the chamber 2 according to the type of product to be fired.

By acting on the handwheel 23 for locking and release, it is possible to manually slide the stem 15 inside the chamber 2 to move the end of the stem, with the corresponding ignition plug 6 and washer 28, from a forward position, shown in solid lines in the figure, to a retracted position, shown in dotted lines. Since combustion occurs downstream of the ignition region, the movement of the stem in practice is equivalent to a change in the volume of the combustion chamber. When the stem is in a forward position, the outlet speed of the combustion products is reduced; when the stem is retracted, the fume speed is high.

It is noted that the stem can be moved inside the chamber even while the kiln is operating.

It has thus been shown that the invention achieves the intended aim and object.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

Moreover, all the details may be replaced with other technically equivalent ones.

In practice, the materials used, as well as the shapes and the dimensions, may be any according to the requirements without thereby abandoning the scope of the protection of the appended claims.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A high heat release burner having a combustion chamber which is connected to a gaseous-fuel intake and to a comburent intake and inside which there is provided an ignition plug, characterized in that said combustion chamber is internally provided with longitudinally adjustable supporting means for a tubular stem which constitutes a duct for feeding the gaseous fuel and is provided with said ignition plug at its end, the movement of the stem and therefore of the ignition in the chamber varying the outlet speed and temperature of the combustion products, an increase of the volume between the ignition and the chamber outlet increasing the speed of the products and their temperature.

2. A burner according to claim 1, characterized in that said supporting means are constituted by a sleeve which is axially fixed to the intake of the chamber and is provided with locking elements for a body which can move longitudinally in the sleeve and protrudes towards the inside of the chamber with said stem.

3. A burner according to claim 1, characterized in that a coupling for feeding comburent air is mounted at

the intake of said combustion chamber.

4. A burner according to claims 2 and 3, characterized in that said coupling is mounted between said sleeve and the intake of said chamber.

5. A burner according to claim 2, characterized in that said combustion chamber is made of refractory material.

6. A burner according to claim 2, characterized in that said sleeve and said movable body are cylindrical, and in that said locking elements have a tapering bush screwed at the mouth of the sleeve, which has a profile which produces the clamping of sectors of the mouth of the sleeve on the movable body.

7. A burner according to claim 2, characterized in that a sealing ring is mounted between said sleeve and said movable body.

8. A burner according to claim 2, characterized in that said combustion chamber has a longitudinally elongated shape.

9. A burner according to claim 1, characterized in that at least one finned washer is mounted proximate to the end on said stem.

10. A burner according to claim 8, characterized in that said chamber is cylindrical and said outlet is axial.

11. A burner according to claim 8, characterized in that said chamber is cylindrical and said outlet is lateral and inclined with respect to the axis of the chamber.

12. A burner according to claim 11, characterized in that said lateral outlet is a double outlet, arranged on two diametrically opposite sides of the end of said chamber.

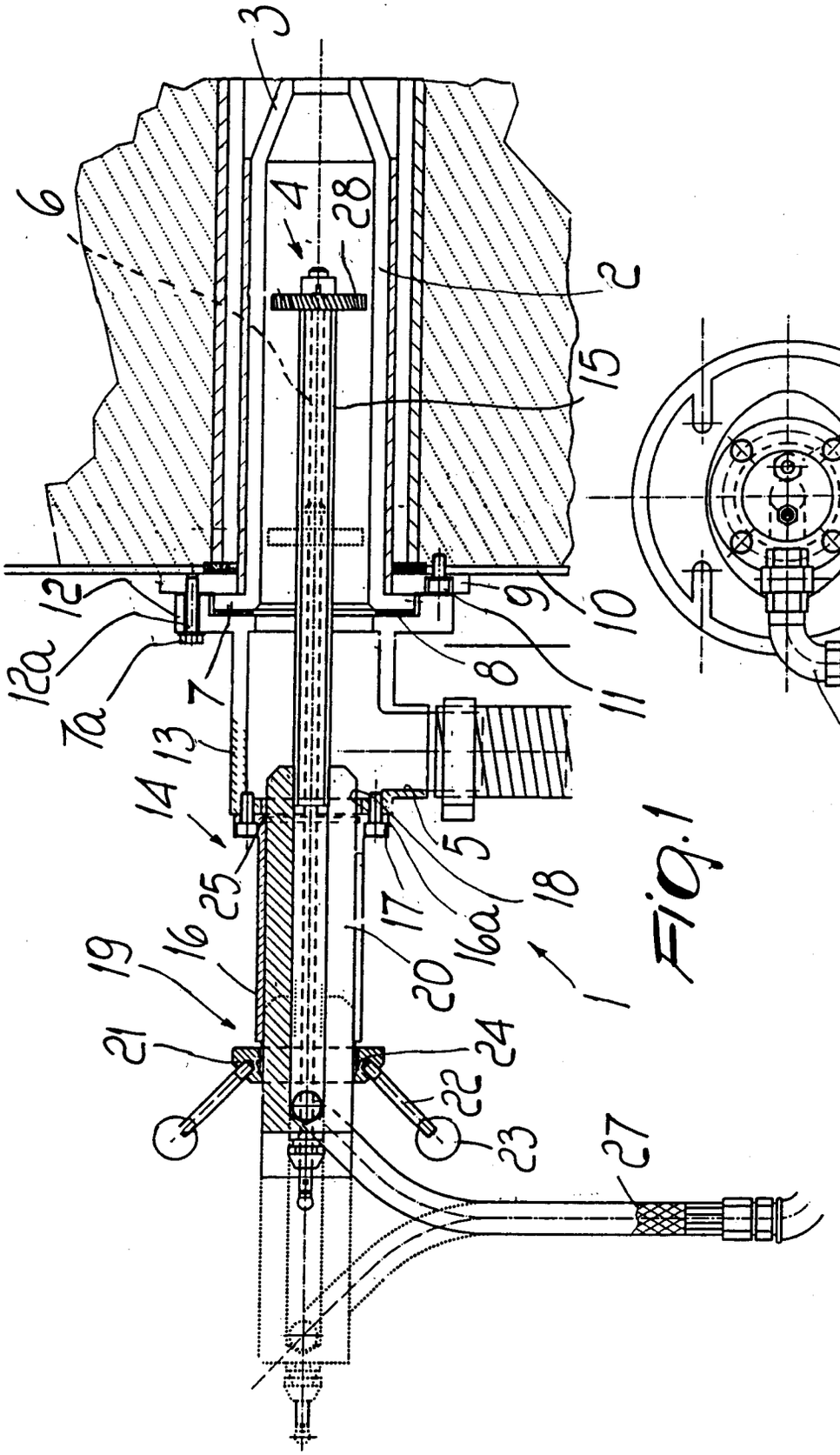
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Fig.1

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Fig.2

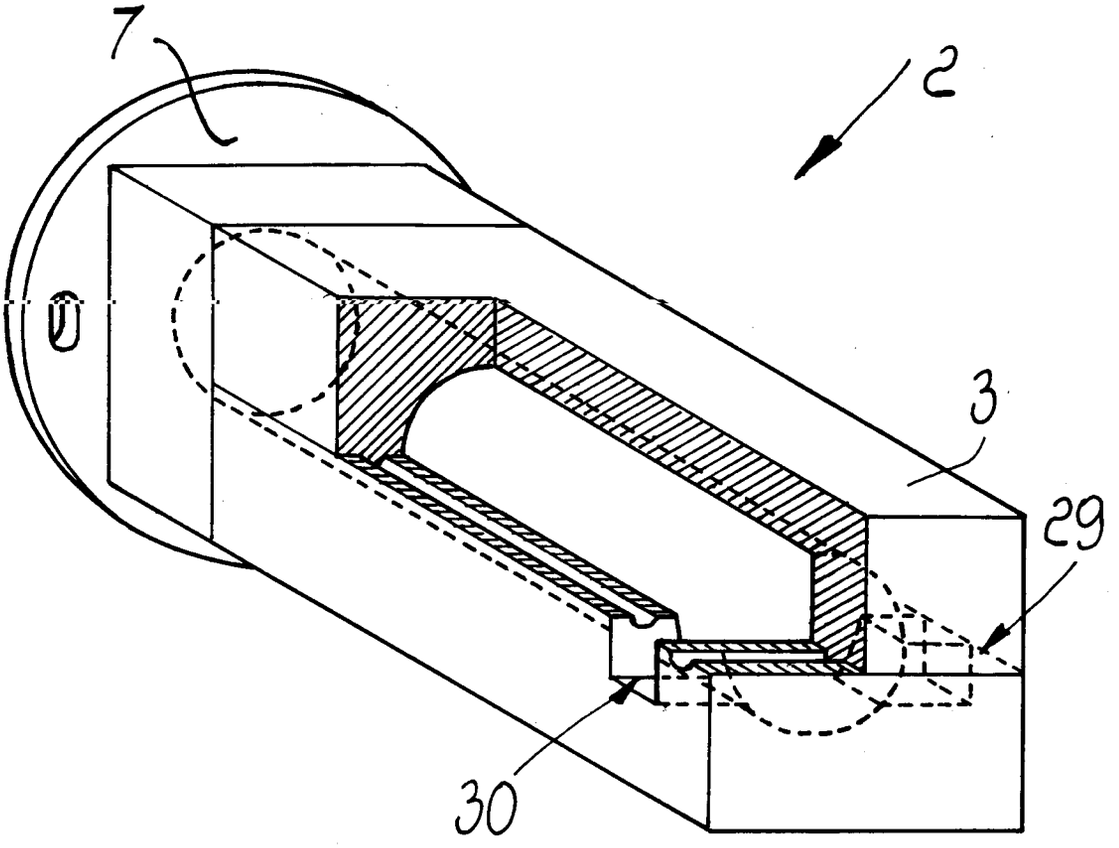

Fig. 3

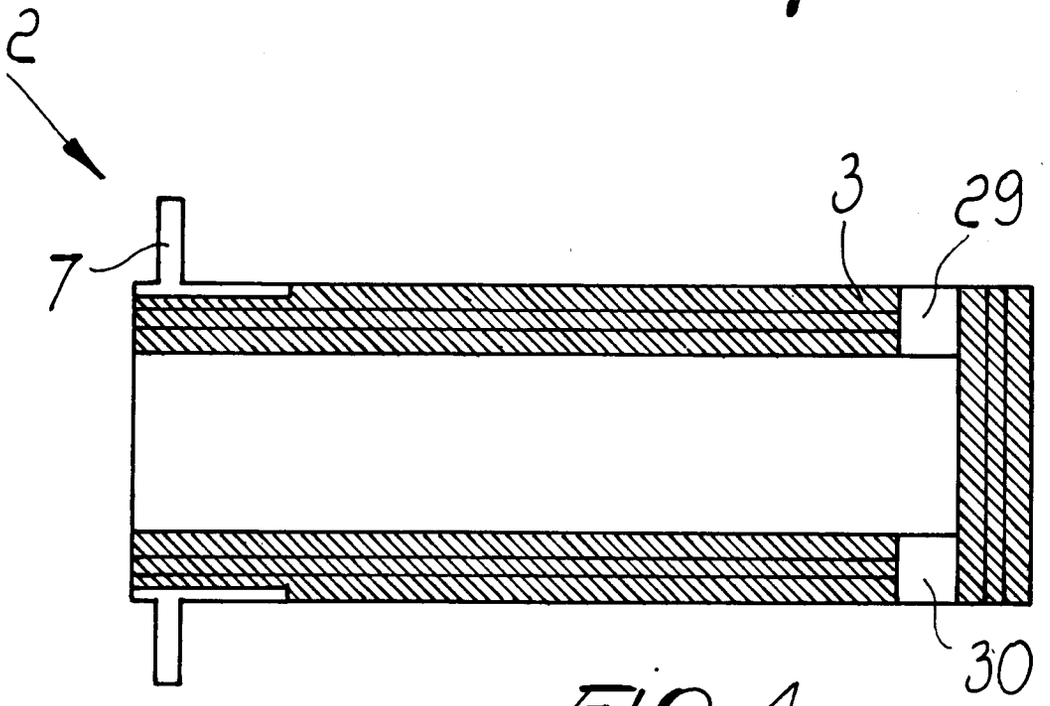

Fig. 4