United States Patent

Vignes

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[54] GAS BURNER

[72] Inventor: **Roger Vignes**, Paris, France

[73] Assignee: **Service National dit: Gaz de France**, Paris, France

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[51] **Int. Cl.** **F24c 3/00**

[58] **Field of Search** ..... 126/39, 39 H, 39 I, 39 J, 39 K, 126/214; 431/347, 348

[56] **References Cited**

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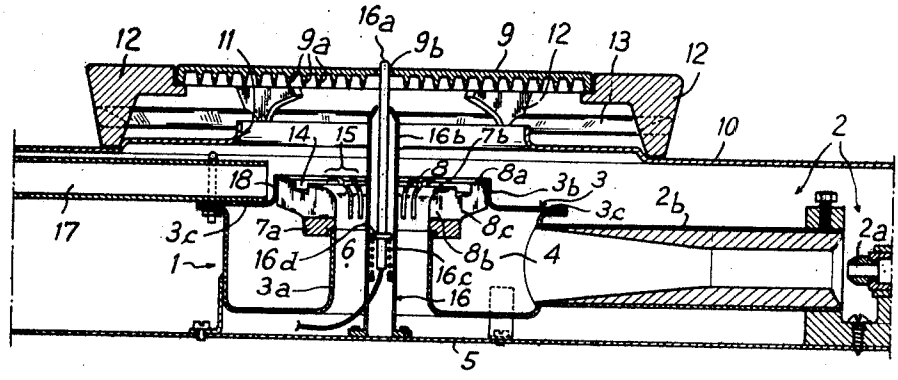
Primary Examiner—Charles J. Myhre

Attorney—Ward, McElhannon, Brooks & Fitzpatrick

[57] **ABSTRACT**

A gas burner, particularly for gas cookers, constituted by a mixer, an enclosure forming an annular distribution chamber and by a burner head provided with radial slots and connecting said distribution chamber to the atmosphere, said gas burner being characterized in that it is placed below a protective plate **10** provided with an opening **11**, in that the upper face of the burner head onto which the radial slots **8** open out is downwardly inclined towards the center of said head, in that the radial slots **8** are obturated at their outer vertical edge **8***a* and at the base in the zone of their inner edge **8***b* completely open at their inner edge and in that, in the central zone of the slots **8***c*, the burner head has an annular groove **14** on its upper face.

6 Claims, 2 Drawing Figures



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SHEET 1 OF 2

Fig. 1

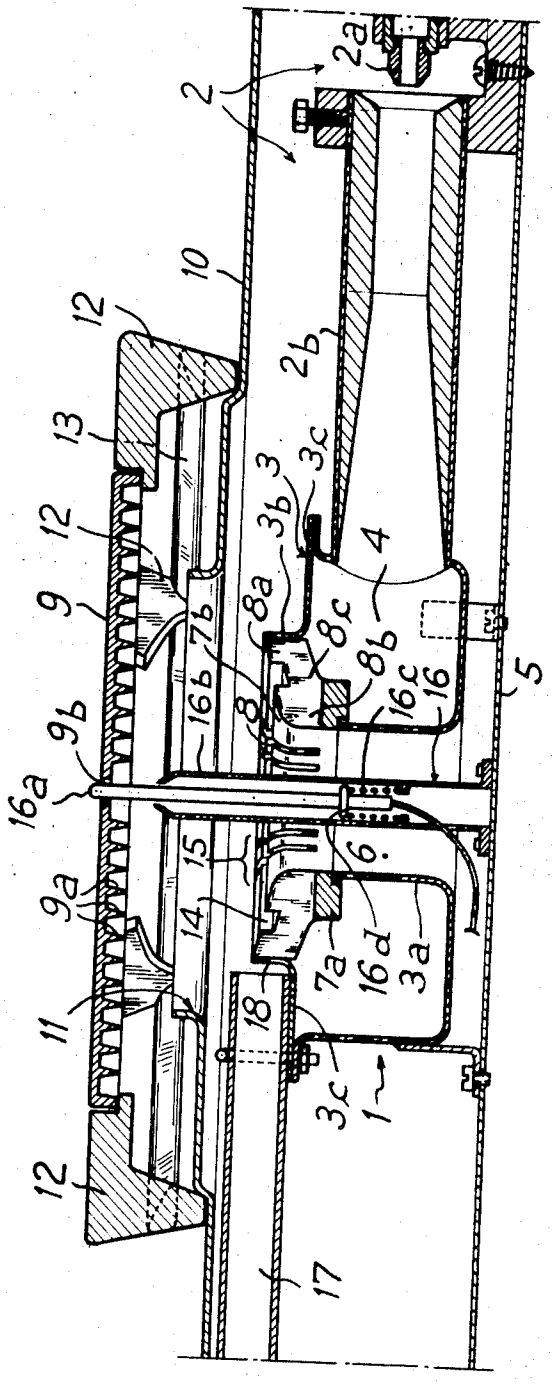
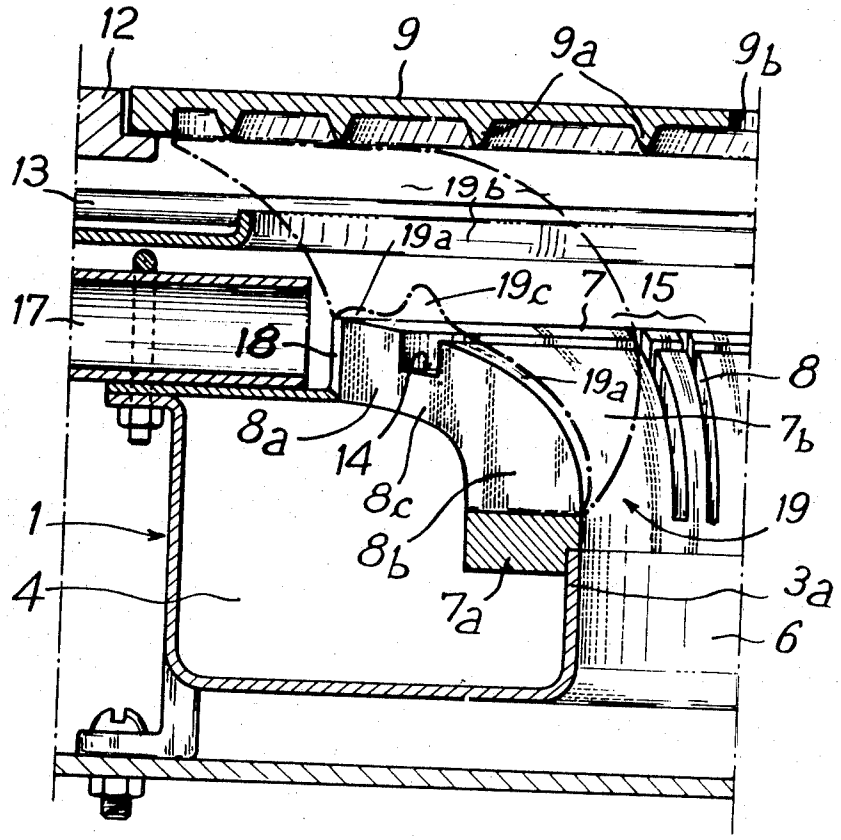


Fig. 2



GAS BURNER

The present invention generally relates to a gas burner, particularly for a gas cooker, comprising a plurality of combustion slots of variable depth.

Known burners of the type having a relatively low ratio of primary aeration, for example, in the order of 0.5 to 0.7 with respect to the stoichiometric mixture of combustion gas and primary air, cannot, for lack of a sufficient secondary aeration, ensure a complete combustion of the natural gases. The thermal outputs of such burners cannot generally be reduced with respect to the nominal thermal output below a certain limiting value which is often still too high for some culinary operations, such as simmering, keeping cooked food warm, etc.

More particularly, the present invention relates to a gas burner, particularly for gas cookers, of the type having a high ratio of primary aeration, said burner being constituted by a mixer with atmospheric induction, an enclosure forming an annular chamber for distributing the mixture of combustion gas and primary air, connected to the front end of the mixer, mounted at a short distance from a supporting plate and fixed thereto, and defining with its central wall a cylindrical space, by a burner head in the form of a crown resting on the distribution chamber and provided with radial slots which are completely upwardly open, having a shallower depth on their outer rim than on their inner rim, presenting in the central part a depth shallower than those prevailing on the outer and inner rims, and connecting said distribution chamber to the atmosphere, and by a hot plate arranged above the burner and serving as a support for the vessels whose contents are to be heated.

The burners of this type having a high ratio of primary aeration may in principle use all gaseous fuels, the primary ratio of aeration being in the order of 0.8 to 0.95

The secondary aeration, which is less important in this case, is then suitably cared for since the atmospheric air may freely reach the outer part of the burner head. However, all this results in a poor flame stability, particularly with thermal outputs which are low with respect to the nominal output, and when the flames are exposed to draughts. This is why it has been found necessary to provide near the burner head devices for lighting and for monitoring the flames. Despite the fact that some burners are capped by a thermal distribution plate serving at the same time to support the containers to be heated, the unprotected lighting and flame monitoring devices are exposed to frequent shocks, clogging, etc., so that the burners, after some operating time begin to misfunction.

The present invention proposes to eliminate the above-mentioned drawbacks and has for its object a gas burner of the type mentioned hereinabove having a high ratio of primary aeration able to function with all commercialized gases, with a good thermal yield, in complete safety with very low-thermal outputs as well as with high-thermal outputs, the ratio between the minimum output and the nominal output being in the order of 1 to 15.

In order to reach the above-mentioned aim, particularly in the case of a burner of the type mentioned hereinabove having a high ratio of primary aeration, in accordance with the invention, the burner is placed below a protective tray provided with an opening above the burner head, the diameter of said opening being larger than the outer diameter of said burner head and said opening being covered by a hot plate, whose outer rim abuts on the protective tray; the upper face of the burner head, onto which the radial slots open out, is downwardly inclined towards the center of said burner head; the radial slots are obturated at their outer vertical edge and at their lower part in the zone of their inner edge and are completely open at their inner edge and, near the central zone of the slots, the burner head presents an annular groove cut in said central zone from its upper face.

Thus, the burner according to the invention is completely protected both against clogging and shocks and against lateral or vertical draughts. Nevertheless, an excellent and rational secondary aeration of the flames of the burner is ensured by fresh air rising towards the burner head up the central space in the enclosure constituting the annular distribution chamber. The flames are stable not only during operation with normal output, but also during operation with deeply reduced output, because in these cases, the flames preferably cling to the central part of the slots at the location of the annular groove which serves at the same time as pipe conducting the mixture of combustion gas and primary air emerging from a flame less slot towards an adjacent flaming slot where this mixture immediately ignites and lights back the slot which had no flame.

In order further to perfect this stability of flames, according to the invention, the radial slots are cut in the burner head in groups of at least two slots which are very close to one another.

In addition, to the advantages mentioned hereinabove, mention should also be made of the advantage of the increase in the thermal yield and in the considerable flexibility of operation. In fact, with the burner according to the invention, a thermal efficiency of 0.6 with respect to the higher calorific power of the gas is reached the thermal efficiency of the known burners being at the utmost in the order of 0.5. As for the flexibility of operation of the burner according to the invention, a perfect functioning has been ascertained for all the thermal outputs comprised between the nominal output of 3.100 mth/h and a much reduced output in the order of 200 mth/h.

The invention will be described in greater detail with reference to the accompanying drawings, in which:

FIG. 1 is an elevational view in axial section of the burner according to the invention and

FIG. 2 is a partial view in detail, also in axial section.

Referring now to the drawings, the gas burner 1, of the type having a high ratio of primary aeration, comprises a mixer 2 with atmospheric induction constituted of an injection nozzle 2*a* for the combustion gas and of a Venturi tube 2*b*; and enclosure 3 forming an annular distribution chamber 4 for the mixture of combustion gas and primary air, connected to the front end of the Venturi tube 2*b*, this enclosure 3 being mounted on a support plate 5 at a short distance therefrom and defining with its central wall 3*a* a cylindrical space or chimney 6; a burner head 7 in the form of a crown resting by its flange 7*a* on the enclosure 3 of the distribution chamber 4 and provided with radial slots 8 which are completely open upwardly, having a depth shallower on the outer edge 8*a* than on the inner edge 8*b*, presenting in the central part or zone 8*c* a depth shallower than those existing at the outer edge 8*a* and inner edge 8*b*, and connecting said distribution chamber 4 to the atmosphere; and also a hot plate 9 arranged above the burner 1 and serving as support for a vessel whose content is to be heated.

Starting from this state of the art, the gas burner 1 is characterized, according to the invention, in that it is placed below a protective tray 10 provided with an opening 11 above the burner head 7, the diameter of which opening is greater than the outer diameter of said head 7 and which is covered by the hot plate 9 abutting on the protective tray 10 by means of a plurality of supporting legs 12 connected together by a connecting ring 13. In addition, the upper face 7*b* of the burner head 7, onto which the radial slots 8 open out, is downwardly inclined towards the center of said head 7 and in the inner marginal zone is downwardly curved, preferably progressively, so as to come in line with the central vertical wall 3*a* of the enclosure 3. It is also important that the radial slots 8 are completely obturated at their outer vertical edge 8*a*, for example, by the upper annular part 3*b* of the enclosure 3, and also completely open at their inner edge 8*b* so as to open out into the central recess 7*b* of the burner head 7. Moreover, in the central zone 8*c* of the radial slots 8, for example, near the central zone, the burner head 7 has an annular groove 14 cut in said latter from its upper face 7*b*, so that in this zone 8*c*, the depth of the slots 8 is shallower than those existing on the outer edge 8*a* and inner edge 8*b*. The radial slots 8 are in addi-

tion obturated at their base in the zone of their inner edge **8***b* by the flange **7***a* which extends approximately below the central zone **8***c*. Thus, the slots **8** communicate with the distribution chamber **4** through a part of the lower face of the burner head **7**, said part being comprised between the flange **7***a* and the upper annular part **3***b* of the enclosure **3**.

By way of example, it will be noted that the slots **8** have a width of about 1 mm., a depth of about 8 mm. in the zone of the outer edge **8***a*, a depth of about 11 mm. in the zone of the inner edge **8***b* and a depth of about 3 mm. in the central zone **8***c* in the region of the region of the annular groove **14**.

It is advantageous to make in the burner head **7** the radial slots **8** in groups **15** of at least two slots placed very close to one another, so that the flame of one slot lights and automatically stabilizes the flame of the next slot, a distance equal to at least double the width of a group of slots **15** being provided between two groups of adjacent slots.

The hot plate **9** comprises on its lower face ribs **9***a* which are preferably spiral.

A thermostat **16** is arranged in the central cylindrical space **6** of the enclosure **3**, passes through the central recess defined by the upper face **7***b* of the burner head **7** and is fixed at its base to the supporting plate **2**, the sensitive member **16***a* of this thermostat **16** being mounted to slide and to move axially freely in the envelope **16***b* of the thermostat **16** by means of a spring **16***c* and being capable of traversing a central hole **9***b* of the plate **9** and of slightly projecting above the upper face of said plate **9** when the spring **16***c* is relaxed or when an annular shoulder **16***d* against which the upper end of the spring **16***c* is applied abuts against a suitable stop fixed to the internal face of the envelope **16***b*.

The enclosure **3** of the distribution chamber **4** has an outer diameter greater than that of the opening **11** of the protective tray **10** and comprises a horizontal annular upper part **3***c* joining the vertical upper part **3***b*. To this horizontal upper part **3***c* is fixed the front end of a flash tube **17** placed below the tray **10**, the slot **8** or the group of slots **15** located opposite this flash tube **17** communicating with this latter by their outer edge **8***a*. Thus, the mixture of combustion gas and primary air flowing out of this slot **8** or group of slots **15** may easily penetrate into the flash tube **17**. In the region of the slot **8** or the group of slots **15** located opposite the flash tube **17**, the vertical upper part **3***b* of the enclosure **3** comprises one or more vertical cuts **18** in alignment with said slot **8** or group of slots **15**.

FIG. **2** shows on a larger scale part of the burner according to the invention, the elements identical to those shown in FIG. **1** bearing the same reference numerals.

This Figure shows in particular that, in the region of the slot **8** through which passes the axial section, the flame **19** leaving this slot **8** comprises a part **19***a* at a very short distance above the upper face **7***b* of the burner head **7**, this part generally known as "blue cone" and a fairly high plume or wreath **19***b* widening considerably towards the outside without touching the opening **11** and licking a large part of the hot plate **9**. However, the plume **19***b* extends only very slightly above the central space **6**.

This particular form of the plume **19***b* is due on the one hand to the shape of the slots **8** and on the other hand to the fact that the secondary air is mainly sucked in upwardly through the central space **6** and, at the level of the burner head, is deviated towards the outside.

This Figure also shows that in the region of and above the annular groove **14**, the "blue cone" **19***a* has a swell **19***c* due to a stronger supply of gas through the central zone **8***c* of the slot **8**. Moreover, during service with a reduced output of gas, it is only in the region of the groove **14** that the flames are lit. The shape of these flames is a continuous ring. The groove ensures in addition the mutual lighting of the gas leaving the different slots **8**.

Thus, as has already been stated hereinabove, is produced a burner which combines all the desired qualities; particularly a good flame stability, a good flexibility of operation, a good thermal efficiency, an absolute protection against clogging and shocks, etc.

The object of the invention may undergo numerous modifications, without departing from the scope of the invention. Thus a principle of similar conception may be employed for producing linear burners, for example, intended for ovens or washing machines with a cylindrical tank of horizontal axis. In this case, the combustion slots are no longer radial but perpendicular to the longitudinal axis of the linear burner. One of the lateral sides of the enclosure **3** is in line with the upper face of the burner head which then has a rectilinear extension.

What is claimed is:

1. A gas burner comprising support means, a mixer mounted on said support means and having atmospheric induction, an enclosure forming an annular distribution chamber connected to the front end of said mixer, said enclosure having an inner wall forming an inner cylindrical space in concentric relationship with respect to said annular distribution chamber, means mounting said enclosure in spaced relationship with respect to said support means so that secondary air can pass from the bottom upwardly into said cylindrical space, a crown-shaped burner head mounted on said enclosure, said head having an upper face downwardly inclined into said cylindrical space, said head having a plurality of radial slots connecting said annular distribution chamber to said cylindrical space, means for obturating the outer vertical edge and the horizontal inner edge of said radial slots, said head having an annular groove in its upper face disposed in an outer zone near a central zone of the head, a protective tray mounted above said burner head and having an opening larger in diameter than the diameter of said head, and a circular hot plate mounted on said protective tray.

2. A gas burner according to claim **1** wherein said radial slots in the burner head are disposed in groups of at least two closely spaced slots with respect to each other.

3. A gas burner according to claim **1** wherein said hot plate has ribs on its lower face.

4. A gas burner according to claim **3** wherein said ribs are of spiral configuration.

5. A gas burner according to claim **1** further comprising a thermostat envelope mounted on said support means to pass upwardly through said cylindrical space, said burner head, and said protective tray, resilient means mounting a thermostat sensitive member in said envelope for movement therewithin, and said sensitive member extending above the hot plate.

6. A gas burner according to claim **1** wherein a flash tube is mounted under said protective tray and has one end thereof disposed adjacent the outer edge of said radial slots, said means for obturating the outer vertical edge of said radial slots having slots adjacent said one end of the flash tube, the other end of said flash tube extending outwardly to communicate with the atmosphere.

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