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(54) Gas burner for food cooking.

(57) The invention refers to a gas burner for cooking appliances, of the type which can be used with gases of different kinds; the main characteristic of the burner is that the flame separator element, to which a cover (4) is superposed, is integrated in the head (1) of the burner, made of a single piece with it, and provides for different orifices, for the exit of the air-gas mixture, disposed in two rings, an upper one (3; 9) and a lower one (2;10), in that a first series of said orifices (2;9), provided for supplying main flames, have a section such that the exit speed of the mixture is higher than the combustion speed of the most critic type of gas and in that a second series of said orifices (3;10), provided for supplying pilot flames, have means (5;11) to reduce the exit speed of the mixture, so that it results in being minor in respect of the exit speed from the orifices of the first series, in order to stabilise said pilot flames and, as a result, the main flames.

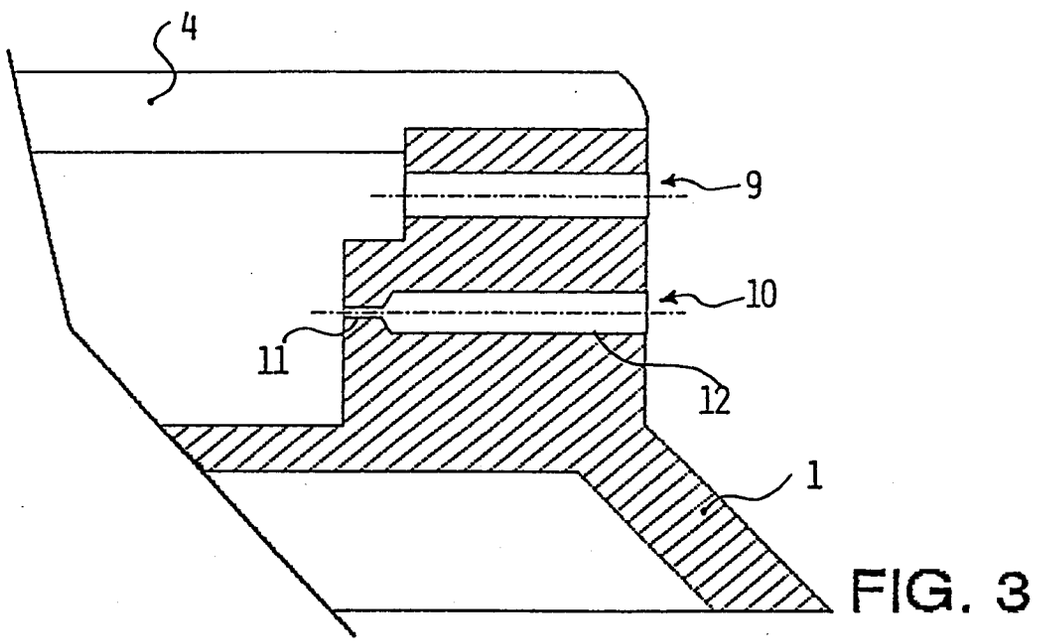

FIG. 3

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The present invention refers to a gas burner for cooking appliances, of the type which can be utilised with gases of different kinds.

As is known, some kinds of burners, that will be in the following also called multigas, are realised so as to be able to operate indifferently with gases of different nature, i.e. members of the big families of gases currently used in the field of household kitchens, and in particular:

- gas of the first family, or artificial gas, which is derived from the transformation of solid or liquid fuels, such as the so called "town gas";
- gas of the second family, or natural gas, which originates naturally from the land and from petroleum drilling, and which present pure methane, methane with nitrogen presence or heavy hydrocarbons;
- gas of the third family, or gas liquefied from petroleum (GPL).

Such kinds of gas have physical characteristics (such as density, calorific power, combustion speed, etc.) very different between themselves and thus burners have to be realised taking into account such different characteristics (for example, gas obtained by the liquefaction of petroleum require burners being well calculated, due to the great quantity of primary air required, and in which the slots of the flame separator rings have to be sized with great precision, because of the low combustion speed of such kinds of gas).

In general, burners provide for gas injectors that have to be adjusted, when the cooking appliance is installed, depending on the type of gas to be used; with such operation the flow of primary air is determined, with which the gas coming from the mains supply will be mixed inside the burner, for realising the flammable mixture.

Such possibility to previously adjust the gas flow contributes to solve the main problem of multigas burners, i.e. assuring a correct combustion, with absence of flame "return" (back-fire) and/or flame "detaching" phenomenon.

In particular the detaching and the flame return - i.e. those phenomenon that occur respectively when the air-gas mixture exits the burner too quickly (and consequently the flame physically leaves the burner) or when the exit thrust of the mixture suddenly falls (and consequently the flame burns the mixture in the inside of the burner, up to the injector) - are commonly solved in the two following ways.

A first system is that of stabilising the main flame by means of a smaller flame, the so-called "pilot flame"; such a pilot flame is a continuous flame, present at the base of the main flame, that exits the burner with a speed very near to the combustion speed of the more critical gas, and thus performs a stabilising function.

The second system generally used is that of providing the burner with a flame separator which presents orifices or slots having different sizes, from which the main flames can exit with different exit speeds, in order to compensate for the different combustion speed of the usable gas.

Such systems do however have some problems, due to the fact that in both cases it is necessary to operate on the flame separator element, or ring, of the burner.

In such element, generally made of pressed brass, the slots for the exit of the flames (both main and pilot flame) have to be realised and disposed in a very careful and precise way.

The openings for the pilot flame are in fact generally realised in form of recesses on the lower edge of the flame separator, that lies on the head of the burner; for the cited precision exigencies, the profile of the flame separator must bear almost perfectly on the head of the burner and this is very difficult to obtain with pressed pieces; in the case in which there is not a perfect compliance, in fact, the pilot flames cannot correctly fulfil their function, because through the relative slots an incorrect quantity of mixture will exit, and a poor combustion will result.

Problems of incorrect combustion can also occur in the case in which the slots for the main flames are realised in the form of recesses on the upper edge of the flame separator, on which the cover of the burner is arranged: in the case in which the contact is not perfect between flame separator and cover, the mixture will exit in a greater o minor quantity in respect of that effectively required and the undesired phenomenon will occur.

Such system requires therefore a very careful, and thus expensive, manufacturing, and moreover the device looses its precision with the passing of time; in fact the flame separator unavoidably deteriorates, for example because of normal removal and cleaning operations, due to the fact that even a small wearing of its profiles is sufficient to negatively influence the correct operation of the burner.

The realisation of narrow slots with variable thicknesses in the brass flame separator is somewhat complex, from an industrial viewpoint, because the precision required for the sizing of the slots and the respect of the tolerances determines a rapid consumption of the tools, with a consequent high cost of this type of solution.

The aim the present invention is thus that to solve the above cited problems and to indicate a multigas burner which allows for avoiding the undesired phenomenon, such as the flame detaching or the back-fire, which is of simple industrial manufacturing, reliable over time, of simple maintenance, of easy cleaning, and inexpensive.

Such aims are reached, according to the invention, by a gas burner for cooking appliances, of the type which can be used with gases of different kinds, characterised in that the flame separator element, to which a cover is superposed, is integrated in the head of the burner, made of a single piece with it, and provides for different orifices, for the exit of the air-gas mixture, disposed in two rings, an upper one and a lower one, in that a first series of said orifices, provided for supplying main flames, have a section such that the exit speed of the mixture is higher than the combustion speed of the most critical type of gas and in that a second series of said orifices, provided for supplying pilot flames, have means to reduce the exit speed of the mixture, so that it results in being minor in respect of the exit speed from the orifices of the first series, in order to stabilise said pilot flames and, as a result, the main flames.

Further aims and advantages of the present invention will result clear from the detailed description which follows and from the annexed drawings supplied as an explicative and non-limiting example, wherein:

- figure 1 represents a first partial and schematic section of the gas burner according to the present invention, in a first possible embodiment;
- figure 2 represents a second partial and schematic section of the gas burner of figure 1;
- figure 3 represents a partial and schematic section of the gas burner according to the present invention, in a second possible embodiment.

With reference to figures 1 and 2, that represent two different partial and schematic section of the gas burner according to present invention, in a first embodiment, reference number 1 indicates the head of a burner; here it has to be specified that burners of the known type are generally composed, in the order of four parts: a sump - arranged beneath the cooking plane -, a head - arranged on the cooking plane, between the sump and flame separator -, a flame separator and a cover - the latter being arranged on the flame separator ; in the burner according to the invention the flame separator is integrated with the head of the burner.

The head 1 has within its perimeter a series of slots 2, realised in the form of notches on its upper edge; between two successive slots 2, the head 1 provides for second slots 3, of minor height if compared to the previous ones, as can be clearly seen in figure 2.

On the upper edge of the head 1 lies the burner cover, indicated with 4, that thus delimits upwardly the cited slots 2 and 3; such cover has in its lower section a ringed zone being of a reduced thickness, that determines along its entire perimeter a wall 5, directed downwardly, having a height substantially analogous to that of the recesses forming the slots 3 and placed in front of them; of course the cover 4 provides for appropriate support and centring means in respect of the head 1, realised for example by means of small protrusions that engage in corresponding cavities of the head (or vice versa), that for simplicity have not been represented in the figures.

Main flames exit through slots 2, while the slots 3 realise the flame transmission function; the exit speed of the air-gas mixture through the slots 2 and 3 is such to be higher than the combustion speed of the most critical gas: in this way the back-fire phenomenon in the slots 2 is prevented, which have an exit section larger than that of the slots 3.

The presence of the wall 5 of the cover 4 in front of the slots 3, has the aim of creating a counter-pressure, represented by the arrow 6, to the air-gas flow exiting the smaller slots. In other words, thus, the air-gas mixture that exits from the slots 3, strikes the wall 5 and tends to return backwards, slowing the further exit of the mixture from the slots 3.

Such counter-pressure has thus the effect of reducing the exiting flow speed, a speed that is thus carried back to the value of the combustion speed of the most critical gas for the flame detaching.

In this way a zone of flame stability is obtained, in the area indicated with the reference number 8, that stabilises the flames exiting the slots 2, thus preventing the risk of the flame detaching phenomenon.

The following figure 3 represents a partial and schematic section of the gas burner according to the present invention, in a second embodiment; in such figure the head of the burner, indicated with 1 as a whole, includes two series of calibrated holes 9 and 10, disposed one above the other. The burner includes also in this case a cover, indicated with 4, directly arranged on the head 1.

The holes 10 realising the lower series have a double holing, i.e. two portions of different diameters; in particular, the zone, indicated with 11, of the end of the hole 10 towards the interior of the head 1 has a smaller diameter if compared to the zone, indicated with 12, towards the exterior of the same head.

Main flames exit the upper holes 9, with a speed such as to be higher than the combustion speed of the most critical gas for the danger of back-fire.

Whereas the pilot flames exit the lower holes 10, which have the aim of stabilising the main flames in the presence of gases having a low combustion speed, or in presence of those gases

that facilitate the detaching flame phenomenon.

The double holing of holes 10 actually has the function of stabilising the flames in case of use of gas that favours the detaching: the diameter of the hole 11 determines the flow of the mixture (thermal flow of the flame), while the diameter of the hole 12, being greater than the first, determines a diminution in the exit speed of the air-gas mixture.

The ratio between the two holes 11 and 12 allows to obtain an exit speed of the mixture lower than the mixture which exits holes 9, and so pilot flames which are stable, also in presence of gas that favours the flame detaching, in a way that they stabilise the main flames exiting by the upper holes 9.

The above described solutions thus consent for realising flame separator elements integrated to the head of the burner, obtainable with simple operations.

In particular, the head of the burner described with reference to figures 1 and 2 is obtainable entirely with a single pressing operation, while the head of the burner of figure 3 is obtainable through a pressing and drilling operation.

The characteristics of the gas burner object of the present invention are clear from the given description and the annexed drawings; also clear are its advantages. In particular:

- with any of the two described solutions the flame detaching phenomenon is effectively avoided;
- the procedure for obtaining the head of the burner is very simple and requires minor workings and controls, with respect the traditional burners, in which the flame separator element is distinct regards the head of the burner; the cost of manufacturing is thus very low;
- the maintenance and the cleaning of the burner are simplified in that the number of pieces of the burner is reduced;
- the burner is reliable over time, because its flame separator integrated to the head is subject to a minor wearing, if compared to distinct flame separators in brass, subject to consumption and deformations.

The described burner can be indifferently a burner of the type that takes the primary air for the formation of the air-gas mixture from above or below the cooking plane.

In the same way the burner can provide for a sensor, for measuring the temperature reached by food contained in cooking containers, or electric/electronic ignition devices.

It is however clear that many changes can be made by the man skilled in the art, to the gas burner for cooking appliance described as an example, without departing from the novelty principles of the invention.

Claims

1. Gas burner for cooking appliances, of the type which can be used with gases of different kinds, characterised in that the flame separator element, to which a cover (4) is superposed, is integrated in the head (1) of the burner, made of a single piece with it, and provides for different orifices, for the exit of the air-gas mixture, disposed in two rings, an upper one (3; 9) and a lower one (2;10), in that a first series of said orifices (2;9), provided for supplying main flames, have a section such that the exit speed of the mixture is higher than the combustion speed of the most critical type of gas and in that a second series of said orifices (3;10), provided for supplying pilot flames, have means (5;11) to reduce the exit speed of the mixture, so that it results in being minor in respect of the exit speed from the orifices of the first series, in order to stabilise said pilot flames and, as a result, the main flames.

2. Burner, according to claim 1, characterised in that said first series of orifices, provided for supplying the main flames, are realised in the form of slots (2) obtained by making a series of carvings on the upper edge of the head of the burner, in that said second series of orifices, provided for supplying pilot flames, are realised in the form of slots (3), intercalated to the previous ones and being of different size, delimited between the upper edge of the head of the burner and the said cover (4), which has along its entire perimeter a wall (5) directed downwardly, in order to slow the exit speed of the mixture from said second series of slots (3).

3. Burner, according to claim 1, characterised in that said first series of orifices, provided for supplying main flames, are realised in the form of calibrated holes (9), obtained in the upper zone of the head of the burner, in that said second series of orifices, provided for supplying pilot flames, are realised in the form of calibrated holes (10), disposed under said first series of orifices, and in that each of said holes of said second series presents a plurality of different sections, in order to reduce the exiting speed of the mixture.

4. Burner, according to claim 3, characterised in that each hole (10) of said second series of orifices has in its more internal part a reduced section (11), and in the more external part a

substantially wider section (12).

5. Burner, according to claim 4, characterised in that the ratio between the two sections (11, 12) of the holes (10) of the second series is sized in order to obtain pilot flames stable in presence of gas that favours flame detaching, so that they stabilise the main flames exiting the holes of the first series (9).

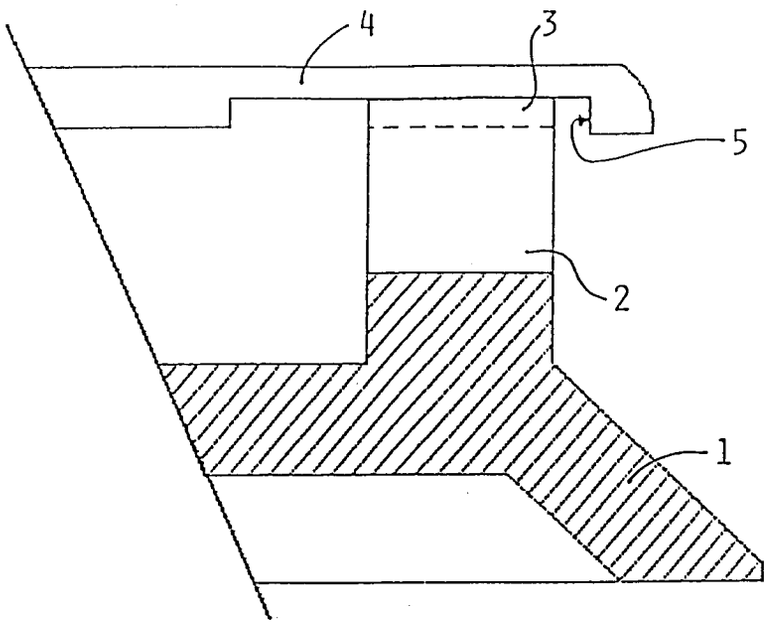

FIG. 1

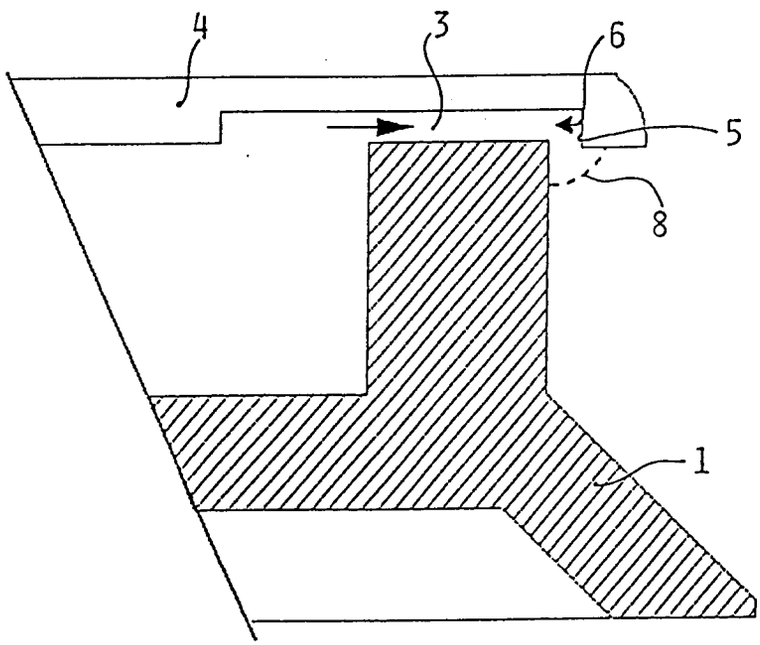

FIG. 2

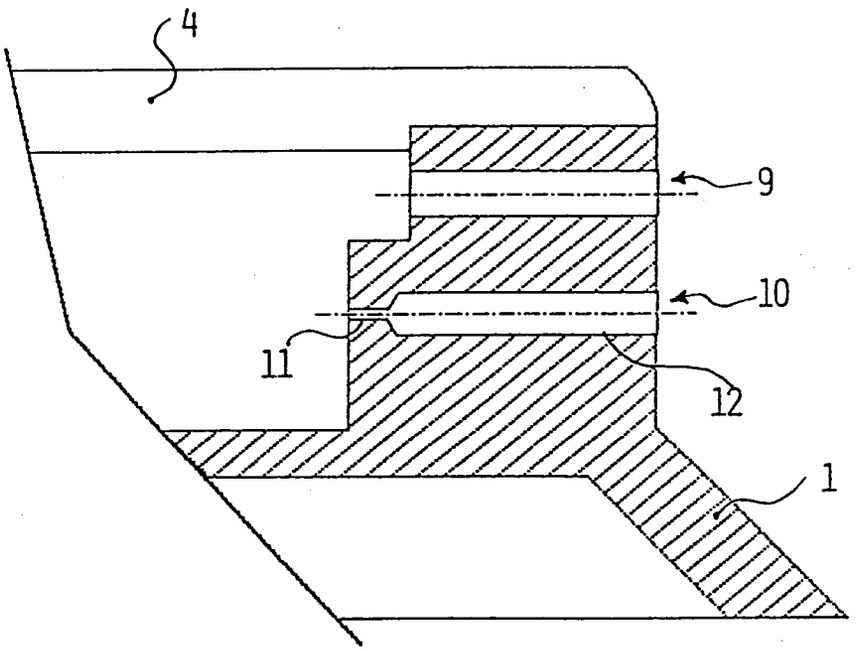

FIG. 3