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(54) Gas fuelled combustion appliance.

(57) Gas fuelled combustion appliance, for example portable space heater of the radiant plaque type, includes a burner (10) fed with gas fuel/air mix formed in a duct (14) having its upstream end (16) open to atmosphere, pressurised gas fuel being directed along said duct from jet means (20) at the upstream end, said means including two or more gas fuel outlets (28,30) at least one of which has connection to the gas fuel supply controlled independently of the supply to the other outlet or outlets whereby one independently controlled outlet (28), e.g.by means of a valve (36), can be turned down or off to regulate heat output from the burner without any substantial effect on its efficiency.

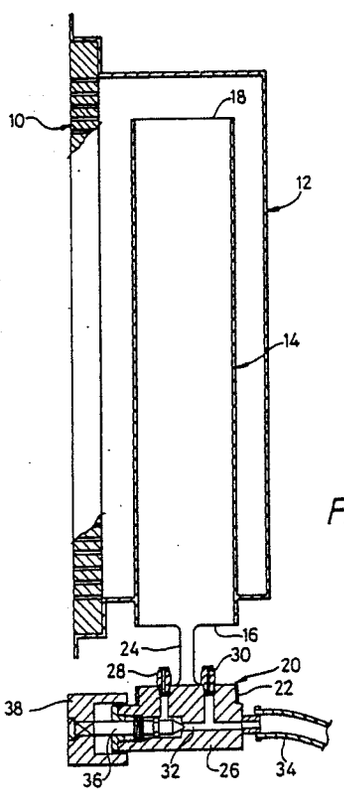

Fig.1

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GAS FUELLED COMBUSTION APPLIANCE

This invention relates to gas fuelled combustion appliances, particularly but not exclusively portable appliances for space heating and similar applications fuelled e.g. by butane or propane LPG gas cylinders. However, it is to be understood that the invention may have application to other forms of combustion appliance e.g. ovens, furnaces or other heat processing equipment, burner assemblies for boilers and the like.

Efficient and safe combustion for the most economic provision of the required heat output and for avoiding atmospheric pollution and/or emission of toxic products of combustion, notably carbon monoxide, requires reliable and foolproof regulation of mix of gas fuel and air suited to the type of burner employed.

It is also desirable for many applications, such as space heating, that the heat output from the appliance can be selectively regulated or, at least, be switchable from high to low heat output levels.

In known appliances, for example, portable or other gas fuelled space heaters of the radiant surface combustion plaque type i.e. not normally provided with any flue or venting of the products of combustion outside the space being heated, regulation of heat output by any substantial degree has hitherto commonly been provided by individual control of separate burner sections each provided with its own gas fuel and air feed and mixing means, by turning one or more said sections off when lower heat output was required.

The object of the invention is to provide a gas fuelled combustion appliance which is of particularly simple and economical construction yet which is safe, reliable and efficient in use and wherein the heat output is readily selectively controlled.

According to the invention there is provided a gas fuelled combustion appliance including a burner for sustained combustion of a mix of gas fuel and air, duct means having an upstream portion open to atmosphere and a downstream portion leading to the burner, and jet means positioned to direct pressurised gas fuel along at least the downstream portion of the duct means to induce air flow from the upstream portion so as to form said mix characterised in that the jet means includes a plurality of gas fuel outlets at least one of which has connection to a supply of the gas fuel controlled independently of the supply to the other outlet or outlets in use, said outlets acting in parallel with respect to the through flow along the duct means to contribute to a common output of the mix to the burner from said downstream portion.

Conveniently the duct means is a simple tube definding a single through passage from its upstream to its downstream end and the jet means comprises two or more separately controlled gas fuel jet nozzles located side by side or otherwise adjacent to each other, typically in or adjacent the inlet end of the said tube.

The tube may be of uniform cross section throughout its length or may be shaped to provide tapered or other configurations e.g. in the downstream portion and/or in the region of the jet means, e.g. a venturi throat or choked section.

The duct means may include a plurality of separate upstream and/or median portions with one or more of the gas fuel outlets positioned in or acting in association with each, for example a Y shaped tube using the arms of the Y as the upstream portion with gas fuel outlet nozzles at the mouth of each arm, or a tube fitted with one or more separating walls to form parallel upstream and/or median portions with the flows merging in a common downstream portion.

An example of the invention is now more particularly described with reference to the accompanying drawing being a vertical section of a burner assembly for a plaque type gas fuelled space heater.

The heater comprises a burner in the form of a planar plaque 10 of known construction. Sustained surface combustion of the appropriate mix of air and gas fuel takes place so that the surface of the plaque becomes incandescent in known manner.

A box-like distribution chamber 12, e.g. formed of sheet metal, encloses the rear face of plaque 10 and duct means in the form of an open ended uniform diameter circular section mixing tube 14 extends vertically through the bottom wall of chamber 12, its upstream or input end 16 being open to atmosphere and its downstream or output end 18 opening into the upper region of chamber 12.

Jet means 20 is located a short distance below the input end 16 of tube 14, conveniently it is located by a collar 22 formed from a downward projection of the structure of tube 14 linked to the latter by a pair of integral limbs 24.

Jet means 20 comprises a jet block 26 mounting a pair of jet nozzles 28, 30 directed toward the input end of tube 14 so that they act in parallel.

Block 26 defines feed passages 32 leading from a supply pipe 34 which will be operatively connected to a source of pressurised gas fuel, for example a cylinder of LPG fuel by way of a regulator (not shown) in known manner.

The part of the feed passages 32 leading to the front nozzle 28 is controlled by a screwdown or other shut-off valve 36 operated by a knob 38 without affecting the operation of the rear nozzle

30.

It will be observed that in this example neither of the jet nozzles 28, 30 is centered with respect to tube 14, though in some arrangements one of the nozzles may be so centered.

In known equipment of this kind a single jet nozzle is used carefully centered on the axis of the mixing tube and the teaching of the prior art regarding burner assemblies using gas fuel/air mixer tubes has always stressed the importance of this alignment for providing adequate primary aeration, i.e. pre-combustion mix of gas fuel and air.

The problem with the hitherto recommended centered single jet arrangement at least with regard to appliances of simple construction and/or using certain types of burner is that the optimum operating gas pressure cannot be substantially reduced without a much more drastic reduction in primary aeration.

For example in a burner assembly having a single gas fuel nozzle positioned axially of a simple mixing tube with gas supplied at a pressure of 37mbar at full heat output, if the heat output was to be reduced by 50% by reducing the gas fuel input it would be necessary to drop the gas pressure to around 9mbar i.e. about one quarter of the full pressure and in many cases this may give such a great reduction in the volume of air flow induced along the tube that the primary aeration would no longer be acceptable, particularly with a burner such as the radiant surface combustion plaque referred to above. This type of burner requires that primary aeration of the gas fuel is maintained at a high and uniform level to ensure good combustion performance and safe operation, thus the main method of heat output control has, in practice, been the provision of multiple burners with individual mixer tubes which can be individually turned on or off as required.

In the described example each of the jet nozzles 28, 30 provides half the fuel input for the burner to operate at maximum heat output. If said output is to be reduced by half the front nozzle 28 is turned off by means of shut-off valve 36 but the rear nozzle 30 continues to operate at the full gas pressure (e.g. 37mbar) and this maintains the required entrainment of primary air mixing in tube 14 thus burner 10 will continue to operate at optimum combustion conditions but providing half the heat output.

In this way the single burner plaque 10 can be operated safely, efficiently and reliable at full or half heat so that a particularly compact dual heat appliance is provided which is economical to manufacture, requires few components, and is easily operated and controlled.

It will be understood that the set of jet nozzles feeding a burner in common could consist of more than two individually controlled jet nozzles operating in conjunction with a common mixing tube 14 e.g. to give a wider range of control, also that the jet nozzles need not all be the same size. In alternative arrangements the set is divided into groups of one or more jet nozzles each said group being associated with a respective branch or division forming the downstream and/or median portions of the duct means with the flows of gas fuel and air mingling in a common upstream portion of the duct means leading to the common burner. Thus Y shaped or other branched mixing tubes may be used and/or the tube may be divided into longitudinal open ended compartments for part of its length. Various shapes and longitudinal profiles of tube may be employed.

A further advantage of the invention is the particularly simple construction of the jet block 26 involving a minimum of pipework and gas tight connections as compared with a multi-burner appliance, thus again reducing manufacturing costs and maintenance and reducing risk of leakage.

The invention may be particularly advantageous used in combination with a radiant plaque or other burner having high through flow resistance where maintenance of high aeration levels is otherwise difficult or critical.

Burners with low through flow resistance e.g. perforated hard ceramic radiant plaques having numerous ports will tolerate substantial primary aeration reduction before suffering ineffective combustion but this type of burner is less efficient, the plaque surface operates at a lower temperature and the overall flame distribution or "picture" is poor. A re-radiant mesh is usually fitted just in front of the plaque radiant surface so as to increase the temperature by reflecting heat back and also improving the visual appearance. The mesh is usually of expanded corrosion resistant steel which is costly to provide.

Much more efficient high flow resistance plaques made from ceramic fibres give high radiant output without need for a mesh but will not tolerate substantial loss of primary aeration. Use of the invention in common with this latter type of plaque enables a wide range of heat regulation while maintaining effective operation of the burner with very simple and economical construction.

The invention may also be applied in up rating the heat output of a burner, the increased primary aeration afforded by the multi-jet arrangement may permit increased fuel input with the necessary mix of air, or for the same fuel input the combustion efficiency may be improved.

The jet nozzles need not necessarily all be positioned at the same height or position along the tube or other duct means, they could be somewhat staggered longitudinally thereof.

Claims

1. A gas fuelled combustion appliance including a burner (10) for sustained combustion of a mix of gas fuel and air, duct means (14) having an upstream portion (16) open to atmosphere and a downstream portion (18) leading to the burner, and jet means (20) positioned to direct pressurised gas fuel along at least the downstream portion of the duct means to induce air flow from the upstream portion so as to form said mix; characterised in that the jet means includes a plurality of gas fuel outlets (28,30) at least one of which has connection to a supply of the gas fuel controlled independently of the supply to the other outlet or outlets in use, said outlets acting in parallel with respect to the through flow along the duct means to contribute a common output of the mix to the burner from said downstream portion.

2. An appliance as in Claim 1 characterised in that the duct means is a simple tube (14) defining a single through passage from its upstream to its downstream end.

3. An appliance as in Claim 2 characterised in that the jet means comprises two or more separately controlled gas fuel jet nozzles (28,30) located side by side or otherwise adjacent to each other.

4. An appliance as in Claim 2 or 3 characterised in that the jet means (20) is located in or adjacent the inlet end (16) of said tube.

5. An appliance as in Claim 2, 3, or 4 characterised in that the tube (14) is of uniform cross-section throughout its length.

6. An appliance as in Claim 2, 3, or 4 characterised in that the tube is shaped to provide a venturi throat, choked section or other tapered configuration.

7. An appliance as in Claim 1 characterised in that the duct means includes a plurality of separate upstream and/or median portions each having at least one gas fuel outlet positioned in or acting in association therewith.

8. An appliance as in Claim 7 characterised in that the duct means is a Y shaped tube, the arms of the Y each having a respective gas fuel outlet associated therewith and constituting the upstream portion.

9. An appliance as in Claim 7 characterised in that the duct is a tube fitted with one or more separating walls to form parallel upstream and/or median portions each having a respective gas fuel outlet associated therewith, the flows therefrom merging in a common downstream portion.

10. An appliance as in any preceding claim characterised in that the burner is a radiant surface combustion plaque (10) for space heating.

11. An appliance as in Claim 8 characterised by including a ceramic fibre or other plaque (10) having high through flow resistance to give high radiant output.

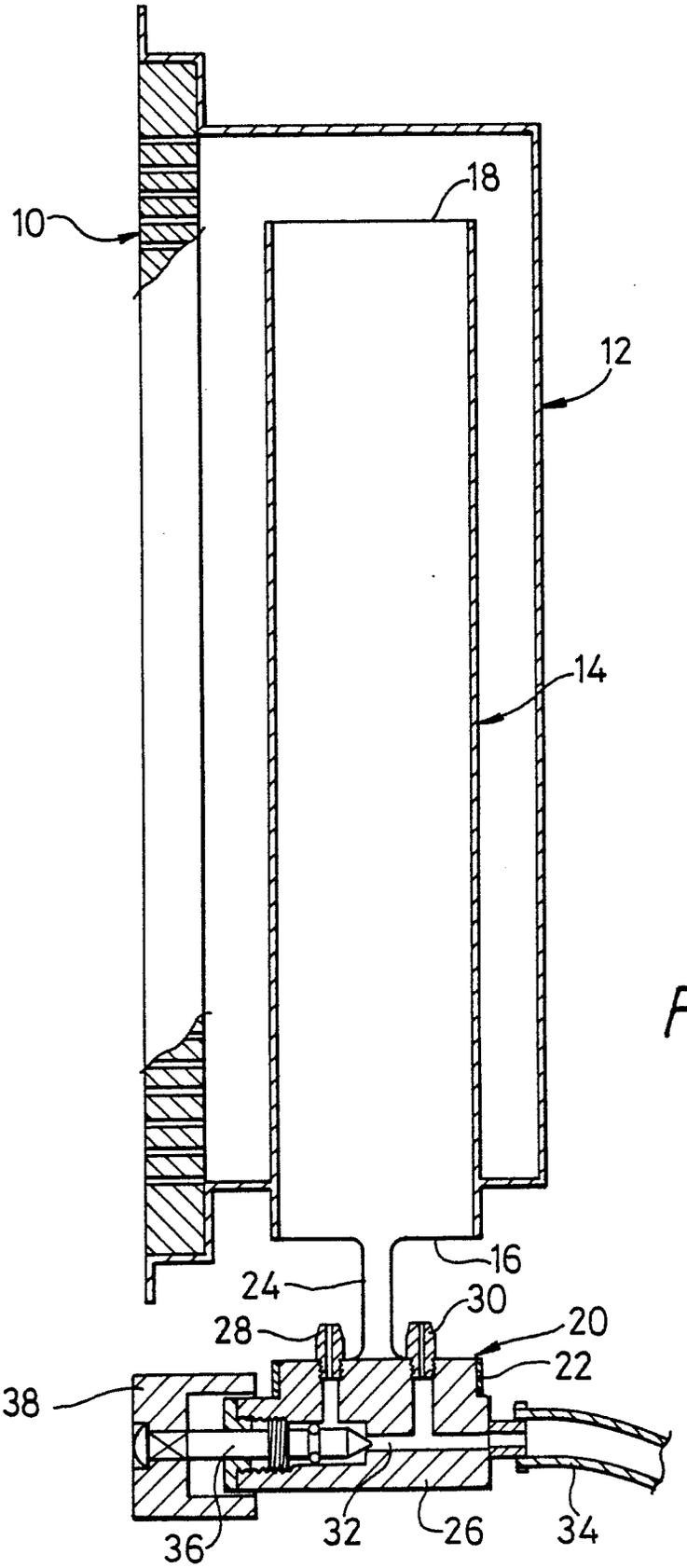

Fig. 1

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EUROPEAN SEARCH REPORT

Application Number

EP 88 30 1253

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.4)
Y	FR-A-1 345 484 (L'ACIDE CARBONIQUE PUR) * Page 4, abstract 1-3; figures *	1-7	F 23 D 14/64 F 24 C 3/08
Y	FR-A-1 398 066 (MASSON) * Page 2, abstract; figures *	1-7	
A	DE-A-1 551 770 (CALORIC) * Page 4; figures 1,2 *	1,6,11	
A	DE-A-2 151 611 (RHEINSTAHL) * Page 5, claims; figures 1,2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 23 D
F 24 C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24-05-1988	VANHEUSDEN J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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