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(54) Space heating appliances.

(57) A living-flame-effect gas fire has two separately regulatable gas supplies. One gas supply is aerated and directed to the front or room-side of the fire and the other is non-aerated and fed to the back of the fire; a control valve first feeds the aerated gas to the fire and then adds a feed of the non-aerated gas. A pilot light can ignite the aerated gas which then serves as a pilot to ignite the non-aerated gas.

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SPACE HEATING APPLIANCES

FIELD OF THE INVENTION

The present invention concerns space heating appliances such as open fires using gas as a fuel but giving the visual effect of a solid fuel burner.

BACKGROUND OF THE INVENTION

For more than the past fifty years, attempts have been made to make gas fires resemble solid fuel burners. Thus British Patent 284867 of 1927 discloses gas fires having radiant plaques heated by non-luminous flames having in addition luminous flames to give the appearance of a coal fire. In burners using radiant plaques, the plaques are uniformly heated and thus there is little of the ever-changing flame patterns typical of a solid fuel fire and thus such burners look artificial and not very similar to the solid fuel fire they are intended to resemble. A more true appearance is obtained by having the gas diffuse through a bed of particles simulating ash and cinders and burning on the surface on which larger articles simulate the solid fuel (coal or logs) as shown in British Patent 1541423. In such fires random changes in the gas flow and in currents of air over the surface give the desired living flame effect. However at low heat outputs neither type of burner gives a realistic imitation of a solid fuel fire, the red glow diminishes and the luminous flame loses realism.

In this Specification, "low heat outputs" means heat outputs at the bottom of the permissible range of outputs below which partial combustion of the fuel could result in carbon monoxide emissions. As an example, in a fire having a maximum gas consumption of 31,400 British Thermal Units per hour a low heat output would correspond to a consumption of 20,000 British Thermal Units per hour. With radiant plaque heaters, lower heat outputs may be possible by confining the "fire" to a central strip by cutting off the fuel gas supply to one or more of a plurality of individual burners as in British Patent 1474033 with a further

loss of realism.

These flame effect fires are normally trapedoidal in plan to fit into an existing hearth and thus have a shorter parallel edge to fit against the back of the hearth and a longer parallel edge which is the outer or room-side edge. However freestanding fires are known with a circular outer edge on the room-side.

In this specification,"aerated" and "non-aerated" mean respectively aerated to a substantial extent conventionally containing half the amount of air for stoichometric combustion so it will burn with a blue, barely visible, flame and aerated to zero or low extent so it will burn with a yellow visible flame.

SUMMARY OF THE INVENTION

According to the present invention, a space heating appliance for giving the effect of a solid fuel fire having a bed of porous material simulating in use cinders and glowing ash with larger material on top simulating in use burning solid fuel such as logs or coal, the bed having an outer roomside edge, at least one fuel gas supply means for gas which will burn with a luminous flame and at least one fuel gas supply means for gas which will burn with an aerated non-luminous flame, the means being disposed so that the gas flows upwardly through at least part of the bed depth, is characterised in that the fuel supply means for the aerated gas is directed to a zone along the outer edge and that the fuel supply means for the luminous burning gas is directed to a zone remote from that edge and in that a gas flow regulator at desired low heat outputs prevents flow of the luminously burning gas and regulates flow of the aerated burning gas and only at higher heat outputs permits an additional flow of the luminously burning gas.

At low heat outputs, the visual effect is not merely that the roomside edge has a red glow with a shimmering blue barely visible flame typical of a fire down to ashes and cinders but in addition since the hot gases are swept over the larger material by a flue effect,

a combination of wall attachment of gas flow and the aspiration of room air (mainly the latter), this larger material also glows. This gives a very good visual effect.

The aerated gas tends to be diffused over both zones by the porous material but any aerated gas entering the second zone is of course ignited by the main flow through the first zone. However restricting that amount of aerated gas which escapes to the second zone surprisingly allows the appliance to operate at very low heat outputs without the emission of noxious gases. Whilst it would be possible to use a shallow bed of porous material in the first zone, it is felt that the natural appearance of the first zone could be impaired if the gas was not evenly diffused. Therefore it is preferred to use a normal depth of material and to separate the zones by a baffle, the top edge of which can be concealed within the material leaving a shallow depth of material over the baffle. If the baffle is in the form of a box divided to form the supply means, the escape path for aerated gas trying to enter the second zone is very shallow and relatively long (the width of the box) and so little aerated gas will enter the second zone. By these means it has been found that the fire given as an example above can be operated at consumptions of 12,000 British Thermal Units per hour. The lower the consumption the less the running cost would be and this is an impressive advantage since most fires of this size can only be turned down to 20,000 British Thermal Units per hour. Another advantage of the appliance according to the present invention is that the heat output build-up when ignited is rapid, and the arrangement is such as to give out heat efficiently even at low outputs. A convenient form of supply means box is one having a lid with depending flanges at front and rear so the emerging gas first flows downwardly and then upwards being diffused by the material on both passes.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic plan view of a burner tray assembly embodying the present invention,

Figure 2 is a schematic section on line II - II of Figure 1 showing in addition material for simulating embers and solid fuel, and

Figure 3 is a schematic circuit diagram.

BEST MODE OF PERFORMING THE INVENTION

An embodiment of the invention will now be described, by way of example, with reference to the drawings.

A burner tray 11 mounts a control panel 12 and a pilot light assembly 13 and contains a burner box 14. The tray can be trapezoidal as shown to fit into a normal hearth and has upturned outer walls 15. The box is conveniently rectangular with upturned walls 16 which are wholly within the tray. The box is towards the front of the tray and spaced about 1 centimetre from the front of the tray (the front is the longer of the two parallel sides of the tray and when the tray is installed will be on the room-side of the fire). A space can be left between the bottom of the box and the tray to allow air to enter the tray through holes (not shown) and flow below the box to merge with the gas in the tray. However it is thought that such an arrangement would not supply significant aeration and if this space is provided it is preferred that the air is directed to the back of the box. A partition divides the box into a rear chamber 17 and a front chamber 18. The box and thus the two chambers are sealed by a lid or cover 19 with depending front and rear flanges except for long narrow passages 20 along the front and rear of the box between on the one hand the cover and the flanges and on the other hand the front and rear walls of the box; each chamber has a gas entry 21. Refractory materials 22 for simulating glowing ash, cinders and other embers, expanded mica is preferred as having nearly ideal properties in a low thermal capacity, good temperature resistance, poor thermal conductivity and all other relevant characteristics is distributed over the tray concealing the box

and its lid, the particle size of this material (as is known) is small enough to diffuse the gas and so that the gas will burn only on the surface of the material. Further refractory material 23 for simulating solid fuel such as logs or coal is placed on top of the material 22. The materials in order to simulate a real solid fuel fire is heaped up towards the back or the centre of a circular fire.

Referring now to Figure 3, a mains supply 30 of fuel gas is split into three branches 24, 25 and 26 which are connected to a regulator 27 of the type that from an "off" position first permits a predetermined flow through the branch 24 (to the pilot light assembly 13), then a flow through the branch 25 preferably from a minimum preset rate progressively to a maximum design flow and thereafter progressively regulates flow through the branch 26. Such regulators are readily available and consist of three valves ganged together with mechanical detents to preset the minimum flow rates. From the regulator, the branch 25 leads to an air aspirator 28, to mix into the gas the usual amount of air for an aerated flame which is about half the stoichometric amount, to the front chamber. The branch 26 leads directly to the rear chamber 17. Originally it was thought that the branch 25 should take between one-fifth and one-half of the total flow at maximum designed heat output for preference; in practice the branch has been found to be able with benefit to take more than one-half the maximum total flow. The gas emerges from the box through the passages which serve one as an aerated jet and the other as a non-aerated jet, the aerated jet entering a zone of the material which is well defined between the box and the front of the tray so the aerated gas distribution or port loading is substantially uniform along the zone. The aerated gas burns steadily and has been found to cross-ignite the non-aerated gas without excessive flame roll-over causing an alarming whoosh.

The pilot light assembly 13 sticks up in front of the tray and has three orifices, one 31 directed to project a flame onto the surface of the material 22, one 32 to direct a flame onto a piezo-electric igniter 33 and the third 34 to direct a flame towards a flame failure senser 35. The three orifices are disposed to give reliable cross-ignition.

It will be understood that the gas could be fed into the tray with perforated pipes, a baffle being used to define the front and rear zones.

The described embodiment has been found to behave surprisingly well. A fire looks realistic burning aerated gas over a range of 12,000 to 18,000 B.T.U.'s per hour glowing like a low fire and then an extra 14,000 to 16,000 B.T.U's can be progressively added to give the luminous flickering flame of a roaring fire. If the luminous flame tends to bunch due to the suction from the chimney to an artificial looking extent (all coal fires have flames which tend to bunch or cone to some extent but with gas fires simulating solid fuel fires using diffusing material the gas starts bunching lower down within the material), it is possible to compensate by means of a baffle or b baffles to spread the luminous flame across the fire.

Care must be taken to avoid gas leaks and it is thought that careful consideration must be given to gas pressures and air pressures before risking allowing air to enter the material 22 as by entering holes into the space which previously indicated could be provided between the tray and the bottom of the box.

C L AI M S

1. A space heating appliance for giving the effect of a solid fuel fire having a bed of porous material simulating in use cinders and glowing ash with larger material on top simulating in use burning solid fuel such as logs or coal, the bed having an outer room-side edge, at least one fuel gas supply means for gas which will burn with a luminous flame and at least one fuel gas supply means for gas which will burn with an aerated non-luminous flame, the means being disposed so that the gas flows upwardly through at least part of the bed depth,
characterised in that the fuel supply means for the aerated gas is directed to a zone along the outer edge and that the fuel supply means for the luminous burning gas is directed to a zone remote from that edge and in that a gas flow regulator at desired low heat outputs prevents flow of the luminously burning gas and regulates flow of the aerated burning gas and only at higher heat outputs permits an additional flow of the luminously burning gas.

2. An appliance according to claim 1 further characterised by a baffle minimising cross flow of the two gases between the two zones.

3. An appliance according to claim 2 further characterised in that the baffle is formed by the gas supply means.

4. An appliance according to claim 3 further characterised in that the baffle is in the form of a box extending parallel to the said edge which box is divided lengthwise to form the two supply means which means are of course totally closed except for gas inlets and outlets.

5. An appliance according to claim 4 further characterised in that the box's top is in the form of a lid with depending front and rear flanges, the gas outlets being defined by clearances between on the one hand the lid and the flanges and on the other hand the front and rear walls of the box.

6. An appliance according according to any one of the preceding claims further characterised in that both

supply means are fed from a common gas feed through the regulator which from an "off" condition first feeds gas through a pipe leading to the aerated gas supply means and then when this pipe is fed with its designed rating of gas to another pipe as well leading to the luminous burning gas supply means.

7. An appliance according to claim 6 wherein the first mentioned pipe includes an aerating device.

8. An appliance according to any one of the preceding claims further characterised in that about one-fifth to one-half of the total gas consumption at full rated heat output is fed through the the aerated fuel supply means.

9. An appliance according to claim 8 further characterised by a pilot flame disposed to ignite gas flowing from the aerated gas supply means.

10. An appliance according to claim 9 further characterised in that associated with the pilot flame ther are an igniter for the pilot flame and a flame failure senser.

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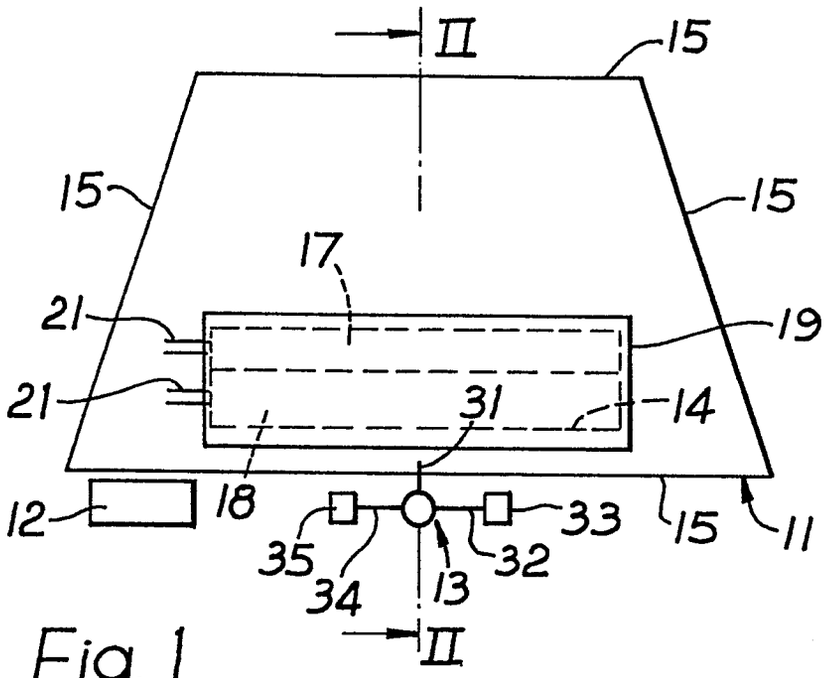

Fig. 1

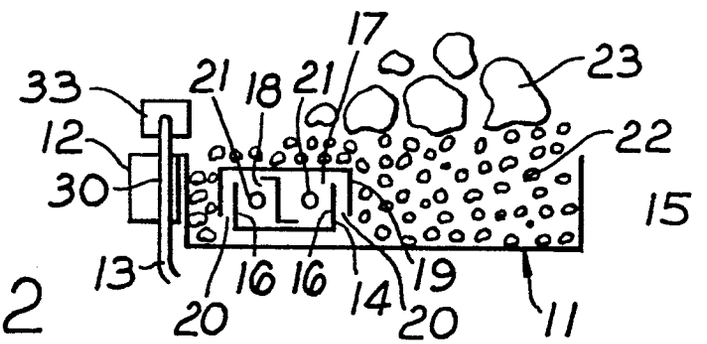

Fig. 2

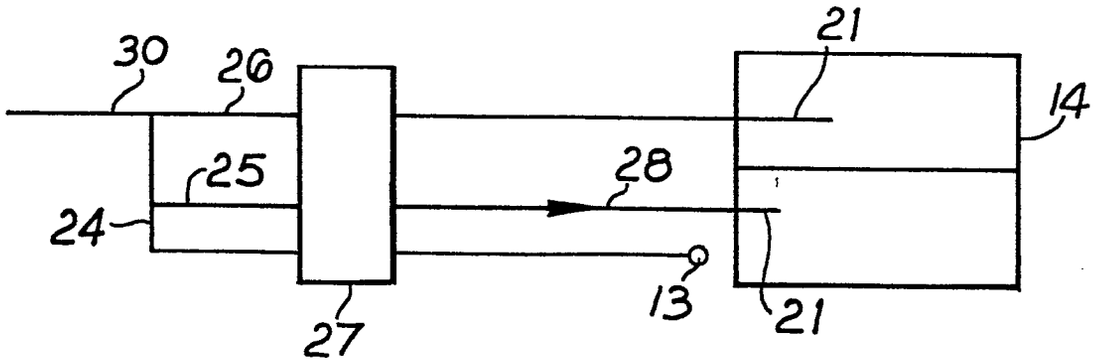

Fig. 3