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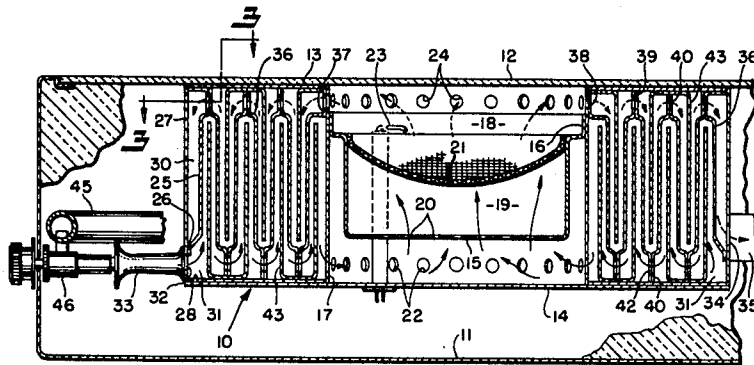
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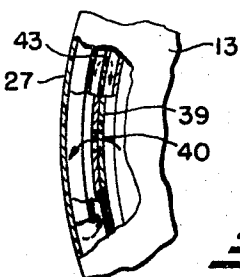
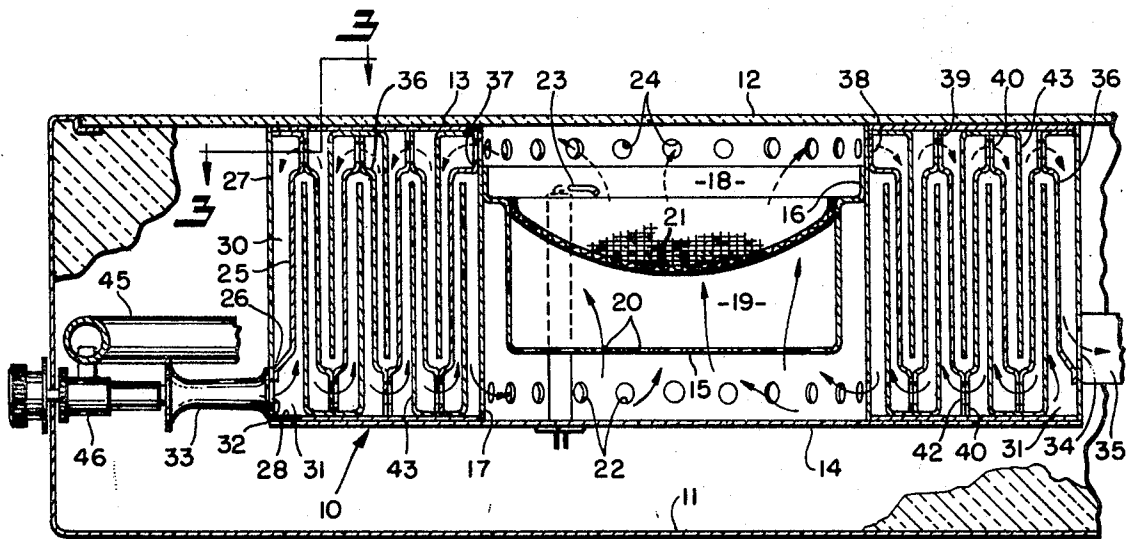
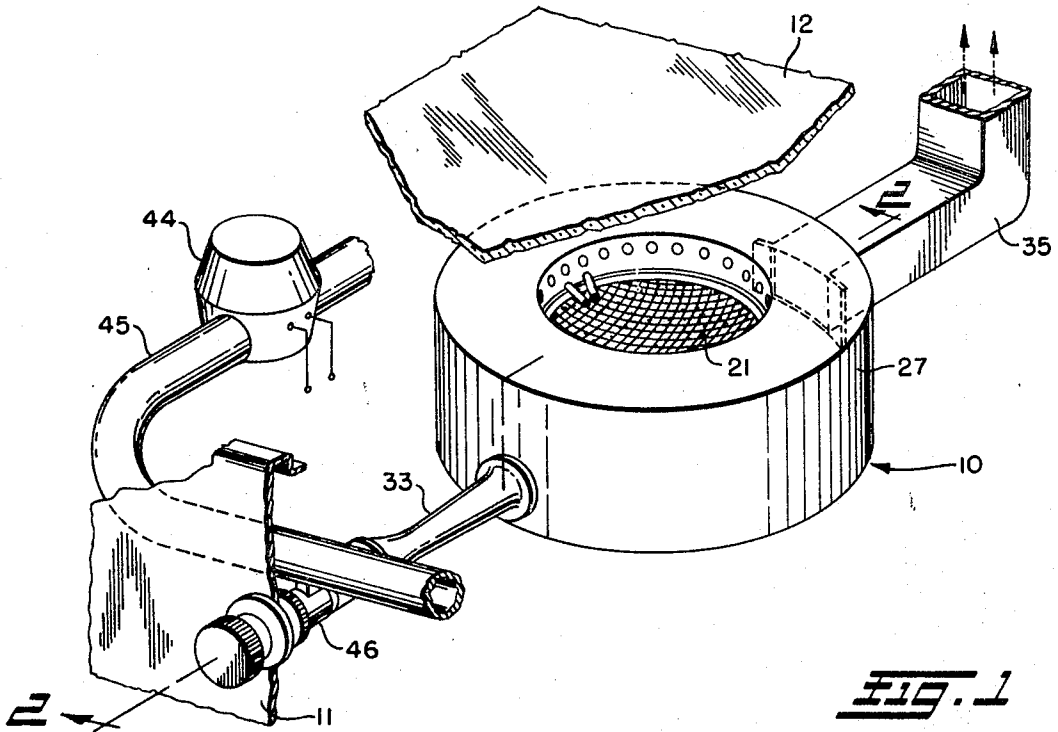
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- [54] **HIGH PRESSURE GAS BURNER**
2 Claims, 5 Drawing Figs.
- [52] U.S. Cl. **126/39,**
431/329, 431/215
- [51] Int. Cl. **F24c 3/04**
- [50] Field of Search..... **431/328,**
329, 215; 126/39

ABSTRACT: An infrared gas range burner assembly including a pump in the gas supply to substantially boost the line pressure, so that the burner is powered by such high gas pressure, with inspirated air. A stationary heat exchanger is included through which the supply and exhaust flow reversely to pre-heat the former and cool the latter.





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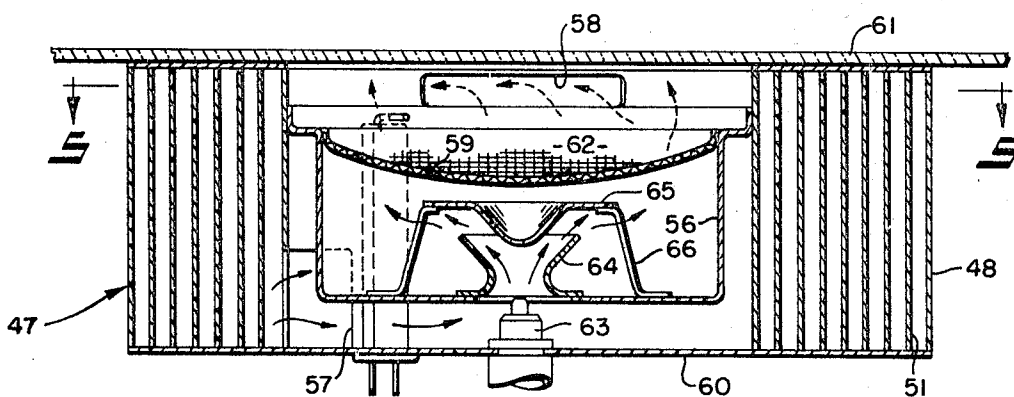


FIG. 4

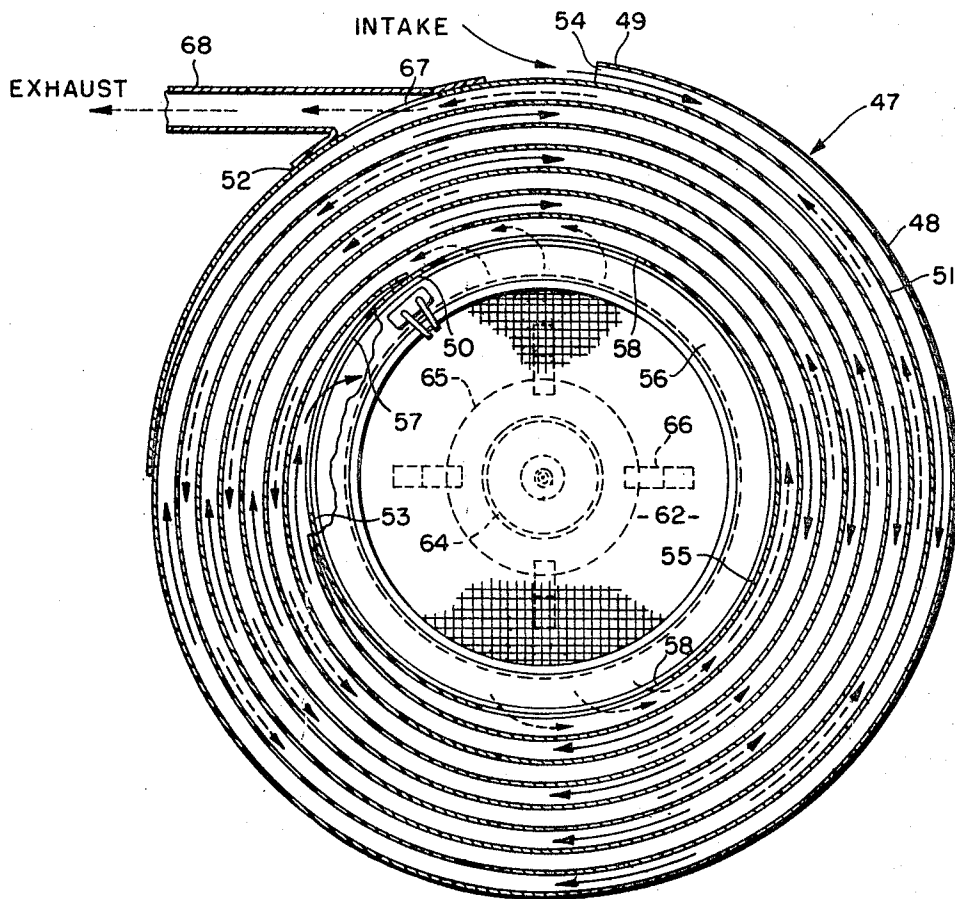


FIG. 5

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HIGH PRESSURE GAS BURNER

This invention relates to powered infrared gas burners and, more particularly, to such a burner for use as a top heating unit in cooking range structure.

As shown by Hess U.S. Pat. No. 2,870,828, this type of range burner includes a top plate, preferably made of heat resistant glass, which supports the utensils or articles to be heated and forms a top closure for the combustion chamber. In the patent assembly, gas at the usual supply line pressure is typically discharged into a venturi and inspirates atmospheric air for combustion, with the gas-air mixture delivered to and burned at the surface of a ceramic disc to heat the same to incandescence, the disc in effect being the bottom of the combustion chamber opposed to the glass top. Since the mixture is not forced through a distributor screen or other foraminous body, the burner can thus be operated with ordinary gas pressure and inspirated air, while infrared heaters of the screen type or equivalent must provide pressurization of the flow and this has commonly been effected by blowers in the air supply. The Hess patent is, however, further relevant for its concern with cooling of the exhaust from the burner and teaches the use of an exhaust pump or blower in the discharge line downstream from two ambient air inlets to this line. The blower accordingly ensures that room air will be drawn into the discharge line for mixing with the combustion gases in such line and cooling of the gases prior to the point of discharge. Accordingly, while basically a low pressure burner, this assembly does require an air blower and, if a screen device or the like is to be used in lieu of the incandescing disc, added pressurization of the delivery of the combustible mixture would be needed.

As above indicated, such pressurization of the mixture has commonly been provided by a blower in the supply of the primary air to the burner, and, at the operating capacities needed and desired for cooking heat, the blower must be of appreciable size. The drive is of course by an electric motor, and the subassembly is a significant space factor in the manufacture of the range. A particular configuration might require a second blower in the exhaust, generally as taught in the Hess patent, and it will be appreciated that these disadvantages of air blowers are multiplied in a range containing a plurality of such burners, even if all are served by a common circulating system for air supply and exhaust.

It is a primary object of the present invention to eliminate such need for air blower means in an infrared gas cook top burner assembly in which the mixture is caused to flow through and be combusted at a screen assembly or the equivalent to generate radiant heat, with this objective briefly realized by supplying the gas to the unit at a pressure substantially higher than normal, together with inspirated air, for powering the burner. It has been found that such pressurization of the gas supply can be effective at substantially less cost than the usual air blower and also provides a very considerable savings in component space.

Another principal object is to provide an infrared gas burner with improved cooling of the exhaust in simple and inexpensive heat exchanger structure common to the supply to and exhaust from the burner. Heat energy is thereby transferred from the exhaust to the supply to cool the former and preheat the latter.

Other objects and advantages of the present invention will become apparent as the following description proceeds.

To the accomplishment of the foregoing and related ends the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawings:

FIG. 1 is a perspective and partially fragmented illustration

of a gas range burner in accordance with the present invention;

FIG. 2 is a transverse vertical section of the assembly the plane of which is indicated by the line 2-2 in FIG. 1;

FIG. 3 is a fragmented section of a portion of the structure as indicated approximately by the line 3-3 in FIG. 2;

FIG. 4 is a vertical section of a modified form of the burner; and

FIG. 5 is a horizontal section of the modified burner at the line 5-5 in FIG. 4.

Referring now to the drawings in detail, the first embodiment of the invention illustrated in FIGS. 1-3 comprises a vertically oriented, hollow annular casing designated generally by reference numeral 10. Such casing is supported within a cook or range top housing 11 the top of which is closed by a plate 12, preferably made of a heat resistant glass which will transmit infrared radiation.

The top wall 13 of the casing 10 engages the underside of the plate 12, the latter thereby closing the upper end of the central opening of the casing, and such opening is closed at the bottom by a circular plate 14.

A burner pan 15 with a top step flange 16 is disposed in the casing opening with its flange engaging the inner casing wall 17 to divide the opening into upper and lower chambers 18 and 19. The bottom of the pan, which is spaced from the bottom closure plate as shown, is provided with perforations 20, and a concave wire screen 21 is supported intermediately within the pan. In a manner to be further described below, a combustible gas-air mixture is delivered to the lower chamber 19 through inlet openings 22 in the inner casing wall 17 and enters the pan through the perforations 20, below the burner screen 21. This flow of the fuel mixture is indicated by the solid arrows and it proceeds upwardly through the screen where it is ignited, for example, by a spark ignitor as shown at 23, when the burner is turned on. The upper chamber 18 of the casing opening is thus the combustion chamber of the burner from which the gases proceed through top openings 24 provided in the inner casing wall, the exhaust flow being indicated by the dashed arrows.

The casing contains two series of concentric baffles in spaced alternation which define separate generally radial flows of the gas-air mixture to and the exhaust from the burner. The outermost baffle 25 is secured at its lower edge 26 to the outer casing wall 27, at a spacing from the bottom wall 28, and extends to the top wall 13 to form respectively above and below the same an outer exhaust section 30 and inlet section 31. Such outer inlet section has an opening 32 from which a venturi mixing tube 33 extends, and the outer exhaust section has a diametrically opposite opening 34 to which a discharge duct 35 is connected.

The baffles of the first series are shaped and joined to form a continuous undulating wall 36 from the outer attachment 26 to the casing to a top inner edge attachment 37 to the inner casing wall 17 where the openings 24 are located, and such inner baffle edge is provided with registering openings 38. This baffle wall, the turns of which are of course concentric, is spaced from both the top and bottom casing walls by top webs 39 in which there are openings 40 and bottom webs 41 provided with openings 42.

The baffles of the second series are concentric walls 43 centered in the turns of the baffle wall 36 to cause the flow of the mixture, below the wall, and the flow of the exhaust, above the same, closely to follow the undulating surfaces through openings 42 and 40, respectively. It will, accordingly, be evident that the gas-air mixture entering the casing from the venturi tube at the outer inlet section 31 will distribute itself circumferentially about the latter and flow radially inwardly against the underside of the baffle wall 36, again as shown by the solid arrows, to the inlet openings 22 below the burner pan. The combustion gases from the burner exiting through the top outlet openings 24 flow reversely radially outwardly over the upper surfaces of the baffle wall 36 to the outer ex-

haust section 30 and from the latter through the duct 35. The casing is thus a heat exchanger through which the incoming mixture and outgoing combustion gases flow reversely to pre-heat the former and cool the latter for discharge.

The burner and heat exchanger assembly must be powered, and this is accomplished by incorporating a booster pump 44 in the gas line 45 supplying gas to the mouth of the venturi tube 33 under control of a manual valve 46. The pump can be of any suitable electric form, such as the simple diaphragm pump used with small aquariums, which will be effective to raise the gas pressure to a value within from about 15 to about 30 inches water. The usual main pressure for natural gas is about 7 inches when unregulated and, if regulated, on the order of about 4 inches, so that the pressure boost is roughly two to three times in the first case and four to eight times in the second. Atmospheric air is inspirated in the venturi tube in the usual manner.

The second embodiment of the invention shown in FIGS. 4 and 5 differs with respect to both the form of the heat exchanger section and the gas supply. While the exchanger 47 is again a hollow annular body, it is more simply formed by a first continuous strip 48 of metal wound as an open spiral from an outer end 49 to an inner end 50 and a second similarly wound strip 51 interleaved in spaced relation with the first between outer and inner ends 52 and 53, respectively.

It will be seen that the outer end 49 of the first strip is spaced from and defines an intake 54 with the inwardly adjacent portion of the second strip, while the outer end 52 of the second strip is secured to the first strip and therefore closes the passage between the two. The inner ends of the strips are spaced and engage a cylindrical inner wall 55 within which burner pan 56 is supported as in the first described embodiment. The wall 55 has an inlet opening 57 between the inner ends 50, 53 of the spiral walls to the space below the burner pan, and top exhaust openings 58 are provided above burner screen 59 to the innermost convolution of the spiral wall 51.

The casing is closed by a bottom disc 60 and a glass plate 61 is applied as the top of the burner combustion chamber 62. In this form, however, the gas under high pressure is injected from a variable pin orifice 63 into a venturi 64 in the pan 56 at a bottom center opening, and the air for combustion is inspirated at this point, which is of course in contrast to the first embodiment in which the mixing is effected ahead of the heat exchanger. A dished spreader plate 65 is supported on legs 66 above the venturi outlet to distribute the incoming mixture throughout the pan below the burner screen.

The solid arrows in FIG. 5 indicate the incoming air flow and the dashed arrows the exhaust, with the two flows reversed as previously. The exhaust exits at an outlet 67 in wall 51 near the end of the same and proceeds through duct 68 to an appropriate discharge point. The inlet 57 and outlet

58 in wall 55 can be enlarged if desired by increasing the separation of the inner end attachments of walls 48 and 51, with diametric opposite locations for the same providing the most area for such openings.

Since the specific form of the foraminous body part of the burner is clearly not a critical factor in the present improvements, the screens 21 and 59 have for convenience been shown as simple single layer devices instead of being comprised of multiple layers as is customary. The material of which the body is made is also obviously a variable factor, with ceramic and fibrous radiant devices also well-known and usable in the disclosed assembly.

It will be understood that the exchanger structure of the second described embodiment can be used with the venturi placement of the first, and also that the exchanger structure of the first can be associated with the second burner configuration.

The new infrared burner forms commonly have the advantage of being powered, not by the usual air blower or blowers, but by a relatively small and inexpensive pump in the gas line within the appliance itself, and such improvement is realized both with and without the heat exchanger. Similarly, the improved exchanger forms are potentially applicable to other types of burners.

It should also be appreciated that the disclosed immediate association of the heat exchanger, and the shape conformance of the same, to the burner provide a generally efficient utilization of space supplementary to the energy transfer function desired, and there may be environments in which separation of the two would be preferred and/or such shape correspondence less significant.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I claim:

1. In an appliance, in unitary combination, a housing, a gas-fired burner within said housing, said burner having a mixing chamber, a fuel supply line extending from said burner and adapted to be connected to a remote low pressure source of gaseous fuel, means for supplying air to said burner for mixing with said fuel, and a booster pump in said fuel supply line within said housing for increasing the pressure of the fuel to a value not less than about 15 inches water, the injection of said fuel by said pump effecting inspiration of atmospheric air through said air supply means for delivery of said gas-air mixture to said mixing chamber.

2. The combination of claim 1 further including a heat exchanger within said housing, said heat exchanger means providing for the flow of the gas-air mixture and the exhaust from said chamber in continuous heat exchange relation for preheating the gas-air mixture and cooling the exhaust.

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