Feb. 10, 1970 R. L. PERL 3,494,350

SMOOTH TOP GAS RANGE WITH REGENERATOR

Filed May 3, 1968 2 Sheets-Sheet 1

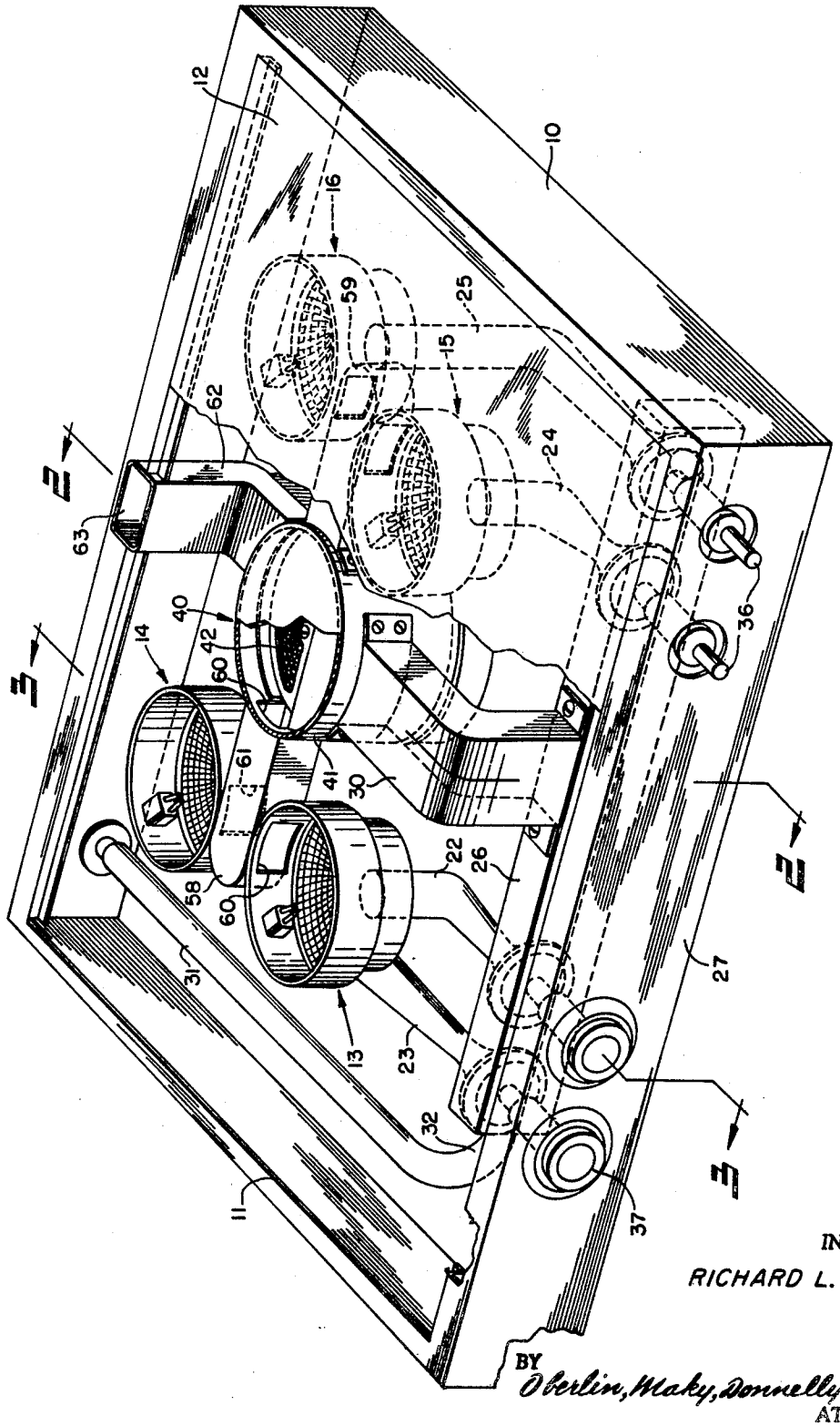


FIG. 1

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SMOOTH TOP GAS RANGE WITH REGENERATOR

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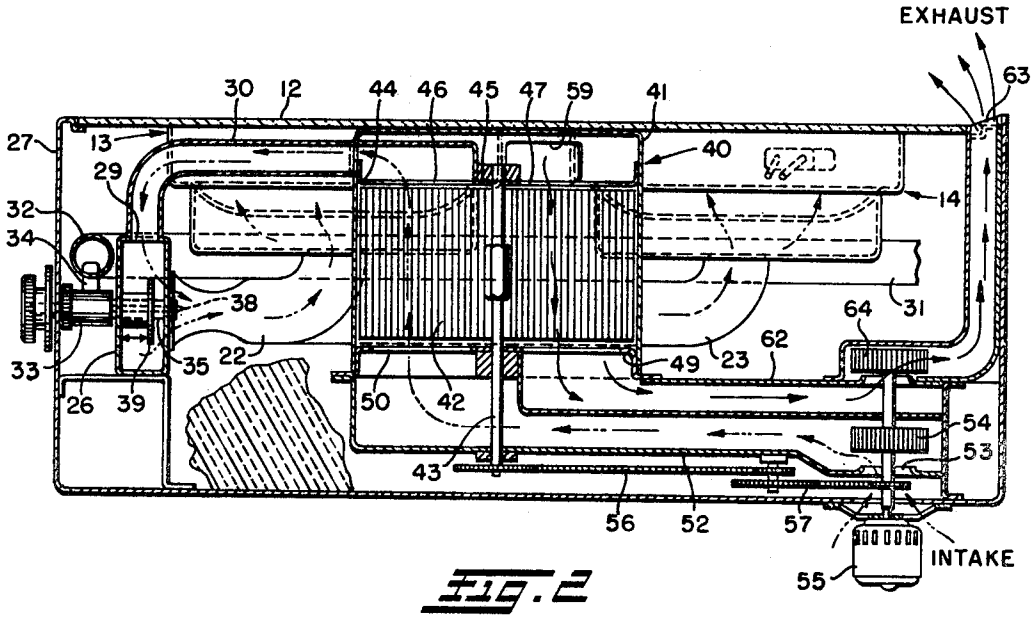


Fig. 2

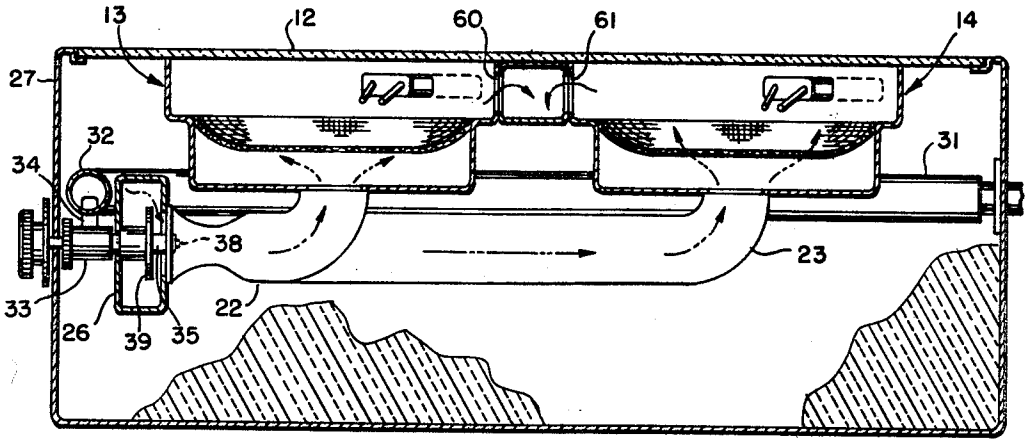


Fig. 3

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SMOOTH TOP GAS RANGE WITH REGENERATOR

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U.S. Cl. 126—39 7 Claims

ABSTRACT OF THE DISCLOSURE

A gas cooking range in which plural infrared burners are contained in a burner box having a top plate, preferably of glass, with combustion air being supplied under pressure by a blower for mixing with the gas supply to the burners and a rotating regenerator wheel commonly disposed in the incoming air and exhaust flows to transfer heat therebetween and cool the exhaust from the burners to a tolerable heat level for direct discharge to the kitchen.

This invention relates to a gas range or cook top in which the utensil-supporting surface is of smooth plate form.

One example of a range on this general order is afforded by Letter U.S. Patent No. 3,241,542, which discloses a full free-standing range configuration having one or more top plates upon which the food can be cooked. Infrared heating units are contained in the burner box beneath the plate or plates to heat the latter, and the fuel-air mixture to these burners is pressurized by a blower driven supply of the primary air. The box is essentially a closed chamber, and the exhaust of the gases from the burners is through a vertical flue coextensive with the range top at the rear and enclosed in spaced relation within a very high backguard.

While not discussed with particularity, the flue construction shown in the patent drawings is quite distinct from the usual backguard or backsplasher of a range, and it obviously resulted from concern that the hot gases driven from the top into the kitchen, if no external venting is provided, would be at least discomforting. Some cooling of the exhaust can be expected by dissipative loss in the flow through the very wide and high flue, and the height of course also places the outlet to the room at a significant distance from a user standing in front of the range. The latter is probably the more significant factor in this exhaust, because it is believed that the pressurized discharge would still be at an uncomfortably high temperature, particularly when two or more burners are in operation at the same time, and the flue construction itself is a very obvious appendage with a substantial space requirement that could be a limiting factor in placement and installation of the range.

It is a primary object of the present invention to provide a gas cook top generally of such closed powered burner type in which the exhaust gases are cooled to a comfort temperature before discharge from the unit and, more particularly, to provide such cooling within a normally dimensioned top for substantially direct discharge from the same.

Another object is to provide such a range or top in which a heat regenerator is incorporated to effect transfer of heat energy from the exhaust gases to the primary air supply to the burners for cooling of the former and preheating of the latter.

It is an additional object of the present invention to provide a range top as last characterized utilizing a rotary exchanger for the regenerative action, with a single air system for the unit and one such regenerator in the same in particular and efficient placement and operative relation to the plural burners.

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 view of a smooth top gas range in accordance with the present invention;

FIG. 2 is a first transverse vertical section the plane of which is indicated by the line 2—2 in FIG. 1; and

FIG. 3 is a further transverse section indicated by the line 3—3 in FIG. 1.

Referring now to the drawings in detail, the illustrated cooking top, which may be part of a free-standing range or a separate appliance, comprises a metal box **10** having a flanged top opening **11** in which a plate **12** is supported and fully closes the opening. This plate is preferably made of a heat resistant glass which will transmit infrared radiation, but as will appear, the choice of material for the same is not a critical factor in the present improvements.

The box contains four infrared burner units **13–16** in a usual spaced array respectively for heating utensils and the like supported in register therewith on the top plate **12**. The burners are the same and are shown as of a type comprising a cylindrical stepped body **17** in which a generally concave screen **18** is shown schematically as supported at an intermediate elevation, the chamber **19** beneath the screen receiving the fuel-air mixture distributively to flow upwardly through the screen and be combusted. Each has a spark ignitor **20** at its upper combustion chamber **21**, also a known feature. It will be understood that a complete screen burner will ordinarily comprise multiple screen elements, and it will become clear that other forms and types of infrared burners can equally be employed in the combination.

Venturi mixing tubes **22–25** extend, respectively, from bottom central apertures of the burners forwardly to a manifold **26** which extends horizontally across substantially the full width of the box closely behind the front wall **27**. The manifold has openings **28** coincident with the ends of the venturi tubes and receives primary air at a top center inlet **29** from a supply duct **30** in a manner to be more fully described below.

The gaseous fuel supplied to the unit is directed through a pipe **31** having a length **32** which is coextensive with the manifold **26** and between the same and the front wall **27**. At the location of each venturi connection to the manifold, there is a gas control valve **33** having an inlet connection **34** to the gas supply pipe **31** and a controllable orifice end **35** within the mouth of the associated venturi, the valve body extending through the manifold **26** and a stem **36** projecting through the box front wall **27** and having a knob **37** mounted thereon for manual adjustment of the valving. The specific form of the valve can vary, with the one shown being the type in which rotation of the stem causes a needle **38** to move axially and variably open the orifice. However, the valve mechanism should include additionally means for coincident opening and closing of the manifold opening **28** to the particular venturi, and such means is shown as a shutter **39** which

will also move axially upon adjustment of the valve, in the exaggerated manner indicated by the double-headed arrow in FIG. 2. It will be appreciated, accordingly, that each burner normally will be isolated from both the gas and air supplies.

The supply of primary air includes the noted duct **30** at the manifold inlet **29** and this duct extends to the regenerator assembly designated generally by reference numeral **40**. Such assembly comprises a vertical cylindrical shell **41** in which a heat exchanger wheel or drum **42** is mounted for rotation on a vertical drive shaft **43**. The wheel body is formed of a heat resistant material with a multiplicity of small axial passages, for example, by winding a strip of corrugated asbestos paper impregnated with sodium silicate solution to cylindrical form.

A top flow plate **44** is disposed adjacent the upper end of the wheel **42** in the form of a ring with a diametrical divider strip **45**, thereby defining top outlet and inlet openings **46** and **47**, respectively, roughly coincident with halves of the wheel, the outlet opening being at the front. A collector shroud **48** encloses the top outlet opening **46** and communicates with the duct **30** to the supply manifold **26**.

A similarly formed bottom flow plate **49** is arranged adjacent the lower end of the wheel **42** and defines comparable, but relatively reversed, bottom inlet and outlet openings **50** and **51**, respectively. An inlet air duct **52** extends from this bottom inlet **50** to the wheel to an ambient air intake **53** at the bottom rear of the box and includes, at the latter, a blower **54** driven by an electric motor **55**. This electric motor serves also to drive the wheel **42** by a chain **56** interconnecting its shaft and the wheel shaft **43** through suitable speed reduction gearing **57** to provide a wheel speed on the order of from 4 to 8 r.p.m. Accordingly, with the blower **54** operative, air is drawn in from the room in which the unit is located and caused to flow through approximately one-half of the rotating wheel to the burner supply manifold, as shown by the dashed arrows.

The exhaust part of the air system includes two collector duct sections **58**, **59** extending from the regenerator assembly **40** respectively to opposite sides from openings **60** in the shell **41** above the top end of the wheel and the top inlet opening **47** to the same. The collector section **58** extending to the left, as viewed from the front, commonly receives exhaust from the burners **13**, **14** through communicating combustion chamber outlets **61** of the same, while the other collector **59** similarly is in communication with the combustion chambers of the remaining two burners **15**, **16**.

An exhaust duct **62** extends from the bottom outlet opening **51** at the rear half of the wheel to the rear wall of the box and then upwardly to an outlet **63**. An exhaust blower **64** is provided in this duct, also driven by the electric motor **55**, with the intake and exhaust blowers **54**, **64** thus simultaneously operated in counter flow rotation as indicated by the arrows.

The basic control of the unit, which can be realized by very simple circuitry, should be such that the turning on of any burner by adjustment of its valve immediately energizes the two blower motors to establish both the forced circulation and rotation of the regenerator wheel. This initiation should of course also be accompanied by energization of the ignition system and all ignitors can be readily connected to spark upon the turning on of any burner.

It will then be evident that when the user operates a particular valve, the gas flow is combined with the pressurized air flow from the rotating regenerator in the associated venturi for mixing and combustion at the burner head in the usual manner. While the primary air supply is available to all the burners upon operation of any one, it can proceed only to the one or more burners turned on by the user. The combustion gases from an operating burner are collected and directed through the rotating wheel reversely to the incoming air and, of course, the wheel transfers heat energy from the exhaust to the incoming air. The exhaust temperature can thereby be reduced to a value permitting it to be exhausted substantially directly to the room, as illustrated, without objection.

The infrared radiation from an operating burner is directed against the superimposed portion of the top plate and, when the latter is of the preferred glass described, the radiation is transmitted to the utensil supported on the plate at this location.

It will be seen that the air system components, including the regenerator wheel, are so arranged that there is little added space demand within the top on such account and generally that these should not materially add to the burden of manufacture of such a direct discharge, compact, pressurized smooth top range. While the wheel form of regenerator is well adapted to such incorporation, other heat exchanger configurations, including stationary structures, might be utilized comparably for practical advantage.

With further regard to the transfer of heat from the exhaust to the incoming air, it is to be noted that the ambient air duct **52** is in heat exchange relation to the exhaust duct **61**, the two having a common wall, and also that the former is beneath the latter. Accordingly, the air flow in this part of the system aids in the extraction of heat energy from the exhaust and further serves to shield the bottom of the burner box.

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, therefore, particularly point out and distinctly claim as my invention:

1. A compact gas cooking top for incorporation in a range or use as a separate appliance, comprising a rectangular relatively shallow burner box forming an enclosure for the cooking top and having a top opening, a plurality of gas-fired infrared burners in said box, smooth plate means assembled with the box for closing the top opening of the same and supporting thereon utensils to be heated by the burners, air system means within the box including blower means for establishing an inflow of room air to the burners for combustion and an outflow from the box of the combustion gases produced by operation of the burners, and heat exchanger means within the box having portions through which said inflow and outflow proceed in heat transfer relation to preheat the former and cool the latter.

2. A gas cooking top as set forth in claim **1**, wherein said plate means transmits infrared radiation generated by the burners.

3. A gas cooking top as set forth in claim **1**, wherein the air system means includes an outlet at a peripheral portion of the box for substantially direct room discharge of the outflow from the heat exchanger.

4. A compact gas cooking top for incorporation in a range or use as a separate appliance, comprising a rectangular relatively shallow burner box forming an enclosure for the cooking top and having a top opening, a plurality of gas-fired infrared burners in said box, smooth plate means assembled with the box for closing the top opening of the same and supporting thereon utensils to be heated by the burners, air system means within the box including blower means for establishing an inflow of room air to the burners for combustion and an outflow from the box of the combustion gases produced by operation of the burners, heat exchanger means within the box having portions through which said inflow and outflow proceed in heat transfer relation to preheat the former and cool the latter, and air flow control means between the burners and the exchanger for normally isolating the former from the latter and being operable to direct the flow selectively to the burners.

5. A gas cooking top as set forth in claim **4**, wherein the burners are provided with gaseous fuel supply con-

trols, and such controls and the air flow control means are interconnected for common actuation.

6. A cook top as set forth in claim 1, wherein the heat exchanger means comprises a rotating body having axial passages and flow control means to direct the incoming air and exhaust to a burner reversely through portions of the body.

7. A cook top as set forth in claim 6, wherein the heat exchanger means is common to the plural burners.

References Cited

UNITED STATES PATENTS

990,884	4/1911	Lang	126—15
3,241,542	3/1966	Lotter	126—39

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U.S. Cl. X.R.

126—15, 214