United States Patent

Rosenberg et al.

[15] **3,698,378**

[45] **Oct. 17, 1972**

[54] **SMOOTH TOP GAS RANGE**

[72] Inventors: **Robert B. Rosenberg,** Evergreen Park; **Esher R. Kweller,** Downers Grove; **William R. Staats,** Chicago, all of Ill.

[73] Assignee: **Institute of Gas Technology**

[22] Filed: **July 12, 1968**

[21] Appl. No.: **744,582**

[52] **U.S. Cl.**...............**126/39 R,** 126/299 B, 126/39 J

[51] **Int. Cl.**.............................**F24c 3/00,** F24c 15/20

[58] **Field of Search**........126/299, 299 A, 299 B, 39, 126/39 H, 39 J, 21 A

[56] **References Cited**

UNITED STATES PATENTS

2,184,671	12/1939	Hollander	126/299 A UX
2,908,267	10/1959	Hess	126/299 A
3,417,742	12/1968	Perl	126/21 A

Primary Examiner—Charles J. Myhre

Attorney—Molinare, Allegretti, Newitt & Witcoff

[57] **ABSTRACT**

A smooth top gas range which includes a hood that draws cooking vapors and fumes and air into a regenerative type heat exchanger for preheating prior to combustion with gas at the burner surface unit. Each burner unit is enclosed in a separate combustion compartment with heat being transmitted to a cooking vessel through an air impervious compartment wall or plate by means of radiation. The combustion products exhaust from the combustion compartment, are cooled to a safe temperature by the heat exchanger and are finally vented to the room.

26 Claims, 5 Drawing Figures

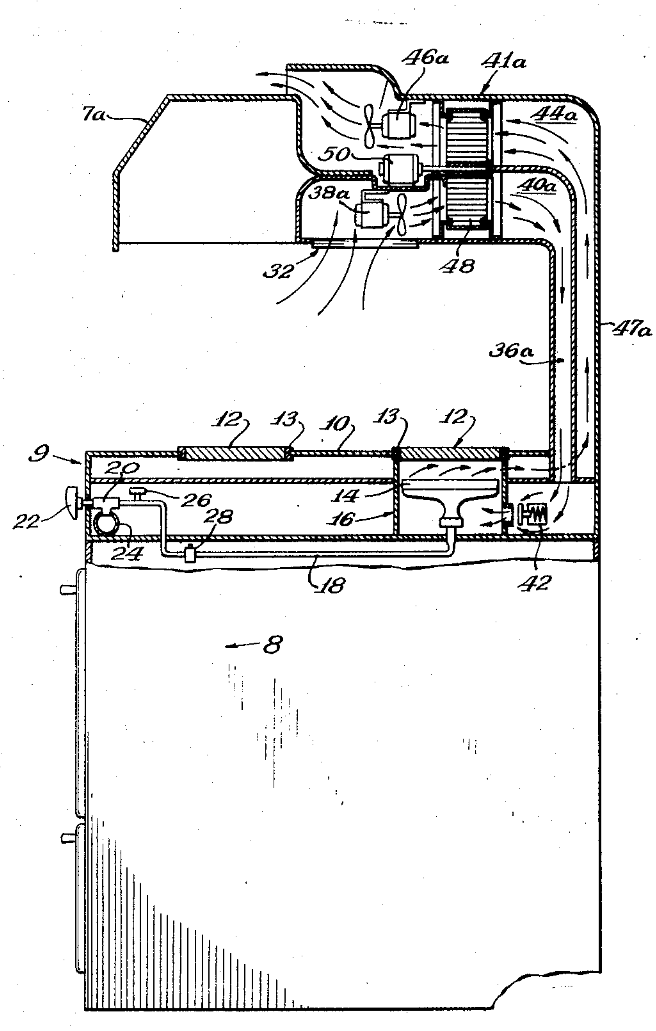
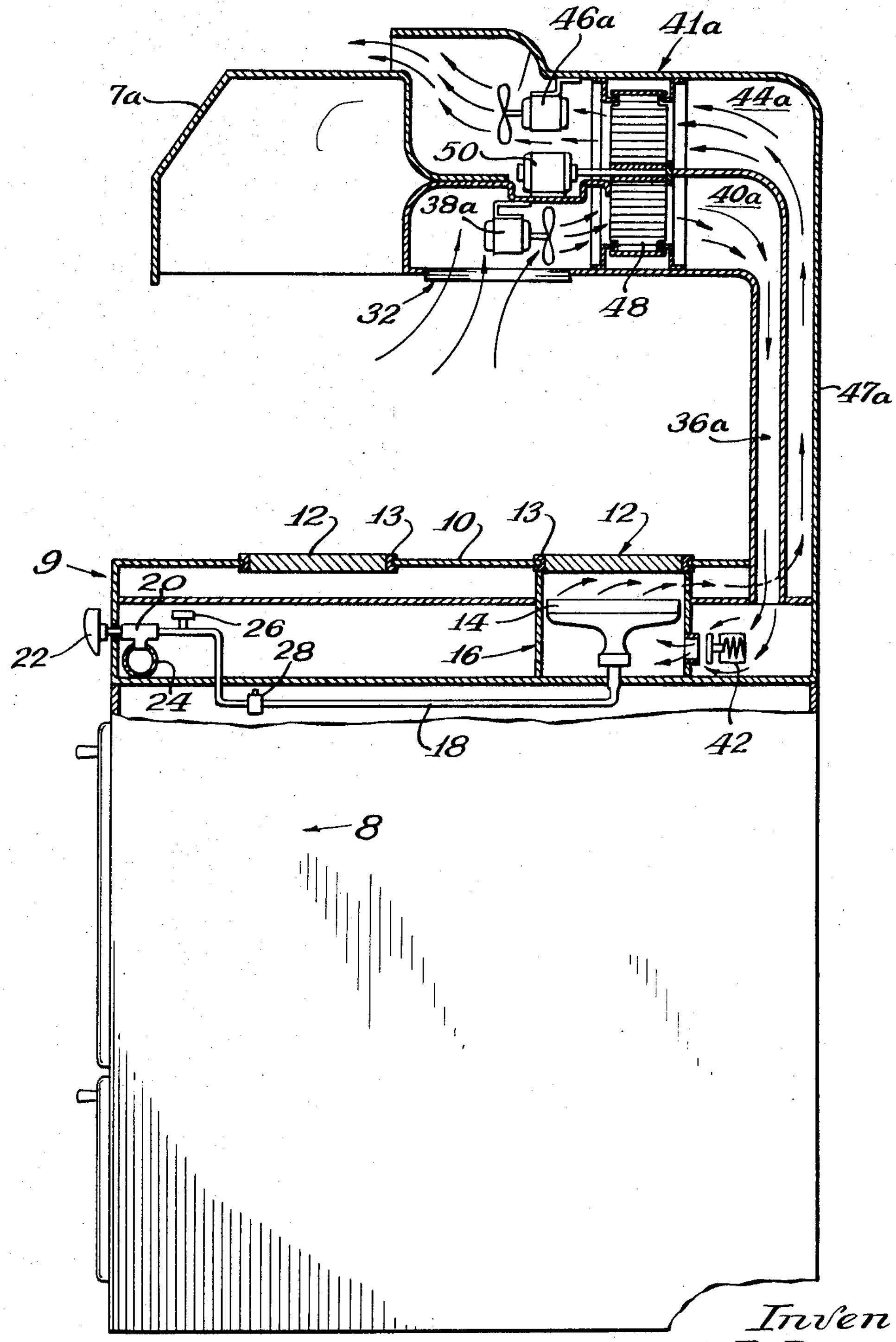


FIG. 1A.



Inventors:
Robert B. Rosenberg
Esher R. Kweller
William R. Staats
By Bair, Freeman & Molinare
Attys.

FIG. 1B.

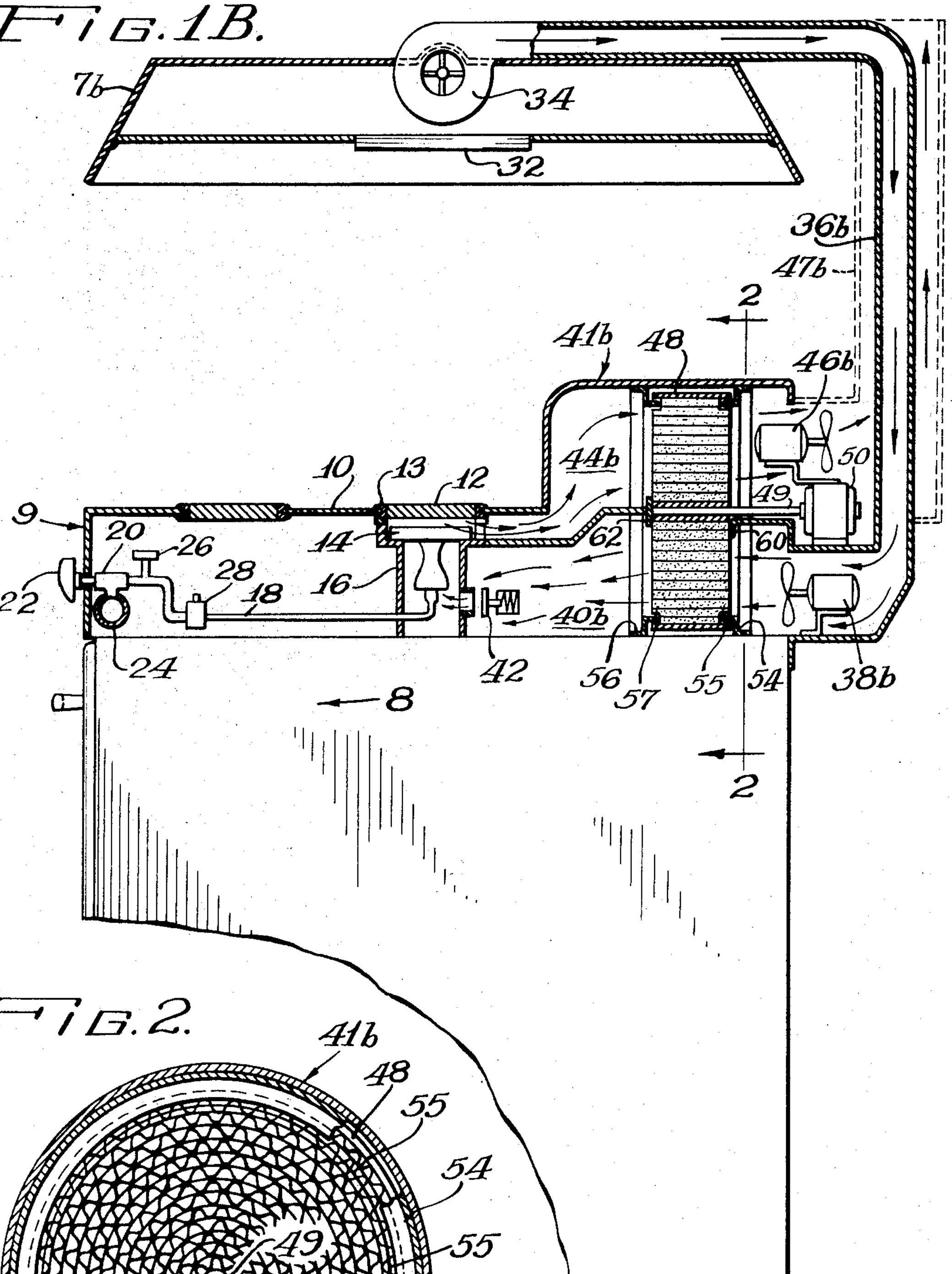
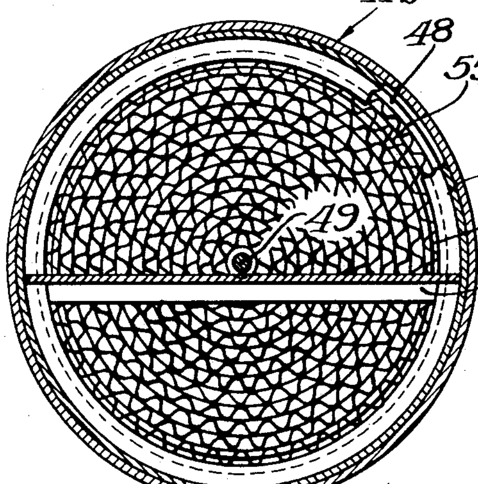


FIG. 2.



Inventors:
Robert B. Rosenberg
Esher R. Kweller
William R. Staats
By Bair, Freeman & Molinare
Attys.

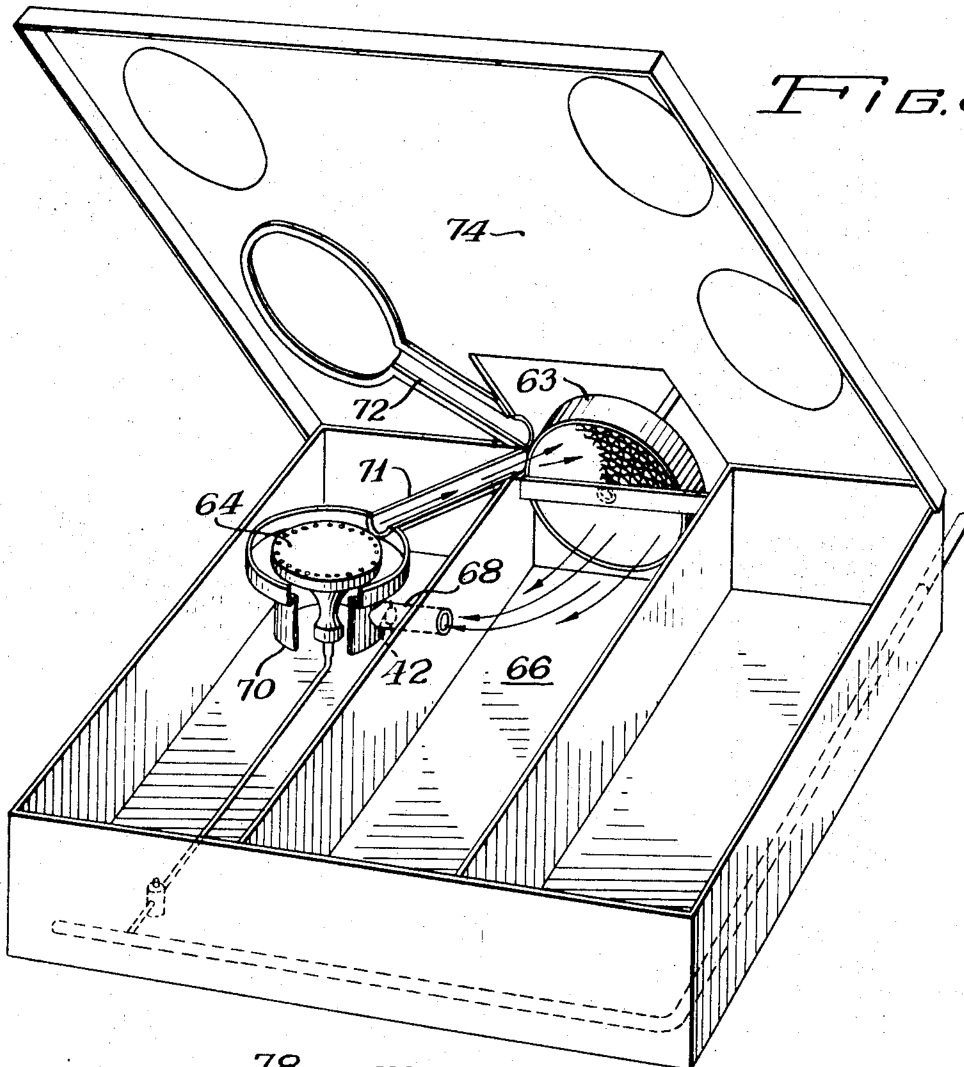


FIG. 3.

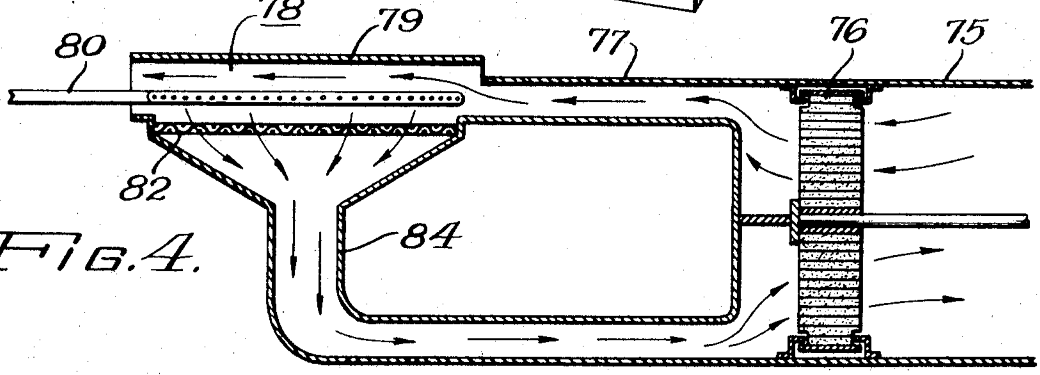


FIG. 4.

Inventors:
Robert B. Rosenberg
Esher R. Kweller
William R. Staats
By Bair, Freeman & Molinare
Attys.

SMOOTH TOP GAS RANGE

BACKGROUND OF THE INVENTION

This invention relates to a smooth top gas range which safely discharges combustion products indoors, and more particularly, to a gas fired smooth top range which draws cooking vapors and fumes from above the cooking surface for complete combustion at the separate burner units.

Huebler et al., in an application filed Nov. 23, 1966, **Ser. No.** 596,521, now U.S. Pat. No. 3,416,509, discloses a self-cleaning gas oven. Hurko in U.S. Pat. No. 3,121,158, had earlier disclosed a self-cleaning electric oven. While very useful for their intended purpose, these inventions do not provide a solution to the problems of dirty surface burner units or fumes, odors and vapors emanating from foods cooking on surface burner units. Since most cooking is done on the top surface of the family range or stove, keeping the top burner units clean as well as keeping the kitchen free from odors and fumes are more frequent as well as more serious problems than the cleanliness of the oven.

Generally the surface units of a range heat the cooking vessel directly by conduction and convection. Thus, a gas flame impinges on the bottom of a pan. When cooking, not only are fumes, etc. released to the kitchen by such an arrangement, but also spilled food, etc. tends to collect at or in the burner units thereby providing much additional cleaning work for the housewife, and also providing a potential hazard to safety and health.

To eliminate dirty burners, engineers have designed burner units which can be easily removed for cleaning, drip pans, etc. These do alleviate somewhat the tedious cleaning chore. Nevertheless, the problem of dirty burner units still plague most homemakers.

To cope with fumes, hoods are often installed. This is an expensive solution and also requires filter systems and external venting. Moreover, many housewives neglect to turn the hood on when cooking or refuse to do so because hoods are often noisy.

Hess U.S. Pat. No. 2,908,267 teaches another method of controlling cooking vapors. Hess circulates the vapors by means of ducts leading from above the burner surface to a combustion chamber housing the surface burner. The drawback of Hess results from cooking vapors which tend to cool before entering the burner combustion chamber. They may condense and collect on the duct walls providing a potential ignition hazard which may also clog the duct work and burners. Finally Hess must discharge combustion products outdoors to insure complete safety without indoor odors. This provides an additional expense.

The present invention presents as a solution to these problems a novel gas range which essentially eliminates dirty burners and cooking vapors by providing for circulation of cooking vapors through a heat exchanger prior to combustion in a burner combustion chamber beneath the air-impervious surface of each burner unit. The range is thus a smooth top gas range having an air-impervious plate between the heating element or flame and the vessel being heated. The present invention also reduces the amount of heat discharged to the room by means of the same heat exchanger used to heat the cooking vapors. By virtue of the heat exchanger, less fuel is required to perform the same cooking operation

as compared to prior art ranges without a heat exchanger.

SUMMARY OF THE INVENTION

In a principal aspect the present invention of a smooth top gas range comprises at least one smooth top gas burner with means for drawing vapors from the region above the cooking surface and directing the vapors along with air to combust at the burner below the cooking surface. The vapor and air mixture passing into the burner is preheated by passage through a heat exchanger prior to combustion. Exhaust products are expelled from the burner and cooled by passage through the same heat exchanger.

It is thus an object of the present invention to provide a self-cleaning smooth top gas range.

It is a further object of the present invention to provide a self-cleaning smooth top gas burner installation in which the combustion products are discharged indoors with full assurance of complete and safe combustion.

Another object is to provide a smooth top gas range which inhibits formation of vapor and dirt deposits at the burner surfaces and which also can be easily cleaned at the burner surfaces.

Still another object of the present invention is to provide a self-cleaning smooth top gas range which may be economically manufactured.

Another object is to provide a self-cleaning smooth top gas range which is more economical to operate than prior art ranges.

Another object of the present invention is to provide a self-cleaning smooth top gas range with a minimum of moving parts that provides complete combustion at the burners of vapors drawn from above the smooth top surface of the range.

Another object is to provide a self-cleaning smooth top gas range that discharges less heat to the kitchen than prior art ranges.

These and other objects, advantages and features of the invention will be more fully understood and appreciated by reference to the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description which follows, reference will be made to the drawings comprised of the following figures:

FIG. 1A is a schematic, cross sectional view of a first preferred embodiment of the self-cleaning smooth top gas burner installation of the present invention;

FIG. 1B is a schematic, cross sectional view of a second embodiment of the self-cleaning smooth top gas burner installation of the present invention showing an alternate location of the regenerator assembly described below;

FIG. 2 is a cross sectional view showing the regeneration wheel of the heat exchanger as utilized in the invention taken substantially along the line **2—2** of FIG. **1B**;

FIG. 3 is a schematic, perspective view of an embodiment of the invention showing the combination of the heat exchanger with the smooth top gas burners; and

FIG. 4 is a schematic, cross sectional view of an alternative embodiment of a smooth top gas burner in combination with a heat exchanger as contemplated by the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1A and 1B illustrate two embodiments of the invention, and the apparatus illustrated in these two FIGURES is substantially similar. Therefore numeration of these FIGURES is identical except where differences in construction are evident. Where the FIGURES have non-identical numeration, the differences in construction are explained.

FIG. 1A illustrates, in a schematic, cross sectional view the preferred embodiment of a typical hood 7 and a smooth top gas range 8 combination utilizing the principles of the present invention. FIG. 1B illustrates a second embodiment. For purposes of illustration, only one burner unit is illustrated in FIGS. 1A and 1B. The invention is, however, not limited to the single burner construction shown in these FIGURES and described below. Rather, it is contemplated that a plurality of burner units will be used in combination with each smooth top gas range and hood. FIG. 3 illustrates a possible configuration in a four burner unit range.

The gas range 8 includes a top burner section, generally shown at 9, having a smooth top surface 10. An air impervious burner plate 12 is shown in FIGS. 1A and 1B over each burner unit position. This plate 12 is not a limiting feature of the invention. The plate 12 or its equivalent or substitute must, however, be air impervious and, as described below, form the top wall of a combustion chamber or compartment for the burner units. Pots, pans or other cooking vessels are placed on the burner plate 12 and heated by energy passing through the plate 12. Heat passes through the burner plate 12 by means of conduction and, primarily, radiation. The amount of heat passing through the plate and the speed with which it passes may be enhanced and predicted by the use of materials and methods well known by those skilled in the art of gas cooking devices. Preferably, the plate 12 is insulated by a plate insulating ring 13 to prevent conduction of heat to top surface 10.

The burner plate 12 is heated by the combustion of gas (a hydrocarbon fuel) and air in a burner unit 14 positioned in a burner chamber 16 defined beneath plate 12. Gas is provided through a conduit 18 to the burner 14 whenever the control valve 20 is turned to an open position by movement of the control knob 22. Gas is supplied through the valve 20 to the conduit 18 by a main gas supply line 24. When the control valve 20 is turned on, gas pressure closes a pressure switch 26. When the pressure switch 26 is closed, a gas solenoid valve 28 opens permitting gas to flow through the conduit 18 to the burner 14 for combustion; at the same time a valve as schematically shown at 42 in FIGS. 1A, 1B or 3 (solenoid or bimetal operated) at the inlet air supply duct as at 68 in FIG. 3 is raised allowing air to pass into compartment or chamber 16. Therefore air is supplied only to those burners which are turned on. Simultaneously, as described below, the motors and valves used in combination with the heat exchanger regeneration unit described below are turned on. Thus, by turning on a single burner, all of the components in the range are activated to insure complete and safe combustion of all gas and air.

Various other safety features may also be included to insure that the gas burner ignites or turns off if not properly ignited. For example, a flame prover may be used when the surface 10 is opaque and ignition of the burner 14 is not visually observable. A flame prover comprises a rod placed above the flame in the burner 14. The rod includes a bimetallic strip which deactivates a safety switch when heated within a certain specified time. Failure of the flame to ignite and heat the rod will result in activation of a lockout switch which closes solenoid 28 and conduit 18 thus closing off the supply of gas to the burner 14. Other flame proving devices are available. For example, a spark ignition system may be utilized wherein electrical impedance is used to monitor the presence of a flame.

Another safety device may be used to insure that air for combustion is flowing into the burner 14. For example, a sail switch may be placed in the path of air leading to the burner 14. When air is being provided as required (in a manner to be more fully described below) to the burner 14, the sail switch would be forced to close and not prevent gas flow through conduit 18. If, however, combustion air were lacking, a sail switch would open simultaneously closing off conduit 18.

Referring now to FIG. 1A, there is shown the preferred arrangement of a heat exchanger 41*a* in combination with a hood 7*a* positioned above the top surface 10 of the range 8. Here the construction of the range in FIG. 1A differs from that in FIG. 1B described below. The heat exchanger 41*a* is positioned in the hood 7*a* and serves to heat incoming vapors and air and cool exiting combustion products. This results in reduction of vapors, etc. to the room and also increases the efficiency of the range. Thus cooking vapors and air entering through a filter 32 are driven by a fan 38*a* into a lower or first regeneration chamber 40*a* where they are heated and finally into an input duct 36*a* leading to the combustion chamber 16. The direction of flow is denoted by arrows.

The heated vapor and air mixture combusts with gas in chamber 16. Combustion products from the combustion chamber 16 then exit through a duct 47*a* to a second or upper regeneration chamber 44*a* where they are cooled. These combustion products are drawn through duct 47*a* and chamber 44*a* by a fan 46*a*. The cooled combustion products finally exit to the room at a safe, low temperature.

The entering cooking vapors and air are heated and the exiting combustion products are cooled by means of the rotating regeneration wheel 48, more fully described below. The wheel 48 is driven by a motor 50.

The embodiment of FIG. 1A is preferred because vapor and grease-laden air entering through the filter 32 is immediately preheated by the heat exchanger 41*a*. By contrast, the embodiment shown in FIG. 1B, described below, includes a heat exchanger 41*b* which is positioned in the main body of the range 8 rather than in a hood 7*b*. Thus in the embodiment of FIG. 1A, vapor will not condense in the duct 36*a* since it is heated by heat exchanger 41 as before entering the duct 36*a*. Also duct 36*a* is shown flush with duct 47*a* resulting in some heat transfer. However this heat transfer is not a requisite to prevent condensation. The exterior surface of ducts 36*a* and 47*a* are preferably insulated however.

Positioned above the top surface **10** of the range **8** is the hood **7*b***. The hood **7*b*** is typical of those well known in the art, as compared to the hood **7*a*** in FIG. **1**A, which is modified to include the heat exchanger **41*a***. The hood **7*b*** extends over the entire top surface **10** and may or may not include a filter screen, as at **32**. A squirrel cage fan **34** driven by an electric motor (not shown) draws the air and vapors given off by cooked foods and other materials over the top surface **10**, through the filter **32** and into a duct **36*b***. Note that the fan **34** is an additional required part of the range shown in FIG. **1**B as compared to the range shown in FIG. **1**A.

The air and vapor mixture is directed as shown by the arrows down the duct **36*b*** to the back of the range **8**. An electrical powered fan **38*b*** assists in drawing the air and vapor down the duct **36*b***. The fan **38*b*** directs the air and vapor mixture into a first or lower regeneration chamber **40*b*** of a heat exchanger **41*b***. The air and vapor mixture is heated in the first regeneration chamber **40*b*** and directed through an air solenoid valve **42** into the burner chamber **16** of burner **14**. There the air and vapor mixture passes upward through the chamber **16** and the burner **14** to combine with gas at the surface of the burner **14** for ignition and combustion.

The combustion products exit from the upper part of the burner chamber **16** into an upper or second regeneration chamber **44*b*** of the heat exchanger **41*b*** positioned directly above the first regeneration chamber **40**. A second electrically driven fan **46*b*** assists in drawing the combustion products from the burner chamber **16** and through the upper chamber **44*b***. When the combustion products are in the second chamber **44*b***, heat is withdrawn therefrom and utilized to heat the incoming air and vapor mixture in the first chamber **40**.

Finally the cooled combustion products are exhausted to the atmosphere indoors. Rather than being directly exhausted into the indoor atmosphere, the cooled combustion products may be made to pass through a duct **47*b*** which in combination with duct **36*b*** defines an annular space about the incoming duct **36*b***. Preferably the outer duct **47*b*** exhausts above the hood **7*b*** to prevent unnecessary recirculation of the combustion products. Such an annular configuration further serves to preheat the incoming air and vapor mixture and simultaneously cool the exiting or exhausting combustion products.

In the arrangement shown in FIG. **1**-B, condensation in the duct **36**b is prevented by transferring heat from combustion products flowing through duct **47*b*** to the wall of duct **36*b*** and then to the incoming air in duct **36*b***. To do this a higher exhaust temperature from the heat exchanger **41**b is required in the range of FIG. **1**B than from the exchanger **41**a in the range of FIG. **1**A with a resultant decrease in efficiency of heat transfer for the regenerator wheel **48**. For this reason the range of FIG. **1**A is preferred. In this arrangement shown in FIG. **1**B heat transfer between the ducts **36*b*** and **47*b*** is desirable. Therefore, **36*b*** is surrounded by **47*b*** to obtain greater heat transfer surface area.

Preferably the vapor and air mixture is preheated and the combustion products are simultaneously cooled by means of a regenerative type heat exchanger and more particularly a heat exchanger which includes a regeneration wheel **48**. Wheel **48** is pivotally mounted on a shaft **49** to rotate between the first and the second regeneration chambers **40** and **44** respectively. An electric motor **50** drives the shaft **49** and attached wheel **48** to provide for the exchange of heat between chambers **40*a*** and **44*a*** or **40*b*** and **44*b***. Heat is absorbed by the vapor and air mixture in the first chamber **40*a*** or **40*b*** whereas heat is given off by the combustion products to the regeneration wheel in the second chamber **44*a*** or **44*b***. The construction of the wheel **48** and its mode of operation is described in the copending U.S. application Ser. No. 596,521, filed Nov. 23, 1966 by Huebler et al., now U.S. Pat. No. 3,416,509.

Briefly, as an example of a typical installation, the regeneration wheel has an effective cross section of about **6** inches in diameter and a thickness of 3 inches. The wheel is made of asbestos impregnated with sodium silicate. As illustrated in FIG. **2** the cross sectional configuration of the wheel corresponds to layers of corrugated paper annularly positioned one on top of the other about the central shaft **49**. Whereas the cross sectional configuration of the wheel **48** shown in FIG. **2** comprises corrugations, other designs may be used as long as a plurality of small axial passages are provided parallel to the shaft **49** for the flow of combustion products or an air and vapor mixture as the case may be. The regeneration wheel **48** may be made of any heat-resistent material, preferably one that has a high heat capacity such as asbestos, asbestos impregnated with sodium silicate or a ceramic or refactory material such as Corning's Cercor.

Typically, the wheel **48** rotates about shaft 49 at 5 r.p.m. The hot exiting exhaust or flue gases pass through the upper half of the wheel **48** in chamber **44*a*** or **44*b*** giving up heat to the wheel **48**. The wheel **48** rotates continuously so that the hot half of the wheel **48** is then exposed at its lower half in chamber **40*a*** or **40*b*** to incoming vapor and air mixture which cools the wheel **48** and heats the mixture. It is to be understood that the dimensions of the regeneration wheel and its rate of rotation are not critical and are functions of burner size, number of burners and temperature requirements. Those skilled in the art will recognize that the parameters can be adjusted within the skill of the art to provide the cooling effect desired for any combination and size of burners.

As disclosed in the copending application by Huebler referred to above, the chambers **40*a*** and **44*a*** or **40*b*** and **44*b*** are sealed from one another even though the wheel **48** is made to rotate. This is to prevent leakage of the gases between the chambers **40*a*** and **44*a*** or **40*b*** and **44*b***. The sealing means consists of a pair of flanged rings **54** and **56** which are adapted to fit into annular grooves **55** and **57** respectively defined in the wheel **48**. The rings **54** and **56** are securely connected to the walls of the regeneration chambers **40*a*** and **44*a*** or **40*b*** and **44*b*** so that the wheel **48** may rotate without interfering with the rings **54** and **56**. The grooves **55** and **57** in the wheel are formed by pressing the flange of a ring **54** or **56** into the relatively soft asbestos material of the wheel **48** and rotating the wheel **48** about the shaft **49** until a suitable clearance is obtained. Alternative methods of sealing may also be utilized.

Also along each face of the wheel **48** there are provided wipers **60** and **62** of tubular or flat configuration, for example, a roll of glass fiber material. The wipers **60** and **62** serve to prevent flow of gas between the first **40***a* or **40***b* and second **44***a* or **44***b* chambers across the face of the wheel **48**. FIG. **2** shows how wiper **60** fits across the face of regeneration wheel **48**.

It has been found desirable to supply air to the burner in an amount in excess of the stoichiometric amount required for complete combustion to carbon dioxide and water vapor of the gas and vapors introduced at the burner **14**. By way of example but not by way of restriction the following temperatures and flow rates are presently preferred with four burners operating at rated input to the burners:

Gas input	34,000 Btu/hr	
Air input	6,000 cubic feet per	hour (**100** cfm)
Exhaust temp.	200° F.	

The exhaust temperature of 200° F. for the smooth-top gas range is much lower than the exhaust gas temperature of a conventional open-top gas burner. For example, a conventional top burner operating with the usual 50 percent efficiency (50 percent of burner input transferred to the pot and its contents) loses 50 percent of its rated input to the kitchen by way of the hot exhaust gases. Four conventional top burners operating at total rated input of 42,000 Btu/hr discharges 21,000 Btu/hr to the kitchen by the exhaust. The smooth top gas range discharges approximately 13,000 Btu/hr to the kitchen by the exhaust. A gas savings of 8,000 Btu/hr results and is reflected in a reduced gas input for the smooth-top gas burners.

The types of burners that may be used in practicing the invention are not limited. There is illustrated in FIG. **1** a burner **14** which divides the burner chamber **16** into two portions. The incoming air and vapor mixture all pass through the burner **14** as primary air. FIG. **3** illustrates a burner **64** of the type wherein the air and vapor mixture may pass around the sides of the burner **64** to combust with the gas as secondary air as well as through the burner **64** as primary air. It is important, however, that the burner chamber as at **16** in FIG. **1** be sealed against the smooth top surface **10** of the range to insure that the incoming air and vapor mixture and the exhaust gases are properly directed and do not leak or stray from their described paths. This burner chamber **16** provides the only gas flow pathway from the lower heat exchanger chamber **40***a* or **40***b* to the upper heat exchanger chamber **44***a* or **44***b* respectively.

FIG. **3** also illustrates the construction of a multiburner, smooth top, gas range utilizing the present invention. In FIG. **3** the incoming air and vapor mixture from a hood passes through the regeneration wheel **63** and into a central regeneration chamber **66** whenever a burner, as at **64**, is turned on. The air vapor mixture then passes in through a duct, as at **68**, and into the burner chamber **70** for burner **64**. The combustion products of burner **64** are directed to an exit duct defined by duct halves **71** and **72**, duct half **72** being attached to the bottom of top surface **74**. The combustion or exhaust products then pass through the top half of regeneration wheel **63** and into the atmosphere.

FIG. **4** illustrates and alternative embodiment of the burner construction for a smooth top gas range installation of the present invention. An incoming air and vapor mixture passes from a hood (not shown), through a duct **75** and the top half of a regeneration wheel **76**. The mixture is then directed through a duct **77** to a burner chamber **78** beneath the burner surface **79**. There the vapor and air mixture is ignited with gas coming in through the burner **80**. The combustion products are then drawn down through a porous plate or screen **82** into an exit duct **84**. Finally the exhaust products are cooled by regenerator wheel **76** in the manner previously described and discharged to the atmosphere. The combustion of the gas vapor and air mixture heats the surface **78** by radiation and conduction. The flow of gases has been reversed in the embodiment shown in FIG. **4** in relation to those previously described.

Thus, it can be seen that by utilizing the construction of the present invention, cooking vapors which often fill a kitchen with obnoxious or bothersome odors and fumes may be drawn from above the cooking surface and directed to the burner which is responsible for the cooking operation. There the fumes are completely combusted into carbon dioxide and water vapor. The combustion products may then be safely discharged into an indoor room. Substantial savings are realized by doing away with the need for costly outside venting. Such applications will have special economic importance in commercial installations. Increased safety factors are also exhibited by the presently claimed invention since turning the burner control knob handle simultaneously activates the motors and valves providing a path for the gas which is to be combusted as well as the incoming air and vapor mixture and exhaust products.

What is claimed is:

1. A top burner installation for removing vapors, fumes and odors generated above said top comprising, in combination:

at least one burner;

an air impervious cooking surface over said burner forming one wall of a burner combustion chamber;

means for drawing said vapors and air from the region above said cooking surface and directing said vapors and air to said burner combustion chamber, said means including a hood over said cooking surface, and circulating means for directing said vapors and air to said burner combustion chamber;

means for exhausting combustion products from said burner combustion chamber; and

heat exchanger means positioned simultaneously within the path of said vapor and air and said combustion products to preheat said vapor and air prior to combustion in said burner combustion chamber and to cool said combustion products subsequent to discharge from said burner combustion chamber.

2. The installation of claim **1** wherein said burner is a gas burner and including combustible gas supply means to provide a source of a gas hydrocarbon fuel to said burner.

3. The installation of claim **1** wherein said heat exchanger means comprises

a first chamber for receiving vapor and air

a second chamber for receiving said combustion products adjacent said first chamber, and means interconnecting said chambers for removing heat from combustion products for heating said vapor and air mixture.

4. The installation of claim 3 wherein said means for removing heat and heating said vapor and air comprise a regeneration wheel revolving about an axis between said first and second chambers to transfer heat from said second to said first chamber.

5. The installation of claim 1 wherein said burner chamber is divided by a gas burner into two separate regions separated by said burner such that all vapors and air pass through said burner as primary air for combustion.

6. The installation of claim 1 wherein said circulating means comprise ducts leading from said hood to said heat exchanger means, said ducts including circulating fans for driving said air, vapor and combustion products from above said surface to said heat exchanger and thence through said burner to said heat exchanger.

7. The installation of claim 1 including flow passage valve means between said heat exchanger and said burner combustion chamber adapted to open when said burner is turned to an on position thereby allowing vapor and air to be drawn into said burner combustion chamber for combustion.

8. The installation of claim 1 wherein said heat exchanger means also comprises said means for drawing vapors and air from the region above said cooking surface.

9. The installation of claim 1 wherein said heat exchanger means is positioned in said hood.

10. A top burner installation for removing vapors, fumes and odors generated above said top comprising, in combination:

at least one burner;

an air impervious cooking surface over said burner forming one wall of a burner combustion chamber;

means for drawing said vapors and air from the region above said cooking surface and directing said vapors and air to said burner combustion chamber;

means for exhausting combustion products from said burner combustion chamber;

heat exchanger means positioned simultaneously within the path of said vapor and air and said combustion products to preheat said vapor and air prior to combustion in said burner combustion chamber and to cool said combustion products subsequent to discharge from said burner combustion chamber, said heat exchanger means including a first chamber for receiving vapor and air, a second chamber for receiving said combustion products adjacent said first chamber, and a regeneration wheel heat exchanger revolving about an axis between said first and second chambers to transfer heat from said second to said first chamber.

11. The installation of claim 10 wherein said burner is a gas burner and including combustible gas supply means to provide a source of a gas hydrocarbon fuel to said burner.

12. The installation of claim 10 wherein said burner chamber is divided by a gas burner into two separate regions separated by said burner such that all vapors and air pass through said burner as primary air for combustion.

13. The installation of claim 11 including flow passage valve means between said heat exchanger and said burner combustion chamber adapted to open when said burner is turned to an on position thereby allowing vapor and air to be drawn into said burner combustion chamber for combustion.

14. The installation of claim 10 wherein said heat exchanger means also comprises said means for drawing vapors and air from the region above said cooking surface.

15. The installation of claim 10 wherein said means for drawing and directing vapors comprises

a hood over said cooking surface, and

circulating means for directing said vapor and air through said heat exchanger to said burner combustion chamber.

16. The installation of claim 15 wherein said circulating means comprise ducts leading from said hood to said heat exchanger means, said ducts including circulating fans for driving said air, vapor and combustion products from above said surface to said heat exchanger and thence through said burner to said heat exchanger.

17. The installation of claim 15 wherein said heat exchanger means is positioned in said hood.

18. A top burner installation for removing vapors, fumes and odors generated above said top comprising, in combination:

at least one burner;

an air impervious cooking surface over said burner forming one wall of a burner combustion chamber;

means for drawing said vapors and air from the region above said cooking surface and directing said vapors and air to said burner combustion chamber;

means for exhausting said combustion products from said burner combustion chamber;

heat exchanger means positioned simultaneously within the path of said vapor and air and said combustion products to preheat said vapor and air prior to combustion in said burner combustion chamber and to cool said combustion products subsequent to discharge from said burner combustion chamber; and

flow passage valve means between said heat exchanger and said burner combustion chamber adapted to open when said burner is turned to an on position thereby allowing vapor and air to be drawn into said burner combustion chamber for combustion.

19. The installation of claim 18 wherein said burner is a gas burner and including combustible gas supply means to provide a source of gas hydrocarbon fuel to said burner.

20. The installation of claim 18 wherein said means for drawing and directing vapors comprises

a hood over said cooking surface, and

circulating means for directing said vapor and air through said heat exchanger to said burner combustion chamber.

21. The installation of claim 18 wherein said heat exchanger means comprises

a first chamber for receiving vapor and air

a second chamber for receiving said combustion products adjacent said first chamber, and means interconnecting said chambers for removing heat from combustion products for heating said vapor and air mixture.

22. The installation of claim 21 wherein said means for removing heat and heating said vapor and air comprise a regeneration wheel revolving about an axis between said first and second chambers to transfer heat from said second to said first chamber.

23. The installation of claim 18 wherein said burner chamber is divided by a gas burner into two separate regions separated by said burner such that all vapors and air pass through said burner as primary air for combustion.

24. The installation of claim 20 wherein said circulating means comprise ducts leading from said hood to said heat exchanger means, said ducts including circulating fans for driving said air, vapor and combustion products from above said surface to said heat exchanger and thence through said burner to said heat exchanger.

25. The installation of claim 18 wherein said heat exchanger means also comprises said means for drawing vapors and air from the region above said cooking surface.

26. The installation of claim 20 wherein said heat exchanger means is positioned in said hood.

* * * * *