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Reid, Jr. et al.

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[54] **SMOOTH TOP RANGE**

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[52] **U.S. Cl.** ..... **126/39 J**

[51] **Int. Cl.** **F24c 3/04**

[58] **Field of Search** ..... 126/39, 214 R

[56] **References Cited**

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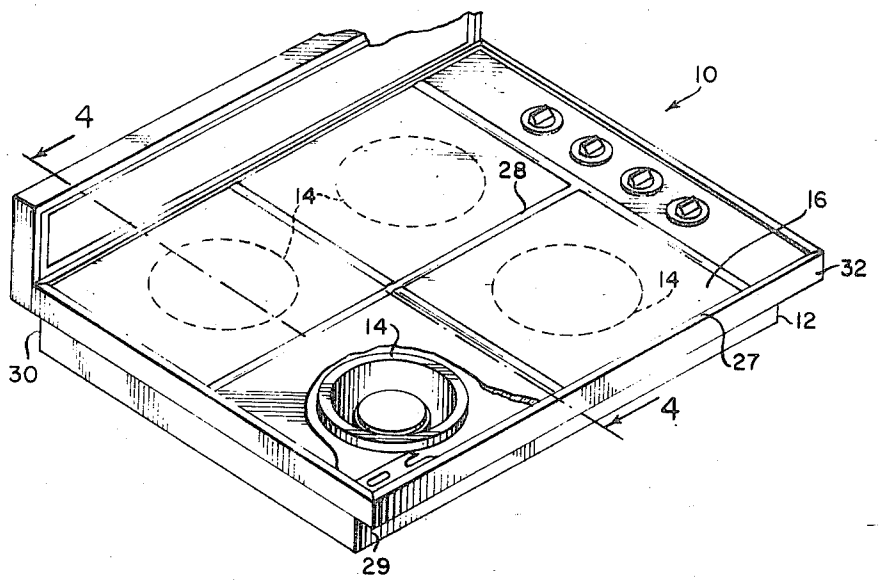
[57] **ABSTRACT**

In a smooth top gas range including a shell construction defining an open top, a plate of heat resistant glass material closes the top of the shell to enclose a plurality of gas burner units therein. An air-impervious plate separates the shell into upper and lower air flow chambers and means is provided in the upper chamber to confine the products of combustion formed by each of the burners and isolate them from the upper chamber. The confining means serves to direct the products of combustion into the lower chamber of the shell construction which communicates with the atmosphere through an opening in the shell, so that the lower chamber defines a common exhaust for the products of combustion formed in each of the burner units. A blower is provided for drawing air into the upper chamber of the shell construction in order to cool the smooth top heat resistant plate during operation of the range and discharges this air into the lower chamber in order to dilute the products of combustion therein prior to their being discharged from the shell.

18 Claims, 4 Drawing Figures



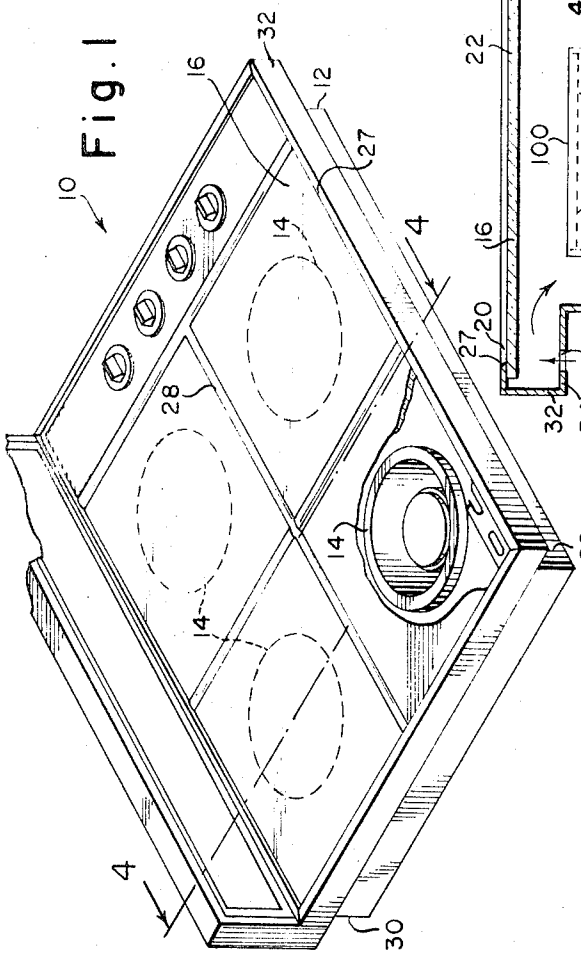


Fig. 1

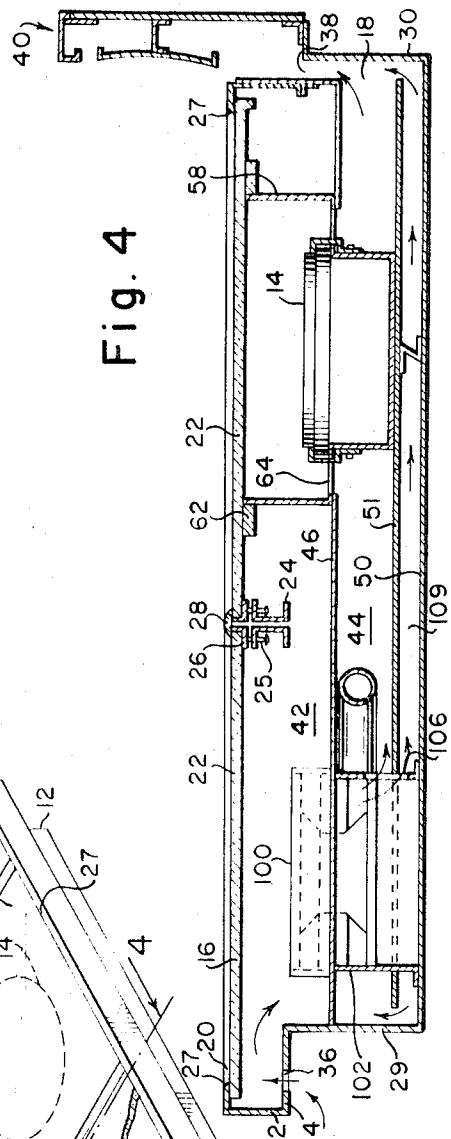


Fig. 4

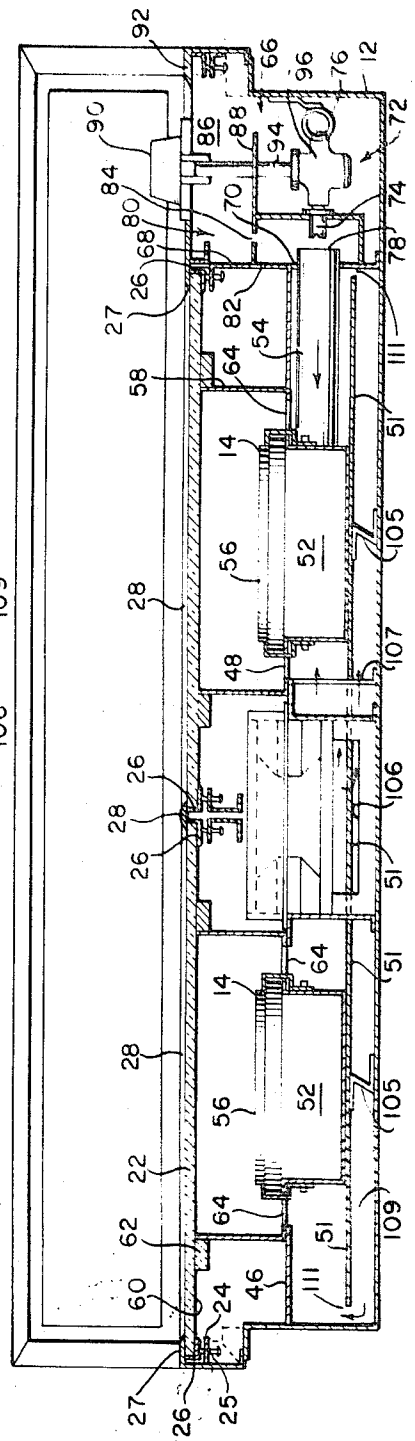


Fig. 3

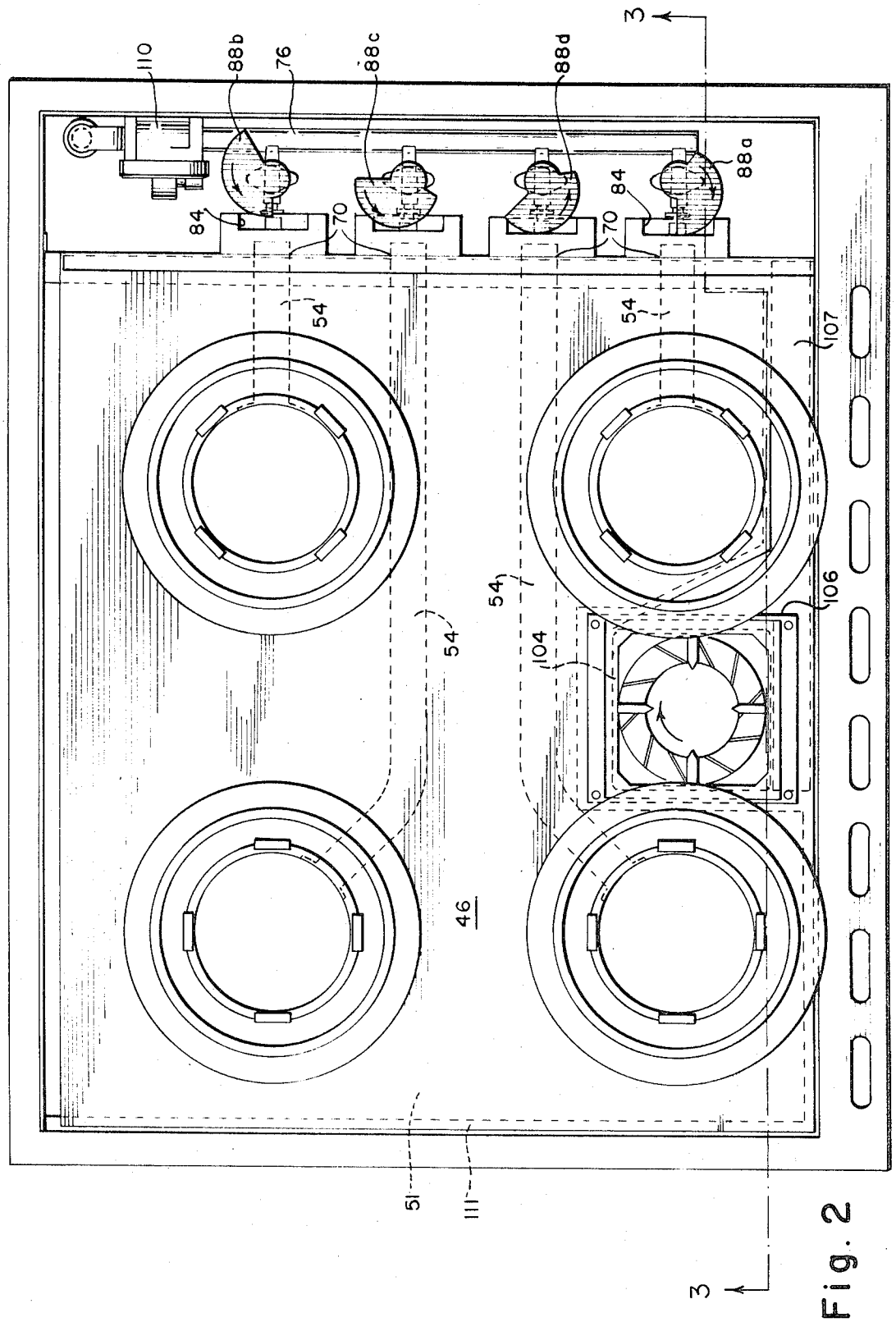


Fig. 2

SMOOTH TOP RANGE

The present invention relates to gas ranges or stoves and more particularly to smooth top gas ranges.

A number of smooth top gas ranges have been previously proposed in which individual gas burner units for the range are contained within a shell construction having a smooth top defined by a heat resistant glass plate that is adapted to transmit heat for cooking by conduction or infrared radiation. While such ranges have been found to be satisfactory, a number of difficulties still arise with them, particularly with respect to their manufacture and use.

For example, a particular problem which must be dealt with in smooth top gas ranges is the fact that the products of combustion of the burners are not exhausted directly to the atmosphere as with conventional gas ranges but must be conducted beneath the heat resistant smooth top of the range to a point of discharge therefrom. Since it is desirable to keep the top of the range cool at all times, except of course directly above the gas burner units when in use, prior ranges were provided with numerous and often complicated ducting systems for removing the products of combustion from the range. In fact, it is typical for each separate burner to have its own individual discharge duct, which often must be bent in a circuitous path to reach the exhaust flue of the surrounding shell. The provision of separate ducts for each of the gas burners represents a substantial and undesirable cost in additional material and labor in the manufacture of the gas range, particularly because of the fact that each of the ducts will normally have a different length depending upon its location in the gas range.

With previously proposed smooth top gas ranges, the products of combustion are normally exhausted directly from the exhaust duct or flue into the atmosphere with little or no dilution of the combustion products prior to discharge from the range. As a result, relatively high temperature gases are exhausted directly into the kitchen area surrounding the range so that the conditions in the surrounding area are sometimes rendered uncomfortable. As a result, exhaust fans are often required to overcome this problem, thereby requiring an additional expenditure.

Moreover, previously proposed smooth top ranges have not been totally successful in maintaining the portions of the top surrounding the burners completely cool during operation of the range since the exhaust duct for the products of combustion often are located near the underside of the top so that heat is transmitted to the top by convection and conduction. It also is desirable to rapidly cool down the burner area of the smooth top range after the cooling operation is completed with that selected burner, however, with prior smooth top ranges the burners merely cool to the ambient temperature without any assistance. Therefore, the cooling time for the burners is relatively long and the top of the range remains hot for an extended period of time. This is an undesirable feature in smooth top ranges and one which is sought to be overcome by the present invention.

Accordingly, it is an object of the present invention to maintain the top of a smooth top range, surrounding the operating burners therein, relatively cool during and after the cooling operation.

Yet another object of the present invention is to rapidly cool down the gas burners in a smooth top range after the burners have been shut off.

Yet another object of the present invention is to dilute the products of combustion from the gas burners in a smooth top range with a substantial amount of cool air prior to discharge of the products from the range into the surrounding atmosphere.

A further object of the invention is to provide a common exhaust for the products of combustion from each of the burners in a smooth top range, thereby to eliminate the use of separate exhaust ducts from each of the individual burners.

In accordance with an aspect of the present invention a smooth top gas range is provided which is formed from a shell construction that defines a cavity having an open top. A relatively flat air-impervious plate is mounted in the shell construction to separate the shell into separate upper and lower air flow chambers and has a plurality of openings therein, corresponding in number to the number of gas burners utilized in the range. Each of the gas burners is mounted in the lower chamber of the shell construction and they respectively extend upwardly therefrom through the individual openings in the separation plate into the upper chamber, in spaced relation with the periphery of their associated openings, thereby to define air flow passages between the burner units and their associated openings to provide communication between the upper and lower chambers in the shell construction.

A relatively flat plate of heat resistant material is mounted in the shell construction to close the top of the cavity and this plate cooperates with a wall arrangement surrounding each of the burners to confine the products of combustion formed in the burners directly above the burners and to isolate them from the remainder of the upper chamber. As a result the products of combustion are prevented from flowing upwardly and are caused to flow through the air flow passages between the burner units and their associated openings into the lower chambers of the shell construction.

The range has a first opening in its shell which provides communication between the lower chamber and the atmosphere. An air and combustible gas assembly, including means for selectively supplying air and a combustible gas mixture to the individual burners is mounted in the shell construction, with a separate air valve being associated with each of the burner units. These air valves are normally open to permit air flow to the burners when the burners are not operating. Blower means mounted in the shell construction draws air through the first opening therein into the upper chamber in order to provide a cooling air flow along the bottom surface of the heat resistant plate which will maintain those portions of the plate surrounding the individual burners in a relatively cool condition even when the burners are operating. The blower supplies this air through a first opening therein to the air and combustible gas assemblies so that air is simultaneously supplied to all of the burner units even when the units are not operating. In this manner, a burner which has been shut off will still be supplied with air from the blower in order to cool down the portion of the heat resistant plate directly above the burner in a relatively rapid manner. In addition the blower, through a second opening therein, discharges a portion of the air drawn into the shell construction through the upper chamber

into the lower chamber in order to dilute the products of combustion discharged into the lower chamber from the burners before these products are exhausted from the shell construction through the second opening therein.

The above, and other objects, features and advantages of this invention will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings, wherein:

FIG. 1 is a perspective view, with parts broken away, of a smooth top gas range constructed in accordance with one embodiment of the present invention;

FIG. 2 is a plan view with the top removed, of the gas range illustrated in FIG. 1;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2; and

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1.

Referring to the drawing in detail, and initially to FIG. 1 thereof, a flat or smooth top range **10** embodying the present invention is formed in a generally rectangular configuration from a shell construction **12** and contains a plurality of gas burner units **14** therein, enclosed by a smooth top **16.**

Shell **12** may be constructed of sheet metal in any convenient manner and defines a cavity **18** having an open top **20** which is closed by smooth top **16.** The latter, in the illustrative embodiment is formed from four individual plate members **22** of heat resistant glass or ceramic material which are supported in the top of the shell **12** on a plurality of rigid frame members **24** secured to the shell. The individual plates **22** are supported on frame members **24** by a plurality of screws **25** which cooperate between frame members **24** and angular metal seal strips **26,** extending along the edges of the plates, to clamp the plates between screws **25,** inwardly extending lip **27** of the shell and upper cross frame members **28.** In addition the plates may be sealed in air tight relation to each other and to shell **12** by gaskets (not shown).

It is noted that while the illustrative embodiment an individual plate **22** has been provided in association with each of the burners **14,** it is contemplated that a signal ceramic or glass heat resistant plate can be utilized in the conventional manner to simultaneously cover each of the burners. Thus, the term "heat resistant plate" as utilized herein is intended to encompass a smooth top formed from a plurality of plates, as in the illustrative embodiment, or a single plate provided in the conventional manner.

Shell **12** includes a front wall **29** and a rear wall **30** formed therein. Front wall **29** is formed with a forwardly extending ledge portion **32** having a bottom surface **34** provided with a plurality of openings **36** through which air is drawn, as more fully described hereinafter, to maintain top **16** in a relatively cool condition during operation of the range. On the other hand, rear wall **30** is provided with an opening **38** formed at its upper edge through which the products of combustion in the gas burners are discharged into a back plate or exhaust flue **40,** rigidly secured to wall **30.**

Substantially all of cavity **18** is separated into upper and lower chambers **42, 44** respectively by an air-impervious plate **46** rigidly secured to shell **12** by welding or the like. Plate **46** has a plurality of openings **48** formed therein and respectively associated with each of the burners **14.** The latter are supported above the base **50** of shell **12** by a plate **51,** for reasons more fully described hereinafter, and extend upwardly through the openings **48** in plate **46** into upper chamber **42.**

Each of the burner units **14** includes a plenum chamber **52** at its bottom to which a mixture of gas and air is delivered through a supply duct **54,** for combustion in burner element **56** contained in the burner. These burners may be of conventional blue flame type, to transmit heat by conduction through the glass plates **22** or alternatively, they may be infrared type burners, such as are disclosed in U.S. Pat. No. 3,470,862, so that products placed on the range are heated by infrared radiation passing through plate **22.** In either case, the products of combustion formed in burners **14** are confined above the burners within a predetermined area by cylindrical wall members **58** secured to plate **46** about the periphery of openings **48.**

Cylindrical walls **58** are maintained in substantially airtight relationship to the bottom surface **60** of plate **22** by gaskets **62** in any convenient manner, as would be apparent to those skilled in the art. Thus, the products of combustion formed in burners **14** are confined within the cylindrical walls **58,** directly above the burners **14** and are isolated from the remainder of the upper chamber **42.** The products of combustion are discharged from their confinement by walls **58,** through the air flow passages **64** defined between the burners and the edges of openings **48,** into the lower chamber **44.** Accordingly, it is seen that the only portions of plate **22** which are heated by the products of combustion, or by infrared radiation, are those portions thereof directly above the burners **14** and within the confines of the isolating walls **58** associated with each of the burners.

The air and combustible gas mixture delivered to burners **14** through ducts **54** is supplied from an assembly **66** mounted within shell **12** and isolated from upper and lower chambers **42** and **44** by an air-impervious wall **68.** Ducts **54** each extend through an associated aperture **70** in wall **68** into a valve assembly **72.** This assembly includes a gas discharge nozzle **74** which receives gas from a supply pipe or manifold **76** in a conventional manner. Nozzles **74** are spaced from and coaxially aligned with the ends **78** of their associated ducts **54,** so that gas discharged from the nozzles cooperates with the open ends **78** of the ducts to act as a venturi assembly by which the gas entrains the desired amount of air to support proper combustion in burners **14.**

The air supplied to duct **54** is controlled by a separate air valve arrangement **80** in valve assembly **72.** This valve arrangement includes a separate airtight housing associated with each of the ducts **54** and respectively secured in airtight relation to wall **68.** Housing **82** includes a generally rectangular opening **84** therein which permits passage of air from the chamber **86** (in which the assembly **66** is mounted) into the housing for entrainment by the jet of gas discharged into nozzle **74.** The volume of air permitted to pass through openings **84** is controlled by a separate vane or valve **88** associated with each of the openings and having an irregular configuration, seen most clearly in FIG. **2.**

In the illustrative embodiment of the invention the position of vanes **88,** and the volume of gas discharged from nozzle **74,** are simultaneously controlled by a ro-

tatably mounted control knob 90 on the top surface 92 of the gas range. Vane 88 is rigidly mounted on a rotatable shaft 94 connected to knob 90, and shaft 94 is, in turn, integrally connected to a valve arrangement 96 which controls the gas supply from manifold 76 to nozzle 74.

In the closed position of knob 90, illustrated at the lowermost vane 88*a* in FIG. 2, opening 84 is partly exposed. When the range is turned on, knob 90 is turned to its fully opened position, illustrated at the uppermost vane 88*d* in FIG. 2, and adjustment of the air and gas supplied to the burners is then accomplished by rotating the knob back to its fully closed position, as illustrated by the two intermediate vanes 88*c* and 88*d*. Thus when any of the burners 14 is shut, air can be supplied to its duct 54 for passage through its burner, without gas, for reasons more fully decribed hereinafter.

In order to supply air to assemblies 66, an electrically operated blower 100 is mounted within shell 12 adjacent front wall 28. Blower 100 extends through plate 46 in airtight relation therewith and, in operation, draws ambient air through openings 36 in ledge 34. This air is relatively cool and serves to maintain those portions of plate 22 surrounding confining walls 58 in a relatively cool condition so that during operation of the range only the portions of the plate directly above burners 14 and within the confines of wall 58 are heated.

Blower 100 is surrounded by an air-impervious housing 102 in lower chamber 44 and this housing has a pair of openings 104 and 106 therein for discharging the air drawn into chamber 42. A portion of this air is discharged through opening 104 and is supplied through a duct 107 (FIGS. 2 and 3) to chamber 86, in order to provide air for air and combustible gas assemblies 66. The remainder of the air from blower 100 is discharged through opening 106 in housing 102 directly into chamber 44 in order to dilute the products of combustion which are discharged from the burners 14 into this lower chamber. In this manner, the products of combustion are cooled and diluted prior to their discharge through openings 38 in shell 12.

In addition, a portion of the air discharged through opening 106 is supplied below plate 51 since that plate extends across opening 106, as seen in FIG. 4. Plate 51 is supported above shell base 50 by frame members 105 so as to define a secondary chamber 109 below burners 14. The plate extends to within approximately one inch of the front, rear and side walls of shell 12 so as to define air passageways 111 providing communication between secondary chamber 109 and the remainder of chamber 44. In this manner, relatively cool air is supplied below the burners 14 to keep shell base 50 cool. This air then flows through passageways 111 and is discharged with the products of combustion through shell opening 28.

Blower 100 is controlled by the actuation of any of the knobs 90 and turns on as soon as any one of the knobs is turned to start one of the burners. In one contemplated embodiment of the invention, the range can be provided with a control system which will automatically turn the blower 100 on prior to the discharge of gas from nozzle 74. Once the blower has reached its operating speed, as determined by an air flow switch, a solenoid valve 110 in manifold 76 is operated to permit gas to flow from the main line into the manifold for discharge through the nozzle 74 which has been opened by the operated knob 90.

Burner units 14 are preferably provided with electric igniters, e.g. a glow coil, which will automatically turn on with the operation of knob 90 and in order to reduce the amount of controls required, it is contemplated that each of the igniters will be turned on by operation of any one of the knobs 90. Since gas will flow only to the burner associated with the operation of the knob, the ignition of the igniters presents no problem and the igniters will automatically turn off after a predetermined time delay, in the conventional manner. Thereafter, the gas supplied from manifold 76, upon actuation of the valve 100, causes entrainment of air flowing through the opening 84 associated with the operated valve 90 to entrain the air and supply it through duct 54 to the plenum chamber 42 of the burner 14 for ignition.

It is thus seen, that upon actuation of blower 100, and ignition of any one of the burners 14, air is simultaneously supplied through the openings 84 in the valve housings 82 of each of the burners 14, even if they were not turned on. This air, because it is under pressure by the operation of blower 100, flows through openings 84 and through their associated ducts 54, into each of the burners 14, and serves to maintain the upper surface of the heat resistant plate above the burners relatively cool. This air passes through passages 64 into lower chamber 44, to further dilute the products of combustion. Moreover, when more than one burner has been in use and one of them is shut off, the air is continuously supplied to that burner after it is shut off, so as to rapidly cool down the plate 22 immediately above it. Accordingly, the heat in the plate is removed by this relatively cool air and discharged through lower chamber 44 to exhaust opening 38. This is a particularly important feature of the invention since with smooth top ranges, after the burners in the smooth top range are shut off, it is often difficult to determine whether or not the surface is warm. Thus, the rapid cooling substantially reduces the danger of having the person utilizing the stove burned by contact with the warm smooth top.

In addition, it is comtemplated that an electronic timer or thermostatic control for blower 100 can be provided so that after all of the burners 14 are shut off the blower 100 will remain in operation for a predetermined time period in order to rapidly cool down the entire surface of the plate 22. This is permitted by the valve arrangement illustrated in FIG. 2 in which the openings 84 remain open when the range is shut off. As a result, the air from blower 100 can be continuously supplied through the burners, and discharged through lower chamber 44 to the atmosphere, even with the burners are off.

Accordingly, it is seen that a relatively simple and inexpensively constructed smooth top range is provided which has numerous constructional advantages that serve to maintain the top of the range as cool as possible during and after operation of the device. This is accomplished by the provision of a common exhaust in the lower portion of the range for the products of combustion of each of the burners while continuously supplying coll air to the upper portion of the range to cool the smooth top surrounding the burners. In addition, because of the novel air supply system utilized in this arrangement, air is continuously supplied to each of the burners when they are not in operation in order to keep

the plate above the burners cool and to cool the plate after the burners have been shut off.

Although an illustrative embodiment of the present invention has been described herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of this invention.

What is claimed is:

1. In a gas range, the combination of, a shell construction defining a cavity having an open top, a relatively flat air-impervious plate mounted in said shell and separating the shell into separate upper and lower air flow chambers, said plate having an opening therein providing communication between said chambers, a gas burner unit mounted in said lower chamber and extending upwardly through said opening into said upper chamber in spaced relation to the periphery of said opening to define an air flow passage between said upper and lower chambers, means in said upper chamber surrounding said burner for isolating said burner from the remainder of said upper chamber and confining products of combustion produced by said burner units to prevent them from flowing into said upper chamber, means forming a plate of heat resistant material mounted in said shell to close the top of said cavity, said heat resistant plate having a bottom surface cooperating with said confining means to confine the combustion products therein from flowing upwardly, said shell having a first opening therein providing communication between said upper chamber and the atmosphere and a second opening therein providing communication between the lower chamber and the atmosphere, an air and combustible gas assembly including means for supplying air and combustible gas to said burner, and blower means for drawing air through said first opening and supplying said air to said assembly, whereby products of combustion produced by said burner and confined by said confining means flows through said air flow passage and are discharged from said lower chamber through said second opening.

2. In a gas range as defined in claim 1 wherein said plate has a plurality of openings therein, a separate gas burner unit mounted in said lower chamber and respectively extending upwardly therefrom through said openings, and confining means surrounding each of said openings and cooperating with the bottom surface of said plate to confine combustion products from said burners from flowing upwardly, whereby the products of combustion from all of said burners flows from said confining means into said lower chamber for common discharge through said opening.

3. In a gas range as defined in claim 1 wherein said blower includes a pair of discharge openings, one of said openings communicating with said lower chamber to supply a portion of said air thereto for diluting said combustion products prior to discharge from said shell, the remainder of said air flowing through the other of said blower openings, and means for directing the air discharged from said other opening to said assembly.

4. In a gas range as defined in claim 3 including means for supporting said burners above the base of said lower chamber and separating said chamber into two communicating sections, said one discharge opening in said blower supplying air to each of said sections to cool the base of said shell.

5. A gas range comprising, a shell construction defining a cavity having an open top, a relatively flat air-impervious plate mounted in said shell and separating the shell into separate upper and lower air flow chambers, said plate having a plurality of openings, a plurality of gas burner units mounted in said lower chamber and respectively extending upwardly therefrom through said openings into said upper chamber in spaced relation to the periphery of their associated openings to define an air flow passage between each of said burner units and their associated opening for communication between said upper and lower chambers, means in said upper chamber associated with each of said openings for enclosing said burners and isolating them from the remainder of said upper chamber, means forming a flat plate of heat resistant material mounted in said shell to close the top of said cavity and said upper chamber, said plate having a bottom surface cooperating with said confining means to prevent combustion products produced by said burner units from flowing upwardly, said shell having a first opening therein providing communication between said upper chamber and the atmosphere and a second opening therein providing communication between said lower chamber and the atmosphere, an air and combustible gas assembly having means for selectively supplying air and a combustible gas to the individual burner units including separate air valves associated with each of said burner units, said air valves being normally open to permit air flow to said burners when the burners are not operating and blower means for drawing air through said first opening into said upper chamber and for supplying said air to said assemblies, whereby products of combustion produced in the burner units are confined by said confining means and flow through said air passages for discharge through said second openings while air is simultaneously supplied to any non-operative burner unit for flow through its associated air flow passage to cool said heat resistant plate and aid in diluting said combustion products in said lower chamber prior to discharge through said second opening.

6. The gas range as defined in claim 5 wherein said heat resistant plate is formed of a heat resistant ceramic material which transmits heat by conduction.

7. The gas range as defined in claim 6 wherein said gas burners include burner elements for producing infrared radiation.

8. The gas range as defined in claim 5 wherein said blower includes a pair of discharge openings, one of said openings communicating with said lower chamber to supply a portion of said air thereto for diluting said combustion products, the remainder of said air flowing through the other of said blower openings and means for directing the air discharged from said other opening to said assembly.

9. The gas range as defined in claim 8 including means for supporting said burners above the base of said lower chamber and separating said chamber into two communicating sections, said one discharge opening in said blower supplying air to each of said sections to cool the base of said shell.

10. The gas range as defined in claim 8 wherein said confining means comprises means forming a peripheral wall about each of said openings, said wall extending from said air-impervious plate to said bottom surface of said heat resistant plate and means forming an airtight seal between said wall and said heat resistant plate.

11. The gas range as defined in claim 10 wherein said shell construction includes front and rear walls and said second opening is located therein adjacent said rear wall.

12. The gas range as defined in claim 10 wherein said front wall includes a forwardly extending portion adjacent said upper chamber having a downwardly facing ledge portion, said first opening being located in said ledge.

13. The gas range as defined in claim 12 wherein said blower is located adjacent said front wall.

14. The gas range as defined in claim 13 including means forming a separate chamber in said shell for containing said air and combustible gas assembly, said assembly including individual supply ducts extending from said separate chamber to respective burner units to deliver said air and combustible gas mixture thereto, a gas discharge nozzle located in spaced relation to and substantially coaxially of the end of each of said ducts in said separate chamber whereby gas discharged from said nozzles entrains air flowing through said valves to project the gas and entrained air through said supply ducts.

15. The gas range as defined in claim 14 wherein said air valves each comprising a housing in said chamber enclosing the end of its associated supply duct and having an air inlet opening therein and means for selectively and variably blocking said opening to vary the amount of air supplied to said housing, said last mentioned means leaving said opening substantially unobstructed when its associated burner is shut off and said nozzles extending into said housing to entrap air passing through said valves.

16. The gas range as defined in claim 15 wherein said means for directing the air discharged from said other blower opening comprises an air supply duct between said blower and said separate chamber.

17. In a smooth top gas range including a shell construction defining an open top, a plate of heat resistant material closing said top, and a plurality of gas burner units mounted in said shell for transmitting heat through said plate, the improvement which comprises means separating said shell into upper and lower chambers, means for confining products of combustion formed by said burner units between said burners and said plate, said confining means isolating said combustion products from said upper chamber and directing them into said lower chamber, said shell construction having an opening therein providing communication between the atmosphere and said lower chamber, whereby said lower chamber defines a common exhaust chamber in said shell construction for the products of combustion formed in said burner units, and means for drawing air into said upper chamber to cool said plate and discharging said air into said lower chamber to dilute said products of combustion prior to discharge through said opening.

18. In a smooth top gas range including a shell construction defining an open top, a top plate of heat resistant material closing said open top, and a plurality of gas burner units mounted in said shell for transmitting heat through said top plate, the improvement which comprises means for confining products of combustion formed by each of said burner units to spaces directly above the respective burner units, means for forming a common discharge chamber in the lower portion of said shell in communication with said spaces above the burners through which said products of combustion are directed from said burner units and having a discharge opening from said discharge chamber to the atmosphere, and air circulating means for circulating air along the bottom of said plate around said burner units and thence into said discharge chamber to dilute said products of combustion and for directing air through each of said burner units immediately after the discontinuance of use of the burner unit to thereby cool the burner unit and the adjacent portion of said top plate.

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