GAS-FIRED FORCED CONVECTION OVENS

In the preferred form, the present invention concerns a gas oven having a cavity including a rear wall, a gas burner mounted on the rear wall, a flow former spaced forwardly of the rear wall so as to form a combustion chamber between the flow former and the rear wall, a cooking chamber forward of the flow former, a blower mounted immediately forward of the flow former which causes recirculative gas flow through the cooking chamber and aids the passage of combustion chamber gases from the combustion chamber around the peripheral edge of the flow former.

3 Claims, 5 Drawing Figures
GAS-FIRED FORCED CONVECTION OVENS

BACKGROUND OF THE INVENTION

1. Field of the Invention
This invention relates to gas ovens and is concerned with a construction in which combustion products are distributed around the cooking cavity of the oven by a blower in order to obtain a more even temperature distribution than normally occurs in a conventional gas oven.

According to the present invention a gas oven has an oven cavity divided by a flow former into a combustion chamber and a cooking chamber. Mounted on the rear wall of the oven cavity is a gas burner. Mounted forwardly of the flow former is a blower which has a central air inlet and radial air exhaust. The periphery of the flow former is spaced from the oven wall so as to permit mixing of the combustion chamber gases with recirculative gases during operation of the oven.

2. Description of the Prior Art
Most known gas-fired forced convection ovens use a fire box external of and separate from the oven cavity and connected thereto by a duct or use a heat exchanger to provide heat in the cooking compartment. Both of these systems tend to be expensive, both in cost and space employed.

Another known form of the gas-fired forced convection ovens utilizes a chamber in the rear of the oven to house a blower which forces air around a gas burner chamber with the exhaust of the gas burner chamber being somewhat limited in size and location. This arrangement is taught in U.S. Pat. No. 3,384,068 wherein the combustion products exhaust near the top of the chamber and the recirculating gases are removed from the bottom of the chamber, thus causing a temperature differential along different walls of the oven.

SUMMARY OF THE INVENTION

According to the present invention, a gas oven has a walled oven cavity, a rotary blower mounted within the cavity in close proximity to a flow former, a combustion chamber formed behind the flow former and having one or more gas flame ports disposed therein, the combustion chamber having a peripheral outlet defined by the periphery of the flow former and the walls of the oven cavity, and the blower being arranged to induce a flow of combustion products from the combustion chamber through the peripheral outlet.

Preferably, the blower is mounted on a driving shaft passing through the flow former and rear wall with the bearings and motor for the blower being external of the cooking compartment. The flow former may be secured into an inwardly projecting portion of the rear wall of the gas burner and partially defines the combustion chamber. The flow former, blower, and burner arrangement induce a flow of combustion products around the periphery of the flow former so that hot gases pass forwardly along the side, bottom and top walls of the cooking compartment.

It is also an object of the present invention that the gas burner be mounted on the rear wall of the cooking compartment and is provided with primary and secondary air inlets at atmospheric pressure. The flow former is disposed between the blower and the gas burner so as to prevent a direct flow of air from the blower to the gas flame ports.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a domestic gas oven which utilizes the present invention.
FIG. 2 is a cross-sectional view of the oven of FIG. 1.
FIG. 3 is a cross-sectional view taken along the lines 3—3 of FIG. 2.
FIG. 4 is a partial cross-sectional view of a second embodiment of the present invention.
FIG. 5 is a cross-sectional view taken along the lines 5—5 of FIG. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a domestic oven 1 having a cabinet 2 with a front door 3. The oven may be provided with a removable rack 4 upon which food may be placed in the oven. The oven may also be provided with suitable controls generally indicated at 5.

The preferred and most highly developed embodiment of the present invention is taught in FIGS. 2 and 3. As shown in FIGS. 2 and 3 the oven is provided with an internal insulated top wall 10, insulated bottom wall 11, and insulated side walls 12. Also, as shown in FIG. 2, the oven is provided with an insulated rear wall 13. These insulated walls, along with the door 3, define an oven cavity 14.

Forwardly spaced of the rear wall 13 is a vertical plate hereinafter referred to as a flow former 15. The flow former 15 is parallel to the rear wall 13 and along with the rear wall 13 defines a combustion chamber 16. In this embodiment, the flow former 15 is provided with a forwardly facing flange 18 spaced from the walls 10, 11, and 12. The portion of the oven cavity 14 located in front of the flow former 15 is hereinafter referred to as a cooking compartment 17.

Located within the combustion chamber 16 and mounted in the rear wall 13 is a gas burner 20. In the preferred form, the gas burner 20 is annular in shape and has a central passageway 21, the purpose of which will be later explained.

Within the combustion chamber the gas burner is provided with a plurality of gas flame ports 22. Preferably, these flame ports 22 are directed radially outwardly around the periphery of the gas burner. Feeding the gas ports 22 is a manifold 23. The manifold 23 and the gas flame ports 22 are disposed in a combustible mixture of primary air and gas from a supply through an inlet pipe 25. The supply is the usual venturi-bellmouth arrangement 26. Also located in the rear wall 13 is a plurality of secondary air inlet ports 24 directed to provide an additional air supply in the vicinity of the gas flame ports.

Located immediately forward of the flow former 15 is a blower 30. The blower 30 in the preferred form is a centrifugal fan of the disc type with a central inlet and radial outward flow. In the preferred form, a plate 31 is...
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also provided immediately forward of the blower 30 and is supported by brackets 29. The plate 31 has a central opening 32. Bridging the central opening 32 is a blower guard 33 which permits the passage of gases to the central inlet of the blower but prohibits the passage of large items such as food or the users hands.

Spaced radially outwardly from the blower 30 is an oven flue 34. One end of the oven flue is located between the flow former 15 and the plate 31. The opposite end of the oven flue 34 is connected to a product dilution chamber 35. The product dilution chamber is provided with a dilution air inlet 36 and a product outlet 37.

In order to drive the blower 30, the preferred form of the oven is provided with a shaft 38 passing through the central passageway 21 of the gas burner 20 earlier defined. The gas burner 20 supports a bearing 39 which is located rearwardly of the oven cavity 14. In this manner the bearing 39 is not affected by the hot combustion gases in the combustion chamber 16. Also mounted on the shaft 38 is a pulley 40 which is driven by a belt 41 from a motor pulley arrangement 42.

In the preferred form, the flow former 15 is also provided with a forwardly facing peripheral flange 18 as stated above. The flange 18 is spaced from the insulated walls 10, 11, and 12, thus providing a combustion product outlet from the combustion chamber 16 between the peripheral flange 18 and the walls of the oven cavity. Furthermore, the flange is spaced outwardly from the peripheral edge of the plate 31 to provide a gas recirculation exhaust from the blower 30 between the plate 31 and the flange 18. The recirculation flow and combustion gases are mixed and are directed forwardly along the oven cavity walls.

During operation of the oven a primary air and gas mixture formed in the venturi-bellmouth arrangement 26 passes through the inlet pipe 25 and the manifold 23 to the flame ports 22 where it is burned in the combustion chamber 16. Secondary air at atmospheric pressure passes through the secondary air inlet ports 24 to aid combustion in the chamber 16.

The products of combustion will exhaust form the chamber 16 through the passageway between the flange 18 of the flow former 15 and the insulated walls of the oven cavity. At the same time, the blower 30 will be rotated through the motor pulley and shaft arrangement described above.

The forced convection caused by the blower 30 will cause a relatively even temperature distribution throughout the cooking compartment 17 by gas recirculation from the center of the cooking compartment, through the blower central inlet, and then through the blower radial exhaust and along the insulated walls of the cooking cavity. This gas flow will also aid the exhaust of the combustion products from the combustion chamber 16 around the periphery of the flow former 15 since these combustion products and the recirculatory air flow from the blower both exhaust in parallel passageways defined by the flange 18.

Part of the gases in the oven will be exhausted through the flue 34 into the product dilution chamber 35 where atmospheric air is provided through the inlet 36 to cool the oven gases prior to leaving the oven through outlet 37.

It is noted that the combination of the combustion products and the recirculatory gases first pass along the top, bottom and side insulated walls of the chamber in a forward direction and then reverse flow so as to be drawn in through the inlet of the blower. This provides even distribution of heat along all the insulated walls of the oven cavity. This is particularly beneficial in ovens of the self-cleaning nature.

FIGS. 4 and 5 show a modification of the oven taught in FIGS. 2 and 3. In this embodiment the insulated back wall 13 is provided with a gas burner of slightly different construction than that shown in FIG. 2. However, the gas burner is again provided with the manifold 23 and a plurality of gas flame ports 22 annularly disposed within the combustion chamber 16. Also provided are the secondary inlet ports 24.

The blower 30 in this embodiment is centrally located within the cooking cabinet in front of the flow former 15. The blower is of the axial flow type. Since the combustion products from the combustion chamber 16 exhaust radially outwardly, the flow former 15 has been curved so as to insuff the axial air flow through the blower is transformed into a radial exhaust so as to aid in the sweeping of the combustion products from the combustion chamber.

While a guard has not been shown in FIGS. 4 and 5, such a guard could be provided so as to insure that the user does not insert either his hand or food into the blower. An oven flue 34 and product dilution chamber 35 are also provided similar to that taught in FIG. 2.

In this second embodiment the burner is provided with a frusto-conical portion 45 which supports the flow former 15 and also provides for a bearing 39 for the fan shaft 38. In order to provide cooling for the bearing which is now within the oven cavity, air inlet ports 46 are provided.

Since the hot combustion products are being removed radially outwardly from the combustion chamber 16 due to the influence of the blower 30, the air inlet ports 46 will help to cool the hub portion. The shaft 38 is again provided with the pulley arrangement so as to drive the fan.

It is noted that both of these embodiments utilize a peripheral exhaust from the combustion chamber and a parallel peripheral exhaust from the blower help draw the combustion products from the combustion chamber. These gases are mixed and then all walls of the oven chamber are swept by hot gases. Furthermore, by having a peripheral opening, the exhaust from the combustion chamber can be of relatively large area.

It is also noted in both of these embodiments that the blower and burner arrangement are located on the rear wall of the oven cavity and utilize very little internal volume of the oven cavity. Furthermore, relatively few parts are utilized and thus insures a relatively inexpensive manufacture.

The foregoing is but the preferred forms of practicing the present invention. The invention is not limited to the particular details or modifications shown and described. It is, therefore, intended that the claims below will cover all modifications which will occur to those skilled in the art and do not depart from the scope and spirit of the invention.

What is claimed is:
1. A gas oven comprising oven walls including a rear wall defining an oven cavity, a gas burner in said rear wall, a flow former parallel to and spaced from said rear wall so as to define a combustion chamber therebetween, said flow former having a periphery spaced from said oven walls so as to form an outlet from said combustion chamber, a blower mounted parallel to and forward of said flow former, said blower creating forced circulation of gases in said oven cavity, whereby said forced circulation of gases aids the flow of combustion products from said combustion chamber.

2. The gas oven of claim 1 wherein said periphery of said flow former has a forwardly extending flange, said flange cooperating with said blower to provide forward air flow along said walls of said oven cavity, and said blower having a central inlet so as to draw gases from the center of said cavity.

3. The gas oven of claim 1 including a panel positioned parallel to said flow former and forward of said blower, said panel having a central opening aligned with said central inlet of said blower, and guard means mounted on said panel so as to prohibit passage of large articles through said central opening.

4. The gas oven of claim 1 wherein said blower is mounted on a shaft passing through said back wall.

5. The gas oven of claim 4 wherein said gas burner is centrally located on said back wall, said gas burner having a central passageway, and including a bearing mounted in said central passageway exterior of said oven cavity, said shaft being mounted in said bearing.

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