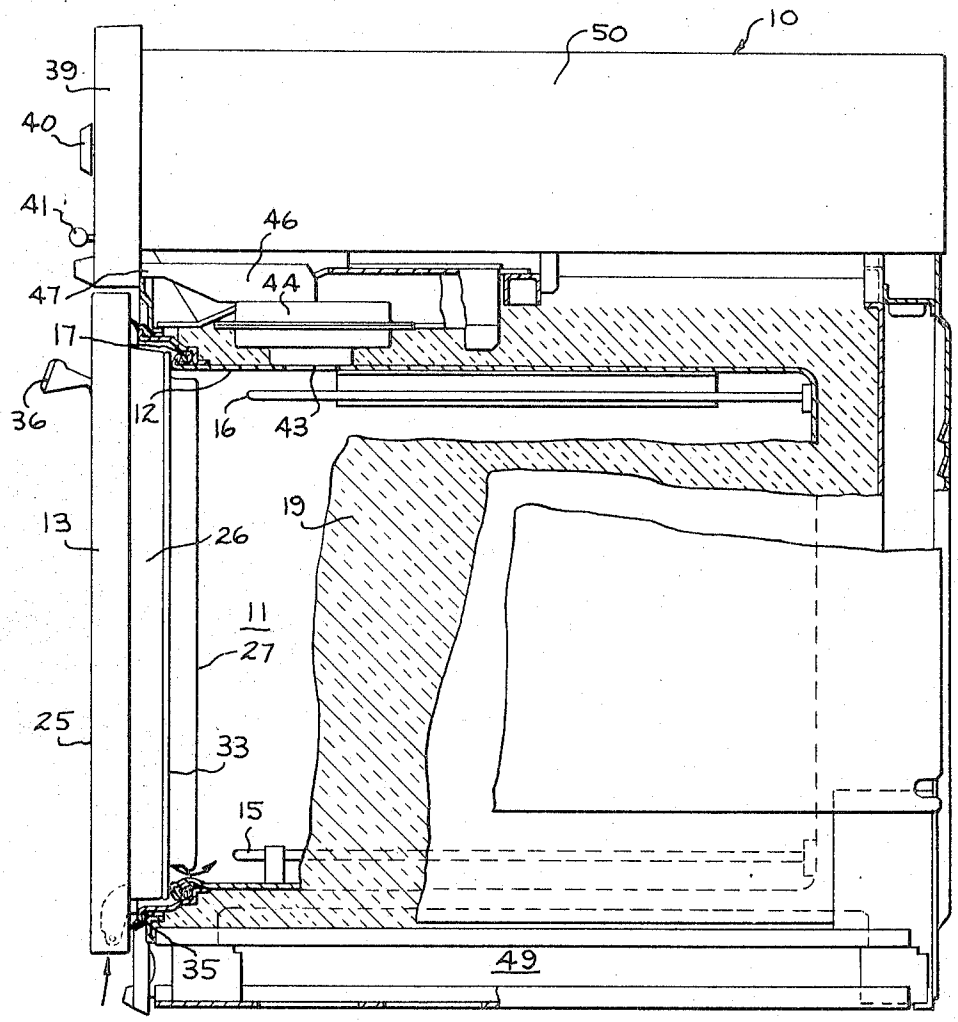
Oct. 17, 1967 W. E. LEWIS ETAL 3,348,023

AIR INLET MEANS FOR SELF-CLEANING OVEN

Filed May 6, 1965 2 Sheets-Sheet 1

FIG. 1



INVENTORS
WALTER E. LEWIS
& ROY D. CHISHOLM
BY Richard L. Caslin
THEIR ATTORNEY

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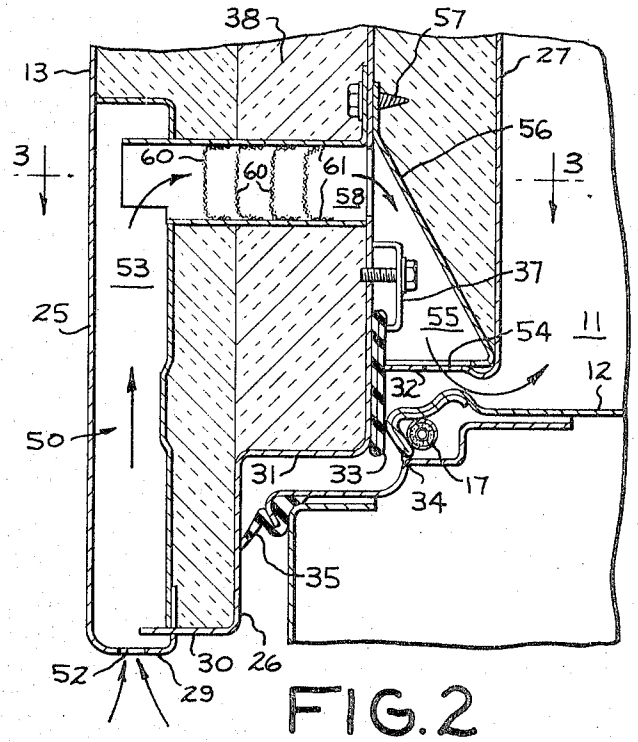


FIG. 2

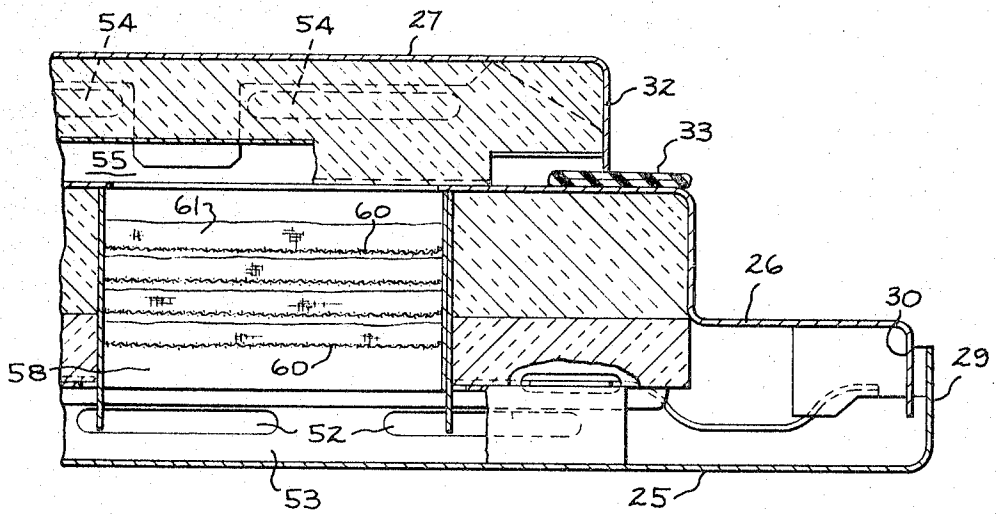


FIG. 3

INVENTORS
WALTER E. LEWIS
& ROY D. CHISHOLM
BY
Richard L. Caslin
THEIR ATTORNEY

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AIR INLET MEANS FOR SELF-CLEANING OVEN

Walter E. Lewis and Roy D. Chisholm, Louisville, Ky., assignors to General Electric Company, a corporation of New York

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6 Claims. (Cl. 219—391)

ABSTRACT OF THE DISCLOSURE

A high-temperature oven having walls forming an oven cavity where one wall includes an access door. The oven has gasket means for sealing the gap between the door and a mating door frame at the front of the oven. The door has an air inlet means built into the lower portion thereof and in communication with the oven cavity. This air inlet means serves to meter the air entering the oven cavity for supplying oxygen to a catalytic oxidation unit assembled in the oven vent for degrading the oven exhaust gases before the gases are returned to the atmosphere. The air inlet means includes a flame-arrester means that serves in the event of an accelerated combustion due to an overloaded amount of food soil within the oven cavity.

The present invention relates to domestic baking ovens and particularly to an automatic self-cleaning oven with an air inlet means for metering the in-rush of room air into the oven cavity during a high temperature self-cleaning cycle.

This invention relates to an oven that incorporates an automatic self-cleaning oven cycle using the principle of pyrolysis for removing the food soil and grease spatter from the inner wall surfaces of the oven liner. The basic features of this self-cleaning oven are described and claimed in the patent of Bohdan Hurko No. 3,121,158 which is assigned to the General Electric Company, the assignee of the present invention. Such a self-cleaning oven cycle has a maximum oven temperature somewhere between about 750° F. and about 950° F. so as to decompose all food soil and grease spatter lodged on the oven walls by degrading the soil into gaseous products which are then passed through an oxidation unit or catalytic smoke eliminator which further degrades the gases before they are returned to the kitchen atmosphere.

In order for the oxidation unit to degrade the exhaust gases properly, it is necessary to supply oxygen in the form of room air into the oven cavity. One way of providing an air inlet means is to create an opening in the door gasket adjacent the lower edge of the oven door to form a gap between the door and the oven body. The amount of air that is allowed to enter the oven cavity is critical. Hence, manufacturing tolerances must be held very closely in order to prevent an excess amount of air which might speed up the pyrolytic reaction and cause high temperature or smoking problems and possibly fires under extreme soil loading conditions. It is deemed best to design the air inlet means within the oven door rather than trying to hold close tolerances between the oven body and the movable oven door.

The principal object of the present invention is to provide an accurate means for controlling the amount of air that enters a self-cleaning oven so as to avoid an excess of air.

A further object of the present invention is to provide a self-cleaning oven with a gentle sweep of room air therethrough while at the same time preventing the possibility of a flame appearing in the air inlet opening.

A further object of the present invention is to provide the door of a self-cleaning oven with an air inlet channel having an elongated tortuous path serving as a flame-arrester.

A further object of the present invention is to provide an oven door with an air inlet means having a tortuous path which includes at least one metal screen for snuffing out any flame that might appear in the air channel.

The present invention, in accordance with one form thereof, is embodied in a domestic oven having inner walls and an access door forming an oven cooking cavity. It is necessary to supply a measured amount of room air into the oven during the high temperature self-cleaning cycle. An air inlet means is built into the oven door so as to supply a sufficient amount of ambient air for the oven. This inlet means includes flame arrester means to snuff out any flame that may tend to become ignited therein due to the presence of high temperature combustible gases generated during a pyrolytic cycle for removing food soil from the walls of the cooking cavity. In one form of the invention the flame arrester means may be in the form of a tortuous path; other modifications include the addition of at least one fine mesh metal screen across the air path to serve as a flame-arrester.

Our invention will be better understood from the following description taken in conjunction with the accompanying drawings and its scope will be pointed out in the appended claims.

FIGURE 1 is a right side elevational view of an electric oven illustrated as a built-in wall oven with parts broken away and some in cross-section to show the general nature of an automatic self-cleaning oven.

FIGURE 2 is a fragmentary cross-sectional elevational view on an enlarged scale showing the interrelation of the lower portion of the oven door with the front of the oven body.

FIGURE 3 is a fragmentary cross-sectional plan view of the oven door taken on the line **3—3** of FIGURE 2 through a small air duct that is shown supplied with a plurality of fine mesh metal screens serving as an additional flame-arrester means.

Turning now to a consideration of the drawings, and in particular to FIGURE 1, there is shown a built-in wall oven **10** with side panels broken away and some in cross-section to show the oven cooking cavity **11** that is formed by a box-like oven liner **12** with a front opening that is adapted to be closed by an oven door **13** that is shown hinged on a lower horizontal axis. The particular oven shown is an electric oven, but the present invention is also adaptable for use in a gas heated oven. As is conventional in this art there is a lower baking element **15** and an upper broiling element **16** for use during normal cooking operations that range in temperature from about 150° F. to 550° F. An additional heating means is used in the form of a perimeter or mullion heater **17** adjacent the front of the oven liner **12** and encircling the oven liner to replenish heat lost through and around the oven door so as to obtain generally uniform wall temperatures within the oven cavity during the heat cleaning cycle.

Due to the high temperatures encountered in this oven, an extra amount or thickness of thermal insulation **19** such as fiberglass or the like is assembled around the outside of the oven liner **12** for retaining as much as possible of the oven heat present within the oven cavity. In a similar manner, the oven door **13** is heavily insulated with fiberglass **38** as compared with the insulation of a standard oven door. The basic door construction comprises three sheet metal panels as are best seen in FIGURE 2; namely, an outer door panel **25**, an inner door liner **26** and a floating inner panel **27**. Full details of this oven door construction are best described and claimed in the copending application of Clarence Getman Ser. No. 326,907, now Patent No. 3,189,020 which is entitled "Oven Door With Floating Inner Panel." This Getman patent is also assigned

to the General Electric Company, the assignee of the present invention.

The outer door panel **25** is of shallow pan-shape by virtue of the fact that it has a small rearwardly-turned peripheral flange **29**. The inner door liner **26** is also of pan-shape and it is of mating construction by virtue of the fact that it has a front-turned peripheral flange **30** which telescopes within the flange **29** of the outer door panel **25**. The inner door liner **26** includes a generally rectangular, central, outer embossment **31** of such a size as to fit closely within the front opening of the oven body. Moreover, the floating inner panel **27** is also of pan-shape with a front-turned flange **32** which is held to the inner door liner **26** to sandwich a folded-over woven fiber glass gasket **33** therebetween. Suitable clamps **37** are used to hold the gasket **33** firmly in place. This gasket **33** is adapted to bear against a turned-out flange **34** on the front of the oven liner **12** as is best seen in FIGURE 2 so as to substantially seal the oven cavity from the passage of air into or the passage of gases out of the cavity. A silicone rubber gasket **35** extends along the bottom edge of the door opening in the oven body as an additional sealing means in the area where the two ends of the gasket **33** are brought together. The oven door **13** is provided with a door handle **36** which is provided with fastening screws (not shown) that extend from the inner side of the door into the handle to serve as the principal means of holding the two door panels **25**, **26** firmly together. Most of the oven door **13** is filled with thermal insulation **38** to retard the transfer of heat therethrough.

In the oven construction shown in the drawings, the circuit and temperature control components, illustrated generally as element **40**, are located in a front control panel **39** positioned directly above the oven door **13**. Such components might include an oven selector switch, a clock-timer, an oven thermostat for controlling both the normal cooking operations as well as for the high-temperature, heat-cleaning cycle. Of course, the heating circuits would include the necessary electrical interlocks and door locking means illustrated only as handle member **41** but designed to insure that the heat cleaning cycle could not be initiated until the oven door was both closed and locked. Moreover, the oven door may not be unlocked while the oven temperature is above about 600° F.

The oven cavity **11** is also supplied with an oven vent **43** in the top wall of the oven liner **12** as is seen in FIGURE 1 for exhausting the hot oven gases therethrough. Interposed in the oven vent **43** is a catalytic oxidation unit **44** which is a small, separately heated chamber that includes a catalytic surface or screen (not shown) to further decompose the smoke, odors and gases pouring therethrough before the gases are returned to the kitchen atmosphere. Leading from the oxidation unit **44** is a horizontal duct work **46** that is directed toward the front of the oven for discharging through an elongated nozzle **47** behind the lower portion of the control panel **39**. This oxidation unit **44** is of the general type described and claimed in the patent of Stanley B. Welch, No. 3,900,483, which is assigned to the General Electric Company, the assignee of the present invention, and it is not shown in greater detail because it does not form part of the present invention.

All self-cleaning ovens do not require it, but a built-in wall oven of the type illustrated in the drawings has a special temperature problem which is overcome by the use of an air chamber **49** that surrounds the insulated oven liner and includes an air flow to dissipate heat therefrom so as to prevent the overheating of the outer cabinet **50** of the oven body. A suitable motor-blower unit (not shown) is installed above the oven in combination with a plenum chamber (not shown) for circulating the cooling air around the oven liner and over the oven controls before being returned to the kitchen atmosphere. This cooling arrangement is best described and claimed in the copending application of George A. Scott and James K. Newell, Jr., Ser. No. 436,436, now Patent No. 3,310,046, which is also assigned to the General Electric Company, the assignee of the present invention.

As was mentioned previously, it is necessary to provide a supply of oxygen for the combustion of the exhaust gases within the oxidation unit. This oxygen is supplied by creating a gentle sweep of room air through the oven cavity. This air is designed to enter the oven cavity **11** through an air inlet means **50** best illustrated in FIGURE 2 as being built into the lower portion of the oven door **13**. Heretofore, air has been introduced into the oven cavity by adjusting an air space between the bottom front edge **34** of the oven liner **12** and the bottom edge of the inner door liner **26**. This space has been held between about .02 inch and .10 inch. This small clearance is difficult to maintain in a mass production assembly factory. Usually, the air gap will be larger than is necessary, and this will allow an excess amount of air to pass into the oven. In some few instances, the air gap would be too small, which would lower the efficiency of the oxidation unit **44** due to an absence of a sufficient air supply. These problems have been overcome by the use of the present invention wherein a controlled door gap or air passage is built into the lower portion of the oven door **13** so as to increase the air flow into the oven and thus increase the capacity of the oxidation unit. This is done while at the same time preventing flames from being expelled from the oven under extreme soil conditions.

Considering both FIGURES 2 and 3, the outer door panel **25** is provided with an inlet means comprising a series of elongated apertures **52** formed in the portion of the flange **29** that extends along the bottom edge of the door. These apertures **52** open into a front chamber **53** that extends for about the complete width of the door, and in the production model, for a height of about six inches. A second series of apertures **54** are formed in the bottom edge of the flange **32** of the floating inner panel **27** to serve as an outlet means for the air passage. A rear chamber **55** is built within the confines of the floating inner panel **27**. An inclined sheet metal plate **56** is fastened to the inner door liner **31** such as by means of fastening screw **57** so as to hold the insulation away from the outlet apertures **54**. These two chambers **53** and **55** are joined together by at least one, and in the production embodiment of this invention two small ducts **58** which are each fastened by screws **57** to the top portions of the two chambers and connect therebetween by means of suitable openings in the walls thereof.

Hence, the air flow enters the oven door **13** through the inlet apertures **52** along the bottom of the door and rises in the front chamber **53** until it reaches the duct or ducts **58** which are of restricted cross-section, and then it passes horizontally through the duct and into the top portion of the rear chamber **55**, thence, down that chamber and out through the outlet apertures **54** and into the bottom portion of the oven cavity **11**. Hence, it will be appreciated that this air passage is of elongated tortuous form serving to extinguish any flame that might ignite in the oven due to the presence of combustible gases trying to reach out for the air supply coming in through the passage. Under most conditions, this air passage would be sufficient to prevent flames from issuing from the inlet apertures **52** in the bottom edge of the front portion of the oven door **13**.

As a safety precaution, for conditions of heavy soil, at least one and preferably a plurality of fine mesh metal screens **60** are wedged into the duct **58** adjacent the midportion of the door, measured from front to back thereof, so they are in a relatively cool area. These metal screens **60** are formed with side flanges **61** for engagement with the side walls of the duct **58**. It is believed to be well to locate the screens in this relatively cool area of the door

so that the flame will not re-ignite after the gases pass the screen.

Modifications of this invention will occur to those skilled in this art therefore it is to be understood that this invention is not limited to the particular embodiments disclosed, but that it is intended to cover all modifications which are within the true spirit and scope of this invention as claimed.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A self-cleaning cooking apparatus comprising walls forming an oven cavity, one wall of the cavity including an opening that is fitted with a door for gaining access thereto, heating means supplied for the cavity, and cleaning means operable for the automatic cleaning of the inner walls of the cavity by causing the heating means to raise the temperature of the cavity to a maximum temperature in the range of from about 750° F. to about 950° F. and thereby degrade food soil adhering to the cavity walls, and gasket means cooperating with the access door to substantially prevent any air leakage between the door and the door opening, oven venting means adjacent the top portion of the oven, the door including an air inlet means through the lower portion thereof and in communication with the oven cavity, said air inlet means including a flame-arrester means that serves in the event of an accelerated combustion due to an overloaded amount of food soil within the oven cavity.

2. A self-cleaning domestic oven comprising an oven liner and an access door that form an oven cooking cavity, heating means for said cavity, and control means for said heating means, an oven vent opening formed in a top portion of the oven liner, gasket means cooperating with the access door to seal the gap between the door and the oven liner, the door including an ambient air inlet means through the lower portion thereof so that the oven vent creates a natural draft of air through the cavity, the air inlet means having a tortuous path so as to elongate the air flow path and provide for a sufficient supply of cooling air to snuff out any flame that may tend to become ignited therein due to the presence of combustible gases generated during an automatic pyrolytic cycle for removing food soil from the walls of the cooking cavity.

3. A high temperature domestic oven comprising walls forming an oven cooking cavity, one wall including an access door, a first electrical resistance heating element adjacent the bottom wall of the cavity, a second electrical resistance heating element adjacent a top wall of the cavity, control means for said heating elements, an oven venting means in the said top wall, and an air inlet opening through the lower portion of the door to produce a chimney effect and create a natural draft of ambient air through the cavity, the inlet opening having means to prevent combustible gases from becoming ignited in the inlet opening, said ignition prevention means including an elongated air flow path to provide a cooling effect within the door so that the relatively low temperature will not support ignition.

4. A high temperature domestic oven as recited in claim 3 wherein the said ignition prevention means includes at least one fine mesh metal screen arranged in closely spaced relationship across the air inlet opening at a relatively cool location adjacent the outer surface of the door.

5. A high temperature domestic oven comprising walls forming an oven cooking cavity, one wall including an access door, a first electrical resistance heating element adjacent the bottom wall of the cavity, a second electrical resistance heating element adjacent a top wall of the cavity, control means for said heating element, an oven venting means adjacent said top wall, and an air inlet passage through the lower portion of the said door to produce a chimney effect and create a natural draft of ambient air through the cavity, said inlet passage having apertures extending along the bottom edge of the door adjacent the front surface thereof, an enlarged chamber communicating with said apertures, other apertures extending along the bottom edge of the door adjacent the inner surface thereof, a second enlarged chamber communicating with said other apertures, and at least one duct of relatively small cross-section connected between said two chambers, and at least one fine mesh metal screen arranged across the duct to serve as a flame-arrester.

6. A high temperature domestic oven comprising walls forming an oven cooking cavity, one wall including an access door, heating means within the oven cavity for raising the temperature therein, control means for said heating means for governing the rate of heating, an oven venting means adjacent said top wall, and an air inlet passage through the lower portion of said door to produce a chimney effect and create a natural draft of room air through the cavity, said door having an inner panel of reduced size which is adapted to fit into the front of the oven cooking cavity, said air inlet passage comprising a first series of apertures in the bottom edge of the door adjacent the front suface thereof, a front chamber in the lower portion of the door for receiving room air through the first apertures, at least one small duct communicating with the top of the front chamber and extending rearwardly therefrom, a rear chamber in the lower portion of the inner door panel and communicating with the said duct, and a second series of apertures in the bottom edge of the inner door panel for exhausting from the rear chamber into the oven cavity.

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RICHARD M. WOOD, *Primary Examiner.*

C. L. ALBRITTON, *Assistant Examiner.*