United States Patent

[11] **3,548,152**

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[54] **SELF-CLEANING OVEN HAVING COOLING AND VENTILATING SYSTEM**
7 Claims, 2 Drawing Figs.

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[51] **Int. Cl.** **F27d 11/02;** A21b 1/26
[50] **Field of Search** ..... 219/400, 413, 396—9; 126/21A, 21, 273, 39

[56] **References Cited**

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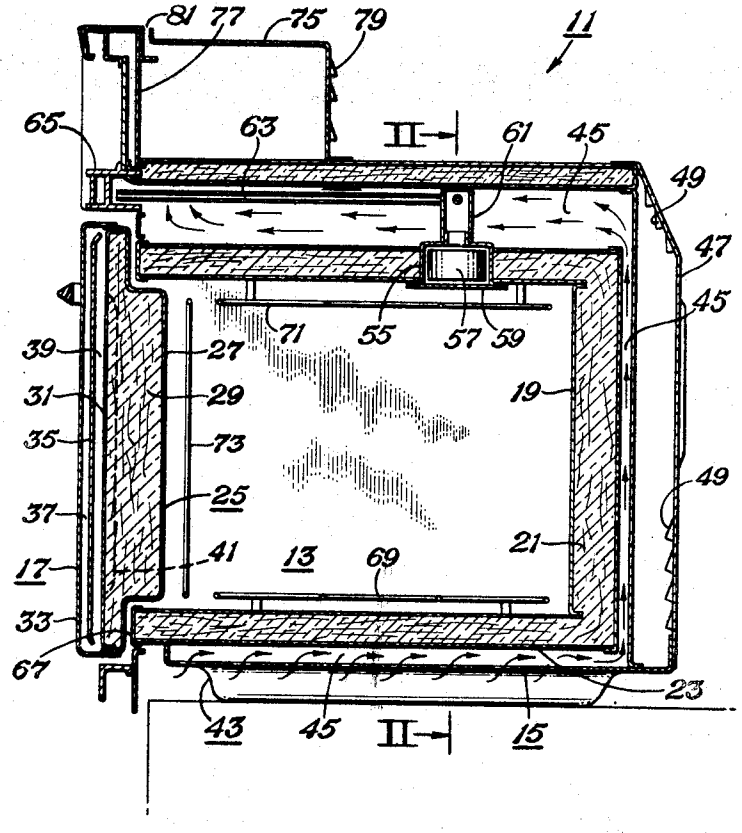
ABSTRACT: A self-cleaning oven characterized by having sufficient cooling through thermal currents alone and without the use of a fan. The oven has an inner insulated tub suspended within a cabinet with an air passageway surrounding the insulated tub. The air passageway is of sufficient thickness that thermal currents alone provide sufficient air circulation to prevent over heating even during the self-cleaning cycle. Also disclosed are suspension means effecting minimal transfer of heat by conduction and minimal interference with the flow of thermal currents; smoke-alleviating means for circulating the high temperature, smoke-filled air from within the insulated tub while simultaneously oxidizing the smoke particles and mixing the high temperature reaction products with the air of the thermal currents over the insulated tub before being vented into the room; and a door having a flow of air between a baffle and an inner insulated portion and between the baffle and an outer panel.



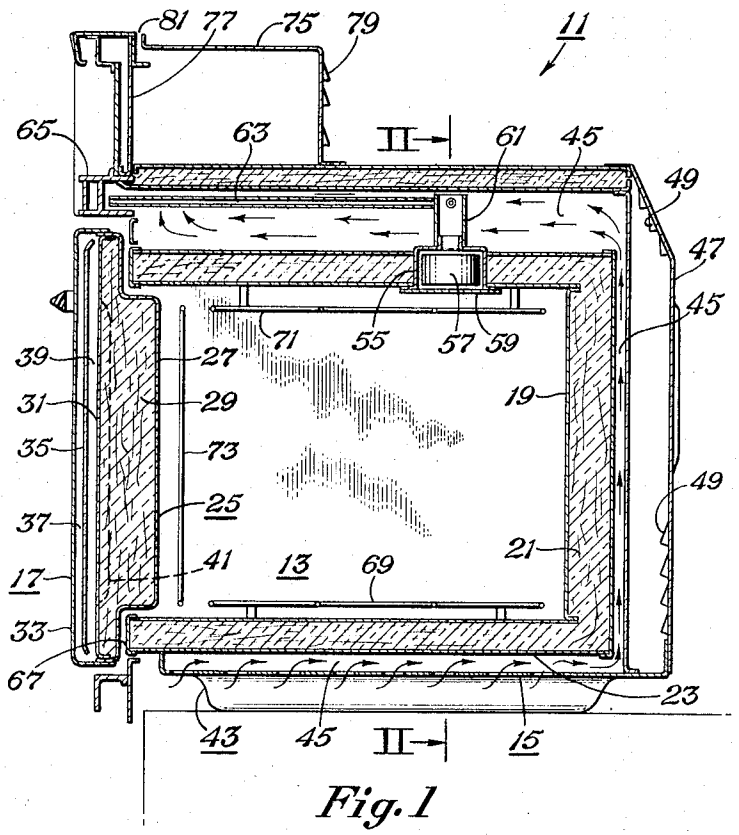


Fig. 1

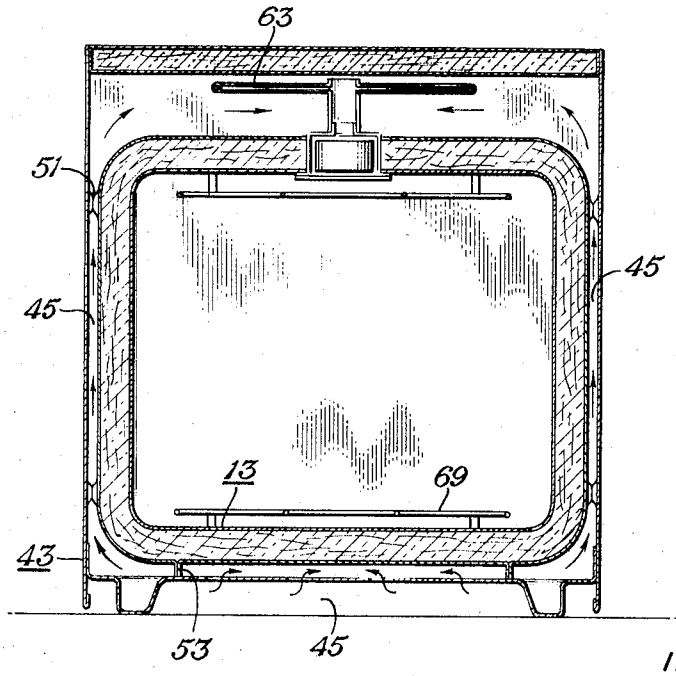


Fig. 2

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SELF-CLEANING OVEN HAVING COOLING AND VENTILATING SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to ovens used in family dwellings; and more particularly, to so-called self-cleaning ovens.

2. Description of the Prior Art

Cleaning ovens with their baked-on deposits has long been an onerous chore for the housewife. It is known to employ ovens, commonly referred to as self-cleaning ovens, that raise their interior surfaces, including any unsightly deposits thereon, to temperatures of from about 875° to 900° F. At this temperature most of the deposits are oxidized or burned to smoke particles. The smoke particles are in turn oxidized to gaseous reaction products. One of the major problems in manufacturing and installing these self-cleaning ovens has been the achieving of sufficient inner dimensions of the ovens, while providing sufficient cooling of the outer surfaces to prevent damaging the structure and accoutrements thereabout. The problem is particularly acute in built-in, self-cleaning ovens in which the self-cleaning oven is built into a standard cut away structure of the home instead of in a self-standing range. Ordinarily, the structure subject to overheating is a wooden frame in a home and the accoutrements are the wiring, accessories, and control panel. To effect the desired degree of cooling, conventional units have employed a fan to achieve a forced circulation of air through small dimension air passageways about the inner insulated tub; and have employed suspending means such as angle iron that interrupts the smooth flow of cooling air and simultaneously conducts large amounts of heat from the oven to the surrounding structure. The self-cleaning ovens of the prior art have not been altogether satisfactory in that they are more expensive and more cumbersome to install; provide the objection of the fan blowing during the self-cleaning cycle; and overheat the surrounding structure if the fan burns out during the self-cleaning cycle.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross-sectional view from the side of one embodiment of the invention.

FIG. 2 is a cross-sectional view from the front taken along lines II–II of FIG. 1.

DESCRIPTION OF PREFERRED EMBODIMENT

In FIG. 1 there is shown a side view in cross section of a self-cleaning oven in accordance with a preferred embodiment of the present invention. Oven 11 has an inner insulated tub 13, an outer cabinet 15 and a door 17.

Inner insulated tub 13 has an inner liner 19, a layer of insulation 21 and an outer insulation retainer 23.

Door 17 is positioned at the entrance and front of the insulated tub and has an inner insulated portion 25 having an inner layer 27, a layer of insulation 29 and an outer insulation retainer 31. Door 17 also has a front panel 33 that is frequently of a design or material that is adversely affected by high temperatures. Panel 33 is disposed near but spaced from inner insulated portion 25. To further protect panel 33 from elevated temperatures, a baffle plate 35 is disposed intermediate the inner liner face of the front panel and the outer insulation retainer of the inner insulated portion, and air circulation passageways 37 and 39 are provided on each side of baffle 35.

In a particularly preferred embodiment, the oven employs a door like the one described in my copending application, Ser. No. 709,978, filed Mar. 4, 1968 now U.S. Pat. No. 3,453,997 entitled OVEN DOOR embodied by reference herein.

Outer cabinet 43, illustrated in more detail in FIG. 2, surrounds insulated tub 13. Cabinet 43 defines an air passageway 45 about insulated tub 13. Air passageway 45 is of sufficient thickness that thermal currents alone will circulate sufficient air to cool outer insulation retainer 23 and prevent overheating of structure and accoutrements in the vicinity of the oven. Expressed otherwise, the air passageway has a minimum cross section thickness of at least one-half inch in order that thermal currents will circulate sufficient air. An inch or more in thickness is even better although in conventional built-in structures it is rarely possible to obtain an inch thickness of air passageway at the rear of the oven and still provide sufficient thickness of insulation 21 and wiring baffle 47 at the rear of the oven.

Wiring baffle 47 provides a convenient space facilitating grouping of wiring from power source and controls. Wiring baffle 47 has louvers 49 for providing air circulation to help keep the wiring and accessories therein cooler.

Suspension means is provided for suspending insulated tub 13 within outer cabinet 15. To keep the heat transferred from the insulated tub to the surrounding cabinet and structure to a minimum, the suspension means must effect minimal transfer of heat by conduction, and to maintain adequate cooling must effect minimal interference with the flow of thermal currents about the inner insulated tub. As a part of the suspension means, a plurality of small area contacts connect two sides of the insulated tub with the cabinet. By plurality of small area contacts is meant at least two contacts between insulated tub 13 and cabinet 15. The contacts have a small cross-sectional area through which to transfer heat by conduction and have a small external area to provide very little interference with the flow of thermal currents of air up the side of insulated tub 13. It has been found that excellent suspension, meeting the above requirements, is provided by four embossed protrusions 51, FIG. 2, extending outward from outer insulation retainer 23 and connected with cabinet 15. Protrusions 51 may be connected by frictional force; for example, held in respective niches formed in the side of cabinet 15. Preferably, however, protrusions 51 are connected with cabinet 15; as, for example, by sheet metal screws. Thus, insulated tub 13 is stably suspended within cabinet 15 without creating elaborate assembly problems such as can be effected by bolts, nuts and ceramic supports.

Additional stability is provided by supports 53 beneath and supporting the bottom of inner insulated tub 13. Supports 53 are very narrow and have very little cross-sectional area to transfer heat by conduction. Moreover, supports 53 are readily cooled by the cool, incoming air traveling along the bottom air passageway 45.

A smoke-alleviating means is provided for circulating the high temperature, smoke-filled air within the insulated tub to the top of the tub where the smoke particles are further oxidized, preferably to products of combustion; such as, carbon dioxide; and conveying the resulting high temperature gases including reaction products, into admixture with the air circulated through air passageway 45 by the thermal currents for cooling in the air passageway over the insulated tub before being vented into a room.

As indicated hereinbefore, the air within the oven is heated to a temperature of from 875° to 900° F., creating smoke-filled air. To allow this air to be carried outside the oven and prevent redeposition of material on the oven upon cooling, receptacle 55 penetrates through the top of the insulated tub. Receptacle 55 contains a catalytic filter 57 which catalyzes the oxidation of the smoke particles. A supplemental heater element 59 heats the catalytic filter above at least 500° F. and also heats the smoke particles to facilitate the oxidation thereof. Conduit means is provided to conduct the hot oxidation, or reaction, products and the high temperature air toward the front of the insulated tub. Suitable conduit means comprises vertical standpipe 61 having symmetrical conduits 63 teed thereinto. Conduits 63 also extends toward the front of the oven to form a U-shaped conduit which ultimately admixes the hot gases with the air of the thermal currents flowing through air passageway 45 over inner insulated tub 13. The resulting admixture rapidly cools the hot gases, which may be as high as 700° at the outlet of conduit 63, to a temperature of less than 300° while still within top vent 65. Ordinarily, tem-

perature of the air in top air passageway will be about 120° maximum and cools top vent **65** as well as further admixing with the high temperature gases from conduit **63**. Temperatures are in degrees Fahrenheit.

A gap is provided at the bottom center of door stop **67** which normally seals the door with the front of the insulated tub, to allow circulation of air past bake element **69** and into the oven. Door stop **67** may be on the door or the insulated tub. This provides circulation in order to pass the high temperature, smoke-filled air within the insulated tub past catalytic filter **57** and into admixture with the air of the thermal currents passing around the insulated tub.

For heating the interior of the oven to this elevated temperature during the self-cleaning cycle, there are four heating elements. One of the heating elements, a supplemental heating element **59**, has been described. Bake element **69** has been referred to. In addition, there are broil elements **71** and a mullion element **73**. The bake and the broil elements are conventional and need not be described herein. Ordinarily, they operate on 220 volts in conjunction with a thermostat control. The mullion element is provided to compensate for heat loss around the oven door at the elevated temperature of the self-cleaning cycle. Ordinarily, the heating elements operate on a reduced voltage; such as, 110 volts; during the self-cleaning cycle to effect the high temperature inside the oven without consuming excessive power. Moreover, no elaborate controls are required to prevent the elements burning out under this reduced potential.

Wiring compartment **75** and instrument panel **77** are illustrated at the top of oven **11**. Top vent **65** serves to direct the heated effluent air out into the room and past panel **77**. Moreover, louvers **79** are provided at the back of wiring compartment **75** to circulate air therethrough and out opening **81**, to further cool wiring compartment **75**.

In operation, the oven is switched to the self-cleaning cycle. The elements begin to heat. As indicated before, the oven and elements are designed such that temperature of from 875° to 900° F. is attained within the oven in about one hours time. The oven is retained at a temperature of about 900° F. for an hour and about 1 hour is required for cool down. Air circulation through the oven is provided through the gap at bottom center of door stop **67** such that the contaminants deposited on the interior components of the oven are oxidized away and the hot gases passed into admixture with the air being circulated by thermal currents about the insulated tub and, thence, into the room. If desired, a vent pipe can be employed to vent the high temperature gases and the air circulated by the thermal currents outside the home. Such a vent pipe is ordinarily unnecessary.

On the other hand, cooling air circulation around the exterior of the insulated tub is effected by thermal currents. The thermal currents provide a means for automatically effecting the requisite flow of air about the outer insulation retainer of the insulated tub. Specifically, as the heat penetrates through insulation **21** and the temperature of insulation retainer **23** increases, increasing thermal currents are effected about the sides and rear of the tub. The increased thermal currents accordingly draw more air into the bottom air passageway **45** and an increased flow of air results through top air passageway **45** and out the exit vent **65**.

One of the particular advantages of the oven of the invention is that, despite the fact that no fan or supplemental source of cooling is provided, the materials ordinarily employed in manufacturing self-cleaning ovens are adequate and no exotic materials are necessary. For example, the inner liner **19** is made of the usual materials of construction; such as, stainless steel or steel covered by a layer of ceramic or other high temperature enamel. The outer insulation retainer is ordinarily of metal such as conventionally employed in self-cleaning ovens. Insulation **21** is the insulation conventionally employed in such ovens; for example, high density mineral wool.

Enlarged air passageways are provided at the bottom and at the top of the insulated tub in order that there be no restriction of flow of air in these regions, the only restriction being that due to the necessarily reduced passageways at the side and rear of the insulated tub.

The invention has been described with respect to built-in ovens since it is in this area that the problem is most critical. The self-cleaning ovens of the invention may be equally advantageously employed, however, in free standing ranges and alleviate the need for circulating means for circulating cooling air past the exterior of the insulated tub.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim:

1. A self-cleaning oven of the type having heating element provisions for both cooking and cleaning comprising:

a. an inner insulated tub having an inner metallic liner, a layer of thermal insulation and an outer metallic insulation retainer; electrical heating element means positioned in said tub and having cooking and high temperature cleaning portions;

b. a door positioned at the front and entrance to said insulated tub and having an inner insulated portion having an inner metallic liner, a layer of thermal insulation and an outer metallic insulation retainer; a front panel connected with said inner insulated portion but spaced from said outer insulation retainer of said door; and a metal baffle plate disposed intermediate said front panel and said outer insulation retainer of said inner insulated portion;

c. an outer metallic cabinet surrounding said insulated tub and defining an air passageway thereabout of sufficient thickness that thermal currents alone will circulate sufficient air to prevent overheating of a structure and accoutrements in the vicinity of said oven said air passageway having inlets and outlets;

d. suspension means suspending said insulated tub within said cabinet, effecting minimal transfer of heat by conduction and minimal interference with flow of said thermal currents, and consisting essentially of a plurality of small area contacts connecting two sides of said insulated tub with said cabinet; and

e. smoke-alleviating means for circulating high temperature, smoke-filled air within said insulated tub to the top of said tub, oxidizing the smoke particles, and conveying the high temperature gases into admixture with the air circulated by said thermal currents for cooling in the top air passageway over said insulated tub and before being vented into a room through said outlets.

2. The oven of claim **1** wherein said plurality of small area contacts comprise embossed protrusions in said outer insulation retainer of said insulated tub.

3. The oven of claim **2** wherein said embossed protrusions are fastened to said cabinet with sheet metal screws.

4. The oven of claim **1** wherein said suspension means also comprise a plurality of supports of small cross section connecting the bottom of said insulated tub with said cabinet.

5. The tub of claim **1** wherein said air passageway has a minimum thickness of at least one-half inch.

6. The oven of claim **1** wherein enlarged air passageways are provided at the top and bottom of said insulated tub.

7. The oven of claim **1** wherein said door has means providing closures at the side of the space between said baffle plate and said outer insulation retainer; means providing openings at the top and bottom of said space between said baffle plate and said outer insulation retainer; and means providing a recessed portion in said outer insulation retainer of said inner insulated portion, whereby air entering bottom of said space between said baffle plate and said outer insulation retainer is subjected to a draw action.