United States Patent

[11] 3,590,803

[72] Inventor **Paul Sauer**
Burg, Germany

[21] Appl. No. **836,742**
[22] Filed **June 26, 1969**
[45] Patented **July 6, 1971**

[73] Assignee **Burger Eisenwerke Aktiengesellschaft**
Herborn Dillkreis, Germany

[32] Priority **July 20, 1968**
[33] **Germany**
[31] **B 76 543**

[54] **FOOD-TREATMENT APPARATUS WITH GAS-CIRCULATING MEANS**
5 Claims, 3 Drawing Figs.

[52] **U.S. Cl.** **126/21**
[51] **Int. Cl.** **A21b 1/26, F24c 15/32**
[50] **Field of Search** ..... 126/19, 21, 21 A, 39, 39 C, 273

[56] **References Cited**

UNITED STATES PATENTS

3,384,068 5/1968 Perry et al. ..... 126/21 A

FOREIGN PATENTS

742,248 12/1955 Great Britain ..... 126/21 A

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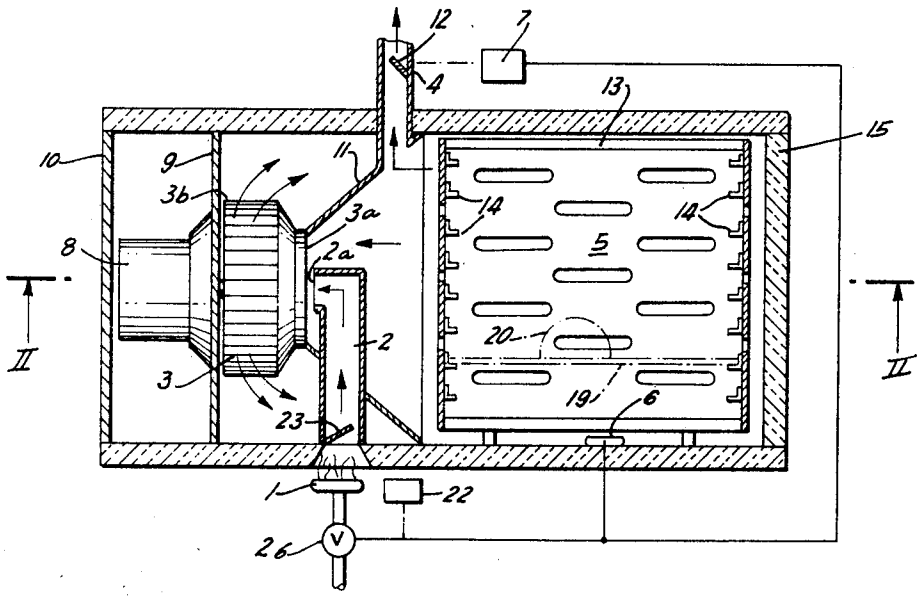
Primary Examiner—Charles J. Myhre
Attorney—Karl F. Ross

ABSTRACT: A food-treatment apparatus—an oven—has a housing in which a food-treatment chamber is enclosed along with an axial-input radial-output blower for circulating air in the housing through the chamber. Heat is drawn from an external gas burner through a conduit which opens in the housing adjacent the axial input of the blower. Slightly upstream of this conduit (in the recirculation path) is an exhaust conduit of variable cross-sectional area out through which heated air can flow. The food-treatment chamber is downstream of the mouth of the heat-input conduit and upstream of the exhaust conduit.



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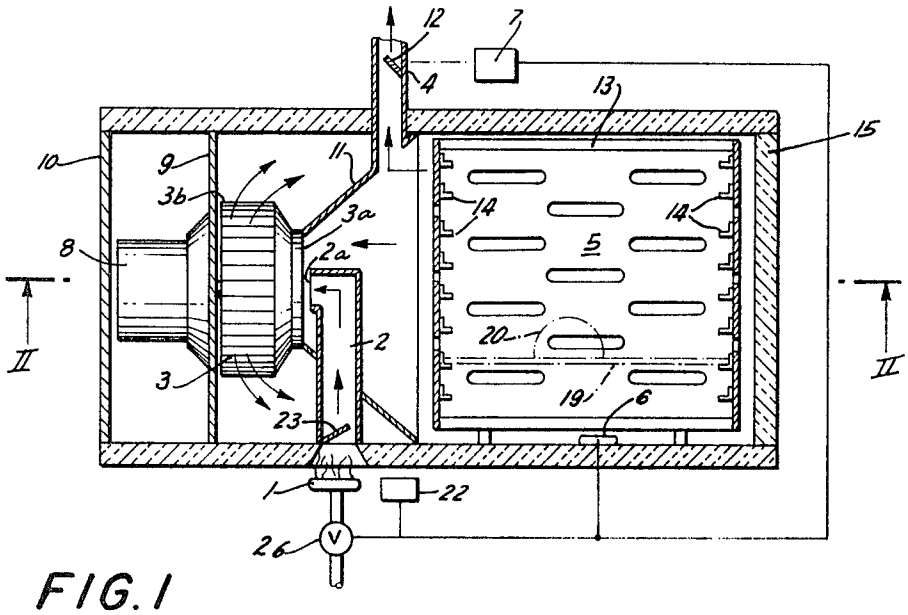

FIG. 1

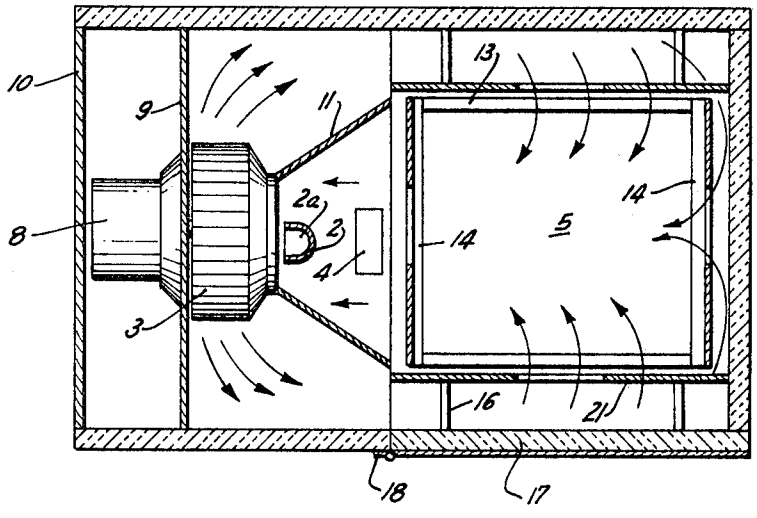

FIG. 2

INVENTOR
PAUL SAUER

BY
Karl F. Ross
ATTORNEY

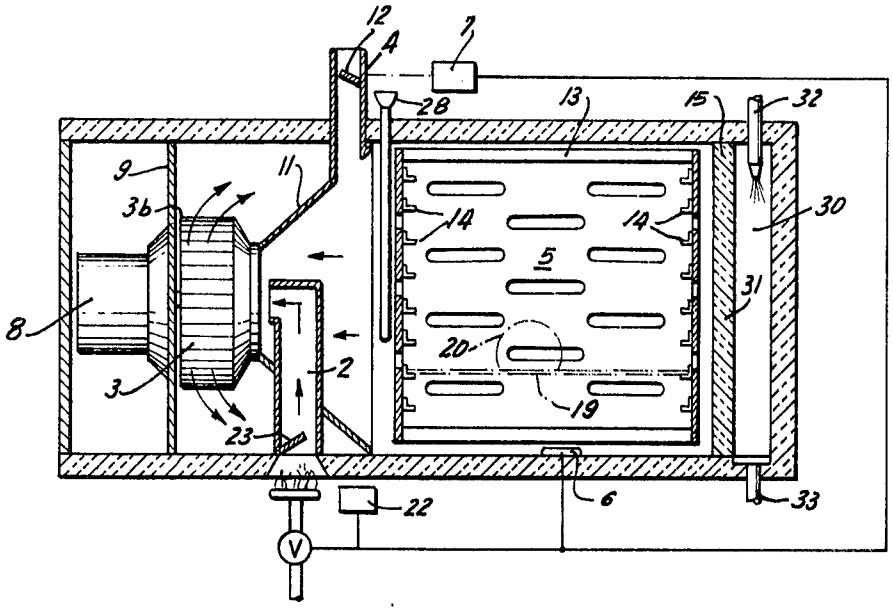

FIG. 3

INVENTOR
PAUL SAUER

BY Karl F. Ross
ATTORNEY

FOOD-TREATMENT APPARATUS WITH GAS-CIRCULATING MEANS

The present invention relates to a food-treatment apparatus, and, more particularly, to an oven for cooking foodstuffs.

Ovens having a closed housing in which a blower creates a path of heater air through a food-treatment chamber, are known as described in my commonly assigned applications Ser. No. 778,123 and Ser. No. 778,269 both filed Nov. 22, 1968 and respectively entitled "FOOD-TREATMENT APPARATUS WITH WASHING MEANS" and "FOOD TREATMENT APPARATUS WITH DEVAPORIZING MEANS."

Such ovens have electric coils mounted adjacent the radial output of the blower to heat the air used for cooking. It has now been found that such a heating arrangement is disadvantageous for several reasons. One of these reasons is that electricity is a relatively expensive commodity when used for generation of heat. In addition, a shock hazard is present in ovens so equipped. Furthermore it often requires conversion of a great amount of energy into heat, with large losses, to heat the ovens adequately.

In addition, conventional methods of heating the furnaces within the housing have the disadvantage that the efficiency of heating is a function of the size of the heating compartment and the size of the walls thereof through which heat exchange is effected. Thus larger, more expensive and more massive units are required for higher temperature ovens. The large temperature differential between the inlet and outlet side of the heating compartment also has a detrimental effect.

It is, therefore, the general object of the present invention to provide an improved food-treatment apparatus of the above-described type.

More specifically, an object of the present invention is to provide improved heating means for such an apparatus.

The above objects are attained in accordance with the principal features of the present invention by providing heating means comprising a gas burner external of the housing. The hot gases generated by this burner are drawn up through a conduit which has a mouth open horizontally toward the axial input of the blower used for circulating hot air within the housing.

According to another feature of the invention, a second conduit opens upstream of the first conduit and extends upwardly out of the housing to allow some of the depleted recirculated air to be discharged, thereby controlling the proportion of fresh hot air mixed with the recirculating mixture. The food-treatment chamber is located in the path of the circulated air downstream of the mouth of the input conduit and upstream of the exhaust conduit.

Yet another feature of the invention is that means—in this case simple flaps—is provided to vary the effective cross section of the outlet conduits to control heating of comestibles in the treatment chamber. This value is advantageously coupled to a thermostat.

The above and other objects, features, and advantages will become more readily apparent from the following description, reference being made to the accompanying drawing, in which:

FIG. 1 is a vertical section through a food-treatment apparatus according to the present invention;

FIG. 2 is a section taken along line II–II of FIG. 1; and

FIG. 3 is a section similar to FIG. 1 showing an alternative food-treatment apparatus according to the present invention.

As shown in FIGS. 1 and 2, a food-treatment apparatus for the warming, thawing, and cooking (roasting or baking) of food has a housing **15** and a food-treatment chamber **5** therein. A blower **3** with an axial input **3***a* and a radial output **3***b* is mounted on a wall **9** in the housing **15** and powered by a motor **8** between this partition wall **9** and an end wall **10** of the housing **15**. The food-treatment chamber **5** has walls **13**, two of which are provided with rails **14** on which shelves **19** (one

shown) carrying the foodstuffs **20** can be held. The walls **13** are pierced at **15** and spaced from the interior of the housing by perforated plates **21** and **24** supported on spacers **16**.

The housing **15** is provided with a door **17** hinged at **18** to open to the side. A conical hood **11** diverges horizontally outward from the input **3***a* of the blower **3** toward the chamber **5** so that an air-circulation path is formed that extends out from the outputs **3***b*, in through the sides and far end of the chamber **5**, out through the end of the chamber **5** near the blower **3**, in through the hood **11** and into the input **3***a*.

Below the housing **15** is a gas burner **1** connected through a valve **26** to a source (not shown) of combustible fuel (cooking) gas. A vertical conduit **2** directly above this burner **1** has a mouth **2***a* which opens horizontally into the axial intake **3***a* of the blower **3**. In this manner air heated by the burner **1** flows up through the conduit **2** and into the input **3***a*. The cross section of the conduit **2** is so calculated that the blower does not interfere with burning of the burner **1**.

The leading, open end of the hood **11** serves as one end of an exhaust conduit **4** which leads vertically upward out of the housing **15**. The cross-sectional area of the exhaust conduit **4** is greater than that of the heating conduit **2**. In addition, the exhaust conduit **4** is to the right, and therefore downstream, of the heating conduit **2** with the chamber **5** in the circulating path between them.

In order to control the heating rate in this oven, a thermostat **6** under the compartment **5** is coupled via servomotors **7** and **22** to dampers or flaps **12** and **23** in the conduits **4** and **2** respectively and to the solenoid-actuated valve **26** in the line leading to the burner **1**. This makes a fine control of the oven possible.

Thus, air is heated by the burner **1** and passes up through the conduit **2**, through the blower **3** and into the compartment **5** where it heats the food **20** therein. Thence the great portion of it is recirculated, but a slight amount is permitted to escape through the conduit **4**. The positions of the dampers **12** and **23** along with that of the valve **26** set the rate of heating.

FIG. **3** shows another embodiment wherein similar reference numerals are used for similar elements. Here, however, a partition wall **31** forms a chamber **30** in the housing **30** with holes (not shown) allowing air to flow between the two. A spray device **32** injects cold water into the chamber **30** to precipitate out steam in the circulating air. This precipitate is drawn off at **33** as described in my above-cited application Ser. No. 778,269.

In addition, an annular nozzle **27** directs a circular jet of cleaning fluid into the hood **11** to spread cleaning fluid all through the oven when desired. This fluid is poured into a cup **28** prior to distribution. The cleaning operation is ideally carried out only with the valve **26** and dampers **12** and **23** closed. This system operates as described in my above-cited application Ser. No. 778,123.

I claim:

1. A food-treatment apparatus comprising:

housing means defining a food-treatment chamber;

air-circulating means including a blower in said housing means and having an input side and an output side for displacing air along a closed circulation path passing through said chamber;

heating means outside said path for heating a gas; and

conduit means opening at said input side of said blower for introducing the heated gas into said path, said heating means including a fuel burner generating a hot exhaust gas conducted to said blower by said conduit means, said burner being a gas burner disposed externally of said housing means and opening into said conduit means, said air-circulation means a funnel-shaped member converging centrally away from said chamber and defining within said funnel-shaped member a return path for recirculated gases and around said funnel-shaped member a duct for supplying hot gas to said chamber; said blower is provided with an axial intake at said input side communicating with the interior of said funnel-shaped member and a radial

outlet communicating with said duct, and a motor for driving said blower axially remote from said funnel-shaped member; said housing means including a partition isolating said motor from said duct; said conduit means including an upwardly extending conduit rising from a floor of said housing means in a vertical stretch and having a horizontal stretch opening in the direction of said intake within said funnel-shaped member, said horizontal stretch having a flow cross section occupying a minor fraction of the flow cross section of said funnel-shaped member adjacent said intake, said burner being disposed below said floor of said housing means in alignment with said vertical stretch; and said apparatus further comprising a second vertically extending conduit opening at its upper end into the atmosphere and at its lower end into said funnel-shaped member between the first-mentioned conduit and said chamber, and means for controlling the flow cross section of said second conduit.

2. A food-treatment apparatus comprising: a housing defining in a portion thereof, a food-treatment chamber and a further chamber alongside said food-treatment chamber;

means in said food-treatment chamber for supporting food to be treated;

air-circulating means in said housing for displacing air along a closed circling path through said food-treatment chamber and around the means for supporting the food therein and including a funnel-shaped air-guide member opening and widening toward said supporting means over

substantially an entire side thereof and converging into said further chamber;

a partition in said housing separating said one portion from another portion of the housing adjoining said further chamber;

an axial-intake blower mounted on said partition and having its intake registering with the interior of said member at its narrow mouth, and an output discharge around the exterior of said member in a closed circling path tranversing said food-treatment chamber;

a motor mounted upon said partition and disposed in said other portion of said housing for driving said blower; and

means opening into said intake of said blower and located within said member for supplying heated gas to said blower.

3. The apparatus defined in claim 2 wherein the last-mentioned means is a conduit having a discharge end extending axially toward said blower within said member.

4. The apparatus defined in claim 3, further comprising a gas-fueled burner connected with said conduit for delivering said hot gases thereto.

5. The apparatus defined in claim 4, further comprising a discharge conduit extending upwardly from said housing and opening adjacent the wide mouth of said member, and control means for varying the flow cross section of said discharge conduit.