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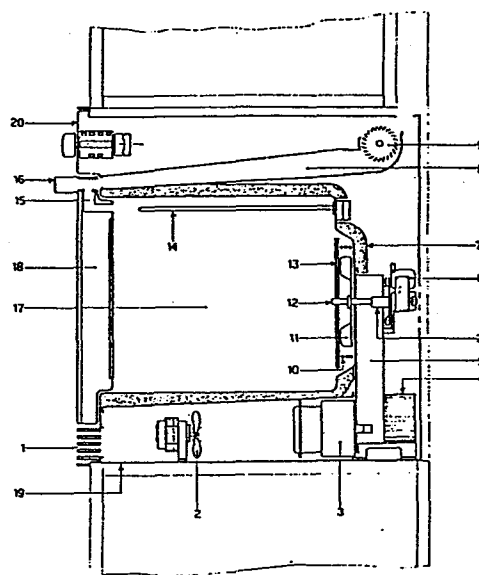
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Combination convection and microwave oven.

A combination convection and microwave oven, in which a microwave generator (3) is located in the lower part of a housing (19) and the radiation of the microwave energy takes place from a zone adjacent the rear wall of the oven cavity (17) by means of the shaft (12) of a motor (6) driving a fan (11) within the oven cavity. The shaft (12) of the motor (6) extends through a waveguide conduit (5), and the motor is adapted to operate at two different speeds, so that the fan (11) is selectively operable as a microwave field agitator and as a fan proper for circulating the air within the oven cavity in the convection heat cooking mode.



D e s c r i p t i o n

5 The present invention relates to a combination oven, particularly for domestic use, in which the heating and cooking of foods is carried out with the aid of conventional gas or electric heating means or by means of microwaves. For
10 achieving a more homogenous heat distribution in the oven cavity, the oven is provided with a motor-driven fan effective to agitate the air within the oven cavity during operation of the oven.

15 Combination convection and microwave ovens present the problem of suitably positioning the elements for microwave generation and diffusion so as to ensure proper operation of the oven in both of its operating modes. According to
20 one solution, the microwave generator is disposed outside and on top of the oven cavity, and the microwaves are radiated into the oven cavity through the top wall thereof.

25 In this case the conventional heating elements have to be of a particular configuration and require special shielding, while the components of the microwave system require extensive provisions for ventilation and insulation. This leads to increased difficulties and costs in designing and manufacturing an oven of this type while reducing the efficiency thereof in the conventional cooking mode, as the increased
30 ventilation carries away a substantial portion of the generated heat.

35 According to another known solution, the microwave generator is located below the oven cavity, while the microwaves are radiated into the oven cavity through the top wall thereof. In this case the temperature problems are somewhat mitigated, but the efficiency is reduced in the microwave cooking mode due to increased losses resulting from the

1 increased length of the waveguide conduit and the low
quality thereof.

If finally the microwave generator is located below the oven
5 cavity and the microwaves are radiated thereinto through
the bottom wall thereof, the foods to be cooked are partially shielded from the microwaves by the vessels containing them. In this case there arise additional problems with regard to cleaning the oven, as grease and other contamin-
10 ations tend to accumulate on the bottom wall of the oven cavity, particularly in the conventional cooking mode.

It is therefore an object of the present invention to provide a combination convection and microwave oven in
15 which the two cooking modes are effectively integrated so as to obtain optimum efficiency ratings, and in which all problems related to the heating of components, to the reduction of energy losses as achieved by the employ of a short waveguide conduit, and to the cleaning and mounting
20 particularly of the conventional heating elements interiorly of the oven cavity are effectively solved.

This object is attained according to the invention by a combination convection and microwave oven comprising:
25 an oven cavity having disposed therein conventional heater elements and a fan driven by an electric motor located outside said cavity, and a microwave generator disposed in a rear portion of said oven below said oven cavity and connected thereto through a waveguide conduit. According to
30 the invention, an oven of this type is characterized in that the end portion of the shaft of said motor driving said fan projects into the oven cavity and forms a rotating antenna for radiating microwaves, said shaft being mounted in a support of an insulating material permeable to micro-
35 waves and extending through said waveguide conduit disposed at the rear of the rear wall of the oven cavity.

1 These and other characteristics of the invention will
become more clearly evident from the following description
of exemplary embodiments with reference to the accompanying
drawing, the only figure of which shows a diagrammatical
5 cross-sectional view of a combination oven according to
a preferred embodiment of the invention.

The oven according to the invention comprises a housing 19
enclosing an oven cavity 17 surrounded by an insulating
10 jacket 7 and provided with a door 18.

Door 18 is of the conventional double glass window type in-
cluding seals for preventing the escape of microwaves and
provided with a handle 16. An opening of handle 16 commun-
15 icates with an open space 15 between the door and the for-
ward edge of the oven cavity, and with a conduit 8 disposed
above the oven cavity and connected to a fan 19. Located
above the oven cavity 17 is a control panel 20. The air
aspirated by fan 9 is thus effective to cool control panel
20 20 and handle 16 and ensures the extraction of the humidity
resulting from the cooking of foods within oven cavity 17.

The lower portion of housing 19 is formed with a seat for
mounting a microwave generator 3 and a transformer 4 asso-
25 ciated therewith adjacent a rear portion of the oven.

A blower fan 2 accommodated by the same seat aspirates air
through a front opening 1 and expells it at the back of the
oven, thereby cooling the microwave generator and other
components located at the rear portion of the oven as will
30 be described.

The microwaves generated by generator 3 are conducted along
a waveguide conduit 5 secured to the rear wall of oven cav-
ity 17 and extending over a limited length to about half
35 the height of the oven cavity.

Interiorly of oven cavity 17 and about at the center of its
rear wall there is mounted a fan 11 the metal shaft 12 of

1 which extends through waveguide 5 to be driven by an electric motor 6 supported by the rear wall of the oven. A support 12 of an insulating material permeable to microwaves surrounds shaft 12 over a part of its length within waveguide conduit 5 so as to avoid any radiation losses. Within oven cavity 17 fan 11 is surrounded by conventional heater elements 10, for instance electric resistance heater elements, while an electric resistance grill rod 14 is mounted in the upper portion of cavity 17.

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Fixedly secured in front of fan 11 and heater elements 10 is a panel 13 made of a heat resistant material permeable to microwaves, for instance of a vitreous ceramic material, provided with central openings permitting air to be circulated within oven cavity 17 by the action of fan 11, such air being aspirated through said central openings and expelled in radial directions from behind panel 13.

The panel 13 is preferably detachable for facilitating cleaning and maintenance operations.

Motor 6 of fan 11 is adapted to operate at two different speeds, while the shaft 12 of fan 11 projects into the oven cavity for a length corresponding to one quarter of the wavelength of the microwave radiation generated by generator 3.

As fan 11 is driven at low speed, its shaft 12 functions as a microwave radiating antenna, while fan 11 is effective to evenly distribute the radiation throughout oven cavity 17. In the conventional cooking mode, fan 11 is driven at higher speed, so that the oven functions as a convection oven.

It is finally also possible to simultaneously carry out the cooking process by the conventional convection method and by the microwave method by alternately driving fan 11 at its low and high speeds, so as to obtain the desired results in an economical manner without prejudice to the reliability

1 of the oven's components.

The present invention thus effectively provides a structural and functional integration of the conventional cooking
5 system with the microwave cooking system with optimum technical and economical results.

The described construction may of course be modified in various manners without leaving the scope of the present
10 invention. The fan 2 for cooling the microwave generating components may thus be mounted at a different location as dictated by the space available within housing 19. Further the electric resistance grill rod 14 may be fixedly or detachably mounted within oven cavity 17.

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Of particular importance is the location of the microwave generator in the lower rear portion of housing 19, and the immission of the microwaves into the oven cavity 17 through the rear wall thereof, the fan 11 used for circula-
20 ating the air within oven cavity 17 and the end portion of fan shaft 12 forming the means for radiating the microwaves into the oven cavity.

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Combination Convection and Microwave Oven

P a t e n t C l a i m s

1. A combination convection and microwave oven, comprising: an oven cavity having disposed therein conventional heater elements and a fan driven by an electric motor located outside said cavity, and a microwave generator disposed in a rear portion of said oven below said oven cavity and connected thereto through a waveguide conduit, characterized in that the end portion of the shaft (12) of said motor (6) driving said fan (11) projects into said oven cavity and forms a rotating antenna for radiating microwaves, said shaft (12) being mounted in a support (21) of an insulating material permeable to microwaves and extending through said waveguide conduit (5) disposed to the rear of the rear wall of said oven cavity (17).

1 2. A combination oven according to claim 1, character-
ized in that said motor (6) is adapted to operate at two
different speeds and in that the shaft (12) of said fan
(11) extends into the interior of said oven cavity (17)
5 so as to function as a rotating antenna for the diffusion
of microwaves.

3. A combination oven according to claim 1, character-
ized in that said fan (11) is surrounded by a conventional
10 heater element (10), for instance an electric resistance
heater element, said fan (11) and said heater element (10)
being protected by a panel (13) formed of a heat-resistant
material permeable to microwaves and provided with central
openings.

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4. A combination oven according to claim 1, character-
ized in that said microwave generator (3) is located below
said oven cavity (17) and outside thereof in a rear portion
of said oven.

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5. A combination convection and microwave oven as
described hereinbefore with reference to the accompanying
drawing.

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