

[54] **PROTECTIVE BARRIERS FOR WINDOW OF MICROWAVE OVEN DOOR**

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[51] Int. Cl. **H05b 9/06**

[58] Field of Search **219/10.55; 126/200**

[56] **References Cited**

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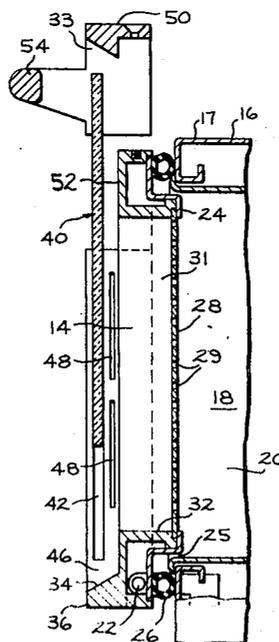
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[57] **ABSTRACT**

A door construction for a microwave cooking oven where the door has a narrow frame with a large window opening. The inner surface of the window opening is covered with a perforated microwave radiation barrier, while the outer surface of the opening is fitted with a transparent interference barrier. Air passages are formed in the door to permit a current of ambient air to sweep the inner surface of the transparent barrier as well as to serve as an oven venting means. This transparent barrier may be quickly removed from the door for ease of cleaning. A portion of the door frame is integral with the transparent barrier for ease of handling this barrier.

8 Claims, 4 Drawing Figures



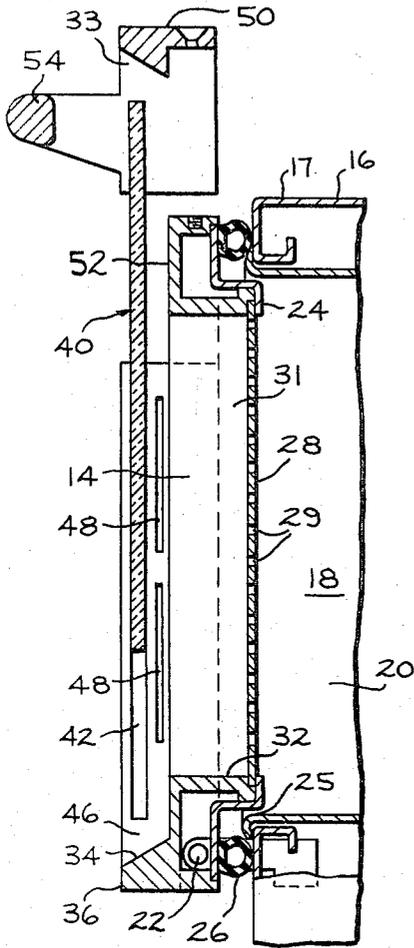


FIG. 3

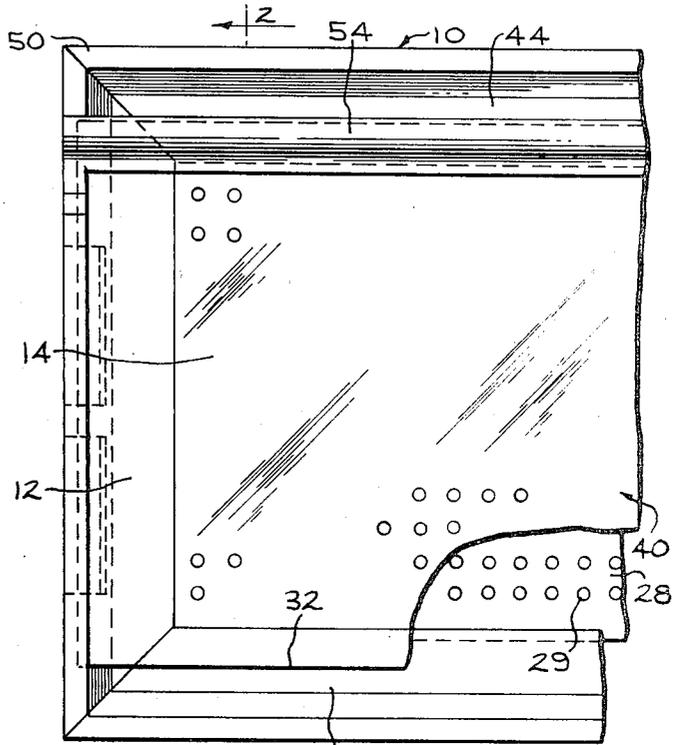


FIG. 1

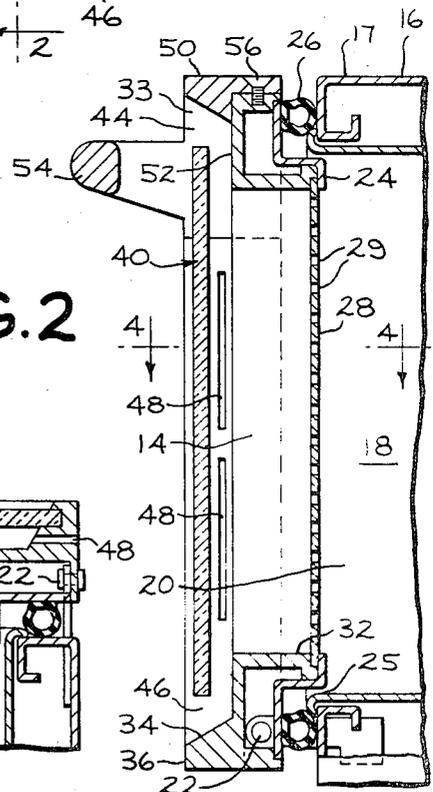


FIG. 2

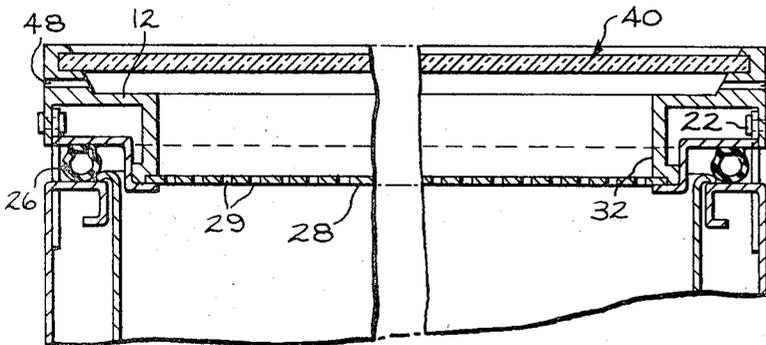


FIG. 4

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PROTECTIVE BARRIERS FOR WINDOW OF MICROWAVE OVEN DOOR

BACKGROUND OF THE INVENTION

The present invention relates to an oven door construction for a microwave cooking oven and particularly such an oven door having a viewing window. The oven may be heated by microwave energy alone or it may be heated with a combination of microwave energy from a magnetron generator and radiant energy from electrical resistance heating elements. There has been a recent dynamic upsurge in the acceptance of the small, single purpose microwave ovens commonly referred to as countertop microwave ovens that are heated with microwave energy alone. The present invention is especially adapted for use with such a countertop oven. The power supply and magnetron tube of such an oven operates at a rather high temperature and a cooling means is used to blow cooling air first over the magnetron tube and then out through the cooking cavity. Accordingly, some means must be provided for exhausting this cooling air from the cooking cavity.

A window in an oven door, whether it be a standard oven or a microwave oven, is a very desirable feature because it is well to be able to observe the condition of the food while it is being cooked to determine the degree of doneness. In the design of a microwave oven, special precautions have to be taken to ensure against the leakage of microwave energy both from around the door gap and through the window area. The present invention does not relate to the problem of leakage prevention from around the door gap, but rather it is directed toward the nature of protective barriers that are combined with the window opening of the oven door.

The principal object of the present invention is to provide an oven door construction with a window opening that is protected with a first microwave radiation barrier, and second by a transparent interference barrier so as to prevent elongated foreign objects from being inserted through the radiation barrier from the outside of the oven which might otherwise nullify the protection afforded by the radiation barrier.

A further object of the present invention is to provide an oven door construction of the class described with an improved mounting means for the transparent barrier such that anyone may readily remove the transparent barrier and wash it of oven soils in the kitchen sink.

SUMMARY OF THE INVENTION

The present invention, in accordance with one form thereof, relates to an oven door construction for a microwave cooking oven where the door has a frame with a large window opening. There is an inner door liner of perforated configuration covering the window opening to serve as a microwave radiation barrier. A transparent interference barrier is carried by the outer side of the door, and air passages are formed in the door to permit a current of room ambient air to sweep the inner surface of the transparent barrier and prevent vapor condensation thereon. The transparent barrier is slidably mounted in the door frame, and a portion of the door frame is detachable therefrom for ease in handling the transparent barrier.

BRIEF DESCRIPTION OF THE DRAWINGS

This 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.

FIG. 1 is a fragmentary, front-elevation view of an oven door construction for a microwave cooking oven embodying the present invention with a portion of the transparent interference barrier broken away in the lower right-hand corner to show the microwave radiation barrier in full lines.

FIG. 2 is a side, cross-sectional elevational view taken on the line 2—2 of FIG. 1.

FIG. 3 is another side, cross-sectional elevational view similar to that of FIG. 2, but showing the outer transparent

barrier in a slightly raised position so as to show the separation of the crown of the door with its integral door handle from the top portion of the door frame.

FIG. 4 is a top, cross-sectional plan view taken on the line 4—4 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning now to a consideration of the drawings, and particularly to FIG. 1, there is shown an oven door 10 comprising a narrow door frame 12 having a large central window opening 14. Only a small portion of the front of a microwave oven 16 is shown in FIG. 2. It should be understood that it is conventional in this art that the oven 16 would have an outer cabinet or body structure 17 and an oven cooking cavity 18 formed by a box-like oven liner 20 and a front-opening oven door 10 which is adapted to close the front opening in the oven liner 20. The door 10 is shown as a hinged door supported along its bottom edge by the hinge means 22 such that the door may be opened by folding it downwardly and outwardly into a generally horizontal position. The present invention is not limited to such a drop-down door design. It is clearly as applicable to either a side-swinging door or a pantograph door which would swing out slightly and then move upwardly in a generally vertical plane to an elevated position above the oven.

As seen in FIG. 2, the inner portion of the door 10 is reduced in overall size to form a plug 24 which is adapted to telescope closely into the throat of the oven liner so as to leave a very narrow gap therebetween as at 25. A microwave sealing gasket 26 is shown fastened to the inner side of the door in a location surrounding the plug 24 such that it is adapted to bear against the front frame of the oven 16 to preclude any microwave radiation leakage from the oven cavity 18. It is standard practice to provide microwave oven doors with door latches (not shown here), such that the door is latched at all times during the operation of the microwave generator. Moreover, suitable interlocks would be provided to ensure that the oven operation would only function after the oven door is latched shut, and that the oven operation would be discontinued before the oven door is unlatched and the door opened. The present invention is not directed to such microwave leakage prevention means and therefore no further explanation is deemed necessary herein.

The innermost surface of the door 10 is provided with a perforated plate or foraminous screen 28 which is provided with a plurality of small openings 29 of such size as to present the leakage of microwave energy therethrough. The size of these openings 29 is controlled as a function of the frequency of the microwave energy employed by the oven. All such frequencies must fall within the Industrial, Scientific and Medical radiofrequency band (ISM). One frequency that is available for microwave cooking purposes is 2,450 MHz, and the other is 915 MHz. At the present time most, if not all, of the countertop or portable microwave ovens now on the market are of the higher frequency, 2,450 MHz.

The innermost half 31 of the window opening 14 is generally of uniform transverse cross-section due to the presence of a uniform throat or collar 32. The frontmost half 33 of the window opening 14 is enlarged over the innermost half by means of the offset beveled portions 34 which are first spaced outwardly from the window opening 14, and then taper outwardly to a rather narrow front edge or thickness, as at 36. Within this frontmost half 33 of the window opening 14 is positioned a transparent interference barrier 40 which may be of glass or plastic material of enlarged size such that it extends beyond the extremities of the radiation barrier 28 as is seen in FIG. 2. This prevents elongated foreign objects from being inserted from the outside of the door through the openings 29 in the perforated barrier 28 so as to preclude the leakage of microwave energy therethrough. This transparent barrier 40 is fitted into opposite grooves 42 formed in the beveled portions 34 at the two sides of the door frame 12. Notice that air

passages are formed above and below the transparent barrier 40, as at 44 and 46 respectively. Such air passages permit a current of ambient air to sweep the inner surface of the transparent barrier 40 so as to prevent the condensation of vapor thereon from the oven air. Another use for such air passages 44 and 46 is to serve as an oven exhaust to handle the cooling air that is provided in such microwave ovens. Such cooling air would be drawn into the oven cabinet to pass over the magnetron tube, and then into the oven cavity 18 for exhausting through the air passages 44 and 46.

Additional air passages 48 are shown in the two opposite side members of the door frame 12 just behind the transparent barrier 40. Either the air passages 44 and 46 may be used or the air passages 48 may be substituted therefor, or a combination of all of these air passages could be used to prevent fogging the inside surface of the transparent barrier 40.

As is best seen in FIG. 3, the top portion of the door frame 12 is provided with a removable crown 50 which cooperates with a skeleton bar 52 that is integral with the remaining three sides of the door frame 12. Hence, when the crown 50 is lowered into place, it mates with the skeleton bar 52 such that those elements combined are generally of the same transverse configuration as the other three sides of the door frame 12. Notice that the transparent plate 40 is attached to the removable crown 50 by means of screw fasteners, glue or the like. Moreover, the crown has an elongated door handle 54 as an integral part thereof such that the transparent plate 40 may be moved by grasping the door handle 54 and raising or lowering the plate 40 as is desired. This handle 54 extends from one side of the door frame to the other and is attached to the crown at its opposite ends. A set screw 56 is shown in FIG. 2 extending down through the crown and being threaded into the top of the skeleton bar 52. A modification could be a releasable catch member supported on the back of the member 52 for engaging the top of the crown 50.

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 embodiment disclosed, but that it is intended to cover all modifications which are within the true spirit and scope of this invention as claimed.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A door construction for a microwave cooking oven comprising a narrow door frame with a large window opening, an inner door liner of perforated configuration covering the window opening and serving as a microwave radiation barrier, and a transparent interference barrier carried by the outer side of the door and serving to prevent elongated foreign objects from being inserted from the outside of the door through

the perforated microwave barrier, and air passages in the door frame to permit a current of air to sweep the inner surface of the transparent barrier and prevent vapor condensation thereon, said air passages also serving as an air exhaust means from the oven, and means whereby said transparent barrier is slidably supported in the door frame for ease of removal.

2. An oven door construction as recited in claim 1 wherein the outer transparent barrier is larger than the inner perforated barrier and extends outwardly beyond the extremities of the perforated barrier.

3. An oven door construction as recited in claim 1 wherein the air passages in the door frame are formed above and below the transparent barrier.

4. An oven door construction as recited in claim 1 wherein the air passages in the door frame are formed in the opposite sides of the door frame.

5. An oven door construction as recited in claim 1 wherein said means comprises a skeleton bar and a removable crown, said crown includes an elongated door handle extending outwardly therefrom, removable crown being attached to the upper edge of the transparent barrier, and fastening means for joining the removable crown to the skeleton bar, whereby the transparent barrier may be removed from the door by detaching the crown from the skeleton bar and using the door handle to lift the transparent barrier away from the door.

6. An oven door construction for a microwave cooking oven comprising a door frame with a window opening, an inner door liner of perforated configuration covering the window opening and serving as a microwave radiation barrier, the front portion of the door frame being beveled outwardly, and an enlarged transparent interference barrier carried by the door and serving as the outer door panel to prevent elongated foreign objects from being inserted from the outside of the door through the perforated microwave barrier, and air passages in the door frame to permit the oven exhaust to pass through the perforated barrier and out the air passages, one portion of the door frame having a skeleton bar and a removable crown, and means whereby the transparent barrier is slidably supported in the door frame and confined in place by the removable crown, and fastening means for joining the crown to the skeleton bar.

7. An oven door construction as recited in claim 6 wherein the removable crown is at the top portion of the door frame, and the crown is attached to the transparent barrier such that when the crown is removed the transparent barrier is separated from the door.

8. An oven door construction as recited in claim 6 wherein the said air passages are located above and below the transparent barrier.

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