An electrically conductive, heat resistant gasket is provided for sealing the door in an oven of the combination pyrolytic self-cleaning and microwave type. The gasket has a knitted stainless steel outer jacket for making electrical contact between the oven door and the oven body and further to make a seal to prevent the escape of microwave radiation from the oven cavity. A woven glass fiber sleeve comprising a pair of co-extensive chambers is disposed coextensively within the outer jacket for sealing the oven against the escape of heat, smoke and gases, especially those generated in the self-cleaning process. Arranged coextensively within one chamber of the sleeve is a flat, metal insert and a resilient core, the combination serving to prevent gathering of the gasket as it is bent around the corners of the oven door and to insure a controlled width and uniform sealing around the entire periphery of the cavity opening. Gasket mounting means in the form of a glass fiber bead draw-string is arranged coextensively within a second chamber of the sleeve for aiding in sub-assembling the gasket on the door inner panel.
3,812,316

DOOR SEAL GASKET FOR COMBINED MICROWAVE AND SELF-CLEANING OVEN

BACKGROUND OF THE INVENTION

The present invention relates to a means for sealing around the door of a microwave oven and more particularly, to a door seal gasket for a combination microwave and self-cleaning oven for assuring electrical grounding contact between the oven door and the oven liner, and further, for sealing the oven against the escape of heat, smoke and gases therefrom.

In a combination microwave and self-cleaning electric oven, the door seal gasket has two functions. First, it serves to prevent the leakage of microwave radiation from the oven by providing an electrical contact to effect grounding between the door and the oven liner. Secondly, it must seal the oven against the escape of heat, smoke and gases, especially those generated in the elevated temperature cycle of the self-cleaning process. To effect the former, metallic or gasket are commonly used. To be effective, such gaskets must make a uniform contact between the oven door and the oven liner along the entire perimeter of the oven cavity opening. Arcing may occur which may destroy portions of the mesh if there is not total contact; likewise, radiation may be allowed to escape from the interior of the oven. This has been an especially common problem since the surfaces of the oven liner and door which are mated to the gasket are often irregular; in other words, not truly flat. As a result, it has been difficult for the sealing gasket to conform to the surface irregularities, especially since the core of the sealing gasket was not a truly resilient material but instead was a somewhat firm material chosen for its ability to hold its shape. Another problem has been that of gathering or puckering of the gasket material as it is bent around the corners of the oven door, with a resulting incomplete or partial gasket to oven liner seal. Leakage problems were also common in the combination microwave and self-cleaning oven gasket wherein it is necessary to make a heat-insulating and gas-tight seal between the door and the oven body to prevent the escape of heat, smoke and gases during the self-cleaning process.

U.S. Pat. No. 3,029,805 — Scott, describes an oven door seal gasket formed of a resilient material, such as silicone rubber, in the shape of a half ellipse cut along its major axis. Inserted within the gasket is a metal retainer which fits snugly against the gasket material along the half ellipse major axis and which provides lateral rigidity to the cross-section of the sealing strip while allowing compression of the gasket material to conform somewhat to irregular surfaces. Such a gasket would be usable only in a conventional oven as there is no provision for making electrical grounding contact between the door and the oven body, nor can the gasket material endure the temperatures of the pyrolytic self-cleaning process.

U.S. Pat. No. 3,578,764 — nunally et al., discloses an oven seal gasket for sealing a self-cleaning oven. Such a gasket has no provision for sealing against the escape of microwave radiation and for making electrical contact between the oven door and the oven body nor does it solve the problem of corner gathering or puckering.

U.S. Pat. No. 3,459,921 — Fussell et al., assigned to the same assignee as the present invention, describes a gasket structure for use in a combination electric and electronic oven. The gasket provided therein is generally cylindrical in shape and is formed of a metal braid having disposed coextensively therewithin a batt of glass fibers to seal against the escape of gases. Although compressible, the gasket described presents problems in effecting a complete seal between the oven door and the oven body around the periphery of the opening. Problems have been especially noted in effecting an electrical seal as the gasket is bent around the corners of the door, there being a gathering of material at those points. There is no provision of resiliency within the gasket to allow it to conform to the irregularities of the surfaces with which it must mate.

A reliable oven door seal gasket is needed, therefore, which can conform to the irregular surfaces of the oven body and the oven door with which it mates in order to seal the oven against the escape of heat, gases and smoke and, further, against the escape of microwave radiation therefrom. This sealing should be uniform not only in the straight portions of the gasket but, likewise, in the portions where the gasket has been bent around the corners to conform to the shape of the door and, likewise, the opening.

It is, therefore, the principal object of this invention to provide a door seal gasket for a combination microwave and self-cleaning oven which will uniformly seal the oven against the escape of microwave energy, heat, smoke and gases.

It is a further object to provide a gasket which will endure the elevated temperatures of the pyrolytic self-cleaning process.

And it is a further object of the present invention to provide a door seal gasket which will aid in its assembly to the oven door structure.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided sealing means for a microwave oven door comprising an endless, flexible, resilient, conductive, outer jacket for making electrical contact between the oven door and the oven body and which is adapted to fit around the periphery of the front opening of the oven cooking cavity. Disposed coextensively within this outer jacket is an elongated, flexible, electrically insulating sleeve formed so as to provide a pair of hollow, tube-like chambers having a common wall portion. Disposed coextensively within a first of these sleeve chambers is a plane, reinforcing insert shaped to conform to the periphery of the oven cavity sealing surface, the insert being located adjacent to the sleeve common wall, the purpose being to prevent gathering of this sealing means as it is shaped around corners. A resilient core member is disposed coextensively within this first sleeve chamber for exerting generally radial pressure against the insert and further against the sleeve and thereby the outer jacket to maintain the insert in place and to effect uniform sealing of the oven door when the door is in its closed and locked position.

BRIEF DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a side elevational view, partly broken away, showing a combination self-cleaning microwave oven with the oven door in the closed position to reveal the relation of the gasket of the present invention, in one form thereof, with its surroundings;
FIG. 2 is a plan view of the inside surface of the oven door of FIG. 1; FIG. 3 is a fragmentary, cross-sectional view taken generally along the line 3--3 of FIG. 2, parts of the oven door having been omitted, showing the gasket of the present invention in relation to a portion of the oven door structure.

FIG. 4 is a fragmentary, perspective view of the preferred embodiment of the present invention, broken away to show individual components thereof in relation to each other.

FIG. 5 is a fragmentary view, partly broken away, taken generally along the line 5--5 of FIG. 3, showing the junction of the free ends of the gasket of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing, there is illustrated an oven 10 of the combination pyrolytic self-cleaning and microwave type. Portions of oven liner 14 are shown which includes an out-turned lip or flange 16 formed thereof around the entire periphery of the cavity opening. Portions of front door frame member 20 are shown, oven liner 14 being in abutting engagement therewith when liner 14 is suitably affixed to the frame of oven 10 by appropriate means. An oven door 24 is provided, here shown in its upright or closed position, and affixed to the frame member by appropriate hinge means not shown through pin 26. Door sealing means such as door seal gasket 28 is provided and is attached to door 24 to seal against the escape from the oven cavity of microwave energy as well as heat, gases and smoke. Door latch mechanism 30 is provided to lock door 24 in its closed position and further to compress gasket 28 to effect a uniform seal around the periphery of the cavity opening. Latch mechanism 30 may be of the type described in Application Ser. No. 256,093 — White et al., assigned to the same assignee as the present invention.

Referring now to FIG. 2 of the drawing, the inner side of door 24 is shown that a better understanding may be had of the arrangement of gasket 28 with respect to the door. The inner surface of door 24 is comprised of an inner door panel 34 and a door liner 36 (better seen in FIG. 3).

In accordance with the present invention, door seal gasket 28 is attached to the inner surfaces of the oven door 24 to provide, when the door 24 is in its closed and locked position, a seal against the escape from the oven cavity of microwave energy as well as gases, smoke and heat which are generated in the elevated temperature cycle of the self-cleaning process. An understanding may be had of the operation of the pyrolytic self-cleaning process by referring to U.S. Pat. No. 3,121,158 — Hurko, assigned to the same assignee as the present invention.

A better understanding may be had of the structure of the door seal gasket of the present invention in one form thereof by referring to FIG. 4. A hollow, elongated conductive outer jacket, such as metallic mesh jacket 40, is disposed coextensively therein an elongated, electrically insulating sleeve, such as heat resistant, woven glass fiber sleeve 44. Woven glass fiber sleeve 44 is formed, as by sewing at 46 (shown better in FIG. 3) to provide a pair of hollow, tubelike coextensive chambers 48 and 50 joined by a common wall portion or a common coextensive web portion such as shown at 52. A resilient core member such as metallic mesh core 56 is disposed coaxially within a first sleeve chamber 48. A plane, reinforcing insert such as flat metal insert 60, shaped to conform to the periphery of the oven cavity opening, is inserted within first chamber 48 so as to be disposed between mesh core 56 and web portion 52 so as to form the first chamber 48 into a transverse cross-sectional shape of a half-ellipse as divided along its major axis. As can be seen in FIG. 3, insert 60 is located essentially on the major axis of this partial ellipse and serves to give gasket 28 a uniformly consistent shape or cross section even as the gasket material is bent around the corners to fit the shape of the oven cavity opening. Insert 60 further serves to insure a good contact between mesh jacket 40 and its mating surfaces of door panel 34 and door liner 36. Disposed within the second sleeve chamber 50 is a tension member such as heat resistant, woven glass fiber, tensioning draw-string 64 which serves to aid in the assembly of gasket 28 to the door inner panel 34.

In assembly, door seal gasket 28 is placed over inner door panel 34 in the general relation shown in FIG. 3. Tensioning draw-string 64 has a pair of free ends 66 and 68, as shown in FIG. 5. Free ends 66 and 68 of draw-string 64 are then pulled to take up the slack in the draw-string and further, to tighten the gasket 28 to conform to the shape of inner door panel 34. Free ends 66 and 68 of the draw-string 64, after having been tightened to take up any slack to fit gasket 28 to inner panel 34, may then be tied or clamped. A termination band 72, comprising a woven, glass fiber inner core covered by a metallic mesh outer jacket, is wrapped around the free ends 74 and 76 of gasket 28 to form a junction thereof so as to effect a complete seal around the entire periphery of the cavity opening. The free ends of termination band 72 are arranged so that they will fall within the interior of the door as defined by inner panel 34 and door liner 36. Termination band 72 then is secured by suitable means such as by stapling of the gasket to web portion 52 as shown at 78. The effect then of termination band 72 is to provide a leak-free seal at the junction of the terminal ends 74 and 76 of the door seal gasket 28 thereby yielding an endless gasket. Door liner 36 is then assembled so as to mate with the prior assembly of the gasket 28 and the inner panel 34 such that the mating face of door liner 36 will align properly with the major axis of the half ellipse formed of door gasket 28. Inner panel 34 and door liner 36 are then securely fastened together by an appropriate means such as sheet metal screws (not shown).

Referring again to FIG. 1, oven door 24 is shown in its closed and latched position with door seal gasket 28 forming a seal between the door 24 and the lip flange 16 formed around the periphery of the box-like oven liner 14. A conductive coating of silver alloy or the like has been applied to the surface of flange 16 as well as to the flanged surface of inner panel 34 which is in contact with gasket 28. Such an application is described in U.S. Pat. No. 3,459,921 — Fussell et al., assigned to the same assignee as the present invention. It is conceivable then, that these surfaces may not always be truly flat or parallel. It is, nevertheless, necessary that gasket 28 conform to these mating surfaces as closely as possible to prevent damage to the gasket material from electrical arcing as well as to prevent the leakage of microwave radiation from the oven cavity.
and to further prevent the escape of heat, smoke and gases generated within the oven cavity.

Gasket 28 is able to accomplish these ends through features inherent in its design. Conductive mesh outer jacket 40 serves to make an electrical contact between door 24 and oven liner 16. In order for this contact to be uniform and to conform to the irregularities of the mating surfaces of flange 16 and panels 34 and 36 of door 24, the metal insert 60 and mesh core 56 have been provided. Insert 60 serves to maintain a uniform half-ellipse shape of first chamber 48 of the gasket 28 and further to prevent gathering or buckling of the chamber 48 as would otherwise occur as the gasket is bent around one of its four corners. Insert 60 then further serves to insure a good contact between mesh 40 and the mating surfaces of door panels 34 and 36. To insure conformance of gasket 28, and particularly of outer mesh jacket 40, with the surface irregularities of the flange 16, the resilient mesh core 56 is provided to exert a radial pressure against outer jacket 40 and, likewise, against insert 60 to hold it in place. In other words, upon locking the door 24, the gasket 28 will be compressed somewhat, but upon opening the door 24, gasket 28, and thereby jacket 40, will spring back to substantially the original shape, that of the half-ellipse form of the first chamber 48.

To seal the oven 10 against the escape of heat, gases and smoke which are generated in the elevated temperature, pyrolytic self-cleaning process, woven glass fiber sleeve 44 is provided. Chamber 48 of sleeve 44 is also responsive to this radially exerted pressure from mesh core 56 and, therefore, chamber 48 will also substantially conform to the irregular surfaces of flange 16 and to those of door panels 34 and 36 to effect a gas-tight seal around the periphery of flange 16.

Gasket 28 is able to endure the effects of the higher temperatures of the pyrolytic self-cleaning process and concurrently to effect a seal against the escape of microwave radiation from the oven cavity as the result of a careful choice of gasket materials. Outer jacket 40 is a knitted mesh made of 0.006 inch diameter Inconel stainless steel wire. Resilient core 56 is a tubular mesh made of knitted stainless steel wire, while sleeve 44 and draw-string 64 are of tightly woven glass fiber fabric. Insert 60 is of 0.050 inch stamped aluminum.

It should be considered that there are other materials which might serve in their stead. For example, a core of silicone rubber may be used to replace the knitted mesh core 56 for use in a non-pyrolytic oven. Likewise, outer jacket 40 may be of any electrically conductive but heat-insulating material which could withstand the rigors of the atmospheres of the present applications.

A further advantage of such a compressible gasket is that the spacing between the door and the oven liner need not be uniform from the top of the door to the hinged bottom. The gasket is compressible to allow for such contingencies.

It should be apparent to those skilled in the art that the embodiment described heretofore is considered to be the presently preferred form of this invention. In accordance with the patent statutes, hinges may be made in the disclosed apparatus and the manner in which it is used without actually departing from the true spirit and scope of this invention.

What is claimed is:

1. In a microwave oven of the type having a body and a door forming an oven cavity, the body further having a sealing surface for mating with the oven door when the door is in its closed position, improved sealing means therefor, comprising:
   a. an endless, flexible, conductive outer jacket for making electrical contact between said oven door and the oven body and arranged to fit around the periphery of the opening thereto;
   b. an elongated, flexible, electrically-insulating sleeve disposed coextensively within said outer jacket, the combined jacket and sleeve being formed to provide a pair of hollow tube-like coextensive chambers having a common wall portion, one of the chambers serving as means for mounting the sealing means;
   c. a planar, reinforcing insert shaped to conform to the periphery of the oven cavity sealing surface, the insert being disposed coextensively within another of said sleeve chambers adjacent said sleeve common wall for preventing gathering of said sealing means as it is formed around corners thereof; and
   d. a resilient core member disposed coextensively within said other sleeve chamber for exerting generally radial pressure against said insert and against said sleeve and likewise said outer jacket to maintain said insert in place and further to effect uniform sealing of said oven door when said door is in its closed and locked position.

2. The sealing means of claim 1 wherein the conductive outer jacket is of knitted metal mesh and the electrically-insulating sleeve is of woven fiber glass mesh.

3. The sealing means of claim 2 wherein the resilient core member is a tubular knitted wire mesh.

4. In a combination self-cleaning and microwave oven of the type having an oven liner with an out-turned lip formed around the periphery of the opening thereof and further having an oven door formed with an inner panel and a door liner so as to provide, in its closed position, a mating surface with the oven liner lip around the periphery of the oven opening, door sealing means therefor comprising:
   a. a hollow, elongated, flexible, conductive outer jacket for making electrical grounding contact between said oven door and said oven liner to prevent the escape of microwave radiation from said oven;
   b. an elongated, electrically-insulating, heat-resistant, flexible sleeve disposed within said outer jacket for sealing said oven against the escape of heat, smoke and gases, the sleeve being formed to provide a pair of hollow, tube-like, coextensive chambers having a common wall portion;
   c. an elongated, resilient, generally-cylindrical core member disposed coextensively within a first of said sleeve chambers for exerting radial pressure against said first sleeve chamber and thereby against said outer jacket to effect uniform sealing of said oven when said door is in its closed and locked position;
   d. a plane, heat-resistant reinforcing insert shaped to conform to the periphery of said oven liner lip, the insert being disposed coextensively within said first sleeve chamber between said core member and said sleeve common wall so as to form of said first
7

chamber a half-ellipse as divided along its major axis, the insert being essentially located on the major axis and held in place by said core member for maintaining a uniformly consistent cross-section of said sealing means around the corners thereof; and

e. a heat-resistant tension member disposed coextensively within a second of said sleeve chambers, to be tightened upon mounting said sealing means upon said door inner panel for aiding in the assembly thereof.

5. In a combination self-cleaning and microwave oven of the type having an oven liner with an out-turned lip formed around the periphery of the opening thereof and further having an oven door formed of an inner panel and a door liner so as to provide, in its closed position, a mating surface with the oven liner lip around the periphery of the oven opening, an endless door seal gasket for mounting on said oven door comprising:

a. a hollow, elongated, metallic-mesh outer jacket for making electrical grounding contact between said oven door and said oven liner to prevent the escape of microwave radiation from said oven;

b. an elongated, glass fiber sleeve disposed coextensively within said mesh jacket for sealing said oven against the escape of heat, smoke and gases, the sleeve being formed to provide a pair of hollow, tube-like, coextensive chambers joined by a common, coextensive web portion serving as a gasket mount means;

c. an elongated, resilient, metallic-mesh core disposed within a first of said sleeve chambers for exerting radial pressure against said sleeve chamber and thereby against said outer jacket;

d. a flat metal insert shaped to conform to the periphery of said oven liner lip, the insert being disposed coextensively within said first sleeve chamber between said resilient core and said web portion so as to form of said first chamber a half-ellipse as divided along its major axis, the insert being essentially located on the major axis and held in place by said core for maintaining a uniformly consistent cross-sectional area and for preventing gathering of said gasket around corners thereof to effect uniform sealing and electrical contact of said door with said oven liner when said door is in its closed, locked position; and

e. a glass fiber bead tensioning drawstring disposed coextensively within a second sleeve chamber, and having a pair of free ends to be tightened upon mounting said gasket upon said door inner panel for aiding in the assembly thereof.

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