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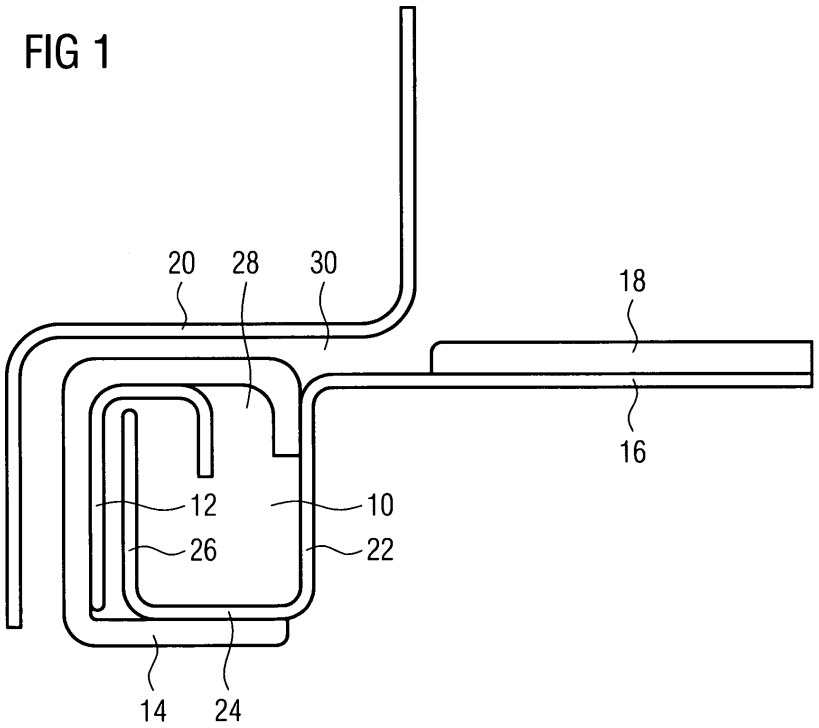
(54) A wave choke system for an oven door of a microwave oven

(57) The present invention relates to a wave choke system for an oven door of a microwave oven. The wave choke system is provided for a door frame of the oven door. The wave choke system comprises an elongated wave choke recess (10) made of conductive material, an elongated choke portion (12) made of conductive material and arranged parallel to the wave choke recess (10), and at least one elongated cover element (14) made of dielectric material and arranged parallel to the wave choke recess (10) and to the choke portion (12). The wave choke recess (10), the choke portion (12) and the cover element (14) are formed as profile parts. The cross-section of the cover element (14) encloses at least partially the cross-sections of the wave choke recess (10) and the choke portion (12). The cross-section of the choke portion (12) covers at least partially the cross-section of the wave choke recess (10). The wave choke recess (10) and the choke portion (12) are electrically isolated from each other.

FIG 1



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Description

[0001] The present invention relates to a wave choke system for an oven door of a microwave oven. Further, the present invention relates to an oven door for a microwave oven. Additionally, the present invention relates to a corresponding microwave oven.

[0002] In household appliances microwave ovens are often used in order to heat food stuff and beverages. However, the microwave ovens generate strong electromagnetic fields. Said electromagnetic fields are a potential threat to the health of the user, if the electromagnetic fields or parts of them leave the cavity of the microwave oven. The oven door of the microwave oven is the most critical part. In particular, microwaves may leave the cavity through the gap between the door frame and the front frame of the cavity.

[0003] Typically, the gap between the oven door and the cavity is sealed with respect to microwaves by integrating wave chokes into the door frame and/or onto the cavity frame. For example, such wave choke systems base on a $\lambda/4$ transformation, in which the impedance at the short circuit wall can be transformed to the space at the opening situated between the wave choke part and the cavity front frame. In this way, the leakage of the microwave is prevented. A wave choke recess has usually a length of $\lambda/4$, wherein λ is the length of the microwaves propagating into the recess. Another type of microwave filter bases on an LC-resonant circuit. This kind of microwave filter is formed by the connection of inductance and capacitance. Mechanical tolerances of the cavity frame and the frame of the oven door can evoke local areas of an increased leakage.

[0004] It is an object of the present invention to provide an improved wave choke system for an oven door of a microwave oven, wherein said wave choke system can be produced in a relative simple way. This object is achieved by the wave choke system according to claim 1.

[0005] The inventive wave choke system for an oven door of a microwave oven is provided for a door frame of the oven door and comprises:

- an elongated wave choke recess made of conductive material,
- an elongated choke portion made of conductive material and arranged parallel to the wave choke recess, and
- at least one elongated cover element made of dielectric material and arranged parallel to the wave choke recess and to the choke portion, wherein
- the wave choke recess, the choke portion and the cover element are formed as profile parts,
- the cross-section of the cover element encloses at least partially the cross-sections of the wave choke recess and the choke portion,
- the cross-section of the choke portion encloses a part of the cross-section of the wave choke recess, and
- the wave choke recess and the choke portion are electrically isolated from each other.

[0006] The main idea of the present invention is the two-part wave choke system, wherein two pieces are made of a conductive material and are electrically isolated from each other. This structure allows a reduced leakage and a higher bandwidth. The functionality of this wave choke system is more robust against mechanical tolerances of the cavity walls and the cavity frame. The required space for the wave choke system within the door frame is relatively small.

[0007] According to a preferred embodiment of the present invention the cross-section of the choke portion encloses a free end part of the cross-section of the wave choke recess.

[0008] Preferably the choke portion comprises a plurality of open slots and lamellae arranged alternating along the longitudinal axis of the choke portion, wherein the slots and the lamellae extend perpendicularly to said longitudinal axis of the choke portion.

[0009] For example, the slots and the lamellae are arranged in a free end part of the cross-section of the choke portion.

[0010] Further, the free end part with the slots and the lamellae is arranged at least partially within an inner space of the wave choke recess.

[0011] According to the preferred embodiment of the present invention the choke portion is formed as a U-shaped profile part.

[0012] Alternatively, the choke portion may be formed as an L-shaped profile part. According to a further embodiment the choke portion may be formed as a C-shaped profile part.

[0013] In the preferred embodiment of the present invention the wave choke recess is formed as a U-shaped profile part enclosing a door panel.

[0014] Further, the open side of the U-shaped wave choke recess may be arranged at an inner side of the oven door.

[0015] In order to allow a simple production, the wave choke recess and the door panel may be formed as a single-piece part. Alternatively, the wave choke recess may be attached at the door panel.

[0016] The cover element may be formed as a C-shaped profile part, wherein the cross-section of the cover element encloses completely the cross-section of the choke portion and partially the cross-section of the wave choke recess.

[0017] Preferably, the cover element covers the open side of the wave choke recess. The cover element prevents accession of non-desirable substances into the wave choke recess.

[0018] Further, the present invention relates to an oven door comprising at least one wave choke system as described above.

[0019] At last, the present invention relates to a microwave oven comprising at least one wave choke system

and/or one oven door as described above.

[0020] The novel and inventive features believed to be the characteristic of the present invention are set forth in the appended claims.

[0021] The invention will be described in further detail with reference to the drawings, in which

FIG 1 illustrates a sectional view of a wave choke system for an oven door of a microwave oven according to a preferred embodiment of the present invention, and

FIG 2 illustrates a perspective sectional view of the wave choke system according the preferred embodiment of the present invention.

[0022] FIG 1 illustrates a sectional view of a wave choke system for an oven door of a microwave oven according to a preferred embodiment of the present invention. FIG 1 shows a part of the oven door and a part of the oven cavity in a closed state of the oven door.

[0023] The wave choke system comprises a wave choke recess 10, a choke portion 12 and a cover element 14. The wave choke recess 10, the choke portion 12 and the cover element 14 are formed as profile parts. The wave choke system is attached at the outer portions of the oven door. The wave choke system is arranged inside the door frame or forms the door frame of the oven door. The oven door comprises a door panel 16 and a viewing glass 18.

[0024] In a closed state of the oven door the wave choke system is arranged in front of a cavity front frame 20. The cavity front frame 20 has a Z-shaped cross-section and encloses circumferentially the frontier portion of the oven cavity.

[0025] The wave choke recess 10 has a substantially rectangular cross section. The wave choke recess 10 is the appendix of the door panel 16 and forms the border of said door panel 16. The wave choke recess 10 encloses partially or completely the door panel 16. In this example the door panel 16 and the wave choke recess 10 form a single-piece part. The door panel 16 with the wave choke recess 10 is made by bending a sheet.

[0026] An inner recess wall 22 extends from the door panel 16 perpendicularly to the plane of said door panel 16. A central recess wall 24 extends from the inner recess wall 22 perpendicularly to said inner recess wall 22 and parallel to the door panel 16. An outer recess wall 26 extends from the central recess wall 24 perpendicularly to said central recess wall 24 and parallel to the inner recess wall 22.

[0027] In an alternative embodiment the wave choke recess 10 consists of one or more separate parts being attached at the door panel 16.

[0028] The cross-section of the wave choke recess 10 has three closed sides 22, 24 and 26 and one open side. The open side of the wave choke recess 10 is partially covered by the choke portion 12 and completely covered by the cover element 14.

[0029] The choke portion 12 is formed as a U-shaped profile part and encloses the outer recess wall 26 of the wave choke recess 10, wherein the open side of the U-shaped profile part faces to outer side of the oven door. In this example the choke portion 12 covers about the half width of the open side of the wave choke recess 10. The cover element 14 is formed as a C-shaped profile part and encloses the central recess wall 26 and the open side of the wave choke recess 10 as well as the outer and upper portions of the choke portion 12.

[0030] Between the inner recess wall 22 of the wave choke recess 10 and the inner side of the choke portion 12 a launch opening 28 is formed. The launch opening 28 extends parallel to the wave choke recess 10. The microwaves from the oven cavity, which propagates through a gap 30 between the cavity front frame 20 and the wave choke system, can intrude through the launch opening 28 into the wave choke recess 10. The launch opening 28 is permeable for the microwaves.

[0031] The wave choke recess 10 and the choke portion 12 are made of an electrically conductive material, in particular metal. The cover element 14 is made of a dielectric material, in particular plastics.

[0032] The wave choke recess 10 and the choke portion 12 are electrically insulated from each other. There is not any galvanic contact between the wave choke recess 10 and the choke portion 12.

[0033] The wave choke recess 10 is in contact with the cover element 14 at the outer side of the inner recess wall 22 and at the bottom side of the central recess wall 24. The choke portion 12 is in contact with the cover element 14 at its outer side and its top side. The choke portion 12 is attached within the cover element 14. The cover element 14 is attached at the wave choke recess 10.

[0034] The wave choke recess 10 can be an extension of or adhered to the door panel 16. The viewing glass 18 is attached on the door panel 16. In its central portion the door panel 16 comprises a cutout or a plurality of holes. Thus, the viewing glass 18 allows a view inside the oven cavity. Preferably, the viewing glass 30 is made of plastics or glass.

[0035] FIG 2 shows a perspective sectional view of the wave choke system according the preferred embodiment of the present invention.

[0036] In FIG 2 the wave choke system, the oven door and the cavity front frame 20 are illustrated. The wave choke system includes the wave choke recess 10, the choke portion 12 and the cover element 14. The oven door comprises a door panel 16 and a viewing glass 18. In the closed state of the oven door the wave choke system is arranged in front of a cavity front frame 20.

[0037] Further, the choke portion 12 includes a plurality of slots 32 und lamellae 34 arranged alternating in series. The slots 32 und lamellae 34 are arranged in that leg of the U-shaped choke portion 12, which extends into the wave choke recess 10. The slots 32 are equally spaced

apart from each other. Thus, also the lamellae 34 are equally spaced apart from each other.

[0038] Although illustrative embodiments of the present invention have been described herein with reference to the accompanying drawing, it is to be understood that the present invention is not limited to those precise embodiments and that various other changes and modifications may be affected therein by one skilled in the art without departing from the scope or spirit of the invention. All such changes and modifications are intended to be included within the scope of the invention as defined by the appended claims.

List of Reference Numerals

[0039]

10	wave choke recess
12	choke portion
14	cover element
16	door panel
18	viewing glass
20	cavity front frame
22	inner recess wall
24	central recess wall
26	outer recess wall
28	launch opening
30	gap
32	slot
34	lamellae

Claims

1. A wave choke system for an oven door of a microwave oven, which wave choke system is provided for a door frame of the oven door and comprises:

- an elongated wave choke recess (10) made of conductive material,
- an elongated choke portion (12) made of conductive material and arranged parallel to the wave choke recess (10), and
- at least one elongated cover element (14) made of dielectric material and arranged parallel to the wave choke recess (10) and to the choke portion (12), wherein
- the wave choke recess (10), the choke portion (12) and the cover element (14) are formed as profile parts,
- the cross-section of the cover element (14) encloses at least partially the cross-sections of the wave choke recess (10) and the choke portion (12),
- the cross-section of the choke portion (12) encloses a part of the cross-section of the wave choke recess (10), and
- the wave choke recess (10) and the choke portion (12) are electrically isolated from each other.

2. The wave choke system according to claim 1, **characterized in that** the cross-section of the choke portion (12) encloses a free end part of the cross-section of the wave choke recess (10).

3. The wave choke system according to claim 1 or 2, **characterized in that** the choke portion (12) comprises a plurality of open slots (32) and lamellae (34) arranged alternating along the longitudinal axis of the choke portion (12), wherein the slots (32) and the lamellae (34) extend perpendicularly to said longitudinal axis of the choke portion (12).

4. The wave choke system according to claim 3, **characterized in that** the slots (32) and the lamellae (34) are arranged in a free end part of the cross-section of the choke portion (12).

5. The wave choke system according to claim 4, **characterized in that** the free end part with the slots (32) and the lamellae (34) is arranged at least partially within an inner space of the wave choke recess (10).

6. The wave choke system according to any one of the preceding claims, **characterized in that** the choke portion (12) is formed as a U-shaped profile part.

7. The wave choke system according to any one of the claims 1 to 5, **characterized in that** the choke portion (12) is formed as an L-shaped profile part.

8. The wave choke system according to any one of the claims 1 to 5, **characterized in that** the choke portion (12) is formed as a C-shaped profile part.

9. The wave choke system according to any one of the preceding claims,
characterized in that
the wave choke recess (10) is formed as a U-shaped profile part enclosing a door panel (16).

10. The wave choke system according to claim 9,
characterized in that
the open side of the U-shaped wave choke recess (10) is arranged at an inner side of the oven door.

11. The wave choke system according to claim 9 or 10,
characterized in that
the wave choke recess (10) and the door panel (16) are formed as a single-piece part or the wave choke recess (10) is attached at the door panel (16).

12. The wave choke system according to any one of the preceding claims,
characterized in that
the cover element (14) is formed as a C-shaped profile part, wherein the cross-section of the cover element (14) encloses completely the cross-section of the choke portion (12) and partially the cross-section of the wave choke recess (10).

13. The wave choke system according to any one of the preceding claims,
characterized in that
the cover element (14) covers the open side of the wave choke recess (10).

14. An oven door for a microwave oven,
characterized in that
the oven door comprises at least one wave choke system according to any one of the claims 1 to 13.

15. A microwave oven with at least one oven door and at least one wave choke system,
characterized in that
the microwave oven comprises at least one wave choke system according to any one of the claims 1 to 13 and/or one oven door according to claim 14.

FIG 1

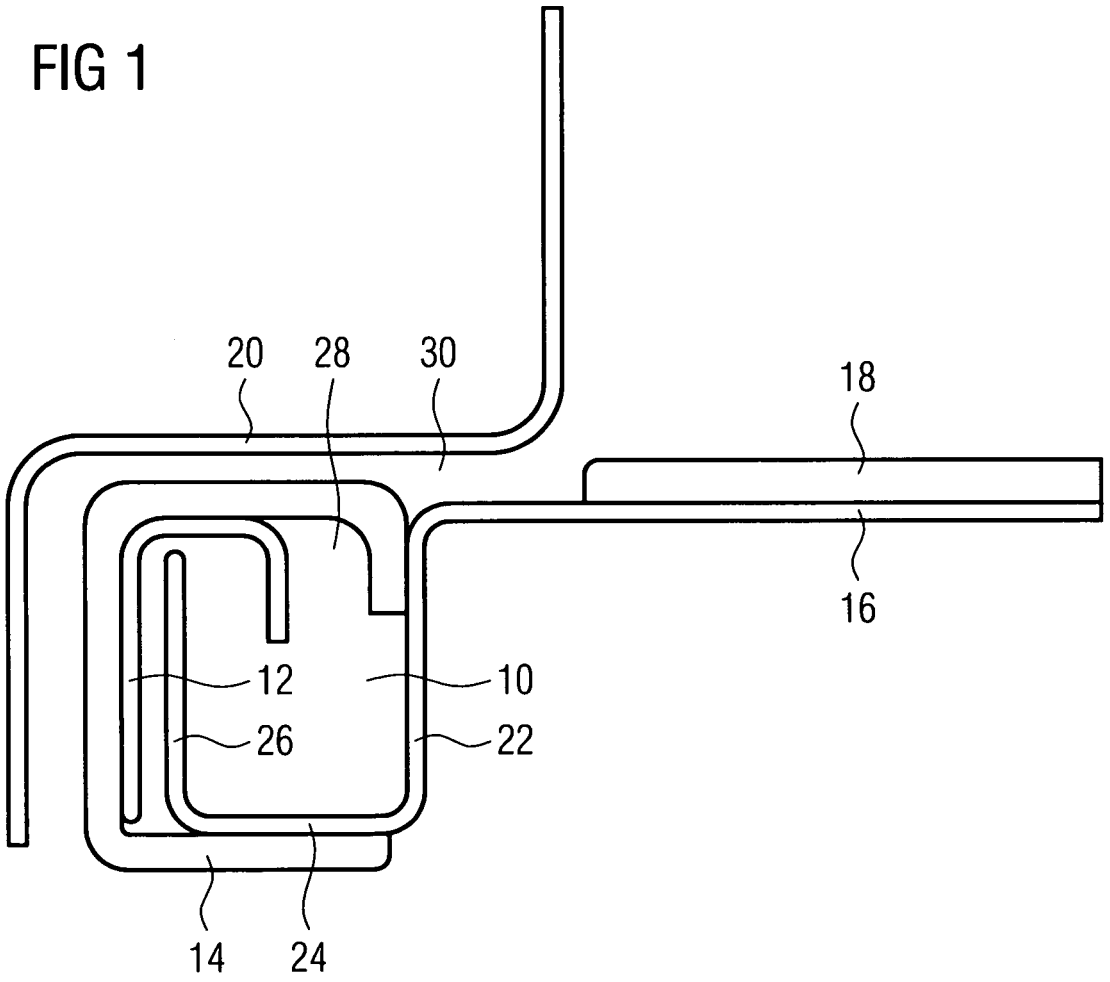
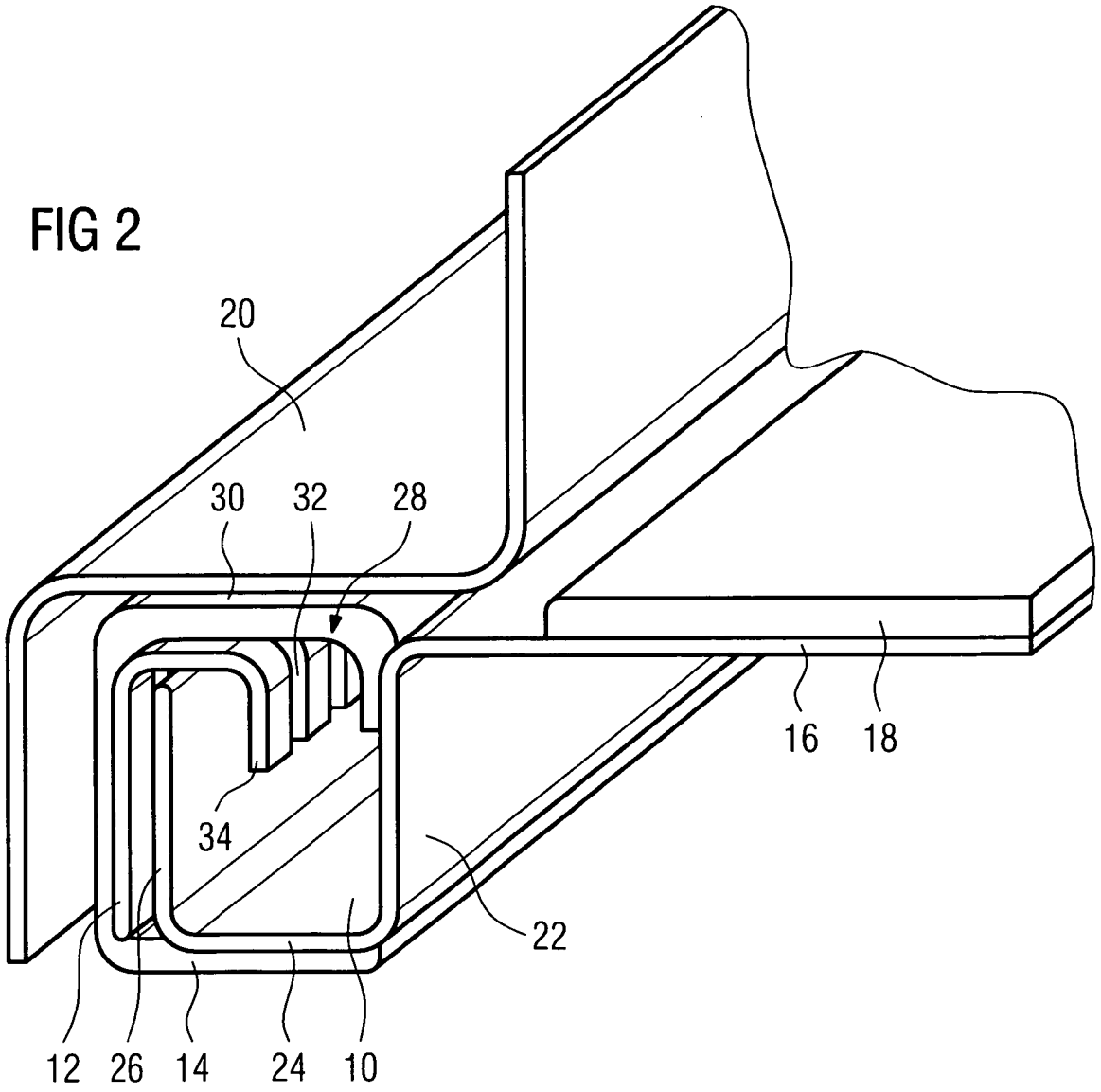


FIG 2



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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 8660

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TECHNICAL FIELDS SEARCHED (IPC)

H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 September 2009	de la Tassa Laforgue

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