(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 763 286 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.03.2007 Bulletin 2007/11

(51) Int Cl.:
H05B 6/80 *(2006.01)*

(21) Application number: **06120454.1**

(22) Date of filing: **11.09.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **12.09.2005 JP 2005263389**

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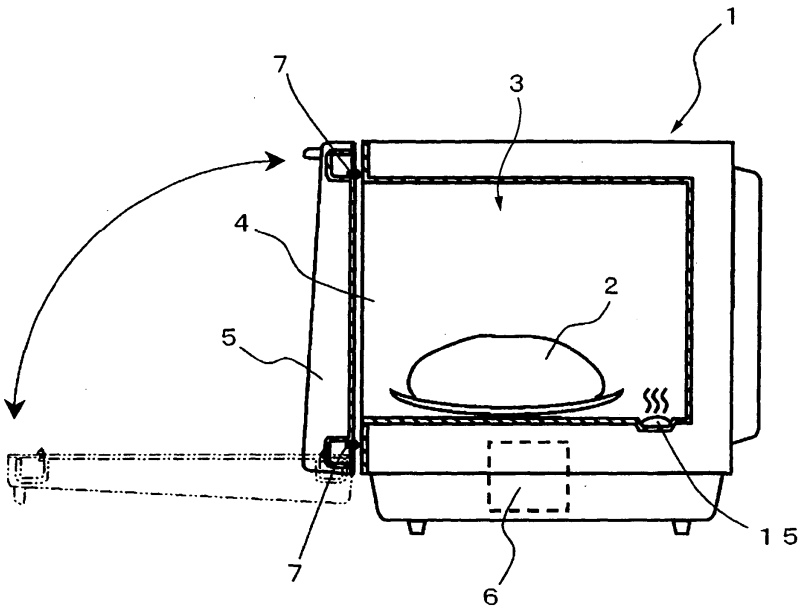
(54) Cooking apparatus

(57) In the cooking apparatus, a gasket 7 is structured such that, where a clearance (shown by an arrow mark G) between a door and the edge of the opening portion of a heating chamber while the door is shut is large, the leading end of a fin-like lip 12 of the gasket 7 is closely stuck on the opening portion edge and also, where the clearance is small, while not only the fin-like lip 12 but also a hollow portion 11 of the gasket are deformed, the gasket 7 is stuck on the opening portion edge. And, where the clearance is further smaller, while the hollow portion 11 and fin-like lip 12 are both deformed greatly, the gasket 7 is stuck on the opening portion edge. In this manner, even when the clearance is uneven, the close contact of the gasket 7 can be secured, which makes it possible to prevent steam and/or smoke against leakage while a food is being heated.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a cooking apparatus such as a microwave oven for cooking a food stored within a heating chamber.

2. Related Art

[0002] Conventionally, there is known a cooking apparatus of a type structured such that a gasket is used to seal between a door and the edge of the opening portion of a heating chamber in order to prevent steam or smoke from leaking out of the door.

[0003] And, there is also known a cooking apparatus in which a gasket is formed in a hollow tubular shape so as to be able absorb an uneven clearance between a door and the edge of the opening portion of a heating chamber and thus stick the gasket closely on the edge of the opening portion; where the uneven clearance is caused by variations in the door assembly and/or by variations in the flatness deviation of the opening portion edge of the heating chamber (For example, see Japanese Patent Publication H05-26460A).

[0004] However, in the structure of the above-mentioned conventional gasket, although the unevenness of the clearance can be absorbed to a certain degree and the gasket can be closely stuck on the opening portion edge, when the gasket is deformed greatly in order to further enhance the sealing performance thereof, a repelling force works excessively, which provides an obstacle to the shutting operation of the door.

SUMMARY OF THE INVENTION

[0005] The present invention aims at solving the above-mentioned problem found in the conventional cooking apparatus. And thus, it is an object of the invention to provide a cooking apparatus which not only can enhance the close contact of the gasket, that is, the sealing performance of the gasket but also can facilitate the shutting operation of the door.

[0006] In solving the above-mentioned conventional problem, according to the invention, there is provided a cooking apparatus which includes a hollow gasket for sealing between a door while shut and the edge of the opening portion of a heating chamber, wherein the gasket includes a fin-like lip formed on the outer surface thereof and extending in the longitudinal direction thereof.

[0007] Therefore, not only because the hollow shape of the gasket can be varied but also because the fin-like lip can be elastically shifted, the gasket can be closely contacted with the edge of the opening portion of the heating chamber with ease.

[0008] According to a cooking apparatus of the invention, even when a clearance between the door and the edge of the opening portion of the heating chamber is uneven, steam and/or smoke can be prevented from leaking out of the door during cooking.

[0009] According to a first aspect of the invention, there is provided a cooking apparatus which comprises: a heating chamber for storing an object to be heated therein; a door for opening and shutting the opening portion of the heating chamber; a heating device for heating the object to be heated; and, a hollow gasket composed of an elastic member for sealing between the door while shut and the edge of the opening portion of the heating chamber, wherein the gasket includes a fin-like lip integrally formed on the outer surface thereof and extending in the longitudinal direction thereof.

Thanks to this aspect, when the door is shut, the hollow portion of the gasket is deformed along with the fin-like lip, thereby being able to enhance the close contact of the gasket on the opening portion edge.

[0010] According to a second aspect of the invention, especially, the fin-like lip according to the first aspect of the invention is inclined inwardly with respect to the edge of the opening portion of the heating chamber. Thanks to this, not only the pressure of the interior of the heating chamber is applied to the fin-like lip but also a force is applied in a direction where the fin-like lip is raised, thereby being able to further enhance the close contact on the gasket.

[0011] According to a third aspect of the invention, especially, the fin-like lip according to the second aspect of the invention is inclined outwardly with respect to the opening portion of the heating chamber. Thanks to this, in the corner portion of the gasket while mounted, the fin-like lip can be prevented from generating wrinkles therein, which makes it possible to enhance the close contact on the gasket.

[0012] According to a fourth aspect of the invention, there is provided a cooking apparatus which comprises: a heating chamber for storing an object to be heated therein; a door for opening and shutting the opening portion of the heating chamber; a heating device for heating the object to be heated; and, a gasket for sealing between the door while shut and the edge of the opening portion of the heating chamber, wherein the gasket includes a fin-like lip inclined inwardly with respect to the opening portion of the heating chamber. Thanks to this, not only the pressure of the interior of the heating chamber is applied to the fin-like lip but also a force is applied in a direction where a fin-like seal piece is raised, thereby being able to further enhance the close contact of the gasket on the edge of the opening portion. Also, in this structure, since the fin-like lip is simply deformed, the shutting operation of the door can be facilitated further.

[0013] According to a fifth aspect of the invention, there is further provided a steam generator for supplying steam to the heating chamber. Thanks to this, the gasket prevents the steam from leaking out of the door, which makes it possible to execute steam cooking in which a

large amount of steam is generated.

[0014] According to a sixth aspect of the invention, the heating device is composed of a high frequency wave supply device for heating the object to be heated directly. Thanks to this, the gasket prevents the steam from leaking out of the door, which makes it possible to execute high frequency cooking in which a large amount of steam is generated.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a side section view of a cooking apparatus according to a first embodiment of the invention.
Fig. 2 is a front view of a door included in the cooking apparatus according to the first embodiment, when it is viewed from the heating chamber side.
Fig. 3 is a section view of the vicinity of a gasket used in the cooking apparatus according to the first embodiment.
Fig. 4A is a section view of the gasket used in the first embodiment, showing its contact state.
Fig. 4B is a section view of the gasket used in the first embodiment, showing its contact state.
Fig. 4C is a section view of the gasket used in the first embodiment, showing its contact state.
Fig. 5A is a section view of a gasket used in a second embodiment of the invention.
Fig. 5B is a section view of the gasket used in the second embodiment, showing its contact state.
Fig. 6A is a section view of a gasket used in a third embodiment of the invention.
Fig. 6B is a section view of the gasket used in the third embodiment, showing its contact state.
Fig. 7A is a section view of a gasket used in a fourth embodiment of the invention.
Fig. 7B is a section view of the gasket used in the fourth embodiment, showing its contact state.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] Now, description will be given below of an embodiment of a cooking apparatus according to the invention with reference to the accompanying drawings. By the way, the invention is not limited to the present embodiment.

(Embodiment 1)

[0017] In Fig. 1, a cooking apparatus 1 composed of a microwave oven includes a heating chamber 3 for storing therein a food 2 which is an object to be heated, a door 5 for shutting the opening portion 4 of the heating chamber 3, and a high frequency wave supply device 6 which is a heating device for heating a food 2 directly.

[0018] As shown in Fig. 2, on the door 5, specifically, outside an observation window 8, there is mounted a gasket 7 which is formed of an elastic material such as rubber in a substantially rectangular ring-like shape and is used to seal between the door 5 while shut and the edge of the opening portion 4.

[0019] As shown in Fig. 3, the door 5 is composed of a door frame 9 and a choke cover 10 which cooperate together in constituting a choke structure for cutting off radio waves generated from the high frequency wave supply device 6, while the gasket 7 is mounted in such a manner that it is secured to the choke cover 10.

[0020] The gasket 7 has a tubular shape including a hollow portion 11 extending continuously in the longitudinal direction of the gasket 7, and further includes a fin-like lip 12 formed integrally on the outer surface of the gasket 7 and extending in the longitudinal direction of the gasket 7.

[0021] By the way, a small lip 13, which is provided on the inner peripheral side of the gasket 7, is used to seal between the door frame 9 and choke cover 10. Also, a void 14 is used to facilitate the mounting of the gasket 7 when it is produced and, therefore, the object and operation effect of the void 14 are different those of the hollow portion 11 according to the invention.

[0022] Now, description will be given below of the operation and operation effects of the above structured cooking apparatus.

[0023] When shutting the door 5, as shown in Fig. 4A, the fin-like lip 12 of the gasket 7 is contacted with and closely stuck on the edge of the opening portion 4 to thereby seal between them. Here, a clearance (which is shown by an arrow mark G), which is a portion to be sealed by the fin-like lip 12, is often uneven due to variations in the assembling operation of the door and/or due to variations in the dimensions of parts.

[0024] Where the clearance is large, as shown in Fig. 4A, the leading end of the fin-like lip 12 is contacted with the edge of the opening portion; and, where the clearance is small, as shown in Fig. 4B, while not only the fin-like lip 12 but also the hollow portion 11 are deformed, the gasket 7 is contacted with and closely stuck on the edge of the opening portion 4. Also, where the clearance is further smaller, as shown in Fig. 4C, while the hollow portion 11 and fin-like lip 12 are both deformed greatly, the gasket 7 is contacted with and closely stuck on the edge of the opening portion 4.

[0025] In this manner, even when the clearance is uneven, the close contact of the gasket 7 can be secured, thereby being able to prevent steam and/or smoke against leakage while the food is being heated.

[0026] As described above, according to the present embodiment, even where the clearance is small, the shutting of the door is not hindered but a positive seal function can be exhibited. Here, the resilient force of the whole gasket is composed of a combination of the resilient force of the fin-like lip and the resilient force of the hollow portion. As an adjusting method (designing method) thereof, there are known a method in which the thick-

nesses and shapes of the fin-like lip and hollow portion are decided selectively, and a method in which there are formed two or more series of hollow portions continuing in the longitudinal direction of the gasket. These may be designed in an optimal manner to thereby be able to secure the close contact of the gasket.

[0027] By the way, the hollow portions may preferably be arranged in series but, depending on the design condition or the like, they may also be intermittent. Preferably, when the gasket is formed in a ring shape, a series of hollow portions may be formed air tight, whereby the elasticity of the air can be used.

[0028] On the other hand, even if the close contact of the gasket is rather insufficient, when the quantities of steam and smoke generated are small, there is not much fear that the steam and smoke can leak. However, in a microwave oven which heats a food directly using high frequency waves, when compared with a cooking apparatus using a heater, the quantity of steam is large because steam is also generated from the inside of the food. Therefore, the present gasket is very useful in the microwave oven.

[0029] Especially, in recent years, in order to prevent a food from drying or for the purpose of a new cooking effect using steam, there has been widely spread a microwave oven including a steam generator 15; and, the quantity of generation of steam tends to increase more and more. In such microwave oven including a steam generator positively as well, the present gasket can provide a great effect.

[0030] By the way, as an example of a cooking apparatus including a steam generator, description has been given of a microwave oven. Of course, according to the present embodiment of the invention, there can be provided a similar effect even in a steam cooking apparatus in which, without using the high frequency waves, the steam generator is used as heating device and a food is heated and cooked using high temperature steam or excessively heated steam.

(Embodiment 2)

[0031] In Figs. 5A and 5B, the fin-like lip 12 formed on the gasket 7, as shown in Fig. 5A, is structured such that it is inclined inwardly with respect to the opening portion 4. This fin-like lip 12, when the door 5 is shut, as shown in Fig. 5B, is contacted with and closely stuck on the edge of the opening portion 4.

[0032] Here, the interior of the heating chamber is in a high pressure state due to generation of steam or the like and/or due to expansion of the air caused by an increase in the temperature of the interior of the heating chamber. As a result of this, such force as shown by an arrow mark A is applied to the fin-like lip 12.

[0033] This causes a force which is applied to the fin-like lip 12 in a direction to raise the projection portion 12, that is, in a direction to increase the close contact performance of the lip 12, resulting in a great effect that the steam and/or smoke can be prevented against leakage.

(Embodiment 3)

[0034] In Figs. 6A and 6B, the fin-like lip 12 formed on the gasket 7, as shown in Fig. 6A, is structured such that it is inclined outwardly with respect to the edge of the opening portion 4. This fin-like lip 12, when the door 5 is shut, as shown in Fig. 6B, is deformed in the outer peripheral direction and is contacted with and closely stuck on the edge of the opening portion 4.

[0035] Here, to produce the gasket 7, generally, an extrusion molding of rubber is cut to a given length and, after then, the given length of molding is formed into a ring shape. The thus structured gasket 7, as shown in Fig. 2, is mounted on the door 5 substantially in a rectangular ring shape. In this case, the corner portion (shown by an arrow mark R in Fig. 2) of the gasket 7 is compressed on the inside thereof and is expanded on the outside thereof when compared with the linear portion (shown by an arrow mark S in Fig. 2) of the gasket 7.

[0036] When the fin-like lip 12 is formed inclined inwardly with respect to the opening portion 4, owning to the compression deformation of the corner portion, wrinkles are easy to occur in the fin-like lip 12, thereby lowering the close contact performance of the lip 12.

[0037] To make the wrinkles difficult to occur, there is known a method in which the radius of the corner portion is increased; however, since there are restrictions to the design of the door frame 9 and to the shape of the observation window 8, this method is not preferable. Also, there is also known a method in which the fin-like lip 12 is shortened. However, in the case of an extrusion molding, because the section thereof is constant over the entire shape of the extrusion molding, the fin-like lip 12 is shortened even in the linear portion of the gasket, with the result that the close contact of the gasket is insufficient for a large clearance. Or, there is further known a method in which a gasket with the fin-like lip 12 shortened only in the corner portion of the gasket is manufactured using a mold not by extrusion molding. However, in this method, the manufacturing cost of the gasket is expensive and also such gasket provides poor versatility when it is diverted to other cooking apparatus which are different only in the length of the gasket.

[0038] According to the present embodiment, since the fin-like lip 12 is inclined outwardly with respect to the opening portion 4, the lip 12 is extendedly deformed in the corner portion of the gasket. Therefore, the elasticity of the rubber material not only can prevent the fin-like lip 12 from causing wrinkles therein but also can prevent the close contact performance of the gasket from being lowered. Thus, the present embodiment can provide a gasket which is inexpensive and versatile as well as can provide a high close contact performance. Also, the radius of the corner portion of the gasket can be reduced.

(Embodiment 4)

[0039] In Figs. 7A and 7B, as shown in Fig. 7A, a gasket 7 is structured such that it includes a fin-like lip 16 formed inclined inwardly with respect to an opening portion 4. This fin-like lip 16, when the door 5 is shut, as shown in Fig. 7B, is contacted with and closely stuck on the edge of the opening portion 4.

[0040] Here, the interior of the heating chamber is in a high pressure state due to generation of steam or the like and/or due to expansion of the air caused by an increase in the temperature of the interior of the heating chamber. As a result of this, such force as shown by an arrow mark B is applied to the fin-like lip 16.

[0041] This causes a force which is applied to the fin-like lip 16 in a direction to raise the projection portion 16, that is, in a direction to increase the close contact performance of the lip 16, resulting in a great effect that can prevent the steam and/or smoke against leakage.

[0042] Now, in the embodiments 1 - 4, description has been given heretofore of an example in which the gasket 7 is mounted on the door 5 of a cooking apparatus. Inversely, there may also be employed a structure in which the gasket 7 is mounted on the main body side of the cooking apparatus, that is, on the edge of the opening portion 4 and thus the gasket 7 can be contacted with and closely stuck on the door side.

[0043] Especially, in such cooking apparatus as shown in Fig. 1 which includes a hinge in the lower portion of the door 5 and the door can be opened and shut in the vertical direction, since a food (dish) is temporarily placed on the door that is opened, sometimes, a foreign object (dirt) such as the food or the like can adhere to the gasket. When the gasket is mounted on the main body side of the cooking apparatus, there is provided an effect that such adherence of the dirt can be prevented.

[0044] Of course, the invention can similarly apply to a cooking apparatus in which a hinge is provided on the side portion of the door and the door can be opened and shut in the horizontal direction, or a cooking apparatus in which a heating chamber is opened upwardly.

[0045] On the other hand, in a microwave oven, when the gasket is complicated in shape, it has an ill influence on the radio wave distribution within a heating chamber and on a measure to reduce a standing wave, which requires a new measure to eliminate such influence. The gasket according to the invention includes only a hollow portion and a fin-like lip, that is, it has a simple shape. Thanks to this, a new measure is not necessary and also there is provided an effect that the design of the microwave oven can be facilitated.

[0046] As has been described heretofore, a cooking apparatus according to the invention can prevent steam and/or smoke from leaking out of the door during cooking and, therefore, it is useful as a cooking apparatus.

Claims

1. A cooking apparatus comprising:

a heating chamber for storing an object to be heated therein;
a door for opening and shutting the opening portion of the heating chamber;
a heating device for heating the object to be heated; and
a hollow gasket made of an elastic member for sealing between the door and an edge of the opening portion of the heating chamber when the door is shut,

wherein the gasket includes a fin-like lip integrally formed on an outer surface thereof and extending in a longitudinal direction of the gasket.

2. A cooking apparatus according to Claim 1, wherein the fin-like lip is inclined inwardly.

3. A cooking apparatus according to Claim 1, wherein the fin-like lip is inclined outwardly.

4. A cooking apparatus comprising:

a heating chamber for storing an object to be heated therein;
a door for opening and shutting the opening portion of the heating chamber;
a heating device for heating the object to be heated; and
a gasket for sealing between the door and an edge of the opening portion of the heating chamber when the door is shut,

wherein the gasket includes an inwardly inclined fin-like lip.

5. A cooking apparatus according to any one of Claims 1 to 4, further including a steam generator for supplying steam to the heating chamber.

6. A cooking apparatus according to any one of Claims 1 to 4, wherein the heating device is a high frequency wave supply device for heating the object to be heated directly.

FIG. 1

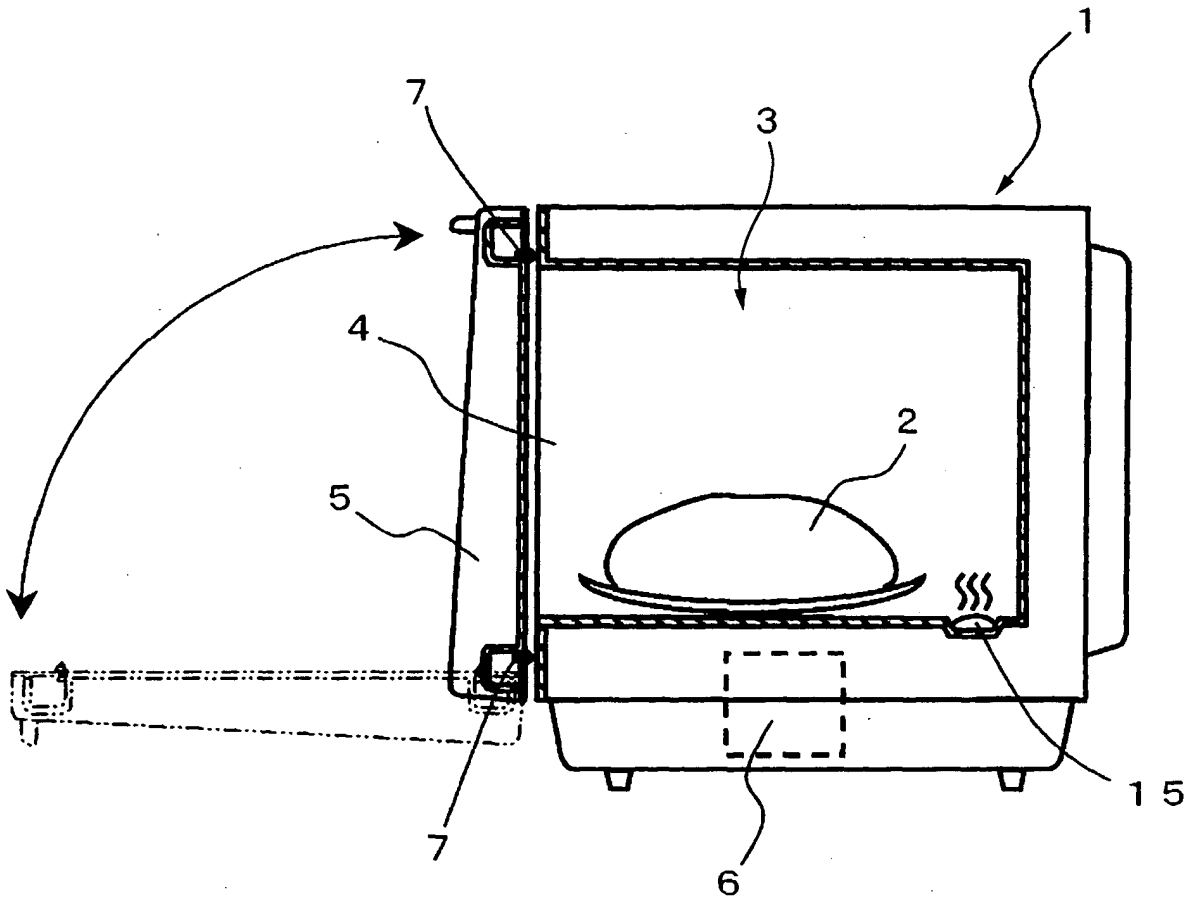


FIG. 2

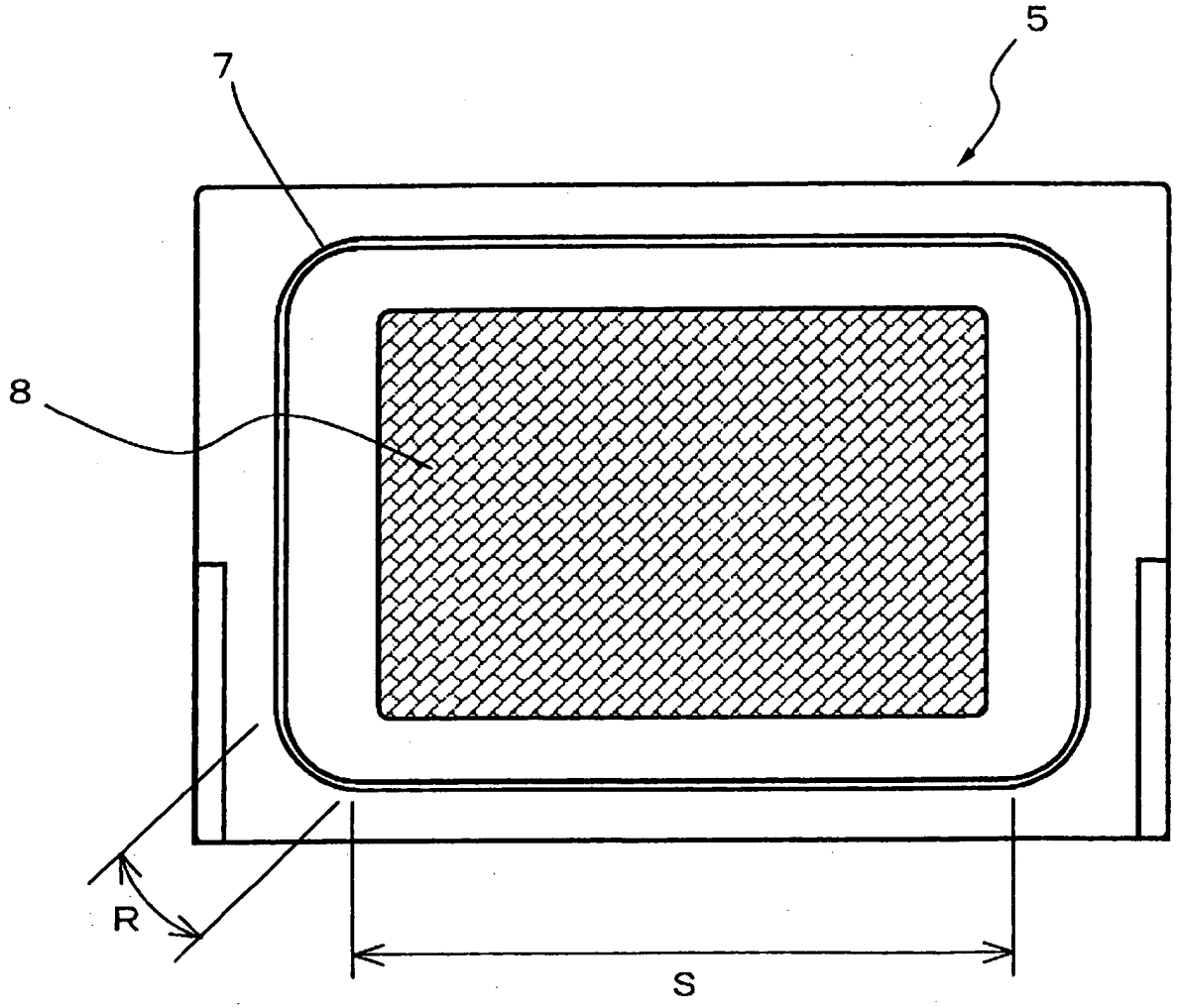


FIG. 3

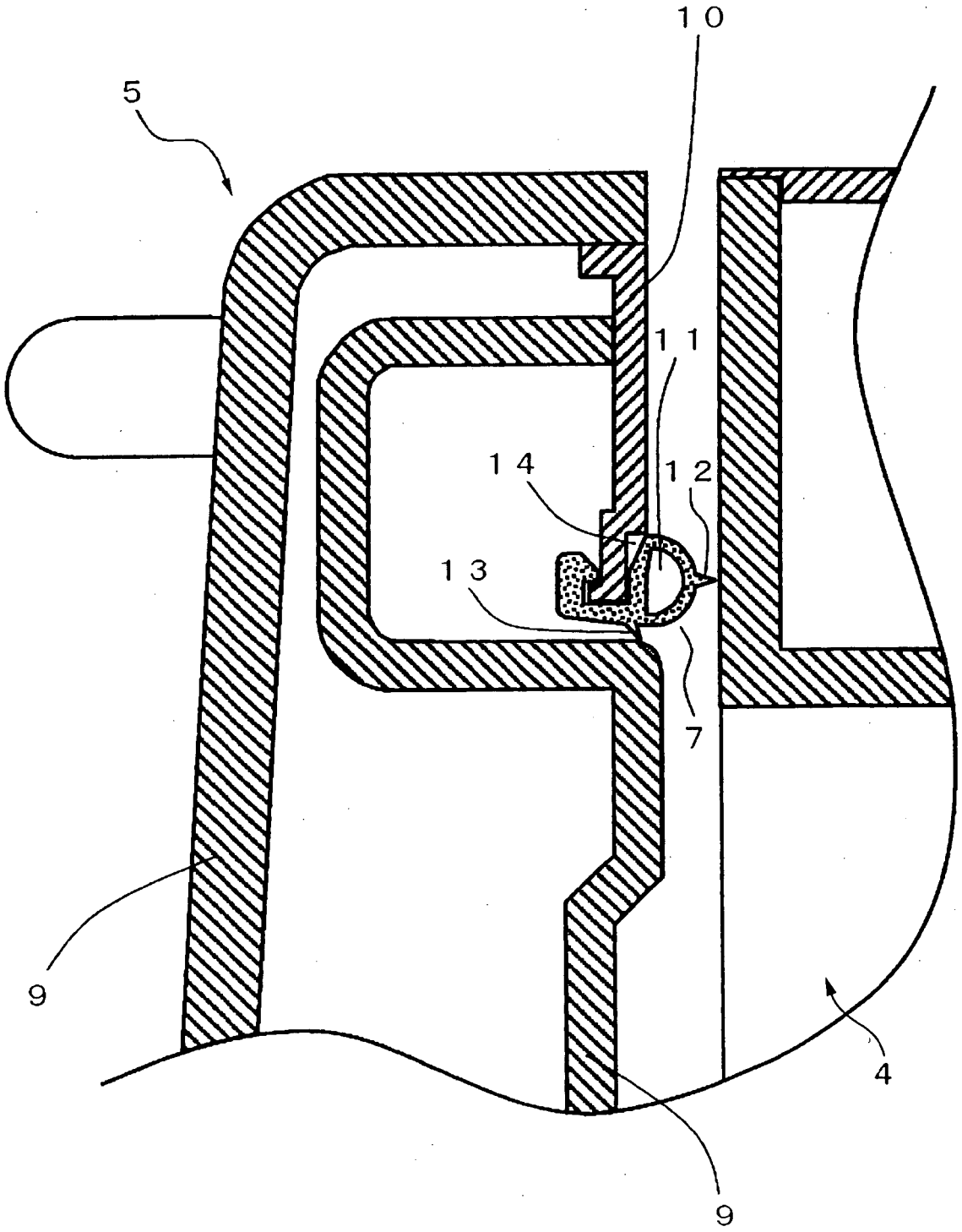


FIG. 4A

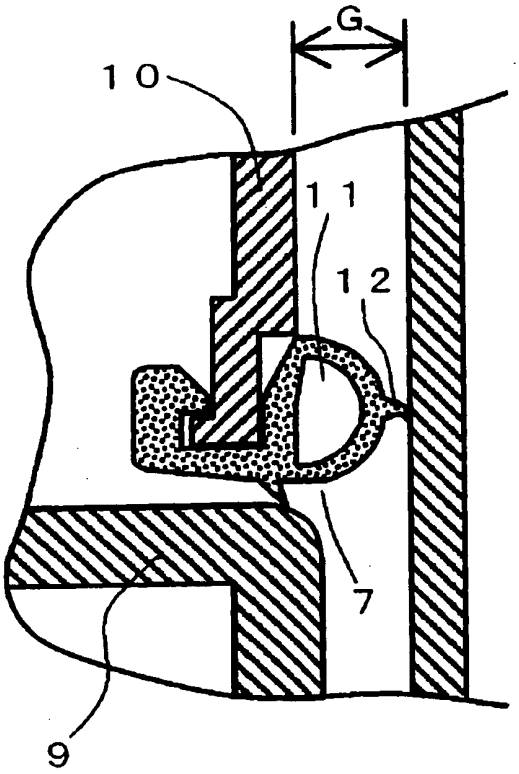


FIG. 4B

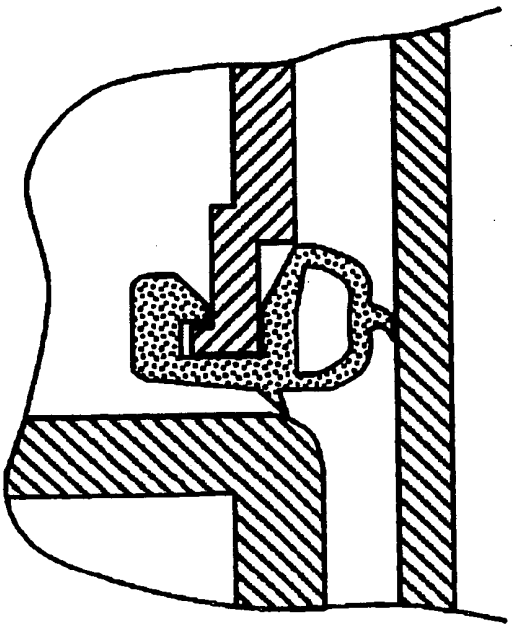


FIG. 4C

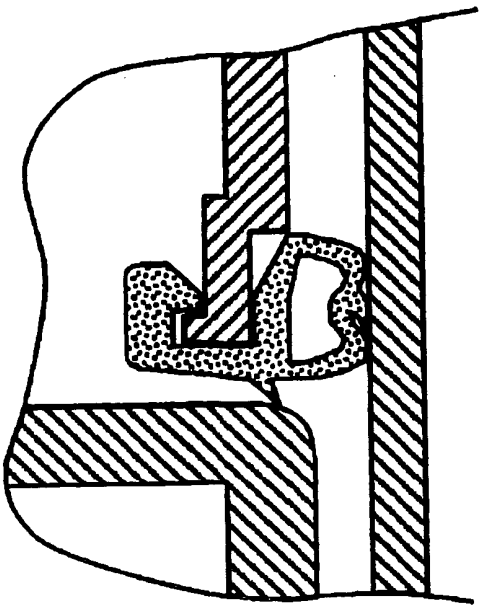


FIG. 5A

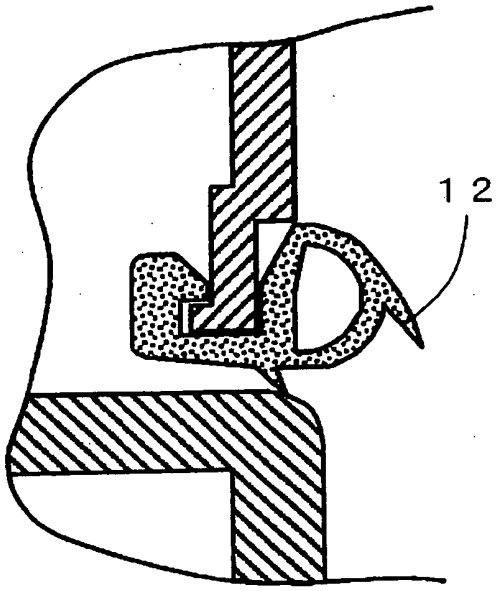


FIG. 5B

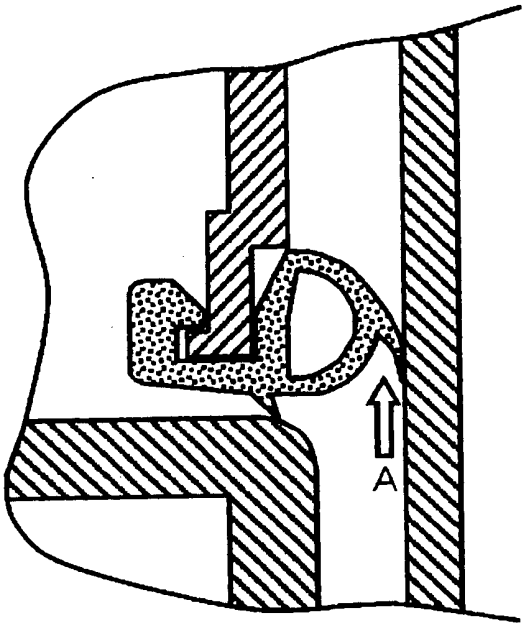


FIG. 6A

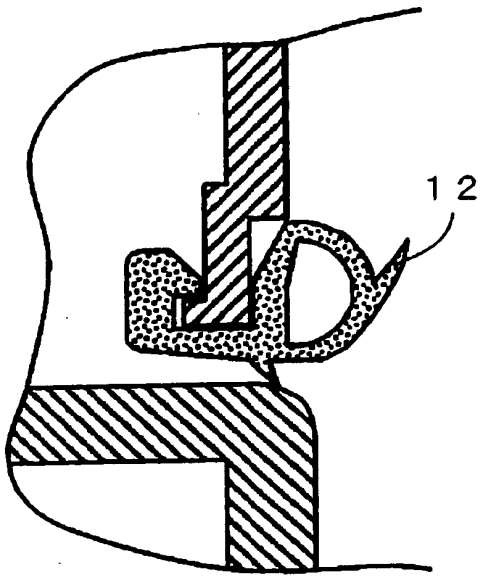


FIG. 6B

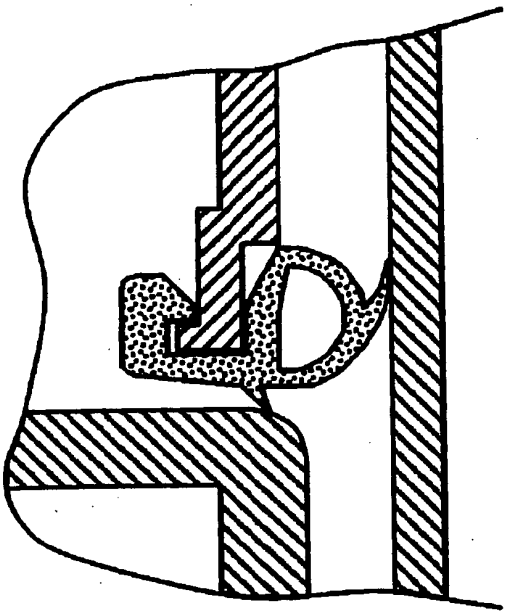


FIG. 7A

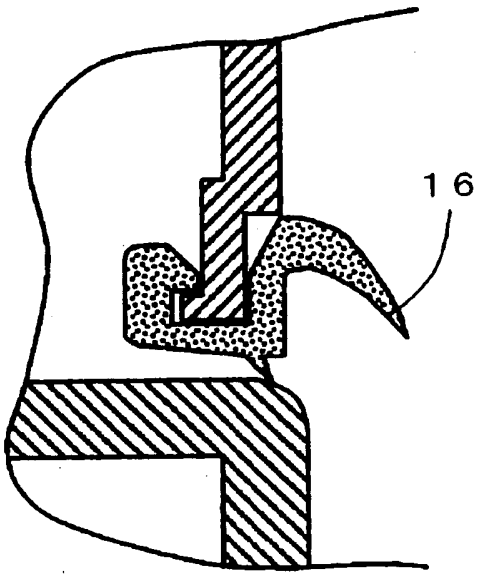
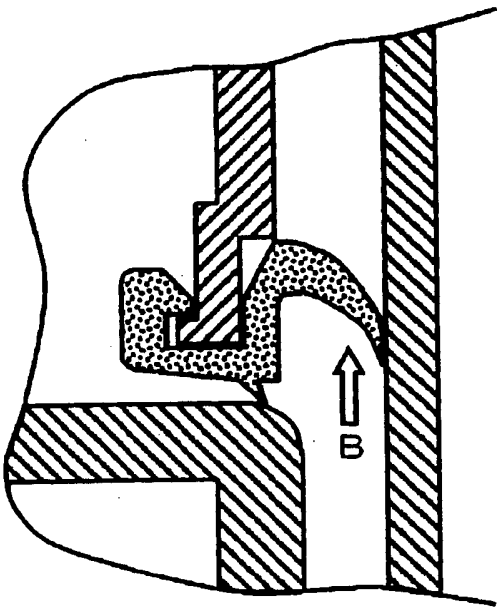


FIG. 7B



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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