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(54) **APPARATUS FOR A HOUSEHOLD APPLIANCE**

(57) The present disclosure relates to an apparatus (100) for a household appliance. The apparatus (100) includes a first panel (110) and a second panel (120) having a space (S) therebetween; an air inlet (130) providing an inlet to the space (S) between the first panel (110) and the second panel (120); and an opening and

closing mechanism (140) configured to selectively open and close the air inlet (130), wherein the opening and closing mechanism (140) includes a material configured to open and close the air inlet (130) by a thermal expansion of the material.

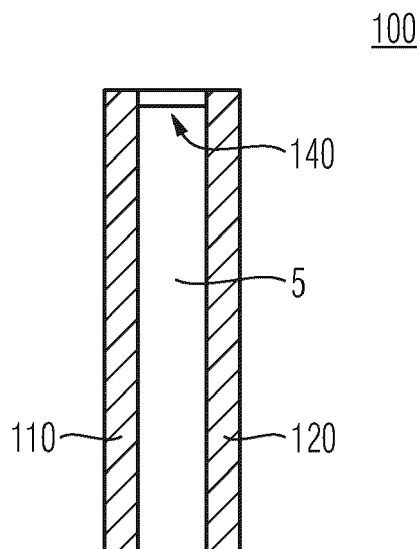


Fig. 1

Description

FIELD

[0001] Embodiments of the present disclosure relate to an apparatus for a household appliance and a household appliance having the apparatus. Embodiments of the present disclosure particularly relate to a double-sided oven door.

BACKGROUND

[0002] In a conventional oven, the door may include two pieces of glass, also known as windows. An air gap may be provided between the two pieces of glass to allow a circulation of air within the space. However, dirt and stains may contaminate the air gap. In order to remove the dirt and stains, the air gap between the two windows should be cleaned regularly.

[0003] In order to clean the two windows, an upper air duct needs to be removed, which may be attached with two bolts on the sides of the windows, and the two windows may be released and cleaned with a cloth. This is generally quite inconvenient for users.

[0004] In an oven where a single glass is used instead of two glasses, dirt can be easily removed, but an energy efficiency is reduced compared to the two glass configuration which provides a thermal insulation of the oven chamber.

[0005] In view of the above, new apparatuses for a household appliance and household appliances having the apparatus that overcome at least some of the problems in the art are beneficial.

SUMMARY

[0006] In light of the above, an apparatus for a household appliance and a household appliance having the apparatus are provided.

[0007] It is an object of the present disclosure to provide an apparatus for a household appliance and a household appliance having the apparatus which can reduce or even prevent the accumulation of dirt between two windows of the apparatus.

[0008] Further objects, aspects, benefits, and features of the present disclosure are apparent from the claims, the description, and the accompanying drawings.

[0009] According to an independent aspect of the present disclosure, an apparatus for a household appliance is provided. The apparatus includes a first panel and a second panel having a space therebetween; an air inlet providing an inlet to the space between the first panel and the second panel; and an opening and closing mechanism configured to selectively open and close the air inlet, wherein the opening and closing mechanism includes a material configured to open and close the air inlet by a thermal expansion of the material.

[0010] According to another independent aspect of the

present disclosure, a household appliance is provided. The household appliance includes the apparatus of the present disclosure which preferably includes a first panel and a second panel having a space therebetween; an air inlet providing an inlet to the space between the first panel and the second panel; and an opening and closing mechanism configured to selectively open and close the air inlet, wherein the opening and closing mechanism includes a material configured to open and close the air inlet by a thermal expansion of the material.

[0011] Embodiments are also directed at devices for carrying out the disclosed methods and include apparatus parts for performing each described method aspect. These method aspects may be performed by way of hardware components, a computer programmed by appropriate software, by any combination of the two or in any other manner. Furthermore, embodiments according to the disclosure are also directed at methods for operating the described apparatus. The methods include method aspects for carrying out every function of the apparatus for a household appliance.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] So that the manner in which the above recited features of the present disclosure can be understood in detail, a more particular description of the disclosure, briefly summarized above, may be had by reference to embodiments. The accompanying drawings relate to embodiments of the disclosure and are described in the following:

FIG. 1 shows a cross-sectional view of an apparatus for a household appliance according to embodiments described herein;

FIG. 2 shows a schematic view of an apparatus for a household appliance according to embodiments described herein;

FIG. 3 shows a schematic view of an opening and closing mechanism of the apparatus for a household appliance according to embodiments described herein; and

FIG. 4 shows a schematic view of a detection mechanism of the apparatus for a household appliance according to embodiments described herein.

DETAILED DESCRIPTION OF EMBODIMENTS

[0013] Reference will now be made in detail to the various embodiments of the disclosure, one or more examples of which are illustrated in the figures. Within the following description of the drawings, the same reference numbers refer to same components. Generally, only the differences with respect to individual embodiments are

described. Each example is provided by way of explanation of the disclosure and is not meant as a limitation of the disclosure. Further, features illustrated or described as part of one embodiment can be used on or in conjunction with other embodiments to yield yet a further embodiment. It is intended that the description includes such modifications and variations.

[0014] An oven door may include two pieces of glass, wherein an air gap may be provided between the two pieces of glass to allow a circulation of air within the space. However, dirt and stains may contaminate the air gap. In order to remove the dirt and stains, the air gap between the two windows should be cleaned on a regular basis.

[0015] The embodiments of the present disclosure can prevent a contamination of the air gap with dirt by providing the opening and closing mechanism configured to selectively open and close the air inlet using a thermal expansion of a cover of the air inlet.

[0016] FIG. 1 shows a cross-sectional view of an apparatus 100 for a household appliance according to embodiments described herein. FIG. 2 shows a schematic view of the apparatus 100 for a household appliance according to embodiments described herein.

[0017] The apparatus 100 includes a first panel 110 and a second panel 120 having a space S therebetween; an air inlet 130 providing an inlet to the space S between the first panel 110 and the second panel 120; and an opening and closing mechanism 140 configured to selectively open and close the air inlet 130, wherein the opening and closing mechanism 140 includes a material configured to open and close the air inlet 130 by a thermal expansion of the material.

[0018] In a closed state, the opening and closing mechanism 140 can prevent liquids, solids and air from entering the space S between the first panel 110 and the second panel 120. In an open state, the opening and closing mechanism 140 allow a circulation of air through the space S between the first panel 110 and the second panel 120.

[0019] Thermal expansion is the tendency of a material to change its shape, area, and volume in response to a change in temperature. For example, the material may be a metal material which has a thermal expansion coefficient suitable to open and close the air inlet 130 in response to a change of temperature e.g. in a cooking chamber of an oven.

[0020] In some implementations, the opening and closing mechanism 140 is located on top of the first panel 110 and the second panel 120 (i.e. the space S between the first panel 110 and the second panel 120). The top may be defined with respect to a vertical direction when the apparatus 100 is in an essentially upright or vertical orientation (e.g. a closed state of a door).

[0021] The term "vertical direction" or "vertical orientation" is understood to distinguish over "horizontal direction" or "horizontal orientation". That is, the "vertical direction" or "vertical orientation" relates to a substantially

vertical orientation e.g. of the apparatus 100, wherein a deviation of a few degrees, e.g. up to 10° or even up to 15°, from an exact vertical direction or vertical orientation is still considered as an "essentially vertical direction" or an "essentially vertical orientation". The vertical direction can be substantially parallel to the force of gravity.

[0022] According to some embodiments, the first panel 110 and the second panel 120 are essentially parallel. The term "substantially parallel" relates to a substantially parallel orientation e.g. of the first panel 110 and the second panel 120, wherein a deviation of a few degrees, e.g. up to 5° or even up to 10°, from an exact parallel orientation is still considered as "essentially parallel".

[0023] In some embodiments, the first panel 110 is a transparent panel or transparent plate. Additionally, or alternatively, the second panel 120 is a transparent panel or transparent plate. The term "transparent" as used herein shall particularly include the capability of a structure to transmit light with relatively low scattering, so that, for example, light transmitted therethrough can be seen in a substantially clearly manner.

[0024] According to some implementations, the first panel 110 is a first glass panel. Additionally, or alternatively, the second panel 120 is a second glass panel. The first glass panel and the second glass panel may also be referred to as a first window and a second window, respectively.

[0025] According to some embodiments, which can be combined with other embodiments described herein, the apparatus 100 is a door, such as an oven door. In particular, the apparatus 100 may be included in the household appliance. The household appliance may be an oven, wherein the apparatus 100 may be configured to open and close a cooking space (or cooking cavity or cooking chamber) of the oven.

[0026] FIG. 3 shows a schematic view of an opening and closing mechanism 140 of the apparatus for a household appliance according to embodiments described herein.

[0027] According to some embodiments, which can be combined with other embodiments described herein, the opening and closing mechanism 140 is configured as a cover of the air inlet 130. The cover(s) may also be referred to as "air flap(s)". In some embodiments, the covers are mechanical covers, and in particular exchangeable mechanical covers.

[0028] In some implementations, the air inlet 130 may include two or more openings 130-1, 130-2, wherein each opening of the two or more openings 130-1, 130-2 is covered by a respective cover 140-1, 140-2 of the opening and closing mechanism 140.

[0029] The opening and closing mechanism 140 includes the material configured to open and close the air inlet 130 by a thermal expansion of the material. In particular, the material may be configured to open the air inlet 130 by a (positive or negative) thermal expansion of the material when a temperature e.g. inside of the cooking cavity of the oven increases. Further, the mate-

rial may be configured to close the air inlet 130 by a (negative or positive) thermal expansion of the material when a temperature e.g. inside of the cooking cavity of the oven decreases.

[0030] According to some embodiments, the opening and closing mechanism 140, and in particular the covers, are located at or in an upper air passages of an oven to prevent an entry of solids and liquids. The covers open up when the oven is operating and allow air to flow into the space to maintain a temperature inside of the cooking cavity. When the oven is switched off, the covers close and the inside of the panels are not exposed to dirt, such as liquids and solids.

[0031] FIG. 4 shows a schematic view of a detection mechanism of the apparatus for a household appliance according to embodiments described herein.

[0032] According to some embodiments, which can be combined with other embodiments described herein, the apparatus includes a conduit 300 between the air inlet 130 and the space between the first panel and the second panel. For example, the conduit 300 may be an upper air passages of an oven.

[0033] In some implementations, a liquid absorbing unit 310 is provided in the conduit 300. The liquid absorbing unit 310 may include, or be, a sponge or a sponge-like material. The liquid absorbing unit 310 may have a size and position to not block an air flow between the air inlet 130 and the space.

[0034] According to some embodiments, the apparatus further includes at least one sensor 320 at (e.g. in or outside of) the conduit 300 configured to detect an absorption state of the liquid absorbing unit 310. For example, the at least one sensor 320 may be located adjacent to the liquid absorbing unit 310 as it is illustrated in the example of FIG. 4. In some implementations, the at least one sensor 320 may be a camera.

[0035] The opening and closing mechanism 140 may be configured to selectively open and close the air inlet 130 based on the absorption state of the liquid absorbing unit 310 detected by the at least one sensor 320.

[0036] In more detail, liquid entering through the air inlet 130 will be absorbed (trapped) by the liquid absorbing unit 310. When the liquid absorbing unit 310 absorbs the liquids, a length or volume of the liquid absorbing unit 310 increases. This change in the length or volume may be detected by the at least one sensor 320. If the change (or the length or volume) is equal to, or larger than, a threshold, the apparatus may be configured to notify a user. The notification may be provided acoustically and/or optically e.g. on a display of the oven. The user may then clean or replace the liquid absorbing unit 310.

[0037] The embodiments of the present disclosure can prevent a contamination of the air gap with dirt by providing the opening and closing mechanism configured to selectively open and close the air inlet using a thermal expansion of a cover of the air inlet.

[0038] In view of the above, the present disclosure provides a user friendly which is less dirty and easy to clean.

Further, the apparatus is energy efficient. Furthermore, the apparatus is more reliable and can be implemented e.g. in a smart home application.

[0039] While the foregoing is directed to embodiments of the disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

Claims

1. An apparatus (100) for a household appliance, comprising:
 - a first panel (110) and a second panel (120) having a space (S) therebetween;
 - an air inlet (130) providing an inlet to the space (S) between the first panel (110) and the second panel (120); and
 - an opening and closing mechanism (140) configured to selectively open and close the air inlet (130), wherein the opening and closing mechanism (140) includes a material configured to open and close the air inlet (130) by a thermal expansion of the material.
2. The apparatus (100) of claim 1, wherein the material is a metal material.
3. The apparatus (100) of claim 1 or 2, wherein the opening and closing mechanism (140) is configured as a cover of the air inlet (130).
4. The apparatus (100) of any one of claims 1 to 3, further including a conduit (300) between the air inlet (130) and the space (S) between the first panel (110) and the second panel (120).
5. The apparatus (100) of claim 4, further including a liquid absorbing unit (310) in the conduit (300).
6. The apparatus (100) of claim 5, further including at least one sensor (320) at the conduit (300) configured to detect an absorption state of the liquid absorbing unit (310).
7. The apparatus (100) of claim 6, wherein the opening and closing mechanism (140) is configured to selectively open and close the air inlet (130) based on the absorption state of the liquid absorbing unit (310) detected by the at least one sensor (320).
8. The apparatus (100) of any one of claims 5 to 7, wherein the liquid absorbing unit (310) includes a sponge material.
9. The apparatus (100) of any one of claims 1 to 8,

wherein opening and closing mechanism (140) is located on top of the first panel (110) and the second panel (120).

10. The apparatus (100) of any one of claims 1 to 9,
wherein the first panel (110) and the second panel
(120) are essentially parallel. 5
11. The apparatus (100) of any one of claims 1 to 10,
wherein the first panel (110) is a first glass panel
and/or the second panel (120) is a second glass panel. 10
12. The apparatus (100) of any one of claims 1 to 11,
wherein the apparatus (100) is a door. 15
13. The apparatus (100) of claim 12, wherein the apparatus (100) is an oven door.
14. A household appliance, including the apparatus 20
(100) of any one of claims 1 to 13.
15. The household appliance of claim 14, wherein the
household appliance is an oven. 25

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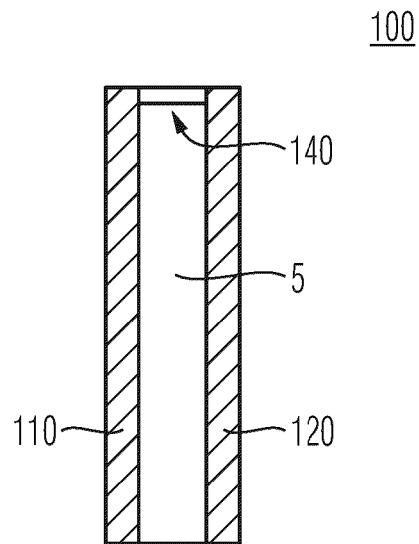


Fig. 1

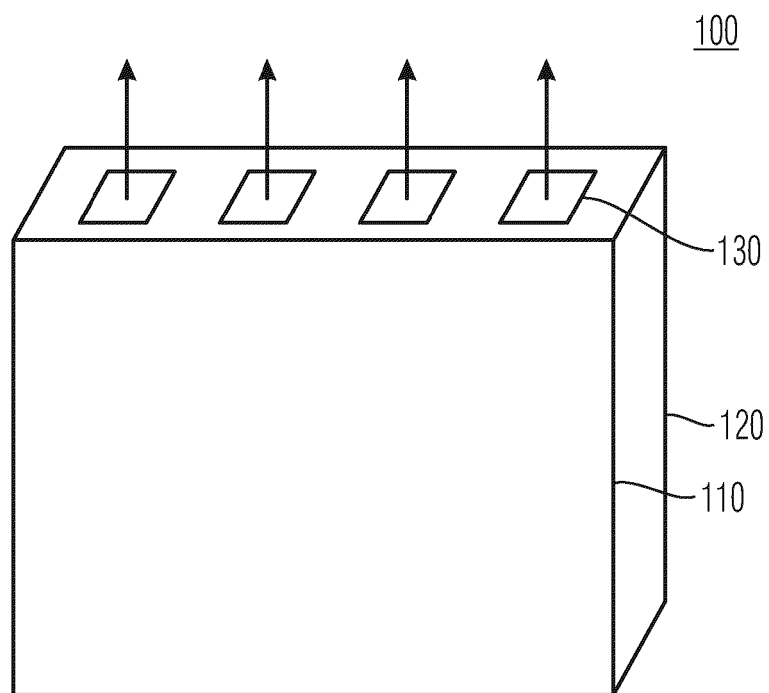


Fig. 2

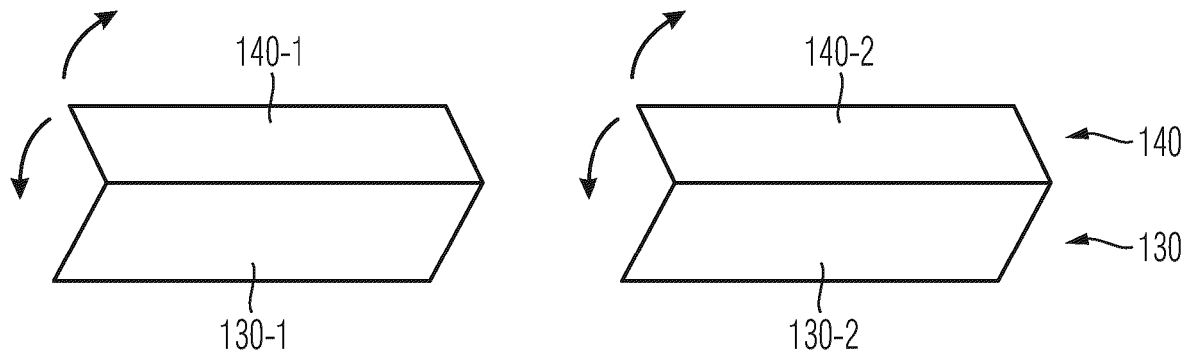


Fig. 3

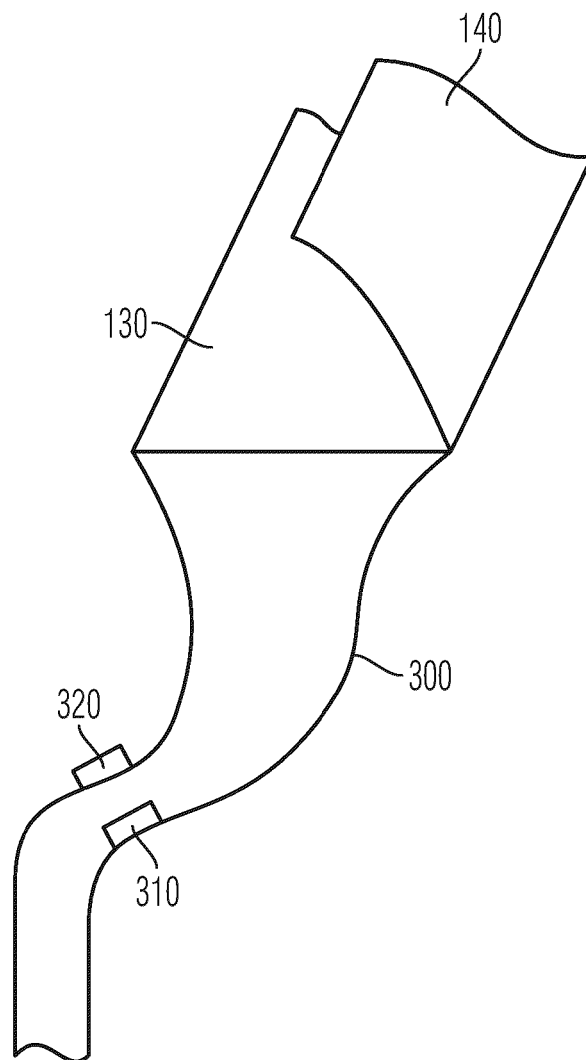


Fig. 4



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Application Number
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Place of search The Hague		Date of completion of the search 7 September 2020	Examiner Verdoodt, Luk
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
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