

Description**COOL AIR DEFLECTOR DEVICE FOR USE WITH AN ICE MAKER IN A REFRIGERATOR**

- [0001] The present invention relates to a refrigerator, in particular to a refrigerator which has an ice maker.
- [0002] Refrigerators having ice makers are commonly known in the art. A refrigerator generally comprises a freezer compartment for freezing the articles which are stored therein; one or more cool air vents formed into the inner wall of the freezer compartment; a refrigeration unit for blowing the cool air through the cool air vents into freezer compartment; an ice maker for making ice and/or ice cream, wherein the ice maker is disposed into the freezer compartment; and a door for opening/closing the freezer compartment. During the operation of the refrigerator, the cool air which is blown into the freezer compartment cools the interior of the freezer compartment, including the ice maker, and thus the ice is formed. The user takes the ice by operating the ice maker.
- [0003] WO2015062667(A1) discloses a refrigerator which has an ice making apparatus.
- [0004] A problem with the prior art refrigerator is that some customer complain that the ice maker requires too long time to prepare the ice. In such occurrences, the technical service cannot provide any solution when the refrigerator is not otherwise defective, and thus the user satisfaction decreases.
- [0005] An objective of the present invention is to provide a cool air deflector device for use in a refrigerator having an ice maker which solves the aforementioned problems in a cost effective way and which enables a comparatively fast formation of ice and an easy installation into the freezer compartment through the assembly operator or the technical service.
- [0006] This objective has been achieved by the cool air deflector device as defined in claim 1, and the refrigerator as defined in claim 12. Further achievements have been attained by the subject-matters respectively defined in the dependent claims.
- [0007] The cool air deflector device of the present invention comprises a

deflecting means which is adapted to deflect the cool air which is blown through one or more cool air vents directly towards the ice maker; and an attachment means for attaching the deflecting means into the freezer compartment between the ice maker and one or more cool air vents.

- [0008] A major advantageous effect of the present invention is that the time required for forming the ice can be comparatively reduced by virtue of the cool air deflector device. Thereby, the user satisfaction can be increased, and the user complaints can be prevented or reduced as much as possible. Another major advantageous effect of the present invention is that the existing refrigerators can be retrofitted with the cool air deflector device. Thereby, the user complaints can be easily overcome through the technical services. Another major advantageous effect of the present invention is that the cool air deflector device is electrically passive and thus consumes no electric power. Thereby, the ice formation performance can be improved without degrading the energy efficiency of the refrigerator.
- [0009] In an embodiment, the deflecting means comprises a one or more ducts which convey the cool air immediately from the cool air vents directly onto the ice maker. This embodiment is particularly advantageous as the cool air can be more effectively deflected towards the ice maker. Thereby, the ice formation performance can be further improved.
- [0010] In another embodiment, one or more ducts are tapered towards the ice maker. This embodiment is particularly advantageous as the ice formation performance can be further improved.
- [0011] In another embodiment, deflecting means has a width that matches the ice maker. This embodiment is particularly advantageous as the ice can be more uniformly formed inside the ice maker.
- [0012] In another embodiment, the cool air deflector device has a sealing means for sealing the interface between the inner wall of the freezer compartment and each duct. This embodiment is particularly advantageous as the cool air can be more effectively deflected towards the ice maker. Thereby, the ice formation performance can be further improved.
- [0013] In another embodiment, the cool air deflector device has one or more first

sealing flanges which at least partly surround the inlets of the ducts so as to seal the interface between the duct and the inner walls of the freezer compartment. This embodiment is particularly advantageous as the first sealing flanges provide a good sealing surface.

[0014] In another embodiment, one or more ducts have u-shaped structure. In this embodiment, the cool air deflector device has one or more second sealing flanges which are respectively disposed at least partly onto the side walls of the duct so as to seal the interface between the duct and the inner walls of the freezer compartment. This embodiment is particularly advantageous as the second sealing flanges provide a good sealing surface. Furthermore, the duct can be made lighter by virtue of the u-shape structure. Thereby, the raw material can be saved.

[0015] In other embodiments, two-sided adhesive tapes are respectively applied between the first/second sealing flanges and the inner wall of the freezer compartment. These embodiments are particularly advantageous as the two sided adhesive tapes improve the sealing. Furthermore, two sided adhesive tapes also function as the attachment means. This embodiment is also particularly advantageous as the cool air deflector device can be attached without modifying the inner walls of the freezer compartment.

[0016] In another embodiment, the deflecting means is attached to the inner wall of the freezer compartment through one or more claws which respectively engage with the recesses that are defined through the cool air vents. This embodiment is particularly advantageous as the cool air deflector device can be attached without modifying the inner walls of the freezer compartment. Alternatively the recess may be formed into the inner wall at a location off the cool air vents.

[0017] In another embodiment, the deflecting means is attached to the inner wall of the freezer compartment through one or more screw bosses. This embodiment is particularly advantageous as the cool air deflector device can be attached to the inner walls of the freezer compartment by one or more screws.

[0018] In another embodiment, the deflecting means is provided as a single piece. This embodiment is particularly advantageous as the deflecting

means can be easily handled by the assembly operator and by the technical service personal. The single piece deflecting means may be manufactured from plastic material through plastic molding.

[0019] In another embodiment, the ice maker has one or more openings on its cover for admitting the cool air towards the ice tray and/or the ice cream container. In this embodiment, the deflecting means deflects the cool air directly to the openings. This embodiment is particularly advantageous as the ice formation performance can be further improved.

[0020] In another embodiment, the deflecting means extends from the cool air vents which are formed into the rear inner wall up to the ice maker which is mounted to the door. This embodiment is particularly advantageous as the ice maker can be operated from the front side of the door. Alternatively, the ice maker may be mounted onto the article shelf or the left/right lateral inner wall or the upper inner wall. Alternatively, the cool air vents may be formed into the left/right lateral wall or into the upper inner wall.

[0021] In another embodiment, the deflecting means is attached to the upper inner wall of the freezer compartment and deflects the cool air from the cool air vents which are formed into the upper section of the rear inner wall towards the ice maker which is also mounted to the upper section of the door. This embodiment is particularly advantageous as the ice maker can be more easily accessed by the user. Furthermore, the cool air deflector device is less noticeable on the upper inner wall. Alternatively, deflecting means may be attached to the left/right lateral inner wall.

[0022] Additional features and additional advantageous effects of the cool air deflector device and the refrigerator of the present invention will become more apparent with the detailed description of the embodiments with reference to the accompanying drawings in which:

[0023] Figure 1 – is a schematic partial perspective view of a refrigerator which has a cool air deflector device according to an embodiment of the present invention, wherein the arrows show the flow path of the deflected cool air;

[0024] Figure 2 – is a schematic partial perspective view of the refrigerator in Fig. 1, prior to attaching the cool air deflector device into the freezer compartment between the ice maker and one or more cool air vents,

wherein the arrows show the flow path of the cool air;

- [0025] Figure 3 – is a schematic perspective view of the cool air deflector device according to an embodiment of the present invention;
- [0026] Figure 4 – is a schematic perspective view of the cool air deflector device according to another embodiment of the present invention;
- [0027] Figure 5 – is another schematic perspective view of the cool air deflector device of Fig.4;
- [0028] Figure 6 – is a schematic front view of the refrigerator according to an embodiment of the present invention, prior to attaching the cool air deflector device into the freezer compartment between the ice maker and one or more cool air vents;
- [0029] Figure 7 – is a schematic partially exploded view of the refrigerator of Fig. 6;
- [0030] Figure 8 – is a schematic partial perspective enlarged view of the refrigerator of Fig. 7;
- [0031] Figure 9 – is a schematic partial cross sectional view of the refrigerator of Fig. 1, taken along the line A-A in Fig. 10;
- [0032] Figure 10 – is a schematic partial front view of the refrigerator of Fig. 6.
- [0033] The reference signs appearing on the drawings relate to the following technical features.

1. Cool air deflector device
2. Refrigerator
3. Freezer compartment
4. Door
5. Ice maker
6. Cool air vent
7. Inner wall
8. Deflecting means
9. Attachment means
10. Duct
11. Inlet
12. Outlet
13. Sealing means

14. First sealing flange
15. Two sided adhesive tape
16. Base
17. Side wall
18. Second sealing flange
19. Claw
20. Screw boss
21. Ice tray
22. Cover
23. Opening
24. Rear inner wall
25. Upper inner wall

[0034] The cool air deflector device (1) is suitable for use in a refrigerator (2) (Fig. 1).

[0035] The refrigerator (2) comprises: a freezer compartment (3) for freezing the articles which are stored therein; a door (4) for opening/closing the freezer compartment (3); an ice maker (5) for making ice and/or ice cream, wherein the ice maker (5) is disposed into the freezer compartment (3); one or more cool air vents (6) formed into the inner wall (7) of the freezer compartment (3); and a refrigeration unit for blowing the cool air through the cool air vents (6) into freezer compartment (3) (Fig. 6).

[0036] The cool air deflector device (1) of the present invention comprises: a deflecting means (8) which is adapted to deflect the cool air which is blown through one or more cool air vents (6) directly towards the ice maker (5); and an attachment means (9) for attaching the deflecting means (8) into the freezer compartment (3) between the ice maker (5) and one or more cool air vents (6) (Fig. 1 and Fig. 9).

[0037] The refrigerator (2) of the present invention comprises the cool air deflector device (1) (Fig. 1 and Fig. 9).

[0038] In an embodiment, the deflecting means (8) comprises: a one or more ducts (10) each having an inlet (11) for admitting the cool air; and an outlet (12) for discharging the cool air (Fig. 3 to Fig. 5). In this embodiment, the inlets (11) respectively face the cool air vents (6) whereas the outlets (12)

directly open towards the ice maker (5) (Fig. 1).

- [0039] In another embodiment, the width of the deflecting means (8) matches the width of the ice maker (5) (Fig. 1).
- [0040] In another embodiment, one or more ducts (10) have a narrowing cross-section towards the ice maker (5) (Fig. 9).
- [0041] In another embodiment, one or more ducts (10) are adapted for attachment onto the inner wall (7) of the freezer compartment (3) (Fig. 1 and Fig. 9). In this embodiment, the cool air deflector device (1) further comprises: a sealing means (13) for sealing the interface between the inner wall (7) of the freezer compartment (3) and each duct (10) (Fig. 3 to Fig. 5).
- [0042] In another embodiment, the sealing means (13) comprises one or more first sealing flanges (14) which are respectively disposed at least partly around the inlets (11) of the ducts (10) (Fig. 4 and Fig. 5).
- [0043] In another embodiment, the sealing means (13) comprises one or more two sided adhesive tapes (15) for respectively applying between the first sealing flanges (14) and the inner wall (7) of the freezer compartment (3) (Fig. 4).
- [0044] In another embodiment, one or more ducts (10) each comprises a base (16) and side walls (17) which define a u-shaped structure (Fig. 3 and Fig. 4). In this embodiment, the side walls (17) are adapted for attachment onto the inner wall (7) of the freezer compartment (3) (Fig. 9). In this embodiment, the sealing means (13) comprises one or more second sealing flanges (18) which are respectively disposed at least partly onto the side walls (17) of the duct (10) (Fig. 3 to Fig. 5).
- [0045] In another embodiment, the sealing means (13) comprises one or more two sided adhesive tapes (15) for respectively applying between the second sealing flanges (18) and the inner wall (7) of the freezer compartment (3) (Fig. 4).
- [0046] In another embodiment, the attachment means (9) comprises one or more claws (19) for attaching the deflecting means (8) to the inner wall (7) of the freezer compartment (3) (Fig. 3 and Fig. 4). In this embodiment, the inner wall (7) has one or more recesses which respectively engage with the

claws (19). In this embodiment, the recesses are defined through the cool air vents (6) (Fig. 1).

- [0047] In another embodiment, the attachment means (9) comprises one or more screw bosses (20) for attaching the deflecting means (8) to the inner wall (7) of the freezer compartment (3) by means of one or more screws (not shown) respectively (Fig. 1 and Fig. 9).
- [0048] In another embodiment, the deflecting means (8) is provided as a single piece.
- [0049] In another embodiment, the ice maker (5) comprises one or more ice trays (21); and a cover (22) which is disposed above the one or more ice trays (21) (Fig. 1). In this embodiment, the cover (22) comprises one or more openings (23) for admitting the cool air (Fig. 1). In this embodiment, the deflecting means (8) is further adapted to deflect the cool air directly to the one or more openings (23) on the cover (22) (Fig. 1 and Fig. 9).
- [0050] In another embodiment, the ice maker (5) is mounted to the door (4) (Fig. 6 and Fig. 7). In this embodiment, the cool air vents (6) are formed into the rear inner wall (24) (Fig. 1 and Fig. 9). In this embodiment, the deflecting means (8) extends from the rear inner wall (24) up to the ice maker (5) (Fig. 1 and Fig. 9).
- [0051] In another embodiment, the ice maker (5) is mounted to the upper section of the door (4) (Fig. 9). In this embodiment, one or more cool air vents (6) are formed into upper section of the rear inner wall (24) (Fig. 9). In this embodiment, the deflecting means (8) is attached to the upper inner wall (25) of the freezer compartment (3) (Fig. 9).
- [0052] A major advantageous effect of the present invention is that the time required for forming the ice can be comparatively reduced by virtue of the cool air deflector device (1). Thereby, the user satisfaction can be increased, and the user complaints can be prevented or reduced as much as possible. Another major advantageous effect of the present invention is that the refrigerators (2) can be retrofitted with the cool air deflector device (1). Thereby, the user complaints can be easily overcome through the technical services. Another major advantageous effect of the present invention is that the cool air deflector device (1) is electrically passive and

thus consumes no electric power. Thereby, the ice formation performance can be improved without degrading the energy efficiency of the refrigerator (2). Other advantageous effects of the present invention can be taken from the above-described embodiments.

Claims

1. A cool air deflector device (1) for use in a refrigerator (2) comprising: a freezer compartment (3) for freezing the articles which are stored therein; a door (4) for opening/closing the freezer compartment (3); an ice maker (5) for making ice, wherein the ice maker (5) is disposed into the freezer compartment (3); one or more cool air vents (6) formed into the inner wall (7) of the freezer compartment (3); and a refrigeration unit for blowing the cool air through the cool air vents (6) into freezer compartment (3), characterized in that the cool air deflector device (1) comprises: a deflecting means (8) which is adapted to deflect the cool air which is blown through one or more cool air vents (6) directly towards the ice maker (5); and an attachment means (9) for attaching the deflecting means (8) into the freezer compartment (3) between the ice maker (5) and one or more cool air vents (6).
2. The cool air deflector device (1) according to claim 1, characterized in that the deflecting means (8) comprises a one or more ducts (10) each having an inlet (11) for admitting the cool air and an outlet (12) for discharging the cool air, wherein the inlets (11) are adapted to respectively face the cool air vents (6), and wherein the outlets (12) are adapted to directly open towards the ice maker (5).
3. The cool air deflector device (1) according to claim 2, characterized in that the width of the deflecting means (8) matches the width of the ice maker (5); and one or more ducts (10) have a narrowing cross-section towards the ice maker (5).
4. The cool air deflector device (1) according to claim 2 or 3, characterized by further comprising: a sealing means (13) for sealing the interface between the inner wall (7) of the freezer compartment (3) and each duct (10), wherein one or more ducts (10) are adapted for attachment onto the inner wall (7) of the freezer compartment (3).
5. The cool air deflector device (1) according to claim 4, characterized in that the sealing means (13) comprises one or more first sealing flanges (14) which are respectively disposed at least partly around the inlets (11) of the ducts (10).
6. The cool air deflector device (1) according to claim 5, characterized in that the sealing means (13) comprises one or more two sided adhesive tapes (15) for

respectively applying between the first sealing flanges (14) and the inner wall (7) of the freezer compartment (3).

7. The cool air deflector device (1) according to any one of claims 4 to 5, characterized in that one or more ducts (10) each comprises a base (16) and side walls (17) which define a u-shaped structure, wherein the side walls (17) are adapted for the attachment onto the inner wall (7) of the freezer compartment (3); and the sealing means (13) comprises one or more second sealing flanges (18) which are respectively disposed at least partly onto the side walls (17) of the duct (10).
8. The cool air deflector device (1) according to claim 7, characterized in that the sealing means (13) comprises one or more two sided adhesive tapes (15) for respectively applying between the second sealing flanges (18) and the inner wall (7) of the freezer compartment (3).
9. The cool air deflector device (1) according to any one of claims 1 to 8, characterized in that the attachment means (9) comprises one or more claws (19) for attaching the deflecting means (8) to the inner wall (7) of the freezer compartment (3).
10. The cool air deflector device (1) according to any one of claims 1 to 9, characterized in that the attachment means (9) comprises one or more screw bosses (20) for attaching the deflecting means (8) to the inner wall (7) of the freezer compartment (3) by means of one or more screws respectively.
11. The cool air deflector device (1) according to any one of claims 1 to 10, characterized in that the deflecting means (8) is provided as a single piece.
12. A refrigerator (2) comprising: a freezer compartment (3) for freezing the articles which are stored therein; a door (4) for opening/closing the freezer compartment (3); an ice maker (5) for making ice and/or ice cream, wherein the ice maker (5) is disposed into the freezer compartment (3); one or more cool air vents (6) formed into the inner wall (7) of the freezer compartment (3); a refrigeration unit for blowing the cool air through the cool air vents (6) into freezer compartment (3), characterized by further comprising: the cool air deflector device (1) as defined in any one of claims 1 to 11.
13. The refrigerator (2) according to claim 12, characterized in that the ice maker (5) comprises one or more ice trays (21); and a cover (22) disposed above the

one or more ice trays (21), wherein the cover (22) comprises one or more openings (23) for admitting the cool air; and the deflecting means (8) is further adapted to deflect the cool air directly to the one or more openings (23) on the cover (22).

14. The refrigerator (2) according to claim 12 or 13, characterized in that an ice maker (5) is mounted to the door (4); the cool air vents (6) are formed into the rear inner wall (24); and the deflecting means (8) extends from the rear inner wall (24) up to the ice maker (5).
15. The refrigerator (2) according to claim 14, characterized in that the ice maker (5) is mounted to the upper section of the door (4); the cool air vents (6) are formed into upper section of the rear inner wall (24); and the deflecting means (8) is attached to upper inner wall (25) of the freezer compartment (3).

Fig. 1

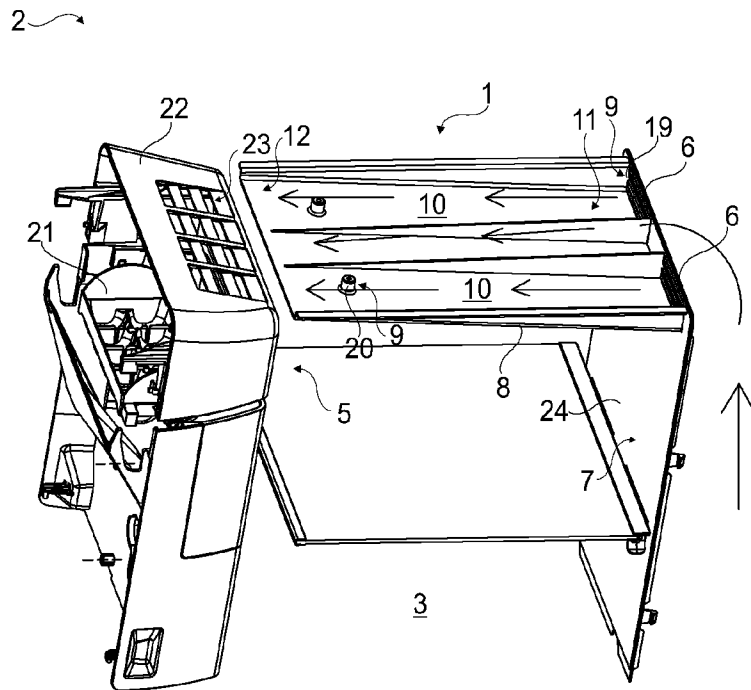


Fig. 2

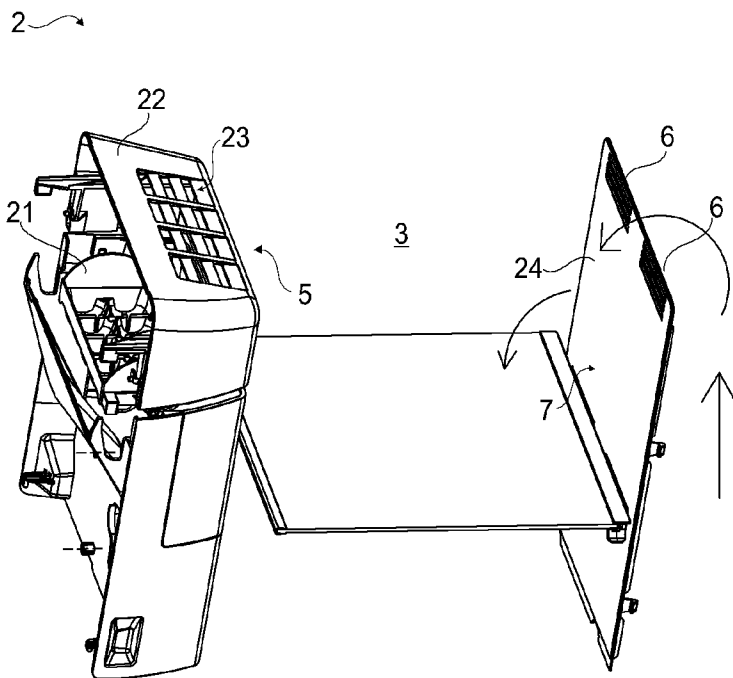


Fig. 3

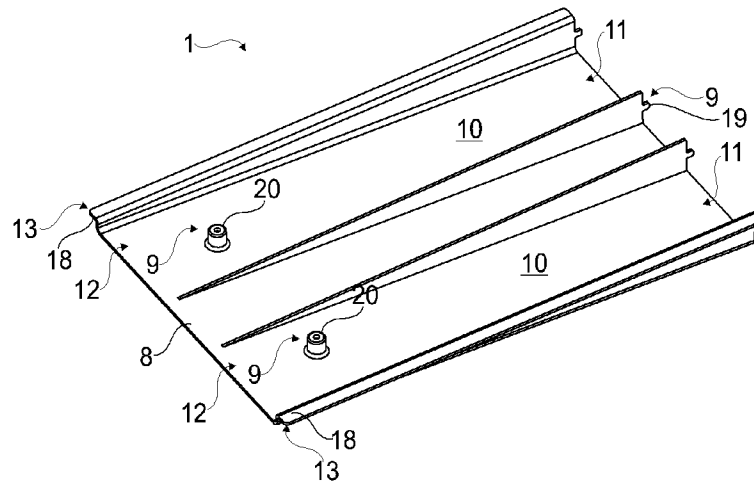


Fig. 4

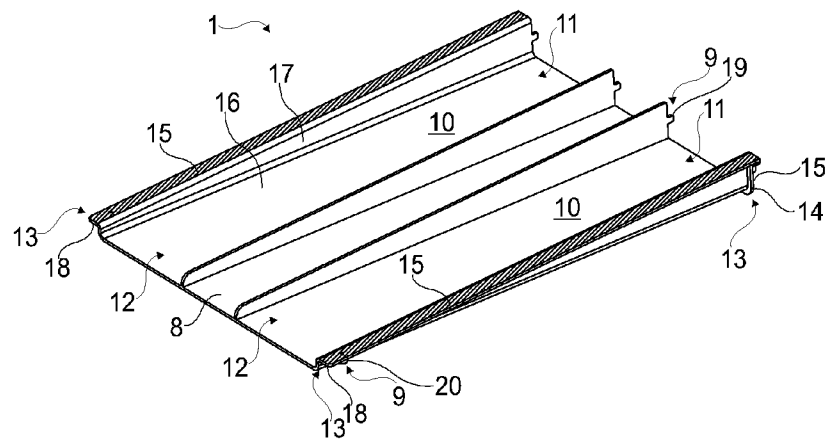


Fig. 5

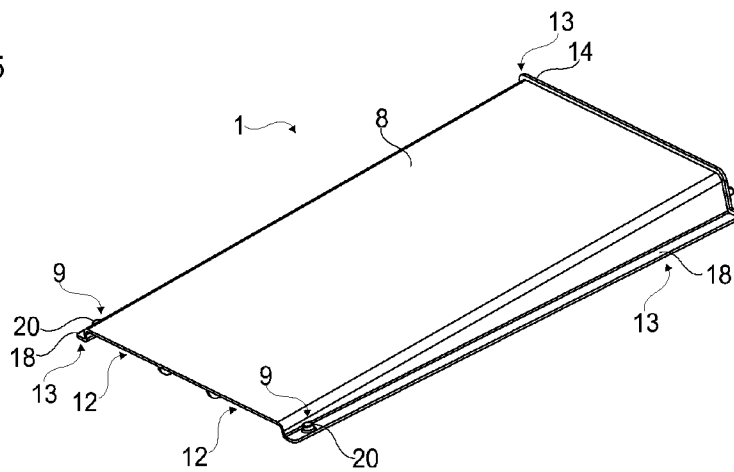


Fig. 6

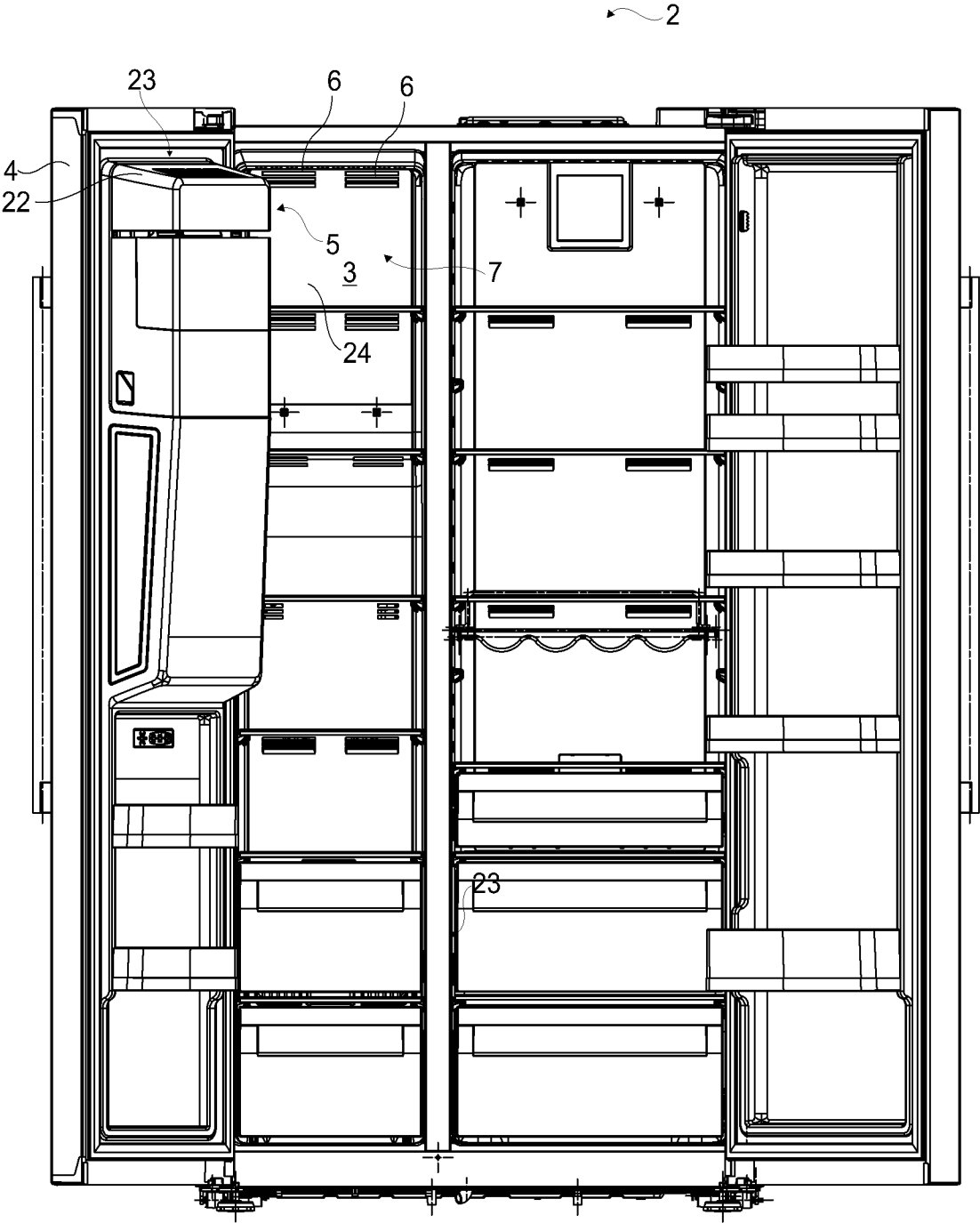


Fig. 7

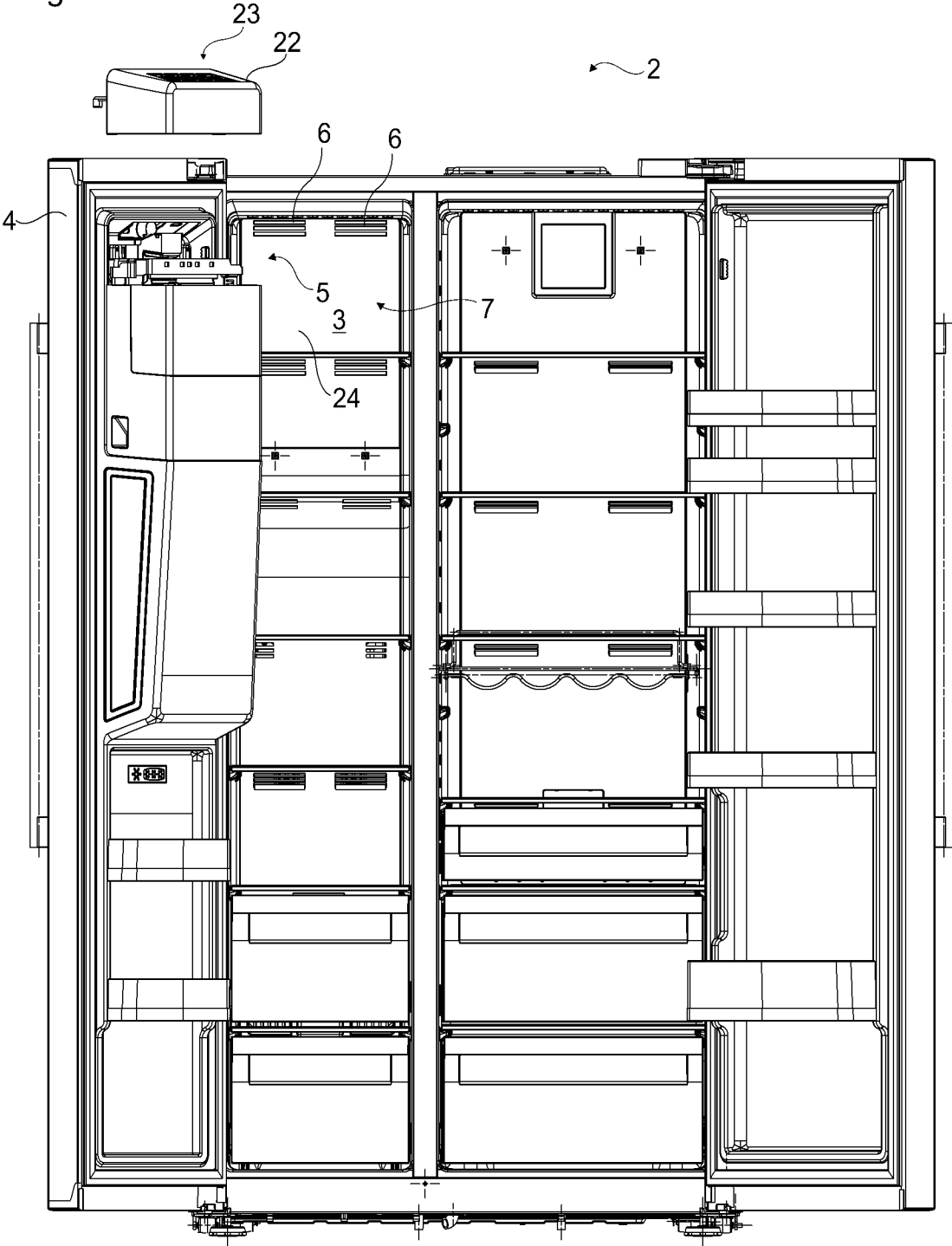


Fig. 8

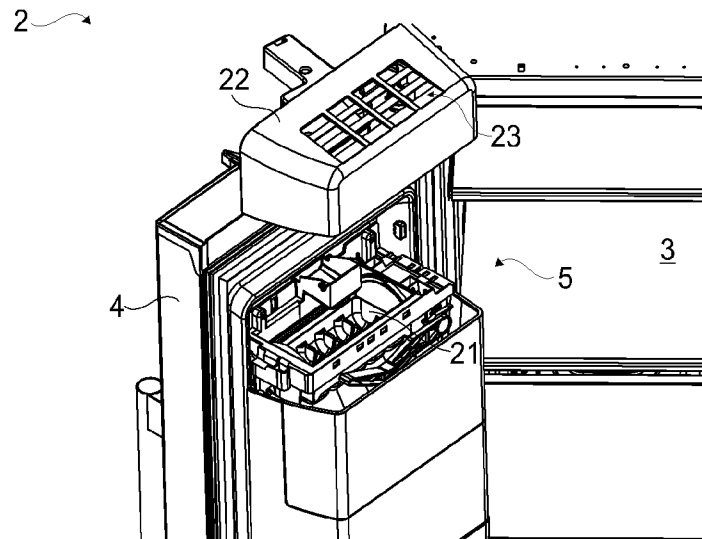


Fig. 9

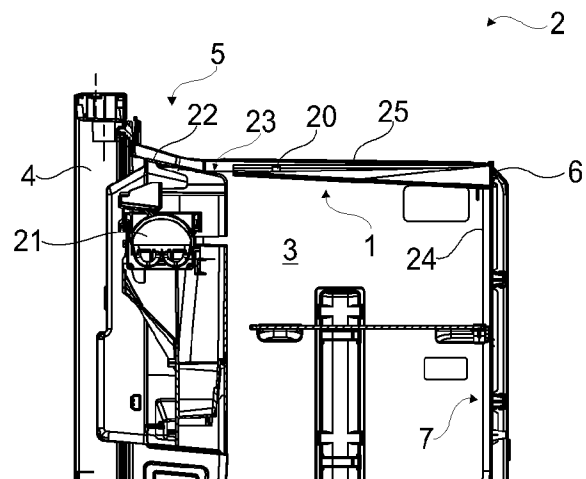
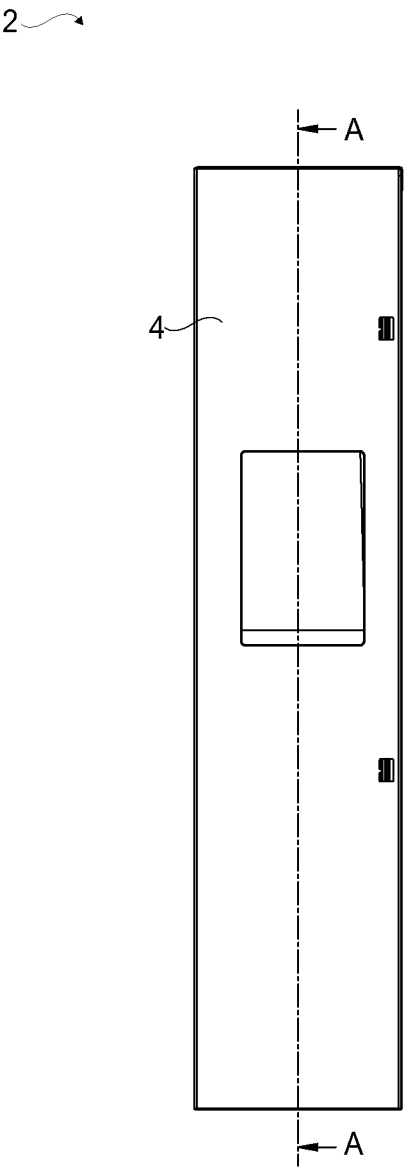


Fig. 10



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2016/060220

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25D17/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 2012/272678 A1 (KIM MYUNG-SOO [KR] ET AL) 1 November 2012 (2012-11-01) paragraphs [0049], [0050], [0061], [0062]; figures 4, 8 -----	1-4, 10-15
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X	KR 2009 0133022 A (LG ELECTRONICS INC [KR]) 31 December 2009 (2009-12-31) figures 2,3 -----	1-3, 11-15
X	US 2015/276298 A1 (ARGUMEDO SINUHE [MX] ET AL) 1 October 2015 (2015-10-01) figures 2,3 ----- -/-	1-3, 11-15



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

12 January 2017

Date of mailing of the international search report

24/01/2017

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/060220

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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