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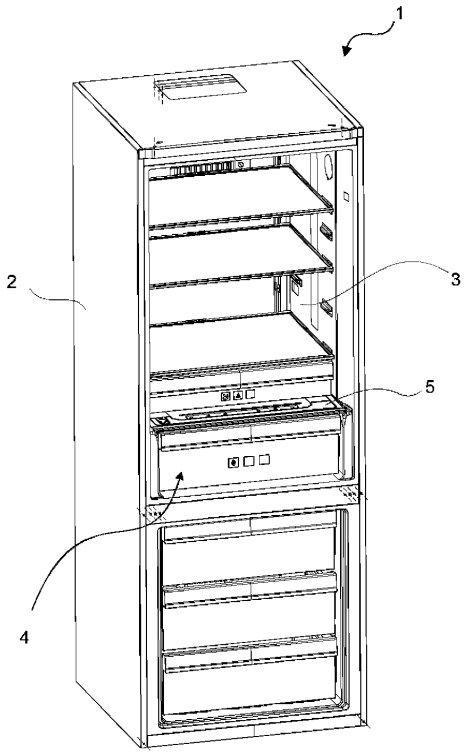
(54) **A REFRIGERATOR COMPRISING A HUMIDIFIER**

(57) Refrigerator (1) comprising a body (2); a fresh food compartment (3) which is disposed in the body (2); a crisper (4) which is provided in the fresh food compartment (3); a crisper lid (5) which covers the crisper (4) so as to maintain the humidity level; a crisper lid upper body (5.1) which forms the upper side of the crisper lid (5) and a crisper lid lower body (5.2) which forms the lower side thereof; a water tank (6) which is detachably attached into the body (2) and which is used for storing water; a piezoelectric member (10) which receives the water in the water tank (6); and a humidifier (7) which enables cold vapor to be delivered into the crisper (4) by means of the piezoelectric member (10) and which is positioned in the body (2).

Figure 1



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Description

[0001] The present invention relates to a refrigerator which performs the humidifying process to keep the foodstuffs in the crisper fresh.

[0002] Today, the refrigeration process in refrigerators is performed in various ways, differently affecting the foodstuffs stored in the inner volume of the refrigerator. The users are more and more looking for devices with efficient foodstuff protection, which makes it a standard. The refrigerators generally comprise compartments which provide different refrigeration conditions, and there are many solutions for each of said compartments to operate efficiently. For example, the foodstuffs placed into the breakfast partition for breakfast are subjected to a different temperature and humidity while different humidity and temperature conditions are realized in the crisper. In particular, a special area is defined in the inner volume of the refrigerator for keeping fresh the fruits and vegetables in the crisper.

[0003] It is a very important requirement that the foodstuffs placed into the crisper in the refrigerators are stored for a long time without losing their properties. Due to the difference between the temperature of the foodstuffs placed into the crisper in the outer environment and the temperature thereof in the crisper, the foodstuffs start to lose humidity quickly. Even if the humidity is controlled by means of the crisper lid placed onto the crisper, the newly placed foodstuffs at the temperature of the outer environment lose a large amount of evaporative humidity until they cool down due to the temperature difference. Moreover, depending on the frequency of use of the crisper, while the crisper is opened/closed each time, the foodstuffs therein are observed to lose humidity in the course of time. Since the humidity lost cannot be added to this area, this causes the foodstuffs in the crisper to lose liquid, to shrivel and lose freshness.

[0004] In the state of the art German Patent Application No. DE102013225716, a humidifier is disclosed, comprising a detachable water tank.

[0005] In the state of the art Chinese Patent Application No. CN108224879, a design is disclosed, wherein the humidifier applies cold vapor onto the crisper lid as the crisper lid is closed.

[0006] The aim of the present invention is the realization of a refrigerator wherein the freshness of the foodstuffs in the crisper are maintained by eliminating humidity loss with minimum loss of space in the crisper.

[0007] The refrigerator realized in order to attain the aim of the present invention, explicated in the claims, comprises a body; a fresh food compartment which is disposed in the body; a crisper which is provided in the fresh food compartment; a crisper lid which covers the crisper so as to maintain the humidity level; a crisper lid upper body which forms the upper side of the crisper lid and a crisper lid lower body which forms the lower side thereof; a water tank which is detachably attached into the body and which is used for storing water; a piezoelectric member which receives the water in the water tank; and a humidifier which enables cold vapor to be delivered into the crisper by means of the piezoelectric member and which is positioned in the body. At least one water tank is provided, which is positioned as adjacent to the crisper lid upper body. The air flows through the openings at the rear section on the crisper lid and sweeps the crisper surface to be discharged through the perforated structure at the front section. The water tank can be positioned at the right, left or front section of the crisper lid upper body. Thus, the water tank is positioned outside the regions where the natural air flow is present, and does not affect the air circulation inside, more efficiently maintaining the humidity balance in the crisper. While the evaporative humidity losses occurring during the opening/closing of the refrigerator door due to the outer environment temperature are minimized, the humidification process is realized without any loss in the usable volume of the crisper. Thus, in the embodiment of crisper lid where the air is efficiently managed, a humidifier arrangement which does not disrupt the air flow is obtained and the risk of sweating is minimized.

[0008] In an embodiment of the present invention, the refrigerator comprises at least one water tank lid which covers the water tank. The water tank lid is detachably attached so as to facilitate the filling of the water. The water tank lid can be attached onto the water tank by squeeze or snap fit. Thus, the water tank upper surface which is opened as per user preference is isolated from the compartment and the outer environment, partially preventing bacterial formation and increasing the hygiene level.

[0009] In another embodiment of the present invention, the refrigerator comprises at least two water tank lids which are symmetrically designed for at least two water tanks which are positioned at both opposite sides of the crisper lid upper body. Thus, the water tank lids at the right and left regions can be interchangeably used by the user. The water tank lids which can have a detachable design can be easily adapted to the changed opening direction of the refrigerator door, and the need for service personnel is eliminated.

[0010] In another embodiment of the present invention, the refrigerator comprises the water tank having the lower surface inclined towards the piezoelectric member. The inclined lower surface of the water tank prevents the unusable accumulation of water, and enables the water filled in by the user to be converted to mist at a higher efficiency.

[0011] In another embodiment of the present invention, the refrigerator comprises the humidifier which is positioned so as to make a vertical angle between 0 and 45 degrees and a horizontal angle between 30 and 60 degrees with respect to the crisper lid. By means of said angles, the most efficient position is obtained for eliminating the risk of affecting the air from back to front, for enabling the air flowing just under the crisper lid to sweep the sweating surfaces, and for maintaining a homogene-

ous humidity in the crisper. For example, in other embodiments with smaller angles, the risk of condensation increases due to the direct contact between the water vapor and the vegetables and in embodiments with greater angles, joins with the air flow, and loses its humidification effect. According to the experimental results, at said angles, the most efficient position is obtained and the highest efficiency is achieved in humidification.

[0012] In another embodiment of the present invention, the refrigerator comprises the water tank lid designed with slides. The water tank lid with slides can be easily placed onto the water tank. By means of the slides eliminating adverse effects such as tipping over or agitation, the user can cover the water tank more securely. By means of a level indicator on the water tank lid, the water is enabled to be filled at the desired level. Thus, a user can change the water in the water tank without any additional information.

[0013] In different embodiments of the present invention, the refrigerator comprises the water tank having a water tank channel which is designed as cavities at the side walls of the crisper and which increases the movement area of the crisper. The channel can extend all along or for a certain part of the crisper. By means of a slippery material therein, the channel can increase the movement capacity of the crisper. Thus, against any jamming which may occur due to the water tank while the crisper is opened/closed as a drawer or removed for cleaning purposes, a cut-out is provided, improving the flexibility of use.

[0014] In another embodiment of the present invention, the refrigerator comprises the crisper having a cable channel wherein the electric cables coming from the piezoelectric member are placed and which is positioned on the crisper lid lower body. The cables coming from the piezoelectric components are concealed by the crisper lid lower body, and extended to the electronic card controlling the humidifier by means of the cable channel formed in the lid. By means of the cable channel, security in terms of electricity is ensured. Moreover, an integrated structure with the crisper lid is designed, realizing a more compact product.

[0015] By means of the refrigerator of the present invention, the inner volume of the refrigerator is more efficiently used, and the humidity loss in the crisper is minimized.

[0016] A refrigerator realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the perspective view of the refrigerator.
Figure 2 - is the perspective view of the crisper.
Figure 3 - is the perspective view of the humidifier on the crisper.
Figure 4 - is the top view of the crisper.
Figure 5 - is the detailed view of the humidifier.

[0017] The elements illustrated in the figures are numbered as follows:

1. Refrigerator
2. Body
3. Fresh food compartment
4. Crisper
5. Crisper lid
    - 5.1. Crisper lid upper body
    - 5.2. Crisper lid lower body
6. Water tank
7. Humidifier
8. Water tank lid
9. Water tank channel
10. Piezoelectric member
11. Cable channel

[0018] The refrigerator (1) comprises a body (2); a fresh food compartment (3) which is disposed in the body (2); a crisper (4) which is provided in the fresh food compartment (3); a crisper lid (5) which covers the crisper (4) so as to maintain the humidity level; a crisper lid upper body (5.1) which forms the upper side of the crisper lid (5) and a crisper lid lower body (5.2) which forms the lower side thereof; a water tank (6) which is detachably attached into the body (2) and which is used for storing water; a piezoelectric member (10) which receives the water in the water tank (6); and a humidifier (7) which enables cold vapor to be delivered into the crisper (4) by means of the piezoelectric member (10) and which is positioned in the body (2). At least one water tank (6) is provided, which is positioned as adjacent to the crisper lid upper body (5.1). The air flows through the openings at the rear section on the crisper lid (5) and sweeps the crisper (4) surface to be discharged through the perforated structure at the front section. The water tank (6) can be positioned at the right, left or front section of the crisper lid upper body (5.1). Thus, the water tank (6) is positioned outside the regions where the natural air flow is present, and does not affect the air circulation inside, more efficiently maintaining the humidity balance in the crisper (4). While the evaporative humidity losses occurring during the opening/closing of the refrigerator (1) door due to the outer environment temperature are minimized, the humidification process is realized without any loss in the usable volume of the crisper (4). Thus, in the embodiment of crisper lid (5) where the air is efficiently managed, a humidifier (7) arrangement which does not disrupt the air flow is obtained and the risk of sweating is minimized.

[0019] In an embodiment of the present invention, the refrigerator (1) comprises at least one water tank lid (8) which covers the water tank (6). The water tank lid (8) is detachably attached so as to facilitate the filling of the water. The water tank lid (6) can be attached onto the water tank by squeeze or snap fit. An environment isolated from the fresh food compartment (3) is formed, in-

creasing the hygiene level.

[0020] In another embodiment of the present invention, the refrigerator (1) comprises at least two water tank lids (8) which are symmetrically designed for at least two water tanks (6) which are positioned at both opposite sides of the crisper lid upper body (5.1). Thus, the water tank lids (8) at the right and left regions can be interchangeably used by the user. The water tank lids (8) which can have a detachable design can be easily adapted to the changed opening direction of the refrigerator (1) door, and the need for service personnel is eliminated.

[0021] In another embodiment of the present invention, the refrigerator (1) comprises the water tank (6) having the lower surface inclined towards the piezoelectric member (10). The inclined lower surface of the water tank (6)prevents the unusable accumulation of water, and enables the water filled in by the user to be converted to mist at a higher efficiency. The entire lower surface of the water tank (6) is inclined towards the piezoelectric members (10) positioned on the crisper lid (5) such that the entire water is enabled to be used by the piezoelectric members (10), and the water is prevented from accumulating at different points, thus realizing a more hygienic water tank (6) inner surface.

[0022] In another embodiment of the present invention, the refrigerator (1) comprises the humidifier (7) which is positioned so as to make a vertical angle between 0 and 45 degrees and a horizontal angle between 30 and 60 degrees with respect to the crisper lid (5). By means of said angles, the most efficient position is obtained for eliminating the risk of affecting the air from back to front, for enabling the air flowing just under the crisper lid (5) to sweep the sweating surfaces, and for maintaining a homogeneous humidity in the crisper (4). For example, in other embodiments with smaller angles, the risk of condensation increases due to the direct contact between the water vapor and the vegetables and in embodiments with greater angles, joins with the air flow, and loses its humidification effect.

[0023] In another embodiment of the present invention, the refrigerator (1) comprises the water tank lid (8) designed with slides. The water tank lid (8) with slides can be easily placed onto the water tank (6). By means of the slides eliminating adverse effects such as tipping over or agitation, the user can cover the upper surface of the water tank (6) facing the fresh food compartment (3) more securely.

[0024] In different embodiments of the present invention, the refrigerator (1) comprises the water tank (6) having a water tank channel (9) which is designed as cavities at the side walls of the crisper (4) and which increases the movement area of the crisper (4) while being placed into the body (2). The water tank channel (9) can extend all along or for a certain part of the crisper (4). By means of a slippery material provided on the inner surface of the water tank channel (9), the movement capacity of the crisper (4) is increased. Thus, against any jamming which may occur due to the water tank (6) while the crisper (4) is opened/closed as a drawer or removed for cleaning purposes, a cut-out is provided, improving the flexibility of use.

[0025] In another embodiment of the present invention, the refrigerator (1) comprises the crisper (4) having a cable channel (11) wherein the electric cables coming from the piezoelectric member (10) are placed and which is positioned on the crisper lid lower body (5.2). The cables coming from the piezoelectric components are concealed by the crisper lid lower body (5.2), and extended to the electronic card controlling the humidifier (7) by means of the cable channel (11) formed in the lid (5). Security in terms of electricity is ensured by said cable channel (11), and by designing an integrated structure with the crisper lid (5), a more compact product is realized.

[0026] In the refrigerator (1) of the present invention, by placing a water tank (6) on the crisper (4), the inner volume of the crisper is more efficiently used while humidifying the inner volume of the crisper (4).

Claims

1. A refrigerator (1) **comprising** a body (2); a fresh food compartment (3) which is disposed in the body (2); a crisper (4) which is provided in the fresh food compartment (3); a crisper lid (5) which covers the crisper (4) so as to maintain the humidity level; a crisper lid upper body (5.1) which forms the upper side of the crisper lid (5) and a crisper lid lower body (5.2) which forms the lower side thereof; a water tank (6) which is detachably attached into the body (2) and which is used for storing water; a piezoelectric member (10) which receives the water in the water tank (6); and a humidifier (7) which enables cold vapor to be delivered into the crisper (4) by means of the piezoelectric member (10) and which is positioned in the body (2), **characterized by**

   - at least one water tank (6) which is positioned as adjacent to the crisper lid upper body (5.1).

2. A refrigerator (1) as in Claim 1, **characterized by** at least one water tank lid (8) which covers the water tank (6).

3. A refrigerator (1) as in Claim 1 or 2, **characterized by** at least two water tank lids (8) which are symmetrically designed for at least two water tanks (6) which are positioned at both opposite sides of the crisper lid upper body (5.1).

4. A refrigerator (1) as in any one of the above claims, **characterized by** the water tank (6) having the lower surface inclined towards the piezoelectric member (10).

5. A refrigerator (1) as in any one of the above claims, **characterized by** the humidifier (7) which is positioned so as to make a vertical angle between 0 and 45 degrees and a horizontal angle between 30 and 60 degrees with respect to the crisper lid (5).

6. A refrigerator (1) as in any one of the Claims 2 to 5, **characterized by** the water tank lid (8) which is designed with slides.

7. A refrigerator (1) as in any one of the above claims, **characterized by** the water tank (6) having a water tank channel (9) which is designed as cavities at the side walls of the crisper (4) and which increases the movement area of the crisper (4) while being placed into the body (2).

8. A refrigerator (1) as in any one of the above claims, **characterized by** the crisper (4) having a cable channel (11) wherein the electric cables coming from the piezoelectric member (10) are placed and which is positioned on the crisper lid lower body (5.2).

Figure 1

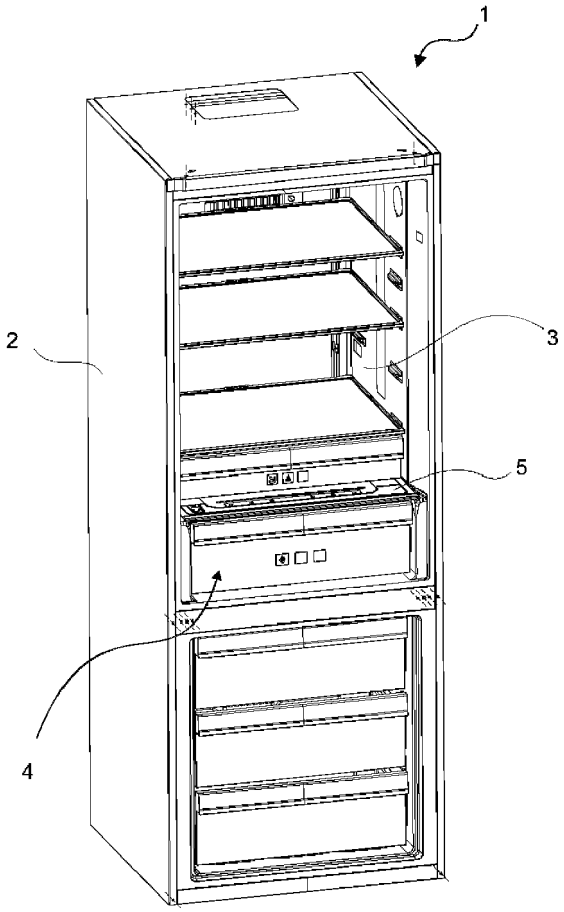


Figure 2

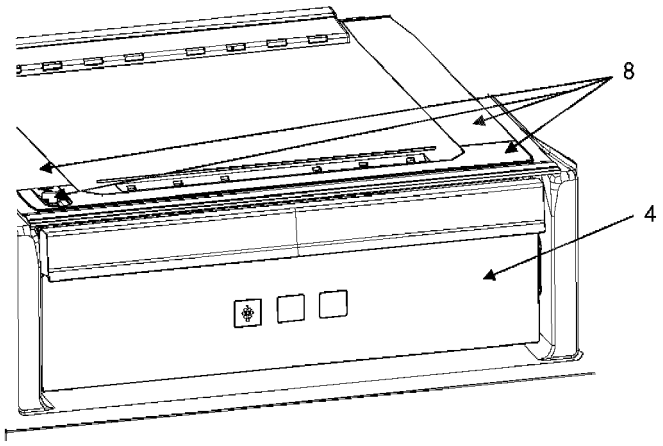


Figure 3

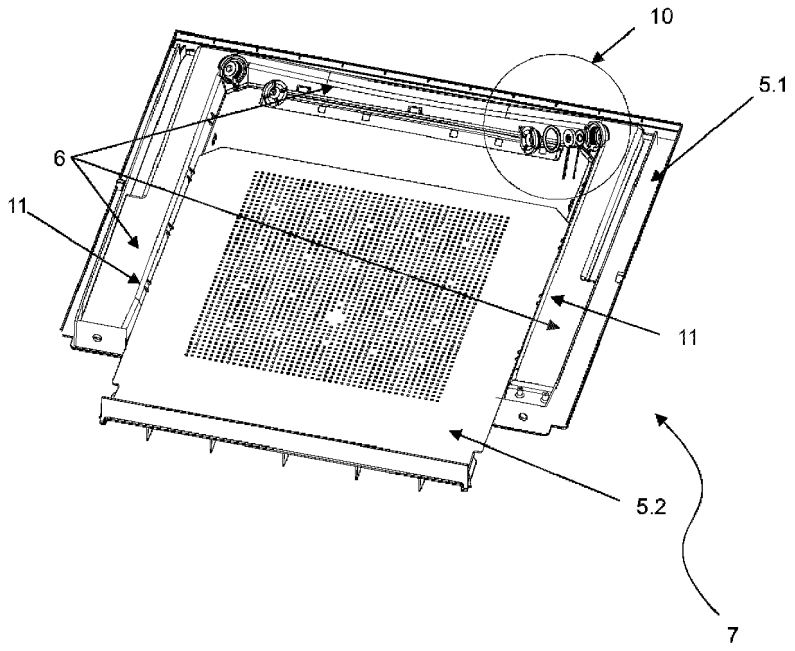


Figure 4

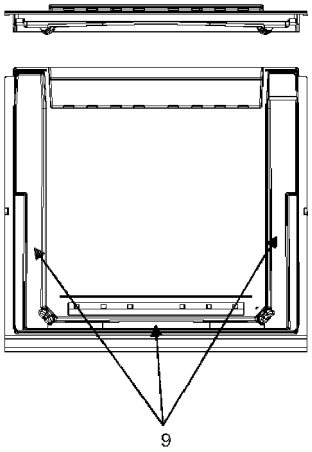
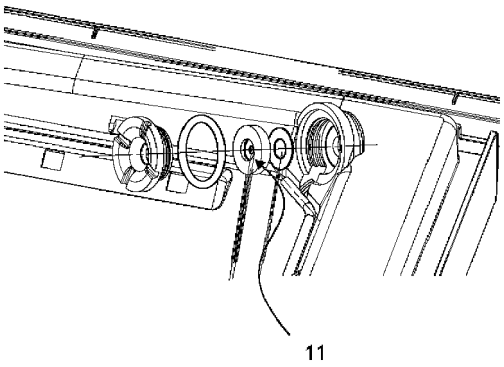


Figure 5



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EUROPEAN SEARCH REPORT

Application Number
EP 20 21 0290

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 2009 002588 A (PANASONIC CORP) 8 January 2009 (2009-01-08) * abstract; figures 12, 13, 14, 15 *	1-8	INV. F25D17/04
X	KR 2016 0096896 A (DAYOU WINIA CO LTD [KR]) 17 August 2016 (2016-08-17) * abstract; figures 1-7 *	1-8	
A	JP 2007 240055 A (MATSUSHITA ELECTRIC IND CO LTD) 20 September 2007 (2007-09-20) * abstract; figures 1-4 *	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 April 2021	Yousufi, Stefanie

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2009002588 A	08-01-2009	JP 5029165 B2	19-09-2012
		JP 2009002588 A	08-01-2009
KR 20160096896 A	17-08-2016	NONE	
JP 2007240055 A	20-09-2007	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 102013225716 **[0004]**
- CN 108224879 **[0005]**