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(54) **A REFRIGERATOR COMPRISING A UV LIGHT SOURCE**

(57) The present invention relates to a refrigerator (1) comprising a body (2); a refrigeration cabin (3) which is provided in the body (2) and wherein the foodstuffs to be cooled are placed; a door (4) which isolates the refrigeration cabin (3) from the outer environment; a UV light source (5) which has an active position where the UV light source (5) emits light onto the foodstuffs and a passive position where there is no light emitted; and a compartment (6) wherein the UV light emitted by the UV light source (5) is sent onto the foodstuffs.

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Description

[0001] The present invention relates to a refrigerant comprising a UV light source.

[0002] There are many pathogenic microorganisms such as bacteria, viruses or harmful substances such as pesticide residues on the packaged foodstuffs, fruits and vegetables placed in the refrigerator. Especially when the packaged foodstuffs are placed in compartments without being cleaned, harmful microorganisms and substances on the packages directly threaten human health. Moreover, although vegetables and fruits are consumed after being washed, sometimes cleaning with water is not sufficient to remove bacteria and viruses. In the state of the art, in order to provide the user with cleaner and safer foodstuffs, there are refrigerators comprising crispers having an ozone generator, shelves or crispers with UV light sources. Moreover, the studies show that the vitamin D synthesis occurs as a result of the contact of the UV light with the foodstuffs containing vitamin D precursor such as mushrooms. However, it is not enough for the mushrooms to come into contact with the UV light in the crisper of the refrigerator.

[0003] In the state of the art European Patent Document No. EP3926265, a refrigerator is disclosed, comprising a UV light source which is used for disinfection.

[0004] The aim of the present invention is the realization of a refrigerator wherein user satisfaction is ensured by increasing nutritional values of foodstuffs.

[0005] The refrigerator realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a body; a refrigeration cabin which is provided in the body and wherein the foodstuffs to be cooled are placed; a door which isolates the refrigeration cabin from the outer environment; a UV light source which has an active position where the UV light source emits light onto the foodstuffs and a passive position where there is no light emitted; and a compartment wherein the UV light source emitted by the UV light source is sent onto the foodstuffs. The foodstuffs placed in the refrigeration cabin are kept cold by the refrigerator. By means of the compartment where the UV light source is disposed, the UV light is enabled to come into contact with the foodstuffs when the UV light source is in the active position.

[0006] The refrigerator of the present invention comprises a heating member which is provided on the compartment; at least one temperature sensor which enables the measurement of the surface temperatures of the foodstuffs, and a control unit which enables the UV light source to be controlled according to the information received from the temperature sensor. Depending on the surface temperature of the foodstuffs, the heating member and the UV light source are controlled by the control unit. Thus, the nutritional value of the foodstuffs is increased and the cooling process continues.

[0007] In an embodiment of the present invention, the refrigerator comprises the control unit which enables the UV light source to be switched to the active position if the measured foodstuff surface temperature is greater than the predetermined threshold surface temperature. If the measured surface temperature of the foodstuff is greater than the threshold surface temperature, the UV light source is switched to the active position, enabling the conversion of ergosterol to vitamin D. Thus, it is ensured that the nutritional value of the foodstuffs, especially mushrooms containing vitamin D precursor, is increased.

[0008] In an embodiment of the present invention, the refrigerator comprises the control unit which ensures that if the measured surface temperature of the foodstuff is lower than the threshold surface temperature value predetermined by the manufacturer the heating member is activated so as to increase the surface temperature of the foodstuff to reach the threshold surface temperature predetermined by the manufacturer. After the foodstuffs reach a certain surface temperature, vitamin synthesis is provided by means of the contact with the UV light emitted by the UV light source. If the foodstuff surface temperature is lower than a predetermined threshold surface temperature, the foodstuff surface temperature is increased by the heating member.

[0009] In an embodiment of the present invention, the refrigerator comprises a timer which enables the calculation of the time the UV light source is in the active position, and the control unit which enables the UV light source to be switched to the passive position when the target UV application time predetermined by the manufacturer is completed.

[0010] By means of the timer, the time when the UV light source is in the active position is recorded. When the recorded time reaches a target time predetermined by the manufacturer, the UV light source is enabled to be switched to the passive position. Thus, the excessive use of the UV light source is prevented. Consequently, energy saving is provided.

[0011] In an embodiment of the present invention, the refrigerator comprises the control unit which enables the foodstuff surface temperature to be measured simultaneously when the UV light source is in the active position and enables the heating member to be activated when the foodstuff surface temperature is lower than the threshold temperature while in contact with the UV light emitted by the UV light source. Thus, it is ensured that the UV light source gets into contact only with foodstuffs with a foodstuff surface temperature higher than a certain temperature. Moreover, an efficient vitamin D synthesis is provided.

[0012] In an embodiment of the present invention, the refrigerator comprises the control unit which enables the UV light source to be switched to the passive position and the heating member to be deactivated when the targeted UV application time and the targeted foodstuff surface temperature are reached.

[0013] In an embodiment of the present invention, the refrigerator comprises the heating member having a fan

which enables hot air to spread in the compartment. By means of the fan, a homogeneous temperature is provided in the compartment.

[0014] In an embodiment of the present invention, the refrigerator comprises the heating member having a heating film which performs the heating process in the compartment. By means of the heating film, the temperature in the compartment is increased.

[0015] By means of the present invention, a refrigerator is realized wherein by enabling the foodstuffs placed into the compartment to come into contact with the UV light emitted by the UV light source, the nutritional values thereof are increased.

[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 compartment.

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

1- Refrigerator

2- Body

3- Refrigeration cabin

4- Door

5- UV light source

6- Compartment

7- Temperature sensor

8- Heating member

9- Control unit

10- Timer

11-Fan

12- Heating film

[0018] The refrigerator (1) comprises a body (2); a refrigeration cabin (3) which is provided in the body (2) and wherein the foodstuffs to be cooled are placed; a door (4) which isolates the refrigeration cabin (3) from the outer environment; a UV light source (5) which has an active position where the UV light source (5) emits light onto the foodstuffs and a passive position where there is no light emitted; and a compartment (6) wherein the UV light emitted by the UV light source (5) is sent onto the foodstuffs. The UV light source (5) is disposed in the compartment (6). Thus, it is ensured that the foodstuffs in the compartment (6) come into contact with the UV light.

[0019] The refrigerator (1) of the present invention comprises at least one temperature sensor (7) which is disposed in the compartment (6) and which measures the surface temperature of the foodstuffs; a heating member (8) which has an open position where the surface temperature of the foodstuff is increased according to the information received from the temperature sensor (7) and a closed position where there is no heating; and a control unit (9) which enables the heating member (8) and the UV light source (5) to be controlled according to the data received from the temperature sensor (7). By means of the temperature sensor (7), the surface temperature of the foodstuffs is measured and the control unit (9) enables the UV light source (5) to be switched between the active position and the passive position according to the surface temperature of the foodstuffs. Thus, the vitamin synthesis of foodstuffs, especially mushrooms containing vitamin D precursor is provided.

[0020] In an embodiment of the present invention, the refrigerator (1) comprises the control unit (9) which enables the UV light source (5) to be switched to the active position if the measured foodstuff surface temperature is greater than the threshold surface temperature value predetermined by the manufacturer. When the surface temperature of the foodstuffs is higher than a certain surface temperature value, the UV light source (5) is switched to the active position so as to radiate. Studies show that when the surface temperature of the foodstuffs is between 20°C and 25°C, the highest amount of vitamin D is synthesized as a result of contact with UV light.

[0021] In an embodiment of the present invention, the refrigerator (1) comprises the control unit (9) which ensures that if the measured surface temperature of the foodstuff is lower than the threshold surface temperature value predetermined by the manufacturer the heating member (8) is activated so as to increase the surface temperature of the foodstuff to reach the threshold surface temperature predetermined by the manufacturer. If the foodstuff surface temperature is less than the threshold value, the heating process is performed. Thus, when the appropriate foodstuff surface temperature is reached, the UV light source (5) is switched to the active position and efficient vitamin D synthesis is provided.

[0022] In an embodiment of the present invention, the refrigerator (1) comprises a timer (10) which enables the calculation of the time the UV light source (5) is in the active position, and the control unit (9) which enables the UV light source (5) to be switched to the passive position when the target UV application time predetermined by the manufacturer is completed. When the UV light source (5) is in the active position, time is calculated by means of the timer (10). After the UV light is applied for the predetermined optimum time, the UV light source (5) is switched to the passive position. Thus, optimum vitamin D synthesis is provided and energy consumption is prevented.

[0023] In an embodiment of the present invention, the

refrigerator (1) comprises the control unit (9) which enables the surface temperature of the foodstuff to be continuously measured simultaneously while the UV light source (5) is in the active position and increases the surface temperature by activating the heating member (8) if the foodstuff surface temperature is lower than the predetermined threshold surface temperature. While the UV light source (5) is in the active position, the surface temperature of the foodstuffs is continuously measured. When the foodstuff surface temperature falls below the threshold temperature value, the heating member (8) is activated.

[0024] In an embodiment of the present invention, the refrigerator (1) comprises the control unit (9) which enables the UV light source (5) to be switched to the passive position and the heating member (8) to the closed position when the targeted UV application time and the targeted foodstuff surface temperature are reached. When the targeted UV application time is completed, the UV light source (5) is switched to the passive position and the heating member (8) is deactivated. Thus, the refrigerator (1) continues the standard cooling process, preventing the spoilage of foods.

[0025] In an embodiment of the present invention, the refrigerator (1) comprises the heating member (8) having a fan (11) which enables hot air to spread in the compartment (6). By means of the fan (11) disposed in the compartment (6), the heat is distributed evenly in the compartment (6) and all foodstuffs are heated equally. Thus, an equal synthesis of vitamin D is provided for the foodstuffs in the compartment (6), especially for the mushrooms.

[0026] In an embodiment of the present invention, the refrigerator (1) comprises the heating member (8) having a heating film (12) which is provided in the compartment (6) and which increases the temperature. The heating process is performed by means of the heating film (12) provided in the compartment (6).

[0027] By means of the invention, a refrigerator (1) is realized, wherein the synthesis of vitamin D is provided by exposing the foodstuffs, especially mushrooms, placed in the compartment (6) to the UV light for a certain period of time at a certain temperature. Thus, the nutritional value of the foodstuffs is increased.

Claims

1. A refrigerator (1) comprising a body (2); a refrigeration cabin (3) which is provided in the body (2) and wherein the foodstuffs to be cooled are placed; a door (4) which isolates the refrigeration cabin (3) from the outer environment; a UV light source (5) which has an active position where the UV light source (5) emits light onto the foodstuffs and a passive position where there is no light emitted; and a compartment (6) wherein the UV light emitted by the UV light source (5) is sent onto the foodstuffs, **characterized by** at least one temperature sensor (7) which is disposed in the compartment (6) and which measures the surface temperature of the foodstuffs; a heating member (8) which has an open position where the surface temperature of the foodstuff is increased according to the information received from the temperature sensor (7) and a closed position where there is no heating; and a control unit (9) which enables the heating member (8) and the UV light source (5) to be controlled according to the data received from the temperature sensor (7).

2. A refrigerator (1) as in Claim 1, **characterized by** the control unit (9) which enables the UV light source (5) to be switched to the active position if the measured foodstuff surface temperature is greater than the threshold surface temperature value predetermined by the manufacturer.

3. A refrigerator (1) as in Claim 1 or Claim 2, **characterized by** the control unit (9) which ensures that if the measured surface temperature of the foodstuff is lower than the threshold surface temperature value predetermined by the manufacturer the heating member (8) is activated so as to increase the surface temperature of the foodstuff to reach the threshold surface temperature predetermined by the manufacturer.

4. A refrigerator (1) as in any one of the above claims, **characterized by** a timer (10) which enables the calculation of the time the UV light source (5) is in the active position, and the control unit (9) which enables the UV light source (5) to be switched to the passive position when the target UV application time predetermined by the manufacturer is completed.

5. A refrigerator (1) as in any one of the above claims, **characterized by** the control unit (9) which enables the surface temperature of the foodstuff to be continuously measured simultaneously while the UV light source (5) is in the active position and increases the surface temperature by activating the heating member (8) if the foodstuff surface temperature is lower than the predetermined threshold surface temperature.

6. A refrigerator (1) as in any one of the above claims, **characterized by** the control unit (9) which enables the UV light source (5) to be switched to the passive position and the heating member (8) to the closed position when the targeted UV application time and the targeted foodstuff surface temperature are reached.

7. A refrigerator (1) as in any one of the above claims, **characterized by** the heating member (8) having a fan (11) which enables hot air to spread in the com-

partment (6).

8. A refrigerator (1) as in any one of the above claims, **characterized by** the heating member (8) having a heating film (12) which is provided in the compartment (6) and which increases the temperature.

Figure 1

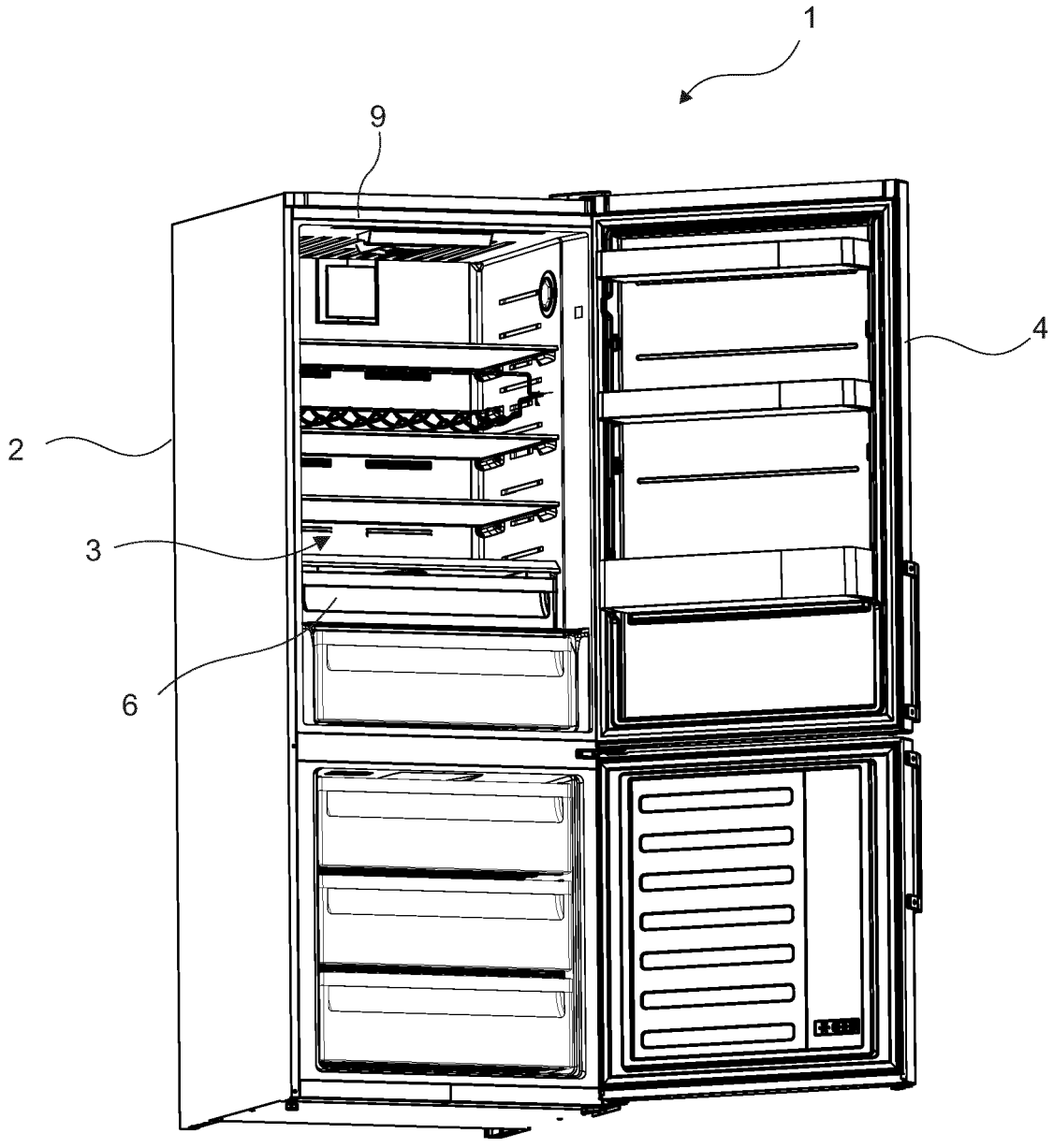
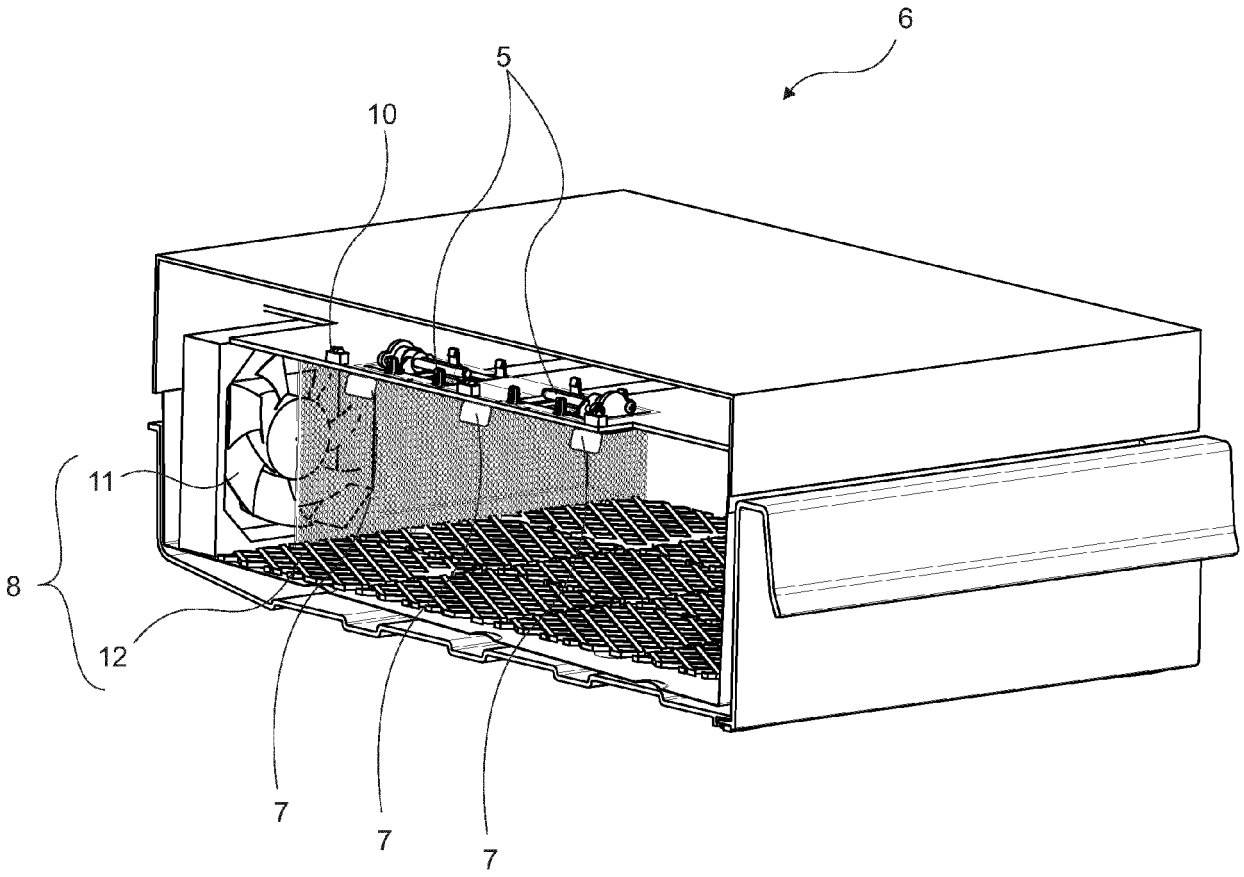


Figure 2



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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 6293

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	JIANG QIYONG ET AL: "UV induced conversion during drying of ergosterol to vitamin D in various mushrooms: Effect of different drying conditions", TRENDS IN FOOD SCIENCE & TECHNOLOGY, ELSEVIER SCIENCE PUBLISHERS, GB, vol. 105, 22 September 2020 (2020-09-22), pages 200-210, XP086319906, ISSN: 0924-2244, DOI: 10.1016/J.TIFS.2020.09.011 [retrieved on 2020-09-22] * the whole document *	1	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	9 November 2023	de Graaf, Jan Douwe

CATEGORY OF CITED DOCUMENTS

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09-11-2023

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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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