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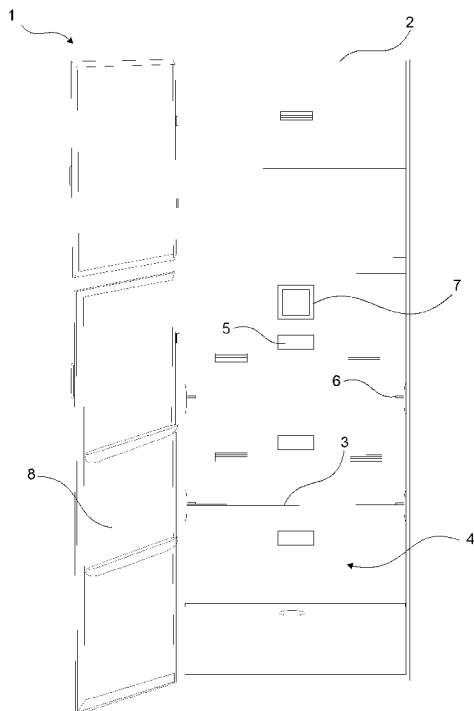
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(54) Title: A COOLING DEVICE COMPRISING ILLUMINATION MEANS

Figure 1



(57) Abstract: The present invention relates to a cooling device (1) comprising a body (2); more than one shelf (3) that is placed into the body (2) and whereon foodstuffs are placed; at least one compartment (4) that is situated between two shelves (3) or between the base of the body (2) and one shelf (3) or between the ceiling of the body (2) and one shelf (3), and at least one illumination means (5) that is disposed in each compartment (4).

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Description**A COOLING DEVICE COMPRISING ILLUMINATION MEANS**

- [0001] The present invention relates to a cooling device the interior illumination of which is controlled.
- [0002] In cooling devices such as refrigerators, deep freezers, all the interior lights are turned on with the opening of the door, thus illuminating all the compartments with the same amount of luminance. The opening/closing of the interior lights is controlled according to the open/closed status of the door. In this case, the illumination of the other compartments together with the compartment where the user performs an operation results in energy consumption.
- [0003] In the state of the art European Patent Application No EP1431689, a refrigerator is disclosed, wherein the middle shelves, that can be easily seen, are illuminated less, and the upper and lower shelves, that are harder to see, are illuminated more.
- [0004] The aim of the present invention is the realization of a cooling device wherein the interior illumination means are prevented from being operated unnecessarily and the amount of interior illumination can be changed by the user.
- [0005] The cooling device realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a body; more than one shelf that is placed into the body and whereon foodstuffs are placed; at least one compartment that is situated between two shelves or between the base of the body and one shelf or between the ceiling of the body and one shelf, and at least one illumination means that is disposed in each compartment.
- [0006] The cooling device of the present invention comprises a distance sensor that is disposed on the shelf and that detects the presence of the user, thus measuring the vertical distance between the user and itself, and a control unit that calculates the change in the distance between the distance sensor and the user according to the movement of the user in the vertical direction, thus enabling the luminance of the illumination means to be controlled depending on the change in the distance. When the user

enters the field of view of the distance sensor, the distance sensor measures the distance between itself and the user and the control unit saves the measured distance as the reference distance. The distance between the user and the distance sensor increases or decreases as a result of the movements of the user in the vertical direction. The control unit measures the distance between the user and the distance sensor and calculates the ratio of the measured distance to the reference distance and enables the light intensity of the illumination means to be increased and decreased depending on the measured ratio of change.

[0007] In an embodiment of the present invention, the control unit provides that when the distance between the distance sensor and the user increases the energy delivered to the illumination means in the compartment where the distance sensor that detects the user is located is increased, thus enabling the luminosity of the illumination means to be increased, and provides that when the distance between the distance sensor and the user decreases the energy delivered to the illumination means in the compartment where the distance sensor that detects the user is located is decreased, thus enabling the luminosity of the illumination means to be decreased. As the energy delivered to the illumination means is increased, the luminosity of the illumination means is increased and hence the interior of the compartment is illuminated by a higher luminosity. As the energy delivered to the illumination means is decreased the luminosity of the illumination means is decreased and hence the interior of the compartment is illuminated by a lower luminosity.

[0008] In another embodiment of the present invention, when the energy delivered to the illumination means located in one of the compartments is decreased and thus the luminosity of the illumination means decreases, the control unit provides that the energy delivered to the illumination means located in other compartments is decreased in an equal amount, thus decreasing the luminosity in an equal amount. Thus, the luminosity of the illuminations means can be decreased easily at one time without decreasing them one by one. Thus, energy consumption is prevented by providing the illumination of all the compartments with the minimum

luminosity and with a lower light intensity that is sufficient for the user. The usage life of the illumination means is increased by means of using them with a lower light intensity.

- [0009] In another embodiment of the present invention, when the user is detected by the distance sensor, the control unit, after waiting for a predetermined time period, enables the distance sensor to perform measurement. After the user extends her/his hand or elbow over the distance sensor and waits for a while without changing position, the distance sensor starts to take measurements after being activated by the control unit. Thus, when the user reaches into any compartment in the cooling device for performing an operation like loading, unloading etc., the distance sensor is prevented from taking measurements at the moment the user is detected and the control unit from changing the luminosity of the illumination means depending on the data received from the distance sensor without the consent of the user.
- [0010] In another embodiment of the present invention, the control unit enables the changing of the luminosity of the illumination means to be ended when the user gets out of the field of view of the distance sensor. When the luminosity of the illumination means inside the compartment reaches the level matching the user's preference, the user gets out of the field of view of the distance sensor and ends the changing of the luminosity of the illumination means. The control unit continues to deliver the current to the illumination means that provides the luminosity level adjusted by the user.
- [0011] In another embodiment of the present invention, the cooling device comprises a door providing access into the body and the control unit that enables the distance sensor to perform measurements with the opening of the door. In cases the door is closed, the distance sensor does not perform any measurements and when the door is opened, the control unit activates the distance sensor, thus enabling the measurement to be performed. Thus, the luminosity of the illumination means can only be changed after the user opens the door.
- [0012] In another embodiment of the present invention, the cooling device comprises a frame surrounding the shelf and the distance sensor that is

disposed on the frame. By mounting the distance sensor to the frame remaining outside the part of the shelf whereon the foodstuffs are placed, the distance sensor is prevented from contacting the foodstuffs and from being damaged.

[0013] By means of the present invention, a cooling device is realized wherein the interior illumination level can be changed easily by the user and energy saving is provided. The user can increase or decrease the luminosity of the illumination means inside the compartment as per his/her needs.

[0014] The cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0015] Figure 1 – is the schematic view of a cooling device.

[0016] Figure 2 – is the perspective view of a cooling device.

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

1. Cooling device
2. Body
3. Shelf
4. Compartment
5. Illumination means
6. Distance sensor
7. Control unit
8. Door
9. Frame

[0018] The cooling device (1) comprises a body (2); more than one shelf (3) that is placed into the body (2) and whereon foodstuffs are placed; at least one compartment (4) that is situated between two shelves (3) or between the base of the body (2) and one shelf (3) or between the ceiling of the body (2) and one shelf (3), and at least one illumination means (5) that is disposed in each compartment (4).

[0019] The cooling device (1) of the present invention comprises a distance sensor (6) that is disposed on the shelf (3) and that measures the vertical distance between the user and itself by detecting the presence of the user, and a control unit (7) that calculates the change in the distance between the distance sensor (6) and the user depending on the movement of the

user in the vertical direction, thus enabling the luminosity of the illumination means (5) to be controlled according to the change in the said distance. When the user enters the field of view of the distance sensor (6), the distance sensor (6) measures the distance between the user and itself. The control unit (7) saves the measured distance as the reference distance (Hset), measures the distance between the user and the distance sensor (6) in the user's movements in upwards – downwards directions and determines the change of the measured distance with respect to the reference distance (Hset). The control unit (7) enables the luminosity of the illumination means (5) to be increased and decreased depending on the determined change. After the user enables the reference distance (Hset) to be determined by extending his/her hand or elbow over the distance sensor (5) positioned on the shelf (3), he/she can adjust the luminosity of the illumination means by moving his/her hand or elbow. Thus, the user enables the interior of the compartment (4) to be illuminated at the desired level even if his/her hands are full of foodstuffs, thus increasing consumer satisfaction.

[0020] In an embodiment of the present invention, the control unit (7) provides that when the distance between the distance sensor (6) and the user increases the luminosity of the illumination means (5) in the compartment (4) where the distance sensor (6) that detects the user is located is increased and provides that when the distance between the distance sensor (6) and the user decreases the luminosity of the illumination means (5) in the compartment (4) where the distance sensor (6) that detects the user is located is decreased. In this embodiment, the illumination means (5) disposed inside the compartments (4) are illuminated at a low brightness level predetermined by the producer. In the case the illumination inside the compartment (4) is not sufficient for the user, the user increases the distance between himself/herself and the distance sensor (6) and enables the control unit (7) to increase the current delivered to the illumination means (5), thus increasing the brightness of the illumination means (5) inside the compartment (4). By decreasing the distance between himself/herself and the distance sensor (6), the user

enables the control unit (7) to decrease the current delivered to the illumination means (5), thus decreasing the brightness of the illumination means (5) located inside the compartment (4). Thus, energy saving is provided by preventing the illumination means (5) from being operated at high brightness level continuously.

[0021] In another embodiment of the present invention, when the luminosity of the illumination means (5) located in one of the compartments (4) decreases, the control unit (7) enables the luminosity of the illumination means (5) located in other compartments (4) to be decreased in an equal amount. When the user enables the control unit (7) to decrease the current delivered to the illumination means (5) located inside the compartment (4) by decreasing the distance between himself/herself and the distance sensor (6), the luminosity in the compartment (4) is decreased. The control unit (7) decreases the current delivered to the illumination means (5) situated in other compartments (4) in an equal amount and enables all the compartments (4) to be illuminated with the lowest luminosity that meets the need of the user. Thus, the energy consumption originating from other illumination means (5) is also decreased.

[0022] In another embodiment of the present invention, when the user is detected by the distance sensor (6), the control unit (7) enables the distance sensor (6) to perform measurement after waiting for a predetermined time period. When the user reaches into any one of the compartments (4) in order to perform an operation such as loading, unloading, etc, the control unit (7) enables the distance sensor (6) to wait for some time after detecting the user and to perform measurements after the predetermined waiting period is completed, in order to prevent the control unit (7) from changing the luminosity of the illumination means (5) depending on the change in distance between the distance sensor (6) and the user as a result of the distance sensor (6) detecting the user without the will of the user. The user, desiring the interior of the compartment (4) to be illuminated less or more, waits for a predetermined time period after extending his/her hand or elbow over the distance sensor (6), and then moves his/her hand or elbow in the vertical direction after the said time period is over and enables

the control unit (7) to change the luminosity of the illumination means (5).

[0023] In another embodiment of the present invention, the control unit (7) enables the changing of the luminosity of the illumination means (5) to be terminated when the user gets out of the field of view of the distance sensor (6). When the luminosity of the illumination means (5) inside the compartment (4) reaches the level matching the preference of the user, the user gets out of the field of view of the distance sensor (6) and ends the changing of the luminosity of the illumination means (5).

[0024] In another embodiment of the present invention, the cooling device (1) comprises a door (8) providing access into the body (2) and the control unit (7) that enables the distance sensor (6) to perform measurement with the opening of the door (8). After the user opens the door (8), the distance sensor (6) starts measuring and the control unit (6) controls the luminosity of the illumination means (5) according to the change in the distance between the distance sensor (6) and the user. Thus, when the door (8) is closed, the user prevents the luminosity of the illumination means (5) from being changed involuntarily.

[0025] In another embodiment of the present invention, the cooling device (1) comprises a frame (9) surrounding the shelf (3) and the distance sensor (6) that is disposed on the frame (9). If the distance sensor (6) contacts the foodstuffs placed onto the shelf (3), the distance sensor (6) is prevented from detecting the user. The distance sensor (6) is prevented from contacting the foodstuffs by being placed onto the frame (9). In this embodiment, the distance sensor (6) is positioned at the part of the frame (9) close to the door (8), thereby the detection of the user by the distance sensor (6) is facilitated.

[0026] In the cooling device (1) of the present invention, by means of the distance sensor (6) disposed on the shelf (3), the user movement is detected and by means of the control unit (7), the luminosity of the illumination means (5) is controlled as per the movement of the user. Consequently, the user can easily adjust the luminosity level in the interior of the compartment (4).

Claims

1. A cooling device (1) **comprising** a body (2); more than one shelf (3) that is placed into the body (2) and whereon the foodstuffs are placed; at least one compartment (4) that is situated between two shelves (3) or between the base of the body (2) and one shelf (3) or between the ceiling of the body (2) and one shelf (3), and at least one illumination means (5) that is disposed in each compartment (4), **characterized by**
 - a distance sensor (6) that is disposed on the shelf (3) and that measures the vertical distance between the user and itself by detecting the presence of the user, and
 - a control unit (7) that calculates the change in the distance between the distance sensor (5) and the user depending on the movement of the user in the vertical direction, thus enabling the luminosity of the illumination means (5) to be controlled according to the said change in distance.
2. A cooling device (1) as in Claim 1, **characterized by** the control unit (7) that provides that the luminosity of the illumination means (4) in the compartment (4) where the distance sensor (6) that detects the user is located is increased when the distance between the distance sensor (6) and the user increases and provides that the luminosity of the illumination means (4) in the compartment (4) where the distance sensor (6) that detects the user is located is decreased when the distance between the distance sensor (6) and the user decreases.
3. A cooling device (1) as in Claim 2, **characterized by** the control unit (7) that enables the luminosity of the illumination means (5) located in other compartments (4) to be decreased in an equal amount when the luminosity of the illumination means (5) located in one of the compartments (4) decreases.
4. A cooling device (1) as in any one of the above claims, **characterized by** the control unit (7) that enables the distance sensor (6) to perform measurement after waiting for a predetermined time period when the user is detected by the distance sensor (6) .
5. A cooling device (1) as in any one of the above claims, **characterized by** the control unit (7) that enables the changing of the luminosity of the illumination means (5) to be ended when the user gets out of the field of view of the distance sensor (6).

6. A cooling device (1) as in any one of the above claims, **characterized by** a door (8) providing access into the body (2) and the control unit (7) that enables the distance sensor (6) to perform measurement with the opening of the door (8).
7. A cooling device (1) as in any one of the above claims, **characterized by** a frame (9) surrounding the shelf (3) and the distance sensor (6) that is disposed on the frame (9).

Figure 1

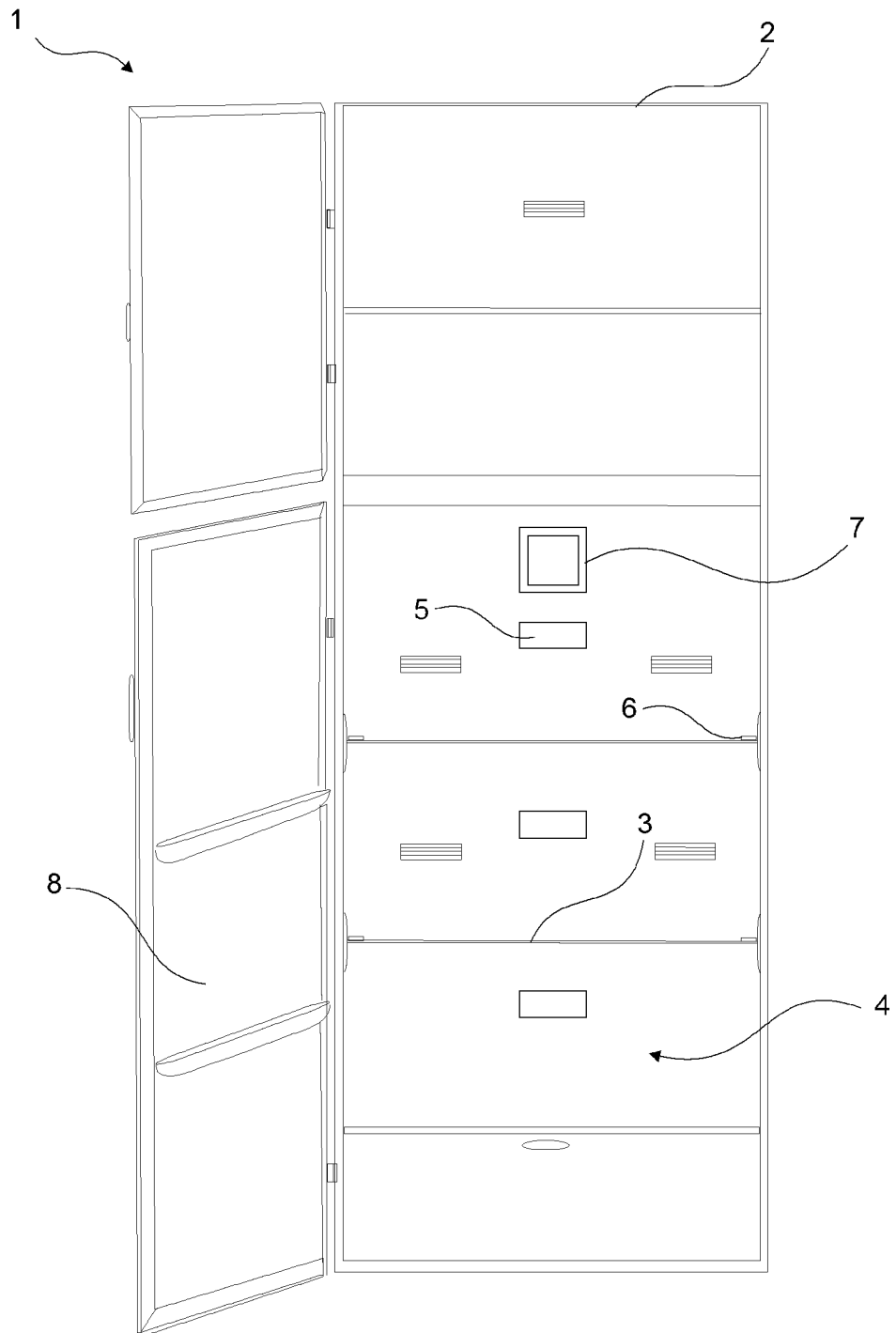
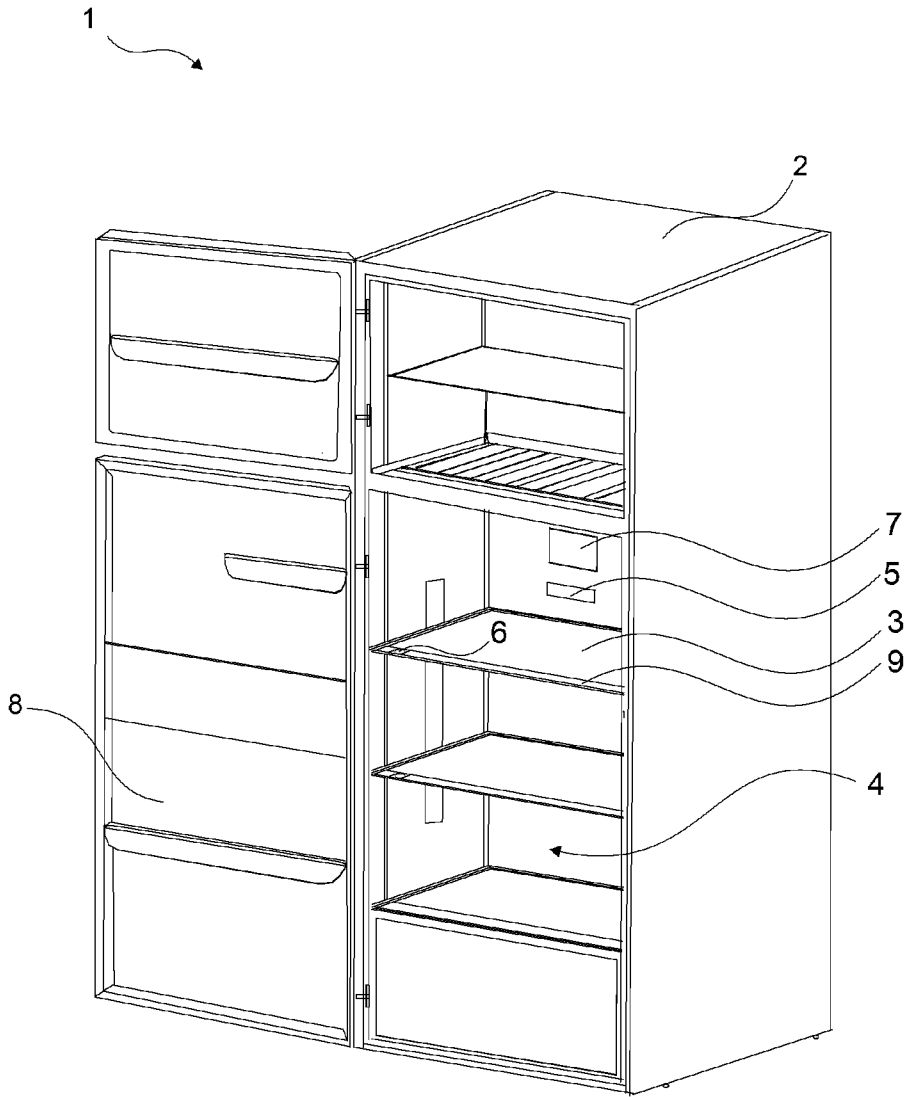


Figure 2



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/074835

A. CLASSIFICATION OF SUBJECT MATTER
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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

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 062 510 A2 (SANYO ELECTRIC CO [JP]) 27 May 2009 (2009-05-27) paragraphs [0002] - [0089]; figures 1-8 -----	1-7
A	JP 2006 266646 A (SANYO ELECTRIC CO) 5 October 2006 (2006-10-05) the whole document -----	1
A	KR 2014 0088720 A (LG ELECTRONICS INC [KR]) 11 July 2014 (2014-07-11) the whole document -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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