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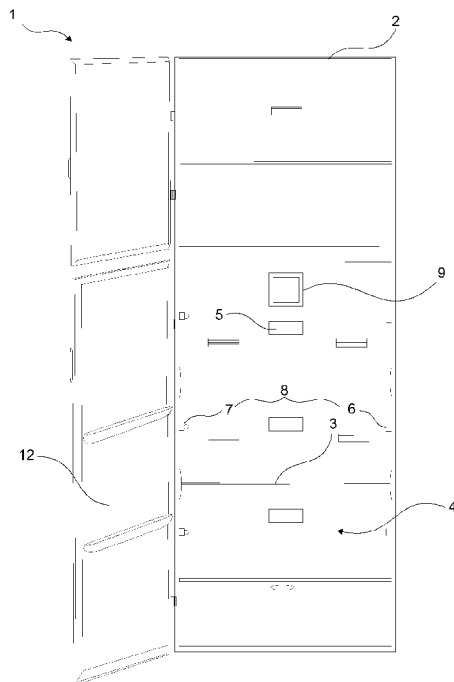
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(54) Title: A COOLING DEVICE COMPRISING ILLUMINATION ELEMENTS

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 element (5) that is disposed in each compartment (4).

Description**A COOLING DEVICE COMPRISING ILLUMINATION ELEMENTS**

- [0001] The present invention relates to a cooling device the interior illumination of which is controlled.
- [0002] In cooling devices such as refrigerator, deep freezers, etc., 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 are controlled according to the open/closed status of the door. In this case, the illumination of the other compartments together with the compartment that is used by the user causes 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 elements are prevented from being operated unnecessarily.
- [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 that has at least two side walls and a rear wall; 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 element that is disposed in each compartment.
- [0006] The cooling device of the present invention comprises at least one sensor that is disposed on the side walls of the body so as to remain outside the compartment, each corresponding to a compartment, the sensor having a receiver and a transmitter, and a control unit that enables the illumination element to be controlled according to the data received from the sensor. When the user reaches to any one of the compartments in order to perform an operation such as loading, unloading, etc., a barrier such as the user's hand, a foodstuff or a receptacle, etc. enters between the

receiver and the transmitter, thus the signal transmission between the receiver and the transmitter is interrupted and the control unit determines the compartment that is used by the user by detecting the sensor without any signal transmission. The illumination elements situated in the compartments are controlled so that sufficient illumination level is provided in the determined compartment for the user.

[0007] In an embodiment of the present invention, when the signal transmission between the receiver and the transmitter is interrupted, the control unit enables the transmission of energy to the illumination element situated in the compartment corresponding to the sensor with no signal transmission. Thus, the compartment that the user reaches for performing an operation is determined and by transmitting energy only to the illumination element of the determined compartment, the said compartment is enabled to be illuminated. Consequently, energy saving is provided by decreasing the energy consumption of the illumination elements. Moreover, the lifespan of the illumination elements is increased by preventing the unnecessary activation of the illumination elements situated in the compartments wherein the user does not perform any operation.

[0008] In another embodiment of the present invention, when the signal transmission between the receiver and the transmitter is interrupted, the control unit enables the brightness of the illumination element situated in the compartment corresponding to the sensor with no signal transmission to be increased. The illumination element preferably has two different brightness levels. While there is signal transmission between the receiver and the transmitter, the illumination elements situated in the compartments are operated at the lower brightness level, namely the first brightness level. At the lower brightness level, the user is enabled to see the foodstuffs in the compartment. When the signal transmission between the receiver and the transmitter is interrupted, the control unit determines the compartment related to the sensor with not signal transmission and the brightness level of the illumination element situated in the determined compartment is increased, thus the illumination element is enabled to be operated at the second brightness level that is a higher brightness level

with respect to the first brightness level. Thus, energy saving is provided by preventing the compartments from being illuminated at the higher brightness at all times.

[0009] In another embodiment of the present invention, the cooling device comprises the control unit that determines the region in the compartment wherein the user performs an operation and that enables the brightness of the illumination element close to the region of operation to be increased. When the signal transmission between the receiver and the transmitter is interrupted, the control unit determines the compartment wherein the user performs an operation and enables the illumination elements situated in the determined compartment to be energized or the luminous intensity thereof to be increased. Upon evaluating the distance from the user to the receiver and the transmitter, the control unit furthermore determines the region wherein the user performs an operation and enables the brightness of the illumination element close to the determined region to be higher than the brightness of the other illumination element inside the compartment. In this embodiment, one illumination element is disposed on each of the opposite walls of the body. By calculating the distance of the user to the receiver and the transmitter, the control unit determines the illumination element close to the user and enables the light intensity of the determined illumination element to be increased. Thus, by illuminating better the region in the compartment wherein the user reaches, the user is enabled to see better the foodstuffs in the region of operation. Moreover, energy saving is provided by illuminating the region where the user does not perform any operation at a lower brightness level.

[0010] In another embodiment of the present invention, the cooling device comprises a housing that is arranged on the body and a carrying apparatus that is placed into the housing and whereon the receiver and/or the transmitter is/are disposed. By means of the receiver and transmitter arrays disposed onto the carrying apparatus having the same height with the compartment, the compartment entrance is scanned all along like a curtain and the movements of the user for reaching into the compartment are enabled to be detected. Moreover, the receivers and the transmitters

are grouped with the carrying apparatus and mounted to the body as a single piece, thus facilitating the assembly process.

- [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 signal transmission to be carried out between the receiver and the transmitter with the opening of the door. The receiver and the transmitter are activated when the door is open and deactivated when the door is closed.
- [0012] By means of the present invention, a cooling device is realized, wherein the compartment wherein the user performs an operation is determined, thus the determined compartment is illuminated while the illumination of the other compartments is turned down or completely turned off, thereby providing energy savings.
- [0013] The cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:
- [0014] Figure 1 – is the schematic view of a cooling device.
- [0015] Figure 2 – is the perspective view of a cooling device.
- [0016] Figure 3 – is the schematic view of the carrier apparatus in an embodiment of the present invention.
- [0017] Figure 4 – is the schematic view of the carrier apparatus in another embodiment of the present invention.
- [0018] The elements illustrated in the figures are numbered as follows:
1. Cooling device
 2. Body
 3. Shelf
 4. Compartment
 5. Illumination element
 6. Receiver
 7. Transmitter
 8. Sensor
 9. Control unit
 10. Housing
 11. Carrier apparatus

12. Door

- [0019] 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 element (5) that is disposed in each compartment (4) (Figure 1 and Figure 2).
- [0020] The cooling device (1) of the present invention comprises at least one sensor (8), each corresponding to a compartment (4), having a receiver (6) and a transmitter (7) that are disposed on the side walls of the body (2) so as to remain outside the compartment (4), the sensor (8) with the interruption of the signal transmission between the receiver (6) and the transmitter (7) when a barrier enters between the receiver (6) and the transmitter (7), detecting the presence of the barrier, the cooling device (1) furthermore comprising a control unit (9) that enables the illumination element (5) to be controlled according to the data received from the sensor (8). When the user reaches towards the compartment (4) in order to place foodstuffs into the compartment or to take foodstuffs from the compartment (4), he/she prevents the signal transmission between the receiver (6) and the transmitter (7) corresponding to the compartment (4) he/she reaches. Thus, the control unit (9) determines the sensor (8) with no signal transmission, hence the compartment (4) the user reaches. The illumination levels inside the compartments (4) are controlled so that sufficient illumination level is provided in the determined compartment (4) for the user.
- [0021] In an embodiment of the present invention, when the signal transmission between the receiver (6) and the transmitter (7) is interrupted, the control unit (9) enables the transmission of energy to the illumination element (5) situated in the compartment (4) corresponding to the sensor (8) with no signal transmission. When the signal transmission between the receiver (6) and the transmitter (7) is interrupted, the control unit (9) determines the compartment (4) corresponding to the sensor (8) with no signal transmission and decides that the user has reached into the determined

compartment (4), thus enabling the transmission of energy to the illumination element (5) situated in the said compartment (4). Thus, by illuminating only the compartment (4) used by the user and keeping the illumination elements (5) in the other compartments (4) closed, energy saving is provided.

[0022] In another embodiment of the present invention, when the signal transmission between the receiver (6) and the transmitter (7) is interrupted, the control unit (9) enables the brightness of the illumination element (5) situated in the compartment (4) corresponding to the sensor (8) with no signal transmission to be increased. In this embodiment, the illumination elements (5) disposed inside the compartments (4) are illuminated at a low brightness level predetermined by the manufacturer. When the signal transmission between the receiver (6) and the transmitter (7) is interrupted, the control unit (9) determines the compartment (4) corresponding to the sensor (8) with no signal transmission and enables the brightness level of the illumination element (5) situated in the determined compartment (4) to be increased. Thus, when the user does not reach into the compartment (4), the compartments (4) are enabled to be illuminated at a low brightness level sufficient for the user to see the foodstuffs placed into the compartment (4).

[0023] In another embodiment of the present invention, the cooling device (1) comprises the control unit (9) that determines the region in the compartment (4) wherein the user performs an operation and that enables the brightness of the illumination element (5) close to the region of operation to be increased. When the signal transmission between the receiver (6) and the transmitter (7) is interrupted, the control unit (9) determines the compartment (4) wherein the user performs an operation and enables the illumination elements (5) situated in the determined compartment (4) to be energized or the brightness thereof to be increased. By evaluating the distance from the user to the receiver (6) and the transmitter (7), the control unit (9) furthermore detects the position the user is situated between the receiver (6) and the transmitter (7), and according to the detected position, determines the region inside the compartment (4)

wherein the user performs an operation and provides that the brightness of the illumination element (5) close to the determined region is higher than the brightness of the other illumination element (5) inside the compartment (4). Thus, the user is enabled to see better the region inside the compartment wherein he/she performs an operation.

[0024] In another embodiment of the present invention, the cooling device (1) comprises a housing (10) that is arranged on the body (2) and a carrying apparatus (11) that is placed into the housing (10) and whereon the receiver (6) and/or the transmitter (7) is disposed. The receiver(s) (6) and the transmitter(s) (7) are disposed on the carrying apparatuses (11) that are oppositely positioned on the body (2) so that only the receiver (6) and only the transmitter (7) or the receivers (6) and the transmitters (7) are placed in order on each apparatus (11) and the receivers (6) and the transmitters (7) face each other. The receiver (6) and transmitter (7) arrays disposed on the carrying apparatus (11) having the same height with the compartment (4) creates a light curtain that completely covers the open surface of the compartment (4) enabling the user to load/unload the foodstuffs. Thus, the compartment (4) the user reaches is easily detected (Figure 3 and 4).

[0025] In another embodiment of the present invention, the cooling device (1) comprises a door (12) providing access into the body (2) and the control unit (9) that enables the signal transmission to be carried out between the receiver (6) and the transmitter (7) with the opening of the door (12). After the user opens the door (12), the control unit (9) starts the signal transmission between the receiver (6) and the transmitter (7) and when the user reaches one of the compartments (4) in order to place foodstuffs into the cooling device (1) or take foodstuffs out of the cooling device (1), determines the compartment (4) the user reaches and controls the illumination elements (5) in the corresponding compartment (4). When the user closes the door (12), the control unit (9) decides that the cooling device (1) is not in use and terminates the signal transmission between the receiver (6) and the transmitter (7).

[0026] In the cooling device (1) of the present invention, the compartment (4) the

user reaches to place foodstuffs or take foodstuffs out is determined and the determined compartment (4) is illuminated at a higher level than other compartments (4), thus preventing the energy consumption originating from the illumination of the unused compartments (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 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 element (5) that is disposed in each compartment (4), **characterized by**
 - at least one sensor (8), each corresponding to a compartment (4), having a receiver (6) and a transmitter (7) that are disposed on the side walls of the body (2) so as to remain outside the compartment (4), the sensor (8) with the interruption of the signal transmission between the receiver (6) and the transmitter (7) when a barrier enters between the receiver (6) and the transmitter (7), detecting the presence of the barrier, and
 - a control unit (9) that enables the illumination element (5) to be controlled according to the data received from the sensor (8).
2. A cooling device (1) as in Claim 1, **characterized by** the control unit (9) that, when the signal transmission between the receiver (6) and the transmitter (7) is interrupted, enables the transmission of energy to the illumination element (5) situated in the compartment (4) corresponding to the sensor (8) with no signal transmission.
3. A cooling device (1) as in Claim 1, **characterized by** the control unit that, when the signal transmission between the receiver (6) and the transmitter (7) is interrupted, enables the brightness of the illumination element (5) situated in the compartment (4) corresponding to the sensor (8) with no signal transmission to be increased.
4. A cooling device (1) as in any one of the above claims, **characterized by** the control unit (9) that determines the region in the compartment (4) wherein the user performs an operation and that enables the brightness of the illumination element (5) close to the region of operation to be increased.
5. A cooling device (1) as in any one of the above claims, **characterized by** a housing (10) that is arranged on the body (2) and a carrying apparatus (11) that is placed into the housing (10) and whereon the receiver (6) and/or the transmitter (7) is disposed.

6. A cooling device (1) as in any one of the above claims, **characterized by** a door (12) providing access into the body (2) and the control unit (9) that enables the signal transmission to be carried out between the receiver (6) and the transmitter (7) with the opening of the door (12).

Figure 1

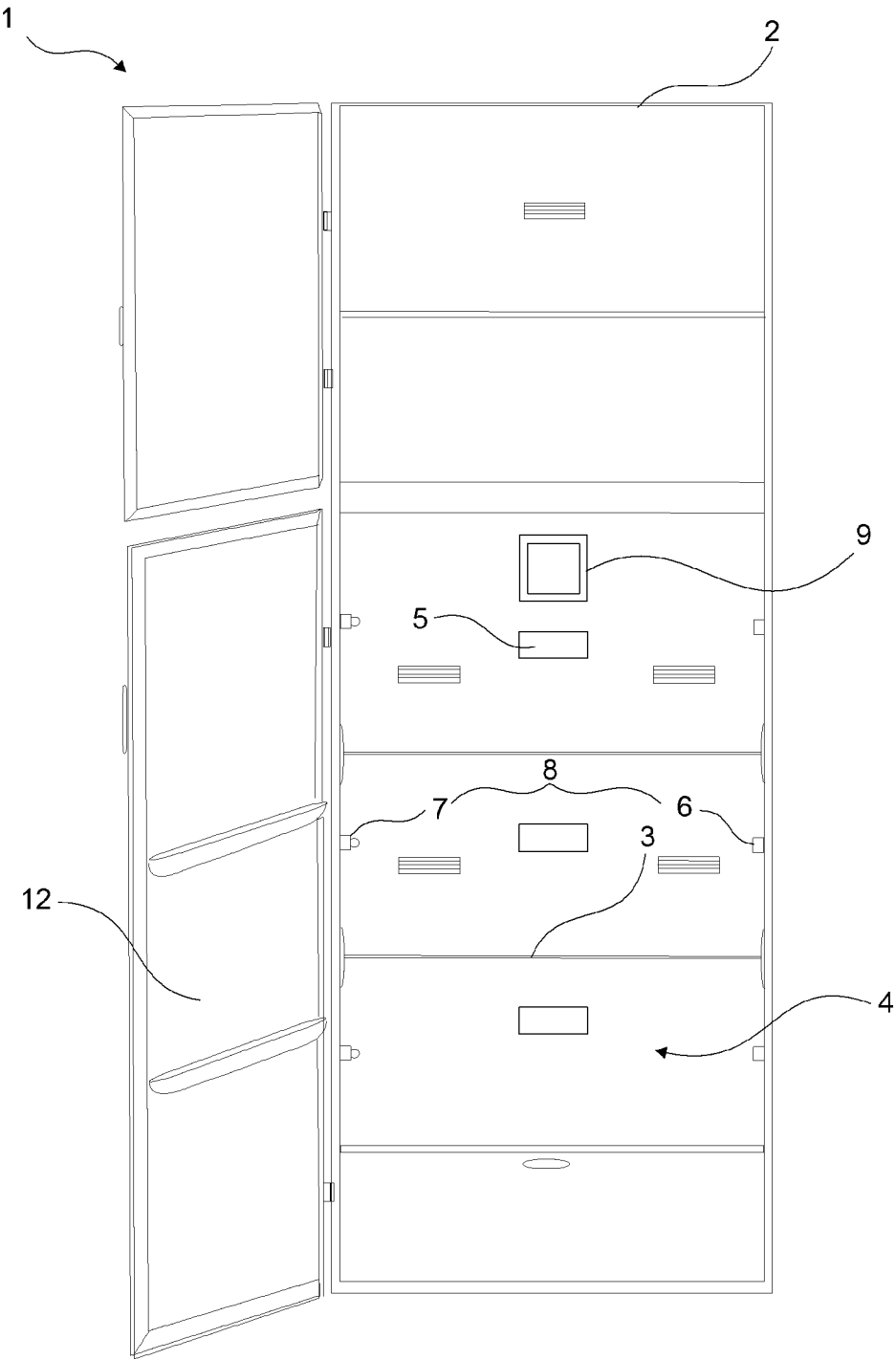


Figure 2

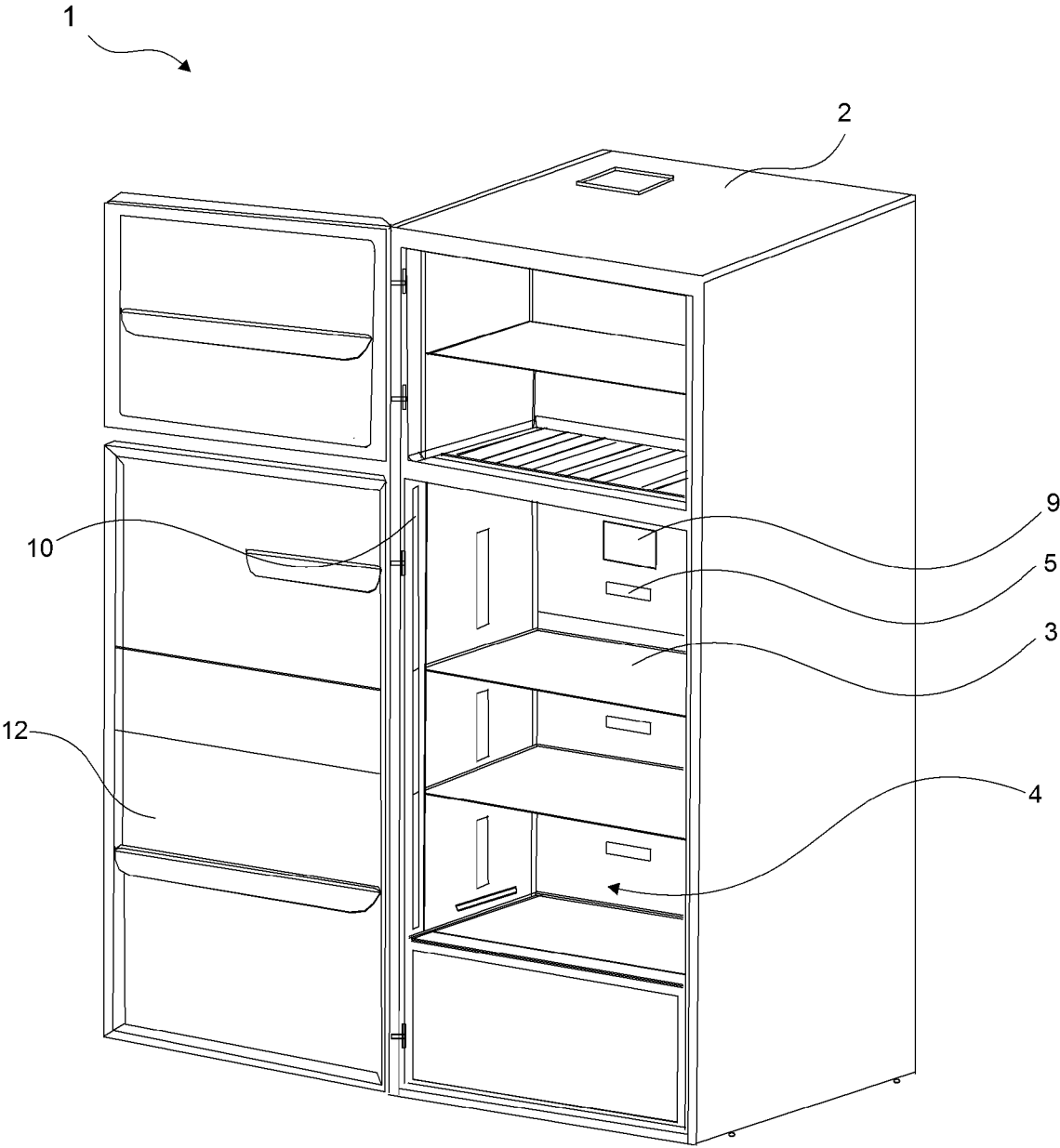


Figure 3

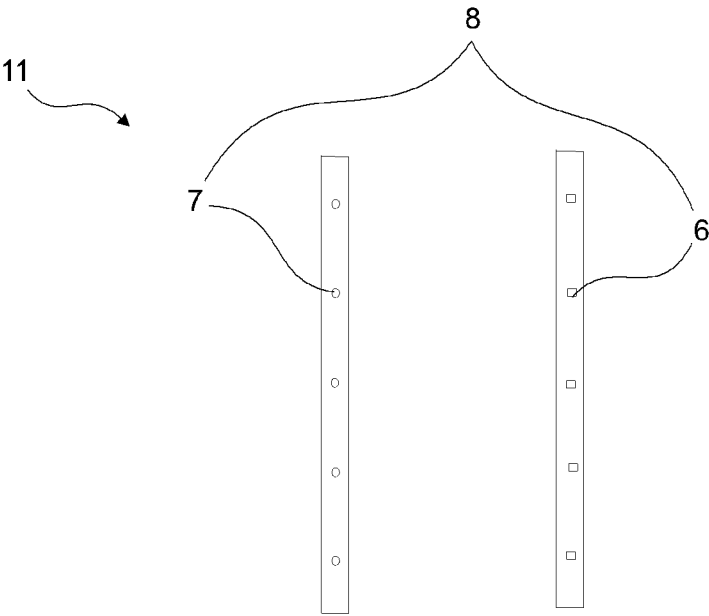
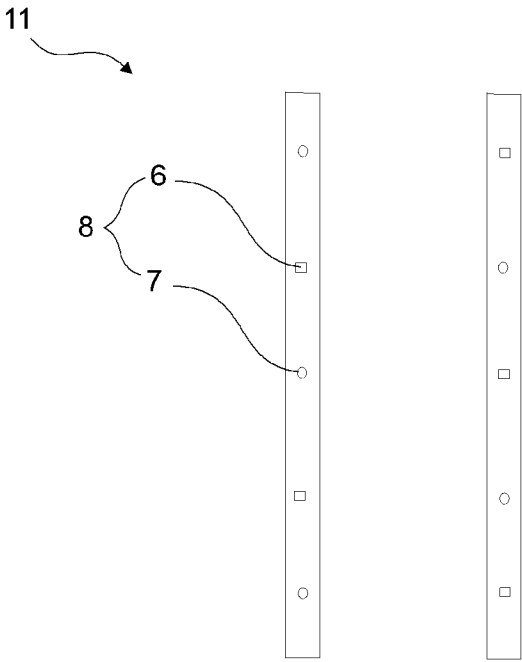


Figure 4



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/072561

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25D27/00
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.
Y	EP 2 062 510 A2 (SANYO ELECTRIC CO [JP]) 27 May 2009 (2009-05-27) paragraphs [0002] - [0089]; figures 1-8 -----	1-6
Y	DE 10 2007 029188 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 8 January 2009 (2009-01-08) paragraphs [0007] - [0032]; figure 1 -----	1-6



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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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