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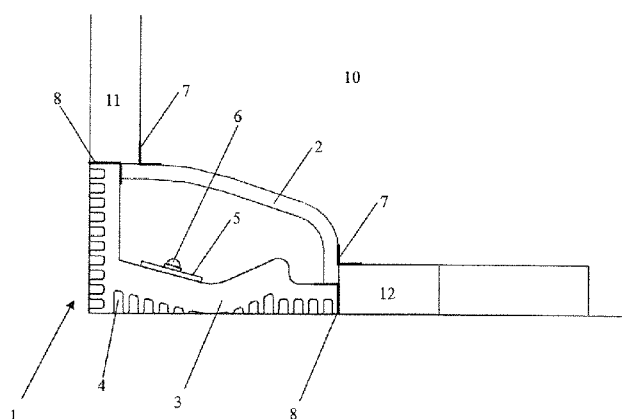


Figure 3

(57) Abstract: The present invention relates to a lightening apparatus (1) used for a refrigeration device (10), comprising a lighting part and a thermal dissipation part, wherein the lighting part is installed at an inner side of the refrigeration device (10) and lightens an inner room of the refrigeration device (10), and the thermal dissipation part is installed at an outer side of the refrigeration device (10) and directly exchange heat with environment. The present invention further relates to a refrigeration device (10) equipped with the lightening apparatus (1) of the type above. The lightening apparatus (1) according to the present invention can provide good lightening effect to the inside of the refrigeration device and does not hinder the mechanical design of the existing refrigeration device; moreover, it will not produce negative influence to the cooling system within the refrigeration device, thereby reducing the energy consumption of the refrigeration device for compensating heating of the lightening apparatus.



Description

A Lightning Apparatus and a Refrigeration Device Equipped with the Lightning Apparatus

5

Technical Field

The present invention relates to a lightning apparatus used for a refrigeration device. In addition, the present invention further relates to a refrigeration device equipped with such lightning apparatus.

10

Background Art

At present, the lightning apparatus, especially LED lightning apparatus, are widely in various aspects of our life. A kind of lightning apparatus particularly used for the refrigeration device, for instance, usually appears in the show box for cold drinks in supermarkets. Fig. 1 shows such common lightning apparatus used for the refrigeration device. This kind of lightning apparatus generally has a hollow cylindrical shell in which a circuit board is fixedly installed. In the shell, the circuit board has one side provided with a lighting module for lighting, and the other side provided with a thermal dissipation body for heat dissipation. Such lightning apparatus usually is fixed within the refrigeration device for providing sufficient illumination intensity to the exhibited articles.

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The lightning apparatus for the refrigeration device in the prior art mainly includes two parts: a lightning part and a thermal dissipation part. The lightning part is formed by a material with poor thermal conductivity, for instance, plastic or glass in particular, and the thermal dissipation part is formed by a material with a good thermal conductivity, for

30

instance, aluminum and other metal materials. This type of common entire lightening apparatus usually acts as a system fixed in the refrigeration device, for example, on an inner edge of the sliding door of the refrigerator.

5 Thus, such lightening apparatus installed in the refrigeration device mainly has two problems: on one hand, the heat energy is usually generated inevitably when the lightening apparatus works, then the lightening apparatus is considered as a constant heat source in the refrigeration device, thus
10 the energy supply device of the refrigeration device provides energy not only to refrigeration thereof but also additional energy to the refrigeration device to compensate the lightening apparatus self-heating effect. And on the other hand, as the refrigeration device maintains a quite low temperature
15 all the time, the hot air in the lightening apparatus and the cold air in the cooling device meet on the surface of the cover body of the lightening apparatus, and further are condensed into liquid herein. This is the technical bottleneck to the IP development and electrical reliability of the
20 lightening apparatus for a long time.

Summary of the Invention

Therefore, the object of the present invention lies in providing a lightening apparatus used for a refrigeration device and a refrigeration device equipped with such lightening apparatus. The lightening apparatus according to the present
25 invention can provide good lightening effect to the inner room of the refrigeration device and does not hinder the mechanical design of the existing refrigeration device; moreover, it will not produce negative influence to the cooling
30 system within the refrigeration device, thereby reducing the energy consumption of the refrigeration device for compensat-

ing heating of the lightening apparatus.

The object of the present invention may be accomplished via a lightening apparatus used for a refrigeration device. The lightening apparatus comprises a lighting part and a thermal
5 dissipation part, wherein the lighting part is installed at an inner side of the refrigeration device and lightens an inner room of the refrigeration device, and the thermal dissipation part is installed at an outer side of the refrigeration device and directly exchanges heat with the environment.

10 According to a preferred solution of the present invention, the lighting part comprises a transparent cover body, a circuit board and an illuminant mounted on the circuit board.

According to a preferred solution of the present invention, the thermal dissipation part is configured as a base supporting the circuit board. According to such design, the base is
15 enabled to have double functions of thermal dissipation and supporting. Thus, the number of the composite parts of the lightening apparatus can be reduced in the situation of realizing normal thermal dissipation, and the cost is further
20 saved.

Preferably, an outer surface of the base away from the cover body is formed with a heat sink structure with a plurality of heat dissipating sheet. Compared with the other structures, the heat sink structure has good thermal dissipation effect
25 and is easy to be manufactured.

More advantageously, respective grooves formed between adjacent heat dissipating sheets have different depths. Different thermal dissipation areas may be obtained by means of the grooves with different depths, thereby better adapted to dif-

ferent heat exchange environments.

According to a preferred solution of the present invention, an inner surface of the base towards the cover body is configured as a reflection face or coated with a reflective material, is mounted with an optical element such as reflector to reflect light. Other optical structure or element such as lens used for refracting light also may be provided on this inner surface. Of course, any optical structure or element can be used, which can project the light emitted from a light source in the inner room of the refrigeration effectively. In a preferred embodiment, the base may be made from aluminum. Other materials such aluminum alloy having excellent thermal conductivity also may be considered to be used to manufacture the base. By designing the inner surface, i.e. one side towards the cover body, of the base into a reflection face, the light emitted from a light source mounted therein may be reflected according to the optical principle, so that the light is emitted from the cover body highly effectively, and a good lightening effect is further obtained in the refrigeration device.

According to a preferred solution of the present invention, the cover body is made from a material selected from PC, PMMA or glass. The cover body made from any one of the above materials or from a material having the same optical properties has good light transmission effect; moreover, since it has sufficient hardness, safety of the lightening apparatus is also assured.

The other object of the present invention lies in providing a refrigeration device equipped with the lightening apparatus of the above type. Such refrigeration device has not only

good internal visual effect but also notable energy saving performance as well. Compared with the traditional refrigeration devices, the refrigeration device according to the present invention has higher efficiency and is more environment-
5 protective.

According to the present invention, the base of the lightening apparatus is installed in the refrigeration device and acts as a portion of a shell of the refrigeration device, i.e. an outer surface away from the cover body of the base
10 constructs a shell section of the shell of the refrigeration device with a matched shape, and natural heat exchange with the outside may be directly carried out as the heat sink structure of the outer surface is located on the shell of the refrigeration device.

15 According to a preferred solution of the present invention, the cover body and the base jointly define a space accommodating an illuminant.

Preferably, a first and a second heat insulation layers are provided between the base and the other portions of the
20 shell, and between the base and the cover body, respectively. As the base is made from a metal, the heat insulation layers thus should be provided for preventing the heat generated by the lightening apparatus from being transferred to the shell of the refrigeration device through the base. The heat insulation layer between the cover body and the base is config-
25 ured to prevent the cover body from deformation when it is heated.

In a preferred embodiment, the first and the second heat insulation layers are formed in one piece as an L-shaped heat
30 insulation layer. The L-shaped heat insulation layer has one

side located between the base and the shell and the other side located between the base and the cover body.

According to the present invention, there is an L-shaped sealing layer made from an elastic material between the cover
5 body and the other portions of the shell. Through provision of such sealing layer, the cold air or dust within the refrigeration device is effectively prevented from going into the cover body, and the heat within the lightening apparatus is also prevented from dissipating into the refrigeration de-
10 vice. This sealing layer may be made from the elastic material, such as plastic or rubber. Of course, other materials that are adapted to sealing and have the ability of effective waterproof and dustproof also may be selected.

Preferably, the base comprises a first portion and a second
15 portion perpendicular to each other. Such base having a right-angle configuration is suited to be used as edges similarly having the right-angle configuration of the refrigeration device.

Further improvements certainly may be made to the refrigeration
20 device in aspects such as size of the cold room, power of the lightening system, usage of the refrigeration device, etc., in order to obtain the working properties of saving more energy.

It should be understood that the general descriptions above
25 and detailed explanations below are for the purpose of illustration, aiming at further describing the present invention for which protection is sought.

Brief Description of the Drawings

The drawings constitute a portion of the Description for further understanding of the present invention. These drawings illustrate the embodiments of the present invention and explain the principle of the present invention together with
5 the Description. In the drawings, the same element is represented by the same reference sign, wherein

Fig. 1 is a lightening apparatus used for a refrigeration device in the prior art;

Fig. 2 is a solid perspective view of a lightening apparatus
10 according to the present invention;

Fig. 3 is a sectional view of the lightening apparatus shown in Fig. 2 according to the present invention; and

Fig. 4 is an embodiment of a refrigeration device according to the present invention.

15 **Detailed Description of the Embodiments**

Fig. 2 is a solid perspective view of the lightening apparatus according to the present invention. In this embodiment, a lightening apparatus 1 has a lighting part and a thermal dissipation part. The lighting part is installed at an inner
20 side of a refrigeration device 10 and lightens an inner room thereof, and the thermal dissipation part is installed at an outer side of the refrigeration device 10 and directly exchanges heat with environment (see Fig. 3). The lighting part of the lightening apparatus 1 comprises a cover body 2
25 through which light can transmit, a circuit board 5 and an illuminant 6 mounted on the circuit board 5. The cover body 2 may be made from a material selected from PC, PMMA, glass or materials with similar light transmission properties. The

thermal dissipation part is configured as a base 3 supporting the circuit board 5.

Fig. 3 is a sectional view of the lightening apparatus shown in Fig. 2 according to the present invention. Compared with
5 Fig. 2, it can be seen more clearly from Fig. 3 that the base 3 in an L shape shown in the figure comprises a first portion and a second portion perpendicular to each other, and has a heat sink structure with a plurality of heat dissipating
10 sheet on an outer surface towards to the outside of the refrigeration device 10. The L-shaped structure of the base 3 advantageously matches the shape of shell edges of the cuboid refrigeration device 10, the base 3 and the refrigeration device 10 thus are formed into an entirety. The base 3 may be
15 made from aluminum and also may be made from other metals with good heat conduction. The lightening apparatus 1 according to the present invention may work continuously and stably to assure visualization of the refrigeration device 10 for exhibiting articles. Outer surfaces of the base 3 towards the
20 refrigeration device 10 are formed with a plurality of grooves 4 to thus form a heat sink structure of the outer surfaces.

Preferably, the grooves 4 may have the same or different depths so as to meet different thermal dissipation requirements. The first portion and the second portion perpendicular
25 to each other of the base 3 are connected with shell regions 11 and 12 perpendicular to each other of the refrigeration device 10 and have the same orientation, thus, one right angle edge of the refrigeration device 10 is formed. As the circuit board 5 mounted with the illuminant 6 is arranged in
30 the base 3, inner surfaces facing the cover body 2 of the base 3 are designed to be reflection faces or coated with a reflective material. The reflection faces are preferably de-

signed to be curved faces capable of realizing optimal optical reflection effect, and possibly, other optical structure or element such as lens used for reflecting light also may be provided on this inner surface. Thus, sufficient light may be
5 provided to the inside of the refrigeration device 10.

In order to realize the energy saving effect of the refrigeration device 10 and to assure the service life of the lightning apparatus 1, good sealing and heat insulation should be achieved with respect to the refrigeration device
10 10, and the technical requirements to dustproof and waterproof of the lightning apparatus 1 itself should be met. Particularly preferably, a sealing layer 7 in an L shape is provided at a position where the cover body 2 of the lightning apparatus 1 and the refrigeration device 10 are connected. This sealing layer may be made from an elastic material, such as rubber or plastic, for maintaining sealing effect of the refrigeration device 10 and preventing the cold air from leaking out through gaps left when the lightning apparatus 1 is mounted. As the base 3 is a good conductor of
15 heat, heat insulation layers 8 in an L shape should be provided between the shell regions 11, 12 of the refrigeration device 10, the base 3 and the cover body 2 to prevent the heat that ought to have been dissipated through the base 3 to the outside from being transferred to the refrigeration device 10 in a contacting manner and also preventing the cover
20 body 2 from deformation when it is heated.
25

Fig. 4 is an embodiment of a refrigeration device according to the present invention. A rectangular lightning apparatus 1 is provided between the two adjacent shell regions 11 and
30 12 perpendicular to each other of the refrigeration device 10. The lightning apparatus 1 according to the present invention is installed, as an edge, on a position where a door

and a body of a vertical cold cupboard 10 are connected.

Through simulation calculation, a portion of the consumed power of the refrigeration device designed according to the present invention may effectively save, compared with the re-
5 frigeration device in the prior art.

The above is merely preferred embodiments of the present invention but not to limit the present invention. For the person skilled in the art, the present invention may have various alterations and changes. Any alterations, equivalent sub-
10 stitutions, improvements, within the spirit and principle of the present invention, should be covered in the protection scope of the present invention.

List of reference signs

1		lightening apparatus
2		cover body
3		base
5	4	groove
	5	circuit board
	6	illuminant
	7	sealing layer
	8	heat insulation layer
10	10	refrigeration device
	11	shell region of refrigeration device
	12	shell region of refrigeration device

Patent claims

1. A lightening apparatus (1) used for a refrigeration device (10), comprising a lighting part and a thermal dissipation part, wherein the lighting part is installed at an inner side of the refrigeration device (10) and lightens an inner room of the refrigeration device (10), and the thermal dissipation part is installed at an outer side of the refrigeration device (10) and directly exchanges heat with environment.
2. The lightening apparatus (1) according to claim 1, wherein the lighting part comprises a transparent cover body (2), a circuit board (5) and an illuminant (6) mounted on the circuit board (5).
3. The lightening apparatus (1) according to claim 1, wherein the thermal dissipation part is configured as a base (3) supporting the circuit board (5).
4. The lightening apparatus (1) according to claim 3, wherein an outer surface of the base (3) away from the cover body (2) is formed with a heat sink structure with a plurality of heat dissipating sheet.
5. The lightening apparatus (1) according to claim 4, wherein respective grooves (4) formed between adjacent heat dissipating sheets have different depths.
6. The lightening apparatus (1) according to claim 3, wherein an inner surface of the base (3) towards the cover body (2) is configured as a reflection face or coated with a reflective material is mounted with an optical element to reflect light .

7. The lightening apparatus (1) according to claim 3,
wherein an optical structure or element configured to refract
light is provided on an inner surface of the base (3) towards
5 the cover body (2).

8. The lightening apparatus (1) according to claim 3,
wherein the base (3) is made from aluminum.

10 9. The lightening apparatus (1) according to claim 2,
wherein the cover body (2) is made from a material selected
from PC, PMMA or glass.

10. A refrigeration device (10), wherein the refrigeration
15 device (10) is equipped with one or more of the lightening
apparatus (1) according to any one of claims 1-9.

11. The refrigeration device (10) according to claim 10,
wherein the base (3) of the lightening apparatus (1) is in-
20 stalled in the refrigeration device (10) as a portion of a
shell of the refrigeration device (10).

12. The refrigeration device (10) according to claim 11,
wherein the cover body (2) and the base (3) jointly define a
25 space accommodating an illuminant.

13. The refrigeration device (10) according to claim 12,
wherein a first and a second heat insulation layers are pro-
vided between the base (3) and other portions of the shell,
30 and between the base (3) and the cover body (2), respec-
tively.

14. The refrigeration device (10) according to claim 13,
wherein the first and the second heat insulation layers are

formed in one piece as an L-shaped heat insulation layer (8).

15. The refrigeration device (10) according to claim 12,
wherein there is an L-shaped sealing layer (7) made from an
5 elastic material between the cover body (2) and other portions of the shell.

16. The refrigeration device (10) according to claim 11,
wherein the base (3) comprises a first portion and a second
10 portion perpendicular to each other.

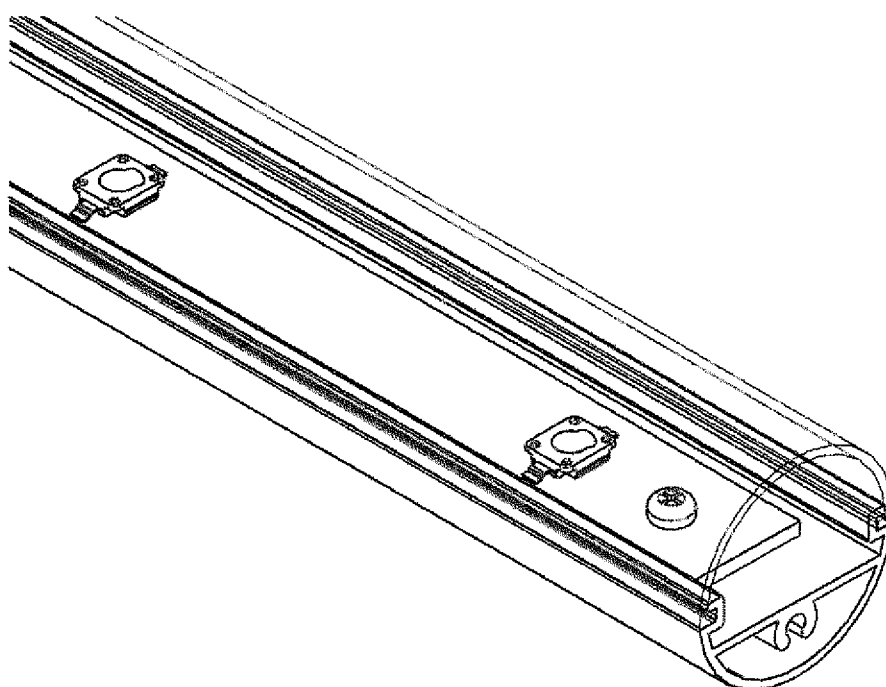
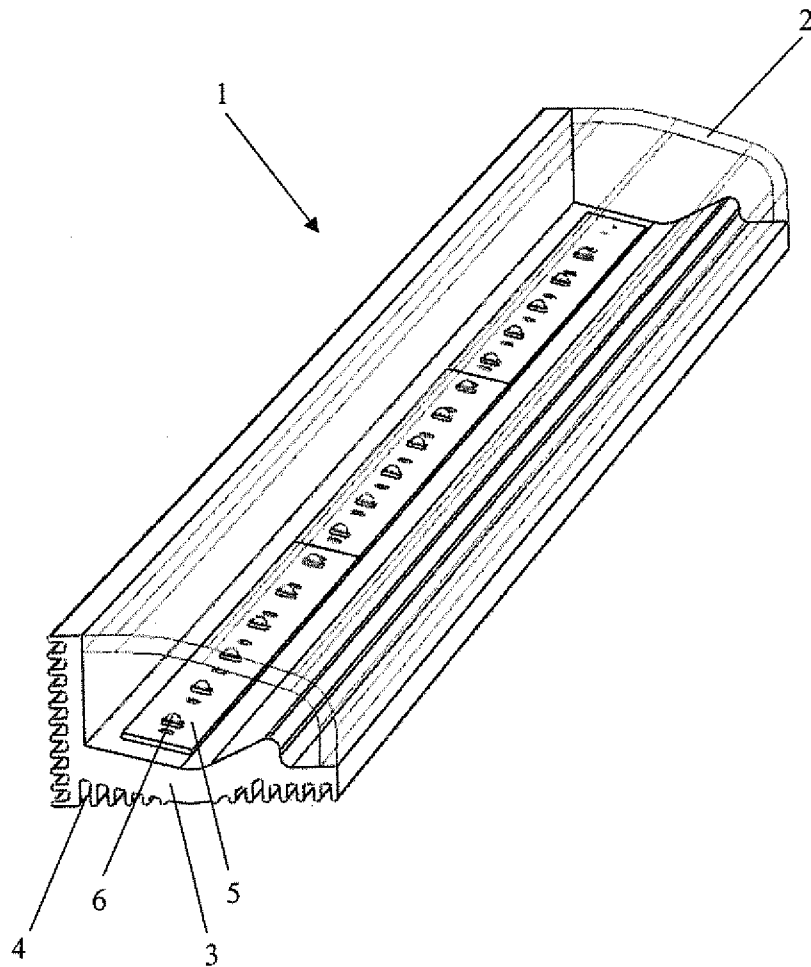


Figure 1

**Figure 2**

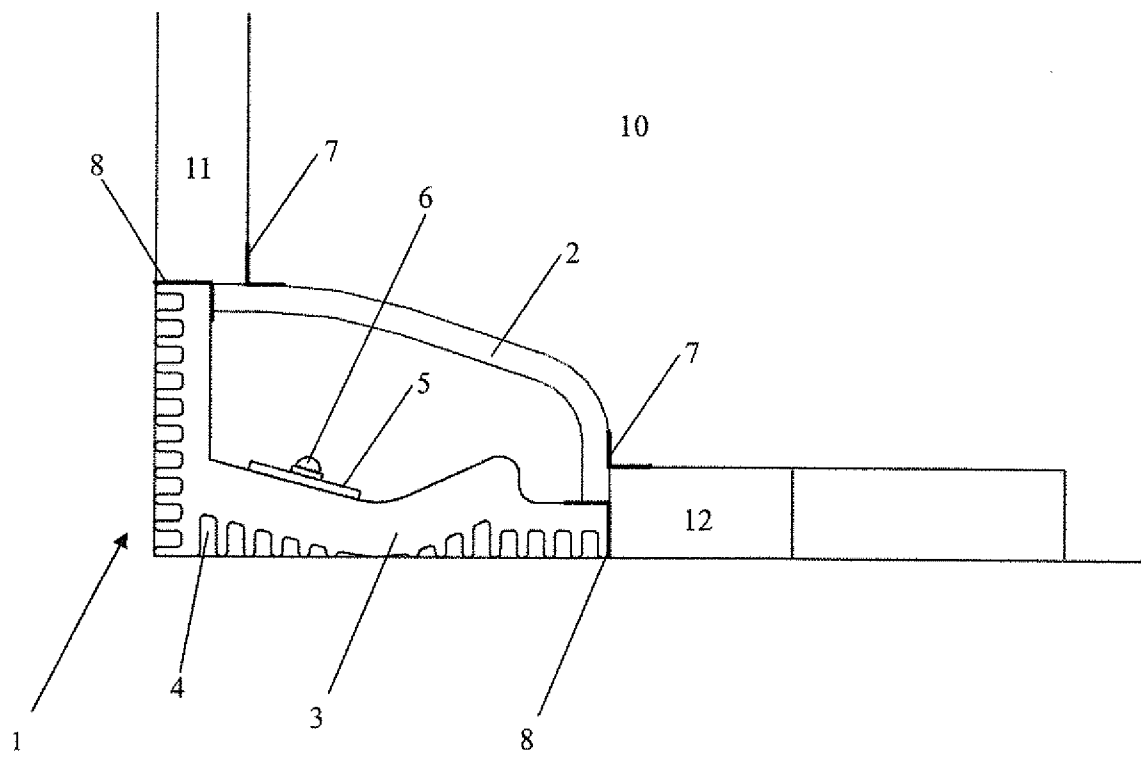


Figure 3

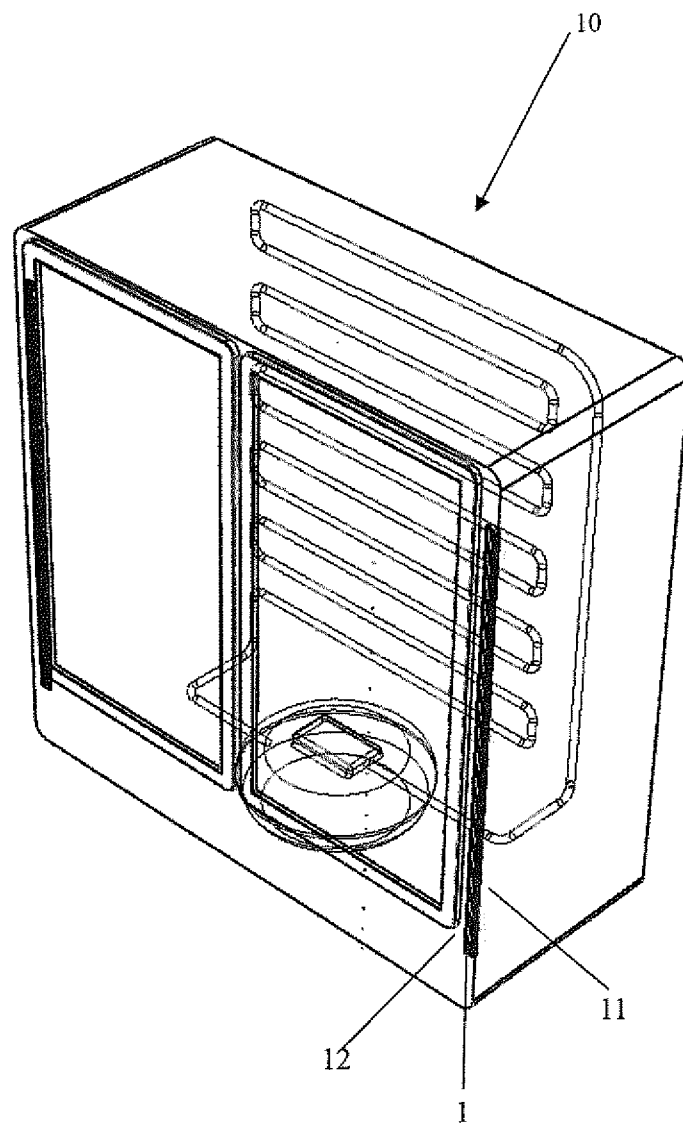


Figure 4