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FRIDGE-FREEZER



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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a fridge-freezer, and more particularly to a fridge-freezer equipped with a deodorizing unit for deodorizing the inside of the fridge-freezer.

2. Description of the Related Art

Fig. 28 is a perspective view of a fridge-freezer disclosed in Unexamined Patent Publication No. 2000-249460, for example, illustrating a relevant part only. Fig. 29 is a sectional view of a photocatalyst means. Fig. 30 is a sectional view of the ice-maker of the fridge-freezer. With referring to the figures, a reference numeral 1 denotes the body of the fridge-freezer. A reference numeral 2 denotes a box-type ice-maker provided in the body. In an upper part of the ice-maker 2, an ice-making unit 3 for making ice is provided. In a lower part of the ice-maker 2, an ice keeping unit 4 for keeping ice made by the ice making unit 3 is provided. In the ice-making unit 3, an ice tray 5 is placed with hollows in a given shape for holding water. In the ice keeping unit 4, an ice box 6 is placed with an open top so as to catch ice cubes made by the ice tray 5. Then, a photocatalyst means 7 is

provided above the ice tray 5.

The photocatalyst means 7 is obtained by coating a photocatalyst 7b such as titanium (TiO_2) transparently or translucently on the surface of a light-irradiating tube 7a by means of such as a sol-gel process or a fine-grain suspension as shown in Fig. 29. As an irradiation light, ultraviolet rays are considered effective. Therefore, it is desirable to use a black light for the photo-irradiating tube 7a of the photocatalyst means 7.

Alternatively, as shown in Fig. 30, a light-reflecting material 8 such as mirror or metal may be fitted on the inner surfaces of the ice-making unit 3. The light-reflecting material 8 may also be obtained through a metal plating process. With the light-reflecting material 8 being provided, reflected light of light emitted by the photocatalyst means 7 is concentrated by the photocatalyst means 7. As a result, an irradiation amount of the photocatalyst is increased, and therefore a decomposition reaction may be facilitated further.

Fig. 31 shows a part of an embodiment disclosed in Unexamined Patent Publication No. Hei9-61042, for example. The figure shows the configuration of a glass-tube heater for defrosting. A reference numeral 28 denotes a glass-tube, a reference numeral 29 denotes a heater wire, and a reference numeral 30 denotes a deodorization coating material. This heater is installed in a lower part of a cooling unit, as shown

in the figure, for the purpose of defrosting the cooling unit.

According to the conventional fridge-freezer, in the case of using a glass-tube lamp such as a black light or a cold cathode, for example, as the light source as mentioned above, the light source becomes bigger. However, an allotted space for installing the deodorizing unit is limited. As a result, the deodorizing means is not allowed to be installed in other compartments in the refrigerator than the ice-maker. This has posed a problem.

Further, the light source is formed by a glass tube. Therefore, the light source should be treated with meticulous care so as not to break it, and designed to be away from any stress to be exerted on the glass tube after installation. Especially with a fluorescent light being used as the light source, because a fluorescent light uses mercury inside, it is not desirable to use a fluorescent light near food in the refrigerator assuming that the fluorescent light is damaged. This has posed a problem.

Furthermore, many refrigerators use AC100V as an input voltage. Hence, there is a fear of causing a critical problem if such as a fault occurred in a refrigerator using an alternate refrigerant such as HC.

Still further, in the case that a deodorizing substance is coated on the glass-tube heater for defrosting, the heater due to its heating function is not allowed to be installed in

an air duct.

Still more, if the deodorizing means is installed above the ice tray like the conventional example, there is a possibility of making ice including broken pieces of glass in case of the glass-tube lamp being damaged. This has posed a problem of having hazardous effects on the human body.

In addition to that, in the case of the deodorizing means obtained by coating a photocatalyst on a material forming the walls of the ice making unit, for example, the coating requires extra labor and extra time such as drying time for the process. This has posed a problem.

SUMMARY OF THE INVENTION

The embodiments of the present invention are designed for solving the problems mentioned above. It is an object of one embodiment of the present invention to minimize the weight and size of a deodorizing means using a photocatalyst. In addition to that, it is another object of one embodiment of the present invention to eliminate any impropriety of a deodorizing means placed near food in a refrigerator. Furthermore, it is another object of one embodiment of the present invention to provide a material such as a photocatalyst at a low cost.

These and other objects of the embodiments of the present

invention are accomplished by the present invention as hereinafter described in further detail.

According to one aspect of the present invention, a fridge-freezer may include a deodorizing unit. The deodorizing unit may include a filter having a photocatalyst, and a light emitting unit for emitting ultraviolet rays.

The light emitting unit may have an LED (Light Emitting Diode) for emitting the ultraviolet rays.

The filter may include an absorption material.

The deodorizing unit may have a solid structure with a fixed distance kept between the filter and the light emitting unit.

The fridge-freezer may include a damper unit. The deodorizing unit and the damper unit may have a solid structure.

The deodorizing unit may include a transparent case which covers the light emitting unit and transmits the ultraviolet rays.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become

apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinafter and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is an overall perspective view of a refrigerator according to a first embodiment of the present invention;

Fig. 2 is a sectional view of the refrigerator according to the first embodiment of the present invention;

Fig. 3 is a perspective view of a filter according to the first embodiment of the present invention;

Fig. 4 is a simplified explanatory drawing of the filter of Fig. 3 according to the first embodiment of the present invention;

Fig. 5(a) is a detailed drawing of the filter illustrating the components thereof according to the first embodiment of the present invention;

Fig. 5(b) is a detailed drawing of the filter illustrating the sintered grains thereof according to the first embodiment of the present invention;

Fig. 6 is a perspective view of a light emitting unit of the refrigerator according to the first embodiment of the present invention;

Fig. 7 is a relative light distribution characteristic drawing illustrating a light emission characteristic of an LED according to the first embodiment of the present invention;

Fig. 8 is a perspective view of a measuring unit for measuring the relative light distribution characteristic of the LED according to the first embodiment of the present invention;

Fig. 9 is a drawing of an electric circuit of the substrate of the refrigerator according to the first embodiment of the present invention;

Fig. 10 is a flow chart for controlling the refrigerator according to the first embodiment of the present invention;

Fig. 11 is a front view of a deodorizing unit of a refrigerator according to a second embodiment of the present invention;

Fig. 12 is a side view of the deodorizing unit of the refrigerator according to the second embodiment of the present invention;

Fig. 13 is a front view of a modified example of the deodorizing unit of the refrigerator according to the second embodiment of the present invention;

Fig. 14 is a side view of the modified example of the

deodorizing unit of the refrigerator according to the second embodiment of the present invention;

Fig. 15 is a front view of a modified example including a number of filters of the deodorizing unit of the refrigerator according to the second embodiment of the present invention;

Fig. 16 is a side view of the modified example including a number of filters of the deodorizing unit of the refrigerator according to the second embodiment of the present invention;

Fig. 17 is a front view of a deodorizing unit of a refrigerator according to a third embodiment of the present invention;

Fig. 18 is a side view of the deodorizing unit of the refrigerator according to the third embodiment of the present invention;

Fig. 19 is a perspective view of a damper unit of the deodorizing unit of the refrigerator according to the third embodiment of the present invention;

Fig. 20 is a sectional view of the refrigerator illustrating the deodorizing unit which is installed in a cool air duct according to the third embodiment of the present invention;

Fig. 21 is a perspective view of a drop-proof substrate unit of a deodorizing unit according to a fourth embodiment of the present invention;

Fig. 22 is a front view of the deodorizing unit according

to the fourth embodiment of the present invention;

Fig. 23 is a side view of the deodorizing unit according to the fourth embodiment of the present invention;

Fig. 24 is a front view of a modified example of the deodorizing unit according to the fourth embodiment of the present invention;

Fig. 25 is a front view of a deodorizing unit according to a fifth embodiment of the present invention;

Fig. 26 is a front view of a deodorizing unit according to a sixth embodiment of the present invention;

Fig. 27 is a schematic drawing of air ducts in which deodorizing units are provided in a refrigerator according to a seventh embodiment of the present invention;

Fig. 28 is a perspective view of a refrigerator according to a conventional invention illustrating a relevant part of the refrigerator;

Fig. 29 is a sectional view of a glass-tube heater for deodorization illustrating a photocatalyst of the refrigerator according to the conventional invention;

Fig. 30 is a front view of the refrigerator according to the conventional invention illustrating a relevant part of the refrigerator; and

Fig. 31 is a front view of a glass-tube heater for deodorization illustrating a relevant part of a refrigerator according to a second conventional art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals indicate like elements through out the several views.

Embodiment 1.

Fig. 1 is a perspective view of a refrigerator according to a first embodiment of the present invention. Fig. 2 is a sectional view of the refrigerator illustrating cool airflow. Fig. 3 is a perspective view of a filter according to the first embodiment of the present invention. Fig. 4 is a simplified explanatory diagram of a filter surface of the filter of Fig. 3. Fig. 5(a) is a detailed drawing of absorption components on the filter surface of Fig. 4. Fig. 5(b) is a detailed drawing of sintered grains on the filter surface of Fig. 4. Fig. 6 is a perspective view of a light emitting unit on which light emitting diodes (hereinafter referred to as LEDs) are mounted.

With reference to the figures, a reference numeral 1 denotes a body of the refrigerator which is separated into such compartments as a refrigerator room 9, a convertible room 10, an ice-maker 2, a vegetable room 11 and a freezer compartment

12. A reference numeral 13 denotes a cool air duct formed inside the body 1 of the refrigerator. The cool air duct 13 communicates with the refrigerator room 9, the convertible room 10, the ice-maker 2, the vegetable room 11 and the freezer compartment 12. The cool air duct 13 includes a cooling chamber 16 in which a cooling unit 14 is installed in a lower part and a fan 15 is installed in an upper part. A reference numeral 17 denotes a filter which is installed in a part of the cool air duct. The filter 17 is formed with wavy inner padding 中芯 17a and flat liners 17b being woven together in lamination layers as shown in Fig. 4. The inner padding 17a may be formed, as one example shown in Fig. 5(a), with a fibrous pulp material 17h being impregnated with an absorption material 17f, which is composed of zeolite 17c, manganese oxide 17d and copper oxide 17e, and a photocatalyst 7a such as a titanium oxide 17g which is activated by ultraviolet rays. As another example shown in Fig. 5(b), the inner padding 17a may be formed with sintered grains of the absorption material 17f, which is composed of zeolite 17c, manganese oxide 17d and copper oxide 17e, and the photocatalyst 7a such as the titanium oxide 17g which is activated by ultraviolet rays. The inner padding 17a thus includes the mixture of the absorption material 18, which is composed of zeolite 17c, manganese oxide 17d and copper oxide 17e, and the photocatalyst 7a such as the titanium oxide 17g which is activated by ultraviolet rays for the purpose of making

use of an absorption property of odor elements such as methyl-mercaptan and tri-methyl-amine which are given off from food stored in the refrigerator. The inner padding 17a may be obtained by varying the proportion and composition of the absorption material 17f and the photocatalyst 17a.

Still alternatively, the filter 17 may be further mixed with a silver component which has an antibacterial action, or the filter 17 may be provided with a blow hole whose size may be designed for allowing ethylene to be removed. The size and surface area of the filter 17 may be selected adaptively depending on the condition of a user environment. A reference numeral 19 denotes a light emitting unit including a substrate, which is installed above the filter 17 placed in the part of the cool air duct. The light emitting unit 19 is provided with lead wires 19a for connection, which are fixed on one end of the substrate. The light emitting unit 19 is provided also with two or more chipped LEDs 19b for emitting ultraviolet rays and a chipped Zener diode 19c for preventing static electricity mounted on the surface of the substrate. Alternatively, the same effect may be obtained by the light emitting unit 19 based on a discrete mounting in which holes are made through the substrate, the lead wires are inserted through the holes and then mounted on the substrate by soldering.

It is to be noted that the same effect may be obtained with at least a single LED mounted on the body of the light

emitting unit.

Fig. 7 is a diagram of a relative light distribution characteristic illustrating a light emission characteristic of the LED. The figure shows relative intensity for relative light distribution in an irradiation range in X and Y directions. The relative intensity may be obtained when the central light intensity is 100. In Fig. 7, the solid line indicates the light distributions in the X direction and the broken line indicates the light distributions in the Y direction.

Fig. 8 is a perspective view of a light measuring unit for measuring the relative light distribution characteristic of the LED. A reference numeral 20 denotes a measuring base on which the LED 19b is mounted.

Fig. 9 shows an electric circuit diagram of the light emitting unit. The electric circuit has two LEDs 19b being connected in series and the Zener diode 19c for preventing static electricity being connected in parallel to the LEDs 19b. The LEDs 19b emit light when DC5V-DC12V is applied and an electric current of about 10mA-20mA is supplied at the both ends of the lead wires 19a. This LED 19b acts with such weak power as DC5V to DC12V and generates ultraviolet rays with a wave length of about 380nm. With such a small value of about 10mA-20mA, the light emitting unit will be safe even if a number of LEDs 19b is required to be mounted thereon depending on the intensity of light and the irradiation range needed.

It is to be noted that the LEDs are connected in series in this example, but the same effect may alternatively be obtained if the LEDs is connected in parallel to each other.

The thus formed filter 17 may be placed at a location where the filter is exposed to air within the refrigerator, for example, in the part of the air duct within the refrigerator as shown in Fig. 2. This allows the filter 17 to absorb odor elements, thereby removing odors from cool air in the refrigerator. Furthermore, the LED 19b may be placed at a location near the filter 17 where light may be irradiated. As a result, the titanium oxide included in the filter 17 is divided into electrons (-) and electron holes (+) by means of ultraviolet rays, thereby producing a radical. The radical has an oxidation decomposition effect on floating odor elements and a deoxidization reaction to decompose odor elements absorbed by the filter 17. Therefore, the life of the filter 17 may be prolonged.

It is to be noted that although power may be supplied continuously to the LED 19b, an intermittent supply of power by such as synchronizing with the fan motor 15a may also be effective. In this case, a required life for the LED 19b may be shortened and the unit price of the LED 19b may be lowered. Still alternatively, a deodorizing switch operable by the user may be provided in the refrigerator. This allows power to be supplied arbitrarily to the LED.

Fig. 10 is a simplified control flow chart. In a step 101, it is judged whether a switch SW is turned on or not by the user while the refrigerator is working. In a step 102, it is judged whether the fan motor is under conditions for driving or not. Therefore, in this case, power is supplied to the LED only when the switch is turned on and also the fan motor is under conditions for driving.

Embodiment 2.

Fig. 11 is a front view of a deodorizing unit of a refrigerator according to a second embodiment of the present invention. Fig. 12 is a side view of the deodorizing unit of the refrigerator according to the second embodiment. With referring to the figures, a reference numeral 21 denotes a deodorizing unit including a pair of angular top frames 21a. In a lower part of the frames, the filter 17 is fitted and in an upper part thereof, the light emitting unit 19 is fitted with the both ends being fixed so that the LEDs 19b face the surface of the filter 17.

Thus, by compactly forming the light emitting unit 19 by using the LEDs 19b, the light emitting unit 19 is allowed to be installed more flexibly in the air duct in the refrigerator. The filter 17 and the LEDs 19b of the light emitting unit 19 are allowed to keep a fixed distance therebetween, so that a stable precision may be achieved. Furthermore, a material

handling performance may be improved. The product is removable on a unit basis for decomposition thereby effectively recyclable.

It is to be noted that the shape of the deodorizing unit 21 is not fixed. Fig. 11 shows an example of the deodorizing unit 21 having an angular top for the purpose of reducing air resistance in the air duct. Alternatively, as shown in Fig. 13 and Fig. 14, the deodorizing unit 21 may be changed to have a slope on one side depending up the use.

Still alternatively, as shown in Fig. 15 and Fig. 16, the LEDs 19b may be mounted on the both sides of the substrate of the light emitting unit 19 and the filters 17 may be fitted below as well as above the light emitting unit 19. Thus, two filters are allowed to be refreshed by means of the single substrate. Furthermore, the filter may alternatively be placed at the center and the LED substrate may be provided on each side of the filter. As a result, the filter 17 is allowed to have the irradiation of ultraviolet rays equally on the both sides. This has an effect of enhancing a refreshing efficiency for the filter 17.

Embodiment 3.

Fig. 17 is a front view of a deodorizing unit of a refrigerator according to a third embodiment of the present invention. Fig. 18 is a side view of the deodorizing unit of

the refrigerator according to the third embodiment. Fig. 19 is a perspective view of a damper unit. Fig. 20 is a sectional view of the refrigerator in which the deodorizing unit is installed in the cool air duct. With referring to the figures, reference numeral 21 represents the body of a deodorizing unit which is installed in the cool air duct 13 of the refrigerator 1 with a cool air channel 21b being opened. The deodorizing unit 21 is provided with a pair of adjustment catches 21c for fixing the filter 17 so as to clog the cool air channel 21b in an upper part on the both sides of the body. On an end panel of the body, the deodorizing unit 21 is provided with a wall 21d which is in contact with the whole surface of the end panel and extends upwards. A reference numeral 22 denotes a transparent case which is placed in an upper part of the wall and contains the light emitting unit 19 including the LEDs 19b. The transparent case 22 is fitted so that the LEDs 19b of the light emitting unit 19 face downwards. A reference numeral 23 denotes a damper unit which is normally installed in the cool air duct 13 in the refrigerator 1. The damper unit 23 is composed of a driving part 23a including a built-in motor, a frame part 23c which is provided horizontally next to the driving part 23a with an opening 23b, and a baffle part 23d for opening/closing the opening. The thus composed damper unit 23 is mounted on the bottom surface of the body of the deodorizing unit 21 so as to clog the opening 23b of the body.

A reference numeral 23e denotes a spring which is used for keeping the baffle part 23d to be in a closed state.

It is to be noted that this damper unit is installed in the air duct 13 as illustrated in Fig. 12 if used for controlling the temperature of the refrigerator room. In this case, the damper unit opens/closes the baffle to control the flow rate of cool air so as to keep a constant temperature in the refrigerator room.

Embodiment 4.

Fig. 21 is a perspective view of a drip-proof substrate unit of a deodorizing unit of a refrigerator according to a fourth embodiment. Fig. 22 is a front view of the deodorizing unit which the drip-proof substrate unit is mounted on. Fig. 23 is a side view of the deodorizing unit which the substrate unit is mounted on. With referring to the figures, reference 19 represents the light emitting unit, reference 19a represents the lead wires, reference numeral 19b represents LEDs, and reference numeral 19c represents the Zener diode for preventing static electricity. A reference numeral 24 denotes a drip-proof substrate case which is composed of an acrylic material or a glass material containing the built-in light emitting unit 19. An opening of the case is sealed and clogged by a seal section 25 with the light emitting unit 19 being built inside the drip-proof substrate case.

The thus formed drip-proof substrate unit allows no dew to be formed on the LED substrate assembly if located at a low temperature, even when warm air flows in through the refrigerator as a result of opening a door of the refrigerator for a long time, for example. Therefore, such as a rust relating disconnection in the lead wires or corrosion in soldered parts may be prevented. It is to be noted that the drip-proof case 24 is made of a material transmitting ultraviolet rays such as acrylic or glass. Alternatively, the case may be vacuumed inside also to prevent dew forming inside the case.

Further alternatively, as shown in Fig. 24, the filter 17 is fitted in a lower part of a pair of frames 21a. Above the filter 17, the drip-proof case is fixed on the both sides with the side of the lead wires 19a being slanted downwards so that the LEDs 19b of the light emitting unit 19 face the surface of the filter 17. Thus, by placing the drip-proof case in a slanted manner, in case of a drip of water 26 entering the case, the water will be kept on one side as illustrated in the figure, so that the substrate is allowed to be less possible to be watered.

Embodiment 5.

Fig. 25 is a diagram illustrating the drip-proof substrate unit 24 of the fourth embodiment with an additional lens section 27 for concentrating ultraviolet rays. The thus

formed drip-proof substrate unit may achieve an effective irradiation of ultraviolet rays to the filter. It is to be noted that light concentration may be adjusted depending on the size of the filter.

Embodiment 6.

Fig. 26 is a perspective view of the substrate of a deodorizing unit according to a sixth embodiment. With referring to the figure, reference 19 represents the light emitting unit composed of a substrate, reference 19a represents the lead wires, reference numeral 19b represents LEDs, and reference numeral 19c represents the Zener diode for preventing static electricity. A reference numeral 28 denotes second reflection materials such as stainless steel. The second reflection materials 28 have circular openings 28a at the center. From the edges of the openings, slanting conic surfaces 28b are formed so as to have reflecting surfaces.

The deodorizing unit thus formed concentrates ultraviolet rays which are emitted by the LEDs 19b of the light emitting unit 19 and then reflected by the second reflection materials 28. As a result, an efficient irradiation of ultraviolet rays may be achieved to the filter. It is to be noted also in this case that light concentration may be adjusted depending on the size of the filter.

Embodiment 7.

Fig. 27 is a schematic drawing of air ducts in which deodorizing units are provided in a refrigerator according to a seventh embodiment. With referring to the figure, reference numeral 15 represents the fan, a reference sign 13a denotes a first air duct, a reference sign 13b denotes a second air duct, a reference sign 13c denotes a third air duct, a reference sign 13d denotes a fourth air duct and reference 23 represents the damper units. The air ducts 13a-13d guide cool air to compartments at different temperatures, respectively, in the refrigerator. The first air duct 13a is provided with the deodorizing unit 21 and leads to a first compartment (e.g., the refrigerator room). The second air duct 13b is provided with the deodorizing unit 21 and leads to a second compartment (e.g., the ice-maker). The third air duct 13c is provided with the deodorizing unit 21 and leads to a third compartment (e.g., the convertible room). The fourth air duct is provided with the deodorizing unit 21 and leads to a fourth compartment (e.g., the freezer compartment).

By installing the deodorizing units 21 equipped with the damper units 23 at the places of the first air duct 13a, the second air duct 13b, the third air duct 13c and the fourth air duct 13d, respectively, cool air flowing into the respective compartments may be deodorized. It is to be noted that the number of the air ducts may correspond to the number of

compartments in the refrigerator. Hence, deodorized cool air may be supplied sufficiently to a compartment which requires deodorization.

The effects of the embodiments of the present invention may be summarized as follows.

The fridge-freezer according to one embodiment of the present invention is provided with the deodorizing unit including the filter, which has a photocatalyst or a mixture of a photocatalyst and an absorption material, and the light emitting unit which has the LED for emitting ultraviolet rays. As a result, light may be emitted by using a low electric current. As an effect, odors given off from food and others may be removed efficiently so that the users are allowed to have a pleasant and comfortable use of the refrigerator.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the deodorizing unit including the filter and the light emitting unit which are solidly formed with a fixed distance being kept therebetween. As a result, a material handling performance of the fridge-freezer is improved. As an effect, the fridge-freezer is efficiently removable for decomposition thereby highly recyclable.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the

deodorizing unit and the damper unit which are solidly formed. As an effect, the number of parts required for the refrigerator may be reduced.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the light emitting unit which is covered with the transparent case which transmits ultraviolet rays. As a result, even if glass is used as a material for the drip-proof structured case, the case does not easily receive such stress as to damage the case in material handling because the light emitting part is small. As an effect, an external stress is not easily exerted on the glass case if the case is placed in the air duct.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the transparent case which has the drip-proof structure. As a result, even if glass is used as a material for the drip-proof structured case, the case does not easily receive such stress as to damage the case in material handling because the light emitting part is small. As an effect, an external stress is not easily exerted on the glass case if the case is placed in the air duct. In addition to that, the case may protect the inside from dew forming or being watered without affecting the performance.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the

transparent case that is formed by the material which may transmit ultraviolet rays and the lens section. As an effect, ultraviolet rays may be concentrated efficiently and irradiation efficiency to the filter may be enhanced.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the light emitting unit which has the reflection materials surrounding the LED. As an effect, ultraviolet rays may be concentrated efficiently and irradiation efficiency to the filter may be enhanced.

Furthermore, the fridge-freezer according to one embodiment of the present invention is provided with the light emitting unit being installed in the cool air duct through which cool air is guided to two or more compartments in different temperatures and which has one or more flow rate controllers being installed therein. This may facilitate the deodorization, as an effect, of the individual compartments in different temperatures.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A fridge-freezer comprising a deodorizing unit;
wherein the deodorizing unit includes,
a filter having a photocatalyst, and
a light emitting unit for emitting ultraviolet rays.

2. The fridge-freezer of claim 1, wherein the light emitting
unit has an LED (Light Emitting Diode) for emitting the
ultraviolet rays.

3. The fridge-freezer of claim 1, wherein the filter further
includes an absorption material.

4. The fridge-freezer of claim 1, wherein the deodorizing
unit has a solid structure with a fixed distance kept between
the filter and the light emitting unit.

5. The fridge-freezer of claim 1, further comprising a
damper unit;
wherein the deodorizing unit and the damper unit have a solid
structure.

6. The fridge-freezer of claim 1, wherein the deodorizing
unit includes a transparent case which covers the light emitting
unit and transmits the ultraviolet rays.

7. The fridge-freezer of claim 6, wherein the transparent case is drip-proof.

8. The fridge-freezer of claim 6, wherein the transparent case has a lens in part.

9. The fridge-freezer of claim 2, wherein the light emitting unit includes a reflecting material which is placed around the LED.

10. The fridge-freezer of claim 1, comprising a plurality of flow-rate regulators for regulating a flow rate of air in a cool air duct in order to control temperatures;

wherein a plurality of deodorizing units corresponding to the plurality of flow-rate regulators is placed in the cool air ducts.

11. The fridge-freezer of claim 10, wherein the plurality of flow-rate regulators are damper units.