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(54) **A REFRIGERATOR**  
**KÜHLVORRICHTUNG**  
**RÉFRIGÉRATEUR**

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(56) References cited:  
**EP-A- 1 630 500 WO-A-2004/100684**  
**WO-A-2007/049935 WO-A-2007/049937**  
**WO-A-2007/125122 WO-A-2007/136171**

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## Description

**[0001]** The present invention relates to a refrigerator wherein the vegetable container is illuminated for keeping fresh the foodstuff stored therein.

**[0002]** The foodstuffs such as vegetables and fruits stored in refrigerators for a long time are observed to lose their freshness with time. The researches have shown that some foods that are exposed to light, particularly like blue, orange and green colored lights of certain wavelengths, not only have a prolonged storage life, but also the vitamin values are increased and the colors are preserved. For example, the substances such as the chlorophyll present in green leafed vegetables or the carotenoid in orange colored foods are sensible to light in certain wavelengths. In state of the art, various irradiation devices are emplaced in refrigerators for the light with certain colors to act on the foodstuffs. Accordingly, fruits and vegetables are maintained to sustain growth and keep their freshness for a longer period of time.

**[0003]** When the vegetable container of a refrigerator is entirely full of foods, the food stuffs remain in the shadow of one another and a light source cannot see all the food and all the food cannot benefit from the light at the same rate (Figure 1). There are embodiments wherein the body of the vegetable container is made of light guiding material for delivering light to the foods, however in these embodiments the light loses effect by dispersing within the wall thickness of the vegetable container body. Disposing a large quantity of light sources at all places in the vegetable container for delivering light to all the foods at a maximum level is far from being an economic and convenient solution.

**[0004]** In the state of the art Patent Document No US6726341, the LED light engine is equipped with a light emitting diode (LED) light source and a light guide coupled to the LED light engine to bring light from the LED light engine into the compartment for illuminating the stored and exhibited contents inside the cold storage compartment.

**[0005]** In the state of the art Japanese Patent Application No JP2005065622, a refrigerator comprising an irradiation board having red, blue and green LED's is described. These LED's are turned on in suitable combinations to form the light in the wavelength required for each vegetable group.

**[0006]** In the patent document no JP11094456, a drawer type receiving vessel is illuminated by an illuminating device that is disposed on the ceiling of the chamber. The wall of the receiving vessel is formed of a transparent or semi-transparent material.

**[0007]** In the Japanese Patent Document No JP1028473; an irradiation device is described that illuminates the vegetable container. A group of reflecting plates provides the light to be dispersed into the vegetable container.

**[0008]** A refrigerator according to the preamble of claim 1 is known from WO 2007/125122A.

**[0009]** The aim of the present invention is the realization of a refrigerator illuminated by light in a wavelength for keeping the foods stored in the vegetable container fresh and the light to be delivered effectively to the foods.

**[0010]** The refrigerator realized in order to attain the aim of the present invention is explicated in the attached claims.

**[0011]** In an embodiment of the present invention, the container is effectively illuminated from below and above by two or more light guides integrated on the lower and upper walls of the container.

**[0012]** In another embodiment of the present invention, the container is effectively illuminated from the right and left by two or more light guides integrated on the side walls of the container.

**[0013]** In another embodiment of the present invention, the container is configured as a rectangular prism and light is delivered to all the walls by at least six light guides receiving light from at least six LEDs.

**[0014]** In another embodiment of the present invention, the LEDs are arranged on the support plate in side by side or superposed arrays so that a planar area is covered thereon and the light guides receive light from the LEDs on the outer periphery.

**[0015]** In another embodiment of the present invention, the refrigerator comprises more than one LED group on the light source, each radiating a different color light. In this embodiment, the light guides receive light from the LEDs in the LED group that radiate light of colors selected according to the needs of the fruits and vegetables in the container.

**[0016]** In another embodiment of the present invention, the refrigerator comprises a movement mechanism that moves the support plate, having LED groups thereon arranged side by side or superposed, upwards, downwards or sideways for aligning the LEDs of the desired color groups in the light source with the light guides.

**[0017]** In yet another embodiment of the present invention, the refrigerator comprises a container produced of a transparent material and light guides made of a transparent material having a different refractive index than the container, integrated on the wall of the container by partially embedding from the outside, one end receiving the light emitted from the light source and delivering into the container from the other end, preventing the light from side-emitting in the direction of carrying the light and hence the light losses along the guided path.

**[0018]** The light guide comprises a curvilinear first lateral surface that encircles the portion partially embedded in the container and a curvilinear second lateral surface that extends outside of the container in the opposite direction of the first lateral surface.

**[0019]** The density of the material used for producing the light guide is more than the material used for producing the container and the refractive index of the light guide is greater than the refractive index of the container and preferably Polystyrene is used for the container material and preferably Polycarbonate for the light guide.

**[0020]** The radius of curvature of the first lateral surface of the light guide embedded in the container wall is greater than the radius of curvature of the second lateral surface, thus preventing the side-emitting of light to the container wall and to the air.

**[0021]** In an embodiment of the present invention, the light guide comprises a light entrance surface disposed on the end facing the light source, contacting with the outer surface of the LED when the container is pushed inside the refrigerator body, moving away from the LED when the container is pulled out. The outer surface of the LED is preferably semi spherical in shape and the light entrance surface is configured as a semi spherical recess.

**[0022]** In another embodiment of the present invention, the light guide comprises a planar illumination surface on its end delivering light to the container.

**[0023]** In another embodiment of the present invention, the light guide is produced by plastic injection overmolding method to be joined with the container emplaced in an injection mold.

**[0024]** The refrigerator realized in order to attain the aim of the present invention is illustrated in the attached claims, where:

Figure 1 - is the schematic view of the vegetable container in a refrigerator of the prior art and the light source illuminating the container.

Figure 2 - is the schematic view of a vegetable container in the position drawn out of the refrigerator body, the light guides disposed on the vegetable container and a light source.

Figure 3 - is the schematic view of a vegetable container in the position pushed into the refrigerator body, the light guides on the vegetable container and a light source.

Figure 4 - is the schematic view of a light source, a movement mechanism and the light guides.

Figure 5 - is the cross sectional view of a container wall and the light guide integrated with the wall.

**[0025]** The elements illustrated in the figures are numbered as follows:

1. Refrigerator
2. Container
3. Wall
4. LED (Light emitting diode)
5. Light guide
6. Movement mechanism
7. First lateral surface
8. Second lateral surface
9. Light entrance surface
10. Illumination surface
11. Light source

**[0026]** The refrigerator (1) comprises a container (2) having more than one wall (3), disposed inside the body,

for example in the cabin base region and wherein foods such as fruits and vegetables are stored, a light source (11) having more than one LED (Light Emitting Diode) (4) arranged on a support plate (P) for illuminating the container (2) with light in a wavelength that preserves the nutritional value of the foods for a long period of time.

**[0027]** The refrigerator (1) of the present invention comprises at least two light guides (5) that are formed as rods and integrated to the walls (3). One end of each of the light guides (5) is aligned with the LED (4) and the other end of the said light guide (5) is disposed on one of the walls (3).

**[0028]** The light received from the LED (4) is delivered by the light guides (5) into the container (2) by the light guides (5) ends which are disposed on the wall (3), thus the light guides (5) illuminate the container (2) through at least two walls (3) (Figures 2, 3).

**[0029]** The light guides (5) are integrated on the outer surface of the walls (3) and surround the container (2) from the outside.

**[0030]** Each of the light guides (5) receives light from only one LED (4).

**[0031]** The LEDs (4) radiate light in a color determined with respect to the needs of the fruits-vegetables placed in the container (2), for example in red, orange, green or blue color, and the light guides (5) deliver the colored light emitted by the LEDs (4) from the point reached on the outer surfaces of the walls (3) intensively into the container (2) by their ends on the side of the wall (3), thus maintaining to sustain activities in the live cells of the fruits and vegetables in the container (2) and hence to keep fresh for a long period of time. In the case the foods are placed one over the other in the container (2), even if one food remains in the shade of another, the light guides (5) transmit the light from the walls (3) at different directions to the foods in the shade and the majority of the foods in the container benefit from the light.

**[0032]** In another embodiment of the present invention, the container (2) is configured as a rectangular prism and comprises six walls (3), at the front, rear, top, bottom and two at the sides and light is delivered to all the walls (3) by at least six light guides (5) receiving light from at least six LEDs (4).

**[0033]** In another embodiment of the present invention, the light source (11) is situated at the rear side of the inner refrigerator (1) body. The LEDs (4) are placed in side by side or superposed arrays covering a planar area on the support plate (P) (Figure 3). The light guides (5) receiving light from the LEDs (4) arranged on the outer periphery of the planar surface on the support plate (P) carry light to the side, front and bottom walls (3) of the container (2) and the LEDs (4) remaining at the center of the planar surface illuminate the rear wall (3) of the container (2). The light guides (5) being connected with the LEDs (4) on the outer periphery of the planar surface on the support plate (P) do not intercept one another topologically from the light source (11) toward the container (2) walls (3).

**[0034]** In another embodiment of the present invention, the refrigerator (1) comprises more than one LED (4) group (G) on the light source (11), each one emitting light of a different color, for example a blue LED (4) group (G), a red LED (4) group (G), etc. and a movement mechanism (6) that moves the support plate (P), having LED (4) groups (G) of different colors thereon arranged side by side or superposed, upwards, downwards or sideways for aligning the desired LED (4) group (G) at the light source (11) with the light guides (5) (Figure 4).

**[0035]** In this embodiment, the light guides (5) receive light from the LEDs (4) in the LED (4) group (G) that emit light in the color selected according to the needs of the fruits and vegetables stored in the container (2). For example, the blue LED (4) group (G) is emplaced on the right of the plate (P) and the red LED (4) group (G) on the left, and when the light guides (5) connected to the blue LED (4) group (G) is wanted to receive light from the red LED (4) group (G), the support plate (P) is moved from the left to the right by the movement mechanism (6) and aligned opposite to the light guides (5) of the red LED (4) group (G).

**[0036]** In another embodiment of the present invention, the refrigerator (1) comprises a container (2) produced of a transparent material and light guides (5) made of a transparent material having a different refractive index ( $n_2$ ) from the refractive index ( $n_1$ ) of the material used to produce the container (2), integrated by partially embedding on the walls (3) and delivering light into the container (2) from its other end by preventing side-emitting along the path of delivery (Figure 5).

**[0037]** The light guide (5) comprises a curvilinear first lateral surface (7) that encircles the portion partially embedded in the container (2) and a curvilinear second lateral surface (8) that contacts with air outside the container (2) in the opposite direction of the first lateral surface (7) (Figure 5).

**[0038]** The light guide (5) prevents the light received from the light source (11) to be reflected from the first lateral surface (7) to the container (2) and to the air from the second lateral surface (8), in other words, the light guide (5) carries light virtually without loss along it, confining between the lateral surfaces (7, 8) and maintains the container (2) to be illuminated extensively from its end whereto the light reaches.

**[0039]** The radius of curvature ( $R_1$ ) of the first lateral surface (7) and the radius of curvature ( $R_2$ ) of the second lateral surface (8) are calculated with respect to the wavelength of the light used and the refractive indexes ( $n_1$ ,  $n_2$ ) of the container (2) and the light guide (5). The first and second lateral surfaces (7, 8) having the said radii of curvatures ( $R_1$ ,  $R_2$ ), deflect the light which tries to pass from the light guide (5) to the container wall (3) and to air more than 90 degrees, causing it to reflect backwards and maintains the light to stay in the light guide (5) environment along the path of delivery.

**[0040]** The density of the material used for producing the light guide (5) is more than the material used for pro-

ducing the container (2) and the refractive index ( $n_2$ ) of the light guide (5) is greater than the refractive index ( $n_1$ ) of the container (2) ( $n_2 > n_1$ ).

**[0041]** The radius of curvature ( $R_1$ ) of the first lateral surface (7) of the light guide (5) is greater than the radius of curvature ( $R_2$ ) of the second lateral surface (8) extending outside the container (2) wall (3) ( $R_1 > R_2$ ) (Figure 5).

**[0042]** The container (2) is produced of Polystyrene (PS) and the light guide (5) is produced of Polycarbonate (PC).

**[0043]** The light guide (5), being integrated with the container (2), moves together with the container (2) and comprises a light entrance surface (9) disposed on its end facing the light source (11), contacting with the outer surface of the LED (4) when the container (2) is pushed inside the refrigerator (1) body, moving away from the LED (4) when the container (2) is pulled out (Figures 2, 3, 4). The outer surface of the LED (4) is for example semi spherical in shape and the light entrance surface (9) is configured as a semi spherical recess matching with the outer surface of the LED (4).

**[0044]** The light guide (5) furthermore comprises a planar illumination surface (10) on its end delivering light to the container (2) in contact with the wall (3) (Figures 2, 3, 4). The light carried by the light guide (5) does not pass into the wall (3) from the convex shaped first lateral surface (7) embedded in the walls (3) of the container (2) and moves along its path reaching the illumination surface (10). The illumination surface (10), since structured planar, does not reflect light backward and aids the light to pass into the container (2).

**[0045]** In another embodiment of the present invention, the light guide (5) is produced by joining with the container (2) emplaced in an injection mold by plastic injection over-molding method. The container (2) is produced with the channels open, wherein the light guide (5) will be partially embedded, afterwards is emplaced in the plastic injection mold and the light guide (5) is injected over it. Since the process temperature of the light guide (5) material is higher than the process temperature of the container (2) material, the channels wherein the light guide (5) will be injected are slightly melted by heating beforehand to near the melting point and afterwards the light guide (5) is injected into the channels.

**[0046]** In the refrigerator (1) of the present invention, the light guides (5) that carry light to the container (2) from the LEDs (4) prevent side-emitting of light in the direction of delivery, the light in the desired wavelength is sent into the container (2) from a single point without loss. Intensive light is sent upon the foods in the container (2) that need light of a certain wavelength and thus the foods in the container (2) can be kept fresh for a prolonged time.

**[0047]** When the container (2) is entirely filled with fruits and vegetables, the light emitted from the LEDs (4) at the light source (11) is delivered to all the container (2) walls (3) separately by means of the light guides (5),

an effective illumination ensures to deliver light to the foods that are below other foods or at the rear and in the shadow thereby the freshness of the foodstuffs stored in the container (2) can be prolonged.

### Claims

1. A refrigerator (1) that comprises a container (2) having more than one wall (3), disposed inside the body, wherein foods such as fruits and vegetables are stored, a light source (11) having more than one LED (4) arranged on a support plate (P) illuminating the container (2) with a light in the wavelength for preserving the nutritional values of the foods for a long period of time and **characterized by** at least two light guides (5), that are formed as rods and integrated to the walls (3) and one end of the each of the light guides (5) being aligned with the LED (4) and the other end of the said light guide (5) -being disposed on one of the walls (3), the light guides (5) delivering the light received from the LED (4) into the container (2) by the light guides (5) ends which are disposed on the wall (3), the light guides (5) illuminating the container (2) through at least two walls (3).
2. A refrigerator (1) as in Claim 1, **characterized by** the light guides (5) whereby each receives light from only one LED (4).
3. A refrigerator (1) as in Claim 1 or 2, **characterized by** the light guides (5) integrated on the outer surfaces of the walls (3) and surrounding the container (2) from the outside.
4. A refrigerator (1) as in Claim 3, **characterized by** the light guide (5), that is produced by joining with the container (2) by plastic injection over-molding method.
5. A refrigerator (1) as in any one of the Claims 1 to 4, **characterized by** the container (2) configured as a rectangular prism having six walls (3), at the front, rear, top, bottom and two at the sides and at least six light guides (5) delivering light to all the walls (3) by receiving light from at least six LEDs (4).
6. A refrigerator (1) as in any one of the Claims 1 to 4, **characterized by** the LEDs (4) placed in side by side or superposed arrays covering a planar area on the support plate (P) whereby the ones on the outer periphery illuminate the side, front and bottom walls (3) of the container (2) by means of the light guides (5) and the ones remaining at the center illuminate the rear wall (3) of the container (2).
7. A refrigerator (1) as in any one of the Claims 1 to 4, **characterized by** more than one LED (4) group (G), each one emitting light of a different color, light guides (5) receiving light from the LEDs (4) in the LED (4) group (G) that emit light in the color selected according to the needs of the fruits and vegetables stored in the container (2) and a movement mechanism (6) that moves the support plate (P), having LED (4) groups (G) of different colors thereon arranged side by side or superposed, upwards, downwards or sideways for aligning the desired LED (4) group (G) with the light guides (5).
8. A refrigerator (1) as in any one of the above Claims, **characterized by** the container (2) produced of a transparent material and light guides (5) made of a transparent material having a different refractive index (n2) from the refractive index (n1) of the material used to produce the container (2), integrated by partially embedding on the walls (3) and delivering light into the container (2) from its other end by preventing side-emitting along the path of delivery.
9. A refrigerator (1) as in Claim 8, **characterized by** the light guide (5) comprising a curvilinear first lateral surface (7) that encircles the portion partially embedded in the container (2) and a curvilinear second lateral surface (8) that contacts with air outside the container (2) in the opposite direction of the first lateral surface (7) and the radius of curvature (R1) of the first lateral surface (7) being greater than the radius of curvature (R2) of the second lateral surface (8).
10. A refrigerator (1) as in Claim 9, **characterized by** the light guide (5) produced of a material with a refractive index (n2) that is greater than the refractive index (n1) of the material used for producing the container (2).
11. A refrigerator (1) as in any one of the Claims 8 to 10, **characterized by** the container (2) produced of Polystyrene (PS) and a light guide (5) produced of Polycarbonate (PC).
12. A refrigerator (1) as in any one of the above Claims, **characterized by** the light guide (5) comprising a light entrance surface (9) disposed on its end facing the light source (11), contacting with the outer surface of the LED (4) when the container (2) is pushed inside the refrigerator (1) body, moving away from the LED (4) when the container (2) is pulled out.
13. A refrigerator (1) as in Claim 12, **characterized by** the LED (4) with the outer surface semi spherical in shape and the light guide (5) having the light entrance surface (9) configured as a semi spherical recess matching with the outer surface of the LED (4).
14. A refrigerator (1) as in any one of the above Claims,

**characterized by** the light guide (5) comprising a planar illumination surface (10) on its end delivering light to the container (2).

### Patentansprüche

1. Kühlschrank (1), umfassend einen Behälter (2) mit mehr als einer Wand (3), der im Gehäuse angeordnet ist, und in dem Lebensmittel wie Obst und Gemüse aufbewahrt werden, eine Lichtquelle (11) mit mehr als einer LED (4), die an einer Trageplatte (P) angeordnet ist und den Behälter (2) mit einem Licht von einer Wellenlänge beleuchtet, bei der der Nährwert der Lebensmittel über einen langen Zeitraum bewahrt wird, und **gekennzeichnet durch** mindestens zwei Lichtleiter (5), die als Stäbe ausgebildet sind und an den Wänden (3) angebaut sind, wobei ein Ende der Lichtleiter (5) mit der LED (4) übereinstimmt und das andere Ende des Lichtleiters (5) an einer der Wände (3) angeordnet ist, und die Lichtleiter (5) das Licht, das von der LED (4) empfangen wird, **durch** die Enden der Lichtleiter (5), die an der Wand (3) angeordnet sind, in den Behälter (2) leiten, und die Lichtleiter (5) den Behälter (2) **durch** wenigstens zwei Wände (3) beleuchten.
2. Kühlschrank (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die einzelnen Lichtleiter (5) jeweils nur Licht von einer LED (4) empfangen.
3. Kühlschrank (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Lichtleiter (5) an den Außenflächen der Wände (3) angebaut sind und den Behälter (2) von außen umgeben.
4. Kühlschrank (1) nach Anspruch 3, **dadurch gekennzeichnet, dass** der Lichtleiter (5) hergestellt wird, indem er durch ein Kunststoffspritz-Aufformungsverfahren mit dem Behälter (2) verbunden wird.
5. Kühlschrank (1) nach einem der vorangehenden Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Behälter (2) als rechteckiges Prisma mit sechs Wänden (3) an der Vorderseite, der Rückseite, der Oberseite, der Bodenseite und an den beiden Seiten und mit wenigstens sechs Lichtleitern (5) konfiguriert ist, die das Licht an alle Wände (3) leiten, indem sie das Licht von wenigstens sechs LEDs (4) empfangen.
6. Kühlschrank (1) nach einem der vorangehenden Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die LEDs (4) in Seite an Seite angeordneten oder übereinander gelagerten Arrays einen ebenen Bereich an der Trageplatte (P) abdecken, wobei diejenigen an der Außenperipherie mithilfe der Lichtleiter

(5) die Seiten-, Vorder- und Bodenwände (3) des Behälters (2) beleuchten und die in der Mitte verbleibenden die Rückwand (3) des Behälters (2) beleuchtet.

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7. Kühlschrank (1) nach einem der vorangehenden Ansprüche 1 bis 4, **gekennzeichnet durch** mehr als eine Gruppe (G) von LEDs (4), von denen jedes Licht einer anderen Farbe ausgibt, wobei die Lichtleiter (5) das Licht von denjenigen LEDs(4) in der Gruppe (G) aus LEDs (4) empfangen, die das Licht in der Farbe ausgeben, die entsprechend den Bedürfnissen des Obstes und des Gemüses, das im Behälter (2) aufbewahrt wird, ausgewählt wird, und **durch** einen Bewegungsmechanismus (6), der die Trageplatte (P) mit den Gruppen (G) von LEDs (4) unterschiedlicher Farben aufweist, die Seite an Seite oder überlagert daran angeordnet sind, aufwärts, abwärts oder seitlich verlagert, um die gewünschte Gruppe (G) von LEDs (4) in Übereinstimmung mit den Lichtleitern (5) zu bringen.
8. Kühlschrank (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Behälter (2) aus einem transparenten Material hergestellt ist und Lichtleiter (5) aus einem transparenten Material mit einem Brechungsindex ( $n_2$ ) hergestellt sind, der sich vom Brechungsindex ( $n_1$ ) des für den Behälter (2) benutzten Materials unterscheidet, und angebaut sind, indem sie teilweise in die Wände (3) eingebettet sind, und das Licht von ihrem anderen Ende in den Behälter (2) leiten, indem sie eine Ausgabe zur Seite auf ihrem Leitweg verhindern.
9. Kühlschrank (1) nach Anspruch 8, **dadurch gekennzeichnet, dass** der Lichtleiter (5) eine kurvenförmige erste Seitenfläche (7) umfasst, die den Abschnitt umgibt, der teilweise im Behälter (2) eingebettet ist, und eine kurvenförmige zweite Seitenfläche (8), die in Kontakt mit Luft außerhalb des Behälters (2) steht und in entgegengesetzter Richtung zur ersten Seitenfläche (7) liegt, wobei der Krümmungsradius ( $R_1$ ) der ersten Seitenfläche (7) größer als der Krümmungsradius ( $R_2$ ) der zweiten Seitenfläche (8) ist.
10. Kühlschrank (1) nach Anspruch 9, **dadurch gekennzeichnet, dass** der Lichtleiter (5) aus einem Material mit einem Brechungsindex ( $n_2$ ) hergestellt ist, der größer ist als der Brechungsindex ( $n_1$ ) des Materials, das zum Herstellen des Behälters (2) benutzt wird.
11. Kühlschrank (1) nach einem der Ansprüche 8 bis 10, **dadurch gekennzeichnet, dass** der Behälter (2) aus Polystyrol (PS) hergestellt ist und ein Lichtleiter (5) aus Polycarbonat (PC) hergestellt ist.

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12. Kühlschrank (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Lichtleiter (5) eine Lichteintrittsfläche (9) umfasst, die an seinem Ende angeordnet ist, das der Lichtquelle (11) zugewandt ist, und in Kontakt mit der Außenfläche der LED (4) steht, wenn der Behälter (2) in den Gehäuse des Kühlschranks (1) geschoben wird, und sich von der LED (4) fort bewegt, wenn der Behälter (2) herausgezogen wird.
13. Kühlschrank (1) nach Anspruch 12, **dadurch gekennzeichnet, dass** die LED (4) eine halbkreisförmige Außenfläche aufweist und die Lichteintrittsfläche (9) des Lichtleiters (5) als halbkreisförmige Vertiefung ausgebildet ist, die der Außenfläche der LED (4) entspricht.
14. Kühlschrank (1) nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** der Lichtleiter (5) an seinem Ende eine ebene Beleuchtungsfläche (10) umfasst, die Licht an den Behälter (2) leitet.

#### Revendications

1. Un réfrigérateur (1) qui comprend un conteneur (2) ayant plus d'une paroi (3), disposé dans le corps, dans lequel les aliments comme les fruits et les légumes sont stockés, une source de lumière (11) ayant plus d'une DEL (4) disposée sur une plaque de support (P) éclairant le conteneur (2) avec une lumière d'une longueur d'onde propre pour la préservation des valeurs nutritionnelles des aliments pendant une longue période de temps et **caractérisé par** au moins deux guides de lumière (5), qui sont formés comme tiges et intégrés avec les parois (3) et une extrémité de chaque guide de lumière (5) étant alignée avec la DEL (4) et l'autre extrémité dudit guide de lumière (5) étant disposé sur l'une des parois (3), les guides de lumière (5) transférant la lumière reçue de la DEL (4) dans le conteneur (2) par les extrémités, disposées sur la paroi (3), des guides de lumière (5), les guides de lumière (5) éclairant le conteneur (2) par au moins deux parois (3).
2. Un réfrigérateur (1) selon la Revendication 1, **caractérisé par** les guides de lumière (5) dont chacun reçoit la lumière d'une seule DEL (4).
3. Un réfrigérateur (1) selon la Revendication 1 ou 2, **caractérisé par** les guides de lumière (5) qui sont intégrés sur les surfaces extérieures des parois (3) et qui entourent le conteneur (2) de l'extérieur.
4. Un réfrigérateur (1) selon la Revendication 3, **caractérisé par** le guide de lumière (5) qui sont produit en étant joint avec le conteneur (2) par la méthode

de surmoulage.

5. Un réfrigérateur (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** le conteneur (2) en forme de prisme rectangulaire ayant six parois (3) à l'avant, à l'arrière, en haut, en bas et deux aux côtés, et au moins six guides de lumière (5) transférant la lumière à toutes les parois (3) en recevant la lumière d'au moins six DELs (4).
6. Un réfrigérateur (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** les DELs (4) placées en réseaux superposés ou côte à côte afin de couvrir une superficie plane sur la plaque de support (P), dont les unes sur la périphérie extérieure éclairent les parois (3) latérale, frontale et du bas du conteneur (2) au moyen des guides de lumière (5) et dont les unes au centre éclairent la paroi arrière (3) du conteneur (2).
7. Un réfrigérateur (1) selon l'une quelconque des revendications de 1 à 4, **caractérisé par** plus d'un groupe (G) de DEL (4), chacun de ceux-ci émettant une lumière d'une couleur différente, les guides de lumière (5) recevant la lumière des DELs (4) dans le groupe (G) de DEL (4) qui émettent la lumière d'une couleur choisie selon les besoins des fruits et légumes stockés dans le conteneur (2) et un mécanisme de mouvement (6) qui déplace la plaque de support (P), qui a des groupes (G) de DEL (4) des couleurs différentes sur celle-ci disposés côte à côte ou l'un sur l'autre, vers le haut, vers le bas ou latéralement afin d'aligner le groupe (G) de DEL (4) désigné avec les guides de lumière (5).
8. Un réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le conteneur (2) produit d'un matériau transparent et guides de lumière (5) qui sont produits d'un matériau transparent ayant un indice de réfraction ( $n_2$ ) différent de l'indice de réfraction ( $n_1$ ) du matériau utilisé pour produire le conteneur (2), qui sont intégrés en étant encastrés sur les parois (3) et qui transfère la lumière dans le conteneur (2) de son autre extrémité en empêchant l'émission latérale sur le chemin de transfert.
9. Un réfrigérateur (1) selon la Revendication 8, **caractérisé par** le guide de lumière (5) comprenant une première surface latérale curviligne (7) qui entoure la partie partiellement enfoncée dans le conteneur (2) et une deuxième surface latérale curviligne (8) qui est en contact avec l'air en dehors du conteneur (2) dans le sens inverse de la première surface latérale (7) et le rayon de courbure ( $R_1$ ) de la première surface latérale (7) étant plus grande que le rayon de courbure ( $R_2$ ) de la deuxième surface latérale (8).

10. Un réfrigérateur (1) selon la Revendication 9, **caractérisé par** le guide de lumière (5) qui est produit d'un matériau dont l'indice de réfraction ( $n_2$ ) est supérieure à l'indice de réfraction ( $n_1$ ) du matériau utilisé pour la production du conteneur (2). 5
11. Un réfrigérateur (1) selon l'une quelconque des revendications de 8 à 10, **caractérisé par** le conteneur (2) produit du polystyrène (PS) et un guide de lumière (5) produit du polycarbonate (PC). 10
12. Un réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le guide de lumière (5) comprenant une surface d'entrée de lumière (9) disposée sur son extrémité faisant face à la source de lumière (11), qui touche la surface extérieure de la DEL (4) lorsque le conteneur (2) est poussé à l'intérieur du corps du réfrigérateur (1) et qui s'éloigne de la DEL (4) lorsque le conteneur (2) est tiré. 15  
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13. Un réfrigérateur (1) selon la Revendication 12, **caractérisé par** la DEL (4) dont la surface extérieure est hémisphérique et le guide de lumière (5) ayant la surface d'entrée de lumière (9) configurée comme un évidement hémisphérique correspondant à la surface extérieure de la DEL (4). 25
14. Un réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé par** le guide de lumière (5) comprenant une surface d'illumination planaire (10) sur son extrémité qui transfère la lumière au conteneur (2). 30

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Figure 1

PRIOR ART

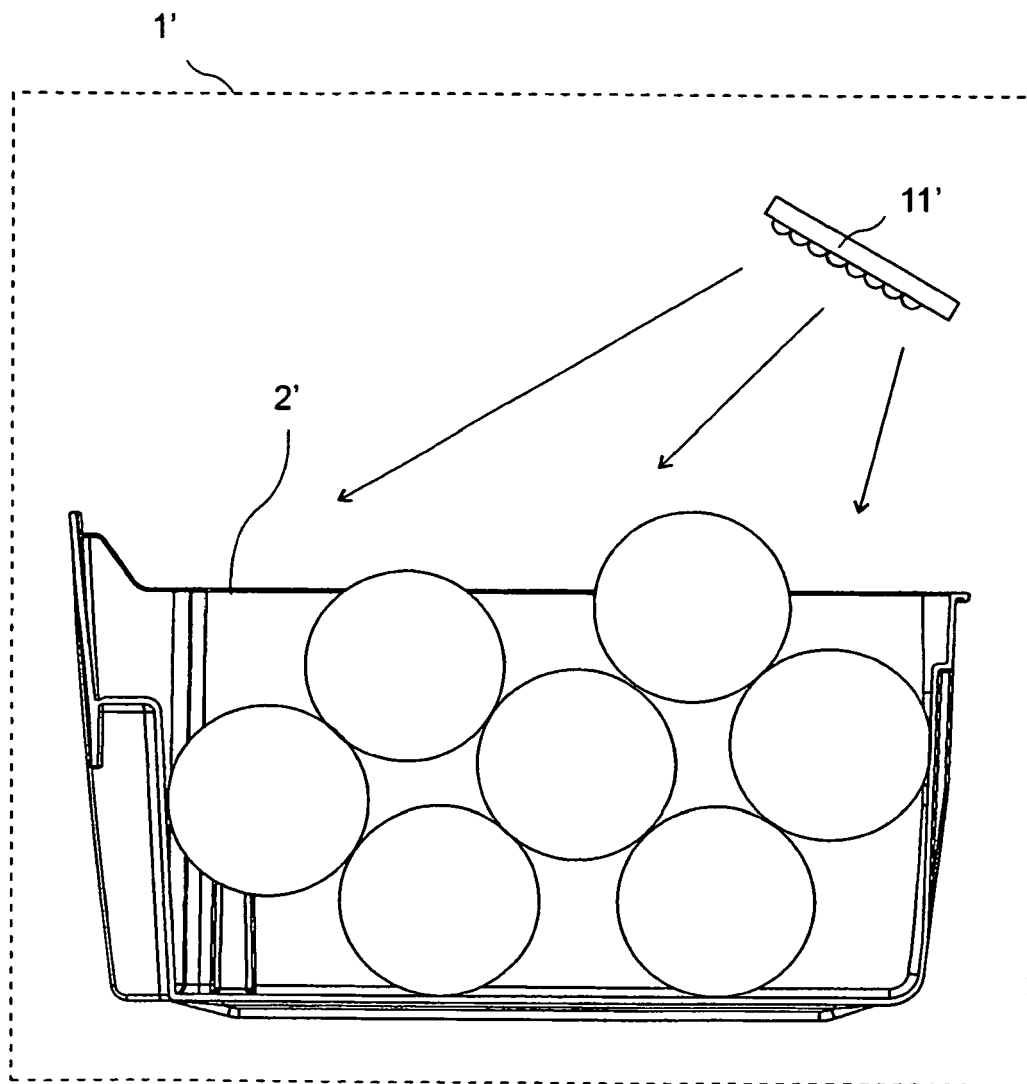


Figure 2

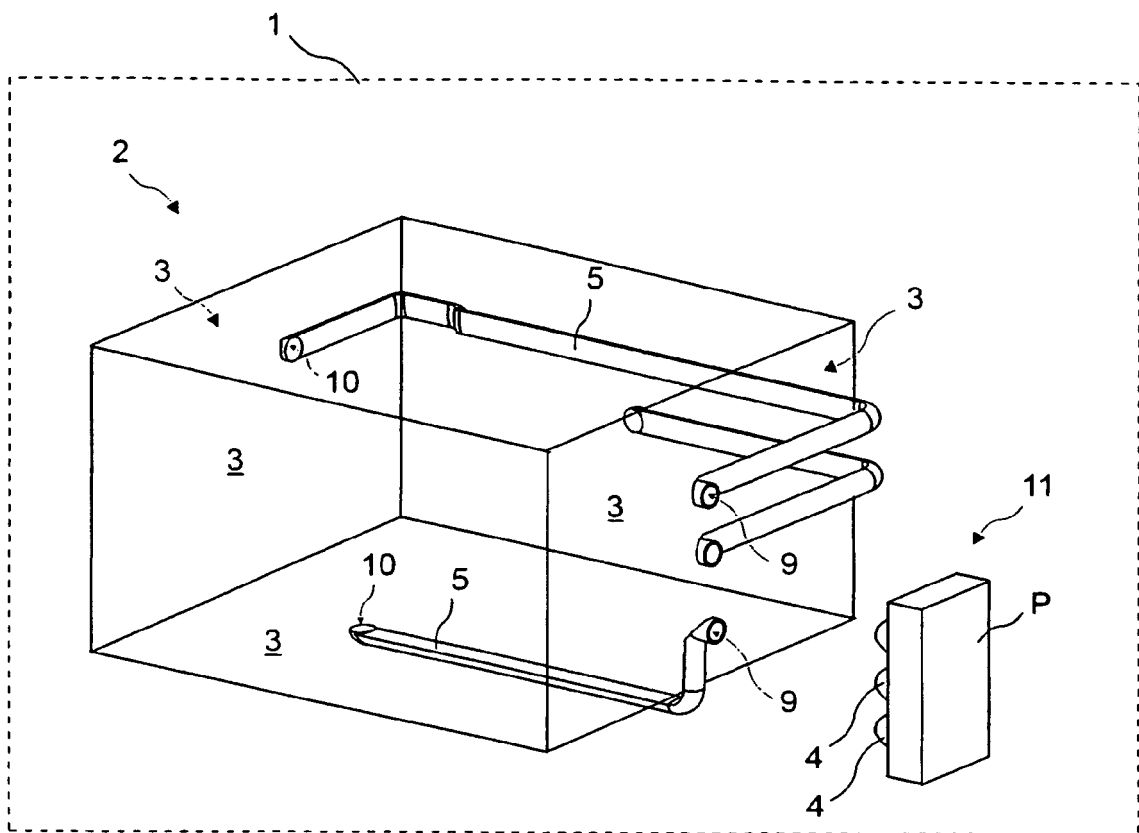


Figure 3

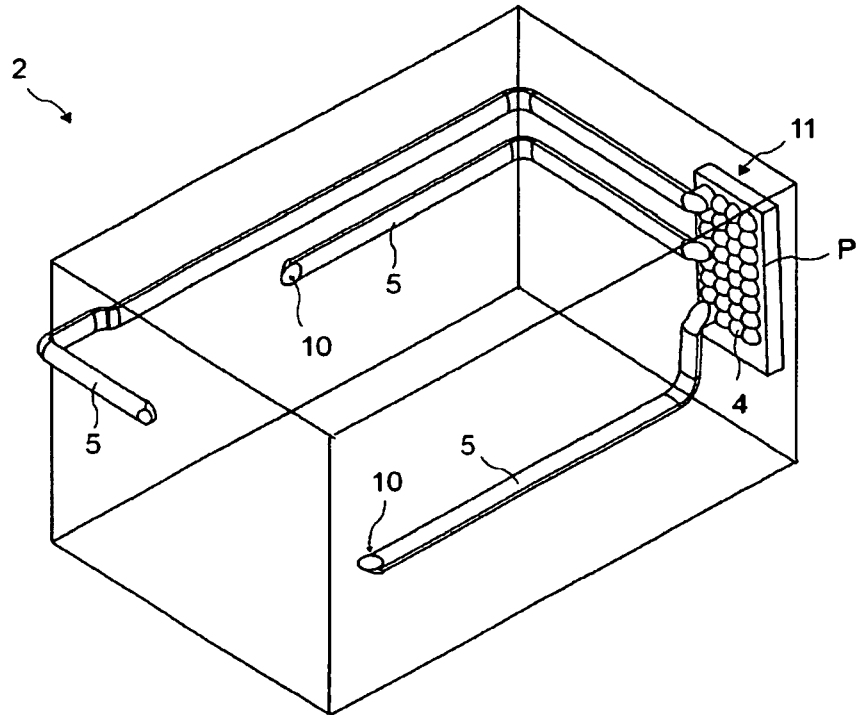


Figure 4

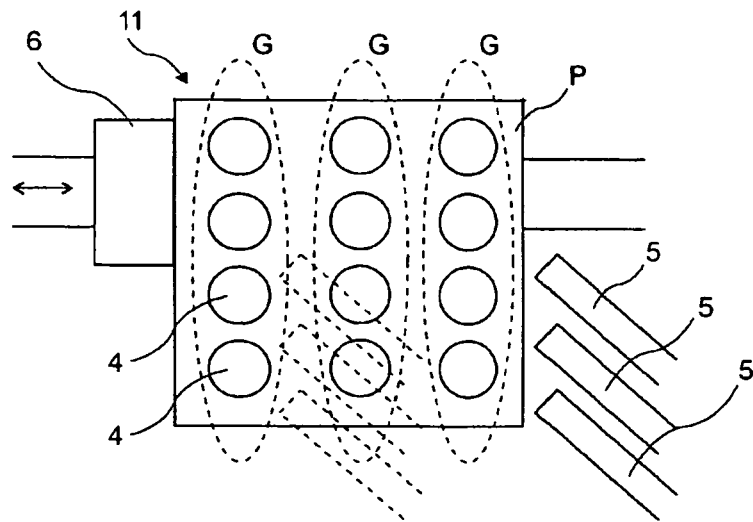
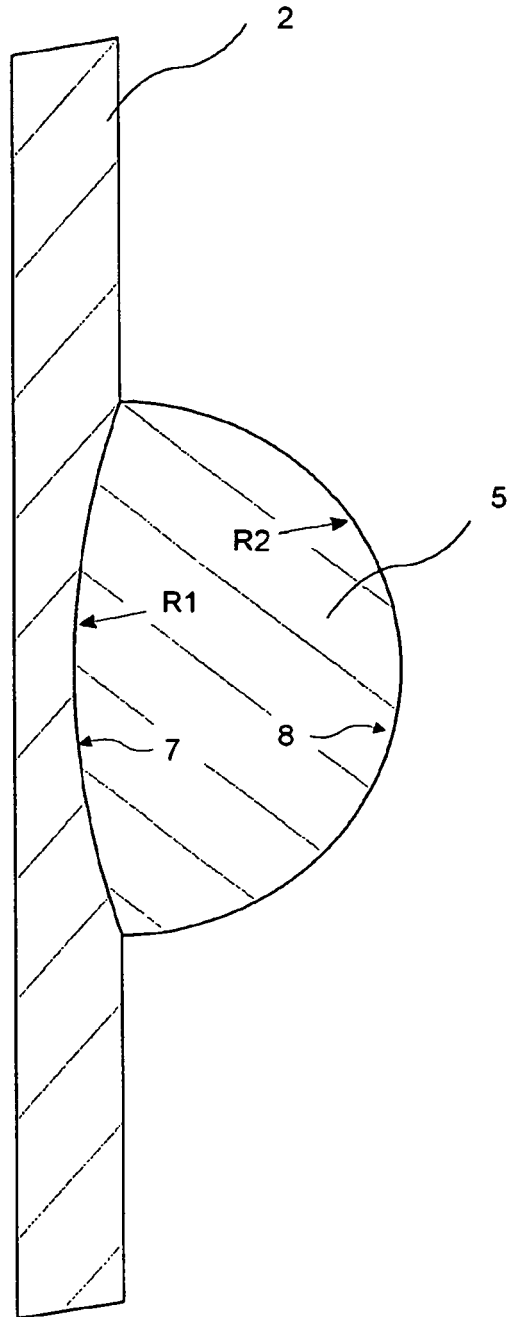


Figure 5



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 6726341 B [0004]
- JP 2005065622 B [0005]
- JP 11094456 B [0006]
- JP 1028473 A [0007]
- WO 2007125122 A [0008]