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(54) **TRANSPARENT ELEMENT SYSTEM AND REFRIGERATING DEVICE**

(57) The present application relates to a transparent element system and a refrigerating device. The transparent element system (10) comprises: a transparent element (101) configured to allow light to penetrate; a power receiving unit (102) configured to receive power in a wireless manner; and a heating unit (103) attached to the transparent element (101) and electrically connected to the power receiving unit (102), wherein the heating unit (103) heats the transparent element (101) by using the power received by the power receiving unit (102). The system can prevent condensation of water vapor on an observable surface such as the refrigerating device, thereby ensuring the internal observability of the device such as the refrigerating device.

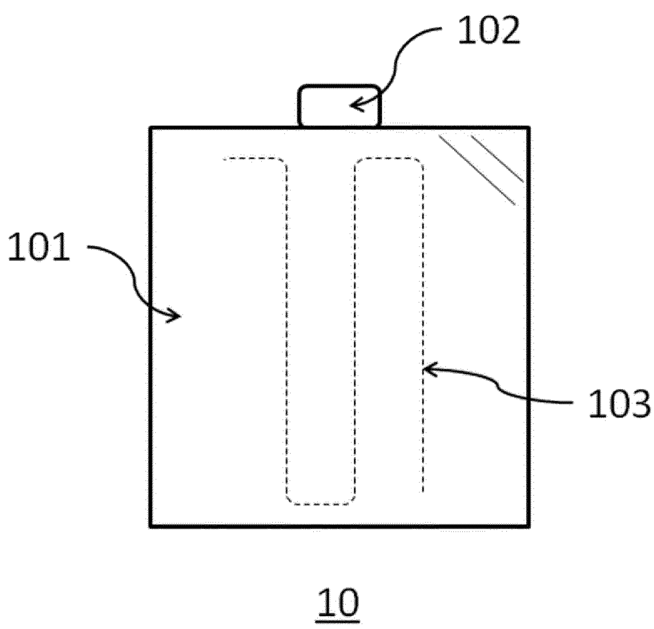

Figure 1

Processed by Luminess, 75001 PARIS (FR)

Description

[0001] The present invention relates to a transparent element system and a refrigerating device comprising the transparent element system.

[0002] At present, some refrigerators use glass as a material isolated from the outside, so as to facilitate the observation of the exhibits in the refrigerator from the outside. However, condensed water is easily formed on the surface of the glass due to the condensation of water vapor in the air, which will cause the observability of the glass to be reduced significantly. In addition, the accumulation of water stains is easy to breed bacteria, which is also detrimental to hygiene and health.

[0003] In the prior art, there is a technical solution for using cables to supply power to the heating film of the sliding glass door of the refrigerator. However, this cable-powered solution is likely to cause the cable to loosen after the glass door is slid multiple times. The insulation performance of the cable may also be damaged.

[0004] According to an aspect of the present invention, there is provided a transparent element system, comprising: a transparent element configured to allow light to penetrate; a power receiving unit configured to receive power in a wireless manner; and a heating unit attached to the transparent element and electrically connected to the power receiving unit, wherein the heating unit heats the transparent element by using the power received by the power receiving unit.

[0005] Such an arrangement may thus provide a transparent element system and, optionally, a refrigerating device comprising the transparent element system that is advantageously configured for preventing condensation of water vapor on an observable surface such as the refrigerating device, thereby ensuring the internal observability of the device such as the refrigerating device. In some instances the transparent element may be referenced as a "perspective medium", and this term may optionally replace "transparent element" as referenced herein. The transparent element may advantageously be an element formed of at least partially transparent material(s) in order to permit at least partial viewing through the transparent element. This may be viewing of an of an interior that is at least in part enclosed by the transparent element, such as with the transparent element providing a window into an enclosed space. The transparent element may be fully transparent in the sense of providing a window allowing a person to view and identify objects the other side of the transparent element. It may be alternatively referred to as a transparent medium, and optionally could be a viewing window. The examples herein provide added detail of the possible function of the transparent element and degrees to which it provides transparency and the ability to see the interior. Notably, whilst large spans of the element may be fully or almost fully transparent (i.e. only small degrees of light filtering/reflection) the transparent element can also incorporate non-transparent materials in a way that does not prevent viewing through the transparent element

[0006] Optionally, the transparent element comprises a plurality of layered structures, and the heating unit is disposed among the plurality of layered structures. The layered structures may comprise or consist of transparent structures.

[0007] Optionally, the degree of reduction in the light transmittance of the heating unit to the transparent element is less than a first preset value.

[0008] Optionally, the heating unit is evenly arranged among the plurality of layered structures.

[0009] Optionally, the system comprises, or further comprises: a transmittance estimating unit configured to evaluate the light transmittance of the transparent element; and the heating unit is configured to stop heating the transparent element if the light transmittance of the transparent element is higher than a second preset value.

[0010] Optionally, the system comprises, or further comprises: a reminding unit configured to send a reminder message when the light transmittance of the transparent element is less than or equal to the second preset value and the power receiving unit fails to receive power.

[0011] Optionally, the transparent element comprises: glass, tempered glass, plexiglass, and coated glass.

[0012] According to another aspect of the present invention, there is provided a refrigerating device, comprising: one or more power transmitting units configured to transmit power in a wireless manner; and one or more of any one of the transparent element systems described above, wherein a power receiving unit of the transparent element system receives power from the power transmitting unit.

[0013] Optionally, the device comprises, or further comprises: a moving rail configured to be coupled to a sliding edge of the transparent element, thereby allowing the transparent element to move along its extension direction; wherein: the power transmitting unit is arranged around the moving rail; and the power receiving unit is arranged at the sliding edge.

[0014] Optionally, the power transmitting unit is configured to be set at intervals with a third preset value, and the third preset value is smaller than the width of the transparent element in the extension direction of the moving rail.

[0015] According to another aspect of the present invention, there is provided a container comprising: a power receiving unit configured to receive power in a wireless manner; and a heating unit attached to an outer surface of the container and electrically connected to the power receiving unit, wherein the heating unit heats the outer surface of the container by using the power received by the power receiving unit.

[0016] Optionally, the container is a liquid bottle-shaped or cup-shaped container.

[0017] The container may comprise of consist of a transparent element system as defined above, and thus may comprise a transparent element that is configured to allow light to penetrate. The heating unit may be attached to the transparent element and electrically connected to the power receiving unit, wherein the heating unit heats the transparent element by using the power received by the power receiving unit. The transparent element may form all of or a part of a wall of the container.

[0018] From the following detailed description in conjunction with the accompanying drawings, the above and other objectives and advantages of the present application will be more complete and clear, wherein the same or similar elements are represented by the same reference numerals.

FIG. 1 shows a transparent element system.
FIG. 2 shows a transparent element system.
FIG. 3 shows a transparent element system.
FIG. 4 shows a refrigerating device.
FIG. 5 shows a refrigerating device.
FIG. 6 shows a refrigerating device.

[0019] For brevity and illustrative purposes, the present application mainly refers to its exemplary embodiments to describe the principles of the present application. However, those skilled in the art will readily recognize that the same principles can be equally applied to all types of transparent element systems and refrigerating devices comprising transparent element systems, and these same or similar principles can be implemented therein, any such changes do not depart from the true spirit and scope of the present application.

[0020] As discussed herein, a transparent element system is provided. This transparent element system can be used, for example, in refrigerating devices, serving as a transparent sliding door or an open door of the refrigerating device. As shown in FIG. 1, the transparent element system 10 comprises a transparent element 101, a power receiving unit 102 and a heating unit 103. Wherein, the transparent element 101 is configured to allow light to penetrate, thereby allowing objects on the other side to be observed from the transparent element 101. In some embodiments of the present application, the transparent element 101 may be glass, tempered glass, plexiglass, coated glass (also known as Low-E glass), etc., or may be other transparent/translucent materials that can serve as air barrier/heat preservation but at least ensure certain optical penetration.

[0021] The power receiving unit 102 of the transparent element system 10 is configured to receive power in a wireless manner. The power receiving unit 102 can be composed of a receiving coil and a corresponding processing circuit. The power receiving unit 102 can receive the power of the power and frequency meeting the preset requirements and use it as an energy source for other components of the transparent element system 10. The power receiving unit 102 can be configured as a wireless power receiving device that meets existing standards (for example, Qi) as needed, it can also be a wireless power receiving device that meets industrial or commercial de facto standards, and it can also be a customized wireless power receiving device that meets specific needs. In some examples of the present application, although the power receiving unit 102 needs to be used in conjunction with the power transmitting unit, the power transmitting unit is not necessarily used as a component of the transparent element system 10.

[0022] The heating unit 103 of the transparent element system 10 is attached to the transparent element 101, and is electrically connected to the power receiving unit 102 (not shown in the figure). At the same time, the heating unit 103 heats the transparent element 101 by using the power received by the power receiving unit 102. In some examples, the heating unit 103 is attached to one side surface of the transparent element 101, but the present application does not limit the way the heating unit 103 is attached to the transparent element 101, as long as the heating unit 103 can move relative to the transparent element 101 and heat the transparent element 101 (comprising its surface). The heating range of the transparent element 101 by the heating unit 103 can cover the entire surface, part of the surface, a designated area on the surface, etc. of the transparent element 101 as needed. The heating range in some examples of the present application refers to the range that the heating unit 103 can thermodynamically affect, and it is not necessary for the heating unit 103 to be in direct contact with all of these ranges.

[0023] The heating unit 103 of the transparent element system 10 is electrically connected to the power receiving unit 102. The electrical connection in the example of the present application refers to a connection method that can realize power transmission. For example, in order to prevent the heating element of the heating unit 103 from heating and affecting the working efficiency of the power receiving unit 102, the heating unit 103 may be connected to the power receiving unit 102 via a length of wire. In addition, if the heating element generates heat without significantly affecting the working efficiency of the power receiving unit 102, the heating element of the heating unit 103 as the conductor itself can also be directly connected to the power receiving unit 102 without a wire.

[0024] The power received by the power receiving unit 102 will be used as a power source for the heating unit 103 after processing, and the heating unit 103 itself can generate heat accordingly to heat the transparent element 101 (comprising its surface). Therefore, the water vapor condensate on the surface of the transparent element 101 will volatilize due to heat, so that the light transmittance of the transparent element 101 will also increase. As shown in FIG. 2, in some embodiments of the present application, the transparent element 101 comprises a plurality of perspective layered structures (the cross-sectional structure of the transparent element 101 shown in FIG. 1). The transparent element 101 shown in the figure comprises a three-layer structure, in which a first layer 101-1 is a hard glass layer, a second layer 101-2 is a glue layer, and a third layer 101-3 is a hard glass layer. The first layer 101-1 and the third layer 101-3 are glued together by the second layer 101-2 to form a complete transparent element 101. The heating unit 103 is arranged among a plurality of perspective layered structures. For example, the heating unit 103 can be arranged between the first layer 101-1 and the third layer 101-3 and buried in the glue layer 101-2. Since heating elements such as heating wires are relatively weak, the heating unit 103 is embedded in the transparent element 101 in this example, which can prevent the heating unit 103 from being disabled by external force.

[0025] The heating unit 103 selects a material that has less influence on light transmittance. In some embodiments of the present application, the degree of reduction in the light transmittance of the heating unit 103 to the transparent element 101 is less than a first preset value. The heating unit 103 can be made of materials such as heating films (for example, metal film layers), heating wires, etc., and the light transmittance of the transparent element 101 is reduced below, for example, 5%, that is, the optical shielding caused by the shielding of the heating unit 103 does not exceed 5%.

[0026] Optionally, the heating unit 103 is evenly arranged among the plurality of perspective layered structures. For example, as shown in FIG. 1, the heating unit 103 is arranged in a regular geometric shape, and the heating material per unit area is made equal as much as possible. In this way, it can be ensured that the heating unit can uniformly heat the transparent element 101 within the range (the entire surface, part of the surface, a designated area on the surface, etc.) that needs to be heated by the heating unit, which is more conducive to the volatilization of water vapor condensate.

[0027] Optionally, the arrangement of the heating unit 103 may also be sparse and dense. In some scenarios, the transparent element system used in the refrigerating device may not be installed horizontally. In this case, under the influence of gravity, the condensed water may flow down to a lower position of the transparent element. Water stains are more likely to accumulate in low places, and therefore require more heating. For this reason, the heating unit 103 may be gradually densely arranged along one direction, so that the heating material per unit area gradually increases along this direction. At this time, the surface of the transparent element 101 of the transparent element system 10 may be marked with a mark indicating that the heating unit 103 is arranged sparsely and densely. When it is necessary to install the transparent element system 10 in, for example, a refrigerating device, according to this mark, the side with more heating material per unit area can be installed at a lower place.

[0028] As shown in FIG. 3, compared with the transparent element system 10 shown in FIGS. 1 and 2, the transparent element system 30 optionally comprises a transmittance estimating unit 301. In other examples, the transparent element system may be both the transparent element system 10 and the transparent element system 30 unless otherwise specified or there is no possibility of implementation. The transmittance estimating unit 301 is configured to evaluate the light transmittance of the transparent element 101. As shown in FIG. 3, a light source with a fixed intensity can be provided on one side of the transparent element 101 and light with a fixed intensity can be emitted to the other side. The light intensity sensing element of the transmittance estimating unit 301 is arranged on the opposite side of the light source, and is used to receive the light emitted by the light source. The light intensity sensing element evaluates the light transmittance of the transparent element 101 based on the received light intensity. For example, if the light intensity on one surface (incident side) is K lux, the light intensity detected on the other surface (exit side) is 0.9K lux, the light transmittance of the transparent element 101 is 90%. On the other hand, if the light transmittance of the transparent element 101 is higher, the heating can be stopped to save power consumption. For example, the heating unit 103 is configured to stop heating the transparent element 101 when the light transmittance of the transparent element 101 is higher than a second preset value (for example, 85%).

[0029] For example, after the transmittance estimating unit 301 has evaluated the light transmittance, it can generate a control signal (for example, an on-off signal) accordingly and send it to a control device (not shown in the figure) that controls the on-off of the heating unit 103. For example, when the light transmittance is lower than or equal to the second preset value, the transmittance estimating unit 301 may generate an on signal, and when the light transmittance is higher than the second preset value, the transmittance estimating unit 301 may generate an off signal. When the control device receives the on signal, the heating unit 103 starts to work; and when the control device receives the off signal, the heating unit 103 stops working.

[0030] Optionally, the transparent element system 30 further comprises a reminding unit (not shown in the Figure). The reminding unit is configured to send a reminder message when the light transmittance of the transparent element 101 is less than or equal to the second preset value and the power receiving unit 102 fails to receive power. In some examples, if the light transmittance of the transparent element 101 is less than or equal to the second preset value, it indicates that the transparent element 101 needs to be heated to clean its surface. However, if the power receiving unit 102 fails to receive power, or its matching power transmitting unit fails to transmit power, or the heating unit 103 fails to heat normally at present, it indicates that there is a special situation in the system that causes the heating unit 103 to fail to work according to the preset logic. Special situations may comprise the following: the power receiving unit 102 or its matching power transmitting unit is damaged, the power receiving unit 102 and its matching power transmitting unit cannot be aligned (the two are not within the effective working distance), and the heating unit 103 is damaged. At this time, the operator or the automated processing equipment should be reminded, for example, a reminder message should be sent to the operator or the automated processing equipment.

[0031] As described herein, a refrigerating device is provided. As shown in FIG. 4, the example refrigerating device 40 comprises one or more power transmitting units and one or more transparent element systems. The Figure shows three power transmitting units 401-1, 401-2 and 401-3 and three corresponding transparent element systems 10-1, 10-2 and 10-3. In actual use, the number of power transmitting unit and the transparent element system are not limited to three. The transparent element systems 10-1, 10-2, and 10-3 in the refrigerating device 40 may be configured according to the above-described transparent element system.

[0032] In the following description, the main components of the transparent element system (for example, a power receiving unit, a heating unit, etc.) can be integrated with the transparent element in the transparent element system, and thus the integral part is called the body of the transparent element system, sometimes referred to as the transparent element system for short, or also referred to as the transparent element.

[0033] In the refrigerating device 40, the power transmitting units 401-1, 401-2, and 401-3 are configured to transmit power in a wireless manner. The power transmitting units 401-1, 401-2, and 401-3 can be composed of a transmitting coil and a corresponding processing circuit. The power transmitting units 401-1, 401-2, and 401-3 can transmit the power of the power and frequency meeting the preset requirements and the power is received by the pre-set matching power receiving unit. The power transmitting units 401-1, 401-2, and 401-3 can be configured as wireless power transmitting device that meets existing standards (for example, Qi) as needed, it can also be a wireless power transmitting device that meets industrial or commercial de facto standards, and it can also be a customized wireless power transmitting device that meets specific needs.

[0034] In the refrigerating device 40, the power receiving units of the transparent element systems 10-1, 10-2, and 10-3 receive the power from the power transmitting unit, and serve as energy sources for other unit modules of the transparent element system.

[0035] As shown in FIG. 4, the transparent element of the transparent element systems 10-1, 10-2, and 10-3 is used as the perspective door of the refrigerating device 40, and the bodies of transparent element systems 10-1, 10-2, and 10-3 can be connected to the body of the refrigerating device 40 by means of a hinge 402, wherein two or more hinges are configured for each piece of transparent element. Since the power is transmitted between the power transmitting unit and the transparent element system in a wireless manner, compared with the wired method, the opening and closing state of the hinge 402 will not affect the stability of the transmission link. In some examples, the power transmitting unit and the transparent element system can be configured to transmit power regardless of the opening and closing state of the hinge 402; in other examples, the power transmitting unit and the transparent element system can be configured to transmit power when the hinge 402 is in the preset opening and closing angle range.

[0036] The refrigerating device 40 shown in FIG. 4 is an open-close door structure. Optionally, the refrigerating device may also be a sliding door structure. As shown in FIG. 5, compared with the corresponding example in FIG. 4, the refrigerating device 50 comprises two upper and lower moving rails 501, and the moving rails for the body of transparent element system can realize the opening and closing of the refrigerating device 50 with the help of the moving rails 501. The moving rails 501 of the refrigerating device 50 are configured to be coupled to the sliding edge of the transparent element of the transparent element system, thereby allowing the transparent element to move along its extending direction. The sliding edge in the example of the present application refers to an edge in the transparent element that can slide along the moving rail, and the transparent element also comprises a non-sliding edge that does not slide on the moving rail. As shown in the figure, the power transmitting units 401-1, 401-2, and 401-3 of the refrigerating device 50 can be arranged around the moving rail, and the power receiving units of the transparent element systems 10-1, 10-2, and 10-3 are arranged at the sliding edge. The power transmitting unit and the power receiving unit are arranged in alignment, so as to ensure that the power transmitting unit and the power receiving unit can stably transmit power when the sliding door is at least in the default closed position.

[0037] When reading the present application, those skilled in the art can find that in addition to the default position, the transparent element system can also obtain power supply in other positions, for example, when the transparent element system 10-1 is moved to the position of the transparent element system 10-2 shown in the figure, the transparent element system 10-1 can also obtain power from the power transmitting unit 401-2.

[0038] In the example corresponding to FIG. 5, the power transmitting unit is arranged corresponding to the transparent element system (specifically, the power receiving unit). Generally speaking, each dimension of the transparent element can be the same, and the position of the power receiving unit relative to the transparent element is also the same. Therefore, the interval of the power transmitting units 401-1, 401-2, and 401-3 can be roughly the same as the width of the transparent element in the extension direction of the moving rail.

[0039] Optionally, the power transmitting unit is configured to be set at intervals with a third preset value, where the third preset value is smaller than the width of the transparent element in the extension direction of the moving rail. As shown in FIG. 6, compared to the corresponding example in FIG. 5, the interval between the power transmitting units 601 shown in FIG. 6 is smaller than the interval between the power transmitting units shown in FIG 5. For example, the interval between the power transmitting units 601 of the refrigerating device 60 is half of the width of the transparent element in the extension direction of the moving rail. At this time, compared to the sparse arrangement of the power transmitting units, the energy transmission path can be established more easily between the power transmitting unit and the power receiving unit during the movement of the sliding door. In some examples, the widths of the respective transparent element in the extension direction of the moving rail may not necessarily be equal, and the third preset value is smaller than the minimum value of the widths of the transparent element in the extension direction of the moving rail at this time.

[0040] As shown in FIG. 6, when the middle transparent element is in the default closed position, a path for transmitting power can be established between the power transmitting unit A and the power receiving unit, and when the middle transparent element moves to the right, a path for transmitting power can be established between the power transmitting unit B and the power receiving unit. As a result, when the sliding door is not in the default closed position, there is a certain probability of obtaining power supply, so as to avoid the phenomenon of water vapor condensation caused by the sliding door not being closed in time.

[0041] The sliding door of the refrigerating device may not move in a horizontal direction, and the sliding door may have a certain angle. In this case, due to gravity, the condensed water may flow to the lower position of the sliding door. The foregoing has introduced a transparent element system in which the heating units are gradually densely arranged in one direction, wherein the surface of the transparent element of the transparent element system may be marked with a mark indicating that the heating unit is arranged sparsely and densely. When it is necessary to install the transparent element system in, for example, a refrigerating device, according to this mark, the side with more heating material per unit area can be installed at a lower place.

[0042] In daily life, we often pour refrigerated beverages into a cup for drinking, but a lower temperature beverage will cause condensation on the outer wall of the cup. The condensed water on the outer wall of the cup may leave water stains on the table, which is very disturbing. In addition, the condensed water will also cause the risk of holding the cup, and a little careless holding may cause the cup to slip off. For this, we need a mechanism that can remove the condensed water on the outer wall of the cup. In addition, due to the rapid development of current wireless charging devices, wireless power sources have also become within reach. In the following examples, wireless charging devices available everywhere can be used to provide power for the condensed water removal mechanism of the example of the present application.

[0043] According to another implementation there is provided a container comprising an power receiving unit and a heating unit. The power receiving unit is configured to receive power in a wireless manner. According to actual usage, the power receiving unit of the container can be arranged at the bottom of the container, so as to be conveniently placed on, for example, a wireless charging base to draw power.

[0044] The heating unit is attached to the outer surface of the container, for example, to the outer surface of a container such as a cup. The heating unit is electrically connected to the power receiving unit, and heats the outer surface of the container by using the power received by the power receiving unit. Therefore, when a container such as a cup is placed on the wireless charging base, the outer surface of the cup can be automatically heated, thereby preventing the generation of condensed water or removing the condensed water. Optionally, the container is a liquid bottle-shaped or cup-shaped container.

[0045] Those skilled in the art can think of other feasible changes or substitutions according to the technical scope disclosed in the present application, and these changes or substitutions are all covered by the protection scope of the present invention, which is defined by the claims. In the case of no conflict, the embodiments of the present application and the features in the embodiments can also be combined with each other. The protection scope of the present application is subject to the description of the claims.

Claims

1. A transparent element system, comprising:

   a transparent element configured to allow light to penetrate;
   a power receiving unit configured to receive power in a wireless manner; and
   a heating unit attached to the transparent element and electrically connected to the power receiving unit, wherein the heating unit heats the transparent element by using the power received by the power receiving unit.

2. The system according to claim 1, wherein the transparent element comprises a plurality of layered structures, and the heating unit is disposed among the plurality of layered structures.

3. The system according to claim 2, wherein the degree of reduction in a light transmittance of the heating unit to the transparent element is less than a first preset value.

4. The system according to claim 2, wherein the heating unit is evenly arranged among the plurality of layered structures.

5. The system according to claim 1, comprising:

a transmittance estimating unit configured to evaluate the light transmittance of the transparent element; and
the heating unit is configured to stop heating the transparent element if the light transmittance of the transparent element is higher than a second preset value.

6. The system according to claim 5, comprising: a reminding unit configured to send a reminder message when the light transmittance of the transparent element is less than or equal to the second preset value and the power receiving unit fails to receive power.

7. The system according to any one of claims 1 to 6, wherein the transparent element comprises: glass, tempered glass, plexiglass, and coated glass.

8. A refrigerating device, comprising:

one or more power transmitting units configured to transmit power in a wireless manner; and
one or more transparent element systems according to any one of claims 1 to 7,

wherein a power receiving unit of the transparent element system receives power from the power transmitting unit.

9. The device according to claim 8, further comprising: a moving rail configured to be coupled to a sliding edge of the transparent element, thereby allowing the transparent element to move along its extension direction; wherein:

the power transmitting unit is arranged around the moving rail; and
the power receiving unit is arranged at the sliding edge.

10. The device according to claim 9, wherein the power transmitting unit is configured to be set at intervals with a third preset value, and the third preset value is smaller than the width of the transparent element in the extension direction of the moving rail.

11. A container comprising:

a power receiving unit configured to receive power in a wireless manner; and
a heating unit attached to an outer surface of the container and electrically connected to the power receiving unit, wherein the heating unit heats the outer surface of the container by using the power received by the power receiving unit.

12. The container according to claim 11, wherein the container is a liquid bottle-shaped or cup-shaped container.

13. The container according to claim 11 or 12, wherein the container comprises or consists of a transparent element system as in any of claims 1 to 7.

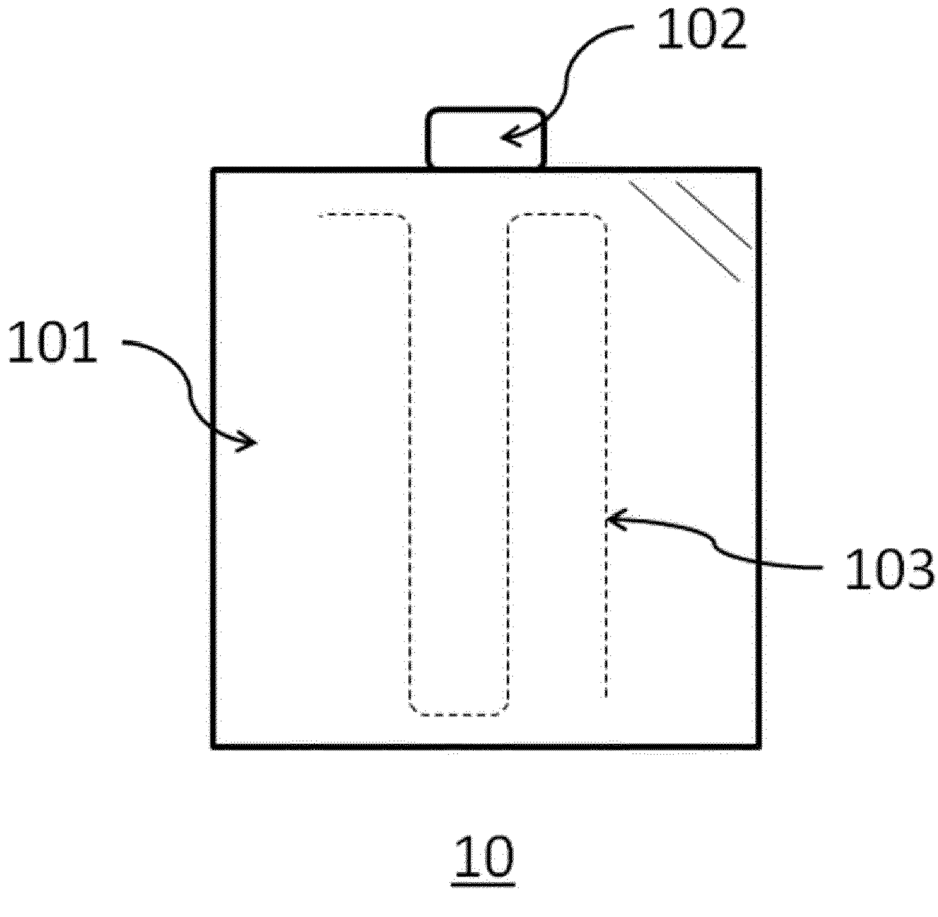

Figure 1

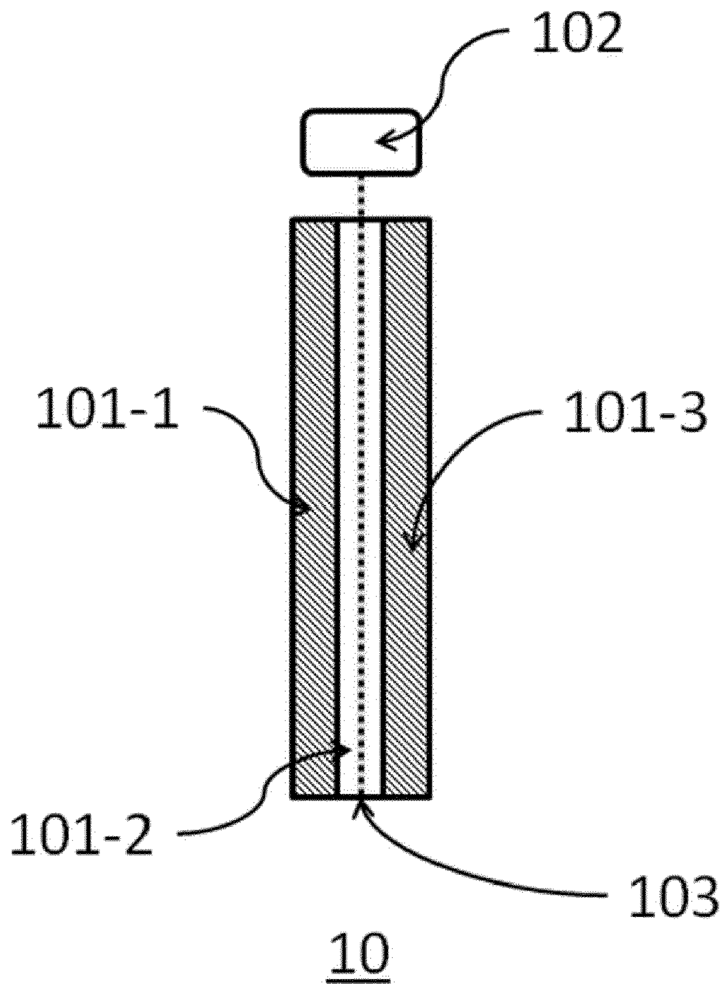

Figure 2

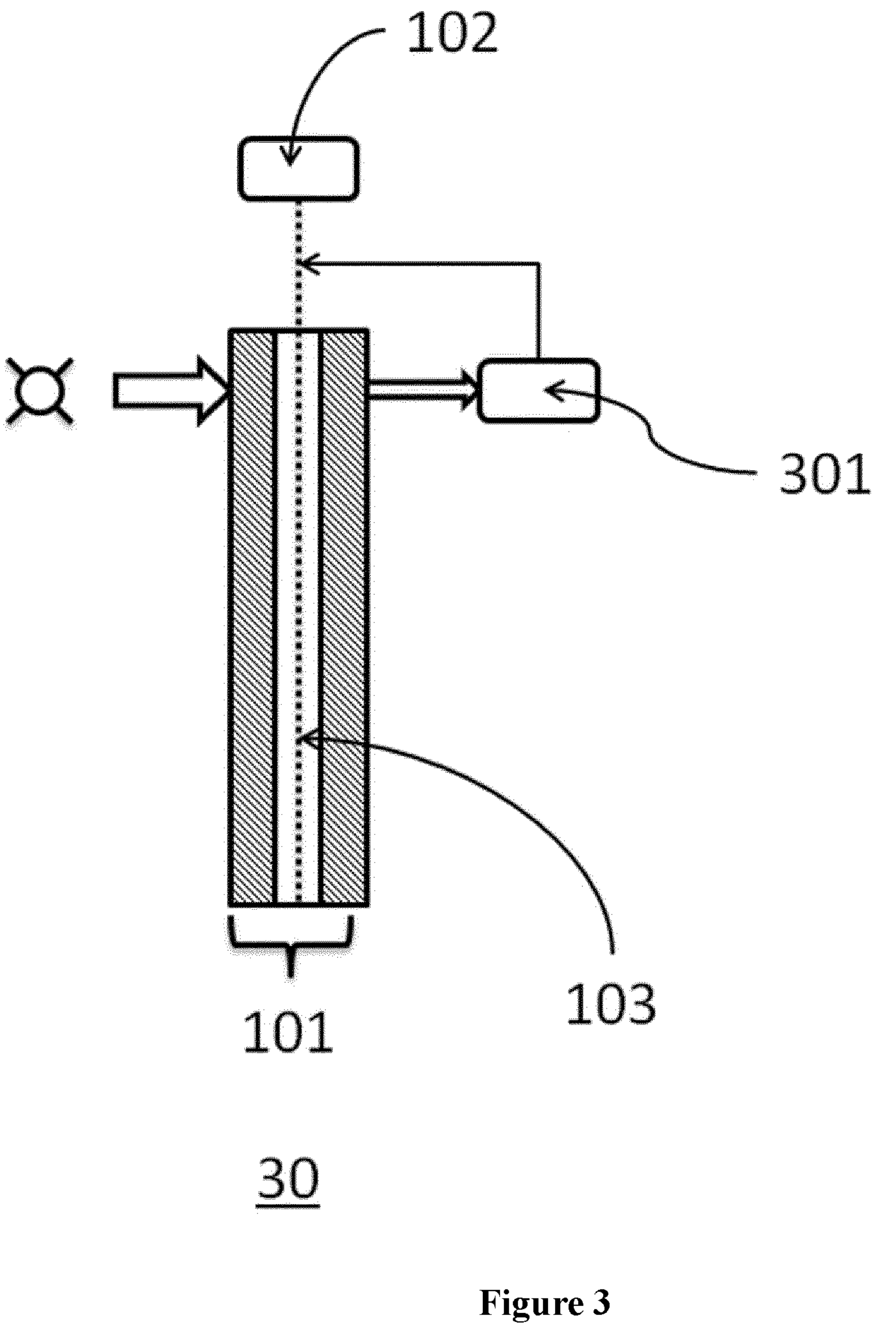

Figure 3

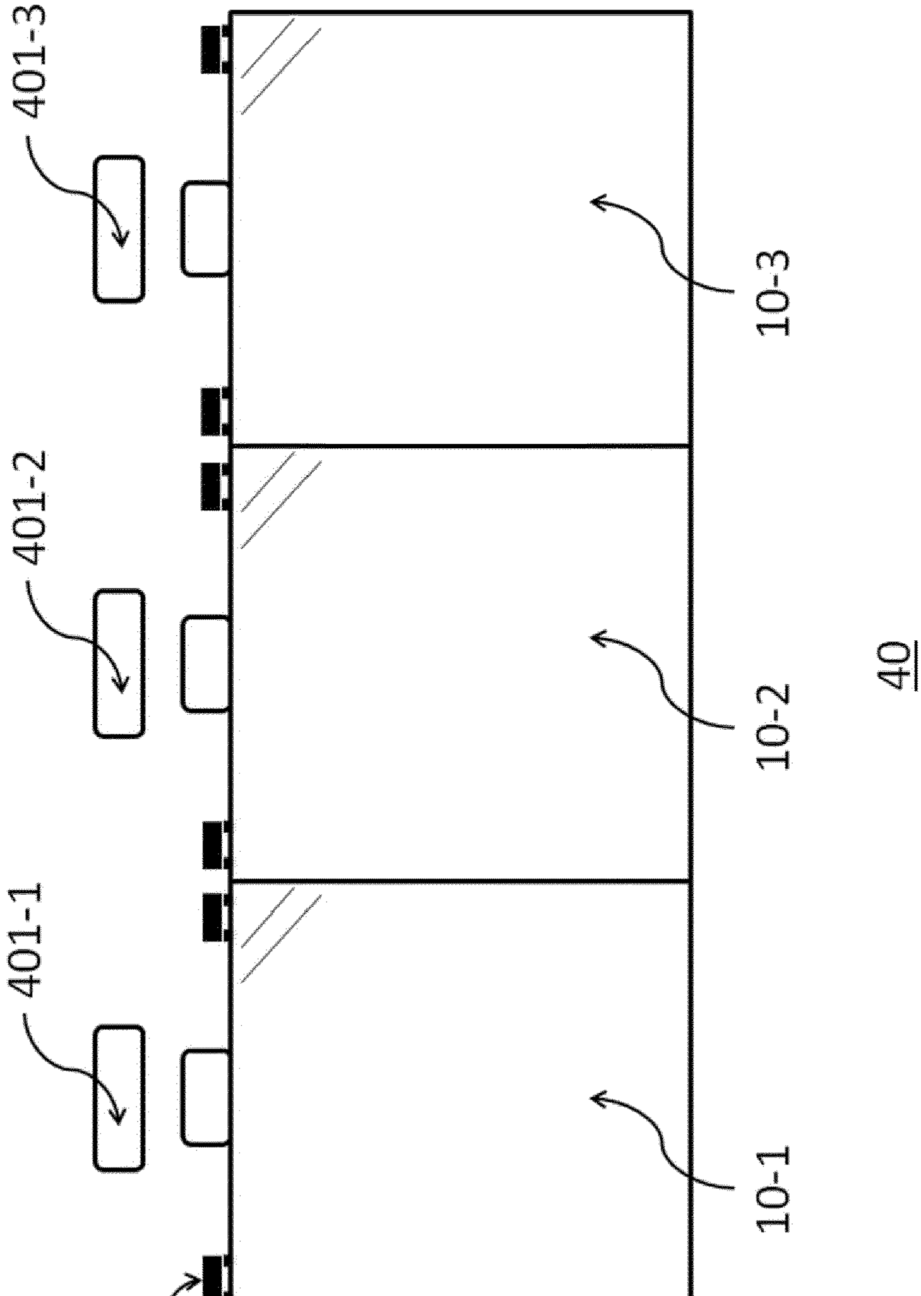

Figure 4

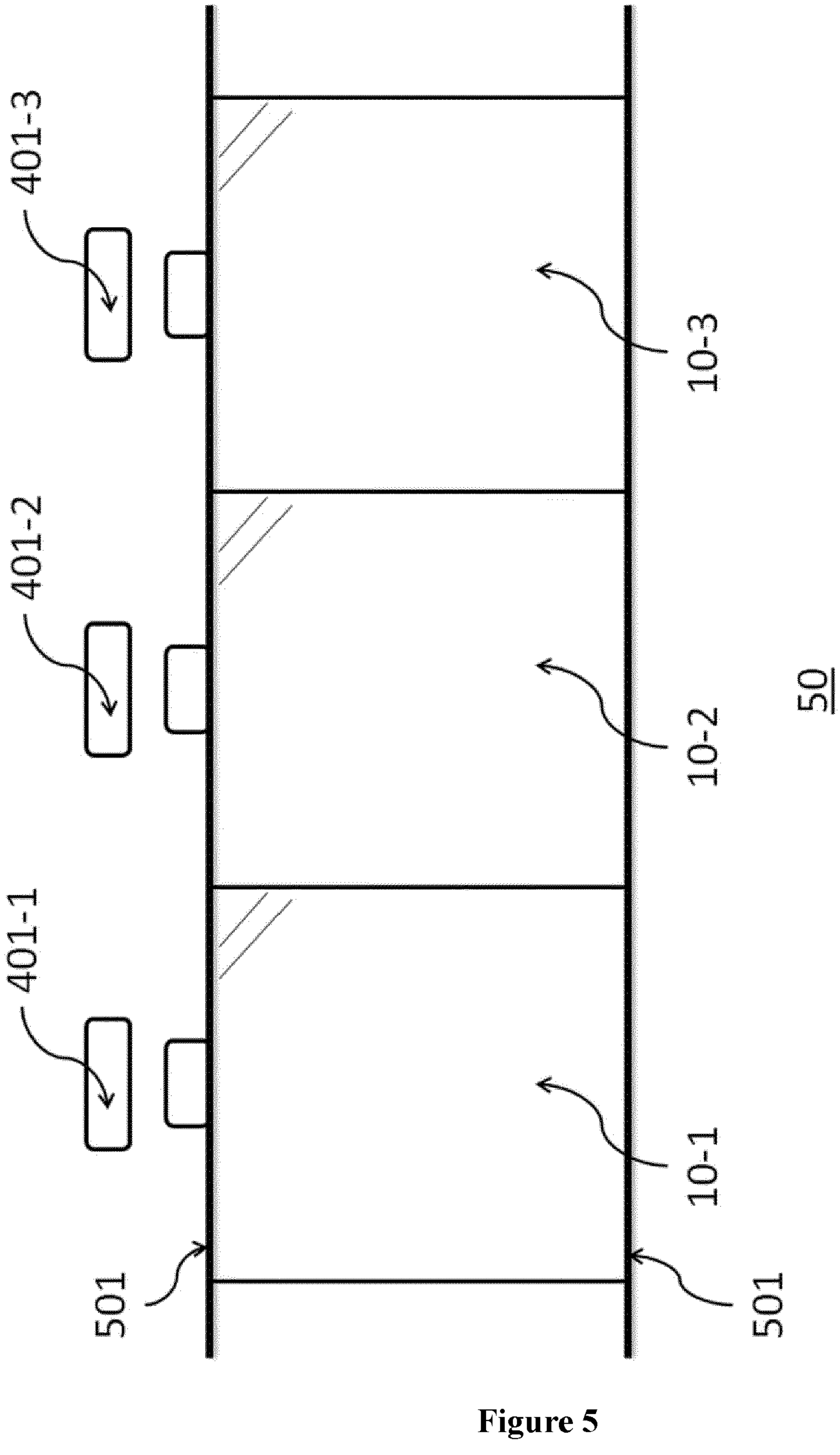

Figure 5

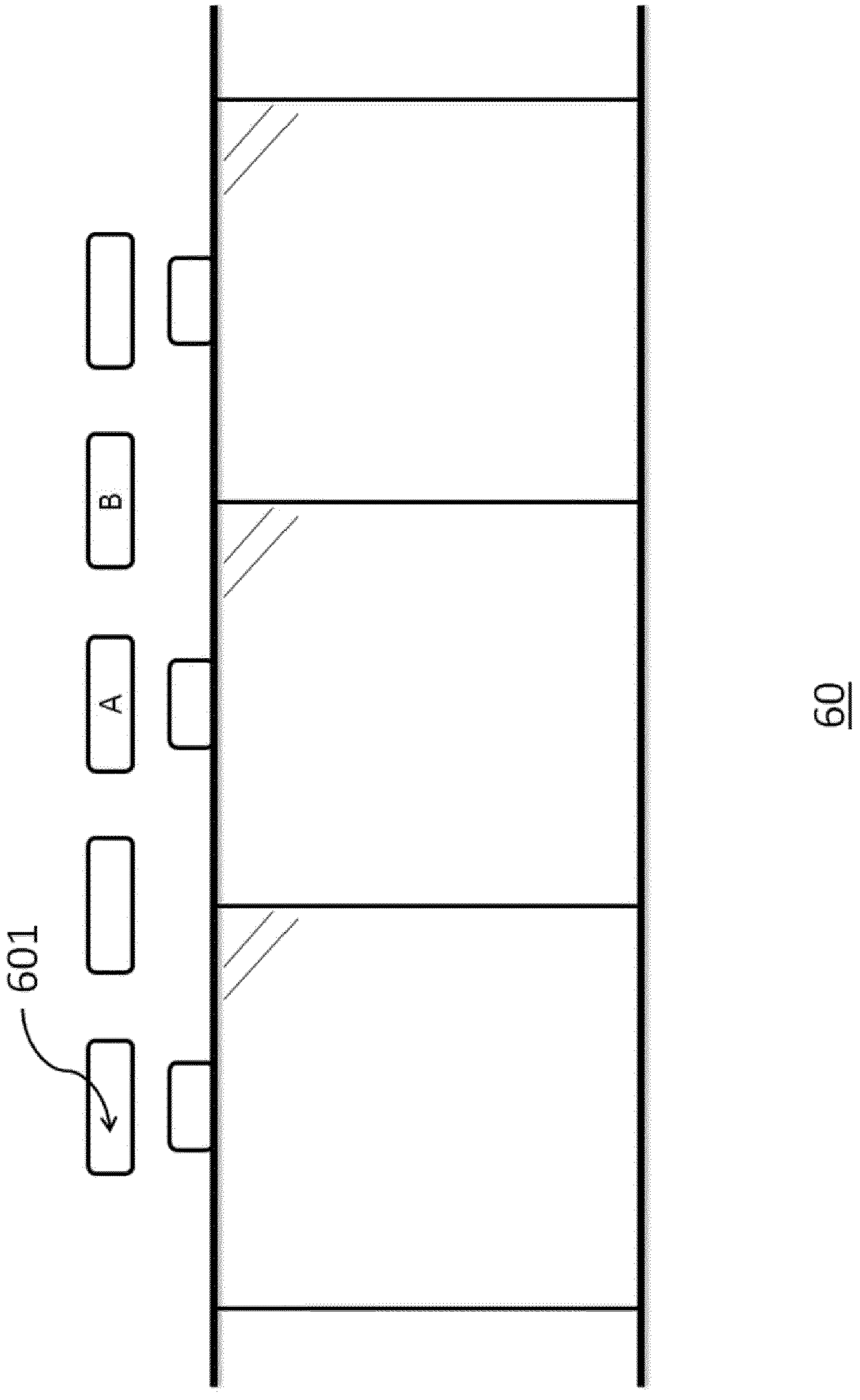

Figure 6