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(54) **VACUUM INSULATION BOX**

(57) The present invention relates to a vacuum insulation box. According to one aspect of the present invention, the vacuum insulation box comprises: a vacuum panel having a plurality of insulation cells arranged to have an inclined part with a one-side end portion inclined at an angle of 45 degrees or higher, and forming a development figure through a plate part that connects the insulation cells while the insulation cells are encompassed; a core material part formed inside the insulation cell so as to block heat exchange between the inner surface and the outer surface of the vacuum panel; and a close-contact part protruding from the outer surface of the inclined part in the outward direction of the inclined part so as to improve adhesion between adjacent insulation cells when the insulation cells are in contact with each other.

The present invention relates to a vacuum insulation box. According to one aspect of the present invention, the vacuum insulation box comprises: a vacuum panel having a plurality of insulation cells arranged to have an inclined part with a one-side end portion inclined at an angle of 45 degrees or higher, and forming a development figure through a plate part that connects the insulation cells while the insulation cells are encompassed; a core material part formed inside the insulation cell so as to block heat exchange between the inner surface and the outer surface of the vacuum panel; and a close-contact part protruding from the outer surface of the inclined part in the outward direction of the inclined part so as to improve adhesion between adjacent insulation cells when the insulation cells are in contact with each other.

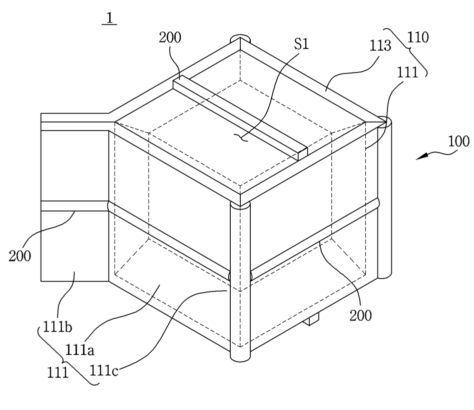

fig.1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a vacuum insulation box, in which a plurality of mutually connectable panels is fabricated and, when the panels are connected to each other, heat dissipation may be minimized.

BACKGROUND ART

[0002] In general, cold storage boxes or insulation boxes are used for the transportation or storage of medical or food items, such as the storage of organs. Such an insulation box may be formed by connecting a plurality of panels together to form a single box so that items stored therein may be transported in an insulated state.

[0003] However, conventional cold storage boxes or insulation boxes have the problem that a large amount of heat dissipation occurs at the joints of the connected panels, thereby causing heat exchange between the items inside the insulation box and the outside of the insulation box.

[0004] To solve this problem, Korean Registered Patent No. 10-2037044 discloses an insulation box in which a plurality of exploded insulating cells are integrally connected in a foldable manner to form a vacuum insulation panel assembly having an insulation compartment defined by an improved insulation structure of contacting connection edges, which prevents heat loss, provides folding deformation close to a right angle between the insulating cells, thereby providing excellent space utilization, and provides areas with different insulation performances through a simple change in the thickness of the insulating cells. However, the insulation box has a problem in that when connecting the insulating cells, the insulating cells fabricated in a vacuum are pressed at atmospheric pressure, which may cause deformation of inner and outer surfaces of each of the insulating cells, and when connecting such insulating cells, the joints of the insulating cells are not tightly connected and completely sealed, resulting in slight heat exchange at the joints.

[0005] In addition, Korean Registered Patent No. 10-2107558 discloses a vacuum insulation pouch having a single 2D vacuum insulation panel folded to form an internal hexagonal enclosed insulation space, thereby blocking heat transfer occurring at the edges. However, the insulation pouch has a problem in that in order to form a pouch, all sides need to be formed differently and overlap in a folded manner, which results in excessive fabricating costs and makes it difficult to fabricate.

DISCLOSURE

TECHNICAL PROBLEM

[0006] Embodiments of the present invention are provided based on the above technical background, and an objective of the present invention is to provide a vacuum insulation box defined by vacuum insulation panels fabricated in a vacuum and discharged at atmospheric pressure, wherein the panels are shaped in consideration of the shrinkage occurring under atmospheric pressure so that the contacting edges of the panels may be completely sealed even in a case where the shape of the panel is deformed, and the fabricating cost and time may be reduced.

TECHNICAL SOLUTION

[0007] To accomplish the above objective, the present invention may include a vacuum panel including a plurality of insulating cells each having an inclined portion inclined at an angle of 45 degrees or more at each side and a plate part configured to enclose and connect the insulating cells, thereby forming a deployed box shape; a core provided inside the insulating cell to block heat exchange between inner and outer surfaces of the vacuum panel; and a close contact portion protruding outward from an outer surface of the inclined portion to increase adhesion between the insulating cells that are adjacent when in contact with each other.

[0008] In addition, the plate part may include a vertical plate disposed perpendicular to a bottom surface to connect the insulating cells; and a horizontal plate perpendicularly coupled to the vertical plate.

[0009] In addition, the core may be formed of an organic fiber, an inorganic fiber, and an inorganic material such as fumed silica, and may include a stack of trapezoidal core members whose areas decrease as the core members are stacked.

[0010] In addition, the core may have rounded protruding surfaces protruding outward from opposite sides.

[0011] In addition, the opposite sides of the core may be inclined at the same angle of inclination as the inclined portion.

[0012] In addition, the core may have has a recess having a shape that is inwardly recessed from the opposite sides thereof.

[0013] In addition, the insulating cell may include an inner wall formed to wrap the core; and an outer wall spaced apart outward from the inner wall to form a space in a vacuum state.

[0014] In addition, the plate part may include a vertical body attached to outer surfaces of the insulating cells; an adhesion member extending from each of opposite ends of the vertical body; and a tensioning portion formed on an opposite side of the vertical body on which the insulating cells are disposed in a position where the adjacent insulating cells are in contact.

[0015] In addition, the core member may include a first core member having an integral structure, and a second core member disposed on one surface of the first core member to be spaced apart from each other, stacked on the first core member with a decreasing area, and having an inclined outer surface to form a trapezoidal shape.

EFFECT OF THE INVENTION

[0016] In the vacuum insulation box according to an embodiment of the present invention, when the box is fabricated by fitting together the insulating cells of the vacuum panel, each insulating cell is formed in a trapezoidal shape with two lateral sides inclined at an angle of 45 degrees or more to increase the contact area between the adjacent insulating cells, which may improve the air-tightness and attachment tightness of the foldable edges between the adjacent insulating cells when the box is fabricated, thereby blocking the heat exchange between the inside and outside of the box at the connected edges.

[0017] Furthermore, in the vacuum insulation box according to an embodiment of the present invention, since the close contact portions protrude outward from the inclined portions of the vacuum panel, bores (voids) to be generated in the vacuum panel due to contraction under atmospheric pressure of the vacuum panel when fabricated in a vacuum and discharged at atmospheric pressure are formed in the close contact portions, and thus upon contact between the inclined portions of the adjacent insulating cells, the close contact portions are compressed so that the bores (voids) in one close contact portion are filled with a portion of the other close contact portion, thereby improving the air-tightness between the adjacent insulating cells.

[0018] In the vacuum insulation box according to an embodiment of the present invention, the rectangular section insulating cells are connected and extended to for the insulation panel having a deployed shape such as an "I" shape, an "L" shape, a "⊂" shape, a square shape "□", so that the connected insulating cells may be packaged at once, thereby reducing the fabricating time.

[0019] In the vacuum insulation box according to an embodiment of the present invention, when the opposite insulating cells of the vacuum panel are connected upon folding from the deployed shape, the adhesion members extending from opposite ends of the vacuum panel are attached to each other, thereby improving the bonding strength of the opposite insulating cells coupled at opposite ends of the vacuum panel.

[0020] In the vacuum insulation box according to an embodiment of the present invention, the core is formed as a stack of core members having different widths, thereby effectively blocking heat exchange between the inside and outside of the insulating cell.

[0021] In the vacuum insulation box according to an embodiment of the present invention, the core has protrusions on opposite sides, thereby preventing deformation of the core occurring due to contraction of the inner wall caused by contraction of the outer wall, or heat exchange occurring due to reduced adhesion between the core and the space.

[0022] In the vacuum insulation box according to an embodiment of the present invention, the core has inwardly recessed surfaces in opposite sides so that upon contract of the vacuum panel, the inner wall is brought into close contact with the recessed surfaces of the opposite sides of the core, which minimizes the deformation of the vacuum panel while maintaining a vacuum state between the outer wall and the inner wall, thereby preventing a reduction in the heat insulation efficiency.

[0023] In the vacuum insulation box according to an embodiment of the present invention, the plate part is located under the trapezoidal insulating cells to connect the insulating cells, and has the tensioning portions protruding outward when folded between adjacent insulating cells, thereby blocking heat exchange occurring at the edges of the insulating cells.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 is a perspective view illustrating a vacuum insulation box according to an embodiment of the present invention.

FIG. 2 is a perspective view illustrating an insulating cell according to an embodiment of the present invention.

FIG. 3 is a cross-sectional view illustrating an insulating cell according to an embodiment of the present invention.

FIG. 4 is a deployed perspective view illustrating a vacuum insulation box according to an embodiment of the present invention.

FIG. 5 is a cross-sectional view illustrating an insulating cell according to an embodiment of the present invention.

FIG. 6 is a diagram illustrating a state in which insulating cells according to an embodiment of the present invention are fitted together.

FIG. 7 is a deployed perspective view illustrating a vacuum panel according to a second embodiment of the present invention.

FIG. 8 is a deployed perspective view illustrating a vacuum panel according to a third embodiment of the present invention.

FIG. 9 is a deployed perspective view illustrating a partially folded vacuum panel according to a third embodiment of the present invention.

FIG. 10 is a cross-sectional view illustrating an insulating cell according to a fourth embodiment of the present invention.

FIG. 11 is a cross-sectional view illustrating an insulating cell according to a fifth embodiment of the present invention.

FIG. 12 is a cross-sectional view illustrating an insulating cell according to a sixth embodiment of the present invention.

FIGS. 13 to 15 are photographs illustrating the fabrication of a vacuum insulation box according to an embodiment of the present invention.

BEST MODE

[0025] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0026] The advantages and features of the present invention and methods of accomplishing the same will be apparent from the following detailed description of the embodiments taken in conjunction with the accompanying drawings.

[0027] However, the present invention is not intended to be limited by the embodiments disclosed herein, but may be implemented in many different forms, and these embodiments are provided merely to make the present invention complete and to fully inform those having ordinary skill in the art, to which the present invention belongs, of the scope of the present invention, and the present invention is defined by the scope of the claims.

[0028] Furthermore, in describing the present invention, if it is determined that the relevant known technologies make the gist of the disclosure obscure, a detailed description thereof will be omitted.

[0029] FIG. 1 is a perspective view illustrating a vacuum insulation box according to an embodiment of the present invention, FIG. 2 is a perspective view illustrating an insulating cell according to an embodiment of the present invention, FIG. 3 is a cross-sectional view illustrating an insulating cell according to an embodiment of the present invention, FIG. 4 is a deployed perspective view illustrating a vacuum insulation box according to an embodiment of the present invention, FIG. 5 is a cross-sectional view illustrating an insulating cell according to an embodiment of the present invention, and FIG. 6 is a diagram illustrating a state in which insulating cells according to an embodiment of the present invention are fitted together.

[0030] A vacuum insulation box 1 has a first space S1 therein, which is isolated from an external environment so that items accommodated in the first space, such as an organ or food, are prevented from heat exchange with the external environment, thereby preventing deterioration, damage, or the like of the items occurring during transportation or storage.

[0031] Furthermore, the vacuum insulation box 1 may prevent the formation of bores or voids that would occur due to contraction of a vacuum panel 100 of the vacuum insulation box 1 at joints between panels when the vacuum insulation box 1 fabricated in a vacuum state is taken out to an external environment having atmospheric pressure, thereby preventing the edge portions of the vacuum insulation box 1 from exchanging heat with the outside.

[0032] In addition, the deployed shape of the vacuum insulation box 1 may have various shapes, such as an "I" shape, an "L" shape, a "⊂" shape, and a square shape "□", so that various shapes of boxes may be fabricated. The vacuum insulation box 1 shown in the deployed shape may be packaged at one time. Accordingly, it is possible to reduce fabricating time and reduce fabricating cost.

[0033] In addition, when the vacuum insulation box 1 is fabricated by folding the same from the deployed shape, it may be difficult to connect the ends, thereby preventing heat exchange from occurring.

[0034] Referring to FIGS. 1 to 5, when the vacuum insulation box 1 according to an embodiment of the present invention stores items therein, heat exchange that would occur at the edges may be blocked. The vacuum insulation box 1 may be fabricated in various shapes, and the vacuum panel 100 may be included to allow packaging at one time.

[0035] The vacuum panel 100 may be formed by connecting a plurality of insulating cells 130 to each other. In addition, the vacuum panel 100 may be part of the deployed shape, such as an "I" shape, an "L" shape, a "⊂" shape, or a square shape, which may be folded.

[0036] For example, the vacuum panel 100 may be fabricated in a shape which may be a deployed shape of a cube, such that a cube-shaped box may be fabricated. Furthermore, when the vacuum panel 100 is fabricated, cores 300, which may be insulating materials, may be disposed in positions of the deployed shape for forming the cube and be packaged at one time, thereby simplifying the fabricating process. In addition, the cores 300 may be formed of an inorganic material such as organic fibers, inorganic fibers, or fumed silica.

[0037] This may reduce the cost and time of fabricating the cube-shaped vacuum insulation box 1, which is formed by folding the vacuum panel 100.

[0038] The vacuum panel 100 according to an embodiment of the present invention may include a plate part 110 and insulating cells 130 such that when folded, the vacuum panel 100 may form a first space S1 therein to store items and block heat exchange with the outside.

[0039] Although the plate part 110 and the insulating cells 130 may be described separately, the plate part 110 and the insulating cells 130 may be integrated. For example, the plate part 110 and the insulating cells 130 may be formed by wrapping the cores 300 described later, i.e., may be a wrapper for vacuum packaging the cores 300.

[0040] Here, the portion located at the bottom of the cores 300 may be the plate part 110, and the portions at the top of the cores 300 may be the insulating cells 130.

[0041] The plate part 110 may include a vertical plate 111 and a horizontal plate 113 such that a first space S1 may be formed therein.

[0042] The vertical plate 111 may include a vertical body 111a, adhesion members 111b, and tensioning portions 111c which may be integrally connected and formed of a rigid material, so that an internal space may be formed and the thermal insulation effect of folding portions may be improved.

[0043] The vertical body 111a may be formed to have a square cross-section. The vertical body 111a may also be arranged in a direction perpendicular to the bottom surface. In addition, the vertical body 111a may be integrally extended. In addition, the vertical body 111a may be extended according to the number of the insulating cells 130 described later, which are seated on one surface. Here, the insulating cells 130 may be provided in a number of one to six.

[0044] In this manner, when the insulating cells 130 provided to the one surface of the vertical body 111a are inclined with respect to each other and contact each other, the inner and outer sides of the insulating cells 130 may be separated, thereby blocking heat exchange, and a form of wrapping the insulating cells 130 bonded to each other is formed, thereby combing the insulating cells 130.

[0045] In the vertical body 111a, as will be described later, when the insulating cells 130 are extended, the adhesion members 111b may be formed to extend a predetermined length or more in a longitudinal direction in which the insulating cells 130 are extended.

[0046] The adhesion members 111b may be formed in a square cross-section. In addition, the adhesion members 111b may be formed to extend in a longitudinal direction in which the vertical body 111a extends so that when the vertical body 111a is folded, two ends of the vertical body 111a that may face each other may be connected to each other. In this manner, the adhesion between the vertical body 111a may be improved, and at the same time, heat exchange at the edges where the two ends of the vertical body 111a are connected may be blocked. Here, the tensioning portions 111c may be provided in an outward direction of the vertical body 111a.

[0047] The tensioning portions 111c may block heat exchange in the folding portions of the vertical body 111a that are formed when the vertical body 111a is folded a plurality of times.

[0048] The tensioning portions 111c may be formed to have a circular cross-section with portions open. Furthermore, a plurality of tensioning portions 111c may be formed depending on the number of times the vertical body 111a is folded. For example, when the vertical body 111a is folded twice, the tensioning portions 111c may be formed at the folding portions.

[0049] This may prevent heat exchange to the outside at the folds which are formed by contact with the vertical body 111a.

[0050] The horizontal plate 113 may be coupled to the upper and lower portions of the vertical plate 111 which is foldable together with the horizontal plate. The horizontal plate 113 may also extend together with the vertical plate 111. For example, the vertical plate 111 and the horizontal plate 113 may be integrally formed to extend the deployed shape of the cube. In another example, the vertical plate 111 and the horizontal plate 113 may be separated from each other, such that the vertical plate 111 may extend in an "I" shape and the horizontal plate 113 may be separately coupled to the upper and lower portions.

[0051] In addition, the vertical plate 111 and the horizontal plate 113 may be fabricated in an "I" shape, an "L" shape, a square shape, an "⊂" shape, or the like, according to the user's choice.

[0052] Here, an item may be stored within the interior of the vertical plate 111 and the horizontal plate 113, and the insulating cells 130 may be coupled to the interior where the item is stored.

[0053] The insulating cells 130 may each include an outer wall 131 and an inner wall 133 to prevent heat exchange between one side and the other side of the insulating cells 130. Here, the thermal conductivity of the insulating cells 130 may be about 0.0080 W/MK or less.

[0054] The cross-section of the outer wall 131 may have a trapezoidal shape. Here, the outer wall 131 may be configured such that the width of the inwardly facing side is narrower than the width of the outwardly facing side. That is, the outer wall 131 may have a trapezoidal shape, the width of which decreases in the inward direction.

[0055] In addition, the outer wall 131 may be formed in a trapezoidal shape, such that inclined portions 131a may be formed on the sides. Since the inclined portions 131a are inclined at a predetermined angle, the contact areas between the adjacent insulating cells 130 may be increased to block heat exchange.

[0056] In addition, the angle between the inclined portion 131a and the inner surface of the outer wall may be formed at an angle of 45 degrees or more. Accordingly, when the adjacent outer walls 131 contact each other, the adjacent inclined portions 131a may contact each other, thereby improving the air-tightness.

[0057] In addition, the outer wall 131 may be formed of polyethylene terephthalate (PET), a heat-resistant synthetic resin, paper, an aluminum thin film (Al film), an aluminum metallized film, or the like. Here, an inner portion may be formed in the inward direction of the outer wall 131.

[0058] The inner wall 133 may have a trapezoidal shape. In addition, the inner wall 133 may be formed in the same shape as the outer wall 131. In addition, the inner wall 133 may be formed in a smaller area than the outer wall 131.

[0059] In addition, the inner wall 133 may be formed of polyethylene terephthalate (PET), heat-resistant synthetic resin, paper, an aluminum thin film (Al film), an aluminum metallized film, or the like.

[0060] That is, the outer wall 131 and the inner wall 133 may be spaced apart by a predetermined distance to form a second space S2 therebetween. Furthermore, the second space S2 may be in a vacuum state. Accordingly, an insulation material may be provided inside the inner wall 133 to block heat exchange between the spaces located on opposite sides of the outer wall 131.

[0061] In addition, when the plate part 110 and the insulating cells 130 are formed to wrap the cores 300 as described above, a plurality of cores 300 may be arranged in a single row, and protruding portions of the cores 300 may be located inside by wrapping the cores, such that the cores 300 are seated inside to form folds 200 therebelow, which are configured to fold.

[0062] The folds 200 may be formed to protrude downward from the plate part 110. The folds 200 may be end portions of the wrapper left after the cores 300 are wrapped. Here, the folds 200 may be portions in which excess portions are folded downward while covering the cores 300 from above. Thus, by forming the folds 200 outside the vacuum insulation box 1, the cores 300 are stacked in a trapezoidal shape, as will be described later. When the insulating cells 130 are folded inward, the interference of the film of the folds 200 may be removed to prevent the occurrence of a gap due to the thickness of the film, thereby blocking the release of heat.

[0063] For example, the folds 200 may be formed with a predetermined thickness so that heat may be effectively blocked at the folds 200. When the vacuum insulation box 1 is fabricated, the first space S1 may be formed wide, so that a larger capacity may be stored inside.

[0064] The cores 300 may be vacuum insulation materials provided on inner portions of the inner walls 133. In addition, the outer surface of each of the cores 300 may be formed in close contact with the inner surface of the corresponding inner wall. In addition, the cores 300 may be formed with a trapezoidal cross-section.

[0065] In addition, each of the cores 300 may be formed by stacking a plurality of layers. For example, the core members 311 may be fabricated in a plate shape, and the core 300 may be formed by stacking the core members 311. Since the thickness or size of the core 300 may be determined, the core 300 may be easily fabricated in a thickness and size required for fabricating the vacuum panel 100. The cost and time of fabricating the vacuum panel may be reduced.

[0066] In addition, although not shown in the drawings, a thin film may be formed on an outer surface or an inner surface of the core 300 such that the thin film may be in close contact with the outer surface of the core 300 to improve the heat transfer blocking effect of the core 300. Thus, the heat transfer blocking effect of the cores 300 may be improved.

[0067] Close contact portions 500 may be formed on the inclined portions 131a so as to protrude outward from the inclined portions 131a. In addition, the close contact portions 500 may have an arcuate outer surface. For example, the close contact portions 500 may be formed of the same material as the outer walls 131 and inner walls 133, or may be formed of an elastic material that is slightly harder than the outer walls 131 and the inner walls 133. In addition, the close contact portions 500 may be formed by separately applying tape having a predetermined thickness, such as silicone, foam tape, silicone foam tape, etc.

[0068] Accordingly, when the inclined portions 131a of the adjacent insulating cells 130 are brought into contact with each other, the close contact portions 500 may be pressed inward to bring the adjacent insulating cells 130 into close contact.

[0069] For example, the cores 300 may be disposed adjacent to each other and wrapped in a packaging material which may be the insulating cells 130. When the packaged and linearly aligned insulating cells 130 are moved from an external vacuum environment to atmospheric pressure, the outer walls 131 or the inner walls 133 of the insulating cells 130 may shrink to form bores or voids. That is, curved surfaces may be formed.

[0070] Here, since bores or voids are formed on the surface of each of the close contact portions 500, when the adjacent insulating cells 130 are pressed against each other, the close contact portions 500 may be compressed so that the bore or void may be filled by the close contact portions 500. In this manner, the bores or voids may be prevented from forming on the inclined portions 131a of the insulating cells 130 in contact with each other, thereby preventing heat loss that would be caused by the bore or void.

[0071] In addition, the areas of the close contact portions 500 may be compressed together to fill the internal bores and voids, thereby compensating for heat exchange at the edges between the interior and exterior of an item enclosed by the insulating cells 130. Accordingly, the close contact and air-tightness between the adjacent insulating cells 130 may be improved to prevent heat exchange between the interior and exterior of the insulating cells 130.

[0072] Referring to FIG. 6, in the vacuum panel 100, a plurality of insulating cells 130 may be formed on an inwardly facing surface of the horizontal plate 113 or the vertical plate 111 so as to protrude therefrom. Here, when the adjacent insulating cells 130 are folded so that the inclined portions 131a of the insulating cells 130 contact each other, the vertical plate 111 or the horizontal plate 113 may be folded.

[0073] Here, the tensioning portions 111c may be formed on the folding portions of the vertical plate 111 and the horizontal plate 113 as complements by which the heat exchange between the inner and outer sides of the folding portions may be blocked.

[0074] In addition, when the vacuum panel 100 is folded, bores or voids may be formed in the outer wall 131 or the inner wall 133 of the insulating cell 130 in response to discharge from the vacuum state to atmospheric pressure. At this time, the bores or voids formed in the inclined portion 131a may also be formed in the close contact portions 500. As the close contact portions 500 fill the bores or voids formed in the surface or the interior of the outer wall 131 or the close contact portions 500, the insulating cells 130 in contact with each other may be in close contact with each other. Accordingly, any heat exchange that would occur in portions where the insulating cells 130 are in contact may be blocked.

[0075] FIG. 7 illustrates a deployed shape of insulating cells according to a second embodiment of the present invention.

[0076] Specific description of the same configurations of the first and second embodiments of the present invention will refer to the above description, and only different configurations will be described.

[0077] Referring to FIG. 7, a vacuum insulation box 1 with an open portion may be fabricated by forming a vacuum panel 600 according to the second embodiment of the present invention by extending five insulating cells 130. Here, a single insulating cell 130 may be used in the open portion as a cover to facilitate opening and closing, and may close the open portion so that items may be stored therein. In this case, the insulating cell sealing the upper or lower portion, i.e., the open portion, may be formed of a different material or have a different shape.

[0078] For example, the vacuum insulation box 1 may be fabricated in an "⊂" shape with opposite sides sealed. When the vacuum insulation box 1 is fabricated in the "⊂" shape, the vacuum panel 600 may be packaged at one time to reduce the fabricating time.

[0079] FIG. 8 illustrates a deployed shape of a vacuum panel according to a third embodiment of the present invention, and FIG. 9 illustrates a partially folded state of the vacuum panel according to a third embodiment of the present invention.

[0080] Specific description of the same configurations of the first and second embodiments of the present invention will refer to the above description, and only different configurations will be described.

[0081] Referring to FIGS. 8 and 9, an "I" shaped vacuum panel 700 may be fabricated by forming the vacuum panel 100 according to the third embodiment of the present invention by extending four insulating cells 130. Here, the "I" shaped vacuum panel 700 may be fabricated by forming a wall body or the like.

[0082] In addition, when the "I" shaped vacuum panel 100 is fabricated, the cores 300, which may be insulating materials, may be arranged and packaged at one time, thereby reducing the fabricating time.

[0083] FIG. 10 is a cross-sectional view illustrating an insulating cell according to a fourth embodiment of the present invention.

[0084] Specific description of the same configuration of the first and fourth embodiments of the present invention will refer to the above description, and only different configurations will be described.

[0085] Referring to FIG. 10, a core 1300 according to the fourth embodiment of the present invention may be formed by stacking a plurality of core members 1310, wherein the core members 1310 are stacked such that a portion where the outer surface of the core 1300 contacts the inner wall 133 protrudes toward the outer wall 131 of the core 1300 to minimize bores or voids that would occur when the vacuum panel 100, which is fabricated in a vacuum state, is moved to atmospheric pressure.

[0086] The core 1300 may include a first core member 1311, a second core member 1312, a third core member 1313, a fourth core member 1314, and a fifth core member 1315 so as to be configured such that the width thereof increases in the top-to-bottom direction.

[0087] The width of the core members 1311, 1312, 1313, 1314, and 1315 may increase in the direction from the first core member 1311 to the fifth core member 1315. Here, protruding surfaces 1311a, 1312a, 1313a, 1314a, and 1315a may be formed to protrude outward from the core members 1311, 1312, 1313, 1314, and 1315 and to contact the inner wall 133.

[0088] The protruding surfaces 1311a, 1312a, 1313a, 1314a, and 1315a may include a first protruding surface 1311a, a second protruding surface 1312a, a third protruding surface 1313a, a fourth protruding surface 1314a, and a fifth protruding surface 1315a according to the respective core members 1311, 1312, 1313, 1314, and 1315. Here, each of the first to fifth protruding surfaces 1311a to 1315a may protrude increasingly outward toward the bottom, and when the first to fifth protruding surfaces 1311a to 1315a are coupled, a single protruding portion gradually protruding outward may be formed.

[0089] For example, an outer surface of the first core member 1311 located in the uppermost portion may have an upper surface in close contact with an upper surface of the inner wall 133. In this case, the first protruding surfaces 1311a formed on opposite sides of the first core member 1311 may be in close contact with the inner surface of the inclined portion 131a forming an inclination on the outer surface of the inner wall 133.

[0090] That is, the first protruding surface 1311a, which may be the outermost surface of the portion protruding from the outer surface of the first core member 1311, may be outwardly pressing the inner wall 133 while being located on top of the inner wall 133. Accordingly, the formation of bores or voids may be minimized.

[0091] The second protruding surface 1312a may be a gradually curved surface at the lowermost portion of the first protruding surface 1311a. For example, the second protruding surface 1312a may extend downward, starting from a portion located at the lowermost portion of the first protruding surface 1311a. Here, the gradual curve of the second protruding surface 1312a may be on a line connected to the curve of the first protruding surface 1311a, such that the extension of the first protruding surface 1311a and the second protruding surface 1312a may form a single curve.

[0092] That is, when the first protruding surface 1311a and the second protruding surface 1312a are extended, the same rate of change of inclination may be formed with the single protruding surface 1311a and 1312a.

[0093] The second protruding surface 1312a is also formed in the same manner as the third protruding surface 1313a, the fourth protruding surface 1314a, and the fifth protruding surface 1315a as described above, and the first to fifth protruding surfaces 1311a to 1315a may have a single concave shape.

[0094] Accordingly, an area in which the bores or voids formed in the inward direction of the insulating cells 130 are pressed outward may be formed to prevent heat loss caused by the bores or voids.

[0095] FIG. 11 is a cross-sectional view illustrating an insulating cell according to a fifth embodiment of the present invention.

[0096] Specific description of the same configuration of the first and the fifth embodiments of the present invention will refer to the above description, and only different configurations will be described.

[0097] Referring to FIG. 11, a plurality of core members 2311, 2312, 2313, 2314, and 2315 of a core 2300 according to a fifth embodiment of the present invention may have a recess (2311a, 2312a, 2313a, 2314a, and 2315a) formed therein such that areas where an outer surface of the core 2300 contacts the inner wall 133 are spaced apart by predetermined distances.

[0098] Accordingly, when the insulating cells 130 moved from a vacuum state to atmospheric pressure press the insulating cells 130 in a direction from outside to inside due to atmospheric pressure, the inner surface of the inner wall 133 may be pressed toward the core 2300 and bonded to the recess (2311a, 2312a, 2313a, 2314a, and 2315a) formed in the outer surface of the core 2300.

[0099] Accordingly, voids that would occur in the insulating cells 130 discharged from the vacuum state to atmospheric pressure may be reduced. That is, a predetermined space to be compressed may be formed and preferentially compressed prior to formation of voids, thereby minimizing the formation of voids.

[0100] In addition, as the voids are formed, conversely, the convexly protruding portions may be recessed inward to prevent a decrease in insulation performance.

[0101] The recess (2311a, 2312a, 2313a, 2314a, and 2315a) may be formed on outer surfaces of the first to fifth core members 2311 to 2315 to be recessed into the core 2300.

[0102] Here, the recess (2311a, 2312a, 2313a, 2314a, and 2315a) may be formed as a first recessed surface 2311a, a second recessed surface 2312a, a third recessed surface 2313a, a fourth recessed surface 2314a, and a fifth recessed surface 2315a formed with different inclinations changing according to the respective first to fifth core members 2311 to 2315.

[0103] The first recessed surface 2311a may be formed in the first core member 2311 formed in the uppermost portion and with the smallest area. Furthermore, the inclination of the first recessed surface 2311a may sharply decrease in the top-to-bottom direction, in which the inner wall 133 is the x-axis and an axis perpendicular to the inner wall 133 is the y-axis. Here, the uppermost portion of the first recessed surface 2311a may be formed in an edge formed in the top portion of the inner wall 133.

[0104] The second recessed surface 2312a may extend from the bottom portion of the first recessed surface 2311a. Here, the second recessed surface 2312a may be formed on an outer surface of the second core member 2312. That is, the second recessed surface 2312a may be provided in a shape extending from the first recessed surface 2311a.

[0105] In this case, the rate of change of inclination of the second recessed surface 2312a may be smaller than the rate of change of inclination of the first recessed surface 2311a. For example, the rate of change of inclination of the second recessed surface 2312a may be smaller than that of the first recessed surface 2311a.

[0106] The rate of change of inclination of the third recessed surface 2313a may be smaller than the rate of change of inclination of the second recessed surface 2312a. In addition, the inclination may increase again from points where the inclination is 0 on the outer surfaces of the third recessed surface 2313a and the fourth recessed surface 2314a to reach the fifth recessed surface 2315a.

[0107] For example, the rate of change of inclination, which may be an absolute value, may increase toward the bottom of the fourth recessed surface 2314a and the fifth recessed surface 2315a, such that the bottom portion of the fifth recessed surface 2315a may contact the bottom portion of the fifth core member 2315a.

[0108] The first to fifth recessed surfaces 2311a to 2315a may form a single gentle recess (2311a, 2312a, 2313a, 2314a, and 2315a) as described above. The recess may be pressed against the outer surface of the core 2300 before voids are formed to minimize the formation of voids, thereby blocking heat transfer in the insulating cells 130.

[0109] FIG. 12 is a cross-sectional view illustrating an insulating cell according to a sixth embodiment of the present invention.

[0110] Specific description of the same configuration of the first to fifth embodiments of the present invention will refer to the above description, and only different configurations will be described.

[0111] Referring to FIG. 12, in the vacuum insulation box 1 according to an embodiment of the present invention, a plurality of cores 3300 forming a single row may be connected to each other. The cores 3300 may be connected via fifth core members 3315 located at the bottom of first to fourth core members 3311, 3312, 3313, and 3314 formed as a plurality of layers so as to prevent heat loss that would occur between the cores 3300 when packaged in a vacuum panel 100.

[0112] For example, when the core members 3310 formed with a narrower area toward the top are stacked, the lowermost fifth core member 3315 may serve as a member connecting the insulating cells 130 and the core 3300. That is, the first to fourth core members 3311, 3312, 3313, and 3314 may be stacked over the fifth core member 3315, and the first to fourth core members 3311, 3312, 3313, and 3314 forming a single trapezoidal shape may be stacked over the fifth core member 3315 to be spaced apart from each other.

[0113] Accordingly, the fifth core member 3315 may be located in joints connecting the insulating cells 130 which may lose heat when the adjacent insulating cells 130 are bent to fabricate the vacuum insulation box 1, thereby preventing heat loss in the joints.

[0114] In this case, the first to fourth core members 3311, 3312, 3313, and 3314 may form a trapezoidal shape while being spaced apart from each other by a separation distance L1. In this case, when the adjacent insulating cells 130 are folded and come into contact with each other at the separation distance L1, the insulating cells 130 may be folded to further increase the thickness of the joints, thereby minimizing heat loss that would generally occur in the joints.

[0115] That is, when the cores 3300 are stacked in a plurality of rows to form a trapezoidal shape, the fifth core member 3315 in the last row may be extended to prevent the core 3300 from floating in the air and being scattered in shape when the vacuum insulation box 1 is evacuated and to prevent dissipation of heat that would dissipate through the gaps of the first to fourth core members 3311, 3312, 3313, and 3314 that are stacked.

[0116] As described above, the vacuum insulation box 1 may be used not only for storing goods therein, but also in various other fields due to the ease of fabricating the vacuum panels 100, 700, 800 in various shapes and forms. The insulating effect may be improved by the material and shape of the insulating cells 130. During the fabrication of the vacuum insulation box 1, heat exchange at the folds may be blocked, thereby improving the heat insulating effect between the inside and the outside.

[0117] The present invention has been described with reference to the embodiment(s) shown in the drawings, but these are exemplary only, and those having ordinary skill in the art will understand that various modifications may be made therefrom, and that all or any part of the embodiment(s) described above may be selectively or optionally combined. Accordingly, the true technical scope of the present invention is to be determined by the technical ideas of the appended claims.

Claims

1. A vacuum insulation box comprising:

   a vacuum panel including a plurality of insulating cells each having an inclined portion inclined at an angle of 45 degrees or more at each side and a plate part configured to enclose and connect the insulating cells and configured to form a deployed box shape;
   a core provided inside the insulating cell to block heat exchange between inner and outer surfaces of the vacuum panel; and
   a close contact portion protruding outward from an outer surface of the inclined portion to increase adhesion between the insulating cells that are adjacent when in contact with each other.

2. The vacuum insulation box of claim 1, wherein the plate part includes:

   a vertical plate configured to connect the insulating cells that are disposed perpendicular to a bottom surface; and
   a horizontal plate perpendicularly coupled to the vertical plate.

3. The vacuum insulation box of claim 1, wherein the core is formed of an organic fiber, an inorganic fiber, and an inorganic material such as fumed silica, and includes a stack of trapezoidal core members whose areas decrease as the core members are stacked.

4. The vacuum insulation box of claim 1, wherein the core includes rounded protruding surfaces protruding outward from opposite sides.

5. The vacuum insulation box of claim 1, wherein the opposite sides of the core are inclined at the same angle of inclination as the inclined portion.

6. The vacuum insulation box of claim 1, wherein the core includes a recess having a shape that is inwardly recessed from the opposite sides thereof.

7. The vacuum insulation box of claim 1, wherein the insulating cell includes:

   an inner wall shaped to wrap the core; and
   an outer wall spaced apart outward from the inner wall to form a space in a vacuum state.

8. The vacuum insulation box of claim 2, wherein the plate part includes:

   a vertical body attached to outer surfaces of the insulating cells;
   an adhesion member extending from each of opposite ends of the vertical body; and
   a tensioning portion provided on a side of the vertical body opposite to sides on which the insulating cells are disposed and in a position where the adjacent insulating cells are in contact.

9. The vacuum insulation box of claim 3, wherein the core member includes:
   a first core member having an integral structure, and a second core member disposed on one surface of the first core member to be spaced apart from each other, stacked on the first core member with a decreasing area, and having an inclined outer surface to form a trapezoidal shape.

10. The vacuum insulation box of claim 9, wherein the second core member extends as a single structure.

11. The vacuum insulation box of claim 1, further comprising:
    a fold configured to seal the core while outwardly

surrounding the core inside the core, such that opposite ends of the vacuum panel are provided in an outward direction of the core so as to be bonded to each other.

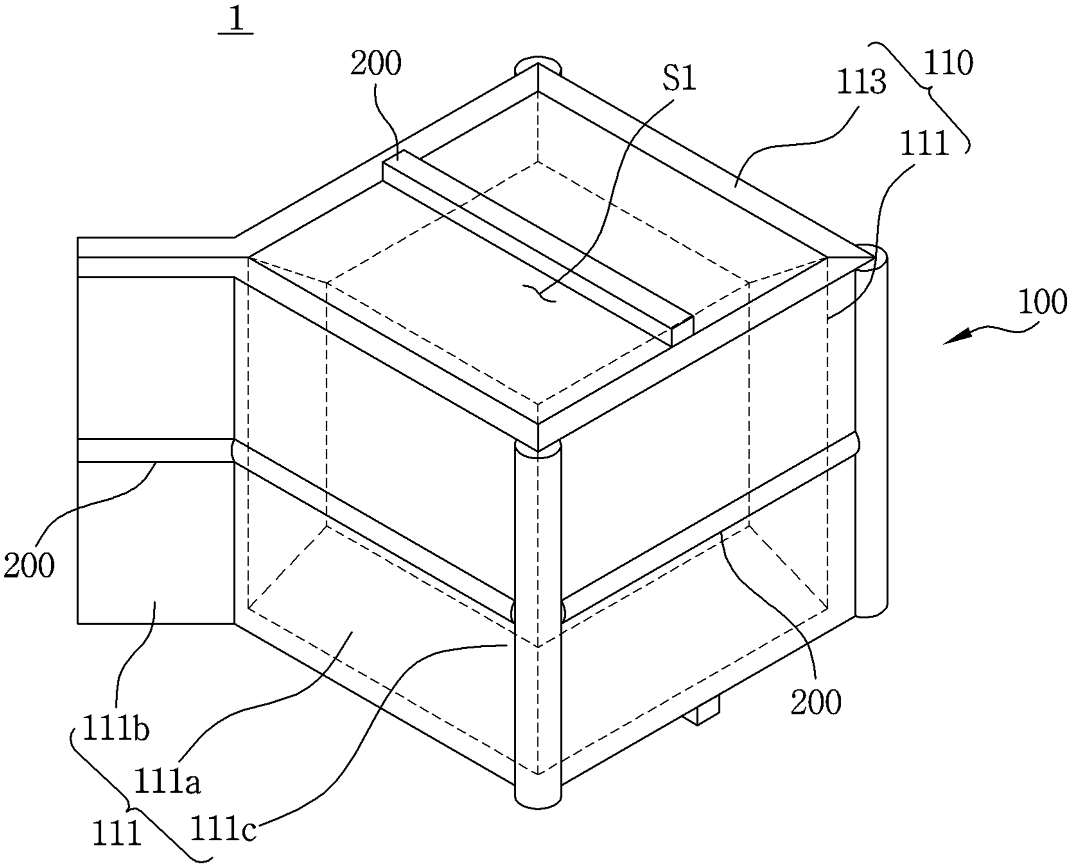


fig.1

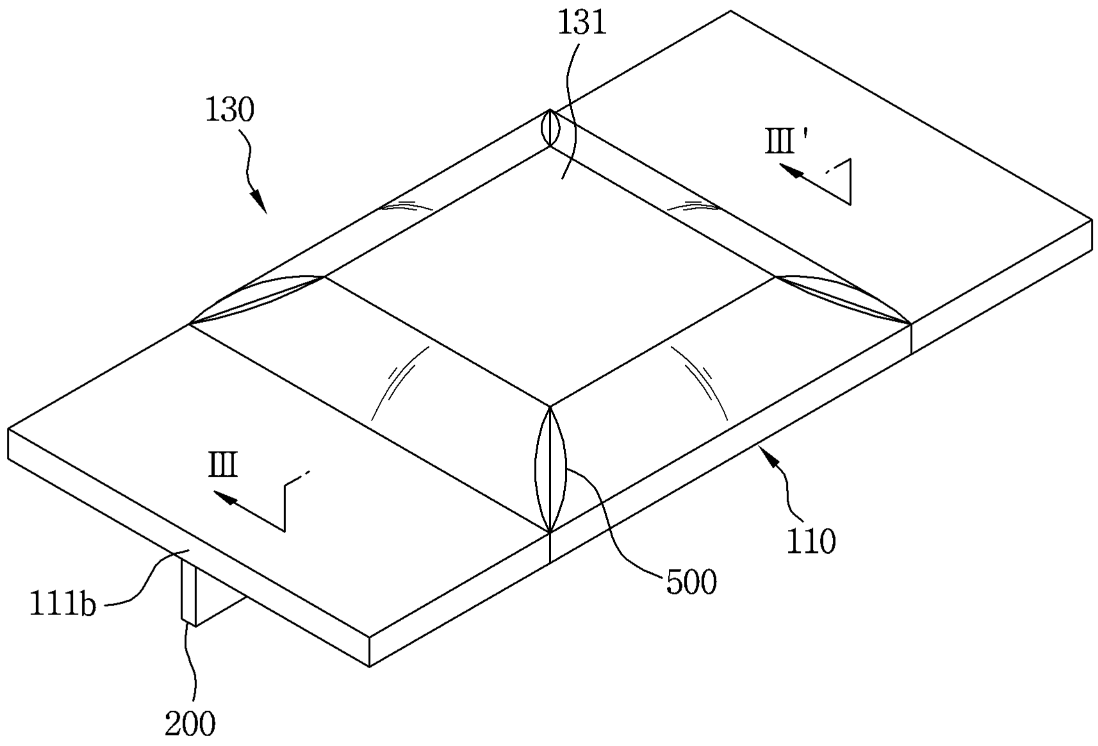


fig.2

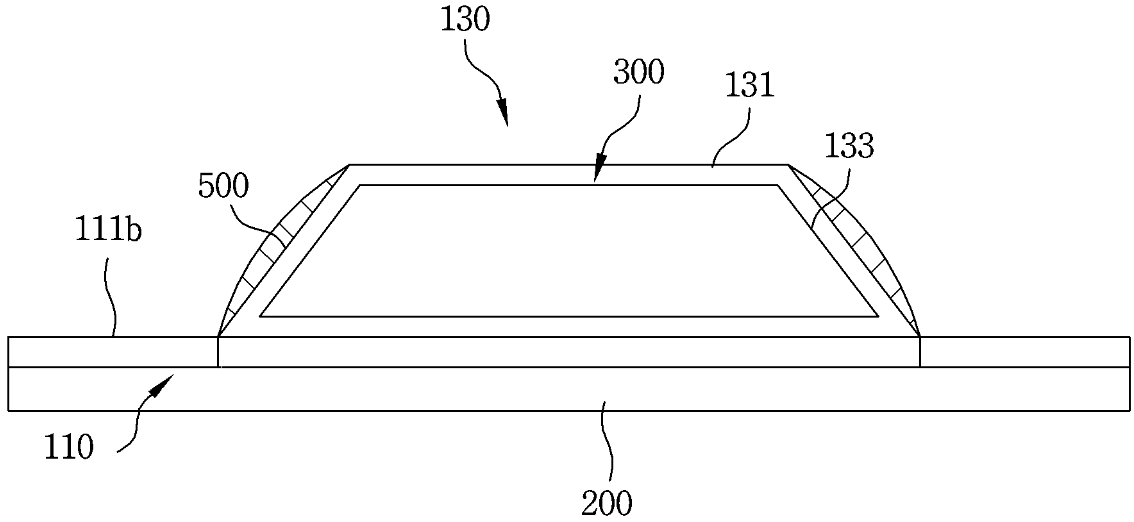


fig.3

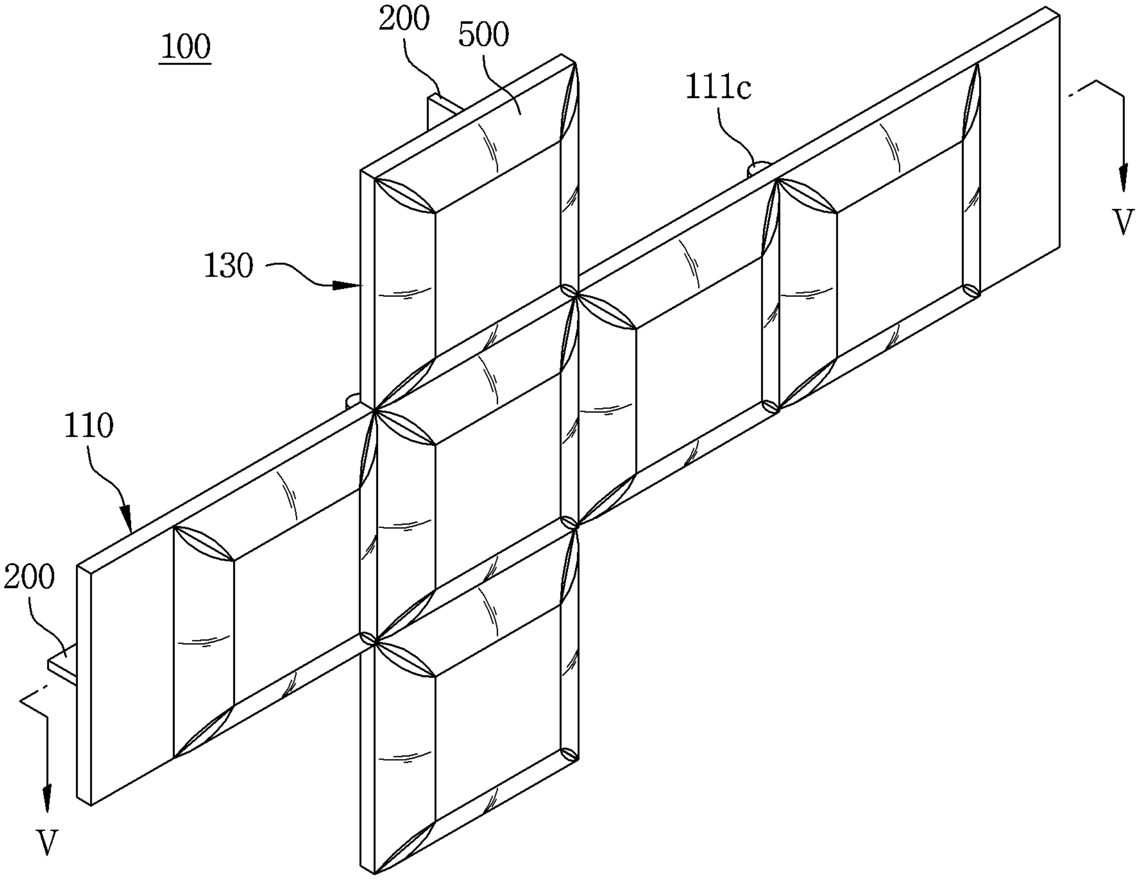
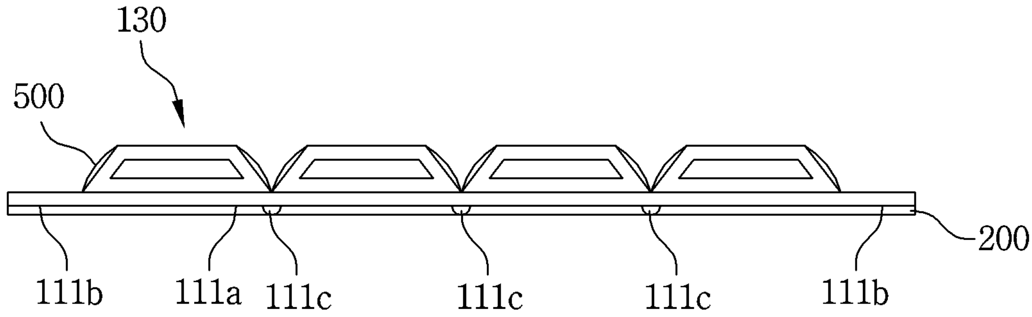


fig.4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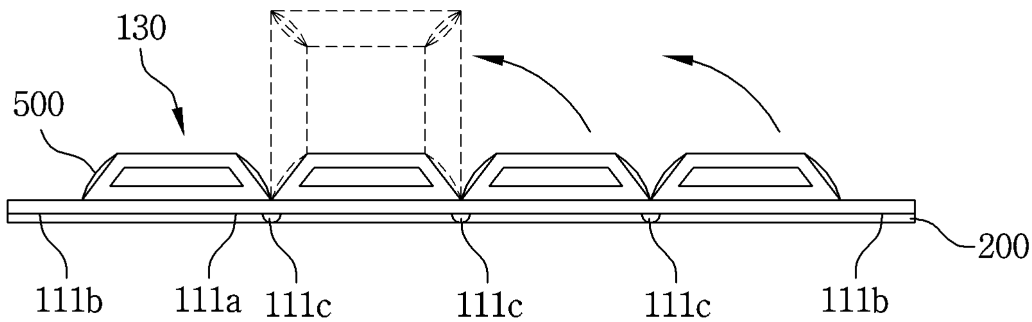
111c
111c
111c
111b

fig.5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200
111b
111a
111c
111c
111c
111b

fig.6

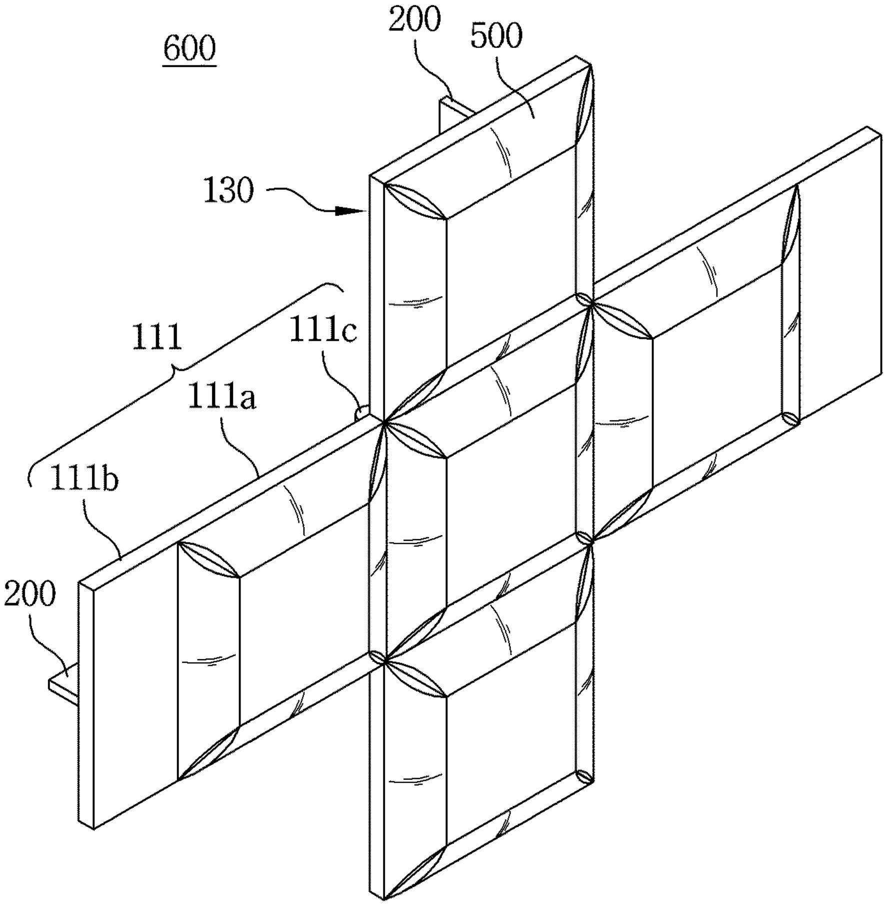


fig.7

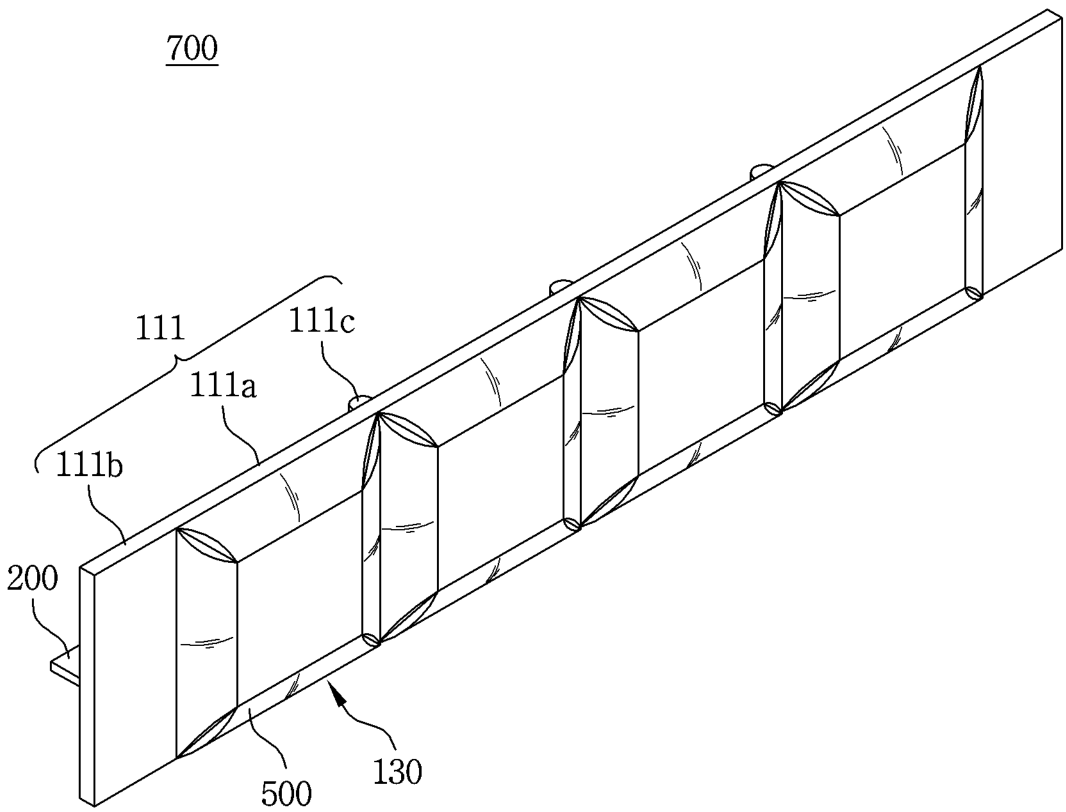


fig.8

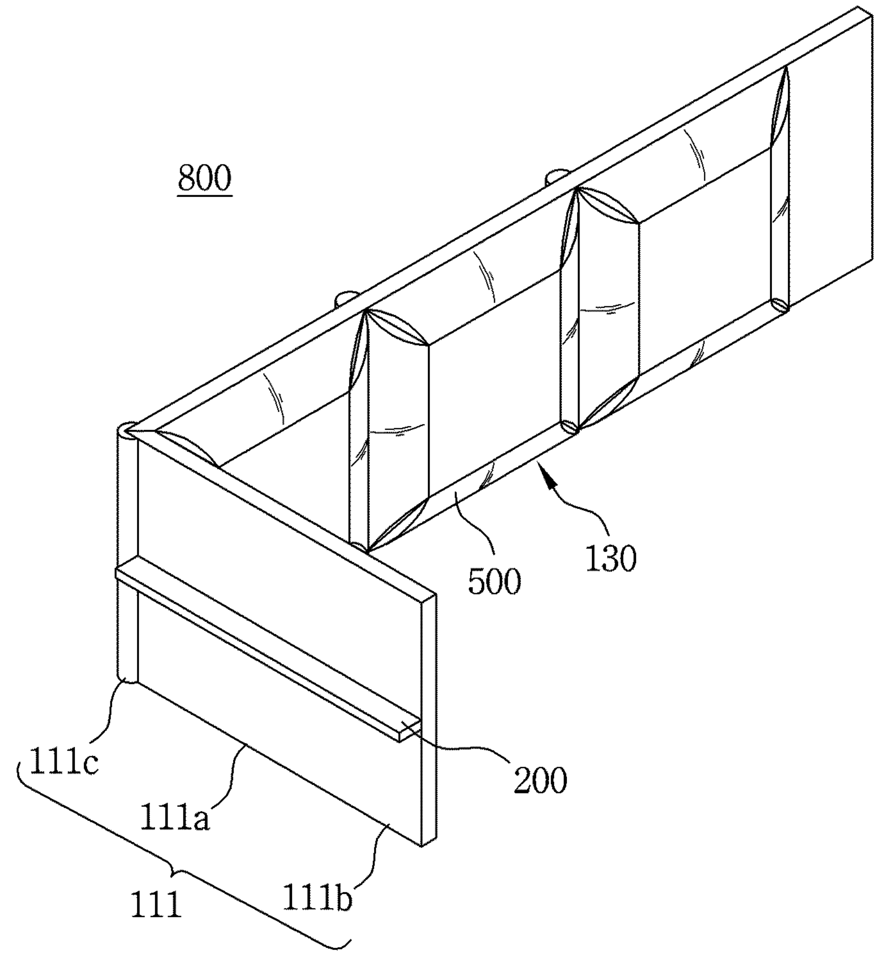
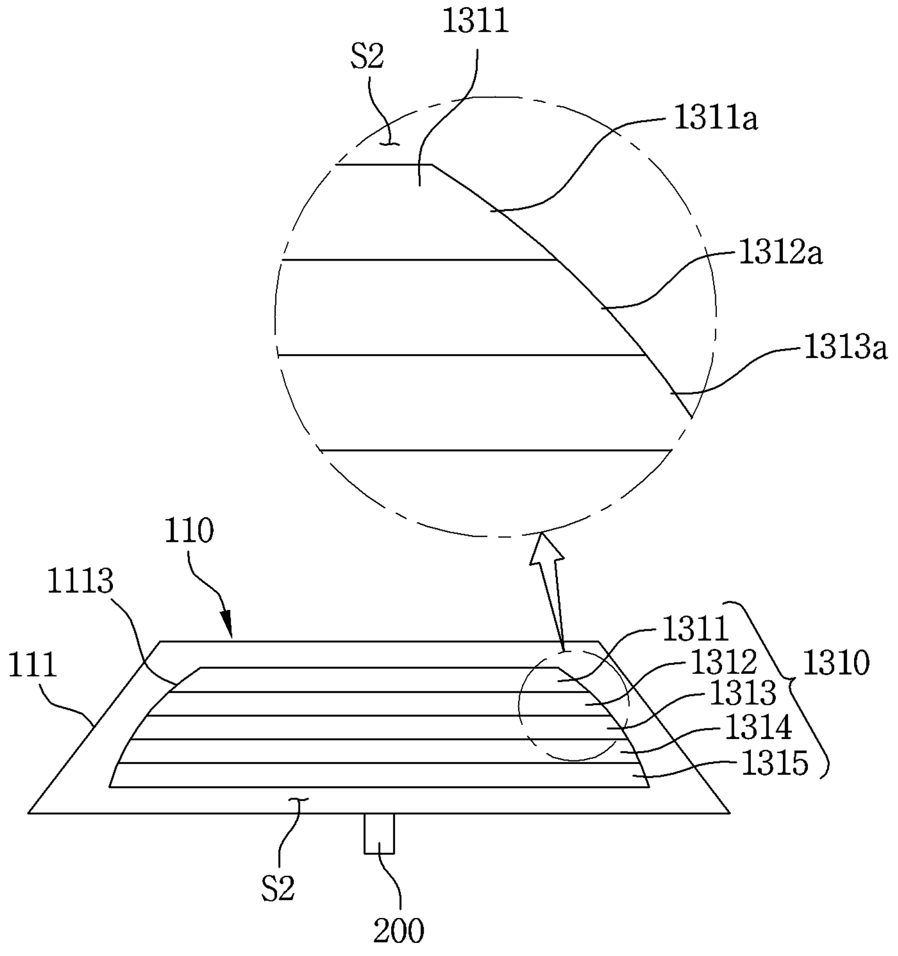


fig.9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S2
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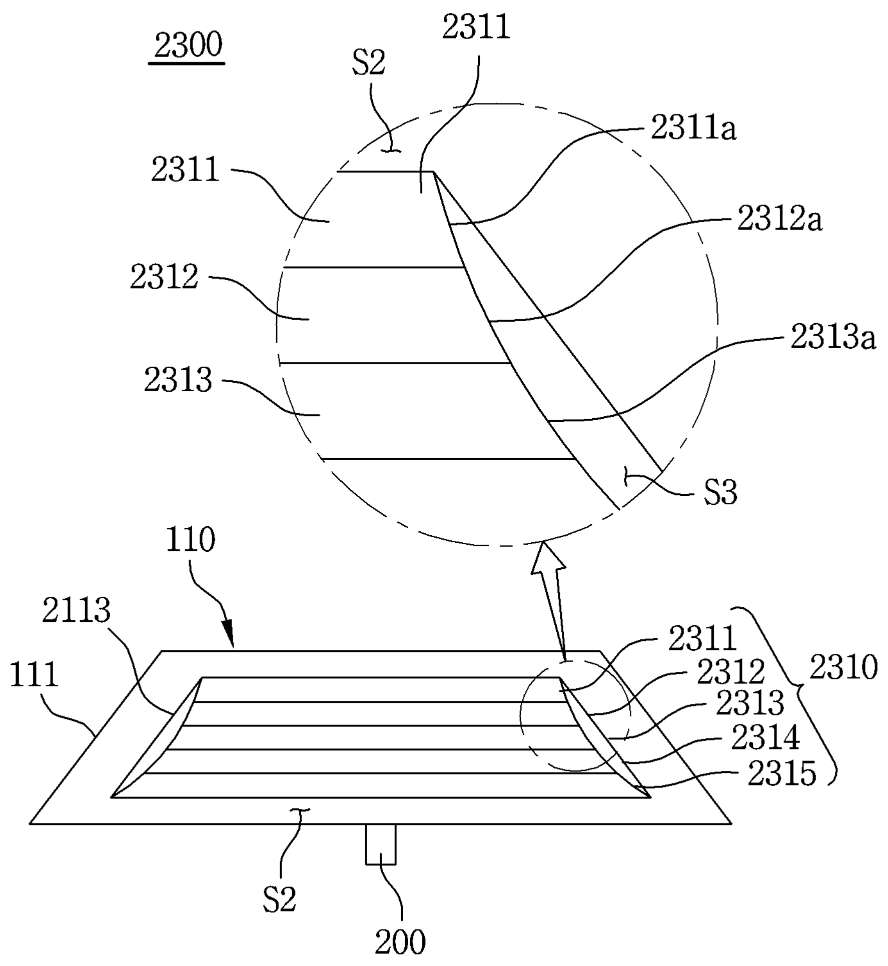
S2
200

fig.10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S2
200

fig.11

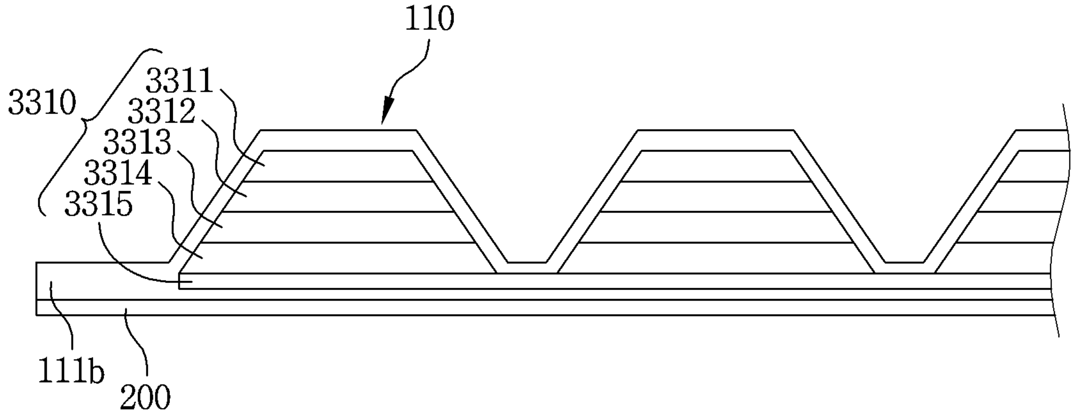

fig.12

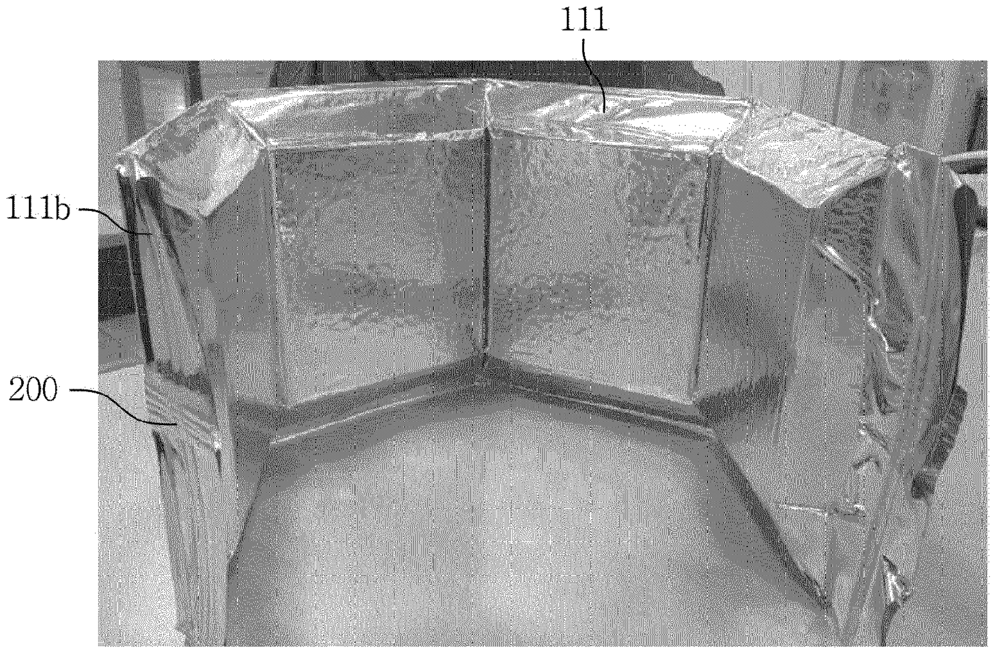

fig.13

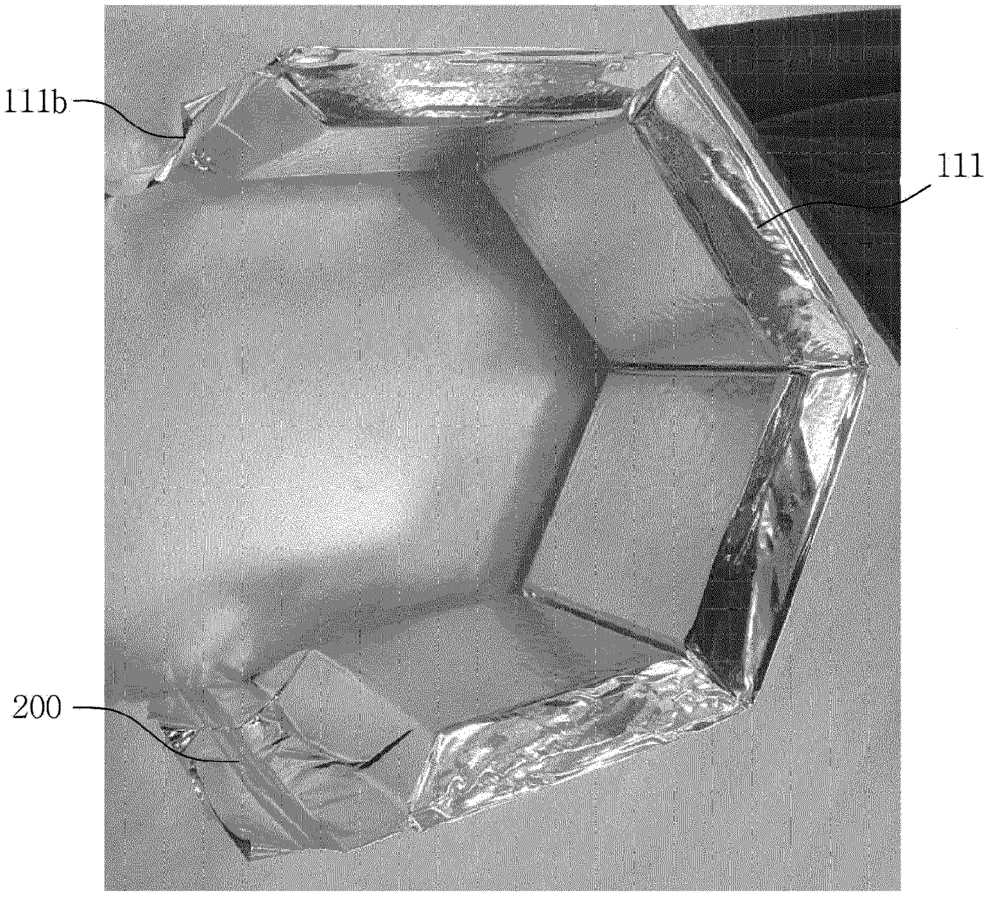

fig.14

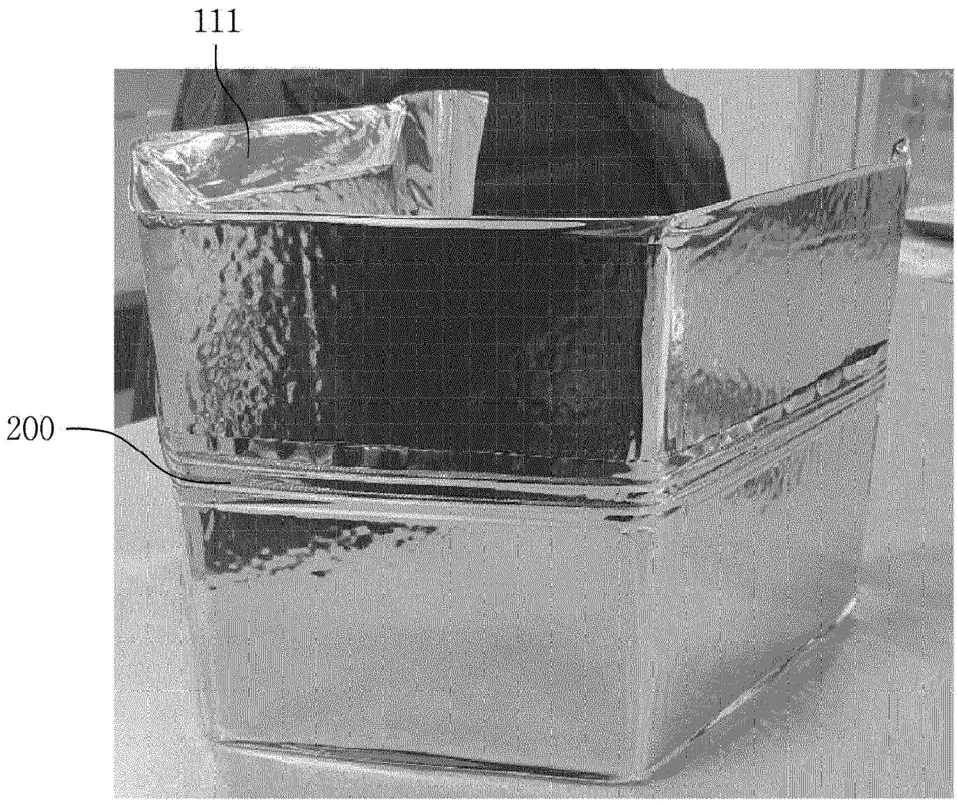

fig.15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2022/015852

A. CLASSIFICATION OF SUBJECT MATTER

B65D 81/38(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65D 81/38(2006.01); B65D 25/04(2006.01); B65D 41/00(2006.01); F16L 59/06(2006.01); F25D 23/06(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 경사부(inclined part), 단열셀(insulation cell), 플레이트부(plate part), 진공패널(vacuum panel), 심재부(core part), 열교환(heat exchange), 밀착부(contact part), 진공 단열 박스(vacuum insulation box)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y	KR 10-2021-0069919 A (HANUL TL CO., LTD.) 14 June 2021 (2021-06-14) See paragraphs [0057]-[0059]; and figure 3.	1-11
A	US 6220473 B1 (LEHMAN et al.) 24 April 2001 (2001-04-24) See column 4, lines 22-39; and figures 4-5.	1-11
A	KR 10-2021-0103214 A (KOREA UNIVERSITY OF TECHNOLOGY AND EDUCATION INDUSTRY-UNIVERSITY COOPERATION FOUNDATION) 23 August 2021 (2021-08-23) See paragraphs [0037]-[0059]; and figures 1-3.	1-11
A	JP 2014-020473 A (MITSUBISHI ELECTRIC CORP.) 03 February 2014 (2014-02-03) See claims 1-8; and figures 1-7.	1-11

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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- "&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 January 2023	**31 January 2023**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208**	
Facsimile No. **+82-42-481-8578**	Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2022/015852

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Form PCT/ISA/210 (patent family annex) (July 2022)

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