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EP 2 751 506 B1

Description

Technical Field

[0001] The present invention relates to a refrigerator, in particular, to a drawing structure and a container in a drawing type storage compartment.

Background Art

[0002] In a conventional refrigerator, a drawing type storage compartment is arranged at a lower level of the refrigerator in terms of effective storage of a back area, convenience, and the like. The drawing type storage compartment requires the smoothness in taking in and out of a container, the easiness of taking articles of food in and out of a storage compartment, easiness of putting and taking the container on/off, and the like.

[0003] As an example, a technique of improving the convenience of a drawing type storage compartment is disclosed (for example, see Patent Literature 1).

[0004] FIG. 31A is a section view showing an internal structure of conventional refrigerator 1100 when viewed from a side, and FIG. 31B is an enlarged view of a region G in FIG. 31A.

[0005] Conventional refrigerator 1100 includes, in heat insulation main body 1101, refrigerating compartment 1102, switching compartment 1106 in which a temperature can be changed, an ice making compartment (not shown) arranged next to switching compartment 1106, vegetable compartment 1103, and freezing compartment 1104, as storage compartments.

[0006] Heat insulation main body 1101 includes outer case 1112, inner case 1110, and thermally insulating material 1111 filled between outer case 1112 and inner case 1110.

[0007] Container 1306 stored in vegetable compartment 1103 is supported with a pair of rail apparatuses 1202 connected to drawing door 1201 of vegetable compartment 1103. Container 1306 stored in freezing compartment 1104 is also supported with one pair of rail apparatuses 1202 connected to drawing door 1201 of freezing compartment 1104.

[0008] The pair of rail apparatuses 1202 support an upper part or almost the center of both side surfaces of container 1306 and regulates horizontal deformation of container 1306.

[0009] As another configuration, a technique in which both left and right ends of a bottom portion of container 1306 are supported with rail apparatuses 1202 to increase a volume of storing space of the drawing type storage compartment is proposed (for example, see Patent Literature 2).

[0010] However, in the configuration in which the both the left and right ends of the bottom portion of container 1306 are supported with rail apparatuses 1202, the horizontal deformation of container 1306 cannot be regulated with rail apparatuses 1202. Thus, when a large number of stored articles are stored in container 1306, the side surface of container 1306 may be deformed in a direction in which the side surface comes close to a side of inner case 1110. When this deformation is sharp, the side surface of container 1306 is brought into contact with inner case 1110, and drawing door 1201 may not be able to be smoothly opened/closed.

[0011] In order to prevent this, a rib or the like that reinforces the strength is formed on an inner wall side of the side surface of container 1306. In this case, an actual volume of storing space decreases. In contrast to this, when a rib or the like that reinforces the strength is formed on an outer wall side of the side surface of container 1306, air trunk resistance to cooling cold air flowing along the side surface of container 1306 increases, and a cooling cold air pocket occurs, so that dew condensation and frost formation may occur.

Citation List

Patent Literature

[0012]

PTL 1: Unexamined Japanese Patent Publication No. 2006-177653
PTL 2: Unexamined Japanese Patent Publication No. 2009-228948

[0013] Moreover, a respective refrigerator according to the preamble of claim 1 is known from EP patent application 2 320 180.

Summary of Invention

[0014] The present invention has been made in consideration of the above and an object thereof is to provide a refrigerator including a drawing type storage compartment wherein a container can be prevented from being deformed while ensuring a large actual volume of storing space of the storage compartment.

[0015] The present invention is a refrigerator comprising a heat insulation main body including an inner case, an outer case, and a thermally insulating material filled between the inner case and the outer case, a storage compartment formed inside the heat insulation main body and having an open front surface, and a container arranged inside the storage compartment and having an open upper surface. The refrigerator also includes a drawing door that openably/closably closes the open front surface of the storage compartment and a rail apparatus configured to move the drawing door and the container back and forth. The container, when viewed from the front, has step parts arranged at both ends of a bottom portion and held by the rail apparatus, a narrow part arranged between the step parts, and protrusion parts arranged on both ends of the narrow part and protruding downward.

[0016] According to the configuration, the rail apparatuses are fitted on both the left and right ends of the bottom portion of the container. In this manner, increases in size and volume of the container supported with the rail apparatuses can be achieved. When the protrusion parts are formed on both the ends of the bottom surface, the strength can be improved without forming a rib on the side surface of the container. Thus, the strength of the container can be improved while ensuring a large actual storing space in the drawing type storage compartment.

Brief Description of Drawings

[0017]

[fig. 1A]FIG. 1A is a front view of a refrigerator according to a first exemplary embodiment of the present invention.

[fig.1B]FIG. 1B is a diagram showing a sectional structure of a heat insulation main body in a region A in FIG. 1A.

[fig.2]FIG. 2 is a section view of the refrigerator according to the first exemplary embodiment of the present invention along a 2 - 2 line in FIG. 1A.

[fig.3]FIG. 3 is a perspective view showing a configuration of a rail apparatus of the refrigerator according to the first exemplary embodiment of the present invention.

[fig.4]FIG. 4 is a section view showing a structure of a fitting part between the inner case and the rail apparatus in the refrigerator according to the first exemplary embodiment when viewed from the front.

[fig.5]FIG. 5 is a section view showing a structure of a fitting part between an inner case in a vegetable compartment and the rail apparatus in the refrigerator according to the first exemplary embodiment of the present invention when viewed from the front.

[fig.6]FIG. 6 is a perspective view showing a state in which a drawing door and a rail apparatus are connected to each other in the refrigerator according to the first exemplary embodiment of the present invention.

[fig.7]FIG. 7 is a back view showing an outline state in which a container is arranged between the rail apparatuses in the refrigerator according to the first exemplary embodiment of the present invention.

[fig. 8A]FIG. 8A is a diagram schematically showing arrangements of the rail apparatus and the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig.8B]FIG. 8B is a diagram schematically showing arrangements of the rail apparatus and the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig. 8C]FIG. 8C is a diagram schematically showing arrangements of the rail apparatus and the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig.9]FIG. 9 is a perspective view of a container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig. 10]FIG. 10 is a side view of the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig. 11]FIG. 11 is a back view of the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig. 12] FIG. 12 is a diagram for explaining a positional relationship between a drawing door, a door frame, and the container in the refrigerator according to the first exemplary embodiment of the present invention when viewed from a side.

[fig.13]FIG. 13 is a side view showing another example of the container in the refrigerator according to the first exemplary embodiment of the present invention.

[fig.14]FIG. 14 is a perspective view of a container in a refrigerator according to a second exemplary embodiment of the present invention.

[fig.15]FIG. 15 is a diagram for explaining a flow of cold air in a storage compartment in which a container is arranged in the second exemplary embodiment of the present invention.

[fig.16]FIG. 16 is a side view showing an example of a relationship between a drawing door and the container in the second exemplary embodiment of the present invention.

[fig.17A]FIG. 17A is a perspective view of a drawing door in a third exemplary embodiment of the present invention.

[fig.17B]FIG. 17B is an enlarged view of a region F of the drawing door in the third exemplary embodiment of the present invention.

[fig.18A]FIG. 18A is an exploded perspective view of the drawing door and the container in the third exemplary embodiment of the present invention.

[fig.18B]FIG. 18B is an enlarged view of a region G of the drawing door and the container in the third exemplary embodiment of the present invention.

[fig.19A]FIG. 19A is a partially section view showing a configuration of a state in which the drawing door and the container are assembled in the third exemplary embodiment of the present invention when viewed from a side.

[fig.19B]FIG. 19B is an enlarged view of a region H showing a configuration of a state in which the drawing door and the container are assembled in the third exemplary embodiment of the present invention.

[fig.20A]FIG. 20A is a side view showing another example of the container in the third exemplary embodiment of the present invention.

[fig.20B]FIG. 20B is a back view showing another example of the container in the third exemplary embodiment of the present invention.

[fig.21]FIG. 21 is an exploded perspective view of a drawing door and a container of the refrigerator ac-

cording to the fourth exemplary embodiment of the present invention.

[fig.22]FIG. 22 is a main-part section view of a sliding part between an upper container and a lower container in the refrigerator according to the fourth exemplary embodiment of the present invention when viewed from the front.

[fig.23]FIG. 23 is a perspective view showing another example of the upper container in the refrigerator according to the fourth exemplary embodiment of the present invention.

[fig.24]FIG. 24 is a main-part section view of the sliding part between the upper container and the lower container in the refrigerator according to the fourth exemplary embodiment of the present invention when viewed from the front.

[fig.25]FIG. 25 is a main-part enlarged view of a side-surface flange part in another example of the lower container in the refrigerator according to the fourth exemplary embodiment of the present invention.

[fig.26]FIG. 26 is a main-part perspective view of a portion near an external protrusion part at the front of a side surface in another example of the upper container in the refrigerator according to the fourth exemplary embodiment of the present invention.

[fig.27]FIG. 27 is a main-part perspective view showing a configuration of a side-surface flange part and a rear-surface flange part in still another example of the lower container in the refrigerator according to the fourth exemplary embodiment of the present invention.

[fig.28]FIG. 28 is a section view showing still another example of the lower container in the refrigerator according to the fourth exemplary embodiment of the present invention when viewed from the front.

[fig.29]FIG. 29 is a perspective view showing a fitting part between a drawing door and a door frame in the refrigerator according to a fifth exemplary embodiment of the present invention.

[fig.30]FIG. 30 is a partially section view showing a state where the container is fitted on the drawing door in the refrigerator according to the fifth exemplary embodiment of the present invention when viewed from a side.

[fig.31A]FIG. 31A is a section view showing an internal structure of a conventional refrigerator when viewed from a side.

[fig.31B]FIG. 31B is an enlarged view of a region G in FIG. 31A.

Description of Embodiments

[0018] Embodiments of the present invention will be described below with reference to the accompanying drawings. The present invention is not limited to the embodiments.

(First Exemplary Embodiment)

[0019] Refrigerator 100 in a first exemplary embodiment of the present invention will be described.

[0020] FIG. 1A is a front view of refrigerator 100 in the first exemplary embodiment of the present invention, and FIG. 1B is a diagram showing a sectional structure of heat insulation main body 101 in a region A in FIG. 1A.

[0021] As shown in FIG. 1A, refrigerator 100 according to the present embodiment includes one pair of thermally insulating double doors 107 arranged on an upper part thereof. Refrigerator 100 includes a plurality of partitioned storage compartments in heat insulation main body 101 having an interior thermally insulated from the outside.

[0022] The plurality of partitioned storage compartments are named, depending on functions (cooling temperatures) thereof, as refrigerating compartment 102, ice making compartment 105, switching compartment 106 the temperature of which can be changed, vegetable compartment 103, and freezing compartment 104, the names being used to discriminate the storage compartments from each other.

[0023] On a front opening of refrigerating compartment 102 located on an uppermost part of refrigerator 100, pivoted thermally insulating door 107 that is filled with a foaming and heat insulating material such as urethane by foaming is arranged. In refrigerating compartment 102, a shelf-like storing space is formed.

[0024] Under refrigerating compartment 102, ice making compartment 105, switching compartment 106, vegetable compartment 103, and freezing compartment 104 are arranged. Each of the storage compartments is a drawing type storing space.

[0025] As shown in FIGS. 1A and 1B, heat insulation main body 101 is formed by filling thermally insulating material 111 such as rigid urethane foam between metal outer case 112 and resin inner case 110. Heat insulation main body 101 is a rectangular box body having an opening in at least one surface thereof. Heat insulation main body 101 has a function of shielding heat flowing from the external atmosphere (atmospheric air) into heat insulation main body 101.

[0026] Refrigerating compartment 102 is a storage compartment a temperature of which is maintained at a low temperature at which stored articles are not frozen to refrigerate the stored articles. A lower limit of a concrete temperature is generally set to 1 to 5 degrees Celsius.

[0027] Vegetable compartment 103 is a storage compartment that is arranged in a lowermost part of heat insulation main body 101 to mainly refrigerate vegetables. Vegetable compartment 103 is set at a temperature equal to or slightly higher than that of refrigerating compartment 102. A lower limit of a concrete temperature is generally set to 2 degrees Celsius to 7 degrees Celsius. As the set temperature of vegetable compartment 103 is decreased, the freshness of leaf vegetables can be main-

tained for a long period of time.

[0028] Freezing compartment 104 is a storage compartment that is set in a freezing temperature range. Set temperature of freezing compartment 104 is generally set to -22 to - 18 degrees Celsius to freeze and preserve articles. However, in order to improve a freezing and preserving state, for example, the set temperature may be set to a low temperature of -30 degrees Celsius, -25 degrees Celsius, or the like.

[0029] Ice making compartment 105 is a storage compartment that has an ice making machine (not shown) arranged therein, makes ice with the ice making machine, and preserves the ice. The set temperature is almost equal to that of freezing compartment 104.

[0030] Switching compartment 106 can switch set temperatures from a refrigerating temperature range to a freezing temperature range depending on applications with a console panel fitted on refrigerator 100.

[0031] FIG. 2 is a section view of refrigerator 100 according to the first exemplary embodiment of the present invention along a 2 - 2 line in FIG. 1A.

[0032] As shown in FIG. 2, in order to partition storage compartments having different temperature ranges, partition walls 108 are installed between the storage compartments. Of the storage compartments arranged in refrigerator 100, on a drawing type storage compartment (in the example in FIG. 2, freezing compartment 104 and vegetable compartment 103), drawing door 201 that closes the front opening and rail apparatus 202 are arranged. Rail apparatus 202 has a function of elastically connecting drawing door 201 to heat insulation main body 101 and a function of enabling container 206 arranged in the storage compartment to move back and forth.

[0033] Drawing door 201 is a plate-like member that can openably/closably close the opening of the storage compartment and has heat resistance. Packing 207 is fitted on a rim on a rear side of drawing door 201. Packing 207 tightly adheres to a surface of an opening of heat insulation main body 101 or the like while drawing door 201 closes the opening of the storage compartment to prevent cold air from leaking out of the storage compartment. As shown in FIG. 1A, handhold 201a on which a user puts her/his hand when the storage compartment is drawn out is arranged on an upper part on the front surface of drawing door 201.

[0034] As shown in FIG. 2, door frame 205 is fitted on drawing door 201 to protrude in a direction substantially perpendicular to drawing door 201. Door frame 205 is fitted on rail apparatus 202. Although will be described later, door frame 205 holds both ends of the bottom portion of container 206. More specifically, container 206 is fitted on rail apparatus 202 through door frame 205 fitted on rail apparatus 202.

[0035] FIG. 3 is a perspective view showing a configuration of rail apparatus 202 of refrigerator 100 according to the first exemplary embodiment of the present invention.

[0036] As shown in FIG. 3, rail apparatus 202 has three rails stacked in three levels. A second rail (middle rail 221) can be moved in a longitudinal direction of a first rail (cabinet rail 222). A third rail (top rail 203) is designed to be able to be moved in a longitudinal direction of the second rail (middle rail 221). In this manner, rail apparatus 202 is configured to be able to expand and contract in a fore and aft direction as a whole.

[0037] Cabinet rail 222 is a "fixed rail" fixed on a side surface or a bottom surface of inner case 110, and top rail 203 and middle rail 221 are "moving rails" that is arranged to be able to move with respect to cabinet rail 222 serving as the fixed rail.

[0038] Planar rail fitting part 223 protruding in a direction substantially perpendicular to the longitudinal direction of cabinet rail 222 is integrally formed on cabinet rail 222.

[0039] FIG. 4 is a section view showing a structure of a fitting part between inner case 110 and rail apparatus 202 in refrigerator 100 according to the first exemplary embodiment when viewed from the front. In FIG. 4, of the drawing type storage compartments, freezing compartment 104 will be exemplified.

[0040] Rail apparatus 202 will be described first.

[0041] A sectional shape perpendicular to the longitudinal direction of cabinet rail 222 is not horizontally symmetrical and has a higher side surface that is fixed to an inner side surface of inner case 110 as rail fitting part 223.

[0042] Middle rail 221 has a shape having a substantially I-shaped section, more specifically, a shape in which horizontally protruding flanges are continuously formed on the upside and the downside in the longitudinal direction. Of the upper and lower flanges, the flange under middle rail 221 is held with cabinet rail 222 such that the flange can be moved in the longitudinal direction.

[0043] Top rail 203 has a substantially laterally-U-shaped section and holds the upper flange of middle rail 221 such that the flange can be moved in the longitudinal direction.

[0044] Cabinet rail 222 and top rail 203 hold a plurality of rotary support members 145 with rotary support member holding parts 146, respectively. Cabinet rail 222 and top rail 203 hold middle rail 221 with rotary support members 145 such that middle rail 221 can be moved. As rotary support members 145, for example, a bearing can be used.

[0045] More specifically, of the upper and lower flanges of middle rail 221, a part centered around the lower flange is held at three points with the plurality of rotary support members 145 of cabinet rail 222.

[0046] A part centered around the upper flange of middle rail 221 is held at three points with the plurality of rotary support members 145 of top rail 203.

[0047] With the above configuration, middle rail 221 can move on cabinet rail 222 in the longitudinal direction thereof. Furthermore, top rail 203 can move on middle rail 221 in the longitudinal direction thereof. That is, top rail 203 can move on cabinet rail 222 in the longitudinal direction thereof through middle rail 221.

[0048] Middle rail 221 and top rail 203 can smoothly move with rotation of the plurality of rotary support members 145.

[0049] Top rail 203, middle rail 221, cabinet rail 222, and rotary support members 145 are fitted on inner case 110 while being built in advance.

[0050] Fitting of rail apparatus 202 to inner case 110 will be described below.

[0051] As shown in FIG. 4, rail fitting part 223 integrally formed on cabinet rail 222 is arranged to have a surface that is brought into contact with a side-surface part of inner case 110, and fixed to a side part of inner case 110 with screw 400.

[0052] At this time, since inner case 110 serving as a fitting surface is mainly shaped with a resin, even though screw 400 is fixed to inner case 110, inner case 110 is difficult to ensure strength that can withstand a load applied on rail apparatus 202.

[0053] Thus, in order to reliably fix rail apparatus 202, rail fitting part 223 is fitted on rail holding member 270 buried in thermally insulating material 111 through inner case 110.

[0054] Rail holding member 270 is made of a metal material such as iron. Rail holding member 270 is fixed to a predetermined position of an inner surface of inner case 110 in advance. Thereafter, a foaming and heat insulating material is filled between inner case 110 and outer case 112 to bury them. In this manner, holding power of rail holding member 270 to the load applied on rail apparatus 202 can be more improved.

[0055] Rail holding member 270 is integrally formed by rail holding part 270a fixed to rail fitting part 223 with screw 400 and internal fall prevention part 270b that prevents rail apparatus 202 from internally falling. Internal fall prevention part 270b is a lateral flange part that is formed on a lower part of rail holding part 270a. Rail holding part 270a is a vertical flange part that is formed to be in tight contact with inner case 110 from the thermally insulating material 111 side.

[0056] More specifically, internal fall prevention part 270b is formed such that internal fall prevention part 270b is separated from inner case 110 from the lower part of rail holding part 270a and bent toward outer case 112. Furthermore, a distal end part of internal fall prevention part 270b is formed to be bent downward. Thermally insulating material 111 is filled, the lateral flange part of internal fall prevention part 270b has a plane that receives thermally insulating material 111 and cuts into thermally insulating material 111. In this manner, the strength of rail holding member 270 can be ensured. Thus, rail fitting part 223 can be prevented from falling on an inner side of the refrigerator in freezing compartment 104, i.e., rail apparatus 202 can be prevented from falling on the inner side of the refrigerator. Thus, drawing door 201 can be smoothly opened or closed.

[0057] Internal fall prevention part 270b serving as the lateral flange part may be integrally formed to be bent from the upper part of rail holding part 270a, and internal fall prevention parts 270b may be formed on both the upper and lower parts, respectively. When internal fall prevention parts 270b are formed on the upper and lower parts, respectively, the lateral flange parts formed on the upper and lower parts of rail holding part 270a have planes that receive thermally insulating material 111 and cut into thermally insulating material 111. In this manner, the strength of rail holding member 270 can be further ensured.

[0058] Bottom-surface step parts 108a are formed on both sides of partition wall 108 serving as a bottom-surface wall of freezing compartment 104. Bottom-surface step part 108a is formed in a direction of depth to have a level one-step higher than that of a central part serving as a reference surface of partition wall 108. Rail apparatus 202 is arranged on bottom-surface step part 108a.

[0059] Side-surface step part 110a is formed on a side wall-surface part of inner case 110 to which rail apparatus 202 is fixed. Side-surface step part 110a is formed to be recessed on outer case 112 side from an upper-side wall-surface part in freezing compartment 104 and has a small wall thickness.

[0060] Rail apparatus 202 is mounted on bottom-surface step part 108a and fixed to side-surface step part 110a with a screw. In this manner, rail apparatus 202 can be suppressed from protruding into a storing space, and an entire width of container 206 in freezing compartment 104 can be increased. For this reason, an invalid space can be reduced.

[0061] Since rail apparatus 202 is mounted on bottom-surface step part 108a and assembled, workability can be improved. Furthermore, since a part of bottom-surface step part 108a has a large wall thickness vertical to partition wall 108, even though metal rail apparatus 202 in freezing compartment 104 is cooled, dew condensation on partition wall 108 serving as a top surface of vegetable compartment 103 under freezing compartment 104 can be prevented.

[0062] FIG. 5 is a section view showing a structure of a fitting part between inner case 110 in vegetable compartment 103 and rail apparatus 202 in refrigerator 100 according to the first exemplary embodiment of the present invention when viewed from the front.

[0063] Even in vegetable compartment 103 formed in the lowermost part of refrigerator 100, rail holding member 280 is arranged in thermally insulating material 111. Rail holding member 280 includes rail holding part 280a and internal fall prevention part 280b.

[0064] Rail holding part 280a is substantially L-shaped, includes a vertical flange part and a lateral flange part, and is in tight contact with the side-surface part and a bottom-surface part of inner case 110. Internal fall prevention part 280b is integrated with the lateral flange part serving as the bottom-surface part of rail holding part 280a, and is formed as a lower flange part that faces downward in a direction away from inner case 110.

[0065] In this manner, internal fall prevention part 280b is buried in thermally insulating material 111 as the lower

flange part that faces downward. Thus, even though a moment in a direction of falling on the inside of the refrigerator in vegetable compartment 103 acts on rail fitting part 223, the movement of internal fall prevention part 280b serving as the lower flange part is blocked with thermally insulating material 111 filled in the lower part of internal fall prevention part 280b. In this manner, rail holding member 280 can be prevented from falling down, and the strength of rail holding member 280 can be ensured. For this reason, rail apparatus 202 of vegetable compartment 103 can be prevented from falling on the inside of the refrigerator.

[0066] Bottom-surface step parts 401a are formed on both side parts of bottom-surface wall 401 of vegetable compartment 103. Bottom-surface step part 401a is formed in a direction of depth to have a level one-step higher than that of a central part serving as a reference surface of bottom-surface wall 401. Rail apparatus 202 is arranged on bottom-surface step part 401a.

[0067] Side-surface step part 110a is formed on the side wall-surface part of inner case 110 to which rail apparatus 202 is fixed. Side-surface step part 110a is formed to be recessed on outer case 112 side from an upper-side wall-surface part in vegetable compartment 103 and has a small wall thickness.

[0068] A side surface of rail fitting part 223 is fixed to metal rail holding member 280 with screw 400 through side-surface step part 110a therebetween.

[0069] In this manner, since rail apparatus 202 is mounted on bottom-surface step part 401a and fixed to side-surface step part 110a with the screw, rail apparatus 202 can be suppressed from protruding into the storing space. Thus, the entire width of container 206 in vegetable compartment 103 can be increased, and an invalid space can be reduced.

[0070] Since rail apparatus 202 is mounted on bottom-surface step part 401a and assembled, workability can be improved. Furthermore, a part of bottom-surface step part 401a can ensure heat resistance because the wall thickness of thermally insulating material 111 under bottom-surface wall 401 increases.

[0071] Drawing door 201 of bottom vegetable compartment 103 is on the lower side of drawing door 201 of freezing compartment 104. For this reason, when a user draws drawing door 201, drawing door 201 of vegetable compartment 103 located on the bottom of the refrigerator is located at a position on which her/his weight is easily put. Thus, in addition to a load of a content of stored articles, an external load may be applied to drawing door 201 of vegetable compartment 103. However, since rail holding member 280 may be integrally formed by substantially L-shaped rail holding part 280a and internal fall prevention part 280b serving as the lower flange part, rail apparatus 202 of bottom drawing door 201 can be prevented from falling down to make it possible to impart a rigid configuration to drawing door 201.

[0072] In each of freezing compartment 104 and vegetable compartment 103, side-surface step part 110a is arranged to decrease the wall thickness of the side surface. As a countermeasure against this, a vacuum thermally insulating material (not shown) can be arranged at a position corresponding to a part where rail apparatus 202 is installed. More specifically, in each of freezing compartment 104 and vegetable compartment 103, a vacuum thermally insulating material having a height larger than a distance between rail apparatuses 202 is stuck to outer case 112 to make it possible to ensure heat resistance.

[0073] Fitting between drawing door 201 and rail apparatus 202 will be described below.

[0074] FIG. 6 is a perspective view showing a state in which drawing door 201 and rail apparatus 202 are connected to each other in refrigerator 100 according to the first exemplary embodiment of the present invention.

[0075] Drawing door 201 includes internal plate 211 that substantially covers an entire internal surface of drawing door 201, and door frame 205. Internal plate 211 is a plate-like member formed by vacuum molding. Door frame 205 directly fixed to internal plate 211 is connected to top rail 203 configuring rail apparatus 202 with a screw or the like. In this manner, drawing door 201 is configured such that drawing door 201 can be drawn or pushed back by the function of rail apparatus 202.

[0076] At a proximal end part of door frame 205 connected to internal plate 211, enlarged part 281 protruding upward from the a main part of door frame 205 is formed. In this manner, concentration of the stress generated on the proximal end part of top rail 203 when a user draws or pushes back drawing door 201 while gripping drawing door 201, in particular, an upper-end part of drawing door 201 can be alleviated.

[0077] Door frame 205 includes bent part 241 that is formed on an end edge part corresponding to one side of door frame 205 and bent along internal plate 211 of drawing door 201. Bent part 241 is fitted on a part of drawing door 201 above the proximal end part of top rail 203.

[0078] When enlarged part 281 is arranged between bent part 241 and door frame 205, the size of a fixing part between door frame 205 and drawing door 201 can be heightwise increased. In this manner, the lack of strength of the fitting part between rail apparatus 202 fitted on the lower part of drawing door 201 and drawing door 201 is compensated for to make it possible to smoothly open/close drawing door 201.

[0079] Internal plate 211 includes container fixing part 301. Container fixing part 301 is a metal member that is fixed to a planar metal plate (not shown) fixed in the foaming and heat insulating material on the rear side of internal plate 211 with a screw or the like through internal plate 211. Above container fixing part 301, a gap is formed between the container fixing part 301 and internal plate 211. A part of container 206 is inserted into the gap to fix container 206.

[0080] With the above configuration, even though a user draws or pushes back drawing door 201 while gripping

drawing door 201, stress is dispersed to bent part 241 and a part connected through door frame 205 without being concentrated on the fitting part of top rail 203. In this manner, as a whole, the fixing strength between drawing door 201 and top rail 203 can be improved.

[0081] The configuration described above is especially useful to a configuration such as refrigerator 100 according to the embodiment in which top rail 203 is fitted on the lower part of drawing door 201.

[0082] In this case, door frame 205 that ensures the minimum strength required for a case in which rail apparatus 202 is fitted at a position near the central part in a vertical direction of drawing door 201 is supposed. By using door frame 205, as in the example of the embodiment, drawing door 201 is opened or closed back and forth while rail apparatus 202 is arranged below the central part in the vertical direction of drawing door 201.

[0083] In this case, door frame 205 or internal plate 211 may be deformed due to the lack of strength of the fixing part side of door frame 205 to drawing door 201. As a result, packing 207 arranged on drawing door 201 is separated from heat insulation main body 101 to form a gap, and a quality defect such as frost formation in refrigerator 100 may occur.

[0084] When the fitting part between drawing door 201 and top rail 203 is on the lower part of drawing door 201, a user draws or pushes back drawing door 201 while gapping the upper part of drawing door 201 to make a moment acting on the fitting part relatively large.

[0085] However, in the embodiment, door frame 205 having enlarged part 281 protruding upward from the fitting part is employed, and container fixing part 301 is arranged above the fitting part. For this reason, a position serving as a fulcrum of tensile strength can be arranged above the fitting part, and a moment acting on the fitting part decreases. Thus, the fitting part of top rail 203 can be prevented from being damaged.

[0086] A positional relationship between container 206 and rail apparatus 202 will be described below in more detail.

[0087] FIG. 7 is a back view showing an outline state in which container 206 is arranged between rail apparatuses 202 in refrigerator 100 according to the first exemplary embodiment of the present invention.

[0088] Container 206 is a container to store vegetables, beverage filled in plastic bottles, articles of frozen food, or the like, and is a resin box body having an opening on the upper side. Container 206 has narrow part 261 having a width narrower than the upper part such that step parts 262 are formed on both the end parts of the lower part to face inward. Container 206 has narrow part 261 arranged between one pair of rail apparatuses 202, and step parts 262 are arranged on an upper surface of door frame 205 so as to be supported with rail apparatuses 202 through door frame 205.

[0089] In this manner, since rail apparatuses 202 are arranged on both the lower-end parts of drawing door 201, narrow part 261 can be widened as much as possible in container 206. Thus, container 206 can employ a shape in which a volume of storing space can be increased as much as possible.

[0090] FIGS. 8A to 8C are a diagram schematically showing arrangements of rail apparatus 202 and container 206 in refrigerator 100 according to the first exemplary embodiment of the present invention. FIGS. 8A to 8C show one end part of container 206 in close up. FIGS. 8A to 8C show a positional relationship between rail apparatus 202 and container 206, and door frame 205 is omitted and is not shown.

[0091] In the example in FIG. 7 described above, as shown in FIG. 8A, container 206 has narrow part 261 having a small width to form step parts 262 on both the end parts of the lower part to face inward. However, the present invention is not limited to the example. For example, the side surface of container 206 may have an almost straight shape that does not have step parts 262, and rail apparatus 202 may be configured to support the sides of both the left and right ends of the bottom portion of container 206 (see FIG. 8B). Rail apparatus 202 may also be configured to support the lower sides of both the left and right ends of the bottom portion of container 206 (see FIG. 8C).

[0092] With the above configuration, the maximum drawing distance of drawing door 201 can be made to a length at which the opening of container 206 is completely open. More specifically, when vegetable compartment 103 is fully open, an end part of the back surface of container 206 is ahead of the front surface of drawing door 201 immediately above vegetable compartment 103. For this reason, storing and taking-out of articles of food on the back side in container 206 can be made easy. Since container 206 does not interfere with upper drawing door 201, fitting and removing of container 206 can be easily performed.

[0093] Container 206 will be described below in detail.

[0094] FIG. 9 is a perspective view of container 206 of refrigerator 100 according to the first exemplary embodiment of the present invention, FIG. 10 is a side view of container 206 of refrigerator 100, and FIG. 11 is a back view of container 206 of refrigerator 100.

[0095] Container 206 includes a flange part that is formed around the opening to protrude externally. More specifically, front-surface flange part 206a is formed on the upper-end part of the front surface, side-surface flange part 206b is formed on the upper-end part of the side surface, and back-side flange part 206c is formed on the upper-end part of the back surface. Front-surface flange part 206a, side-surface flange part 206b, and back-side flange part 206c are continuously formed. The flange parts are formed so as to fold the side walls on the front surface, the side surface, and the back surface, respectively, and desirably have hollow insides in terms of weight saving. The flange parts are formed to make it possible to increase the strength of the opening of container 206.

[0096] Container 206 is configured such that a wall sur-

face height on the back surface is smaller than at least one of wall surface heights on the front surface and both the side surfaces. In other words, back-side flange part 206c is arranged at a position lower than that of at least one of front-surface flange part 206a and side-surface flange part 206b.

[0097] On step parts 262 formed on lower parts of both the side surfaces of container 206, protrusion part 206d integrated with container 206 and protruding downward is formed on at least one of the front and rear sides.

[0098] In this manner, a position that is a fulcrum of tensile strength is behind drawing door 201 to make it possible to decrease a moment acting on the fitting part. In this manner, the fitting part of top rail 203, rail fitting part 223, and the like can be prevented from being damaged.

[0099] On the outside of step parts 262, narrow-plate-like side-surface fin part 266 is formed in a fore and aft direction (direction of depth) to cover protrusion part 206d. Side-surface fin part 266 is formed to protrude downward from both the ends of step part 262 to extend a plane of the side surface of container 206 downward.

[0100] On the bottom part of container 206, bottom-surface rib 206e that protrudes inward from the bottom part is formed. Bottom-surface rib 206e is formed on the front side of the center of container 206 in the direction of depth, i.e., on drawing door 201 side when container 206 is fitted in vegetable compartment 103. Bottom-surface rib 206e is lengthwise formed in a direction of width (horizontal direction) over both the side surfaces of container 206. Furthermore, bottom-surface rib 206e is formed to have a top located above the position of step parts 262.

[0101] Container 206 is partitioned with bottom-surface rib 206e into two regions, i.e., first storing part 263 arranged on the front side and second storing part 264 arranged on the rear side. The depth of first storing part 263 is configured to have a depth larger than that of second storing part 264.

[0102] On the bottom surface of container 206, at both the ends of narrow part 261, narrow rectangular-columnar protrusion part 265 is formed in a fore and aft direction (direction of depth) to protrude downward from the bottom surface of second storing part 264. Protrusion part 265 is formed over almost entire portions of both the ends of second storing part 264 to have a height that is substantially equal to the height of the bottom surface of first storing part 263.

[0103] On the inside of the container on the bottom surface of second storing part 264, a plurality of bottom-surface internal rib parts 267 that protrude on the inside of the refrigerator (upward) to have planar shapes horizontally elongated are formed.

[0104] Furthermore, outside the container on the bottom surface of second storing part 264, bottom-surface external rib part 268 that protrudes on the outside of the refrigerator to have a net-like shape is formed between protrusion parts 265.

[0105] In this case, fitting of container 206 to door frame 205 will be described.

[0106] FIG. 12 is a diagram for explaining a positional relationship between drawing door 201, door frame 205, and container 206 in refrigerator 100 according to the first exemplary embodiment of the present invention when viewed from a side.

[0107] Front-surface flange part 206a of container 206 is inserted into a gap between container fixing part 301 arranged on internal plate 211 and internal plate 211 to fix container 206 to drawing door 201.

[0108] Protrusion part 206d formed on step part 262 of container 206 is inserted into a notch-shaped fixing hole (not shown) formed in door frame 205.

[0109] More specifically, protrusion part 206d has a shape that can be inserted into the hole formed in door frame 205.

[0110] In this manner, container 206 can be fixed to door frame 205 without deteriorating the detachability/attachability. In particular, when rail apparatus 202 is fitted on both the ends of the bottom portion of container 206, a moment of force in a drawing direction in a drawing state of drawing door 201 is orthogonal to a fixing direction. For this reason, a load applied on door frame 205 and rail apparatus 202 can be effectively reduced.

[0111] Furthermore, an external upper-end part of door frame 205 is covered with side-surface fin part 266. In this manner, container 206 can be fixed to door frame 205.

[0112] When container 206 is correctly fixed to door frame 205, protrusion part 265 protrudes downward from the lower surface of middle rail 221 serving as a moving rail. In other words, protrusion part 265 protrudes such that the lower end of protrusion part 265 is located between a horizontal surface S1 including a lower end surface of drawing door 201 and a horizontal surface S2 including a lower surface of middle rail 221.

[0113] In this manner, protrusion parts 265 are formed on both the ends of narrow part 261 to make it possible to improve the strength of container 206 without forming a rib or the like on the side surface of container 206.

[0114] Front-surface flange part 206a of container 206 is fixed to container fixing part 301 of drawing door 201, and protrusion part 206d and side-surface fin part 266 are fixed to door frame 205. In this manner, the lack of strength of the fitting part between rail apparatus 202 fitted on the lower part of drawing door 201 and drawing door 201 is compensated for to make it possible to smoothly open/close drawing door 201.

[0115] Protrusion part 265 protrudes downward from the lower surface of middle rail 221 serving as a moving rail. In this manner, a user can prevent her/his fingers or toe or the like from being caught between a front end part B of middle rail 221 and a rear end part C of first storing part 263 or between the front end part B of middle rail 221 and a rear end part D of drawing door 201. If a finger, a toe, or the like is inserted from a side into a part between the front end part B of middle rail 221 and the rear end

part C of first storing part 263 or the rear end part D of drawing door 201, the finger or the like is brought into contact with protrusion part 265 without being inserted moreover. At this time, even though drawing door 201 is closed in this state, a finger, a toe, or the like is not caught.

[0116] In particular, as in the embodiment, when container 206 is also stored in the bottom storage compartment (vegetable compartment 103), there exists a floor surface on which refrigerator 100 is placed is present 30 to 50-mm under the horizontal surface S1 including the lower end surface of drawing door 201. In this case, since the possibility that a user erroneously catches her/his toe increases, protrusion part 265 is significantly configured to prevent her/his finger or toe or the like from being caught when drawing door 201 is closed.

[0117] Furthermore, protrusion part 265 is protruded to have a plane at the same level as that of the bottom surface of first storing part 263. In this manner, even though container 206 is removed and placed on a floor or the like, by a difference between the depths of first storing part 263 and second storing part 264, container 206 is not inclined as a whole, and stored articles in container 206 are not fallen down or broken down.

[0118] Container 206 is held on the bottom portion with door frame 205. For this reason, rail apparatus 202 does not horizontally divide a space on a side of container 206, and dew condensation, frost formation, or the like is not caused by occurrence of a temperature difference between the upper and lower parts or a convection air pocket.

[0119] Furthermore, side-surface fin part 266 is arranged to make it possible to form a side surface of container 206 below the lower surface of side-surface flange part 206b and above the upper surface of door frame 205 in a flat shape that does not have an uneven surface. In this manner, air trunk resistance to cooling cold air flowing from the front side to the rear side along the side surface of container 206 can be reduced. In this manner, an input to a cooling fan (not shown) can be reduced, and energy saving of refrigerator 100 can be realized. Since the side surface can be made flat, the design can be improved. When container 206 is drawn together with drawing door 201, cold air in container 206 flowing out of container 206, i.e., out of vegetable compartment 103 can be reduced, and energy saving of refrigerator 100 can be achieved.

[0120] Bottom-surface rib 206e is formed on the front side of the central part, and bottom-surface rib 206e is formed in a direction of width over both the side surfaces of container 206, so that the depth of first storing part 263 is set to be larger than the depth of second storing part 264. With the above configuration, strength to tensile strength acting on the side surface of container 206 in a direction of depth acting can be ensured.

[0121] The embodiment has been described on the assumption that container 206 has first storing part 263. However, the present invention is not limited to the configuration. For example, in container 206, a configuration may be formed by second storing part 264 without first storing part 263. In contrast to this, the configuration may have still another storing part, for example, a third storing part.

[0122] Protrusion part 265 need not be always the rectangular-columnar shape described above. Protrusion part 265 may be shaped to protrude between the horizontal surface S1 including the lower end surface of drawing door 201 and the horizontal surface S2 including the lower surface of middle rail 221 when drawing door 201 is opened. Protrusion part 265 may be shaped to reduce a gap between the front end part B of middle rail 221 and the rear end part C of first storing part 263 or the rear end part D of drawing door 201.

[0123] The embodiment has been described on the assumption that containers 206 are containers stored in vegetable compartment 103 and freezing compartment 104. However, even though container 206 is used as a container stored in another storage compartment such as switching compartment 106, the same effect can be obtained.

[0124] In this case, another example in the embodiment will be described below.

[0125] FIG. 13 is a side view showing another example of container 406 in refrigerator 100 according to the first exemplary embodiment of the present invention.

[0126] In container 406, bottom-surface rib 406e is formed such that a top of bottom-surface rib 406e is under step part 262. In comparison with container 206 described above, container 406 does not have side-surface fin part 266, and the height of protrusion part 265 is smaller than that of the plane of the bottom surface of first storing part 263.

[0127] In a state in which container 406 is fitted on door frame 205, protrusion part 265 protrudes to a level lower than the level of the lower surface of middle rail 221 serving as a moving rail.

[0128] In container 406, a top of bottom-surface rib 406e is set to be on the lower side of step part 262. In this manner, on the side surface of container 406, a side surface of container 406 above the lower surface of side-surface flange part 206b and above the upper surface of door frame 205 can be formed in a flat shape that does not have an uneven surface. Thus, air trunk resistance to cooling cold air flowing from the front side to the rear side along the side surface of container 406 can be reduced. An input to a cooling fan (not shown) can be reduced, and energy saving of refrigerator 100 can be achieved. Since the side surface can be made flat, the design can be improved.

[0129] Also in container 406, when protrusion part 265 protrudes downward from the lower surface of middle rail 221 serving as a moving rail. In this manner, a user can prevent her/his fingers or toe or the like from being caught by a gap formed between the front end part B of middle rail 221 and the rear end part C of first storing part 263 or the rear end part D of drawing door 201.

(Second Exemplary Embodiment)

[0130] A second exemplary embodiment of the present invention will be described below.

[0131] In the embodiment, points different from those in the first exemplary embodiment will be mainly described. Descriptions of the same configuration, the same operation, and the same function may be omitted.

[0132] FIG. 14 is a perspective view of container 506 in refrigerator 100 according to the second exemplary embodiment of the present invention.

[0133] Container 506 includes a flange part that is formed around the opening to protrude externally. More specifically, front-surface flange part 206a is formed on the upper-end part of the front surface, side-surface flange part 206b is formed on the upper-end part of the side surface, and back-side flange part 206c is formed on the upper-end part of the back surface. Front-surface flange part 206a, side-surface flange part 206b, and back-side flange part 206c are continuously formed. The flange parts are formed so as to fold the side walls on the front surface, the side surface, and the back surface, respectively, and desirably have hollow insides in terms of weight saving. The flange parts are formed to make it possible to increase the strength of the opening of container 506.

[0134] On step parts 262 formed on lower parts of both the side surfaces of container 506, protrusion part 206d integrated with container 506 and protruding downward is formed on at least one of the front and rear sides. Each of protrusion parts 206d is inserted into a notch-shaped fixing hole (not shown) formed in door frame 205.

[0135] Like container 206 according to the first exemplary embodiment, front-surface flange part 206a of container 506 is fixed to container fixing part 301 of drawing door 201 (see FIG. 12), and protrusion part 206d is fixed to door frame 205. In this manner, the lack of strength of the fitting part between rail apparatus 202 fitted on the lower part of drawing door 201 and drawing door 201 is compensated for to make it possible to smoothly open/close drawing door 201.

[0136] More specifically, even though container 506 according to the embodiment is used, a position that is a fulcrum of tensile strength is behind drawing door 201 to make it possible to decrease a moment acting on the fitting part. For this reason, the fitting part of top rail 203 or the fitting part of rail apparatus 202 can be prevented from being damaged.

[0137] Container 506 is configured such that a wall surface height on the back surface is smaller than at least one of wall surface heights on the front surface and both the side surfaces. In other words, back-side flange part 206c is arranged at a position lower than that of at least one of front-surface flange part 206a and side-surface flange part 206b.

[0138] On the bottom part of container 506, bottom-surface rib 406e that is protruded inward from the bottom part is formed. Bottom-surface rib 406e is formed on the front side of the center (E - E segment in FIG. 14) of container 506 in the direction of depth, i.e., on drawing door 201 side after container 506 is fitted in the storage compartment. Bottom-surface rib 406e is formed in a direction of width over both the side surfaces of container 506. A top of bottom-surface rib 406e is set to be on the lower side of the position of step part 262.

[0139] Container 506 is partitioned with bottom-surface rib 406e into two regions, i.e., first storing part 263 arranged on the front side and second storing part 264 arranged on the rear side. The depth of first storing part 263 is configured to have a depth larger than that of second storing part 264.

[0140] On the front surface of container 506, front-surface blowhole 365 configured by a plurality of longitudinal slits (that are vertically formed) formed in the direction of width is formed. In the side surface of container 506, side-surface blowhole 366 configured by a plurality of horizontally long slits is formed.

[0141] Side-surface blowhole 366 is formed on the front side of the center (E - E segment in FIG. 14) of container 506 in the direction of depth, i.e., on drawing door 201 side after container 506 is fitted in a storage compartment such as freezing compartment 104. Furthermore, side-surface blowhole 366 is formed under the lower surface of side-surface flange part 206b and above step parts 262.

[0142] It is assumed that container 506 is molded by injection molding using a conventional metal mold that is vertically moved. In this case, horizontally long slits are difficult to be formed in a side surface of container 506 because a frame formed between the horizontally long slits interferes with the metal mold when the metal mold is moved upward.

[0143] Thus, in the embodiment, container 506 is molded by using injection molding using, as a part of a metal mold, a slide core that is moved in a horizontal direction of container 506. In this manner, a post-process such as a process of forming slits by cutting after injection molding is unnecessary, and container 506 having side-surface blowhole 366 configured by the horizontally long slits can be easily manufactured.

[0144] A flow of cold air in the storage compartment in which container 506 configured as described above is arranged, for example, in the freezing compartment 104 will be described below.

[0145] FIG. 15 is a diagram for explaining a flow of cold air in the storage compartment in which container 506 is arranged in the second exemplary embodiment of the present invention.

[0146] Cooling cold air 367 is supplied from a discharge port (not shown) formed in an upper rear part of container 506. At this time, as described above, container 506 is configured such that a wall surface height on the back surface is smaller than a wall surface height on another surface. In this manner, cooling cold air 367 is smoothly supplied into container 506 without increasing air trunk resistance. Cooling cold air 367 supplied into

container 506 flows to the front side to cool the interior of container 506.

[0147] Thereafter, a part of cooling cold air 367 passes through front-surface blowhole 365 and flows from the upper side to the lower side in a space between container 506 and internal plate 211 of drawing door 201. Cooling cold air 367 flows from the front side to the rear side along the bottom surface of container 506 and returns from the rear bottom surface of container 506 to an inlet port (not shown) formed in the lower rear part of container 506.

[0148] A part of cooling cold air 367 passes through side-surface blowhole 366, flows from the front side to the rear side in the space between container 506 and inner case 110, and returns to the inlet port formed in the lower rear part of container 506.

[0149] Even in the embodiment, container 506 is held on the bottom portion with door frame 205. For this reason, rail apparatus 202 does not divide a side space of container 506 into upper and lower parts, and dew condensation or frost formation is not caused by occurrence of a temperature difference between the upper and lower parts or a convection air pocket.

[0150] Since side-surface blowhole 366 is formed above the upper surface of rail apparatus 202, even though container 506 is drawn together with drawing door 201, rail apparatus 202, door frame 205, and the like serving as mechanical components are not seen through side-surface blowhole 366. For this reason, a configuration having a good appearance and a good design can be realized.

[0151] On the side surface of container 506, on the rear side (side close to the discharge port), side-surface blowhole 366 is not formed. In this manner, a part of cooling cold air 367 supplied from the upper rear part of container 506 can be prevented from automatically returning to the rear bottom surface of container 506 without being circulated to the front side in the storage compartment. In this manner, the interior of container 506 can be efficiently cooled.

[0152] Side-surface blowhole 366 is configured by a horizontally long slit. For this reason, in comparison with the case in which the longitudinal slit is formed, air trunk resistance occurring when cooling cold air 367 flowing from the rear inner side to the front outer side of container 506 passes through the slit can be reduced. An input to a cooling fan (not shown) can be reduced, and energy saving of refrigerator 100 can be achieved.

[0153] Since the slits are formed on the upper side, when container 506 is drawn together with drawing door 201, cold air in container 506 can be suppressed from flowing out of container 506, i.e., out of the storage compartment, and energy saving of refrigerator 100 can be achieved.

[0154] A top of bottom-surface rib 406e is set at a position under step parts 262, and a recessed part is not formed under the lower surface of side-surface flange part 206b and above step part 262. Except for side-surface blowhole 366, an uneven surface is not formed under the lower surface of side-surface flange part 206b and above step parts 262. In this manner, air trunk resistance to cooling cold air 367 flowing from the front side to the rear side along the side surface of container 506 can be reduced. Since the side surface becomes flat, the design can be improved.

[0155] Also in the embodiment, front-surface flange part 206a of container 506 is fixed to container fixing part 301 of drawing door 201, and protrusion part 206d is fixed to door frame 205 to compensate for a lack of strength of the fitting part between rail apparatus 202 and drawing door 201. For this reason, when drawing door 201 is moved back and forth to perform an opening/closing operation, tensile strength in the direction of depth acts on the side surface of container 506.

[0156] However, in the embodiment, since side-surface blowhole 366 is formed on only the front side of the side surface of container 506, the strength of the side surface of container 506 is not lack. Since side-surface blowhole 366 is configured by horizontally long slits, strength to the tensile strength in the direction of depth can be ensured by a frame between the slits.

[0157] Bottom-surface rib 406e is formed on the front side of the center, bottom-surface rib 406e is widthwise formed over both the side surfaces of container 206, and the depth of first storing part 263 is set to be larger than the depth of second storing part 264. With the configuration, the strength to the tensile strength in the direction of depth acting on the side surface of container 506 can also be ensured.

[0158] The embodiment has been described on the assumption that side-surface blowhole 366 is formed on the front side of the side surface. However, the present invention is not limited to the example. For example, even in a configuration in which only front-surface blowhole 365 is formed without forming side-surface blowhole 366, the same effect as described above can be obtained.

[0159] FIG. 16 is a side view showing an example of a relationship between drawing door 201 and container 506 in the second exemplary embodiment of the present invention.

[0160] In the example shown in FIG. 16, side-surface blowhole 366 is formed such that the height of the lowermost side of side-surface blowhole 366 is located at a position (rear surface height H2 < lowermost side height H1 of the side-surface blowhole) higher than the rear surface of container 506. In the example, furthermore, since side-surface blowhole 366 is arranged above, when drawing door 201 is drawn together with container 506, the cold air in container 506 can be suppressed from flowing out of container 506, i.e., out of the storage compartment such as freezing compartment 104, and energy saving of refrigerator 100 can be achieved.

(Third Exemplary Embodiment)

[0161] A third exemplary embodiment of the present invention will be described below.

[0162] Also in the embodiment, points different from those in another embodiment will be mainly described. Descriptions of the same configuration, the same operation, and the same function may be omitted.

[0163] FIG. 17A is an enlarged view of a region F of drawing door 601 in the third exemplary embodiment of the present invention, and FIG. 17B is an enlarged view of a region F in the third exemplary embodiment. FIG. 18A is an exploded perspective view of drawing door 601 and container 606 in the third exemplary embodiment of the present invention, and FIG. 18B is an enlarged view of a region G in the third exemplary embodiment. FIG. 19A is a partially section view showing a configuration of a state in which drawing door 601 and container 606 are assembled in the third exemplary embodiment of the present invention when viewed from a side, and FIG. 19B is an enlarged view of a region H in the third exemplary embodiment.

[0164] As shown in FIG. 18A, container 606 includes a flange part that is formed around the opening to protrude externally. More specifically, front-surface flange part 206a is formed on the upper-end part of the front surface, side-surface flange part 206b is formed on the upper-end part of the side surface, and back-side flange part 206c is formed on the upper-end part of the back surface. Front-surface flange part 206a, side-surface flange part 206b, and back-side flange part 206c are continuously formed.

[0165] The flange parts are formed so as to fold the side walls on the front surface, the side surface, and the back surface, respectively, and desirably have hollow insides in terms of weight saving. The flange parts are formed to make it possible to increase the strength of the opening of container 606.

[0166] Step parts 262 are formed on a lower part of both side surfaces of container 606. Protrusion part 206d integrated with container 606 and protruding downward is formed on at least one of the front and rear sides. Each of protrusion parts 206d is inserted into notch-shaped fixing hole 302 formed in door frame 205.

[0167] As shown in FIG. 17A, a gap is formed between the upper side of container fixing part 301 and internal plate 211. Front-surface flange part 206a of container 606 is inserted into the gap to make it possible to fix container 606.

[0168] In this manner, front-surface flange part 206a of container 606 is fixed to container fixing part 301 of drawing door 601, and protrusion part 206d is fixed to door frame 205. In this manner, the lack of strength of the fitting part between rail apparatus 202 fitted on the lower part of drawing door 601 and drawing door 201 is compensated for to make it possible to smoothly open/close drawing door 601.

[0169] More specifically, a position that is a fulcrum of tensile strength is behind drawing door 601 to make it possible to decrease a moment acting on the fitting part. For this reason, the fitting part of top rail 203, the fitting part of rail apparatus 202, and the like can be prevented from being damaged.

[0170] As shown in FIG. 18B, inclined part 303 is formed on an upper surface of enlarged part 281 of door frame 205, and hole 302 is formed in a horizontal portion at a position where inclined part 303 is in contact with horizontal portion 304 of door frame 205.

[0171] In general, a user confirms a rough position of hole 302 and places container 606 on door frame 205. The user slightly moves container 606 back and forth from the state in which door frame 205 is placed and inserts protrusion part 206d into hole 302 to complete fixation.

[0172] With the configuration, when container 606 is placed ahead of the fixed position, protrusion part 206d is placed on inclined part 303, and protrusion part 206d easily slides on inclined part 303 by the weight of container 606. Thus, by slight operating physical force or the weight, protrusion part 206d is guided to hole 302 formed on the horizontal portion side being in contact with inclined part 303 and then inserted into hole 302.

[0173] On the other hand, when container 606 is placed at the rear of the fixed position, protrusion part 206d is placed on horizontal portion 304. Container 606 is moved forward to insert protrusion part 206d into hole 302. At this time, even though protrusion part 206d moves over horizontal portion 304, force to move protrusion part 206d forward by inclined part 303 being in contact with horizontal portion 304 is suppressed, and, as in the case in which container 606 is placed ahead of the fixed position, protrusion part 206d is guided to hole 302.

[0174] When inclined part 303 is formed in a curved shape and formed to be in contact with horizontal portion 304, protrusion part 206d can smoothly move on inclined part 303 and horizontal portion 304, and protrusion part 206d can be guided to hole 302.

[0175] Furthermore, in a state in which a rear end AB of hole 302 is in contact with a rear end TB of protrusion part 206d, a hook part of front-surface flange part 206a is located above container fixing part 301.

[0176] When container 606 is moved forward from the rear side on door frame 205 and installed, protrusion part 206d is placed on horizontal portion 304. Container 606 is moved forward, and, immediately before protrusion part 206d is inserted into hole 302, the rear end AB of hole 302 is brought into contact with the rear end TB of protrusion part 206d. Immediately before that, the hook part of front-surface flange part 206a is located above container fixing part 301. For this reason, at the moment protrusion part 206d is inserted into hole 302, container fixing part 301 is inserted into front-surface flange part 206a and fixed.

[0177] Thus, by an operation of only moving container 606 forward, container 606 can be surely fixed at two positions corresponding to drawing door 601 and door frame 205 so as to make it possible to improve the detachability/attachability.

[0178] Furthermore, in a state in which a rear end AF of hole 302 is in contact with a rear end TF of protrusion

part 206d, a hook part of front-surface flange part 206a is located above container fixing part 301.

[0179] When container 606 is moved backward from the front side on door frame 205 and installed, protrusion part 206d is placed on inclined part 303. In this state, when container 606 is moved backward, in the process immediately before protrusion part 206d is inserted into hole 302, a front end AF of hole 302 is in contact with a front end TF of protrusion part 206d. At this time, the hook part of front-surface flange part 206a is located above container fixing part 301. For this reason, at the moment protrusion part 206d is inserted into hole 302, container fixing part 301 is inserted into front-surface flange part 206a and fixed.

[0180] Thus, when, by an operation of only moving the container backward or the weight of container 606, container 606 is only placed on inclined part 303, container 606 can be fixed at two positions corresponding to drawing door 601 and door frame 205 so as to make it possible to improve the detachability/attachability.

[0181] FIG. 20A is a side view showing another example of container 706 in the third exemplary embodiment of the present invention, and FIG. 20B is a back view thereof.

[0182] Container 706 is formed such that container drop-out preventing rib 466 that covers the side part of the upper surface of door frame 205 is arranged outside step parts 262 serving as a door frame receiving part.

[0183] With the configuration, when container 706 is placed on door frame 205, the position of door frame 205 is limited to a position between side surface 467 of container 706 and container drop-out preventing rib 466. For this reason, container 706 can be prevented from dropping out of door frame 205.

[0184] That is, in the example, container 706 can be prevented from horizontally dropping out. Thus, in addition to an effect of moving container 606 in a fore and aft direction to fix container 606 as described above, container 706 can be reliably and easily installed, the detachability/attachability can be improved, and convenience for a user can be improved.

[0185] Container drop-out preventing rib 466 can be configured to cover inclined part 303 and horizontal portion 304 of door frame 205.

[0186] According to the configuration, even though the container 706 is moved on door frame 205 to fix and install container 706 at two position corresponding to drawing door 601 and door frame 205, container 706 can be reliably fixed to door frame 205 and prevented from dropping out.

(Fourth Exemplary Embodiment)

[0187] A fourth exemplary embodiment of the present invention will be described below.

[0188] Also in the embodiment, points different from those in another embodiment will be mainly described. Descriptions of the same configuration, the same operation, and the same function may be omitted.

[0189] FIG. 21 is an exploded perspective view of drawing door 201 and container 806 of refrigerator 100 in the fourth exemplary embodiment of the present invention.

[0190] Container 806 includes upper container 208 and lower container 906.

[0191] Container 906 includes a flange part that is formed around the opening to protrude externally. More specifically, front-surface flange part 206a is formed on the upper-end part of the front surface, side-surface flange part 206b is formed on the upper-end part of the side surface, and back-side flange part 206c is formed on the upper-end part of the back surface. Front-surface flange part 206a, side-surface flange part 206b, and back-side flange part 206c are continuously formed.

[0192] The flange parts are formed so as to fold the side walls on the front surface, the side surface, and the back surface, respectively, and desirably have hollow insides in terms of weight saving. The flange parts are formed to make it possible to increase the strength of the opening of lower container 906.

[0193] On step parts 262 formed on lower parts of both the side surfaces of lower container 906, protrusion part 206d integrated with lower container 906 and protruding downward is formed on at least one of the front and rear sides. Each of protrusion parts 206d is inserted into a notch-shaped fixing hole (not shown) formed in door frame 205.

[0194] Front-surface flange part 206a of lower container 906 is fixed to container fixing part 301 of drawing door 201, and protrusion part 206d is fixed to door frame 205. In this manner, the lack of strength of the fitting part between rail apparatus 202 fitted on the lower part of drawing door 201 and drawing door 201 is compensated for to make it possible to smoothly open/close drawing door 201.

[0195] More specifically, a position that is a fulcrum of tensile strength is behind drawing door 201 to make it possible to decrease a moment acting on the fitting part. For this reason, the fitting part of top rail 203 or the fitting part of rail apparatus 202 can be prevented from being damaged.

[0196] Lower container 906 is configured such that a wall surface height on the back surface is smaller than at least one of wall surface heights on the front surface and both the side surfaces. In other words, back-side flange part 206c is arranged at a position lower than that of at least one of front-surface flange part 206a and side-surface flange part 206b.

[0197] Upper container 208 includes a protrusion part (will be described later) and rail flange 209 at a side surface of upper container 208, and upper container 208 is slid on a rail groove (not shown) formed in side-surface flange part 206b and inner case 110 of container 706 to make it possible to move upper container 208 onto lower container 906 and into inner case 110.

[0198] FIG. 22 is a main-part section view of a sliding

part between upper container 208 and lower container 906 in the refrigerator 100 according to the fourth exemplary embodiment of the present invention when viewed from the front.

[0199] Upper container 208 includes external protrusion part 208a and internal protrusion part 208b at a side surface of upper container 208. Side-surface flange part 206b that is a side-surface upper-end part of lower container 906 includes external rib 210a and internal rib 210b.

[0200] External protrusion part 208a is arranged between external rib 210a and internal rib 210b. Internal protrusion part 208b is arranged on the inner-surface side of internal rib 210b. With the configuration, upper container 208 slides on lower container 906. The protrusion of internal protrusion part 208b is made higher than the protrusion of external protrusion part 208a to set an overlap width of external protrusion part 208a to about 7 mm and to set an overlap width of internal protrusion part 208b to about 15 mm, so that an internal overlap width is set to be larger than an external overlap width. With respect to a rib of lower container 906, the height of external rib 210a is set to be larger than the height of internal rib 210b.

[0201] An operation and a function of container 806 configured as described above will be described below.

[0202] Since the two ribs, i.e., external rib 210a and internal rib 210b are formed in a direction of depth on side-surface flange part 206b serving as a side-surface upper-end part of lower container 906, deformation of lower container 906 in a lateral direction can be reduced.

[0203] Furthermore, external protrusion part 208a and internal protrusion part 208b of upper container 208 that configure the sliding part between upper container 208 and lower container 906 configure a rail-like fitting structure between external rib 210a and internal rib 210b of lower container 906. For this reason, a deformation pressure in the lateral direction of lower container 906 can be diffused to upper container 208. Deformation in the lateral direction of lower container 906 can be reduced also by the rigidity of upper container 208.

[0204] It is important that a distance between each protrusion part and each rib that configure a fitting structure is set to a value at which the sliding function and improvement of the rigidity and the strength of lower container 906 can be compatible. For example, the distance is set to about 1 to 5 mm, and the flange part of lower container 906 is not deformed. In this state, the distance is set such that a gap for sliding is formed between each protrusion part and each rib, the gap is eliminated when the deformation exceeds a tolerance level, and a deformation preventing function of lower container 906 can be exerted.

[0205] Since upper container 208 itself also has two protrusion parts, i.e., external protrusion part 208a and internal protrusion part 208b, a structure having high rigidity can be obtained. For this reason, the upper container can indirectly contribute to prevention of deformation of lower container 906.

[0206] Internal protrusion part 208b closer to the side wall of upper container 208 is made higher than external protrusion part 208a to make it possible to increase the rigidity and the strength of upper container 208.

[0207] In lower container 906, external rib 210a is set to be higher than internal rib 210b to make it possible to suppress or prevent external protrusion part 208a from dropping out of the groove between external rib 210a and internal rib 210b.

[0208] As described above, according to the present invention, in the configuration in which rail apparatus 202 is fitted on both the left and right ends of the bottom portion of lower container 906, deformation of the upper part of lower container 906 that poses a problem can be suppressed and prevented. In this manner, the volume of lower container 906 can be further increased, and the capacity can be increased. In addition, improvement of convenience can be achieved by selectively using the upper and lower containers.

[0209] FIG. 23 is a perspective view showing another example of upper container 308 in refrigerator 100 according to the fourth exemplary embodiment of the present invention.

[0210] In upper container 308, internal protrusion part 208b is formed in the entire area of upper container 308 in the direction of depth. In this manner, since internal protrusion part 208b closely arranged on the side surface of upper container 308 is formed in the entire area of upper container 308 in the direction of depth, the rigidity and the strength of upper container 308 in the direction of depth can be improved.

[0211] FIG. 24 is a main-part section view of the sliding part between upper container 308 and lower container 906 in refrigerator 100 according to the fourth exemplary embodiment of the present invention when viewed from the front.

[0212] As shown in FIGS. 23 and 24, cold air communicating ports 212 are formed at predetermined intervals near internal protrusion part 208b on the side surface of upper container 308. In this manner, cold air supplied to upper container 308 can be supplied to lower container 906 through cold air communicating ports 212, and stored articles in lower container 906 can be cooled.

[0213] With the configuration, the rigidity and the strength of the side surface of upper container 308 are deteriorated by cold air communicating ports 212 formed near internal protrusion part 208b. However, internal protrusion part 208b is formed in the entire area of upper container 308 in the direction of depth to reinforce the rigidity and the strength of upper container 308. For this reason, even though cold air communicating ports 212 are formed at predetermined intervals near internal protrusion part 208b on the side surface of upper container 308, decrease in rigidity and strength of upper container 308 can be complemented.

[0214] FIG. 25 is a main-part enlarged view of side-surface flange part 206b in another example of lower container 716 of refrigerator 100 according to the fourth

exemplary embodiment of the present invention, and FIG. 26 is a main-part perspective view of a part near external protrusion part 208a at the front of the side surface in another example of upper container 408.

[0215] External protrusion part 208a is formed at the front of upper container 408, and first backward protrusion part 213 (groove part may be configured in place of the protrusion part) is formed behind a side-surface upper-end part (side-surface flange part 206b) of lower container 716. When upper container 408 is moved to the rearmost position, external protrusion part 208a is configured to be in contact with first backward protrusion part 213. External protrusion part 208a and first backward protrusion part 213 function as positioning stoppers that prevent upper container 408 from overrunning backward and dropping out.

[0216] As described above, in the example, external protrusion part 208a on the side surface of upper container 408 is used as a stopper that prevents lower container 716 from being deformed and prevents upper container 408 from dropping out to the rear caused by back-and-forth movement of upper container 408. In this manner, the following excellent effects are exerted. That is, a protrusion need not be formed on the bottom portion of upper container 408, upper container 408 can be prevented from dropping out to the rear, and the protrusion does not damage the stored articles in lower container 716.

[0217] FIG. 27 is a main-part perspective view showing a configuration of side-surface flange part 206b and rear-surface flange part 206c in still another example of lower container 726 in refrigerator 100 according to the fourth exemplary embodiment of the present invention.

[0218] In this case, a combination between upper container 408 shown in FIG. 26 and lower container 726 shown in FIG. 27 is supposed. Internal protrusion part 208b is arranged in front of upper container 408, and second backward protrusion parts 214 and 215 are formed on the rear side of a side-surface upper-end part (side-surface flange part 206b) of lower container 726 or a rear-surface upper-end part (side-surface flange part 206c) of lower container 726 (although two second backward protrusion parts 214 and 215 are shown in FIG. 27, one of them may be formed).

[0219] When upper container 408 is moved to the rearmost position, internal protrusion part 208b is brought into contact with second backward protrusion part 214 and second backward protrusion part 215. In this manner, internal protrusion part 208b and second backward protrusion parts 214 and 215 function as positioning stoppers that prevent upper container 408 from overrunning backward and dropping out.

[0220] As described above, in the configuration described above, internal protrusion part 208b on the side surface of upper container 408 can be used as a stopper that prevents upper container 408 from dropping out to the rear with back-and-forth movement of upper container 408. In this manner, the rigidity and the strength of lower container 726 can be improved, deformation can be prevented, and a stopper function can be realized. When second backward protrusion part 215 is formed on the rear-surface upper-end part (side-surface flange part 206), second backward protrusion part 215 need not be always newly formed as another one, and internal protrusion part 208b may be brought into contact with the wall surface of back-side flange part 206c by using the wall surface of the side-surface flange part 206c.

[0221] Internal protrusion parts 208b are arranged on both the side surfaces of upper container 408. For this reason, internal protrusion parts 208b are arranged on both the end parts of lower container 726, and the protrusion does not damage stored articles in lower container 726.

[0222] Next, a combination between lower container 716 shown in FIG. 25 and upper container 408 shown in FIG. 26 is supposed. In this case, external protrusion part 208a is formed in front of upper container 408, and forward protrusion part 216 is formed in front of the side-surface upper-end part (side-surface flange part 206b) of lower container 716 (groove part may be configured in place of the protrusion part). When upper container 408 is moved to the rearmost position, external protrusion part 208a is configured to be in contact with forward protrusion part 216. In this manner, external protrusion part 208a and forward protrusion part 216 function as positioning stoppers that prevent upper container 408 from overrunning forward and dropping out.

[0223] In the configuration, external protrusion part 208a on the side surface of upper container 408 can be used as a stopper that prevents upper container 408 from dropping out to the front with back-and-forth movement of upper container 408. In this manner, the rigidity and the strength of lower container 716 can be improved, deformation can be prevented, and a stopper function can be realized.

[0224] In this manner, lower container 716 and upper container 408 have positioning parts (stopper functions) to avoid upper container 408 from jumping out, and the convenience can be improved.

[0225] FIG. 28 is a section view showing still another example of lower container 736 in refrigerator 100 according to the fourth exemplary embodiment of the present invention when viewed from the front.

[0226] In lower container 736, frame 506a is configured with as a part other than lower container 736. More specifically, frame 506a is fitted in and fixed to upper-surface opening peripheral part 506d from above.

[0227] At this time, upper-surface opening peripheral part 506d has a shape having step 506f having a thickness equal to a sectional thickness of frame 506a such that an inner wall surface of lower container 736 and frame 506a do not form a step, and the side surface wall is formed not to have an uneven surface.

[0228] Thus, even when the lower part of lower container 736 is supported with door frame 205, the side surface wall of lower container 736 or the upper-surface

opening serving as leading edge parts of the front and rear surface walls can be reinforced with frame 506a having high rigidity. For this reason, even though articles of food or the like are stored, lower container 736 can be suppressed from being deformed.

[0229] Furthermore, sliding part 506e to slide upper containers 208, 308, and 408 back and forth is formed on an opposite surface (upper surface) of a surface with which upper-surface opening peripheral part 506d of frame 506a is brought into contact.

[0230] Sliding part 506e is formed to have a groove-like shape, and sliding surface parts formed on both the side parts of the bottom portions of upper containers 208, 308, and 408 move sliding part 506e back and forth to make it possible to move upper containers 208, 308 and 408 back and forth.

[0231] A PP resin is used as a molding material of lower container 736, and an ABS resin having rigidity and hardness higher than those of the PP resin is used as frame 506a. In this manner, an ABS resin having abrasion resistance and impact resistance higher than those of a PP resin is used as the material of frame 506a with which articles stored in upper containers 208, 308, and 408 easily contact when the stored articles are put in or pulled out in a sliding state of upper containers 208, 308, and 408. In this manner, the reliability can be ensured. Lower container 736 having an uneven shape is molded with a PP resin that has good moldability and is not easily damaged with stored articles to make it possible to ensure the quality of the surface.

[0232] Since frame 506a has high hardness, deflection in the fore and aft direction can be reduced, and upper containers 208, 308, and 408 can be prevented from dropping out of sliding part 506e of lower container 736. Since frame 506a that is in contact with the upper container is made of an ABS resin having high impact resistance and high abrasion resistance, the reliability can be ensured, and good dimensional stability can be obtained. Thus, errors between lots are small, and slidability can be maintained while ensuring dimensional accuracies of upper containers 208, 308, and 408.

(Fifth Exemplary Embodiment)

[0233] A fifth exemplary embodiment of the present invention will be described below.

[0234] Also in the embodiment, points different from those in another embodiment will be mainly described. Descriptions of the same configuration, the same operation, and the same function may be omitted.

[0235] FIG. 29 is a perspective view showing a fitting part between drawing door 251 and door frame 205 in refrigerator 100 according to a fifth exemplary embodiment of the present invention.

[0236] Internal plate 211 includes inner-surface recessed part 602 serving as a recessed part. Inner-surface recessed part 602 is formed in a recessed shape on the left and right of internal plate 211. A recessed part of inner-surface recessed part 602 may be reinforced with a metal member. Reinforcement of inner-surface recessed part 602 and reinforcement of door frame 205 can also be performed with the same reinforcing plate. A part of container 306 is inserted into inner-surface recessed part 602 to make it possible to connect container 306 to drawing door 251.

[0237] FIG. 30 is a partially section view showing a state where container 306 is fitted on drawing door 251 in refrigerator 100 according to the fifth exemplary embodiment of the present invention when viewed from a side.

[0238] Forward protrusion part 306e formed in front of container 306 is inserted into inner-surface recessed part 602 formed on internal plate 211 to make it possible to connect container 306 to drawing door 251.

[0239] Forward protrusion part 306e is formed by a vertical portion that substantially vertically rises with respect to front-surface flange part 206a and a horizontal portion that is bent upward from the vertical portion to be substantially horizontal to front-surface flange part 206a.

[0240] Inner-surface recessed part 602 is desirably formed by a vertical portion that is substantially vertically recessed with respect to internal plate 211 and a horizontal portion that is bent upward from the vertical portion to be substantially horizontal to internal plate 211 to make it reliable to connect container 306 and drawing door 251 to each other.

[0241] Inner-surface recessed part 602 has a size that is large enough to insert forward protrusion part 306e into inner-surface recessed part 602, and upper-end insert part 603 inserted between the vertical portion of forward protrusion part 306e and front-surface flange part 206a is formed on the upper-end of inner-surface recessed part 602. This configuration is desirable to make it reliable to connect container 306 and drawing door 251 to each other. Protrusion parts 206d of container 306 is inserted into a notch-shaped fixing hole (not shown) formed in door frame 205. In this manner, container 306 can be fixed to door frame 205.

[0242] A method of fitting container 306 will be described here. A rear part of container 306 is slightly raised, and the vertical portion of forward protrusion part 306e is inserted into inner-surface recessed part 602 while avoiding upper-end insert part 603. Thereafter, container 306 is horizontally arranged. In this manner, upper-end insert part 603 is inserted between the vertical portion of forward protrusion part 306e and front-surface flange part 206a, and protrusion part 206d is inserted into the fixing hole of door frame 205.

[0243] As described above, container 306 and drawing door 251 are fixed to each other to make it possible to decrease a moment that rotates drawing door 251 in a direction to cause drawing door 251 to fall forward. For this reason, door frame 205 and rail apparatus 202 can be prevented from being deformed.

[0244] Force that is generated by the moment that rotates drawing door 251 in the direction to cause drawing

door 251 to fall forward and raises the front part of container 306 upward is received by the upper surface of inner-surface recessed part 602 formed in drawing door 251 through forward protrusion part 306e. In this manner, container 306 can be prevented from rising upward.

[0245] Furthermore, forward protrusion part 306e is a protrusion part but made of a resin like container 306. Inner-surface recessed part 602 is a recessed part, and metal components are not arranged to protrude from drawing door 251 and container 306. In this manner, safety in use and a visual quality level are not lost. Since the metal component does not protrude into the storage compartment such as vegetable compartment 103, the metal component does not cause dew condensation.

[0246] Forward protrusion parts 306e are arranged on the left and right of container 306. Recessed parts are arranged on the left and right of internal plate 211 of drawing door 251. With the configuration, cold air can be efficiently circulated without increasing air trunk resistance of cooling cold air 367 flowing along internal plate 211. For this reason, an energy-saving operation can be realized.

[0247] The fixing part between top rail 203 and door frame 205 is covered with side-surface fin part 266. In this manner, with a simple configuration, a hand or a finger can be prevented from being injured by the fixing part. For this reason, safety is improved. When drawing door 251 is opened, the fixing part is not easily seen. For this reason, appearance design can be improved.

[0248] Furthermore, side-surface fin part 266 is formed on the lower side of the central part of container 306 in a vertical direction. In this manner, a large part of the side surface of container 306 can be formed in a flat shape in which an uneven surface is not formed. In this manner, air trunk resistance to cooling cold air 367 flowing from the front side to the rear side along the side surface of container 306 can be reduced. As a result, an input to a cooling fan (not shown) can be reduced, and energy saving of refrigerator 100 can be achieved. Since the side surface is flat, the design can be improved.

[0249] Furthermore, when container 306 is drawn together with drawing door 251, cold air in container 306 can be suppressed from flowing out of container 306, i.e., out of vegetable compartment 103, and energy saving of refrigerator 100 can be achieved.

[0250] For this reason, since container 306 has a bottom portion held by door frame 205, rail apparatus 202 does not divide a side space of container 306 into upper and lower parts, and dew condensation or frost formation is not caused by occurrence of a temperature difference between the upper and lower parts or a convection air pocket.

[0251] In the embodiment, container 306 is explained as a container stored in vegetable compartment 103. However, even in the container in which freezing compartment 104 is stored, the same effect as described above can be obtained.

Industrial Applicability

[0252] As has been described above, the present invention exerts a special effect that can provide a refrigerator including a drawing type storage compartment, wherein a container can be prevented from being deformed while ensuring a large actual volume of storing space of the storage compartment. Thus, the present invention can be used in a refrigerator including a drawing type storage compartment, and is useful because the present invention can also be applied to products such as a unit kitchen having a drawer in a field requiring a high quality level and good design.

Reference Signs List

[0253]

100 Refrigerator
101 Heat insulation main body
102 Refrigerating compartment
103 Vegetable compartment
104 Freezing compartment
105 Ice making compartment
106 Switching compartment
107 Thermally insulating door
108 Partition wall
108a Bottom-surface step part
110 Inner case
110a Side surface step part
111 Thermally insulating material
112 Outer case
145 Rotary support member
146 Rotary support member holding part
201, 251, 601 Drawing door
201a Handhold
202 Rail apparatus
203 Top rail
205 Door frame
206, 306, 406, 506, 606, 706, 806 Container
206a Front surface flange part
206b Side surface flange part
206c Rear surface flange part
206d Protrusion part
206e, 406e Bottom-surface rib
207 Packing
208, 308, 408 Upper container
208a External protrusion part
208b Internal protrusion part
209 Rail flange
210a External rib
210b Internal rib
211 Internal plate
212 Cold air communicating port
213 First backward protrusion part
214, 215 Second backward protrusion part
216 Forward protrusion part
221 Middle rail (moving rail)

222 Cabinet rail (fixed rail)
223 Rail fitting part
241 Bent part
261 Narrow part
262 Step part
263 First storing part
264 Second storing part
265 Protrusion part
266 Side-surface fin part
267 Bottom-surface internal rib part
268 Bottom-surface external rib part
270, 280 Rail holding member
270a, 280a Rail holding part
270b, 280b Internal fall prevention part
281 Enlarged part
301 Container fixing part
302 Hole
303 Inclined part
304 Horizontal portion
306e Forward protrusion part
365 Front-surface blowhole
366 Side-surface blowhole
367 Cooling cold air
400 Screw
401 Bottom surface wall
401a Bottom-surface step part
466 Container drop-out preventing rib
467 Side surface
506a Frame
506d Upper-surface opening peripheral part
506e Sliding part
506f Step
602 Inner surface recessed part
603 upper-end insert part
716, 726, 736, 906 Lower container

Claims

1. A refrigerator comprising:

a heat insulation main body (101) including an inner case (110), an outer case (112), and a thermally insulating material (111) filled between the inner case (110) and the outer case (112);
a storage compartment (103, 104) formed inside the heat insulation main body (101) and having an open front surface;
a container (206) arranged inside the storage compartment (103, 104) and having an open upper surface;
a drawing door (201) that openably/closably closes the open front surface of the storage compartment (103, 104); and
a rail apparatus (202) configured to move the drawing door (201) and the container back and forth, wherein
the container (206), when viewed from the front, has step parts (262) arranged at both ends of a bottom portion and held by the rail apparatus (202),
wherein the rail apparatus (202) includes a fixed rail (222) fixed to the inner case (110) and a moving rail (221) arranged to move with respect to the fixed rail (222),
characterized by
a narrow part (261) arranged between the step parts (262), and protrusion parts (265) arranged on both ends of the narrow part (261) and protruding downward,
wherein the protrusion part (265) protrudes downward from a lower surface of the moving rail (221).

2. The refrigerator according to claim 1, wherein the container (206) includes a side-surface blowhole (366) on a side surface, and the side-surface blowhole (366) is arranged above an upper surface of the rail apparatus (202).

3. The refrigerator according to claim 1, further comprising:

a door frame (205) fixed to the drawing door (201), connected to the rail apparatus (202), and holding the container (206);
a protrusion part (206d) formed on each of the step parts (262) of the container (206); and
a hole (302) formed in the door frame (205), wherein
the protrusion part (206d) has a shape that can be inserted into the hole (302).

4. The refrigerator according to claim 1, wherein the container (806) includes a lower container (906) having an open upper surface and an upper container (208) arranged above an upper part of the lower container,
the lower container (906) is held at both ends of a bottom portion with the rail apparatus (202),
an external rib (210a) and an internal rib (210b) are formed on a side-surface upper-end part of the lower container (906),
an external protrusion part (208a) and an internal protrusion part (208b) are formed on a side surface of the upper container (208), and
the external protrusion part (208a) is arranged between the external rib (210a) and the internal rib (210b), the internal protrusion part (208b) is arranged on an inner-surface side of the internal rib (210b), and the upper container (208) slides on the lower container (906).

5. The refrigerator according to any one of claims 1 to 4, wherein the lower container (716) and the upper container (408) have positioning parts (208a, 213).

Patentansprüche

1. Kühlschrank, umfassend:

ein Wärmedämmgehäuse (101), enthaltend ein inneres Gehäuse (110), ein äußeres Gehäuse (112) und einen Wärmedämmstoff (111), eingefüllt zwischen dem inneren Gehäuse (110) und dem äußeren Gehäuse (112);
ein Lagerfach (103, 104), ausgebildet in dem Wärmedämmgehäuse (101) und mit einer offenen Vorderfläche;
einen Behälter (206), angeordnet im Lagerfach (103, 104) und mit einer offenen oberen Fläche;
eine Schubladentür (201), die die offene Vorderfläche des Lagerfachs (103, 104) öffenbar/schließbar verschließt; und
eine Schienenvorrichtung (202), ausgelegt, die Schubladentür (201) und den Behälter vor und zurück zu bewegen, wobei
der Behälter (206), gesehen von vorn, an beiden Enden eines Bodenbereichs angeordnete und durch die Schienenvorrichtung (202) gehaltene Stufenteile (262) aufweist,
wobei die Schienenvorrichtung (202) eine feste Schiene (222), befestigt am inneren Gehäuse (110), und eine bewegliche Schiene (221) aufweist, angeordnet, sich bezüglich der festen Schiene (222) zu bewegen,
gekennzeichnet durch
einen schmalen Teil (261), angeordnet zwischen den Stufenteilen (262), und Vorsprungsteile (265), angeordnet an beiden Enden des schmalen Teils (261) und nach unten ragend,
wobei der Vorsprungsteil (265) von einer unteren Fläche der beweglichen Schiene (221) nach unten ragt.

2. Kühlschrank nach Anspruch 1, wobei der Behälter (206) ein Seitenflächen-Ausblasloch (366) an einer Seitenfläche enthält und das Seitenflächen-Ausblasloch (366) oberhalb einer oberen Fläche der Schienenvorrichtung (202) angeordnet ist.

3. Kühlschrank nach Anspruch 1, weiter umfassend:

einen Türrahmen (205), befestigt an der Schubladentür (201), verbunden mit der Schienenvorrichtung (202), und den Behälter (206) haltend;
einen Vorsprungsteil (206d), ausgebildet an jedem der Stufenteile (262) des Behälters (206); und
ein Loch (302), ausgebildet im Türrahmen (205), wobei
der Vorsprungsteil (206d) eine Form aufweist, die in das Loch (302) eingesetzt werden kann.

4. Kühlschrank nach Anspruch 1, wobei der Behälter (806) einen unteren Behälter (906) mit einer offenen oberen Fläche und einen oberen Behälter (208) enthält, angeordnet oberhalb eines oberen Teils des unteren Behälters,
der untere Behälter (906) an beiden Enden eines Bodenbereichs mit der Schienenvorrichtung (202) gehalten ist,
eine äußere Rippe (210a) und eine innere Rippe (210b) auf einem Teil am oberen Ende einer Seitenfläche des unteren Behälters (906) ausgebildet sind,
ein äußerer Vorsprungsteil (208a) und ein innerer Vorsprungsteil (208b) an einer Seitenfläche des oberen Behälters (208) ausgebildet sind, und
der äußere Vorsprungsteil (208a) zwischen der äußeren Rippe (210a) und der inneren Rippe (210b) angeordnet ist, der innere Vorsprungsteil (208b) auf einer Innenflächenseite der inneren Rippe (210b) angeordnet ist, und der obere Behälter (208) auf dem unteren Behälter (906) gleitet.

5. Kühlschrank nach einem beliebigen der Ansprüche 1 bis 4, wobei der untere Behälter (716) und der obere Behälter (408) Positionierungsteile (208a, 213) aufweisen.

Revendications

1. Réfrigérateur comportant:

un corps principal (101) d'isolation thermique comprenant un caisson intérieur (110), un caisson extérieur (112) et une matière thermiquement isolante (111) remplie entre le caisson intérieur (110) et le caisson extérieur (112);
un compartiment de stockage (103, 104) formé au sein du corps principal d'isolation thermique (101) et possédant une surface frontale ouverte;
un conteneur (206) disposé au sein du compartiment de stockage (103, 104) et possédant une surface supérieure ouverte;
une porte coulissante (201) qui limite de manière ouvrable/fermable la surface frontale ouverte du compartiment de stockage (103, 104); et
un appareil de rail (202) configuré pour déplacer la porte coulissante (201) et le conteneur en arrière et en avant, dans lequel
le conteneur (206), lorsqu'il est vu de l'avant, comporte des parties à palier (262) disposées aux deux extrémités d'une partie de bas et tenues par le dispositif de rail (202),
dans lequel le dispositif de rail (202) comprend un rail fixe (222) fixé sur le caisson intérieur (110) et un rail mobile (221) disposé pour se déplacer par au rail fixe (222),
caractérisé par
une partie mince (261) disposée entre les parties à palier (262), et des parties protubérantes

(265) disposées sur les deux extrémités de la partie mince (261) et faisant saillie vers le bas, dans lequelp la partie protubérante (265) faisant saillie vers le bas depuis une surface inférieure du rail mobile (221).

2. Réfrigérateur selon la revendication 1, dans lequel le conteneur (206) comporte un trou de soufflage (366) de surface latérale sur une surface latérale et le trou de soufflage (366) de surface latérale est disposé au-dessus d'une surface de haut de l'appareil de rail (202).

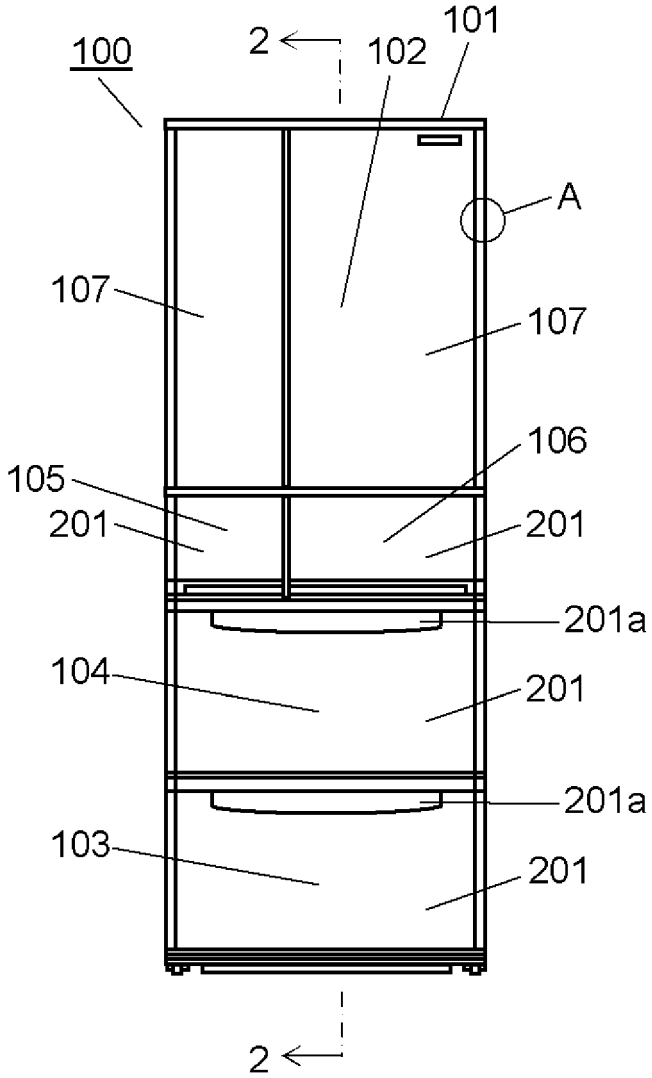
3. Réfrigérateur selon la revendication 1, comprenant en outre:

un encadrement de porte (205) fixé sur la porte coulissante (201), connecté à l'appareil de rail (202) et tenant le conteneur (206);
une partie protubérante (206d) formée sur chacune des parties à palier (262) du conteneur (206); et
un trou (302) formé dans l'encadrement de porte (205), sachant que la partie protubérante (206d) possède une forme qui peut être insérée dans le trou (302).

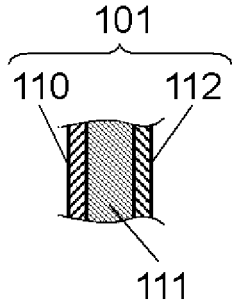
4. Réfrigérateur selon la revendication 1, dans lequel le conteneur (806) contient un conteneur inférieur (906) possédant une surface supérieure ouverte, et un conteneur supérieur (208) disposé au-dessus d'une partie supérieure du conteneur inférieur,
le conteneur inférieur (906) est tenu aux deux extrémités d'une partie inférieure avec l'appareil de rail (202),
une nervure extérieure (210a) et une nervure intérieure (210b) sont formées sur une partie d'extrémité supérieure de surface latérale du conteneur inférieur (906),
une partie protubérante extérieure (208a) et une partie protubérante intérieure (208b) sont formées sur une surface latérale du conteneur supérieur (208), et la partie protubérante extérieure (208a) est disposée entre la nervure extérieure (210a) et la nervure intérieure (210b), la partie protubérante intérieure (208b) est disposée sur un côté de surface intérieure de la nervure intérieure (210b) et le conteneur supérieur (208) coulisse sur le conteneur inférieur (906).

5. Réfrigérateur selon l'une quelconque des revendications 1 à 4, dans lequel le conteneur inférieur (716) et le conteneur supérieur (408) possèdent des pièces de positionnement (208a, 213).

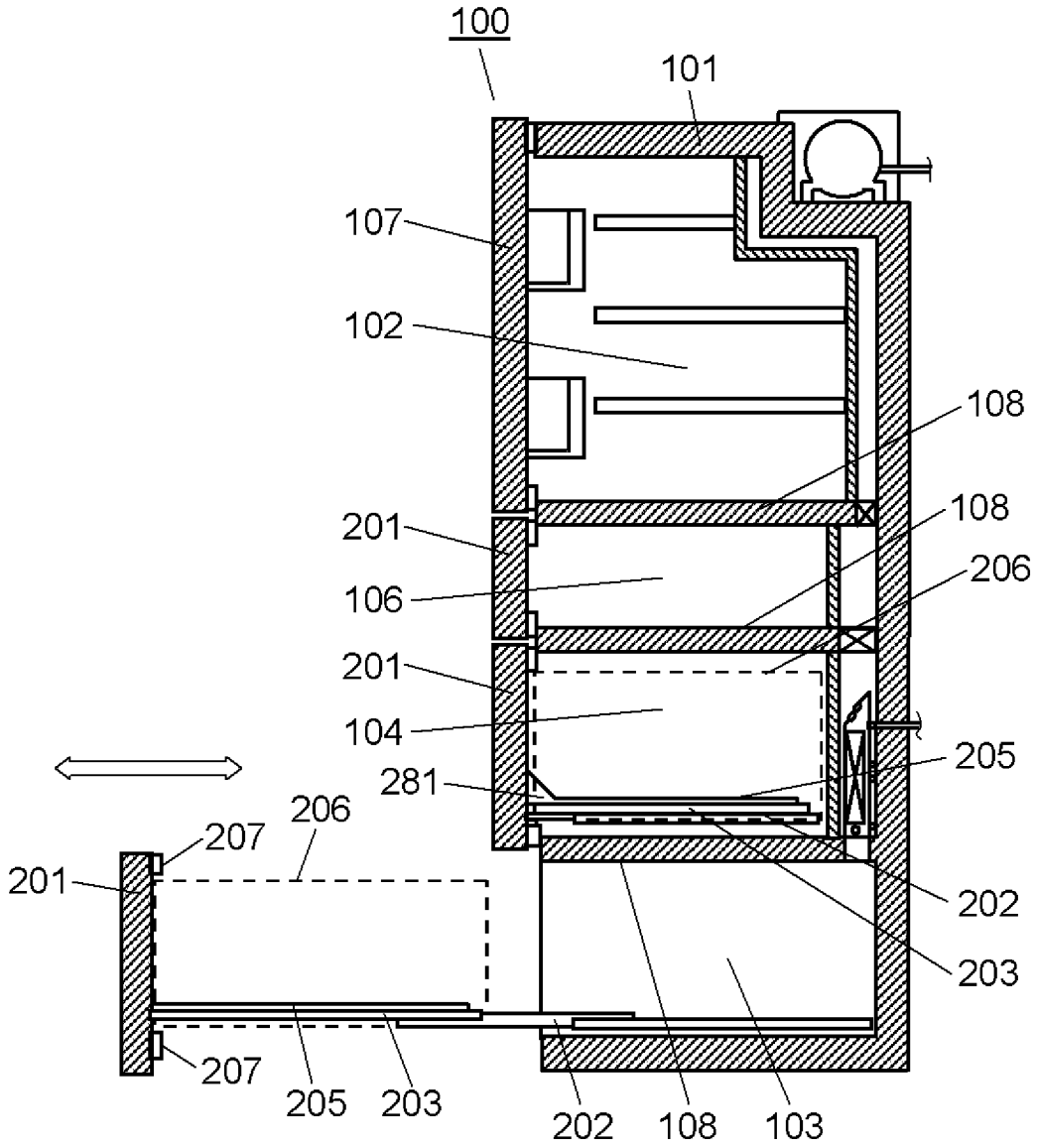
[Fig. 1A]


100
2
102
101
A
107
107
106
105
201
201
201a
104
201
201a
103
201
2

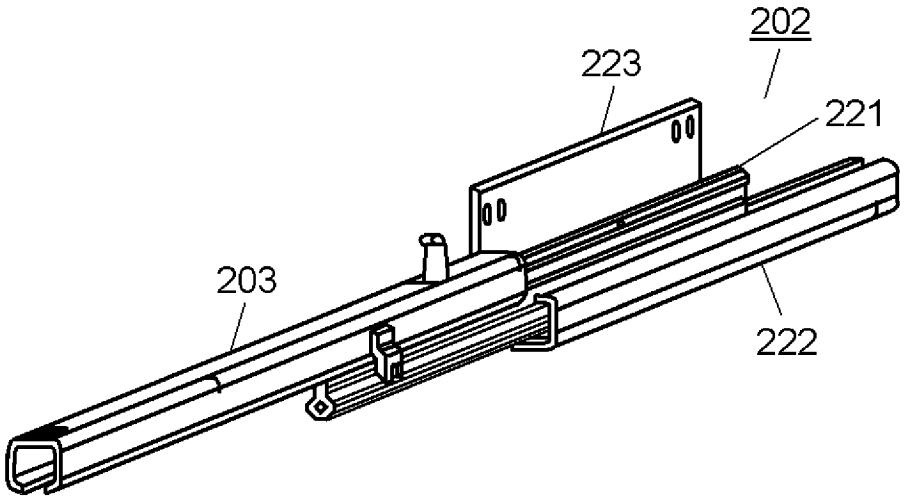
[Fig. 1B]


101
110
112
111

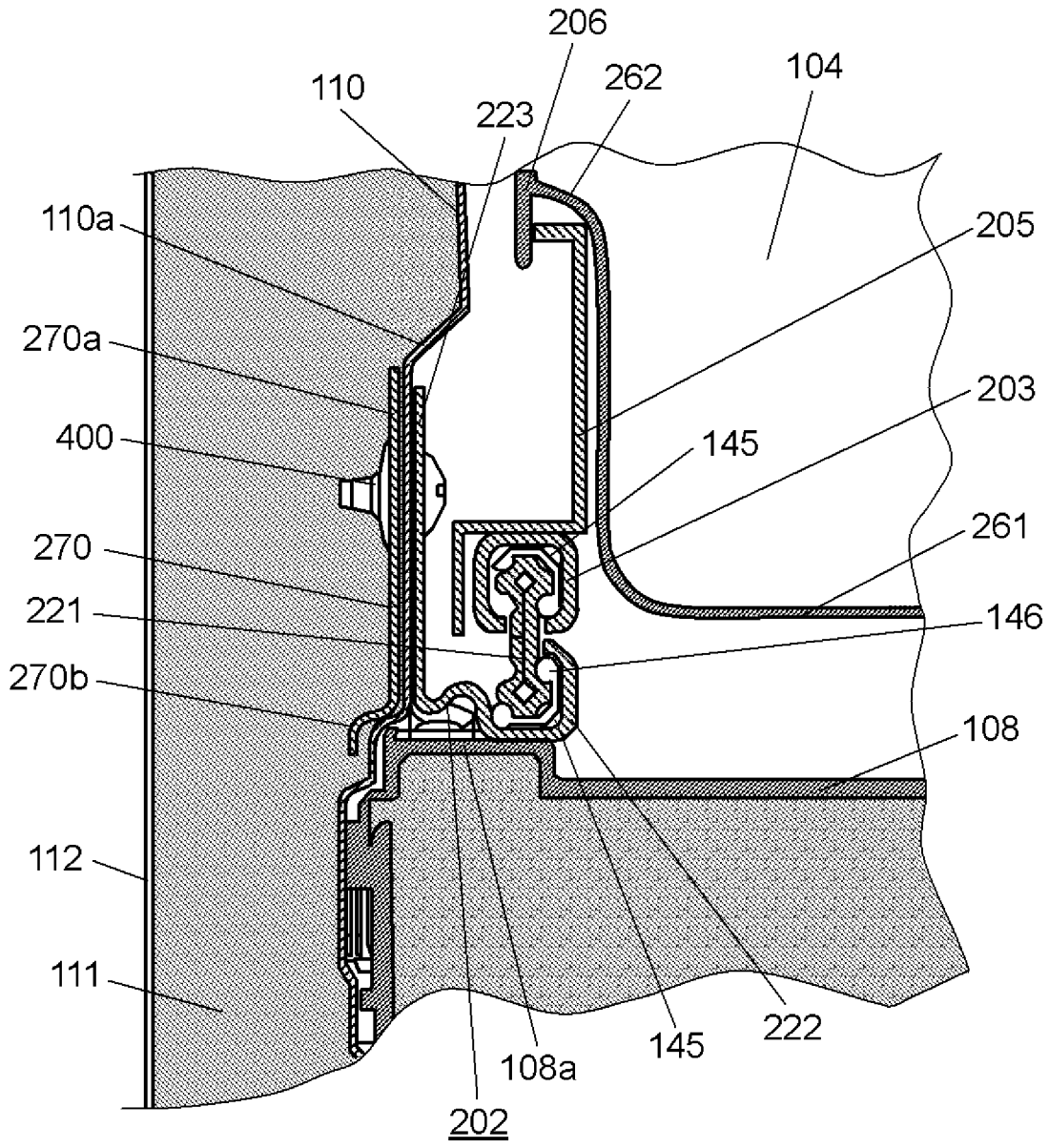
[Fig. 2]


100
101
107
102
108
108
201
206
106
201
104
205
281
206
207
201
202
203
207
205
203
202
108
103

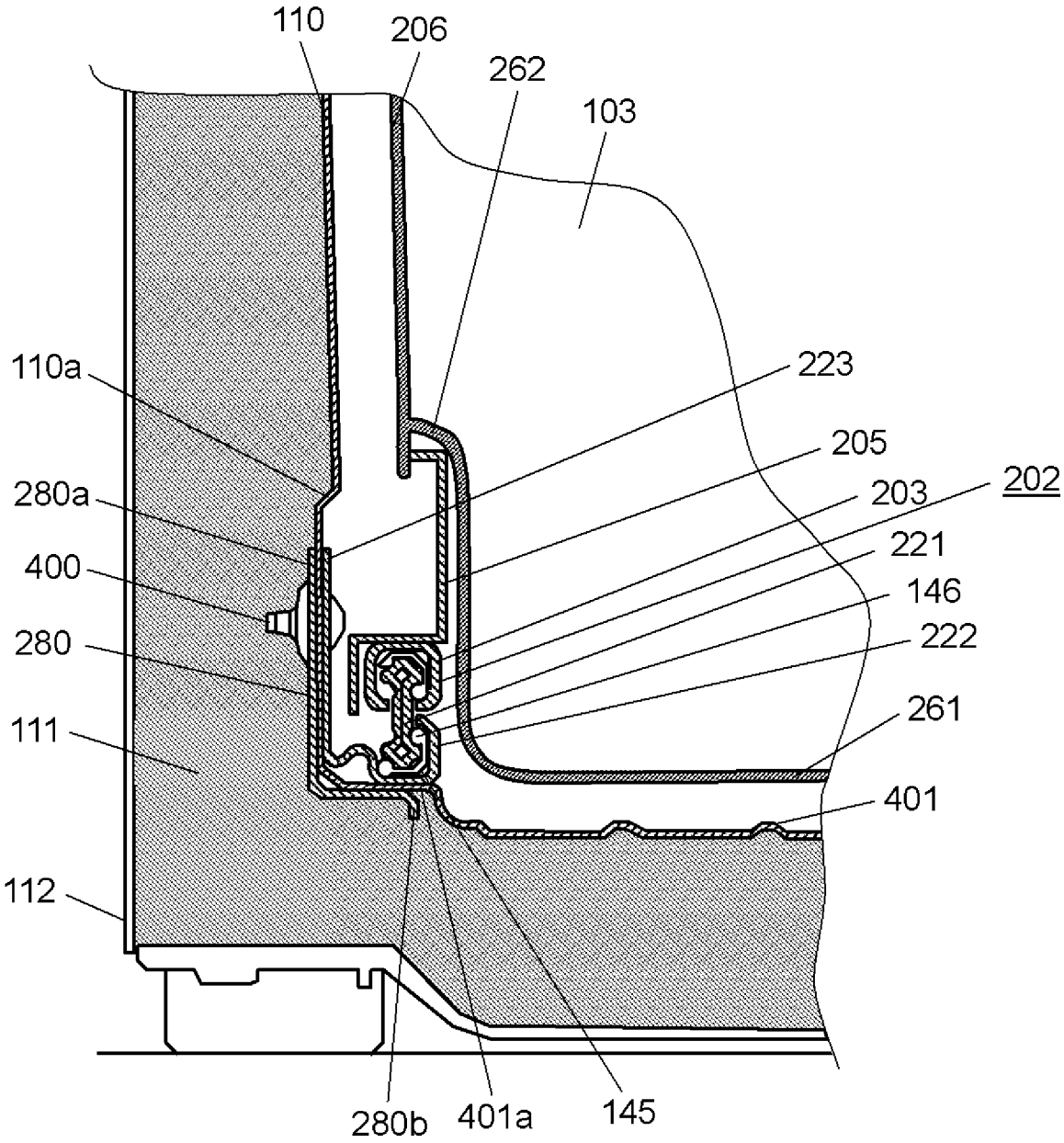
[Fig. 3]


202
223
221
203
222

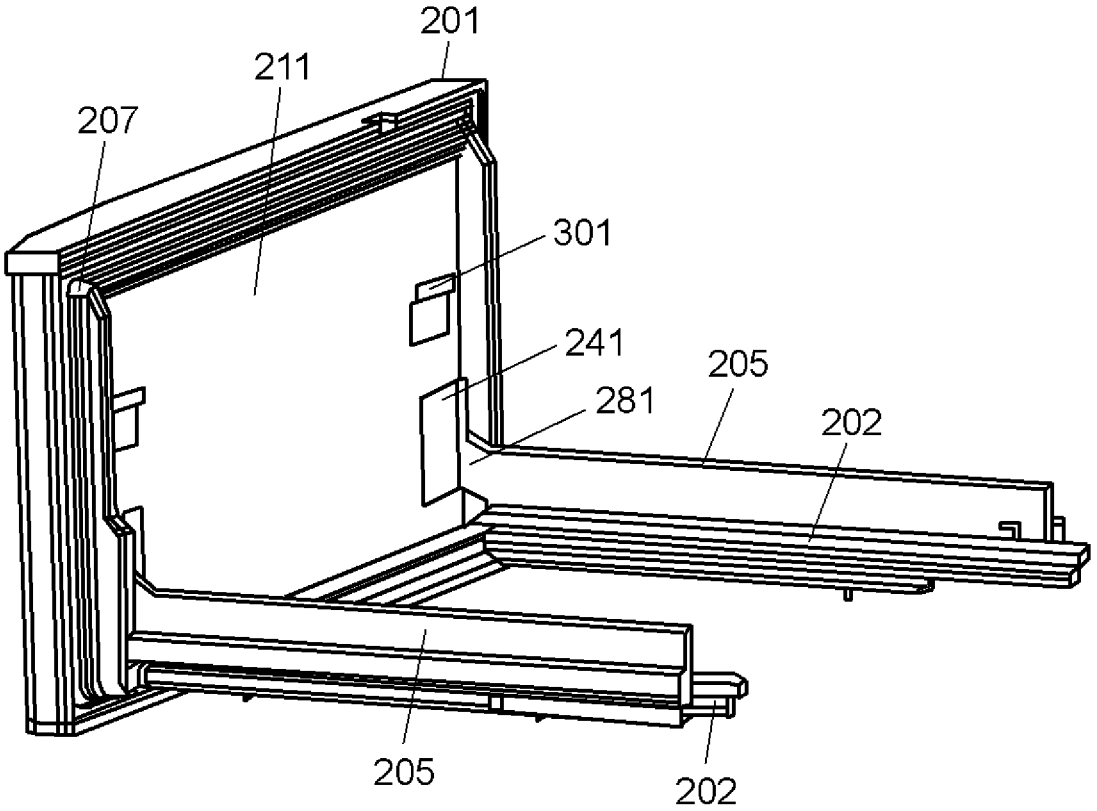
[Fig. 4]


206
110
262
104
223
110a
205
270a
203
400
145
261
270
221
146
270b
108
112
111
222
145
108a
202

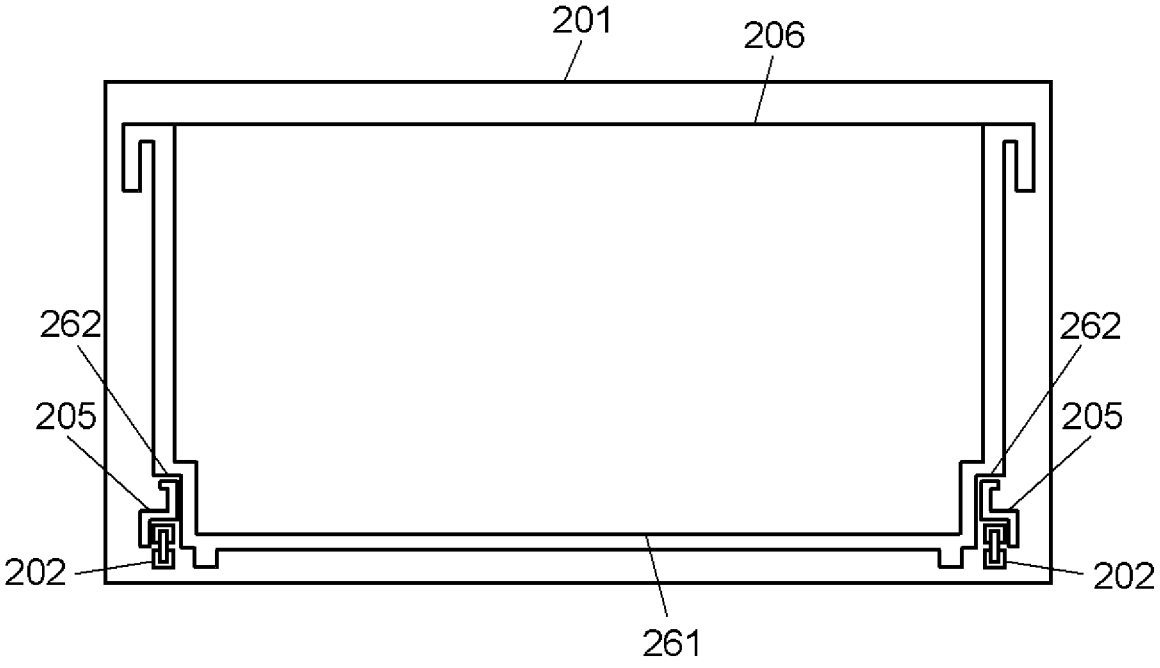
[Fig. 5]


110
206
262
103
110a
223
205
202
203
280a
221
400
146
280
222
261
111
401
112
280b
401a
145

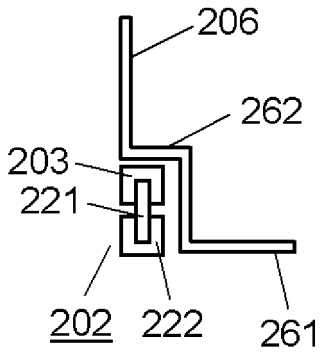
[Fig. 6]


201
211
207
301
241
205
281
202
205
202

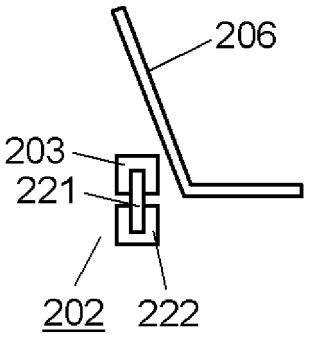
[Fig. 7]


201
206
262
205
262
205
202
202
261

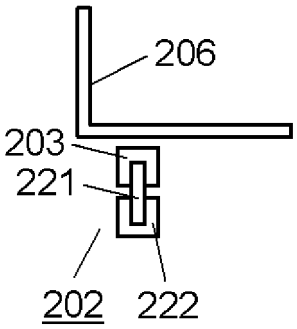
[Fig. 8A]



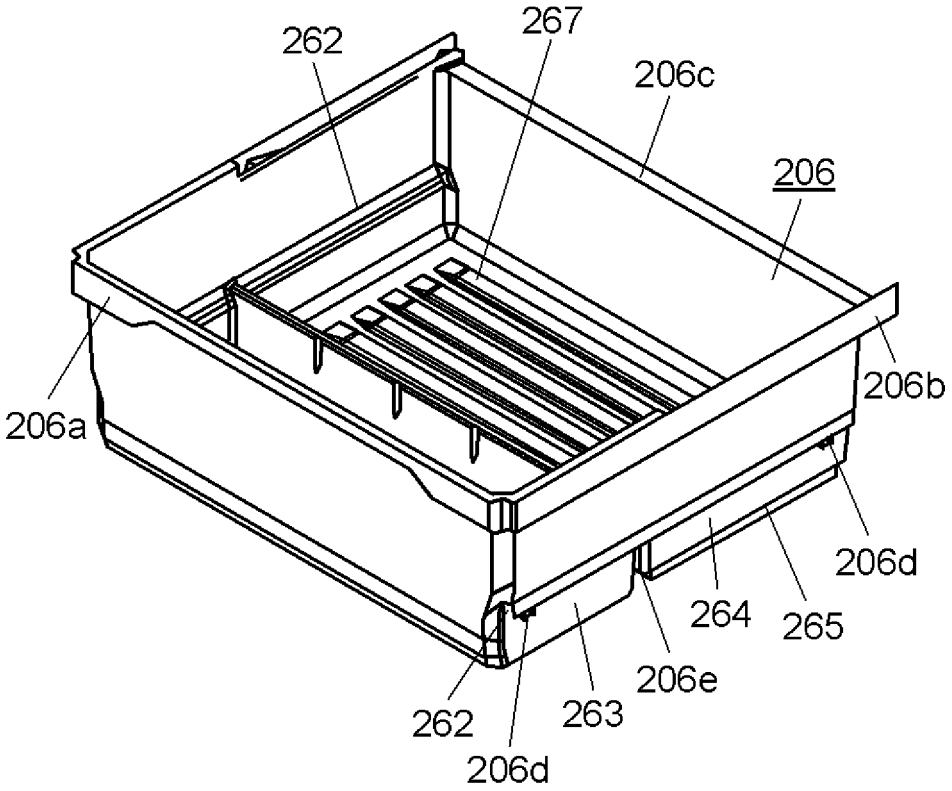
[Fig. 8B]



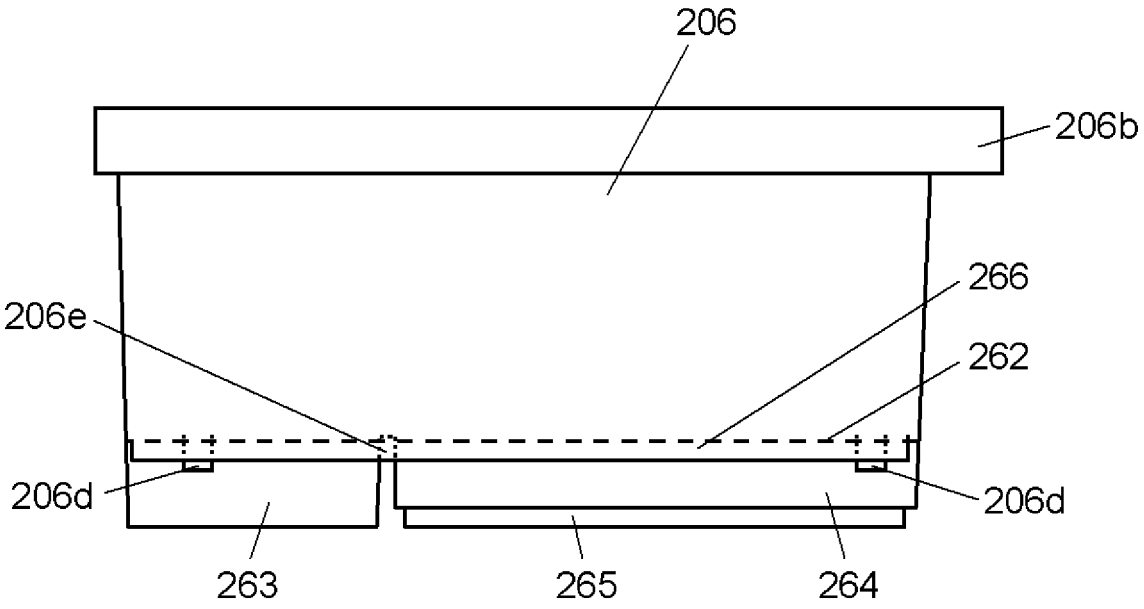
[Fig. 8C]



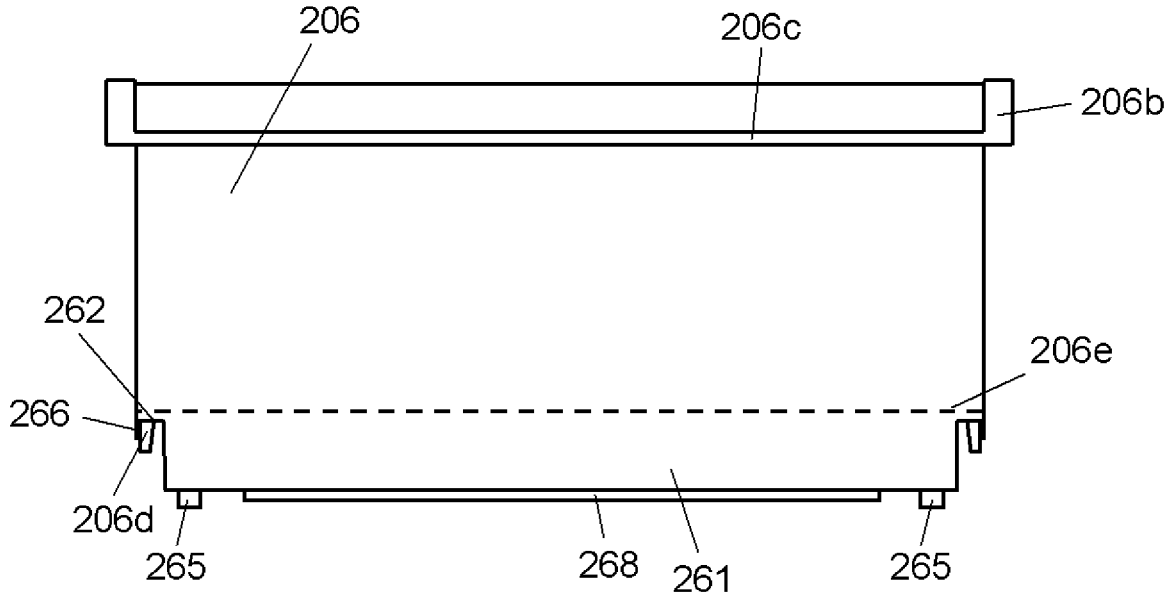
[Fig. 9]


262
267
206c
206
206a
206b
206d
264
265
206e
262
263
206d

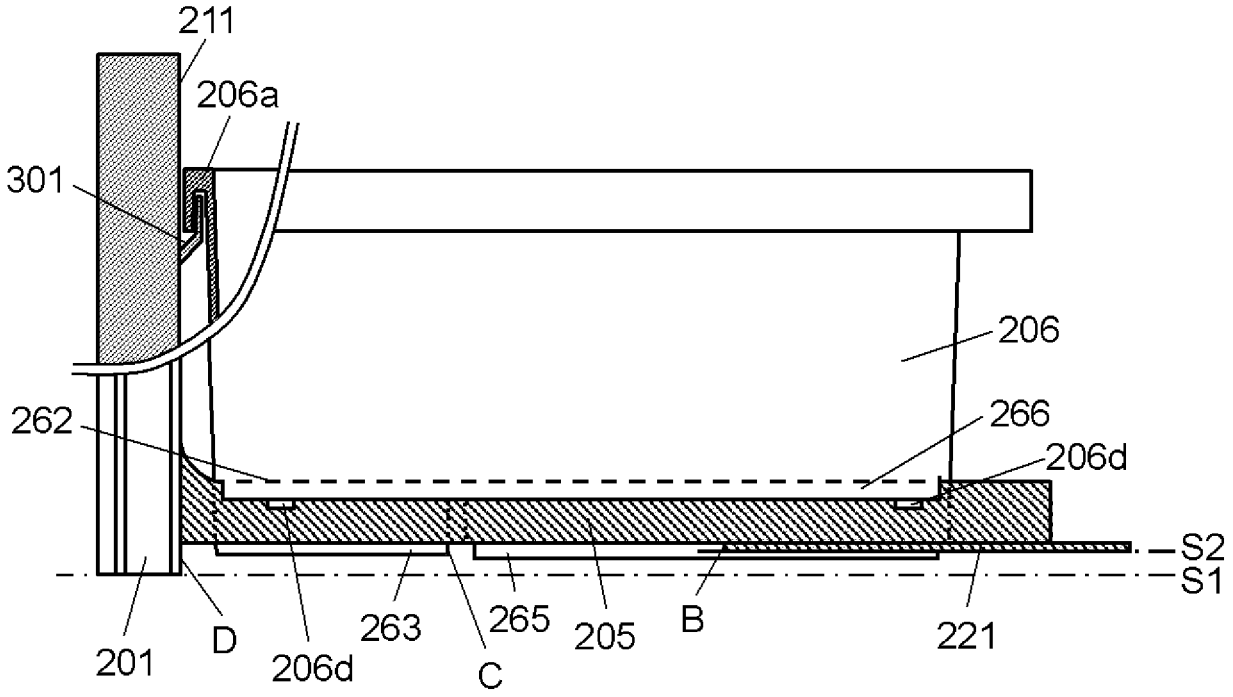
[Fig. 10]


206
206b
206e
266
262
206d
206d
263
265
264

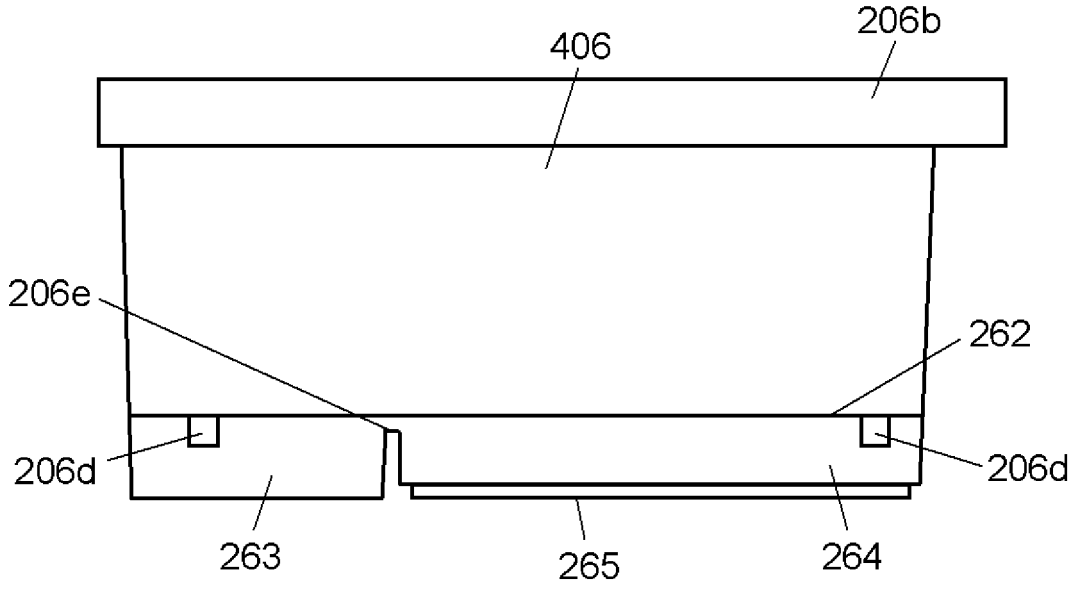
[Fig. 11]


206
206c
206b
262
206e
266
206d
265
268
261
265

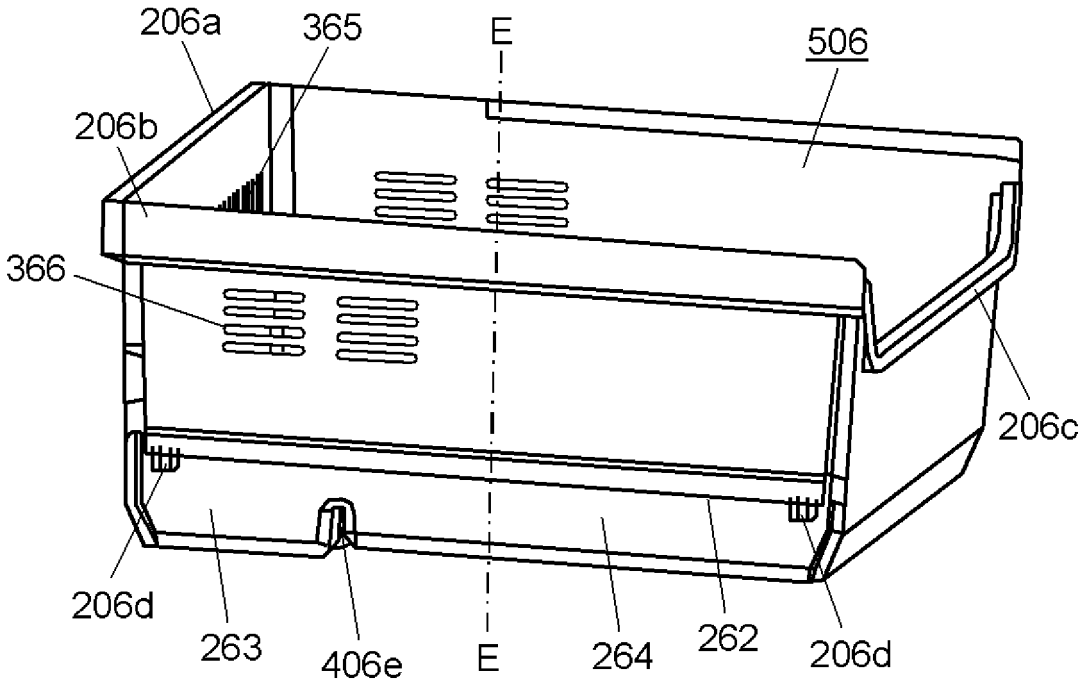
[Fig. 12]


211
206a
301
206
262
266
206d
S2
S1
201
D
206d
263
C
265
205
B
221

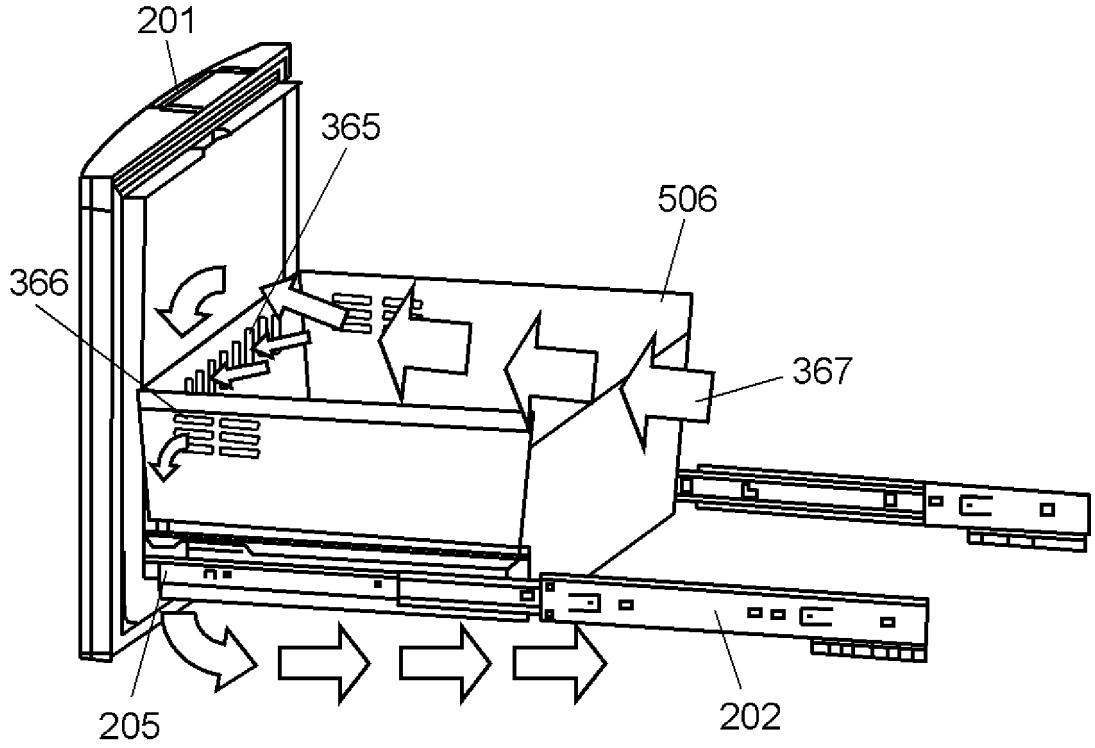
[Fig. 13]


406
206b
206e
262
206d
206d
263
265
264

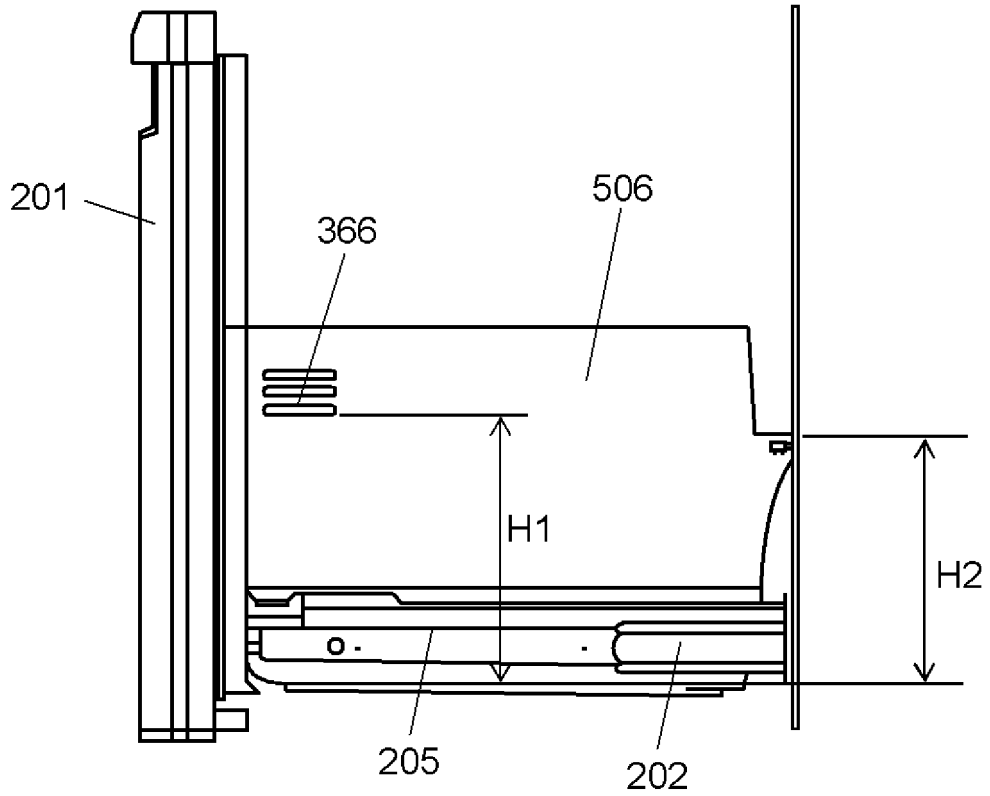
[Fig. 14]


206a
365
E
506
206b
366
206c
206d
263
406e
E
264
262
206d

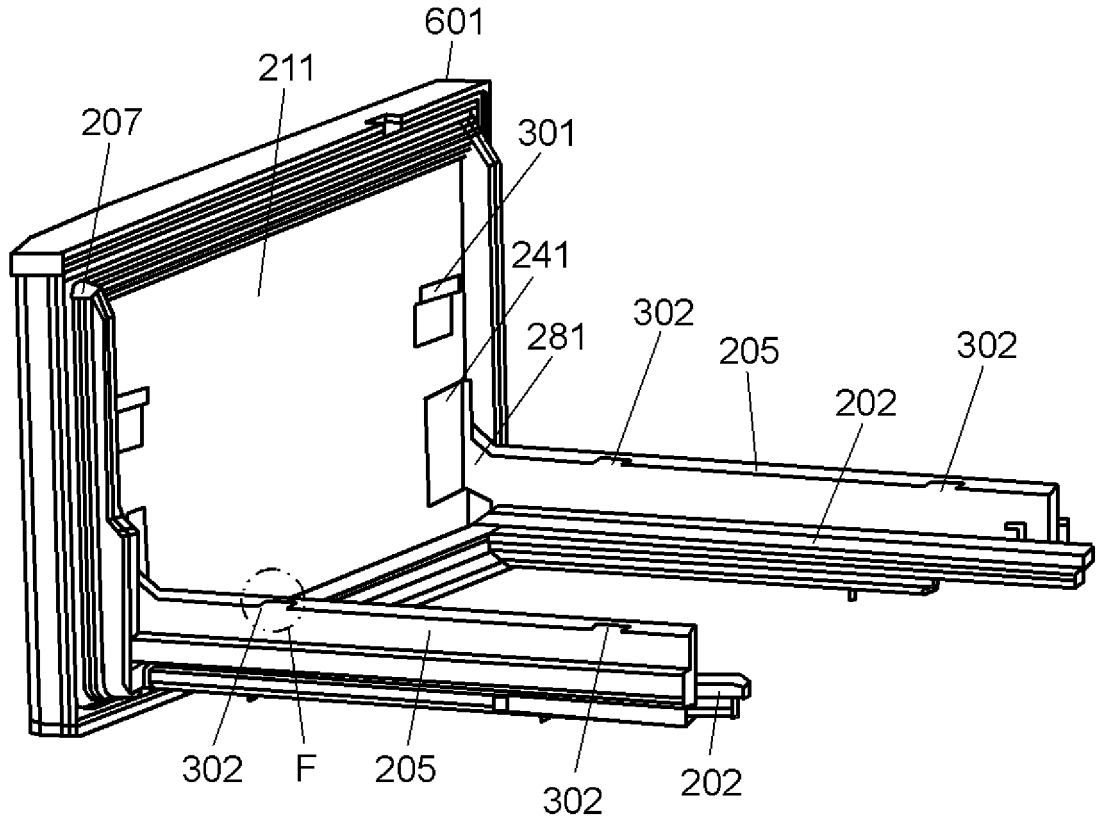
[Fig. 15]



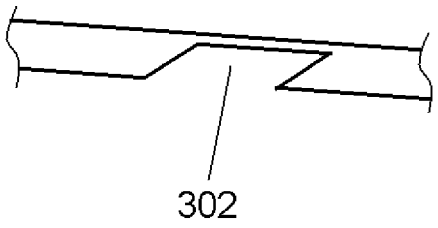
[Fig. 16]



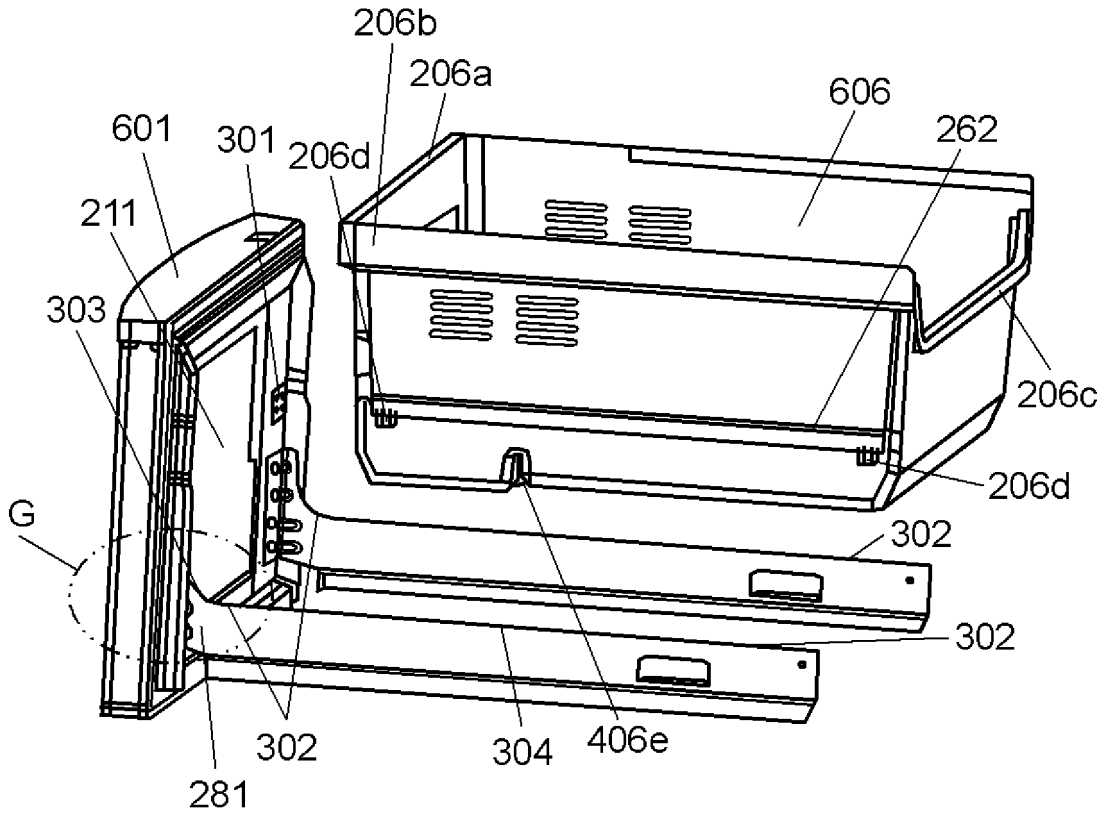
[Fig. 17A]



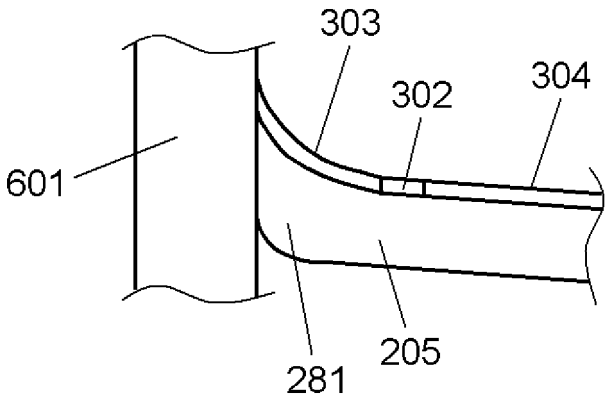
[Fig. 17B]



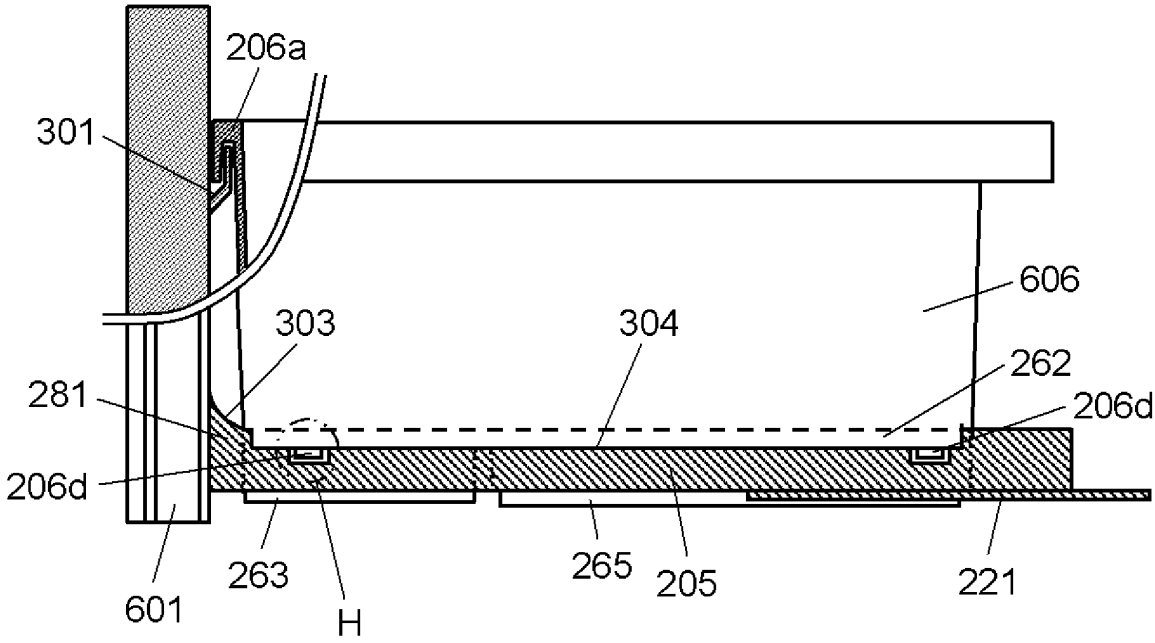
[Fig. 18A]



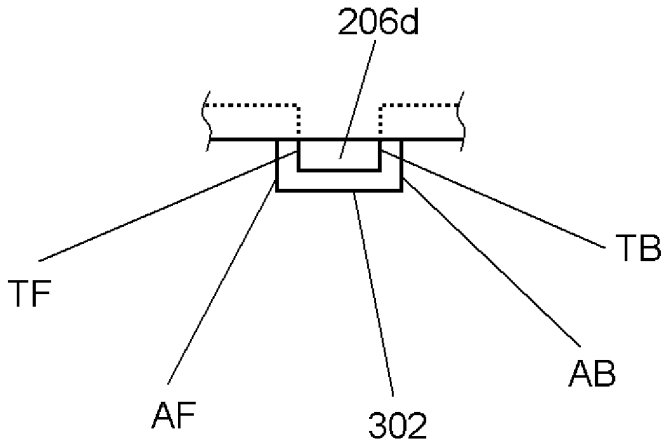
[Fig. 18B]



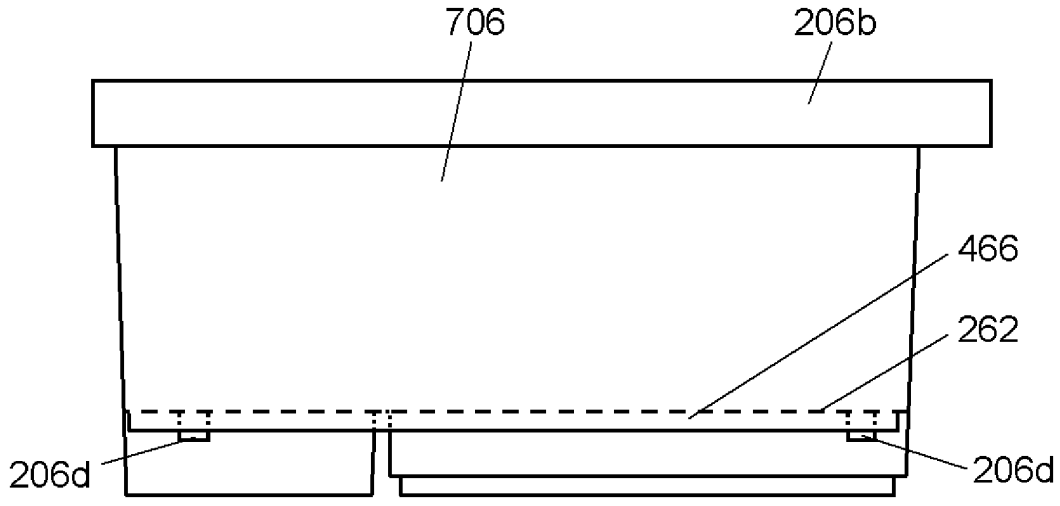
[Fig. 19A]



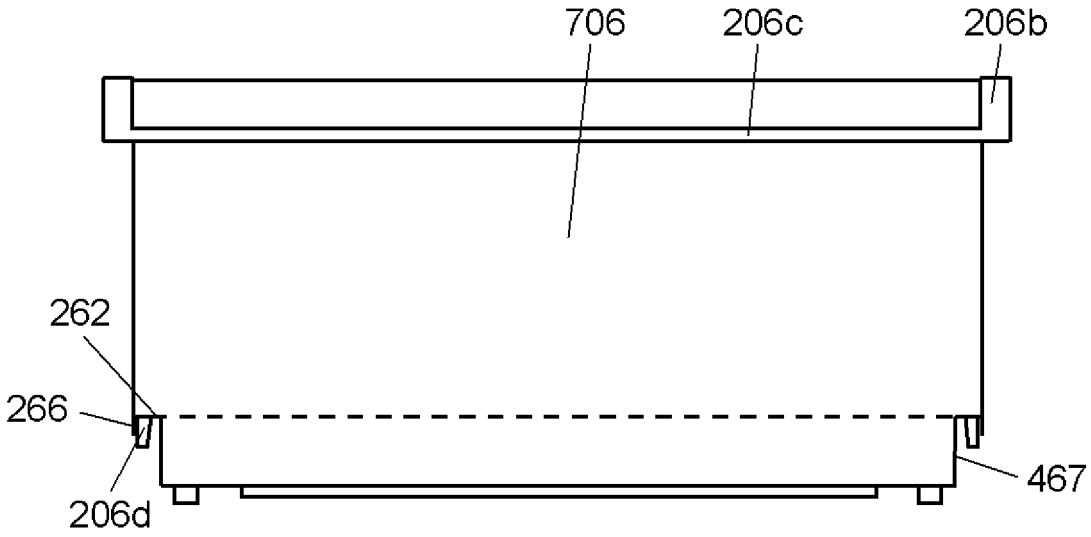
[Fig. 19B]



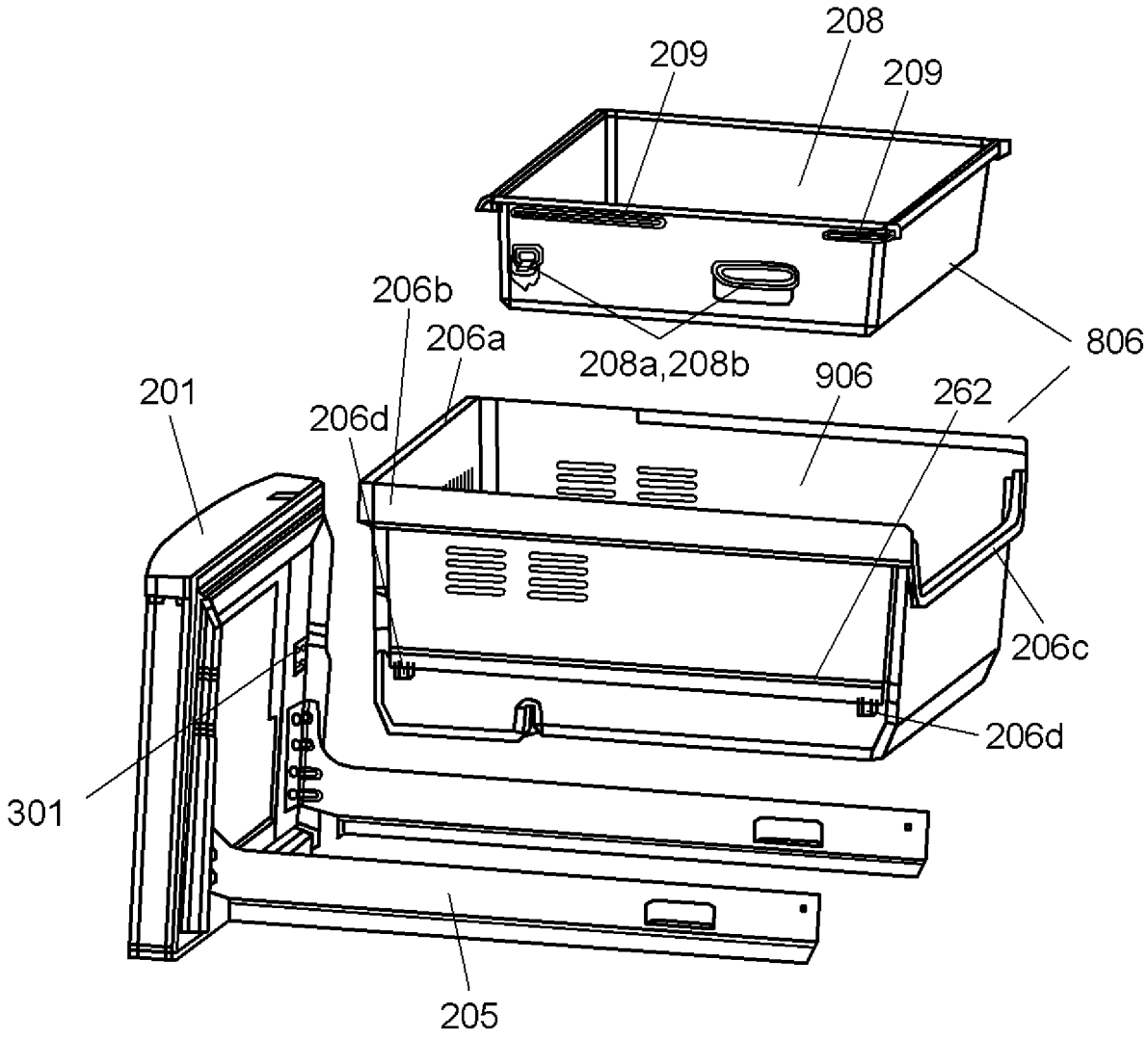
[Fig. 20A]



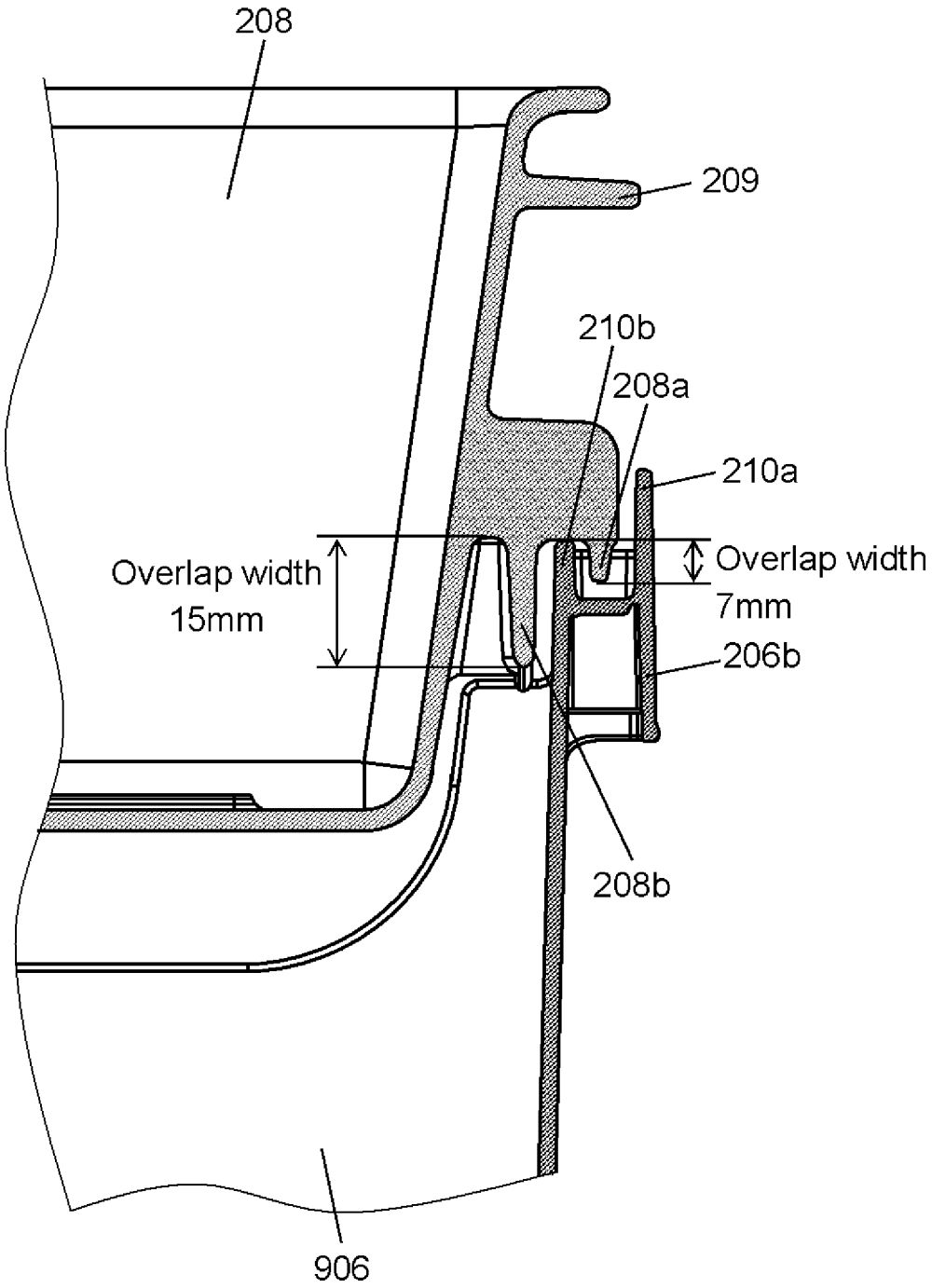
[Fig. 20B]



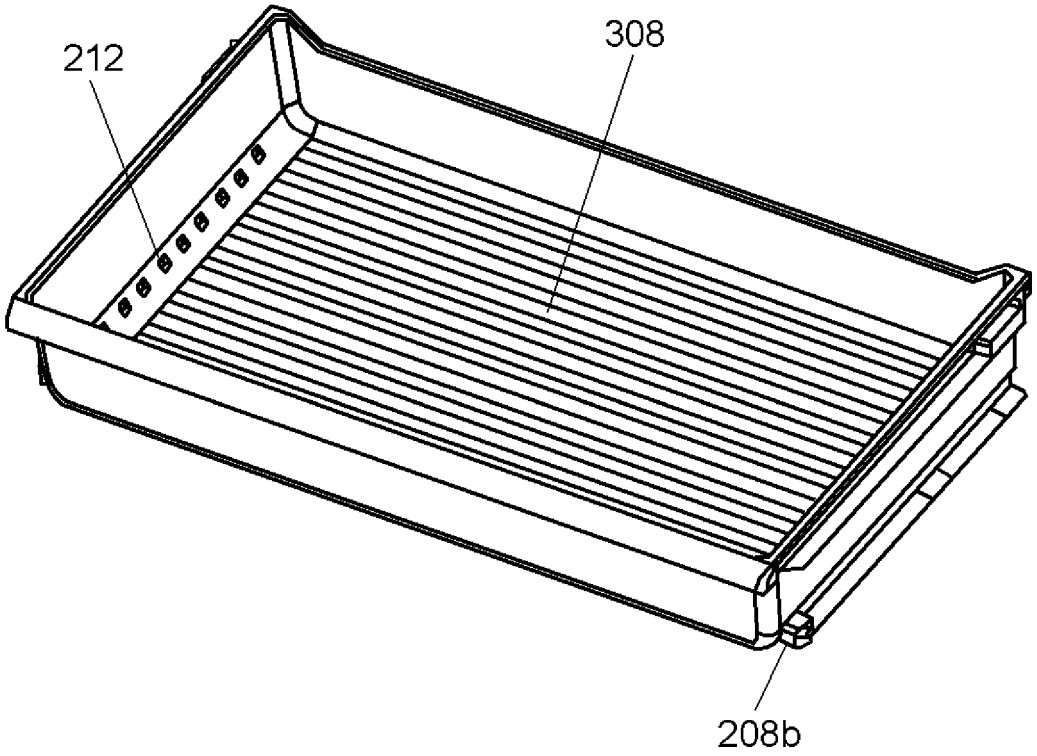
[Fig. 21]



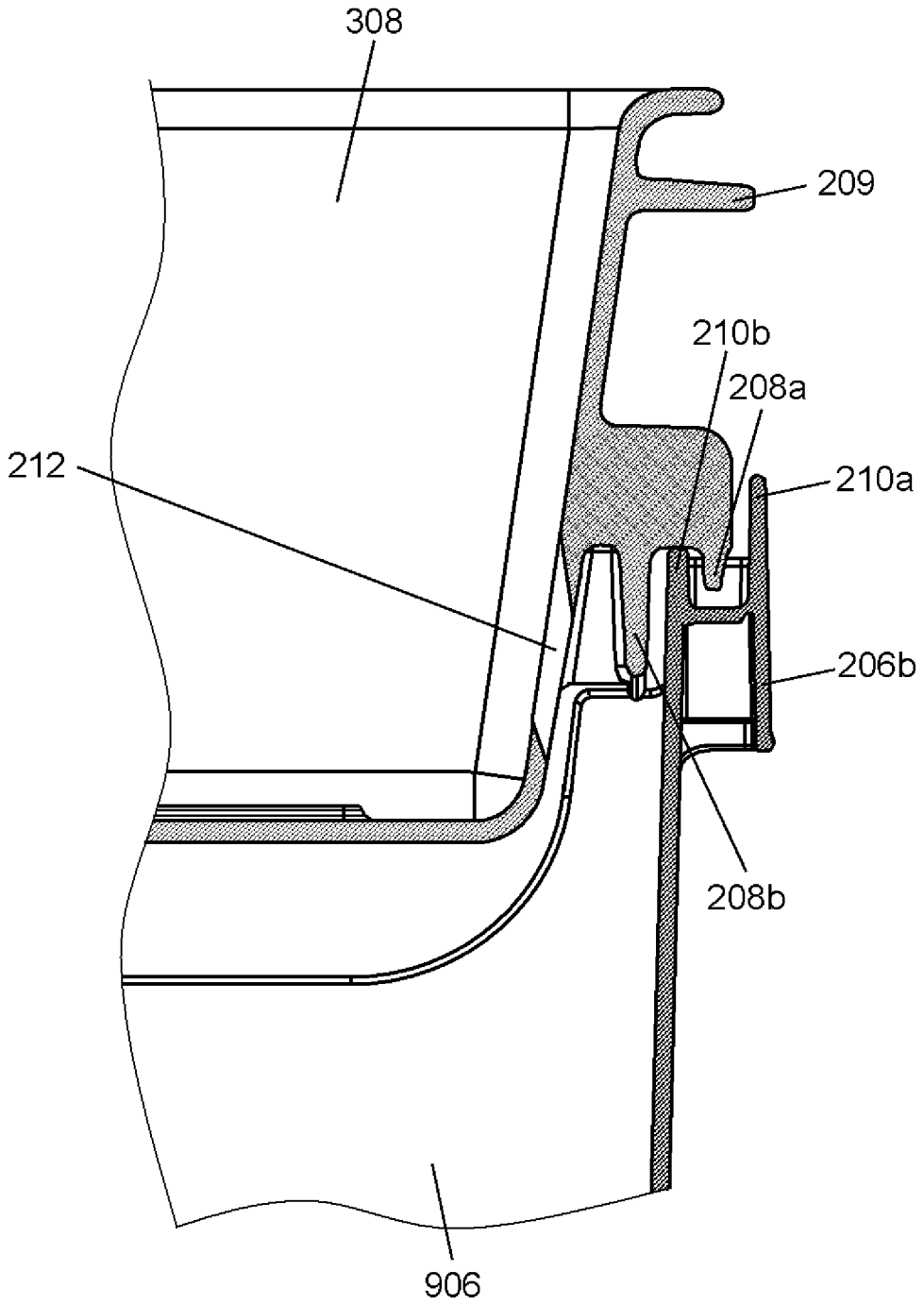
[Fig. 22]


208
209
210b
208a
210a
Overlap width
15mm
Overlap width
7mm
206b
208b
906

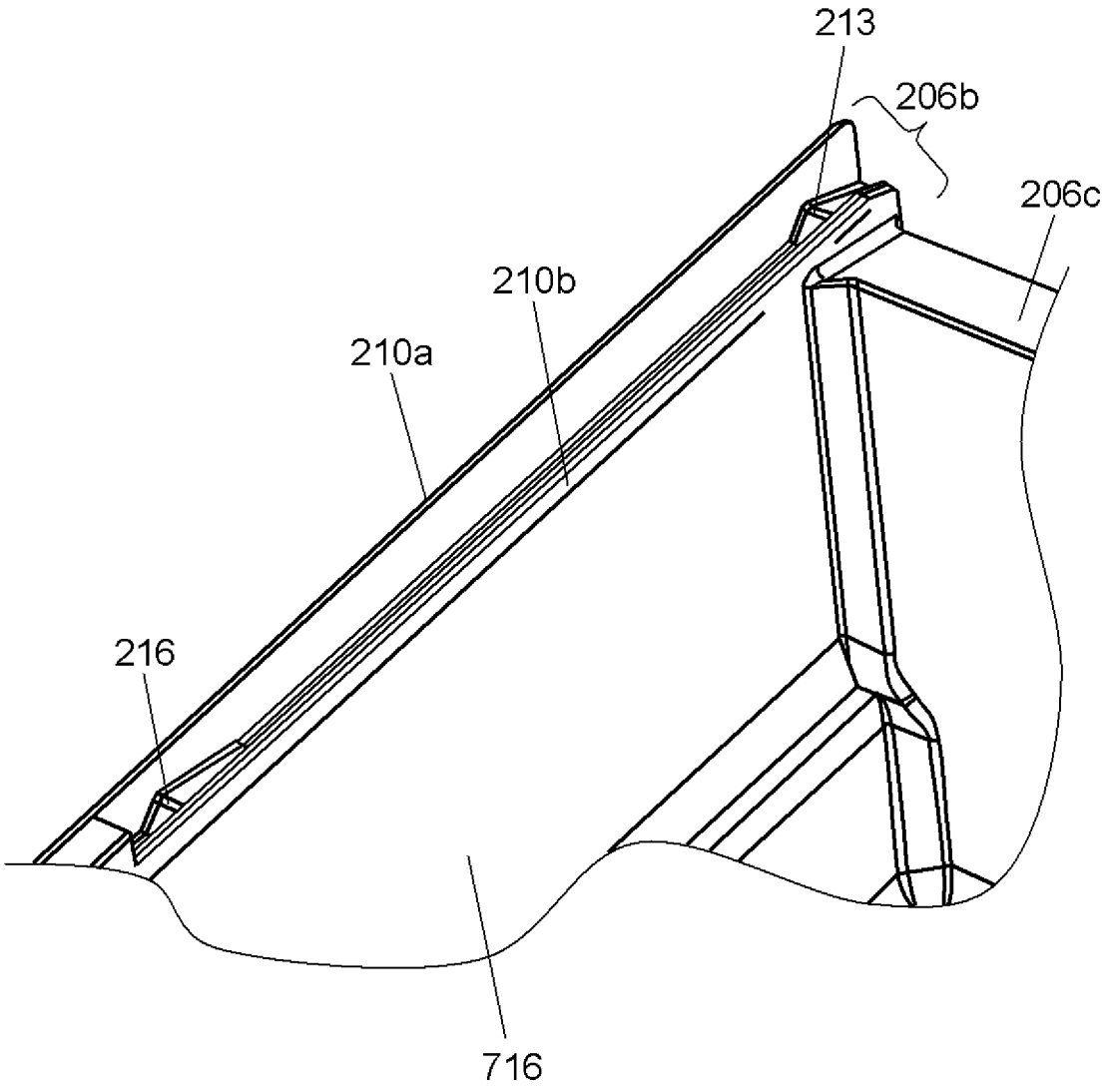
[Fig. 23]



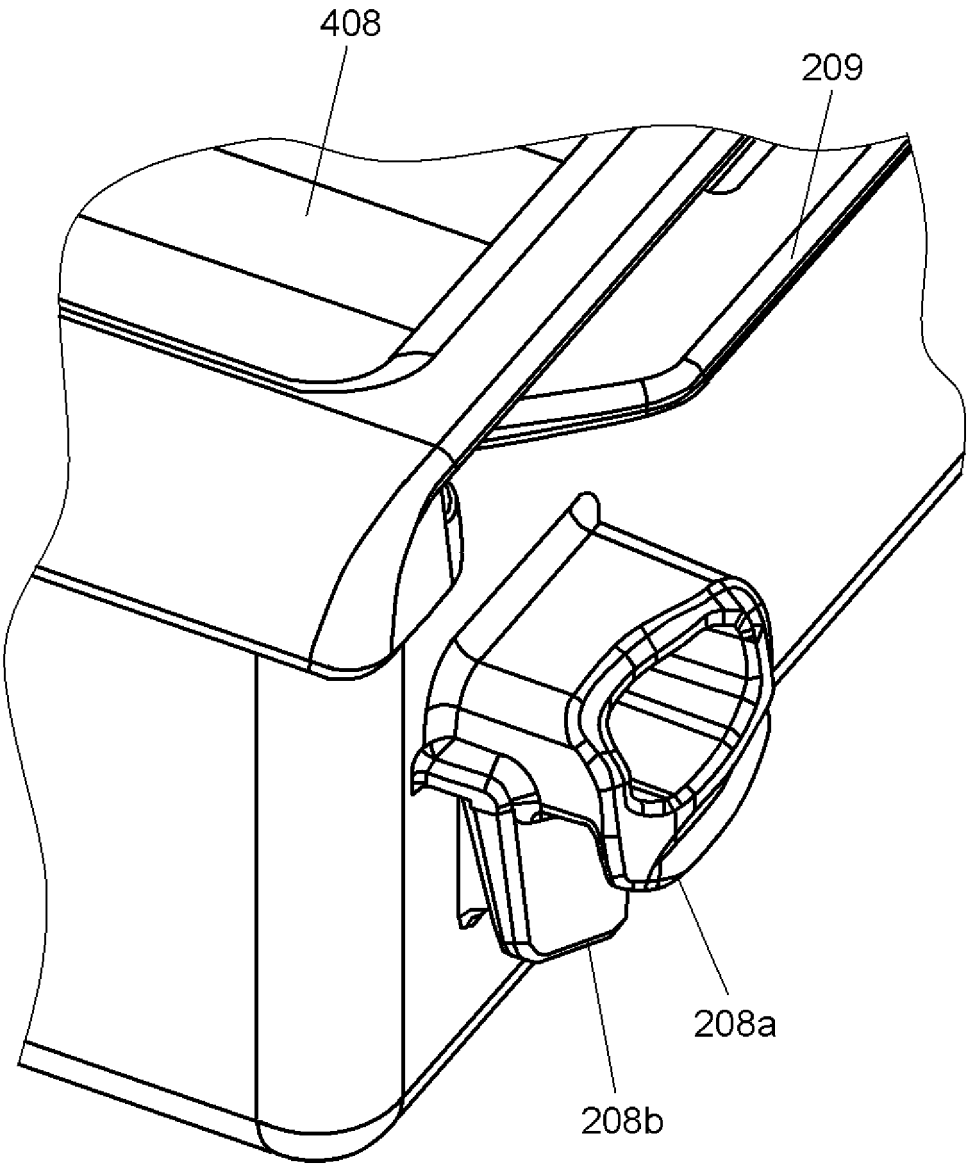
[Fig. 24]



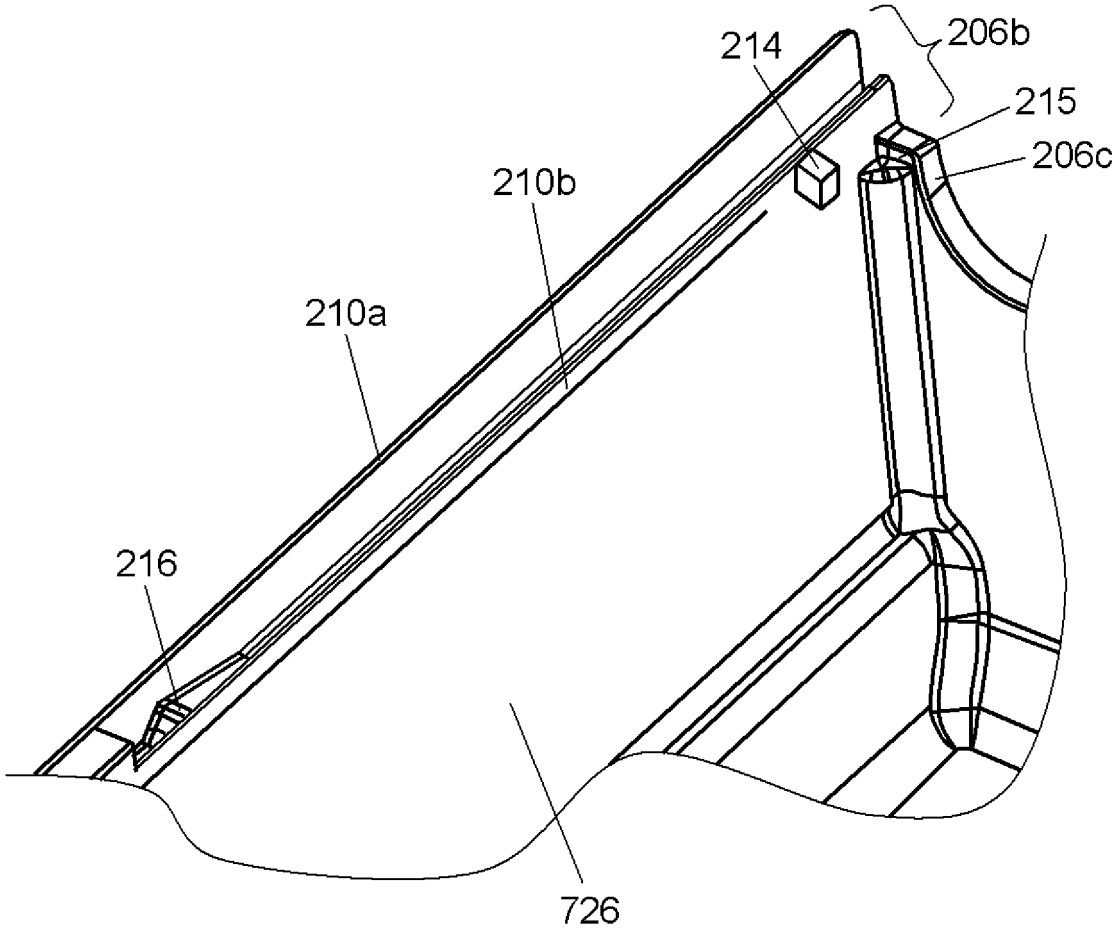
[Fig. 25]



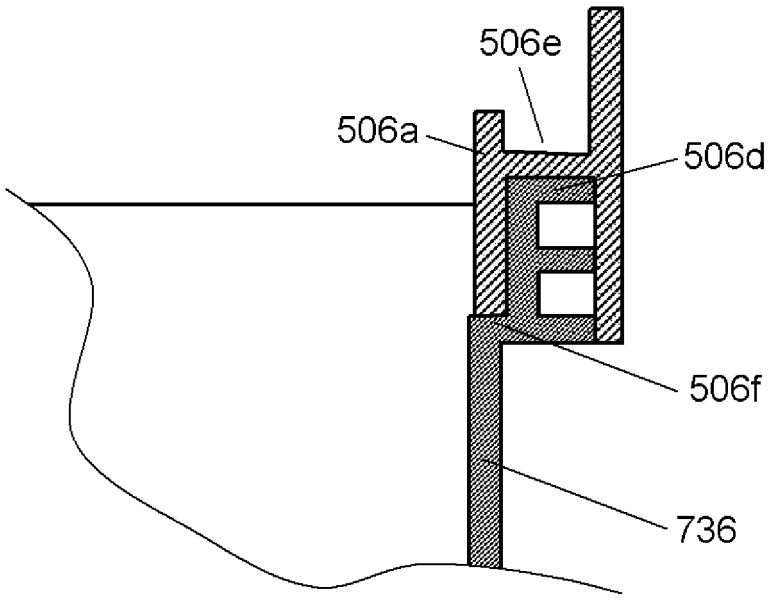
[Fig. 26]



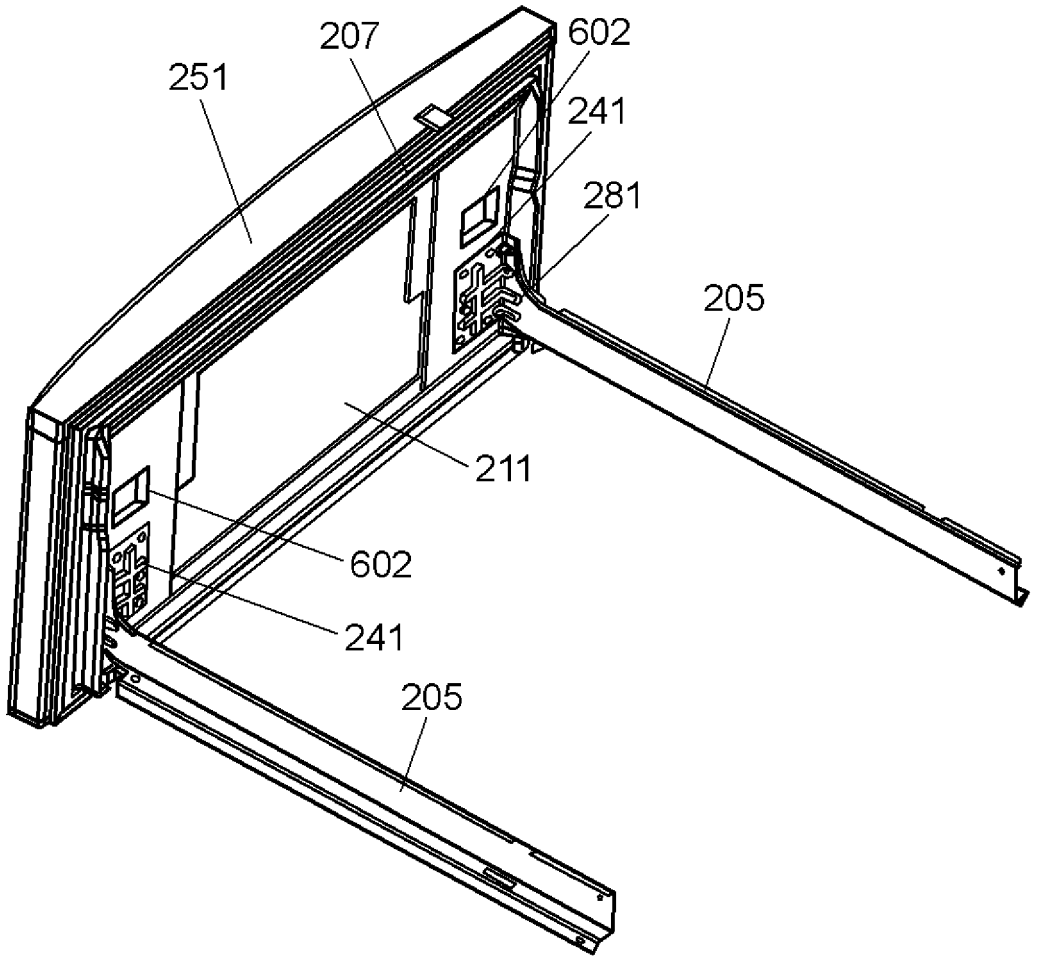
[Fig. 27]



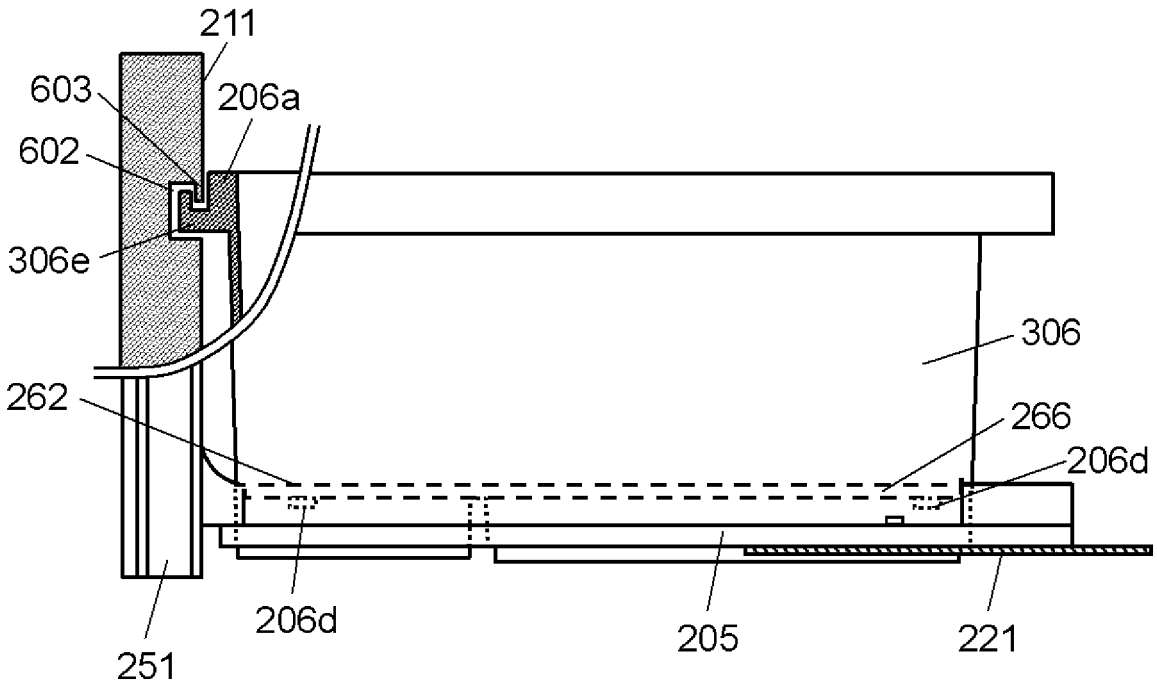
[Fig. 28]



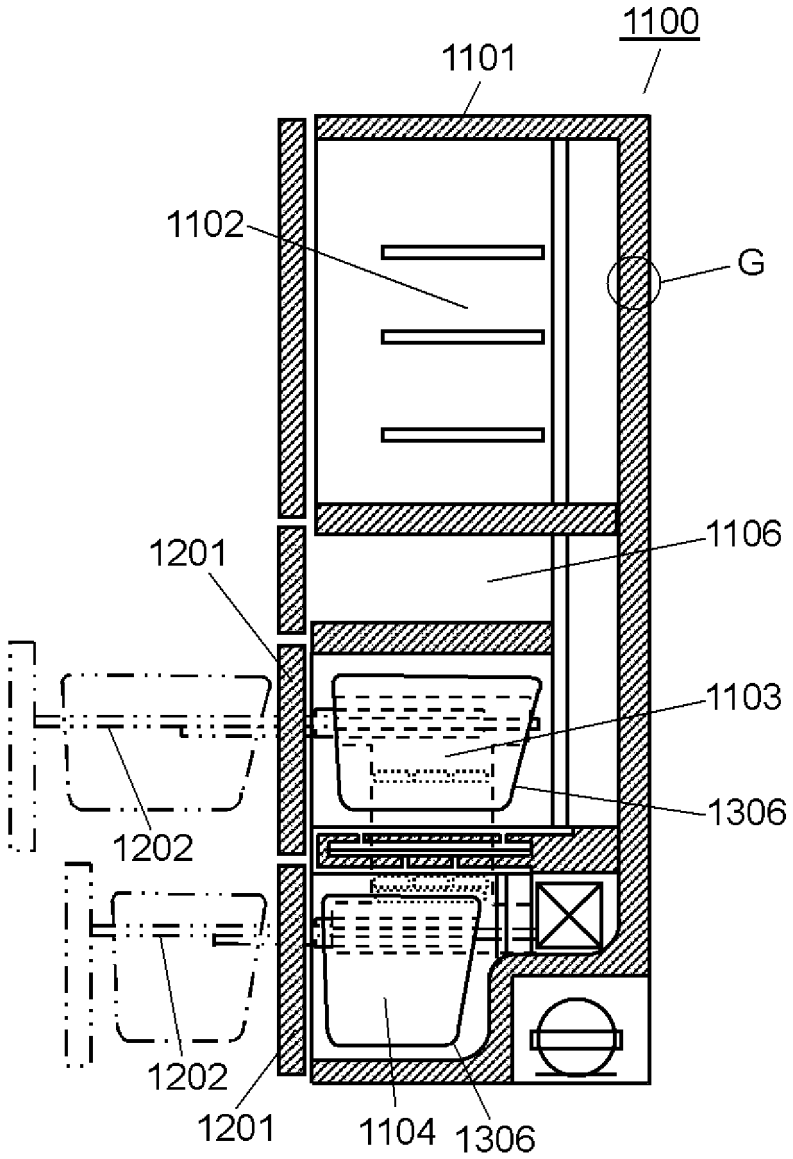
[Fig. 29]


207
602
251
241
281
205
211
602
241
205

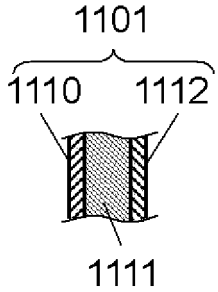
[Fig. 30]


211
603
206a
602
306e
306
262
266
206d
206d
205
221
251

[Fig. 31A]



[Fig. 31B]



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2006177653 A **[0012]**
- JP 2009228948 A **[0012]**
- EP 2320180 A **[0013]**