(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 110 629 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.10.2009 Bulletin 2009/43

(51) Int Cl.:
F25D 27/00 *(2006.01)*

(21) Application number: **09167541.3**

(22) Date of filing: **17.01.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR

(30) Priority: **13.02.2007 JP 2007032771**
13.02.2007 JP 2007032783
13.02.2007 JP 2007032770
13.02.2007 JP 2007032788
13.02.2007 JP 2007032778
13.02.2007 JP 2007032789
13.02.2007 JP 2007032792
13.02.2007 JP 2007032779
12.09.2007 JP 2007236172

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
08703354.4

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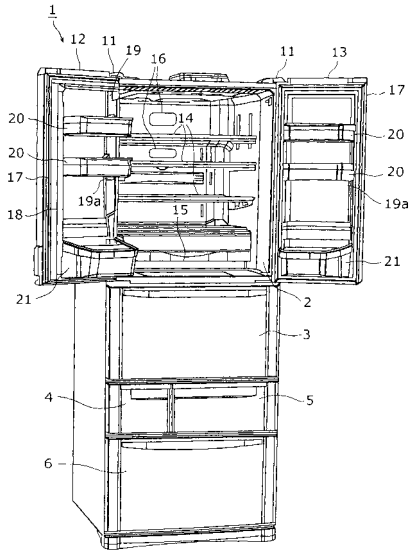
Remarks:
This application was filed on 10-08-2009 as a divisional application to the application mentioned under INID code 62.

(54) Refrigerator

(57) The present invention relates to a refrigerator (1) that includes a heat-insulating main body which is made of heat-insulating material, and inside of which a storage compartment (2) is formed; and a lighting device (16) embedded in said heat-insulating main body, which includes at least one light-emitting diode as a light source and illuminates an inside of the storage compartment (2).

FIG. 1



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Description

Technical Field

[0001] The present invention relates to refrigerators including shelf plates within a storage compartment.

Background Art

[0002] Conventionally, refrigerators are constructed to allow storage items to be placed in door storage shelves and in-compartment storage shelves, and techniques for changing the size distribution of shelves depending on the purpose of storage are proposed (for example, see Patent Reference 1).

[0003] FIG. 1 and FIG. 2 are diagrams showing a conventional refrigerator 1 described in Patent Reference 1. FIG. 1 is a perspective view of the refrigerator 1 with doors opened, and FIG. 2 is a diagram showing a horizontal cross-section of the refrigerator 1.

[0004] The refrigerator 1 is formed from a heat-insulating main body, the inside of which serves as storage space. The refrigerator 1 includes, at the top-most portion, a refrigerator compartment 2 which is the largest compartment, and a vegetable compartment 3 below the refrigerator compartment 2.

[0005] An ice-making compartment 4, in which an automatic ice-making device is disposed, and a temperature-switchable compartment 5 are provided side-by-side below the vegetable compartment 3, and a freezer compartment 6 is arranged independently at the bottom-most portion. Furthermore, a dedicated door is provided for the openings of the respective storage compartments in a manner which allows opening and closing.

[0006] As shown in FIG. 1, plural shelf plates 14 are disposed inside the refrigerator compartment 2, and storage spaces spanning plural levels are formed. A lighting device 16 is included in the back surface included in the refrigerator compartment 2. The lighting device 16 is a device for illuminating the inside of the refrigerator compartment 2, and includes a lamp 16a and a lighting cover 16b, as shown in FIG. 2.

[0007] Furthermore, a left door 12 and a right door 13 are mounted on the opening of the refrigerator compartment 2 in a manner which allows swinging, by having the top and bottom portions of their respective outer ends pivotally supported by hinges 11. Specifically, the refrigerator 1 includes what are called French doors.

[0008] Here, as shown in FIG. 1 and FIG. 2, French doors refer to doors including a left door and a right door, with the left door having swing axis on the left side and the right door having swing axis on the right side, and which open to the left and right from the boundary of the left door and the right door.

[0009] Furthermore, aside from French doors in which the width of the left door and right door are the same, as shown in FIG 1 and FIG. 2, there are also French doors in which the width of the left door and the right door are different.

[0010] Plural door pockets 20 are disposed in the left door 12 and the right door 13 thereby forming storage spaces spanning plural levels. Furthermore, each door includes plural protrusions 19a, and the door pockets 20 are configured to engage with the protrusions 19a in a manner which allows attachment and removal.

[0011] Furthermore, as shown in FIG. 2, the door pockets 21 provided at the bottom-most tier is configured of a forward storage part 22 and a rear storage part, and the shelf plates 14 are disposed in the inner-side of the storage compartment, facing the door pockets 21. The storage items placed on the shelf plates 14 are illuminated by the lighting device 16.

[0012] The forward storage part 23 can easily be detached from the rear storage part 22 and, when the doors can only be opened up to 90 degrees, it is possible to widen the opening of the refrigerator compartment 2 and make taking storage items in and out easy, by detaching the forward storage part 23.

[0013] Furthermore, when the doors can be opened more than 90 degrees, storage volume can be increased by attaching the forward storage part 23. Specifically, the user of the refrigerator 1 can determine whether or not to use the forward storage part 23 depending on the degree to which the doors open.

Patent Reference 1: Japanese Unexamined Patent Application Publication No. 2005-282897

Disclosure of Invention

Problems that Invention is to Solve

[0014] In this manner, with the conventional refrigerator 1, storage volume is increased and storage capability are improved by providing plural door pockets such as the door pockets 20 in the inner-side of the doors provided on the front plane of the refrigerator compartment 2.

[0015] Here, the door pockets are in positions that allow the user to take items in and out easily and, from the perspective of convenience, primarily store plastic bottles and glass bottles. Furthermore, there is a demand for the enlargement of door pockets with the enlargement of plastic bottles in recent years. For this reason, there is a tendency for door pockets to have increased horizontal depth.

[0016] However, when enlarging door pockets in the aforementioned conventional configuration, it is necessary to ensure that the shelf plates 14 and drawer 15 inside the refrigerator compartment 2 do not interfere with the door pockets when one of the doors is opened by being swung with the left end or right end of the refrigerator as a center. Specifically, it is necessary to reduce the horizontal depth of the shelf plates 14 and the drawer 15.

[0017] In addition, it is necessary to keep each door pocket within the opening and closing swing trajectories of the respective doors so that the door pockets of one

door do not interfere with the door pockets of the other door.

[0018] As such, as shown in FIG. 2 for example, an inoperative space 25 between the two door pockets 21 and between the shelf plates 14 and both door pockets 21, or between the two door pockets 21 and the drawer 15 becomes larger.

[0019] Specifically, in the conventional refrigerator, there is the problem that the inoperative space within the refrigerator increases with the enlargement of door pockets.

[0020] In addition, in the case of a refrigerator having a door pocket configured of a forward storage part and a rear storage part as shown in FIG. 2, when there are walls to the left and right in the environment in which the refrigerator is used, the forward storage part is eventually removed for convenience of taking things in and out, as previously described.

[0021] In this case, there is the problem that the storage volume of the door pocket is reduced and the storage volume in the refrigerator is reduced as a result.

[0022] Furthermore, in the case of a refrigerator having French doors, the door pockets of the respective doors need to be made in a form and size within the swing trajectories, as previously described. Therefore, the door pockets assume an increasingly triangular shape as their horizontal depth increases.

[0023] With this, there is also the problem of reduced storage volume and deteriorating storage capability, such as the inability to efficiently store storage items such as plastic bottles and milk cartons in the door pockets.

[0024] It should be noted that such a problem of increased inoperative space and deteriorating storage capability accompanying the enlargement of door pockets exists, not only in refrigerators having French doors, but also in refrigerators having a single swing door.

[0025] Here, a single swing door refers to a door which swings by being supported by the heat-insulating body through hinges provided on the right side or left side of the heat-insulating main body making up the main body of the refrigerator, with a straight line parallel to a height direction of the heat-insulating body as a swing axis.

[0026] Furthermore, since light is shined upon the storage items placed on the shelf plates from the back, there is the problem that shadows are formed from the user's perspective thereby making storage items difficult to see. Such a problem as the forming of shadows which obstruct storage item visibility exists, not only in refrigerators having French doors, but also in refrigerators having a single swing door

[0027] The present invention is conceived to solve the aforementioned conventional problems and has as an object to provide a refrigerator having high storage efficiency and convenience.

Means to Solve the Problems

[0028] In order to solve the aforementioned conventional problems, the refrigerator in an aspect of the present invention is a refrigerator which includes a storage compartment which has an opening in front and in which items are stored; and a shelf plate disposed in a bridging manner to span between a left side-surface and a right side-surface of the storage compartment and having different left and right horizontal depths.

[0029] With this, it is possible to fill-up the conventionally inoperative space within the storage compartment using the portion of either the left side or the right side of the shelf plate that has a longer horizontal depth. In other words, it is possible to reduce the inoperative space compared to what is conventional.

[0030] Furthermore, since the shelf plate has different horizontal depths on the left and right side, the shelf plate can be used separately as two areas, that is, the area with the longer horizontal depth and the area with the shorter horizontal depth, for example. As such, efficient sectionalized storage, such as placing relatively large food items, and the like, on the horizontally deeper side, becomes possible and it becomes easier for the user to take storage items in and out of the storage compartment.

[0031] Furthermore, it is possible to enlarge the horizontal depth of the shelf plate which has the convenience of facilitating the taking in and out of relatively long storage items such as a skillet, and so on.

[0032] Furthermore, the refrigerator may further include a door which covers the opening of the storage compartment in a manner which allows opening and closing; and a projecting part which is provided on an inner wall of the door and projecting inward, and which has a horizontal depth that offsets the horizontal depth of the shelf plate when the door is closed.

[0033] With this, in the refrigerator in the present embodiment, the front edge of the shelf plate and the projecting part, realized as a door pocket for example, are disposed to follow each other's shapes. Therefore, it is possible to fill-up the conventionally inoperative space within the storage compartment using the portion of either the left side or the right side of the shelf plate that has a longer horizontal depth.

[0034] Therefore, the space created between the door inner-surface and the shelf plate, that is, the inoperative space, can be made as small as possible and the storage space within the storage compartment can be increased.

[0035] In addition, the storage area within the storage compartment can be roughly divided into the three areas of the storage area of the projecting part realized as a door pocket for example, and the above-described two areas on the shelf plate, and the user can select a storage area according to the size, purpose, and so on, of the storage items. In other words, efficient sectionalized storage is realized.

[0036] Furthermore, the shelf plate may include a gradation part which continuously connects, with a curve, a left side and a right side of a front edge of the shelf plate.

[0037] In this manner, by providing a curve on the gradation part present on the shelf plate, it is possible to for

example, reducing stress concentration and distortion occurring when, for example, food items, and so on, are placed on the front edge portion of the shelf plate.

[0038] Specifically, even the placement of relatively heavy storage items on the shelf plate does not lead to significant sagging or cracking, and thus the user can use the refrigerator safely and without worry.

[0039] Furthermore, by shaping the gradation part into a smooth curve, that is, into a waveform, and in addition making the section facing the back surface of the storage compartment flat, a duct and the like for injecting cool air can be configured simply, and thus achieving superior aesthetics and design characteristics.

[0040] Furthermore, the shelf plate may include a brim material on at least a portion of the front edge, the portion including the gradation part.

[0041] With this, the gradation part can be reinforced with the brim material, for example. Furthermore, for example, by making the brim material out of stainless steel, the brim material can be used as a decorative plate of the shelf plate. With this, it is possible to beautify the front edge portion of the shelf plate which is the most eye-catching spot, and thus the shelf plate can have superior design characteristics.

[0042] Furthermore, the shelf plate may further include the brim material on a left edge and a right edge, and the shelf plate may be supported by the left side-surface and the right side-surface of the storage compartment via the brim material on the left edge and the brim material on the right edge.

[0043] With this, the shelf plate can be set onto the storage compartment without providing a latching part, and the like, on the main body of the shelf plate.

[0044] Furthermore, the shelf plate may include the brim material on an entire perimeter including the front edge, and the shelf plate may be supported by the left side-surface, the right side-surface, and a back surface of the storage compartment via the brim material.

[0045] This allows, for example, the shelf plate to be protected or reinforced from all around, and for the shelf plate to be steadily supported by the storage compartment.

[0046] Furthermore, the shelf plate may be made of a material having transparency.

[0047] For example, by making the shelf plate into a relatively thin tabular shape, it is possible to avoid imparting a sense of crampedness to the most visible frontal portion of the shelf plate, and by applying transparency, it is possible to eliminate the sense of crampedness in the entire storage compartment and the sense of spaciousness is not impaired. Furthermore, when a light is provided in the storage compartment, it allows the light to spread thought the storage compartment.

[0048] Furthermore, the shelf plate may be made of glass.

[0049] With this, for example, it is possible to improve the strength of the shelf plate without impairing its aesthetics as a shelf plate of the refrigerator.

[0050] Furthermore, the brim material may be fastened onto the shelf plate by insert molding.

[0051] With this, for example, fixing strength between the shelf plate and the brim material can be improved. Specifically, when the shelf plate is set onto the refrigerator compartment via the brim material, the shelf plate is more steadily supported by the refrigerator compartment.

[0052] Furthermore, the brim material may include a latching part with which the shelf plate is supported by the left side-surface, the right side-surface, or a back surface of the storage compartment.

[0053] With this, the shelf plate can be set onto the storage compartment without providing a latching part, and the like, on the main body of the shelf plate that is made of glass.

[0054] Furthermore, the shelf plate may be made of resin, and the brim material provided on the front edge of the shelf plate may be made of metal.

[0055] With this, the shelf plate can be made from resin which allows easy formation, and the brim material can provide the shelf plate with sufficient strength for supporting storage items such as food items, and the like.

[0056] Specifically, the storage compartment may include a storage case in a base surface, in a position that is below the projecting part and below a space from the gradation part of the shelf plate toward a side of the shelf plate which has a shorter horizontal depth.

[0057] In this manner, by providing a storage case in the inoperative space on the base of the refrigerator compartment created due to the door pocket projecting into the refrigerator compartment, such inoperative space can be effectively utilized.

[0058] Furthermore, small items, such as small soy sauce containers, that are not suited for storage in the shelf plate or the door pocket can be efficiently stored. Specifically, storage efficiency of the entire refrigerator can be improved and more efficient sectionalized storage becomes possible.

[0059] Furthermore, the refrigerator may further include an ice-making device which makes ice, wherein the storage case may be a feed-water container which supplies water to the ice-making device, and is detachably attached to the storage compartment.

[0060] In this manner, the aforementioned storage case may be used as a supply container, and by allowing flexibility in detachment and attachment, maintenance such as cleaning becomes easy.

[0061] Furthermore, the shelf plate may be divided into a forward shelf plate and a rear shelf plate at an intermediate portion in a horizontal depth direction.

[0062] With this, it is possible to remove only the front half of the shelf plate, and thus a space which conforms to the height of a storage item can be created. Furthermore, it is possible to solve the problem that, due to having a portion that is horizontally deeper than conventional, the shelf plate is difficult to remove from the inside of the compartment when a tall storage item cannot be placed with the shelf plate present and adequate height

is secured by removing several storage shelf plates.

[0063] Furthermore, the refrigerator may further include supports which are provided on the left side-surface and the right side-surface of the storage compartment and project inward, and which support the forward shelf plate in a bridging manner below the rear shelf plate.

[0064] This produces the same effect as described above. In addition, since the removed forward shelf plate can be attached below the rear shelf plate, the storage space for the removed forward shelf plate will not be a problem. Moreover, depending on the distance between the forward shelf plate and the rear shelf plate, it is possible to create a new storage space for short storage items, and thus space can be utilized without waste.

[0065] Furthermore, it is preferable that the refrigerator further includes a placement shelf plate which is disposed in a bridging manner to span between the left side-surface and the right side-surface of the storage compartment, and which has a shape that is identical to a shape of the shelf plate in an undivided state.

[0066] Since a storage item that requires the removal of shelf plates for storage is relatively heavy, steady storage can be achieved by placing the storage item on the placement shelf plate which is not to be divided.

[0067] Furthermore, refrigerator may further include: a pair of supports each provided on either side-surface of the storage compartment and which supports, from beneath, a corresponding one of left and right edges of the shelf plate, the pair of supports projecting inward and extending in a horizontal depth direction like rails; and a pair of latching pieces each of which is protrudingly provided in an intermediate section of the left and right edges of the shelf plate, and which engages with a bottom of a corresponding one of the pair of supports when the shelf plate is placed on the pair of supports, wherein each of the pair of supports may include a cutout part which allows the engagement with a corresponding one of the pair of latching pieces to be released at an intermediate section in the horizontal depth direction and the latching piece to pass upward.

[0068] With this, the engagement between the shelf plate and the supports can be released without fully pulling out the shelf plate, and thus the shelf plate can be removed without having to significantly pull the shelf plate out the front of the refrigerator. To be more specific, it is possible to solve the problem that, in the case where a shelf plate having a portion with a long depth is adopted, the pull-out distance when pulling the shelf plate out of the refrigerator in order to change the attachment position of the shelf plate becomes long, and it becomes difficult to change the attachment position of the shelf plate when there is no space at the front of the refrigerator equivalent to the depth of the refrigerator. In particular, it is possible to solve the problem in which the attachment position of the shelf plate cannot be changed when the refrigerator is set up in a situation in which the door cannot be fully opened, since the shelf plate interferes with the door itself and the door pocket, and the shelf-plate cannot be completely removed.

[0069] Furthermore, a plurality of the pair of supports may be provided along a vertical direction in the storage compartment, and cutout parts of a higher one of adjacent ones of the pairs of supports may be disposed at positions which allow a back edge of the shelf plate placed on a lower one of the adjacent ones of the pairs of supports to pass through when tilting the shelf plate so as to lift the back edge while concurrently letting the pair of latching pieces of the shelf plate pass through cutout parts of the lower one of the adjacent ones of the pairs of supports.

[0070] With this, it is possible to achieve, in one refrigerator, the conflicting effects of the advantage of providing several supports and increasing the attachment positions of the shelf plate, and reducing the space for removing the shelf plate by tilting the shelf plate inside the refrigerator.

[0071] Furthermore, the pair of supports may be integrally formed with an inner casing making up the storage compartment.

[0072] With this, it is possible to enhance the structural strength of the supports and, in the case where heat-insulating material is injected inside the supports, the structural strength of the supports can be further increased. Thus, since it is possible to reduce the thickness of the supports in the vertical direction, it is possible to secure a large space which allows the tilting of the shelf plate. Furthermore, since the forming of the supports becomes easy, it is possible to reduce the manufacturing cost of the refrigerator.

[0073] Furthermore, the door may be configured of French doors.

[0074] Furthermore, the French doors may include a left door and a right door, and the curve of the gradation part may have an arc corresponding to an arc of a swing trajectory of the one of the left door and the right door having a shorter distance between a back surface of the storage compartment and a door inner-surface which is a storage compartment-side surface including the projecting part of the door.

[0075] By adopting such a shape, interference between the shelf plate and the projecting part can be prevented, and the gradation part can be brought closer to the projecting part. Specifically, the inoperative space created between the projecting parts of both doors and the shelf plate, which is typical in French doors, can be made as small as possible, and the storage space within the storage compartment can be increased.

[0076] Furthermore, the French doors may include a left door and a right door, the left door and the right door may each include a storage pocket as the projecting part, a horizontal depth of the storage pocket included in the left door and a horizontal depth of the storage pocket included in the right door may be different, and the front edge on a side of the shelf plate having a shorter horizontal depth may face the storage pocket having a longer horizontal depth, and the front edge on a side of the shelf

plate having a longer horizontal depth may face the storage pocket having a shorter horizontal depth.

[0077] Specifically, in the refrigerator in the present invention, the horizontally deeper side of the shelf plate faces the side of the door having a longer distance from the door inner-surface to the back surface, that is, the side at which an inoperative space tends to be created.

[0078] Therefore, the space created between the door inner-surface and the shelf plate, that is, the inoperative space, can be made as small as possible and the storage space within the storage compartment can be increased.

[0079] Furthermore, the user can separately use the two storage areas of varied size, namely, the horizontally deeper storage pocket and the horizontally shallower storage pocket in addition to the above-described two areas on the shelf plate, and thus convenience is extremely high.

[0080] Furthermore, a width of the left door and a width of the right door may be different, and the horizontal depth of the storage pocket of one of the left door and the right door having a greater width may be longer than the horizontal depth of the storage pocket of the other.

[0081] In this manner, reducing the size of the storage pocket on the door having a shorter width and which has a shorter swing radius than the other door makes it possible to prevent such door pocket from interfering with the other door, and enlarging the door pocket on the other door allows the total storage volume of both storage pockets to be boosted up to a predetermined amount.

[0082] Furthermore, providing a door having a small swing radius facilitates the easy opening of the door. In addition, when the door having a longer width is opened, there is a good view to the inside of the storage compartment and taking storage items in and out becomes easy.

[0083] Specifically, opening and closing of both doors can be done separately depending on the purpose of the user. In addition, the instances in which the opening of the storage compartment is fully opened are reduced, thus leading to energy conservation.

[0084] Furthermore, the door may be a single swing door.

[0085] Furthermore, a distance between (i) a door inner-surface which is a storage compartment-side surface including the projecting part of the door and (ii) a back surface of the storage compartment may be different on a left side and a right side, due to the provision of the projecting part on the inner wall of the door, and the front edge on a side of the shelf plate having a shorter horizontal depth may face the door inner-surface on a side having a longer distance from the door inner-surface to the back surface, and the front edge on a side of the shelf plate having a longer horizontal depth may face the door inner-surface on a side having a shorter distance from the door inner-surface to the back surface.

[0086] Specifically, in the refrigerator in the present invention, the horizontally deeper side of the shelf plate faces the side of the door having a longer distance from the door inner-surface to the back surface, that is, the side at which an inoperative space tends to be created.

[0087] Therefore, the space created between the door inner-surface and the shelf plate, that is, the inoperative space, can be made as small as possible and the storage space within the storage compartment can be increased.

[0088] Furthermore, the projecting part may be a storage pocket, a width of the door pocket may be identical to a width of the shelf plate, and a distance between the door inner-surface and the back surface may be different on the left side and the right side since a horizontal depth of the storage pocket is different on the left side and the right side.

[0089] Furthermore, the user can separately use the two storage areas, big and small, present side-by-side in the door pocket in addition to the above-described two areas on the shelf plate, and thus convenience is extremely high.

[0090] Furthermore, a main body of the refrigerator may be configured with a heat-insulating main body, the door may be a single swing door which swings by being supported by the heat-insulating main body with hinges provided on a left end portion or a right end portion of the heat-insulating main body, and which has, as a swing axis, a straight line parallel to a height direction of the heat-insulating main body, and between a left side and a right side of the door inner-surface, the distance from the door inner-surface to the back surface on a side which is nearer the swing axis may be shorter than the distance on a side which is farther.

[0091] Specifically, the horizontal depth on the side of the door pocket which is close to the swing axis may be made relatively long and the horizontal depth on the side which is far from the swing axis may be made relatively short.

[0092] When enlarging one of the storage pockets generally referred to as a door pocket in a refrigerator having a single swing door, the horizontal depth becomes long. However, the horizontal depth of the door pocket can only be increased up to a certain extent in consideration of the opening and closing of the door.

[0093] Consequently, by reducing the horizontal depth on the side of the door pocket which is far from the swing axis as described above, the door pocket does not obstruct the opening and closing of the door. In addition, by increasing the horizontal depth of the side of the door pocket which is near the swing axis, the storage volume of the entire door pocket can be boosted up to a predetermined amount.

[0094] Furthermore, the projecting part may be a storage pocket, the storage pocket may have a width that is shorter than a width of the shelf plate, and is provided on a side of the inner wall of the door that is near the swing axis, and the front edge on a side of the shelf plate having a longer horizontal depth may face the door inner-surface on a side which is far from the swing axis.

[0095] Specifically, a storage pocket having a short width may be provided and, in this case, the horizontal depth of the side of the shelf plate having a longer hori-

zontal depth can be further increased. As such, it is possible to increase the surface area of the shelf plate and thus allowing more items to be placed on the shelf plate.

[0096] Furthermore, refrigerator may further include a stand pocket for storing small items, provided on a side of the inner wall of the door which is far from the swing axis, wherein the front edge on the side of the shelf plate having the longer horizontal depth may face a surface of the stand pocket on the storage compartment-side which is the door inner-surface on the side which is far from the swing axis.

[0097] In this manner, the refrigerator in the present invention may include, on the side of the door inner-surface which is far from the swing axis, a stand pocket for upright storage of small items such as tubes containing condiments.

[0098] Even in this case, the storage volume of the refrigerator as a whole does not change significantly, and it is possible to efficiently store small items not suited for storing in the shelf plate and the door pocket.

[0099] Furthermore, the refrigerator may further include a drawer having different horizontal depths on a left side and a right side, corresponding to a shape of the shelf plate.

[0100] By having such a drawer, the conventional inoperative space can be filled-up using the horizontally deep portion of the drawer, and thus storage efficiency can be improved. Furthermore, it is possible to separately use the two storage areas depending on the difference in horizontal depths, and thus convenience to the user can be improved.

[0101] Furthermore, the drawer may include a left drawer part and a right drawer part which are independent and have different horizontal depths from one another.

[0102] In this manner, the door has a door pocket in the inner wall.

By having a door pocket which conforms to the shape of the drawer, the inoperative space surrounded by the drawer and the door pocket can be reduced, and thus storage efficiency be improved.

[0103] Furthermore, the refrigerator may further include lighting devices provided on the left side-surface and the right side-surface of the storage compartment, which include a light-emitting diode as a light source and illuminate the storage compartment from different positions in the horizontal depth direction corresponding to a shape of the shelf plate.

[0104] In this manner, the lighting device is fitted to each of the right side-surface and the left side-surface of the refrigerator compartment and illuminates the inside of the refrigerator compartment from in front of the front edge of the shelf plate, with light-emitting diodes as a light source. With this, shadows are not cast on the storage items on the shelf plate and the user can easily see the storage items, and thus convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0105] Furthermore, it is possible to illuminate the gradation part and thus it is possible to improve the aesthetics for when the user opens the door of the refrigerator.

[0106] Furthermore, the shelf plate may have areas having different properties.

[0107] Furthermore, the shelf plate may have areas having different color tones.

[0108] Furthermore, the shelf plate may have areas of different sizes.

[0109] Here, properties refer to color tones or size, for example. For example, by having areas of different color tones, it is possible to improve the aesthetics when looking at the refrigerator from the front. Furthermore, for example, by having areas of different sizes, it is possible to fabricate the shelf plate by joining the plates of different sizes making up the respective areas. As such, it becomes possible to share components with other products, and thus reduction of manufacturing costs becomes possible.

[0110] Furthermore, a plurality of shelf plates including the shelf plate may be disposed along a vertical direction within the storage compartment, and respective front edges of the plurality of shelf plates may be set to have identical horizontal depth positions.

[0111] Specifically, the plural shelf plates set in the refrigerator compartment may have the same shape. In this case, the plural shelf plates can be constructed using the same component and thus manufacturing costs can be suppressed.

[0112] Furthermore, the respective gradation parts of each of the shelf plates are aligned vertically. As such, from the user's perspective, there is a sense of unity when the door is opened, and thus superior design characteristics are achieved.

[0113] Furthermore, the storage compartment may be a refrigerator compartment, and may be located at a topmost section of a heat-insulating main body which forms a main body of the refrigerator.

[0114] With this, the refrigerator compartment which is most frequently used and into which storage items of various shapes are put can be disposed at the most user-friendly eye-level position, and thus the usability of the refrigerator can be further improved.

[0115] Furthermore, abutting surfaces of the forward shelf plate and the rear shelf plate may lap in a vertical direction.

[0116] With this, even when the shelf plate sags during the storage of heavy food items, it is possible to increase the strength of the forward shelf plate and the rear shelf plate combined, since the abutting surfaces of the forward shelf plate and the rear shelf plate lap in the vertical direction.

[0117] Furthermore, the refrigerator may include a latching unit which latches together the forward shelf plate and the rear shelf plate.

[0118] With this, the forward shelf plate and the rear

shelf plate are reliably secured to each other and misalignment of the forward shelf plate and the rear shelf plate can be prevented, and thus it is possible to enhance reliability when the forward shelf plate and the rear shelf plate are used integrally.

[0119] Furthermore, the refrigerator may further include: a support part provided above or below the rear shelf plate, which can support the forward shelf plate when the forward shelf plate is detached, and a latching unit which latches on to the forward shelf plate.

[0120] With this, it is possible to secure a storage area for the forward shelf plate when the forward shelf plate is removed, and thus convenience can be improved and displacement during the storage of the forward shelf plate can be reliably prevented.

[0121] Furthermore, the refrigerator may further include a fastening unit which prevents the rear shelf plate from easily falling out of place when the forward shelf plate is attached or detached.

[0122] With this, the rear shelf plate is not displaced when the forward shelf plate is attached or detached, and thus the attachment and detachment of the forward shelf plate can be performed reliably.

[0123] Furthermore, when a horizontal depth of the rear shelf plate is L, a minimum horizontal depth of the forward shelf plate is M, and a maximum horizontal depth of the forward shelf plate is N, a relationship of N>L>M may be maintained.

[0124] With this, it is possible to optimize the left and right horizontal depths when the shelf plates are used integrally, while ensuring the strength of the respective shelf plates when divided into the forward shelf plate and the rear shelf plate.

[0125] Furthermore, each of the forward shelf plate and the rear shelf plate may be configured of a glass plate and a perimeter-portion resin member.

[0126] With this, the design characteristics and the usability in actual use of the shelf plate can be improved.

[0127] Furthermore, the refrigerator may further include: a door which covers the opening of the storage compartment in a manner which allows opening and closing; and a projecting part provided on an inner wall of the door and projecting inward, wherein the door may be divided, into a left door and a right door, along approximately a full height of the storage compartment, and the shelf plate may be disposed further inward of the storage compartment than the projecting part and has a maximum horizontal depth behind a space created between projecting parts each of which corresponds to the projecting part and is disposed on a corresponding one of the left door and the right door.

[0128] With this, it becomes possible to minimize the French door-specific inoperative space created behind the section where both left and right doors meet, and increase the horizontal depth of the shelf plate within the storage compartment, that is, increase storage space, while maintaining the size of the door pocket.

[0129] Specifically, there is the advantage of increasing the storage volume by changing what is inoperative space in terms of storage within the storage compartment into storage space, and enabling long storage items (such as large bottles) to be placed in the portion of the shelf plate with the maximum horizontal depth, which is not possible in typical refrigerators.

[0130] Furthermore, the shelf plate may include a gradation part in a front-back direction of a front edge so that a placement surface for placement of storage items has different horizontal depths in a width direction.

[0131] With this, it is possible to have, in the shelf plate, two storage sections, that is, the horizontally deep section and, conversely, the horizontally shallow section, and flexibility in terms of the size of storage items and particularly in terms of the length direction is enhanced, and thus the storage efficiency and accessibility for the user is significantly improved.

[0132] Furthermore, since it is possible to configure the gradation part into a smooth waveform, and in addition make the back of the storage compartment flat, a duct and the like for injecting cool air can be configured simply, and thus achieving superior aesthetics and design characteristics.

[0133] Furthermore, the shelf plate may be provided with the gradation part behind the space created between both projecting parts respectively disposed on the left door and the right door, and may have greater horizontal depth on one side of a front-back direction bordered by the gradation part, and less horizontal depth on the other side.

[0134] With this, it is possible to minimize the space created between both door pockets and the space between the shelf plate and the door pockets, that is, the inoperative space in terms of storage, and increase the storage space within the storage compartment, as well as to roughly divide the inside of the storage compartment into the three sections of the door pocket having a relatively small storage space, the door pocket having the relatively large storage space, and the shelf plate. Therefore, since storage is done depending on the size or the purpose of the storage item, efficient sectionalized storage becomes possible.

[0135] Furthermore, the door which is divided into the left door and the right door may be configured of French doors that open by swinging towards both left and right sides.

[0136] Accordingly, by minimizing the inoperative space within the storage compartment having French doors by using creativity in the shape of the door pockets and the shelf plate, the storage space of the door pockets and the shelf plate within the storage compartment can be dramatically increased. In addition, storage capability can be improved by sectionalized storage according to the shape, size, and purpose of various types of storage items such as plastic bottles, salad dressing, and so on.

[0137] Furthermore, the ease of opening the door, the ease with which the inside of the storage compartment can be viewed, and consequently the taking in and out

of storage items is improved due to the small swing radius of the doors centering on the user. In addition, since the left and right doors can be opened and closed as the situation demands, there is no need to open the entire storage compartment and this leads to energy conservation.

[0138] Furthermore, the gradation part may be formed by providing a recessed portion on the shelf plate, the recessed portion receding in a horizontal depth direction relative to a shape of either of the projecting parts on the left or right side.

[0139] With this, the inoperative space can be minimized by forming the shelf plate to follow the shape of the door pockets. In particular, since an even larger inoperative space is created due to the swinging of the door, adopting the above-described shape on the side of the horizontally deeper door pocket increases the advantageous effect.

[0140] Furthermore, the gradation part may be formed by providing two recessed portions on the shelf plate each relative to a shape of a corresponding one of the projecting parts on the left door and the right door.

[0141] With this, since a gradation part can be provided on the front of the shelf plate with respect to the inoperative space created between the left and right door pockets, it can be considered as the most efficient shape for increasing the storage space within the storage compartment.

[0142] Furthermore, since a projecting gradation part is created on the front of the shelf plate and behind the portion at which the left and right doors meet, the shelf plate can be given a new look which completely revises the conventional shelf plate.

[0143] Furthermore, the door may have a different width for the left door and the right door, and a horizontal depth of the projecting part on a narrower one of the left door and the right door may be small compared to a horizontal depth of the projecting part on a wider one of the left door and the right door.

[0144] Accordingly, since a narrow door will have a small radius for its swing trajectory and the inoperative space within the storage consumption increases accordingly, reducing the horizontal depth of the narrow door and reducing the inoperative space as well as extending the shelf plate forward is more effective in increasing the total storage space within the storage compartment.

[0145] Furthermore, reducing the horizontal depth of the door pocket allows for a large opening when the doors are opened and has the convenience of allowing relatively easy choking of storage items inside the storage compartment as well as allowing relatively easy taking in and out of storage items placed on the shelf plate, even when the door can only be opened for example 90 degrees for example.

[0146] In addition, by roughly sectionalizing the storage compartment into which various storage items are put, into the three sections of the door pocket having an extremely small storage capacity, the door pocket having an extremely large storage capacity, and a shelf plate provided with a gradation part having different horizontal depths, and by storing frequently used items on the side of the larger door, it is possible to take even relatively large items in and out, and just opening and closing the larger door should be sufficient for most instances requiring door opening and closing. Therefore, usability for the user also improves.

[0147] Furthermore, a plurality of shelf plates including the shelf plate may be disposed along a vertical direction within the storage compartment, and front edges of the shelf plates from a top level to a bottom level may be set to have identical positions in a horizontal depth direction.

[0148] With this, the shelf plates from the top level to the bottom level, together with their respective gradation parts, have the same positions, and thus there is a sense of unity when the user opens the door, and superior design characteristics are achieved.

[0149] Furthermore, by adopting the same shape for the shelf plates, plural shelf plates can be configured using the same component, and thus allowing further lowering of costs.

[0150] Furthermore, the shelf plate may be made of a planar material having transparency.

[0151] Accordingly, by making the shelf plate into a relatively thin tabular shape, it is possible to avoid imparting a sense of crampedness to the most visible frontal portion of the shelf plate, and by applying transparency, it is possible to eliminate the sense of crampedness in the entire storage compartment and the sense of spaciousness is not impaired. Assuming that lighting is provided, it is possible to allow light to pass through the entire storage compartment.

[0152] At least one of a left edge, a right edge, and a back edge of the shelf plate may be supported by a corresponding one of the left side-surface, the right side-surface, or a back surface of the storage compartment, and the front edge may be provided with a reinforcing member along approximately an entire width of the shelf plate.

[0153] Accordingly, proving a reinforcing structure for preventing stress concentration and deformation through the provision of the gradation part on the front portion of the shelf plate, it is allows sagging and cracking caused by storage items to be prevented, and thus allows worry-free use.

[0154] Furthermore, providing a stainless steel material for the reinforcing structure allows it to be used as a decorative plate, and beautifies the most eye-catching area, and thus achieving superior design characteristics.

[0155] Furthermore, the storage compartment may be a refrigerator compartment, and may be located at a topmost section of a heat-insulating main body which forms a main body of the refrigerator.

[0156] With this, the refrigerator compartment which is most frequently used and into which storage items of various shapes are put can be disposed at the most user-friendly eye-level position, and thus the usability of the

refrigerator can be further improved.

Effects of the Invention

[0157] The refrigerator in the present invention uses creativity in the shapes of the shelf plate and door pocket and can minimize the inoperative space within the storage compartment. With this, it is possible to dramatically increase the storage space of the door pocket and the shelf plate within the storage compartment.

[0158] Furthermore, by providing a gradation in the front-back direction on the front edge of the shelf plate within the storage compartment, a horizontally deep area and a horizontally shallow area can be formed on the shelf plate.

[0159] In other words, the user can select a storage area from among the two areas on the shelf plate and the door pocket depending on the shape, size, and purpose of various types of storage items such as plastic bottles, salad dressing, and so on. In addition, when the door pocket includes the two areas, big and small, the user can select the storage area from among four areas. Specifically, from the user's perspective, sectionalized storage based on the shape, and so on, of storage items becomes possible, and thus the convenience of the refrigerator is improved.

[0160] Furthermore, since the horizontal depth of the shelf plate can be enlarged as much as possible, there is the convenience of allowing relatively long storage items such as a skillet to be taken in and out with relative ease.

[0161] Furthermore, when seen from the user's standpoint, shadows are not easily cast on the front surfaces of storage items on the shelf plate and thus the storage items on the shelf plate can be seen easily. Therefore, usability for the user can be improved.

[0162] Furthermore, by making the aforementioned gradation part in a waveform and configuring the storage compartment positioning to be disposed at the eye-level position of the user, visual beauty is enhanced and the design characteristics of the refrigerator as a whole is improved. Furthermore, since the shelf plate has areas of different color tones, the design characteristics of the inside of the storage compartment is improved.

[0163] Furthermore, it becomes possible to attach and detach the shelf plate easily from the supports even when the shelf plate is enlarged, and thus the convenience of the refrigerator is improved. In particular, there is the convenience of being able to attach and detach the shelf plate even when the space in front of the refrigerator is not sufficiently wide.

[0164] Furthermore, since the horizontal depth of the shelf plate and the height between shelf plates can be varied according to the form of the storage items, storage becomes possible even for tall storage items, for example, and thus the storage ability and usability of the refrigerator can be improved.

[0165] In this manner, the present invention can provide a refrigerator that has better storage efficiency and convenience than conventional refrigerators.

Brief Description of Drawings

[0166]

[FIG. 1] FIG. 1 is a perspective view of when the refrigerator compartment doors of a conventional refrigerator is open.

[FIG. 2] FIG. 2 is a horizontal cross-section view of the refrigerator compartment of the conventional refrigerator.

[FIG. 3] FIG. 3 is a front view of the refrigerator in a first embodiment of the present invention.

[FIG. 4A] FIG. 4A is a perspective view of the refrigerator in the first embodiment with doors opened.

[FIG. 4B] FIG. 4B is a perspective view of a part of the refrigerator compartment of the refrigerator in the first embodiment.

[FIG. 4C] FIG. 4C is a perspective view of a small item case included in the refrigerator compartment in the refrigerator in the first embodiment.

[FIG. 4D] FIG. 4D is a perspective view of a chiller case included in the refrigerator compartment in the refrigerator in the first embodiment.

[FIG. 5] FIG. 5 is a cross-section view of the refrigerator in the first embodiment.

[FIG. 6] FIG. 6 is a horizontal cross-section view of the refrigerator in the first embodiment.

[FIG. 7] FIG. 7 is a perspective view of a shelf plate in the first embodiment.

[FIG. 8] FIG. 8 is a horizontal cross-section view of the refrigerator in the first embodiment with the left door opened.

[FIG. 9] FIG. 9 is a horizontal cross-section view of the refrigerator in the first embodiment when the widths of the left door and the right door are made the same.

[FIG. 10] FIG. 10 is diagram showing a glass shelf plate in the refrigerator in the first embodiment fitted with the brim material covering its entire perimeter.

[FIG. 11] FIG. 11 is a horizontal cross-section view of a refrigerator in a second embodiment.

[FIG. 12] FIG. 12 is a horizontal cross-section view of a refrigerator in a third embodiment.

[FIG. 13] FIG. 13 is a horizontal cross-section view of the refrigerator in the third embodiment with the left door opened.

[FIG. 14] FIG. 14 is a front view of a refrigerator in a fourth embodiment.

[FIG. 15] FIG. 15 is a horizontal cross-section view of the refrigerator in the fourth embodiment.

[FIG. 16] FIG. 16 is a diagram showing the case where a storage case is set in the base of the refrigerator compartment of the refrigerator in the fourth embodiment.

[FIG. 17] FIG. 17 is a front view of a refrigerator in a

fifth embodiment.

[FIG. 18] FIG. 18 is a perspective view of the refrigerator in the fifth embodiment with doors opened.

[FIG. 19] FIG. 19 is a vertical cross-section view of the refrigerator in the fifth embodiment.

[FIG. 20] FIG. 20 is a horizontal cross-section view of the refrigerator in the fifth embodiment.

[FIG. 21] FIG. 21 is a perspective view of a part of the refrigerator compartment of the refrigerator in the fifth embodiment.

[FIG. 22] FIG. 22 is a perspective diagram showing the inside of the storage compartment of the refrigerator in the fifth embodiment when a forward shelf plate is moved below a rear shelf plate.

[FIG. 23] FIG. 23 is a perspective view of a shelf plate in the fifth embodiment.

[FIG. 24] FIG. 24 is a horizontal cross-section view of the refrigerator in the fifth embodiment with the left door opened.

[FIG. 25] FIG. 25 is a horizontal cross-section view of the refrigerator in the fifth embodiment when the widths of the left door and the right door are made the same.

[FIG. 26] FIG. 26 is diagram showing a glass shelf plate in the refrigerator in the fifth embodiment fitted with the brim material covering its entire perimeter.

[FIG. 27] FIG. 27 is a horizontal cross-section view of a refrigerator in a sixth embodiment.

[FIG. 28] FIG. 28 is a horizontal cross-section view of a refrigerator in a seventh embodiment.

[FIG. 29] FIG. 29 is a horizontal cross-section view of the refrigerator in the seventh embodiment with the left door opened.

[FIG. 30] FIG. 30 is a front view of a refrigerator in an eighth embodiment.

[FIG. 31] FIG. 31 is a horizontal cross-section view of the refrigerator in the eighth embodiment.

[FIG. 32] FIG. 32 is a diagram showing the case where a storage case is set in the base of the refrigerator compartment of the refrigerator in the eighth embodiment.

[FIG. 33] FIG. 33 is a vertical cross-section view of a refrigerator in a ninth embodiment.

[FIG. 34] FIG. 34 is a perspective view showing the left edge portion of a shelf plate of the refrigerator in the ninth embodiment, as seen from below the shelf plate.

[FIG. 35] FIG. 35 is a vertical cross-section view showing the shelf plate of the refrigerator in the ninth embodiment in an unattached state.

[FIG. 36] FIG. 36 is a front view of a refrigerator in a tenth embodiment.

[FIG. 37] FIG. 37 is a perspective view of the refrigerator in the tenth embodiment with doors opened.

[FIG. 38] FIG. 38 is a vertical cross-section view of the refrigerator in the tenth embodiment.

[FIG. 39] FIG. 39 is a horizontal cross-section of the refrigerator in the tenth embodiment.

[FIG. 40] FIG. 40 is a horizontal cross-section view of the refrigerator in the tenth embodiment with the left door opened.

[FIG. 41] FIG. 41 is a horizontal cross-section view of the refrigerator in the tenth embodiment when the widths of the left door and the right door are made the same.

[FIG. 42] FIG. 42 is a horizontal cross-section view of a refrigerator in an eleventh embodiment.

[FIG. 43] FIG. 43 is a horizontal cross-section view of a refrigerator in a twelfth embodiment.

[FIG. 44] FIG. 44 is a horizontal cross-section view of the refrigerator in the twelfth embodiment with the left door opened.

[FIG. 45] FIG. 45 is a front view of a refrigerator in a thirteenth embodiment.

[FIG. 46] FIG. 46 is a horizontal cross-section view of the refrigerator in the thirteenth embodiment.

[FIG. 47] FIG. 47 is a diagram showing the case where a storage case is set in the base of the refrigerator compartment of the refrigerator in the thirteenth embodiment.

[FIG. 48] FIG. 48 is a horizontal cross-section view of the case where the refrigerator in the thirteenth embodiment includes only a laterally-short door pocket.

[FIG. 49] FIG. 49 is a front view of a refrigerator in a fourteenth embodiment.

[FIG. 50] FIG. 50 is a perspective view of the refrigerator in the fourteenth embodiment with doors opened.

[FIG. 51] FIG. 51 is a horizontal cross-section view of the refrigerator in the fourteenth embodiment.

[FIG. 52] FIG. 52 is diagram showing a shelf plate included in the refrigerator in the fourteenth invention.

[FIG. 53] FIG. 53 is a horizontal cross-section view of the refrigerator in the fourteenth embodiment.

[FIG. 54] FIG. 54 is a perspective view of the shelf plate in the fourteenth embodiment.

[FIG. 55] FIG. 55 is a horizontal cross-section view of the refrigerator in the fourteenth embodiment with the left door opened.

[FIG. 56] FIG. 56 is a horizontal cross-section view of the refrigerator in the fourteenth embodiment when the widths of the left door and the right door are made the same.

[FIG. 57] FIG. 57 is diagram showing a glass shelf plate in the refrigerator in the fourteenth embodiment fitted with the brim material covering its entire perimeter.

[FIG. 58] FIG. 58 is a horizontal cross-section view of a refrigerator in a fifteenth embodiment.

[FIG. 59] FIG. 59 is a horizontal cross-section view of a refrigerator in a sixteenth embodiment.

[FIG. 60] FIG. 60 is a horizontal cross-section view of the refrigerator in the sixteenth embodiment with the left door opened.

[FIG. 61] FIG. 61 is a front view of a refrigerator in a seventeenth embodiment.
[FIG. 62] FIG. 62 is a horizontal cross-section view of the refrigerator in the seventeenth embodiment.
[FIG. 63] FIG. 63 is a diagram showing a first modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments.
[FIG. 64] FIG. 64 is a diagram showing a second modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments.
[FIG. 65] FIG. 65 is a diagram showing a third modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments.
[FIG. 66] FIG. 66 is a partial perspective diagram of the inside of the refrigerator compartment of a refrigerator in an eighteenth embodiment, seen from a forward-bottom perspective.
[FIG. 67] FIG. 67 is a vertical-central cross-section view of a forward shelf plate and a rear shelf plate in the eighteenth embodiment, in their integrated state.
[FIG. 68] FIG. 68 is a magnified view of section Q in FIG. 67.
[FIG. 69] FIG. 69 is a perspective view of the forward shelf plate and the rear shelf plate in the eighteenth embodiment.
[FIG. 70] FIG. 70 is a perspective view of the forward shelf plate and the rear shelf plate in the eighteenth embodiment, in their separated state.
[FIG. 71] FIG. 71 is a P-P cross-section view of FIG. 66.
[FIG. 72] FIG. 72 is a magnified view of section R in FIG. 71.
[FIG. 73] FIG. 73 is a cross-section view showing the inside of the refrigerator compartment with the forward shelf plate moved above the rear shelf plate, in the eighteenth embodiment.
[FIG. 74] FIG. 74 is a magnified view of section T in FIG. 73.
[FIG. 75] FIG. 75 is a perspective view showing the rear shelf plate in the eighteenth embodiment in its removed state.
[FIG. 76] FIG. 76 is a horizontal cross-section view of a refrigerator in a nineteenth embodiment.
[FIG. 77] FIG. 77 is a horizontal cross-section view of the case where the refrigerator in the fourth embodiment includes only a laterally-short door pocket.
[FIG. 78] FIG. 78 is a horizontal cross-section view of the case where the refrigerator in the seventeenth embodiment includes only a laterally-short door pocket.

Numerical References

[0167]

72 Foam heat-insulating material
80, 102, 112, 121, 180, 202, 212, 221, 280, 480, 502, 512, 521, 601, 602, 702 Shelf plate
81 Hinge
82 Chiller case
83 Small item case
84 Cool air duct
85 Gasket
86 Divider
87, 387 Lighting device
88 Swing axis
89 Door inner-surface
90, 100, 700 Left door pocket
91, 101, 111, 701 Right door pocket
92, 114, 124, 192, 214, 224, 492, 514, 524 Gradation part
93, 113, 122, 193, 213, 222, 493, 513, 522 Large shelf plate part
94, 115, 123, 194, 215, 223, 494, 515, 523 Normal shelf plate part
95, 195, 495 Metal plate
96, 196, 496 Brim material
96a, 196a, 496a, 612, 613 Latching part
97, 99 Door pocket
98 Storage case
106, 206, 506 Boundary part
180a, 604 Rear shelf plate
180b, 603 Forward shelf plate
183 Placement shelf plate
296a Latching piece
605, 608 Glass portion
606, 609 Frame
607 Forward shelf extension part
610 Rear shelf extension part
614, 615, 620 Shelf support
616 Recess
617 Protrusion
618 Hook
619 Latch hole
621 Projection hole

Best Mode for Carrying Out the Invention

[0168] Hereinafter, embodiments of the present invention shall be described with reference to the Drawings.

(First Embodiment)

[0169] First, the configuration of a refrigerator in a first embodiment of the present invention shall be described using FIG. 3 to FIG. 10.
[0170] FIG. 3 is a front view of the refrigerator in the first embodiment of the present invention.
[0171] As shown in FIG. 3, a refrigerator 51 in the present embodiment is a refrigerator including French doors and a compartmentalized storage compartment within a heat-insulating main body 52.
[0172] The refrigerator 51 in the present embodiment specifically includes, from the top, a refrigerator compart-

ment 53, an ice-making compartment 54, a switchable compartment 55 provided beside the ice-making compartment 54 and which allows switching of inside temperature, a vegetable compartment 56, and a freezer compartment 57.

[0173] The opening of each storage compartment is provided with a heat-insulating door filled with a foam heat-insulating material such as urethane. Specifically, the refrigerator compartment 53 is provided with a left door 60a and a right door 60b which cover the opening of the heat-insulating main body 52 in a manner which allows opening and closing.

[0174] Furthermore, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57 are provided with a drawer-type door 61, door 62, door 63, and door 64, respectively.

[0175] From the perspective of storage capability and usability, the left door 60a is configured with a shorter length in the left-right direction, that is, a shorter width than the right door 60b, and the left door 60a and the right door 60b are split at approximately the same location in the left-right direction as the location at which the ice-making compartment 54 and the switchable compartment 55 are split.

[0176] Furthermore, depending on the storage configuration, and so on, there are cases where the doors of the storage compartment are French doors having a left door and a right door of identical width, and there are also configurations where one of the left door or the right door is of the drawer-type. Here, "identical width" refers not only to when the widths of the respective doors match perfectly, but also to when they are substantially the same. This is also true for the cases when other dimensions, locations, and so on, are said to be "the same" or "matching".

[0177] Furthermore, a cooler and fan which are not shown in the Drawings are provided behind the vegetable compartment 56 and the freezer compartment 57. The cooler is driven by a compressor disposed at the bottom portion of the main body of the refrigerator 51, and cooled air from the cooler is sent to the respective storage compartments. Furthermore, cooling is controlled to predetermined temperatures for each of the storage compartments.

[0178] FIG. 4A is a perspective view of the refrigerator 51 in the present embodiment with doors opened, and FIG. 4B is a perspective view of a part of the refrigerator compartment of the refrigerator 51 in the present embodiment. Furthermore, FIG. 4C and FIG. 4D are perspective views of a small-item case 83 and a chiller case 82, respectively, included in the refrigerator compartment 53 of the refrigerator 51 in the present embodiment. FIG. 5 is a vertical cross-section view (A-A shown in FIG. 3) of the refrigerator 51 in the present embodiment.

[0179] As shown in FIG. 4A and FIG. 5, plural shelf plates 80 for organizing and storing food items, and so on, are placed in the refrigerator compartment 53 in a bridging manner to span between the left side-surface and the right side-surface.

[0180] With the plural shelf plates 80, storage spaces spanning plural levels are formed in the refrigerator compartment 53.

[0181] Furthermore, as previously described, the left door 60a and the right door 60b are placed at the opening of the refrigerator compartment 53. Specifically, the left door 60a and the right door 60b are each supported by the hinges 81 at the left and right ends of the heat-insulating main body 52.

[0182] A gasket 85 is fitted along the edges of the inner-side of such French door 60a and door 60b and thus the cold air inside the refrigerator compartment 53 is prevented from flowing to the outside.

[0183] Furthermore, the left door 60a has plural left door pockets 90 in a vertical direction in its refrigerator compartment 53-side, and the right door 60b also has plural right door pockets 91 in the same manner.

[0184] Specifically, each door pocket is held in place by a holding member and the like, not shown in the Drawings, which is cast with a door inner-surface 89 and the like thus ensuring holding strength in the holding of storage items. Furthermore, the intra-compartment surface of the doors is formed by the door inner-surface 89 and the storage compartment-side surfaces of the respective door pockets.

[0185] The plural door pockets in the respective doors form storage spaces spanning plural levels in the refrigerator compartment 53. Furthermore, each of the plural door pockets is intended to store mainly plastic bottles of beverages and the like and bottles of condiments and the like, and are shaped to have walls on the front, back, left, and right, and an upside opening.

[0186] Specifically, each door pocket is an example of a projecting part provided in the inner wall of a door, and has a recessed part opening upward.

[0187] It should be noted that the projecting part need not have a recessed part as long as items can be placed on it.

[0188] Furthermore, there are cases where each door pocket does not have a wall on the door-side (back wall) and instead utilizes the door inner-surface 89 as a back wall.

[0189] Furthermore, a lighting device 87 is provided in a sunken space on both left and right sides of the forward locations of an inner casing 70 forming the wall surface of the refrigerator compartment 53, and such space is covered by a cover not shown in the Drawings. The inside of the storage compartment is illuminated from the front by the lighting device 87.

[0190] It should be noted that the lighting device 87 may be provided in a cool air duct 84 described later, located at the back side of the refrigerator compartment 53 or the ceiling of the refrigerator compartment 53, and plural lighting devices 87 may be provided.

[0191] Furthermore, the chiller case 82 for improving the freshness of meat, fish, and the like, and small-item

cases 83 for storing eggs and so on, are disposed in the lowest level of the storage spaces in the refrigerator compartment 53.

[0192] As shown in FIG. 4B, the chiller case 82 and the small-item cases 83 are drawers included in the refrigerator compartment 53 and, in accordance with the shape of the shelf plates 80, the left and right horizontal depths are different. Drawers in the present embodiment are disposed in the space formed between the bottom surface of the lowest shelf plate 80 included in the refrigerator compartment 53 and the inner casing 70 of the refrigerator compartment 53, and include independent left and right drawers.

[0193] As shown in FIG. 4C and 4D the small-item case 83 is an independent left drawer unit and the chiller case 82 is an independent right drawer unit.

[0194] It should be noted that the drawers may be a single-piece drawer having different left and right lengths in accordance with the shape of the shelf plate 80.

[0195] Furthermore, drawers need not be disposed in the space beneath the lowest shelf plate 80, and may be disposed in a space of the refrigerator compartment 53 partitioned by any of the plural shelf plates 80. Specifically, it is sufficient that the drawers are disposed in the space formed between the top surface or bottom surface of a shelf plate 80 included in the refrigerator compartment 53 and the inner casing 70 of the refrigerator compartment 53.

[0196] Since the drawers are shaped in this manner, storage space can be increased over the conventional refrigerator without changing the overall size of the refrigerator 51, compared to when the front surfaces are flat such as that which is conventional.

[0197] Furthermore, by including drawers having different left and right lengths, the user of the refrigerator 51 can be creative in the use of the drawers thereby improving convenience. For example, by adopting the long left drawer unit as a small-item case and the short right drawer unit as a chiller case, as in the present embodiment, the user can organize and store items between them accordingly. Furthermore, even when including a single-piece drawer having different left and right lengths unlike in the present embodiment, the user can be creative in storing long items in the horizontally deep portion of the drawer.

[0198] Furthermore, as shown in FIG. 5, the heat-insulating main body 52 is configured of a heat-insulating wall in which a foam heat-insulating material 72 is injected into a space formed between the inner casing 70 that is a vacuum formed body of resin such as ABS and an outer casing 71 using a metal material such as pre-coated steel plate.

[0199] Furthermore, the cool air duct 84 for blowing the cool air cooled by the previously described cooler to the inside of the storage compartment is provided at the back side of the refrigerator compartment 53, that is, at the back of the shelf plates 80.

[0200] In general, the cool air duct 84 is configured from approximately the entire back-side of the inside of the heat-insulating main body 52 and, as necessary, is configured by providing outlets, not shown in the Drawings, between the respective shelf plates 80 so that cool air flows through the respective storage spaces. Furthermore, the cool air duct can also be used as a positioning unit or fastening unit for the plural shelf plates 80.

[0201] FIG. 6 is a horizontal cross-section view (B-B shown in FIG. 3) of the refrigerator 51 in the present embodiment.

[0202] As shown in FIG. 6, a divider 86 is disposed between both doors positioned at the opening of the refrigerator compartment 53. When both doors are closed, the gap between both doors is sealed by the divider 86 and the gasket 85.

[0203] The divider 86 is fitted to the right end of the left door 60a and is configured to turn together with the opening and closing of the left door 60a such that the left door 60a can be closed even after the right door 60b is closed first.

[0204] As such, a small space is required behind (the refrigerator compartment-side) the divider 86 in order for the divider 86 to turn.

[0205] It should be noted that when the gap between both doors can be sealed by the contact between the gaskets fitted along the perimeter of both doors, a divider 86 need not be set at the center portion.

[0206] Furthermore, the shelf plate 80 is disposed within the storage compartment space between the left door pocket 90, the right door pocket 91 and the cool air duct 84, and is provided with a certain amount of clearance from the door pockets so as not to interfere with the left door pocket 90 and the right door pocket 91.

[0207] It should be noted that the shelf plate 80 is supported and held in place in the heat-insulating main body 52 by being set on protrusions or the like, that are cast with the inner casing 70, and is disposed so as to be approximately horizontal.

[0208] Here, in the present embodiment, the left door pocket 90 is shorter in width than the right door pocket 91 in the same manner as the relationship between the left and right doors. In addition, the horizontal depth C of the top plane opening of the left door pocket 90 and the horizontal depth D of the top plane opening of the right door pocket 91 are in a C<D relationship.

[0209] In this manner, in the refrigerator 51, the right door pocket 91 is configured to protrude further into the storage compartment-side and thus have an enlarged storage space. In other words, the distance from the door inner-surface of the French doors up to the back surface of the refrigerator compartment 53 is different on the left and right, with the distance being greater on the left side.

[0210] Furthermore, in accordance with the shape of the left door pocket 90 and the right door pocket 91 having such magnitude relationship, the horizontal depth of the shelf plate 80 is different on the left and right as seen from the opening of the refrigerator compartment 53.

[0211] By shaping the shelf plate 80 in such a manner,

storage space can be increased over the conventional refrigerator without changing the overall size of the refrigerator 51.

[0212] The advantageous effects achieved by shelf plate 80 and the left door pocket 90 and right door pocket 91 in the present embodiment shall be described hereafter.

[0213] Each of the French-type left door 60a and right door 60b configured at the opening of the refrigerator compartment 53 opens by swinging outward from the boundary of the left door 60a and the right door 60b, with the hinges 81 as an axis. With this movement, the left door pocket 90 and the right door pocket 91 included in the respective doors swing together with the doors.

[0214] At this time, in order to prevent one door from interfering with the other door (including the door pockets fitted to each door), each of the door pockets need to be in a shape that fits within the swing trajectory (dashed-dotted line) of each door.

[0215] In the present embodiment, the right door pocket 91 is provided with a slanting portion on the left side and is made to be horizontally deeper than the left door pocket 90 but within the swing trajectory of the right door 60b. Furthermore, the left door pocket 90 has a width and horizontal depth that are comparatively short so as to fit within the swing trajectory of the left door 60a without having to make such a slanting portion as described above.

[0216] Specifically, although the storable volume for the left door pocket 90 is comparatively small, enlarging the right door pocket 91 guarantees a fixed amount for the total storable volume for the left and right door pockets.

[0217] Here, in general, the slanting portion becomes more acute as the horizontal depth of the right door pocket 91 increases, and the space between the right door pocket 91, the left door pocket 90 and the shelf plate 80, that is, the inoperable space around the back of the divider 86, becomes larger.

[0218] It should be noted that regardless of whether the door pocket is in the left side or the right side, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the above-described inoperative space increases.

[0219] Consequently, in the present embodiment, the front edge on the horizontally shallow side of the shelf plate 80 faces the door inner-surface with the shorter distance from the door inner-surface to the back surface, and the front edge on the horizontally deeper side of the shelf plate 80 faces the door inner-surface with the longer distance from the door inner-surface to the back surface.

[0220] Specifically, as shown in FIG. 6, the front edge of the horizontally shallow right side of the shelf plate 80 faces the horizontally deep right door pocket 91, and the front edge of the horizontally deep left side of the shelf plate 80 faces the horizontally shallow left door pocket 90.

[0221] In other words, the respective horizontal depths of the projecting parts consisting of the right door pocket 91 and the left door pocket 90 conform to the horizontal depths of the shelf plate 80.

[0222] With this, it is possible to reduce the inoperative space around the back of the divider 86 and increase the storage space inside the storage compartment.

[0223] Specifically, as shown in FIG. 6, assuming the horizontal depth of the left end side of the shelf plate 80 to be E and the horizontal depth of the right end side to be F, the shelf plate 80 assumes a shape that satisfies E>F and the sum of E and C is approximately equal to the sum of F and D.

[0224] In this manner, the shape of the front end portion of the shelf plate 80 toward the left and right is opposite those of the left door pocket 90 and the right door pocket 91.

[0225] Therefore, the front edge of the shelf plate 80 in the present embodiment has a gradation in the front-back direction that is not present in conventional refrigerator shelf plates. The part making up this gradation shall be referred to as a gradation part 92.

[0226] The gradation part 92 is a part which continuously connects the respective front edges of the left side and the right side of a shelf plate through a curve.

[0227] Furthermore, the left side portion of the shelf plate 80 including the portion having the horizontal depth E shall be referred to as the large shelf plate part 93 and the right side portion of the shelf plate 80 including the portion having the horizontal depth F shall be referred to as the normal shelf plate part 94.

[0228] The large shelf plate part 93 and the normal shelf plate part 94 can be roughly distinguished as the left side (large shelf plate part 93) and the right side (normal shelf plate part 94) of the straight line stretching in the horizontal depth direction from the center point of the left-right direction of the gradation part 92.

[0229] It should be noted that the method for distinguishing the large shelf plate part 93 and the normal shelf plate part 94 is not limited to the above-described method and, for example, in FIG. 6, it is acceptable to refer to only the area having the horizontal depth F as the normal shelf plate part 94, and refer to the remaining area as the large shelf plate part 93.

[0230] In the present embodiment, the front edge of the large shelf plate part 93 and the front edge of the normal shelf plate part 94 are continuously connected by the gradation part 92.

[0231] Furthermore, this curved shape is a result of shaping to match the shape of the right door pocket 91 including the slanting portion. Determining the respective dimensions of the normal shelf plate part 94 in a shape that follows the shape of the left door pocket 91 in this manner is particularly effective in reducing the inoperative space.

[0232] As such, the shape of the shelf plate 80 in the present embodiment enlarges the storable shelf base area of the entire storage compartment combining the left door pocket 90, the right door pocket 91 and the shelf plate 80, and can thus be regarded as a shape which

efficiently increases the storage space.

[0233] It should be noted that the shape of the gradation part 92 may be any shape which does not interfere with the horizontally deep right door pocket 91. Here, the shape of the right door pocket 91 is a shape that does not interfere with the left door 60a, that is, a shape that fits within the swing trajectory of the right door 60b.

[0234] Therefore, as long as the gradation part 92 is on the outer side of the swing trajectory of the right door 60b, it does not interfere with the right door pocket 91. Furthermore, in order to reduce the inoperative space, it is sufficient for the curve included in the gradation part 92 to be a curve having an arc which corresponds to the swing trajectory of the right door 60b.

[0235] Furthermore, the right door pocket 91 is made to be horizontally deeper than normal to make up for the reduced storage space of the left door pocket 90.

[0236] With this, only the storage space of the shelf plate 80 is increased without changing the approximate combined storage space of both door pockets.

[0237] Specifically, in the refrigerator 51 in the present embodiment, the storage space is increased over the conventional refrigerator without changing the overall size.

[0238] Furthermore, the size of the inoperative space resulting from the swing trajectories of the French doors described above can be suppressed by moving the location of the swing trajectories forward by moving the location of the hinges 81 forward, and so on.

[0239] However, in recent years, there has been an increasing need for enlargement of the storage space of door pockets due to the increased consumption of plastic bottles and glass bottles, and from the perspective of convenience in allowing the user to take items in and out of upon opening the doors.

[0240] With this, with recent refrigerators, there is an increased tendency for door pockets to project further towards the storage compartment side, and as a result, there is a tendency for the inoperative space inside the storage compartment to increase.

[0241] In response to this tendency, the refrigerator 51 in the present embodiment increases the storage space over the conventional refrigerator without changing overall size. In other words, the refrigerator 51 is a refrigerator that has better storage efficiency and convenience than what is conventional.

[0242] These described details are merely a result of one horizontal cross-section of the refrigerator compartment 53 shown in FIG. 6. However, the shape of the swing trajectory of the left door pocket 90 and the right door pocket 91 is approximately the same for the entire height of the French doors.

[0243] As such, by adopting approximately the same shapes for the plural shelf plates 80 and the plural left door pockets 90 and right door pockets 91 which configure storage spaces spanning plural levels, it is possible to increase the storage spaces spanning the entire height within the storage compartment, and thus a significant advantageous effect can be attained.

[0244] Furthermore, with the plural shelf plates 80 in the vertical direction, the respective front edges of the shelf plates from the top level to the bottom level are disposed in parallel positions, that is, the plural shelf plates 80 are disposed such that the positions in the horizontal depth direction of the respective front edges are approximately the same.

[0245] With this, there is a sense of unity from the perspective of the user, and superior design characteristics are achieved.

[0246] In addition, the plural shelf plates 80 can be made up of identical components, and this contributes to the reduction of manufacturing costs through component standardization, and the reduction of manufacturing costs through reduced operational load in the manufacturing stage.

[0247] With respect to the left door pockets 90 and the right door pockets 91, there is also a possibility for enabling component standardization for the plural door pockets spanning vertically, as with the shelf plates 80. In such a case, this is likewise very effective in the reduction of manufacturing costs and so on.

[0248] Furthermore, as described above, the shelf plate 80 includes a large shelf plate part 93 and the normal shelf plate part 94, in accordance with the shape of the left door pockets 90 and the right door pockets 93 which have long and short horizontal depths. Specifically, the shelf plate 80 includes, in the large shelf plate part 93, a large area which allows storage and is not conventionally available.

[0249] The large shelf plate part 93 is characterized in being horizontally deep, and allows relatively long storage items such as a skillet or a large bottle to be placed steadily without interfering with the taking in and out of other storage items.

[0250] From the perspective of the user, this is convenient in terms of storing a large amount of items separately in the refrigerator 51, and in terms of taking out a desired storage item from among the large amount of storage items.

[0251] Such advantageous effects can be obtained simply by reducing the horizontal depths C and D of the left door pocket 90 and right door pocket 91, respectively, and increasing the horizontal depths E and F of the shelf plate 80.

[0252] However, such a case reduces the storage capacity of the door pockets which are very convenient for a user and instead degrades the storage characteristics of the storage compartment and making it difficult to use, and is thus impractical.

[0253] Furthermore, by making the shelf plate 80 into a relatively thin flat plate, the storage spaces spanning plural levels can be enlarged as much as possible. In other words, the storage space can be increased. Furthermore, there is no sense of crampedness in the front edge of the shelf plates 80, which is most visually concerning.

[0254] In addition, by fabricating the shelf plates 80 with a material having transparency, it is possible to reduce the sense of crampedness imparted by the shelf plates 80 and give a sense of spaciousness. Furthermore, it is also possible to impart a sense of cleanliness inside the refrigerator compartment 53.

[0255] Furthermore, in the present embodiment, the gradation part 92 of the shelf plate 80 is not an angular step but has a smooth-flowing wave shape such as a rounded shape or a chamfered shape for example.

[0256] This also has an advantageous effect as a reinforcing structure for preventing the occurrence of stress concentration and distortion in the shelf plate 80. As such, since it is possible to prevent sagging and cracking even when storage items are placed on top, and it is attractive in appearance and superior design-wise, it is a very effective means.

[0257] Here, in general, the front edge of the shelf plate 80 forming the opening for taking storage items in and out is not supported anywhere. Consequently, in the present embodiment, the shelf plate 80 includes, as a brim material, a molded metal plate 95 of stainless steel, and the like, as shown in FIG. 7.

[0258] FIG. 7 is a perspective view of a shelf plate 80 in the present embodiment.

[0259] As shown in FIG. 7, including the metal plate 95 in the front edge of the shelf plate 80 has an advantage of allowing strength to be increased and allowing the metal plate 95 to be used as a decorative plate.

[0260] It should be noted that, although the metal plate 95 is fitted on the entire width of the front edge in FIG. 7, it is sufficient to have a brim material at least on the portion including the gradation part 92. This is because the vicinity of the gradation part 92 is most prone to the occurrence of stress centering.

[0261] Furthermore, as shown in FIG. 7, when the metal plate 95 is fitted so as to sandwich the top and bottom surfaces of the shelf plate 80, it is possible to reduce the chances of items placed on the shelf plate 80 from falling off from the front end portion.

[0262] Furthermore, the shelf plate 80 may be made to allow switching in the vertical direction depending on the shapes of the storage items, and enable the dimension in the horizontal depth direction to be variable by folding the shelf plate 80.

[0263] Furthermore, although it is described that the aforementioned shelf plate 80 is configured to be a single flat plate, even with a two-part construction divided right in the vicinity of the gradation part 92, as long as it is configured by a shelf plate making up the large shelf plate part 93 and a shelf plate making up the normal shelf plate part 94 and the gradation part 92 is present in between, it is possible to attain the same advantageous effect, as described above, of reducing the inoperative space to a certain degree.

[0264] Here, the case where the metal plate 95 is fitted, as decoration, to the front edge of a shelf plate 80 having transparency and including a wave-shaped gradation part 92 is assumed.

[0265] In this case, when such shelf plate 80 and metal plate 95 are illuminated by the lighting device 87 with a light from the front of the storage compartment, the shelf plate and metal plate are illuminated from approximately the same direction as the direction of the line of sight of the user. With this, the storage items inside the storage compartment become very easy to see, and the design characteristics of the shelf plate 80 having the wave-form gradation part 92 is improved.

[0266] Furthermore, using glass as the material for the shelf plate 80 serves a dual purpose of increasing light transmissivity and making the shelf plate clean and superior in strength.

[0267] Furthermore, by using LED and embedding the lighting device 87 in the heat-insulating wall of the inner casing 70, space-saving is possible compared to when the lighting device is conventionally provided mainly in the cool air duct 84 or in the ceiling.

[0268] Furthermore, as described above, the left door pocket 90 is configured to have a relatively short horizontal depth C. As such, as shown in FIG. 8, even when assuming a usage environment in which the left door 60a can only be opened 90 degrees, the opening dimension G has a length which allows the storage items to be taken in and out.

[0269] Specifically, in the refrigerator 51 in the present embodiment, it is possible to position storage items further in front using the forward-projecting large shelf plate part 93, and there is the advantage that taking storage items placed in the shelf plate 80 in and out is easy even in a usage environment in which the left door 60a cannot be sufficiently opened.

[0270] Furthermore, the refrigerator compartment 53 in the present embodiment is located on the uppermost part of the refrigerator 51. Therefore, in the case where the refrigerator 51 is a refrigerator of approximately 1800 mm main body height which is the currently predominant over-400 liter capacity type, the storage items in the refrigerator compartment 53 are positioned at approximately the same height as the user's line of sight.

[0271] With this, the user can easily take storage items in and out. In addition, with the above-described ingenuity placed in the shape of the left door pocket 90 and the right door pocket 91 provided in the French-type left door 60a and right door 60b, respectively, and the shelf plate 80, storage space within the storage compartment is dramatically increased and efficient storage that matches the size and shape of storage items is realized.

[0272] For example, sectionalized storage, in which the user stores relatively small bottles such as condiments and dressing in the left door pocket 90, and stores relatively big items such as plastic bottles or milk cartons in the right pocket 91, becomes possible.

[0273] In addition, the shelf plate 80 also allows sectionalized storage in which the horizontally deep but narrow large shelf plate part 93 is used as a stocking zone for storing food items that are not frequently taken in and

out, and the large shelf plate part 93 which has a relatively short horizontal depth but is wider than the large shelf plate part 93 is used as a flowing zone for storing food items that are frequently taken in and out.

[0274] In other words, the user can roughly divide the inside of refrigerator compartment 53 into 4 zones, and use each section depending on the purpose.

[0275] Furthermore, by making the refrigerator compartment 53 opening the largest, and positioning, below the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and so on, which have drawer doors, a very user-friendly storage compartment positioning can be realized.

[0276] The above-described embodiment is merely one embodiment of the present invention and various modifications and applications are possible.

[0277] For example, although the left door 60a is described to have a form in which left-right length, that is, the width is less than that of the right door 60b, the ratio for dividing both doors may be in any proportion.

[0278] Specifically, no matter what proportion is assumed for the ratio in which both doors are divided, by making the normal shelf plate part 94 of the shelf plate 80 face the horizontally deep door pocket and making the large shelf plate part 93 of the shelf plate 80 face the horizontally shallow door pocket, it is possible to obtain approximately the same advantageous effect albeit with a slight difference in the amount of increase in storage space.

[0279] Furthermore, although the left door pocket 90 is made horizontally shallow, this is the result of consideration being given mainly to user-friendliness in a situation where relatively more users are right-handed, and it goes without saying that the same advantageous effect can be obtained even when the configurations of the left and right doors were to be interchanged.

[0280] Furthermore, the length in the left-right direction of the left door 60a and the right door 60b, that is, the width of the left door 60a and the width of the right door 60b may be made the same.

[0281] Here, as shown in FIG. 6, when the width of the left door 60a is less than the width of the right door 60b, the width of the large shelf plate part 93 and the width of the normal shelf plate part 94 are the same albeit approximately.

[0282] Consequently, as shown in FIG. 9 which is a plan cross-section view of the case where the widths of the left door and the right door of the refrigerator in the present embodiment are made the same, the width of the left door 60a and the width of the right door 60b are made the same. With this, the width of the large shelf plate part 93 increases. As such, more food items, and so on, can be placed on the large shelf plate part 93.

[0283] Furthermore, in the present embodiment, the strength, design characteristics, and so on, of the shelf plate 80 is improved by fitting the metal plate 95 on the front edge of the shelf plate 80.

[0284] However, the brim material may be fitted on the entire perimeter of the shelf plate 80. For example, when the shelf plate 80 is fabricated from resin, a latching part and the like, for setting the shelf plate 80 in the inner casing 70 can be provided by casting. In other words, the shelf plate 80 can be easily provided with protrusions.

[0285] However, when the shelf plate 80 is fabricated from glass, in order to provide a latching part to the shelf plate 80 for example, the latching part needs to be attached to the glass shelf plate 80 using an adhesive and the like.

[0286] Consequently, for example, it is possible to fabricate, using resin and the like, a brim material covering the entire perimeter of the glass shelf plate 80, and provide a latching part on the brim material by casting.

[0287] In this case, by fitting the brim material onto the glass shelf plate 80, the latching part for setting the shelf plate 80 on the inner casing 70 can also be provided to the shelf plate 80.

[0288] FIG. 10 is a diagram showing the glass shelf plate 80 of the refrigerator 51 in the present embodiment, fitted with the brim material covering its entire perimeter.

[0289] A brim material 96 shown in FIG. 10 is for example made of resin, and is provided with latching parts 96a in parts corresponding to both ends of the shelf plate 80 by casting.

[0290] Furthermore, although not shown in the Drawings, a latching part such as a protrusion may be provided in a position of the brim material corresponding to the back end of the shelf plate 80, to allow it to be supported by the back surface of the refrigerator compartment 53. With this, the shelf plate 80 is supported not only by the left and right side-surfaces of the refrigerator compartment 53, but also by the back surface of the refrigerator compartment 53.

[0291] Here, the glass shelf plate 80 and the brim material 96 shown in FIG. 10 may be fabricated separately and combined after each is completed, and the shelf plate 80 and the brim material 96 may be cast by insert molding.

[0292] In the case of insert molding, the shelf plate 80 including the brim material 96 and the latching part 96a can be fabricated more rapidly. Furthermore, the fixing strength between the shelf plate 80 and the brim material 96 can be improved.

[0293] It should be noted that when the shelf plate 80 is fabricated from glass, it is also possible that the fitting of a brim material for the purpose of improving strength is unnecessary.

[0294] However, the brim material fitted onto the glass shelf plate can serve to protect the perimeter of the shelf plate 80, prevent items placed on the shelf plate 80 from falling off, improve design characteristics, and so on.

[0295] Furthermore, as shown in FIG. 7 and FIG. 10, brim materials such as the metal plate 95 and the brim material 96 adopt a form which sandwiches the top surface and bottom surface of the shelf plate 80.

[0296] However, the brim material need not assume such a form. For example, a metal plate having a width

that is narrower than the thickness of the shelf plate 80 is fitted to the front end portion or the entire perimeter of the resin shelf plate 80 by being plugged therein.

[0297] Even in such a case, it is possible to improve the strength of the shelf plate 80 for example.

(Second Embodiment)

[0298] Hereinafter, a second embodiment of the present invention shall be described using FIG. 11.

[0299] FIG. 11 is a horizontal cross-section view (B-B shown in FIG. 3) of the refrigerator compartment section of a refrigerator 118 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment and their description shall be omitted.

[0300] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 118 in the present embodiment are different from those of the refrigerator 51 in the first embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 51 in the first embodiment.

[0301] As shown in FIG. 11, the refrigerator 118 in the present embodiment includes the left door 60a, the right door 60b, a left door pocket 100, a right door pocket 101, and a shelf plate 102.

[0302] Furthermore, plural left door pockets 100 are supportively held in place in the left door 60a and disposed along the vertical length of the left door 60a. Plural right door pockets 101 are likewise supportively held in place in the right door 60b and disposed along the vertical length of the right door 60b.

[0303] Plural shelf plates 102 are disposed from the top to bottom of a space between the door pockets and the cool air duct 84 in positions and shapes that do not interfere with the door pockets. The plural shelf plates 102 form storage spaces spanning plural levels.

[0304] The left door pocket 100 is of a size that fits within the swing trajectory of the left door 60a in the figure so as not to interfere with the right door 60b, and is shaped so that the shape of its base is approximately square.

[0305] The right door pocket 101 is horizontally deeper than the left door pocket 100. Furthermore, the horizontal depth of the left end of the right door pocket 101 is reduced in order to fit within the swing trajectory of the right door 60b in the figure so as not to interfere with the left door 60a.

[0306] The shelf plate 102 is disposed within the storage compartment space between the left door pocket 100, the right door pocket 101 and the cool air duct 84 in such a way that a certain amount of clearance is provided so as not to interfere with the left door pocket 100 and the right door pocket 101.

[0307] Specifically, the shelf plate 102 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0308] Furthermore, as shown in FIG. 11, the shape of the shelf plate 102 is one in which the left end side is horizontally deeper than the right end side.

[0309] Specifically, when the length of the left end side is assumed to be H and the length of the right end side is J, their relationship is such that H>J.

[0310] Furthermore, a boundary part 106 is provided between the left door pocket 100 and the right door pocket 101, in the space just behind the divider 86, and the horizontal depth of the shelf plate 102 gradually decreases from the boundary part 106 towards the right side.

[0311] It should be noted that, in the same manner as with the gradation part 92 in the shelf plate 80 in the first embodiment, the boundary part 106 is a part which serves as an approximate boundary at which the horizontal depth of the shelf plate changes.

[0312] Specifically, the left side from the boundary part 106 of the shelf plate 102 corresponds to the large shelf plate part 93 in the first embodiment, and the right side from the boundary part 106 corresponds to the normal shelf plate part 94 in the first embodiment.

[0313] The advantageous effects achieved by shelf plate 102 and the left door pocket 100 and right door pocket 101 in the present embodiment shall be described hereafter.

[0314] As described above, by making the width and horizontal depth of the left door pocket 100 relatively short so that the shape of its base is approximately square, the inoperative space behind the divider 86 can be minimized.

[0315] Furthermore, by making the left side of the shelf plate 102 into a shape which projects up to the vicinity of the left door pocket 100, the horizontal depth of the left-side portion of the shelf plate 102 can be increased.

[0316] Furthermore, the right door pocket 101 is made larger than the left door pocket 100 so as to compensate for the smallness of the left door pocket 100.

[0317] With this, the storage space within the storage compartment can be dramatically increased without reducing the door pocket storage space which is very convenient for the user.

[0318] In particular, by positioning the boundary part 106 of the front edge of the shelf plate 102 in the space behind the divider 86 between the left door pocket 100 and the right door pocket 101, and configuring the shape of the right door pocket 101 to follow the front edge of the shelf plate 102, it is possible to minimize the inoperative space existing in the space behind the divider 86, which has always been typical to conventional French doors.

[0319] Specifically, in the refrigerator 118 in the present embodiment, by adopting the shapes shown in FIG. 11 for the shapes of the shelf plate 102, the left door pocket 100, and the right door pocket 101, it is possible to improve the storage efficiency of the refrigerator 118 by enlarging the storable shelf base area within the storage compartment in the same manner as in the refrigerator 51 in the first embodiment.

[0320] Furthermore, as with the refrigerator 51 in the first embodiment, the refrigerator 118 also allows the storage space of inside the refrigerator compartment to be divided into the 4 sections of the left door pockets 100, the right door pockets 101, the left area and the right area of the shelf plates 102, each having different horizontal depths, and so on.

[0321] This allows the user to perform efficient sectionalized storage in accordance with the size and shape of storage items.

[0322] Furthermore, a single boundary part 106 is present in the front edge of the shelf plate 102 and, when looking at the shelf plate 102 from the top and bottom directions, the front edge has a relatively simple shape consisting of mainly 2 straight lines. In this case, since it is possible to simplify the shape of the metal plate (not shown in the Drawings) which is fitted to the front edge as a brim material and which also serves as decoration, the shelf plate 102 and the brim material can be fabricated at a low cost.

[0323] It should be noted that, when viewed from the top and bottom directions, the front edge of the shelf plate 102 need not be in a shape consisting mainly of 2 straight lines as shown in FIG. 11. Specifically, the front edge of the shelf plate 102 need not be in a shape that bends at the boundary part 106.

[0324] For example, the front edge may be in a shape which softly curves at the boundary part 106. Furthermore, the boundary part 106 may bulge toward the divider 86 within a range that does not enter the swing trajectory of the left door 60a and the right door 60b and the area required for the turning of the divider 86.

[0325] Even in such a case, it is possible to obtain the advantageous effect of increasing storage space albeit with some difference in degree.

(Third Embodiment)

[0326] Hereinafter, a third embodiment of the present invention shall be described using FIG. 12 and FIG. 13.

[0327] FIG. 12 is a horizontal cross-section view of the refrigerator compartment section of a refrigerator 119 in the present embodiment. FIG. 13 is a horizontal cross-section view of the refrigerator 119 in the present embodiment when a left door 110a is opened. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment and their description shall be omitted.

[0328] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 119 in the present embodiment are different from those of the refrigerator 51 in the first embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 51 in the first embodiment.

[0329] As shown in FIG. 12, the refrigerator 119 in the present embodiment includes a left door 110a, a right door 110b and a right door pocket 111. However, unlike the respective refrigerators in the first and second embodiments, the refrigerator 119 in the present embodiment does not include a left door pocket.

[0330] Moreover, the refrigerator 119 in the present embodiment further includes a shelf plate 112, and plural right door pockets 111 are disposed along the vertical length of the right door 110b.

[0331] Plural shelf plates 112 are disposed from the top to bottom of a space between the right door pockets 111 and the cool air duct 84 in positions and of a shape that does not interfere with the right door pockets 111. The plural shelf plates 112 form storage spaces spanning plural levels.

[0332] Here, the shelf plate 112 is disposed within the storage space between the right door pocket 111 and the cool air duct 84 so as to provide a certain amount of clearance so as not to interfere with the right door pocket 111.

[0333] Specifically, the shelf plate 112 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0334] Furthermore, as shown in FIG. 12, the shelf plate 112 is shaped to cover almost the entire area of the space located in the refrigerator compartment-side of the left door 110a and shaped so as not to interfere with the right door pocket 111 in the forward and backward direction at the refrigerator compartment-side of the right door 110b.

[0335] In other words, the shelf plate 112 in the present embodiment is shaped to have a gradation in the front edge in the same manner as the shelf plate 80 in the first embodiment.

[0336] Specifically, when assuming the horizontal depth on the left side of a gradation part 114 to be K and the horizontal depth on the right side of the gradation part 114 to be L, the shelf plate 112 maintains a relationship in which K>L.

[0337] It should be noted that, in the same manner as the shelf plate 80 in the first embodiment, the left side of a straight line extending in the horizontal depth direction from the approximate center point of the gradation part 114 of the shelf plate 112 is the large shelf plate part 113 and the right side of the straight line is the normal shelf plate part 115.

[0338] The advantageous effects achieved by the shelf plates 112 and the right door pockets 111 in the present embodiment shall be described hereafter.

[0339] In the refrigerator 119, the horizontal cross-section of the inside of the refrigerator compartment is virtually allocated to the right door pocket 111 and the shelf plate 112, as shown in FIG. 12.

[0340] Furthermore, the shape of the door pocket 111 which swings integrally with the right door 110b fits within the swing trajectory of the right door 110b in the figure.

[0341] In addition, in the shelf plate 112, there is a normal shelf plate part 115 having a horizontal depth which does not interfere with the right door pocket 111, and the

large shelf plate part 113 is shaped to project up to the vicinity of the left door 110a.

[0342] With this, the inoperative space existing in the space between the door pockets and the shelf plates, that is, behind the divider 86, which is typical of conventional French doors, can be virtually eliminated except for the minimum space required for the turning of the divider 86.

[0343] Specifically, the shape of the shelf plate 112 and the right door pocket 111 shown in FIG. 12 is considered to be extremely effective in increasing storage space.

[0344] Furthermore, the left door 110a does not include door pockets as storage space and is configured of only a heat-insulating wall. With this, the shelf plate 112 can be projected up to the vicinity of the left door 110a, and the horizontal depth of the shelf plate 112 can be made to approximate the length from the door inner-surface of the left door 110a to the back surface of the storage compartment.

[0345] In this case, storage items can be placed in front of the user's line of sight and up front where they can easily be taken out, thus making the taking of items in and out easy and convenient. In addition, it is convenient for storing long items.

[0346] Furthermore, as shown in FIG. 12, the upper surface of the shelf plate 112 can be made into an approximate L-shape. As such, when the right door 110b is opened, aside from the taking in and out of items with respect to the forward area of the normal shelf plate part 115, the taking in and out of items with respect to the area around the gradation part 114 existing in the in-compartment direction of the left door 110a also becomes easy.

[0347] This is because, when the right door 110b is opened, the direction in which items are taken in and out with respect to the area around the gradation part 114, that is, the space in the a roughly sideward direction becomes a free space. Specifically, this is because the space through which items can be taken in and out of such area from the sideward direction when the right door 110b is opened is wide.

[0348] Furthermore, although dependent on the allocation of storage space in the storage compartment between the right door pocket 111 and the shelf plate 112, it is possible to equalize the left and right length of the placement areas of the shelf plate 112, that is, make L shown in FIG. 12 and the width of the front edge of the large shelf plate part 113 the same.

[0349] In this case, there is the advantage that visually checking plural storage items placed on the shelf plate 112 becomes easy.

[0350] Furthermore, as shown in FIG. 13, even when in a usage environment in which the left door can only be opened 90 degrees, it is possible to have a large opening size M when the left door 110a is opened. Specifically, the ease of taking items in and out is significantly improved compared to a left door including conventional left door pockets.

[0351] In addition, the case is assumed in which a small-item case 83 shown in FIG. 4C and having a width that is equal to or less than M is placed in the large shelf plate part 113 of the shelf plate 112.

[0352] In this case, the user can pull out the small-item case 83 to the front without being bothered by the left door 110a. In addition, pulling out and using the small-item case 83 outside the storage compartment from time to time can be done easily.

[0353] Furthermore, in the same manner as the refrigerator 51 in the first embodiment, the refrigerator 119 in the present embodiment also allows sectionalized storage through separate usage of the large shelf plate parts 113, the normal shelf plate parts 115, and the right door pockets 111.

[0354] In this manner, the refrigerator 119 in the present embodiment can efficiently increase storage space in the same manner as the respective refrigerators in the first and second embodiments. In addition, in the refrigerator 119, by providing various drawer mechanisms in the storage compartment space on the left door 110-side, the taking in and out of items can also be improved.

[0355] In other words, the refrigerator 119 in the present embodiment is a refrigerator that has better storage efficiency and convenience than what is conventional.

(Fourth Embodiment)

[0356] As described above, the respective refrigerators in the first through third embodiments include French doors having 2 doors, one each for the left and right, in the opening of the refrigerator compartment. Furthermore, the horizontal depths of the left side and the right side of the shelf plate are in accordance with the shape of the door inner-surface of the doors.

[0357] Specifically, the aforementioned dimensions of the shelf plate are dimensions for filling up the inoperative space within the refrigerator compartment. This increases the storage space within the storage compartment. Furthermore, there are also advantageous effects such as allowing efficient sectionalized storage.

[0358] Here, these advantageous effects achieved by adopting the previously described shapes for the shelf plates are effective, not only for a French door refrigerator, but also for what is called a single door refrigerator which has only one door for the refrigerator compartment.

[0359] Consequently, a single door refrigerator shall be described as a fourth embodiment of the present invention.

[0360] FIG. 14 is a front view of the refrigerator in the present embodiment.

[0361] As shown in FIG. 14, a refrigerator 120 in the present embodiment includes the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the

freezer compartment 57, as in the refrigerator 51 in the first embodiment.

[0362] Furthermore, a single swing door 65 is set in the refrigerator compartment 53. By opening the door 65, the user can take items in and out of the refrigerator compartment 53.

[0363] FIG. 15 is a horizontal cross-section view (B-B shown in FIG. 14) of the refrigerator 120 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment and their description shall be omitted.

[0364] As shown in FIG. 15, the refrigerator 120 in the present embodiment includes a door pocket 97. Plural door pocket 97 are supportively held in place in the door 65 and disposed along the vertical length of the door 65.

[0365] Furthermore, the door pocket 97 has a lateral width that is the same as the lateral width of a shelf plate 121, and has a shape in which the horizontal depth R on a swing axis 88-side is greater than a horizontal depth Q on the opposite side. In other words, it maintains an R>Q relationship.

[0366] Furthermore, the plural shelf plates 121 included in the refrigerator 120 are disposed from the top to bottom of a space between the door pocket 97 and the cool air duct 84 in positions and of a shape that does not interfere with the door pocket 97. The plural shelf plates 121 form storage spaces spanning plural levels.

[0367] In the same manner as the shelf plate 80 in the first embodiment, this shelf plate 121 includes a gradation part 124 and includes a horizontally deep large shelf plate part 122 and a horizontally shallow normal shelf plate part 123.

[0368] Specifically, when the horizontal depth of the large shelf plate part 122 is assumed to be N and the horizontal depth of the normal shelf plate part 123 is P, it maintains a relationship in which N>P and the sum of N and Q is approximately equal to the sum of P and R.

[0369] In other words, in the same manner as the shelf plate 80 in the first embodiment, this shelf plate 121 is shaped to fill up the inoperative space within the storage compartment.

[0370] The advantageous effects achieved by the shelf plates 121 and the door pockets 97 in the present embodiment shall be described hereafter.

[0371] As previously described, there is also demand from users for door pockets and a certain degree of enlargement is necessary. Furthermore, when enlarging door pockets, the horizontal depth is increased because the width is limited to the width of the storage compartment.

[0372] However, the horizontal depth of the door pocket can only be increased up to a certain extent in consideration of the opening and closing of the door.

[0373] Specifically, in the case of the refrigerator 120 which is a single door refrigerator, the door pocket 97 needs to fit within a circle (dashed-dotted line) having a swing axis 88 which is the swing center of the door 65 as a center and passing the end of the inner casing 70 opposite the swing axis 88.

[0374] Consequently, so as not to interfere with the circle, it is possible to increase horizontal depth while providing a slanting portion on the side of the door pocket 97 which is far from the swing axis 88, that is, the left side of the door pocket 97. However, as previously described, in this case, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the inoperative space increases. Furthermore, the shape of the base of the door pocket 97 approximates a triangle and storage capability deteriorates.

[0375] As such, in the refrigerator 120 in the present embodiment, between the right side and the left side of the door inner-surface, the distance from the door inner-surface on the side near the swing axis 88 to the back surface of the refrigerator compartment 53 is made shorter than the distance from the door inner-surface on the side which is far from the swing axis 88 to the back surface.

[0376] Specifically, by relatively shortening the horizontal depth of the left side which is the side of the door pocket 97 which is far from the swing axis 88, the opening and closing of the door 65 becomes possible without having to provide a slanting portion.

[0377] Furthermore, increasing the horizontal depth of the right side which is the side of the door pocket 97 which is near the swing axis 88 compensates for the reduction in storage capacity brought about by the reduction of the horizontal depth on the left side.

[0378] Specifically, when seen as a whole, the door pocket 97 has a shape in which the right side projects into the storage compartment.

[0379] As such, it is possible for an inoperative space to appear in the storage compartment direction on the left side of the door pocket 97. Consequently, the left side of the shelf plate 121 opposing the door pocket 97 is lengthened in the horizontal depth direction to an extent that does not interfere with the door pocket 97, so as to fill up such inoperative space.

[0380] With this, it is possible to enlarge the storable shelf base area of the entire storage compartment combining the door pockets 97 and the shelf plates 121 while suppressing the appearance of inoperative spaces.

[0381] Furthermore, sectionalized storage is possible in the same manner as the refrigerator 51 in the first embodiment, and thus the refrigerator 120 is a user-friendly refrigerator.

[0382] In this manner, the refrigerator 120 in the present embodiment is a refrigerator that has better storage efficiency and convenience than what is conventional, in the same manner as the respective refrigerators in the first through third embodiments.

[0383] It should be noted that in the previously described first through fourth embodiments, there is a relatively large, flat space at the base of the of the refrigerator compartment below the projecting portion of the door pocket.

[0384] Specifically, such space exists in a position that is below the door pocket and below the space from the gradation part of the shelf plate toward the horizontally shallow side of the shelf plate, in the base of the refrigerator compartment.

[0385] This space is an inoperative space that cannot be used as a placement area for food items and so on because the door pocket is located directly above when the door is closed.

[0386] However, by providing a recessed part in this space and fitting a storage case in the recessed part, it is possible to hold food items and so on in the storage case.

[0387] FIG. 16 is a diagram showing the case where a storage case is set in the base of the refrigerator compartment 53 of the refrigerator in the fourth embodiment.

[0388] As shown in FIG. 16, a storage case 98 is set below the door pocket 97 and below the space on the right side of the gradation part 124 of the shelf plate 121.

[0389] With this, for example, the user can store, in the storage case 98, small soy sauce containers and so on that are not suited for storage in the shelf plates 121 or the door pockets 97. In other words, the storage efficiency and convenience of the refrigerator 120 is improved.

[0390] Aside from the refrigerator 120 in the present embodiment, such a storage case 98 can be set in the same manner in the refrigerators in the first through third embodiments and the same advantageous effect is achieved.

[0391] Furthermore, for example, in a refrigerator having an ice-making device for making ice, the storage case 98 can also be used as a feed-water container for supplying water to the ice-making device.

(Fifth Embodiment)

[0392] First, the configuration of a refrigerator in a fifth embodiment of the present invention shall be described using FIG. 17 to FIG. 26. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment.

[0393] FIG. 17 is a front view of the refrigerator in the present embodiment.

[0394] As shown in FIG. 17, a refrigerator 151 in the present embodiment is a refrigerator including French doors in the same manner as the refrigerator 51 in the first embodiment, and includes a compartmentalized storage compartment within the heat-insulating main body 52.

[0395] The refrigerator 151 in the present embodiment specifically includes, from the top, a refrigerator compartment 53, an ice-making compartment 54, a switchable compartment 55 provided beside the ice-making compartment 54 and which allows switching of inside temperature, a vegetable compartment 56, and a freezer compartment 57.

[0396] The front plane opening of each storage compartment is provided with a heat-insulating door filled with a foam heat-insulating material such as urethane. Specifically, the refrigerator compartment 53 is provided with the left door 60a and the right door 60b which compartmentalize, into left and right sides, the front plane opening of the heat-insulating main body 52.

[0397] Furthermore, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57 are provided with the drawer-type door 61, door 62, door 63, and door 64, respectively.

[0398] From the perspective of storage capability and usability, the left door 60a is configured with a shorter length in the left-right direction, that is, a shorter width than the right door 60b, and the left door 60a and the right door 60b are split at approximately the same left-right direction location as the location at which the ice-making compartment 54 and the switchable compartment 55 are split.

[0399] Furthermore, depending on the storage configuration, and so on, there are cases where the doors of the storage compartment are French doors having a left door and a right door of identical width, and there are also configurations where one of the left door or the right door is of the drawer-type.

[0400] Furthermore, a cooler and fan which are not shown in the Drawings are provided behind the vegetable compartment 56 and the freezer compartment 57. The cooler is driven by a compressor disposed at the bottom portion of the main body of the refrigerator 151, and cooled air from the cooler is sent to the respective storage compartments. Furthermore, cooling is controlled to predetermined temperatures for each of the storage compartments.

[0401] FIG. 18 is a perspective view of the refrigerator 151 in the present embodiment with doors opened, and FIG. 19 is a vertical cross-section view (A-A shown in FIG. 17) of the refrigerator 151 in the present embodiment.

[0402] As shown in FIG. 18 and FIG. 19, plural shelf plates 180 for organizing and storing food items, and so on, are placed in the refrigerator compartment 53, and the plural shelf plates 180 create storage spaces spanning plural levels in the refrigerator compartment 53.

[0403] Furthermore, the left door 60a and the right door 60b are placed at the front plane opening of the refrigerator compartment 53.

Specifically, the left door 60a and the right door 60b are each supported by the hinges 81 at the left and right ends of the heat-insulating main body 52.

[0404] A gasket 85 is fitted along the edges of the inner-side of such French door 60a and door 60b and thus the cold air inside the refrigerator compartment 53 is prevented from flowing to the outside.

[0405] Furthermore, the left door 60a has plural left door pockets 90 in a vertical direction in its refrigerator compartment 53-side, and the right door 60b also has plural right door pockets 91 in the same manner.

[0406] Specifically, each door pocket is held in place

by a holding member and the like, not shown in the Drawings, which is cast with a door inner-surface 89 and the like thus ensuring holding strength in the holding of storage items. Furthermore, the intra-compartment surface of the doors is formed by the door inner-surface 89 and the storage compartment-side surfaces of the respective door pockets.

[0407] The plural door pockets in the respective doors form storage spaces spanning plural levels in the refrigerator compartment 53. Furthermore, each of the plural door pockets is intended to store mainly plastic bottles of beverages and the like and bottles of condiments and the like, and are shaped to have walls on the front, back, left, and right, and an upside opening. Specifically, each door pocket is a projecting part on a respective door, and has a recessed part opening upward.

[0408] It should be noted that the projecting part need not have a recessed part as long as items can be placed on it.

[0409] Furthermore, there are cases where each door pocket does not have a wall on the door-side (back wall) and instead utilizes the door inner-surface 89 as a back wall.

[0410] Furthermore, the lighting device 87 is provided in a sunken space on both left and right sides of the forward locations of the inner casing 70 forming the wall surface of the refrigerator compartment 53, and such space is covered by a cover not shown in the Drawings. The inside of the storage compartment is illuminated from the front by the lighting device 87.

[0411] It should be noted that the lighting device 87 may be provided in a cool air duct 84 described later, located at the back side of the refrigerator compartment 53 or the ceiling of the refrigerator compartment 53, and plural lighting devices 87 may be provided.

[0412] Furthermore, the chiller case 82 for improving the freshness of meat, fish, and the like, and small-item cases 83 for storing eggs and so on, are disposed in the lowest level of the storage spaces in the refrigerator compartment 53.

[0413] Furthermore, as shown in FIG. 19, the heat-insulating main body 52 is configured of a heat-insulating wall in which a foam heat-insulating material 72 is injected into a space formed between the inner casing 70 that is a vacuum formed body of resin such as ABS and an outer casing 71 using a metal material such as pre-coated steel plate.

[0414] Furthermore, the cool air duct 84 for blowing the cool air cooled by the previously described cooler to the inside of the storage compartment is provided at the back of the refrigerator compartment 53, that is, at the back of the shelf plates 180.

[0415] In general, the cool air duct 84 is configured from approximately the entire back-side of the inside of the heat-insulating main body 52 and, as necessary, is configured by providing outlets, not shown in the Drawings, between the respective shelf plates 180 so that cool air flows through the respective storage spaces. Furthermore, the cool air duct can also be used as a positioning unit or fastening unit for the plural shelf plates 180.

[0416] FIG. 20 is a horizontal cross-section view (B-B shown in FIG. 17) of the refrigerator 151 in the present embodiment.

[0417] As shown in FIG. 20, the divider 86 is disposed between both doors positioned at the front plane opening of the refrigerator compartment 53. When both doors are closed, the gap between both doors is sealed by the divider 86 and the gasket 85.

[0418] The divider 86 is fitted to the right end of the left door 60a and is configured to turn together with the opening and closing of the left door 60a such that the left door 60a can be closed even after the right door 60b is closed first.

[0419] As such, a small space is required behind (the refrigerator compartment-side) the divider 86 in order for the divider 86 to turn.

[0420] It should be noted that when the gap between both doors can be sealed by the contact between the gaskets fitted along the perimeter of both doors, a divider 86 need not be set at the center portion.

[0421] Furthermore, the shelf plate 180 is disposed within the storage compartment space between the left door pocket 90, the right door pocket 91 and the cool air duct 84, and is provided with a certain amount of clearance from the door pockets so as not to interfere with the left door pocket 90 and the right door pocket 91.

[0422] Here, in the present embodiment, the left door pocket 90 is shorter in width than the right door pocket 91 in the same manner as the relationship between the left and right doors. In addition, the horizontal depth C of the top plane opening of the left door pocket 90 and the horizontal depth D of the top plane opening of the right door pocket 91 are in a C<D relationship.

[0423] In this manner, in the refrigerator 151, the right door pocket 91 is configured to protrude further into the storage compartment-side and thus have an enlarged storage space. In other words, the distance from the door inner-surface of the French doors up to the back surface of the refrigerator compartment 53 is different at the left and right, with the distance being greater on the left side.

[0424] Furthermore, in accordance with the shape of the left door pocket 90 and the right door pocket 91 having such magnitude relationship, the horizontal depth of the shelf plate 180 is different on the left and right.

[0425] By shaping the shelf plate 180 in such a manner, storage space can be increased over the conventional refrigerator without changing the overall size of the refrigerator 151.

[0426] Furthermore, FIG. 21 is a perspective view of a part of the refrigerator compartment of the refrigerator 151 in the present embodiment, and FIG. 22 is a perspective diagram showing the inside of the storage compartment of the refrigerator 151 when a forward shelf plate is moved below a rear shelf plate.

[0427] As shown in FIG. 19, FIG. 21, and FIG. 22, the shelf plate 180 is divided into 2, that is, forward and rear,

at the center portion in the horizontal depth direction. The shelf plate at the front in the horizontal depth direction is a forward shelf plate 180b, and the shelf plate at the back in the horizontal depth direction is a rear shelf plate 180a.

[0428] Furthermore, shelf plate supports 182 are provided in the form of opposing protrusions on the right side-surface and the left side-surface of the refrigerator compartment 53. By engaging the left and right end parts of the forward shelf plate 180b onto the shelf plate supports 182, the forward shelf plate 180b can be fitted to span between the right side-surface and the left side-surface of the refrigerator compartment 53 in a bridging manner. Furthermore, the same applies for the rear shelf plate 180a.

[0429] In addition, supports 181 for supporting the forward shelf plate 180b that is removed from the shelf plate supports 182 are fitted below the shelf plate supports 182 on which the rear shelf plate 180a is placed. The supports 181 are provided in the form of opposing protrusions on the right side-surface and the left side-surface of the refrigerator compartment 53.

[0430] A placement shelf plate 183 is provided at the bottom-most level of the refrigerator compartment 53 directly above the small-item case 83. The placement shelf plate 183 is of an undivided, single-piece construction and is approximately the same shape as the combined forward shelf plate 180b and the rear shelf plate 180a.

[0431] The advantageous effects achieved by shelf plate 180 and the left door pocket 90 and right door pocket 91 in the present embodiment shall be described hereafter.

[0432] Each of the French-type left door 60a and right door 60b configured at the front plane opening of the refrigerator compartment 53 opens by swinging outward from around the center of the refrigerator 151, with the hinges 81 as an axis. With this movement, the left door pocket 90 and the right door pocket 91 included in the respective doors swing together with the doors.

[0433] At this time, in order to prevent one door from interfering with the other door (including the door pockets fitted to each door), each of the door pockets need to be in a shape that fits within the swing trajectory (dashed-dotted line) of each door.

[0434] In the present embodiment, the right door pocket 91 is provided with a slanting portion on the left side and is made to be horizontally deeper than the left door pocket 90 but within the swing trajectory of the right door 60b. Furthermore, the left door pocket 90 has a relatively short width and horizontal depth so as to fit within the swing trajectory of the left door 60a without having to make a slanting portion as described above.

[0435] Specifically, although the storable volume for the left door pocket 90 is comparatively small, enlarging the right door pocket 91 guarantees a fixed amount for the total storable volume for the left and right door pockets.

[0436] Here, in general, the slanting portion becomes more acute as the horizontal depth of the right door pocket 91 increases, and the space between the right door pocket 91, the left door pocket 90 and the shelf plate 180, that is, the inoperable space around the back of the divider 86, becomes larger.

[0437] It should be noted that regardless of whether the door pocket is in the left side or the right side, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the above-described inoperative space increases.

[0438] Consequently, in the present embodiment, the front edge on the shallow side of the shelf plate 180 faces the door inner-surface with the shorter distance from the door inner-surface to the back surface, and the front edge on the deep side of the shelf plate 180 faces the door inner-surface with the longer distance from the door inner-surface to the back surface.

[0439] Specifically, as shown in FIG. 20, the front edge of the horizontally shallow right side of the shelf plate 180 faces the horizontally deep right door pocket 91, and the front edge of the horizontally deep left side of the shelf plate 180 faces the horizontally shallow left door pocket 90.

[0440] With this, it is possible to reduce the inoperative space around the back of the divider 86 and increase the storage space inside the storage compartment.

[0441] Specifically, as shown in FIG. 20, assuming the horizontal depth of the left end side of the shelf plate 180 to be E and the horizontal depth of the right end side to be F, the shelf plate 180 assumes a shape that satisfies E>F and the sum of E and C is approximately equal to the sum of F and D.

[0442] In this manner, the shape of the front end portion of the shelf plate 180 toward the left and right is opposite those of the left door pocket 90 and the right door pocket 91.

[0443] Therefore, the front edge of the shelf plate 180 in the present embodiment has a gradation in the front-back direction that is not present in conventional refrigerator shelf plates. This gradation part shall be referred to as a gradation part 192.

[0444] The gradation part 192 is a part which continuously connects the respective front edges of the left side and the right side of a shelf plate through a curve.

[0445] Furthermore, the left side portion of the shelf plate 180 including the portion having the horizontal depth E shall be referred to as a large shelf plate part 193 and the right side portion of the shelf plate 180 including the portion having the horizontal depth F shall be referred to as a normal shelf plate part 194.

[0446] The large shelf plate part 193 and the normal shelf plate part 194 can be roughly distinguished as the left side (large shelf plate part 193) and the right side (normal shelf plate part 194) of the straight line stretching in the horizontal depth direction from the center point of the left-right direction of the gradation part 192.

[0447] It should be noted that the method for distinguishing the large shelf plate part 193 and the normal shelf plate part 194 is not limited to the above-described

method and, for example, in FIG. 20, it is acceptable to refer to only the area having the horizontal depth F as the normal shelf plate part 194, and refer to the remaining area as the large shelf plate part 93.

[0448] In the present embodiment, the front edge of the large shelf plate part 193 and the front edge of the normal shelf plate part 194 are continuously connected by the gradation part 192.

[0449] Furthermore, this curved shape is a result of shaping to match the shape of the right door pocket 91 including the slanting portion. Determining the respective dimensions of the normal shelf plate part 194 in a shape that follows the shape of the left door pocket 91 in this manner is particularly effective in reducing the inoperative space.

[0450] As such, the shape of the shelf plate 180 in the present embodiment enlarges the storable shelf base area of the entire storage compartment combining the left door pocket 90, the right door pocket 91 and the shelf plate 180, and can thus be regarded as a shape which efficiently increases the storage space

[0451] It should be noted that the shape of the gradation part 192 may be any shape which does not interfere with the horizontally deep right door pocket 91. Here, the shape of the right door pocket 91 is a shape that does not interfere with the left door 60a, that is, a shape that fits within the swing trajectory of the right door 60b. Therefore, as long as the gradation part 192 is on the outer side of the swing trajectory of the right door 60b, it does not interfere with the right door pocket 91.

[0452] Furthermore, the right door pocket 91 is made to have a horizontal depth that is greater than normal to make up for the reduced storage space of the left door pocket 90.

[0453] With this, only the storage space of the shelf plate 180 is increased without changing the approximate combined storage space of both door pockets.

[0454] Specifically, in the refrigerator 151 in the present embodiment, the storage space is increased over the conventional refrigerator without changing the overall size.

[0455] Furthermore, the size of the inoperative space resulting from the swing trajectories of the French doors described above can be suppressed by moving the location of the swing axes forward by moving the location of the hinges 81 forward, and so on.

[0456] However, in recent years, there has been an increasing need for enlargement of the storage space of door pockets due to the increased consumption of plastic bottles and glass bottles, and from the perspective of convenience in allowing the user to take items in and out of upon opening the doors.

[0457] With this, with recent refrigerators, there is an increased tendency for door pockets to project further towards the storage compartment side, and as a result, there is a tendency for the inoperative space inside the storage compartment to increase.

[0458] In response to this tendency, the refrigerator 151 in the present embodiment increases the storage space over the conventional refrigerator without changing overall size. In other words, the refrigerator 151 is a refrigerator that responds to the needs of the user while suppressing the emergence of inoperative space inside the refrigerator.

[0459] These described details are merely a result of one horizontal cross-section of the refrigerator compartment 53 shown in FIG. 20. However, the shape of the swing trajectory of the left door pocket 90 and the right door pocket 91 is the approximately the same for the entire height of the French doors.

[0460] As such, by adopting approximately the same shapes for the plural shelf plates 180 and the plural left door pockets 90 and right door pockets 91 which configure storage spaces spanning plural levels, it is possible to increase the storage spaces spanning the entire height within the storage compartment, and thus a significant advantageous effect can be attained.

[0461] Furthermore, the plural shelf plates 180 in the vertical direction are positioned so that the front edge of each shelf plate from the top level to the bottom level are parallel, that is, the gradation part 192 of each shelf plate 180 are aligned, thereby giving a sense of unity from the user's perspective and exhibiting extremely superior design characteristics.

[0462] In addition, the plural shelf plates 180 can be made up of identical components, and this contributes to low-cost configuration through component standardization, and the reduction of manufacturing costs through reduced operational load in the manufacturing stage. With respect to the left door pockets 90 and the right door pockets 91, there is also a possibility for enabling component standardization for the plural door pockets spanning vertically, as with the shelf plates 180. Such case is very effective in the reduction of manufacturing costs and so on.

[0463] Furthermore, as described above, the shelf plates 180 include the large shelf plate part 193 and the normal shelf plate part 194, in accordance with the shape of the left door pockets 90 and the right door pockets 93 which have long and short horizontal depths. Specifically, the large shelf plate part 193 includes a large area which allows storage and that is not conventionally available.

[0464] The large shelf plate part 193 is characterized in being horizontally deep, and allows the placement of a skillet, and so on, and, by removing the forward shelf plate 180b, allows relatively long storage items such as a large bottle to be placed steadily without interfering with the taking in and out of other storage items.

[0465] Such advantageous effects can be obtained simply by reducing the horizontal depths C and D of the left door pocket 90 and right door pocket 91, respectively, and increasing the horizontal depths E and F of the shelf plate 180.

[0466] However, such a case reduces the storage capacity of the door pockets which are very convenient for a user and instead degrades the storage characteristics

of the storage compartment and making it difficult to use, and is thus impractical.

[0467] From the perspective of the user, this is convenient in terms of storing a large amount of items separately in the refrigerator 151, and in terms of taking out a desired storage item from among the large amount of storage items.

[0468] Furthermore, by making the shelf plate 180 into a relatively thin flat plate, the storage spaces spanning plural levels can be enlarged as much as possible, and the storage space can be increased. Furthermore, there is no sense of crampedness in the front edge of the shelf plate 180, which is most visually concerning.

[0469] In addition, by fabricating the shelf plates 180 with a material having transparency, it is possible to eliminate the sense of crampedness in the entire storage compartment and give a sense of spaciousness. Particularly, when using glass as the material for the shelf plate 180, transparency is high, design characteristics is superior and, since rigidity is high, sagging due to the placement of storage items can be prevented even with a refrigerator compartment 53 that is relatively wide in the left-right direction.

[0470] Furthermore, the gradation part 192 is not an angular step but has a smooth-flowing wave shape such as a rounded shape or a chamfered shape for example.

[0471] This also has an advantageous effect as a reinforcing structure for preventing the occurrence of stress concentration and distortion in the shelf plate 180. As such, since it is possible to prevent sagging and cracking even when storage items are placed on top, and it is attractive in appearance and superior design-wise, it is a very effective means.

[0472] Here, in general, the front edge of the shelf plate 180 forming the opening for taking storage items in and out is not supported anywhere. Consequently, in the present embodiment, a molded metal plate 95 of stainless steel, and the like, may be fitted to the front edge of the shelf plate 180 as a reinforcing material of the shelf plate 180, as shown in FIG. 23.

[0473] FIG. 23 is a perspective view of the shelf plate 180 in the present embodiment.

[0474] As shown in FIG. 23, fitting a metal plate 95 in the front edge of the shelf plate 180 has an advantage of allowing strength to be further increased and allowing the metal plate 95 to be used as a decorative plate.

[0475] Furthermore, by fitting the metal plate 195 to the shelf plate 180, it is possible to reduce the chances of items placed on the shelf plate 180 from falling off from the front end portion.

[0476] It should be noted that, as described above, by configuring the shelf plate 180 using a material having transparency, it is possible to impart a sense of spaciousness and cleanliness within the storage compartment.

[0477] Furthermore, even with a two-part construction divided right in the vicinity of the gradation part 192, as long as the above-described shelf plate 180 is formed with a shelf plate making up the large shelf plate part 193, a shelf plate making up the normal shelf plate part 194, and the gradation part 92 therebetween, it is possible to attain the same advantageous effect, as described above, of reducing the inoperative space to a certain degree.

[0478] Here, the case where the metal plate 195 is fitted, as decoration, to the front edge of a shelf plate 180 having transparency and including a wave-shaped gradation part 192 is assumed.

[0479] In this case, when such shelf plate 180 and metal plate 195 are illuminated with a light by the lighting device 87 from the front of the storage compartment, that is, when illuminated from approximately the same direction as the direction of the line of sight of the user, the storage items inside the storage compartment become very easy to see, and the design characteristics of waveform the shelf plate 18can be further improved.

[0480] Furthermore, using glass as the material for the shelf plate 180 serves a dual purpose of increasing light transmissivity and making the shelf plate clean and superior in strength.

[0481] Furthermore, by using LED and embedding the lighting device 87 in the heat-insulating wall of the inner casing 70, space-saving is possible compared to when the lighting device is conventionally provided mainly in the cool air duct 84 or in the ceiling.

[0482] Furthermore, as described above, the left door pocket 90 is configured to have a relatively short horizontal depth C. As such, as shown in FIG. 24, even when assuming a usage environment in which the left door 60a can only be opened 90 degrees, the opening dimension G has a length which allows the storage items to be taken in and out.

[0483] Specifically, in the refrigerator 151 in the present embodiment, it is possible to position storage items further in front using the forward-projecting large shelf plate part 93, and there is the advantage that taking storage items placed in the shelf plate 180 in and out is easy even in a usage environment in which the left door 60a cannot be sufficiently opened.

[0484] Furthermore, the refrigerator compartment 53 in the present embodiment is located on the uppermost part of the refrigerator 151. Therefore, in the case where the refrigerator 151 is a refrigerator of approximately 1800 mm main body height which is the currently predominant over-400 liter capacity type, the storage items in the refrigerator compartment 53 are positioned at approximately the same line as the user's line of sight.

[0485] With this, the user can easily take storage items in and out. In addition, with the above-described ingenuity placed in the shape of the left door pocket 90 and the right door pocket 91 provided in the French-type left door 60a and right door 60b, respectively, and the shelf plate 80, storage space within the storage compartment is dramatically increased and efficient storage that matches the size and shape of storage items can be realized.

[0486] For example, sectionalized storage, in which the user stores relatively small bottles such as condi-

ments and dressing in the left door pocket 90, and stores relatively big items such as plastic bottles or milk cartons in the right pocket 91, becomes possible.

[0487] In addition, the shelf plate 180 also allows sectionalized storage in which horizontally deep but narrow the large shelf plate part 193 is used as a stocking zone for storing food items that are not frequently taken in and out, and the large shelf plate part 193 which has a relatively short horizontal depth but is wider than the large shelf plate part 193 is used as a flowing zone for storing food items that are frequently taken in and out

[0488] In other words, the user can roughly divide the inside of refrigerator compartment 53 into 4 zones, and use each section depending on the purpose.

[0489] Furthermore, by making the refrigerator compartment 53 opening the largest, and positioning, below the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and so on, which have drawer doors, a very user-friendly storage compartment positioning can be realized.

[0490] In addition the shelf plate 180 can be divided into the forward shelf plate 180b and the rear shelf plate 180a. Therefore, by removing the forward shelf plate 180b at the bottom-most level of the shelf plate 180 for example, tall storage items can be stored by being placed on top of the placement shelf plate 183. In addition, since the placement shelf plate 183 also has a portion that is identical in shape as the large shelf plate part 193, it is possible to place large tall storage items in such portion and place tall, slender storage items in the other portions.

[0491] Furthermore, since the removed forward shelf plate 180b can be set onto the supports 181 provided below the rear shelf plate 180b, there is no problem with the storage of the removed forward shelf plate 180b. In addition, since there is some clearance between the forward shelf plate 180b set onto the supports 181 and the rear shelf plate 180a directly above it, a new storage space is created in such portion.

[0492] Furthermore, the removed forward shelf plate 180b can be supported by slipping it under the bottom portion of the rear shelf plate 180b. This allows to some extent tall storage items to be placed at the back of the refrigerator compartment 53.

[0493] The above-described embodiment is merely one embodiment of the present invention and various modifications and applications are possible.

[0494] For example, although the left door 60a is described to have a form in which left-right length, that is, the width is less than that of the right door 60b, the ratio for dividing both doors may be in any proportion.

[0495] Specifically, by forming the normal shelf plate part 194 of the shelf plate 180 in the position across the horizontally deep door pocket and forming the large shelf plate part 193 of the shelf plate 80 in the position across the horizontally shallow door pocket, it is possible to obtain approximately the same advantageous effect albeit with a slight difference in the amount of increase in storage space.

[0496] Furthermore, although the left door pocket 90 is made horizontally shallow, this is the result of consideration being given mainly to user-friendliness in a situation where relatively more users are right-handed, and it goes without saying that the same advantageous effect can be obtained even when the configurations of the left and right doors were to be interchanged.

[0497] Furthermore, the length in the left-right direction of the left door 60a and the right door 60b, that is, the width of the left door 60a and the width of the right door 60b may be made the same.

[0498] Here, as shown in FIG. 20, when the width of the left door 60a is less than the width of the right door 60b, the width of the large shelf plate part 193 and the width of the normal shelf plate part 194 are the same albeit approximately.

[0499] Consequently, as shown in FIG. 25 which is a plan cross-section view of the case where the widths of the left door and the right door of the refrigerator in the present embodiment are made the same, the width of the left door 60a and the width of the right door 60b are made the same. With this, the width of the large shelf plate 193 increases. As such, more food items, and so on, can be placed on the large shelf plate part 193.

[0500] Furthermore, in the present embodiment, the strength, design characteristics, and so on, of the shelf plate 180 is improved by fitting the metal plate 195 on the front edge of the shelf plate 180.

[0501] However, a brim material such as a metal plate may be fitted on the entire perimeter of the shelf plate 180. For example, when fabricating the shelf plate 180 from resin, protrusions and the like for setting the shelf plate 180 onto the inner casing 70 may be provided by casting. Specifically, the shelf plate 80 can be easily provided with protrusions.

[0502] However, when the shelf plate 180 is made from glass, in order to provide the shelf plate 180 with protrusions for example, the protrusions need to be attached to the glass shelf plate 180 using an adhesive and the like.

[0503] Consequently, for example, it is possible to fabricate, using resin and the like, a brim material covering the entire perimeter of the glass shelf plate 180, and provide protrusions on the brim material by casting.

[0504] In this case, by fitting the brim material onto the glass shelf plate 180, the protrusions for setting the shelf plate 180 on the inner casing 70 can also be provided to the shelf plate 180.

[0505] FIG. 26 is a diagram showing the glass shelf plate 180 of the refrigerator 151 in the present embodiment, fitted with the brim material covering its entire perimeter.

[0506] A brim material 196 shown in FIG. 26 is for example made of resin, and is provided with latching parts 196a in parts corresponding to both ends of the shelf plate 180 by casting.

[0507] Here, the glass shelf plate 180 and the brim material 196 shown in FIG. 26 may be fabricated sepa-

rately and combined after each is completed, and the shelf plate 180 and the brim material 196 may be cast by insert molding.

[0508] In the case of insert molding, the shelf plate 180 including the brim material 196 and the latching part 196a can be fabricated more rapidly. Furthermore, the fixing strength between the shelf plate 180 and the brim material 196 can be improved.

[0509] It should be noted that when the shelf plate 180 is fabricated from glass, it is possible that the fitting of a brim material for the purpose of improving strength is unnecessary.

[0510] However, the brim material fitted onto the glass shelf plate can serve to protect the perimeter of the shelf plate 180, prevent items placed on the shelf plate 180 from falling off, improve design characteristics, and so on.

[0511] Furthermore, as shown in FIG. 23 and FIG. 26, brim materials such as the metal plate 195 and the brim material 196 adopt a form which projects higher than the top surface and lower than the bottom surface of the shelf plate 180. Specifically, the shelf 180 is formed with a flange in its rim.

[0512] However, the brim material need not be in a form which projects beyond the top surface and the bottom surface of the shelf plate 180. For example, a metal plate having a width that is narrower than the thickness of the shelf plate 180 is fitted to the front edge or the entire perimeter of the resin shelf plate 180 by being plugged therein.

[0513] Even in such a case, it is possible to improve the strength of the shelf plate 180 for example.

(Sixth Embodiment)

[0514] Hereinafter, a sixth embodiment of the present invention shall be described using FIG. 27.

[0515] FIG. 27 is a horizontal cross-section view of the refrigerator compartment section of a refrigerator 218 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fifth embodiment and their description shall be omitted.

[0516] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 218 in the present embodiment are different from those of the refrigerator 151 in the fifth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 151 in the fifth embodiment. As such, description shall be focused on the characteristic configurations of the refrigerator 218 in the present embodiment.

[0517] As shown in FIG. 27, the refrigerator 218 in the present embodiment includes the left door 60a, the right door 60b, the left door pocket 100, the right door pocket 101, and a shelf plate 202.

[0518] Furthermore, plural left door pockets 100 are supportively held in place in the left door 60a and disposed along the vertical length of the left door 60a. Plural right door pockets 101 are likewise supportively held in place in the right door 60b and disposed along the vertical length of the right door 60b.

[0519] Plural shelf plates 202 are disposed from the top to bottom of a space between the door pockets and the cool air duct 84 in positions and shapes that do not interfere with the door pockets. The plural shelf plates 202 create storage spaces for storage items spanning plural levels.

[0520] The left door pocket 100 is of a size that fits within the swing trajectory of the left door 60a in the figure so as not to interfere with the right door 60b, and is shaped so that the shape of its base is approximately square.

[0521] The right door pocket 101 is horizontally deeper than the left door pocket 100. Furthermore, the horizontal depth of the left end of the right door pocket 101 is reduced in order to fit within the swing trajectory of the right door 60b in the figure so as not to interfere with the left door 60a.

[0522] The shelf plate 202 is disposed within the storage compartment space between the left door pocket 100, the right door pocket 101 and the cool air duct 84 in such a way that a certain amount of clearance is provided so as not to interfere with the left door pocket 100 and the right door pocket 101.

[0523] Specifically, the shelf plate 202 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0524] Therefore, as shown in FIG. 27, the shelf plate 202 has a shape in which the left end side is horizontally deeper than the right end side.

[0525] Specifically, as shown in FIG. 27, when the length of the left end side is assumed to be H and the length of the right end side is J, their relationship is such that H>J.

[0526] Furthermore, a boundary part 206 is provided between the left door pocket 100 and the right door pocket 101, in the space just behind the divider 86, and the horizontal depth of the shelf plate 202 gradually decreases from the boundary part 206 towards the right side.

[0527] It should be noted that, in the same manner as with the gradation part 192 of the shelf plate 180 in the fifth embodiment, the boundary part 206 is a part which serves as an approximate boundary at which the horizontal depth of the shelf plate changes.

[0528] Specifically, the left side from the boundary part 206 of the shelf plate 202 corresponds to the large shelf plate part 193 in the fifth embodiment, and the right side from the boundary part 206 corresponds to the normal shelf plate part 194 in the fifth embodiment.

[0529] The advantageous effects achieved by shelf plate 202 and the left door pocket 100 and right door pocket 101 in the present embodiment shall be described hereafter.

[0530] As described above, by making the width and horizontal depth of the left door pocket 100 relatively short

so that the shape of its base is approximately square, the inoperative space behind the divider 86 can be minimized.

[0531] Furthermore, by making the left side of the shelf plate 202 into a shape which projects up to the vicinity of the left door pocket 100, the horizontal depth of roughly the left-side portion of the shelf plate 202 can be increased.

[0532] Furthermore, the right door pocket 101 is made larger than the left door pocket 100 so as to compensate for the smallness of the left door pocket 100.

[0533] With this, the storage space within the storage compartment can be dramatically increased without reducing the door pocket storage space which is very convenient for the user.

[0534] In particular, by positioning the boundary part 206 of the front edge of the shelf plate 202 in the space behind the divider 86 between the left door pocket 100 and the right door pocket 101, and configuring the shape of the right door pocket 101 to follow the front edge of the shelf plate 202, it is possible to minimize the inoperative space existing in the space behind the divider 86, which has always been typical to conventional French doors.

[0535] Specifically, in the refrigerator 218 in the present embodiment, by adopting the shapes shown in FIG. 28 for the shapes of the shelf plate 202, the left door pocket 100, and the right door pocket 101, it is possible to improve the storage efficiency by enlarging the storable shelf base area within the storage compartment in the same manner as in the refrigerator 151 in the fifth embodiment.

[0536] Furthermore, a single boundary part 206 is present in the front edge of the shelf plate 202 and, when looking at the shelf plate 202 from the top and bottom directions, the front edge has a relatively simple shape consisting of mainly 2 straight lines. In this case, since it is possible to simplify the shape of the metal plate (not shown in the Drawings) which is fitted to the front edge and which also serves as decoration, the shelf plate 202 and the metal plate can be fabricated at a low cost.

[0537] It should be noted that, when viewed from the top and bottom directions, the front edge of the shelf plate 202 need not be in a shape consisting mainly of 2 straight lines as shown in FIG. 27. Specifically, the front edge of the shelf plate 202 need not be in a shape that bends at the boundary part 206.

[0538] For example, the front edge may be in a shape which softly curves at the boundary part 206. Furthermore, the boundary part 206 may bulge toward the divider 86 within a range that does not enter the swing trajectory of the left door 60a and the right door 60b and the area required for the turning of the divider 86.

[0539] Even in such a case, it is possible to obtain the advantageous effect of increasing storage space albeit with some difference in degree.

(Seventh Embodiment)

[0540] Hereinafter, a seventh embodiment of the present invention shall be described using FIG. 28 and FIG. 29.

[0541] FIG. 28 is a horizontal cross-section view of the refrigerator compartment section of a refrigerator 219 in the present embodiment. FIG. 29 is a horizontal cross-section view of the refrigerator 219 in the present embodiment when the left door 110a is opened. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fifth embodiment and their description shall be omitted.

[0542] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 219 in the present embodiment are different from those of the refrigerator 151 in the fifth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 151 in the fifth embodiment. As such, description shall be focused on the characteristic configurations of the refrigerator 219 in the present embodiment.

[0543] As shown in FIG. 28, the refrigerator 219 in the present embodiment includes the left door 110a the right door 110b and the right door pocket 111. However, unlike the respective refrigerators in the fifth and sixth embodiments, the refrigerator 219 in the present embodiment does not include a left door pocket.

[0544] Moreover, the refrigerator 219 in the present embodiment further includes a shelf plate 212, and the right door pocket 111 is supportively held in place in the right door 110b. Moreover, plural right door pockets 111 are disposed along the vertical length of the right door 110b.

[0545] Plural shelf plates 212 are disposed from the top to bottom of a space between the right door pockets 111 and the cool air duct 84 in positions and of a shape that does not interfere with the right door pockets 111. The plural shelf plates 212 create storage spaces for storage items spanning plural levels.

[0546] Here, the shelf plate 212 is disposed within the storage space between the right door pocket 111 and the cool air duct 84 so as to provide a certain amount of clearance so as not to interfere with the right door pocket 111.

[0547] Specifically, the shelf plate 2 1 2 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0548] Therefore, as shown in FIG. 28, the shelf plate 212 is shaped to cover approximately the entire area in the horizontal depth direction of the left door 110a, and shaped so as not to interfere with the right door pocket 111 in the forward and backward direction at the refrigerator compartment-side of the right door 110b.

[0549] In other words, the shelf plate 212 in the present embodiment is shaped to have a gradation in the front

edge in the same manner as the shelf plate 180 in the fifth embodiment.

[0550] Specifically, when assuming the horizontal depth on the left side of a gradation part 214 to be K and the horizontal depth on the right side of the gradation part 214 to be L, the shelf plate 212 maintains a relationship in which K>L.

[0551] It should be noted that the left side of a straight line extending in the horizontal depth direction from the approximate center point of the gradation part 214 of the shelf plate 212 is a large shelf plate part 213 and the right side of the straight line is a normal shelf plate part 215.

[0552] The advantageous effects achieved by the shelf plates 212 and the right door pockets 111 in the present embodiment shall be described hereafter.

[0553] In the refrigerator 219, the inside of the refrigerator compartment is allocated to the right door pocket 111 and the shelf plate 112, as shown in FIG. 28.

[0554] Furthermore, the shape of the door pocket 111 which swings integrally with the right door 110b fits within the swing trajectory of the right door 110b in the figure.

[0555] In addition, in the shelf plate 212, there is the normal shelf plate part 215 having a horizontal depth which does not interfere with the right door pocket 111, and the large shelf plate part 213 is shaped to project up to the vicinity of the left door 110a.

[0556] With this, the inoperative space existing in the space between the door pockets and the shelf plates, that is, behind the divider 86, which is typical of conventional French doors, can be virtually eliminated except for the minimum space required for the turning of the divider 86.

[0557] Specifically, the shape of the shelf plate 212 and the right door pocket 111 shown in FIG. 28 is considered to be extremely effective in increasing storage space.

[0558] Furthermore, the left door 110a does not include door pockets as storage space and is configured of only a heat-insulating wall. With this, the shelf plate 212 can be projected up to the vicinity of the left door 110a, and the horizontal depth of the shelf plate 212 can be made to approximate the length from the door inner-surface of the left door 110a to the back surface of the storage compartment.

[0559] In this case, storage items can be placed in front of the user's line of sight and up front where they can easily be taken out, and thus taking items in and out becomes easy and convenient. In addition, it is convenient for storing long items.

[0560] Furthermore, as shown in FIG. 28, the upper surface of the shelf plate 212 can be made into an approximate L-shape. As such, when the right door 110b is opened, aside from the taking in and out of items with respect to the forward area of the normal shelf plate part 215, the taking in and out of items with respect to the area around the gradation part 214 existing in the in-compartment direction of the left door 110a also becomes easy.

[0561] This is because, when the right door 110b is opened, the space in the direction in which items are taken in and out with respect to the area around the gradation part 214 becomes a free space. Specifically, this is because the space through which items can be taken in and out of such area from the sideward direction when the right door 110b is opened is wide.

[0562] Furthermore, although dependent on the allocation of storage space in the storage compartment between the right door pocket 111 and the shelf plate 212, it is possible to equalize the left and right horizontal depths of the shelf plate 212, that is, make the left and right horizontal depths approximately even. In this case, there is the advantage that storage items are present in a position that is closer to the user, and thus visually checking plural storage items placed on the shelf plate 112 becomes very easy.

[0563] Furthermore, as shown in FIG. 29, even when in a usage environment in which the left door can only be opened 90 degrees, it is possible to have the large opening size M when the left door 110a is opened. Specifically, the ease of taking items in and out is significantly improved compared to a left door including conventional left door pockets.

[0564] In addition, the case is assumed in which the small-item case 83 shown in FIG. 18 and having a width that is equal to or less than M is placed in the large shelf plate part 213 of the shelf plate 212.

[0565] In this case, the user can pull out the small-item case 83 to the front without being bothered by the left door 110a. In addition, pulling out and using the small-item case 83 outside the storage compartment from time to time can be done easily.

[0566] In this manner, the refrigerator 219 in the present embodiment can efficiently increase storage space in the same manner as the respective refrigerators in the fifth and sixth embodiments. In addition, in the refrigerator 219, by providing various drawer mechanisms in the storage compartment space on the left door 110-side, the taking in and out of items can also be improved.

(Eighth Embodiment)

[0567] As described above, the respective refrigerators in the fifth through seventh embodiments are French door-type refrigerators including 2 doors. Furthermore, the horizontal depth of the shelf plate changes according to the compartment-side shape of the door pocket or the door.

[0568] Specifically, the shelf plate is shaped to fill up the inoperative space in the refrigerator compartment. This increases the storage space within the storage compartment. Furthermore, there is also the advantageous effect of enabling sectionalized storage in which the storage location of storage items is changed depending on frequency of use and size.

[0569] Here, these advantageous effects achieved by adopting the previously described shapes for the shelf

plates are effective, not only for a French door refrigerator, but also for what is called a single door refrigerator which has only one door for the refrigerator compartment.

[0570] Consequently, the case where the present invention is applied to a single door refrigerator shall be described as an eighth embodiment of the present invention.

[0571] FIG. 30 is a front view of a refrigerator in the present embodiment.

[0572] As shown in FIG. 30, a refrigerator 220 in the present embodiment includes the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57, as in the refrigerator 151 in the fifth embodiment.

[0573] Furthermore, the single swing door 65 is set in the refrigerator compartment 53. By opening the door 65, the user can take items in and out of the refrigerator compartment 53.

[0574] FIG. 31 is a horizontal cross-section view (B-B shown in FIG. 30) of the refrigerator 220 in the fourth embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fifth embodiment and their description shall be omitted.

[0575] As shown in FIG. 31, the refrigerator 220 in the present embodiment includes the door pocket 97. Plural door pocket 97 are supportively held in place in the door 65 and disposed along the vertical length of the door 65.

[0576] Furthermore, the door pocket 97 has a shape in which the horizontal depth R on the swing axis 88-side is greater than a horizontal depth Q on the opposite side. In other words, it maintains an R>Q relationship.

[0577] Furthermore, plural shelf plates 221 included in the refrigerator 220 are disposed from the top to bottom of a space between the door pocket 97 and the cool air duct 84 in positions and of a shape that does not interfere with the door pocket 97. The plural shelf plates 121 create storage spaces for storage items spanning plural levels.

[0578] In the same manner as the shelf plate 180 in the fifth embodiment, this shelf plate 221 includes a gradation part 224 and includes a horizontally deep large shelf plate part 222 and a horizontally shallow normal shelf plate part 223.

[0579] Specifically, when the horizontal depth of the large shelf plate part 222 is assumed to be N and the horizontal depth of the normal shelf plate part 223 is P, it maintains a relationship in which N>P and the sum of N and Q is approximately equal to the sum of P and R.

[0580] In other words, in the same manner as the shelf plate 180 in the fifth embodiment, this shelf plate 221 is shaped to fill up the inoperative space within the storage compartment.

[0581] The advantageous effects achieved by the shelf plates 221 and the door pockets 97 in the present embodiment shall be described hereafter.

[0582] As previously described, there is also demand from users for door pockets and a certain degree of enlargement is necessary. Furthermore, when enlarging door pockets, the horizontal depth is increased because the width is limited to the width of the storage compartment.

[0583] However, the horizontal depth of the door pocket can only be increased up to a certain extent in consideration of the opening and closing of the door.

[0584] Specifically, in the case of the refrigerator 220 which is a single door refrigerator, the door pocket 97 needs to fit within a circle (dashed-dotted line) having a swing axis 88 which is the swing center of the door 65 as a center and passing the end of the inner casing 70 opposite the swing axis 88.

[0585] Consequently, so as not to interfere with the circle, it is possible to increase horizontal depth while providing a slanting portion on the side of the door pocket 97 which is far from the swing axis 88, that is, the left side of the door pocket 97. However, as previously described, in this case, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the inoperative space increases.

[0586] As such, in the refrigerator 220 in the present embodiment, by making the horizontal depth of the left side of the door pocket 97 relatively short, the opening and closing of the door 65 becomes possible without having to provide a slanting portion.

[0587] Furthermore, increasing the horizontal depth of the right side of the door pocket 97 compensates for the reduction in storage capacity brought about by the reduction of the horizontal depth on the left side.

[0588] Specifically, when seen as a whole, the door pocket 97 has a shape in which the right side projects into the storage compartment.

[0589] As such, it is possible for an inoperative space to appear in the storage compartment direction on the left side of the door pocket 97. Consequently, the left side of the shelf plate 221 opposing the door pocket 97 is lengthened in the horizontal depth direction to an extent that does not interfere with the door pocket 97, so as to fill up such inoperative space.

[0590] With this, it is possible to enlarge the storable shelf base area of the entire storage compartment combining the door pockets 97 and the shelf plates 221 while suppressing the appearance of inoperative spaces.

[0591] Furthermore, sectionalized storage is possible in the same manner as the refrigerator 151 in the fifth embodiment, and thus the refrigerator 220 is a user-friendly refrigerator.

[0592] In this manner, the refrigerator 220 in the present embodiment is a refrigerator having high storage efficiency and convenience in the same manner as the respective refrigerators in the fifth through seventh embodiments.

[0593] It should be noted that in the previously described fifth through eighth embodiments, there is a relatively large, flat space at the base of the of the refrigerator compartment below the projecting portion of the door pocket.

[0594] Specifically, such space exists in a position that is below the door pocket and below the space from the gradation part of the shelf plate toward the horizontally shallow side of the shelf plate, in the base of the refrigerator compartment.

[0595] This space cannot be used as a placement area for food items and so on because the door pocket is located directly above when the door is closed.

[0596] However, by providing a recessed part in this space and fitting a storage case in the recessed part, it is possible to hold food items and so on in the storage case.

[0597] FIG. 32 is a diagram showing the placement area of a storage case, in the refrigerator 220 in the present embodiment

[0598] As shown in FIG. 32, the storage case 98 is set below the door pocket 97 and below the space on the right side of the gradation part 224 of the shelf plate 221.

[0599] With this, for example, the user can store, in the storage case 98, small soy sauce containers and so on that are not suited for storage in the shelf plates 221 or the door pockets 97. Furthermore, it is possible to improve the storage efficiency of the refrigerator 220.

[0600] Aside from the refrigerator 220 in the present embodiment, such a storage case 98 can be set in the same manner in the refrigerators in the fifth through seventh embodiments and the same advantageous effect is achieved

[0601] Furthermore, for example, in a refrigerator having an ice-making device for making ice, the storage case 98 can also be used as a feed-water container for supplying water to the ice-making device.

(Ninth Embodiment)

[0602] A refrigerator in a ninth embodiment of the present invention shall be described using FIG. 33 to FIG. 35.

[0603] FIG. 33 is a horizontal cross-section view of a refrigerator 251 in the present embodiment. FIG. 34 is a perspective view showing the left edge portion of a shelf plate of the refrigerator 251 in the present embodiment, as seen from below the shelf plate. FIG. 35 is a vertical cross-section view showing the shelf plate of the refrigerator 251 in the present embodiment in an unattached state. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment and their description shall be omitted.

[0604] Furthermore, although the refrigerator 251 in the present embodiment is different from the refrigerator 51 in the first embodiment in the point of including supports for easy detachment and attachment of the shelf plate, other constituent elements, their functions, and so on, are the same as in the refrigerator 51 in the first embodiment. As such, description shall be focused on the characteristic configurations of the refrigerator 219 in the present embodiment.

[0605] As shown in FIG. 33, shelf plates 280 in the present embodiment are arranged inside the storage compartment 53 at predetermined intervals, by being supported from beneath by supports 281 fabricated integrally with the inner casing forming the storage compartment 53. As shown in FIG. 34, on both edges of the shelf plate 289 in the left and right direction, an L-shaped latching piece 296a projects from each of the edges in a drooping manner. The latching pieces 296a prevent the shelf plate 280 from inadvertently disengaging from the supports 281, by engaging with the bottom surface of the supporting parts 281.

[0606] Each of the supports 281 includes a cutout part 282 before the center in the horizontal depth direction. The cutout part 282 has a length in the horizontal depth direction which allows the latching piece 296a to pass through, and sliding the shelf plate 280 up to the cutout part 282 allows the supports 281 to be released from the state of being clipped between the shelf plate 280 and the latching piece 296a. In addition, by tipping the rear edge of the shelf plate 280 so as to lift it in such manner as shown in FIG. 35, the shelf plate 280 can be removed even when the left door 60a cannot be fully opened and the left door pocket 90 is present as shown by the dashed-dotted line. Furthermore, the shelf plate 280 can be attached within the storage compartment 53 by performing the reverse procedure.

[0607] With this, the shelf plate 280 can be easily attached and detached to the inside of the storage compartment 53 even when the shelf plate 280 has a horizontally deep portion. Furthermore, through the cutout part 282 of supports 281 disposed above, the tipping of the shelf plate 280 disposed below can be increased, and thus the shelf plate 280 can be easily removed even when the supports are parallelly arranged in close intervals.

(Tenth Embodiment)

[0608] First, the configuration of a refrigerator in a tenth embodiment of the present invention shall be described using FIG. 36 to FIG. 41. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment.

[0609] FIG. 36 is a front view of the refrigerator in the present embodiment.

[0610] As shown in FIG. 36, a refrigerator 351 in the present embodiment is a refrigerator including French doors in the same manner as the refrigerator 51 in the first embodiment, and includes a compartmentalized storage compartment within the heat-insulating main body 52.

[0611] The refrigerator 351 in the present embodiment specifically includes, from the top, a refrigerator compartment 53, an ice-making compartment 54, a switchable compartment 55 provided beside the ice-making compartment 54 and which allows switching of inside temperature, a vegetable compartment 56, and a freezer

compartment 57

[0612] The opening of each storage compartment is provided with a heat-insulating door filled with a foam heat-insulating material such as urethane. Specifically, the refrigerator compartment 53 is provided with a left door 60a and a right door 60b which cover the opening of the heat-insulating main body 52 in a manner which allows opening and closing.

[0613] Furthermore, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57 are provided with the drawer-type door 61, door 62, door 63, and door 64, respectively.

[0614] From the perspective of storage capability and usability, the left door 60a is configured with a shorter length in the left-right direction, that is, a shorter width than the right door 60b, and the left door 60a and the right door 60b are split at approximately the same left-right direction location as the location at which the ice-making compartment 54 and the switchable compartment 55 are split.

[0615] Furthermore, depending on the storage configuration, and so on, there are cases where the doors of the storage compartment are French doors having a left door and a right door of identical width, and there are also configurations where one of the left door or the right door is of the drawer-type. Here, "identical width" refers not only to when the widths of the respective doors match perfectly, but also to when they are substantially the same. This is also true for the cases when other dimensions, locations, and so on, are said to be "the same" or "matching".

[0616] Furthermore, a cooler and fan which are not shown in the Drawings are provided behind the vegetable compartment 56 and the freezer compartment 57. The cooler is driven by a compressor disposed at the bottom portion of the main body of the refrigerator 351, and cooled air from the cooler is sent to the respective storage compartments. Furthermore, cooling is controlled to predetermined temperatures for each of the storage compartments.

[0617] FIG. 37 is a perspective view of the refrigerator 351 in the tenth embodiment with doors opened, and FIG. 38 is a vertical cross-section view (A-A shown in FIG. 36) of the refrigerator 351.

[0618] As shown in FIG. 37 and FIG. 38, the plural shelf plates 80 for organizing and storing food items, and so on, are placed in the refrigerator compartment 53 in a bridging manner to span between the left side-surface and the right side-surface.

[0619] With the plural shelf plates 80, storage spaces spanning plural levels are formed in the refrigerator compartment 53.

[0620] Furthermore, as previously described, the left door 60a and the right door 60b are placed at the opening of the refrigerator compartment 53. Specifically, the left door 60a and the right door 60b are each supported by the hinges 81 at the left and right ends of the heat-insulating main body 52.

[0621] A gasket 85 is fitted along the edges of the inner-side of such French door 60a and door 60b and thus the cold air inside the refrigerator compartment 53 is prevented from flowing to the outside.

[0622] Furthermore, the left door 60a has plural left door pockets 90 in a vertical direction in its refrigerator compartment 53-side, and the right door 60b also has plural right door pockets 91 in the same manner.

[0623] Specifically, each door pocket is held in place by a holding member and the like, not shown in the Drawings, which is cast with a door inner-surface 89 and the like thus ensuring holding strength in the holding of storage items. Furthermore, the intra-compartment surface of the doors is formed by the door inner-surface 89 and the storage compartment-side surfaces of the respective door pockets.

[0624] The plural door pockets in the respective doors form storage spaces spanning plural levels in the refrigerator compartment 53. Furthermore, each of the plural door pockets is intended to store mainly plastic bottles of beverages and the like and bottles of condiments and the like, and are shaped to have walls on the front, back, left, and right, and an upside opening.

[0625] Specifically, each door pocket is an example of a projecting part provided in the inner wall of a door, and has a recessed part opening upward.

[0626] It should be noted that the projecting part need not have a recessed part as long as items can be placed on it.

[0627] Furthermore, there are cases where each door pocket does not have a wall on the door-side (back wall) and instead utilizes the door inner-surface 89 as a back wall.

[0628] Furthermore, a lighting device 387 is provided in a sunken space on both left and right sides of the forward locations of the inner casing 70 forming the wall surface of the refrigerator compartment 53, and such space is covered by a cover not shown in the Drawings. The inside of the storage compartment is illuminated from the front by the lighting device 387. The light source of the lighting device 387 is plural Light-Emitting Diodes (LEDs). Specifically, the lighting device 387 is an example of a device, having light-emitting diodes as a light source, which is fitted to each of the right side-surface and the left side-surface of the storage compartment 53 and illuminates the inside of the storage compartment from in front of the front edge of the shelf plate 80.

[0629] By illuminating the inside of the storage compartment from in front of the front edge of the shelf plate 80, shadows are not cast on the storage items and the user can easily see the storage items. As such, convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0630] Furthermore, the chiller case 82 for improving the freshness of meat, fish, and the like, and small-item

cases 83 for storing eggs and so on, are disposed in the lowest level of the storage spaces in the refrigerator compartment 53.

[0631] Furthermore, as shown in FIG. 38, the heat-insulating main body 52 is configured of a heat-insulating wall in which a foam heat-insulating material 72 is injected into a space formed between the inner casing 70 that is a vacuum formed body of resin such as ABS and an outer casing 71 using a metal material such as pre-coated steel plate.

[0632] Furthermore, the cool air duct 84 for blowing the cool air cooled by the previously described cooler to the inside of the storage compartment is provided at the back of the refrigerator compartment 53, that is, at the back of the shelf plates 80.

[0633] In general, the cool air duct 84 is configured from approximately the entire back-side of the inside of the heat-insulating main body 52 and, as necessary, is configured by providing outlets, not shown in the Drawings, between the respective shelf plates 80 so that cool air flows through the respective storage spaces. Furthermore, the cool air duct can also be used as a positioning unit or fastening unit for the plural shelf plates 80.

[0634] FIG. 39 is a horizontal cross-section view (B-B shown in FIG. 36) of the refrigerator 351 in the present embodiment.

[0635] As shown in FIG. 39, the divider 86 is disposed between both doors positioned at the opening of the refrigerator compartment 53. When both doors are closed, the gap between both doors is sealed by the divider 86 and the gasket 85.

[0636] The divider 86 is fitted to the right end of the left door 60a and is configured to turn together with the opening and closing of the left door 60a such that the left door 60a can be closed even after the right door 60b is closed first.

[0637] As such, a small space is required behind (the refrigerator compartment-side) the divider 86 in order for the divider 86 to turn.

[0638] It should be noted that when the gap between both doors can be sealed by the contact between the gaskets fitted along the perimeter of both doors, a divider 86 need not be set at the center portion.

[0639] Furthermore, the shelf plates 80 is disposed within the storage compartment space between the left door pocket 90, the right door pocket 91 and the cool air duct 84, and is provided with a certain amount of clearance from the door pockets so as not to interfere with the left door pocket 90 and the right door pocket 91.

[0640] It should be noted that the shelf plate 80 is supported and held in place in the heat-insulating main body 52 by being set on protrusions or the like that are cast with the inner casing 70, and is disposed so as to be approximately horizontal.

[0641] Here, in the present embodiment, the left door pocket 90 is shorter in width than the right door pocket 91 in the same manner as the relationship between the left and right doors. In addition, the horizontal depth C of the top plane opening of the left door pocket 90 and the horizontal depth D of the top plane opening of the right door pocket 91 are in a C<D relationship.

[0642] In this manner, in the refrigerator 351, the right door pocket 91 is configured to protrude further into the storage compartment-side and thus have an enlarged storage space. In other words, the distance from the door inner-surface of the French doors up to the back surface of the refrigerator compartment 53 is different at the left and right, with the distance being greater on the left side.

[0643] Furthermore, in accordance with the shape of the left door pocket 90 and the right door pocket 91 having such magnitude relationship, the horizontal depth of the shelf plate 80 is different on the left and right as seen from the opening of the refrigerator compartment 53.

[0644] By shaping the shelf plate 80 in such a manner, storage space can be increased over the conventional refrigerator without changing the overall size of the refrigerator 351.

[0645] The advantageous effects achieved by shelf plate 80 and the left door pocket 90 and right door pocket 91 in the present embodiment shall be described hereafter.

[0646] Each of the French-type left door 60a and right door 60b configured at the opening of the refrigerator compartment 53 opens by swinging outward from the boundary of the left door 60a and the right door 60b, with the hinges 81 as an axis. With this movement, the left door pocket 90 and the right door pocket 91 included in the respective doors swing together with the doors.

[0647] At this time, in order to prevent one door from interfering with the other door (including the door pockets fitted to each door), each of the door pockets need to be in a shape that fits within the swing trajectory (dashed-dotted line) of each door.

[0648] In the present embodiment, the right door pocket 91 is provided with a slanting portion on the left side and is made to be horizontally deeper than the left door pocket 90 but within the swing trajectory of the right door 60b. Furthermore, the left door pocket 90 has a relatively short width and horizontal depth so as to fit within the swing trajectory of the left door 60a without having to make a slanting portion as described above.

[0649] Specifically, although the storable volume for the left door pocket 90 is comparatively small, enlarging the right door pocket 91 guarantees a fixed amount for the total storable volume for the left and right door pockets.

[0650] Here, in general, the slanting portion becomes more acute as the horizontal depth of the right door pocket 91 increases, and the space between the right door pocket 91, the left door pocket 90 and the shelf plate 80, that is, the inoperable space around the back of the divider 86, becomes larger.

[0651] It should be noted that regardless of whether the door pocket is in the left side or the right side, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the above-

described inoperative space increases.

[0652] Consequently, in the present embodiment, the front edge on the shallow side of the shelf plate 80 faces the door inner-surface with the shorter distance from the door inner-surface to the back surface, and the front edge on the deep side of the shelf plate 80 faces the door inner-surface with the longer distance from the door inner-surface to the back surface.

[0653] Specifically, as shown in FIG. 39, the front edge of the horizontally shallow right side of the shelf plate 80 faces the horizontally deep right door pocket 91, and the front edge of the horizontally deep left side of the shelf plate 80 faces the horizontally shallow left door pocket 90.

[0654] In other words, the respective horizontal depths of the projecting parts consisting of the right door pocket 91 and the left door pocket 90 conform to the horizontal depths of the shelf plate 80.

[0655] With this, it is possible to reduce the inoperative space around the back of the divider 86 and increase the storage space inside the storage compartment.

[0656] Specifically, as shown in FIG. 39, assuming the horizontal depth of the left end side of the shelf plate 80 to be E and the horizontal depth of the right end side to be F, the shelf plate 80 assumes a shape that satisfies E>F and the sum of E and C is approximately equal to the sum of F and D.

[0657] In this manner, the shape of the front end portion of the shelf plate 80 toward the left and right is opposite those of the left door pocket 90 and the right door pocket 91.

[0658] Therefore, the front edge of the shelf plate 80 in the present embodiment has a gradation in the front-back direction that is not present in conventional refrigerator shelf plates. The part making up this gradation shall be referred to as the gradation part 92.

[0659] The gradation part 92 is a part which continuously connects the respective front edges of the left side and the right side of a shelf plate through a curve. Here, the lighting device 387 illuminates the gradation part 92. With this, it is possible to improve the aesthetics in the state when the doors of the refrigerator are opened by the user.

[0660] Furthermore, the left side portion of the shelf plate 80 including the portion having the horizontal depth E shall be referred to as the large shelf plate part 93 and the right side portion of the shelf plate 80 including the portion having the horizontal depth F shall be referred to as the normal shelf plate part 94.

[0661] The large shelf plate part 93 and the normal shelf plate part 94 can be roughly distinguished as the left side (large shelf plate part 93) and the right side (normal shelf plate part 94) of the straight line stretching in the horizontal depth direction from the center point of the left-right direction of the gradation part 92.

[0662] It should be noted that the method for distinguishing the large shelf plate part 93 and the normal shelf plate part 94 is not limited to the above-described method and, for example, in FIG. 39, it is acceptable to refer to only the area having the horizontal depth F as the normal shelf plate part 94, and refer to the remaining area as the large shelf plate part 93.

[0663] In the present embodiment, the front edge of the large shelf plate part 93 and the front edge of the normal shelf plate part 94 are continuously connected by the gradation part 92.

[0664] Furthermore, this curved shape is a result of shaping to match the shape of the right door pocket 91 including the slanting portion. Determining the respective dimensions of the normal shelf plate part 94 in a shape that follows the shape of the left door pocket 91 in this manner is particularly effective in reducing the inoperative space.

[0665] As such, the shape of the shelf plate 80 in the present embodiment enlarges the storable shelf base area of the entire storage compartment combining the left door pocket 90, the right door pocket 91 and the shelf plate 80, and can thus be regarded as a shape which efficiently increases the storage space

[0666] It should be noted that the shape of the gradation part 92 may be any shape which does not interfere with the horizontally deep right door pocket 91. Here, the shape of the right door pocket 91 is a shape that does not interfere with the left door 60a, that is, a shape that fits within the swing trajectory of the right door 60b.

[0667] Therefore, as long as the gradation part 92 is on the outer side of the swing trajectory of the right door 60b, it does not interfere with the right door pocket 91. Furthermore, in order to reduce the inoperative space, it is sufficient for the curve included in the gradation part 92 to be a curve having an arc which corresponds to the swing trajectory of the right door 60b.

[0668] Furthermore, the right door pocket 91 is made to have a horizontal depth that is greater than normal to make up for the reduced storage space of the left door pocket 90.

[0669] With this, only the storage space of the shelf plate 80 is increased without changing the approximate combined storage space of both door pockets.

[0670] Specifically, in the refrigerator 351 in the present embodiment, the storage space is increased over the conventional refrigerator without changing the overall size.

[0671] Furthermore, the size of the inoperative space resulting from the swing trajectories of the French doors described above can be suppressed by moving the location of the swing trajectories forward by moving the location of the hinges 81 forward, and so on.

[0672] However, in recent years, there has been an increasing need for enlargement of the storage space of door pockets due to the increased consumption of plastic bottles and glass bottles, and from the perspective of convenience in allowing the user to take items in and out of upon opening the doors.

[0673] With this, with recent refrigerators, there is an increased tendency for door pockets to project further towards the storage compartment side, and as a result,

there is a tendency for the inoperative space inside the storage compartment to increase.

[0674] In response to this tendency, the refrigerator 351 in the present embodiment increases the storage space over the conventional refrigerator without changing overall size. In other words, the refrigerator 351 is a refrigerator that has better storage efficiency and convenience than what is conventional.

[0675] These described details are merely a result of one horizontal cross-section of the refrigerator compartment 53 shown in FIG. 39. However, the shape of the swing trajectory of the left door pocket 90 and the right door pocket 91 is the same for the entire height of the French doors.

[0676] As such, by adopting approximately the same shapes for the plural shelf plates 80 and the plural left door pockets 90 and right door pockets 91 which configure storage spaces spanning plural levels, it is possible to increase the storage spaces spanning the entire height within the storage compartment, and thus a significant advantageous effect can be attained.

[0677] Furthermore, with the plural shelf plates 80 in the vertical direction, the respective front edges of the shelf plates from the top level to the bottom level are disposed in parallel positions, that is, the plural shelf plates 80 are disposed such that the positions in the horizontal depth direction of the respective front edges are approximately the same.

[0678] With this, there is a sense of unity from the perspective of the user, and superior design characteristics are achieved.

[0679] In addition, the plural shelf plates 80 can be made up of identical components, and this contributes to the reduction of manufacturing costs through component standardization, and the reduction of manufacturing costs through reduced operational load in the manufacturing stage.

[0680] With respect to the left door pockets 90 and the right door pockets 91, there is also a possibility for enabling component standardization for the plural door pockets spanning vertically, as with the shelf plates 80. In such a case, this is likewise very effective in the reduction of manufacturing costs and so on.

[0681] Furthermore, as described above, the shelf plate 80 includes a large shelf plate part 93 and the normal shelf plate part 94, in accordance with the shape of the left door pockets 90 and the right door pockets 93 which have long and short horizontal depths. Specifically, the shelf plate 80 includes, in the large shelf plate part 93, a large area which allows storage and is not conventionally available.

[0682] The large shelf plate part 93 is characterized in being horizontally deep, and allows relatively long storage items such as a skillet or a large bottle to be placed steadily without interfering with the taking in and out of other storage items.

[0683] From the perspective of the user, this is convenient in terms of storing a large amount of items separately in the refrigerator 351, and in terms of taking out a desired storage item from among the large amount of storage items.

[0684] Such advantageous effects can be obtained simply by reducing the horizontal depths C and D of the left door pocket 90 and right door pocket 91, respectively, and increasing the horizontal depths E and F of the shelf plate 80.

[0685] However, such a case reduces the storage capacity of the door pockets which are very convenient for a user and instead degrades the storage characteristics of the storage compartment and making it difficult to use, and is thus impractical.

[0686] Furthermore, by making the shelf plate 80 into a relatively thin flat plate, the storage spaces spanning plural levels can be enlarged as much as possible. In other words, the storage space can be increased. Furthermore, there is no sense of crampedness in the front edge of the shelf plates 80, which is most visually concerning.

[0687] In addition, by fabricating the shelf plates 80 with a material having transparency, it is possible to reduce the sense of crampedness imparted by the shelf plates 80 and give a sense of spaciousness. Furthermore, it is also possible to impart a sense of cleanliness inside the refrigerator compartment 53.

[0688] Furthermore, in the present embodiment, the gradation part 92 of the shelf plate 80 is not an angular step but has a smooth-flowing wave shape such as a rounded shape or a chamfered shape for example.

[0689] This also has an advantageous effect as a reinforcing structure for preventing the occurrence of stress concentration and distortion in the shelf plate 80. As such, since it is possible to prevent sagging and cracking even when storage items are placed on top, and it is attractive in appearance and superior design-wise, it is a very effective means.

[0690] Here, in general, the front edge of the shelf plate 80 forming the opening for taking storage items in and out is not supported anywhere. Consequently, in the same manner as in the first embodiment, in the present embodiment, the shelf plate 80 includes, as a brim material, the molded metal plate 95 of stainless steel, and the like, as shown in FIG. 5.

[0691] Consequently, in the case where the metal plate 95 is fitted as decoration to the front edge of a shelf plate 80 having transparency and including a wave-shaped gradation part 92 as in the first embodiment, when such shelf plate 80 and metal plate 95 are illuminated by the lighting device 387 with a light from the front of the storage compartment, the shelf plate and metal plate are illuminated from approximately the same direction as the direction of the line of sight of the user. With this, the storage items inside the storage compartment become very easy to see, and the design characteristics of the shelf plate 80 having the wave-form gradation part 92 is improved.

[0692] Furthermore, using glass as the material for the shelf plate 80 serves a dual purpose of increasing light

transmissivity and making the shelf plate clean and superior in strength.

[0693] Furthermore, by using LED and embedding the lighting device 387 in the heat-insulating wall of the inner casing 70, space-saving is possible compared to when the lighting device is conventionally provided mainly in the cool air duct 84 or in the ceiling.

[0694] Furthermore, as described above, the left door pocket 90 is configured to have a relatively short horizontal depth C. As such, as shown in FIG. 40, even when assuming a usage environment in which the left door 60a can only be opened 90 degrees, the opening dimension G has a length which allows the storage items to be taken in and out.

[0695] Specifically, in the refrigerator 351 in the present embodiment, it is possible to position storage items further in front using the forward-projecting large shelf plate part 93, and there is the advantage that taking storage items placed in the shelf plate 80 in and out is easy even in a usage environment in which the left door 60a cannot be sufficiently opened.

[0696] Furthermore, the refrigerator compartment 53 in the present embodiment is located on the uppermost part of the refrigerator 351. Therefore, in the case where the refrigerator 351 is a refrigerator of approximately 1800 mm main body height which is the currently predominant over-400 liter capacity type, the storage items in the refrigerator compartment 53 are positioned at approximately the same height as the user's line of sight.

[0697] With this, the user can easily take storage items in and out. In addition, with the above-described ingenuity placed in the shape of the left door pocket 90 and the right door pocket 91 provided in the French-type left door 60a and right door 60b, respectively, and the shelf plate 80, storage space within the storage compartment is dramatically increased and efficient storage that matches the size and shape of storage items is realized.

[0698] For example, sectionalized storage, in which the user stores relatively small bottles such as condiments and dressing in the left door pocket 90, and stores relatively big items such as plastic bottles or milk cartons in the right pocket 91, becomes possible.

[0699] In addition, the shelf plate 80 also allows sectionalized storage in which the horizontally deep but narrow large shelf plate part 93 is used as a stocking zone for storing food items that are not frequently taken in and out, and the large shelf plate part 93 which has a relatively short horizontal depth but is wider than the large shelf plate parts 93 is used as a flowing zone for storing food items that are frequently taken in and out.

[0700] In other words, the user can roughly divide the inside of refrigerator compartment 53 into 4 zones, and use each section depending on the purpose.

[0701] Furthermore, by making the refrigerator compartment 53 opening the largest, and positioning, below the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and so on, which have drawer doors, a very user-friendly storage compartment positioning can be realized.

[0702] The above-described embodiment is merely one embodiment of the present invention and various modifications and applications are possible.

[0703] For example, although the left door 60a is described to have a form in which left-right length, that is, the width is less than that of the right door 60b, the ratio for dividing both doors may be in any proportion.

[0704] Specifically, no matter what proportion is assumed for the ratio in which both doors are divided, by making the normal shelf plate part 94 of the shelf plate 80 face the horizontally deep door pocket and making the large shelf plate part 93 of the shelf plate 80 face the horizontally shallow door pocket, it is possible to obtain approximately the same advantageous effect albeit with a slight difference in the amount of increase in storage space.

[0705] Furthermore, although the left door pocket 90 is made horizontally shallow, this is the result of consideration being given mainly to user-friendliness in a situation where relatively more users are right-handed, and it goes without saying that the same advantageous effect can be obtained even when the configurations of the left and right doors were to be interchanged.

[0706] Furthermore, the length in the left-right direction of the left door 60a and the right door 60b, that is, the width of the left door 60a and the width of the right door 60b may be made the same.

[0707] Here, as shown in FIG. 39, when the width of the left door 60a is less than the width of the right door 60b, the width of the large shelf plate part 93 and the width of the normal shelf plate part 94 are the same albeit approximately.

[0708] Consequently, as shown in FIG. 41 which is a plan cross-section view of the case where the widths of the left door and the right door of the refrigerator in the present embodiment are made the same, the width of the left door 60a and the width of the right door 60b are made the same. With this, the width of the large shelf plate part 93 increases. As such, more food items, and so on, can be placed on the large shelf plate part 93.

[0709] Furthermore, in the present embodiment, the strength, design characteristics, and so on, of the shelf plate 80 is improved by fitting the metal plate 95 on the front edge of the shelf plate 80.

[0710] However, the brim material may be fitted on the entire perimeter of the shelf plate 80. For example, when the shelf plate 80 is fabricated from resin, a latching part and the like, for setting the shelf plate 80 in the inner casing 70 can be provided by casting. In other words, the shelf plate 80 can be easily provided with protrusions.

[0711] However, when the shelf plate 80 is fabricated from glass, in order to provide a latching part to the shelf plate 80 for example, the latching part needs to be attached to the glass shelf plate 80 using an adhesive and the like.

[0712] Consequently, for example, it is possible to fab-

ricate, using resin and the like, a brim material covering the entire perimeter of the glass shelf plate 80, and provide a latching part on the brim material by casting.

[0713] In this case, by fitting the brim material onto the glass shelf plate 80, the latching part for setting the shelf plate 80 on the inner casing 70 can also be provided to the shelf plate 80.

(Eleventh Embodiment)

[0714] Hereinafter, a refrigerator in an eleventh embodiment of the present invention shall be described using FIG. 42.

[0715] FIG. 42 is a horizontal cross-section view of the refrigerator compartment section of a refrigerator 418 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the tenth embodiment and their description shall be omitted.

[0716] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 418 in the present embodiment are different from those of the refrigerator 351 in the tenth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 351 in the tenth embodiment.

[0717] As shown in FIG. 42, the refrigerator 418 in the present embodiment includes the left door 60a, the right door 60b, the lighting device 387, the left door pocket 100, the right door pocket 101, and the shelf plate 102.

[0718] Furthermore, plural left door pockets 100 are supportively held in place in the left door 60a and disposed along the vertical length of the left door 60a. Plural right door pockets 101 are likewise supportively held in place in the right door 60b and disposed along the vertical length of the right door 60b.

[0719] Plural shelf plates 102 are disposed from the top to bottom of a space between the door pockets and the cool air duct 84 in positions and shapes that do not interfere with the door pockets. The plural shelf plates 80 form storage spaces spanning plural levels.

[0720] Specifically, the lighting device 387 is fitted to each of the right side-surface and the left side-surface of the refrigerator compartment and illuminates, with light-emitting diodes as a light source, the inside of the refrigerator compartment from in front of the front edge of the shelf plate 102. With this, shadows are not cast on the storage items on the shelf plate 102 and the user can easily see the storage items, and thus convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0721] The left door pocket 100 is of a size that fits within the swing trajectory of the left door 60a in the figure so as not to interfere with the right door 60b, and is shaped so that the shape of its base is approximately square.

[0722] The right door pocket 101 is horizontally deeper than the left door pocket 100. Furthermore, the horizontal depth of the left end of the right door pocket 101 is reduced in order to fit within the swing trajectory of the right door 60b in the figure so as not to interfere with the left door 60a.

[0723] The shelf plate 102 is disposed within the storage compartment space between the left door pocket 100, the right door pocket 101 and the cool air duct 84 in such a way that a certain amount of clearance is provided so as not to interfere with the left door pocket 100 and the right door pocket 101.

[0724] Specifically, the shelf plate 102 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0725] Furthermore, as shown in FIG. 42, the shape of the shelf plate 102 is one in which the left end side is horizontally deeper than the right end side.

[0726] Specifically, when the length of the left end side is assumed to be H and the length of the right end side is J, their relationship is such that H>J.

[0727] Furthermore, a boundary part 106 is provided between the left door pocket 100 and the right door pocket 101, in the space just behind the divider 86, and the horizontal depth of the shelf plate 102 gradually decreases from the boundary part 106 towards the right side.

[0728] It should be noted that, in the same manner as with the gradation part 92 in the shelf plate 80 in the tenth embodiment, the boundary part 106 is a part which serves as an approximate boundary at which the horizontal depth of the shelf plate changes.

[0729] Specifically, the left side from the boundary part 106 of the shelf plate 102 corresponds to the large shelf plate part 93 in the tenth embodiment, and the right side from the boundary part 106 corresponds to the normal shelf plate part 94 in the tenth embodiment.

[0730] The advantageous effects achieved by shelf plate 102 and the left door pocket 100 and right door pocket 101 in the present embodiment shall be described hereafter.

[0731] As described above, by making the width and horizontal depth of the left door pocket 100 relatively short so that the shape of its base is approximately square, the inoperative space behind the divider 86 can be minimized.

[0732] Furthermore, by making the left side of the shelf plate 102 into a shape which projects up to the vicinity of the left door pocket 100, the horizontal depth of the left-side portion of the shelf plate 102 can be increased.

[0733] Furthermore, the right door pocket 101 is made larger than the left door pocket 100 so as to compensate for the smallness of the left door pocket 100.

[0734] With this, the storage space within the storage compartment can be dramatically increased without reducing the door pocket storage space which is very convenient for the user.

[0735] In particular, by positioning the boundary part 106 of the front edge of the shelf plate 102 in the space

behind the divider 86 between the left door pocket 100 and the right door pocket 101, and configuring the shape of the right door pocket 101 to follow the front edge of the shelf plate 102, it is possible to minimize the inoperative space existing in the space behind the divider 86, which has always been typical to conventional French doors.

[0736] Specifically, in the refrigerator 418 in the present embodiment, by adopting the shapes shown in FIG. 42 for the shapes of the shelf plate 102, the left door pocket 100, and the right door pocket 101, it is possible to improve the storage efficiency of the refrigerator 418 by enlarging the storable shelf base area within the storage compartment in the same manner as in the refrigerator 351 in the tenth embodiment.

[0737] Furthermore, as with the refrigerator 351 in the tenth embodiment, the refrigerator 418 also allows the storage space of inside the refrigerator compartment to be divided into the 4 sections of the left door pockets 100, the right door pockets 101, the left area and the right area of the shelf plates 102, each having different horizontal depths, and so on.

[0738] This allows the user to perform efficient sectionalized storage in accordance with the size and shape of storage items.

[0739] Furthermore, a single boundary part 106 is present in the front edge of the shelf plate 102 and, when looking at the shelf plate 102 from the top and bottom directions, the front edge has a relatively simple shape consisting of mainly 2 straight lines. In this case, since it is possible to simplify the shape of the metal plate (not shown in the Drawings) which is fitted to the front edge as a brim material and which also serves as decoration, the shelf plate 102 and the brim material can be fabricated at a low cost.

[0740] It should be noted that, when viewed from the top and bottom directions, the front edge of the shelf plate 102 need not be in a shape consisting mainly of 2 straight lines as shown in FIG. 42. Specifically, the front edge of the shelf plate 102 need not be in a shape that bends at the boundary part 106.

[0741] For example, the front edge may be in a shape which softly curves at the boundary part 106. Furthermore, the boundary part 106 may bulge toward the divider 86 within a range that does not enter the swing trajectory of the left door 60a and the right door 60b and the area required for the turning of the divider 86.

[0742] Even in such a case, it is possible to obtain the advantageous effect of increasing storage space albeit with some difference in degree.

(Twelfth Embodiment)

[0743] Hereinafter, a twelfth embodiment of the present invention shall be described using FIG. 43 and FIG. 44.

[0744] FIG. 43 is horizontal cross-section view of the refrigerator compartment section of a refrigerator 419 in the present embodiment. FIG. 44 is a horizontal cross-section view of the refrigerator 419 in the present embodiment when the left door 110a is opened. It should be noted that the same numerical reference is given to constituent elements that are the same as in the tenth embodiment and their description shall be omitted.

[0745] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 419 in the present embodiment are different from those of the refrigerator 351 in the tenth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 351 in the tenth embodiment.

[0746] As shown in FIG. 43, the refrigerator 419 in the present embodiment includes the lighting device 387, the left door 110a, the right door 110b, and the right door pocket 111. However, unlike the respective refrigerators in the tenth and eleventh embodiments, the refrigerator 419 in the present embodiment does not include a left door pocket.

[0747] Moreover, the refrigerator 419 in the present embodiment further includes the shelf plate 112, and plural right door pockets 111 are disposed along the vertical length of the right door 110b.

[0748] Plural shelf plates 112 are disposed from the top to bottom of a space between the right door pockets 111 and the cool air duct 84 in positions and of a shape that does not interfere with the right door pockets 111. The plural shelf plates 112 form storage spaces spanning plural levels.

[0749] Specifically, the lighting device 387 is fitted to each of the right side-surface and the left side-surface of the refrigerator compartment and illuminates, with light-emitting diodes as a light source, the inside of the refrigerator compartment from in front of the front edge of the shelf plate 102.

[0750] By illuminating the inside of the storage compartment from in front of the front edge of the shelf plate 80, shadows are not cast on the storage items and the user can easily see the storage items. As such, convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0751] Here, the shelf plate 112 is disposed within the storage space between the right door pocket 111 and the cool air duct 84 so as to provide a certain amount of clearance so as not to interfere with the right door pocket 111.

[0752] Specifically, the shelf plate 112 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0753] Furthermore, as shown in FIG. 43, the shelf plate 112 is shaped to cover almost the entire area of the space located in the refrigerator compartment-side of the left door 110a, and shaped so as not to interfere with the right door pocket 111 in the forward and backward direc-

tion at the refrigerator compartment-side of the right door 110b.

[0754] In other words, the shelf plate 112 in the present embodiment is shaped to have a gradation in the front edge in the same manner as the shelf plate 80 in the tenth embodiment.

[0755] Specifically, when assuming the horizontal depth on the left side of a gradation part 114 to be K and the horizontal depth on the right side of the gradation part 114 to be L, the shelf plate 112 maintains a relationship in which K>L.

[0756] It should be noted that, in the same manner as the shelf plate 80 in the tenth embodiment, the left side of a straight line extending in the horizontal depth direction from the approximate center point of the gradation part 114 of the shelf plate 112 is the large shelf plate part 113 and the right side of the straight line is the normal shelf plate part 115.

[0757] The advantageous effects achieved by the shelf plates 112 and the right door pockets 111 in the present embodiment shall be described hereafter.

[0758] In the refrigerator 419, the horizontal cross-section of the inside of the refrigerator compartment is virtually allocated to the right door pocket 111 and the shelf plate 112, as shown in FIG. 43.

[0759] Furthermore, the shape of the door pocket 111 which swings integrally with the right door 110b fits within the swing trajectory of the right door 110b in the figure.

[0760] In addition, in the shelf plate 112, there is a normal shelf plate part 115 having a horizontal depth which does not interfere with the right door pocket 111, and the large shelf plate part 113 is shaped to project up to the vicinity of the left door 110a.

[0761] With this, the inoperative space existing in the space between the door pockets and the shelf plates, that is, behind the divider 86, which is typical of conventional French doors, can be virtually eliminated except for the minimum space required for the turning of the divider 86.

[0762] Specifically, the shape of the shelf plate 122 and the right door pocket 111 shown in FIG. 43 is considered to be extremely effective in increasing storage space.

[0763] Furthermore, the left door 110a does not include door pockets as storage space and is configured of only a heat-insulating wall. With this, the shelf plate 112 can be projected up to the vicinity of the left door 110a, and the horizontal depth of the shelf plate 112 can be made to approximate the length from the door inner-surface of the left door 110a to the back surface of the storage compartment.

[0764] In this case, storage items can be placed in front of the user's line of sight and up front where they can easily be taken out, and thus taking items in and out becomes easy and convenient. In addition, it is convenient for storing long items.

[0765] Furthermore, as shown in FIG. 43, the upper surface of the shelf plate 112 can be made into an approximate L-shape. As such, when the right door 110b is opened, aside from the taking in and out of items with respect to the forward area of the normal shelf plate part 115, the taking in and out of items with respect to the area around the gradation part 114 existing in the in-compartment direction of the left door 110a also becomes easy.

[0766] This is because, when the right door 110b is opened, the direction in which items are taken in and out with respect to the area around the gradation part 114, that is, the space in the a roughly sideward direction becomes a free space. Specifically, this is because the space through which items can be taken in and out of such area from the sideward direction when the right door 110b is opened is wide.

[0767] Furthermore, although dependent on the allocation of storage space in the storage compartment between the right door pocket 111 and the shelf plate 112, it is possible to equalize the left and right length of the placement areas of the shelf plate 112, that is, make L shown in FIG. 43 and the width of the front edge of the large shelf plate part 113 the same.

[0768] In this case, there is the advantage that visually checking plural storage items placed on the shelf plate 112 becomes easy.

[0769] Furthermore, as shown in FIG. 44, even when in a usage environment in which the left door can only be opened 90 degrees, it is possible to have the large opening size M when the left door 110a is opened. Specifically, the ease of taking items in and out is significantly improved compared to a left door including conventional left door pockets.

[0770] In addition, the case is assumed in which the small-item case 83 shown in FIG. 37 and having a width that is equal to or less than M is placed in the large shelf plate part 113 of the shelf plate 112.

[0771] In this case, the user can pull out the small-item case 83 to the front without being bothered by the left door 110a. In addition, pulling out and using the small-item case 83 outside the storage compartment from time to time can be done easily.

[0772] Furthermore, in the same manner as the refrigerator 351 in the tenth embodiment, the refrigerator 419 also allows sectionalized storage through separate usage of the large shelf plate parts 113, the normal shelf plate parts 115, and the right door pockets 111.

[0773] In this manner, the refrigerator 419 in the present embodiment can efficiently increase storage space in the same manner as the respective refrigerators in the tenth and eleventh embodiments. In addition, in the refrigerator 419, by providing various drawer mechanisms in the storage compartment space on the left door 110-side, the taking in and out of items can also be improved.

[0774] In other words, the refrigerator 419 in the present embodiment is a refrigerator that has better storage efficiency and convenience than what is conventional.

(Thirteenth Embodiment)

[0775] As described above, the respective refrigerators in the tenth through twelfth embodiments include French doors having 2 doors, one each for the left and right, in the opening of the refrigerator compartment. Furthermore, the horizontal depths of the left side and the right side of the shelf plate are in accordance with the shape of the door inner-surface of the doors.

[0776] Specifically, the aforementioned dimensions of the shelf plate are dimensions for filling up the inoperative space within the refrigerator compartment. This increases the storage space within the storage compartment. Furthermore, there are also advantageous effects such as allowing efficient sectionalized storage.

[0777] Here, these advantageous effects achieved by adopting the previously described shapes for the shelf plates are effective, not only for a French door refrigerator, but also for what is called a single door refrigerator which has only one door for the refrigerator compartment.

[0778] Consequently, the case where the present invention is applied to a single door refrigerator shall be described as a thirteenth embodiment of the present invention

[0779] FIG. 45 is a front view of the refrigerator in the present embodiment.

[0780] As shown in FIG. 45, a refrigerator 420 in the present embodiment includes the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57, as in the refrigerator 351 in the tenth embodiment.

[0781] Furthermore, a single swing door 65 is set in the refrigerator compartment 53. By opening the door 65, the user can take items in and out of the refrigerator compartment 53.

[0782] FIG. 46 is a horizontal cross-section view (B-B shown in FIG. 45) of the refrigerator 420 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the tenth embodiment and their description shall be omitted.

[0783] As shown in FIG. 46, the refrigerator 420 in the present embodiment includes the door pocket 97. Plural door pocket 97 are supportively held in place in the door 65 and disposed along the vertical length of the door 65.

[0784] Furthermore, the door pocket 97 has a shape in which the horizontal depth R on the swing axis 88-side is greater than a horizontal depth Q on the opposite side. In other words, it maintains an R>Q relationship.

[0785] Furthermore, plural shelf plates 121 included in the refrigerator 420 are disposed from the top to bottom of a space between the door pocket 97 and the cool air duct 84 in positions and of a shape that does not interfere with the door pocket 97. The plural shelf plates 121 form storage spaces spanning plural levels.

[0786] The lighting device 387 is fitted to each of the right side-surface and the left side-surface of the refrigerator compartment and illuminates, with light-emitting diodes as a light source, the inside of the refrigerator compartment from in front of the front edge of the shelf plate 102.

[0787] By illuminating the inside of the storage compartment from in front of the front edge of the shelf plate 80, shadows are not cast on the storage items and the user can easily see the storage items. As such, convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0788] In the same manner as the shelf plate 80 in the tenth embodiment, this shelf plate 121 includes the gradation part 124 and includes the horizontally deep large shelf plate part 122 and the horizontally shallow normal shelf plate part 123.

[0789] Specifically, when the horizontal depth of the large shelf plate part 122 is assumed to be N and the horizontal depth of the normal shelf plate part 123 is P, it maintains a relationship in which N>P and the sum of N and Q is approximately equal to the sum of P and R.

[0790] In the same manner as the shelf plate 80 in the tenth embodiment, this shelf plate 121 is shaped to fill up the inoperative space within the storage compartment.

[0791] The advantageous effects achieved by the shelf plates 121 and the door pockets 97 in the present embodiment shall be described hereafter.

[0792] As previously described, there is also demand from users for door pockets and a certain degree of enlargement is necessary. Furthermore, when enlarging door pockets, the horizontal depth is increased because the width is limited to the width of the storage compartment.

[0793] However, the horizontal depth of the door pocket can only be increased up to a certain extent in consideration of the opening and closing of the door.

[0794] Specifically, in the case of the refrigerator 420 which is a single door refrigerator, the door pocket 97 needs to fit within a circle (dashed-dotted line) having a swing axis 88 which is the swing center of the door 65 as a center and passing the end of the inner casing 70 opposite the swing axis 88.

[0795] Consequently, so as not to interfere with the circle, it is possible to increase horizontal depth while providing a slanting portion on the side of the door pocket 97 which is far from the swing axis 88, that is, the left side of the door pocket 97. However, as previously described, in this case, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the inoperative space increases. Furthermore, the shape of the base of the door pocket 97 approximates a triangle and storage capability deteriorates.

[0796] As such, in the refrigerator 420 in the present embodiment, by making the horizontal depth of the left side of the door pocket 97 relatively short, the opening and closing of the door 65 becomes possible without having to provide a slanting portion.

[0797] Furthermore, increasing the horizontal depth of the right side of the door pocket 97 compensates for the reduction in storage capacity brought about by the reduction of the horizontal depth on the left side.

[0798] Specifically, when seen as a whole, the door pocket 97 has a shape in which the right side projects into the storage compartment.

[0799] As such, it is possible for an inoperative space to appear in the storage compartment direction on the left side of the door pocket 97. Consequently, the left side of the shelf plate 121 opposing the door pocket 97 is lengthened in the horizontal depth direction to an extent that does not interfere with the door pocket 97, so as to fill up such inoperative space.

[0800] With this, it is possible to enlarge the storable shelf base area of the entire storage compartment combining the door pockets 97 and the shelf plates 121 while suppressing the appearance of inoperative spaces.

[0801] Furthermore, sectionalized storage is possible in the same manner as the refrigerator 351 in the tenth embodiment, and thus the refrigerator 420 is a user-friendly refrigerator.

[0802] In this manner, the refrigerator 420 in the present embodiment is a refrigerator that has better storage efficiency and convenience than what is conventional, in the same manner as the respective refrigerators in the tenth through twelfth embodiments.

[0803] It should be noted that in the previously described tenth through thirteenth embodiments, there is a relatively large, flat space at the base of the of the refrigerator compartment below the projecting portion of the door pocket.

[0804] Specifically, such space exists in a position that is below the door pocket and below the space from the gradation part of the shelf plate toward the horizontally shallow side of the shelf plate, in the base of the refrigerator compartment.

[0805] This space is an inoperative space that cannot be used as a placement area for food items and so on because the door pocket is located directly above when the door is closed.

[0806] However, by providing a recessed part in this space and fitting a storage case in the recessed part, it is possible to hold food items and so on in the storage case.

[0807] FIG. 47 is a diagram showing the case where a storage case is set in the base of the refrigerator compartment of the refrigerator in the present embodiment.

[0808] As shown in FIG. 47, the storage case 98 is set below the door pocket 97 and below the space on the right side of the gradation part 124 of the shelf plate 121.

[0809] With this, for example, the user can store, in the storage case 98, small soy sauce containers and so on that are not suited for storage in the shelf plates 121 or the door pockets 97. In other words, the storage efficiency and convenience of the refrigerator 420 is improved.

[0810] Aside from the refrigerator 420 in the present embodiment, such a storage case 98 can be set in the same manner in the refrigerators in the tenth through twelfth embodiments and the same advantageous effect is achieved.

[0811] Furthermore, for example, in a refrigerator having an ice-making device for making ice, the storage case 98 can also be used as a feed-water container for supplying water to the ice-making device.

[0812] Furthermore, the lighting device 387 may also illuminate the storage case 98 aside from the refrigerator compartment. This can be realized by facing a part of the LEDs included in the lighting device 387 toward the back surface and facing the remainder towards the bottom. With this, the inside of the storage case 98 can be brightly illuminated, and thus making it possible to see the storage items inside the storage case 98 easily.

[0813] Although the refrigerators in the tenth through thirteenth embodiments have been described thus far, the present invention is not limited to such descriptions. Furthermore, constituent elements of mutually different embodiments may be combined. For example, in place of the door pocket 97, the single-door refrigerator 420 described in the thirteenth embodiment may include a shallow door pocket such as in the right door pocket 111 in the twelfth embodiment.

[0814] FIG. 48 is a horizontal cross-section view of the case where the refrigerator 420 in the thirteenth embodiment includes only a laterally-short door pocket.

[0815] As shown in FIG. 48, the door 65 includes a projecting part on the right side since the door 65 includes a door pocket 99 only on the swing axis 88-side, that is, the right side which is near the hinge.

[0816] Furthermore, horizontal depth of the right side of the shelf plate 112 which faces the door pocket 99 is short so that the shelf plate 112 and the door pocket 99 do not interfere with each other. Furthermore, the horizontal depth of the left side is longer than the horizontal depth of the right side, and is such that the front edge of the left side extends up to the vicinity of the heat-insulating wall making up the door 65.

[0817] In addition, the gradation part 114 of the shelf plate 112 is made up of a curve so as not to interfere with the door pocket 99 and to reduce the inoperative space.

[0818] In this manner, even when configured in the manner shown in FIG. 48, the refrigerator 420 can fill up, with the shelf plate 112, the space on the storage compartment-side of left side of the door 65 which usually tends to become an inoperative space, and thus achieves high storage efficiency.

[0819] Furthermore, the refrigerator 420 shown in FIG. 48 includes the three storage areas of the large shelf plate part 113 and the normal shelf plate part 115 of the shelf plate 112, and the door pocket 99, and thus allows the user to perform sectionalized storage efficiently. In other words, the refrigerator 420 is a very convenient refrigerator.

[0820] Furthermore, the lighting device 387 is fitted to each of the right side-surface and the left side-surface of the refrigerator compartment and illuminates, with light-

emitting diodes as a light source, the inside of the refrigerator compartment from in front of the front edge of the shelf plate 112. With this, shadows are not cast on the storage items on the shelf plate 112 and the user can easily see the storage items, and thus convenience is improved. Furthermore, compared to conventional light bulbs, light-emitting diodes have low power consumption and a longer lifespan. Therefore, energy conservation becomes possible.

[0821] Furthermore, the door 65 may include a horizontally shallow storage pocket, on the left side of the surface on the storage compartment-side. For example, the door 65 may include, on the left side of the storage compartment-side surface, a stand pocket for storing small items, such as condiments tubes, in an upright manner.

[0822] In this case, it is necessary to marginally reduce the horizontal depth of the large shelf plate part 113 of the shelf plate 112. However, by including such a stand pocket in the door 65, small items that are not suitable for storing in the shelf plate 112 and the door pocket 99 can be efficiently stored without a significant change in the storable volume of the refrigerator 420 as a whole.

(Fourteenth Embodiment)

[0823] First, the configuration of a refrigerator in a fourteenth embodiment of the present invention shall be described using FIG. 49 to FIG. 57. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment.

[0824] FIG. 49 is a front view of the refrigerator in the present embodiment.

[0825] As shown in FIG. 49, a refrigerator 451 in the present embodiment is a refrigerator including French doors in the same manner as the refrigerator 51 in the first embodiment, and includes a compartmentalized storage compartment within the heat-insulating main body 52.

[0826] The refrigerator 451 in the present embodiment specifically includes, from the top, a refrigerator compartment 53, an ice-making compartment 54, a switchable compartment 55 provided beside the ice-making compartment 54 and which allows switching of inside temperature, a vegetable compartment 56, and a freezer compartment 57.

[0827] The opening of each storage compartment is provided with a heat-insulating door filled with a foam heat-insulating material such as urethane. Specifically, the refrigerator compartment 53 is provided with a left door 60a and a right door 60b which cover the opening of the heat-insulating main body 52 in a manner which allows opening and closing.

[0828] Furthermore, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57 are provided with the drawer-type door 61, door 62, door 63, and door 64, respectively.

[0829] From the perspective of storage capability and usability, the left door 60a is configured with a shorter length in the left-right direction, that is, a shorter width than the right door 60b, and the left door 60a and the right door 60b are split at approximately the same left-right direction location as the location at which the ice-making compartment 54 and the switchable compartment 55 are split.

[0830] Furthermore, depending on the storage configuration, and so on, there are cases where the doors of the storage compartment are French doors having a left door and a right door of identical width, and there are also configurations where one of the left door or the right door is of the drawer-type. Here, "identical width" refers not only to when the widths of the respective doors match perfectly, but also to when they are substantially the same. This is also true for the cases when other dimensions, locations, and so on, are said to be "the same" or "matching".

[0831] Furthermore, a cooler and fan which are not shown in the Drawings are provided behind the vegetable compartment 56 and the freezer compartment 57. The cooler is driven by a compressor disposed at the bottom portion of the main body of the refrigerator 451, and cooled air from the cooler is sent to the respective storage compartments. Furthermore, cooling is controlled to predetermined temperatures for each of the storage compartments.

[0832] FIG. 50 is a perspective view of the refrigerator 451 in the present embodiment with doors opened, and FIG. 51 is a vertical cross-section view (A-A shown in FIG. 49) of the refrigerator 151.

[0833] As shown in FIG. 50 and FIG. 51, plural shelf plates 480 for organizing and storing food items, and so on, are placed in the refrigerator compartment 53 in a bridging manner to span between the left side-surface and the right side-surface.

[0834] With the plural shelf plates 480, storage spaces spanning plural levels are formed in the refrigerator compartment 53. FIG. 52 is diagram showing the shelf plate 480 included in the refrigerator 451 in the present invention. As shown in the figure, the shelf plate 480 includes, on the left and right, areas having different color tones. With such a shelf plate 480, it is possible to improve the aesthetics in the state when the doors of the refrigerator are opened. By being illuminated by the lighting device 87 to be described later, the shelf plate looks even more beautiful to the user, when the doors of the refrigerator are opened. Furthermore, as previously described, the left door 60a and the right door 60b are placed at the opening of the refrigerator compartment 53. Specifically, the left door 60a and the right door 60b are each supported by the hinges 81 at the left and right ends of the heat-insulating main body 52.

[0835] A gasket 85 is fitted along the edges of the inner-side of such French door 60a and door 60b and thus the cold air inside the refrigerator compartment 53 is prevented from flowing to the outside.

[0836] Furthermore, the left door 60a has plural left door pockets 90 in a vertical direction in its refrigerator compartment 53-side, and the right door 60b also has plural right door pockets 91 in the same manner.

[0837] Specifically, each door pocket is held in place by a holding member and the like, not shown in the Drawings, which is cast with a door inner-surface 89 and the like thus ensuring holding strength in the holding of storage items. Furthermore, the intra-compartment surface of the doors is formed by the door inner-surface 89 and the storage compartment-side surfaces of the respective door pockets.

[0838] The plural door pockets in the respective doors form storage spaces spanning plural levels in the refrigerator compartment 53. Furthermore, each of the plural door pockets is intended to store mainly plastic bottles of beverages and the like and bottles of condiments and the like, and are shaped to have walls on the front, back, left, and right, and an upside opening.

[0839] Specifically, each door pocket is an example of a projecting part provided in the inner wall of a door, and has a recessed part opening upward.

[0840] It should be noted that the projecting part need not have a recessed part as long as items can be placed on it.

[0841] Furthermore, there are cases where each door pocket does not have a wall on the door-side (back wall) and instead utilizes the door inner-surface 89 as a back wall.

[0842] Furthermore, the lighting device 87 is provided in a sunken space on both left and right sides of the forward locations of the inner casing 70 forming the wall surface of the refrigerator compartment 53, and such space is covered by a cover not shown in the Drawings. The inside of the storage compartment is illuminated from the front by the lighting device 87.

[0843] It should be noted that the lighting device 87 may be provided in a cool air duct 84 described later, located at the back side of the refrigerator compartment 53 or the ceiling of the refrigerator compartment 53, and plural lighting devices 87 may be provided.

[0844] Furthermore, the chiller case 82 for improving the freshness of meat, fish, and the like, and small-item cases 83 for storing eggs and so on, are disposed in the lowest level of the storage spaces in the refrigerator compartment 53.

[0845] Furthermore, as shown in FIG. 51, the heat-insulating main body 52 is configured of a heat-insulating wall in which a foam heat-insulating material 72 is injected into a space formed between the inner casing 70 that is a vacuum formed body of resin such as ABS and an outer casing 71 using a metal material such as pre-coated steel plate.

[0846] Furthermore, the cool air duct 84 for blowing the cool air cooled by the previously described cooler to the inside of the storage compartment is provided at the back of the refrigerator compartment 53, that is, at the back of the shelf plates 480.

[0847] In general, the cool air duct 84 is configured from approximately the entire back-side of the inside of the heat-insulating main body 52 and, as necessary, is configured by providing outlets, not shown in the Drawings, between the respective shelf plates 480 so that cool air flows through the respective storage spaces. Furthermore, the cool air duct can also be used as a positioning unit or fastening unit for the plural shelf plates 480.

[0848] FIG. 53 is a horizontal cross-section view (B-B shown in FIG. 49) of the refrigerator 451 in the present embodiment.

[0849] As shown in FIG. 53, the divider 86 is disposed between both doors positioned at the opening of the refrigerator compartment 53. When both doors are closed, the gap between both doors is sealed by the divider 86 and the gasket 85.

[0850] The divider 86 is fitted to the right end of the left door 60a and is configured to turn together with the opening and closing of the left door 60a such that the left door 60a can be closed even after the right door 60b is closed first.

[0851] As such, a small space is required behind (the refrigerator compartment-side) the divider 86 in order for the divider 86 to turn.

[0852] It should be noted that when the gap between both doors can be sealed by the contact between the gaskets fitted along the perimeter of both doors, a divider 86 need not be set at the center portion.

[0853] Furthermore, the shelf plate 480 is disposed within the storage compartment space between the left door pocket 90, the right door pocket 91 and the cool air duct 84, and is provided with a certain amount of clearance from the door pockets so as not to interfere with the left door pocket 90 and the right door pocket 91.

[0854] It should be noted that the shelf plate 480 is supported and held in place in the heat-insulating main body 52 by being set on protrusions or the like that are cast with the inner casing 70, and are disposed so as to be approximately horizontal.

[0855] Here, in the present embodiment, the left door pocket 90 is shorter in width than the right door pocket 91 in the same manner as the relationship between the left and right doors. In addition, the horizontal depth C of the top plane opening of the left door pocket 90 and the horizontal depth D of the top plane opening of the right door pocket 91 are in a C<D relationship.

[0856] In this manner, in the refrigerator 451, the right door pocket 91 is configured to protrude further into the storage compartment-side and thus have an enlarged storage space. In other words, the distance from the door inner-surface of the French doors up to the back surface of the refrigerator compartment 53 is different at the left and right, with the distance being greater on the left side.

[0857] Furthermore, in accordance with the shape of the left door pocket 90 and the right door pocket 91 having such magnitude relationship, the horizontal depth of the shelf plate 480 is different on the left and right as seen from the opening of the refrigerator compartment 53.

[0858] By shaping the shelf plate 480 in such a manner, storage space can be increased over the conventional refrigerator without changing the overall size of the refrigerator 451.

[0859] The advantageous effects achieved by shelf plate 480 and the left door pocket 90 and right door pocket 91 in the present embodiment shall be described hereafter.

[0860] Each of the French-type left door 60a and right door 60b configured at the opening of the refrigerator compartment 53 opens by swinging outward from the boundary of the left door 60a and the right door 60b, with the hinges 81 as an axis. With this movement, the left door pocket 90 and the right door pocket 91 included in the respective doors swing together with the doors.

[0861] At this time, in order to prevent one door from interfering with the other door (including the door pockets fitted to each door), each of the door pockets need to be in a shape that fits within the swing trajectory (dashed-dotted line) of each door.

[0862] In the present embodiment, the right door pocket 91 is provided with a slanting portion on the left side and is made to be horizontally deeper than the left door pocket 90 but within the swing trajectory of the right door 60b. Furthermore, the left door pocket 90 has a relatively short width and horizontal depth so as to fit within the swing trajectory of the left door 60a without having to make a slanting portion as described above.

[0863] Specifically, although the storable volume for the left door pocket 90 is comparatively small, enlarging the right door pocket 91 guarantees a fixed amount for the total storable volume for the left and right door pockets.

[0864] Here, in general, the slanting portion becomes more acute as the horizontal depth of the right door pocket 91 increases, and the space between the right door pocket 91, the left door pocket 90 and the shelf plate 480, that is, the inoperable space around the back of the divider 86, becomes larger.

[0865] It should be noted that regardless of whether the door pocket is in the left side or the right side, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the above-described inoperative space increases.

[0866] Consequently, in the present embodiment, the front edge on the shallow side of the shelf plate 480 faces the door inner-surface with the shorter distance from the door inner-surface to the back surface, and the front edge on the deep side of the shelf plate 480 faces the door inner-surface with the longer distance from the door inner-surface to the back surface.

[0867] Specifically, as shown in FIG. 53, the front edge of the horizontally shallow right side of the shelf plate 480 faces the horizontally deep right door pocket 91, and the front edge of the horizontally deep left side of the shelf plate 480 faces the horizontally shallow left door pocket 90.

[0868] In other words, the respective horizontal depths of the projecting parts consisting of the right door pocket 91 and the left door pocket 90 conform to the horizontal depths of the shelf plate 80.

[0869] With this, it is possible to reduce the inoperative space around the back of the divider 86 and increase the storage space inside the storage compartment.

[0870] Specifically, as shown in FIG. 53, assuming the horizontal depth of the left end side of the shelf plate 480 to be E and the horizontal depth of the right end side to be F, the shelf plate 480 assumes a shape that satisfies E>F and the sum of E and C is approximately equal to the sum of F and D.

[0871] In this manner, the shape of the front end portion of the shelf plate 480 toward the left and right is opposite those of the left door pocket 90 and the right door pocket 91.

[0872] Therefore, the front edge of the shelf plate 480 in the present embodiment has a gradation in the front-back direction that is not present in conventional refrigerator shelf plates. The part making up this gradation shall be referred to as a gradation part 492.

[0873] The gradation part 492 is a part which continuously connects the respective front edges of the left side and the right side of a shelf plate through a curve.

[0874] Furthermore, the left side portion of the shelf plate 480 including the portion having the horizontal depth E shall be referred to as a large shelf plate part 493 and the right side portion of the shelf plate 480 including the portion having the horizontal depth F shall be referred to as a normal shelf plate part 494.

[0875] The large shelf plate part 493 and the normal shelf plate part 494 can be roughly distinguished as the left side (large shelf plate part 493) and the right side (normal shelf plate part 494) of the straight line stretching in the horizontal depth direction from the center point of the left-right direction of the gradation part 492.

[0876] It should be noted that the method for distinguishing the large shelf plate part 493 and the normal shelf plate part 494 is not limited to the above-described method and, for example, in FIG. 53, it is acceptable to refer to only the area having the horizontal depth F as the normal shelf plate part 494, and refer to the remaining area as the large shelf plate part 493.

[0877] In the present embodiment, the front edge of the large shelf plate part 493 and the front edge of the normal shelf plate part 494 are continuously connected by the gradation part 492.

[0878] Furthermore, this curved shape is a result of shaping to match the shape of the right door pocket 91 including the slanting portion. Determining the respective dimensions of the normal shelf plate part 494 in a shape that follows the shape of the left door pocket 91 in this manner is particularly effective in reducing the inoperative space.

[0879] As such, the shape of the shelf plate 480 in the present embodiment enlarges the storable shelf base area of the entire storage compartment combining the left door pocket 90, the right door pocket 91 and the shelf

plate 480, and can thus be regarded as a shape which efficiently increases the storage space

[0880] It should be noted that the shape of the gradation part 492 may be any shape which does not interfere with the horizontally deep right door pocket 91. Here, the shape of the right door pocket 91 is a shape that does not interfere with the left door 60a, that is, a shape that fits within the swing trajectory of the right door 60b.

[0881] Therefore, as long as the gradation part 492 is on the outer side of the swing trajectory of the right door 60b, it does not interfere with the right door pocket 91. Furthermore, in order to reduce the inoperative space, it is sufficient for the curve included in the gradation part 492 to be a curve having an arc which corresponds to the swing trajectory of the right door 60b.

[0882] Furthermore, the right door pocket 91 is made to have a horizontal depth that is greater than normal to make up for the reduced storage space of the left door pocket 90.

[0883] With this, only the storage space of the shelf plate 480 is increased without changing the approximate combined storage space of both door pockets.

[0884] Specifically, in the refrigerator 451 in the present embodiment, the storage space is increased over the conventional refrigerator without changing the overall size.

[0885] Furthermore, the size of the inoperative space resulting from the swing trajectories of the French doors described above can be suppressed by moving the location of the swing trajectories forward by moving the location of the hinges 81 forward, and so on.

[0886] However, in recent years, there has been an increasing need for enlargement of the storage space of door pockets due to the increased consumption of plastic bottles and glass bottles, and from the perspective of convenience in allowing the user to take items in and out of upon opening the doors.

[0887] With this, with recent refrigerators, there is an increased tendency for door pockets to project further towards the storage compartment side, and as a result, there is a tendency for the inoperative space inside the storage compartment to increase.

[0888] In response to this tendency, the refrigerator 451 in the present embodiment increases the storage space over the conventional refrigerator without changing overall size. In other words, the refrigerator 451 is a refrigerator that has better storage efficiency and convenience than what is conventional.

[0889] These described details are merely a result of one horizontal cross-section of the refrigerator compartment 53 shown in FIG. 53. However, the shape of the swing trajectory of the left door pockets 90 and the right door pockets 91 is approximately the same for the entire height of the French doors.

[0890] As such, by adopting approximately the same shapes for the plural shelf plates 480 and the plural left door pockets 90 and right door pockets 91 which configure storage spaces spanning plural levels, it is possible to increase the storage spaces spanning the entire height within the storage compartment, and thus a significant advantageous effect can be attained.

[0891] Furthermore, the plural shelf plates 480 in the vertical direction are positioned so that the front edge of each shelf plate from the top level to the bottom level are parallel, that is, the position in the horizontal depth direction of the respective front edges of the plural shelf plates 480 are the same.

[0892] With this, there is a sense of unity from the perspective of the user, and superior design characteristics are achieved.

[0893] In addition, the plural shelf plates 480 can be made up of identical components, and this contributes to the reduction of manufacturing costs through component standardization, and the reduction of manufacturing costs through reduced operational load in the manufacturing stage.

[0894] With respect to the left door pockets 90 and the right door pockets 91, there is also a possibility for enabling component standardization for the plural door pockets spanning vertically, as with the shelf plates 80. In such a case, this is likewise very effective in the reduction of manufacturing costs and so on.

[0895] Furthermore, as described above, the shelf plate 480 includes a large shelf plate part 493 and the normal shelf plate part 494, in accordance with the shape of the left door pocket 90 and the right door pocket 93 which have long and short horizontal depths. Specifically, the large shelf plate part 493 includes a large area which allows storage and that is not conventionally available.

[0896] The large shelf plate part 493 is characterized in being horizontally deep, and allows relatively long storage items such as a skillet or a large bottle to be placed steadily without interfering with the taking in and out of other storage items.

[0897] From the perspective of the user, this is convenient in terms of storing a large amount of items separately in the refrigerator 451, and in terms of taking out a desired storage item from among the large amount of storage items.

[0898] Such advantageous effects can be obtained simply by reducing the horizontal depths C and D of the left door pocket 90 and right door pocket 91, respectively, and increasing the horizontal depths E and F of the shelf plate 180.

[0899] However, such a case reduces the storage capacity of the door pockets which are very convenient for a user and instead degrades the storage characteristics of the storage compartment and making it difficult to use, and is thus impractical.

[0900] Furthermore, by making the shelf plate 480 into a relatively thin flat plate, the storage spaces spanning plural levels can be enlarged as much as possible. In other words, the storage space can be increased. Furthermore, there is no sense of crampedness in the front edge of the shelf plate 480, which is most visually concerning.

[0901] In addition, by fabricating the shelf plates 480 with a material having transparency, it is possible to reduce the sense of crampedness imparted by the shelf plates 480 and give a sense of spaciousness. Furthermore, it is also possible to impart a sense of cleanliness inside the refrigerator compartment 53.

[0902] Furthermore, in the present embodiment, the gradation part 492 of the shelf plate 480 is not an angular step but has a smooth-flowing wave shape such as a rounded shape or a chamfered shape for example.

[0903] This also has an advantageous effect as a reinforcing structure for preventing the occurrence of stress concentration and distortion in the shelf plate 480. As such, since it is possible to prevent sagging and cracking even when storage items are placed on top, and it is attractive in appearance and superior design-wise, it is a very effective means.

[0904] Here, in general, the front edge of the shelf plate 480 forming the opening for taking storage items in and out is not supported anywhere. Consequently, in the present embodiment, the shelf plate 480 includes, as a brim material, a molded metal plate 495 of stainless steel, and the like, as shown in FIG. 54.

[0905] FIG. 54 is a perspective view of the shelf plate 480 in the present embodiment.

[0906] As shown in FIG. 54, including the metal plate 495 in the front edge of the shelf plate 480 has an advantage of allowing strength to be increased and allowing the metal plate 495 to be used as a decorative plate.

[0907] It should be noted that, although the metal plate 495 is fitted on the entire width of the front edge in FIG. 54, it is sufficient to have a brim material at least on the portion including the gradation part 492. This is because the vicinity of the gradation part 492 is most prone to the occurrence of stress centering.

[0908] Furthermore, as shown in FIG. 54, when the metal plate 495 is fitted so as to sandwich the top and bottom surfaces of the shelf plate 480, it is possible to reduce the chances of items placed on the shelf plate 480 from falling off from the front end portion.

[0909] Furthermore, the shelf plate 480 may be made to allow switching in the vertical direction depending on the shapes of the storage items, and enable the dimension in the horizontal depth direction to be variable by folding the shelf plate 80.

[0910] Furthermore, although it is described that the aforementioned shelf plate 480 is configured to be a single flat plate, even with a two-part construction divided right in the vicinity of the gradation part 492, as long as it is configured by a shelf plate making up the large shelf plate part 493 and a shelf plate making up the normal shelf plate part 494 and the gradation part 492 is present in between, it is possible to attain the same advantageous effect, as described above, of reducing the inoperative space to a certain degree.

[0911] Here, the case where the metal plate 495 is fitted as decoration to the front edge of a shelf plate 480 having transparency and including a wave-shaped gradation part 492 is assumed.

[0912] In this case, when such shelf plate 480 and metal plate 495 are illuminated by the lighting device 87 with a light from the front of the storage compartment, the shelf plate and metal plate are illuminated from approximately the same direction as the direction of the line of sight of the user. With this, the storage items inside the storage compartment become very easy to see, and the design characteristics of the shelf plate 480 having the wave-form gradation part 492 is improved.

[0913] Furthermore, using glass as the material for the shelf plate 480 serves a dual purpose of increasing light transmissivity and making the shelf plate clean and superior in strength.

[0914] Furthermore, by using LED and embedding the lighting device 87 in the heat-insulating wall of the inner casing 70, space-saving is possible compared to when the lighting device is conventionally provided mainly in the cool air duct 84 or in the ceiling.

[0915] Furthermore, as described above, the left door pocket 90 is configured to have a relatively short horizontal depth C. As such, as shown in FIG. 55, even when assuming a usage environment in which the left door 60a can only be opened 90 degrees, the opening dimension G has a length which allows the storage items to be taken in and out.

[0916] Specifically, in the refrigerator 451 in the present embodiment, it is possible to position storage items further in front using the forward-projecting large shelf plate part 493, and there is the advantage that taking storage items placed in the shelf plate 80 in and out is easy even in a usage environment in which the left door 60a cannot be sufficiently opened.

[0917] Furthermore, the refrigerator compartment 53 in the present embodiment is located on the uppermost part of the refrigerator 451. Therefore, in the case where the refrigerator 451 is a refrigerator of approximately 1800 mm main body height which is the currently predominant over-400 liter capacity type, the storage items in the refrigerator compartment 53 are positioned at approximately the same height as the user's line of sight.

[0918] With this, the user can easily take storage items in and out. In addition, with the above-described ingenuity placed in the shape of the left door pocket 90 and the right door pocket 91 provided in the French-type left door 60a and right door 60b, respectively, and the shelf plate 80, storage space within the storage compartment is dramatically increased and efficient storage that matches the size and shape of storage items can be realized.

[0919] For example, sectionalized storage, in which the user stores relatively small bottles such as condiments and dressing in the left door pocket 90, and stores relatively big items such as plastic bottles or milk cartons in the right pocket 91, becomes possible.

[0920] In addition, the shelf plate 80 also allows sectionalized storage in which the horizontally deep but narrow large shelf plate part 493 is used as a stocking zone for storing food items that are not frequently taken in and

out, and the large shelf plate part 493 which has a relatively short horizontal depth but is wider than the large shelf plate part 493 is used as a flowing zone for storing food items that are frequently taken in and out.

[0921] In other words, the user can roughly divide the inside of refrigerator compartment 53 into 4 zones, and use each section depending on the purpose.

[0922] Furthermore, by making the refrigerator compartment 53 opening the largest, and positioning, below the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and so on, which have drawer doors, a very user-friendly storage compartment positioning can be realized.

[0923] The above-described embodiment is merely one embodiment of the present invention and various modifications and applications are possible.

[0924] For example, although the left door 60a is described to have a form in which left-right length, that is, the width is less than that of the right door 60b, the ratio for dividing both doors may be in any proportion.

[0925] Specifically, no matter what proportion is assumed for the ratio in which both doors are divided, by making the normal shelf plate part 494 of the shelf plate 480 face the horizontally deep door pocket and making the large shelf plate part 493 of the shelf plate 480 face the horizontally shallow door pocket, it is possible to obtain approximately the same advantageous effect albeit with a slight difference in the amount of increase in storage space.

[0926] Furthermore, although the left door pocket 90 is made horizontally shallow, this is the result of consideration being given mainly to user-friendliness in a situation where relatively more users are right-handed, and it goes without saying that the same advantageous effect can be obtained even when the configurations of the left and right doors were to be interchanged.

[0927] Furthermore, the length in the left-right direction of the left door 60a and the right door 60b, that is, the width of the left door 60a and the width of the right door 60b may be made the same.

[0928] Here, as shown in FIG. 53, when the width of the left door 60a is less than the width of the right door 60b, the width of the large shelf plate part 493 and the width of the normal shelf plate part 494 are the same albeit approximately.

[0929] Consequently, as shown in FIG. 56, the width of the left door 60a and the width of the right door 60b are made the same. With this, the width of the large shelf plate 493 increases. As such, more food items, and so on, can be placed on the large shelf plate part 493.

[0930] Furthermore, in the present embodiment, the strength, design characteristics, and so on, of the shelf plate 480 is improved by fitting the metal plate 495 on the front edge of the shelf plate 480.

[0931] However, the brim material may be fitted on the entire perimeter of the shelf plate 480. For example, when the shelf plate 480 is fabricated from resin, a latching part, and the like, for setting the shelf plate 480 in the inner casing 70 can be provided by casting. In other words, the shelf plate 480 can be easily provided with protrusions.

[0932] However, when the shelf plate 480 is fabricated from glass, in order to provide a latching part to the shelf plate 80 for example, the latching part needs to be attached to the glass shelf plate 480 using an adhesive and the like.

[0933] Consequently, for example, it is possible to fabricate, using resin and the like, a brim material covering the entire perimeter of the glass shelf plate 480, and provide a latching part on the brim material by casting.

[0934] In this case, by fitting the brim material onto the glass shelf plate 480, the protrusions for setting the shelf plate 480 on the inner casing 70 can also be provided to the shelf plate 480.

[0935] FIG. 57 is diagram showing the glass shelf plate 480 included in the refrigerator 451 in the present invention fitted with the brim material covering its entire perimeter.

[0936] A brim material 496 shown in FIG. 57 is for example made of resin, and is provided with latching parts 496a in parts corresponding to both ends of the shelf plate 480 by casting.

[0937] Furthermore, although not shown in the Drawings, a latching part such as a protrusion may be provided in a position of the brim material corresponding to the back end of the shelf plate 480, to allow it to be supported by the back surface of the refrigerator compartment 53. With this, the shelf plate 480 is supported not only by the left and right side-surfaces of the refrigerator compartment 53, but also by the back surface of the refrigerator compartment 53.

[0938] Here, the glass shelf plate 480 and the brim material 496 shown in FIG. 58 may be fabricated separately and combined after each is completed, and the shelf plate 480 and the brim material 496 may be cast by insert molding.

[0939] In the case of insert molding, the shelf plate 480 including the brim material 496 and the latching part 496a can be fabricated more rapidly. Furthermore, the fixing strength between the shelf plate 480 and the brim material 496 can be improved.

[0940] It should be noted that when the shelf plate 480 is fabricated from glass, it is also possible that the fitting of a brim material for the purpose of improving strength is unnecessary.

[0941] However, the brim material fitted onto the glass shelf plate can serve to protect the perimeter of the shelf plate 480, prevent items placed on the shelf plate 480 from falling off, improve design characteristics, and so on.

[0942] Furthermore, as shown in FIG. 54 and FIG. 57, brim materials such as the metal plate 495 and the brim material 496 adopt a form which sandwiches the top surface and bottom surface of the shelf plate 480.

[0943] However, the brim material need not assume such a form. For example, a metal plate having a width

that is narrower than the thickness of the shelf plate 480 is fitted to the front end portion or the entire perimeter of the resin shelf plate 480 by being plugged therein.

[0944] Even in such a case, it is possible to improve the strength of the shelf plate 480 for example.

[0945] It should be noted that although the shelf plate 480 includes, on the left and right, areas having different color tones, the color tones are merely one example of the properties of the respective areas included in the shelf plate 480. For example, the properties of the respective areas of in the shelf plate 480 include the size, shape, and so on, of such area. More specifically, in the case where the shelf plate 480 shown in FIG. 52 is made of glass, the shelf plate 480 is configured by joining glass sheets which are respectively different in size for the area 480a and 480b included in the shelf plate 480.

[0946] In this manner, when the shelf plate 480 includes areas having different sizes, component standardization, such as using at least one of the areas such as the area 480b together with a shelf plate of another product, becomes possible. Therefore, production cost can be reduced.

(Fifteenth Embodiment)

[0947] Hereinafter, a refrigerator in a fifteenth embodiment of the present invention shall be described using FIG. 58.

[0948] FIG. 58 is a horizontal cross-section view of the refrigerator compartment section of a refrigerator 518 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fourteenth embodiment and their description shall be omitted.

[0949] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 518 in the present embodiment are different from those of the refrigerator 451 in the fourteenth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 451 in the fourteenth embodiment.

[0950] As shown in FIG. 58, the refrigerator 518 in the present embodiment includes the left door 60a, the right door 60b, the left door pocket 100, the right door pocket 101, and a shelf plate 502.

[0951] Furthermore, plural left door pockets 100 are supportively held in place in the left door 60a and disposed along the vertical length of the left door 60a. Plural right door pockets 101 are likewise supportively held in place in the right door 60b and disposed along the vertical length of the right door 60b.

[0952] Plural shelf plates 502 are disposed from the top to bottom of a space between the door pockets and the cool air duct 84 in positions and shapes that do not interfere with the door pockets. The plural shelf plates 480 form storage spaces spanning plural levels.

[0953] The shelf plate 502 in the present embodiment also includes, on the left and right, areas having different color tones, in the same manner as the shelf plate 480 in the fourteenth embodiment. With such a shelf plate 480, it is possible to improve the aesthetics in the state when the doors of the refrigerator are opened.

[0954] The left door pocket 100 is of a size that fits within the swing trajectory of the left door 60a in the figure so as not to interfere with the right door 60b, and is shaped so that the shape of its base is approximately square.

[0955] The right door pocket 101 is horizontally deeper than the left door pocket 100. Furthermore, the horizontal depth of the left end of the right door pocket 101 is reduced in order to fit within the swing trajectory of the right door 60b in the figure so as not to interfere with the left door 60a.

[0956] The shelf plate 502 is disposed within the storage compartment space between the left door pocket 100, the right door pocket 101 and the cool air duct 84 in such a way that a certain amount of clearance is provided so as not to interfere with the left door pocket 100 and the right door pocket 101.

[0957] Specifically, the shelf plate 502 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0958] Furthermore, as shown in FIG. 58, the shape of the shelf plate 502 is one in which the left end side is horizontally deeper than the right end side.

[0959] Specifically, when the length of the left end side is assumed to be H and the length of the right end side is J, their relationship is such that H>J.

[0960] Furthermore, a boundary part 506 is provided between the left door pocket 100 and the right door pocket 101, in the space just behind the divider 86, and the horizontal depth of the shelf plate 502 gradually decreases from the boundary part 506 towards the right side.

[0961] It should be noted that, in the same manner as with the gradation part 492 in the shelf plate 480 in the fourteenth embodiment, the boundary part 506 is a part which serves as an approximate boundary at which the horizontal depth of the shelf plate changes.

[0962] Specifically, the left side from the boundary part 506 of the shelf plate 502 corresponds to the large shelf plate part 493 in the fourteenth embodiment, and the right side from the boundary part 506 corresponds to the normal shelf plate part 494 in the fourteenth embodiment.

[0963] The advantageous effects achieved by shelf plate 502 and the left door pocket 100 and right door pocket 101 in the present embodiment shall be described hereafter.

[0964] As described above, by making the width and horizontal depth of the left door pocket 100 relatively short so that the shape of its base is approximately square, the inoperative space behind the divider 86 can be minimized.

[0965] Furthermore, by making the left side of the shelf plate 502 into a shape which projects up to the vicinity of the left door pocket 100, the horizontal depth of the

left-side portion of the shelf plate 502 can be increased.

[0966] Furthermore, the right door pocket 101 is made larger than the left door pocket 100 so as to compensate for the smallness of the left door pocket 100.

[0967] With this, the storage space within the storage compartment can be dramatically increased without reducing the door pocket storage space which is very convenient for the user.

[0968] In particular, by positioning the boundary part 506 of the front edge of the shelf plate 502 in the space behind the divider 86 between the left door pocket 100 and the right door pocket 101, and configuring the shape of the right door pocket 101 to follow the front edge of the shelf plate 502, it is possible to minimize the inoperative space existing in the space behind the divider 86, which has always been typical to conventional French doors.

[0969] Specifically, in the refrigerator 518 in the present embodiment, by adopting the shapes shown in FIG. 58 for the shapes of the shelf plate 502, the left door pocket 100, and the right door pocket 101, it is possible to improve the storage efficiency of the refrigerator 518 by enlarging the storable shelf base area within the storage compartment in the same manner as in the refrigerator 451 in the fourteenth embodiment.

[0970] Furthermore, as with the refrigerator 451 in the fourteenth embodiment, the refrigerator 518 also allows the storage space of inside the refrigerator compartment to be divided into the 4 sections of the left door pockets 100, the right door pockets 101, the left area and the right area of the shelf plates 502, each having different horizontal depths, and so on.

[0971] This allows the user to perform efficient sectionalized storage in accordance with the size and shape of storage items.

[0972] Furthermore, a single boundary part 506 is present in the front edge of the shelf plate 502 and, when looking at the shelf plate 502 from the top and bottom directions, the front edge has a relatively simple shape consisting of mainly 2 straight lines. In this case, since it is possible to simplify the shape of the metal plate (not shown in the Drawings) which is fitted to the front edge as a brim material and which also serves as decoration, the shelf plate 502 and the brim material can be fabricated at a low cost.

[0973] It should be noted that, when viewed from the top and bottom directions, the front edge of the shelf plate 502 need not be in a shape consisting mainly of 2 straight lines as shown in FIG. 58. Specifically, the front edge of the shelf plate 502 need not be in a shape that bends at the boundary part 506.

[0974] For example, the front edge may be in a shape which softly curves at the boundary part 506. Furthermore, the boundary part 506 may bulge toward the divider 86 within a range that does not enter the swing trajectory of the left door 60a and the right door 60b and the area required for the turning of the divider 86.

[0975] Even in such a case, it is possible to obtain the advantageous effect of increasing storage space albeit with some difference in degree.

(Sixteenth Embodiment)

[0976] A refrigerator in a sixteenth embodiment of the present invention shall be described using FIG. 59 and FIG. 60.

[0977] FIG. 59 is horizontal cross-section view of the refrigerator compartment section of a refrigerator 519 in the present embodiment. FIG. 60 is a horizontal cross-section view of the refrigerator 519 in the present embodiment when the left door 110a is opened. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fourteenth embodiment and their description shall be omitted.

[0978] Furthermore, although the shapes of the left and right door pockets and shelf plate of the refrigerator 549 in the present embodiment are different from those of the refrigerator 451 in the fourteenth embodiment, other constituent elements, their functions, and so on, are the same as in the refrigerator 451 in the fourteenth embodiment.

[0979] As shown in FIG. 59, the refrigerator 519 in the present embodiment includes the left door 110a, the right door 110b, and the right door pocket 111. However, unlike the respective refrigerators in the fourteenth and fifteenth embodiments, the refrigerator 519 in the present embodiment does not include a left door pocket.

[0980] Furthermore, the refrigerator 519 in the present embodiment further includes a shelf plate 512, and plural right door pockets 111 are disposed along the vertical length of the right door 110b.

[0981] Plural shelf plates 512 are disposed from the top to bottom of a space between the right door pockets 111 and the cool air duct 84 in positions and of a shape that does not interfere with the right door pockets 111. The plural shelf plates 512 form storage spaces spanning plural levels.

[0982] Here, the shelf plate 512 is disposed within the storage space between the right door pocket 111 and the cool air duct 84 so as to provide a certain amount of clearance so as not to interfere with the right door pocket 111.

[0983] Specifically, the shelf plate 512 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[0984] Furthermore, as shown in FIG. 60, the shelf plate 512 is shaped to cover almost the entire area of the space located in the refrigerator compartment-side of the left door 110a, and shaped so as not to interfere with the right door pocket 111 in the forward and backward direction at the refrigerator compartment-side of the right door 110b.

[0985] In other words, the shelf plate 512 in the present embodiment is shaped to have a gradation in the front

edge in the same manner as the shelf plate 480 in the fourteenth embodiment.

[0986] Specifically, when assuming the horizontal depth on the left side of a gradation part 514 to be K and the horizontal depth on the right side of the gradation part 514 to be L, the shelf plate 512 maintains a relationship in which K>L.

[0987] It should be noted that, in the same manner as the shelf plate 480 in the fourteenth embodiment, the left side of a straight line extending in the horizontal depth direction from the approximate center point of the gradation part 514 of the shelf plate 512 is a large shelf plate part 513 and the right side of the straight line is a normal shelf plate part 515.

[0988] The advantageous effects achieved by the shelf plates 512 and the right door pockets 111 in the present embodiment shall be described hereafter.

[0989] In the refrigerator 519, the horizontal cross-section of the inside of the refrigerator compartment is virtually allocated to the right door pocket 111 and the shelf plate 512, as shown in FIG. 59.

[0990] Furthermore, the shape of the door pocket 111 which swings integrally with the right door 110b fits within the swing trajectory of the right door 110b in the figure.

[0991] In addition, in the shelf plate 512, there is the normal shelf plate part 515 having a horizontal depth which does not interfere with the right door pocket 111, and the large shelf plate part 513 is shaped to project up to the vicinity of the left door 110a.

[0992] With this, the inoperative space existing in the space between the door pockets and the shelf plates, that is, behind the divider 86, which is typical of conventional French doors, can be virtually eliminated except for the minimum space required for the turning of the divider 86.

[0993] Specifically, the shape of the shelf plate 512 and the right door pocket 111 shown in FIG. 59 is considered to be extremely effective in increasing storage space.

[0994] The shelf plate 512 in the present embodiment also includes, on the left and right, areas having different color tones, in the same manner as the shelf plate 480 in the fourteenth embodiment. With such a shelf plate 480, it is possible to improve the aesthetics in the state when the doors of the refrigerator are opened.

[0995] Furthermore, the left door 110a does not include door pockets as storage space and is configured of only a heat-insulating wall. With this, the shelf plate 512 can be projected up to the vicinity of the left door 110a, and the horizontal depth of the shelf plate 512 can be made to approximate the length from the door inner-surface of the left door 110a to the back surface of the storage compartment.

[0996] In this case, storage items can be placed in front of the user's line of sight and up front where they can easily be taken out, and thus taking items in and out becomes easy and convenient. In addition, it is convenient for storing long items.

[0997] Furthermore, as shown in FIG. 59, the upper surface of the shelf plate 512 can be made into an approximate L-shape. As such, when the right door 110b is opened, aside from the taking in and out of items with respect to the forward area of the normal shelf plate part 515, the taking in and out of items with respect to the area around the gradation part 514 existing in the in-compartment direction of the left door 110a also becomes easy.

[0998] This is because, when the right door 110b is opened, the direction in which items are taken in and out with respect to the area around the gradation part 114, that is, the space in the a roughly sideward direction becomes a free space. Specifically, this is because the space through which items can be taken in and out of such area from the sideward direction when the right door 110b is opened is wide.

[0999] Furthermore, although dependent on the allocation of storage space in the storage compartment between the right door pocket 111 and the shelf plate 112, it is possible to equalize the left and right length of the placement areas of the shelf plate 512, that is, make L shown in FIG. 59 and the width of the front edge of the large shelf plate part 513 the same.

[1000] In this case, there is the advantage that visually checking plural storage items placed on the shelf plate 512 becomes very easy.

[1001] Furthermore, as shown in FIG. 60, even when in a usage environment in which the left door can only be opened 90 degrees, it is possible to have the large opening size M when the left door 110a is opened. Specifically, the ease of taking items in and out is significantly improved compared to a left door including conventional left door pockets.

[1002] In addition, the case is assumed in which the small-item case 83 shown in FIG. 50 and having a width that is equal to or less than M is placed in the large shelf plate part 513 of the shelf plate 512.

[1003] In this case, the user can pull out the small-item case 83 to the front without being bothered by the left door 110a. In addition, pulling out and using the small-item case 83 outside the storage compartment from time to time can be done easily.

[1004] Furthermore, in the same manner as the refrigerator 451 in the fourteenth embodiment, the refrigerator 519 also allows sectionalized storage through separate usage of the large shelf plate parts 513, the normal shelf plate parts 515, and the right door pockets 111.

[1005] In this manner, the refrigerator 519 in the present embodiment can efficiently increase storage space in the same manner as the respective refrigerators in the fourteenth and fifteenth embodiments. In addition, in the refrigerator 519, by providing various drawer mechanisms in the storage compartment space on the left door 110-side, the taking in and out of items can also be improved.

[1006] In other words, the refrigerator 519 in the present embodiment is a refrigerator that has better stor-

age efficiency and convenience than what is conventional.

(Seventeenth Embodiment)

[1007] As described above, the respective refrigerators in the fourteenth through sixteenth embodiments include French doors having 2 doors, one each for the left and right, in the opening of the refrigerator compartment. Furthermore, the horizontal depths of the left side and the right side of the shelf plate are in accordance with the shape of the door inner-surface of the doors.

[1008] Specifically, the aforementioned dimensions of the shelf plate are dimensions for filling up the inoperative space within the refrigerator compartment. This increases the storage space within the storage compartment. Furthermore, there are also advantageous effects such as allowing efficient sectionalized storage.

[1009] Here, these advantageous effects achieved by adopting the previously described shapes for the shelf plates are effective, not only for a French door refrigerator, but also for what is called a single door refrigerator which has only one door for the refrigerator compartment.

[1010] Consequently, the case where the present invention is applied to a single door refrigerator shall be described as seventeenth embodiment of the present invention.

[1011] FIG. 61 is a front view of a refrigerator in the present embodiment.

[1012] As shown in FIG. 61, a refrigerator 520 in the present embodiment includes the refrigerator compartment 53, the ice-making compartment 54, the switchable compartment 55, the vegetable compartment 56, and the freezer compartment 57, as in the refrigerator 451 in the fourteenth embodiment.

[1013] Furthermore, a single swing door 65 is set in the refrigerator compartment 53. By opening the door 65, the user can take items in and out of the refrigerator compartment 53.

[1014] FIG. 62 is a horizontal cross-section view (B-B shown in FIG. 61) of the refrigerator 520 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fourteenth embodiment and their description shall be omitted.

[1015] As shown in FIG. 62, the refrigerator 520 in the present embodiment includes the door pocket 97. Plural door pocket 97 are supportively held in place in the door 65 and disposed along the vertical length of the door 65.

[1016] Furthermore, the door pocket 97 has a shape in which the horizontal depth R on the swing axis 88-side is greater than a horizontal depth Q on the opposite side. In other words, it maintains an R>Q relationship.

[1017] Furthermore, plural shelf plates 521 included in the refrigerator 520 are disposed from the top to bottom of a space between the door pocket 97 and the cool air duct 84 in positions and of a shape that does not interfere with the door pocket 97. The plural shelf plates 521 form storage spaces spanning plural levels.

[1018] In the same manner as the shelf plate 480 in the fourteenth embodiment, this shelf plate 521 includes a gradation part 524 and includes a horizontally deep large shelf plate part 522 and a horizontally shallow normal shelf plate part 523.

[1019] Specifically, when the horizontal depth of the large shelf plate part 522 is assumed to be N and the horizontal depth of the normal shelf plate part 523 is P, it maintains a relationship in which N>P and the sum of N and Q is approximately equal to the sum of P and R.

[1020] In other words, in the same manner as the shelf plate 480 in the fourteenth embodiment, this shelf plate 521 is shaped to fill up the inoperative space within the storage compartment.

[1021] Furthermore, the shelf plate 521 in the present embodiment also includes, on the left and right, areas having different color tones, in the same manner as the shelf plate 480 in the fourteenth embodiment. With such a shelf plate 480, it is possible to improve the aesthetics in the state when the doors of the refrigerator are opened.

[1022] The advantageous effects achieved by the shelf plates 521 and the door pockets 97 in the present embodiment shall be described hereafter.

[1023] As previously described, there is also demand from users for door pockets and a certain degree of enlargement is necessary. Furthermore, when enlarging door pockets, the horizontal depth is increased because the width is limited to the width of the storage compartment.

[1024] However, the horizontal depth of the door pocket can only be increased up to a certain extent in consideration of the opening and closing of the door.

[1025] Specifically, in the case of the refrigerator 520 which is a single door refrigerator, the door pocket 97 needs to fit within a circle (dashed-dotted line) having a swing axis 88 which is the swing center of the door 65 as a center and passing the end of the inner casing 70 opposite the swing axis 88.

[1026] Consequently, so as not to interfere with the circle, it is possible to increase horizontal depth while providing a slanting portion on the side of the door pocket 97 which is far from the swing axis 88, that is, the left side of the door pocket 97. However, as previously described, in this case, the slanting portion becomes more acute as the horizontal depth of the door pocket increases, and thus the inoperative space increases. Furthermore, the shape of the base of the door pocket 97 approximates a triangle and storage capability deteriorates.

[1027] As such, in the refrigerator 520 in the present embodiment, by making the horizontal depth of the left side of the door pocket 97 relatively short, the opening and closing of the door 65 becomes possible without having to provide a slanting portion.

[1028] Furthermore, increasing the horizontal depth of the right side of the door pocket 97 compensates for the reduction in storage capacity brought about by the reduction of the horizontal depth on the left side.

[1029] Specifically, when seen as a whole, the door pocket 97 has a shape in which the right side projects into the storage compartment.

[1030] As such, it is possible for an inoperative space to appear in the storage compartment direction on the left side of the door pocket 97. Consequently, the left side of the shelf plate 521 opposing the door pocket 97 is lengthened in the horizontal depth direction to an extent that does not interfere with the door pocket 97, so as to fill up such inoperative space.

[1031] With this, it is possible to enlarge the storable shelf base area of the entire storage compartment combining the door pockets 97 and the shelf plates 521 while suppressing the appearance of inoperative spaces.

[1032] Furthermore, sectionalized storage is possible in the same manner as the refrigerator 451 in the fourteenth embodiment, and thus the refrigerator 520 is a user-friendly refrigerator.

[1033] In this manner, the refrigerator 520 in the present embodiment is a refrigerator that has better storage efficiency and convenience than what is conventional, in the same manner as the respective refrigerators in the fourteenth through sixteenth embodiments.

[1034] It should be noted that in the previously described fourteenth through seventeenth embodiments, there is a relatively large, flat space at the base of the of the refrigerator compartment below the projecting portion of the door pocket.

[1035] Specifically, such space exists in a position that is below the door pocket and below the space from the gradation part of the shelf plate toward the horizontally shallow side of the shelf plate, in the base of the refrigerator compartment.

[1036] This space is an inoperative space that cannot be used as a placement area for food items and so on because the door pocket is located directly above when the door is closed.

[1037] However, by providing a recessed part in this space and fitting a storage case in the recessed part, it is possible to hold food items and so on in the storage case.

[1038] FIG. 63 is a diagram showing a first modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments. As shown in the figure, the shelf plate includes, left to right, areas having three different color tones. Specifically, a first area 480c is colored with a dark color and a third area 480e is not colored. In addition, a second area 480d has a smooth color-graduation connecting the coloration from the first area to the third area. With such a shelf plate, it is possible to improve the aesthetics in the state when the door of the refrigerator is opened.

[1039] FIG. 64 is a diagram showing a second modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments. As shown in the figure, the shelf plate includes, at the front and back, areas having two different color tones. Specifically, a first area 480f is not colored and a second area 480g is colored. With such a shelf plate, it is possible to improve the aesthetics in the state when the door of the refrigerator is opened.

[1040] FIG. 65 is a diagram showing a third modification of the shelf plate included in the refrigerators in the fourteenth through seventeenth embodiments. As shown in the figure, the shelf plate includes, from front to back, areas having three different color tones. Specifically, a first area 480h is colored with a dark color and a third area 480j is not colored. In addition, a second area 480i has a smooth color-graduation connecting the coloration from the first area to the third area. With such a shelf plate, it is possible to improve the aesthetics in the state when the door of the refrigerator is opened.

(Eighteenth Embodiment)

[1041] FIG. 66 is a partial perspective diagram of the inside of the refrigerator compartment of a refrigerator in an eighteenth embodiment of the present invention, seen from a forward-bottom perspective. FIG. 67 is a vertical-central cross-section view (showing an S-S cross-section of FIG. 66) of a forward shelf plate and a rear shelf plate in the same embodiment, in their integrated state. FIG. 68 is a magnified view of section Q in FIG. 67, and FIG. 69 is a perspective view of the forward shelf plate and the rear shelf plate in the same embodiment. FIG. 70 is a perspective view of the forward shelf plate and the rear shelf plate in the same embodiment, in their separated state. FIG. 71 is a P-P cross-section view of FIG. 66. FIG. 72 is a magnified view of section R in FIG. 71. FIG. 73 is a cross-section view showing the inside of the refrigerator compartment with the forward shelf plate moved above the rear shelf plate, in the present embodiment. FIG. 74 is a magnified view of section T in FIG. 73, and FIG. 75 is a perspective view showing the rear shelf plate in the present embodiment in its removed state.

[1042] The point of difference with the fifth embodiment is that the shelf plate that can be separated into the forward shelf plate and the rear shelf plate is only the shelf plate at the bottom-most level inside the refrigerator compartment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the fifth embodiment and their description shall be omitted.

[1043] In FIG. 66, single-piece shelf plates 601 having different horizontal depth left and right are disposed on the upper portion of the refrigerator compartment 53, and a bottom-most shelf plate 602 is configured of a forward shelf plate 603 and a rear shelf plate 604.

[1044] In FIG. 67 and FIG. 68, the forward shelf plate 603 is fabricated by integrally forming a glass portion 605 and a resin frame 606 covering the outer perimeter of the glass portion 605, and a forward shelf extension part 607 is integrally formed at the back of the frame 606. Furthermore, the rear shelf plate 604 is fabricated by integrally forming a glass portion 608 and a resin frame 609 covering the outer perimeter of the glass portion 608,

and a rear shelf extension part 610 is integrally formed at the front of the frame 609. In addition, the abutting surfaces of the forward shelf plate 603 and the rear shelf plate 604 are constructed such that the forward shelf extension part 607 and the rear shelf extension part 610 are lapping in the vertical direction, with the forward shelf extension part 607 being positioned above and the rear shelf extension part 610 being positioned below. Furthermore, the back part of the rear shelf plate 604 is positioned so as to lap onto a protruding part 611 from the cool air duct 84.

[1045] Furthermore, as shown in FIG. 69, when the horizontal depth of the rear shelf plate 604 is assumed to be L, the minimum horizontal depth of the forward shelf plate 603 is M, and the maximum horizontal depth of the forward shelf plate 603 is N, dimensions are set to a relationship in which N>L>M. Furthermore, a latching part 612 is integrally formed with the frame 606 on both sides of the forward shelf plate 603 and a latching part 613 is integrally formed with the frame 606 on both sides of the rear shelf plate 604. As shown in FIG. 66, the latching parts 612 and 613 fit with shelf supports 614 and 615 integrally formed on both sides of the inner casing 70, and can slide back and forth.

[1046] Furthermore, a recess 616 which is recessed in the lateral direction is included between the shelf supports 614 supporting the forward shelf plate 603 and the shelf supports 615 supporting the rear shelf plate 604, and a protrusion 617 is included at the bottom of the frame 609 on the sides of the rear shelf plate 604 corresponding to the recesses 616. When the rear shelf plate 604 is placed in the normal position, the protrusions 617 drop into the recesses 616. Therefore, in the normal position, the rear shelf plate 604 does not easily move even when pulled forward.

[1047] Furthermore, in FIG. 70, FIG. 71, and FIG. 72, a hook 618 is included, integrally with the frame 606, at the left and right of the rear portion of the front shelf plate 603, and a latch hole 619 is included at left and right forward positions of the rear shelf plate 604 corresponding to the hooks 618. In the state where the forward shelf plate 603 is in contact with the rear shelf plate 604, the hooks 618 fit and latch together with the latch holes 619. In addition, in such state, the opposing planes of the forward shelf plate 603 and the rear shelf plate 604 are positioned with almost no gap in between.

[1048] Furthermore, in FIG. 73 and FIG. 74, as a storage area for the forward shelf plate 603 when the forward shelf plate 603 is removed by being separated from the rear shelf plate 604, the latching parts 612 enable the removed forward shelf plate latch on to a shelf support 620 that is cast on the left and right of the inner casing at positions that are above or below and a predetermined distance away from the rear shelf plate 604. In addition, when stored at the rear-most section by being placed on the shelf supports 620, the hooks 618 included on the left and right of the rear portion of the forward shelf plate 603 fit and latch together with projection holes 621 formed integrally with the cool air duct 84. In other words, the hooks 618 of the forward shelf plates 603 can be used for latching with the rear shelf plate 604 and for latching with the back surface when the forward shelf plate is detached from the rear shelf plate 604 and stored inside the refrigerator compartment.

[1049] Furthermore, FIG. 75 is a perspective partial cross-section view of the refrigerator compartment as seen from a frontal bottom perspective. In FIG. 75, when removing the rear shelf plate 604, the rear shelf plate 604 can be moved forward by pulling the rear shelf plate 604 forward while lifting it up in order to release the protrusions 617 fitting in the recesses 616. In addition, by further lifting the rear shelf plate 604 when the latching parts 613 are positioned at the recess 616, the rear shelf plate 604 can be moved freely without moving it up to the most-forward part of the shelf supports 614.

[1050] In the above-described configuration, by including the shelf plate 601 and the shelf plate 602 having different horizontal depths left and right in the refrigerator compartment 53, it is possible to increase the substantive shelf storage efficiency during normal use, in the same manner as described in the fifth embodiment. In addition, depending on the conditions of use, when storing tall food items, it is possible to store tall food items by removing the forward shelf plate 603, since the bottom-most shelf plate 602 is configured of the forward shelf plate 603 and the rear shelf plate 604 which are separable. Moreover, in the present embodiment, since only the bottom-most shelf plate 602 can be separated into the forward shelf plate 602 and the rear shelf plate 603, the lowest surface of the inside of the refrigerator compartment is configured of the placement shelf plate 183 including a wall surface or a vertical divider plate, and thus tall and heavy storage items such as tall pots can be stored while ensuring stability. Furthermore, since the top-most storage compartment of the refrigerator 151 is the refrigerator compartment 53, user-friendliness is also improved in terms of the vertical storage characteristics of tall and heavy storage items (heavy items can be stored in the lowest surface of the refrigerator compartment without having to be lifted too high). In addition, by making only the bottom-most shelf plate 602 separable into the forward shelf plate 603 and the rear shelf plate 604, among the plural shelf plates in the refrigerator compartment 53, reducing cost becomes possible by improving storage characteristics in the most rational manner.

[1051] Furthermore, in the present embodiment, since the abutting surfaces of the forward shelf plate 603 and the rear shelf plate 604 are constructed such that the forward shelf extension part 607 and the rear shelf extension part 610 are lapping in the vertical direction, with the forward shelf extension part 607 being positioned above and the rear shelf extension part 610 being positioned below, the lapping portions of the forward shelf extension part 607 and the rear shelf extension part 610 can absorb the sagging of the shelf even when heavy items are placed on the shelf plate 602, and thus the

overall strength of the shelf plate 602 can be enhanced using a simple structure.

[1052] Furthermore, a latching unit together the forward shelf plate 603 and the rear shelf plate 604 is included in which the hook 618 is included, integrally with the frame 606, at the left and right of the rear portion of the front shelf plate 603, the latch hole 619 is included at left and right forward positions of the rear shelf plate 604 corresponding to the hooks 618, and the hooks 618 fit and latch together with the latch holes 619 when the forward shelf plate 603 is in contact with the rear shelf plate 604. Therefore, the front shelf plate 603 and the rear shelf plate 604 are held firmly in place and misalignment between the front shelf plate 603 and the rear shelf plate 604 can be prevented, and thus it is possible to increase reliability when the front shelf plate 603 and the rear shelf plate 604 are used integrally.

[1053] Furthermore, latching units are included in which: the latching parts 612 enable the removed forward shelf plate 603 to latch on to the shelf support 620 that is cast on the left and right of the inner casing at positions that are above or below and a predetermined distance away from the rear shelf plate 604, as a storage area for the forward shelf plate 603 when the forward shelf plate 603 is removed by being separated from the rear shelf plate 604; and the hooks 618 included on the left and right of the rear portion of the forward shelf plate 603 fit and latch together with projection holes 621 formed integrally with the cool air duct 84, when the forward shelf plate 603 is stored at the rear-most section by being placed on the shelf supports 620. Therefore, it is possible to secure a storage area for the forward shelf plate 603 when the forward shelf plate 603 is removed, and it is possible to reliably prevent the forward shelf plate 603 from coming off during storage. At such time, since the hooks 618 of the forward shelf plates 603 have a structure which allow the hooks 618 to be used for latching with the rear shelf plate 604 and for latching with the back surface when the forward shelf plate is detached from the rear shelf plate 604 and stored inside the refrigerator compartment, structures can be simplified and cost reduction becomes possible.

[1054] Furthermore, when the forward shelf plate 603 is placed a predetermined distance above or below the rear shelf plate 604, for example, approximately a half-distance between an upper and a lower shelf plate, small items can be stored on the forward shelf plate 603 even when the forward shelf plate 603 is being stored.

[1055] Furthermore, a recess 616 which is recessed in the lateral direction is included between the shelf supports 614 supporting the forward shelf plate 603 and the shelf supports 615 supporting the rear shelf plate 604, and a protrusion 617 is included at the bottom of the frame 609 on the sides of the rear shelf plate 604 corresponding to the recesses 616. When the rear shelf plate 604 is placed in the normal position, the protrusions 617 drop into the recesses 616. Specifically, since the rear shelf plate 604 includes a fastening unit which keeps the rear shelf plate 604 from easily moving forward in the normal position even when pulled forward due to the moving of the forward shelf plate 603, the attachment and detachment of the forward shelf plate can be reliably performed without the rear shelf plate coming off during such attachment and detachment of the forward shelf plate, and thus user-friendliness is improved.

[1056] Furthermore, since dimensions are set such that, when the horizontal depth of the rear shelf plate 604 is assumed to be L, the minimum horizontal depth of the forward shelf plate 603 is M, and the maximum horizontal depth of the forward shelf plate 603 is N, the relationship N>L>M is maintained, it is possible to optimize the left and right horizontal depths of the forward shelf plate 603 and the rear shelf plate 604 during integrated use, while ensuring the strength of each shelf plate (minimum measurements for horizontal depths set from a strength aspect, based on the widths of the glass portions 605 and 608) during separate use of the forward shelf plate 603 and the rear shelf plate 604.

[1057] Furthermore, since the forward shelf plate 603 and the rear shelf plate 604 are configured or glass portions 605 and 608, and resin frames 606 and 609 (perimeter part resin member), respectively, the forward shelf extension part 607, the rear shelf extension part 610, the latching parts 612 and 613, the protrusions 617, and so on, can be integrally formed on the perimeter of the forward shelf plate 603 and the rear shelf plate 604, and thus improvement of user-friendliness during actual use and reduction in costs become possible through improvement of design characteristics and improvement of dimensional accuracy.

[1058] It should be noted that although, in the present embodiment, the abutting surfaces of the forward shelf plate 603 and the rear shelf plate 604 are constructed such that the forward shelf extension part 607 and the rear shelf extension part 610 are lapping in the vertical direction, with the forward shelf extension part 607 being positioned above and the rear shelf extension part 610 being positioned below, it is also acceptable to have the forward shelf extension part 607 positioned below and the rear shelf extension part 610 positioned above. Furthermore, one of the forward shelf extension part and the rear shelf extension part may have a protruding shape and the other a receding shape which lap, one on top of the other. Furthermore, the lapping portion of the forward shelf extension part and the rear shelf extension part may be formed throughout the entirety of the opposing surfaces or a lapping portion may be formed partially on the opposing surfaces.

[1059] Furthermore, although each of the forward shelf plate 603 and the rear shelf plate 604 is described in the present embodiment as being configured of a glass portion and a resin frame, the shelf plates are not limited to such configuration, and it goes without saying that the respective shelf plates may be cast from resin.

(Nineteenth Embodiment)

[1060] A refrigerator in a nineteenth embodiment of the present invention shall be described using FIG. 76.

[1061] FIG. 76 is horizontal cross-section view of the refrigerator compartment section of a refrigerator 718 in the present embodiment. It should be noted that the same numerical reference is given to constituent elements that are the same as in the first embodiment and their description shall be omitted.

[1062] As shown in FIG. 76, the refrigerator 718 in the nineteenth embodiment includes the left door 60a, the right door 60b, a left door pocket 700, a right door pocket 701, and a shelf plate 702.

[1063] Furthermore, plural left door pockets 700 are supportively held in place in the left door 60a and disposed along the vertical length of the left door 60a. Plural right door pockets 701 are likewise supportively held in place in the right door 60b and disposed along the vertical length of the right door 60b.

[1064] Plural shelf plates 702 are disposed from the top to bottom of a space between the door pockets and the cool air duct 84 in positions and shapes that do not interfere with the door pockets. The plural shelf plates 702 form storage spaces spanning plural levels.

[1065] In order that the left door pocket 700 fits within the swing trajectory of the left door 60a in the figure so as not to interfere with the right door 60b, the horizontal depth of the right end of the left door pocket 700 is reduced.

[1066] The right door pocket 701 is horizontally deeper than the left door pocket 700. Furthermore, the horizontal depth of the left end of the right door pocket 701 is reduced in order to fit within the swing trajectory of the right door 60b in the figure so as not to interfere with the left door 60a.

[1067] The shelf plate 702 is disposed within the storage compartment space between the left door pocket 700, the right door pocket 701 and the cool air duct 84 in such a way that a certain amount of clearance is provided so as not to interfere with the left door pocket 700 and the right door pocket 701.

[1068] Specifically, the shelf plate 702 is supportively held in place by the inner casing 70 by being placed on protrusions, and the like, that are cast with the inner casing 70, and is disposed to be approximately horizontal with respect to the vertical direction.

[1069] Furthermore, a protruding part 706 is provided between the left door pocket 700 and the right door pocket 701, in the space just behind the divider 86, and forms a maximum horizontal depth. In addition, a left receding part 710 corresponding to the left door pocket 700 and a right receding part 711 corresponding to the right door pocket 701 are provided such that the horizontal depths on both the left and right sides from the protruding part 706 gradually become shorter.

[1070] At this time, it is preferable that the shelf plate 702 has a shape that is approximately opposite the shapes of the left door pocket 700 and the right door pocket 701.

[1071] The advantageous effects achieved by shelf plate 702 and the left door pocket 700 and right door pocket 701 in the present embodiment shall be described hereafter.

[1072] First, since the protruding part 706 is formed to fit the shape of the inoperative space in terms of the storage possible between the left door pocket 700 and right door pocket 701, it is possible to maximize the base area of the shelf plate 702. In particular, by matching the shape of both door pockets to the swing trajectory (dashed-dotted line) of the respective doors, and forming the shelf plate 702 to include the left receding part 710 and the right receding part 711 which follow the shape of both door pockets, it is possible to further enlarge the storage space within the storage compartment.

[1073] Furthermore, since the front edge of the shelf plate 702 is configured of a single protruding part 706, the front edge of the shelf plate 702 has a relatively simple shape. In this case, since it is possible to simplify the shape of the metal plate (not shown in the Drawings) which is fitted to the front edge as a brim material and which also serves as decoration, the shelf plate 702 and the brim material can be fabricated at a low cost.

[1074] The above-described embodiment is merely one embodiment of the present invention and various modifications and applications are possible.

[1075] For example, although the provision of the protruding part 706 on the front edge of the shelf plate 702 has been described, the protruding part 706 need not be a clearly protruding shape and may be of a softly bulging shape. Even when the protruding part 706 is of a softly bulging shape, the same effect of increasing storage space can be obtained albeit with a difference in the extent of the advantageous effect.

[1076] Although the refrigerators in the respective embodiments have been described thus far, the present invention is not limited to such descriptions. Furthermore, constituent elements of mutually different embodiments may be combined. For example, in place of the door pocket 97, the single door refrigerator 120 described in the fourth embodiment and the single door refrigerator 520 described in the seventeenth embodiment may include a door pocket having a lateral width that is shorter than the lateral width of the shelf plate such as the right door pocket 111 in the third embodiment.

[1077] FIG. 77 is a horizontal cross-section view of the case where the refrigerator 120 in the fourth embodiment includes only a laterally-short door pocket. FIG. 78 is a horizontal cross-section view of the case where the refrigerator 520 in the seventeenth embodiment includes only a laterally-short door pocket.

[1078] As shown in FIG. 77 and FIG. 78, the door 65 includes a projecting part on the right side since the door 65 includes the door pocket 99 only on the swing axis 88-side, that is, the right side which is near the hinge.

[1079] Furthermore, the horizontal depth of the right

side of the shelf plate 112 and the shelf plate 512, which faces the door pocket 99, is reduced so that the shelf plate 112 and the shelf plate 512 do not interfere with the door pocket 99. Furthermore, the horizontal depth of the left side is longer than the horizontal depth of the right side, and is such that the front edge of the left side extends up to the vicinity of the heat-insulating wall making up the door 65.

[1080] In addition, the gradation part 114 of the shelf plate 112 and the gradation part 514 of the shelf plate 512 are made up of a curve so as not to interfere with the door pocket 99 and to reduce the inoperative space.

[1081] In this manner, even when configured in the manner shown in FIG. 77 and FIG. 78, the refrigerator 120 and the refrigerator 520 can fill up, with the shelf plate 112 and the shelf plate 512, respectively, the space on the storage compartment-side of the left side of the door 65 which usually tends to become an inoperative space, and thus achieve high storage efficiency.

[1082] Furthermore, the refrigerator 120 shown in FIG. 77 includes the three storage areas of the large shelf plate part 113 and the normal shelf plate part 115 of the shelf plate 112, and the door pocket 99, and thus allows the user to perform sectionalized storage efficiently.
In the same manner, the refrigerator 520 shown in FIG. 78 includes the three storage areas of the large shelf plate part 113 and the normal shelf plate part 115 of the shelf plate 112, and the door pocket 99, and thus allows the user to perform sectionalized storage efficiently. In other words, the refrigerators are very convenient.

[1083] Furthermore, the door 65 may include a horizontally shallow storage pocket, on the left side of the surface on the storage compartment-side. For example, the door 65 may include, on the left side of the storage compartment-side surface, a stand pocket for storing small items, such as condiments tubes, in an upright manner.

[1084] In this case, it is necessary to marginally reduce the horizontal depth of the large shelf plate part 113 of the shelf plate 112 and the large shelf plate part 513 of the shelf plate 512. However, by including such a stand pocket in the door 65, small items that are not suitable for storing in the shelf plate 112, the shelf plate 512, and the door pocket 99 can be efficiently stored without a significant change in the storable volume of the refrigerator 120 and the refrigerator 520 as a whole.

[1085] Furthermore, the shapes of the shelf plates, and so on, for improving the storage efficiency within the refrigerator compartment have been described in the respective embodiments.

[1086] However, the present invention can be applied even in storage compartments other than the refrigerator compartment and the same effects as in the effects in the respective embodiments can be produced as long as it is a storage compartment in which a shelf plate is disposed within the storage compartment and there is a door at the opening of the storage compartment, which includes a projecting part in the storage compartment-side allowing the storage of items, in the same manner as the refrigerator compartment.

[1087] For example, by shaping the shelf plate in the same manner as the shelf plate 80 shown in FIG. 6 and shaping the projecting part in the same manner as the left door pocket 90 and the right door pocket 91 shown in FIG. 6, the storage efficiency and convenience of the storage compartment is improved beyond what is conventional.

Industrial Applicability

[1088] Together with minimizing the inoperative space within the storage compartment and increasing the storage space of door pockets and shelf plates, the present invention enables efficient sectionalized storage through the configuration of storage spaces that are suitable to the shapes of storage items, and can be applied to various refrigerators and the like which include a shelf plate and a storage pocket.

Claims

1. A refrigerator comprising:

a heat-insulating main body which is made of heat-insulating material, and inside of which a storage compartment is formed; and
a lighting device embedded in said heat-insulating main body, which includes at least one light-emitting diode as a light source and illuminates an inside of the storage compartment.

2. The refrigerator according to Claim 1,
wherein said heat-insulating main body has recesses formed at positions corresponding to each of a left side-surface and a right side-surface of the storage compartment, the recesses opening inward of the storage compartment, and
said lighting device is provided in each of the recesses.

3. The refrigerator according to one of Claims 1 and 2, further comprising
a shelf plate disposed in a bridging manner between a left side-surface and a right side-surface of the storage compartment,
wherein said lighting device illuminates the storage compartment from a position that is forward of a front edge of said shelf plate.

4. The refrigerator according to one of Claims 1 to 3, further comprising
covers each provided to cover an opening of a corresponding one of the recesses.

5. A refrigerator according to one of Claims 1 to 4,

wherein said lighting device includes plural light-emitting diodes as the at least one light-emitting diode,
part of the plural light emitting diodes is provided to emit light toward a back of the storage compartment, and
another part of the plural light emitting diodes is provided to emit light toward a bottom of the storage compartment.

6. The refrigerator according to one of Claims 1 to 5, further comprising
a cool air duct provided at a back surface of the storage compartment,
wherein said lighting device is further provided in said cool air duct or a ceiling of the storage compartment.

FIG. 1

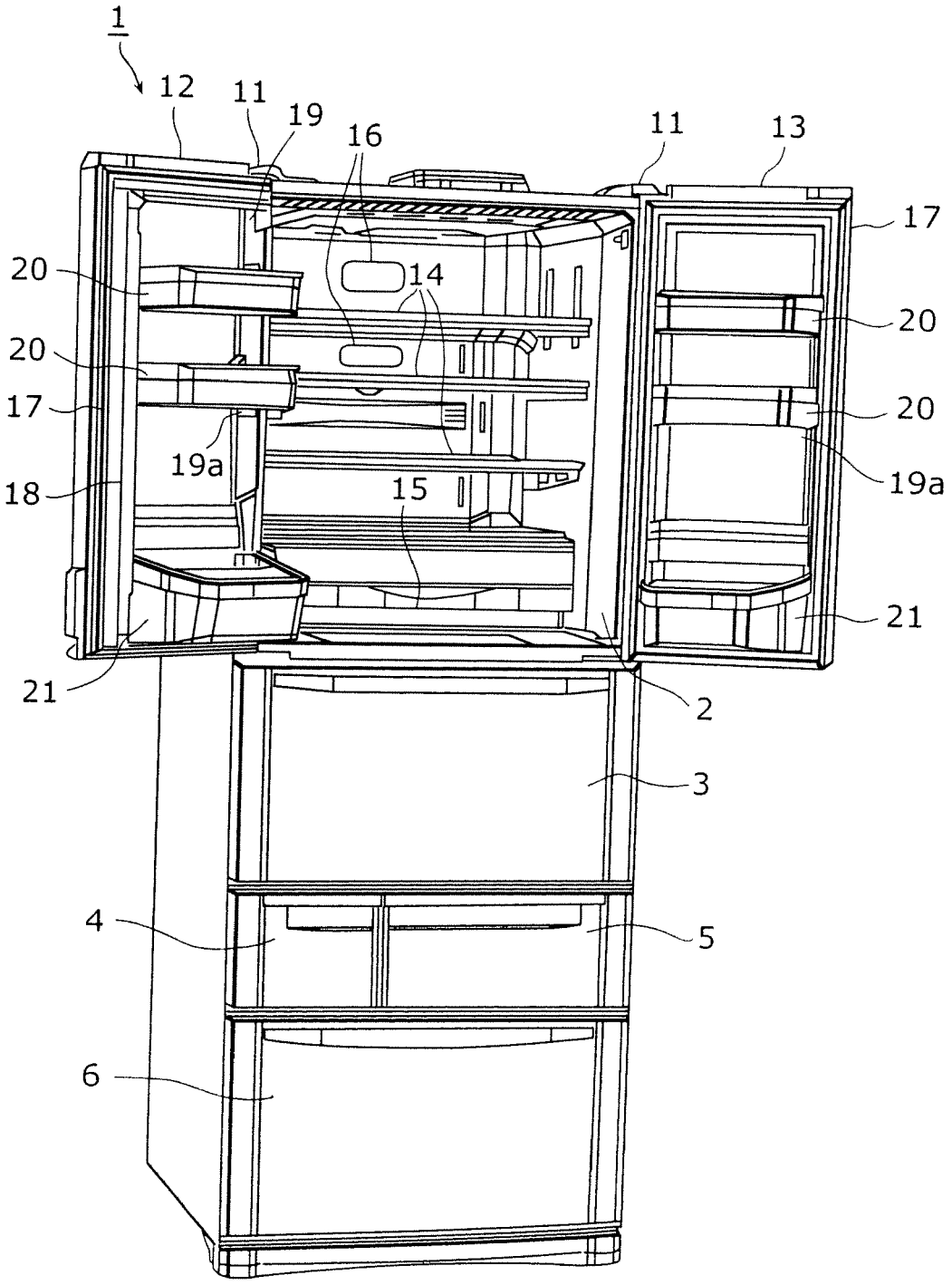

FIG. 2

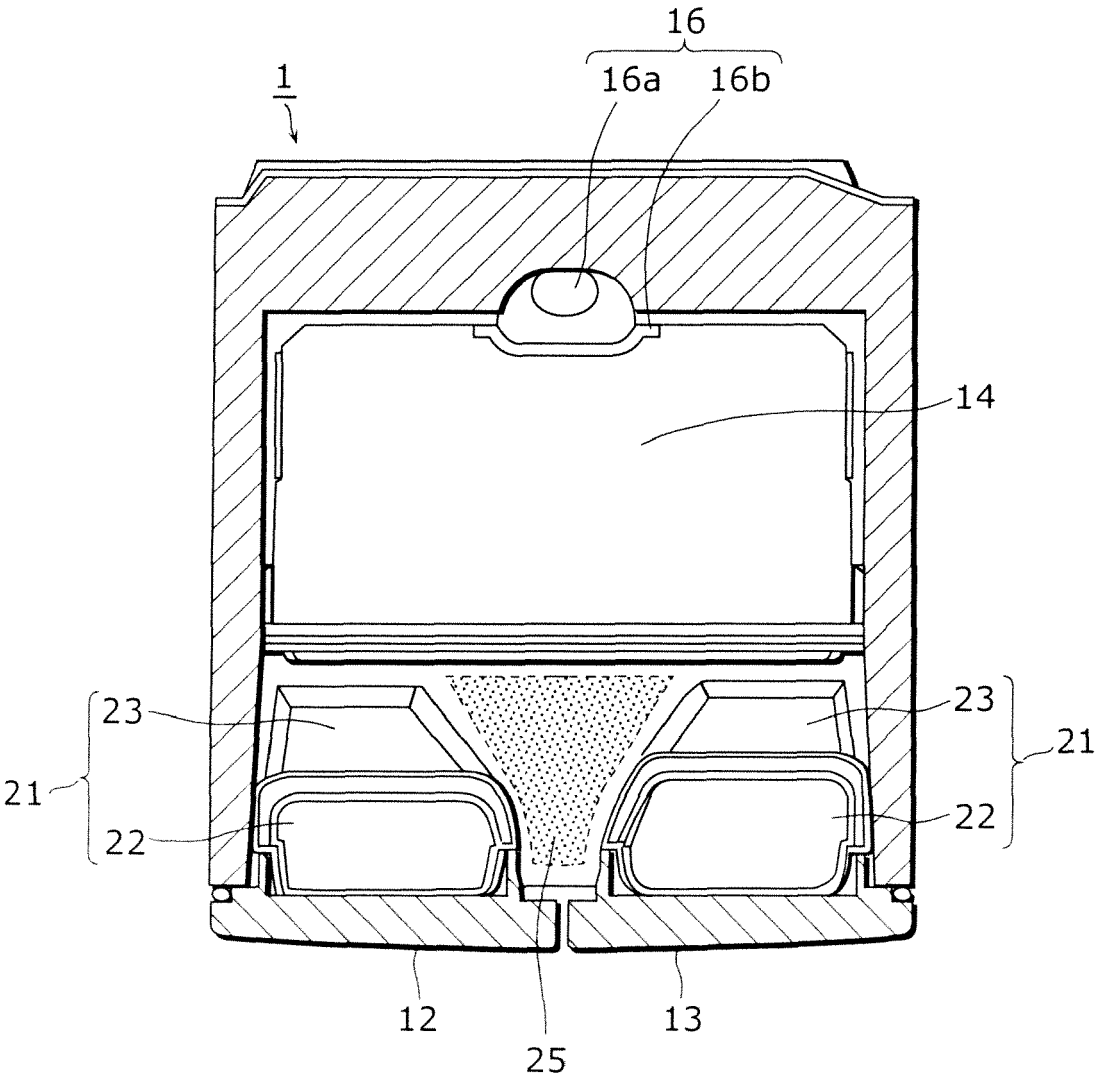

FIG. 3

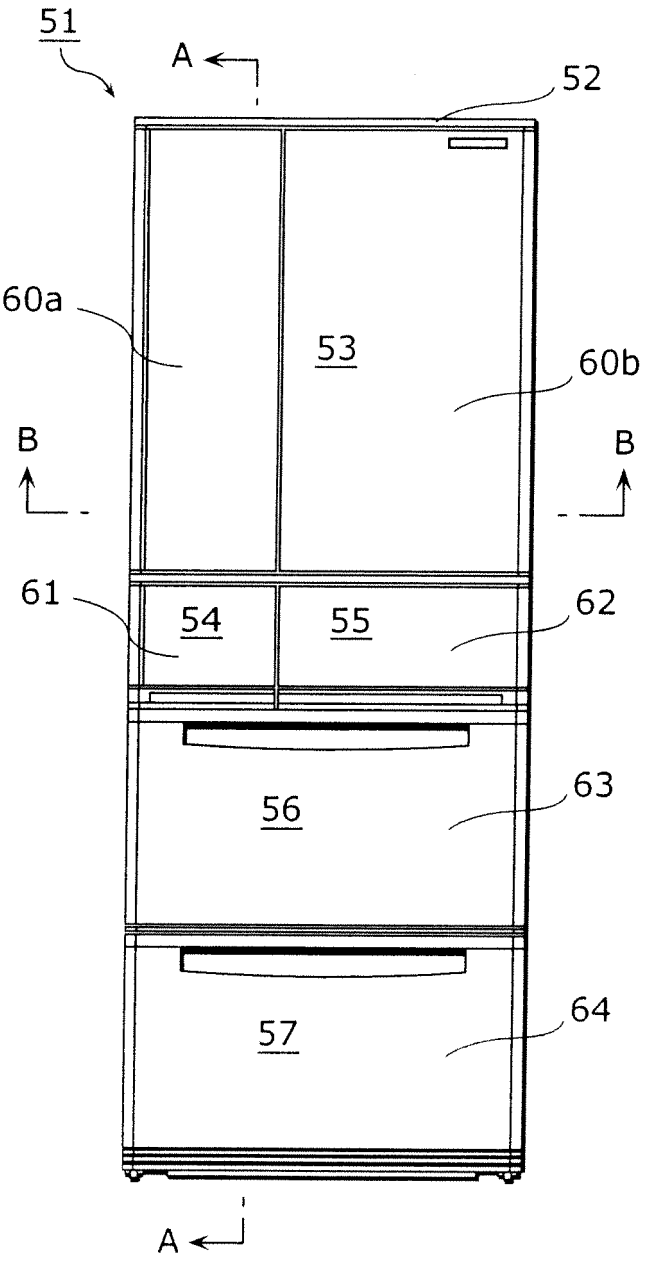

FIG. 4A

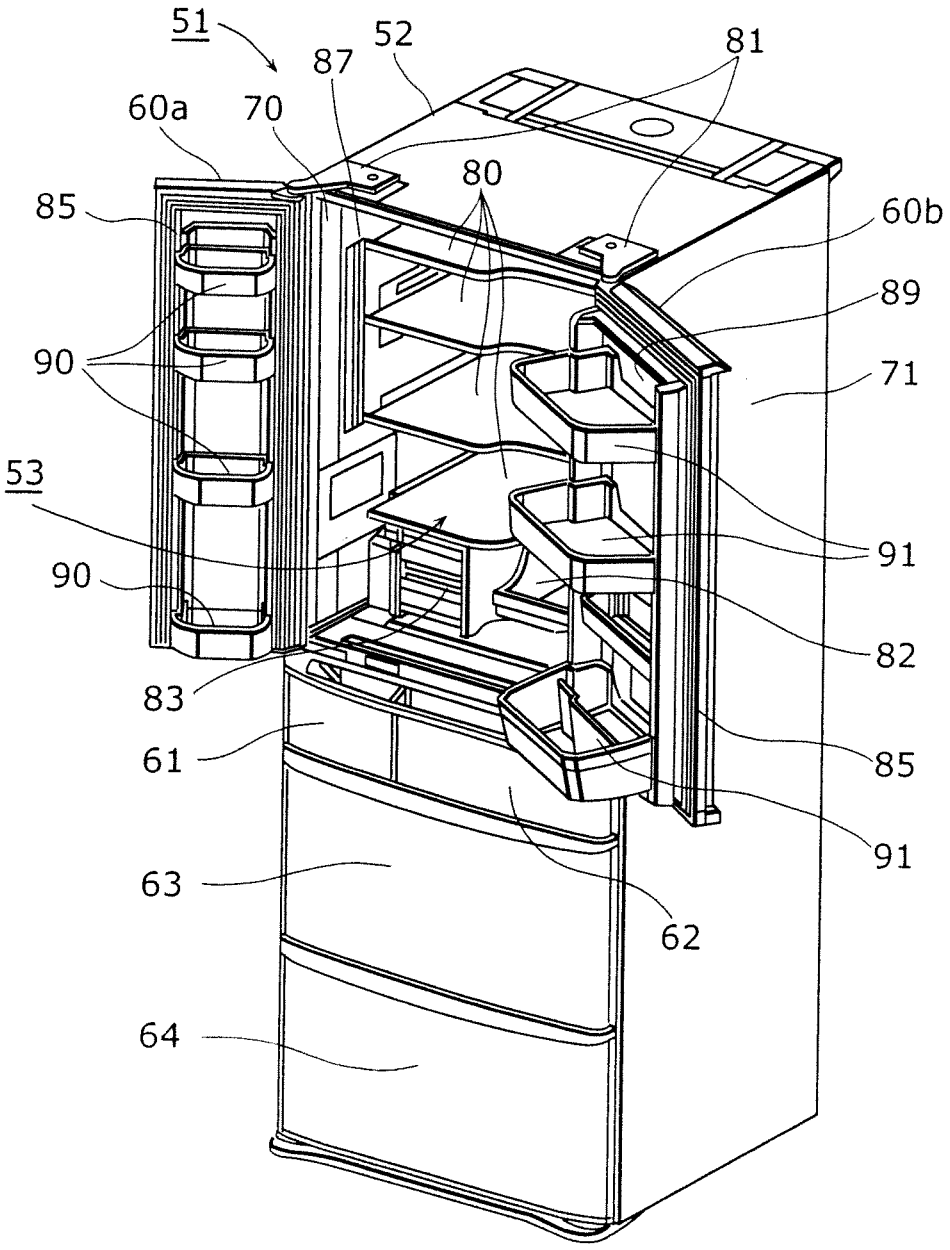

FIG. 4B

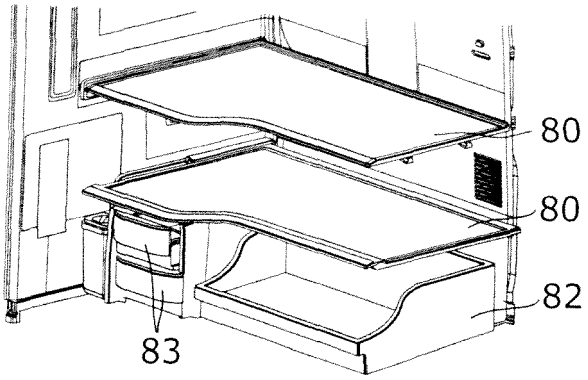

FIG. 4C

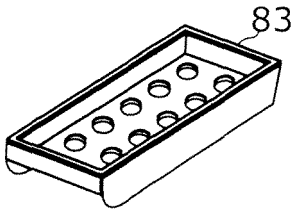

FIG. 4D

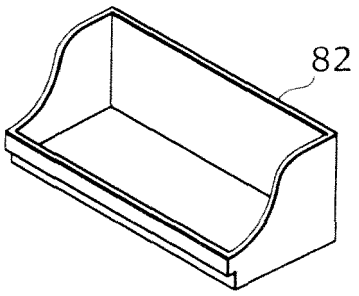

FIG. 5

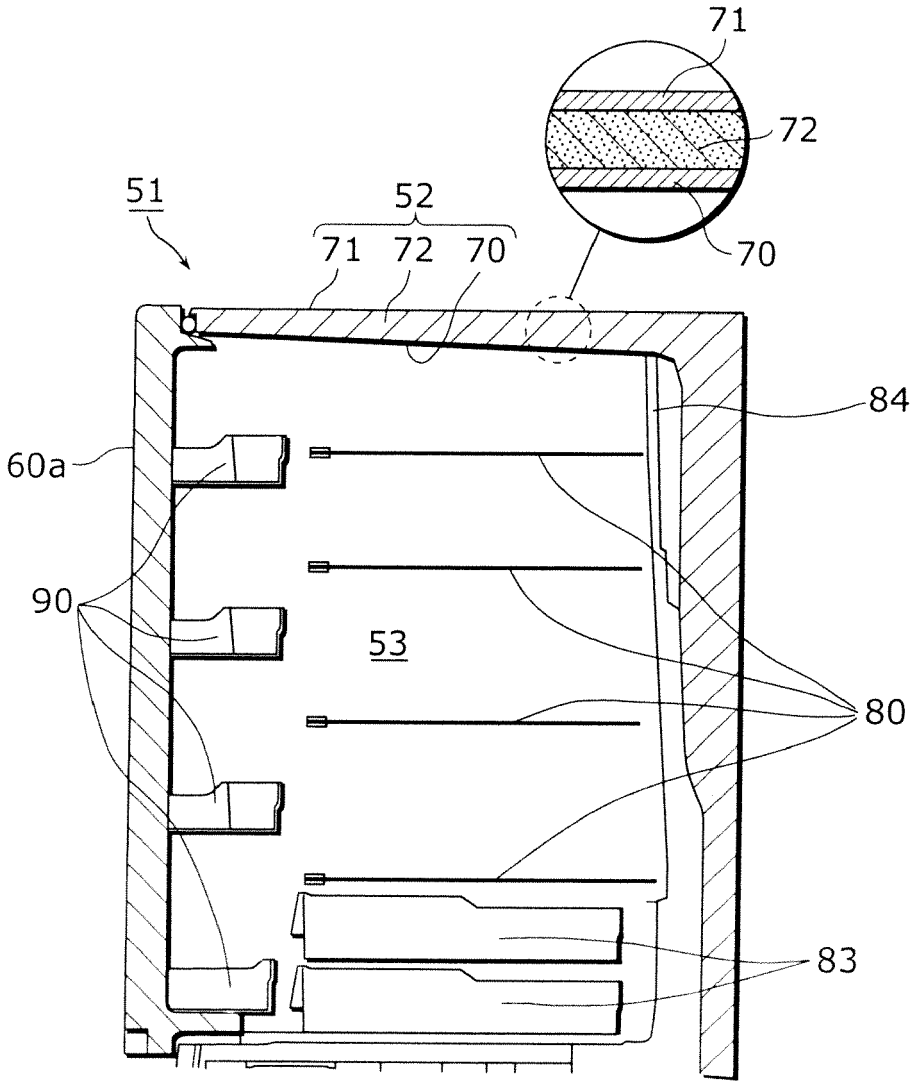

FIG. 6

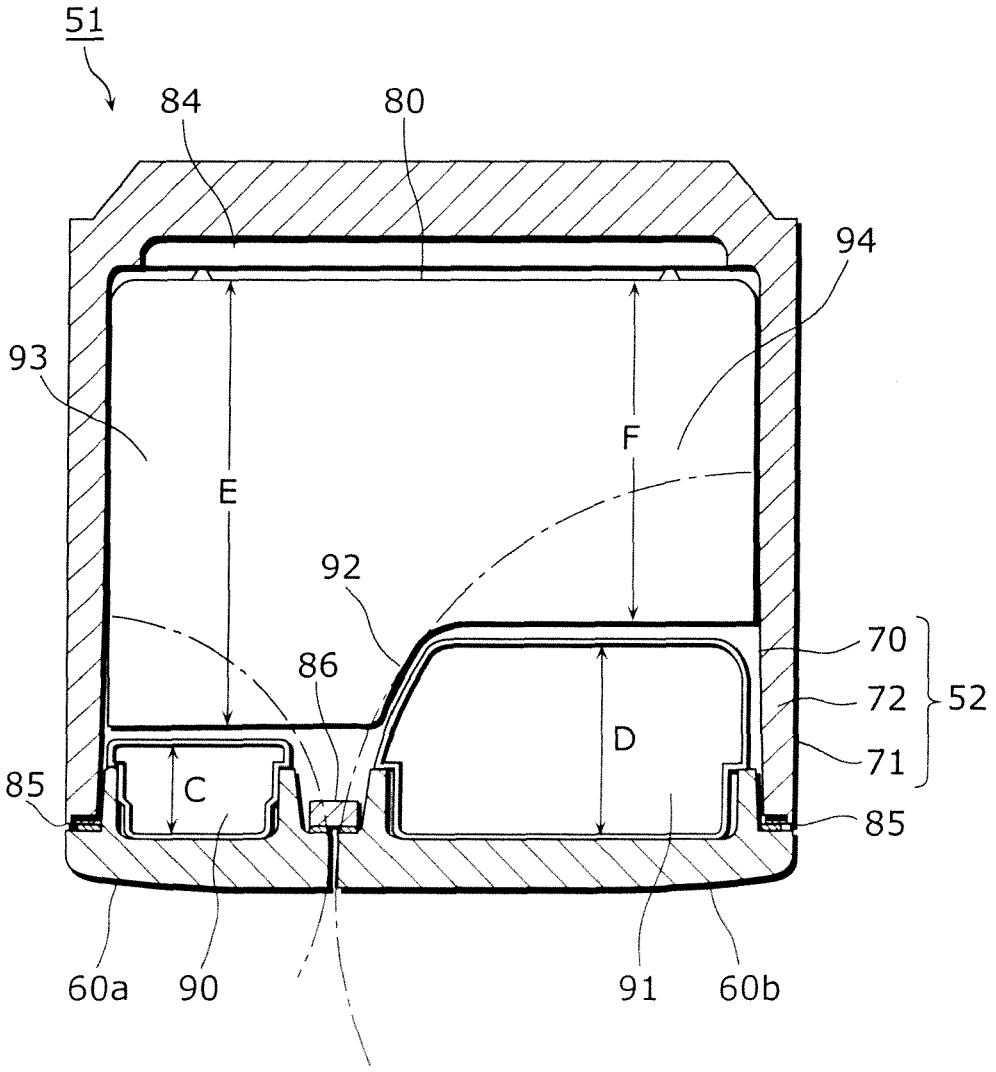

FIG. 7

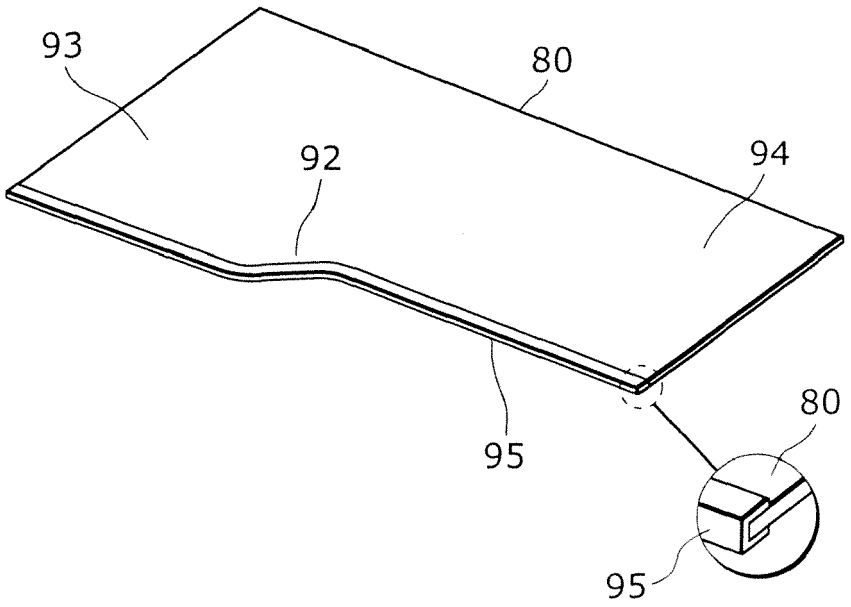

FIG. 8

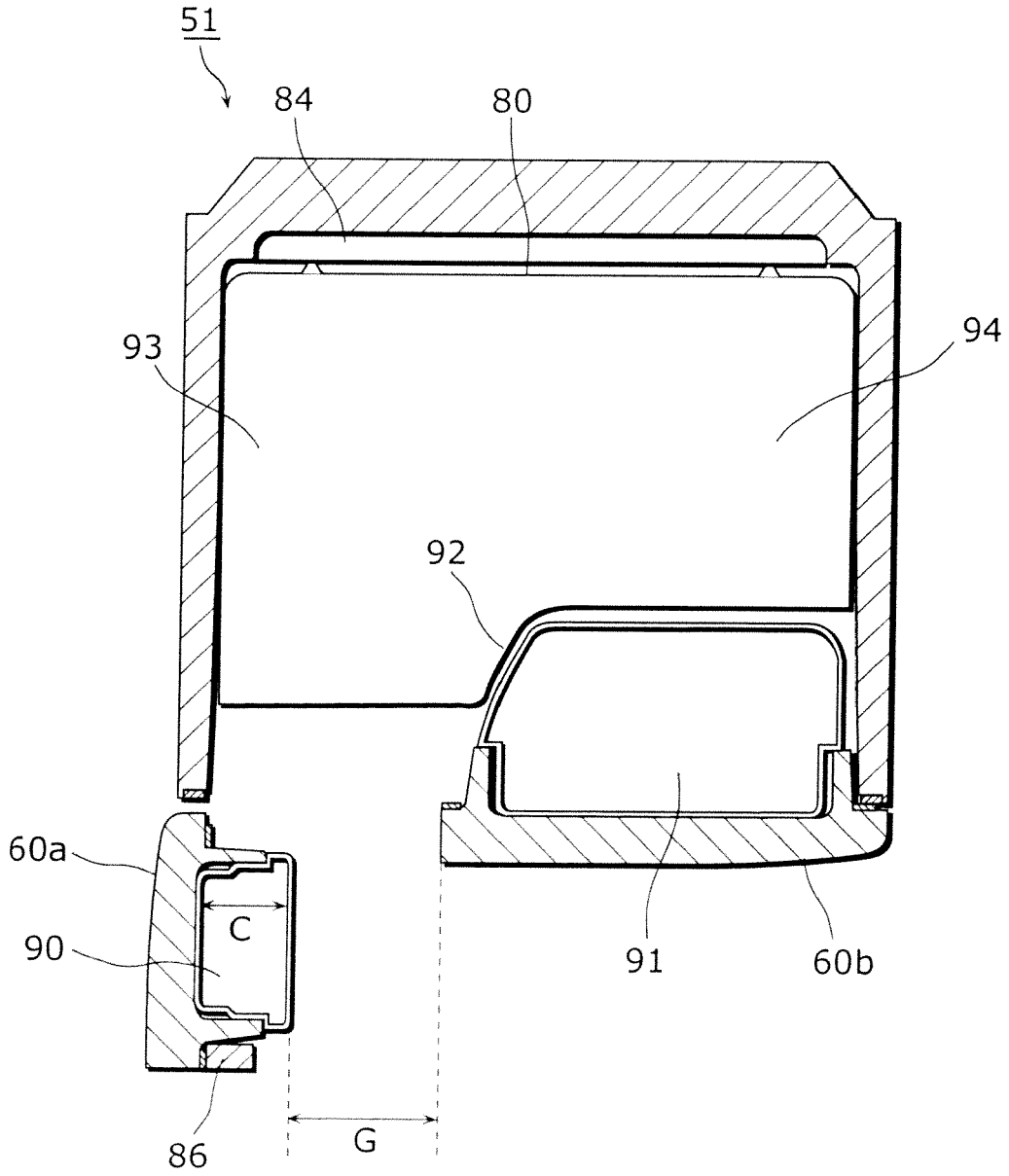

FIG. 9

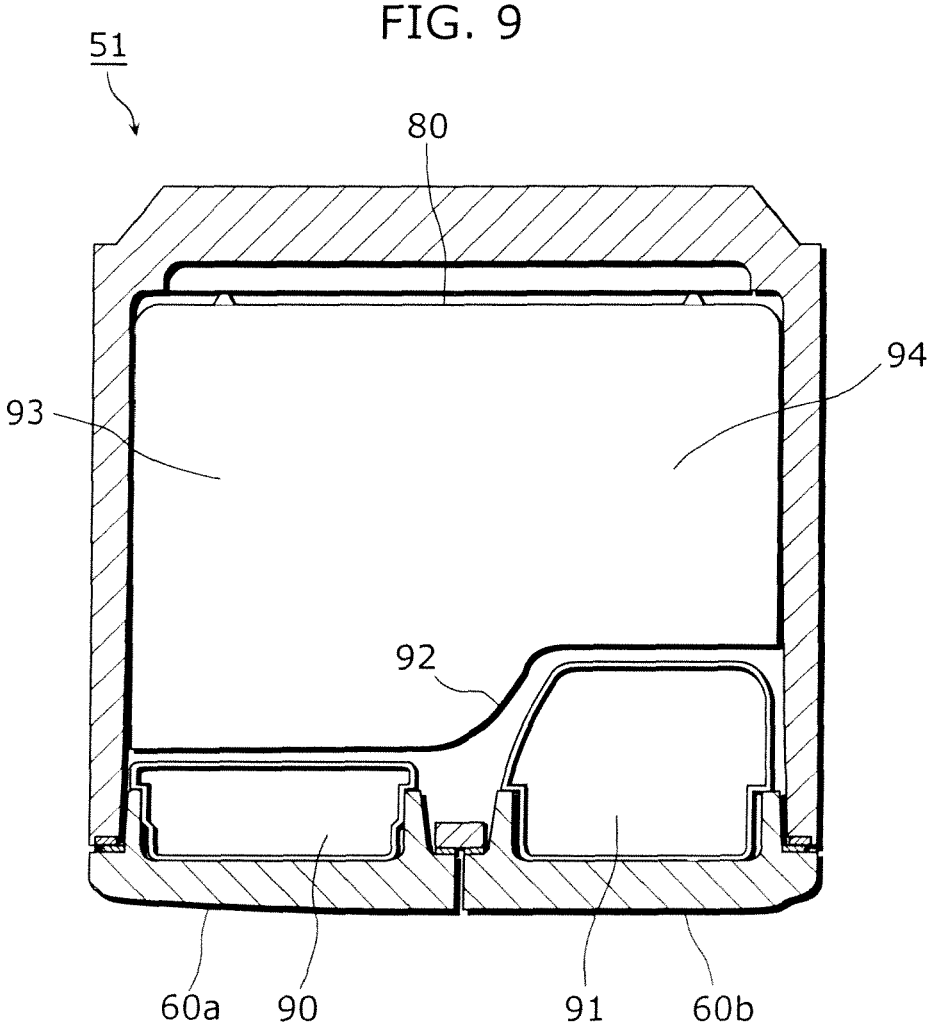

FIG. 10

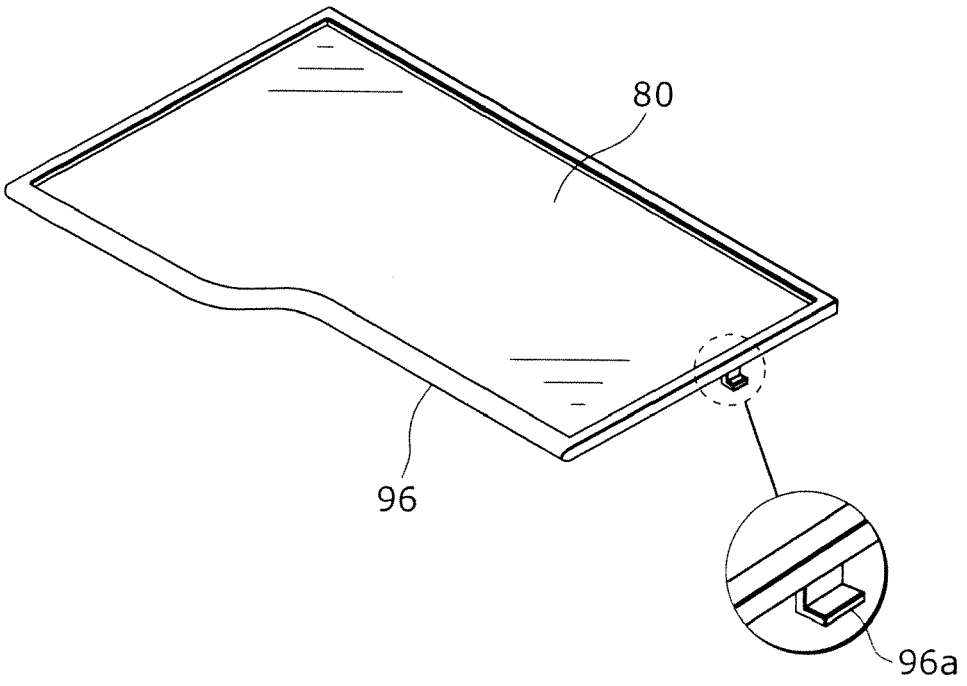

FIG. 11

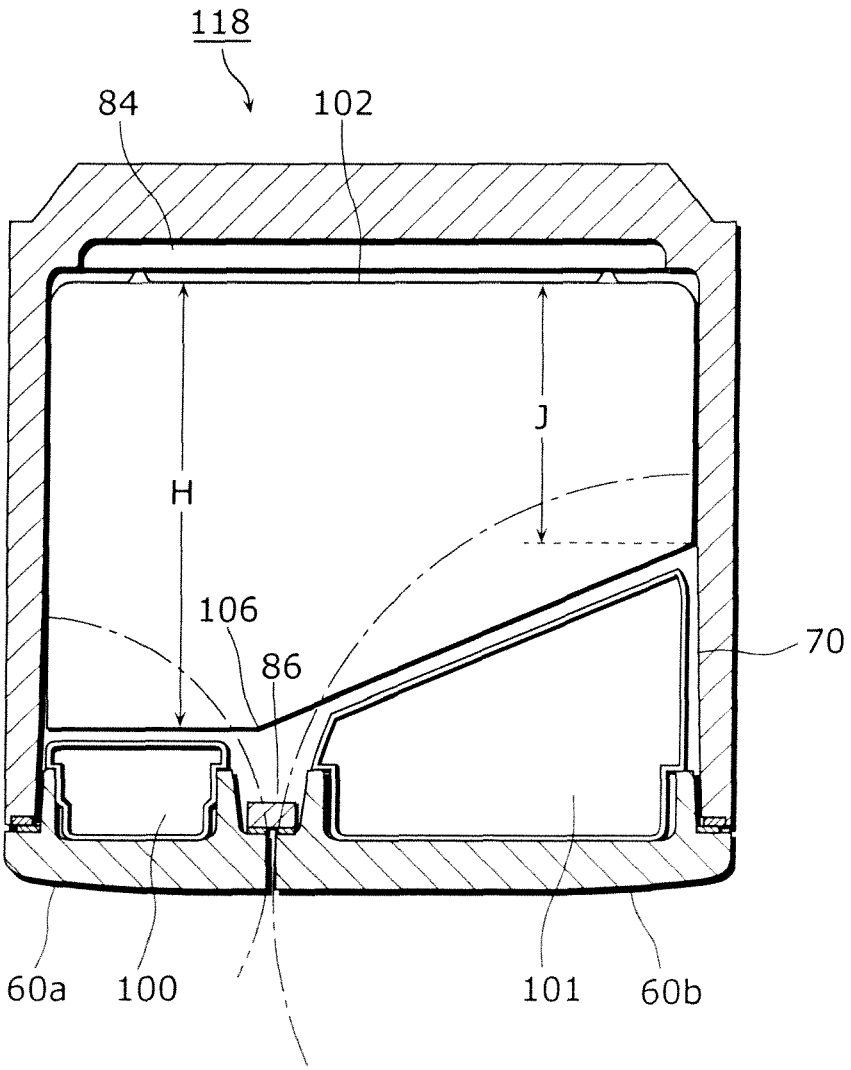

FIG. 12

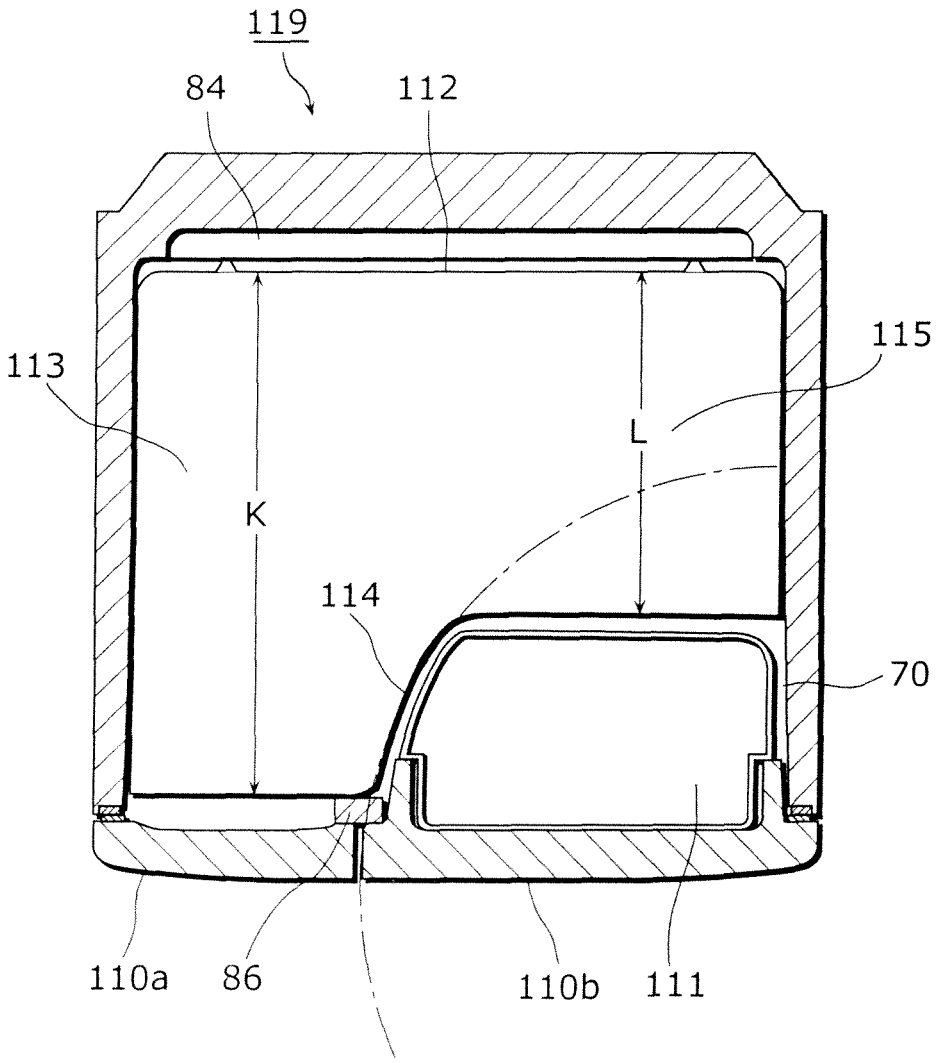

FIG. 13

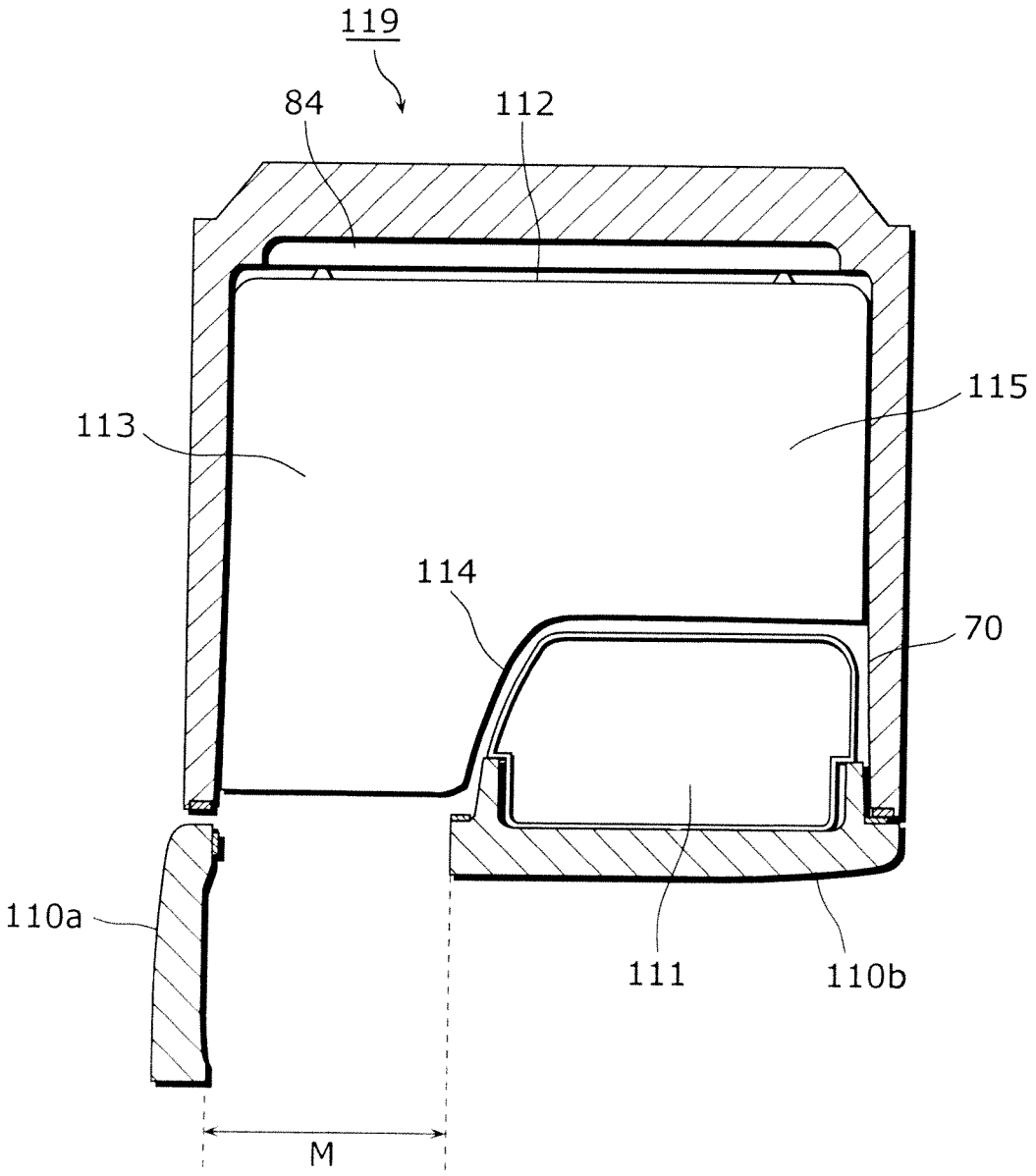

FIG. 14

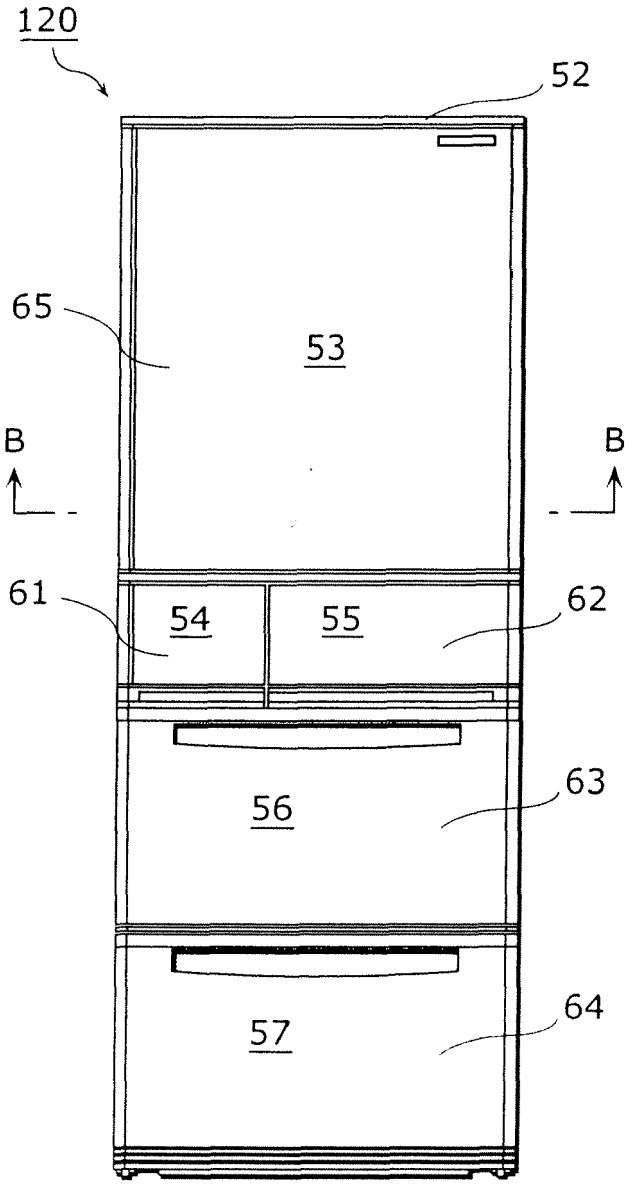

FIG. 15

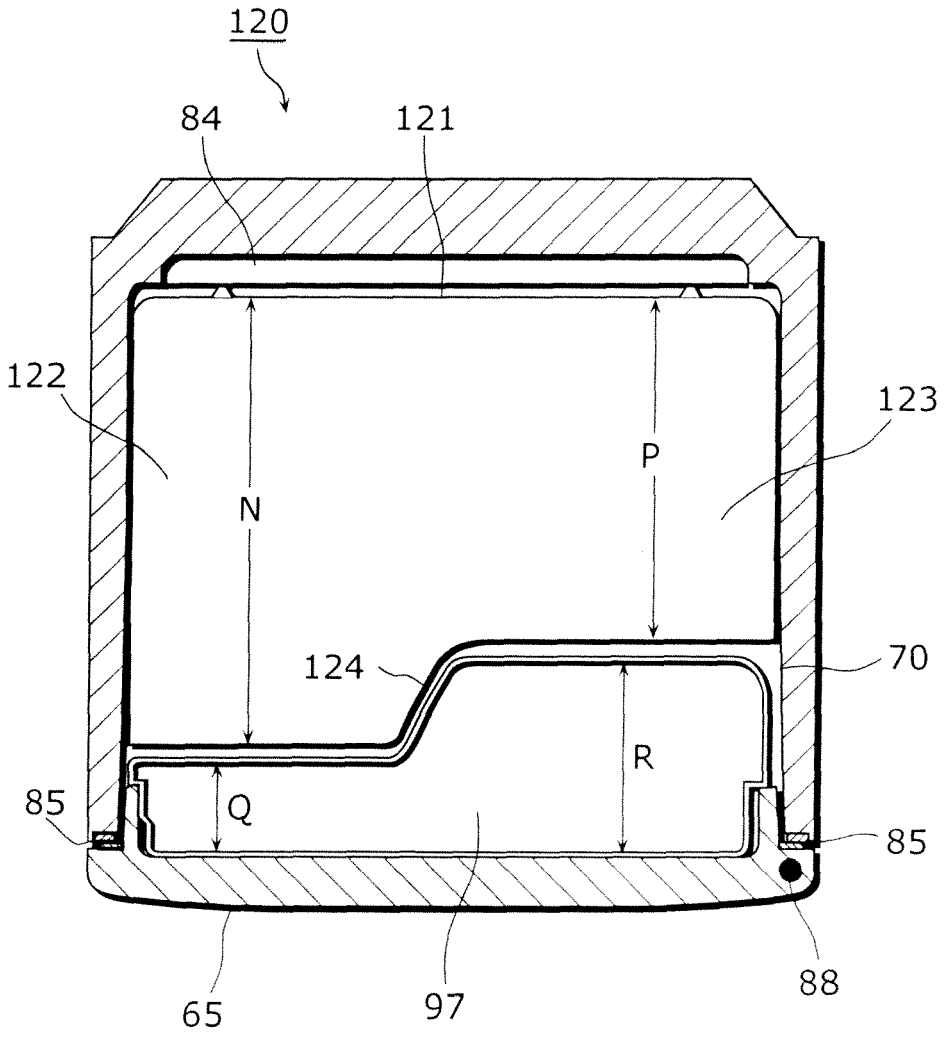

FIG. 16

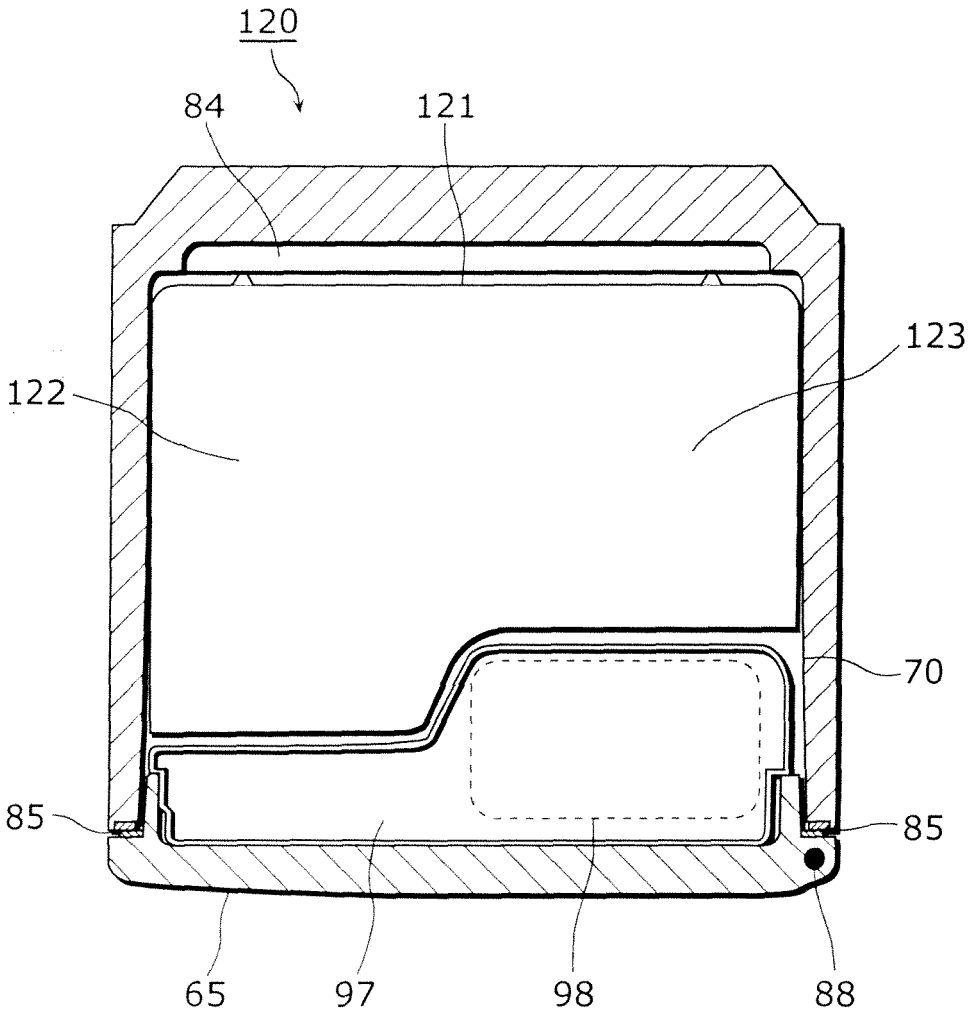

FIG. 17

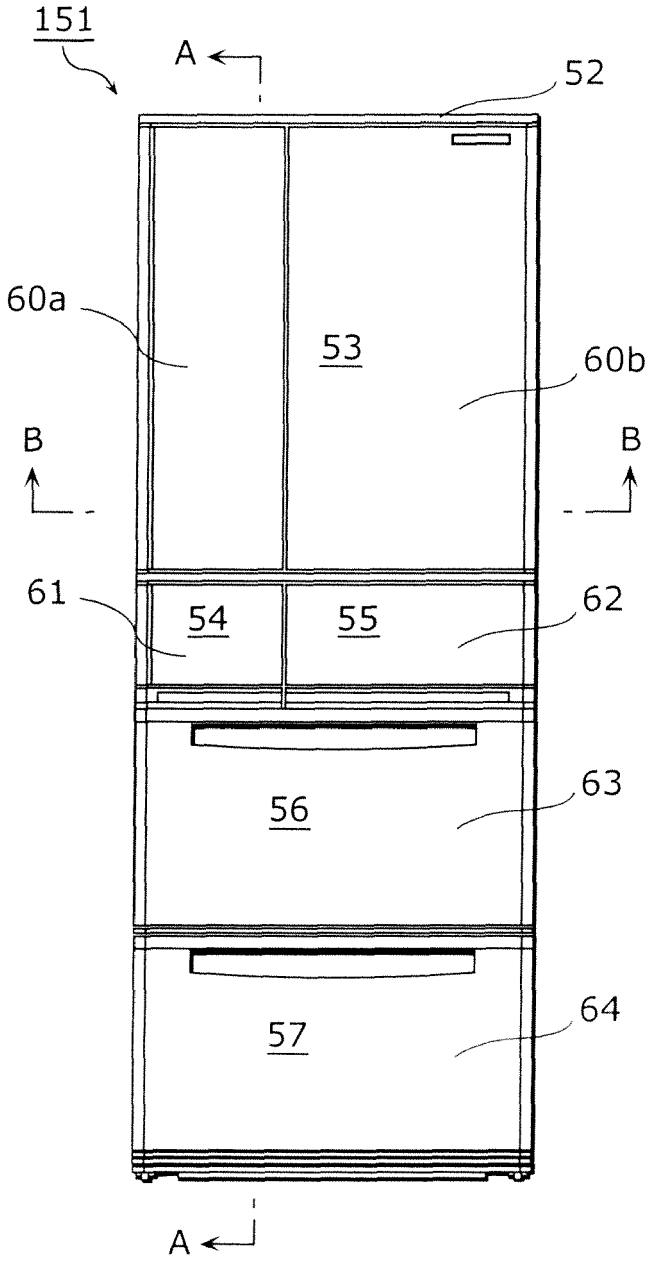

FIG. 18

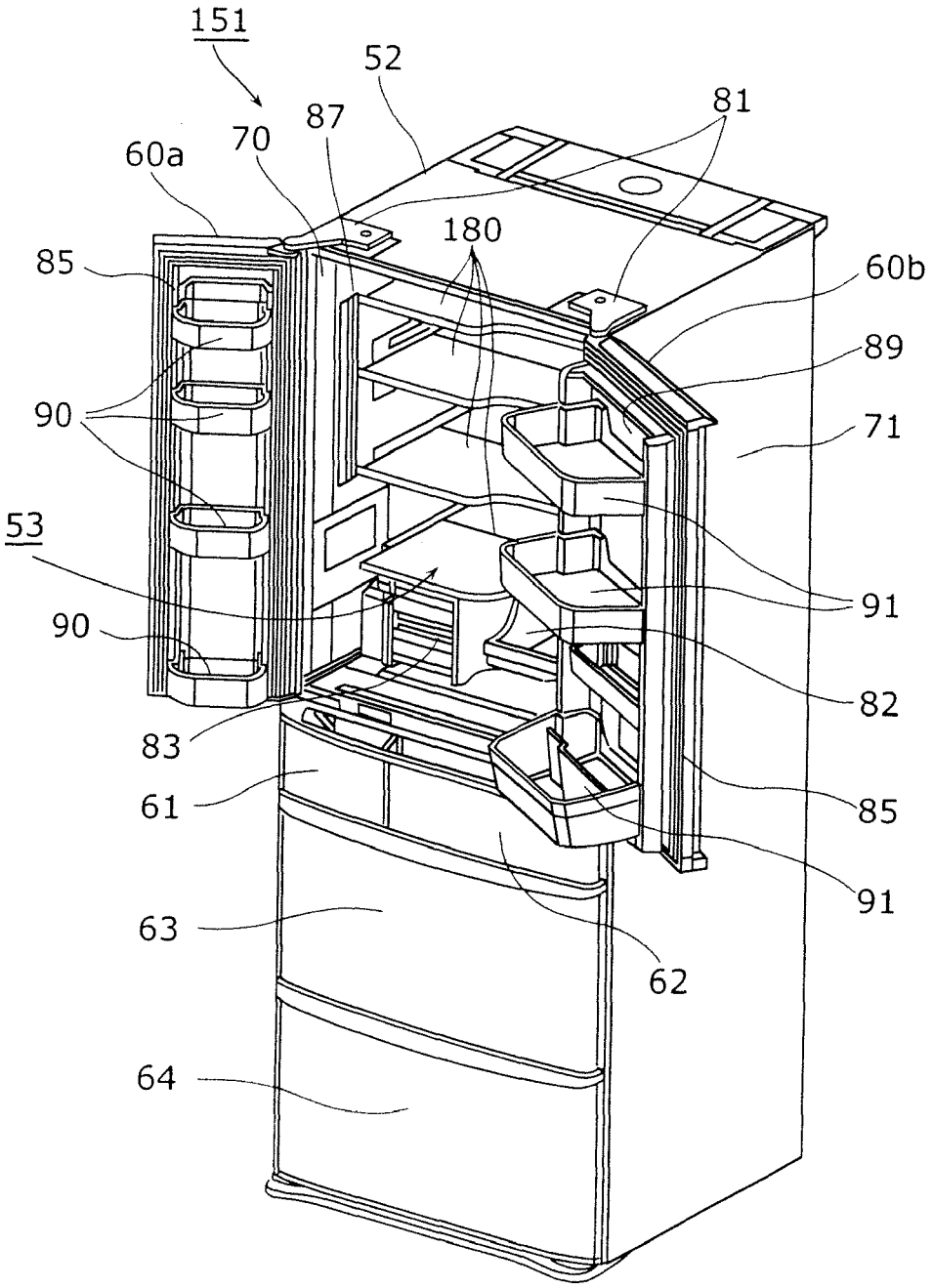
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FIG. 19

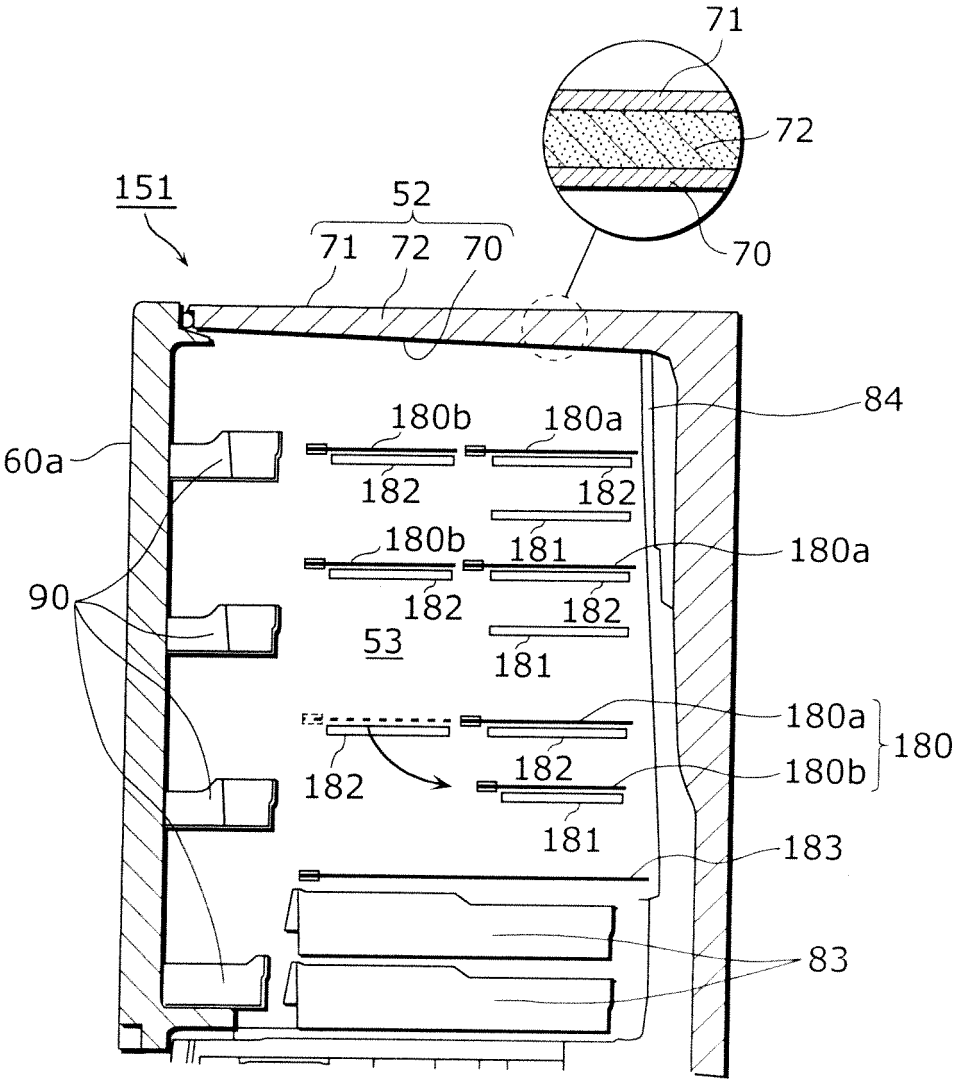
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FIG. 20

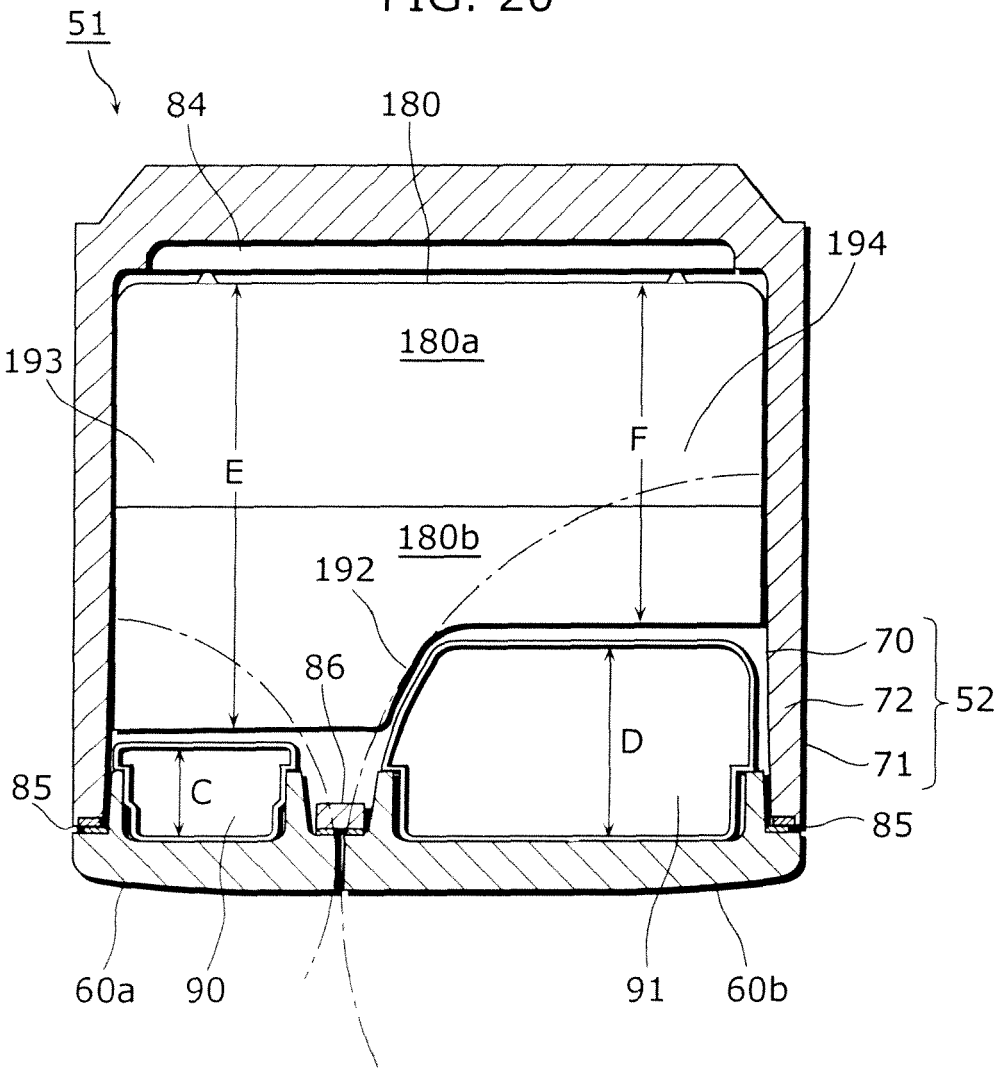
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FIG. 21

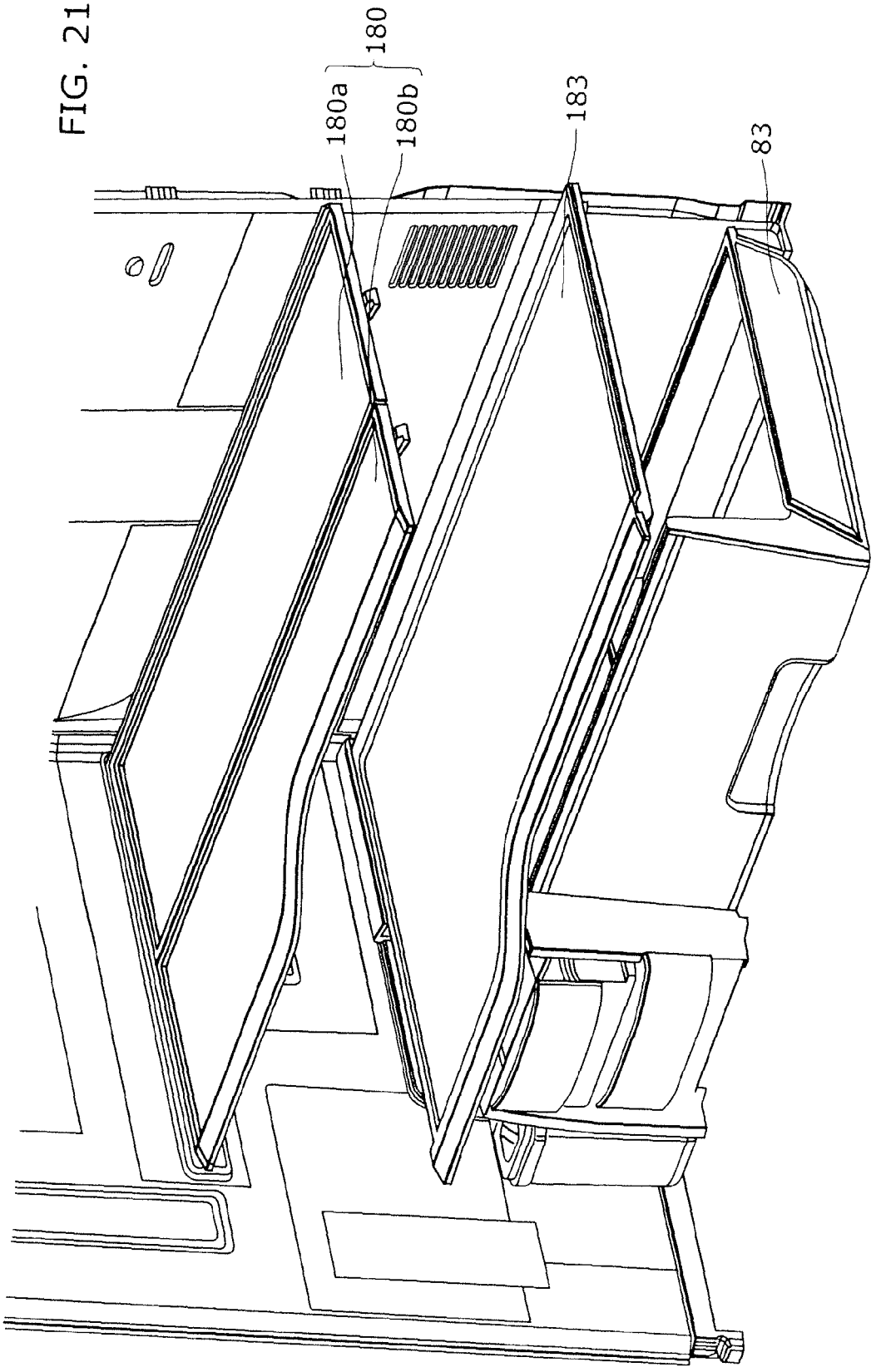

FIG. 22

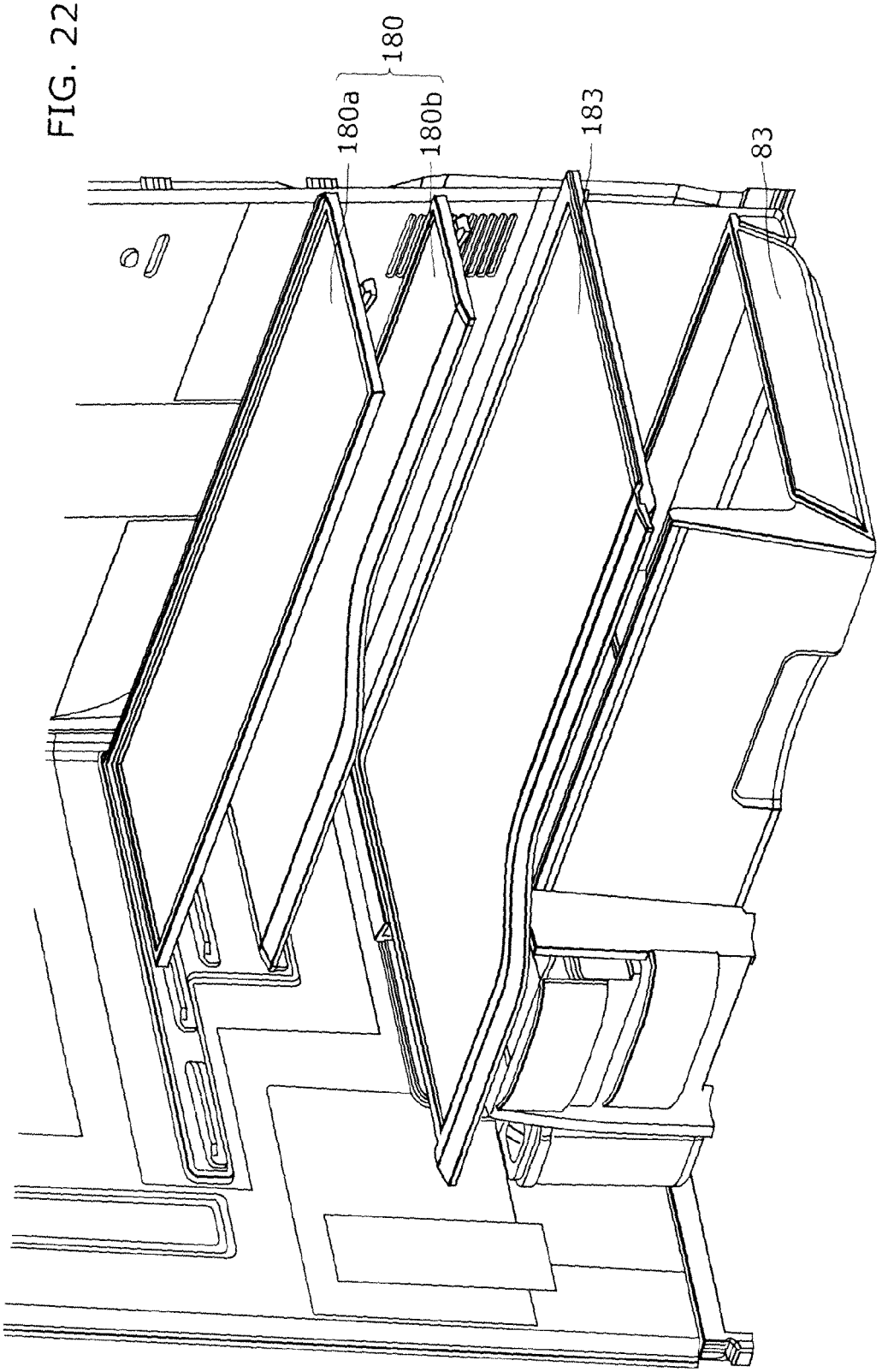

FIG. 23

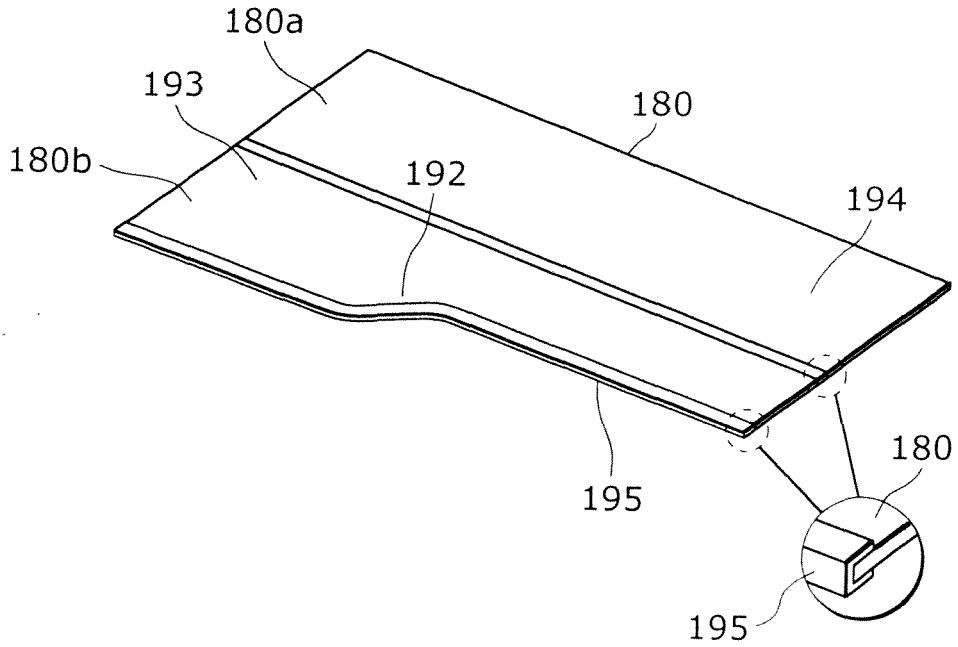

FIG. 24

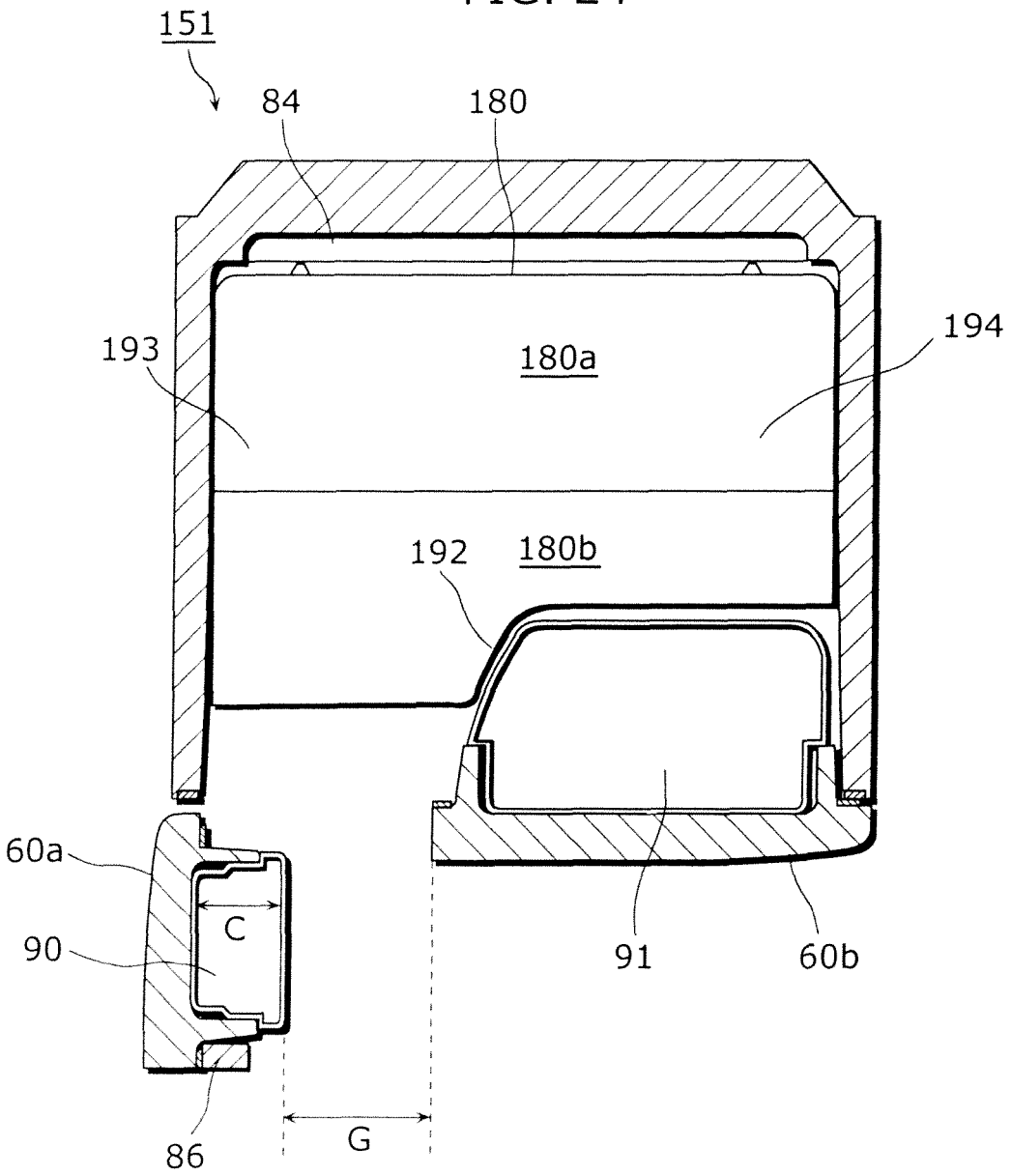

FIG. 25

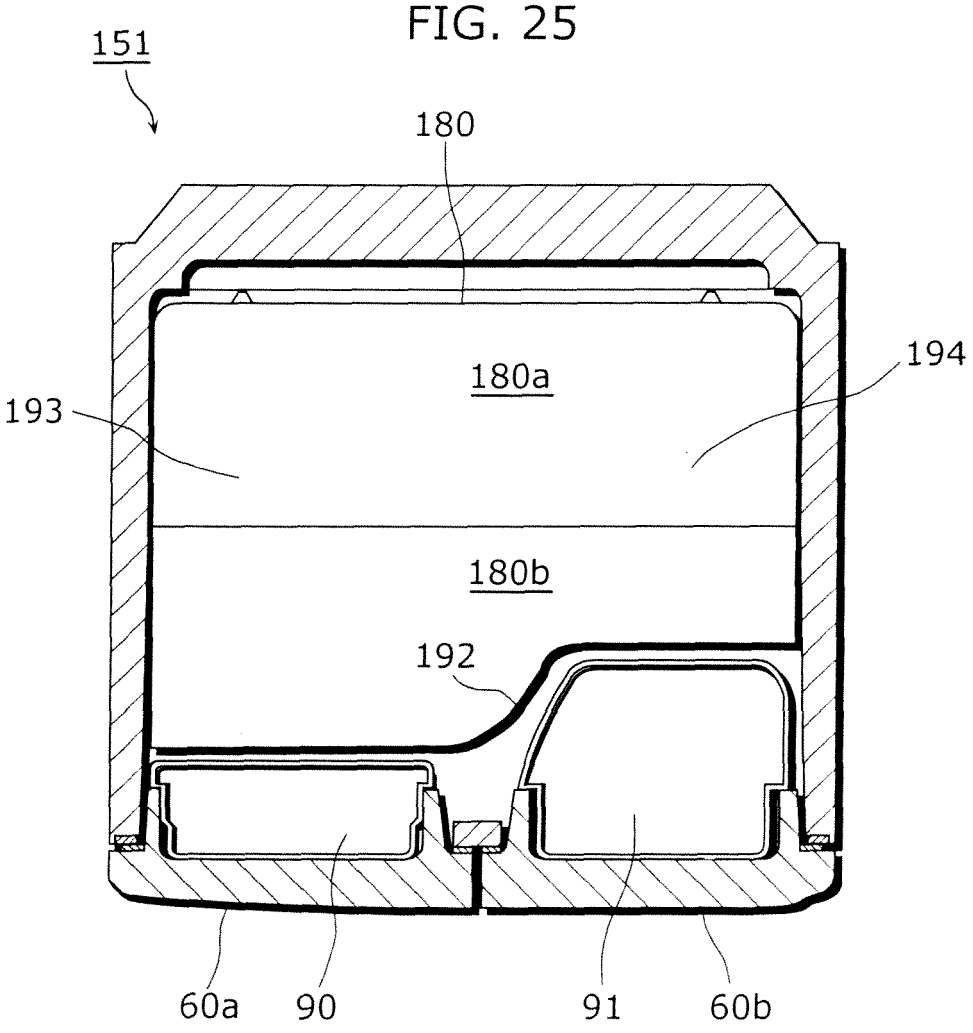

FIG. 26

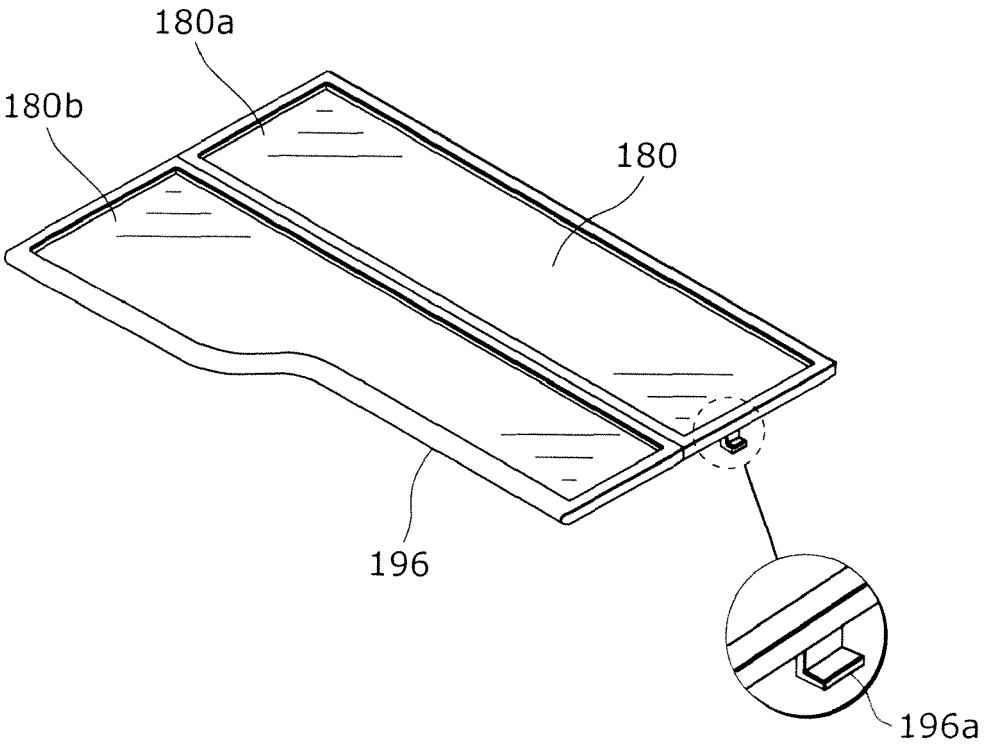

FIG. 27

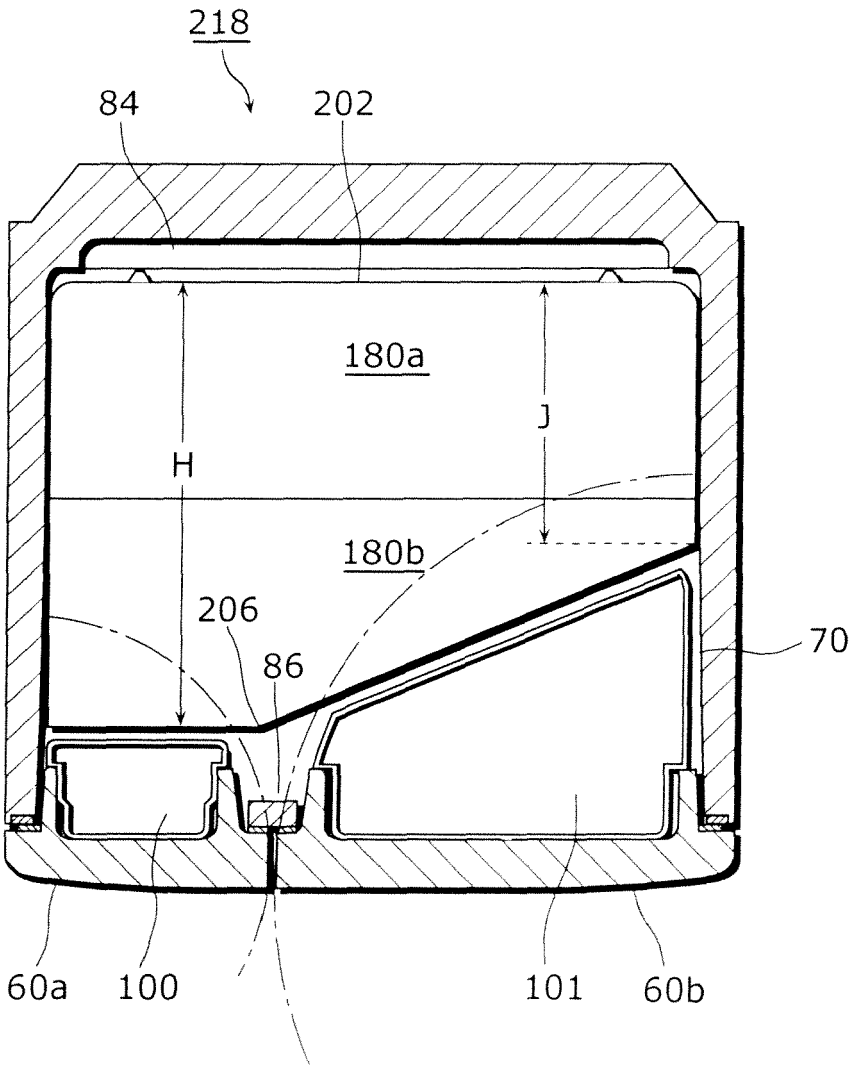

FIG. 28

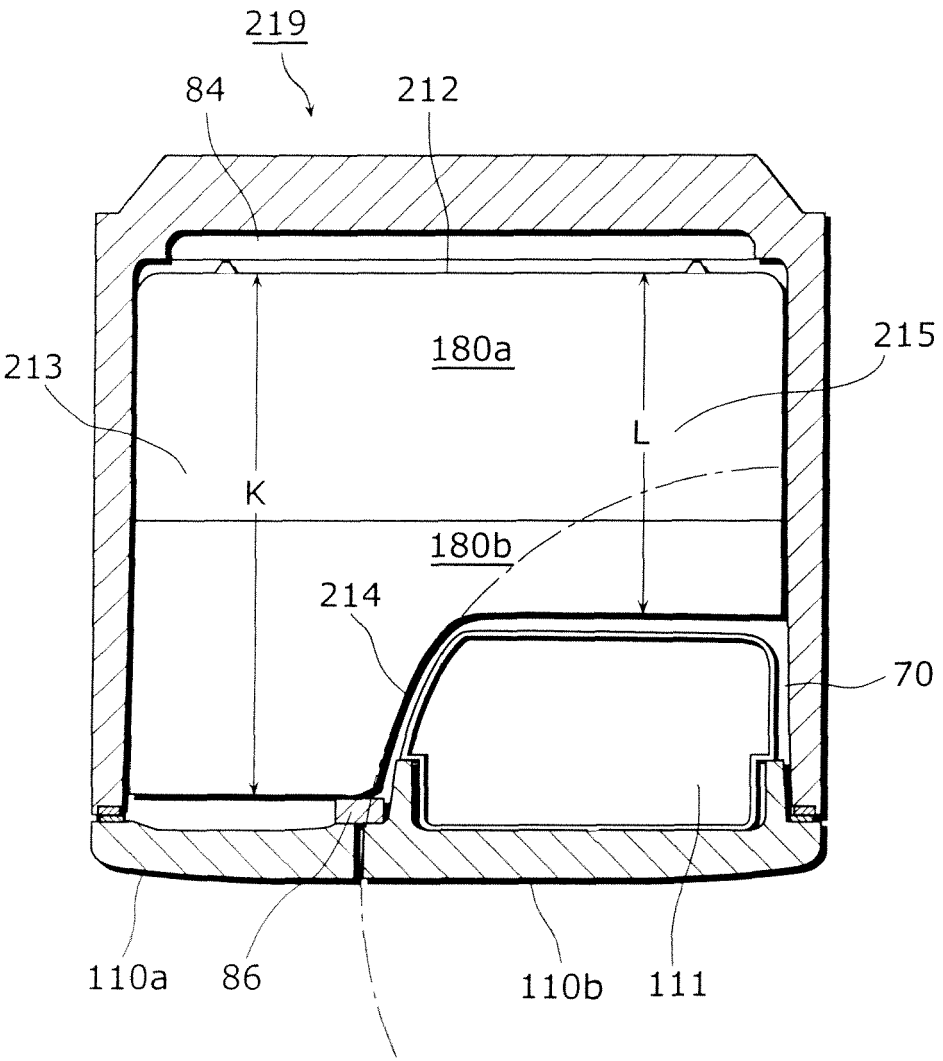

FIG. 29

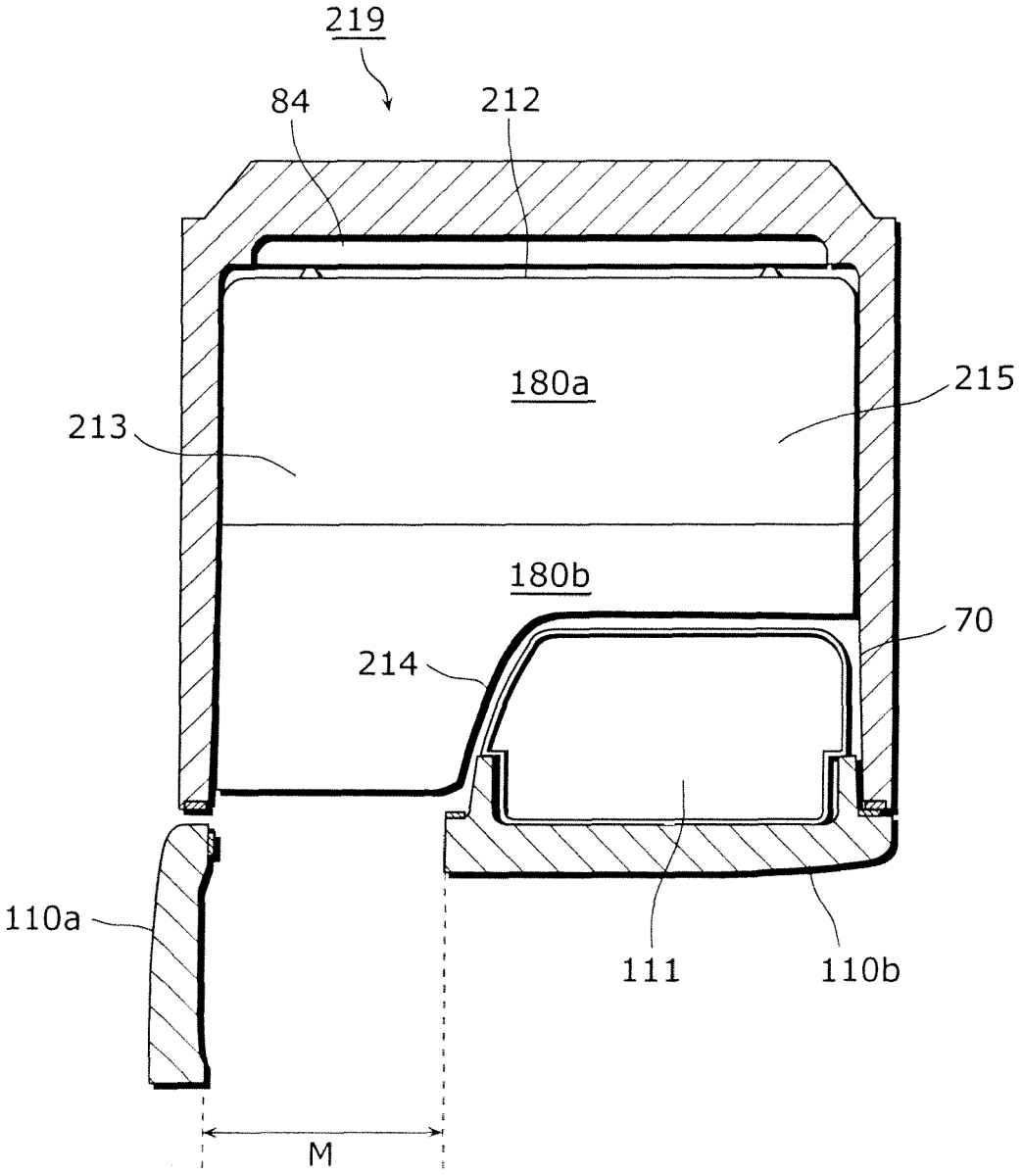

FIG. 30

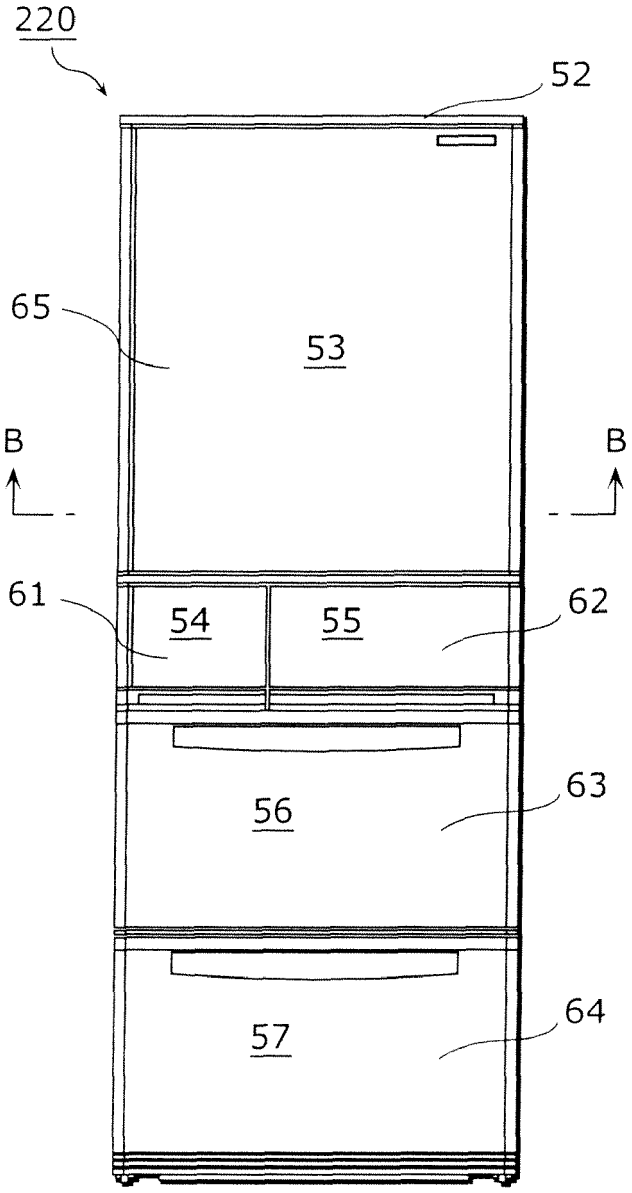

FIG. 31

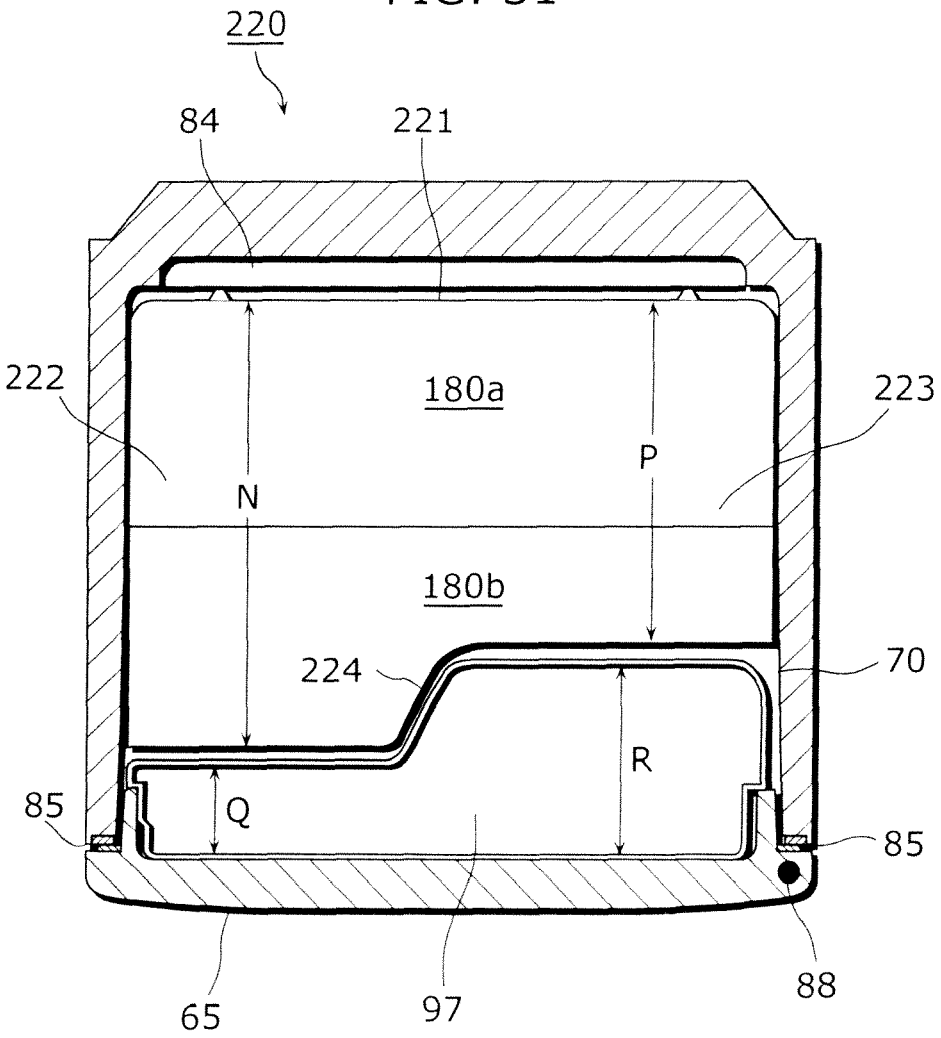

FIG. 32

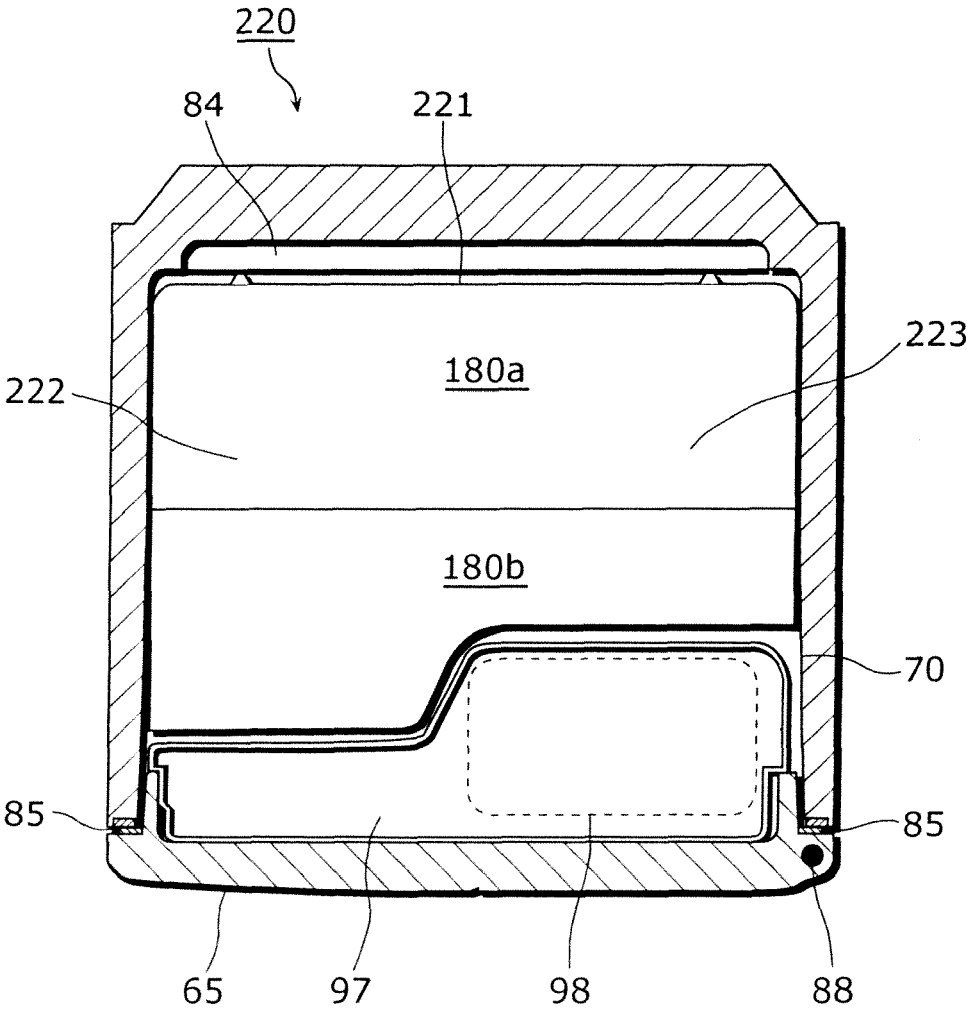

FIG. 33

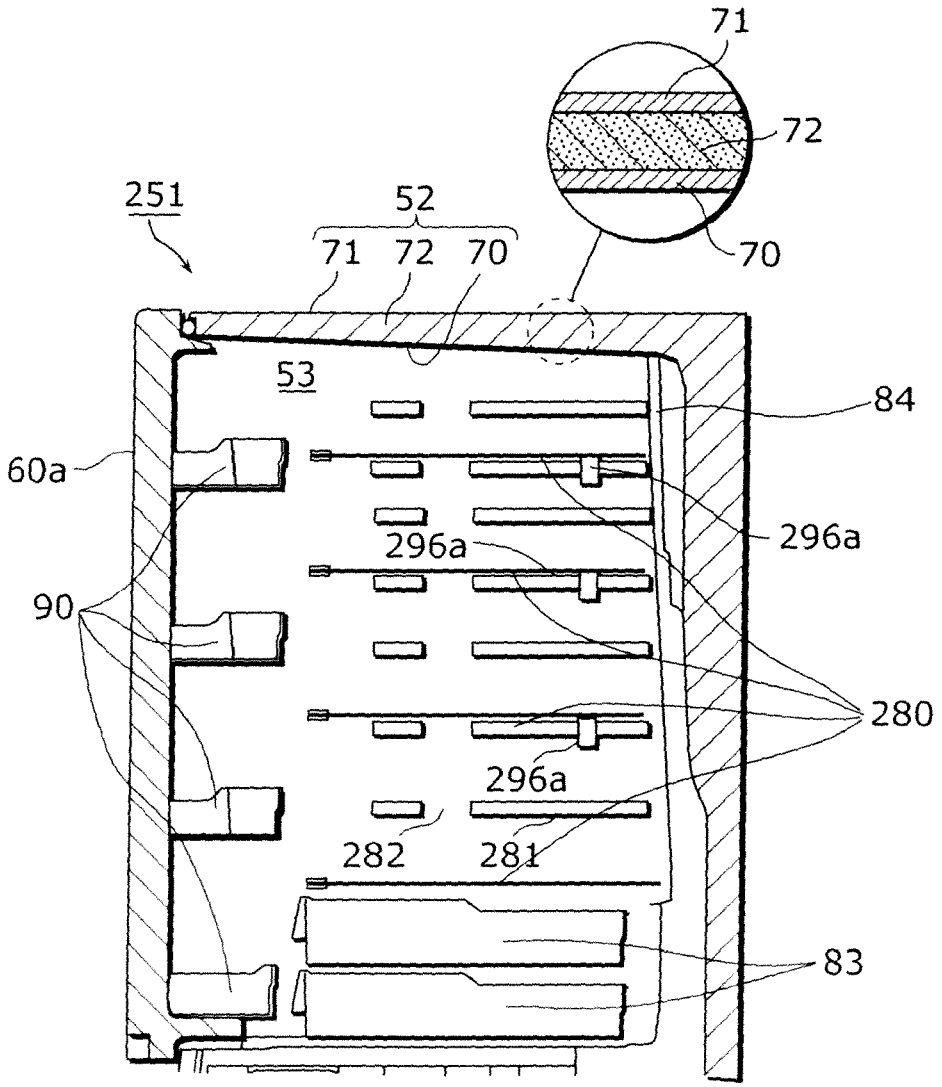

FIG. 34

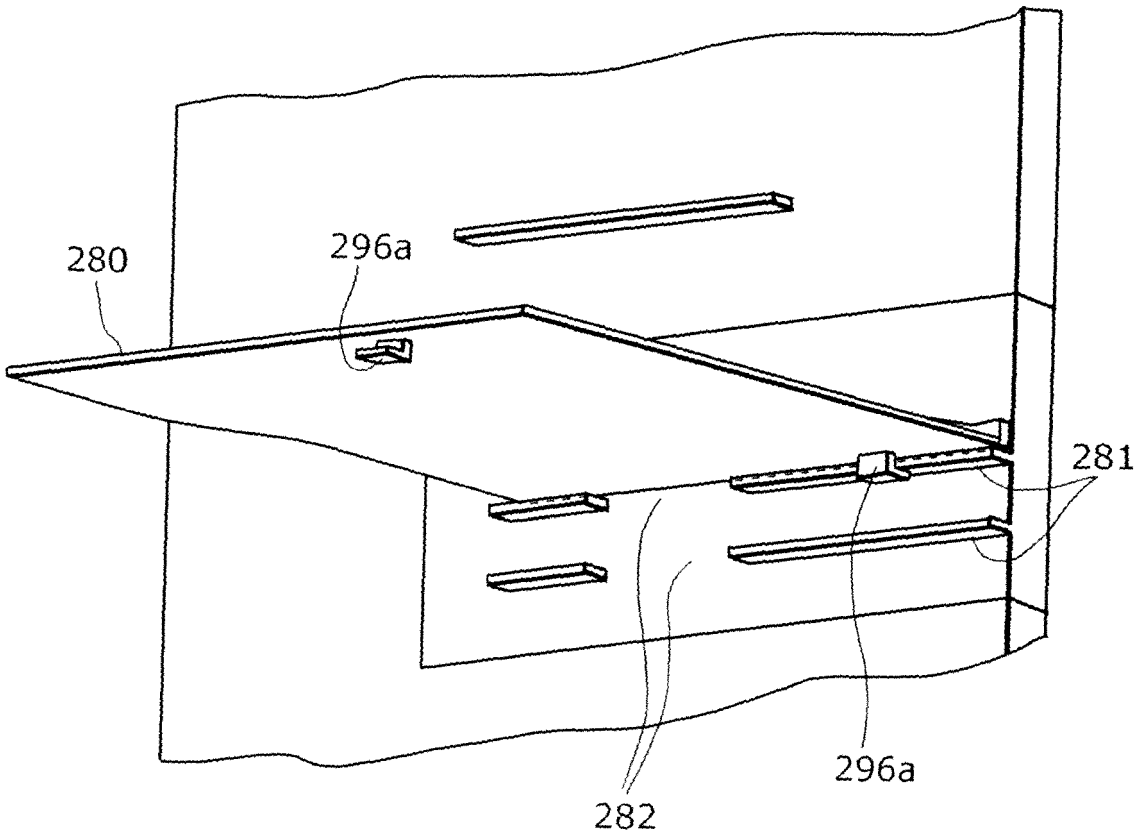

FIG. 35

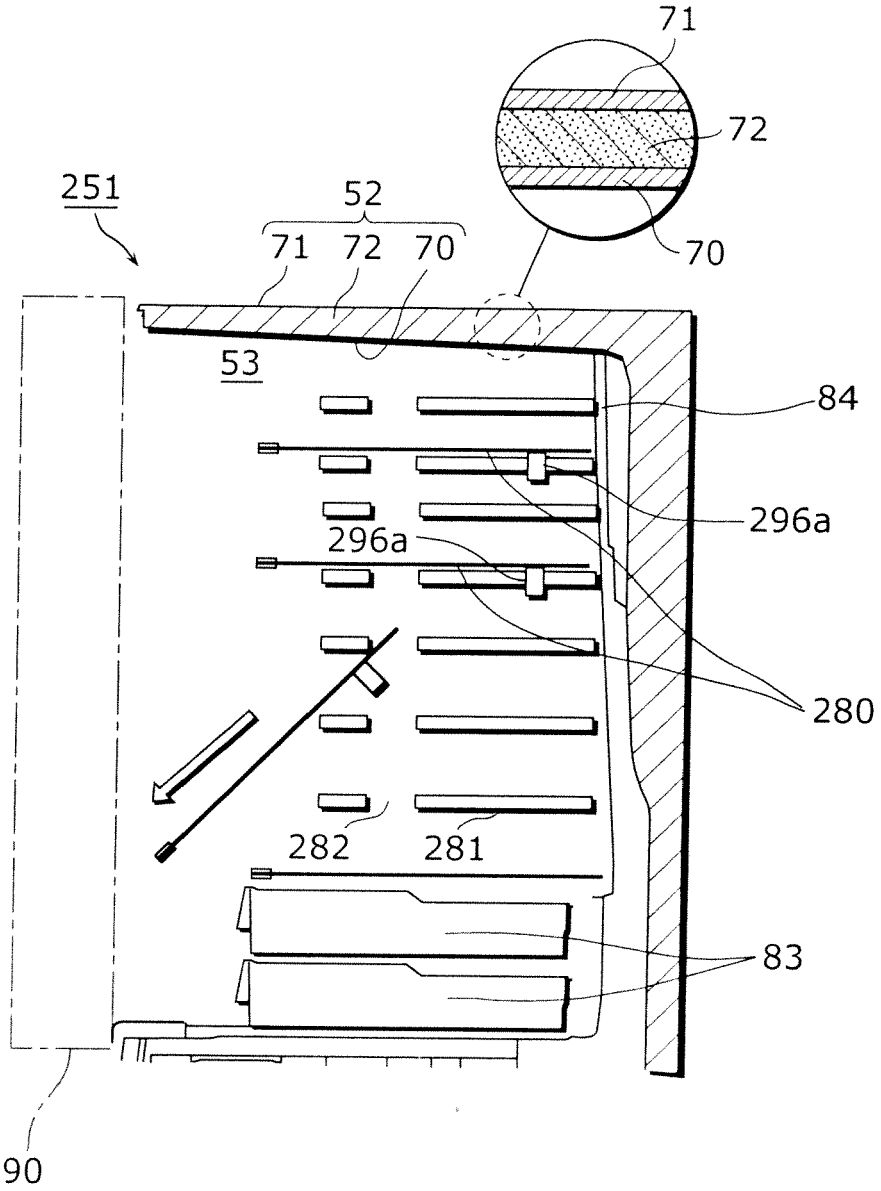

FIG. 36

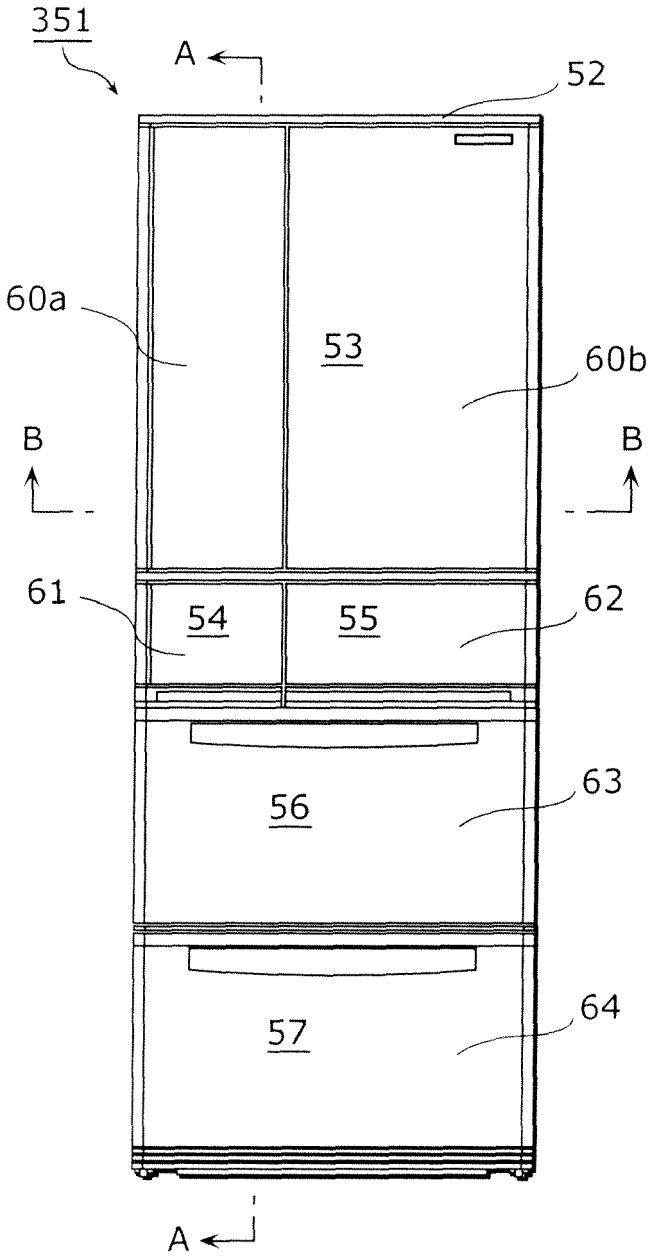

FIG. 37

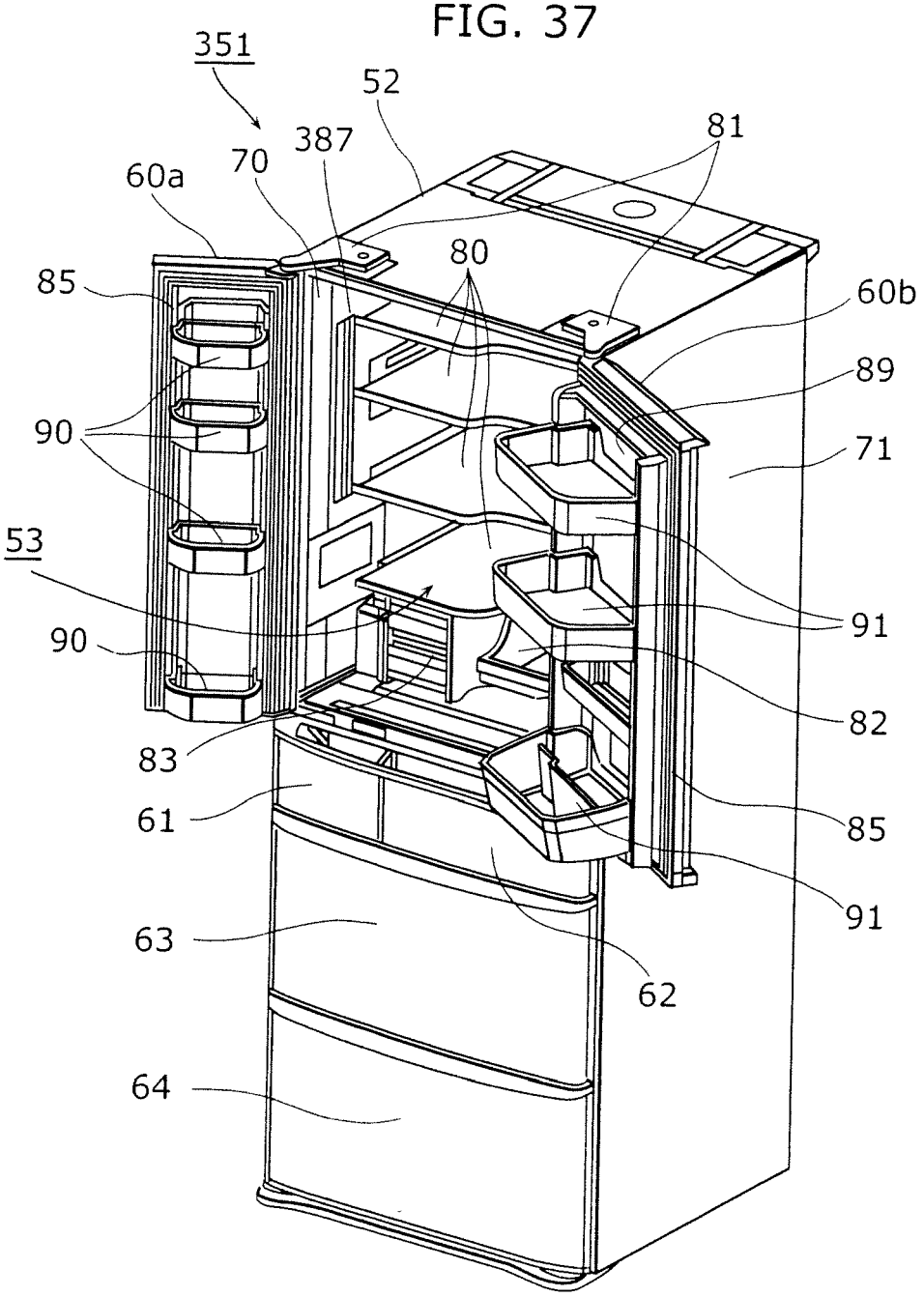
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FIG. 38

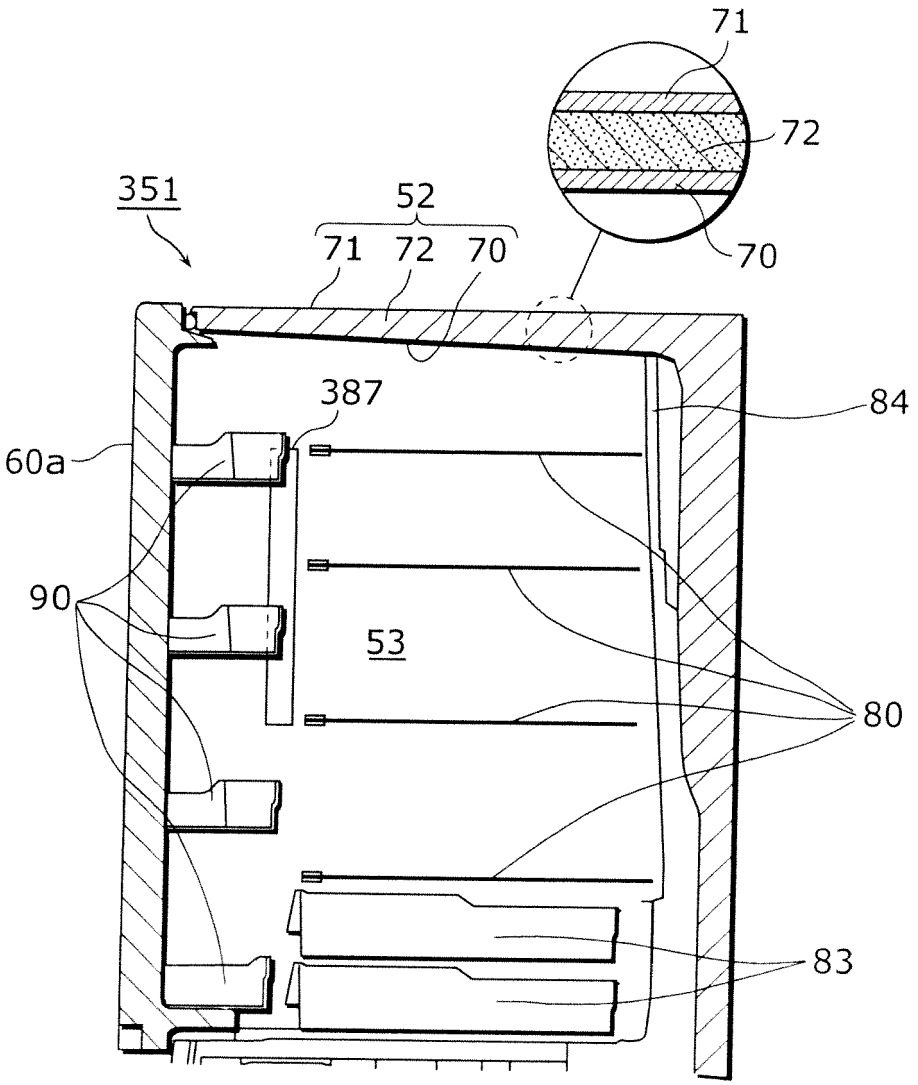

FIG. 39

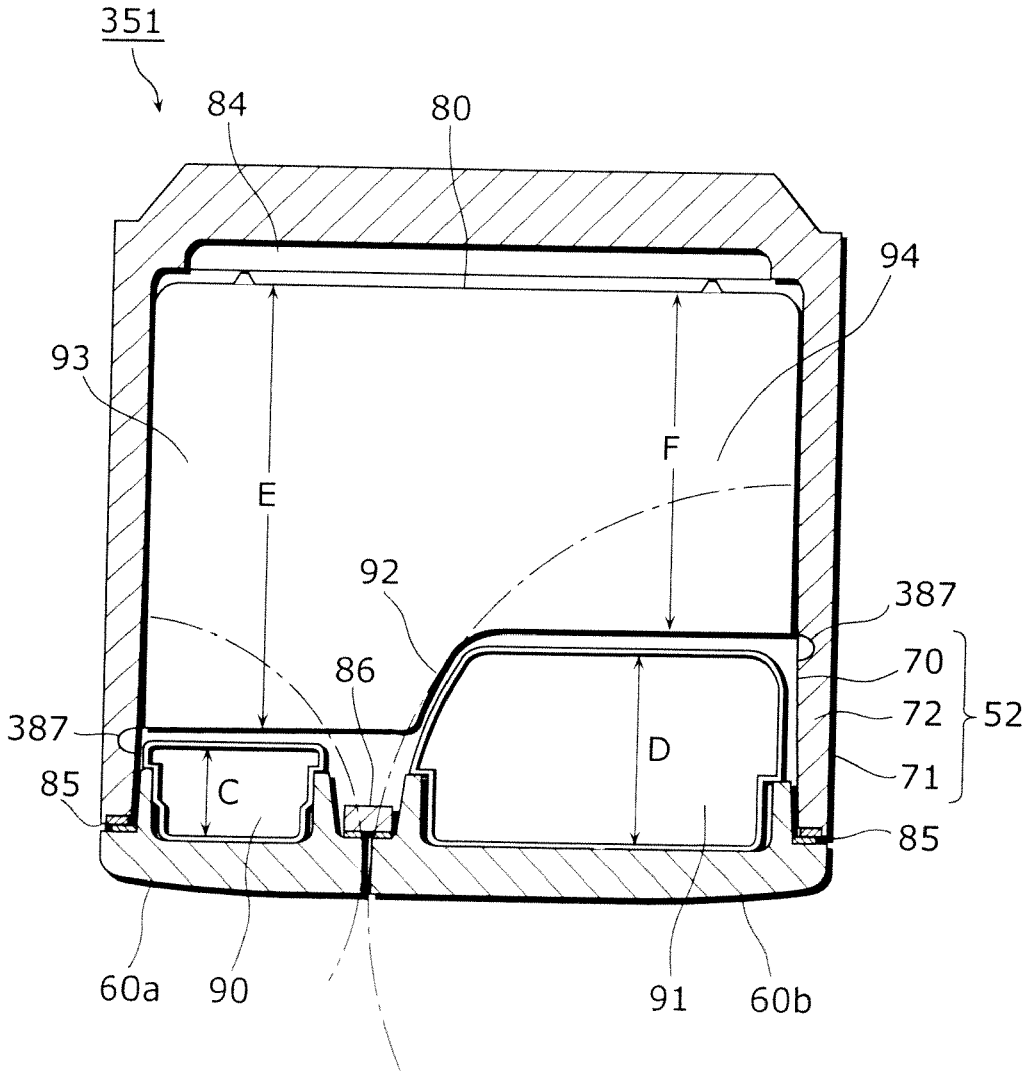

FIG. 40

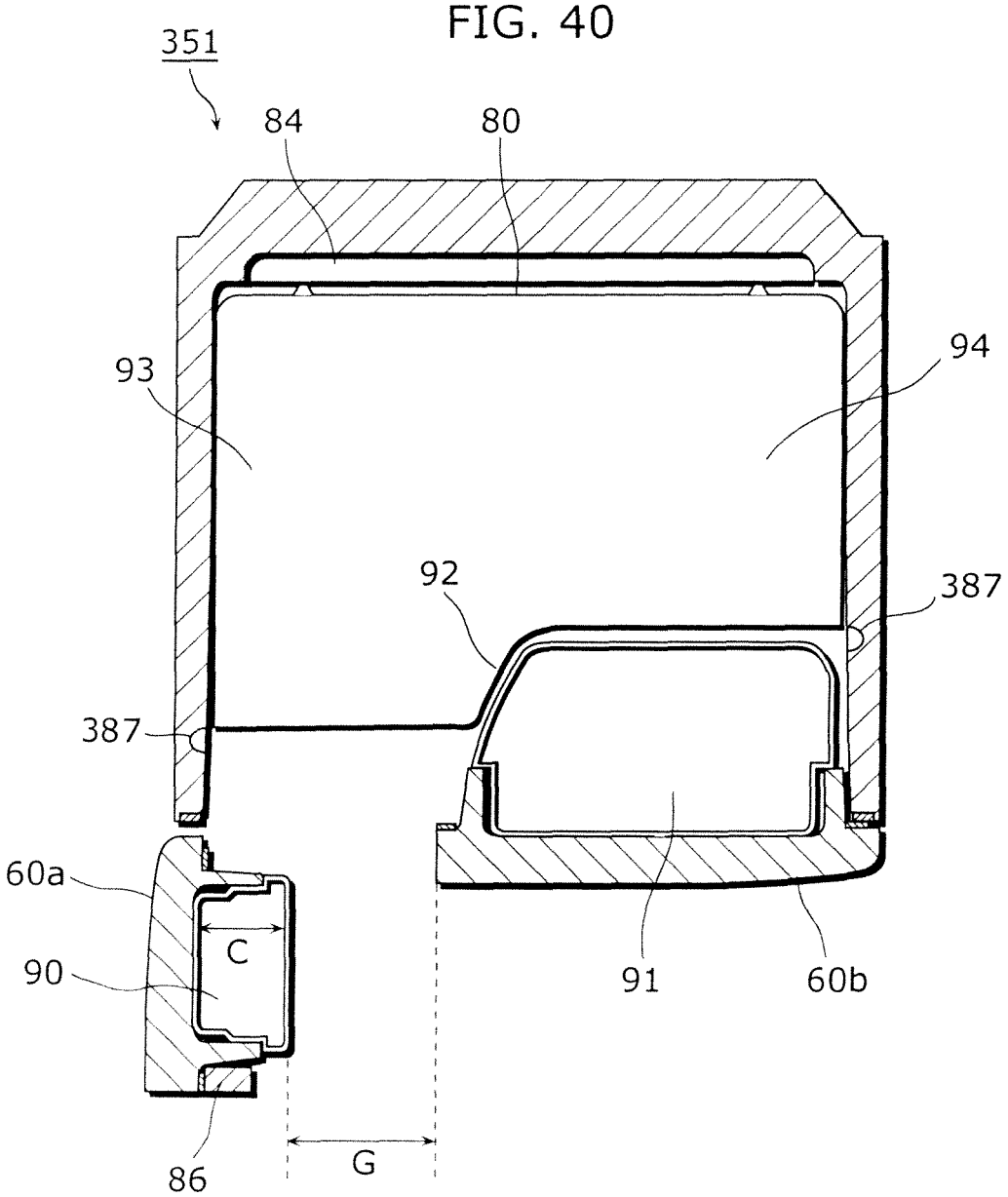

FIG. 41

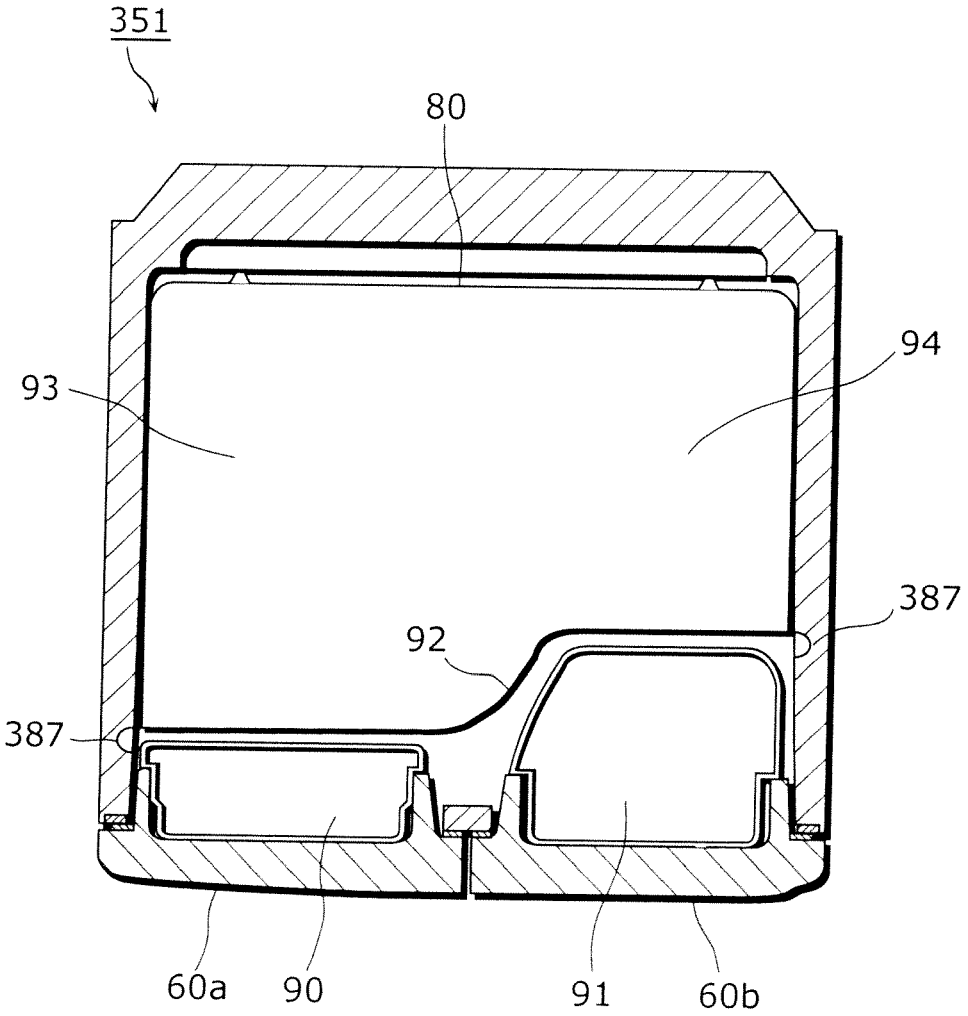

FIG. 42

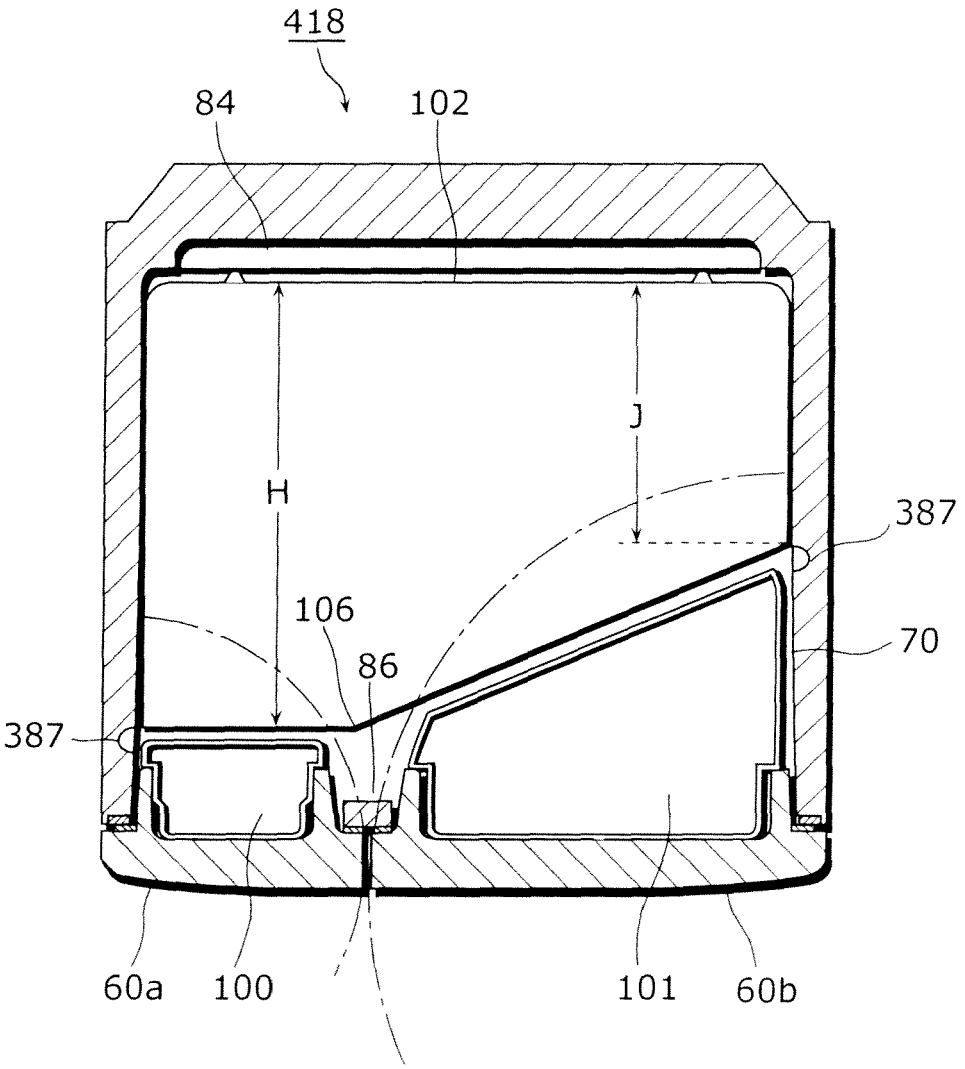

FIG. 43

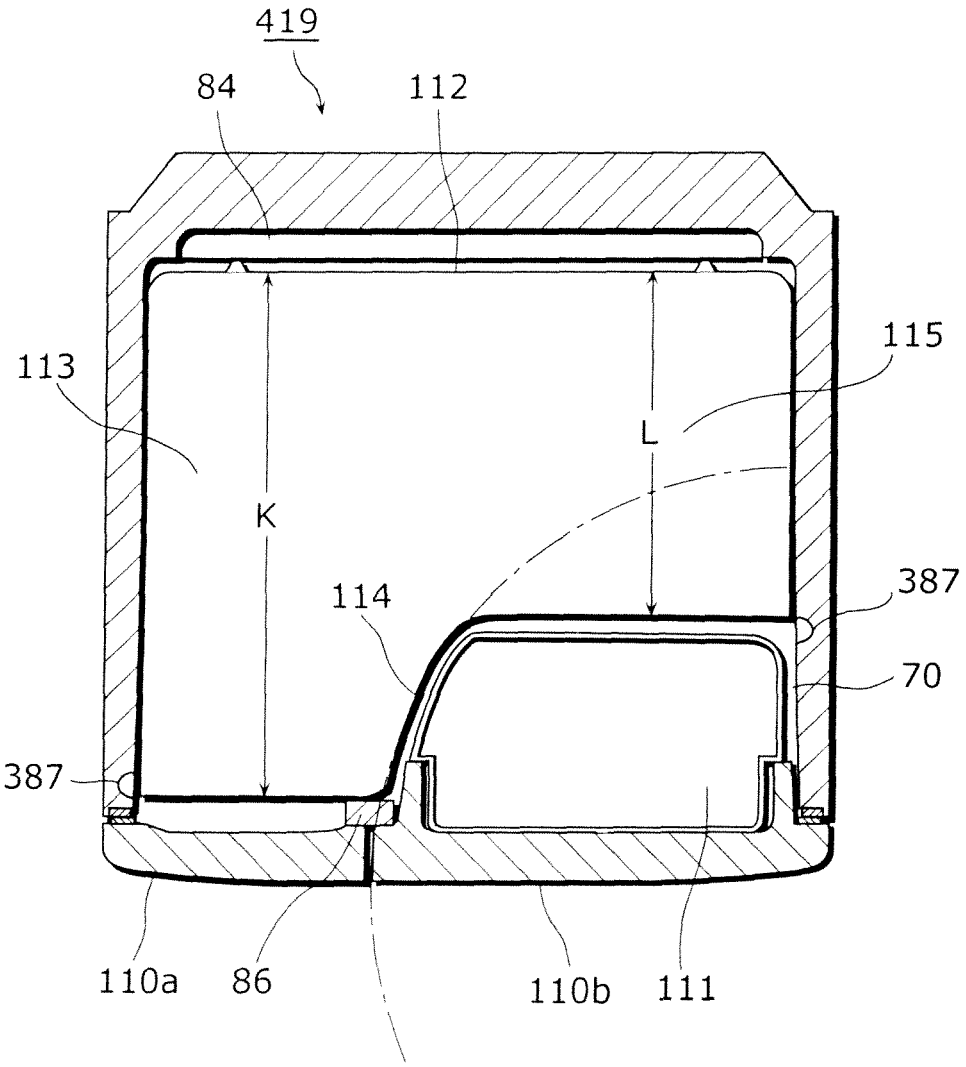

FIG. 44

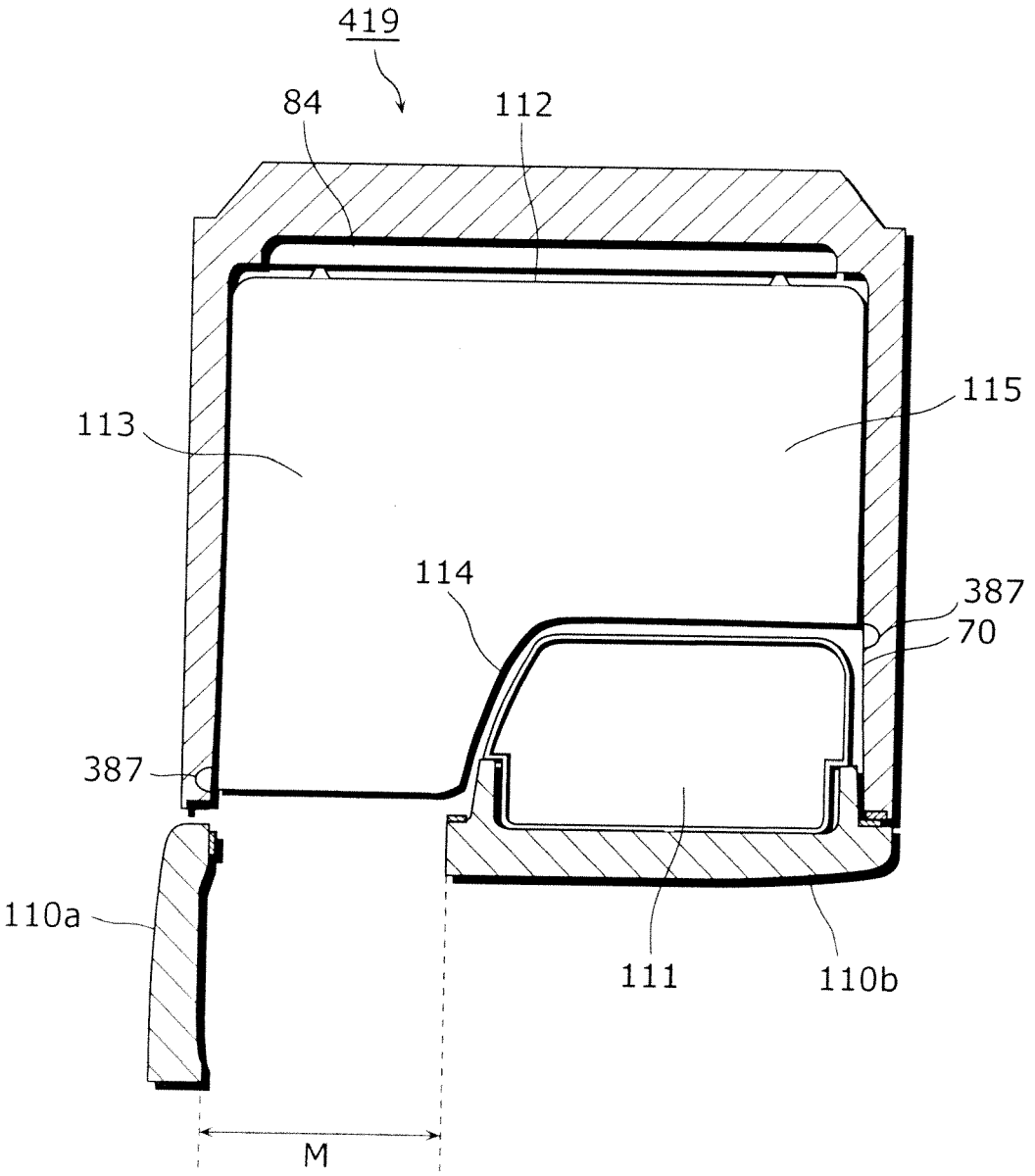

FIG. 45

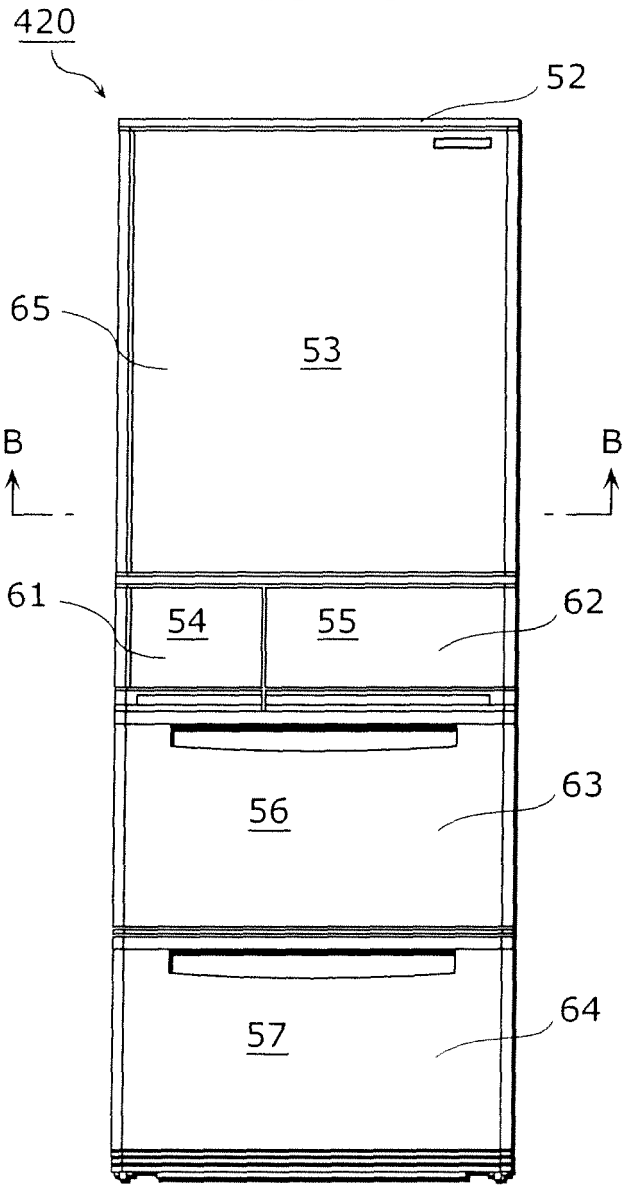

FIG. 46

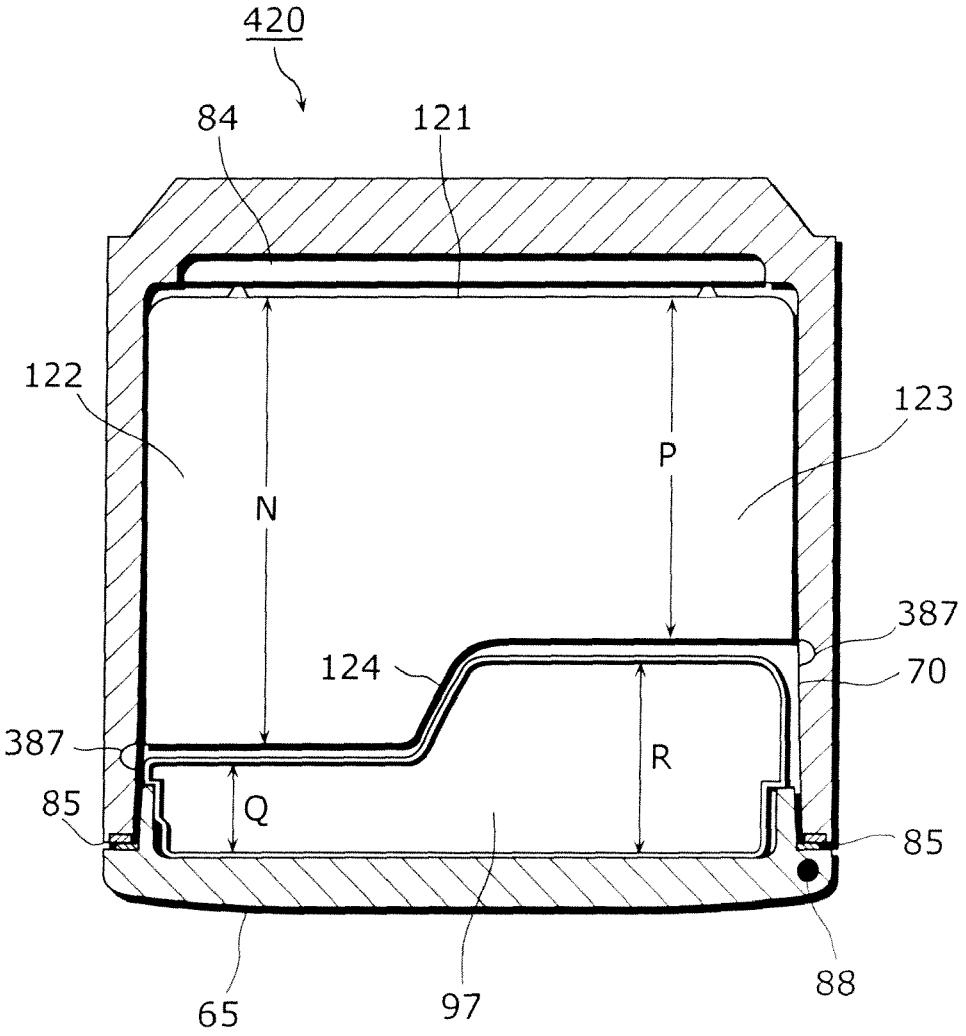

FIG. 47

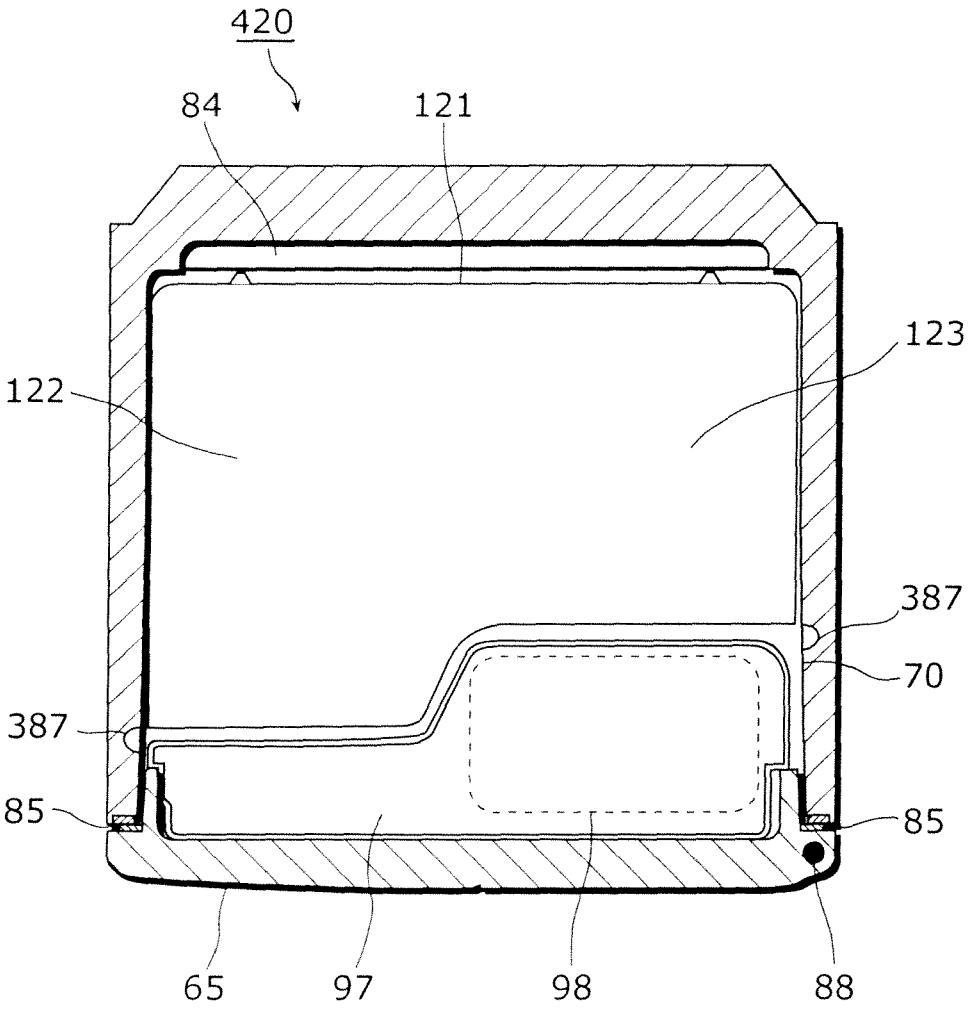

FIG. 48

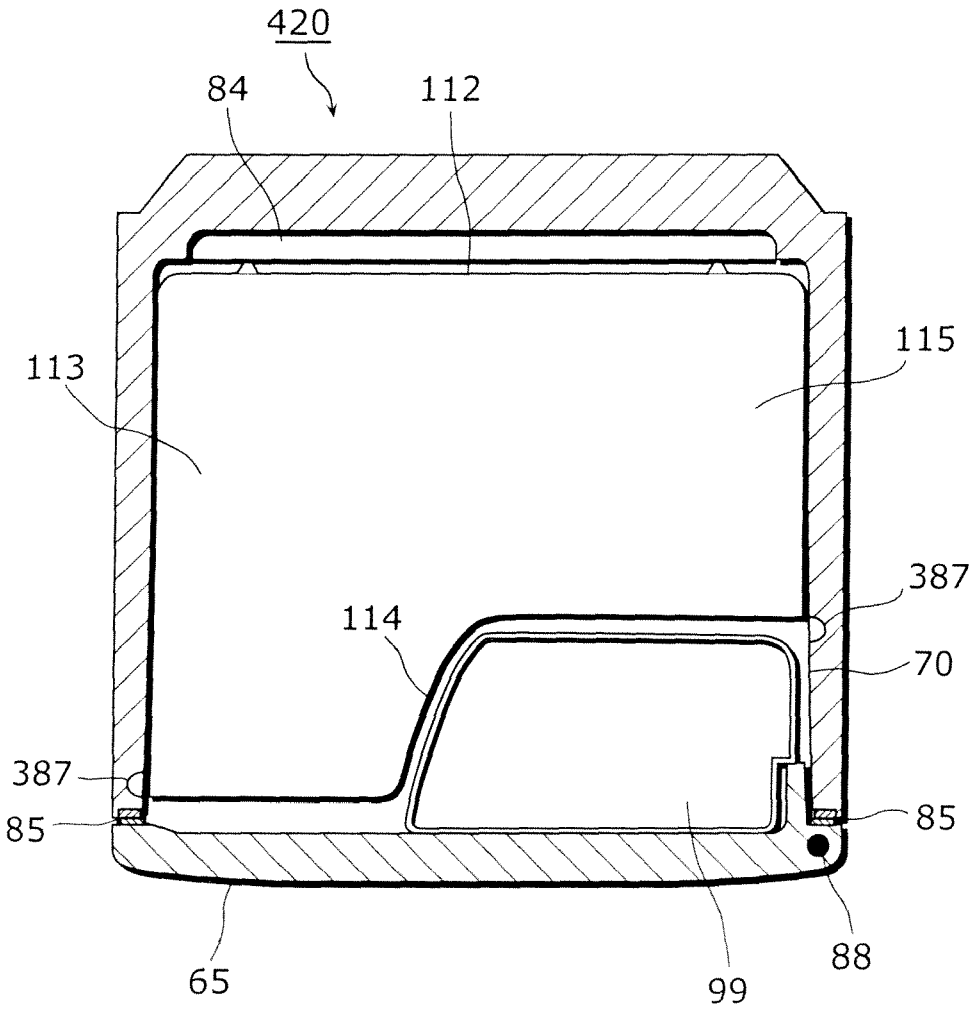

FIG. 49

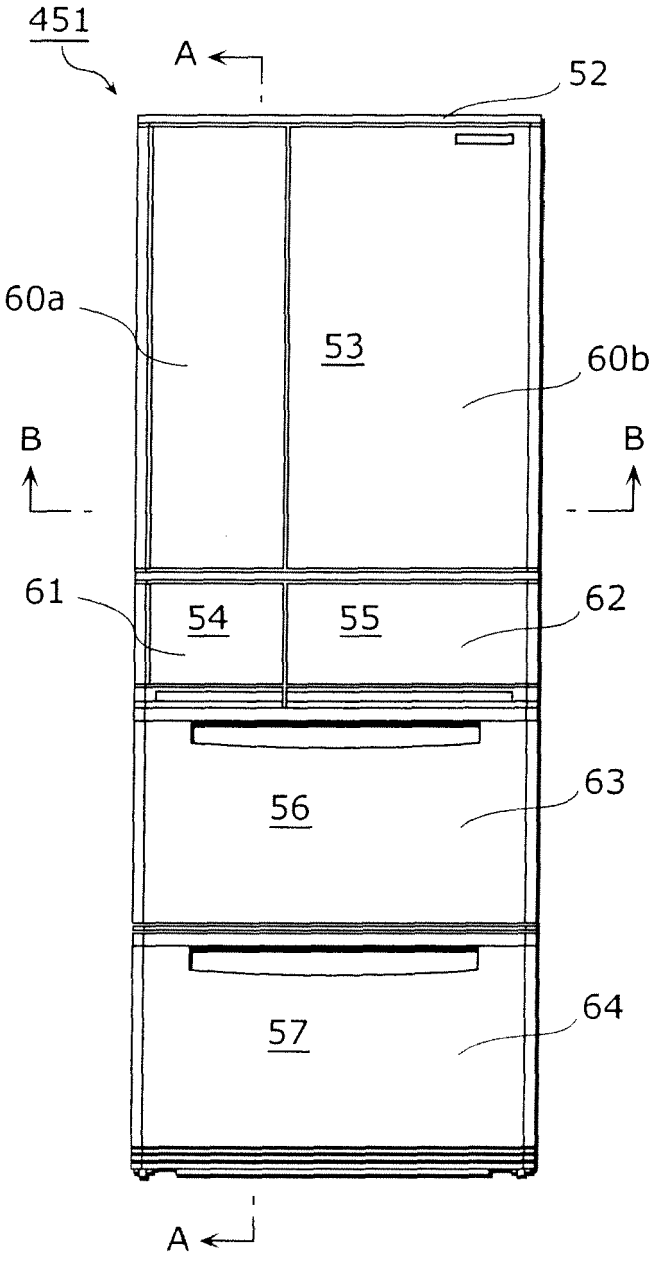

FIG. 50

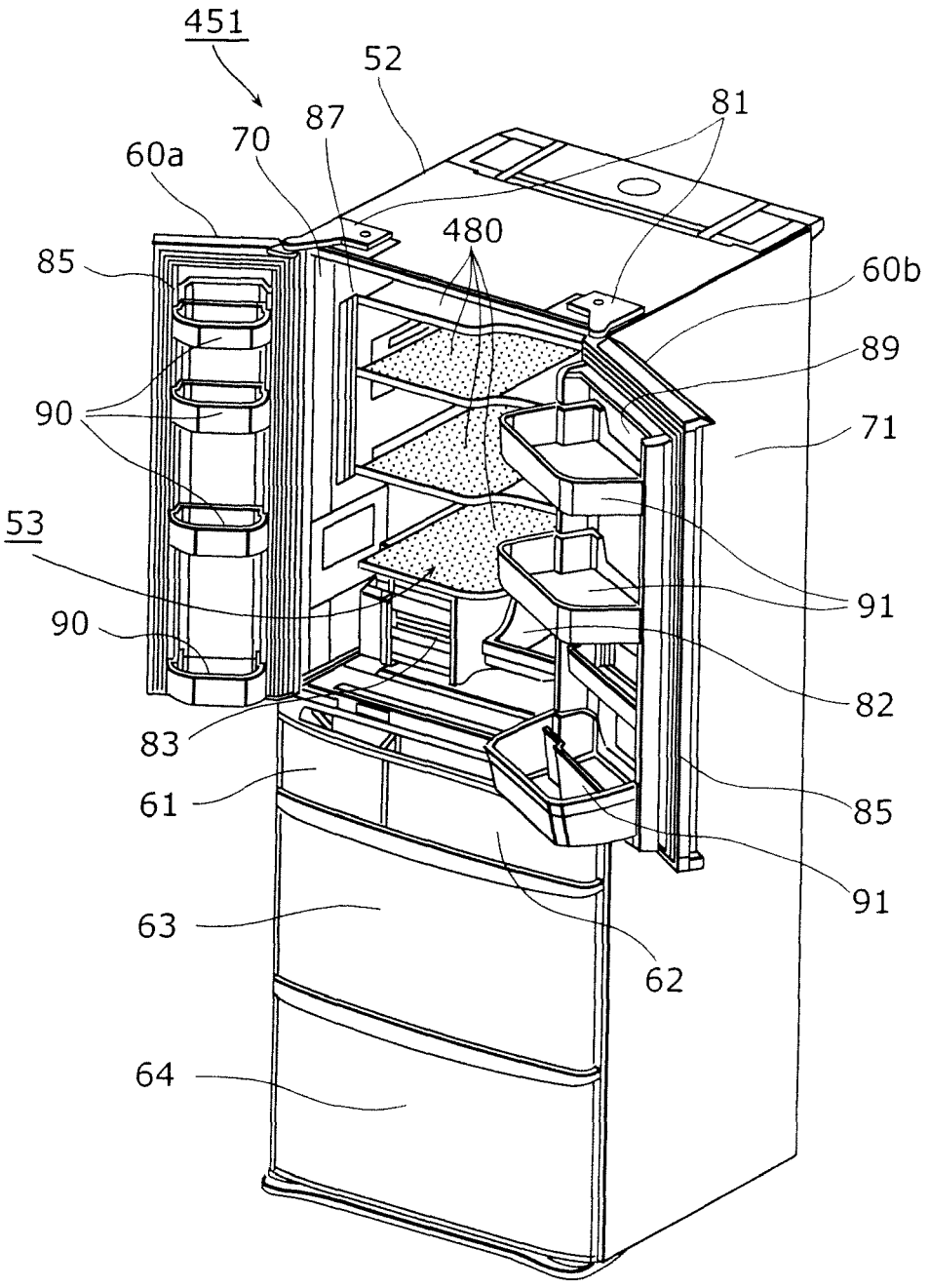
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FIG. 51

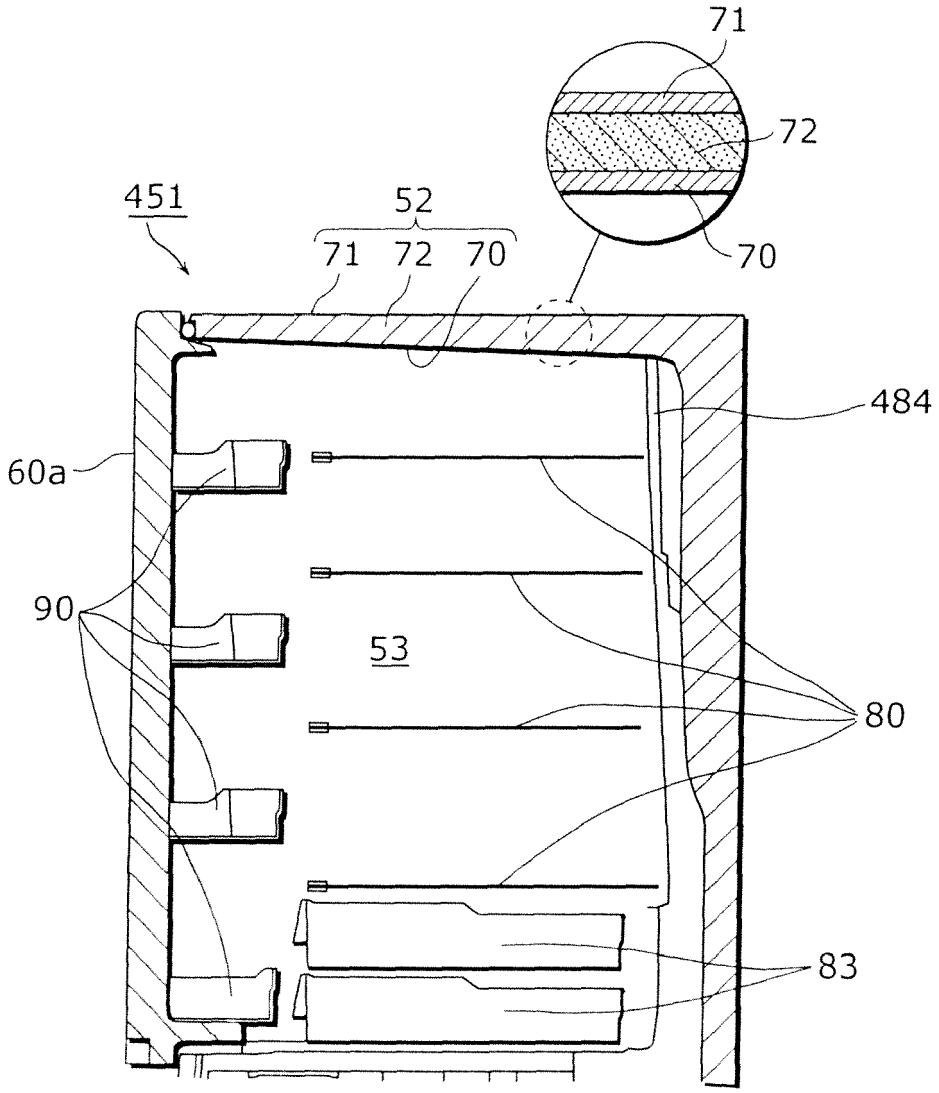

FIG. 52

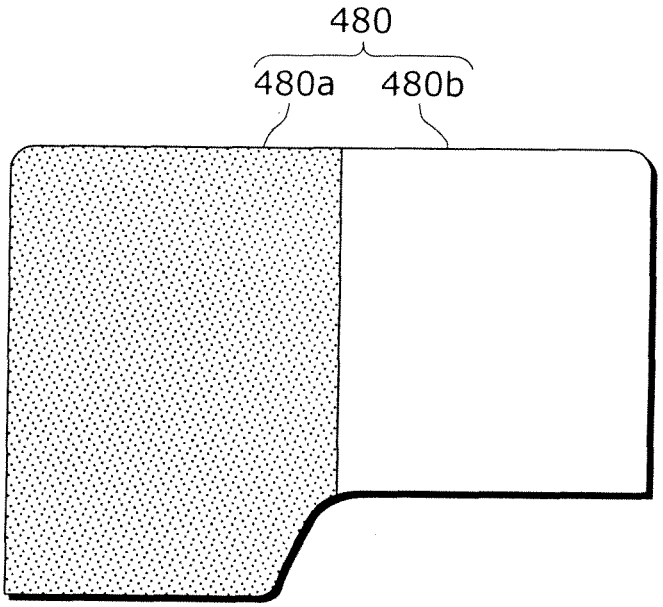

FIG. 53

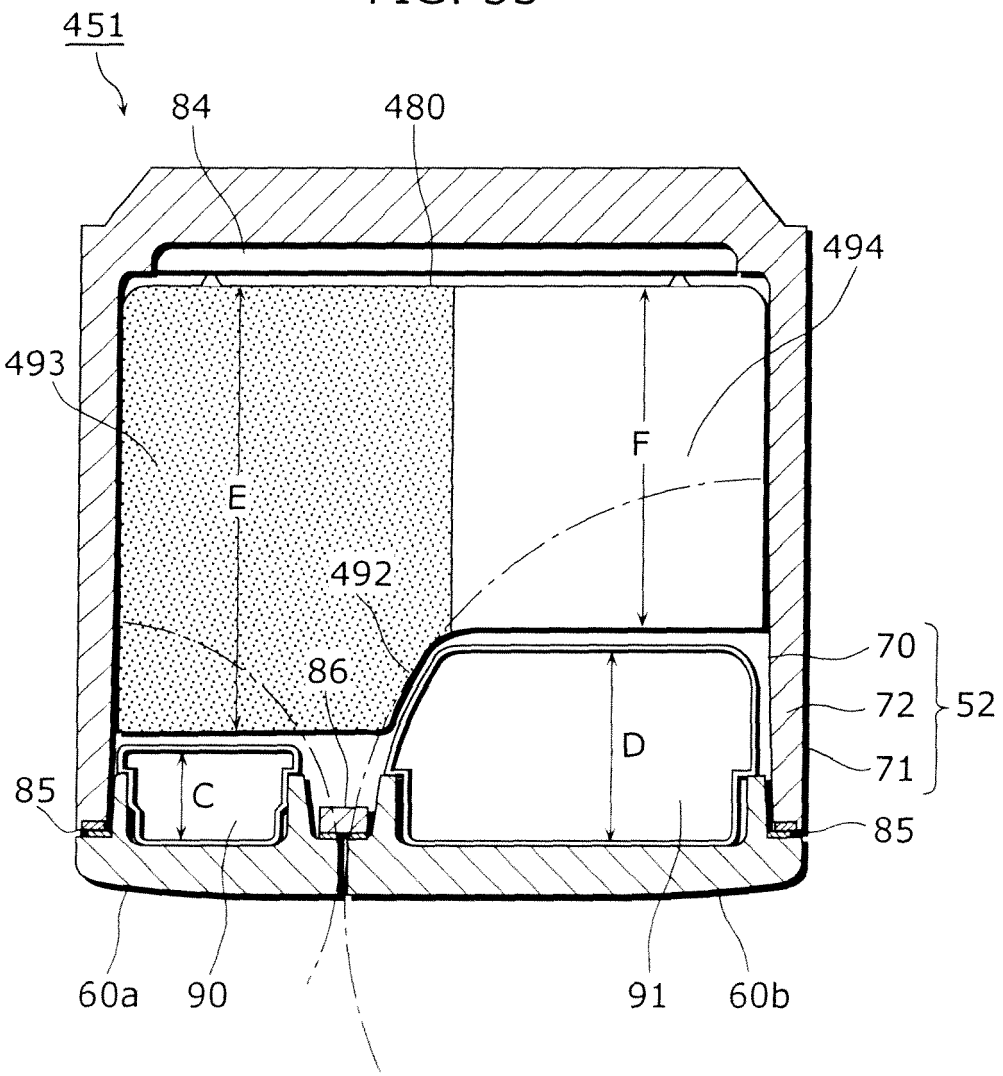

FIG. 54

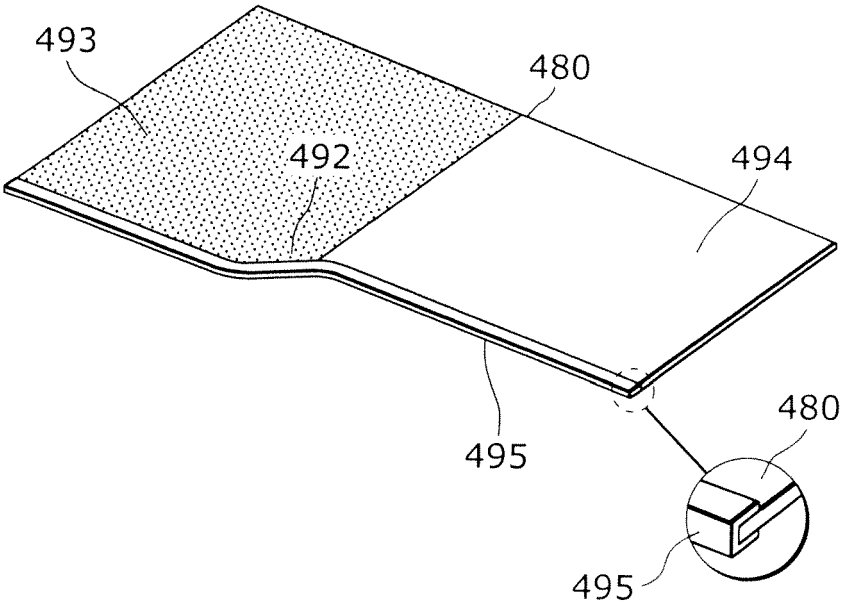

FIG. 55

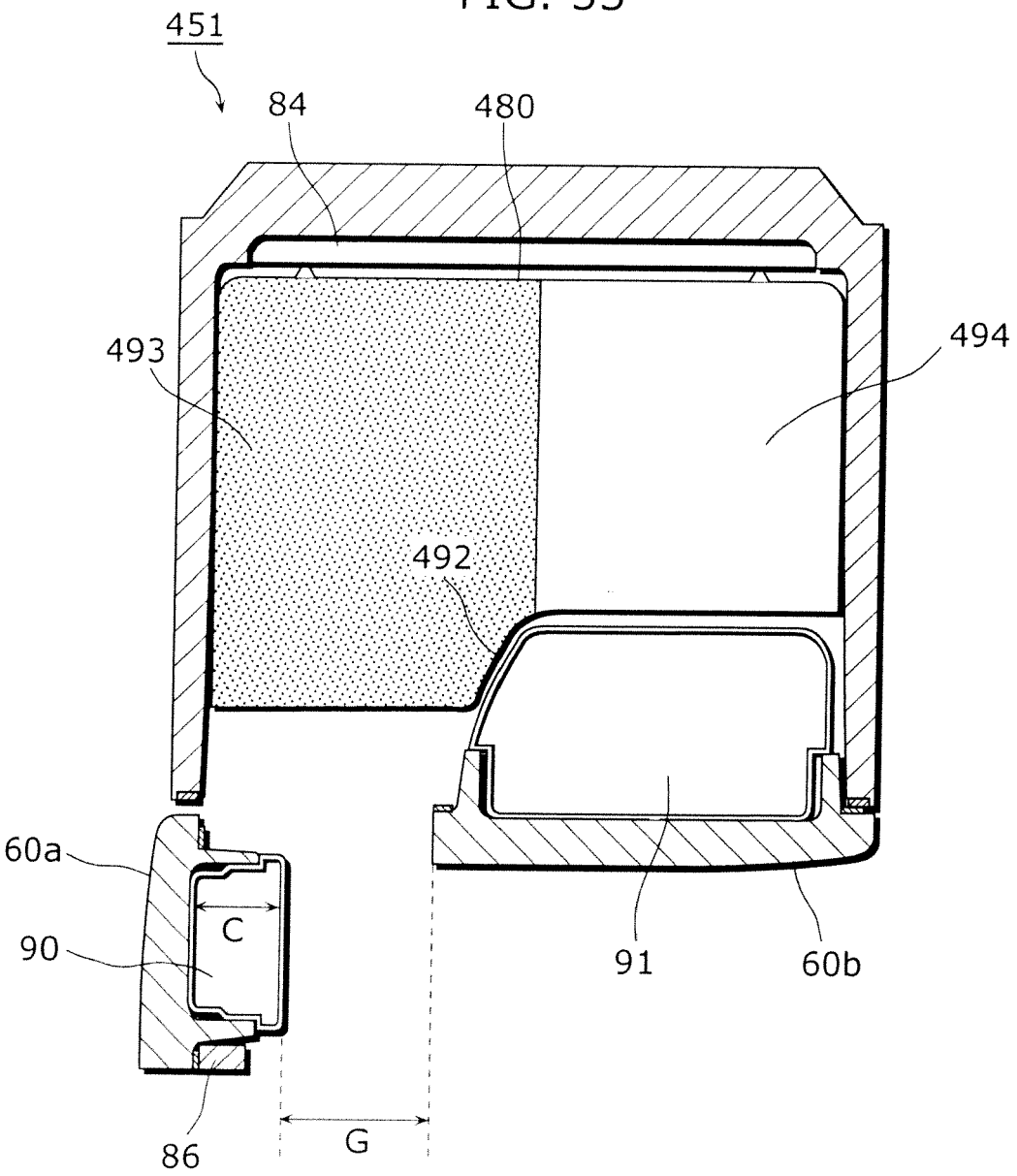

FIG. 56

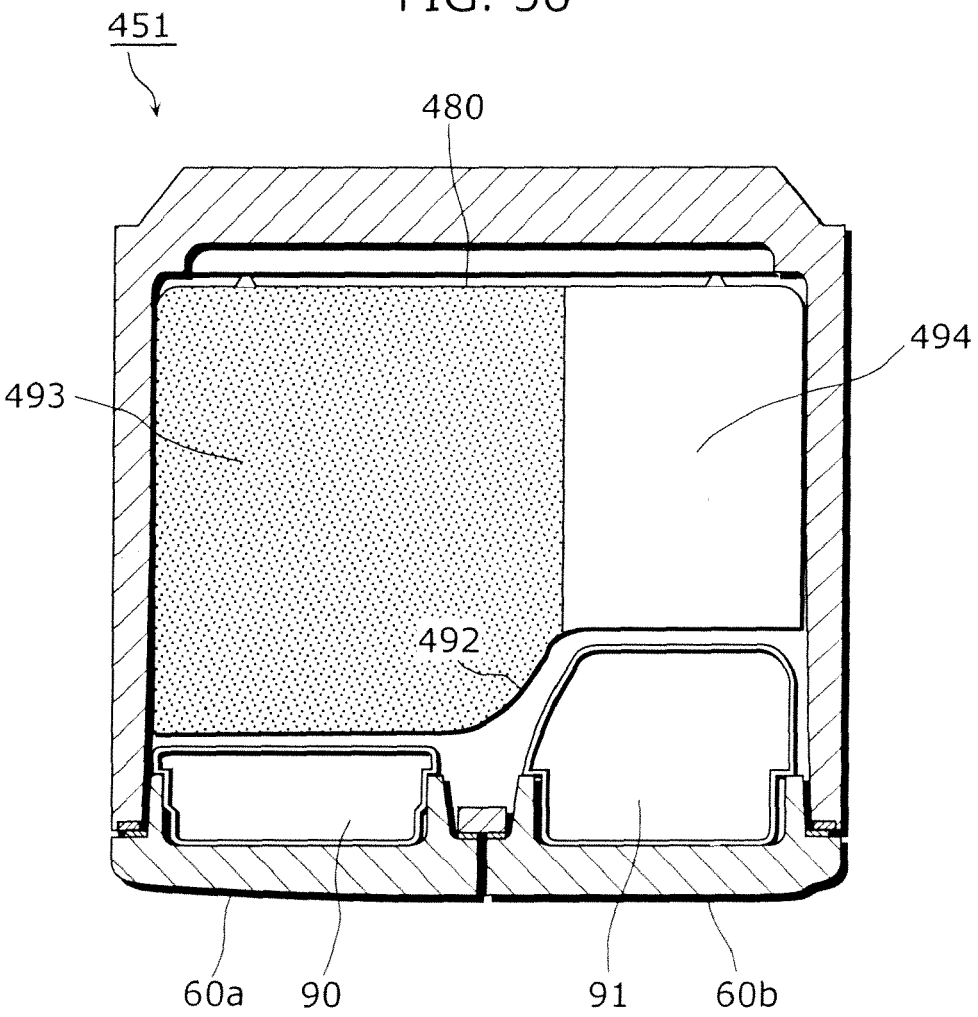

FIG. 57

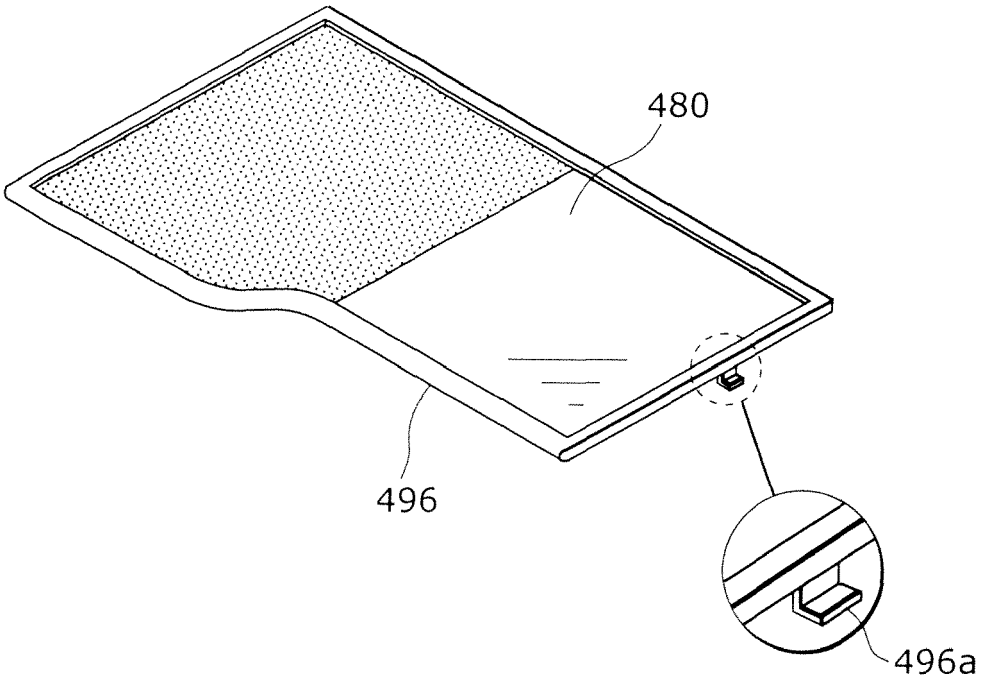

FIG. 58

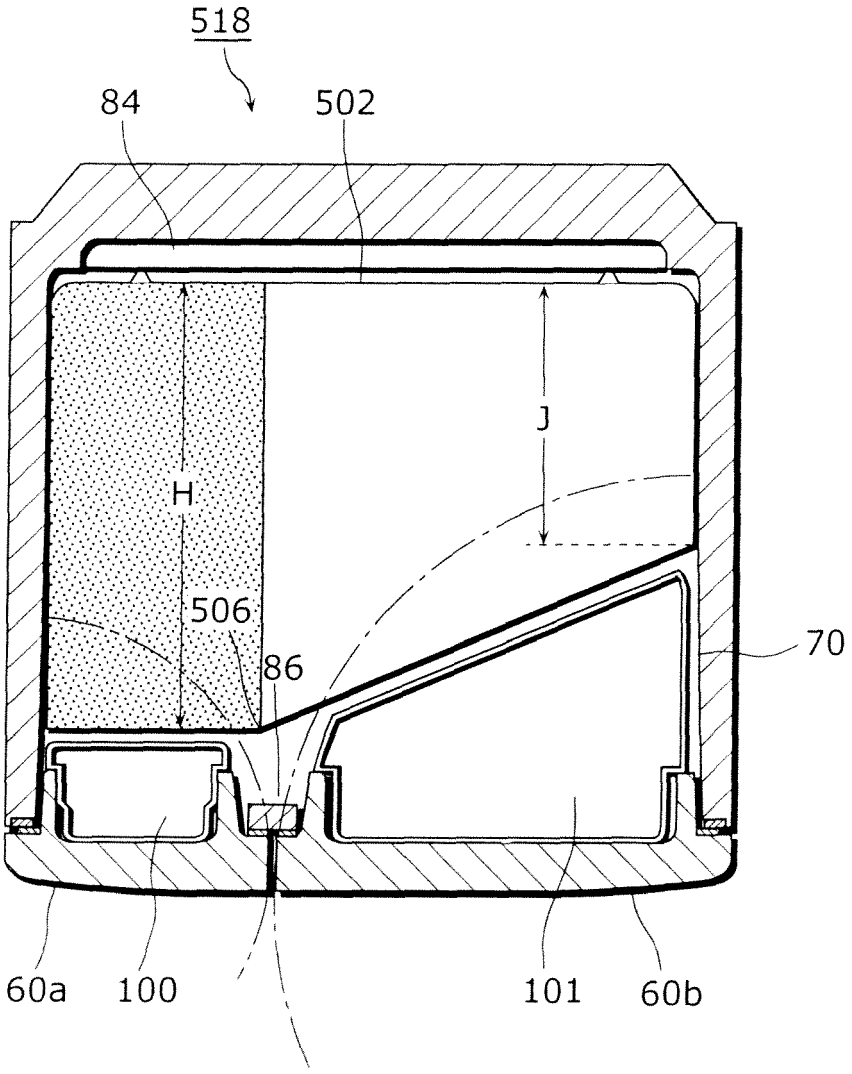

FIG. 59

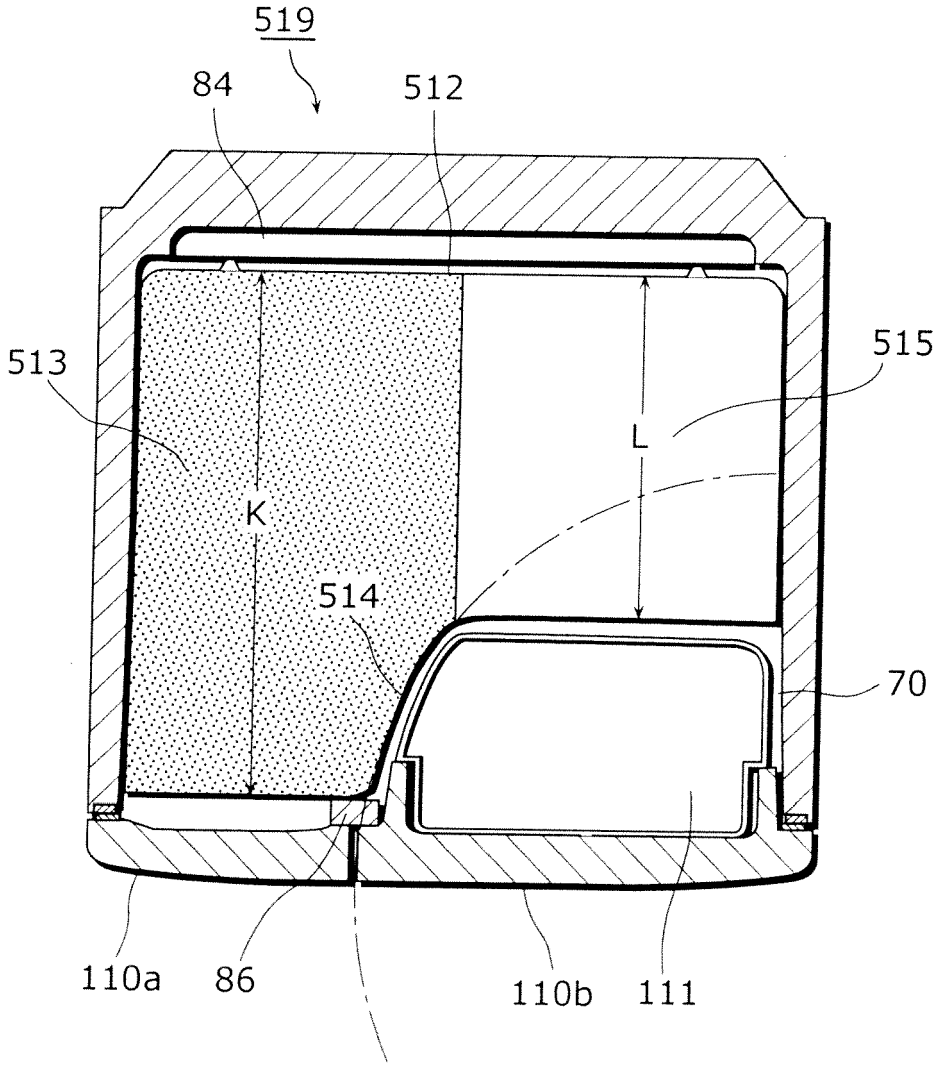

FIG. 60

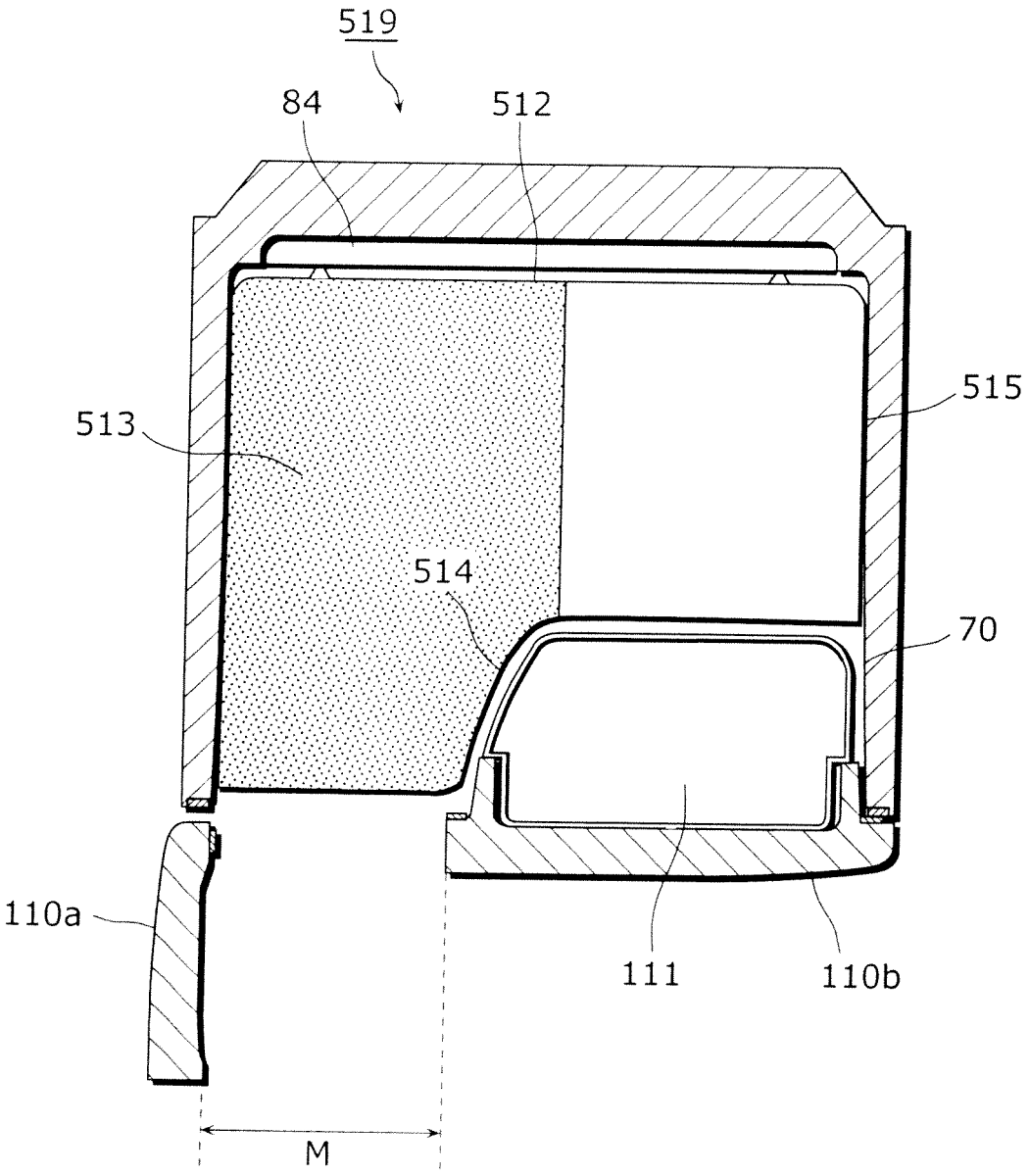

FIG. 61

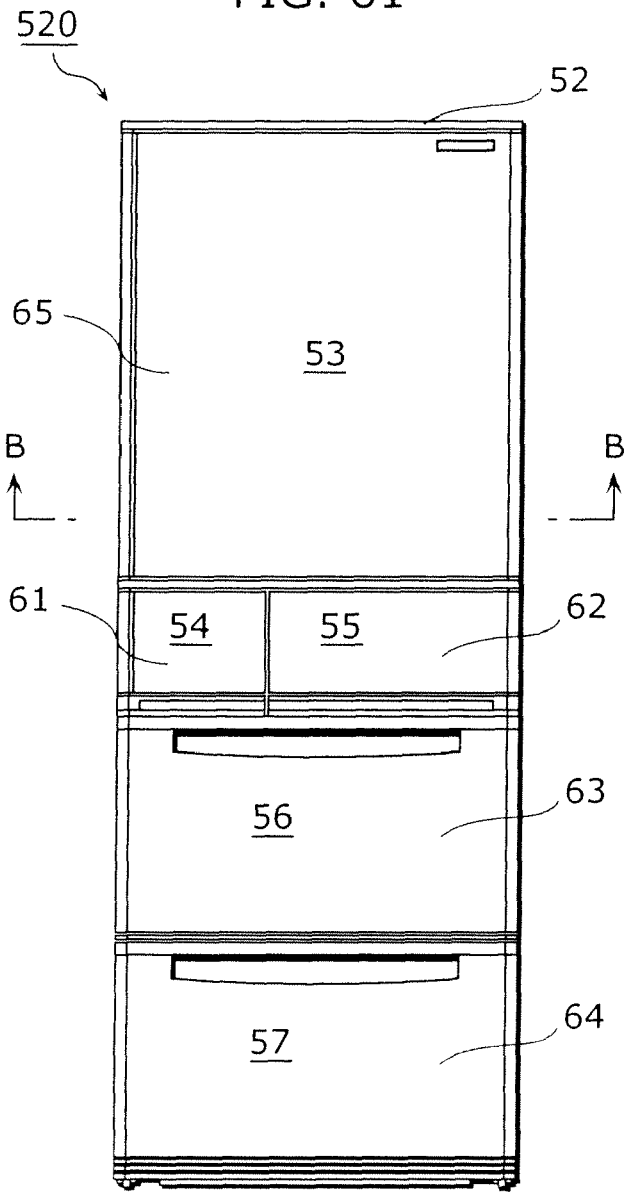

FIG. 62

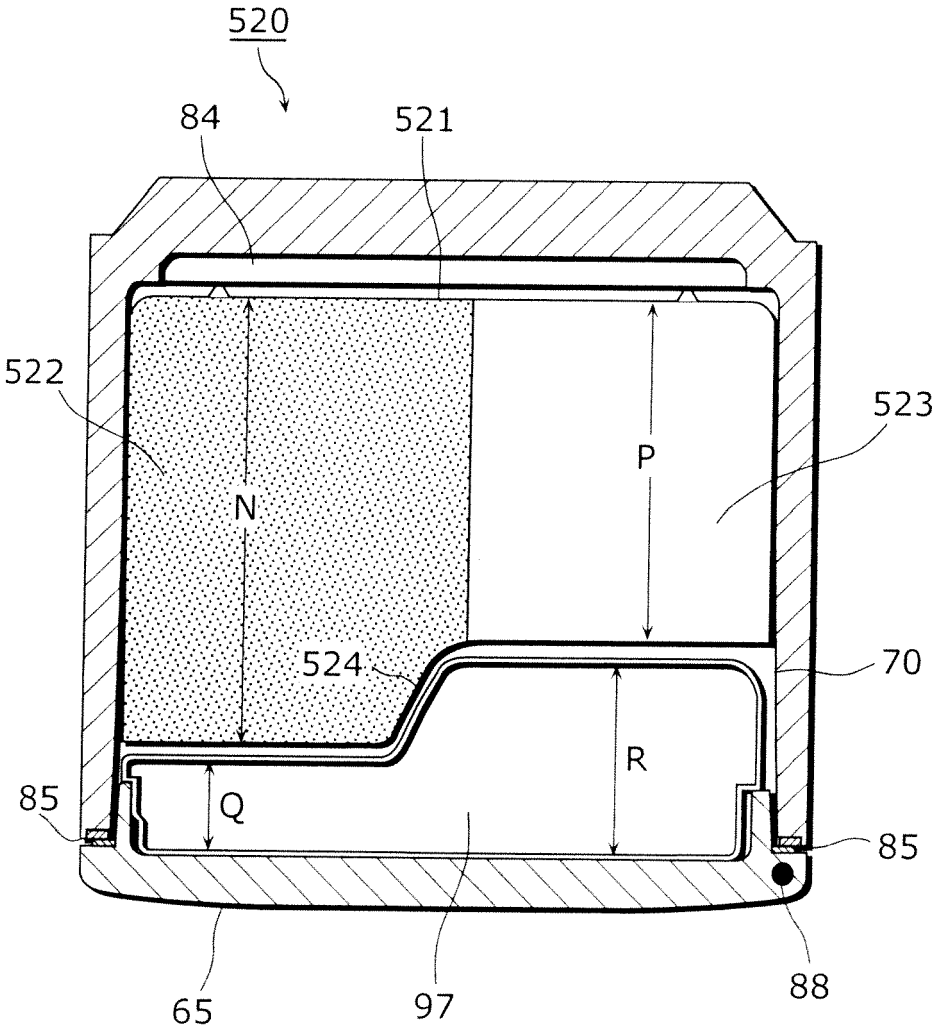

FIG. 63

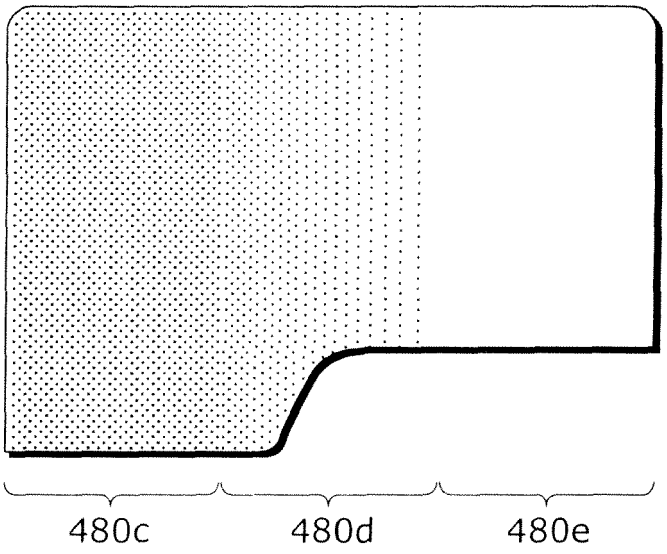

FIG. 64

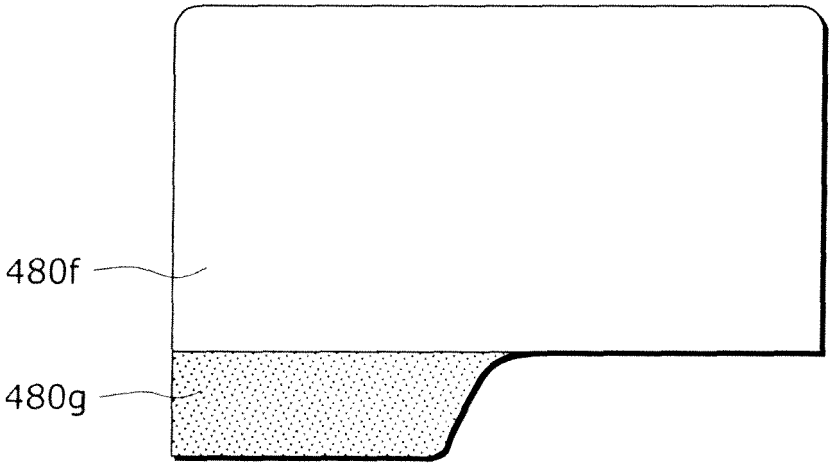

FIG. 65

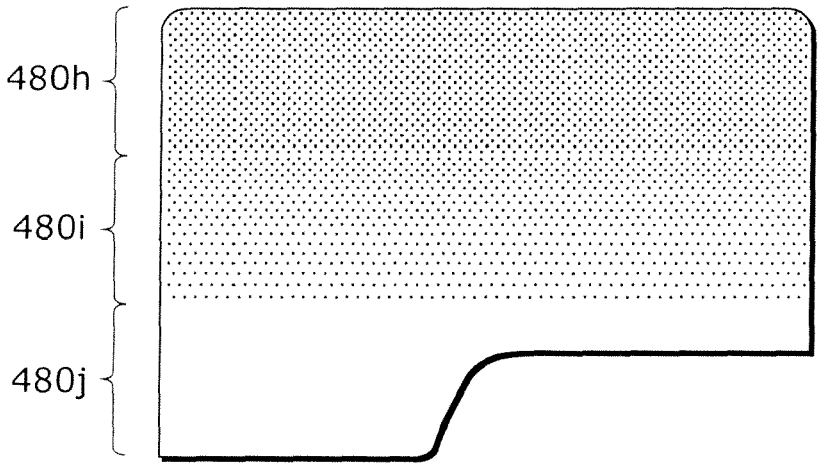

FIG. 66

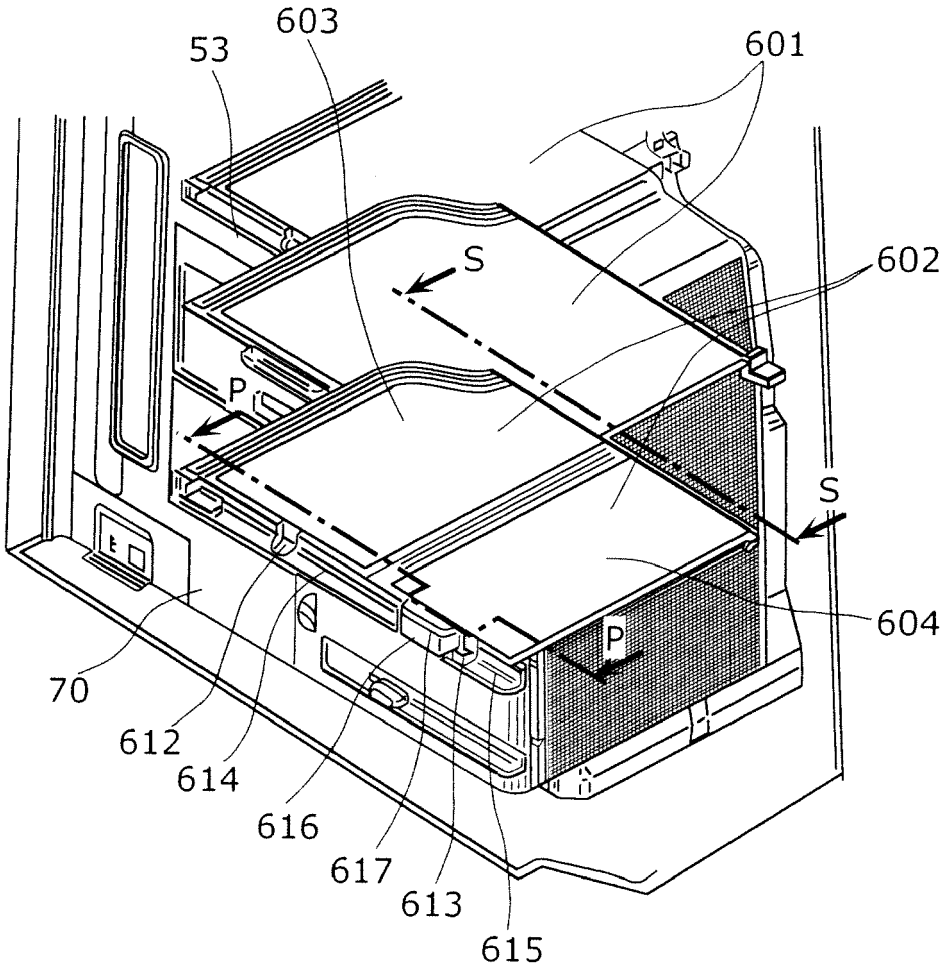

FIG. 67

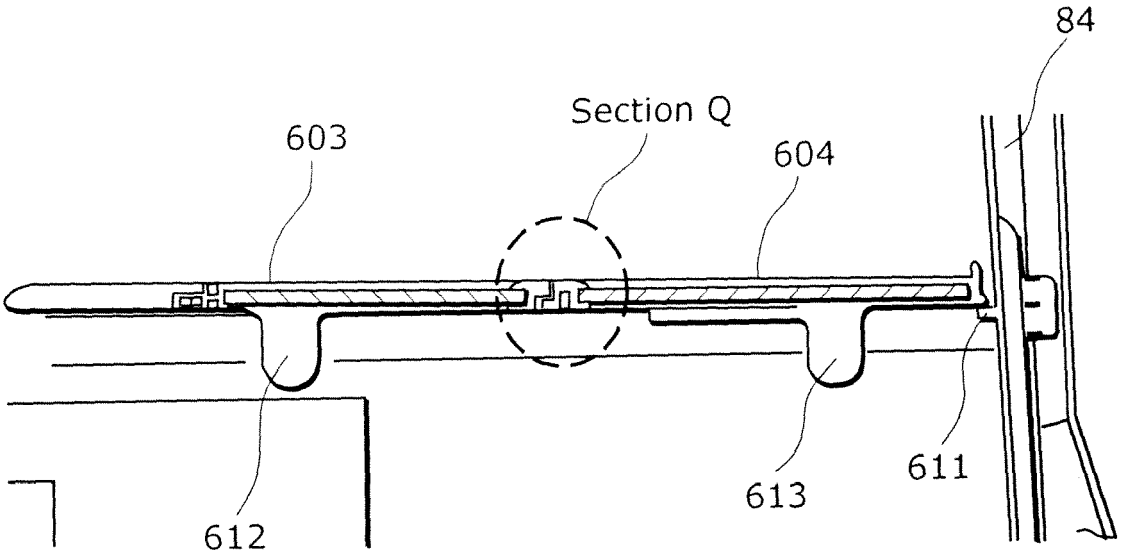

FIG. 68

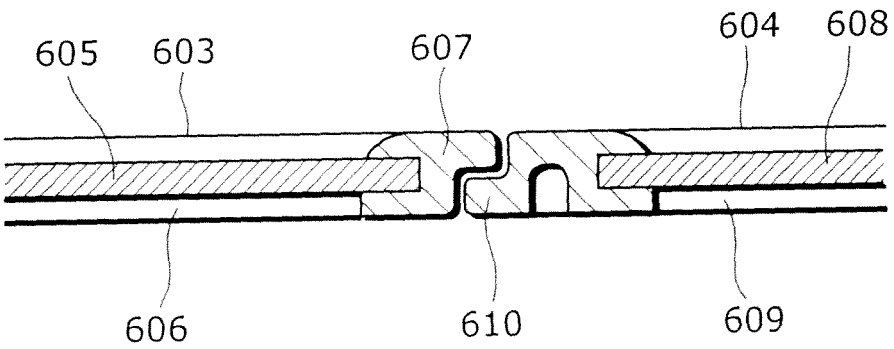

FIG. 69

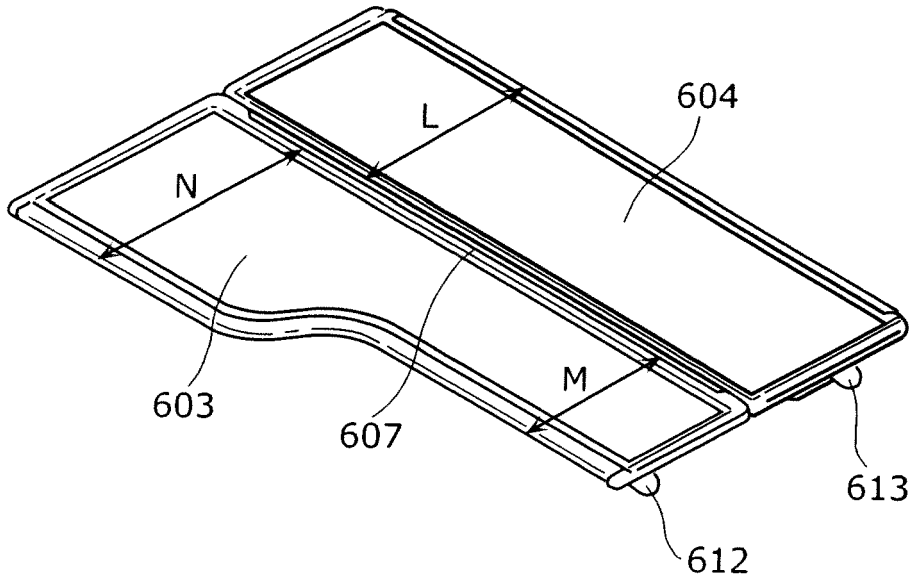

FIG. 70

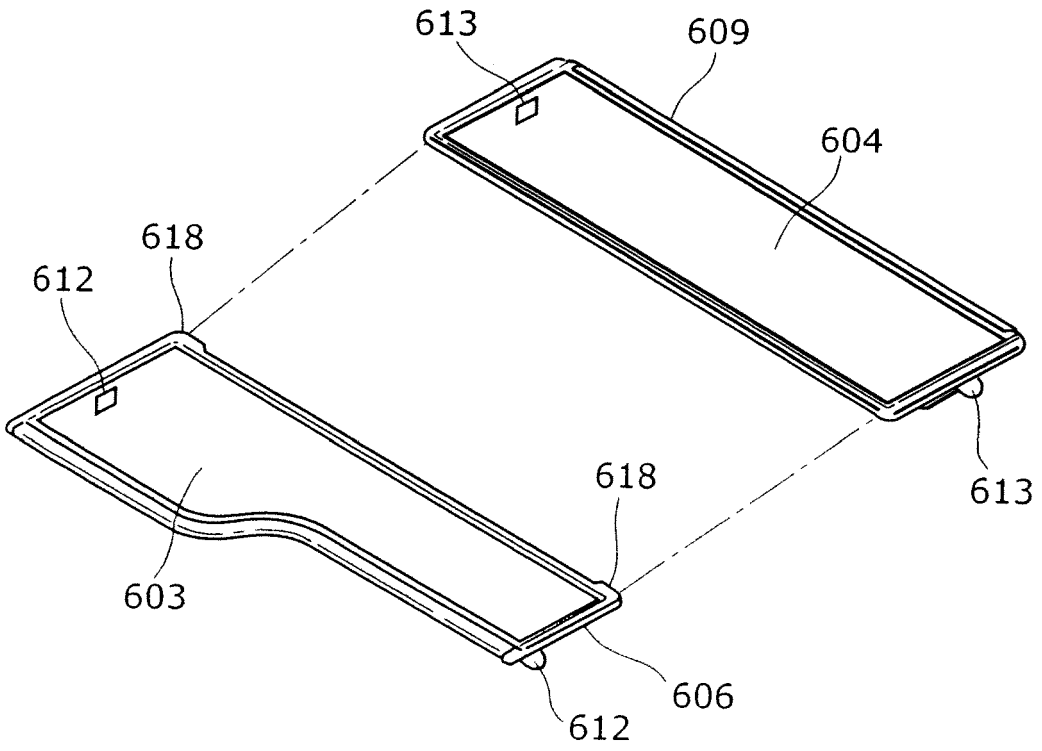

FIG. 71

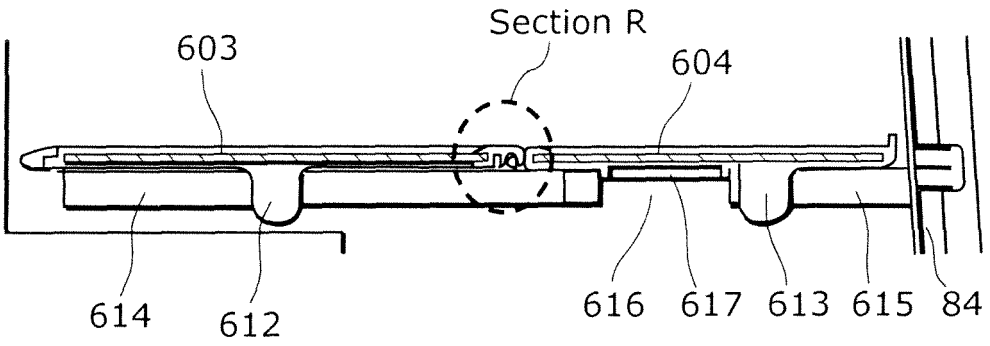
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FIG. 72

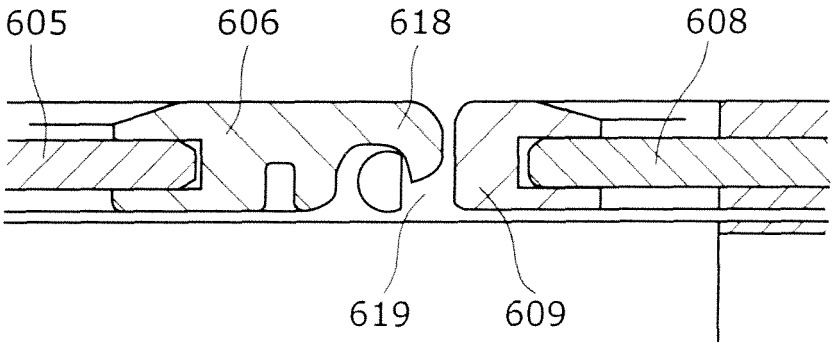
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FIG. 73

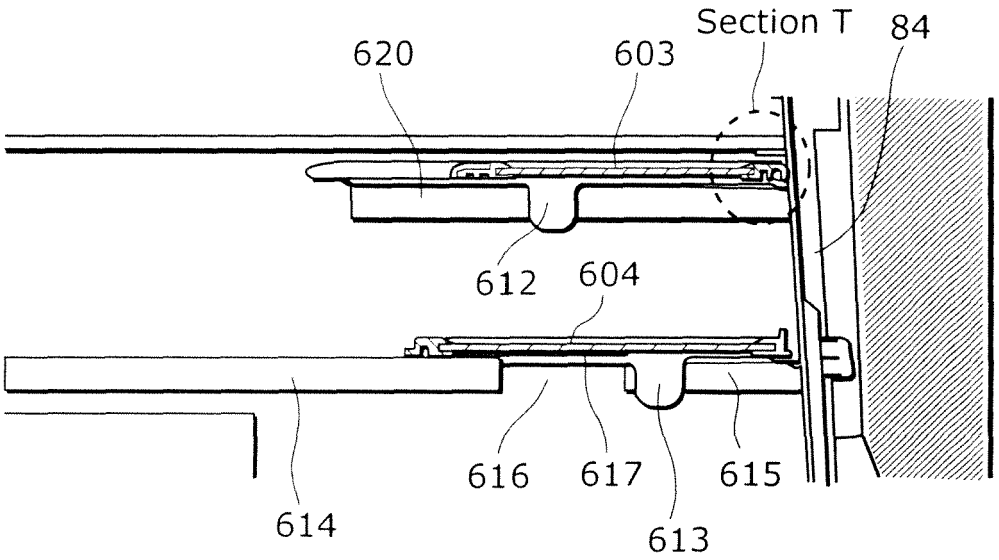
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FIG. 74

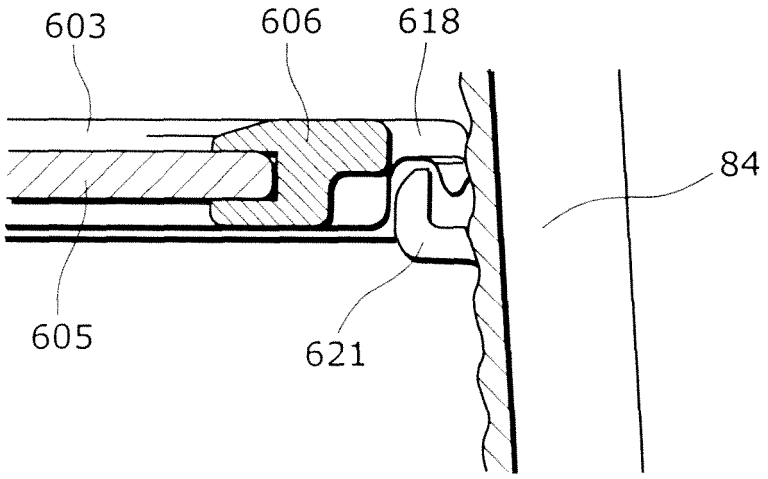
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FIG. 75

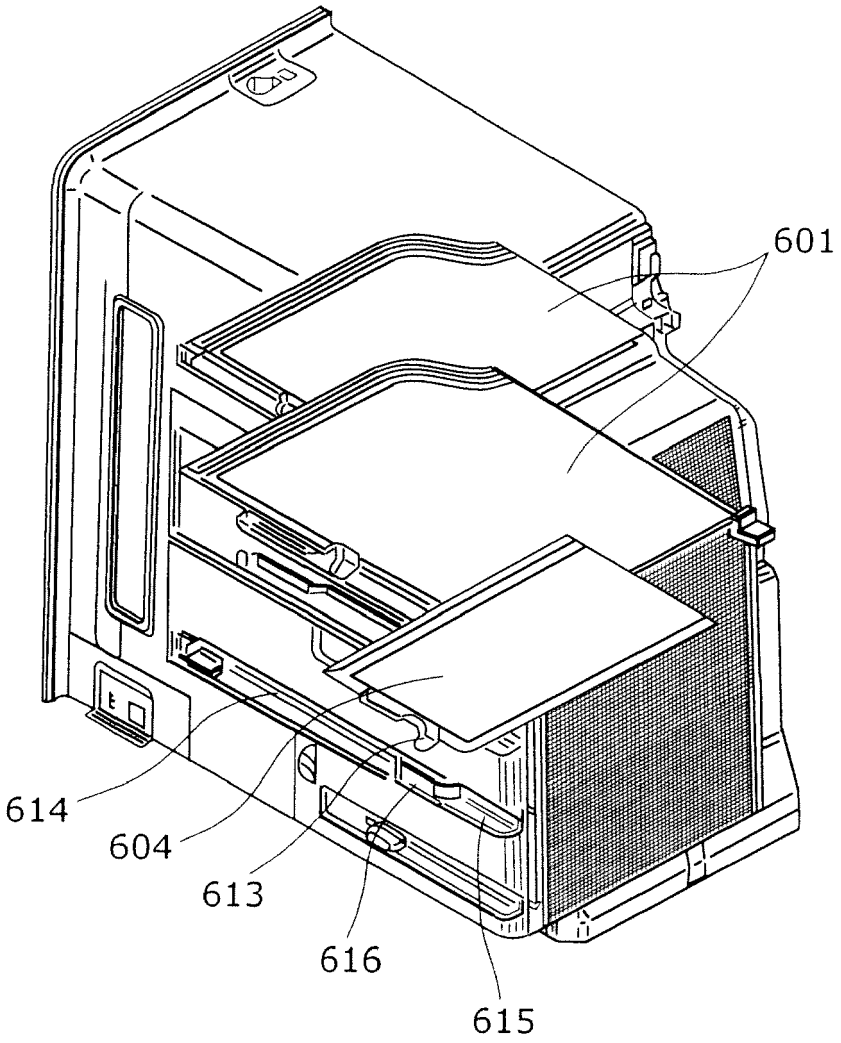


FIG. 76

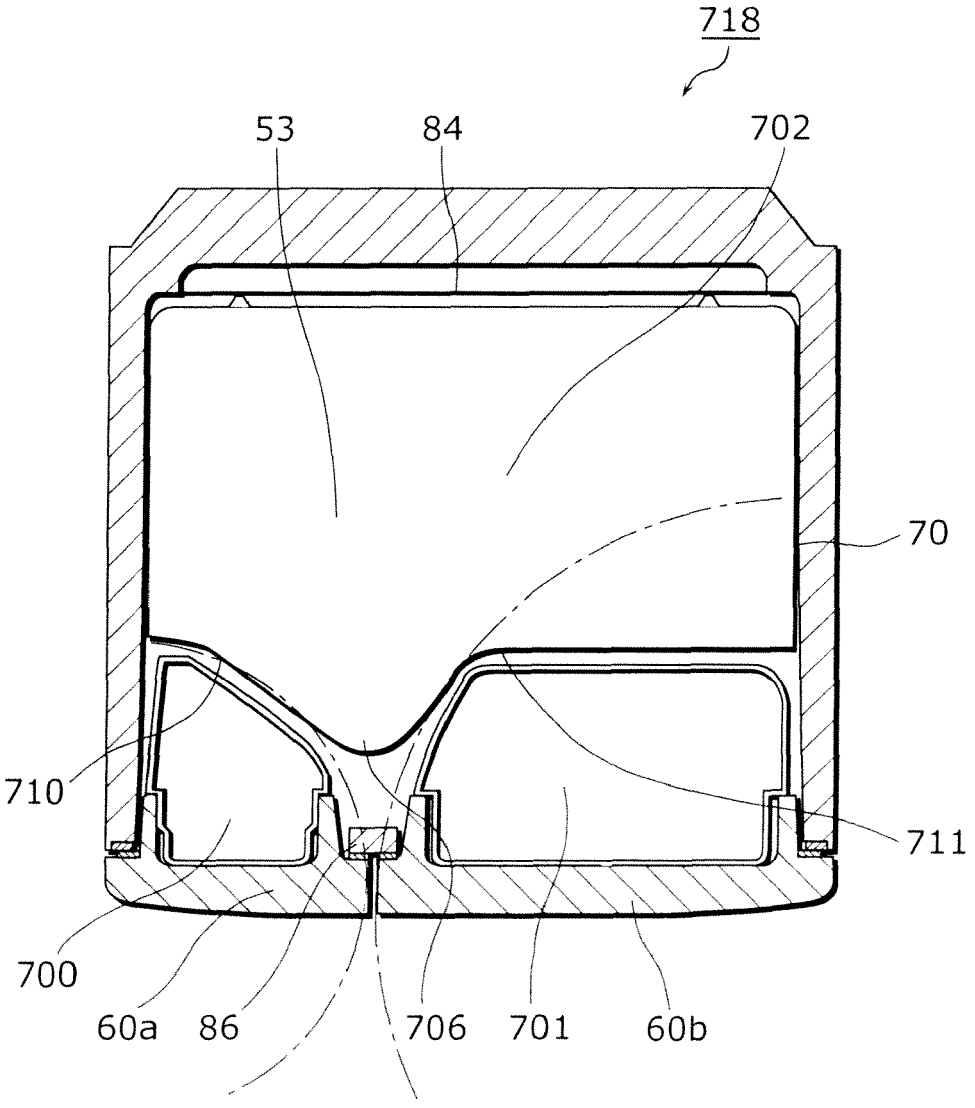


FIG. 77

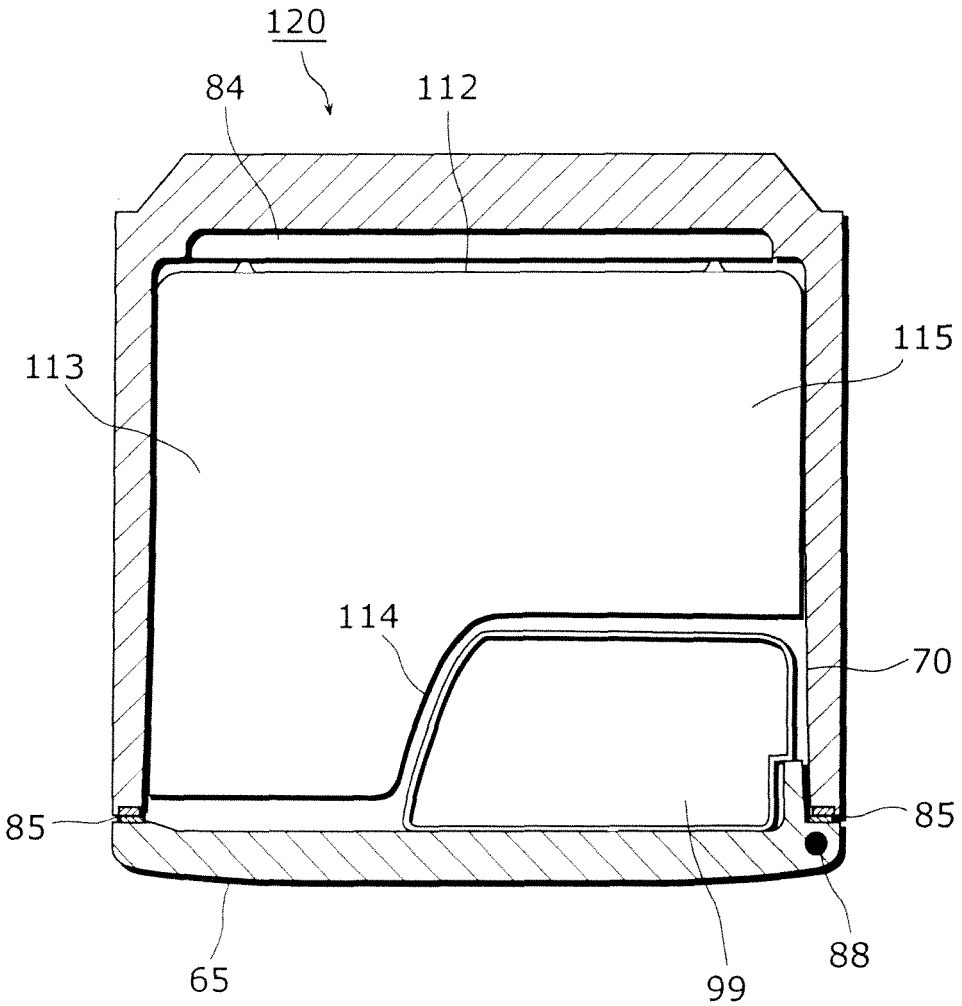
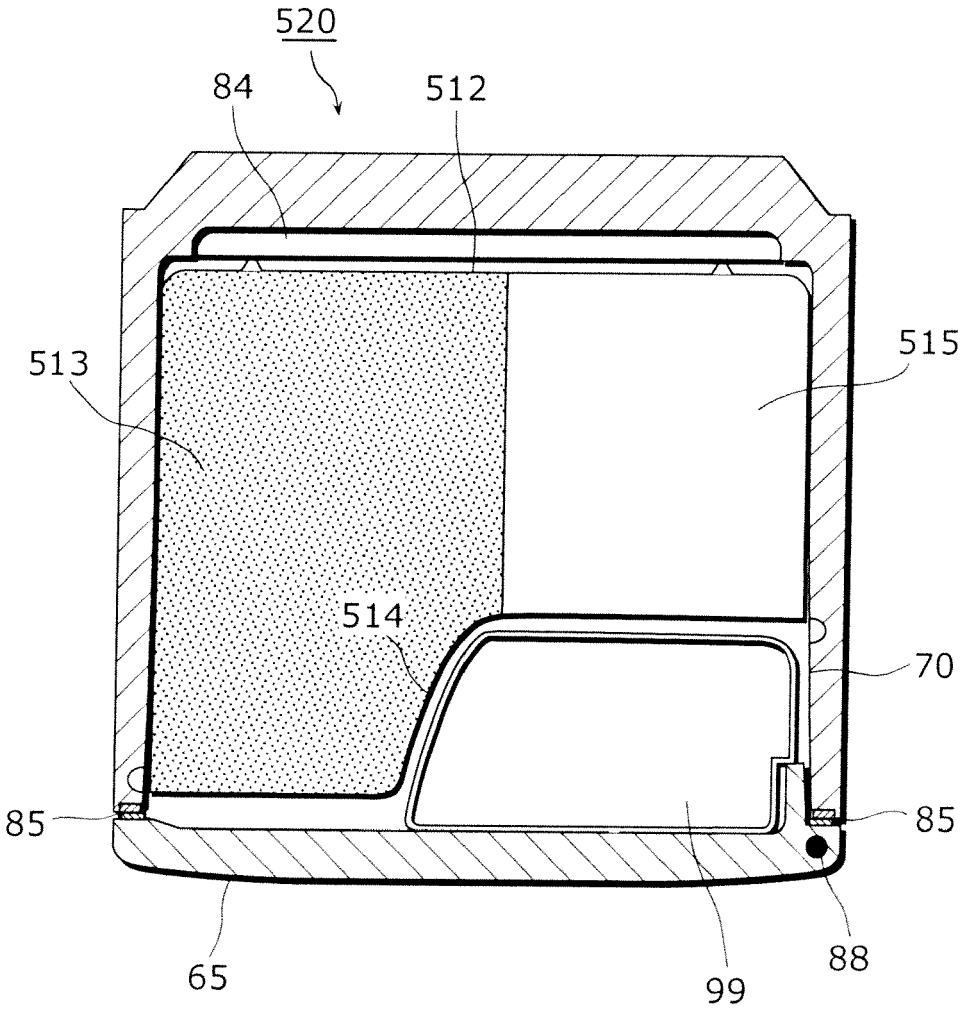


FIG. 78



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Patent documents cited in the description

- JP 2005282897 A **[0013]**