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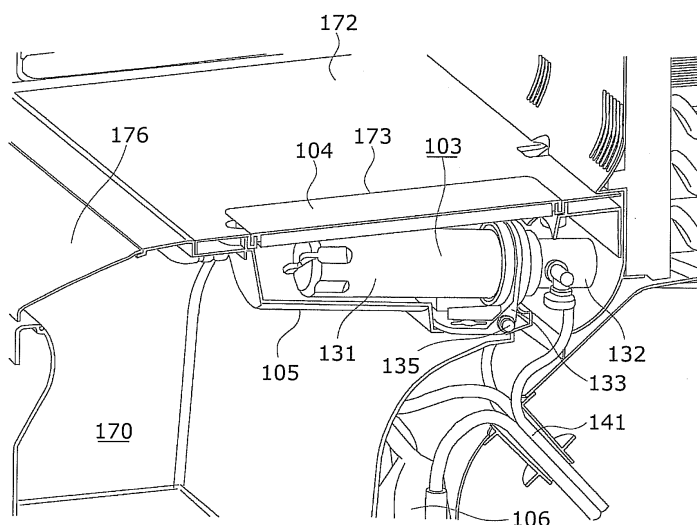
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(54) **REFRIGERATOR**

(57) A refrigerator (100) includes a main body (150) with thermal insulation properties, a liquid cooling device (140) which cools a liquid introduced to an inside of the main body (150), and a purifying device (103) which pu-

rifies a liquid, and further includes a plate (172) which partitions the inside of the main body (150) in a vertical direction, wherein the purifying device (103) is disposed at an upper part of a storage space located below the plate (172).

FIG. 4



Description

[Technical Field]

[0001] The present invention relates to refrigerators, and particularly to a refrigerator which can purify and cool a liquid such as water introduced to inside of the refrigerator.

[Background Art]

[0002] Conventionally, there is a refrigerator which introduces water directly from a water pipe or the like, purifies the water, stores and cools the water in a tank, and supplies the cool water or ice from a supply opening provided on a door.

[0003] For example, Patent Literature (PTL) 1 describes a refrigerator which includes, in a space behind a drawer inside of the refrigerator, a purifying device which purifies water, and a meander-shaped tank which stores water, and supplies water or ice from a supply opening provided on a front door of the refrigerator.

[Citation List]

[Patent Literature]

[0004]

[PTL 1]
US Patent No. 7,216,502

[Summary of Invention]

[Technical Problem]

[0005] Unfortunately, in the refrigerator according to PTL 1, the depth width of the drawer is decreased because the purifying device and the tank are disposed behind the drawer. In other words, the conventional refrigerator sacrifices an effective storage space to dispose the purifying device.

[0006] The present invention has been conceived in view of the above-described problem and has an object to provide a refrigerator which can secure a large effective storage space regardless of the purifying device disposed inside the refrigerator.

[Solution to Problem]

[0007] To solve the above-described problem, the refrigerator according to the present invention is a refrigerator including a main body with thermal insulation properties, a liquid cooling device which cools a liquid introduced to an inside of the main body, and a purifying device which purifies a liquid, and the refrigerator includes a plate which partitions the inside of the main body in a vertical direction, wherein the purifying device is dis-

posed at an upper part of a storage space located below the plate.

[0008] With this, the purifying device is disposed just below the plate that is a storage space inside of the refrigerator but tends to be unused. Thus, it is possible to avoid wasting an effective storage space for the purifying device. In other words, storage items are piled up from a bottom in the storage space and storage items are usually not piled up to an upper part of the storage space. Thus, the purifying device disposed in the upper part of the storage space does not affect much an amount of storage items to be stored.

[0009] It is preferable that the purifying device include: a connecting portion interposed in a liquid path that is a path for a liquid in the liquid cooling device; and a filter assembly which is attachable to and detachable from the connecting portion by moving the filter assembly forward or backward with respect to the refrigerator, the filter assembly including a function of purifying a liquid.

[0010] With this, by replacing only the filter assembly, it is possible to lower the maintenance cost of the purifying device.

[0011] It is preferable that the plate include: a maintenance opening through which the filter assembly can be passed to allow the filter assembly to be attached to and detached from the connecting portion from above the plate; and a lid which closes the maintenance opening.

[0012] With this, filter assembly can be replaced without bending down, allowing the filter assembly to be replaced easily. Further, since the maintenance opening is usually closed by the lid, it is possible to place storage items on the part where maintenance opening is provided.

[0013] Further, it is preferable that the refrigerator include a drawer which has an upper opening closed by the plate to block an entry of cool air from above the plate, the drawer being disposed in a space below the plate.

[0014] Particularly in the case of a drawer that is slid forward or backward to put in or take out storage items, an upper part of the drawer is usually not filled with storage items. Thus, by disposing the purifying device at the upper part of the drawer, it is possible to use the storage space effectively.

[0015] It is preferable that the plate hold the purifying device.

[0016] This allows an attachment of the purifying device to be easy as compared to the case where the purifying device is attached to the main body directly.

[0017] It is preferable that the connecting portion is suspended from the plate.

[0018] With this, the filter assembly can be attached to and detached from the connecting portion just by moving the filter assembly forward or backward with respect to the plate. Thus, it is easy to replace the filter assembly.

[0019] It is preferable that the purifying device include a housing which is suspended from the plate.

[0020] With this, it is possible to protect the purifying device against impact when storage items are put in to

or taken out from the storage space.

[0021] It is preferable that the liquid cooling apparatus include a valve device which is disposed on an outer side of a back part of the main body and controls a flow of a liquid, and the valve device and the purifying device are disposed at a substantially same height.

[0022] With this, the length of the pipe that extends in the main body is short. Thus, it is possible to suppress the decrease in the thermal insulation properties of the main body.

[Advantageous Effects of Invention]

[0023] According to the present invention, a purifying device is disposed in the storage space without wasting an effective storage space.

[Brief Description of Drawings]

[0024]

[FIG. 1] FIG. 1 is a perspective view showing an external appearance of a refrigerator.

[FIG. 2] FIG. 2 is a perspective view showing an external appearance of the refrigerator with a first door and a second door open.

[FIG. 3] FIG. 3 is a perspective view showing a lower part of a first body.

[FIG. 4] FIG. 4 is a cut-out perspective view showing a storage space located below a plate.

[FIG. 5] FIG. 5 is a perspective view showing, from above, a plate with a lid removed.

[FIG. 6] FIG. 6 is a perspective view showing how a filter assembly is attached and detached.

[FIG. 7] FIG. 7 is a perspective view showing a valve device.

[FIG. 8] FIG. 8 is a diagram schematically showing a positional relationship in terms of height between a purifying device and the valve device.

[FIG. 9] FIG. 9 is a diagram schematically showing a liquid cooling device.

[FIG. 10] FIG. 10 is a perspective view showing a state in which a drawer is removed to show a tank.

[FIG. 11] FIG. 11 is a perspective view showing an other example of a tank.

[FIG. 12] FIG. 12 is a plan view showing, from main body side, a lower part of the first door.

[Description of Embodiment]

[0025] Next, an embodiment of a refrigerator according to the present invention is described with reference to the drawings.

[0026] FIG. 1 is a perspective view showing an external appearance of a refrigerator.

[0027] A refrigerator 100 is an apparatus for chilling or freezing and preserving a storage item placed inside, and includes a main body 150, a first door 111, a second door

121, a third door 112, a through hole 113, and a fourth door 122. The refrigerator 100 is a rectangular box-shaped body whose height is largest of height, width, and depth.

[0028] The first door 111 is a door which covers the opening on the right when facing the main body 150, with flexibility in opening and closing. In this embodiment, the first door 111 is attached to the main body 150 using a hinge (not shown) so as to turn back and forth centering on a vertical axis that extends in an anterior portion of the right-side wall of the main body 150. In addition, the first door 111 is in the form of a rectangle which is long in the vertical direction, and disposed so as to extend from top to bottom of the refrigerator 100, with the above axis extending along the right-edge rim of the first door 111.

[0029] The second door 121 is a door which covers the opening on the left when facing the main body 150, with flexibility in opening and closing. In this embodiment, the second door 121 is attached to the main body 150 using a hinge (not shown) so as to turn back and forth centering on a vertical axis that extends in an anterior portion of the left-side wall of the main body 150. In addition, the second door 121 is in the form of a rectangle which is long in the vertical direction, and disposed so as to extend from top to bottom of the refrigerator 100, with the above axis extending along the left-edge rim of the second door 121.

[0030] The through hole 113 is a hole penetrating through the first door 111 in the thickness direction. The through hole 113 is a hole through which a storage item stored behind the first door 111 is taken out or through which a storage item is put for storage behind the first door 111, without opening the first door 111.

[0031] The third door 112 is a door which covers the through hole 113 with flexibility in opening and closing. In this embodiment, the third door 112 is attached to the first door 111 using a hinge (not shown) so as to turn back and forth centering on a horizontal axis that extends at the lower end of the through hole 113. In addition, the third door 112 is square in shape as viewed from the front (round-cornered), with the above axis extending along the lower-end rim of the third door 112.

[0032] The fourth door 122 is a door that opens and closes at a supply opening 123 of a dispenser. The dispenser supplies drink such as water that is cooled by an after-mentioned liquid cooling device and ice or the like.

[0033] FIG. 2 is a perspective view showing an external appearance of the refrigerator with the first door and the second door open.

[0034] FIG. 2 shows also a storage item A stored in the refrigerator 100.

[0035] As shown in these figures, the refrigerator 100 includes a first body 151, a second body 152, and an outer case 156.

[0036] The first body 151 is a vertically-long heat-insulating body having an opening in the front face and defining a refrigerator compartment. In this embodiment,

the first body 151 is disposed on the right in the refrigerator 100 so as to extend entirely from top to bottom of the refrigerator 100. The refrigerator compartment is a compartment having a temperature inside maintained in the temperature range of no lower than 0 degree C.

[0037] The second body 152 is a vertically-long heat-insulating body having an opening in the front face and defining a freezer compartment. In this embodiment, the second body 152 is disposed on the left in the refrigerator 100 so as to extend entirely from top to bottom of the refrigerator 100. The freezer compartment is a compartment having a lower temperature than a temperature of the refrigerator compartment, maintained at around minus 18 degrees C, and storing a storage item such as a frozen food.

[0038] The outer case 156 is a metal plate covering the first body 151 and the second body 152 which are arranged next to each other in the horizontal direction.

[0039] The main body 150 in this embodiment is manufactured as follows. That is, each of the refrigerator compartment and the freezer compartment separated by a partition 153 is independently manufactured with resin in solid casting. Outside the inner case 157, the outer case 156 is disposed so as to cover the inner case 157 with a predetermined gap between the outer case 156 and the inner case 157. Inside the partition 153, there is also a gap which is communicated with the gap located between the outer case 156 and the inner case 157. Into the gap located between the outer case 156 and the inner case 157 and into the gap of the partition 153, rigid urethane foams or the like are injected and foamed to serve as a heat insulating material, for example. Thus, the main body 150 is manufactured.

[0040] Consequently, in this embodiment, the wall between the first body 151 and the second body 152 is inseparable, which means that the first body 151 and the second body 152 share the partition 153 as a wall part.

[0041] FIG. 3 is a perspective view showing a lower part of the first body.

[0042] As shown in FIG. 2 and FIG. 3, the first body 151 includes a plate 172 and, below the plate 172, a drawer 170. Furthermore, the first body 151 includes, above the plate 172, a second drawer 117.

[0043] The plate 172 is a plate-shaped member that partitions an inside of the first body 151, which is a part of the main body 150, in a vertical direction. The plate 172 closes an upper opening of the drawer 170, and thus prevents a cool air flow that is present above the plate 172 from directly flowing into an inside of the drawer 170. The plate 172 is a member provided to span across both side walls of the first body 151, and which permanently partitions the first body 151 into an upper space and a lower space.

[0044] In this embodiment, the plate 172 includes a flap 176 in a front. The flap 176 is a movable member which is provided in the front part of the plate 172 so as to extend in an entire width direction of the plate 172. The flap 176 is a member that rotates to allow a front part

of the flap 176 to swing upwardly when the drawer 170 is pulled out. With this, storage items can be easily taken out and put in even when the drawer 170 is pulled out only a little. Furthermore, the flap 176 is formed by transparent resin, and thus the storage items in the drawer 170 can be seen through from above the drawer 170.

[0045] The drawer 170 is a box-like member having an upper opening closed by the plate 172 when inserted in a space below the plate 172. The drawer 170 is detachable from the main body 150. With the plate 172, the cool air does not enter into the drawer 170 from the above. Thus the items stored in the drawer 170 are not directly exposed to the cool air that circulates inside the first body 151. Furthermore, it is possible to maintain humidity inside the drawer 170. Thus, the drawer 170 is suitable for storing vegetables and fruits raw, and sometimes referred to as a vegetable compartment. In this embodiment, the drawer 170 is formed by transparent (translucent) resin. In this way, it is possible to increase visibility of items stored in the drawer 170.

[0046] FIG. 4 is a cut-out perspective view showing a storage space below the plate.

[0047] As shown in the figure, at the upper part of the storage space located below the plate 172, a purifying device 103 is disposed. The purifying device 103 includes a filter assembly 131, a connecting portion 132, and a housing 105. Furthermore, the plate 172 includes a maintenance opening 173 to which a lid 104 is provided.

[0048] The purifying device 103 is a device which purifies water introduced to inside of the main body 150. This embodiment employs, as the purifying device 103, a device which filters water with a bundle of hollow fibers and absorbs impurities by letting water flow through activated carbon.

[0049] The connecting portion 132 is equipment interposed in a liquid path 141 which is a path for water in a liquid cooling device (described later). The connecting portion 132 includes a function of introducing water that passes through the liquid path 141 into the filter assembly 131, and introducing the water that has been purified by passing through the filter assembly 131 back to the liquid path 141. In addition, the connecting portion 132 is attached, via a mounting bracket 133 that includes a tilting mechanism using a hinge, to the housing 105. With this, the connecting portion 132 is attached such that the connecting portion 132 is suspended from the plate 172 via the mounting bracket 133.

[0050] The filter assembly 131 is equipment which includes a function of purifying water. In this embodiment, the filter assembly 131 includes the bundle of hollow fibers for filtering water and the activated carbon for absorbing impurities included in water. Furthermore, the filter assembly 131 is attachable to and detachable from the connecting portion 132 by moving the filter assembly forward or backward with respect to the refrigerator 100. Note that, after the filter assembly 131 is inserted to the connecting portion 132, the filter assembly 131 is rotated with respect to the connecting portion 132 so that a thread

provided in the filter assembly 131 and a thread provided in the connecting portion 132 are engaged. Thus, the filter assembly 131 is fixed to the connecting portion 132.

[0051] The housing 105 is a box-like member which is attached such that the housing 105 is suspended from the plate 172. In this embodiment, the housing 105 is in a form that can surround the filter assembly 131 and the connecting portion 132. An upper part of the housing 105 is open. The housing 105 prevents the storage items stored in the drawer 170 from directly hitting and impacting the filter assembly 131 and the connecting portion 132 when the drawer 170 is being pulled out or inserted. In addition, the connecting portion 132 is attached to the housing 105 via the mounting bracket 133. The filter assembly 131 is attached to the connecting portion 132. Furthermore, the mounting bracket 133 is axially supported by the housing 105 with a mounting shaft 135 in a manner that allows tilting. Thus, the filter assembly 131 is attached to the housing 105 such that the filter assembly 131 can tilt together with the mounting bracket 133 centering the mounting shaft 135.

[0052] FIG. 5 is a perspective view showing, from above, the plate with the lid removed.

[0053] As shown in the figure, the maintenance opening 173 is a hole that runs through the plate 172 and is in a size through which the filter assembly 131 can be passed. Through the maintenance opening 173, the filter assembly 131 is attachable to and detachable from the connecting portion 132 from above the plate 172.

[0054] The lid 104 fits into the maintenance opening 173 to be flush with the plate 172.

[0055] FIG. 6 is a perspective view showing how the filter assembly is attached and detached.

[0056] As shown in the figure, when a tip of the filter assembly 131 is lifted upwardly, the mounting bracket 133 is also lifted up due to hinge mechanism of the mounting shaft 135, and a tip of the filter assembly 131 protrudes above the plate 172. Thus, the filter assembly 131 can be easily attached to and detached from the connecting portion 132 by moving the filter assembly 131 in the direction indicated by an arrow.

[0057] As described, the purifying device 103 is attached such that the purifying device 103 is suspended from the plate 172. Thus, the purifying device 103 is disposed without affecting much the storage space inside the drawer 170. Furthermore, since the maintenance opening 173 is provided in the plate 172, the filter assembly 131 can be replaced from above the plate 172. Thus, it is possible to replace the filter assembly 131 in a comfortable posture. Furthermore, the maintenance opening 173 is usually closed by the lid 104. Thus, it is possible to place storage items on the plate 172 and the lid 104.

[0058] FIG. 7 is a perspective view showing a valve device.

[0059] A valve device 142 shown in the figure is a device which controls a flow of water introduced to an inside of the refrigerator 100, and is attached to an outer side

of a back part of the main body 150. In this embodiment, the valve device 142 includes: a gate valve 143 which is connected to a water pipe and can select whether or not to introduce water from the water pipe; and a three way valve 144 which can determine whether to let the introduced water to flow in a path for cooling or in a path for producing ice. The three way valve 144 includes an electric component 144a which is placed on the three way valve 144 and controls a flow path. Furthermore, in an upper part of connecting portions where the liquid paths 141 and 147 are connected to a bottom part of the three way valve 144, a cover member 148 that is larger than a projected area of the three way valve 144 is disposed. Thus, even when water leakage occurs at the connecting portions, the cover member 148 prevents water from spilling onto the electric component 144a, and thus safety is enhanced.

[0060] FIG. 8 is a diagram schematically showing a positional relationship in terms of height between the purifying device and the valve device; (a) shows a lateral view and (b) shows a top view.

[0061] As shown in (a) in the figure, the valve device 142 and the purifying device 103 are disposed at the substantially same height. With this, even in a state where the filter assembly 131 is detached from the connecting portion 132, it is possible to suppress water that remains in the liquid path 141 from spilling out from the connecting portion 132. Furthermore, in this embodiment, as shown in (b) in the figure, a position of the valve device 142 and the purifying device 103 in the horizontal direction is also substantially the same. With this, a length of the liquid path 141 penetrating the main body 150 is short, and thus it is possible to suppress a deterioration of thermal insulation properties of the main body 150.

[0062] FIG. 9 is a diagram schematically showing the liquid cooling device.

[0063] As shown in the figure, a liquid cooling device 140 includes a tank 145 and an ice maker 146.

[0064] The water supplied from a water pipe W is, via the gate valve 143 located outside the refrigerator 100, supplied to the purifying device 103 located inside the refrigerator 100. The water purified by the purifying device 103 is introduced to the outside of the refrigerator 100 and supplied to the three way valve 144. A path of water is selected by the three way valve 144 and, for example, water flows through the liquid path 141 and supplied to the ice maker 146. The ice maker 146 transforms water purified by the purifying device 103 into ice and stores the ice. The stored ice can be arbitrarily taken out from the supply opening 123. On the other hand, water flows through the liquid path 147 and supplied to the tank 145. The tank 145 is a member which stores the water purified by the purifying device 103. The stored water can be arbitrarily taken out from the supply opening 123.

[0065] FIG. 10 is a perspective view showing a state in which the drawer is removed to show the tank.

[0066] As shown in the figure, the tank 145 is a con-

tainer which has a meandering shape and thin thickness, and is disposed behind the drawer 170 inside of the main body 150. When the tank 145 is disposed in the thus described position, the cool air that flows avoiding the drawer 170 hits the tank 145 directly. As a result, the water stored in the tank 145 can be efficiently cooled. Furthermore, because a depth of the tank 145 is thin as compared to the purifying device 103, the tank 145 does not affect capacity of the storage space so much. Furthermore, the tank 145 is in the meandering shape such that stagnation of water is suppressed and the cooled water is sequentially supplied.

[0067] As shown in the figure, it is preferable that a path of the liquid path 141 which connects the tank 145 to the ice maker 146 and the supply opening 123 be selected to be short by allowing the liquid path 141 to be taken from an inside of the main body 150 to an outside, to pass the outside of the refrigerator 100 to be inserted to the hinge of the second door 121. In this way, it is possible to prevent, as much as possible, the water from freezing in the liquid path 141 and clogging the liquid path 141.

[0068] Note that, alternatively, the tank 145 may be disposed at the bottom of the first body 151, that is, below the drawer 170 as shown in FIG. 11. In this way, it is possible to further increase a dimension of depth of the drawer 170 to increase the storage space.

[0069] FIG. 12 is a plan view showing, from main body side, a lower part of the first door.

[0070] As shown in the figure, the purifying device 103 is disposed at the lower part of the first door 111. Furthermore, the purifying device 103 may be covered by the housing 105. With this, the filter assembly 131 can be replaced easily in a comfortable posture without opening the drawer 170.

[Industrial Applicability]

[0071] The present invention is applicable to refrigerators, and particularly to a refrigerator which supplies ice and cold water and includes a plate which partitions storage space in a vertical direction.

[Reference Signs List]

[0072]

100 Refrigerator
103 Purifying device
104 Lid
105 Housing
111 First door
112 Third door
113 Through hole
117 Second drawer
121 Second door
122 Fourth door
123 Supply opening

131 Filter assembly
132 Connecting portion
133 Mounting bracket
135 Mounting shaft
140 Liquid cooling device
141 Liquid path
142 Valve device
143 Gate valve
144 Three way valve
144a Electric component
145 Tank
146 Ice maker
147 Liquid path
148 Cover member
150 Main body
151 First body
152 Second body
153 Partition
156 Outer case
157 Inner case
170 Drawer
172 Plate
173 Maintenance opening
176 Flap

Claims

1. A refrigerator which includes a main body with thermal insulation properties, a liquid cooling device which cools a liquid introduced to an inside of said main body, and a purifying device which purifies a liquid, said refrigerator comprising a plate which partitions the inside of said main body in a vertical direction, wherein said purifying device is disposed at an upper part of a storage space located below said plate.
2. The refrigerator according to Claim 1, wherein said purifying device includes:
 - a connecting portion interposed in a liquid path that is a path for a liquid in said liquid cooling device; and
 - a filter assembly which is attachable to and detachable from said connecting portion by moving said filter assembly forward or backward with respect to said refrigerator, said filter assembly including a function of purifying a liquid.
3. The refrigerator according to Claim 2, wherein said plate includes:
 - a maintenance opening through which said filter assembly can be passed to allow said filter assembly to be attached to and detached from said connecting portion from above said plate; and
 - a lid which closes said maintenance opening.

4. The refrigerator according to any one of Claim 1 to Claim 3, further comprising
a drawer which has an upper opening closed by said
plate to block an entry of cool air from above said
plate, said drawer being disposed in a space below said plate. 5
5. The refrigerator according to Claim 1,
wherein said plate holds said purifying device. 10
6. The refrigerator according to Claim 5,
wherein a connecting portion is suspended from said
plate.
7. The refrigerator according to Claim 1, 15
wherein said purifying device includes
a housing which is suspended from said plate.
8. The refrigerator according to Claim 1, 20
wherein said liquid cooling device includes
a valve device which is disposed on an outer side of
a back part of said main body and controls a flow of
a liquid, and
said valve device and said purifying device are dis-
posed at a substantially same height. 25

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FIG. 1

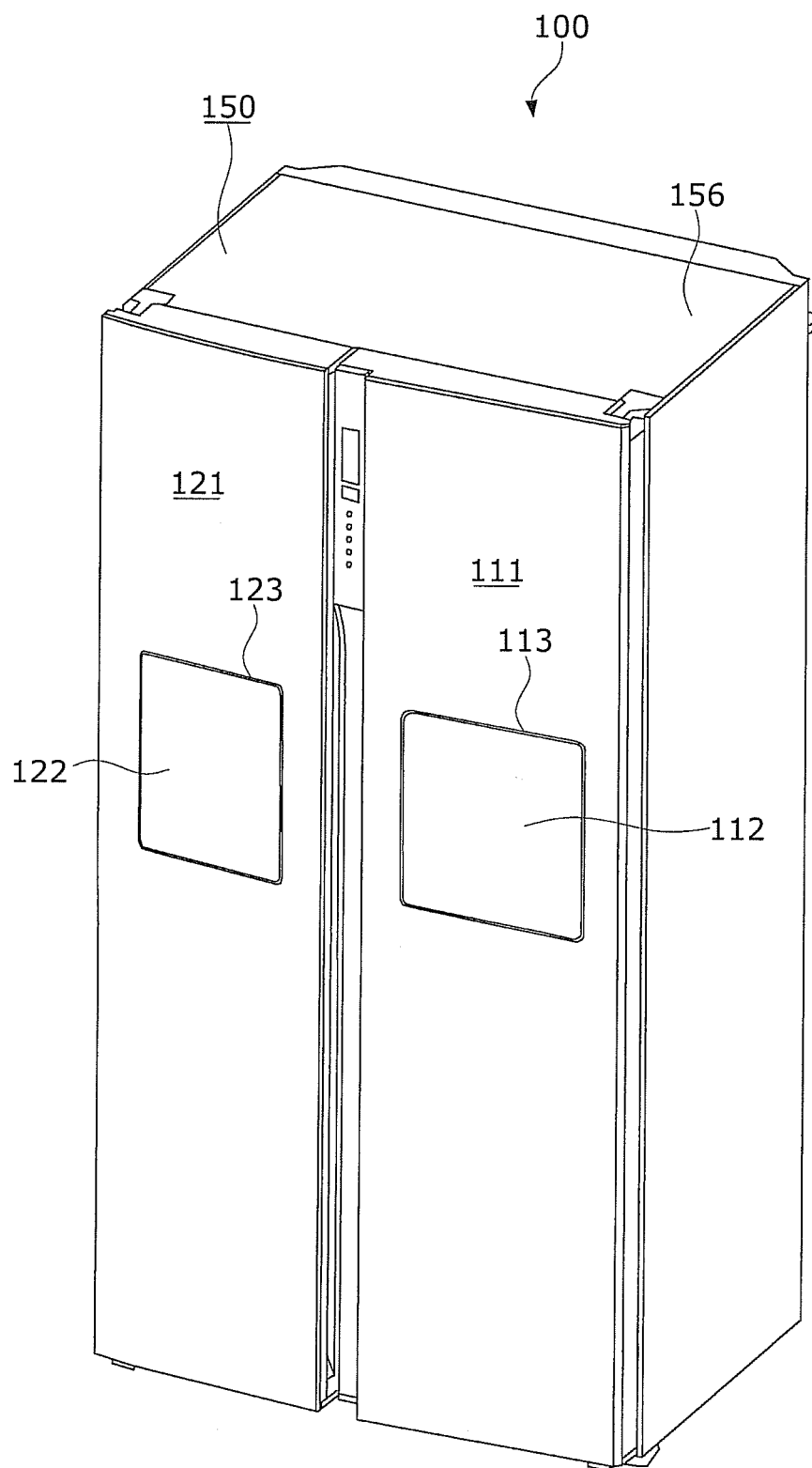


FIG. 2

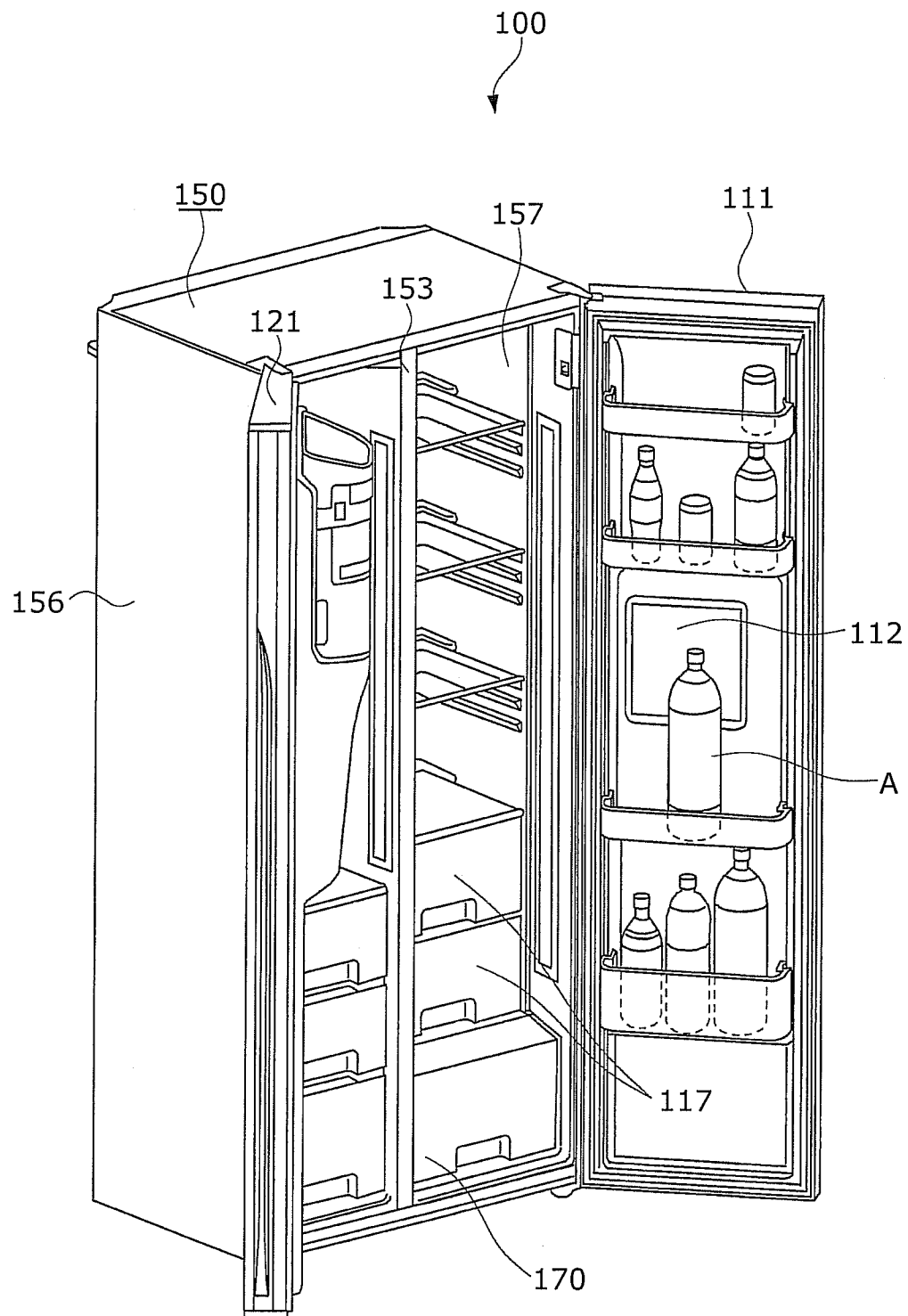


FIG. 3

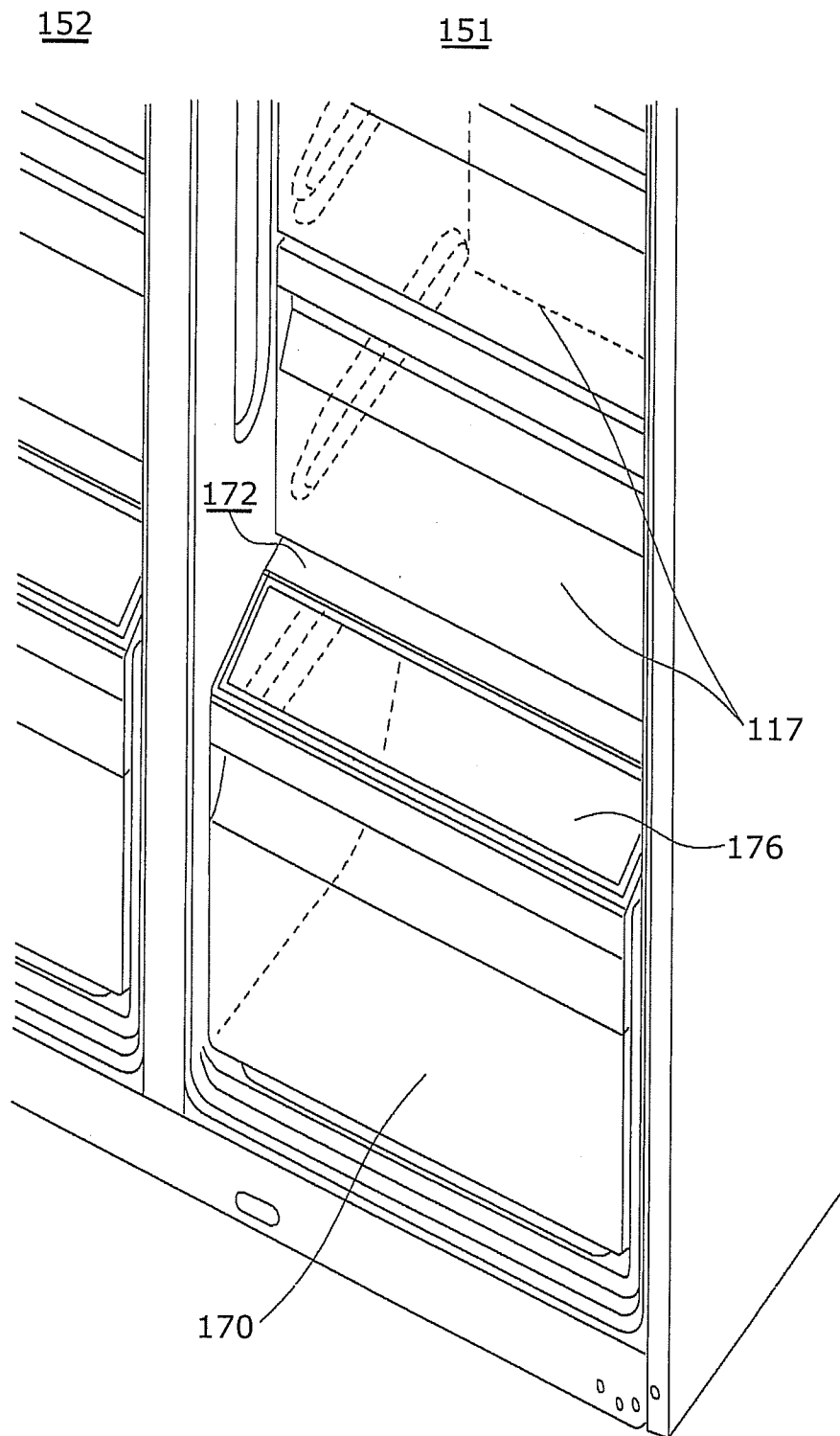


FIG. 4

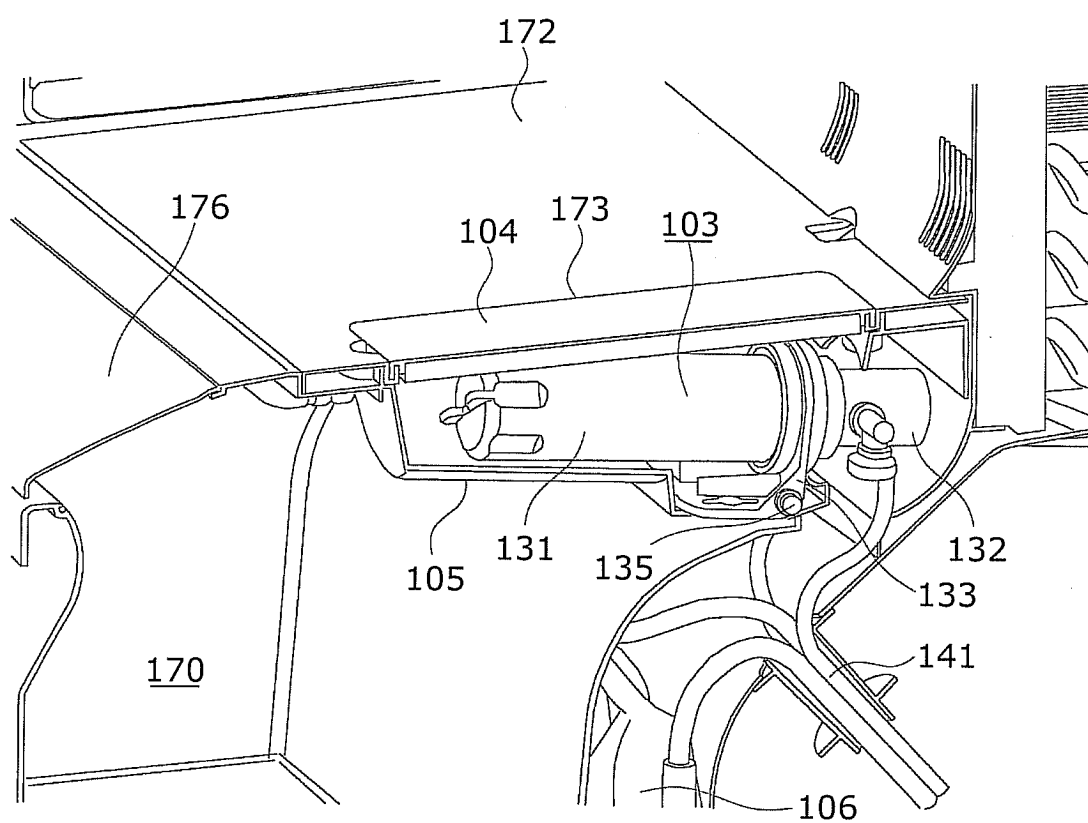


FIG. 5

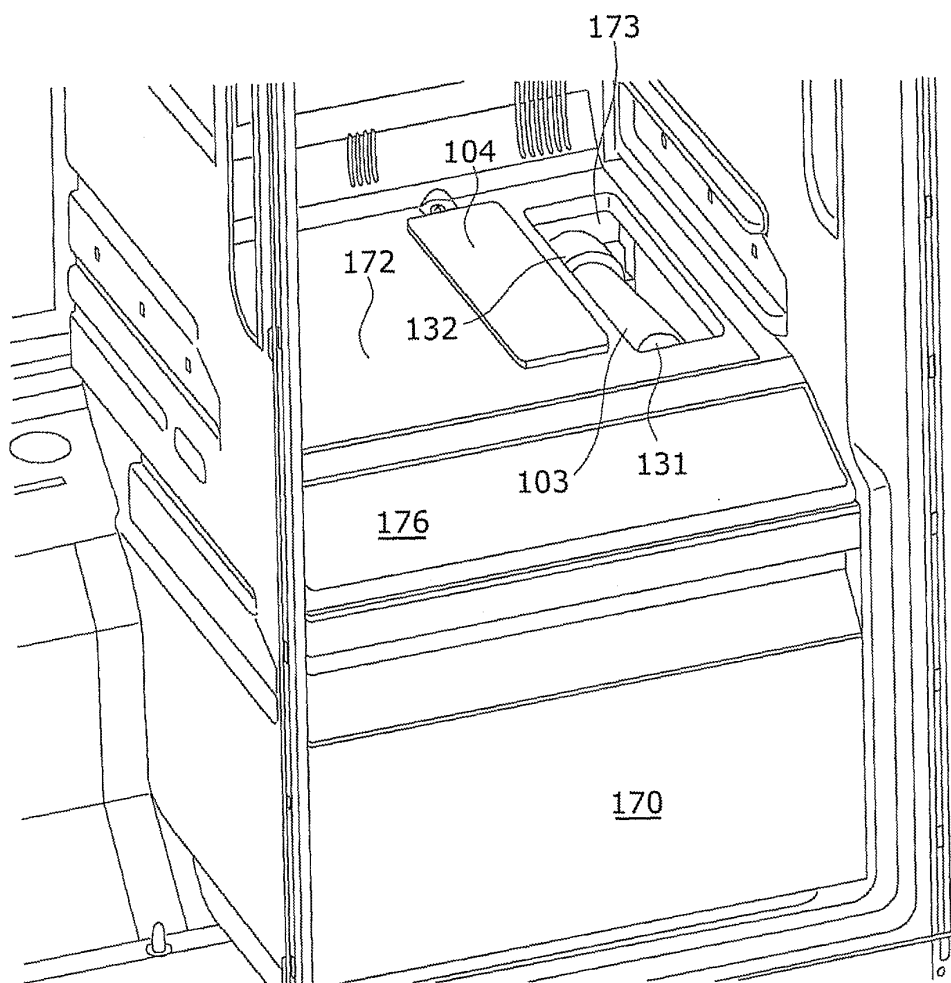


FIG. 6

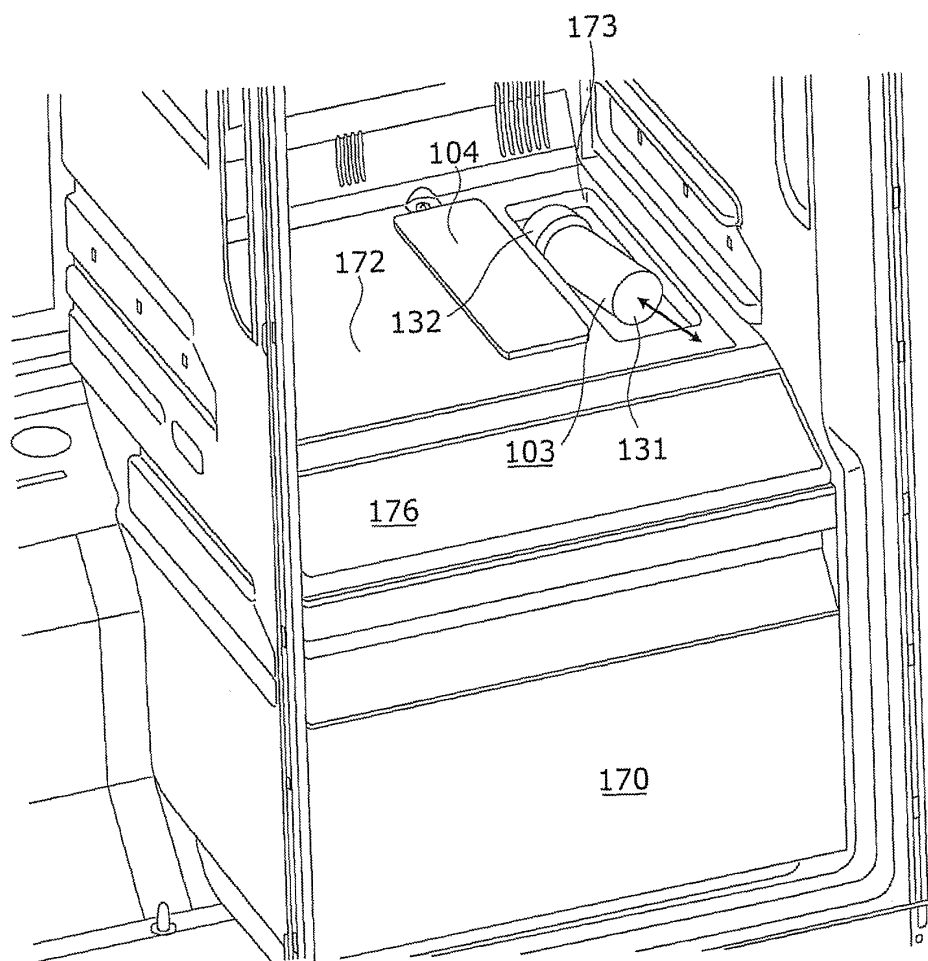


FIG. 7

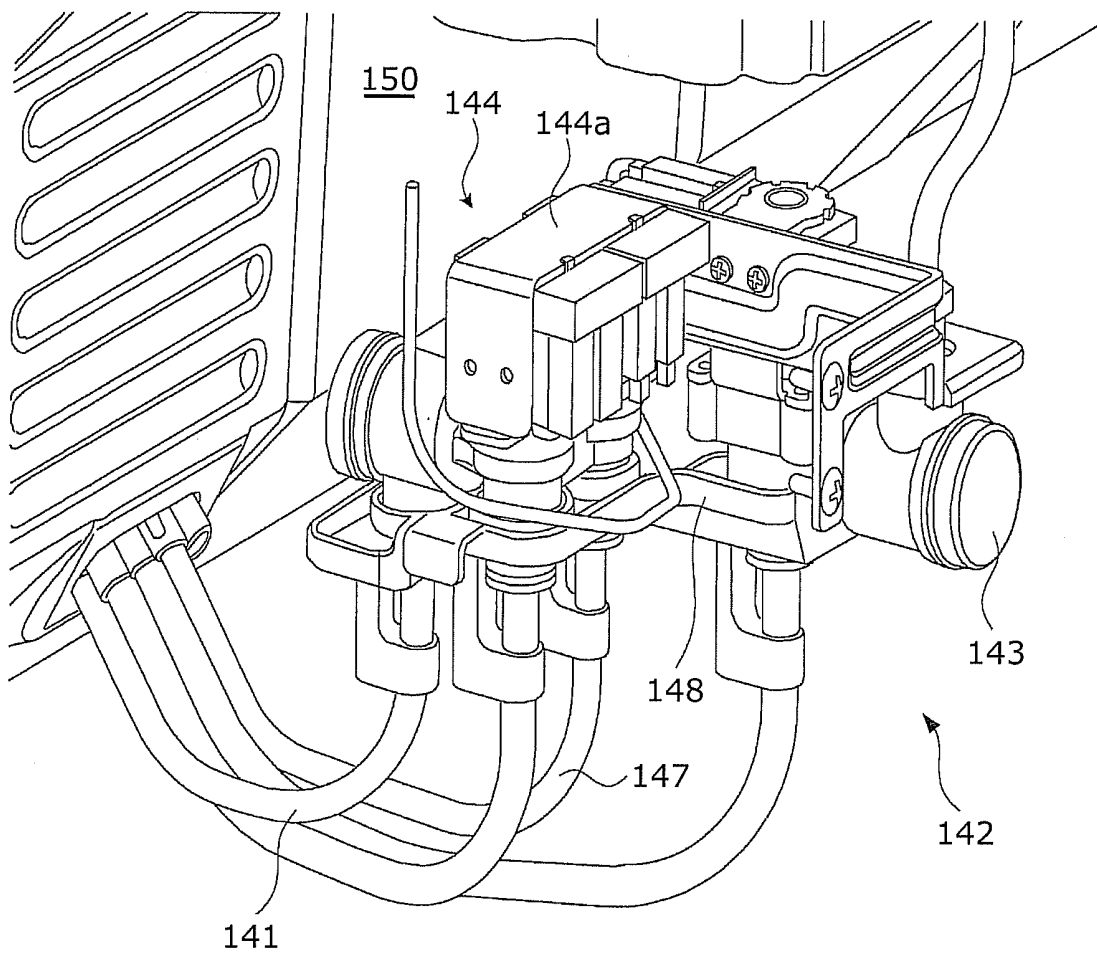
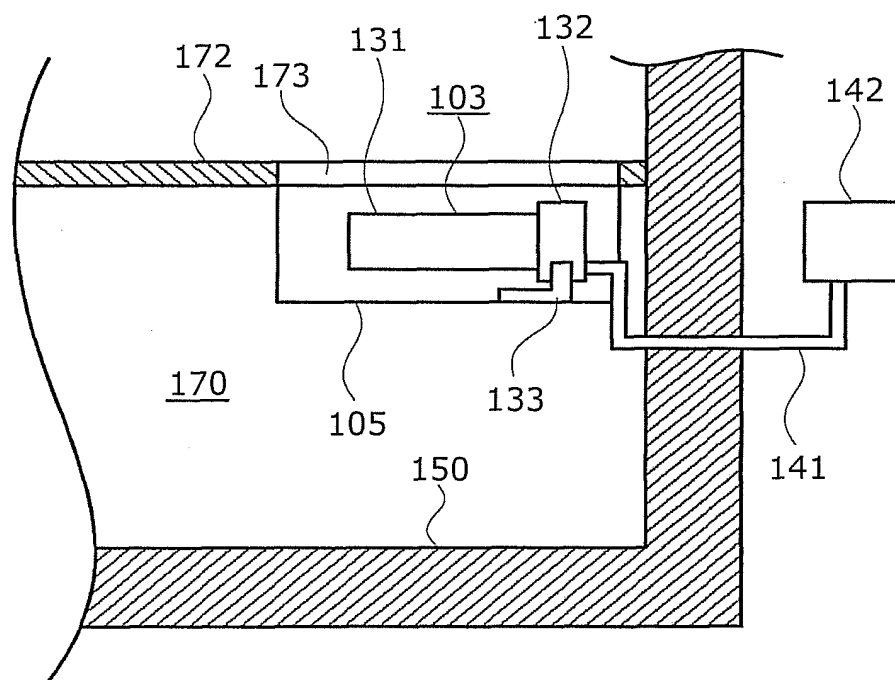
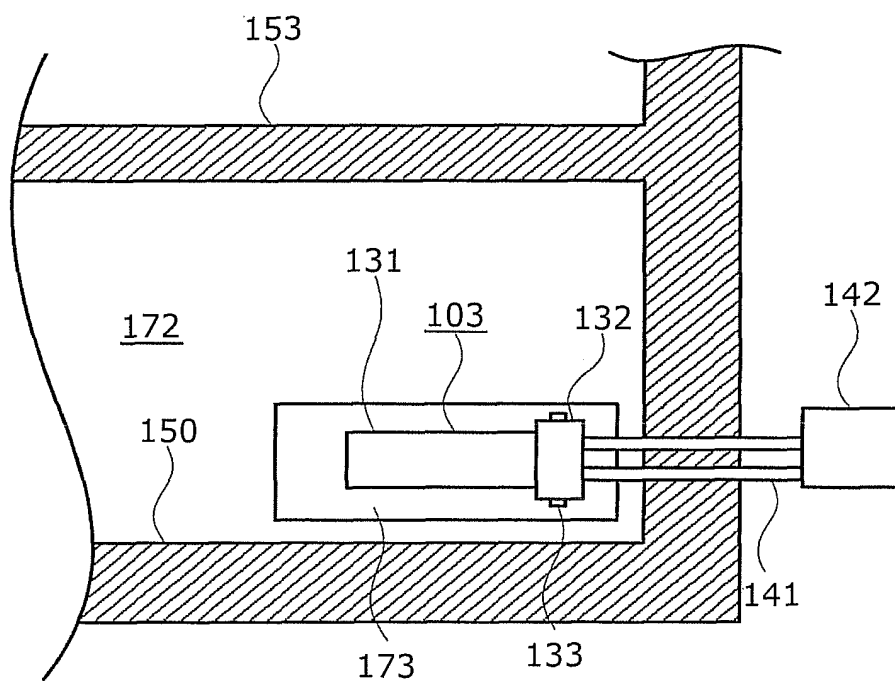


FIG. 8



(a)



(b)

FIG. 9

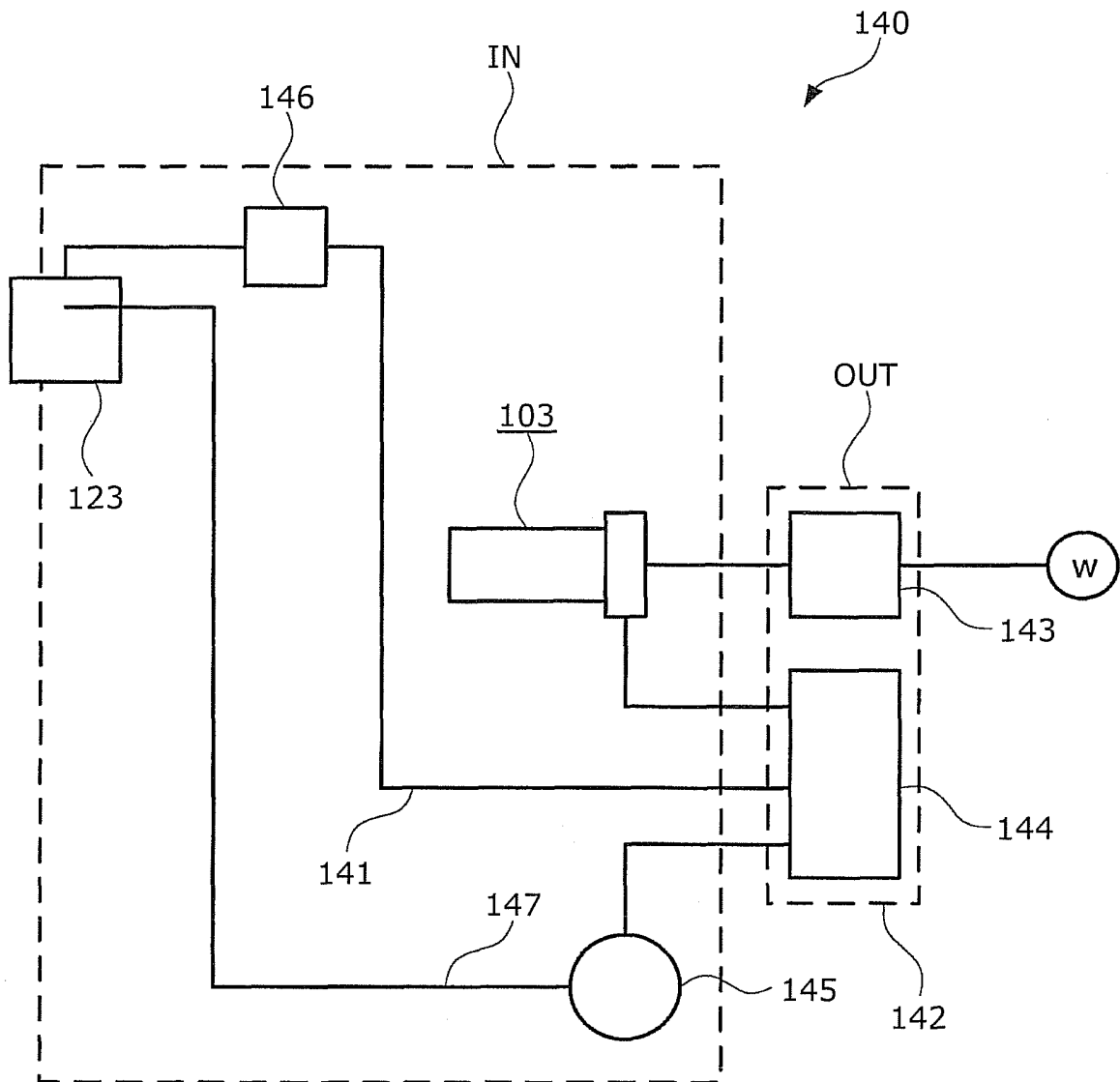


FIG. 10

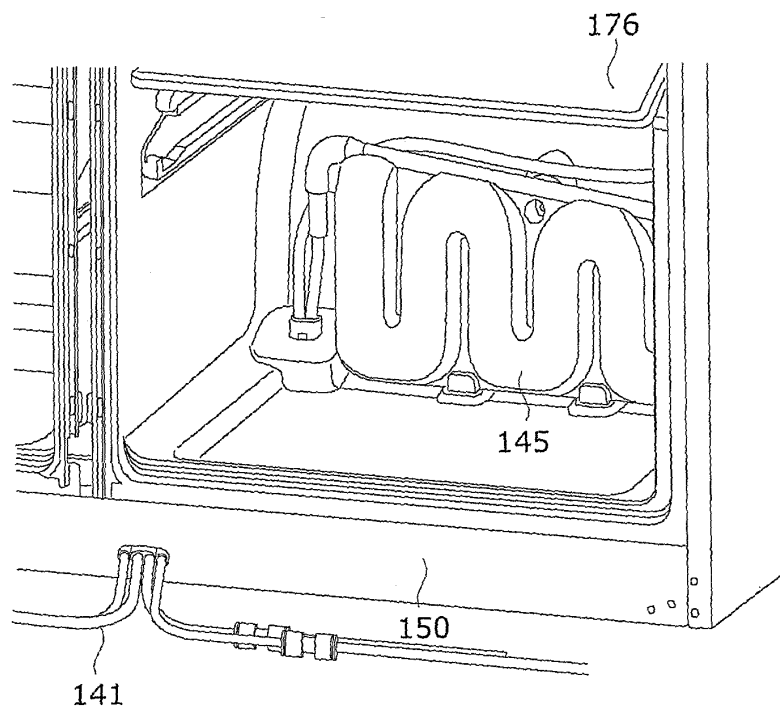


FIG. 11

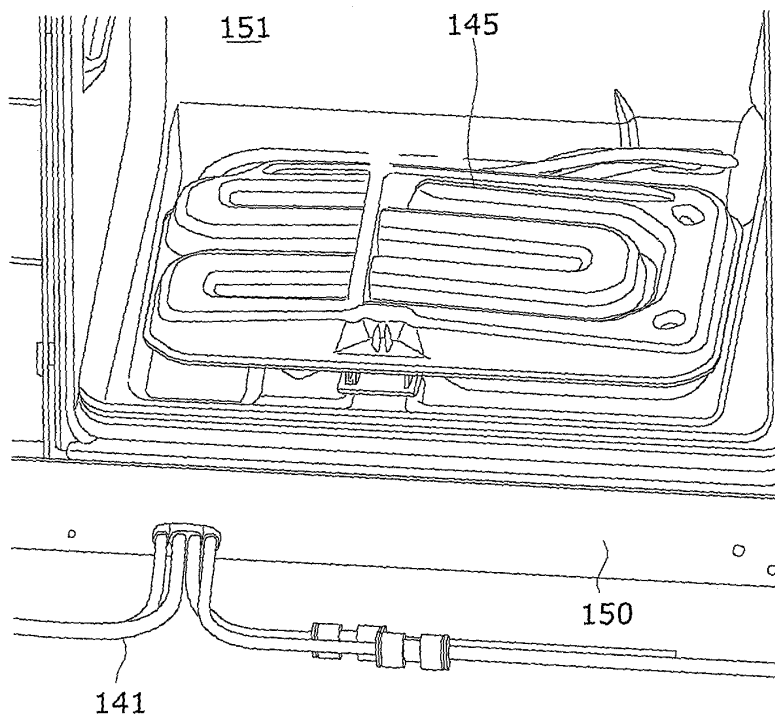
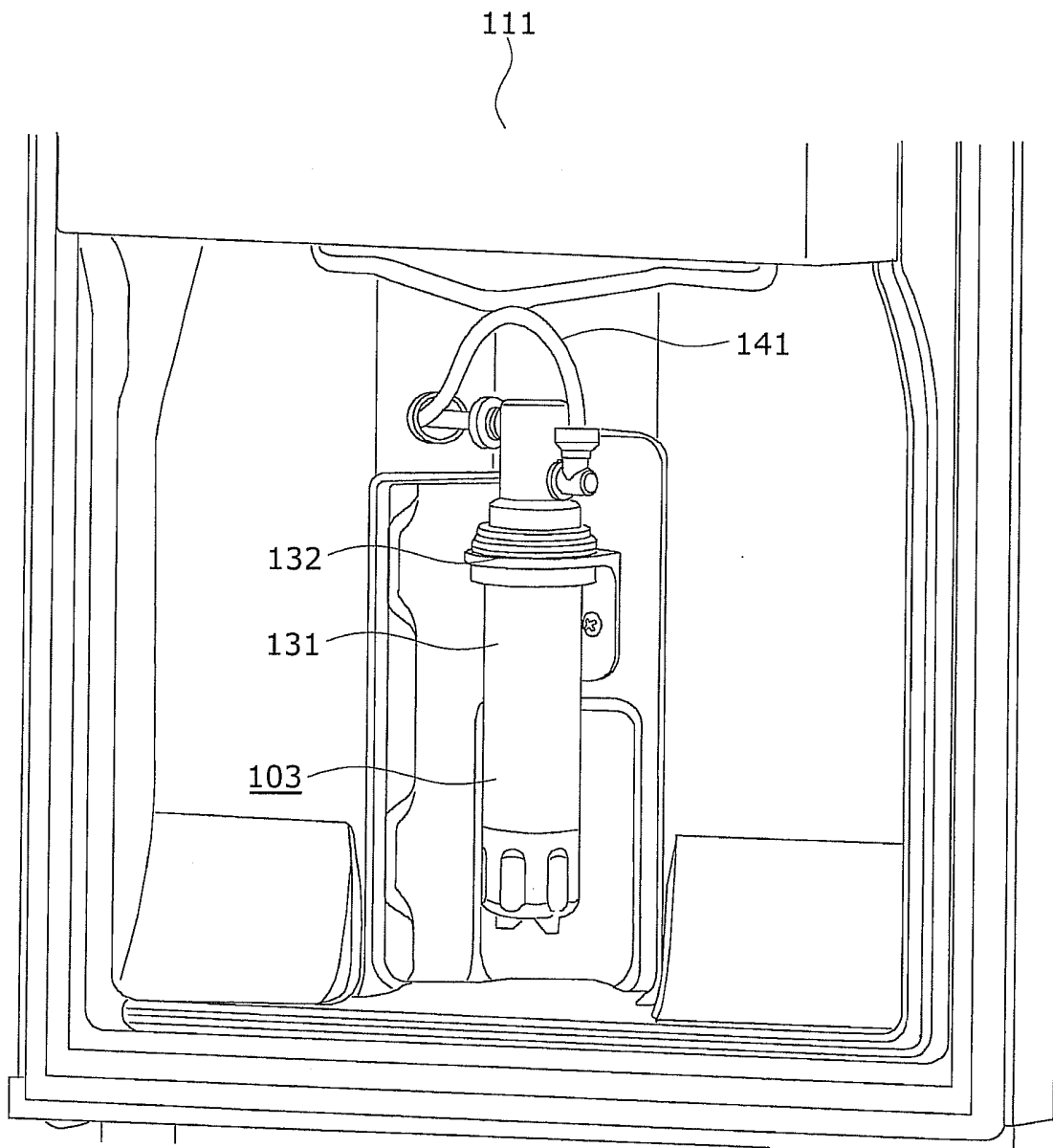


FIG. 12



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/001494

A. CLASSIFICATION OF SUBJECT MATTER

F25D25/00 (2006.01) i, F25C1/24 (2006.01) i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F25D25/00, F25C1/24

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

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2010
Kokai Jitsuyo Shinan Koho	1971-2010	Toroku Jitsuyo Shinan Koho	1994-2010

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 2007-518963 A (3M Innovative Properties Co.), 12 July 2007 (12.07.2007), claims; paragraphs [0001] to [0038]; fig. 1 to 11	1 2-4
Y	JP 9-273843 A (Mitsubishi Electric Corp.), 21 October 1997 (21.10.1997), claims; paragraphs [0001] to [0139]; fig. 1 to 46	2-4
A	US 2005/0160755 A1 (SAMSUNG ELECTRONICS CO., LTD.), 28 July 2005 (28.07.2005), entire text; all drawings	1-4



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

01 June, 2010 (01.06.10)

Date of mailing of the international search report

15 June, 2010 (15.06.10)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

EP 2 405 220 A1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/JP2010/001494

JP 2007-518963 A	2007.07.12	US 2005/0178273 A1	2005.08.11
		WO 2005/073124 A2	2005.08.11
		KR 10-2006-0126779 A	2006.12.08
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		CN 1136160 A	1996.11.20
US 2005/0160755 A1	2005.07.28	KR 10-2005-0077853 A	2005.08.04
		CN 1648561 A	2005.08.03

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/001494

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

See extra sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-4

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/001494

Continuation of Box No.III of continuation of first sheet (2)

Document 1: JP 2007-518963 A (3M Innovative Properties Co.), 12 July 2007 (12.07.2007), claims, paragraph [0001]-[0038], fig. 1-11

The matter common to the inventions in claims 1 to 8 is the matter necessary to define the invention in claim 1.

However, the search has revealed that the invention in claim 1 (hereafter referred to as "specified invention") is the invention stated in document 1, or the invention which is different from the invention disclosed in document 1 only in the matter of design, or the invention obtained by an addition, conversion, etc. of well-known art or commonly used art, and therefore the invention in claim 1 exhibits no new effect. Since the common matter makes no contribution over the prior art, the common matter is not a special technical feature within the meaning of PCT Rule 13.2, second sentence.

That is, document 1 discloses a technical matter relating to a refrigerator provided with: a liquid cooling device for cooling liquid introduced into the inner side of a box having heat insulating ability; and a purifying device disposed at the upper part of a storage space below a plate body which partitions the inside of the box by a horizontal plane and purifying the introduced liquid.

Accordingly, the inventions in claims 1 to 8 have no special technical features, within the meaning of PCT Rule 13.2, second sentence, which are the same or corresponding to each other, and in addition, the inventions in claims 1 to 8 have no other common matter which can be considered as a special technical feature within the same meaning. As a consequence, the inventions have no technical relationship within the meaning of the first sentence of the same rule.

The invention in claim 1 having no special technical feature as described above is categorized into the first invention group, and the inventions in claims 2 to 8 are categorized into the first to fourth invention groups in the note below on the basis of the special technical features determined at the time of the issuance of the order for payment of additional fees.

As stated above, the first invention group and the second to fourth invention groups shown in the note are not so linked as to form a single general inventive concept, and therefore the inventions in claims 1 to 8 do not satisfy the requirement of unity of invention.

Note:

[The statements in the parentheses are the special technical features determined at the time of the issuance of the order for payment of additional fees.]

First invention group: the inventions in claims 1 to 4

(A refrigerator ...including the matters necessary to define the invention which are stated in claims 1 and 2.)

Second invention group: the inventions in claims 5 and 6

(A refrigerator ... the matters necessary to define the invention which are stated in claims 1 and 5.)

Third invention group: the invention in claim 7

(A refrigerator ... the matters necessary to define the invention which are stated in claims 1 and 7.)

Fourth invention group: the invention in claim 8

(A refrigerator ... the matters necessary to define the invention which are stated in claims 1 and 8.)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

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