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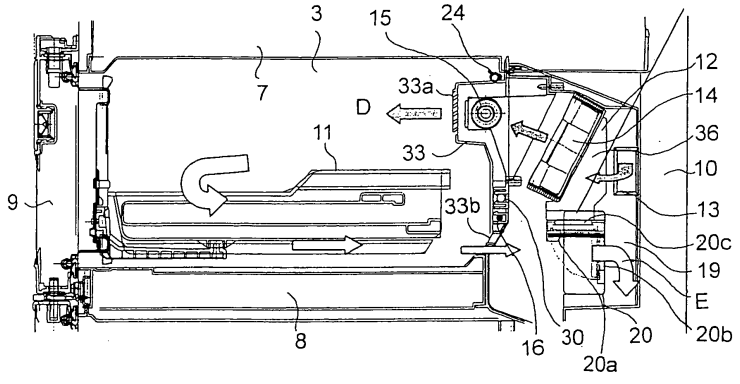
(54) **REFRIGERATOR**

(57) A refrigerator (1) having a temperature switchable compartment (3) whose interior temperature can be switched among more than one alternatives is provided with: a cooling device (17) for producing cold air; a blower (14) for sending out the cold air produced by the cooling device (17) into the temperature switchable compartment (3); a temperature switchable compartment discharge damper (13) for opening and closing an air introduction path (12) through which the cooling device (17) communicates with the blower (14); and a temperature switchable compartment return damper (20) for opening and closing an air return path (19) through which an outlet port (33b), from which air in the temperature switchable compartment (3) flows out, communicates with the cooling device (17) and opens and closes a communication path (36) through which the outlet port (33b) communicates with the inlet side of the blower (14). When the communication path (36) is closed and the air return path (19) is opened by the temperature switchable compartment return damper (20) and the blower (14) is driven after the temperature switchable compartment discharge damper (13) is opened, cold air is introduced into the temperature switchable compartment (3). When the communication path (36) is opened and the air return path (19) is closed by the temperature switchable compartment return damper (20) and the blower (14) is activated after the temperature switchable compartment discharge damper (13) is closed, the air in the temperature switchable compartment (3) is circulated. In the temperature switchable compartment discharge damper (13), a baffle (42) is arranged closer to the cooling device (17) than an opening (40a) is, so that the baffle (42) is swingable even if moisture condensation occurs on the baffle (42) and the condensed water freezes.

FIG.4



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Description

Technical Field

[0001] The present invention relates to a refrigerator having a temperature switchable compartment whose interior temperature can be switched to a desired one by the user. The present invention also relates to a refrigerator including a damper for opening and closing a cold air path, the damper being provided at the cold air inlet side of a storage compartment.

Background Art

[0002] Patent Publication 1 discloses a refrigerator provided with a temperature switchable compartment in addition to a freezer compartment and a cooling compartment. This refrigerator includes: a damper device for opening and closing a cold air path through which cold air is supplied to the temperature switchable compartment; and a heater for raising the interior temperature of the temperature switchable compartment. This makes it possible for the user to switch the interior temperature of the temperature switchable compartment, according to the purpose for which he/she uses it, to a desired low temperature zone among, for example, those intended for freezing, cooling, partial freezing, and chilling.
[Patent Publication 1] JP-A-H10-288440

Disclosure of the Invention

Problems to be Solved by the Invention

[0003] One disadvantage with the conventional refrigerator described above is that since the interior temperature of the temperature switchable compartment is changed through the adjustment, using a damper device, of the amount of cold air flowing from a cooling device into the temperature switchable compartment, if there is a large difference between the temperature of the cold air flowing into the temperature switchable compartment and the preset temperature, it is not possible to produce an even temperature distribution. Another disadvantages is that when a heater is energized in an airtight condition, the temperature around the heater rises, making it impossible to produce an even temperature distribution.

[0004] An object of the present invention is to provide a refrigerator that can produce an even temperature distribution in a temperature switchable compartment.

Means for Solving the Problem

[0005] To achieve the above object, according to one aspect of the present invention, a refrigerator including a temperature switchable compartment, whose interior temperature can be switched among more than one alternatives, is provided with: a cooling device for producing cold air; a blower for sending the cold air produced by the cooling device into the temperature switchable compartment; an introduction gate for opening and closing an air introduction path through which the cooling device communicates with the blower; a return gate for opening and closing an air return path through which the cooling device communicates with an outlet port through which air flows out of the temperature switchable compartment; and a circulation gate for opening and closing a communication path through which a circulation port formed in the temperature switchable compartment communicates with an inlet side of the blower. Here, when the introduction gate and the return gate are opened, the circulation gate is closed, and when the circulation gate is opened, the introduction gate and the return gate are closed.

[0006] With this structure, when the blower is operated with the circulation gate closed and the introduction gate and the return gate open, the cold air produced by the cooling device is sent into the temperature switchable compartment through the air introduction path. The cold air flows through the temperature switchable compartment, through the outlet port, and flows back to the cooling device through the air return path. The temperature switchable compartment is cooled in this way, and by varying the degrees to which the introduction gate and the return gate are opened or the amount of air supplied from the blower, the interior temperature of the temperature switchable compartment can be switched to different internal temperatures such as a freezing, a partial freezing, a chilling, and a cooling temperature. On the other hand, when the blower is operated with the circulation gate open and with the introduction gate and the return gate closed, the air inside the temperature switchable compartment is led out thereof via the circulation port through the communication path to the inlet side of the blower, and is then sent into the temperature switchable compartment. Thus, the air inside the temperature switchable compartment is circulated.

[0007] According to the present invention, in the refrigerator structured as described above, a heater may be provided for raising the interior temperature of the temperature switchable compartment so as to switch it to the hot setting for keeping cooked food warm. With this structure, when the setting for the temperature switchable compartment is switched to the hot setting, the circulation gate is opened, and the introduction gate and the return gate are closed. Then, the blower and the heater are operated so as to raise the interior temperature of the temperature switchable compartment. This makes temporary storage of cooked food, warm storage of food for cooking purposes in winter, and the like possible.

[0008] According to the present invention, the heater provided in the refrigerator structured as described above may be a heat-radiating glass-tube heater arranged so as to face the blower.

[0009] Accorcing to the present invention, in the refrigerator structured as described above, a single temperature switchable compartment return damper may be

shared to serve as both the return gate and the circulation gate; a single opening may be formed to serve as both the outlet port and the circulation port so that the return path and the communication path extending from the opening branch off each other at the temperature switchable compartment damper; and the temperature switchable compartment return damper may have a double-sided baffle that swings between a position in which the baffle interrupts the communication path and a position in which the baffle interrupts the air return path.

[0010] With this structure, the temperature switchable compartment return damper having the swingable double-sided baffle is shared to serve as both the return gate and the circulation gate, and when the double-sided baffle closes the air return path, the communication path is opened. In this state, when the blower is operated with the temperature switchable compartment discharge damper closed, the air inside the temperature switchable compartment is led out thereof via the opening through the communication path to the inlet side of the blower, and thus the air is circulated. When the communication path is closed by the double-sided baffle, the air return path is opened. In this state, when the blower is operated with the temperature switchable compartment discharge damper open, the cold air produced by the cooling device flows into the temperature switchable compartment through the air introduction path, through the opening, and then back to the cooling device through the air return path.

[0011] According to the present invention, in the refrigerator structured as described above, the double-sided baffle may be swingably supported by a pivot shaft extending horizontally along a top end of the double-sided baffle. With this structure, when the double-sided baffle closes the air return path and condensation occurs on the double-sided baffle due to a temperature difference between the temperature switchable compartment side and the cooling device side, the condensed water runs down, away from the horizontally extending pivot shaft.

[0012] According to the present invention, a single damper may be shared to serve as both the introduction gate and the circulation gate; the air introduction path and the communication path may join at the damper so as to be led to the inlet side of the blower; and the damper may have a double-sided baffle that swings between a position inn which the baffle closes the communication path and a position in which the baffle closes the air introduction path.

[0013] With this structure, a single damper having a swingable double-sided baffle is shared to serve as both the introduction gate and the circulation gate, and when the air introduction path is closed by the double-sided baffle, the communication path is opened. In this state, when the blower is operated with the air return gate closed, the air inside the temperature switchable compartment is led out thereof via the opening through the communication path, and to the inlet side of the blower, and thus the air is circulated. When the communication path is closed by the double-sided baffle, the air introduction path is opened. In this state, when the blower is operated with the air return path open, the cold air produced by the cooling device flows into the temperature switchable compartment through the air introduction path, through the opening, and back to the cooling device through the air return path.

[0014] According to the present invention, in the refrigerator structured as described above, the introduction gate may be a temperature switchable compartment discharge damper, and the temperature switchable compartment discharge damper may have an opening that communicates with the temperature switchable compartment and a movable baffle for opening and closing the opening that is arranged on the cooling device side of the opening.

[0015] With this structure, when the blower is operated with the circulation gate closed and with the temperature switchable compartment discharge damper and the return gate open, the cold air produce by the cooling device is sent into the temperature switchable compartment through the air introduction path. The cold air flows through the temperature switchable compartment, through the outlet port, and then back to the cooling device through the air return path. In this way, the temperature switchable compartment is cooled, and according to the degrees to which the discharge damper of the temperature switchable compartment and the return gate are opened or according to the amount of the air supplied from the blower, the interior temperature of the temperature switchable compartment can be switched among, for example, those intended for freezing, partial freezing, chilling, and cooling. When the blower is operated with the circulation gate open and with the temperature switchable compartment discharge damper and the return gate closed, the air inside the temperature switchable compartment is led through the circulation port, via the communication path, and to the inlet side of the blower, and is then sent into the temperature switchable compartment. Thus, the air inside the temperature switchable compartment is circulated. The temperature-swtichable compartment discharge damper is disposed in the air introduction path, and the temperature switchable compartment communicates with the cooling device via the opening. The opening is opened and closed by the movable baffle disposed on the cooling device side of the opening.

[0016] According to the present invention, in the refrigerator structured as described above, there may be provided a heater for raising the interior temperature of the temperature switchable compartment so that, by operating the heater, the interior temperature of the temperature switchable compartment can be switched to the hot setting for keeping cooked food warm. With this structure, when the setting for the temperature switchable compartment is switched to the hot setting, the circulation gate is opened, and the temperature switchable compartment discharge damper and the air return gate are closed.

Then, the blower and the heater are operated so as to raise the interior temperature of the temperature switchable compartment. This allows temporary storage of cooked food, warm storage of food for cooking purposes in winter, and the like.

[0017] According to another aspect of the present invention, in a refrigerator in which the cold air produced by a cooling device is supplied to a storage compartment through a cold air path, a damper for varying the amount of cold air supplied to the storage compartment is disposed in the cold air path; and the damper has an opening that communicates with the storage compartment and a movable baffle that opens and closes the opening and that is arranged on the cooling device side of the opening. With this structure, the cold air produced by the cooling device is supplied to the storage compartment through the cold air path, and thus the storage compartment is cooled. The damper is disposed in the cold air path, and the storage compartment communicates with the cooling device via the opening. The opening is opened and closed by the movable baffle arranged on the cooling device side of the opening.

[0018] According to the present invention, in the refrigerator structured as described above, the storage compartment may be a temperature switchable compartment whose interior temperature can be switched among more than one alternatives; and there may be provided a cooling compartment that is arranged in parallel with the storage compartment and to which cold air is supplied through a path that branches off the cold air path.

[0019] According to the present invention, in the refrigerator structured as described above, the baffle may be supported by a pivot shaft horizontally extending along the top end of the baffle. With this structure, when a path through which cold air is supplied to a storage compartment such as a temperature switchable compartment is closed by the baffle and a temperature difference arises between the storage compartment side and the cooling device side, causing condensation on the baffle, the condensed water runs down, away from the horizontally extending pivot shaft.

[0020] According to the present invention, in the refrigerator structured as described above, a heat insulator may be provided on a surface of the baffle.

[0021] According to the present invention, in the refrigerator structured as described above, at a rim of the opening, at a side thereof opposite from the baffle, there may be formed a step lower than the opening or a slope slanting downward from the rim of the opening. With this structure, when condensation occurs on the side of the baffle opposite from the cooling device side, the condensed water runs down the baffle and is led to the storage compartment (e.g., a temperature switchable compartment) side via the step or the slope.

Advantages of the Invention

[0022] According to the present invention, a refrigerator is provided with a blower for sending cold air, an introduction gate for opening and closing an air introduction path, a return gate for opening and closing an air return path, and a circulation gate for opening and closing a communication path through which a circulation port formed in a temperature switchable compartment communicates with the inlet side of the blower. Here, when the circulation gate is opened, the introduction gate and the return gate are closed, and this allows the air inside the temperature switchable compartment in an airtight state to be circulated therein, making it possible to produce an even temperature distribution inside the temperature switchable compartment. The circulation gate is closed when the introduction gate and the return gate are opened, and hence the cold air flows through the temperature switchable compartment, and this makes it possible to produce an even temperature distribution inside the temperature switchable compartment. At this time, since the circulation gate is closed, it is possible to prevent the efficiency of the blower from decreasing.

[0023] According to the present invention, a heater is provided for raising the interior temperature of the temperature switchable compartment and the interior temperature of the temperature switchable compartment can be switched to the hot setting for keeping heated food hot by operating the heater, and hence, it is possible to provide a refrigerator that is economical to the user by eliminating the need for a separate warm-keeping box or the like for keeping cooked food warm and that is useful by eliminating the need for securing a space for such a warm-keeping box or the like. It is also possible to prevent the heater and the components around it from deforming, burning, or smoking.

[0024] According to the present invention, the heater is a heat-radiating glass-tube heater having a high heating rate arranged so as to face the blower, and this allows the interior temperature of the temperature switchable compartment to quickly pass through the temperature range in which food poisoning microorganisms grow. Therefore, it is possible to provide a refrigerator which is safe in terms of food hygiene. Furthermore, even a high-capacity heat-radiating glass-tube heater occupies a small space, and hence the heater can be disposed in a rear portion of the temperature switchable compartment, and this reduces the risk of the user getting burned. Moreover, the surface temperature of the heater can be lowered, thereby improving the safety.

[0025] According to the present invention, a single temperature switchable compartment return damper is shared to serve as both the return gate and the circulation gate, and a swingable double-sided baffle selectively closes one of the communication path and the air return path at a time, and this reduces the cost of the refrigerator and improves the volume efficiency thereof.

[0026] According to the present invention, the double-sided baffle is supported by a pivot shaft horizontally extending along the top end of the double-sided baffle, and hence, when a temperature difference arises between

the storage compartment side and the cooling device side of the double-sided baffle, causing condensation on the double-sided baffle, the condensed water runs down, away from the pivot shaft. This prevents the pivot shaft from being frozen up even if the condensed water freezes when the opening is opened, permitting the double-sided baffle to move normally. This also helps prevent the swinging movement of the double-sided baffle from being hampered by the condensed water that has dripped down from the double-sided baffle to freeze in a heap.

[0027] According to the present invention, a single damper is shared to serve as both the introduction gate and the circulation gate, and the swingable double-sided baffle selectively closes one of the communication path and the air return path at a time. This reduces the cost of the refrigerator and improves the volume efficiency thereof.

[0028] According to the present invention, in the temperature switchable compartment discharge damper disposed in the air introduction path, a baffle for opening and closing the opening is located on the cooling device side of the opening, and thus, when the baffle closes the opening, only the portion thereof showing through the rim of the opening is exposed to the temperature switchable compartment side, whose temperature is higher than that of the cooling device side. Hence, when a temperature difference exists between the cooling device side and the temperature switchable compartment side, condensation occurs only on the portion of the baffle showing through the rim of the opening but not on the pivot shaft of the baffle or other portions thereof. Therefore, even when the opening is opened and the condensed water meets the cold air to freeze, the normal movement of the baffle is not hampered, and thus undercooling and overcooling of the temperature switchable compartment can be prevented.

[0029] According to the present invention, since, in the damper disposed in the cold air path, the baffle for opening and closing the opening is disposed on the cooling device side of the opening, when the baffle closes the opening, only the portion of the baffle showing through the rim of the opening is exposed to the storage compartment side, whose temperature is higher than that of the cooling device side. Hence, when a temperature difference exists between the cooling device side and the storage compartment side, condensation occurs only on the portion of the baffle showing through the rim of the opening but not on the pivot shaft of the baffle or other portions thereof. Therefore, when the opening is opened and the condensed water meets cold air to freeze, the normal movement of the baffle is not hampered, and thus undercooling and overcooling of the storage compartment can be prevented.

[0030] According to the present invention, the baffle is supported by a pivot shaft horizontally extending along the top end of the baffle. Thus, when a temperature difference arises between the temperature switchable compartment side and the cooling device side of the baffle and condensation occurs on the baffle, the condensed water runs down, away from the pivot shaft. Hence, even when the opening is opened and the condensed water meets cold air to freeze, it is possible to prevent the pivot shaft from being frozen up, and thereby to permit the baffle to move normally. It is also possible to prevent the swinging movement of the baffle from being hampered by the freezing of the condensed water that has dripped from the baffle.

[0031] According to the present invention, a heat insulator is provided on a surface of the baffle, and this reduces condensation on the baffle.

[0032] According to the present invention, around the rim of the opening at the side of the opening opposite from the baffle, there is formed a step lower than the opening or a slope slanting downward from the rim of the opening. Hence, when condensation occurs on the baffle and the condensed water runs down, the condensed water is led from the rim of the opening down to the step or along the slope to the side opposite from the cooling device. Therefore, it is possible to prevent the condensed water from entering the cooling device side via the opening when the baffle is opened.

[0033] According to the present invention, the storage compartment is a temperature switchable compartment whose interior temperature can be switched among more than one alternatives, and there is provided a cooling compartment that is arranged in parallel with the storage compartment and to which cold air is supplied through a path branching off the cold air path. Hence, it is possible to store articles in the cooling compartment either in cold storage or in frozen storage, while producing an even temperature distribution inside the temperature switchable compartment by keeping it airtight and circulating air therein.

Brief Description of Drawings

[0034]

[Fig. 1] A front view of a refrigerator embodying the present invention;

[Fig. 2] A right side view of the refrigerator embodying the present invention;

[Fig. 3] A vertical sectional view as seen from the right side of the refrigerator embodying the present invention;

[Fig. 4] A vertical sectional view as seen from the right side of a temperature switchable compartment of the refrigerator embodying the present invention;

[Fig. 5] A vertical sectional view as seen from the right side of the temperature switchable compartment of the refrigerator embodying the present invention;

[Fig. 6] A vertical sectional view as seen from the front of a middle portion of the refrigerator embodying the present invention;

[Fig. 7] A cold air circuit diagram showing how cold

air flows in the refrigerator embodying the present invention;

[Fig. 8] Diagrams showing a discharge damper of the temperature switchable compartment in the refrigerator embodying the present invention;

[Fig. 9] A vertical sectional view as seen from the side showing how the discharge damper of the temperature switchable compartment is fitted in the refrigerator embodying the present invention;

[Fig. 10] A diagram illustrating, by way of a counterexample, the effect of the discharge damper of the temperature switchable compartment of the refrigerator embodying the present invention; and

[Fig. 11] A diagram illustrating, by way of a counterexample, the effect of the discharge damper of the temperature switchable compartment of the refrigerator embodying the present invention.

List of Reference Symbols

[0035]

1	refrigerator
2	cooling compartment
3	temperature switchable compartment
4	ice-maker compartment
5	vegetable compartment
6	freezer compartment
9	door
12	air introduction path
13	temperature switchable compartment discharge damper
14, 18, 28	blower
15	heater
17	evaporator
16, 24	temperature sensor
19, 21	air return path
20	temperature switchable compartment return damper
22	freezer compartment damper
25	chilling compartment damper
30	thermal fuse
31, 32	cold air path
33	rear panel
33a	inlet port
33b	outlet port
35	compressor
36	communication path
40	housing
40a	opening
42	baffle
42a	pivot shaft
43	sealing member

Best Mode for Carrying Out the Invention

[0036] Hereinafter, embodiments of the present invention will be described with reference to the accompanying drawings. Figs. 1 and 2 are a front view and a right side view, respectively, of a refrigerator embodying the present invention. A cooling compartment 2 is arranged in a top portion of the refrigerator 1, and a temperature switchable compartment 3 and an ice-maker compartment 4 are arranged in a middle portion thereof. In a bottom portion of the refrigerator 1, a vegetable compartment 5 and a freezer compartment 6 are arranged.

[0037] The cooling compartment 2 has double doors and keeps articles in cold storage. The temperature switchable compartment 3 is arranged in a left side of the middle portion of the refrigerator 1 and the interior temperature of the temperature switchable compartment 3 can be switched by the user. The ice-maker compartment 4 is arranged in a right side of the middle portion of the refrigerator 1 and makes ice. The vegetable compartment 5 is arranged in a left side of the bottom portion of the refrigerator 1 and the interior temperature thereof is maintained at a temperature suitable for storing vegetables (e.g., 8°C). The freezer compartment 6 is arranged in a right side of the bottom portion of the refrigerator 1; it communicates with the ice-maker compartment 4, and keeps articles in frozen storage.

[0038] FIG. 3 is a vertical sectional view, as seen from the right side, of the refrigerator 1. The freezer compartment 6 and the ice-maker compartment 4 are each provided with a storage case 11. Likewise, the vegetable compartment 5 and the temperature switchable compartment 3 are each provided with a storage case 11. The cooling compartment 2 includes a plurality of storage shelves 41 on which to place stored articles. The doors of the cooling compartment 2 have storage pockets 42. These make the refrigerator 1 handy to use. Inside the cooling compartment 2, in a bottom part thereof, a chilling compartment 23 is arranged, and the interior temperature is maintained within a chilling temperature zone (about -3°C).

[0039] Behind the freezer compartment 6, a cold air path 31 is formed. In the cold air path 31, there is arranged an evaporator 17, which is connected to a compressor 35. Behind the cooling compartment 2, there is formed a cold air path 32 that communicates with the cold air path 31. When the compressor 35, to which a condenser and an expander (neither is illustrated) are connected, is operated, it circulates a refrigerant such as isobutane through a refrigeration cycle and thereby achieves heat exchange with the evaporator 17, which is disposed at the cold end of the refrigeration cycle, where cold air is produced. Thus, the compressor 35 and the evaporator 17, together with the condenser and the expander, constitute a cooling device for producing cold air.

[0040] In the cold air paths 31 and 32, blowers 18 and 28 are arranged, respectively. As will be described in detail later, when the blower 18 is operated, the cold air produced at the evaporator 17 is supplied through the cold air path 31 to the freezer compartment 6, the ice-maker compartment 4, the chilling compartment 23, and the temperature switchable compartment 3. Moreover,

when the blower 28 is operated, the cold air is also supplied through the cold air path 32 to the cooling compartment 2 and the vegetable compartment 5.

[0041] FIG. 4 is a vertical sectional view, as seen from the right side, of the temperature switchable compartment 3. The temperature switchable compartment 3 is, at the top and bottom faces thereof, separated from the cooling compartment 2 and the vegetable compartment 5 by partition walls 7 and 8, respectively. The temperature switchable compartment 3 can be opened and closed at the front face thereof with a pivoted door 9. The rear face of the temperature switchable compartment is covered with a rear panel 33. Inside the temperature switchable compartment, a drawer-type storage case 11 is provided.

[0042] Behind the rear panel 33, between it and a heat insulating wall 10, which constitutes an exterior wall of the refrigerator 1, an air introduction path 12 is formed. Through the air introduction path 12, an inflow port 33a formed in the rear panel 33 connects to the cold air path 31 (see Fig. 3). In the air introduction path 12, a temperature switchable compartment discharge damper 13 (introduction gate) is provided. When the temperature switchable compartment discharge damper 13 is opened, the cold air produced at the evaporator 17 (see Fig. 3) is led to the temperature switchable compartment 3.

[0043] Figs. 8A to 8C are a front view, a top view, and a vertical sectional side view, respectively, of the temperature switchable compartment discharge damper 13. The temperature switchable compartment discharge damper 13 has a baffle 42 provided inside a resin-molded housing 40 having an opening 40a formed in the front face thereof. The baffle 42 is swingably supported on a pivot shaft 42a extending horizontally along the top end thereof inside the housing 40.

[0044] When a drive motor 41 coupled to the pivot shaft 42a is driven, the baffle 42 swings as indicated by arrow H. As the baffle 42 swings, it opens and closes the opening 40a, and thereby opens and closes the temperature switchable compartment discharge damper 13. On the baffle 42, on the side thereof facing the opening 40a, there is disposed a sealing member 43 that is formed of a heat insulating material and comes into close contact with the rim of the opening 40a.

[0045] FIG. 9 is a vertical sectional view, as seen from the side, showing how the temperature switchable compartment discharge damper 13 is fitted. The temperature switchable compartment discharge damper 13 is fitted to a wall 50 of the air introduction path 12. As will be described later, the air introduction path 12 branches in two directions, specifically on one hand in the direction of the temperature switchable compartment 3, which is arranged further leftward of the figure, and on the other hand, in the direction of the chilling compartment 23, which is arranged further upward of the figure. The air introduction path 12 communicates with the temperature switchable compartment 3 via a hole 50a. The temperature switchable compartment discharge damper 13 is arranged with the opening 40a located on the temperature switchable compartment 3 side of the baffle 42, and with the baffle 42 located on the evaporator 17 side of the opening 40a (relative to Fig. 9, the temperature switchable compartment 3 is situated further leftward and the evaporator 17 is situated further rightward).

[0046] Since the temperature of the cold air flowing through the air introduction path 12 is lower than the interior temperature of the temperature switchable compartment 3, when the baffle 42 closes the opening 40a, a temperature difference arises between opposite sides of the baffle 42. If, as shown in Fig. 10, the baffle 42 is located on the temperature switchable compartment 3 side of the opening 40a (i.e., left in the figure), the baffle 42 becomes hotter except in the portion thereof that shows through the opening 40a.

[0047] This causes condensation on the warmer portion of the baffle 42, and, if it happens, when the opening 40a is opened, the condensed water meets cold air and freezes, freezing up the pivot shaft 42a. If, as a result, the baffle 42 becomes unable to fully open the opening 40a, the interior temperature of the temperature switchable compartment 3 is undercooled; if the baffle 42 becomes unable to fully close the opening 40a, the temperature switchable compartment 3 is overcooled.

[0048] In contrast, in the present embodiment, the baffle 42 is located on the evaporator 17 side of the opening 40a; hence, when the opening 40a is closed, the baffle 42 becomes hotter only in the portion thereof showing through the opening 40a. In addition, the sealing member 43 formed of a heat insulating material disposed on the surface of the baffle 42 prevents condensation. The heat insulator may be disposed on the face of the baffle 42 opposite from the opening 40a.

[0049] Even if condensation occurs on the baffle 42, it occurs only on the portion thereof that shows through the opening 40a, and not on the pivot shaft 42a of the baffle 42. Therefore, even if the condensed water freezes when the opening 40a is opened, the baffle 42 swings normally, without causing undercooling or overcooling of the temperature switchable compartment 3.

[0050] The baffle 42 is particularly prone to condensation of moisture from stored articles when the internal temperature of the temperature switchable compartment 3 is at the hot setting (for example , 55°C to 80°C), which will be described later. Even then, despite a large amount of frozen condensed water, the baffle 42 swings normally, without causing undercooling or overcooling of the temperature switchable compartment 3, and thus with greater effect. Similar benefits can be obtained also in a case where the baffle 42 is a sliding one instead of a swinging one.

[0051] With a similar structure, similar benefits can be obtained also in a case where a damper is arranged for opening and closing a cold air path through which cold air is supplied to a storage compartment whose cold air circuit is arranged in parallel with that of another cooling compartment wherein when the damper is closed, the air

in the storage compartment is circulated inside it. Specifically, by locating a baffle on the evaporator (cooling device) side of an opening in the damper, it is possible to prevent frozen condensed water from hampering the normal movement of the baffle. Thus, it is possible to prevent undercooling and overcooling of the storage compartment.

[0052] Since the pivot shaft 42a is arranged along the top end of the baffle 42, even when condensation occurs on the baffle 42, the condensed water runs down, away from the pivot shaft 42a. Hence, even when the opening 40a is opened and the condensed water meets cold air and freezes, the pivot shaft 42a is prevented more effectively from being frozen up, so that the baffle 42 swings normally.

[0053] If, as shown in Fig. 11, the pivot shaft of the baffle 42 extends vertically, when the opening 40a is opened, the condensed water that has dripped from the baffle 42 freezes in a heap, and this hampers the swinging movement of the baffle 42. By contrast, in the present embodiment, where the pivot shaft 42a extends horizontally along the top end of the baffle 42, when the opening 40a is opened, the bottom end of the baffle 42 retracts by moving up. This makes it possible to prevent the swinging movement of the baffle 42 from being hampered even when condensed water drips from the baffle 42 and freezes.

[0054] Back in Fig. 9, the hole 50a in the wall 50 is formed to be larger in diameter than the opening 40a, and a step 50b is formed at a level lower than the opening 40a. Thus, the condensed water that has run down the baffle 42 is diverted from the rim of the opening 40a into the temperature switchable compartment 3. This prevents entry of condensed water through the opening 40a into the evaporator 17. Instead of the step 50b, a slope slanting downward from the rim of the opening 40a may be formed.

[0055] In Fig. 4, a blower 14 is arranged between the temperature switchable compartment discharge damper 13 and the inlet port 33a. In a bottom portion of the rear panel 33, an outlet port 33b is formed, and when the blower 14 is activated, cold air is easily introduced from the cold air path 31 into the temperature switchable compartment 3 via the inlet port 33a and then discharged out of the temperature switchable compartment 3 via the outlet port 33b. The amount of air supplied from the air introduction path 12 to the temperature switchable compartment 3 is controlled by opening and closing the temperature switchable compartment discharge damper 13.

[0056] Behind the outlet port 33b, there is formed an air return path 19 through which air returns to the air cooling device 17. In the air return path 19, there is formed a temperature switchable compartment return damper 20 (return gate) open to face the outlet port 33b. In the rear and the top of the temperature switchable compartment return damper 20, openings 20b and 20c are formed, respectively, and inside the temperature switchable compartment return damper 20, there is arranged a double-sided swingable baffle 20a for selectively closing one of the openings 20b and 20c at a time.

[0057] When the opening 20c is closed and the opening 20b is open, the air that has flowed out of the outlet port 33b flows into the air return path 19. When the opening 20b is closed and the opening 20c is opened, as shown in Fig. 5, the air that has flowed out of the outlet port 33b is led to the inlet side of the blower 14. In this way, a communication path 36 is formed, through which the outlet port 33b communicates with the inlet side of the blower 14 via the opening 20c of the temperature switchable compartment return damper 20. Thus, with the blower 14 operated, the air in the temperature switchable compartment 3 can be circulated inside it via the communication path 36.

[0058] Since the pivot shaft of the baffle 20a extends horizontally along the top end thereof, even when a temperature difference arises between the evaporator 17 side and the temperature switchable compartment 3 side of the baffle 20a and condensation occurs on the baffle 20a, the condensed water runs down, away from the pivot shaft. Hence, even when the condensed water freezes when the opening 20b is opened, it is possible to prevent the pivot shaft from being frozen up to ensure that the baffle 20a swings normally. When the baffle 20a swings, the bottom end thereof retracts by moving up. This prevents the swinging movement of the double-sided baffle 20a from being hampered by condensed water that has dripped therefrom and has frozen in a heap.

[0059] The temperature switchable compartment return damper 20 serves as a circulation gate for opening and closing the circulation path that includes the communication path 36. The outlet port 33b serves as a circulation port via which air flows out of the temperature switchable compartment 3 into the communication path 36. The communication path 36 may be formed by arranging the circulation port at a position different from that of the outlet port 33b. In this case, however, in addition to the temperature switchable compartment return damper 20, another circulation gate for opening and closing the communication path 36 needs to be formed. Hence, with the present embodiment, in which the outlet port 33b is shared as the circulation port and the temperature switchable compartment return damper 20 having the double-sided baffle 20a serves as the circulation gate, it is possible to reduce the cost of the refrigerator 1 and to improve the volume efficiency thereof.

[0060] In a top rear portion of the rear panel 33, a heater 15 is arranged. The heater 15 is a heat-radiating glass-tube heater, and the heat therefrom is radiated through the rear panel 33 to heat the temperature switchable compartment 3. The blower 14 is arranged such that it sends air toward the surface of the heater 15. This helps lower the surface temperature of the heater 15, and thereby improves safety.

[0061] On the bottom rear portion of the rear panel 33, a temperature sensor 16 is arranged. The temperature sensor 16 detects the interior temperature of the temper-

ature switchable compartment 3 and sends a detection signal to a controller (not shown). The controller, according to the detection result of the temperature sensor 16, controls the heater 15, the temperature switchable compartment discharge damper 13, and the blower 14, so that the interior temperature of the temperature switchable compartment 3 is maintained at a preset temperature.

[0062] Above the heater 15, a temperature sensor 24 is arranged adjacent to the heater 15. The temperature sensor 24 is firmly attached on the ceiling face of the part of the rear panel 33 so bent as to enclose the heater 15. Thus, the temperature closely above the heater 15, where heating proceeds fastest with the rising stream of air heated by the heat radiating from the heater 15, is detected by the temperature sensor 24.

[0063] When the temperature sensor 24 finds the temperature in the vicinity of the heater 15 to be abnormally high, the heater 15 is de-energized. In this way, it is possible to prevent the heater 15 and the components around it from breaking, burning, or smoking. Furthermore, above the temperature sensor 16, a thermal fuse 30 is arranged. The thermal fuse 30, when the temperature thereof becomes as high as a predetermined level, melts so that the heater 15 is de-energized. This further improves safety.

[0064] Fig. 6 is a vertical sectional view, as seen from the front, of the middle portion of the refrigerator 1. The cold air path 31 behind the freezer compartment 6 has an opening formed at upper front of the blower 18, and the blower 18 sends air into the ice-maker compartment 4. In a bottom portion of the freezer compartment 6, which communicates with the ice-maker compartment 4, there is arranged a freezer compartment damper 22. Behind the freezer compartment 6, at the bottom thererof, there is arranged an air return path 21 (see Fig. 3) that leads air through the freezer compartment damper 22, to the evaporator 17, and then back to the cold air path 31. The amount of air led out of the freezer compartment 6 is controlled by opening and closing the freezer compartment damper 22.

[0065] At the top thereof, the cold air path 31 communicates with the cold air path 32 via the cooling compartment damper 27. The cold air path 31 also branches into the air introduction path 12, so as to communicate, on one hand, with the chilling room 23 via the chilling compartment damper 25 and, on the other hand, with the temperature switchable compartment 3 via the temperature switchable compartment discharge damper 13 as described above.

[0066] In the cooling compartment 2, in a rear bottom portion thereof, there is formed a cooling compartment outlet port (not shown). In the vegetable compartment 5, a vegetable compartment inlet port (not shown) is formed. The cooling compartment outlet port and the vegetable compartment inlet port are coupled to each other via a path (not shown) located behind the temperature switchable compartment 3, and thereby the cooling compartment 2 communicates with the vegetable compartment 5.

[0067] The air return path 19 that communicates with the temperature switchable compartment 3 extends downward from the temperature switchable compartment return damper 20 to run behind the temperature switchable compartment 3 and the vegetable compartment 5. By opening and closing the temperature switchable compartment return damper 20, the air in the temperature switchable compartment 3 is led to the evaporator 17 through the air return paths 19 and 21. In the rear face of the vegetable compartment 5, there is formed a vegetable compartment outlet port (not shown) that communicates with the air return path 19.

[0068] Fig. 7 is a cold air circuit diagram showing how cold air flows in the refrigerator 1. When the blower 18 is operated, the cold air produced at the evaporator 17 rises through the cold air path 31 as indicated by arrow A (see Fig. 6), and is supplied to the ice-maker compartment 4. The cold air supplied to the ice-maker compartment 4 flows through the ice-maker compartment 4 and the freezer compartment 6, and then flows out via the freezer compartment damper 22 to return to the evaporator 17 through the air return path 21. In this way, the ice-maker compartment 4 and the freezer compartment 6 are cooled.

[0069] When the blower 28 is operated, part of the cold air branches off the cold air path 31 at the top thereof to flow into and through the cold air path 32 as indicated by arrow B (see Fig. 6) via the cooling compartment damper 27, and is sent to the cooling compartment 2; that part of the cold air also flows into and through the air introduction path 12 as indicated by arrow C (see Fig. 6), and is then supplied to the chilling compartment 23. The cold air sent into the cooling compartment 2 and the chilling compartment 23 flows through them and then flows into the vegetable compartment 5. The cold air that has flowed into the vegetable compartment 5 flows therethrough and then flows through the air return paths 19 and 21 back to the evaporator 17. In this way, the cooling compartment 2 and the vegetable compartment 5 are cooled. When the preset temperatures are obtained, the cooling compartment damper 27 and the chilling compartment damper 25 are closed.

[0070] When the blower 14 is operated, part of the cold air branches off the cold air path 31 at the top thereof to flow through the air introduction path 12 into, as indicated by arrow D (see Figs. 4 and 6), the temperature switchable compartment 3 via the temperature switchable compartment discharge damper 13. The cold air that has flowed into the temperature switchable compartment 3 flows therethrough, then flows out thereof through the outlet port 33b, and then returns to the evaporator 17 through the air return paths 19 and 21 as indicated by arrow E (see Figs. 4 and 6). Thus, the inside of the temperature switchable compartment 3 is cooled.

[0071] As described above, the interior temperature of the temperature switchable compartment 3 can be

switched by the user as he/she desires. For example, the user can select any temperature zone from among those intended for freezing (-15 °C), partial freezing (-8 °C), chilling (-3 °C), cooling (3 °C), vegetable (8 °C). This enables the user to keep articles in frozen or cool storage at the desired temperature. The switching of the interior temperature of the temperature switchable compartment 3 can be achieved by changing the degree to which the temperature switchable compartment discharge damper 13 is opened or the amount of air supplied from the blower 14.

[0072] In that case, as shown in Fig. 4, the double-sided baffle 20a of the temperature switchable compartment return damper 20 is so located that it keeps the air return path 19 open and the communication path 36 closed. Hence, the cold air that flows in via the inlet port 33a flows via the temperature switchable compartment return damper 20 into the air return path 19, without circulating through the communication path 36. This prevents the cold air from being short-circuited through the communication path 36 and thereby improves the efficiency of the blower 14.

[0073] When, for example, the interior temperature of the temperature switchable compartment 3 is switched from the "freezing" to the "cooling" zone, the temperature may be raised by energizing the heater 15. This allows quick switching of the interior temperature of the temperature switchable compartment 3 to a desired one. Furthermore, by energizing the heater 15, the interior temperature of the temperature switchable compartment 3 can be switched from the cold setting for frozen or cold storage of articles to the hot setting for temporary storage of cooked food, warm storage of food for cooking purposes, and the like.

[0074] When the interior temperature of the temperature switchable compartment 3 is at the hot setting, as shown in Fig. 5, the temperature switchable compartment discharge damper 13 is closed and the double-sided baffle 20a of the temperature switchable compartment return damper 20 is positioned such that it keeps the air return path 19 closed and the communication path 36 open. When the heater 15 and the blower 14 are operated, the air sent by the blower 14 as indicated by arrow F flows through the communication path 36 via the outlet port 33b as indicated by arrow G.

[0075] Thus, the air in the temperature switchable compartment 3 is circulated by being led to the blower 14 via the temperature switchable compartment return damper 20 as indicated by the dotted line S in Fig. 7. This makes it possible to keep the temperature switchable compartment 3 airtight and thereby to prevent the warm air therein from escaping. Hence, it is possible to produce an even temperature distribution inside the temperature switchable compartment 3 at the hot setting and to prevent the heater 15 and the components around it from deforming, burning, or smoking. Moreover, it is possible to realize a refrigerator that is economical to the user by eliminating the need for a separate warm-keeping box or the like for keeping cooked food warm and that is useful by eliminating the need for securing a space for such a warm-keeping box or the like.

[0076] It is preferable that the interior temperature of the temperature switchable compartment 3 at the hot setting be kept at 50°C or more. This is in consideration of the fact that common microorganisms causing food poisoning grow at 30°C to 45°C, and also in consideration of the permitted tolerance in the heater capacity, the temperature distribution inside the temperature switchable compartment 3, and other factors. This helps prevent growth of microorganisms. It is preferable, however, that the interior temperature of the temperature switchable compartment 3 at the hot setting be kept at 80°C or less. This contributes to low cost, because resin components commonly used in refrigerators are resistant up to 80°C.

[0077] Microorganisms causing food poisoning are killed by heat; for example, enterohaemorrhagic Escherichia coli (e.g., E. coli 0157) are killed when kept at 75°C for one minute. In consideration of this, and also in consideration of the permitted tolerance in the heater capacity and the temperature distribution inside the temperature switchable compartment 3, it is particularly preferable that the interior temperature of the temperature switchable compartment 3 at the hot setting be kept at 80°C.

[0078] Here are the results of a test on how the numbers of food poisoning microorganisms decrease when kept at 55 °C. A test sample was prepared that in its initial state included 2.4×10^3 CFU/mL of *Escherichia coli,* 2.0×10^3 CFU/mL of *Staphylococcus aureus,* 2.1×10^3 CFU/mL of *Salmonella,* 1.5×10^3 CFU/mL of *Vibrio parahaemolyticus,* and 4.0×10^3 CFU/mL of *Bacillus cereus.* The test sample was first heated from 3°C to 55°C over 40 minutes, was then maintained at 55°C for 3.5 hours, and was then cooled from 55°C to 3°C over 80 minutes; then the number of the microorganisms were counted again. It was found that the number of any of the kinds of microorganism tested had decreased to 10 CFU/mL or less (i.e., below the detectable level). This demonstrates that keeping the temperature switchable compartment 3 at 55°C at the hot setting provides a sufficient effect of reducing microorganisms.

[0079] As described above, the heater 15 is a heat-radiating glass-tube heater. The heater 15 may be a heat-conducting heater such as a sheet-shaped aluminum-deposited heater, which is inexpensive but has a low heating rate. For this reason, with a heat-conducting heater, when the temperature switchable compartment 3 is at the hot setting, the interior temperature thereof takes a long time to pass through the temperature range from 30°C to 45°C, in which microorganisms actively grow, leading to low safety in terms of food hygiene. A higher heating rate can be achieved by increasing the heater capacity; this, however, cannot be done above the temperature (normally, about 80°C) up to which the component to which the heater is attached is resistant; moreover, doing so may make the heat-radiating surface

so large that it extends up to a front part of the temperature switchable compartment 3, increasing the risk of the user getting burned.

[0080] By contrast, a heat-radiating glass-tube heater has a high heating rate, which contributes to safety in terms of food hygiene. Furthermore, even a high-capacity heat-radiating glass-tube heater occupies only a small area of space, and thus, as shown back in Fig. 4, it can be arranged in a rear portion of the temperature switchable compartment 3, and this reduces the risk of the user getting burned. Therefore, it is more preferable that the heater 15 be a heat-radiating glass-tube heater.

[0081] The heater 15 is capable of being operated at an heat output higher than is needed to maintain the interior temperature of the temperature switchable compartment 3 at the hot setting, in which cooked food are kept warm. The heat output of the heater 15 can be changed by changing the energization rate of the heater 15. Hence, rapid switching of the interior temperature of the temperature switchable compartment 3 from the cold setting to the hot setting can be achieved by operating the heater 15 at a high heat output, and this makes the refrigerator 1 useful. When the interior temperature of the temperature switchable compartment 3 reaches a preset hot-setting temperature, it can be maintained at the preset temperature by operating the heater 15 at a lower heat output.

[0082] For example, when, as the heater 15, a heater whose power consumption is about 190 W and whose surface area is about 10,990 mm^2 is used and operated at an energization rate of 100%, the interior temperature of a temperature switchable compartment 3, when it has a volume of about 0.023 m^3, can be raised from 3°C up to 80°C in about 30 minutes. Then, by operating the heater 15 intermittently at an energization rate of 15% (ON for 15 seconds and OFF for 85 seconds), the interior temperature of the temperature switchable compartment 3 can be kept about 80°C. The blower 14 has a motor equipped with an axial flow fan, and is operated so as to send air approximately at a rate of 0.4 m^3/m.

[0083] Here, while the temperature is kept constant, the surface temperature of the heater 15 remains not higher than 250°C, and thus below the ignition point (494°C) of isobutane, which is a flammable refrigerant. Thus, when, out of consideration of the environment, isobutane, which is a flammable refrigerant, is used as the refrigerant sealed in the refrigeration cycle, even if isobutane leaks from the evaporator 17 or elsewhere, there is no risk of the heat from the heater 15 causing an explosion. This makes the refrigerator 1 safer to the user.

[0084] In the present embodiment, when the interior temperature of the temperature switchable compartment 3 has reached a predetermined temperature at the cold setting, the air inside the temperature switchable compartment 3 may be circulated. Specifically, with the temperature switchable compartment return damper 20 so located as to keep the air return path 19 closed and the communication path 36 open, and with the temperature switchable compartment discharge damper 13 closed, the blower 14 is operated. This makes it possible to produce a more even temperature distribution inside the temperature switchable compartment 3 at the cold setting.

[0085] Instead of opening and closing the air return path 19 and the communication path 36 with the temperature switchable compartment return damper 20, the air introduction path 12 and the communication path 36 may be opened and closed with the temperature switchable compartment discharge damper 13. This can be achieved by provindig the temperature switchable compartment discharge damper 13 with a double-sided baffle similar to the one provided in the temperature switchable compartment return damper 20.

[0086] When the double-sided baffle is positioned so as to keep the air introduction path 12 open and the communication path 36 closed, the cold air that has flowed into the temperature switchable compartment 3 via the inlet port 33a flows out thereof via the outlet port 33b, and is led to the air return path 19 via the temperature switchable compartment return damper 20. On the other hand, when the baffle is positioned so as to keep the communication path 36 open and keep the air introduction path 12 closed, the air circulates inside the temperature switchable compartment 3. This makes it possible to reduce the cost of the refrigerator 1 and to improve the volume efficiency thereof as effectively as in the case described above.

[0087] A damper may be provided at the outlet port of the vegetable compartment 5. In this case, when the temperature switchable compartment 3 is switched from the hot setting to the cold setting, closing the above-mentioned damper makes it possible to prevent the hot air in the temperature switchable compartment 3 from flowing back into the vegetable compartment 5. In addition, it is possible to prevent the cold air in the vegetable compartment 5 from reaching the double-sided baffle 20a and causing condensation thereon.

[0088] The freezer compartment damper 22 is closed if, when the temperature switchable compartment 3 is switched from the hot setting to the cold setting, the blower 18 is not operated. This prevents the hot air in the temperature switchable compartment 3 from flowing back into the freezer compartment 6 as the blower 14 is operated.

Industrial Applicability

[0089] The present invention is applicable to a refrigerator provided with a temperature switchable compartment whose interior temperature can be switched by the user. The present invention is also applicable to a refrigerator provided with, at the cold air inlet side of a storage compartment, a damper for opening and closing a cold air path.

Claims

1. A refrigerator including a temperature switchable compartment whose interior temperature can be switched among more than one alternatives, the refrigerator comprising:

   a cooling device for producing cold air;
   a blower for sending the cold air produced by the cooling device into the temperature switchable compartment;
   an introduction gate for opening and closing an air introduction path through which the cooling device communicates with the blower;
   a return gate for opening and closing an air return path through which the cooling device communicates with an outlet port through which air flows out of the temperature switchable compartment; and
   a circulation gate for opening and closing a communication path through which a circulation port formed in the temperature switchable compartment communicates with an inlet side of the blower,
   wherein,
   when the introduction gate and the return gate are opened, the circulation gate is closed, and
   when the circulation gate is opened, the introduction gate and the return gate are closed.

2. The refrigerator of claim 1, further comprising a heater for raising the interior temperature of the temperature switchable compartment,
   wherein
   with the heater operated, the interior temperature of the temperature switchable compartment can be switched to a hot setting for keeping cooked food warm.

3. The refrigerator of claim 2, wherein the heater is a heat-radiating glass-tube heater arranged so as to face the blower.

4. The refrigerator of claim 1,
   wherein
   a single temperature switchable compartment return damper is shared to serve as both the return gate and the circulation gate,
   a single opening is formed to serve as both the outlet port and the circulation port so that the return path and the communication path extending from the opening branch off each other at the temperature switchable compartment return damper, and
   the temperature switchable compartment return damper has a double-sided baffle that swings between a position in which the baffle closes the communication path and a position in which the baffle closes the air return path.

5. The refrigerator of claim 4, wherein the double-sided baffle is swingably supported by a pivot shaft extending horizontally along a top end of the double-sided baffle.

6. The refrigerator of claim 1,
   wherein
   a single damper is shared to serve as both the introduction gate and the circulation gate,
   the air introduction path and the communication path join at the damper so as to be led to the inlet side of the blower, and
   the damper has a double-sided baffle that swings between a position in which the baffle interrupts the communication path and a position in which the baffle interrupts the air introduction path.

7. The refrigerator of claim 1,
   wherein
   a temperature switchable compartment discharge damper has an opening that communicates with the temperature switchable compartment and a movable baffle that is arranged on a cooling device side of the opening so as to open and close the opening.

8. The refrigerator of claim 7, wherein the baffle is swingably supported by a pivot shaft extending horizontally along a top end of the baffle.

9. The refrigerator of claim 7, wherein a heat insulator is provided on a surface of the baffle.

10. The refrigerator of claim 7, wherein, at a rim of the opening, at a side thereof opposite from the baffle, there is formed a step lower than the opening or a slope slanting downward from the rim of the opening.

11. A refrigerator in which cold air produced by a cooling device is supplied to a storage compartment through a cold air path,
    wherein
    a damper for varying an amount of cold air supplied to the storage compartment is arranged in the cold air path, and
    the damper includes an opening that communicates with the storage compartment and a movable baffle that is arranged on a cooling device side of the opening so as to open and close the opening.

12. The refrigerator of claim 11,
    wherein
    the storage compartment is a temperature switchable compartment whose interior temperature can be switched among more than one alternatives, and
    a cooling compartment is provided that is arranged parallel with the storage compartment so as to receive cold air through a path branching off the cold air path.

13. The refrigerator of claim 12, further comprising a heater for raising the interior temperature of the temperature switchable compartment,
wherein, with the heater operated, the interior temperature of the temperature switchable compartment can be switched to a hot setting for keeping cooked food warm.

14. The refrigerator of claim 11, wherein the baffle is swingably supported by a pivot shaft extending horizontally along a top end of the baffle.

15. The refrigerator of claim 11, wherein a heat insulator is provided on a surface of the baffle.

16. The refrigerator of claim 11,
wherein,
at a rim of the opening, at a side thereof opposite from the baffle, there is formed a step lower than the opening or a slope slanting downward from the rim of the opening.

FIG.1

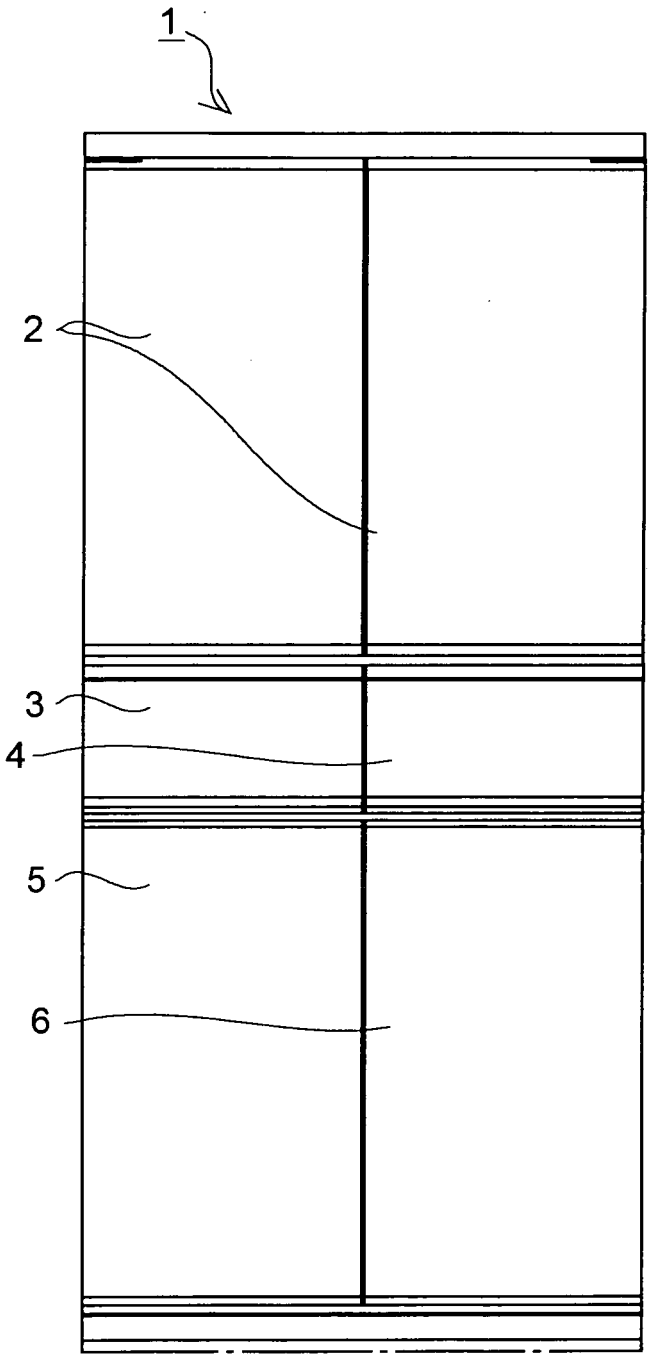


FIG.2

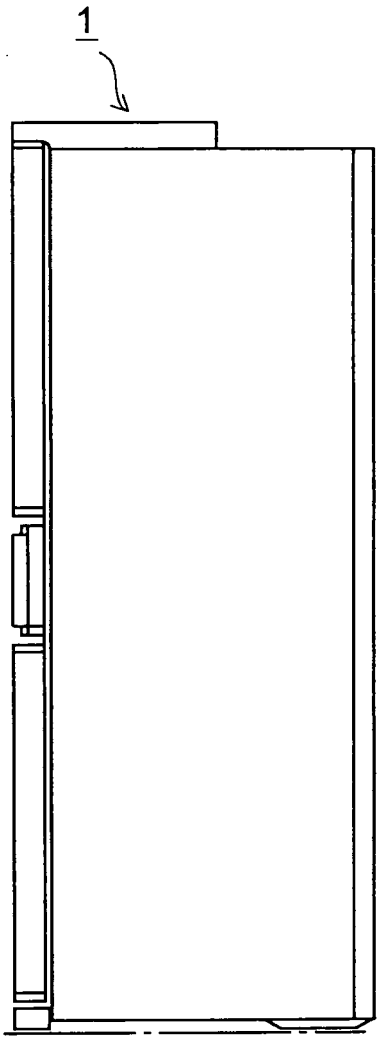


FIG.3

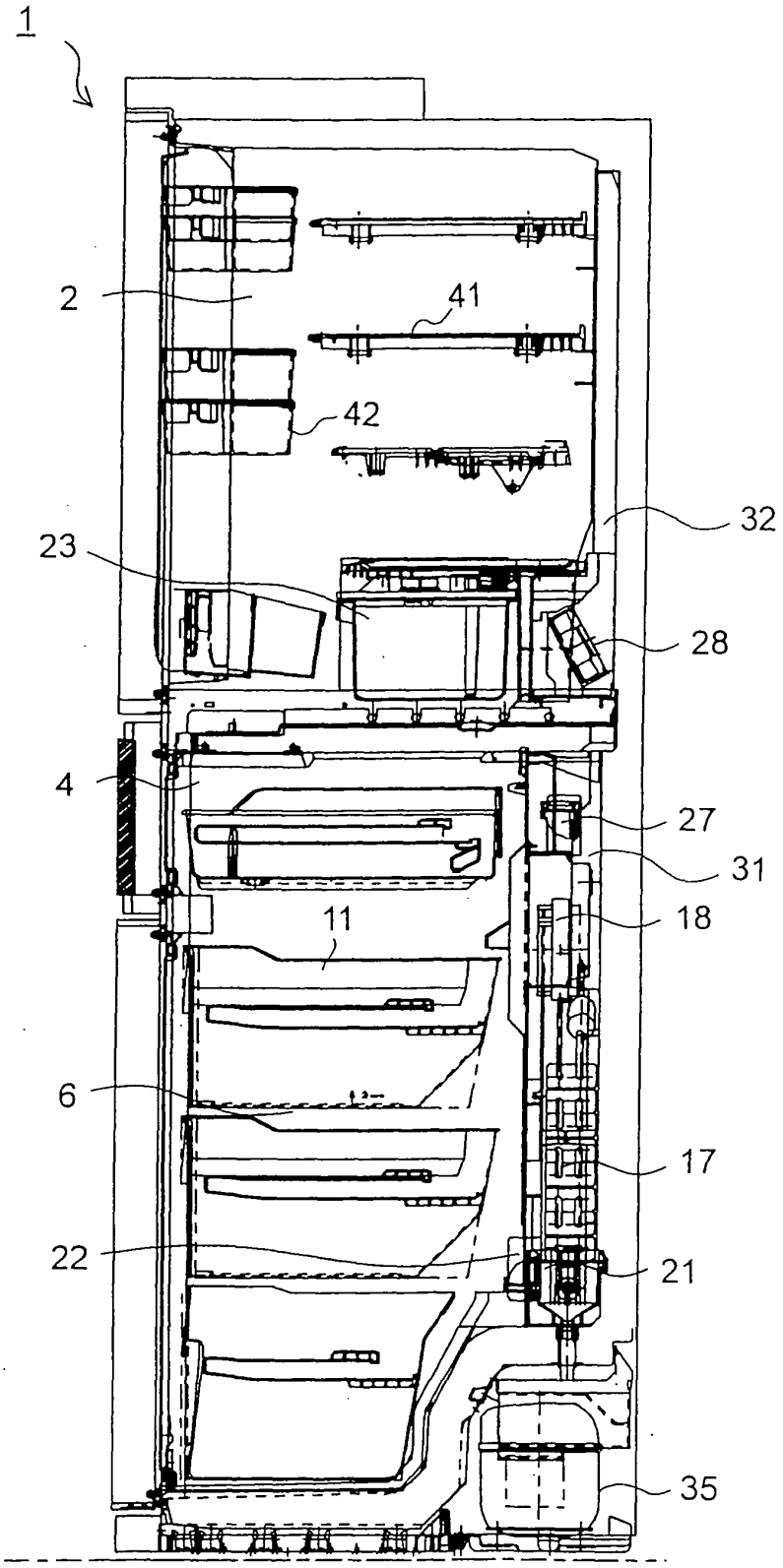


FIG.4

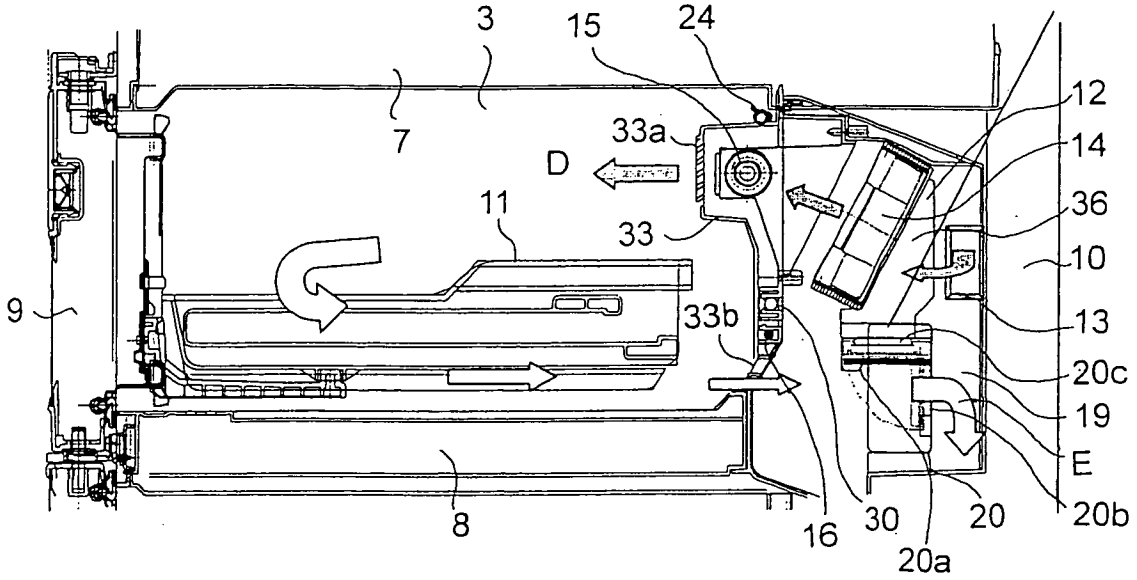
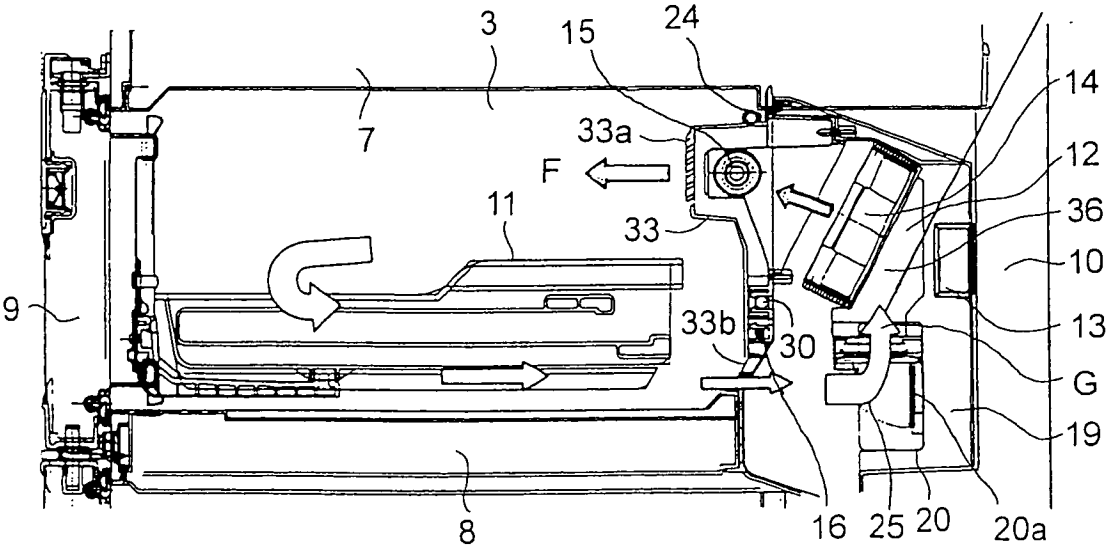

3
15
24
12
7
33a
14
D
11
36
33
10
9
33b
13
20c
19
E
8
16
30
20
20b
20a

FIG.5


3
15
24
14
7
33a
12
F
11
36
33
10
9
33b
30
13
G
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8
16
25
20
20a

FIG.6

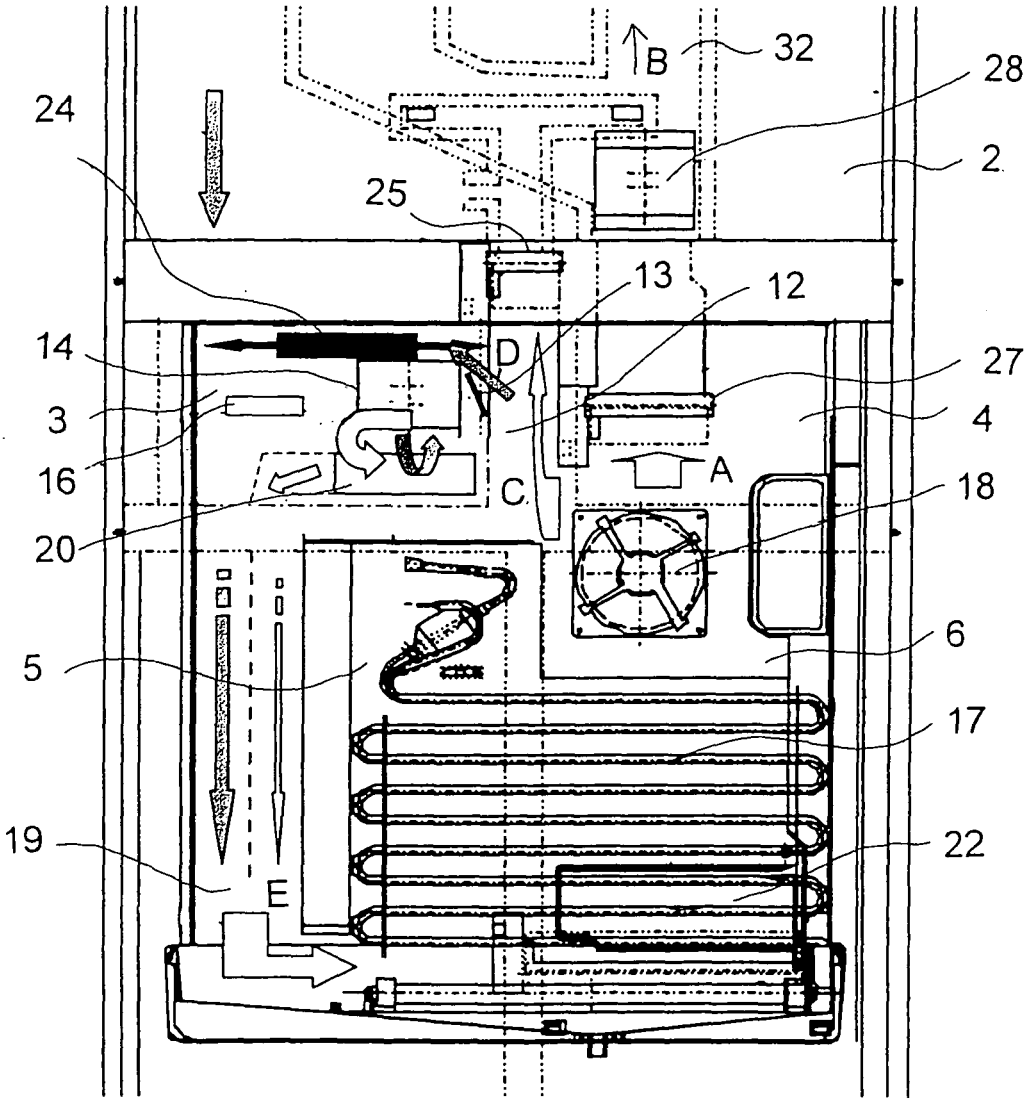
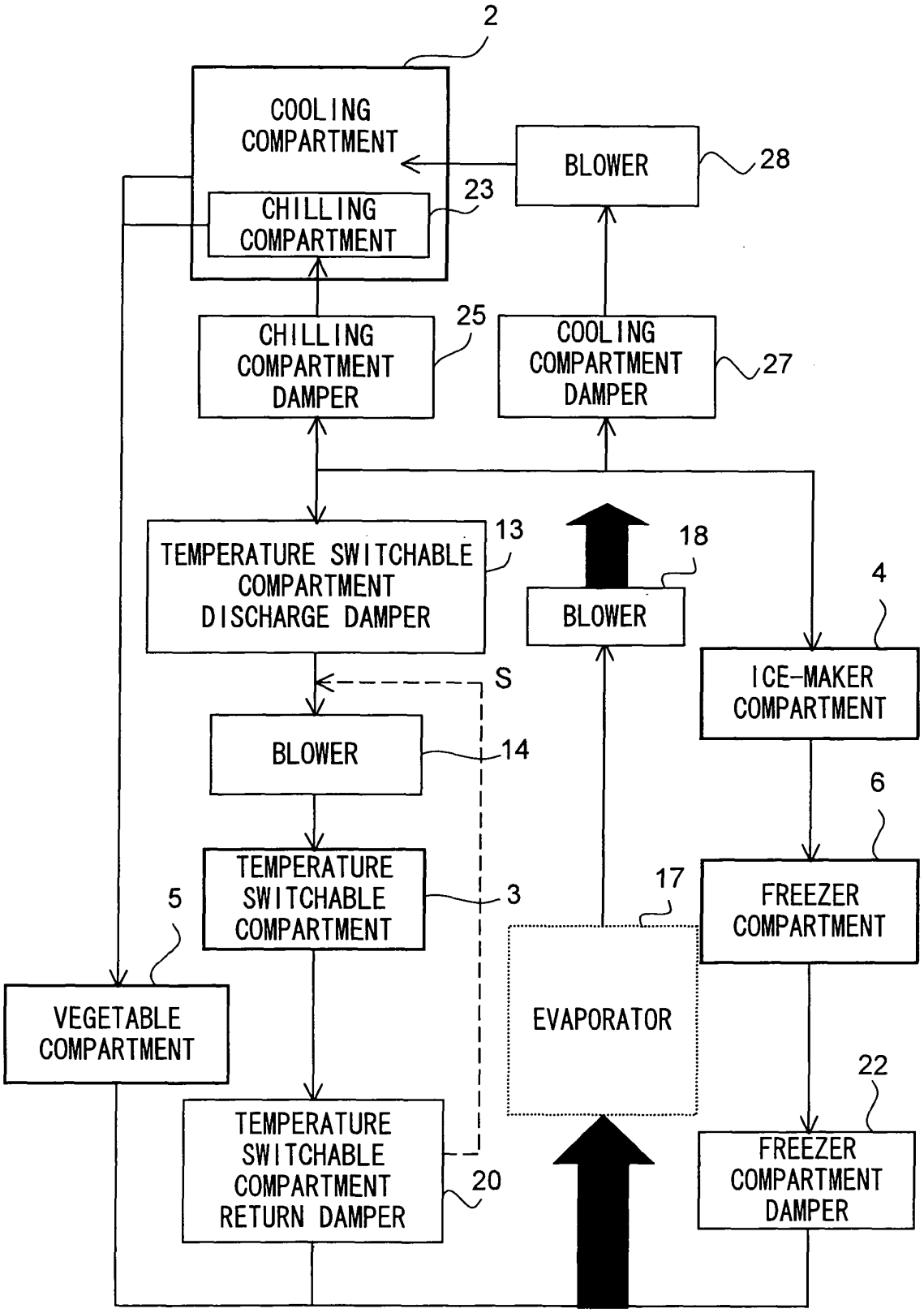


FIG.7


2
COOLING COMPARTMENT
CHILLING COMPARTMENT
23
BLOWER
28
CHILLING COMPARTMENT DAMPER
25
COOLING COMPARTMENT DAMPER
27
TEMPERATURE SWITCHABLE COMPARTMENT DISCHARGE DAMPER
13
18
BLOWER
4
ICE-MAKER COMPARTMENT
S
BLOWER
14
6
TEMPERATURE SWITCHABLE COMPARTMENT
3
17
FREEZER COMPARTMENT
5
VEGETABLE COMPARTMENT
EVAPORATOR
22
TEMPERATURE SWITCHABLE COMPARTMENT RETURN DAMPER
20
FREEZER COMPARTMENT DAMPER

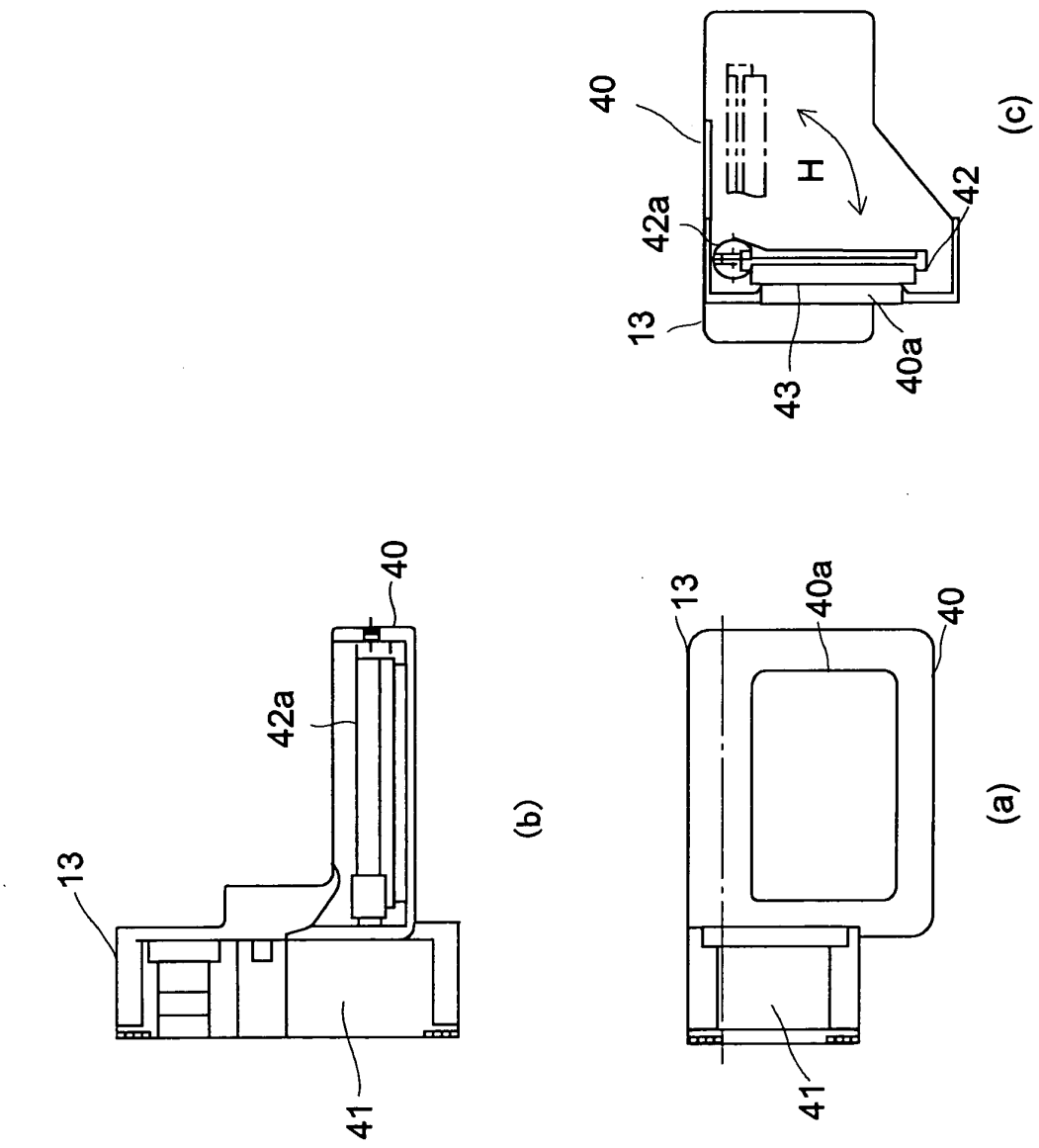


FIG.8

FIG.9

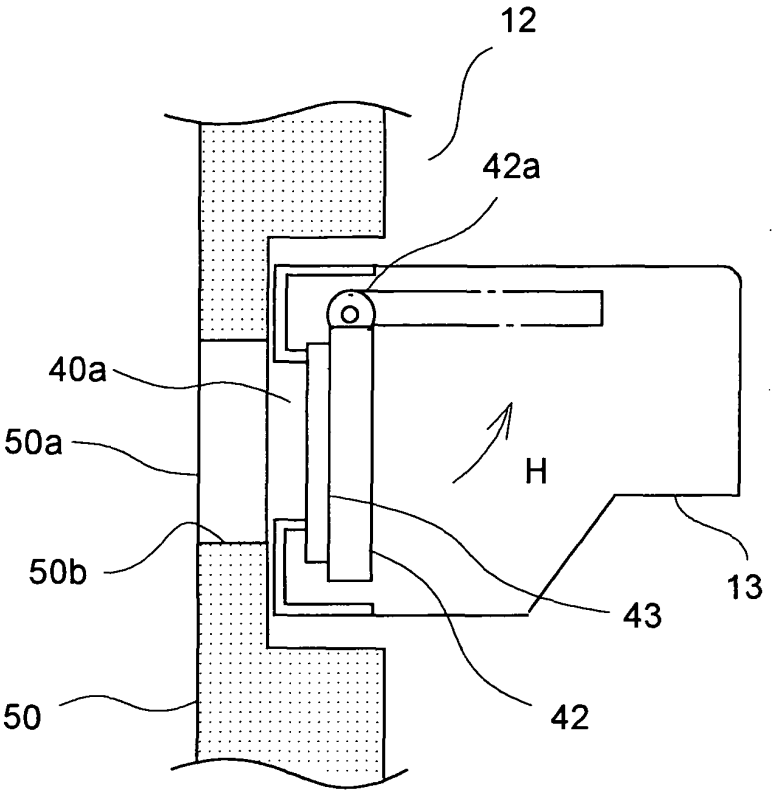


FIG.10

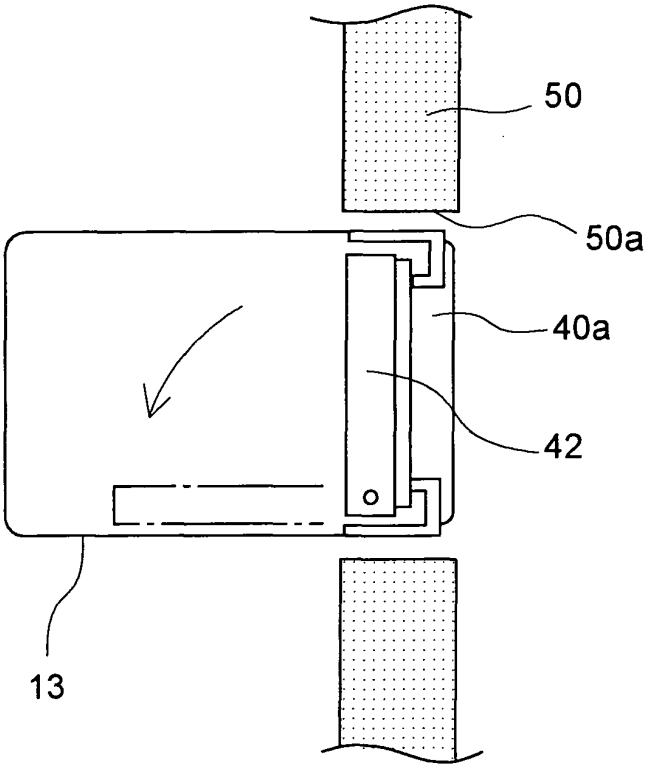
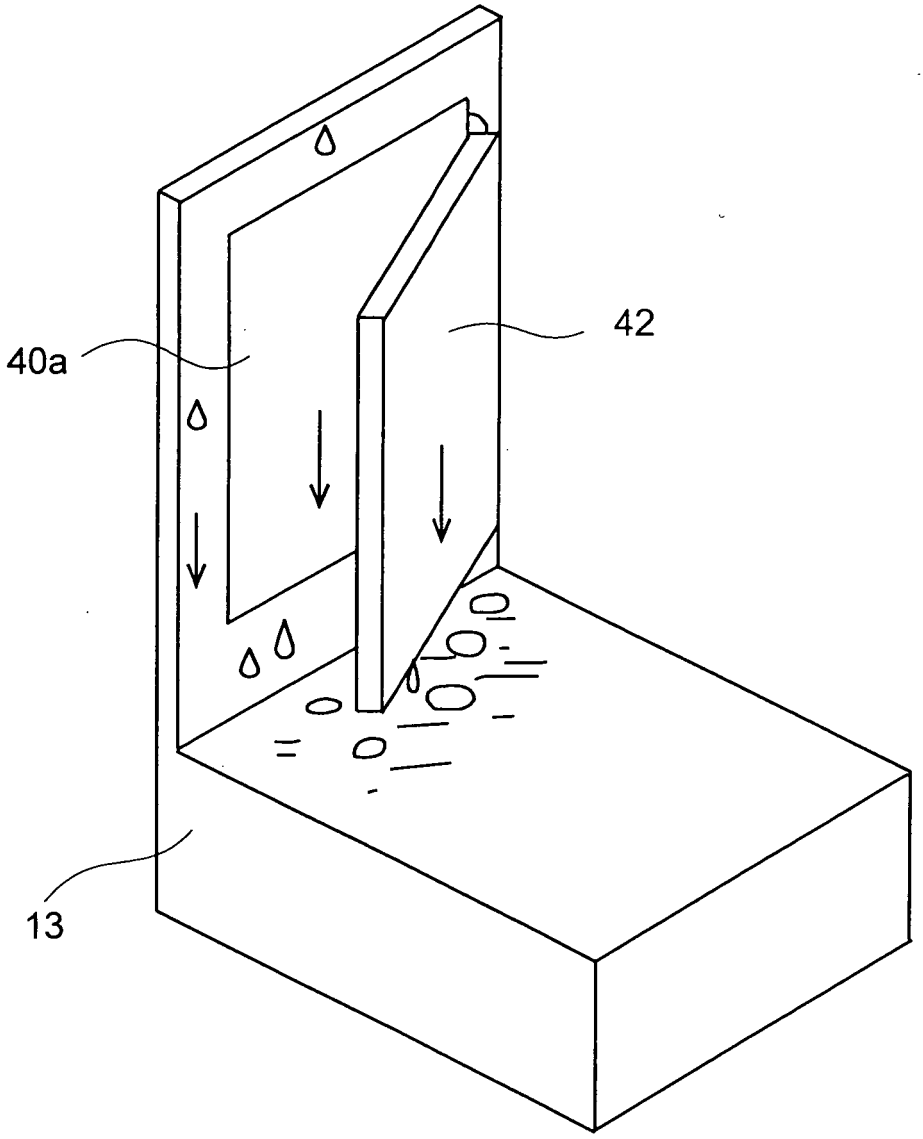


FIG.11



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/017676

A. CLASSIFICATION OF SUBJECT MATTER
F25D11/02(2006.01), ***F25D17/08***(2006.01), ***F25D23/12***(2006.01)

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)
F25D11/02(2006.01), ***F25D17/08***(2006.01), ***F25D23/12***(2006.01)

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 1996-2005
Kokai Jitsuyo Shinan Koho 1971-2005 Toroku Jitsuyo Shinan Koho 1994-2005

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 2002-323279 A (General Electric Co.), 08 November, 2002 (08.11.02), Par. Nos. [0023] to [0037]; Figs. 4 to 6 & US 2003/29178 A1 & EP 1221577 A1 & AU 1000002 A & CN 1367364 A	1 2-10,11-16
Y	JP 4-45379 A (Matsushita Refrigeration Co.), 14 February, 1992 (14.02.92), Page 3, lower right column, lines 10 to 14; Fig. 3 (Family: none)	2-3,11-16
Y	JP 2002-295951 A (Sankyo Seiki Mfg. Co., Ltd.), 09 October, 2002 (09.10.02), Par. No. [0015]; Fig. 2 & US 2002/139135 A1 & EP 1245915 A1 & CN 1379220 A & TW 538228 B	4-6

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

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 December, 2005 (07.12.05)	20 December, 2005 (20.12.05)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/017676

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2002-267321 A (Matsushita Refrigeration Co.), 18 September, 2002 (18.09.02), Par. Nos. [0016] to [0022]; Figs. 1 to 3 (Family: none)	7-10,11-16

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H10288440 A **[0002]**