

[Name of Document] DESCRIPTION

[Title of Invention] REFRIGERATOR AND STORAGE CASE PROVIDED IN REFRIGERATOR

[Technical Field]

[0001]

The present disclosure relates to a refrigerator and a storage case provided in the refrigerator.

[Background Art]

[0002]

Many fruits and vegetables contain 90 % or more water content therein and, generally, are said to have no commercial value when about 5 % of the water content is lost. Loss of water content due to transpiration is a cause of degradation of fruits and vegetables, such as weight loss, shriveling, and the like. Accordingly, it is important to suppress transpiration from fruits and vegetables to keep them fresh. Transpiration from vegetables is higher the higher the temperature is, and is suppressed when temperature is low. Further, it is known that, in addition to temperature, control of humidity is effective in suppressing transpiration. Furthermore, transpiration is proportionate to a difference in water vapor pressure between the surface of the fruits and vegetables and the ambient air. Accordingly, in order to keep the fruits and vegetables fresh, it is desirable that a low temperature storeroom is set so as to have a high humidity environment and that the fruits and vegetables are stored (preserved) in this environment.

[0003]

However, on the other hand, in order to keep the fruits and vegetables fresh, dew condensation needs to be suppressed also. For example, dew condensation occurs in the storeroom when external air flows into the storeroom with the opening and closing of the door, sudden rise in humidity of the storeroom with the storing of foodstuff in the storeroom, and the like. At this moment, when the condensed water droplet drips and make contact with the foodstuff, the dew condensation water promoting the growth of fungi and bacteria results in rotting of the fruits and vegetables.

[0004]

With the above background, a refrigerator has been proposed, for example, "providing a vegetable containing section with a plurality of containing blocks arranged in the vegetable chamber, in which each block is sectioned into a substantially enclosed state" (refer to Patent Literature 1). Further, in Patent Literature 1, in addition to the above configuration of the refrigerator, a refrigerator has been disclosed added with "a humidity control means that controls the humidity between the adjoining containing blocks and that is provided in each partition wall partitionally constituting the plurality of containing blocks".

[Citation List]

[Patent Literature]

[0005]

Patent Literature 1: Japanese Unexamined Patent Application Publication No. 10-332259 (paragraphs [0006] and [0012], Fig. 1)

[Summary of Invention]

[Technical Problem]

[0006]

The refrigerator described in Patent Literature 1 keeps the fruits and vegetables fresh by making the flow of air between each containing block in the containing portion (storage case) small and by making the temperature distribution and humidity distribution small. Further, the refrigerator described in Patent Literature 1 attempts to keep the humidity in each block satisfactory by providing humidity control means in the partitions that partitionally constitutes the containing blocks in which the humidity control means adjust the humidity of adjoining containing blocks.

However, in the refrigerator described in Patent Literature 1, when all of the blocks are in a high humidity state, there are cases in which the humidity in each block cannot be kept satisfactory even by performing absorption and desorption of humidity between the blocks. Therefore, disadvantageously, the refrigerator described in Patent Literature 1 cannot sufficiently suppress the dew condensation in the blocks.

[0007]

The present disclosure has been made to solve the above disadvantages,

and an object is to provide a refrigerator and a storage case that is provided to the refrigerator that is capable of suppressing transpiration of water content in foodstuff by maintaining a humidity of a storeroom storing foodstuff and that is capable of suppressing dew condensation in the storage space.

[Solution to Problem]

[0008]

An refrigerator according to the disclosure includes a storeroom storing foodstuff; a cooling device supplying cold air to the storeroom; and a storage case, which is provided in the storeroom, storing foodstuff therein. The storage case includes a box that is opened on one side and a cover covering the opening of the box, the cover is a double structure with a hollow internal space, and is provided with an external vent hole that connects the internal space of the double structure and a space in the storeroom, which is an exterior of the box, and an internal vent hole that connects the internal space of the double structure and the space in the box. The internal space of the double structure is configured as an air passage that connects the space in the storeroom, which is an exterior of the box, and the space in the box.

[0009]

Further, a storage case according to the disclosure includes a box opened at one side; and a cover covering the opening, in which the cover is a double structure with a hollow internal space, and is provided with an external vent hole that connects the internal space of the double structure and a space in the storeroom, which is an exterior of the box, and an internal vent hole that connects the internal space of the double structure and the space in the box. The internal space of the double structure is configured as an air passage that connects the space, which is an exterior of the box, and the space in the box.

[Advantageous Effects of Invention]

[0010]

The present disclosure is capable of providing a storage space that is high in humidity and is free from dew condensation, and is capable of storing foodstuff such as fruits and vegetables in a fresh state.

[Brief Description of Drawings]

[0011]

[Fig. 1] Fig.1 is a front view of a refrigerator according to Embodiment 1 of the disclosure.

[Fig. 2] Fig. 2 is a cross-sectional view taken along the line A-A of Fig. 1.

[Fig. 3] Fig.3 is a cross-sectional side view of a vegetable compartment according to Embodiment 1 of the disclosure.

[Fig. 4] Fig.4 is a cross-sectional top view of a refrigerator according to Embodiment 1 of the disclosure.

[Fig. 5] Fig.5 is a cross-sectional side view of a vegetable compartment according to Embodiment 2 of the disclosure.

[Fig. 6] Fig.6 is a cross-sectional side view of a vegetable compartment according to Embodiment 3 of the disclosure.

[Fig. 7] Fig.7 is a cross-sectional side view of a vegetable compartment according to Embodiment 4 of the disclosure.

[Fig. 8] Fig.8 is a cross-sectional side view of another exemplary vegetable compartment according to Embodiments 1 to 4 of the disclosure.

[Fig. 9] Fig.9 is a cross-sectional side top of another exemplary vegetable compartment according to Embodiments 1 to 4 of the disclosure.

[Description of Embodiments]

[0012]

Embodiment 1

Fig.1 is a front view of a refrigerator according to Embodiment 1 of the disclosure. Further, Fig. 2 is a cross-sectional view taken along the line A-A of Fig. 1.

A refrigerator 1 includes a plurality of storerooms (refrigerating compartment 100, switching compartment 200, ice compartment 300, freezing compartment 400, and vegetable compartment 500) for storing (preserving) foodstuff.

[0013]

The refrigerating compartment 100 is disposed in the uppermost section and is provided with an opening and closing door. The switching compartment 200 is disposed below the refrigerating compartment 100 and is provided with a drawer door. This switching compartment 200 can switch the temperature range in the compartment to each of the temperature ranges from

a freezing temperature range (-18 degrees C) to refrigeration (3 degrees C), chilled (about 0 degree C), soft frozen (about -7 degrees C), or the like. The ice compartment 300 is disposed below the refrigerating compartment 100 and side by side with the switching compartment 200, and is provided with a drawer door. The freezing compartment 400 is disposed below the switching compartment 200 and the ice compartment 300, and is provided with a drawer door. The vegetable compartment 500 is disposed in the lowermost section and is provided with a drawer door 11.

[0014]

Further, an operating switch controlling the temperature and settings of each storeroom and an operation panel 6 including a liquid crystal display and the like displaying the temperature and the like of each storeroom are provided on the surface of the door of the refrigerating compartment 100. Note that the operation panel 6 may be disposed in the refrigerator such as on the lateral side inside the refrigerating compartment 100.

[0015]

A storage case 101 is disposed in the refrigerating compartment 100, and the storage case 101 is also configured such that foodstuff can be stored therein. Further, a storage case 201 is disposed in the switching compartment 200 in which the storage case 201 is also configured such that foodstuff can be stored therein. Similarly, a storage case 301 is disposed in the ice compartment 300, and it is possible to store foodstuff in the storage case 301, too. A storage case 401 is disposed in the freezing compartment 400 in a similar manner, and it is possible to store foodstuff in the storage case 401. Furthermore, a storage case 501 is disposed in the vegetable compartment 500 in a similar manner, and it is possible to store foodstuff in the storage case 501. Details of the storage case that is disposed in the vegetable compartment 500 will be described subsequently.

Here, the number of cases disposed in each storeroom may be one, but regarding the overall capacity of the refrigerator, if it facilitates organization of the storeroom, two or more may be disposed.

[0016]

A cooling device, which supplies cold air to each storeroom, includes a

compressor 2, a cooler 3, an air fan 4, and the like. The compressor 2 and the cooler 3 are connected with a refrigerant piping in the order of the compressor 2, the cooler 3, and a decompressor (not shown). The piping connecting the decompressor and the suction side of the compressor 2 is, for example, disposed on the lateral side of the refrigerator 1 and functions also as an evaporator. That is, a refrigeration cycle apparatus is constituted by the compressor 2, the cooler 3, the decompressor (not shown), and the like.

[0017]

Among these components, the compressor 2, cooler 3, and the air fan 4 are disposed on the back side of the refrigerator 1. Specifically, the compressor 2 is provided at the bottom of the back side of the refrigerator 1. The cooler 3 and the air fan 4 are provided in an air passage 5 formed on the back side of the refrigerator 1. This air passage 5 is in communication with the cold air outlet port of each of the refrigerating compartment 100, the switching compartment 200, the ice compartment 300, the freezing compartment 400, and the vegetable compartment 500. Additionally, the air in the air passage 5 that has been cooled by the cooler 3 is supplied to each storeroom from the air passage 5 with the air fan 4. Furthermore, the vegetable compartment 500 is cooled by the circulation of the returning cold air from the refrigerating compartment 100 in the return air passage 5a for the refrigerating compartment (refer to Figs. 1 and 3). The cold air that has cooled the vegetable compartment 500 is returned to the cooler 3 through the return air passage 5b for the vegetable compartment.

[0018]

In addition, the temperature of each storeroom is detected with a temperature detection sensor (thermister and the like) disposed in each storeroom. Furthermore, a control unit (not shown) disposed, for example, on the top of the back side of the refrigerator 1 controls the opening degree of a damper (not shown) disposed in the air passage 5, output of the compressor 2, and the blast volume of the air fan 4 so that the temperature of each storeroom becomes a preset temperature.

[0019]

Next, details of the vegetable compartment 500 of the refrigerator 1

according to Embodiment 1 will be described.

[0020]

Fig.3 is a cross-sectional side view of the vegetable compartment according to Embodiment 1 of the disclosure. Further, Fig. 4 is a cross-sectional view of this vegetable compartment viewed from above. Note that Fig. 3 is a cross-sectional view viewed from the same direction as that of Fig. 2 and the opening of the vegetable compartment 500 (that is, the position of door 11) is depicted on the left side of the paper. Furthermore, in Fig. 4, the opening of the vegetable compartment 500 (that is, the position of door 11) is depicted on the bottom side of the paper.

[0021]

The storage case 501 provided in the vegetable compartment 500 includes two boxes (lower case 7 and upper case 8). The lower case 7 is opened on the top and is connected to the door 11 (or integrally formed with the door 11). That is, the lower case 7 is drawn out in conjunction with the door 11. Further, the lower case 7 is provided with a partition plate 10 and is divided into two areas (front area 7a and back area 7b).

[0022]

The upper case 8 is opened on the top and is stacked on the lower case 7 on the upper side. Specifically, the upper case 8 is disposed so as to cover a portion of the opening of the back area 7b of the lower case 7. In figs. 3 and 4, the upper case 8 covers the opening of the back area 7b except for the rear part of the back area 7.

Additionally, in the lower case 7, sidewalls defining the front area 7a, whose opening is not covered by the upper case 8, are extended to an upper direction higher than the bottom side of the upper case 8. As such, foodstuff with height that cannot be stored in the lower case 7 can be stored in the front area 7a. Accordingly, tall foodstuff, such as PET bottled drinks, can be stored in an upright position, and, thus, increases convenience.

[0023]

The openings of the lower case 7 and the upper case 8 is covered with a cover 9. Specifically, the internal space of the lower case 7 according to Embodiment 1 is divided by a partition plate 10, and the opening of the back

area 7b of the lower case 7 (more specifically, the range of the opening of the back area 7b that is not covered by the upper case 8) and the opening of the upper case 8 are covered with the cover 9. With the above, the internal spaces of the back area 7b of the lower case 7 and the upper case 8 can be made into spaces with high degree of sealing. Note that "space with high degree of sealing" in Embodiment 1 refers to a state in which the cover 9 covers the opening of the back area 7b of the lower case 7 and the opening of the upper case 8 to the extent that air will not flow out from the back area 7b of the lower case 7 and the upper case 8 except from the air passage 13 which will be described later.

[0024]

This cover 9 is a double structure formed by a top plate 9a and a bottom plate 9b and a layer of air is formed between the top plate 9a and the bottom plate 9b. In other words, the cover 9 has a double structure with its inner portion (between the top plate 9a and the bottom plate 9b) being hollow. Further, the cover 9 is formed with a vent hole 12a and vent holes 12b which are in communication with the internal space of the double structure. The vent hole 12a is formed in the top plate 9a and connects the "vegetable compartment 500 that will be the exterior of the back area 7b of the lower case 7 and the upper case 8" and the "inner space of the double structure". The vent holes 12b are formed in the bottom plate 9b and connects the "interior of the back area 7b of the lower case 7 and the upper case 8" and the "inner space of the double structure". That is, "the internal space of the double structure" is an air passage that connects the "vegetable compartment 500 that will be the exterior of the back area 7b of the lower case 7 and the upper case 8" and the "inner space of the double structure", and the "interior of the back area 7b of the lower case 7 and the upper case 8" and the "inner space of the double structure". Note that the vent holes 12b of Embodiment 1 includes first vent holes 12b1 and second vent holes 12b2 that is in communication with the back area 7b of the lower case 7. In the following description, when it is not required to distinguish the first vent holes 12b1 and the second vent holes 12b2 in the description, they will be referred to as vent holes 12b without any distinction.

Here, the vent hole 12a corresponds to the external vent hole of the disclosure and the vent hole 12b corresponds to the internal vent hole of the disclosure.

[0025]

As mentioned above, in the refrigerator 1 configured as Embodiment 1, since the opening of the back area 7b of the lower case 7 and the opening of the upper case 8 are covered with the cover 9, the internal spaces of the back area 7b of the lower case 7 and the upper case 8 can be made into spaces with high degree of sealing. Accordingly, it will be possible to prevent cold air containing moisture content from excessively flowing out from the back area 7b of the lower case 7 and the upper case 8, and the back area 7b of the lower case 7 and the upper case 8 can be maintained at high humidity. Therefore, it will be possible to prevent the drying of the foodstuff stored in the back area 7b of the lower case 7 and the upper case 8 so as to be of minimum degree and transpiration of foodstuff can be suppressed.

[0026]

Further, in the refrigerator 1 configured as Embodiment 1, due to the vent holes 12a and 12b and the air passage 13 formed in the cover 9, air in the back area 7b of the lower case 7 and the upper case 8 can enter and leave the vegetable compartment 500 that is the exterior of the back area 7b of the lower case 7 and the upper case 8. Accordingly, when the air in the back area 7b of the lower case 7 and the upper case 8 turns into air with excessively high humidity, the air is vented into the vegetable compartment 500, which is the exterior of the back area 7b of the lower case 7 and the upper case 8, through the vent holes 12a and 12b and the air passage 13, and, thus, excessive increase in humidity in the back area 7b of the lower case 7 and the upper case 8 resulting in occurrence of dew condensation can be suppressed. Note that the humidity inside the back area 7b of the lower case 7 and the upper case 8 can be adjusted to a predetermined humidity by the amount of opening (largeness of the opening area) of the vent holes 12a and 12b.

[0027]

Furthermore, in the refrigerator 1 configured as Embodiment 1, air

containing moisture content (that is, the cold air vented from the back area 7b of the lower case 7 and the upper case 8) can be retained in the air passage 13 in order to maintain the moisture content in the air passage 13.

Accordingly, when humidity in the back area 7b of the lower case 7 and the upper case 8 decreases, the cold air containing moisture content can be moved into the back area 7b of the lower case 7 and the upper case 8 from the air passage 13 in order to increase the humidity of the back area 7b of the lower case 7 and the upper case 8.

[0028]

As such, it will be possible to achieve venting of excessive moisture content and retention of moisture with the double structured air passage 13 and the vent holes 12a and 12b, and it will be possible to keep the back area 7b of the lower case 7 and the upper case 8 to be in a favorable humidity environment while preserving the foodstuff.

[0029]

In addition, by double structuring the cover 9, it will also be possible to uniformize the temperature distribution in the back area 7b of the lower case 7 and the upper case 8 with the insulation effectiveness of the layer of air in the air passage 13. Accordingly, deterioration of foodstuff due to temperature change in the back area 7b of the lower case 7 can be prevented.

Additionally, in the refrigerator 1 configured as Embodiment 1, since the vegetable compartment 500 is cooled by the circulation of the returning cold air from the refrigerating compartment 100 in the return air passage 5a for the refrigerating compartment, when comparing the top plate 9a and the bottom plate 9b of the cover 9, the top plate 9a is configured so as to have a lower temperature than the bottom plate 9b due to the radiational cooling of the top surface. Accordingly, when dew condensation occurs in the air passage 13, the dew condensation water will condense on the top plate 9b side.

Therefore, it will be possible to prevent the dew condensation water from dripping into the back area 7b of the lower case 7 and the upper case 8 with the bottom plate 9b that is provided below the top plate 9a. This will enable prevention of the dew condensation water making contact with the foodstuff, which is one of the causes of rotting of foodstuff.

[0030]

Further, in the refrigerator 1 configured as Embodiment 1, the storage case 501 is configured with two boxes (lower case 7 and upper case 8), and the cover 9 covers the opening of both of the boxes (lower case 7 and upper case 8). The vent holes 12b includes the first vent holes 12b1, which is in communication with the lower case 7, and the second vent holes 12b2, which is in communication with the upper case 8. That is, the lower case 7 and the upper case 8 are in communication through the first vent holes 12b1, air passage 13, and the second vent holes 12b2. Accordingly, air can freely go in and out from and to the upper case 8 and the lower case 7. For example, when either one of the boxes becomes low in humidity, air containing moisture content can flow therein from the other box, and thus, the humidity in the two boxes can be balanced and the humidity in the two boxes can be adjusted between each other.

Note that in Embodiment 1, since the lower case 7 is divided into the front area 7a and the back area 7b with the partition plate 10, the cover 9 covers the opening of the back area 7b of the opening of the lower case 7. That is, the space in communication with the upper case 8 is the back area 7b of the lower case 7.

[0031]

Furthermore, in Embodiment 1, it is possible to further suppress the occurrence of dew condensation in the back area 7b of the lower case 7 and the upper case 8 by forming the vent hole 12a and the vent holes 12b in positions as below, for example. Specifically, as above-mentioned, the vegetable compartment 500 is cooled by the circulation of the returning cold air from the refrigerating compartment 100 in the return air passage 5a for the refrigerating compartment. The vegetable compartment 500 is also cooled by the cold air blown out from the cold air outlet port 5c formed on the back side (refer to Fig. 3). Accordingly, in the vegetable compartment 500, the ceiling side has a lower temperature than that of the bottom side, and the back side has a lower temperature than the door 11 side. Thus, by forming the vent holes 12b at positions more to the back side than that of the vent hole 12a, the vent holes 12b can be disposed at positions having lower

temperature than that of the vent hole 12a. By disposing the vent hole 12a and the vent holes 12b in such positions so that the vent holes 12b is disposed on the back side where temperature is low, the air containing the water content of the foodstuff that are stored in the back area 7b of the lower case 7 and the upper case 8 can be cooled into air with high humidity. Furthermore, since the vicinity of the vent hole 12a is in communication with the external portion of the back area 7b of the lower case 7 and the upper case 8 having air of low humidity and the vicinity of the vent hole 12a has higher temperature than that of the vent holes 12b, the vicinity of the vent hole 12a is always lower in humidity compared to the vicinity of the vent holes 12b. Accordingly, by disposing the vent holes 12a and 12b with accordance to temperature distribution, the moisture content contained in the air close to the vent holes 12b is more easily moved to the vent hole 12a side in the air passage 13 and is more easily vented to the outside through the vent hole 12a. Thus, the occurrence of dew condensation in the back area 7b of the lower case 7 and the upper case 8 can be further suppressed.

[0032]

Embodiment 2

As described above, depending on the amount of opening of the vent holes 12a and 12b, the humidity settings of the back area 7b of the lower case 7 and the upper case 8 differ. Accordingly, by providing a regulating device that controls the amount of opening (in other words, the opening ratio) of the vent hole 12a, the humidity settings of the back area 7b of the lower case 7 and the upper case 8 can be changed, and, thus, usability is further improved. Note that in Embodiment 2, items not described in particular are the same as Embodiment 1 and like functions and configurations are described using like reference numerals.

[0033]

Fig.5 is a cross-sectional side view of the vegetable compartment according to Embodiment 2 of the disclosure. Note that Fig. 5 is a cross-sectional view viewed from the same direction as that of Fig. 3 and the opening of the vegetable compartment 500 (that is, the position of door 11) is depicted on the left side of the paper.

As shown in Fig. 5, an adjustable cover 14 is provided on the top plate 9a of the cover 9. The adjustable cover 14 is, for example, provided slidably on the cover 9 and depending on the position of the adjustable cover 14, the opening ratio of the vent hole 12a can be changed.

Here, the adjustable cover 14 and the sliding mechanism of the adjustable cover 14 correspond to an opening ratio control device.

[0034]

Bu providing the adjustable cover 14 as such, depending on the amount and type of foodstuff that is preserved, the degree of sealing of the back area 7b of the lower case 7 and the upper case 8 can be changed. For example, when storing a large amount of foodstuff in the back area 7b of the lower case 7 and the upper case 8, the adjustable cover 14 can be shifted such that the opening ratio of the vent hole 12a becomes large, and, thus, excessive moisture content in the back area 7b of the lower case 7 and the upper case 8 can be vented and dew condensation can be suppressed. For example, when storing a small amount of foodstuff in the back area 7b of the lower case 7 and the upper case 8, the adjustable cover 14 can be shifted such that the opening ratio of the vent hole 12a becomes small (such as closing the cover, for example), and, thus, the flowing out of excessive moisture content from the back area 7b of the lower case 7 and the upper case 8 can be prevented and loss of water content of the foodstuff can be suppressed. That is, with the shifting of the adjustable cover 14 and the control of the opening ratio of the vent hole 12a, optimum preservation environment can be created corresponding to the amount and type of foodstuff.

[0035]

Further, in Embodiment 2, the vent hole 12a is disposed in the front direction of the cover 9 and the adjustable cover 14 is configured so as to be slidable to the back direction of the vent hole 12a. With the above configuration, when the storage case 501 is pulled out by opening the door 11, since the adjustable cover 14 enters the visual angle of the user, it will be easier to adjust the opening ratio of the vent hole 12a, and, thus, usability is improved.

[0036]

Embodiment 3

A deodorant may be provided in the vegetable compartment 500 described in Embodiment 1 and Embodiment 2. Note that in Embodiment 3, items not described in particular are the same as Embodiment 1 or Embodiment 2 and like functions and configurations are described using like reference numerals.

[0037]

Fig.6 is a cross-sectional side view of a vegetable compartment according to Embodiment 3 of the disclosure. Note that Fig. 6 is a cross-sectional view viewed from the same direction as that of Fig. 3 and an opening of the vegetable compartment 500 (that is, the position of door 11) is depicted on the left side of the paper.

A refrigerator according to Embodiment 3 is provided with a deodorant 15 in the vegetable compartment 500. By providing a deodorant 15 in the vegetable compartment 500, spread of bad odor or bad odor remaining in the vegetable compartment can be suppressed and odor getting into other foodstuff can be prevented.

In particular, as shown in Fig. 6, deodorizing effect can be obtained more efficiently by providing the deodorant 15 in the air passage 13. The air passage can carry out effective deodorization because the cold air in the back area 7b of the lower case 7 and the upper case 8 passes through the air passage 13. Note that the disposition of the deodorant 15 is not limited to the inside of the air passage 13, but it goes without saying, can be provided in at least either the upper case 8 or the lower case 7.

[0038]

Embodiment 4

A moisture control material may be provided in the vegetable compartment 500 described in Embodiment 1 to Embodiment 3. Note that in Embodiment 4, items not described in particular are the same as Embodiment 1 to Embodiment 3 and like functions and configurations are described using like reference numerals.

[0039]

Fig.7 is a cross-sectional side view of the vegetable compartment according to Embodiment 4 of the disclosure. Note that Fig. 7 is a cross-sectional view

viewed from the same direction as that of Fig. 3 and the opening of the vegetable compartment 500 (that is, the position of door 11) is depicted on the left side of the paper.

A refrigerator according to Embodiment 4 is provided with a moisture control material 16 in the air passage 13. By its property, the moisture control material absorbs moisture content when the humidity is higher than a certain humidity and releases moisture content when the humidity is lower than a certain humidity. With the above, it will be easier to keep the humidity of the back area 7b of the lower case 7 and the upper case 8 uniform. Note that the disposition of the moisture control material 16 is not limited to the inside of the air passage 13, but it goes without saying, can be provided in at least either the upper case 8 or the lower case 7.

[0040]

As above, explanatory descriptions of the disclosure have been made in Embodiment 1 to Embodiment 4, but the configurations are not limited to the ones described in Embodiment 1 to Embodiment 4.

For example, as shown in Figs. 8 and 9, the cover 9 may be formed so as to be partially double structured. Note that in Figs. 8 and 9, the rear side of the cover 9 is made into a double structure by making the area of the bottom plate 9b smaller than that of the top plate 9a. By double structuring the portion in the vegetable compartment 500 where the temperature is low and where there is tendency of dew condensation occurring, the same effect can be obtained as when the entire cover 9 was double structured.

[0041]

Further, in the above Embodiment 1 to Embodiment 4, the inside of the lower case 7 was divided into two areas with the partition plate 10, but the number divided can be any number. For example, the inside of the lower case 7 may be divided into three areas, or, naturally, the inside of the lower case may not be divided. Furthermore, when dividing the inside of the lower case 7 into a plurality of spaces, all of the openings of all the areas may be covered, naturally. That is, as shown in the above Embodiment 1 to Embodiment 4, the area such as the front area 7a in which the opening is not covered is not necessarily a required configuration of the disclosure.

[0042]

Furthermore, in such a case where there is no area in which the opening is not covered such as the front area 7a (that is, an area for storing foodstuff with a height that cannot be stored in a single box is not formed), the lower case 7 and the upper case 8 may be arranged to be lined in the vertical direction or in the horizontal direction, for example. That is, an opening may be formed on the front or the side of each lower case 7 and upper case 8, a cover 9 may cover each opening, and the lower case 7 and the upper case 8 may be made into a space with high degree of sealing.

[0043]

Additionally, in the above Embodiment 1 to Embodiment 4, explanatory cases in which the storage case 501 is configured into two boxes (lower case 7 and upper case 8) are described, but the number of boxes configuring the storage case 501 (that is, the number of boxes that are stacked in the vegetable compartment 500) may be any number. For example, three or more boxes may be stacked and the opening of these boxes may be covered by the cover 9. Here, the vent holes 12b may be formed as a plurality of vent holes that connects each boxes. Additionally, for example, it goes without saying that a single box may be provided in the vegetable compartment 500 in which the opening of the box is covered by the cover 9.

[0044]

In addition, the formed position and the formed number of the vent holes 12a and 12b described in the above Embodiment 1 to Embodiment 4 are exemplary and explanatory only. For example, a vent hole 12a may be disposed in the center portion.

[0045]

Further, in the above Embodiment 1 to Embodiment 4, an explanatory case in which a box with its opening covered with a cover 9 is provided in the vegetable compartment 500 is described. However, any storeroom that stores foodstuff that requires humidity control may be provided with a box with its opening covered with a cover 9. Furthermore, in the above Embodiment 1 to Embodiment 4, the disclosure is described by an explanatory refrigerator having a plurality of storerooms. However, it goes without saying that the

disclosure can be applied to a refrigerator with only one storeroom (vegetable compartment, for example).

[Reference Signs List]

[0046]

1. refrigerator; 2. compressor; 3. cooler; 4. air fan; 5. air passage; 5b. return air passage for the vegetable compartment; 5c. cold air outlet port; 6. operation panel; 7. lower case; 8a. front area; 7b. back area; 8. upper case; 9. cover; 9a. top plate; 9b. bottom plate; 10. partition plate; 11. door; 12a. vent hole; 12b. vent hole; 12b1. first vent hole; 12b2. second vent hole; 13. air passage; 14. adjustable cover; 15. deodorant; 16. moisture control material; 100. refrigerating compartment; 200. switching compartment; 300. ice compartment; 400. freezing compartment; 500. vegetable compartment; 501 storage case.

CLAIMS

[Claim 1]

A refrigerator, comprising:
a storeroom storing foodstuff;
a cooling device supplying cold air to the storeroom; and
a storage case, which is provided in the storeroom, storing foodstuff therein, wherein the storage case includes a plurality of boxes that are opened on one side and a cover covering openings of the boxes,
the boxes are disposed so as to be stacked,
the cover covers the openings of the boxes with a single cover,
the cover is a double structure with a hollow internal space, and is provided with an external vent hole that connects the internal space of the double structure and a space in the storeroom which is an exterior of each box, and a plurality of internal vent holes that connect the internal space of the double structure and each space in each box, and
the internal space of the double structure is configured as an air passage that connects the space in the storeroom which is the exterior of each box and each space in the each box.

[Claim 2]

The refrigerator of claim 1, wherein
in a state that the boxes and the cover are provided in the storeroom, the internal vent holes are disposed at a position whose temperature is lower than a temperature of a position of the external vent hole.

[Claim 3]

The refrigerator of any one of claims 1 or 2, further comprising an opening ratio control device that openably and closably covers the external vent hole, and controls an opening ratio of the external vent hole.

[Claim 4]

The refrigerator of claim 1, wherein
the boxes are opened in the upper portion and are disposed so as to be stacked in the vertical direction,
at least one box that is on the lowermost section includes a partition plate dividing the inside of the box into two or more areas, and
at least one opening of the areas is not covered by a box disposed above and by the cover, and a side wall, which define the area, of the lowermost box is extended to higher position than a bottom of the box disposed above.

[Claim 5]

The refrigerator of any one of claims 1 to 4, further comprising a deodorant provided in the internal space of the double structure.

[Claim 6]

The refrigerator of any one of claims 1 to 5, further comprising a moisture control material provided in the internal space of the double structure.

[Claim 7]

A storage case, comprising:
a plurality of boxes opened on one side; and
a cover covering openings of the boxes, wherein
the boxes are disposed so as to be stacked, the cover covers openings of the boxes with a single cover,
the cover is a double structure with a hollow internal space, and is provided with an external vent hole that connects the internal space of the double structure and a space which is an exterior of each box, and a plurality of internal vent holes that connect the internal space of the double structure and each space in each box, and
the internal space of the double structure is configured as an air passage that connects the space that is the exterior of each box and each space in each box.