Refrigerator

Field of the Invention

The invention relates to a refrigerator having a fresh-food compartment on upper part of the refrigerator, a freezer chamber on lower part and having a vegetable container in the fresh-food compartment.

Background of the Invention

Household refrigerators of large volume capacity, which have many doors for respective storage chambers, are commercialized to cope with various user demands. Such refrigerators have been commercialized with various arrangement of the chambers such as; a top-freezer arrangement, in which the freezer chamber is arranged above the fresh-food compartment; a middle-freezer arrangement, in which the freezer chamber is arranged between the fresh-food compartment on top and the vegetable chamber on bottom; a bottom-freezer arrangement, in which the freezer chamber is arranged at lowermost position; an arrangement, in which the fresh-food and the vegetable chambers are vertically long and are arranged side-by-side at below of the fresh-food compartment on top; and a side-by-side arrangement, in which the freezer and fresh-food compartments are in a right-left-wise side-by-side arrangement.

In such commercial environment, following arrangement

of the compartments has recently become predominate in view of ease of use: the fresh-food compartment having a large capacity and high frequency of use is arranged on top; the vegetable compartment is arranged at beneath of the fresh-food compartment; and the freezer compartment is arranged on bottom. Moreover, following arrangement such as that shown in JP2004-037042A (Japan patent application publication No.2004-037042) has become increasingly predominate to improve the ease of use: ice-maker and temperature-switchable chambers, which are relatively small in capacity, are arranged at between the vegetable chamber and the freezer chamber. Meanwhile, refrigerators of following arrangement have also commercialized: the ice-maker and temperature-switchable chambers or the like, of small capacity, are arranged at between the fresh-food compartment and the vegetable chamber that is arranged at middle part.

Also commercialized are refrigerators that have a vegetable chamber within the fresh-food compartment. In such arrangement, the vegetable chamber is predominately constructed as a drawer that is placed on a shelf at lower part of the fresh-food compartment, as shown in JP1993(H05)-157429A (Japan patent application publication No.H05(1993)-157429).

Meanwhile, the JP2003-185334A shows following arrangement: a flapper door for closing a front opening of the fresh-food compartment is secured on door hinges on upper and

lower sides as freely rotatable; storage pockets are arranged in a plurality of tiers, on inner face of the flapper door; lowermost one of the storage pockets is partitioned to front and rear parts by a partition wall and is constructed to enable accommodating of a large-height containers.

Problems to be solved

The bottom-freezer arrangement shown in JP1993(H05)-157429A has following problems: the fresh-food and vegetable chambers having large capacity are arranged on top part so that the ice-maker and the temperature-switchable chambers are arranged at a low height position; hence it is rather difficult to pull out the chambers of drawer construction and to take out articles in the chambers; and top fringe of a door of the vegetable chamber is positioned below waist of a user, or belt height, so as to give impression to the viewer that the refrigerator appears to be short in height and small, thus ornamental appearance of the refrigerator is damaged.

Such drawback in ornamental appearance also occurs for the arrangement having the ice-maker and temperature-switchable chambers between the fresh-food compartment and the vegetable chamber at middle part. Moreover, inside of the vegetable chamber is shown to the user only when the door for the vegetable chamber is opened; and thus, the user tends to fails to notice deterioration of freshness of vegetables and might fail to use them.

The arrangement shown in the JP1993(H05)-157429A is as follows as shown in Fig.6. A low-temperature container 65 is placed at lowermost position within the fresh-food compartment 56; a vegetable container 63 in a drawer construction is placed on top of the low-temperature container 65; and vertical dimension of the fresh-food compartment 56 on top is slightly larger than that of the freezer chamber 57 on bottom. Moreover, the freezer chamber 57 has a flapper door 73 that swings horizontally; and has a plurality of freezer containers 75-78 that are open-topped and in drawer constructions. Thus, the refrigerator has two doors on top and bottom; and both of these doors are flapper doors swinging horizontally. Consequently, this arrangement is rather simple and distinguished from that shown in the JP2004-037042A or other documents, also in respect of the ease of use. Each of the arrangements has an advantage and a disadvantage.

The arrangement shown in JP2003-185334A has a drawback that height dimension of the fresh-food compartment is restricted so that storage pockets for storing tall bottles such as of PET bottles are difficult to be formed in more than two tiers. Thus, spaces for accommodating the tall bottles might not be fully available. The tall bottles may be stored in the vegetable chamber. Nevertheless, the vegetable chamber is predominantly formed in a drawer construction, in which an open-top storage container is pulled out when the door of the

vegetable chamber is pulled out to be opened. And, depth dimension of the storage container is set to be larger than heights of the PET or glass bottles for sake of satisfying a user demand of securing sufficient volume capacity of the vegetable chamber. Thus, storing the bottles in the vegetable chamber has a drawback that the bottles have to be lifted by a large vertical distance when to pull out the bottles.

Present invention has been made in view of the above. It is aimed to provide a refrigerator, in which not only the fresh-food compartment but also the vegetable chamber is good in ease of use in respect of height position and volume capacity; the ice-maker and other chambers having small capacity are positioned at adequate height to improve their ease of use; the freezer chamber having an improved volume capacity is able to be arranged; a ratio of volume capacity to external volume is improved; and achieved are high strength of the refrigerator and its ornamental appearance that gives impression of neatness and large expanse.

Means for Solving the Problem

A refrigerator of the invention comprises: a fresh-food compartment that is arranged at uppermost part within heat-insulator casing; a vegetable chamber that is arranged in lower part within the fresh-food compartment; a chill storage chamber and an ice-maker chamber that are arranged side-by-side at beneath of a heat-insulator wall (5), which is on bottom

of the fresh-food compartment (6), and are partitioned with each other by a vertical partitioner plate; and a freezer chamber in a drawer construction, which is arranged at lowermost part within the heat-insulator casing, is adjacent to the chill storage and the ice-maker chambers and has a right-left-wise dimension tantamount to that of the heat-insulator casing; so that inside of the heat-insulator casing is partitioned to four divisions.

Advantage of the Invention

By the above features, each of the storage chambers is positioned at a height that is good in ease of use; volume capacities of the storage chambers are improved as to improve space-use efficiency; and achieved are high strength of the refrigerator and good ornamental appearance of the refrigerator, which gives impression of large expanse.

Most preferred Embodiments of the Invention

An embodiment of the invention is explained in below, in conjunction with drawings. Fig.1 shows an entire perspective view of a refrigerator body 1; Fig.2 shows the perspective view in a state fresh-food doors are opened; and Fig.3 shows a vertical sectional view of the refrigerator. The refrigerator body 1 shown in Figs. 1-3 is constructed such that; a heat-insulator casing is formed of outer casing 2, inner casing 3 and heat-insulator foam 4 filled between the outer and inner casings; and inside of the heat-insulator casing 2 is partitioned

by a heat-insulating partitioner wall 5, into a fresh-food compartment 6 on top side and a freezer compartment 7 on bottom side.

Front opening of the fresh-food compartment 6 is to be closed by a pair of flapper doors 8 in a French-door arrangement. The fresh-food compartment 6 is partitioned to: a fresh-food chamber 10 on top part, which is arranged with a plurality of shelves 9; a vegetable chamber 11 having a vegetable container 13 in a drawer construction, as a chamber separate from and arranged at beneath of the fresh-food chamber 10; and a lower-temperature chamber 15 on bottom, which is maintained in a temperature range of about $0^{\circ}C$ to $-3^{\circ}C$; by a ceiling partitioner plate 12 that is formed of a transparent resin and serves also as a shelf at bottom of the fresh-food chamber 10 and by a bottom partitioner plate 14 that serves as bottom wall of the vegetable chamber 11. The fresh-food compartment 6, which includes the vegetable chamber 11, has a vertical dimension not less than 900mm.

The vegetable container 13 is a top-open vessel formed of; a low-rise front wall 13a of small vertical dimension and other surrounding walls; and is slidable in front-rear direction by slider rail elements that run in the front-rear direction and are arranged on right-hand-side and left-hand-side walls of the inner casing 3.

When the vegetable container 13 is arranged as

accommodated at predetermined position in the fresh-food compartment 6, top opening of the vegetable container 13 is closed by the ceiling partitioner plate 12; and a front opening, which is formed between the low-rise front wall 13a and front fringe of the ceiling partitioner plate 12, is closed by a lid 16. The lid 16 shuts and opens the front opening as driven by and linked with frontward and rearward motion of the vegetable container 13. The lid 16 may also be shut and opened by a hand of the user and may thus be kept opened all the time. A top-open small-article container 17 is arranged within the vegetable container 13 at its left-hand side; and is supported from a rail arranged on inner face of left-hand-side wall of the vegetable container 13, as supported in a manner of cantilever, as to be slidable in front-rear direction.

In the freezer compartment 7, arranged are; an ice-maker chamber 18, which is equipped with automated icemaker mechanism; and a temperature-switchable chamber 19; as shown in Fig.4. These chambers are relatively small in volume and arranged just below the heat-insulating partitioner wall 5 on side-by-side arrangement with each other, and are constructed as drawers as to be pulled out along with their doors on front side. The temperature-switchable chamber 19 may be maintained for examples, at $-18^{\circ}C$, and at $-9^{\circ}C$ in a soft freezing temperature range; and also be maintained at $-3^{\circ}C$ of partial freezing temperature, at near-zero non-meat-freezing temperature, at

fresh-food storage temperature and at a vegetable storage temperature, as switched among such temperatures. The temperature-switchable chamber 19 may be replaced by a second freezer chamber only for freezer use, and may be replaced by a second vegetable chamber, which is used as a separate chamber only for fruits for example. If replaced by the second freezer chamber, a heat insulator wall is not needed at between the second freezer chamber and the ice-maker chamber 18.

At below of the ice-maker chamber 18 and the temperature-switchable chamber 19 that are in a side-by-side arrangement; a freezer chamber 22 that is also constructed in a drawer construction in same manner as the two chambers 19 and 18 is arranged and partitioned from the two chambers 19 and 18 by a horizontal partitioner plate 21. The freezer chamber 22 has a right-left-wise dimension tantamount to that of the refrigerator body 1 and a vertical dimension of 350-550mm, which is larger than that in conventional refrigerator.

The freezer chamber 22 has: a door 23 that closes up and opens up front opening of the freezer chamber 22; a pair of not-illustrated supporter frames on right-hand and left-hand sides, which are attached as secured on inner face of the door 23; rail elements that are arranged on right-hand and left-hand walls of the freezer chamber 22 and run in front-rear direction; and a storage container 25 for storing of frozen foods, which is supported by the supporter frames and the rail elements,

so as to be slidable in front-rear direction in a manner of a drawer, as shown in Fig.5.

The storage container 25 is formed by extrusion of synthetic resin, into a top-open box having a rather large depth dimension; and has flange parts on top fringe surrounding a top opening. By way of the flange parts, a middle-tier container 26 having a relatively small depth dimension and a shape of shallow dish is overlaid on the storage container 25. The middle-tier container 26 covers almost entirely the top opening of the storage container 25 and has a rearward recess on front fringe of the container 26 so that a milk cartoon for ice making or other tall articles may be stored in the storage container 25.

When the freezer door 23 is pulled out, the middle-tier container 26 is pulled out along with the storage container 25 by way of rail elements until rear end of the middle-tier container 26 comes out from the front opening of the freezer chamber 22 so that top opening of the middle-tier container 26 is fully opened up. The middle-tier container 26 is slidable in front-rear direction along the flange parts of the storage container 25 as to be pulled out and pushed in, in a manner to open and close the top opening of the storage container 25. At above the storage and middle-tier containers 25,26, there is arranged a top-tier container 27 that is pulled out from and pushed into inside of the chamber independently from opening

up and shutting up of the freezer door 23 as well as the other containers 25-26.

Thus, the freezer chamber 22 has three tiers of containers 25-27 in a drawer construction. The top-tier container 27, which is arranged on top of the middle-tier container 26, is supported to be slidable in front-rear direction by following mechanism. Flange parts, which are formed on right-hand-side and left-hand-side of the top opening of the top-tier container 27, are directly supported by support rails that are inward protrusions from right-hand-side and left-hand-side walls of the freezer chamber 22. As a result of such support mechanism, the top-tier container 27 does not apply a load to any of the freezer door 23, the middle-tier container 26 and the bottom-tier storage container 25; and is pulled out independently from motion of the freezer door 23. When to pull out the top-tier container 27, the freezer door 23 is pulled out on first hand, and then top-tier container 27 is separately pulled out from the chamber; and thereafter pushed into the chamber. The top-tier container 27 has a grip on a portion of front wall confronting to inner face of the freezer door; and the grip is seized at a time of pulling out of the top-tier container 27.

By varying depth dimensions of the spaces on the containers and selecting their engagement/non-engagement with the freezer door 23, food articles to be stored are sorted into the spaces on the containers. For example, articles that are relatively

large and to be repeatedly used are stored in the bottom-tier storage container 25; and articles that are relatively small and to be frequently used are stored in the middle-tier container 26. Because the bottom-tier storage and middle tier containers 25,26 are pulled out by pulling out of the freezer door 23; articles are conveniently taken out from and put into these containers 25,26.

The top-tier container 27 may accommodate frozen articles that are large and to be stored for a long period. Then, because of large depth dimension of the top-tier container 27, such articles may be stored without squeezing. Moreover, the top-tier container 27 is kept as closed regardless of opening and closing of the freezer door 23 and is pulled out only when and if needed; thus, influence from temperature of the air is curbed, and the articles are kept in good frozen state over a long period.

Thus, above arrangement of the containers in drawer construction facilitates efficient use of storage spaces in accordance with shape and/or size of the food articles, frequency of taking out and in and usage of food articles as well as engagement/non-engagement with motion of the freezer door.

On rear of the fresh-food and freezer compartments 6 and 7, arranged respectively are a fresh-food and freezer coolers 28 and 29 for respective compartments as well as fans 30 and 31 for the respective coolers 28 and 29. Air cooled by the

coolers 28 and 29 is led to the compartments 6 and 7 respectively by fans 30 and 31, through respective ducts.

The fresh-food and freezer coolers 28 and 29 are arranged in a not-illustrated refrigerant circuit, by which refrigerant outputted from an outlet port of a compressor 32 that is arranged on bottom of the refrigerator body 1 is alternately led into the coolers 28 and 29. Air cooled with heat exchange is sent out by the fan 30, into the fresh-food compartment 6 as to cool the fresh-food and vegetable chambers 10 and 11 to their proper temperatures. The lower-temperature chamber 15 is cooled to a temperature lower than those in other parts of the fresh-food compartment 6, by introducing air that has been circulated in the fresh-food compartment 6 and in same time by directly introducing a portion of air that has just been cooled by the fresh-food cooler 28.

During a freezer cooling operation, the refrigerant is directly led into the freezer cooler 29, as to be evaporated at a relatively low temperature. Air cooled to not higher than $-20^{\circ}C$ is sent out by the fan 31 to the freezer and the ice-maker chambers 22 and 18 and so on, as to keep these chambers at respective preset temperatures.

The controller compares a temperature in the fresh-food compartment 6, mainly with that in freezer chamber 22, and actuates the compressor 32 and the fans 30 and 31. The controller actuates switching between the fresh-food cooling operation

and freezer cooling operation when temperatures in compartments become as low as preset temperatures. For example, the switching is made when a temperature detected by a sensor in the fresh-food compartment 8 becomes as low as $0^{\circ}C$ and when a temperature detected by a sensor in the freezer chamber 19 becomes as low as $-20^{\circ}C$. In otherwise, the switching is made when duration of the cooling operation becomes as long as a preset time length. For example, the switching is made when duration of the fresh-food cooling operation has reached 15-20 minutes and when duration of the freezer cooling operation has reached 30-40 minutes.

At during the freezer cooling operation, surface of the fresh-food cooler 28 has frost and a temperature of about $-3^{\circ}C$ even though refrigerant does not flow through the fresh-food cooler 22. By rotating the fan 30 in this state; cooled air in the fresh-food compartment, which has a temperature not less than $0^{\circ}C$, flows along the fresh-food cooler 28 and thus melts the frost. Resultantly, cooled air having lot of moisture flows through the fresh-food compartment 8 and then into the vegetable chamber 10.

In this way, inside of the vegetable chamber 10 may be cooled as low as about $2^{\circ}C$, and keeps an average temperature of $4^{\circ}C$. Due to inflow of moistened air, humidity in the fresh-food and vegetable chambers 8 and 10 become as high as about 80%. In addition, when vegetables are stored, due to

vapors from those, humidity becomes as high as 90-95%. Thus, even when the lid 16 is kept opened, humidity in the vegetable container 13 is able to be kept in a level curbing of drying the vegetables in the container 13.

As explained hereto, inside of the refrigerator body 1 is partitioned roughly into four divisions; by the heat-insulating partitioner wall 5 at beneath of the fresh-food compartment 6; by the horizontal partitioner plate 21 that separates the freezer chamber 22 from the ice-maker and temperature switchable chambers 18 and 19; and by a vertical partitioner plate 20, which is arranged between the heat-insulating partitioner wall 5 and the horizontal partitioner plate 21 and separates the ice-maker chamber 18 from the temperature switchable chamber 19.

In a conventional refrigerator, inside of the refrigerator body 1 is simply partitioned to three divisions; and a door is arranged on front side of each of the divisions. Then, size and weight of the doors become large, and thus weight load on the heat-insulator casing is increased. Hence, designed strength of the heat-insulator casing should be high. On contrary, in the refrigerator of the invention, a sideways H-shaped reinforcement arrangement is formed by: the heat-insulating partitioner wall 5 on lower side of the refrigerator body 1; the horizontal partitioner plate 21 on top of the freezer chamber 22; and the vertical partitioner

plate 20 that separates a space between the partitioner wall 5 and the partitioner plate 21, into right-hand-side and left-hand-side ones. Hence, rigidity and strength is increased as a cabinet structure.

Moreover, one of the divisions formed by the vertical partitioner plate 20 is the ice-maker chamber 18, which is thus separate from the other chambers. And, height position of the ice-maker chamber 18 is relatively heigh compared with that in the conventional refrigerator because the ice-maker chamber 18 is arranged on top of the freezer chamber 22 having a large volume. In detail, top fringe of the ice-maker chamber 18 comes to a position of about 700mm height above a floor, on which the refrigerator is installed. This position would be slightly lower than waist line of the user; and thus, taking out of ices would be made easily without need of bending at the waist, as to achieve an ease of use.

Meanwhile, the vegetable chamber 11 is formed as partitioned by: the vegetable container 13 that is arranged on lower part of the fresh-food compartment 6; and the ceiling partitioner plate 12 on top of the vegetable container 13. Thus, compared with a conventional refrigerator having a vegetable chamber at middle part in height of the refrigerator body; omitted are at least either of the heat-insulator partitioner walls on top and beneath of the vegetable chamber as well as a separate door in a drawer construction and a rail mechanism,

which are required in the conventional refrigerator. Hence, real storage volume is increased not only in height direction but also in right-left wise direction and front-rear direction. Moreover, production cost is considerably decreased by omitting the separate door and by simplifying the rail mechanism. Additionally, due to decreasing of number of the doors, frosting on front openings is suppressed; and heat dissipation through the front openings is decreased so that power consumption is decreased.

Because the vegetable chamber 11 is within the fresh-food compartment 6, mere opening of the fresh-food door 8 enables taking in of not only the fresh-food articles but also vegetables all at once. This is contrary to the conventional refrigerator that requires opening of both of the fresh-food door and a vegetable-chamber door. When the lid 16 of the vegetable chamber 11 is kept to be opened all the time as mentioned before; mere opening of the fresh-food door 8 enables taking in and out of the vegetables directly by putting in hand through the front opening. The vegetable container 13 is pulled out forward when necessary. Thus, taking in and out of various vegetables to and from the vegetable container is made with ease in a level same with that of the articles in the fresh-food chamber 10. Thus, the ease of use is improved; and door-open duration and number of opening the doors are decreased so that heat dissipation is decreased.

Top fringe of the vegetable chamber 11 comes to a height of 700-120mm above the floor and thus comes closer to eye line than that in the conventional refrigerator. Also in view of this, stored articles are easily captured by the eyes of the user so that failing of use of the articles is decreased and the ease of use is improved.

As mentioned before, bottom fringe of the fresh-food compartment 6 comes to a position slightly higher than waist line of the user and size of the fresh-food door 8 becomes large as a result of arranging the vegetable chamber within the compartment 6. Hence, overall view of the refrigerator gives a fresh impression and a brand-new ornamental appearance is achieved. When the door is opened, the user is given an impression of roomy and spaciousness in respect of capacity of the compartment.

In the embodiment, because the fresh-food doors 8 are in the French-door arrangement, an apparent vertical partition line between the right-hand-side and left-hand-side doors 8 is continuous with an apparent vertical partition line between the ice-maker and the temperature-switchable chambers 18 and 19 to form a single straight line. Hence, ornamental appearance at a time the doors are closed is improved. Moreover, because of the French-door arrangement, heat leakage is decreased and opening and closing of the doors are made with a relatively small force. Because vertical dimension of the fresh-food

doors become large, dimensional restriction on arranging the door pockets 33 is relieved while such dimensional restriction has been large in respect of relation between vertical dimension of the articles to be stored and design dimension of the pockets. For example, the door pockets 35 for accommodating large-height PET bottles are able to be constructed in a two-story arrangement, which has been difficult to be achieved in the conventional refrigerator. In such a way, the ease of use is improved.

In detail, the upper-side door pockets 34 on two tiers and the lower-side door pockets 35 on two tiers are arranged on each of the right-hand-side and left-hand-side doors 8 almost over whole width dimension of the door. These door pockets are attached to be hung between right-hand-side and left-hand-side rib-shaped protrusions on each of the doors, as to form the slots of the door pockets. A vertical distance between the lower-side door pockets 35 is taken to be large; and a vertical distance between the lower-side door pockets 35 and the upper-side door pockets 34 is taken to be large; so that large-height containers such as PET bottles and glass bottles are able to be stored in the lower-side door pockets 35.

Each of the upper-side and lower-side door pockets 34 and 35 is comprised of a front guard wall that curbs falling down of the stored articles. Especially, each of the lower-side door pockets 35 has the front guard wall higher than that of

the upper-side door pocket 34; and has a partition wall that runs in a door width direction and separates inside of the pocket into front-side and rear-side divisions. In this way, large-height containers such as PET bottles and beer bottles are arranged in each of such divisions so that these containers are arranged in two rows on front and rear sides and are stably stored.

Top fringe of the front guard wall on the door pockets 35 in a lowermost tier is arranged in a position higher than bottom of the front wall of the vegetable container 13. By such arrangement, when the vegetable container 13 is in a pulled-out state and the fresh-food door 8 is being shut, the front-guard wall of the door pocket 35 abuts on the front wall 13a of the vegetable container 13 as to push it into the vegetable chamber 11.

Hence, according to the embodiment, a plurality of tiers of the door pockets 34 and 35 are arranged on inner face of the fresh-food door 8; and many containers having large heights are able to be stored in the door pockets at positions easy to be taken in and out; thus, the ease of use is excellent. On contrary, according to the conventional refrigerator, the containers having large heights have to be stored in the vegetable chamber that is in a drawer construction and separate from the fresh-food compartment, when to secure large sum of spaces for storing the containers having large heights. Thus,

taking in and out of the containers have to be made by pulling up the containers by a large height distance.

Brief Description of the Drawing

Fig.1 is a perspective view showing whole of a refrigerator according to first embodiment of the invention;

Fig.2 is a perspective view of the refrigerator of Fig.1, showing a state the fresh-food doors are opened;

Fig.3 is a vertical sectional view of the refrigerator of Fig.1;

Fig.4 is a perspective view of the refrigerator of Fig.1, showing a state one of the fresh-food doors and a door of the temperature-switchable chamber are opened;

Fig.5 is a perspective view of the refrigerator of Fig.1, showing a state the freezer door has been pulled out to be opened; and

Fig.6 is a vertical sectional view of the conventional refrigerator.

Reference numerals

1 refrigerator body; 5 heat-insulator wall; 6 fresh-food compartment; 7 freezer compartment; 8 freezer door; 9 shelf; 10 fresh-food chamber; 11 vegetable chamber; 12 ceiling partition plate; 13 vegetable container; 13a front wall; 14 bottom partition plate; 15 near-freezing-point chamber; 16 lid; 18 ice-maker chamber; 19 temperature-switchable chamber; 20 vertical partitioner plate; 21 horizontal

partitioner plate; 22 freezer chamber; 23 freezer door; 25 storage container; 26 middle-tier container; 27 top-tier container; 28 fresh-food cooler; 29 freezer cooler; 30,31 fan; 33 door-inner-face pockets; 34 upper-side door pockets; 35 PET-bottle pockets; 36 partition wall.

Claims

1. A refrigerator comprising: a fresh-food compartment (6) that is arranged at uppermost part within a heat-insulator casing; a vegetable container (13), which is arranged in lower part within the fresh-food compartment (6) and has a front opening that is formed on at least a portion of front wall of the vegetable container (13); a chill storage chamber (19) and an ice-maker chamber (18) that are arranged side-by-side at beneath of a heat-insulating partitioner wall (5), which is on bottom of the fresh-food compartment (6), and are partitioned with each other by a vertical partitioner plate; and a freezer chamber (22) in a drawer construction, which is arranged at lowermost part within the heat-insulator casing, is adjacent to the chill storage and the ice-maker chambers (19 and 18) and has a right-left-wise dimension tantamount to that of the heat-insulator casing; a fresh-food cooler (28) and a fresh-food fan (30) that are for cooling the fresh-food compartment (6); and a freezer cooler (29) and a freezer fan (31) that are for cooling the chill storage chamber (19), the ice-maker chamber (18) and the freezer chamber (22);

wherein inside of the heat-insulator casing is partitioned to four divisions that are the fresh-food compartment (6), the chill storage chamber (19), the ice-maker chamber (18) and the

freezer chamber (22); and the fresh-food fan (30) is rotated at a time refrigerant flows through the freezer cooler (29).

2. The refrigerator according to claim 1, wherein doors in a French-door arrangement is arranged to the fresh-food compartment.

3. The refrigerator according to claim 1, wherein the chill storage chamber under the fresh-food compartment is constructed as a freezing chamber.

4. The refrigerator according to claim 1, wherein the chill storage chamber under the fresh-food compartment is constructed as a temperature-switchable chamber that is able to be set to at least a freezing temperature.

5. The refrigerator according to claim 1, wherein the freezer chamber has a height dimension of 350-550mm above floor, on which the refrigerator is installed, and has at least three tiers of containers within the chamber.

6. The refrigerator according to claim 1, further comprising a lid that closes and opens the front opening of the vegetable container; wherein the lid is able to be maintained to open up the front opening all the time.

7. The refrigerator according to claim 6, wherein the vegetable container (13) is freely pulled out and pushed in, in front-rear direction; and the lid is able to be opened up and closed up, by such motion of the vegetable container (13) in the front-rear direction, and also manually by a hand of a user.

8. The refrigerator according to claim 1, wherein vertical dimension of the fresh-food compartment (6) is not less than 900mm; and door pockets for PET bottles are arranged in two-story arrangement of upper and lower tiers.

9. The refrigerator according to claim 1, wherein top fringe of a vegetable chamber comes to a height of 700-120mm above a floor.