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(71) Applicant: **LG Electronics Inc.**  
**Youngdungpo-ku**  
**Seoul**  
**150-721 (KR)**

(72) Inventors:  
• **KANG, Byeong-Gyu**  
**Gyeongsangnam-do 641-711 (KR)**  
• **LEE, Hang-Bok**  
**Seongnam City 463-703 (KR)**

- **PARK, Kyung-Soo**  
**Seoul City 135-944 (KR)**
- **YU, Sang-Min**  
**Seoul City 158-073 (KR)**
- **YOON, Jong-Suk**  
**Gyeonggi-do 451-852 (KR)**
- **KIM, Seon-Kyu**  
**Dongjak-gu**  
**Seoul City 156-775 (KR)**
- **KIM, Hyun-Gki**  
**Seoul City 131-814 (KR)**

(74) Representative: **Boult Wade Tennant LLP**  
**Salisbury Square House**  
**8, Salisbury Square**  
**London EC4Y 8AP (GB)**

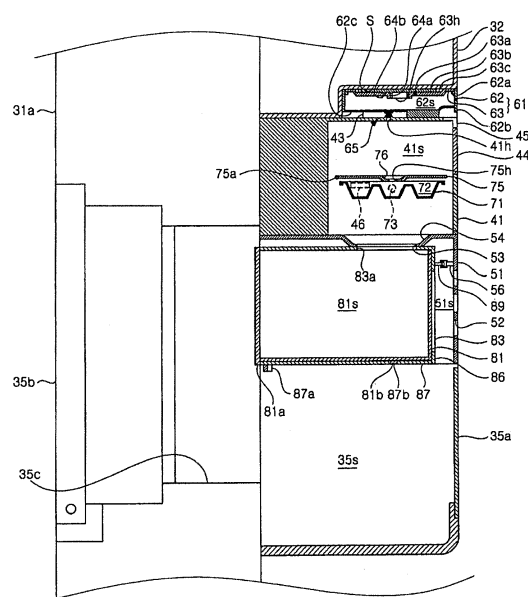
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(54) **ICE-MAKING DEVICE FOR REFRIGERATOR AND REFRIGERATOR HAVING THE SAME**

(57) The present invention relates to an ice-making device for a refrigerator and a refrigerator having the same. The ice-making device of the present invention comprises a water tank detachably mounted to a rear surface of a refrigerator door, an ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein, an ice tray mounted into the installation space and provided with an ice-making groove in which water supplied from the water tank is frozen into ice, and an ice bank for storing ice made in the ice tray, wherein the ice bank can be received in or withdrawn from the installation space. According to the present invention, there are advantages in that ice-making water can be prevented from running down from the ice tray, ice made in the ice tray can be prevented from being impregnated with odor of other foods, the ice can be more easily withdrawn while the loss of cold air is minimized, and the ice can be prevented from being impregnated with odor of the other foods.

【Figure 6】



## Description

[Technical Field]

**[0001]** The present invention relates to a refrigerator, and more particularly, to an ice-making device for a refrigerator and a refrigerator including the ice-making device.

[Background Art]

**[0002]** Refrigerators are household appliances for keeping foods refrigerated or frozen in order to store the foods in a fresh state for a long time. The interior of the refrigerator is portioned into freezing and refrigerating chambers, and an ice-making device is provided in the freezing chamber.

**[0003]** FIGS. 1 and 2 show a refrigerator provided with a conventional ice-making device, and FIG. 3 shows an ice-making device installed in a refrigerator.

**[0004]** As shown in these figures, freezing and refrigerating chambers 11 and 13 which are partitioned side by side are provided within a main body 10 of a refrigerator. The main body 10 is provided with a freezing chamber door 11a and a refrigerating chamber door 13a in order to selectively open or close the freezing and refrigerating chambers 11 and 13, respectively. The freezing and refrigerating chamber doors 11a and 13a are hinged to opposite lateral sides of the main body 10, respectively, such that the doors can be pivoted in a forward direction.

**[0005]** Furthermore, home bars 15 and 17 are provided on the freezing and refrigerating chamber doors 11a and 13a, respectively. Food such as drinking water is stored in the home bars 15 and 17. Each of the home bars 15 and 17 is composed of a home bar housing 15a or 17a and a home bar door 15b or 17b.

**[0006]** The home bar housings 15a and 17a are provided on rear surfaces of the freezing and refrigerating chamber doors 11a and 13a, respectively. The home bar housings 15a and 17a are provided with predetermined storage spaces, respectively, in which food such as drinking water can be received.

**[0007]** Each of the home bar doors 15b and 17b functions to selectively open or close an opening that is formed by cutting out a portion of the freezing or refrigerating chamber door 11a or 13a to correspond to the home bar housing 15a or 17a. Each of the home bar doors 15b and 17b is installed to be vertically pivoted.

**[0008]** Referring to FIG. 2, an ice-making device 19 is installed at a position in the freezing chamber 11. The ice-making device 19 is an apparatus for making ice. The ice-making device 19 is retractably installed within the freezing chamber 11. Further, as shown in FIG. 3, the ice-making device 19 is composed of a support frame 21 and a pair of ice trays 23.

**[0009]** The support frame 21 is formed into a rectangular shape. The support frame 21 functions to rotatably support the ice trays 23. That is, the ice trays 23 can be

installed to be rotatable within the support frame 21.

**[0010]** Each of the ice trays 23 is formed with a plurality of ice-making grooves 23a. Support shafts 24 are provided at the centers of front and rear surfaces of the ice trays 23, respectively. The ice tray 23 is rotated clockwise or counterclockwise about the support shaft 24 as viewed in FIG. 2. To this end, the support shaft 24 is rotatably inserted into the rear surface of the support frame 21.

**[0011]** A stopper 25 is installed at a certain position on the rear surface of support frame 21 to the left side of the support shaft 24 as viewed in this figure. The stopper 25 protrudes from the rear surface of the support frame 21 by a predetermined distance and is positioned on a moving path of the ice tray 23. The ice tray 23 rotating about the support shaft 24 is twisted by the stopper 25.

**[0012]** A handle 26 is provided on a front surface of the support frame 21 corresponding to the front of the ice tray 23. The handle 26 is a portion which a user grips to rotate the ice tray 23. A pair of handles 26 are provided to be in harmony with the number of ice trays 23.

**[0013]** Referring again to FIG. 2, an ice bank 27 is installed below the ice-making device 19 within the freezing chamber 11. Ice made in the ice-making device 19 is stored in the ice bank 27. The ice bank 27 is also retractably installed within the freezing chamber 11.

**[0014]** The ice-making device configured as such is operated as follows.

**[0015]** First, the ice-making groove 23a of the ice tray 23 is filled with water. The freezing chamber door 11a is opened to open the freezing chamber 11. Next, the ice-making device 19 is received in a position in the freezing chamber 11. After the ice-making device 19 is installed in such a way, the freezing chamber door 11a is closed to close the freezing chamber 11.

**[0016]** In the meantime, if the water filled in the ice-making grooves 23a is frozen after a certain period of time, the freezing chamber door 11a is again opened to open the freezing chamber 11. If the handle 26 is rotated clockwise as viewed in FIG. 2, the ice tray 23 is also rotated in the same direction.

**[0017]** When the ice tray 23 is rotated by a predetermined angle, a rear surface of ice tray 23 is caught to the stopper 25. Thus, the ice tray 23 cannot be further rotated clockwise as viewed in FIG. 2. If the handle 26 is further rotated clockwise from such a state as viewed in FIG. 2, the ice tray 23 is twisted. Therefore, ice made in the ice-making grooves 23a is separated from the ice tray 23 and then stored in the ice bank 27.

**[0018]** However, the related art ice-making device for a refrigerator has the following problems.

**[0019]** As described above, the ice tray 23 is received in the freezing chamber 11 in a state where the ice-making grooves 23a are filled with water. Therefore, there is a problem in that the water filled in the ice-making grooves 23a runs down from the grooves while the ice tray 23 is received in the freezing chamber 11.

**[0020]** Further, the water may be impregnated with odor from the other foods stored in the freezing chamber

11 while the water filled in the ice-making grooves 23a is frozen. Thus, the water made in the freezing chamber in such a way is not sanitary and odor of the other food may smell when the ice is utilized.

**[0021]** If a user intends to withdraw the ice bank 27 with ice stored therein from the freezing chamber 11, he/she should rotate the freezing chamber door 11a to open the freezing chamber 11. Therefore, there is a problem in that it is troublesome to put the ice bank 27 into or out of the freezing chamber.

**[0022]** Moreover, when the freezing chamber 11 is opened in order to withdraw the ice bank 27 from the chamber, cold air in the freezing chamber 11 is discharged to the outside. That is, in the related art ice-making device for a refrigerator, cold air in the freezing chamber 11 is unnecessarily discharged to the outside while the ice bank 27 is withdrawn. Therefore, power consumption of the refrigerator is increased.

**[0023]** Further, the ice bank 27 is accommodated in the freezing chamber 11. Thus, it is likely that ice stored in the ice bank 27 is impregnated with odor of foods stored in the freezing chamber 11.

[Disclosure]

[Technical Problem]

**[0024]** Accordingly, the present invention is conceived to solve the problems in the prior art. An object of the present invention is to provide an ice-making device for a refrigerator capable of preventing ice-making water from running down from an ice tray.

**[0025]** Another object of the present invention is to provide an ice-making device for a refrigerator capable of making ice in a more sanitary way.

**[0026]** A further object of the present invention is to provide an ice-making device for a refrigerator capable of withdrawing ice in a more convenient way.

**[0027]** A still further object of the present invention is to provide an ice-making device for a refrigerator capable of minimizing the leakage of cold air occurring while withdrawing ice from the refrigerator to the outside.

**[0028]** A still further object of the present invention is to provide an ice-making device for a refrigerator capable of preventing ice stored in an ice bank from being impregnated with odor of foods stored in the refrigerator.

[Technical Solution]

**[0029]** According to an aspect of the present invention for achieving the objects, there is provided an ice-making device for a refrigerator comprising: a water tank detachably mounted to a rear surface of a refrigerator door; an ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein; an ice tray mounted into the installation space and provided with an ice-making groove in which water supplied from the water

tank is frozen into ice; and an ice bank for storing ice made in the ice tray, wherein the ice bank can be received in or withdrawn from the installation space.

**[0030]** In one embodiment of the invention, the water tank is detachably mounted into a mounting space defined between a bottom surface of any one of door baskets provided on the rear surface of the door and a top surface of the ice-making housing.

**[0031]** In another embodiment of the invention, the water tank is provided with a water storage space, a supply port through which water is supplied into the water storage space, a discharge port through which the water stored in the water storage space is supplied to the ice tray, and a valve for selectively opening or closing the discharge port.

**[0032]** In another embodiment of the invention, the discharge port is formed at a position deviated from a region where the water is supplied into the water storage space through the supply port.

**[0033]** In another embodiment of the invention, the water tank includes: a tank main body formed into a polyhedral shape with an open top to form the water storage space therein and provided with the discharge port at a bottom surface thereof; a tank cover coupled to an upper portion of the tank main body to selectively open or close the water storage space and provided with the supply port at a predetermined position; and a supply port cover provided on the tank cover to selectively open or close the supply port, and at least a part of the water tank is formed of a transparent or translucent material to visually check an amount of water stored in the water storage space from the outside.

**[0034]** In another embodiment of the invention, a support member is provided at an inner side of a sidewall of the tank main body to support an outer periphery of the tank cover.

**[0035]** In another embodiment of the invention, a seating recess in which the supply port cover is seated when the supply port is closed by the cover and a packing groove covers the supply port are formed on a top surface of the tank cover, a cutout which communicates with the seating recess to allow a user's hand to be inserted into the recess is formed at a position on the tank cover to open the supply port cover which has covered the supply port, and a contact protrusion brought into close contact with the supply port and a packing protrusion fitted into the packing groove are provided on a bottom surface of the supply port cover.

**[0036]** In another embodiment of the invention, the valve includes: a valve bracket provided at an outer periphery of the discharge port and formed with a supply port; a valve main body installed to be vertically movable through the supply port of the valve bracket to selectively open or close the supply port; a packing ring provided between the valve bracket and the valve main body to stop up a gap between the valve bracket and the valve main body; and an elastic member for imparting an elastic force to the valve main body in a direction in which the

valve main body closes the supply port of the valve bracket, and the valve main body is actuated by an actuating protrusion provided on the top surface of the ice-making housing to open the discharge port.

**[0037]** In another embodiment of the invention, the water tank is provided with a guide groove formed by depressing upward a portion of a bottom surface of the water tank, the ice-making housing is provided with a guide rib protruding upward from the top surface of the ice-making housing, and the water tank can be guided by allowing the guide rib to be inserted and slid in the guide groove while the water tank is received in or withdrawn from the mounting space.

**[0038]** In another embodiment of the invention, the ice-making housing comprises a first ice-making housing mounted below the water tank and having an ice tray installed in an installation space thereof, and a second ice-making housing mounted below the first ice-making housing and having an ice bank installed in an installation space thereof.

**[0039]** In another embodiment of the invention, a supply port is provided at a top surface of the first ice-making housing to supply water stored in the water tank into the ice tray.

**[0040]** In another embodiment of the invention, the first ice-making housing further comprises at least one cold air supply port for supplying cold air into the installation space, a viewing window for visually checking from the outside a process of making ice in the ice-making groove, and a handle opening through which a user's hand can pass to allow the water tank to be mounted or withdrawn.

**[0041]** In another embodiment of the invention, support shafts are provided at both lateral sides of the ice tray to pivotally support the ice tray on the first ice-making housing, a stopper is provided on an inner side of the first ice-making housing and is located within a range of the ice tray pivoting about the support shafts, a pivoting lever is provided on an outer side of the first ice-making housing to allow the ice tray to be pivoted, and the ice made in the ice-making groove is separated from the ice-making groove and then stored in the ice bank by actuating the pivoting lever to allow the ice tray to be caught to the stopper and then twisted while the ice tray is pivoted.

**[0042]** In another embodiment of the invention, the pivoting lever is provided on one side of the first ice-making housing corresponding to a free end of the door.

**[0043]** In another embodiment of the invention, further comprising a tray cover mounted in the installation space of the first ice-making housing to be vertically pivoted in cooperation with the pivot motion of the ice tray and to selectively open or close the ice-making groove.

**[0044]** In another embodiment of the invention, the tray cover is made of a transparent or translucent material to allow a user to visually check a process of making ice in the ice-making groove.

**[0045]** In another embodiment of the invention, the tray cover is provided with a supply port through which water supplied from the water tank through the supply port of

the first ice-making housing can be supplied to the ice tray.

**[0046]** In another embodiment of the invention, the supply port of the tray cover is formed at a position deviated from a region where the water is supplied from the water storage space through the supply port of the first ice-making housing.

**[0047]** In another embodiment of the invention, the tray cover is further provided with a water guide surface downwardly inclined toward the supply port of the tray cover to guide the water into the supply port.

**[0048]** In another embodiment of the invention, an ice transfer opening through which ice made in the ice tray is transferred to the ice bank and a transfer guide surface which is formed to be downwardly inclined toward the ice transfer opening to guide the ice into the ice guide opening are provided on a top surface of the second ice-making housing.

**[0049]** In another embodiment of the invention, the ice bank is formed into a hexahedral shape with an open top and provided with an ice storage space therein, and at least a portion of the ice bank is made of a transparent or translucent material to allow a user to visually check the ice stored in the ice storage space from the outside.

**[0050]** In another embodiment of the invention, further comprising a guide means for allowing the ice bank to be received in or withdrawn from the installation space of the second ice-making housing through a home bar provided in the door.

**[0051]** In another embodiment of the invention, the home bar includes: a home bar housing installed in the rear surface of the door below the second ice-making housing and provided with a predetermined storage space; an opening formed by cutting out a portion of the door and communicating with the storage space and the installation space of the second ice-making housing; and a home bar door for selectively opening or closing the opening, and the ice bank is received in or withdrawn from the installation space of the second ice-making housing through the opening by means of the guide means.

**[0052]** In another embodiment of the invention, the guide means is a guide box for moving forward or rearward of the installation space of the second ice-making housing in a state where the ice bank is seated thereon.

**[0053]** In another embodiment of the invention, a support rib is provided at a rear end of the guide box to be brought into close contact with a rear side of the ice bank in a state where the ice bank is seated on a top surface of a floor plate of the guide box, and a support projection is provided at a front side of the ice bank to be brought into close contact with a front end of the guide box in a state where the ice bank is seated on the top surface of the floor plate of the guide box.

**[0054]** In another embodiment of the invention, the floor plate of the guide box can be slid in a forward and rearward direction with respect to lateral sides of the guide box in a state where the ice bank is seated thereon,

and a catching groove and a catching protrusion inserted in the catching groove are provided respectively at a position on a bottom surface of the ice bank and a corresponding position on the floor plate of the guide box.

**[0055]** In another embodiment of the invention, the guide box which is received in the installation space of the second ice-making housing in a state where the ice bank is seated thereon is prevented from being inadvertently withdrawn from the installation space of the second ice-making housing by means of a locking means.

**[0056]** In another embodiment of the invention, the locking means is composed of: a push latch provided on one side of the guide box or the second ice-making housing brought into close contact with the guide box; and a latch hook provided on the other side of the guide box or the second ice-making housing brought into close contact with the guide box and inserted selectively in the push latch by pushing the guide box in a direction in which the ice bank is received in the installation space of the second ice-making housing.

**[0057]** According to another aspect of the present invention for achieving the objects, there is provided an ice-making device for a refrigerator comprising: a water tank detachably mounted to a rear surface of a refrigerator door; a first ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein; an ice tray pivotally mounted into the installation space of the first ice-making housing and provided with an ice-making groove in which water supplied from the water tank is frozen into ice; a tray cover mounted in the installation space of the first ice-making housing to be vertically pivoted in cooperation with a pivot motion of the ice tray and to selectively open or close the ice-making groove; a second ice-making housing detachably mounted to the rear surface of the door below the first ice-making housing and provided with a predetermined installation space therein; an ice bank for storing ice made in the ice tray; and a guide box for moving forward or rearward of the installation space of the second ice-making housing in a state where the ice bank is seated thereon such that the ice bank can be received in or withdrawn from the installation space of the second ice-making housing through a home bar provided in the door, wherein the ice bank and the guide box can be received in or withdrawn from the installation space of the second ice-making housing.

**[0058]** In another embodiment of the invention, the water tank is detachably mounted into a mounting space defined between a bottom surface of any one of door baskets provided on the rear surface of the door and a top surface of the first ice-making housing.

**[0059]** In another embodiment of the invention, the water tank includes: a tank main body formed into a polyhedral shape with an open top to form a water storage space therein and provided with a discharge port, through which water stored in the water storage space is supplied to the ice bank, at a bottom surface thereof; a valve coupled to the tank main body to selectively open or close

the discharge port; a tank cover coupled to an upper portion of the tank main body to selectively open or close the water storage space and provided with a supply port through which water is supplied into the water storage space; and a supply port cover provided on the tank cover to selectively open or close the supply port, and the discharge port is formed at a position deviated from a region where the water is supplied into the water storage space through the supply port and at least a part of the water tank is made of a transparent or translucent material to visually check an amount of water stored in the water storage space from the outside.

**[0060]** In another embodiment of the invention, the valve includes: a valve bracket provided at an outer periphery of the discharge port and formed with a supply port; a valve main body installed to be vertically movable through the supply port of the water tank to selectively open or close the supply port; a packing ring provided between the valve bracket and the valve main body to stop up a gap between the valve bracket and the valve main body; and an elastic member for imparting an elastic force to the valve main body in a direction in which the valve main body closes the supply port of the water tank, and the valve main body is actuated by an actuating protrusion provided on the top surface of the first ice-making housing to open the discharge port.

**[0061]** In another embodiment of the invention, a supply port is provided at the top surface of the first ice-making housing to supply the water stored in the water tank into the ice tray, an ice transfer opening through which ice made in the ice tray is transferred to the ice bank and a transfer guide surface which is formed to be downwardly inclined toward the ice transfer opening to guide the ice into the ice guide opening are provided on a top surface of the second ice-making housing.

**[0062]** In another embodiment of the invention, ice made in the ice-making groove is separated from the ice-making groove and then stored in the ice bank by actuating a pivoting lever, which is provided on an outer side of the first ice-making housing corresponding to a free end of the door, and then allowing the ice tray to be caught to and twisted by a stopper provided on an inner side of the first ice-making housing when the ice tray is supported on the stopper.

**[0063]** In another embodiment of the invention, the tray cover is provided with a supply port formed at a position deviated from a region where the water is supplied from the water tank to the ice tray through the supply port of the first ice-making housing, and a water guide surface downwardly inclined toward the supply port of the tray cover to guide the water into the supply port of the tray cover.

**[0064]** In another embodiment of the invention, the ice bank is formed into a hexahedral shape with an open top and provided with an ice storage space therein, and at least a portion of the ice bank is made of a transparent or translucent material to allow a user to visually check the ice stored in the ice storage space from the outside.

**[0065]** In another embodiment of the invention, a floor plate of the guide box can be slid in a forward and rearward direction with respect to lateral sides of the guide box in a state where the ice bank is seated thereon.

**[0066]** In another embodiment of the invention, a push latch and a latch hook are provided respectively on the guide box and the second ice-making housing brought into close contact with the guide box such that the latch hook is selectively fastened to the push latch by pushing the guide box in a direction in which the ice bank is received in the installation space of the second ice-making housing.

**[0067]** According to another aspect of the present invention for achieving the objects, there is provided a refrigerator, comprising: a refrigerator main body provided with a predetermined storage space; a refrigerator door for selectively opening or closing the storage space; and an ice-making device according to any one of the above-mentioned aspects or embodiments mounted to a rear surface of the door.

#### [Advantageous Effects]

**[0068]** According to an ice-making device for a refrigerator of the present invention as described above, the following effects can be expected.

**[0069]** It is possible to prevent ice-making water from running down from the ice tray. It is also possible to prevent ice made in the ice tray from being impregnated with odor of other foods. Further, the ice can be easily withdrawn and an amount of cold air lost while the ice is withdrawn can also be minimized. Furthermore, it is also possible to prevent the ice stored in the ice bank from being impregnated with odor of other foods.

#### [Description of Drawings]

#### [0070]

FIG. 1 is a front view showing an external appearance of a refrigerator equipped with a related art ice-making device;

FIG. 2 is a front view showing the interior of the refrigerator shown in FIG. 1;

FIG. 3 is a plan view of the ice-making device provided in the refrigerator shown in FIG. 2;

FIG. 4 is a front view showing an external appearance of a refrigerator equipped with a preferred embodiment of an ice-making device according to the present invention;

FIG. 5 is a front view showing the interior of a refrigerator equipped with a preferred embodiment of an ice-making device according to the present invention;

FIG. 6 is a sectional view showing the embodiment of the present invention shown in FIG. 5;

FIG. 7 is an exploded view of a water tank constituting the embodiment of the present invention shown

in FIG. 5;

FIG. 8 is an enlarged view of a valve of a water tank constituting the embodiment of the present invention shown in FIG. 5;

FIG. 9 is a perspective view showing an external appearance of a first ice-making housing constituting the embodiment of the present invention shown in FIG. 5;

FIG. 10 is a sectional view showing the interior of a first ice-making housing constituting the embodiment of the present invention shown in FIG. 5;

FIG. 11 is a perspective view showing an external appearance of a second ice-making housing constituting the embodiment of the present invention shown in FIG. 5;

FIG. 12 is a sectional view showing the interior of a second ice-making housing constituting the embodiment of the present invention shown in FIG. 5;

FIGS. 13 and 14 are sectional views illustrating a process of storing water into a water storage space in a water tank shown in FIG. 5;

FIGS. 15 and 16 are sectional views illustrating a process of installing a water tank shown in FIG. 5;

FIGS. 17 to 19 are sectional views illustrating an operating process of an ice tray shown in FIG. 5; and

FIGS. 20 to 23 are sectional views illustrating a withdrawing process of an ice bank shown in FIG. 5.

#### [Best Mode]

**[0071]** Hereinafter, a preferred embodiment of an ice-making device for a refrigerator according to the present invention will be described in detail with reference to the accompanying drawings.

**[0072]** FIGS. 4 and 5 show a refrigerator equipped with a preferred embodiment of an ice-making device according to the present invention, FIG. 6 is a sectional view showing the embodiment of the present invention shown in FIG. 5, FIG. 7 shows a water tank constituting the embodiment of the present invention shown in FIG. 5, FIG. 9 shows an external appearance of a first ice-making housing constituting the embodiment of the present invention shown in FIG. 5, FIG. 10 shows the interior of the first ice-making housing, FIG. 11 shows an external appearance of a second ice-making housing constituting the embodiment of the present invention shown in FIG. 5, and FIG. 12 shows the interior of the second ice-making housing.

**[0073]** As shown in the figures, freezing and refrigerating chambers 31 and 33 are provided within a main body 30 of a refrigerator. The freezing and refrigerating chambers 31 and 33 are partitioned side by side within the main body 30. Further, freezing and refrigerating chamber doors 31a and 33a are pivotally installed to the main body 30 such that one side of each door is horizontally rotated about another hinged side thereof. The freezing and refrigerating chamber doors 31a and 33a serve to selectively open or close the freezing and refrigerating

chambers 31 and 33, respectively.

**[0074]** Referring to FIG. 5, support sidewalls 31b and 33b are provided at opposite side ends on rear surfaces of the freezing and refrigerating chamber doors 31a and 33a, respectively. Each of the support sidewalls 31b and 33b is formed in such a manner that a portion of a door liner constituting an outer appearance of a rear surface of the door 31a or 33a protrudes rearward by a predetermined height.

**[0075]** A plurality of door baskets 32 and 34 are provided on the rear surfaces of freezing and refrigerating chamber doors 31a and 33a between the support sidewalls 31b and 33b. An accommodating space for accommodating foods therein is formed in each of the door baskets 32 and 34. The door baskets 32 and 34 are detachably installed on the rear surfaces of the freezing and refrigerating chamber doors 31a and 33a, respectively.

**[0076]** Home bars 35 and 37 are provided in the freezing and refrigerating chamber doors 31a and 33a, respectively. The home bars 35 and 37 are used to receive or withdraw foods such as drinking water without opening the freezing and refrigerating chamber doors 31a and 33a, respectively. As shown in FIG. 6, the home bar 35 or 37 comprises a home bar housing 35a or 37a and a home bar door 35b or 37b.

**[0077]** The home bar housing 35a or 37a is generally formed into a polyhedral shape with an open front. The home bar housing 35a or 37a is provided on the rear surface of the freezing or refrigerating chamber door 31a or 33a between the support sidewalls 31b and 33b. A storage space 35s or 37s for accommodating drinking water and the like is defined within the home bar housing 35a or 37a.

**[0078]** Further, as shown in FIG. 6, an opening 35c is formed by cutting out a portion of the freezing chamber door 31a. The opening 35c communicates with the storage space 35s of the home bar housing 35a and an installation space 61s of a second ice-making housing 61 to be explained later.

**[0079]** The home bar doors 35b and 37b serve to selectively open or close the openings 35c and 37c, respectively. The home bar door 35b or 37b is installed on a front surface of the freezing or refrigerating chamber door 31a or 33a such that home bar door can be vertically pivoted.

**[0080]** In addition, ice-making housings 41 and 51 are provided on the rear surface of the freezing door 31a above the home bar housing 35a. The ice-making housing 41 and 51 are composed of a first ice-making housing 41 and a second ice-making housing 51. Installation spaces 41s and 51s are defined within the first and second ice-making housings 41 and 51, respectively.

**[0081]** The first ice-making housing 41 is detachably installed on the rear surface of the freezing door 31a between support sidewalls 31b of the freezing door. To this end, as shown in FIG. 9, fixing grooves 41a are formed on both external sides of the first ice-making housing 41. In addition, fixing protrusions (not shown) are provided

at inner sides of the support sidewalls 31b of the freezing chamber door 31a to correspond to the fixing grooves 41a of the first ice-making housing 41.

**[0082]** As shown in FIG. 6, the first ice-making housing 41 is installed below any one of the door baskets 32 provided on the rear surface of the freezing chamber door 31a. At this time, the first ice-making housing 41 is installed at a position downward below the door basket 32 by a predetermined height. Therefore, a certain mounting space S is defined between a bottom surface of the door basket 32 and a top surface of the first ice-making housing 41. A water tank 61 to be explained later is detachably mounted into the mounting space S.

**[0083]** The first ice-making housing 41 is formed into a polyhedral shape with an open bottom. A water supply port 41h is provided on the top surface of the first ice-making housing 41. The water supply port 41h is used to deliver water stored in the water tank 61 into the installation space 41s.

**[0084]** An actuating protrusion 42 is provided on the top surface of the first ice-making housing 41 adjacent to an outer periphery of the water supply port 41h. The actuating protrusion 42 protrudes from the top surface of the first ice-making housing 41 by a predetermined height. The actuating protrusion 42 functions to actuate a valve 65 to be explained later.

**[0085]** A guide rib 43 is provided on the top surface of the first ice-making housing 41. The guide rib 43 protrudes at a position adjacent to the actuating protrusion 41 upward from the top surface of the first ice-making housing 41 by a predetermined height, and extends in a direction in which the water tank 61 is installed or detached. The guide rib 43 functions to guide the water tank 61 which is received in or withdrawn from the mounting space S.

**[0086]** Further, a viewing window 44 is provided in a rear surface of the first ice-making housing 41. The viewing window 44 is formed of a transparent or translucent material. The viewing window 44 functions to visually check a process of making ice in an ice tray 71 to be explained later.

**[0087]** A handle opening 45 is formed at an upper rear edge of the first ice-making housing 41. The handle opening 45 is formed by cutting out a portion of a top surface of the first ice-making housing 41 corresponding to a rear end of the mounting space S and a portion of an upper end of the viewing window 44. The handle opening 45 functions to allow a user's hand to pass therethrough to mount or withdraw the water tank 61 and also to supply cold air in the freezing chamber 31 into the installation space 41s of the first ice-making housing 41.

**[0088]** Stoppers 46 are provided on inner sides of the first ice-making housing 41. Each of the stoppers 46 protrudes into the installation space 41s by a predetermined length from the inner side of the first ice-making housing 41. The stoppers 46 are located within a range where the ice tray 71 is pivoted. The stopper 46 functions to support the ice tray 71 and also to allow the ice tray 71

to be twisted after being pivoted by a predetermined angle.

**[0089]** As shown in FIG. 11, the second ice-making housing 51 is detachably installed at the rear surface of the freezing chamber door 31a below the first ice-making housing 41. To this end, similar to the first ice-making housing 41, fixing grooves 51a are formed on both external sides of the second ice-making housing 51. In addition, fixing protrusions (not shown) are provided at inner sides of the support sidewalls 31b of the freezing chamber door 31a to correspond to the fixing grooves 51a of the second ice-making housing 51.

**[0090]** The second ice-making housing 51 is formed into a polyhedral shape with an open bottom. A plurality of cold air supply ports 52 are provided on a rear surface of the second ice-making housing 51. Each of the cold air supply ports 52 functions to deliver cold air in the freezing chamber 31 into an installation space 51s of the second ice-making housing 51.

**[0091]** In addition, an ice transfer opening 53 is formed in a top surface of the second ice-making housing 51. The ice transfer opening 53 becomes a passage through which ice made in the ice tray 71 is delivered to an ice bank 81 to be explained later.

**[0092]** A transfer guide surface 54 is also defined on the top surface of the second ice-making housing 51. The guide surface 54 is formed by downward inclining a portion of the top surface of the second ice-making housing 51 toward the ice transfer opening 53. The guide surface 54 functions to guide ice made in the ice tray 71 into the ice transfer opening 53.

**[0093]** Guide protrusions 55 are provided on inner sides of the second ice-making housing 51. Each of the guide protrusions 55 protrudes from the inner sides of the second ice-making housing 51 by a predetermined height and extends in a front or rear direction of the installation space 51s. The guide protrusion 55 functions to guide the movement of a guide box 83 to be explained later.

**[0094]** A latch hook 56 is provided on a side of the second ice-making housing 51. The latch hook 56 is inserted in a push latch 89 to be explained later and then prevents the ice bank from being inadvertently withdrawn in a state where the ice tray 71 is received in the installation space 51s of the second ice-making housing 51.

**[0095]** Further, water is stored in the water tank 61 mounted into the mounting space S such that the stored water can be supplied to the ice tray 71. Referring to FIG. 7, the water tank 61 comprises a tank main body 62, a tank cover 63, a supply port cover 64 and a valve 65.

**[0096]** The tank main body 62 is formed into a polyhedral shape with an open top. A water storage space 62s for storing an amount of water (corresponding to an amount of water required to make ice once in the ice tray 71) is provided within the tank cover 63. The tank main body 62 is formed into a polyhedral shape with an open top. It is preferred that at least a portion of the tank main body 62 (and/or the tank cover 63 and the supply port

cover 64) be formed of a transparent or translucent material such that an amount of water stored in the water storage space 62s can be checked from the outside.

**[0097]** A discharge port 62h is provided at a portion on a bottom surface of the tank main body 62 corresponding to the water supply 41h of the first ice-making housing 41. Water stored in the water storage space 62s is supplied to the ice tray 71 through the discharge port 62h. A fitting rib 62r is provided at an outer periphery of the discharge port 62h on the bottom surface of the tank main body 62. The fitting rib 62r protrudes downward from the bottom surface of the tank main body by a predetermined height.

**[0098]** Further, a support member 62a is provided at an inner upper portion of a sidewall of the tank main body 62. The support member 62a protrudes inwardly from the inner upper portion of the tank main body 62 by a predetermined height to support an outer periphery of the tank cover 63.

**[0099]** A handle 62b is provided at a portion on the bottom surface of the tank main body 62. The handle 62b is a part which a user grips to mount or withdraw the water tank 61 into or from the mounting space S. The handle 62b is formed by upwardly depressing a portion of the bottom surface of the tank main body 62.

**[0100]** A guide groove 62c is formed in the bottom surface of the tank main body 62. The guide groove 62c serves to guide the water tank 61 when the water tank 61 is received in or withdrawn from the mounting space S. The guide groove 62c is formed by upwardly depressing a portion of the bottom surface of the tank main body 62 including the discharge port 62h. While the water tank 61 is received in or withdrawn from the mounting space S, an outward surface of the guide rib 43 of the first ice-making housing 41 comes into contact with lateral sides of the guide groove 62c of the tank main body 62.

**[0101]** The tank cover 63 is coupled with a top portion of the tank main body 62 to selectively open or close the water storage space 62s. The outer periphery of the tank cover 63 is supported by the support member 62a of the tank main body 62 in a state where the tank cover 63 is coupled with the tank main body 62. At this time, a top surface of the tank cover 63 is level with an upper end of the sidewall of the tank main body 62.

**[0102]** Further, a supply port 63h is provided at a portion of the tank cover 63. Water supplied from an external water source (not shown) is stored in the water storage space 62s through the supply port 62h.

**[0103]** In the meantime, the discharge port 62h of the tank main body 62 is spaced apart from the supply port 63h of the tank cover 63 by a predetermined distance in a lateral direction. That is, the discharge port 62h of the tank main body 62 is formed at a position deviated from a region where water is stored in the water storage space 62s through the supply port 63h of the tank cover 63. The reason is to prevent water stored in the water storage space 62s through the supply port 63h of the tank cover 63 from being immediately discharged through the dis-

charge port 62h of the tank main body 62.

**[0104]** A packing groove 63a is formed in the tank cover 63. As shown in FIG. 7, the packing groove 63a is positioned on the top surface of the tank cover 63 such that it can cover an outer periphery of the supply port 63h in a state where it is spaced apart from the outer periphery of the supply port 63h by a predetermined distance.

**[0105]** In addition, the seating recess 63b is provided in the tank cover 63. The seating recess 63b is formed by depressing a portion of tank cover 63 including the supply port and packing groove 63a of the tank cover 63. The supply port cover 64 is securely placed in the seating recess 63b in a state where the supply port 63h of the tank cover 63 is covered. As such, the supply port cover 64 is securely placed in the seating recess 63b, and thus, it does not protrude upwardly from the tank cover 63 even in a state where the supply port 63h is covered with the supply port cover 64.

**[0106]** A cutout 63c is also formed in the tank cover 63. The cutout 63c communicates with the seating recess 63b. The cutout 63c is a part through which a user's hand is inserted in the seating recess to allow the supply port cover 64 to be pivoted about the tank cover 63. To this end, the cutout 63c is formed by depressing a portion of the tank cover 63 relatively more deeply and downwardly as compared with the seating groove 63b.

**[0107]** The supply port cover 64 can be vertically and forwardly pivoted. The supply port cover 64 serves to selectively open or close the supply port 63h of the tank cover 63. The supply port cover 64 is securely placed in the seating recess 63b in a state where the supply port is covered with the cover 64.

**[0108]** A contact protrusion 64a and a packing protrusion 64b are also provided on a bottom surface of the supply port cover 64. The contact protrusion 64a and the packing protrusion 64b protrude downwardly from the bottom surface of the supply port cover 64 at positions corresponding to the outer periphery of the supply port 63h of the tank cover and the packing groove 63a, respectively, by a predetermined height. An outward surface of the contact protrusion 64a is brought into close contact with the outer periphery of the supply port 63h in a state where the supply port 63h of the tank cover 63 is covered with the supply port cover 64. In addition, the packing protrusion 64b is fitted into the packing groove 63a in a state where the supply port 63h of the tank cover 63 is covered with the supply port cover 64.

**[0109]** Referring now to FIG. 8, the valve 65 functions to selectively open or close the discharge port 62h of the tank main body 62. More specifically, the valve 65 is designed to allow water stored in the water storage space 62s to be supplied to the ice tray 71 only when the water tank 61 is mounted into the mounting space S. The valve 65 comprises a valve bracket 66, a valve main body 67, a packing ring 68 and an elastic member 69.

**[0110]** The valve bracket 66 is provided at an outer periphery of the discharge port 62h of the tank main body 62. The valve bracket 66 is formed with a supply port 66h

through which the water stored in the water storage space 62s is substantially supplied to the ice tray 71. Further, the valve bracket 66 is formed with a top surface inclined downward toward the supply port 66h.

**[0111]** In addition, a seating groove 66a is formed in the top surface of the valve bracket 66 at a position adjacent to the supply port 66h of the valve bracket 66. The packing ring 68a is securely placed in the seating groove 66a.

**[0112]** A fitting groove 66b is formed in the top surface of the valve bracket 66. The fitting rib 62r of the tank main body 62 is inserted in the fitting groove 66b. A fixing hook 66c is provided at an upper portion of the valve bracket 66 corresponding to an inner side of the fitting groove 66b. Since the fixing hook 66c is caught to a floor surface of the tank main body 62 in a state where the fitting rib 62r is inserted in the fitting groove 66b, the valve bracket 66 is fixed to the bottom surface of the tank main body 62.

**[0113]** The valve main body 67 is installed to be vertically movable through the supply port 66h of the valve bracket 66. The valve main body 67 selectively opens or closes the supply port 66h of the valve bracket 66. That is, the water tank 61 is mounted into the mounting space S, the valve main body 67 is moved upward by the actuating protrusion 42 such that the supply port 66h of the valve bracket 66 can be opened.

**[0114]** A fitting groove 67a into which the packing ring 68a is fitted is also formed at an upper portion of the valve main body 67. Further, a flange 67f is provided at a lower portion of the valve main body 67 such that an end of the elastic member 69 is supported on the top surface of the flange. A supply port 66h is also provided in the flange 67f. The supply port 67h of the flange 67f is formed at a position corresponding to the supply port 66h of the valve bracket 66.

**[0115]** The packing ring 68a stops up a gap between valve bracket 66 and the valve main body 67 to prevent the water stored in the water storage space 62s from being discharged to the outside. The packing ring 68a is vertically moved together with valve main body 67 in a state where it is inserted in the fitting groove 66b.

**[0116]** Further, a packing member 68b is provided between the fitting rib 62r of the tank main body 62 and the fitting groove 66b of the valve bracket 66. The packing member 68b functions to prevent the water stored in the water storage space 62s from flowing out to the outside through a gap between the fitting rib 62r and the fitting groove 66b when the fitting rib 62r is inserted in the fitting groove 66b.

**[0117]** Both ends of the elastic member 69 are supported by the bottom surface of the valve bracket 66 and a top surface of the flange 67f, respectively. The elastic member 69 serves to prevent the supply port 66h of the valve bracket 66 from being inadvertently opened by means of the valve main body 67. To this end, the elastic member 69 imparts an elastic force to the valve main body 67 in a direction in which the valve main body 67 intends to close the supply port 66h of the valve bracket

66.

**[0118]** As shown in FIGS. 6 and 10, the ice tray 71 is installed in the installation space 41s of the first ice-making housing 41. The ice tray 71 is formed into a rectangular shape. The ice tray 71 is also provided with a plurality of ice-making grooves 72. The ice tray 71 is pivotally installed in the installation space 41s of the first ice-making housing 41.

**[0119]** To this end, support shafts 73 are provided on short sides of the ice tray 71, respectively. A tip end of the support shaft 73 is pivotally supported on an inner surface of the first ice-making housing 41. As shown in FIG. 5, a pivoting lever 74 is provided on an external surface of the first ice-making housing 41 corresponding to a free end of the freezing chamber door 31a. The pivoting lever 74 is connected to any one of the support shafts 73 of the ice tray 71. Therefore, a user can rotate the pivoting lever 74 with his/her hand such that the ice tray 71 connected to the lever is pivoted.

**[0120]** A side of the ice tray 71, i.e. the left side as shown in FIG. 6, is supported by the stopper 46. At this time, the ice tray 71 is in a horizontal state. Therefore, the ice tray 71 can be pivoted only in one direction, i.e. in a clockwise direction as viewed in FIG. 6.

**[0121]** Although it has not been illustrated in the figures, the support shaft 73 is provided with an elastic member. The elastic member imparts an elastic force to the ice tray 71 in a direction opposite to a direction in which the ice tray 71 is pivoted, i.e. in a clockwise direction as viewed in FIG. 6. Therefore, an elastic force for causing the pivoting lever 74 to be pivoted is removed, the ice tray 71 is returned to an initial original position by means of the elastic force of the elastic member. As this time, since one side of the ice tray 71 is supported to be kept at a horizontal state by means of the stopper 46, the ice tray 71 cannot be further pivoted in a counterclockwise direction from a position shown in FIG. 6.

**[0122]** Further, the ice tray 71 is caught to the stoppers 46 while being pivoted about the support shafts 73. Thus, since the ice tray 71 can be distorted while being pivoted about the support shafts 73, ice made in the ice-making grooves 72 can be separated from the ice tray.

**[0123]** Referring again to FIGS. 6 and 10, a tray cover 75 is installed in the installation space 41s of the first ice-making housing 41. The tray cover 75 serves to selectively open or close the ice-making grooves 72 of the ice tray 71. The tray cover 75 is formed into a plate shape corresponding to a cross section of the ice tray 71. Further, the tray cover 75 is preferably formed of a transparent or translucent material in order to visually check a process of making ice in the ice-making grooves 72.

**[0124]** The tray cover 75 is vertically pivoted about any one end corresponding to long sides of the ice tray 71 in cooperation with the pivot motion of the ice tray 71. To this end, pivoting shafts 75a are provided at both sides of the one long end of the tray cover 75, respectively. Therefore, the tray cover 75 is pivoted about the pivoting shafts 75a in cooperation with the ice tray 71.

**[0125]** A supply port 75h is also formed in the tray cover 75. The supply port 75h of the tray cover 75 functions as a passage through the water stored in the water storage space 62s of the water tank 61 is supplied to the ice tray 71. Further, the supply port 75h of the tray cover 75 is spaced apart from the discharge port 62h of the water tank 61 by a certain distance in a lateral direction. That is, the supply port 75h of the tray cover 75 is formed at a position deviated from a region where water is discharged through the discharge port 62h of the water tank 61. The reason is to prevent water supplied from the water tank 61 from impinging directly against a floor surface of the ice-making groove 72 of the ice tray 71 and thus from being splashed from the ice-making groove 72 to the outside.

**[0126]** A water guide surface 76 is also formed on the tray cover 75. The water guide surface 76 serves to guide water supplied from the water tank 61 into the supply port 75h of the tray cover 75. The water guide surface 76 is formed by allowing a portion of the tray cover 75 to be inclined downward toward the supply port 75h.

**[0127]** Referring to FIGS. 6 and 12, the ice bank 81 is installed in the installation space 51s of the second ice-making housing 51. The ice bank 81 can be received in or withdrawn from the installation space 51s of the second ice-making housing 51 through the opening 35c.

**[0128]** In addition, the ice bank 81 is formed into a hexahedral shape with an open top. An ice storage space 81s is defined within the ice bank 81. Ice made in the ice tray 71 is stored in the ice storage space 81s. Further, a front side of the ice bank 81 is made of a transparent or translucent material such that ice stored in the ice storage space 81s can be visually viewed from the outside.

**[0129]** A support projection 81a is provided at the front side of the ice bank 81. The support projection 81a extends outwards from an edge of the front side of the ice bank 81 by a predetermined length. The support projection 81a is brought into close contact with a front brim of the guide box 83 to be explained later.

**[0130]** A catching protrusion 81b is provided on a bottom surface of the ice bank 81. The catching protrusion 81b protrudes downwardly from the bottom surface of the ice bank 81 by a predetermined height and extends in a lateral direction. Preferably, the catching protrusion 81b is formed to have the same height as the support projection 81a provided at the lower end of the ice bank 81. The catching protrusion 81b is inserted in a catching groove 87b of the guide box 83.

**[0131]** The guide box 83 is installed in the installation space 51s of the second ice-making housing 51. The guide box 83 serves to guide the ice bank 81 which is received in or withdrawn from the installation space 51s of the second ice-making housing 51. The guide box 83 is installed to be movable in a forward or rearward direction of the installation space 51s of the second ice-making housing 51.

**[0132]** The guide box 83 is formed into a hexahedral shape with open front and back in accordance with the

ice bank 81. An ice transfer opening 83a which communicates with the ice transfer opening 53 of the second ice-making housing 51 is provided on a top surface of the guide box 83. Guide slots 84 are also formed on outer lateral sides of the guide box 83, respectively, in a forward or rearward direction. The guide protrusions 55 of the second ice-making housing 51 are inserted in the guide slots 84.

**[0133]** The ice bank 81 is securely placed on a floor plate 87 of the guide box 83. The floor plate 87 of the guide box 83 is installed such that it can be slid in a forward or rearward direction with respect to the lateral sides of the guide box 83. To this end, guide protrusions 85 are formed at lower ends of the inner sides of the guide box 83 to extend in a forward or rearward direction. Further, guide slots 88 in which the guide protrusions 85 are inserted are provided at both lateral sides of the floor plate 87 of the guide box 83.

**[0134]** Support ribs 86 are provided at upper and lower ends on the rear side of the guide box 83. The support ribs 86 extend upward or downward from the upper and lower ends on the rear side of the guide box 83 by a predetermined height. The support ribs 86 are brought into close contact with upper and lower ends on the rear side of the ice bank 81 securely placed on the floor plate 87 of the guide box 83.

**[0135]** A handle rib 87a is provided on the floor plate 87 of the guide box 83. The handle rib 87a protrudes downward from a front end on a bottom surface of the floor plate of the guide box 83 by a predetermined length. The handle grip 87a is a part which a user grips to allow the floor plate 87 of the guide box 83 to be slid with respect to both lateral sides of the guide box 83.

**[0136]** The catching groove 87b is formed in the floor plate 87 of the guide box 83. The catching groove 87b is formed by cutting out a portion of the floor plate 87 of the guide box 83 in a lateral direction in accordance with the catching protrusion 81b. Since the catching protrusion 81b is inserted in the catching groove 87b, the ice bank 81 can be moved in cooperation with the sliding motion of the floor plate 87 of the guide box 83.

**[0137]** The push latch 89 is provided on a rear surface of the guide box 83. The latch hook 56 is selectively inserted in the push latch 89. That is, the latch hook 56 is inserted into or separated from the push latch 89 by pushing the ice bank 81 or the guide box 83 into the installation space 51s of the second ice-making housing 51. Therefore, the ice bank 81 can be mounted into the installation space 51s of the second ice-making housing 51 in a state where it is received in the space or be withdrawn from the installation space 51s of the second ice-making housing 51.

**[0138]** Next, a process of making ice using an ice-making device for a refrigerator according to the present invention will be described in more detail with reference to the accompanying drawings.

**[0139]** FIGS. 13 and 14 show a process of storing water into the water storage space in the water tank of the ice-

making device according to the present invention, FIGS. 15 and 16 show a process of mounting the water tank of the ice-making device according to the present invention, FIGS. 17 to 19 show an operating process of the ice tray of the ice-making device according to the present invention, and FIGS. 20 to 23 show a withdrawing process of an ice bank of the ice-making device according to the present invention.

**[0140]** Referring first to FIG. 13, the supply port cover 64 is pivoted at a predetermined angle with respect to the tank cover 63 to open the supply port 63h. Then, water is fed and stored into the water storage space 62s of the water tank 61 through the supply port 63h. At this time, the supply port 63h of the tank cover 63 and the discharge port 62h of the tank main body 62 are spaced apart from each other by a predetermined distance in a lateral distance. Therefore, it is possible to prevent water from being immediately discharged through discharge port 62h of the tank main body 62 while storing the water in the water storage space 62s through the supply port 63h of the tank cover 63.

**[0141]** If water is stored in the water storage space 62s, the supply port cover 64 is pivoted to close the supply port 63h as shown in FIG. 14. Then, in a state where the supply port 63h is closed, the water tank is mounted into the mounting space S.

**[0142]** More specifically, the water tank 61 is first slid into the mounting space S as shown in FIG. 15. At this time, the bottom surface of the tank main body 63 comes into contact with the top surface of the first ice-making housing 41. Then, the top surface of the tank cover 63 is brought into contact with a bottom surface of the door basket 34.

**[0143]** As shown in FIG. 16, the water tank 61 is further slid into the mounting space S in a state where the guide ribs 43 of the first ice-making housing 41 are brought into contact with the lateral sides of the guide groove 62c of the tank main body 62. That is, the water tank 61 can be easily mounted by using the guide ribs 43 and the guide groove 63c.

**[0144]** If the water tank has been completely mounted into the mounting space S as shown in FIG. 14c, the discharge port 62h of the water tank 61 is positioned to correspond to the supply port 41h of the first ice-making housing 41. Then, the valve main body 67 is moved upward, i.e. into the water tank 61, by means of the actuating protrusion 42 of the first ice-making housing 41. Therefore, the discharge port 62h of the water tank 61 and substantially supply port 66h of the valve bracket 66 are opened, and consequently, water stored in the water storage space 62s of the water tank 61 can be transferred through the supply port 66h of the valve bracket 66 and the supply port 67h of the valve main body 67.

**[0145]** The water transferred through the supply port 66h of the valve bracket 66 drops onto a top surface of the tray cover 75 through the supply port 41h of the first ice-making housing 41. Then, the water dropped onto the top surface of the tray cover 75 is guided into the

supply port 75h of the tray cover 75 by means of the water guide surface 76.

**[0146]** As shown in FIG. 17, the water guided into the supply port 75h of the tray cover 75 is supplied into the ice-making grooves 72 of the ice tray 71. The water stored in the water storage space 62s of the water tank 61 as such drops onto the tray cover 75 and is then supplied into ice-making grooves 72 of the ice tray 71. Therefore, it is possible to prevent the water stored in the water storage space 62s of the water tank 61 from impinging directly against the floor surface of the ice-making groove 72 of the ice tray 71 and thus from being splashed from the ice-making groove 72 to the outside.

**[0147]** Thereafter, the water contained in the ice-making grooves 72 of the ice tray 71 is frozen into ice by means of cold air from the freezing chamber 31. At this time, the cold air is supplied from the freezing chamber 31 into the installation space 41s of the first ice-making housing 41 through the handle opening 45.

**[0148]** After the water contained in the ice-making grooves 72 of the ice tray 71 has been frozen into ice, the pivoting lever 74 is rotated. As shown in FIG. 18, therefore, the ice tray 71 connected to the pivoting lever 74 is pivoted about the support shafts 73.

**[0149]** As shown in FIG. 19, if the ice tray 71 is pivoted by a predetermined angle, one end of the ice tray 71 is caught to the stoppers 46. If the pivoting lever 74 is further rotated in such a state, the ice tray 71 is twisted by means of the stoppers 46. Thus, the ice is separated from the grooves 72.

**[0150]** As shown in FIG. 20, the ice separated from the ice-making grooves 72 of the ice tray 71 is stored in the ice bank 81 placed in the guide box 83. The ice stored in the guide box 83 has been guided by means of the transfer guide surface 54 of the second ice-making housing 51 and transferred through the ice transfer opening 53 of the second ice-making housing 51 and the ice transfer opening 53a of the guide box 83.

**[0151]** In order to use the ice stored in the ice bank 81, the home bar door 35b of the home bar 35 is first opened to open the opening 35c. Then, ice bank 81 or the guide box 83 is pushed into the installation space 51s of the second ice-making housing 51. Thus, the latch hook 56 of the second ice-making housing 51 is released from the push latch 89 of the guide box 83.

**[0152]** Therefore, the guide box 83 with the ice bank 81 seated therein can be moved forward from the installation space 51s of the second ice-making housing 51. As shown in FIG. 21, if the guide box 83 is pulled forward out of the installation space 51s of the second ice-making housing 51, both the ice bank 81 and the guide box 83 can be pulled out of the installation space 51s of the second ice-making housing 51.

**[0153]** Further, as shown in FIG. 22, the ice bank 81 is further pulled forward out of the installation space 51s of the second ice-making housing 51 with respect to the guide box 83. Therefore, the ice bank 81 and the floor plate 87 of the guide box 83 are completely pulled out of

the installation space 51s of the second ice-making housing 51 through the opening 35c of the home bar 35.

**[0154]** Finally, as shown in FIG. 23, the ice bank 81 can be separated from the floor plate 87 of the guide box 83. That is, the ice bank 81 can be completely withdrawn by pulling up the ice bank 81 and then taking the ice bank out of the floor plate through the opening 35c of the home bar 35.

**[0155]** It will be apparent to those skilled in the art that various modifications and changes can be made thereto within the scope of the invention defined by the claims. Thus, the scope of the present invention should be construed on the basis of the claims.

#### 15 [Industrial Applicability]

**[0156]** From an ice-making device for a refrigerator and a refrigerator including an ice-making device according to the present invention so configured, the following effects can be expected.

**[0157]** First, according to the present invention, water used to make ice is supplied to an ice tray in a state where it is contained in a water tank. Therefore, it is possible to avoid a phenomenon in which a freezing chamber or a room may be stained or dirty due to the ice-making water running down from the water tank or ice tray.

**[0158]** Further, the ice tray is mounted into an installation space of the ice-making housing partitioned from the freezing chamber. Therefore, it is possible to prevent ice from being impregnated with odor of other foods stored in the freezing chamber while water supplied from the water tank is frozen into ice within the ice tray. As a result, a user can utilize ice in a more sanitary and comfortable way.

**[0159]** In addition, an ice bank for storing ice therein is withdrawn out of the freezing chamber through a home bar. That is, the ice bank can be withdrawn to the outside by opening a home bar door which is relatively smaller than a freezing chamber door for opening or closing the freezing chamber. Therefore, the ice bank can be withdrawn in a more convenient way.

**[0160]** Furthermore, since the ice bank can be withdrawn out of the freezing chamber without opening the freezing chamber door, it is possible to prevent cold air in the freezing chamber from being unnecessarily discharged to the outside. Therefore, it is possible to minimize power consumption of a refrigerator and thus to utilize the refrigerator in a more economical way.

**[0161]** Moreover, the ice bank is mounted into the installation space of the ice-making housing provided on a rear surface of the freezing chamber door. Therefore, since ice stored in the ice bank from is prevented from being impregnated with the odor of other foods stored in the freezing chamber, the ice can be utilized in a more sanitary way.

**[0162]** Various examples are set out in the following numbered paragraphs (NPs).

NP1. An ice-making device for a refrigerator, comprising:

a water tank detachably mounted to a rear surface of a refrigerator door; 5  
 an ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein; 10  
 an ice tray mounted into the installation space and provided with an ice-making groove in which water supplied from the water tank is frozen into ice; and  
 an ice bank for storing ice made in the ice tray, wherein the ice bank can be received in or withdrawn from the installation space. 15

NP2. The ice-making device as in NP1, wherein the water tank is detachably mounted into a mounting space defined between a bottom surface of any one of door baskets provided on the rear surface of the door and a top surface of the ice-making housing. 20

NP3. The ice-making device as in NP1, wherein the water tank is provided with a water storage space, a supply port through which water is supplied into the water storage space, a discharge port through which the water stored in the water storage space is supplied to the ice tray, and a valve for selectively opening or closing the discharge port. 25 30

NP4. The ice-making device as in NP3, wherein the discharge port is formed at a position deviated from a region where the water is supplied into the water storage space through the supply port. 35

NP5. The ice-making device as in NP4, wherein the water tank includes:

a tank main body formed into a polyhedral shape with an open top to form the water storage space therein and provided with the discharge port at a bottom surface thereof; 40  
 a tank cover coupled to an upper portion of the tank main body to selectively open or close the water storage space and provided with the supply port at a predetermined position; and  
 a supply port cover provided on the tank cover to selectively open or close the supply port, and at least a part of the water tank is formed of a transparent or translucent material to visually check an amount of water stored in the water storage space from the outside. 45 50

NP6. The ice-making device as in NP5, wherein a support member is provided at an inner side of a sidewall of the tank main body to support an outer periphery of the tank cover. 55

NP7. The ice-making device as in NP6, wherein a seating recess in which the supply port cover is seated when the supply port is closed by the cover and a packing groove covers the supply port are formed on a top surface of the tank cover, a cutout which communicates with the seating recess to allow a user's hand to be inserted into the recess is formed at a position on the tank cover to open the supply port cover which has covered the supply port, and a contact protrusion brought into close contact with the supply port and a packing protrusion fitted into the packing groove are provided on a bottom surface of the supply port cover.

NP8. The ice-making device as in NP3, wherein the valve includes:

a valve bracket provided at an outer periphery of the discharge port and formed with a supply port;  
 a valve main body installed to be vertically movable through the supply port of the valve bracket to selectively open or close the supply port;  
 a packing ring provided between the valve bracket and the valve main body to stop up a gap between the valve bracket and the valve main body; and  
 an elastic member for imparting an elastic force to the valve main body in a direction in which the valve main body closes the supply port of the valve bracket, and  
 the valve main body is actuated by an actuating protrusion provided on the top surface of the ice-making housing to open the discharge port.

NP9. The ice-making device as in NP1, wherein the water tank is provided with a guide groove formed by depressing upward a portion of a bottom surface of the water tank, the ice-making housing is provided with a guide rib protruding upward from the top surface of the ice-making housing, and the water tank can be guided by allowing the guide rib to be inserted and slid in the guide groove while the water tank is received in or withdrawn from the mounting space.

NP10. The ice-making device as in NP1, wherein the ice-making housing comprises a first ice-making housing mounted below the water tank and having an ice tray installed in an installation space thereof, and a second ice-making housing mounted below the first ice-making housing and having an ice bank installed in an installation space thereof.

NP11. The ice-making device as in NP10, wherein a supply port is provided at a top surface of the first ice-making housing to supply water stored in the water tank into the ice tray.

NP12. The ice-making device as in NP10, wherein the first ice-making housing further comprises at least one cold air supply port for supplying cold air into the installation space, a viewing window for visually checking from the outside a process of making ice in the ice-making groove, and a handle opening through which a user's hand can pass to allow the water tank to be mounted or withdrawn.

NP13. The ice-making device as in NP10, wherein support shafts are provided at both lateral sides of the ice tray to pivotally support the ice tray on the first ice-making housing, a stopper is provided on an inner side of the first ice-making housing and is located within a range of the ice tray pivoting about the support shafts, a pivoting lever is provided on an outer side of the first ice-making housing to allow the ice tray to be pivoted, and the ice made in the ice-making groove is separated from the ice-making groove and then stored in the ice bank by actuating the pivoting lever to allow the ice tray to be caught to the stopper and then twisted while the ice tray is pivoted.

NP14. The ice-making device as in NP13, wherein the pivoting lever is provided on one side of the first ice-making housing corresponding to a free end of the door.

NP15. The ice-making device as in NP13, further comprising a tray cover mounted in the installation space of the first ice-making housing to be vertically pivoted in cooperation with the pivot motion of the ice tray and to selectively open or close the ice-making groove.

NP16. The ice-making device as in NP15, wherein the tray cover is made of a transparent or translucent material to allow a user to visually check a process of making ice in the ice-making groove.

NP17. The ice-making device as in NP15, wherein the tray cover is provided with a supply port through which water supplied from the water tank through the supply port of the first ice-making housing can be supplied to the ice tray.

NP18. The ice-making device as in NP17, wherein the supply port of the tray cover is formed at a position deviated from a region where the water is supplied from the water storage space through the supply port of the first ice-making housing.

NP19. The ice-making device as in NP18, wherein the tray cover is further provided with a water guide surface downwardly inclined toward the supply port of the tray cover to guide the water into the supply port.

NP20. The ice-making device as in NP10, wherein an ice transfer opening through which ice made in the ice tray is transferred to the ice bank and a transfer guide surface which is formed to be downwardly inclined toward the ice transfer opening to guide the ice into the ice guide opening are provided on a top surface of the second ice-making housing.

NP21. The ice-making device as in NP20, wherein the ice bank is formed into a hexahedral shape with an open top and provided with an ice storage space therein, and at least a portion of the ice bank is made of a transparent or translucent material to allow a user to visually check the ice stored in the ice storage space from the outside.

NP22. The ice-making device as in NP21, further comprising a guide means for allowing the ice bank to be received in or withdrawn from the installation space of the second ice-making housing through a home bar provided in the door.

NP23. The ice-making device as in NP22, wherein the home bar includes:

- a home bar housing installed in the rear surface of the door below the second ice-making housing and provided with a predetermined storage space;
- an opening formed by cutting out a portion of the door and communicating with the storage space and the installation space of the second ice-making housing; and
- a home bar door for selectively opening or closing the opening, and
- the ice bank is received in or withdrawn from the installation space of the second ice-making housing through the opening by means of the guide means.

NP24. The ice-making device as in NP23, wherein the guide means is a guide box for moving forward or rearward of the installation space of the second ice-making housing in a state where the ice bank is seated thereon.

NP25. The ice-making device as in NP24, wherein a support rib is provided at a rear end of the guide box to be brought into close contact with a rear side of the ice bank in a state where the ice bank is seated on a top surface of a floor plate of the guide box, and a support projection is provided at a front side of the ice bank to be brought into close contact with a front end of the guide box in a state where the ice bank is seated on the top surface of the floor plate of the guide box.

NP26. The ice-making device as in NP24, wherein

the floor plate of the guide box can be slid in a forward and rearward direction with respect to lateral sides of the guide box in a state where the ice bank is seated thereon, and a catching groove and a catching protrusion inserted in the catching groove are provided respectively at a position on a bottom surface of the ice bank and a corresponding position on the floor plate of the guide box.

NP27. The ice-making device as in NP24, wherein the guide box which is received in the installation space of the second ice-making housing in a state where the ice bank is seated thereon is prevented from being inadvertently withdrawn from the installation space of the second ice-making housing by means of a locking means.

NP28. The ice-making device as in NP27, wherein the locking means is composed of:

a push latch provided on one side of the guide box or the second ice-making housing brought into close contact with the guide box; and  
a latch hook provided on the other side of the guide box or the second ice-making housing brought into close contact with the guide box and inserted selectively in the push latch by pushing the guide box in a direction in which the ice bank is received in the installation space of the second ice-making housing.

NP29. An ice-making device for a refrigerator, comprising:

a water tank detachably mounted to a rear surface of a refrigerator door;  
a first ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein;  
an ice tray pivotally mounted into the installation space of the first ice-making housing and provided with an ice-making groove in which water supplied from the water tank is frozen into ice;  
a tray cover mounted in the installation space of the first ice-making housing to be vertically pivoted in cooperation with a pivot motion of the ice tray and to selectively open or close the ice-making groove;  
a second ice-making housing detachably mounted to the rear surface of the door below the first ice-making housing and provided with a predetermined installation space therein;  
an ice bank for storing ice made in the ice tray; and  
a guide box for moving forward or rearward of the installation space of the second ice-making housing in a state where the ice bank is seated

thereon such that the ice bank can be received in or withdrawn from the installation space of the second ice-making housing through a home bar provided in the door,

wherein the ice bank and the guide box can be received in or withdrawn from the installation space of the second ice-making housing.

NP30. The ice-making device as in NP29, wherein the water tank is detachably mounted into a mounting space defined between a bottom surface of any one of door baskets provided on the rear surface of the door and a top surface of the first ice-making housing.

NP31. The ice-making device as in NP29, wherein the water tank includes:

a tank main body formed into a polyhedral shape with an open top to form a water storage space therein and provided with a discharge port, through which water stored in the water storage space is supplied to the ice bank, at a bottom surface thereof;  
a valve coupled to the tank main body to selectively open or close the discharge port;  
a tank cover coupled to an upper portion of the tank main body to selectively open or close the water storage space and provided with a supply port through which water is supplied into the water storage space; and  
a supply port cover provided on the tank cover to selectively open or close the supply port, and the discharge port is formed at a position deviated from a region where the water is supplied into the water storage space through the supply port and at least a part of the water tank is made of a transparent or translucent material to visually check an amount of water stored in the water storage space from the outside.

NP32. The ice-making device as in NP31, wherein the valve includes:

a valve bracket provided at an outer periphery of the discharge port and formed with a supply port;  
a valve main body installed to be vertically movable through the supply port of the water tank to selectively open or close the supply port;  
a packing ring provided between the valve bracket and the valve main body to stop up a gap between the valve bracket and the valve main body; and  
an elastic member for imparting an elastic force to the valve main body in a direction in which the valve main body closes the supply port of the water tank, and

the valve main body is actuated by an actuating protrusion provided on the top surface of the first ice-making housing to open the discharge port.

NP33. The ice-making device as in NP29, wherein a supply port is provided at the top surface of the first ice-making housing to supply the water stored in the water tank into the ice tray, an ice transfer opening through which ice made in the ice tray is transferred to the ice bank and a transfer guide surface which is formed to be downwardly inclined toward the ice transfer opening to guide the ice into the ice guide opening are provided on a top surface of the second ice-making housing.

NP34. The ice-making device as in NP29, wherein ice made in the ice-making groove is separated from the ice-making groove and then stored in the ice bank by actuating a pivoting lever, which is provided on an outer side of the first ice-making housing corresponding to a free end of the door, and then allowing the ice tray to be caught to and twisted by a stopper provided on an inner side of the first ice-making housing when the ice tray is supported on the stopper.

NP35. The ice-making device as in NP29, wherein the tray cover is provided with a supply port formed at a position deviated from a region where the water is supplied from the water tank to the ice tray through the supply port of the first ice-making housing, and a water guide surface downwardly inclined toward the supply port of the tray cover to guide the water into the supply port of the tray cover.

NP36. The ice-making device as in NP29, wherein the ice bank is formed into a hexahedral shape with an open top and provided with an ice storage space therein, and at least a portion of the ice bank is made of a transparent or translucent material to allow a user to visually check the ice stored in the ice storage space from the outside.

NP37. The ice-making device as in NP29, wherein a floor plate of the guide box can be slid in a forward and rearward direction with respect to lateral sides of the guide box in a state where the ice bank is seated thereon.

NP38. The ice-making device as in NP29, wherein a push latch and a latch hook are provided respectively on the guide box and the second ice-making housing brought into close contact with the guide box such that the latch hook is selectively fastened to the push latch by pushing the guide box in a direction in which the ice bank is received in the installation space of the second ice-making housing.

NP39. A refrigerator, comprising:

a refrigerator main body provided with a predetermined storage space;  
a refrigerator door for selectively opening or closing the storage space; and  
an ice-making device according to any one of NPs 1 to 38, which is mounted to a rear surface of the door.

## 10 Claims

### 1. An ice-making device for a refrigerator, comprising:

a water tank detachably mounted to a rear surface of a refrigerator door;  
a first ice-making housing detachably mounted to the rear surface of the door below the water tank and provided with a predetermined installation space therein;  
an ice tray pivotally mounted into the installation space of the first ice-making housing and provided with an ice-making groove in which water supplied from the water tank is frozen into ice;  
a tray cover mounted in the installation space of the first ice-making housing to be vertically pivoted in cooperation with a pivot motion of the ice tray and to selectively open or close the ice-making groove;  
a second ice-making housing detachably mounted to the rear surface of the door below the first ice-making housing and provided with a predetermined installation space therein; an ice bank for storing ice made in the ice tray; and

a guide box for moving forward or rearward of the installation space of the second ice-making housing in a state where the ice bank is seated thereon such that the ice bank can be received in or withdrawn from the installation space of the second ice-making housing through a home bar provided in the door,  
wherein the ice bank and the guide box can be received in or withdrawn from the installation space of the second ice-making housing.

### 2. The ice-making device as claimed in claim 1, wherein the water tank is detachably mounted into a mounting space defined between a bottom surface of any one of door baskets provided on the rear surface of the door and a top surface of the first ice-making housing, and wherein the water tank includes:

a tank main body formed into a polyhedral shape with an open top to form a water storage space therein and provided with a discharge port,

through which water stored in the water storage space is supplied to the ice bank, at a bottom surface thereof;

a valve coupled to the tank main body to selectively open or close the discharge port;

a tank cover coupled to an upper portion of the tank main body to selectively open or close the water storage space and provided with a supply port through which water is supplied into the water storage space; and

a supply port cover provided on the tank cover to selectively open or close the supply port, and the discharge port is formed at a position deviated from a region where the water is supplied into the water storage space through the supply port and at least a part of the water tank is made of a transparent or translucent material to visually check an amount of water stored in the water storage space from the outside.

3. The ice-making device as claimed in claim 2, wherein the valve includes:

a valve bracket provided at an outer periphery of the discharge port and formed with a supply port;

a valve main body installed to be vertically movable through the supply port of the water tank to selectively open or close the supply port;

a packing ring provided between the valve bracket and the valve main body to stop up a gap between the valve bracket and the valve main body; and

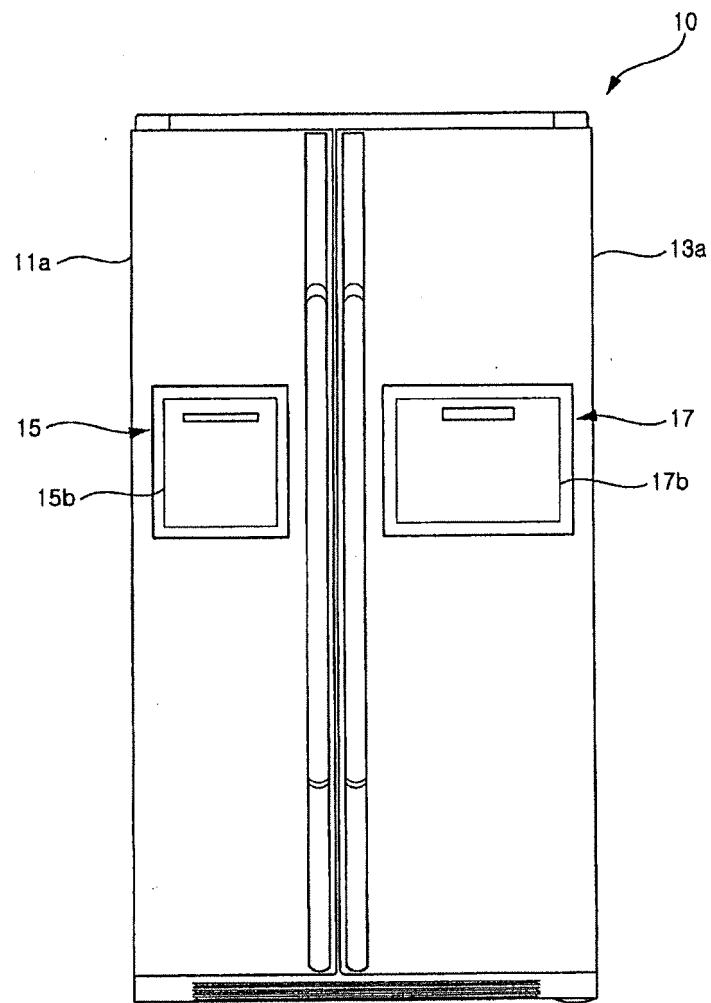
an elastic member for imparting an elastic force to the valve main body in a direction in which the valve main body closes the supply port of the water tank, and the valve main body is actuated by an actuating protrusion provided on the top surface of the first ice-making housing to open the discharge port.

4. The ice-making device as claimed in claim 1, wherein a supply port is provided at the top surface of the first ice-making housing to supply the water stored in the water tank into the ice tray, an ice transfer opening through which ice made in the ice tray is transferred to the ice bank and a transfer guide surface which is formed to be downwardly inclined toward the ice transfer opening to guide the ice into the ice guide opening are provided on a top surface of the second ice-making housing, and wherein ice made in the ice-making groove is separated from the ice-making groove and then stored in the ice bank by actuating a pivoting lever, which is provided on an outer side of the first ice-making housing corresponding to a free end of the door, and then allowing the ice tray to be caught to and twisted by a stopper provided on an inner side of the first

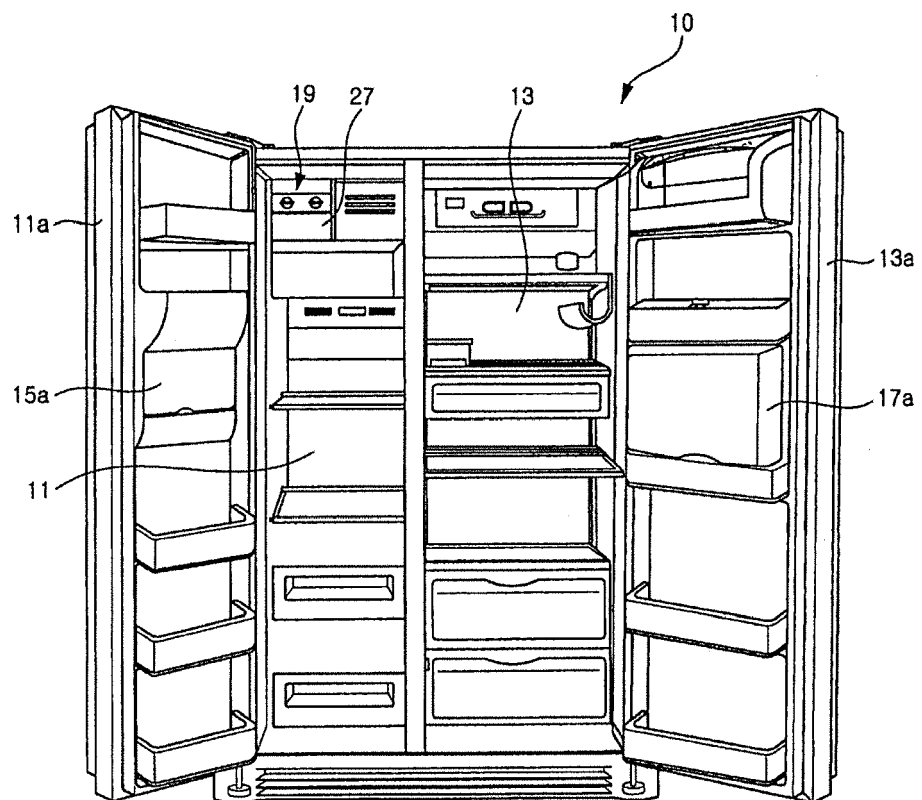
ice-making housing when the ice tray is supported on the stopper.

5. The ice-making device as claimed in claim 1, wherein the tray cover is provided with a supply port formed at a position deviated from a region where the water is supplied from the water tank to the ice tray through the supply port of the first ice-making housing, and a water guide surface downwardly inclined toward the supply port of the tray cover to guide the water into the supply port of the tray cover.

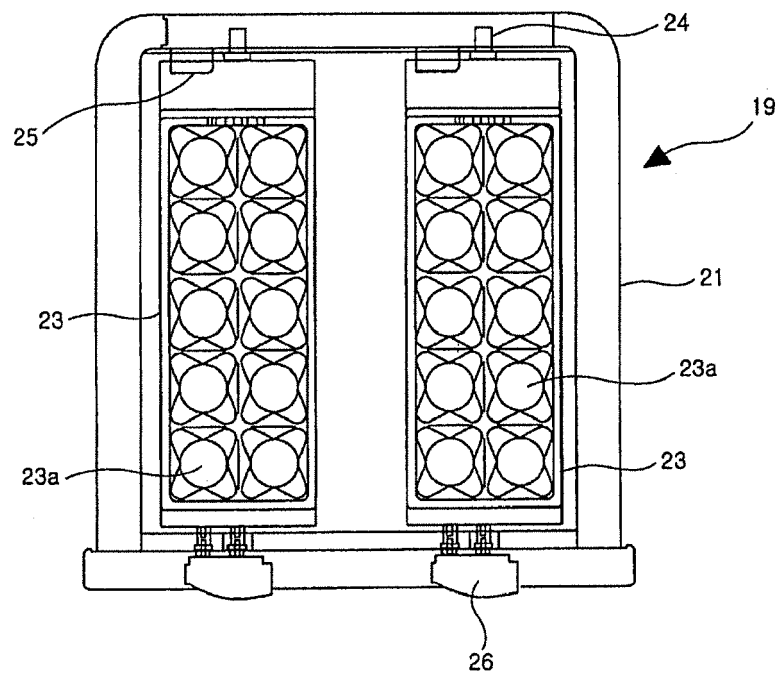
【Figure 1】



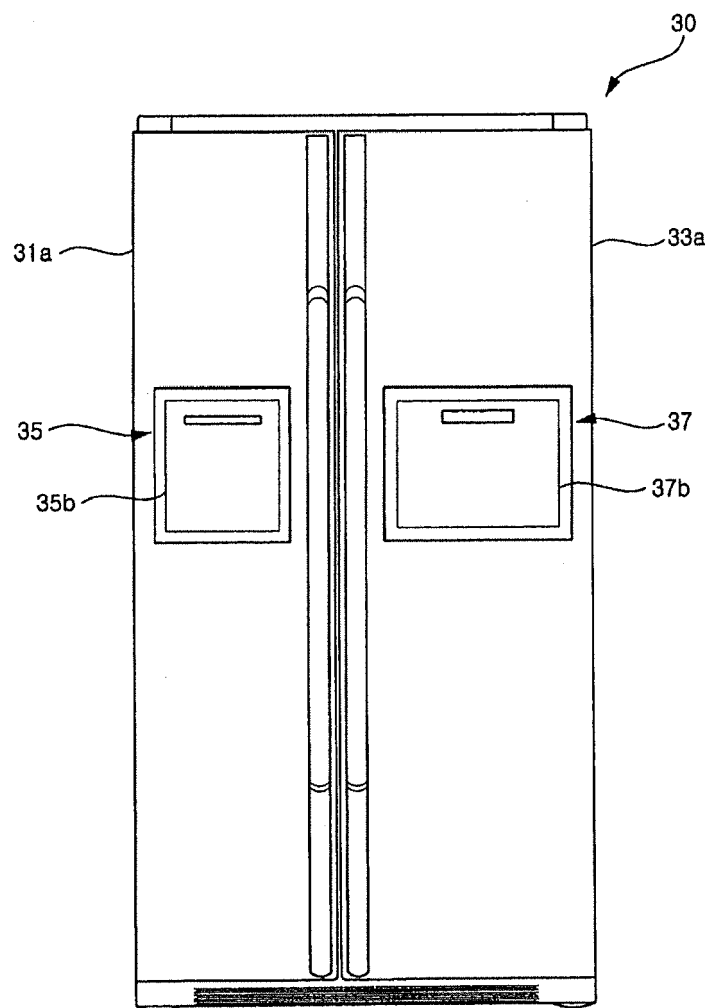
【Figure 2】



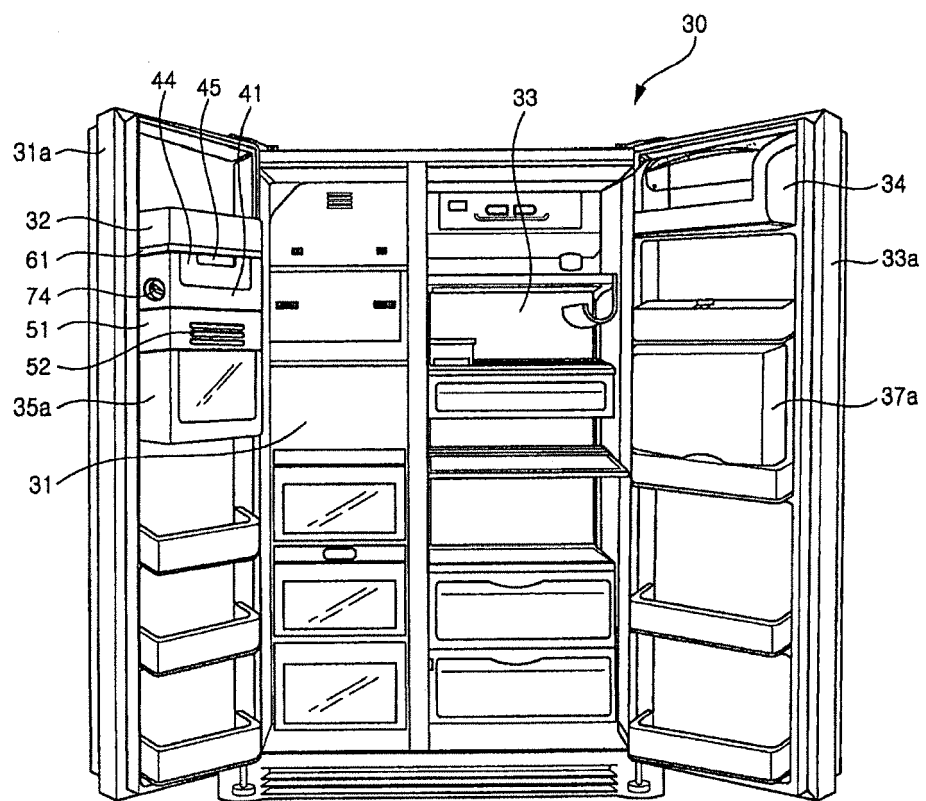
【Figure 3】



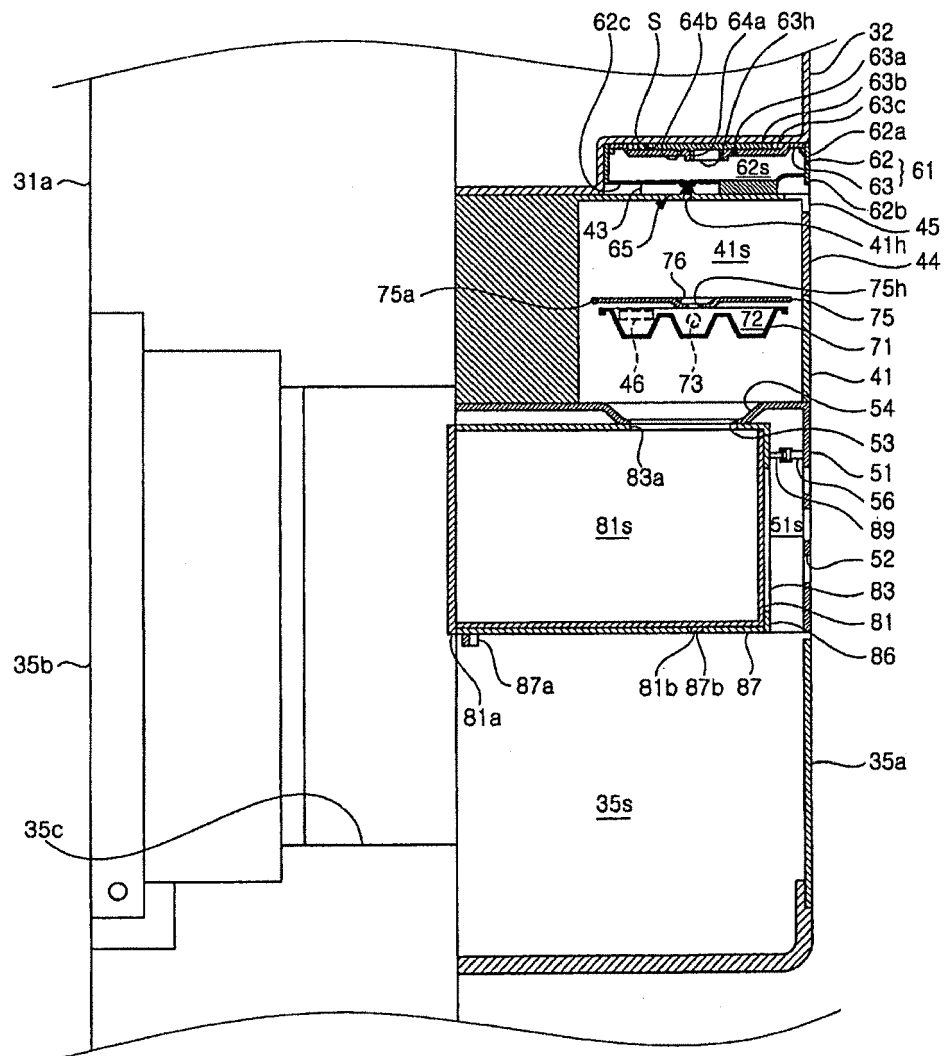
【Figure 4】



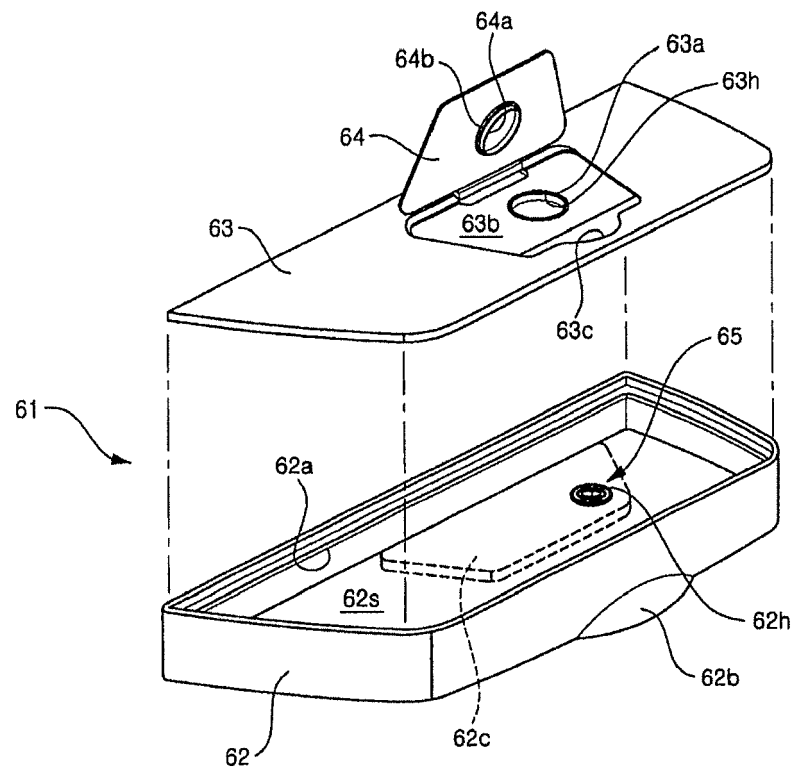
【Figure 5】



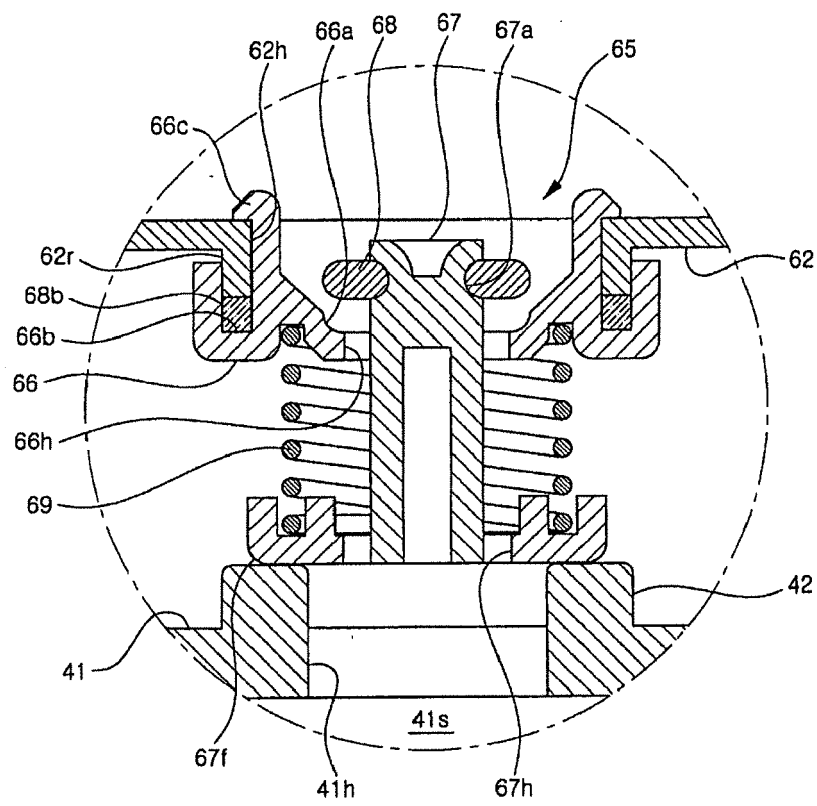
【Figure 6】



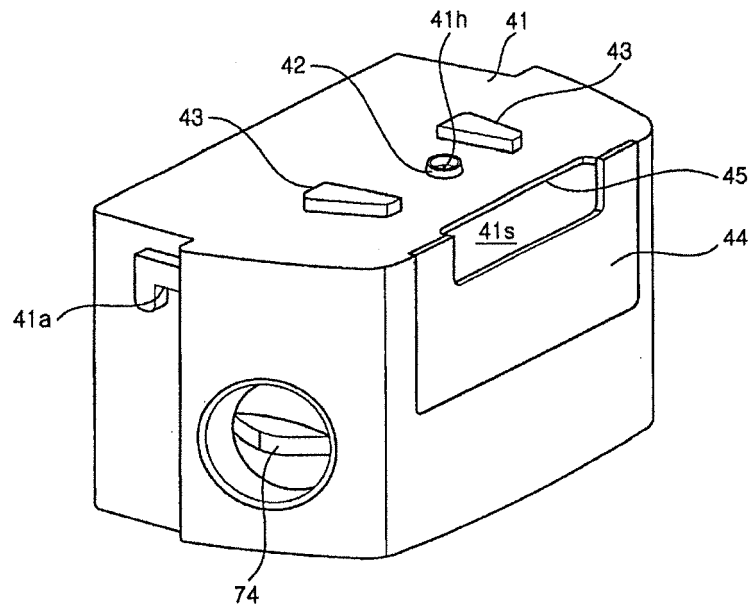
【Figure 7】



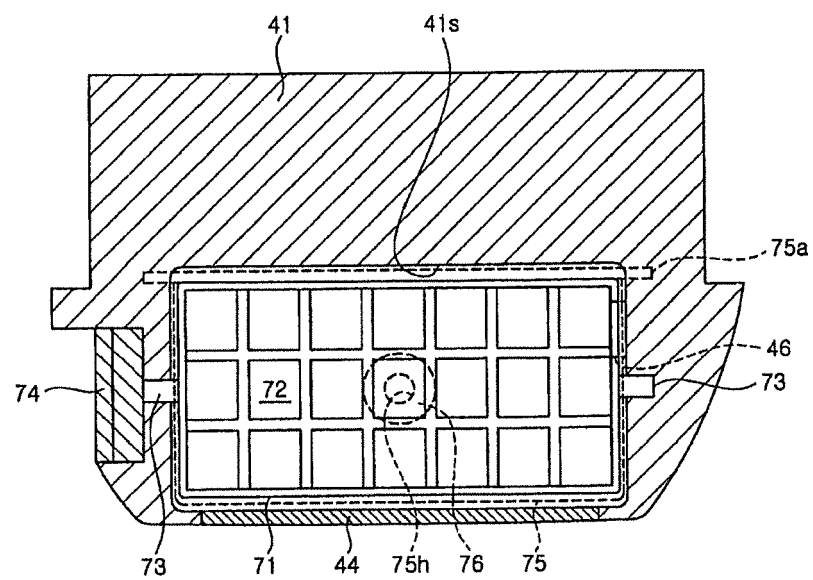
【Figure 8】



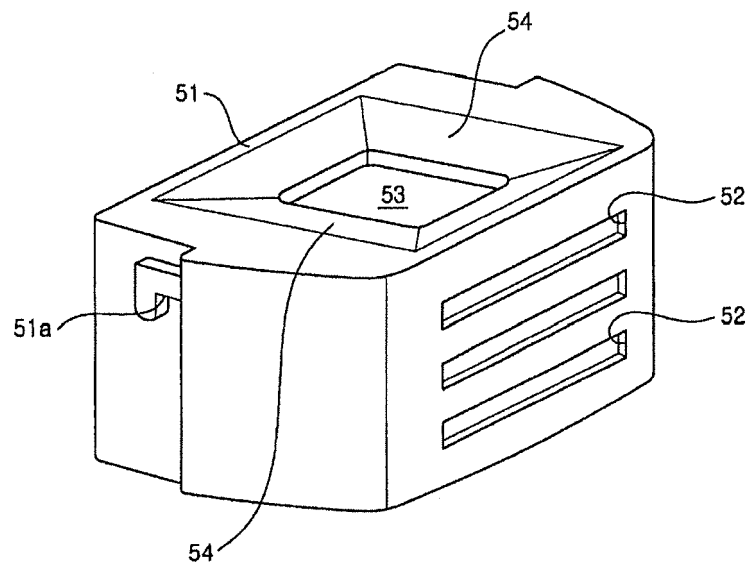
【Figure 9】



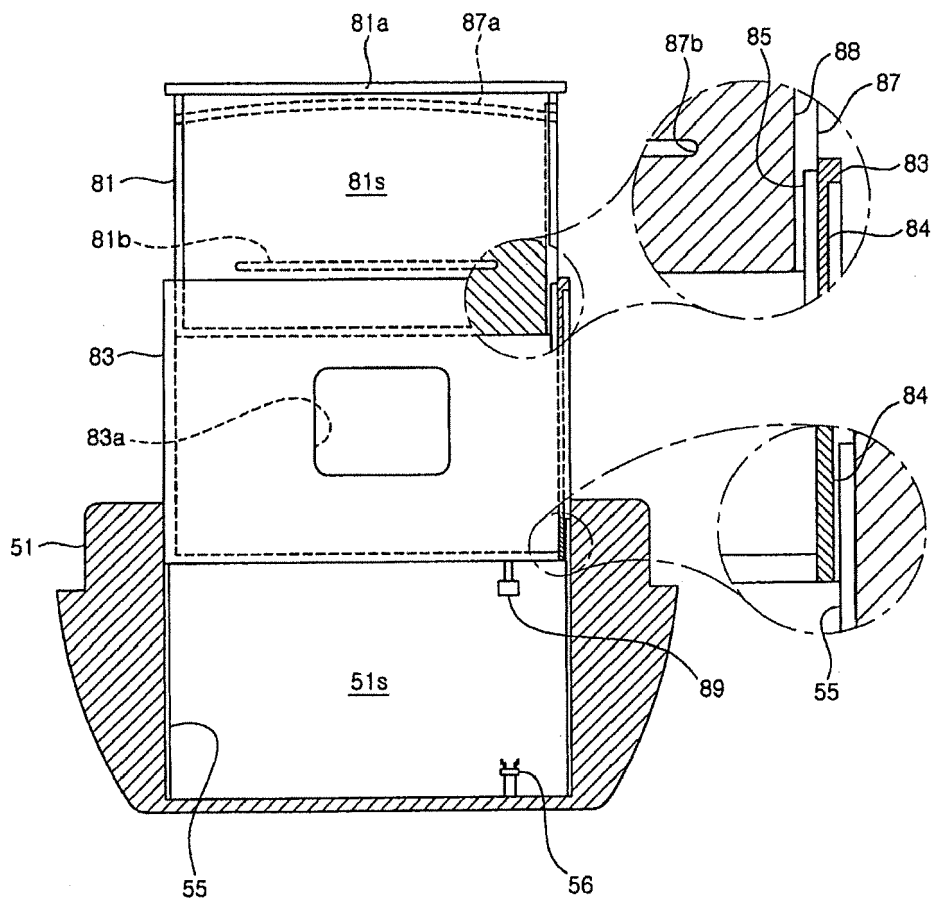
【Figure 10】



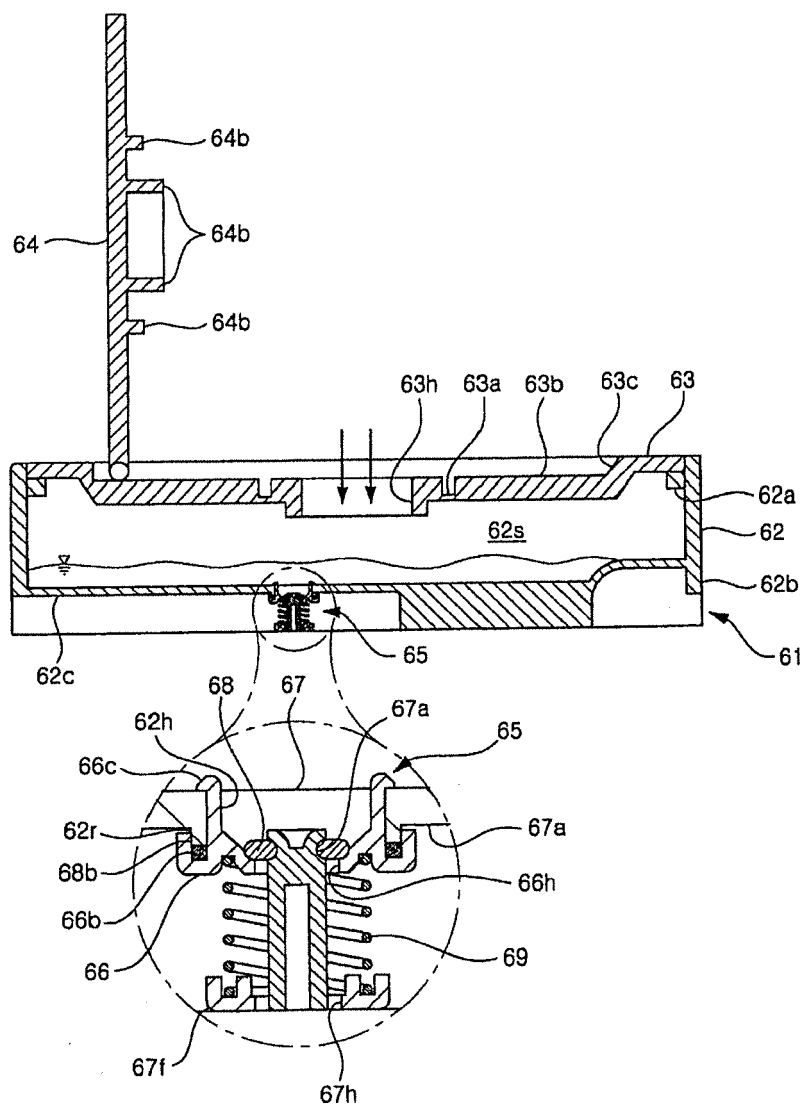
【Figure 11】



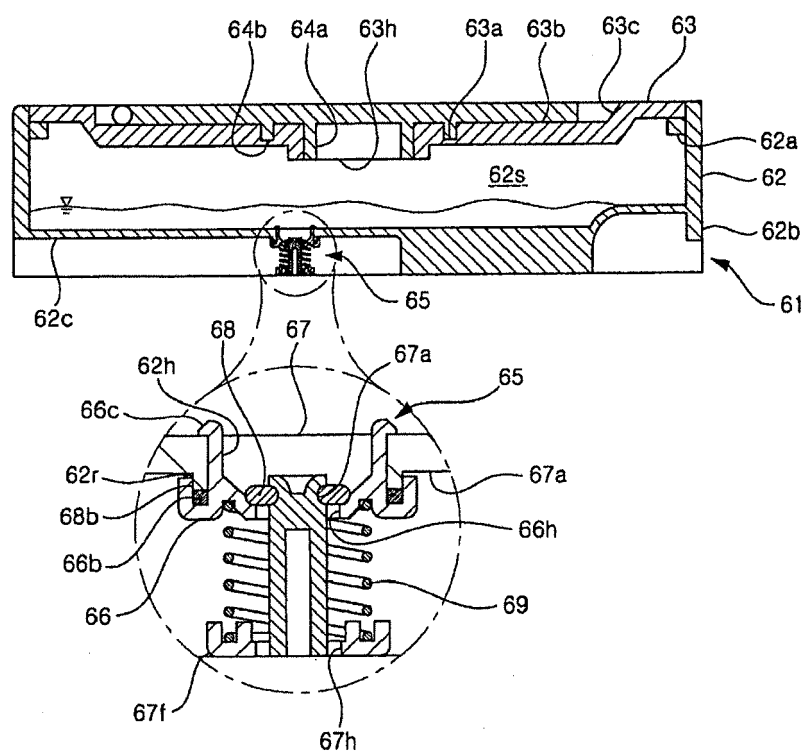
【Figure 12】



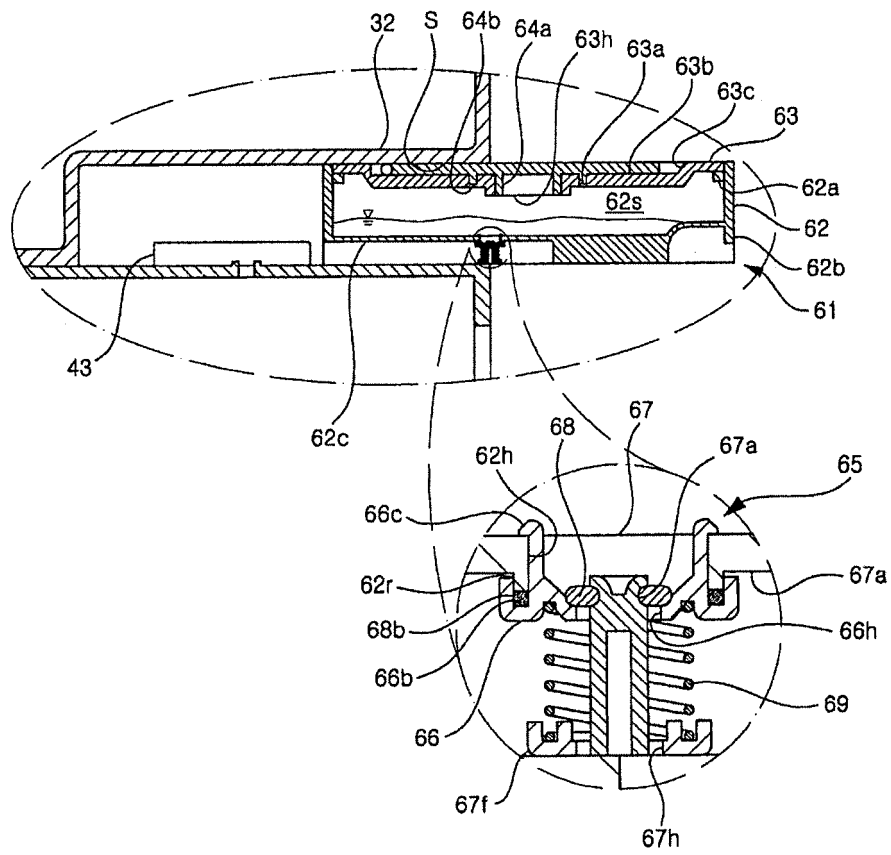
【Figure 13】



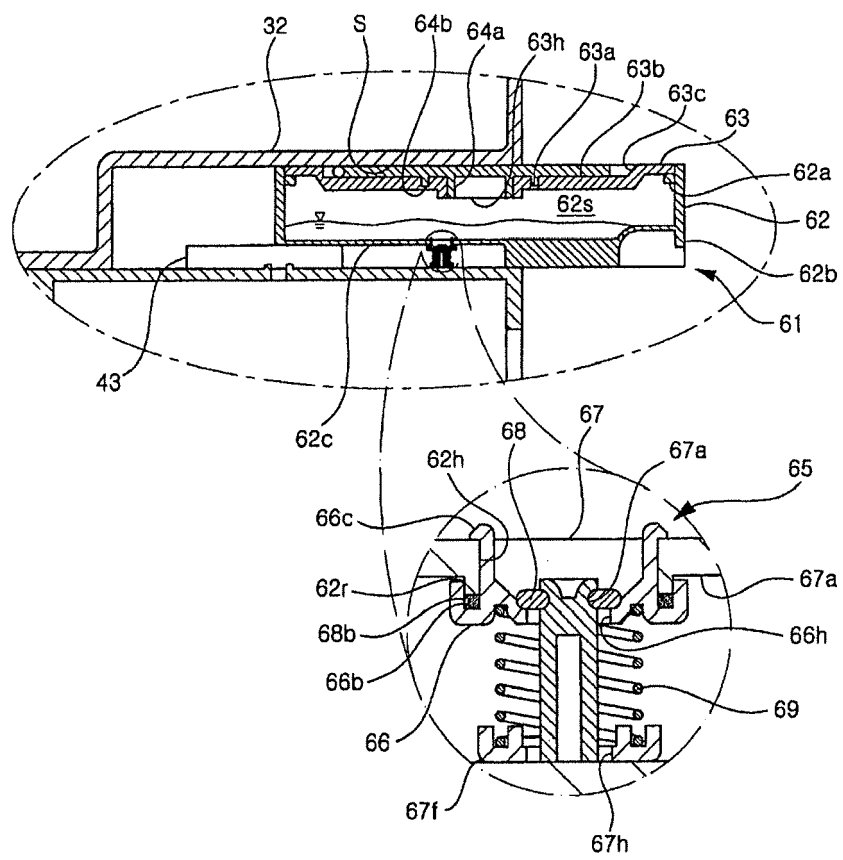
【Figure 14】



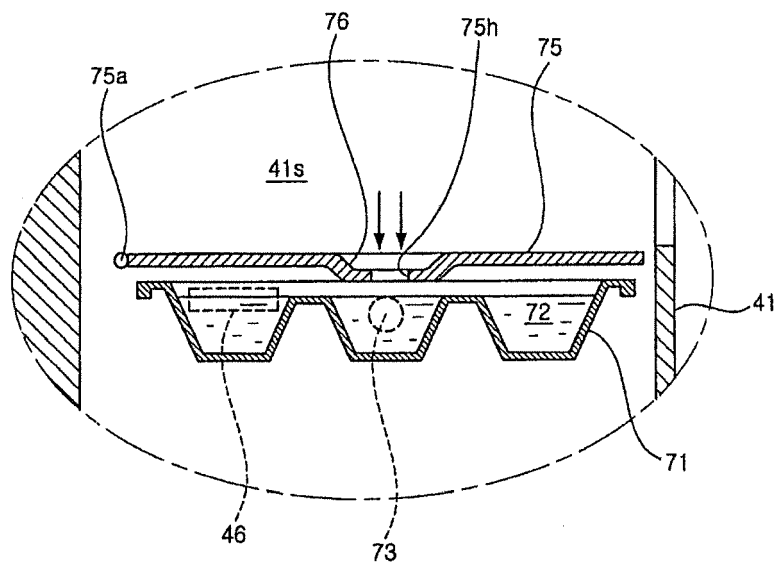
【Figure 15】



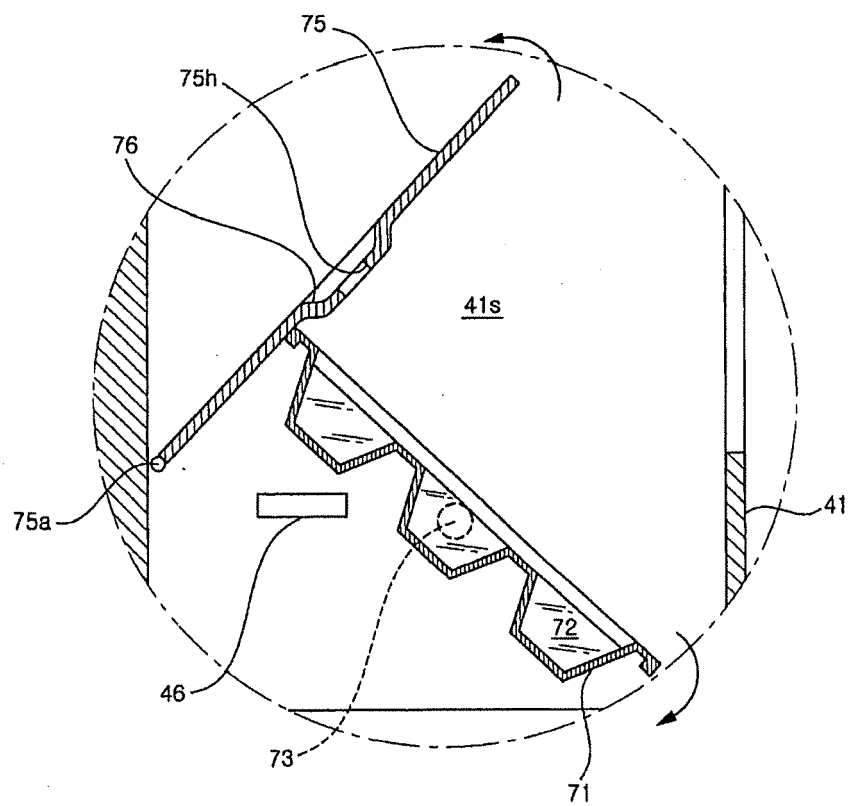
【Figure 16】



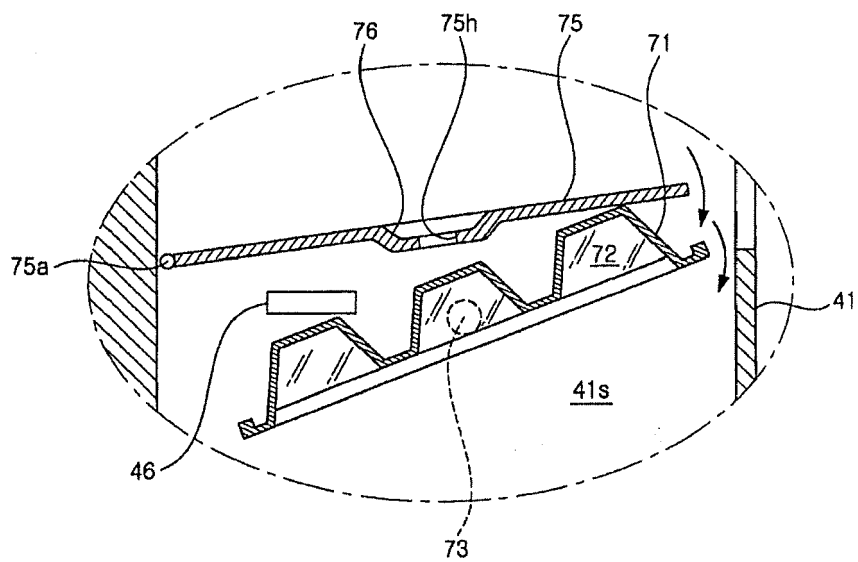
【Figure 17】



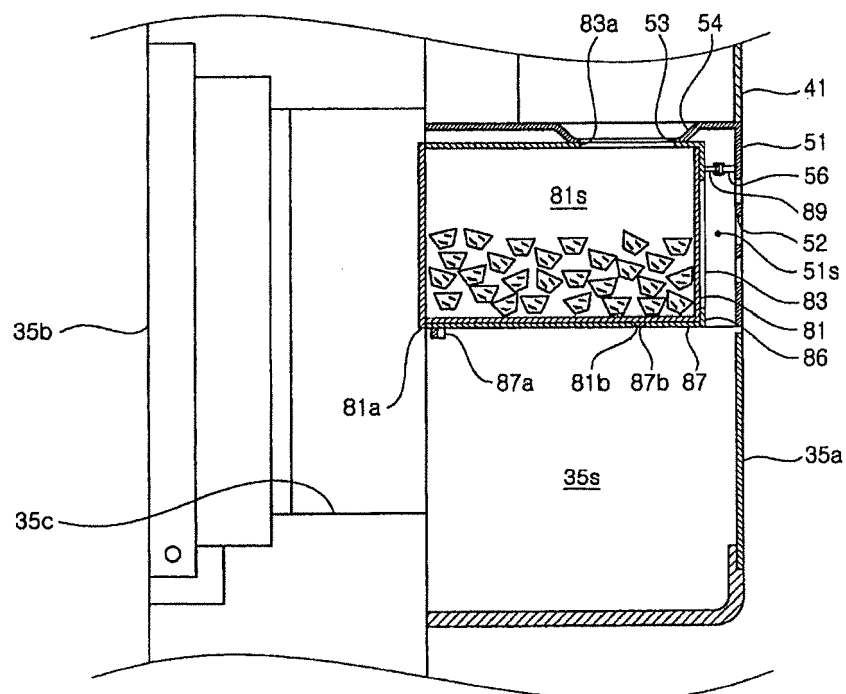
【Figure 18】



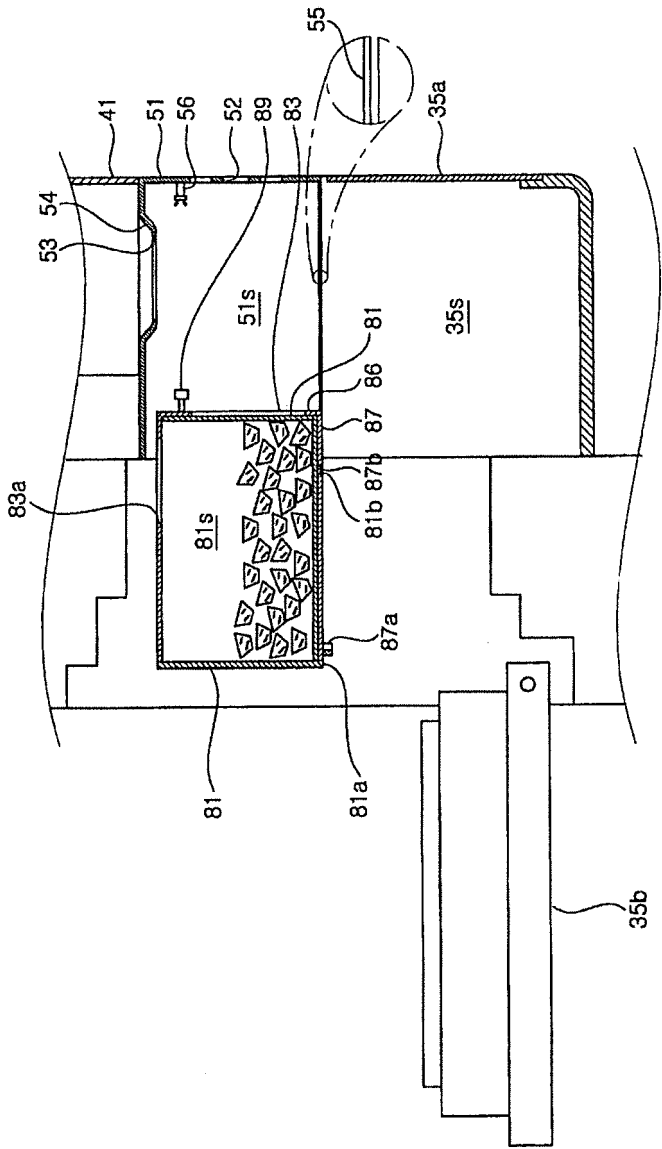
【Figure 19】



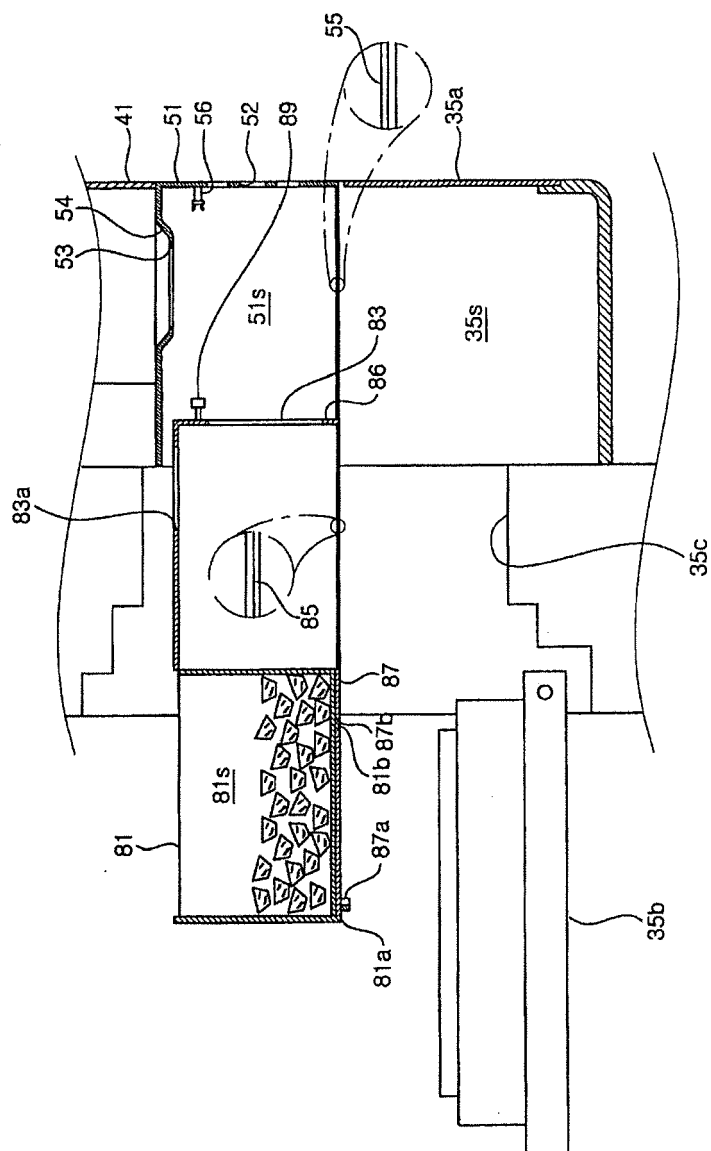
【Figure 20】



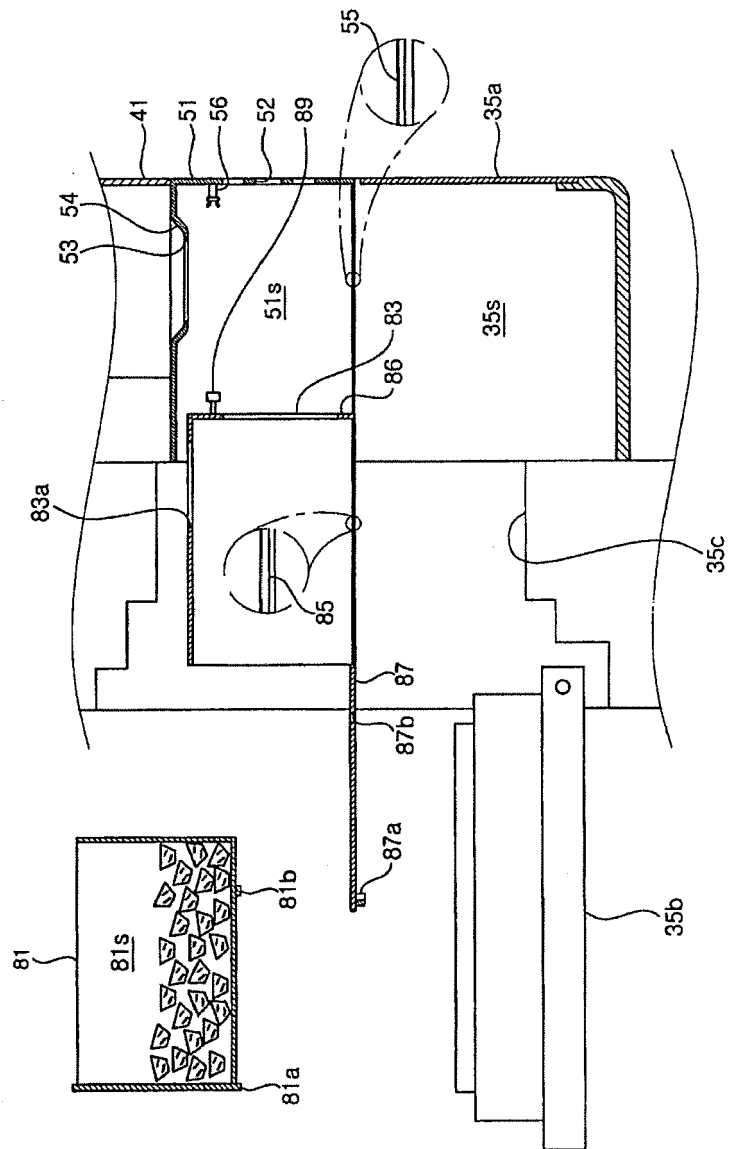
【Figure 21】



【Figure 22】



【Figure 23】





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Application Number  
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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                       |                                                                                                                                                                                                                                                                                       |                                         |
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|                                                                                                                                                                                                                                                        |                                                                                                                                                       |                                                                                                                                                                                                                                                                                       | F25C<br>F25D                            |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                       |                                                                                                                                                                                                                                                                                       |                                         |
| Place of search<br><b>Munich</b>                                                                                                                                                                                                                       |                                                                                                                                                       | Date of completion of the search<br><b>18 July 2019</b>                                                                                                                                                                                                                               | Examiner<br><b>Amous, Moez</b>          |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                       | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |                                         |

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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