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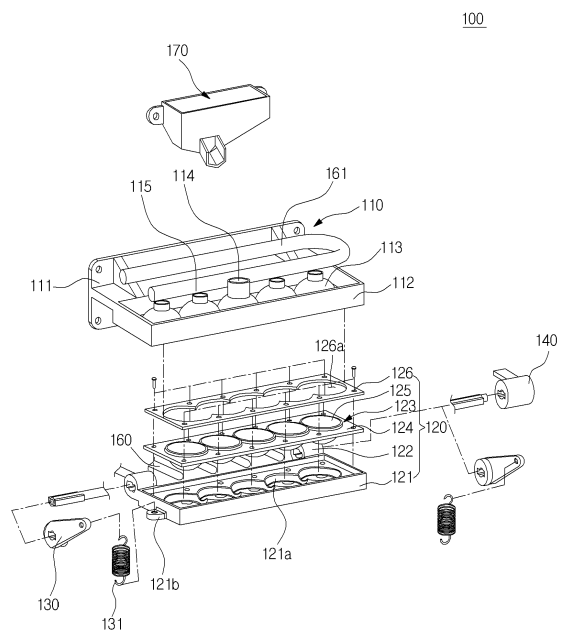
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(54) **Refrigerator**

(57) A refrigerator includes an ice making device (100). The ice making device (100) includes an upper plate tray (110) having first recess parts (115) that have a hemispherical shape and a lower plate tray (120) having second recess parts (125) which correspond to the first recess parts (113) and have a hemispherical shape. The refrigerator also includes a water supply module (30) configured to sense and store water to be supplied into the ice making device (100), an inflow-side valve (8) configured to selectively block water supply into the water supply module (20), and a discharge-side valve (9) configured to selectively supply the water stored in the water supply module (30) into the ice making device (100). The water supply module (30) includes a water tank (31, 41) configured to store water supplied from a water supply source (6) and a sensor (32, 42) configured to sense whether a preset amount of water has been supplied to the water tank (31, 41).

FIG.3



Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefits of priority to Korean Patent Application No. 10-2012-0062427 filed on June 12, 2012, which is herein incorporated by reference in its entirety.

FIELD

[0002] The present disclosure relates to a refrigerator.

BACKGROUND

[0003] Refrigerators are home appliances that store foods in a refrigerated or frozen state. Recently, an ice making device for making ice is commonly mounted to such a refrigerator. In refrigerators with an ice making device, water supply mechanisms for making ice are provided. Here, accurately controlling an amount of water supplied for making ice may be important. In particular, in an ice making device for making globular or spherical ice pieces, it may be important to accurately control an amount of supplied water. For example, if the amount of supplied water is insufficient, it is impossible to make perfect globular or spherical ice pieces. On the other hand, if an amount of supplied water is excessive, an ice making tray may be broken due to the volume expansion of an ice piece during the ice making process.

[0004] Fig. 1 illustrates an example water supply system for making ice in a refrigerator.

[0005] Referring to Fig. 1, a water supply passage is connected to a water supply source 1, and a switching valve 2 is mounted on the water supply passage. In addition, a flow sensor 3 is mounted on an outlet side of the switching valve 2, and the water supply passage has an end connected to a water supply hole of an ice maker 5. Further, the flow sensor 3 and the valve 2 are electrically connected to a controller 4 (e.g., a Micom).

[0006] In general, a flowmeter may be used as the flow sensor 3, and an amount of water to be supplied may be calculated according to the number of pulse of the flowmeter corresponding to the rotation number of the flowmeter. When the water is completely supplied, a valve locking signal may be output from the controller 4 to close the valve 2.

[0007] A method of supplying water for a time preset in the controller 4 may be used as another method of supplying water into the ice maker. For example, if a water supply time is set to about 5 seconds, water may be unconditionally supplied for about 5 seconds regardless of a water pressure of a water supply source.

[0008] Fig. 2 illustrates an excessive water supply phenomenon occurring when water supply is controlled using the flow sensor in a low water-pressure area. As shown in Fig. 2, more water than the target amount A of water is supplied in the low water-pressure area.

SUMMARY

[0009] In one aspect, a refrigerator includes an ice making device. The ice making device includes an upper plate tray having first recess parts that have a hemispherical shape and a lower plate tray having second recess parts which correspond to the first recess parts and have a hemispherical shape. The lower plate tray is rotatably coupled to the upper plate tray and the first recess parts and the second recess parts are configured to attach to each other to define spherical cells based on the upper plate tray contacting the lower plate tray. The refrigerator also includes a water supply module configured to sense and store water to be supplied into the ice making device and an inflow-side valve configured to selectively block water supply into the water supply module. The refrigerator further includes a discharge-side valve mounted at a passage connecting the water supply module to the ice making device and configured to selectively supply water stored in the water supply module into the ice making device. The water supply module includes a water tank configured to store water supplied from a water supply source and a sensor configured to sense whether a preset amount of water has been supplied to the water tank.

[0010] Implementations may include one or more of the following features. For example, the water tank may include a case configured to store the water supplied from the water supply source and a sensing part that extends from a first side of a top surface of the case. In this example, the sensing part may have a cylindrical shape and the water tank may include a water inflow part disposed on a second side of the top surface of the case. The second side of the top surface of the case may be opposite of the first side of the top surface of the case. The water tank further may include a water discharge part disposed on a bottom surface of the case.

[0011] In some implementations, the sensor may be a capacitance sensor mounted at the sensing part and configured to sense presence of water in the sensing part based on a change in capacitance resulting from the sensing part being filled with water. In these implementations, the capacitance sensor may be mounted on an upper end of the sensing part and an electrode of the capacitance sensor may extend downward to an inside of the sensing part. Further, in these implementations, the capacitance sensor may be configured to sense presence of water in the sensing part based on water contacting the electrode.

[0012] In addition, the bottom surface of the case may be inclined such that a transversal cross-sectional area of the bottom surface of the case gradually reduces toward the water discharge part. The water inflow part may extend upward from the top surface of the case by a predetermined length.

[0013] In some examples, the sensor may be a floating sensor mounted inside the sensing part and configured to sense presence of water in the sensing part based on movement of a portion of the floating sensor that moves

with water flowing into the sensing part. In these examples, the floating sensor may include a buoy configured to float on water, the buoy being the portion of the floating sensor that moves with water flowing into the sensing part. Further, in these examples, the floating sensor may include a magnet attached to the buoy and a level sensor mounted to a side of the sensing part and configured to sense the magnet attached to the buoy based on the magnet attached to the buoy reaching a level of the level sensor. The level sensor may include a Hall Effect sensor.

[0014] In some implementations, the refrigerator may include a control part connected to the sensor, the inflow-side valve, and the discharge-side valve. In these implementations, the control part may be configured to control an opening and closing of each of the inflow-side valve and the discharge-side valve according to a signal transmitted from the sensor. Also, in these implementations, the control part may be configured to, based on the signal transmitted from the sensor indicating that the preset amount of water has been supplied to the water tank, close the inflow-side valve and open the discharge-side valve.

[0015] The sensor may be a capacitance sensor configured to sense that the preset amount of water has been supplied to the water tank based on a change in capacitance resulting from a location of the capacitance sensor being filled with water. The sensor may be a floating sensor mounted inside the water tank and configured to sense that the preset amount of water has been supplied to the water tank based on movement of a portion of the floating sensor that moves with water flowing into the water tank. The sensor may be a load cell configured to sense that the preset amount of water has been supplied to the water tank based on sensing a weight of water supplied to the water tank.

[0016] In another aspect, a refrigerator includes an ice making device. The ice making device includes an upper plate tray having first recess parts that have a hemispherical shape and a lower plate tray having second recess parts which correspond to the first recess parts and have a hemispherical shape. The lower plate tray is rotatably coupled to the upper plate tray and the first recess parts and the second recess parts are configured to attach to each other to define spherical cells based on the upper plate tray contacting the lower plate tray. The refrigerator also includes an inflow-side valve configured to selectively block water supply to the ice making device and a sensor mounted to at least one of the upper plate tray and the lower plate tray and configured to sense whether a preset amount of water has been supplied to the spherical cells defined by the first recess parts and the second recess parts. The refrigerator further includes a control part connected to the inflow-side valve and the sensor and configured to control the inflow-side valve to block water supply to the ice making device based on the sensor sensing that the preset amount of water has been supplied to the spherical cells defined by the first recess

parts and the second recess parts.

[0017] Implementations may include one or more of the following features. For example, the sensor may be mounted to the upper plate tray. In addition, the sensor may be a capacitance sensor configured to sense that the preset amount of water has been supplied to the spherical cells defined by the first recess parts and the second recess parts based on a change in capacitance resulting from a location of the capacitance sensor being filled with water.

[0018] In some implementations, the sensor may be a floating sensor configured to sense that the preset amount of water has been supplied to the spherical cells defined by the first recess parts and the second recess parts based on movement of a portion of the floating sensor that moves with water supplied to the spherical cells defined by the first recess parts and the second recess parts. In these implementations, the floating sensor may include a sensing part mounted to the upper plate tray. The sensing part may be configured to receive water through a communication hole defined in the upper plate tray. The floating sensor also may include a buoy located in the sensing part and configured to float on water. The buoy may be the portion of the floating sensor that moves with water supplied to the spherical cells defined by the first recess parts and the second recess parts. The floating sensor further may include a magnet attached to the buoy and a level sensor mounted to a side of the sensing part and configured to sense the magnet attached to the buoy based on the magnet attached to the buoy reaching a level of the level sensor.

[0019] The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Fig. 1 is a schematic view of an example water supply system for making ice in a refrigerator according to a related art.

[0021] Fig. 2 is a graph illustrating an excessive water supply phenomenon occurring when water supply is controlled using a flow sensor in a low water-pressure area.

[0022] Fig. 3 is a schematic exploded perspective view illustrating an example ice making device to which an example water supply system is applied.

[0023] Fig. 4 is a side cross-sectional view illustrating a water supply state of the example ice making device.

[0024] Fig. 5 is a schematic system view of an example water supply mechanism.

[0025] Fig. 6 is a longitudinal cross-sectional view taken along line I-I of Fig. 5.

[0026] Fig. 7 is a longitudinal cross-sectional view of an example quantitative water supply module.

[0027] Fig. 8 is a cross-sectional view illustrating another example water supply system.

[0028] Fig. 9 is a cross-sectional view of yet another

example water supply system.

[0029] Figs. 10 and 11 are side views illustrating an example ice making device having an example water supply structure.

[0030] Fig. 12 is a schematic view illustrating another example water supply mechanism.

DETAILED DESCRIPTION

[0031] Fig. 3 illustrates an example ice making device to which an example water supply system is applied, and Fig. 4 illustrates a water supply state of the example ice making device.

[0032] Referring to Fig. 3, an ice making device 100 includes an upper plate tray 110 defining an upper appearance, a lower plate tray 120 defining a lower appearance, a driving unit 140 for operating one of the upper plate tray 110 and the lower plate tray 120, and an ejecting unit 160 (see Fig. 4) for separating ice pieces made in the upper plate tray 110 or the lower plate tray 120. The ejecting unit 160 includes an ejecting pin having a rod shape.

[0033] In some implementations, recess parts 125 each having a hemispherical shape may be arranged inside of the lower plate tray 120. Here, each of the recess parts 125 defines a lower half of a globular or spherical ice piece. The lower plate tray 120 may be formed of a metal material. As necessary, at least a portion of the lower plate tray 120 may be formed of an elastically deformable material. The lower plate tray 120 in which a portion is formed of an elastic material will be described as an example.

[0034] The lower plate tray 120 includes a tray case 121 defining an outer appearance, a tray body 123 mounted on the tray case 121 and having the recess parts 125, and a tray cover 126 fixing the tray body 123 to the tray case 121.

[0035] The tray case 121 may have a square frame shape. Also, the tray case 121 may further extend upward and downward along a circumference thereof. Also, a seat part 121a through which the recess parts 125 pass may be disposed inside the tray case 121. Also, a lower plate tray connection part 122 may be disposed on a rear side of the tray case 121. The lower plate tray connection part 122 may be coupled to the upper plate tray 110 and the driving unit 140. The lower plate tray connection part 122 may function as a center of rotation of the tray case 121. Further, an elastic member mounting part 121b may be disposed on a side surface of the tray case 121, and an elastic member 131 providing elastic force so that the lower plate tray 120 is maintained in a closed state may be connected to the elastic member mounting part 121b.

[0036] The tray body 123 may be formed of an elastically deformable flexible material. The tray body 123 may be seated from an upper side of the tray case 121. The tray body 123 includes a plane part 124 and the recess part 125 recessed from the plane part 124. The recess part 125 may pass through the seat part 121a of the tray

case 121 to protrude downward. Thus, as shown as a dotted line in Fig. 4, the recess part 125 may be pushed by the ejecting unit 160 when the lower plate tray 120 is rotated to separate the ice within the recess part 125 to the outside.

[0037] The tray cover 126 may be disposed above the tray body 123 to fix the tray body 123 to the tray case 121. A punched part 126a having a shape corresponding to that of an opened top surface of the recess part 125 defined in the tray body 123 may be defined in the tray cover 126. The punched part 126a may have a shape in which a plurality of circular shapes successively overlap one another. Thus, when the lower plate tray 120 is assembled, the recess part 125 is exposed through the punched part 126a.

[0038] Also, the upper plate tray 110 defines an upper appearance of the ice making device 100. The upper plate tray 110 may include a mounting part 111 for mounting the ice making device 100 and a tray part 112 for making ice.

[0039] In some examples, the mounting part 111 fixes the ice making device 100 to the inside of a freezing compartment or an ice making chamber. The mounting part 111 may extend in a direction perpendicular to that of the tray part 112. Thus, the mounting part 111 may be stably fixed to a side surface of the freezing compartment or the ice making chamber through surface contact. Also, the tray part 112 may have a shape corresponding to that of the lower plate tray 120. The tray part 112 may include a plurality of recess parts 113 each being recessed upward in a hemispherical shape. The plurality of recess parts 113 are successively arranged in a line. When the upper plate tray 110 and the lower plate tray 120 are closed, the recess part 125 of the lower plate tray 120 and the recess part 113 of the upper plate tray 110 are coupled to match each other in shape, thereby defining a cell 150 (see Fig. 4) that defines an ice making space having a globular or spherical shape. The recess part 113 of the upper plate tray 110 may have a hemispherical shape corresponding to that of the lower plate tray 120.

[0040] The upper plate tray 110 may be formed of a metal material entirely. Also, the upper plate tray 110 may be configured to quickly freeze water within the cell 150. A heater 161 heating the upper plate tray 110 to separate ice pieces may be further disposed on the upper plate tray 110. In addition, a water supply unit 170 for supplying water into water supply part 114 of the upper plate tray 110 may be further disposed above the upper plate tray 110.

[0041] The recess part 113 of the upper plate tray 110 may be formed of an elastic material, like the recess part 113 of the lower plate tray 120, so that ice pieces are easily separated.

[0042] A rotating arm 130 and the elastic member 131 are disposed on a side of the lower plate tray 120. The rotating arm 130 may be rotatably mounted on the lower plate tray 120 to provide the tension of the elastic member 131.

[0043] In some implementations, the rotating arm 130 may have an end axially coupled to the lower plate tray connection part 122. Also, the rotating arm may further rotate even though the lower plate tray 120 is closed to allow the elastic member 131 to extend. The elastic member 131 is mounted between the rotating arm 130 and the elastic member mounting part 121b. The elastic member 131 may include a tension spring. In some examples, the rotating arm 130 may further rotate in a direction in which the lower plate tray 120 is closely attached to the upper plate tray 110 in the state where the lower plate tray 120 is in the closed state, to allow the elastic member 131 to extend. Also, in a state where the rotating arm 130 is stopped, restoring force is applied to the elastic member 130 in a direction in which the elastic member 130 decreases to an original length thereof. Since the lower plate tray 120 is more closely attached to the upper plate tray 110 due to the restoring force, the leakage of water may be reduced (e.g., prevented) during ice making.

[0044] In addition, a plurality of air holes 115 are defined in the recess parts 113 of the upper plate tray 110. Each of the air holes 115 may be configured to exhaust air when water is supplied into the cell 150. The air hole 115 may have a cylinder sleeve shape extending upward to guide access of an ejecting pin 160 for separating an ice piece. Here, the ejecting unit 160 may be provided as a structure that does not press the recess part 125 of the lower plate tray 120 in a horizontal state, but that is vertically disposed above the upper plate tray 110 to pass through the air hole 115 and the water supply part 114. The ejecting unit 160 may be connected to the rotating arm 130 to ascend or descend when the rotating arm 130 rotates. Therefore, if the lower plate tray 120 rotates, the rotating arm 130 may rotate downward. Thus, the ejecting unit 160 passes through the air hole 115 and the water supply part 114 while descending to push a globular or spherical ice piece attached to the recess part 113 of the upper plate tray 110 out.

[0045] The water supply part 114 or the air hole 115 is disposed in an approximately central portion of each of the plurality of cells 150. The water supply part 114 may have a diameter greater than that of the air hole 115 to supply water smoothly. The water supply part 114 may be disposed in one end of both left and right ends of the plurality of cells 150 to conveniently supply water. The water supply part 114 may be configured to guide the access of the ejecting unit 160 for exhausting air and separating ice pieces when water is supplied in addition to the water supply function.

[0046] As shown in Fig. 4, the upper plate tray 110 and the lower plate tray 120 are closely attached to each other to prevent the stored water from leaking. Also, inner surfaces of the upper plate tray 110 and the lower plate tray 120 may define a globular or spherical surface to make a globular or spherical ice piece. Here, whether a perfect globular or spherical ice piece is made may be determined according to an amount of water supplied to the

cell 150. For example, if the amount of water supplied to the cell 150 is less than a preset supply amount, a top surface of the made ice may be flat. On the other hand, if an amount of water supplied to the cell 150 is greater than the present supply amount, the upper plate tray 110 and the lower plate tray 120 may have a gap there between or be broken by the volume expansion of ice during the ice making process. Therefore, the accurate control of a water supply amount in the ice making device for making globular or spherical ice pieces may be an important factor.

[0047] Fig. 5 illustrates an example water supply mechanism, and Fig. 6 is a longitudinal cross-sectional view taken along line I-I of Fig. 5.

[0048] Referring to Figs. 5 and 6, a water supply system for making ice includes a water supply source 6, a quantitative water supply module 30 connected to the water supply source 6, and an ice making device 100 connected to an outlet side of the quantitative water supply module 30.

[0049] In some implementations, an inlet-side valve 8 is mounted between the water supply source 6 and the quantitative water supply module 30, and an outlet-side valve 9 is mounted between the ice making device 100 and the quantitative water supply module 30 so that water supply into the quantitative water supply module 30 and the ice making device is controlled. Each of the inlet-side valve 8 and the outlet-side valve 9 is connected to a control part 7 to control the opening or closing of the valves.

[0050] The quantitative water supply module 30 includes a water tank 31 that stores water supplied from the water supply source 6 and a flow sensor sensing an amount of water supplied into the water tank 31. In this example, the flow sensor includes a capacitive sensor 32. The capacitive sensor 32 is connected to the control part 7 to transmit, to the control part 7, a signal indicating that a preset water level has been reached.

[0051] The water tank 31 constituting the capacitive water supply module 30 includes a case 311 providing a space for storing water, an water inflow part 312 disposed in one side of a top surface of the case 311, a water discharge part 313 disposed in a bottom surface of the water tank 31, a sensing part 315 protruding from the other side of the top surface of the case 311, and a capacitive sensor 32 mounted to the sensing part 315.

[0052] In some examples, the bottom surface of the case 311 may have an inclined surface 314 to collect water toward the water discharge part 313. That is, the bottom surface of the case 311 may be gradually inclined toward the water discharge part 313. This design may prevent water from remaining in the case 311 in the water discharge process for supplying water into the ice making device 100.

[0053] Also, an electrode 321 of the capacitive sensor 32 extends into the sensing part 315. When a preset supply amount of water is supplied to the water tank 31, water may reach a height at which an end of the electrode 321

is disposed. When water contacts the electrode 321, a resistance value sensed by the capacitance sensor 32 may be changed due to a difference between capacitances of air and water. As a result, an electrical signal according to the change of the resistance value may be transmitted to the control part 7 to sense that an amount of supplied water reaches the preset supply amount of water. A transversal cross-sectional area of the sensing part 315 is less than that of the case 311. This design may reduce (e.g., minimize) a supply amount error due to a water level error.

[0054] In addition, the water inflow part 312 has a tube shape extending upward from a top surface of the case 311 so that a water supply direction, e.g., a water flow direction, is oriented in a direction of gravity. This design may reduce (e.g., minimize) a flow of water into the tank when water is supplied to reduce (e.g., minimize) a water level sensing error of the electrode 312.

[0055] An air hole 316 is disposed on the upper end of the sensing part 315 to maintain the inside of the case 311 in an atmospheric condition during the supply and discharge of water.

[0056] When it is determined that the supply of the preset supply amount of water is completed by the capacitance sensor 32, the control part 7 may close the inflow-side valve 8 and open the discharge-side valve 9. Thus, the water supplied and stored in the case 311 is supplied to the ice making device 100.

[0057] Fig. 7 is a longitudinal cross-sectional view of an example quantitative water supply module.

[0058] Referring to Fig. 7, a quantitative water supply module 40 has the same structure as that of the quantitative water supply module 30, except for a water level sensor mounted on a sensing part 415.

[0059] A case 411, a water inflow part 412, a water discharge part 413, an inclined surface 414, a sensing part 415, and an air hole 416 establishing a water tank 41 have the same structure as those described above and, thus, their duplicated descriptions will be referenced, rather than repeated.

[0060] In the example shown in Fig. 7, a floating sensor 42 is applied as a sensor mounted inside the sensing part 415.

[0061] For instance, the floating sensor 42 includes a buoy 421 vertically moving according to a water level within the sensing part 415, a magnet 424 mounted inside the buoy 421, and a sensor 423 mounted on a side of an inner circumferential surface of the sensing part 415 to sense magnetic force generated from the magnet 424. The sensor 423 may be a Hall Effect sensor.

[0062] The buoy 421 may ascend due to an increase of the water level from a time point at which water is supplied into a case 411 to a time point at which water reaches a lower end of the sensing part 415. When the magnet 424 within the buoy 421 is disposed at a height corresponding to that of the sensor 423, the sensor 423 may sense the magnet 424 to transmit a signal into a control part 7. And the control part 7 may close an inflow-

side valve 8 and open a discharge-side valve 9 to supply the water supplied into the case 411 to an ice making device 100.

[0063] Fig. 8 illustrates another example water supply system.

[0064] Referring to Fig. 8, a capacitance sensor 32a is mounted on an upper plate tray 110 of an ice making device 100 for making globular or spherical ice.

[0065] For example, the capacitance sensor 32a may be mounted nearby an upper edge of the upper plate tray 110. Here, since water existing within a water tube may be supplied into the ice making device 100 after water supply is stopped, the capacitance sensor 32a may be disposed at a position that enables the water existing within the water tube to be received after the capacitance sensor 32a detects water and transmits a signal to stop water supply. If the capacitance sensor 32a is mounted on the uppermost end of the upper plate tray 110, supplied water may exceed a preset supply amount and flow down to the outside of the ice making device 100, or a tray may be broken during an ice making process. Thus, considering an amount of water supplied after the supply of the water is stopped, the capacitance sensor 32a may be mounted on a position corresponding to a slightly lower side from the uppermost end of the upper plate tray 110.

[0066] Also, the capacitance sensor 32a may be mounted on the upper plate tray 110 corresponding to the outermost side from the water supply unit 170 so that the supply of the water is stopped after water is fully supplied into the water supply tray.

[0067] Fig. 9 illustrates yet another example water supply system.

[0068] Referring to Fig. 9, the floating sensor shown in Fig. 7 is directly mounted on a side surface of an upper plate tray 110 of an ice making device 100 for making globular or spherical ice.

[0069] For instance, a sensing part 415 and a flow sensing (or a water level sensing) module 40a including the floating sensor 42 disposed within the sensing part 415 may communicate with each other through a communication hole 110a defined in one position of the upper plate tray 110. If water is supplied into a cell defined between the upper plate tray 110 and a lower plate tray 120, and a water level reaches the communication hole 110a, the water supplied into of the cell may be introduced into the sensing part 415. Then, the water level increases while the water level within the cell and the sensing part 415 are maintained equally. As the water level increases, the buoy 421 floats upward and moves the magnet 422 closer to the sensor 423. When the magnet 422 floats up to the position of the sensor 423, the supply of the water may be stopped. An air hole 41b is defined in the sensing part 415.

[0070] Figs. 10 and 11 illustrate an example ice making device having an example water supply structure.

[0071] Referring to Figs. 10 and 11, a sensor 50 may be mounted on an outer surface of a lower plate tray 120

of an ice making device, and a magnet may be mounted on a side surface of a case in which the ice making device is accommodated. Also, water quantitatively supplied may be sensed by sensing a degree of downward rotation of the lower plate tray 120.

[0072] An upper plate tray 110 and a lower plate tray 120 may be maintained in a closely attached state before water supply starts. When water is supplied into the lower plate tray 120 through a water supply unit 170, as shown in Figs. 10 and 11, the lower plate tray 120 may be gradually rotated downward with respect to an axis of a driving unit 140 by a weight of supplied water. Also, when a preset supply amount is supplied, the rotation of the lower plate tray 120 may be stopped just before the water supply amount reaches the preset supply amount. At this moment, the sensor 50 may sense the magnet to generate a water supply stop signal. The magnet may be mounted on any position of a part separated from the ice making device. Here, the separate part may be a sidewall of an ice making chamber accommodating the ice making device.

[0073] In some examples, a time point at which the sensor 50 senses the magnet is set to a time point just before the water supply amount reaches the preset supply amount to accommodate an amount of remaining water in the water supply tube because the water remaining in the water supply tube or member connected to the water supply unit 170 may be supplied into the lower plate tray 120 after the water supply is stopped as described above.

[0074] The sensor 50 may be mounted on a side opposite to the magnet. That is, the magnet may be mounted on the lower plate tray 120, and the sensor 50 may be mounted on the sidewall of the ice making chamber at a position facing the magnet.

[0075] Fig. 12 illustrates an example water supply mechanism for making ice.

[0076] Referring to Fig. 12, the example water supply mechanism is similar to those described above in that the mechanism for quantitatively supplying water includes a water tank 61, an inflow-side valve 8, a quantitative water supply module, and a discharge-side valve 9.

[0077] However, the example water supply mechanism is different from those described above in that the quantitative water supply module includes the water tank 61 and a load cell 60 for sensing an amount of water supplied into the water tank 61. The load cell 60 for sensing a weight of water supplied into the water tank 61 may be mounted on an upper end or a bottom surface of the water tank 61. When supply of water into the water supply tank 61 starts, the load cell 60 may sense the weight of supplied water to sense the accurate amount of supplied water.

[0078] For instance, a control part may initialize the load cell 60 before the water supply starts. Then, when the water supply starts, the load cell 60 may measure the weight of supplied water. When it is determined that the weight of supplied water reaches a preset weight val-

ue, the control part may determine that the quantitative water supply is completed. Thus, the load cell 60 transmits a water supply stop signal to the control part. Thereafter, an ice making process and an ice separation process may be performed.

[0079] The load cell 60 may be directly mounted on the lower plate tray 120 as well as the water tank 61.

[0080] The quantitative water supply unit as described above may be mounted on the ice making device for making the globular or spherical ice, in which an amount of supplied water may be accurately controlled, to easily make substantially globular or spherical ice.

[0081] The refrigerator may be advantageous for an ice making system in which an accurate control is required in an amount of water to be supplied, such as the ice making device for making globular or spherical ice.

[0082] Although implementations have been described with reference to a number of illustrative examples thereof, it should be understood that numerous other modifications and implementations can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this disclosure. More particularly, various variations and modifications are possible in the component parts and/or arrangements and fall within the scope of the disclosure, the drawings and the appended claims. In addition to variations and modifications in the component parts and/or arrangements, alternative uses will also be apparent to those skilled in the art.

Claims

1. A refrigerator comprising:

an ice making device (100), the ice making device (100) including:

an upper plate tray (110) having first recess parts (115) that have a hemispherical shape; and

a lower plate tray (120) having second recess parts (125) which correspond to the first recess parts (113) and have a hemispherical shape, the lower plate tray (120) being rotatably coupled to the upper plate tray (110) and the first recess parts (113) and the second recess parts (125) being configured to attach to each other to define spherical cells based on the upper plate tray (110) contacting the lower plate tray (120);

a water supply module (30) configured to sense and store water to be supplied into the ice making device (100);

an inflow-side valve (8) configured to selectively block water supply into the water supply module (30); and

a discharge-side valve (9) mounted at a passage

- connecting the water supply module (30) to the ice making device (100) and configured to selectively supply water stored in the water supply module (30) into the ice making device (100), wherein the water supply module (30) comprises:
- a water tank (31, 41) configured to store water supplied from a water supply source (6); and
 - a sensor (32, 42) configured to sense whether a preset amount of water has been supplied to the water tank (31, 41).
2. The refrigerator according to claim 1, wherein the water tank (31, 41) comprises:
 - a case (311, 411) configured to store the water supplied from the water supply source (6);
 - a sensing part (315, 415) that extends from a first side of a top surface of the case (311, 411), the sensing part (315, 415) having a cylindrical shape;
 - a water inflow part (312, 412) disposed on a second side of the top surface of the case (311, 411), the second side of the top surface of the case being opposite of the first side of the top surface of the case; and
 - a water discharge part (313, 413) disposed on a bottom surface of the case.
 3. The refrigerator according to claim 2, wherein the sensor is a capacitance sensor (32) mounted at the sensing part (315) and configured to sense presence of water in the sensing part (315) based on a change in capacitance resulting from the sensing part (315) being filled with water.
 4. The refrigerator according to claim 3, wherein the capacitance sensor (32) is mounted on an upper end of the sensing part (315), and an electrode (321) of the capacitance sensor (32) extends downward to an inside of the sensing part (315).
 5. The refrigerator according to claim 4, wherein the capacitance sensor (32) is configured to sense presence of water in the sensing part (315) based on water contacting the electrode (321).
 6. The refrigerator according to claim 2, wherein the bottom surface of the case (311, 411) is inclined such that a transversal cross-sectional area of the bottom surface of the case (311, 411) gradually reduces toward the water discharge part (313, 413).
 7. The refrigerator according to claim 2, wherein the water inflow part (312, 412) extends upward from the top surface of the case (311, 411) by a predetermined length.
 8. The refrigerator according to claim 2, wherein the sensor is a floating sensor (42) mounted inside the sensing part (415) and configured to sense presence of water in the sensing part (415) based on movement of a portion of the floating sensor (42) that moves with water flowing into the sensing part (415).
 9. The refrigerator according to claim 8, wherein the floating sensor comprises:
 - a buoy (421) configured to float on water, the buoy (421) being the portion of the floating sensor (42) that moves with water flowing into the sensing part (415);
 - a magnet (424) attached to the buoy (421); and
 - a level sensor (423) mounted to a side of the sensing part (415) and configured to sense the magnet (424) attached to the buoy (421) based on the magnet (424) attached to the buoy (421) reaching a level of the level sensor (423).
 10. The refrigerator according to claim 9, wherein the level sensor (423) comprises a Hall Effect sensor.
 11. The refrigerator according to claim 1, further comprising a control part (7) connected to the sensor (32), the inflow-side valve (8), and the discharge-side valve (9), wherein the control part is configured to control an opening and closing of each of the inflow-side valve (8) and the discharge-side valve (9) according to a signal transmitted from the sensor (32).
 12. The refrigerator according to claim 11, wherein the control part (7) is configured to, based on the signal transmitted from the sensor (32) indicating that the preset amount of water has been supplied to the water tank (31), close the inflow-side valve (8) and open the discharge-side valve (9).
 13. The refrigerator according to claim 1, wherein the sensor is a load cell (60) configured to sense that the preset amount of water has been supplied to the water tank (61) based on sensing a weight of water supplied to the water tank (61).
 14. A refrigerator comprising:
 - an ice making device (100), the ice making device including:
 - an upper plate tray (110) having first recess parts (113) that have a hemispherical shape; and
 - a lower plate tray (120) having second recess parts (125) which correspond to the

first recess parts (113) and have a hemi-spherical shape, the lower plate tray (120) being rotatably coupled to the upper plate tray (110) and the first recess parts (113) and the second recess parts (125) being 5 configured to attach to each other to define spherical cells based on the upper plate tray (110) contacting the lower plate tray (120);

an inflow-side valve configured to selectively 10 block water supply to the ice making device (100);
a sensor (32a, 42) mounted to at least one of the upper plate tray (110) and the lower plate tray (120) and configured to sense whether a 15 preset amount of water has been supplied to the spherical cells defined by the first recess parts (113) and the second recess parts (125); and
a control part connected to the inflow-side valve and the sensor (32a, 42) and configured to control 20 the inflow-side valve to block water supply to the ice making device (100) based on the sensor (32a, 42) sensing that the preset amount of water has been supplied to the spherical cells 25 defined by the first recess parts (113) and the second recess parts (125).

second recess parts (125);
a magnet (442) attached to the buoy (421); and
a level sensor (423) mounted to a side of the sensing part (415) and configured to sense the magnet (422) attached to the buoy (421) based on the magnet (422) attached to the buoy (421) reaching a level of the level sensor (423).

15. The refrigerator according to claim 16, wherein the sensor is a capacitance sensor (32a) configured to sense that the preset amount of water has been supplied to the spherical cells defined by the first recess parts (113) and the second recess parts (125) based on a change in capacitance resulting from a location of the capacitance sensor (32a) being filled with water. 30 35

16. The refrigerator according to claim 14, wherein the sensor is a floating sensor (42) configured to sense that the preset amount of water has been supplied to the spherical cells defined by the first recess parts (113) and the second recess parts (125) based on movement of a portion of the floating sensor (45) that moves with water supplied to the spherical cells defined by the first recess parts (113) and the second recess parts (125). 40 45

17. The refrigerator according to claim 16, wherein the floating sensor (42) comprises:

a sensing part (415) mounted to the upper plate 50 tray (110), the sensing part (415) being configured to receive water through a communication hole (110a) defined in the upper plate tray (110);
a buoy (421) located in the sensing part (415) and configured to float on water, the buoy (421) 55 being the portion of the floating sensor (42) that moves with water supplied to the spherical cells defined by the first recess parts (113) and the

FIG.1
Related Art

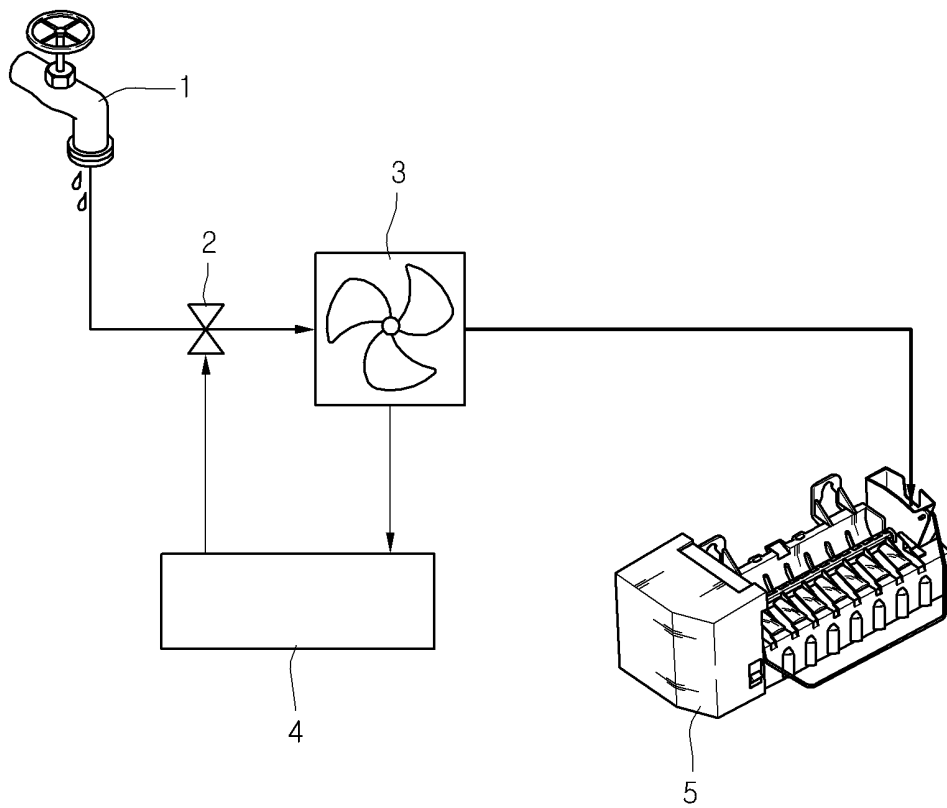


FIG.2
Related Art

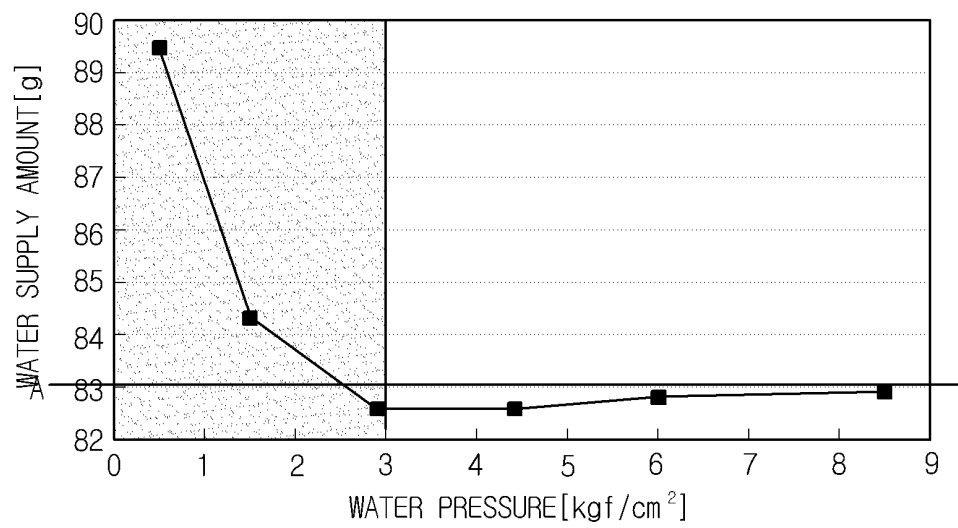


FIG.3

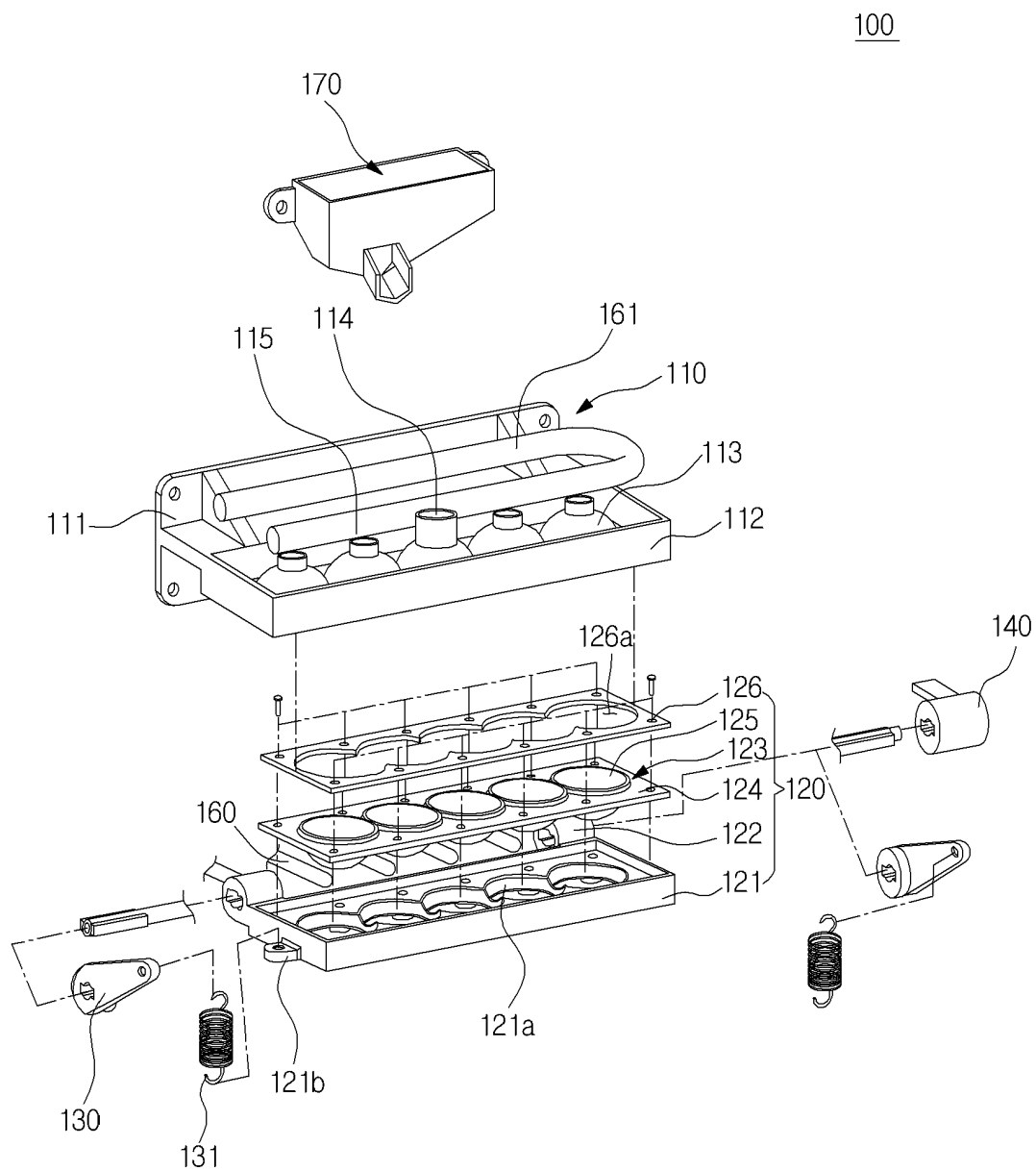


FIG.4

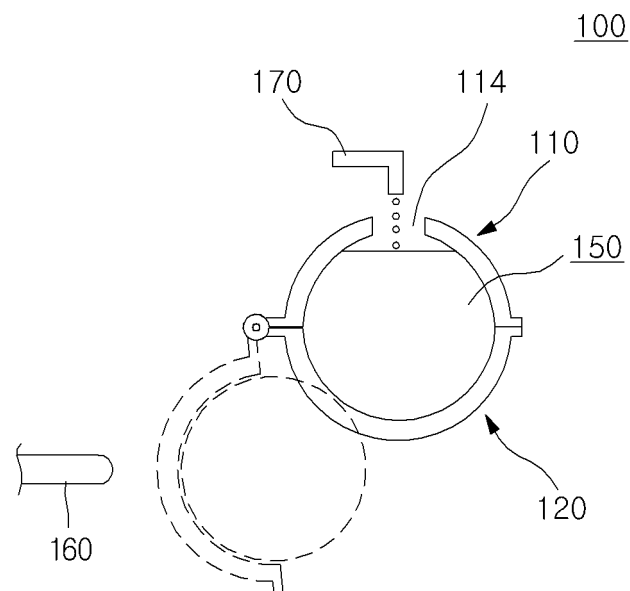


FIG.5

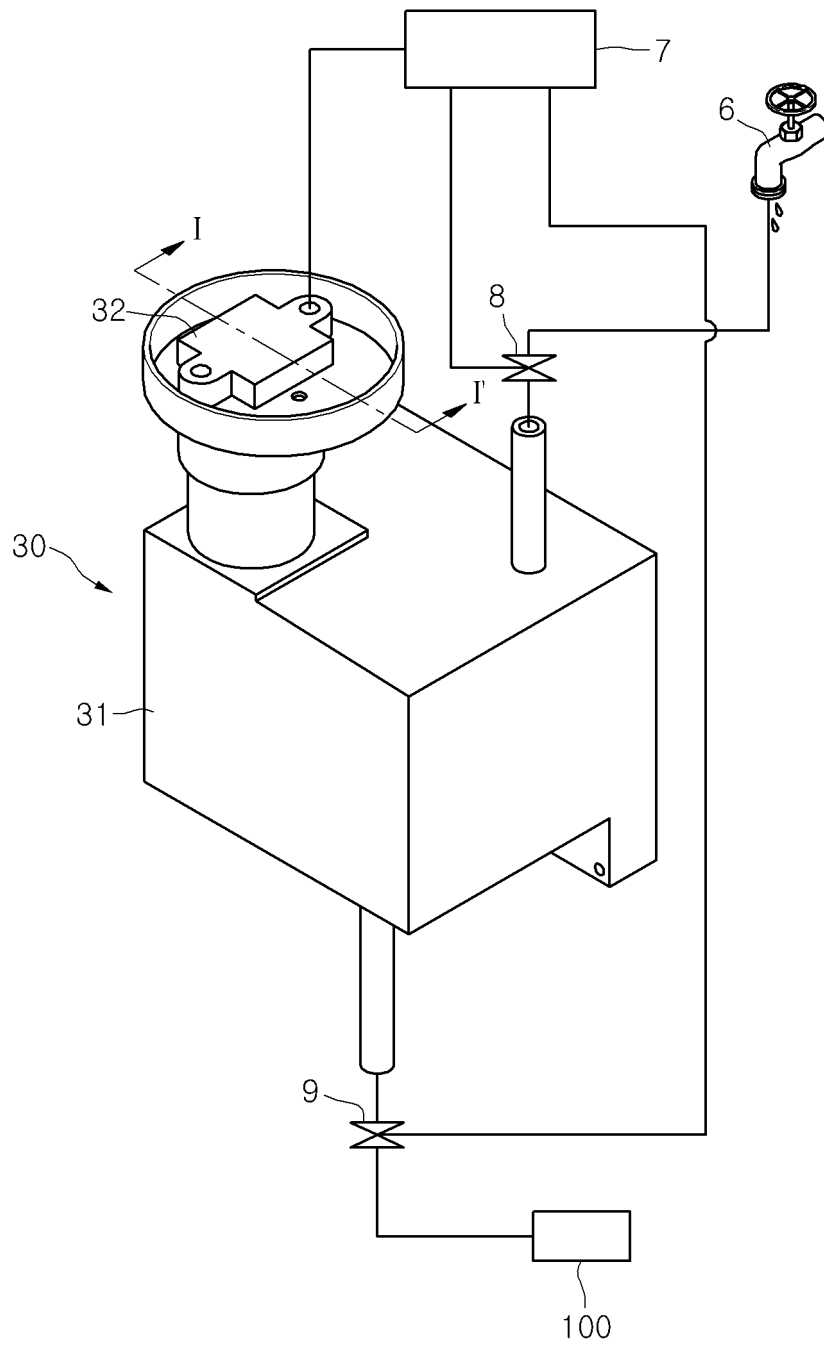


FIG.6

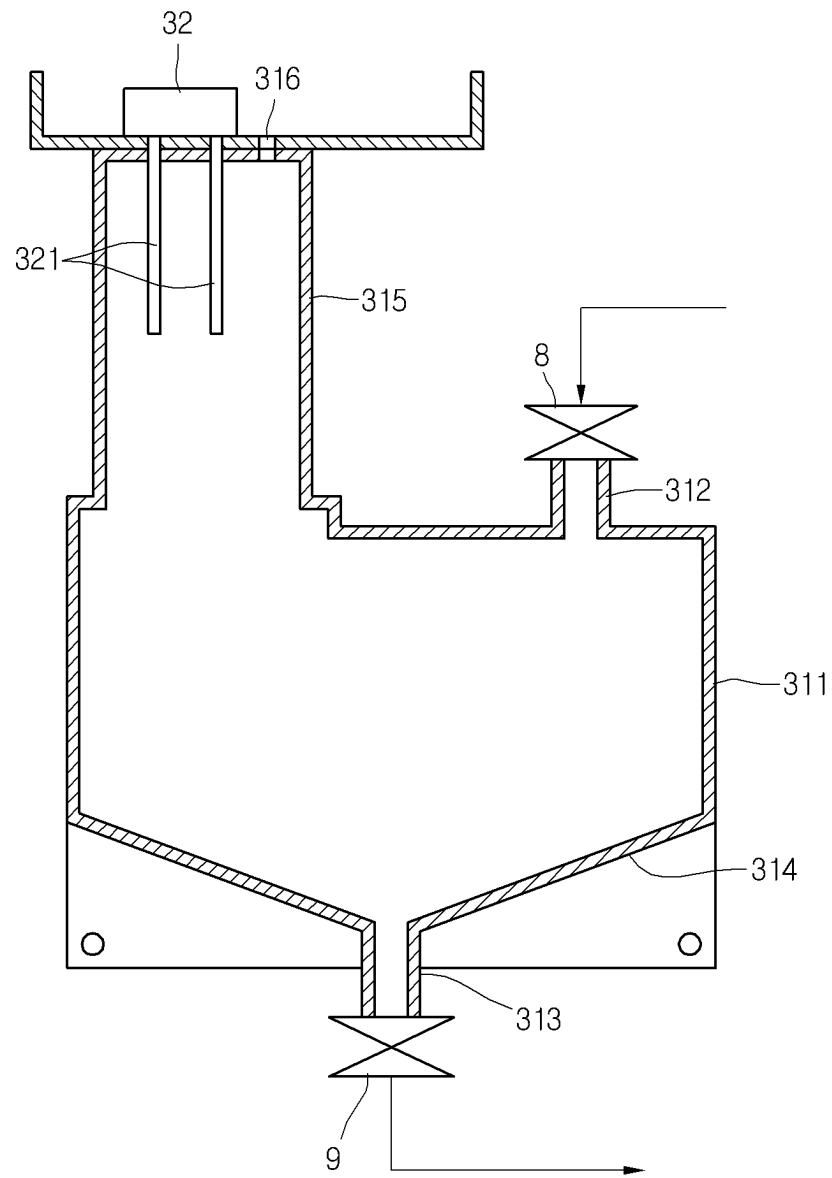


FIG.7

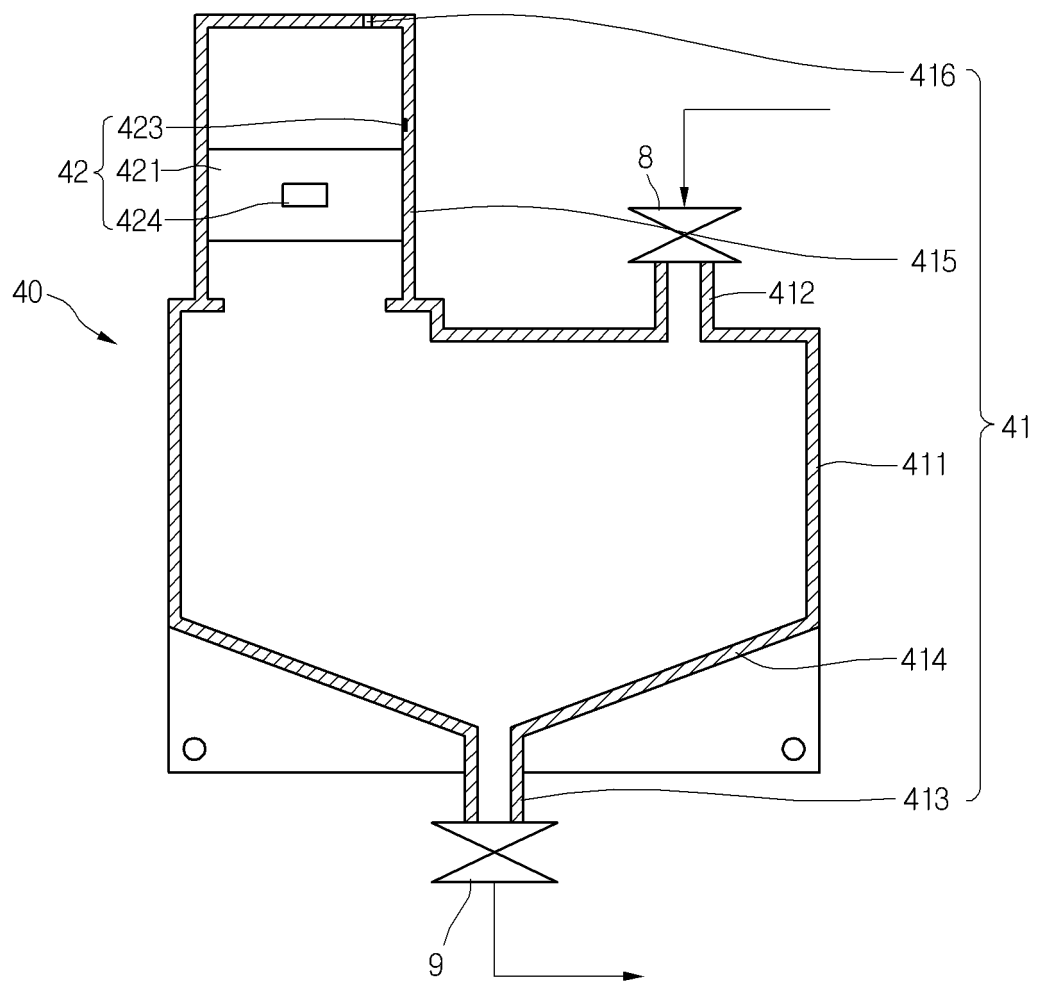


FIG.8

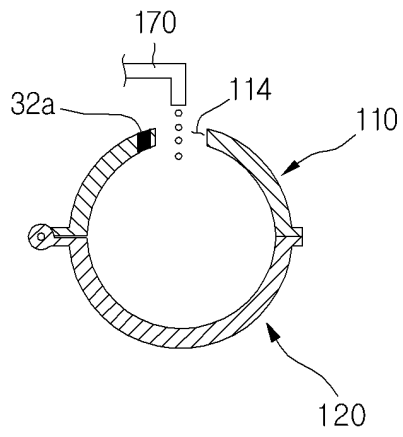


FIG.9

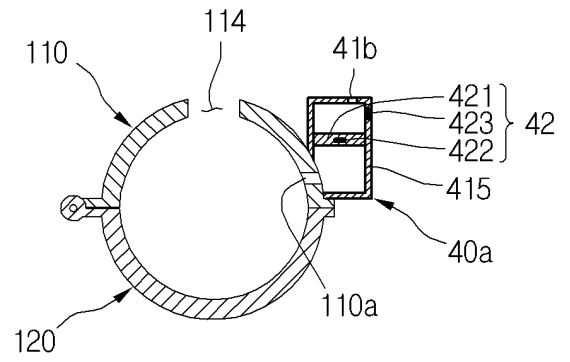


FIG.10

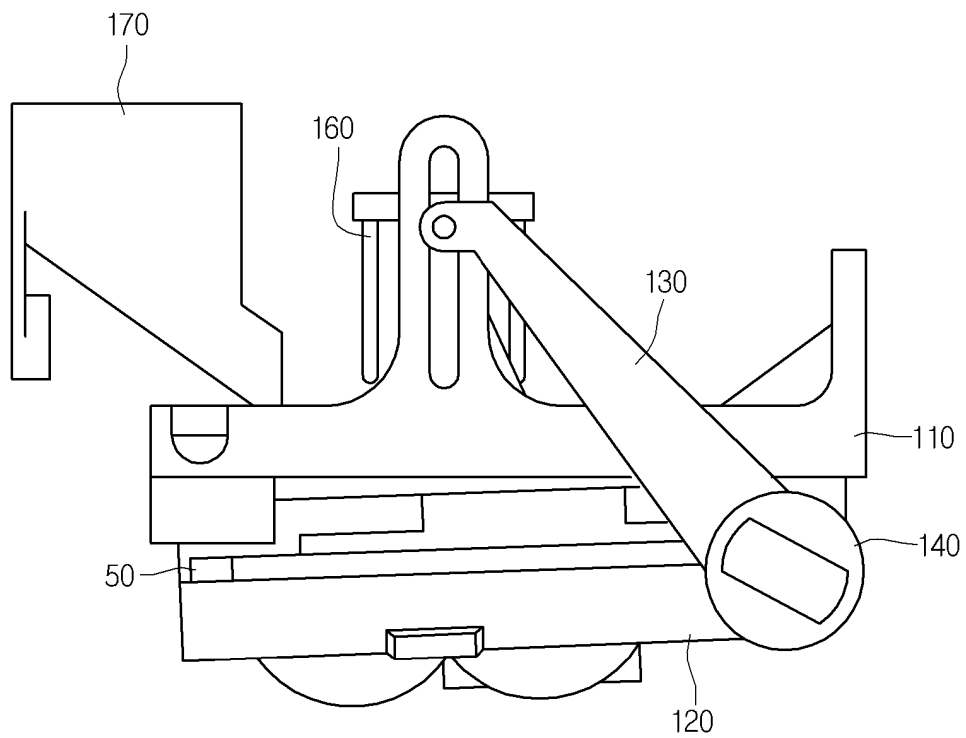


FIG.11

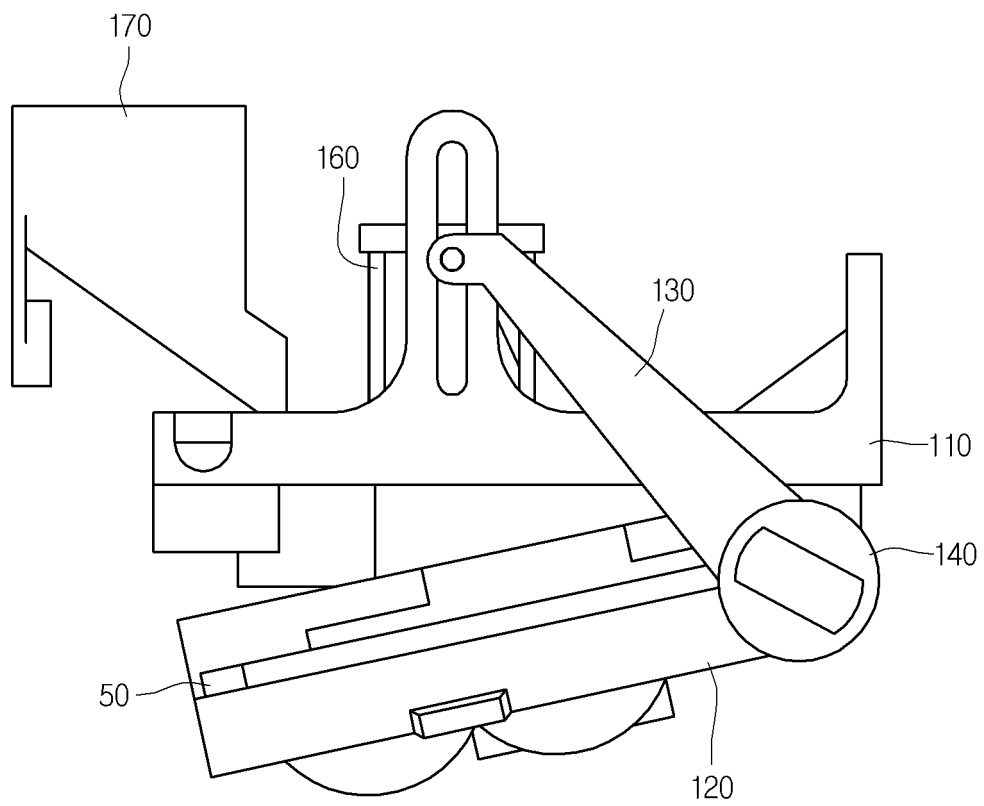
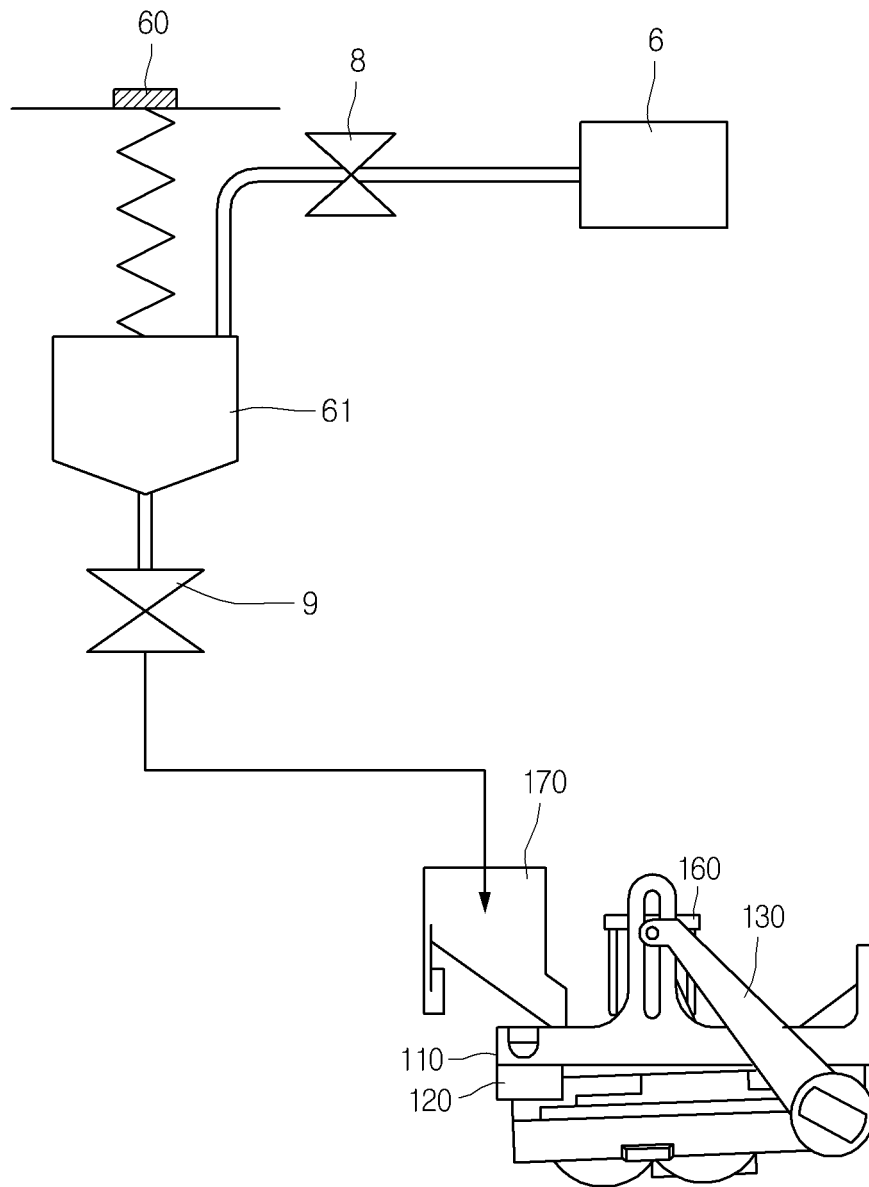


FIG.12



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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