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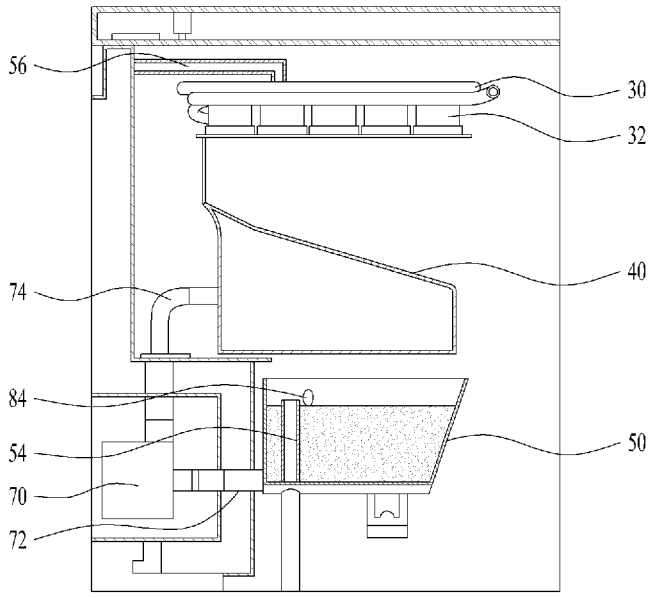
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(54) Title: ICE MACHINE



(57) Abstract: The present disclosure provides an ice machine including a cabinet, a tray disposed inside the cabinet, wherein ice is formed on the tray, a nozzle disposed below the tray and spraying water toward the tray, a storage tank for storing the water to be supplied to the nozzle therein, a water-level sensor disposed in the storage tank, a pump connected to the nozzle by a guide pipe and supplying the water stored in the storage tank to the nozzle, a supply pipe for supplying water to the tray, a water supply valve disposed on the supply pipe, and a controller that opens and closes a flow path of the water supply valve based on a water-level measured by the water-level sensor.

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[Continued on next page]

TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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Description

Title of Invention: ICE MACHINE

Technical Field

[1] The present disclosure relates to an ice machine, and more particularly, to an ice machine that may be installed in a kitchen sink and conserve water.

Background Art

[2] An ice machine installed in a kitchen sink for providing ice to a user typically has a structure in which transparent ice is made by applying a direct cooling cycle, an ice making portion for making the ice is disposed at a top of the ice machine, and the ice is transferred to an ice storage portion at a bottom of the ice machine through an ice-removal process and stored in the ice storage portion.

[3] In order to make the transparent ice by applying the direct cooling cycle, water is sprayed through a pump to a bottom of the tray, which is in contact with an evaporation pipe (EVA) to be kept at low temperature in a state in which water is stored in a storage tank. In this connection, water to be circulated is supplied to the storage tank, and the water is supplied only for a predetermined time through time control. In general, a flow rate varies even for the same time period depending on a water pressure condition in a region where the ice machine is installed. Thus, excessive water over a predetermined amount will be supplied, and overflowing water will be discarded. Typically, when one ice making cycle is driven, a ratio of drained water amount out of water usage amount is estimated to be about 80 %. That is, according to the prior art, most of the supplied water is not used and is discarded.

[4] When applying a conventional technique, since excessive water over a proper amount is supplied and then discarded, an amount of water used in a product is increased, which causes unnecessary waste of a water resource. In addition to the waste of the water resource, the water supplied to the ice machine passes through a filter and then is supplied to the storage tank, so that, when the amount of water used is increased, a life of the filter is shortened.

Disclosure of Invention

Technical Problem

[5] The present disclosure is to solve the above problems, and a purpose of the present disclosure is to provide an ice machine that supplies only an appropriate amount of water to save water.

[6] In addition, another purpose of the present disclosure is to provide an ice machine in which a water-level sensor is mounted in a storage tank, so that an appropriate amount of water is supplied regardless of a water pressure of an ice machine installation

condition, thereby reducing an amount of water discarded.

Solution to Problem

[7] The present disclosure minimizes an amount of drained water by mounting a water-level sensor in a storage tank. In addition, when additional water supply is required to improve hygiene of water in the storage tank and a transparency of made ice, the water may be supplied for a predetermined time after a water-level sensor signal is acquired. Further, when a certain ice-making cycle is selected, the additional water supply may be processed every selected period.

[8] Further, in the present disclosure, only set amount of water is supplied to the storage tank, which stores water for spraying the water to a bottom of a tray, so that an amount of water discarded resulted from the additional water supply may be reduced.

[9] In the present disclosure, since a difference in a flow rate occurs due to a water pressure depending on an installation condition of the ice machine, unlike the conventional technique of performing time control, only a selected amount of water is supplied by a water-level sensor.

[10] Further, in the present disclosure, in order to prevent the hygiene problem of the water stored in the storage tank and increase of ice opacity, the additional water supply may be performed at regular intervals.

[11] One aspect of the present disclosure proposes an ice machine including: a cabinet; a tray disposed inside the cabinet, wherein ice is formed on the tray; a nozzle disposed below the tray and spraying water toward the tray; a storage tank for storing the water to be supplied to the nozzle therein; a water-level sensor disposed in the storage tank; a pump connected to the nozzle by a guide pipe and supplying the water stored in the storage tank to the nozzle; a supply pipe for supplying water to the tray; a water supply valve disposed on the supply pipe; and a controller that opens and closes a flow path of the water supply valve based on a water-level measured by the water-level sensor.

[12] In one implementation, the controller may open the water supply valve and supply the water to the tray when the water-level sensor detects that the water-level is lowered to a predetermined level or below.

[13] In one implementation, the water-level sensor may periodically transmit water-level information to the controller.

[14] In one implementation, each through pipe may be disposed in the tray such that the water supplied to the supply pipe may fall through each through pipe to the storage tank.

[15] In one implementation, the tray may have a plurality of cells for respectively forming ice cubes, and each through pipe may penetrate each cell vertically.

[16] In one implementation, the storage tank may be disposed below the tray.

[17] In one implementation, the ice machine may further include a compressor for compressing a refrigerant to supply cold-air to the tray.

[18] In one implementation, the controller may open the water supply valve when the compressor starts to operate.

[19] In one implementation, the ice machine may further include: a door for opening and closing a front opening of the cabinet; and a door opening and closing sensor for detecting the opening and closing of the door.

[20] In one implementation, the controller may allow the water supply valve to open the flow path when the door opening and closing sensor detects closing after opening of the door.

[21] In one implementation, the controller may allow the water supply valve to open the flow path after a predetermined period of time even when the water-level sensor does not detect that the water-level is lowered to a predetermined level or below.

Advantageous Effects of Invention

[22] Only the appropriate amount of water may be supplied by the water-level sensor according to the present disclosure, so that the amount of water used may be reduced to prevent waste of the water resource.

[23] In addition, an amount of water flowing into a filter is reduced as the amount of water used decreases, which increases a filter replacement cycle, thereby reducing a filter replacement cost for a consumer. From a manufacturer's point of view, a limit life span of the filter of a certain cycle is reduced, so that a volume utilization of a machine room may be increased resulted from cost reduction and volume reduction.

Brief Description of Drawings

[24] FIG. 1 is a view illustrating an ice machine according to an embodiment of the present disclosure.

[25] FIG. 2 is a view illustrating an interior of FIG. 1.

[26] FIG. 3 is a view illustrating main portions of FIG. 2.

[27] FIG. 4 is a block diagram according to an embodiment.

[28] FIG. 5 is a view illustrating a concept of an embodiment.

Mode for the Invention

[29] Hereinafter, a preferred embodiment of the present disclosure that may specifically realize the above purposes will be described with reference to the accompanying drawings.

[30] In this process, a size, a shape, or the like of a component shown in the drawings may be exaggerated for clarity and convenience of description. In addition, terms that are specifically defined in consideration of the composition and operation of the present disclosure may vary depending on the intention of a user or an operator or a custom.

Definitions of such terms should be made based on contents throughout the specification.

[31] FIG. 1 is a view illustrating an ice machine according to an embodiment of the present disclosure. Further, FIG. 2 is a view illustrating an interior of FIG. 1. Further, FIG. 3 is a view illustrating main portions of FIG. 2.

[32] Referring to FIG. 1, an ice machine according to the present disclosure includes a cabinet 10 for forming an outer shape of the ice machine and a door 20 for opening and closing a front opening of the cabinet 10. The door 20 may be coupled to one side of the cabinet 10 to open and close the opening of the cabinet 10 while pivoting left and right about a pivoting shaft in a vertical direction.

[33] A handle 22 is disposed at one side of the door 20, so that a user may grip the handle 22 of the door 20 to pivot the door 20.

[34] FIG. 2 is a view illustrating the interior in a state in which a side of FIG. 1 is cut. Referring to FIGS. 2 and 3, a machine room 12 is defined below the cabinet 10. The machine room 12 has a compressor 90 disposed therein that compresses a refrigerant as one component of a freezing cycle. The compressor 90 may compress the refrigerant and finally generate cold air.

[35] The machine room 12 may be defined in a lower portion of the cabinet 10 to reduce noise and vibration generated.

[36] An evaporator 30 in which the refrigerant compressed by the compressor 90 is cooled while being evaporated is disposed at an upper portion of the cabinet 10. The evaporator 30 is formed in a pipe shape, and in contact with a tray 32. The tray 32 is cooled by the cold refrigerant passing through an interior of the evaporator 30, and then when water comes into contact with the cold tray 32, the water is converted into ice.

[37] The evaporator 30 may be formed in a twisted shape to cool a space in which a plurality of ice cubes are generated defined in the tray 32. The tray 32 may include a plurality of cells in which the plurality of ice cubes are respectively generated.

[38] A nozzle 40 for spraying water toward the tray 32 is disposed below the tray 32. The nozzle 40 sprays the water in an upward direction to spray the water into each cell of the tray 32.

[39] A storage tank 50 for storing the water supplied to the nozzle 40 therein is disposed below the nozzle 40. A first guide pipe 72 is connected to the storage tank 50, and the first guide pipe 72 is connected to a pump 70. A second guide pipe 74 is connected to the pump 70, and the second guide pipe 74 is connected to the nozzle 40. After the water stored in the storage tank 50 is flowed to the pump 70 through the first guide pipe 72, the water is flowed to the nozzle 40 through the second guide pipe 74 and then sprayed from the nozzle 40.

[40] A supply pipe 56 for supplying water to the tray 32 is disposed on the tray 32. One end of the supply pipe 56 is connected to an external water supply. Water supplied from the external water supply is guided to the supply pipe 56 and then sprayed on a top of the tray 32.

[41] The tray 32 has a plurality of cells 33 in which a plurality of ice cubes are respectively generated. As each cell 33 comes into contact with the water sprayed from the nozzle 40, ice is generated inside each cell 33. Each through pipe 34, which is vertically penetrated, is disposed in each cell 33, so that the water supplied through the supply pipe 56 falls down through each through pipe 34. Each through pipe 34 is disposed in each cell 33, and is formed to penetrate a central portion of each cell 33, so that the water may flow in a direction perpendicular to each cell 33 (see FIG. 5).

[42] A drain pipe 54 is disposed in the storage tank 50, so that, when a water-level of the storage tank 50 exceeds a certain level, the water may be discharged from the storage tank 50 through the drain pipe 54. The drain pipe 54 is disposed in a form of a tube erected to have a certain vertical level inside the storage tank 50. When the water-level inside the storage tank 50 is higher than the vertical level of the drain pipe 54, as the water enters the drain pipe 54, the water-level of the storage tank 50 is no longer increased.

[43] A water-level sensor 84 is disposed in the storage tank 50, so that the water-level of the storage tank 50 may be measured. While the drain pipe 54 serves to prevent the water-level of the storage tank 50 from rising above a certain level, the water-level sensor 84 may measure the water-level of the water stored in the storage tank 50.

[44] An ice bin 80 is disposed below the storage tank 50, so that the ice generated in the tray 32 may be dropped and stored in the ice bin 80. In order to use the stored ice, the user may access the ice bin 80 after opening the door 20 and then may scoop the ice from the ice bin 80. The drain pipe 54 extends downward to penetrate a bottom of the ice bin 80, so that the water discharged from the drain pipe 54 is flowed to the bottom of the ice bin 80.

[45] FIG. 4 is a block diagram according to an embodiment. Further, FIG. 5 is a view illustrating a concept of an embodiment.

[46] Referring to FIGS. 4 and 5, in one embodiment, a door opening and closing sensor 14 for detecting opening and closing of the door 20 is disposed. The door opening and closing sensor 14 may be located at a portion where the door 20 is in contact with the cabinet 10 to detect whether the door 20 is in contact and sealed with the cabinet 14. Information on whether the door is opened or closed may be transmitted from the door opening and closing sensor 14 to a controller 100.

[47] Information on whether the compressor 90 is driven is also transmitted to the controller 100. The controller 100 may drive the compressor 90 or stop driving the

compressor 90.

[48] Water-level information measured by the water-level sensor 84 may be transmitted to the controller 100. When the water-level sensor 84 detects that the water-level of the storage tank 50 is lowered to a certain level or below, the controller 100 may supply water. The water-level sensor 84 may periodically transmit the water-level information to the controller 100.

[49] A water supply valve 58 for opening and closing a flow path in the supply pipe 56 is disposed on the supply pipe 56. When the water supply valve 58 opens the flow path, the water is supplied to the tray 32 through the supply pipe 56, and when the water supply valve 58 closes the flow path, no water is supplied to the tray 32 through the supply pipe 56.

[50] The controller 100 may determine a situation in which the water should be supplied to the storage tank 50. When the water should be supplied to the storage tank 50, the controller 100 opens the water supply valve 58.

[51] When the water-level sensor 84 detects that the water-level of the storage tank 84 is lower than the certain water-level, it may mean the situation in which the water should be supplied to the storage tank 50. In addition, when the door opening and closing sensor 14 detects that the user opens and then closes the door 20, it may mean a situation in which the water should be supplied to generate the ice. In addition, when the compressor 90 starts to operate, it may mean a situation in which the water should be supplied into the storage tank 50 to generate the ice on the tray 32. In various situations, the situation in which the ice should be generated on the tray 32 may occur.

[52] In order for the ice to be generated on the tray 32, the water should be supplied into the storage tank 50. Further, the controller 100 may allow the water supply valve 58 to open the flow path, thereby supplying the water to the tray 32. When the water is supplied to the tray 32, the water is lowered to a lower portion of the tray 32 through the plurality of through pipes 34 from an upper portion of the tray 32, then passes through the nozzle 40, and then is stored in the storage tank 50. When the water is flowed to the storage tank 50, the pump 70 is driven, so that the water in the storage tank 50 is guided to the nozzle 40 after passing through the first guide pipe 72 and the second guide pipe 74. Since the water is sprayed from the nozzle 40 to the tray 32, and the tray 32 is cold by the evaporator 30, the ice may be generated on the tray 32.

[53] The ice is generated while the water is circulated by the pump 70 located below the tray 32, and the water is initially supplied through the supply pipe 56. In this connection, the water-level sensor 84 is mounted in the storage tank 50, and when the certain water-level is satisfied, the compressor 90 is driven to stop the water supply and generate the ice.

[54] When additional water is only supplied as much ice, which is formed by a portion of

the stored water being frozen, and is flowed to the ice bin 80, the water stored in the storage tank 50 may be reduced, and an amount of the water finally circulated may be reduced.

[55] In this case, a transparency of the ice may decrease due to a hygiene problem of the water or as an accumulation of minerals in the storage tank increases. To prevent this, the controller 100 may control the water supply valve 58 to open the flow path and supply the water when a certain time passes regardless of the water-level measured by the water-level sensor 84.

[56] In addition, a minimum period in which the problem does not occur may be selected based on the same principle, so that the controller 100 may control the water supply valve 58 to open the flow path based on the selected period.

[57] In the present disclosure, after supplying enough water to satisfy the water-level measured by the water-level sensor, the water supply valve 58 may open the flow path for a certain time to supply the additional water. In this case, the opening of the flow path may be performed every selected period.

[58] The present disclosure is not limited to the above-described embodiment. Further, as seen from the appended claims, modifications are possible by those skilled in the art of the present disclosure, and such modifications fall within the scope of the present disclosure.

Claims

[Claim 1] An ice machine comprising:
a cabinet;
a tray disposed inside the cabinet, wherein ice is formed on the tray;
a nozzle disposed below the tray and spraying water toward the tray;
a storage tank for storing the water to be supplied to the nozzle therein;
a water-level sensor disposed in the storage tank;
a pump connected to the nozzle by a guide pipe and supplying the water stored in the storage tank to the nozzle;
a supply pipe for supplying water to the tray;
a water supply valve disposed on the supply pipe; and
a controller configured to open and close a flow path of the water supply valve based on a water-level measured by the water-level sensor.

[Claim 2] The ice machine of claim 1, wherein the controller is configured to open the water supply valve and supply the water to the tray when the water-level sensor detects that the water-level is lowered to a predetermined level or below.

[Claim 3] The ice machine of claim 1, wherein the water-level sensor periodically transmits water-level information to the controller.

[Claim 4] The ice machine of claim 1, wherein each through pipe is disposed in the tray such that the water supplied to the supply pipe falls through each through pipe to the storage tank.

[Claim 5] The ice machine of claim 4, wherein the tray has a plurality of cells for respectively forming ice cubes, and
wherein each through pipe penetrates each cell vertically.

[Claim 6] The ice machine of claim 1, wherein the storage tank is disposed below the tray.

[Claim 7] The ice machine of claim 1, further comprising:
a compressor for compressing a refrigerant to supply cold-air to the tray.

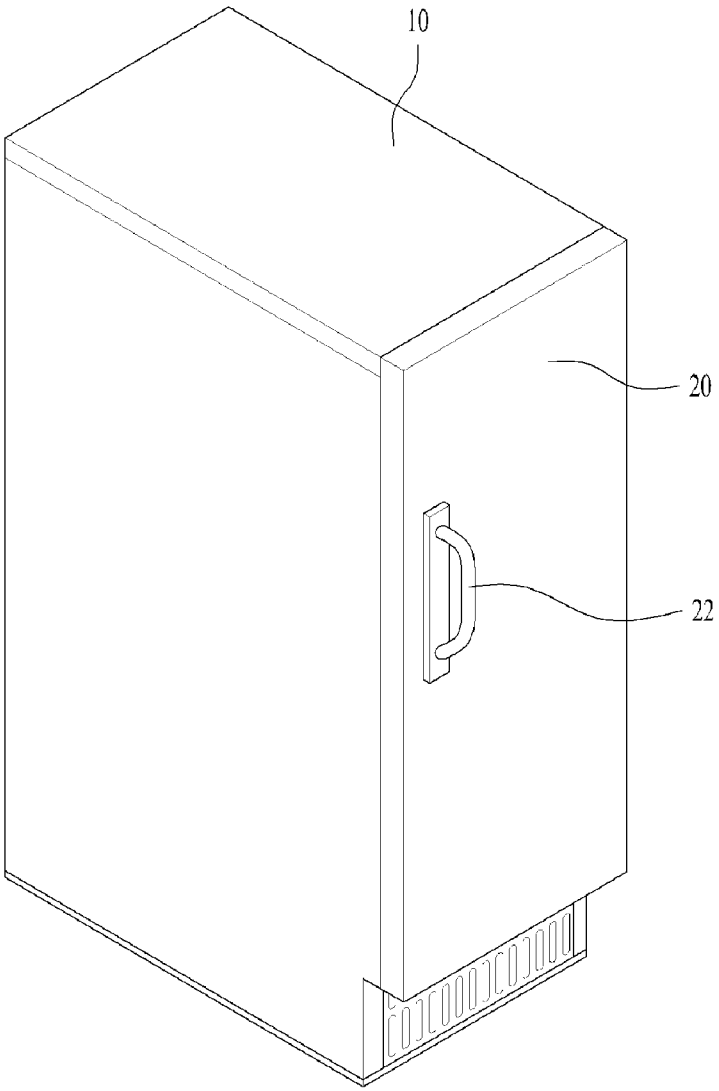
[Claim 8] The ice machine of claim 7, wherein the controller is configured to open the water supply valve when the compressor starts to operate.

[Claim 9] The ice machine of claim 1, further comprising:
a door for opening and closing a front opening of the cabinet; and
a door opening and closing sensor for detecting the opening and closing of the door.

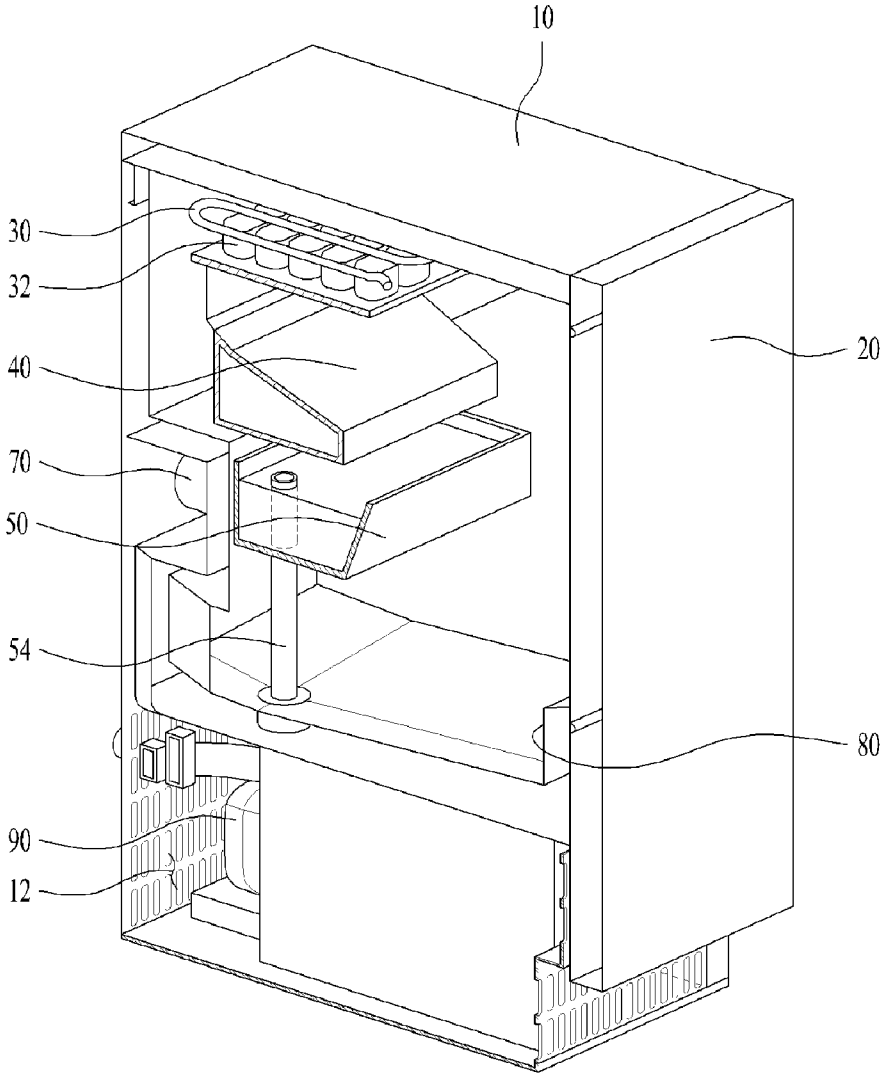
[Claim 10] The ice machine of claim 9, wherein the controller is configured to allow the water supply valve to open the flow path when the door opening and closing sensor detects closing after opening of the door.

[Claim 11] The ice machine of claim 1, wherein the controller is configured to allow the water supply valve to open the flow path after a predetermined period of time even when the water-level sensor does not detect that the water-level is lowered to a predetermined level or below.

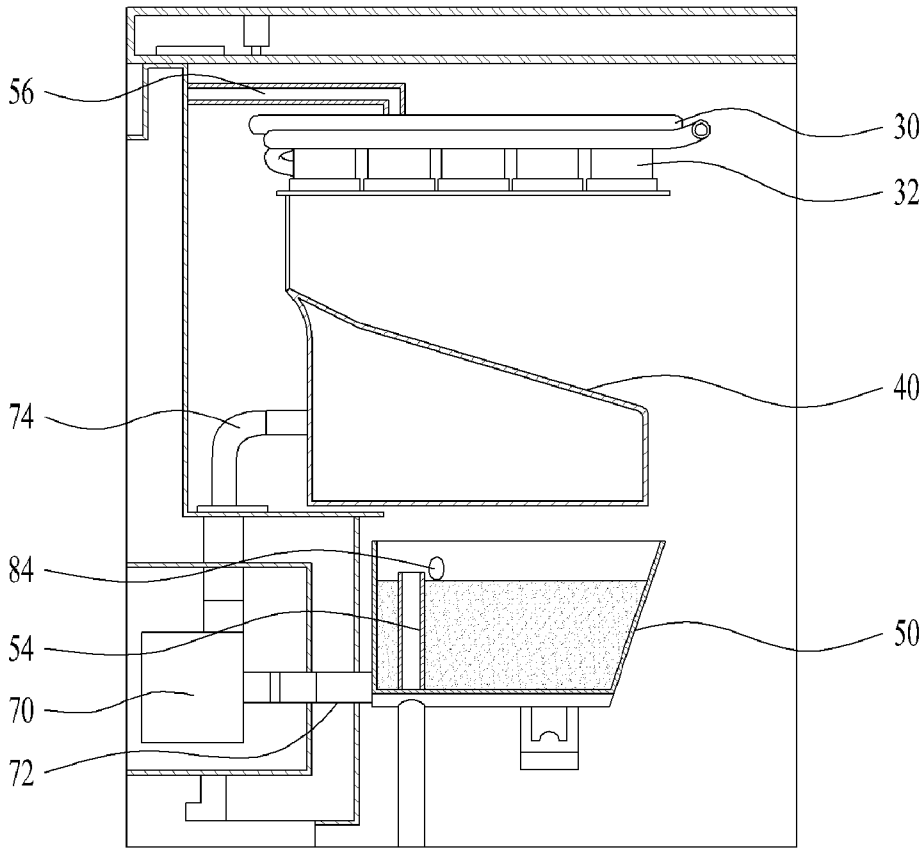
[Fig. 1]



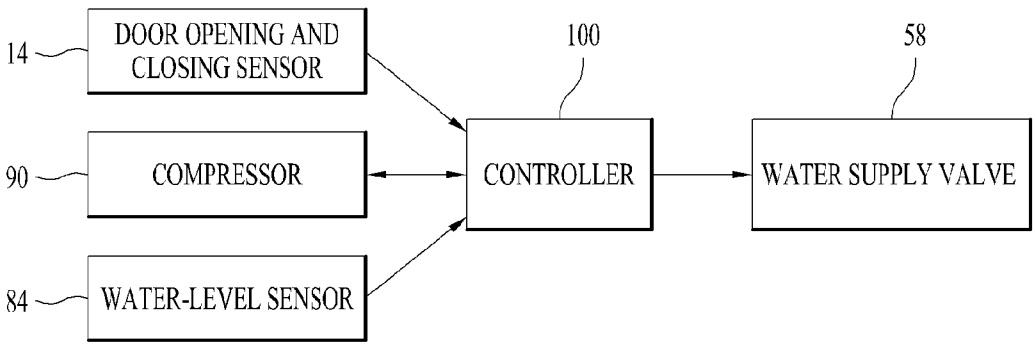
[Fig. 2]



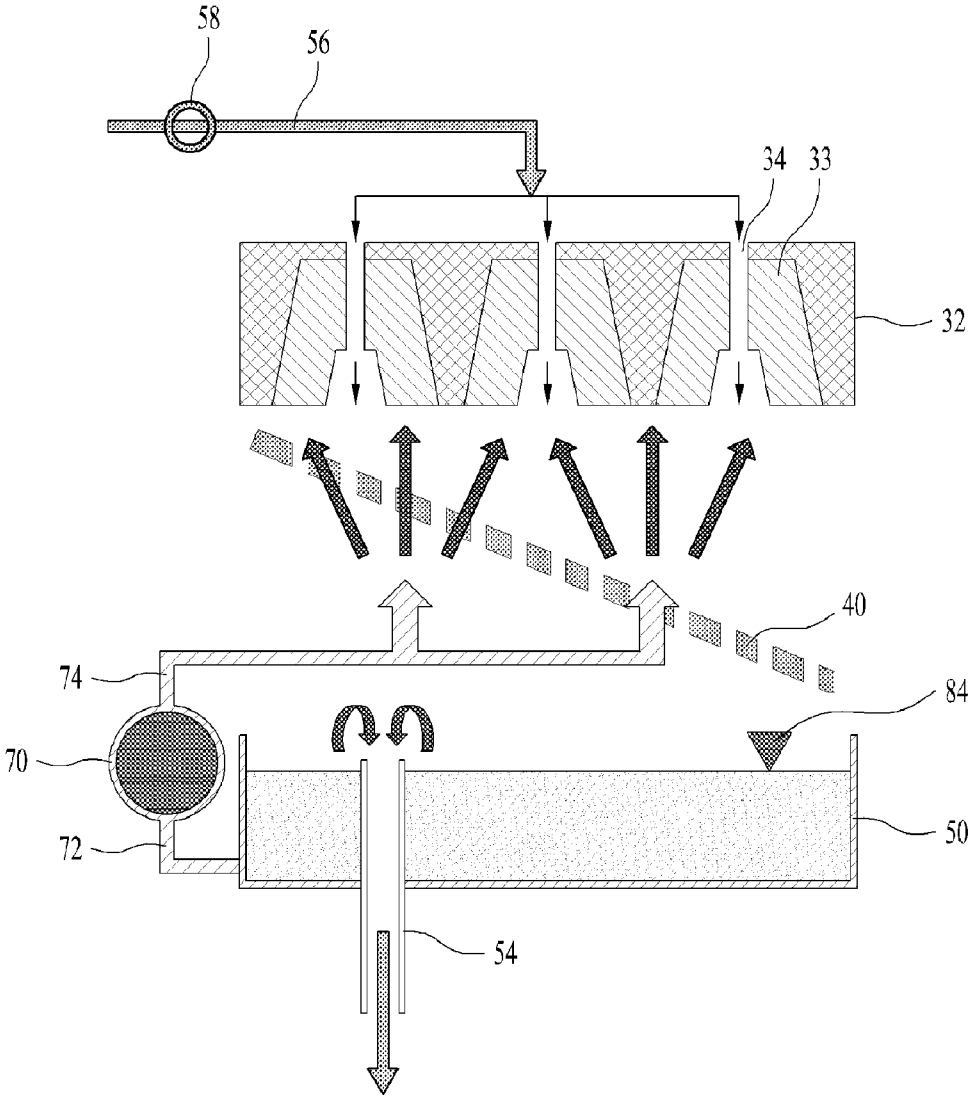
[Fig. 3]


56
30
32
40
74
84
54
50
70
72

[Fig. 4]


14
DOOR OPENING AND CLOSING SENSOR
100
58
90
COMPRESSOR
CONTROLLER
WATER SUPPLY VALVE
84
WATER-LEVEL SENSOR

[Fig. 5]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2019/015744

A. CLASSIFICATION OF SUBJECT MATTER

F25C 1/25(2018.01)i, F25C 1/18(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25C 1/25; F25C 1/04; F25C 1/12; F25C 1/22; F25C 5/00; F25C 5/10; F25D 23/00; F25C 1/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: ice machine, tray, nozzle, water level sensor, tank, pump, valve, door sensor

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4505130 A (HIBINO et al.) 19 March 1985 column 3, line 46 - column 5, line 16, claim 1, and figure 2	1-11
Y	KR 10-1482097 B1 (LG ELECTRONICS INC.) 21 January 2015 paragraphs [0054], [0076] and figures 3a, 6, 14	1-11
Y	KR 10-0610296 B1 (SANYO ELECTRIC CO., LTD.) 30 November 2006 claim 1	9-10
A	KR 10-2013-0110875 A (COWAY CO., LTD.) 10 October 2013 paragraphs [0041]-[0062] and figures 1-5	1-11
A	JP 10-197115 A (HOSHIZAKI ELECTRIC CO LTD) 31 July 1998 paragraph [0015] and figure 1	1-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"D" document cited by the applicant in the international application
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 February 2020 (25.02.2020)	**26 February 2020 (26.02.2020)**

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2019/015744

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