(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 357 436 A2

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
17.08.2011 Bulletin 2011/33

(21) Application number: **09801550.6**

(22) Date of filing: **04.11.2009**

(51) Int Cl.:
F25D 23/12 *(2006.01)*

(86) International application number:
PCT/IB2009/054902

(87) International publication number:
WO 2010/052656 (14.05.2010 Gazette 2010/19)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR

(30) Priority: **09.11.2008 CN 200810236382**

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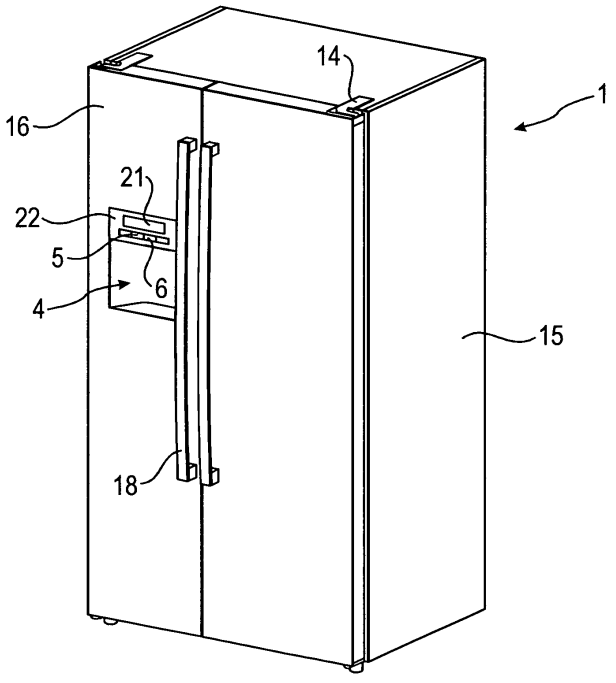
(54) **THE REFRIGERATOR AND ITS OPERATING METHOD**

(57) An operation method of a refrigerator, wherein the refrigerator comprises a storage space, an ice container (3) in the storage space (2), a dispensing apparatus (4) for dispensing ice from the ice container (4) to outside of the storage space (2), the dispensing apparatus being configured to dispense at least two types of ice; and a switch (5,6) for selecting the type of ice to be dispensed, **characterized in that** the method comprising: when the switch (5,6)is activated, the dispenser apparatus (4) dispenses the type of ice selected by the actuation of the switch (5,6), responsive to actuation of the switch (5,6).

Fig.1



EP 2 357 436 A2

Description

[Field of the Invention]

[0001] The present invention generally relates to a refrigerator and an operating method; in particular, it relates to a refrigerator with a dispenser and an operating method of the refrigerator.

[Description of the Related Art]

[0002] Refrigerators having dispenser for dispensing ice and water are well-known technology products. The dispenser has an ice delivery channel through the refrigerator door and an ice supplying gate that can be opened or closed. In order to satisfy a consumer's request, the dispenser usually provides two types of ice, such as ice cubes and crushed ice generated by crushing the ice cubes. With the most current technology, such as the refrigerator disclosed in patent No. US2006/0144075A1, the control panel has a select button for selecting the type of ice to be supplied and a start button for opening the ice supplying gate. In operation, a user first presses on the select button to select the type of ice to supply, and then the user must activate the start button to cause the selected ice to be dispensed. Therefore, the dispenser requires two different switches, and ice dispensing requires two steps.

[SUMMARY OF THE INVENTION]

[0003] An objective of the present invention is to provide a refrigerator and an operating method of the refrigerator, to mitigate at least one of the aforementioned problems in prior art, to simplify the operating steps of the refrigerator, and to reduce the number of components.

[0004] One aspect of the present invention includes a refrigerator operating method, in which the refrigerator comprises a storage space, an ice storage container placed in the storage space, and an ice dispensing device for dispensing ice from the ice storage container to outside the storage space wherein the ice dispensing device is configured for dispensing at least two types of ice. The refrigerator further comprises switches for selecting the type of ice for supplying. The invention is characterized in that, for the method, when one of the switches is activated the ice dispensing device responds to the operation of the switches and dispenses the ice type selected via the switches.

[0005] Therefore, the user only needs to operate one switch in order both to select the type of ice to dispense and to dispense the selected ice, which simplifies operating the refrigerator and reduces the number of components, thereby lowering costs.

[0006] Other single or combined characteristics of the present invention are described in following dependent claims.

[0007] According to a preferred embodiment, the method further includes, when the switches are turned on, a motor for driving the ice removing device to remove the ice from the ice storage container is activated.

[0008] According to a preferred embodiment, the method further comprises: when one of the switches is turned on, a door component for opening or closing an ice delivery channel is opened.

[0009] According to a preferred embodiment, the method further comprises: when one of the switches is turned on, the motor for driving the ice removing device to remove the ice from the ice storage container is activated, and the door component which is used for opening or closing the ice delivery pass is opened; wherein the step of opening the door component is performed before the step of activating the motor.

[0010] According to a preferred embodiment, the at least two types of ice includes ice cubes and crushed ice generated by an ice crushing device crushing the ice cubes. When the switch corresponding to the crushed ice is turned on, the ice crushing device is activated.

[0011] According to a preferred embodiment, the refrigerator comprises a water dispensing switch for selecting water dispensing, the ice dispensing device including a water supplying valve for controlling water dispensing, wherein when the water dispensing switch is turned on, the water supplying valve is opened for water dispensing.

[0012] According to a preferred embodiment, when one of the switches is turned on, an illumination device for illuminating the dispensing chamber is turned on.

[0013] Another aspect of the present invention includes, a refrigerator comprises an ice storage container placed in a storage space, and an ice dispensing device for dispensing ice from the ice storage container to outside of the storage space; wherein the ice dispensing device is configured for dispensing at least two types of ice; the refrigerator further comprising switches for selecting the type of ice for supplying and a control unit connected to the switches; characterized in that the control unit is used for performing the method as claimed in any one of the above claims.

[0014] In a preferred embodiment, the ice dispensing device includes a dispensing chamber for placement of an external container, and the switches are disposed external to the dispensing chamber. Therefore, it is easy to operate, and can also prevent the external container from accidentally touching the switch.

[0015] In a preferred embodiment, the switches are automatic resetting switches; therefore, the user can control the amount dispensed, which also prevents unintentional dispensing of ice or water.

[0016] Other objects, advantages, and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

[BRIEF DESCRIPTION OF THE FIGURES]

[0017] The present invention described herein may be understood by reference to the following figures:

FIG. 1 is a perspective view of a refrigerator according to a preferred embodiment of the present invention.

FIG.2 is a cross-sectional view of a refrigerator according to a preferred embodiment of the present invention.

FIG.3 is a schematic drawing of a control panel according to a preferred embodiment of the present invention.

FIG.4 is a schematic drawing of a refrigerator according to a preferred embodiment of the present invention.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]

[0018] Please refer to FIG. 1 and FIG. 2. The refrigerator 1 comprises a box body 15; in the embodiment, the box body 15 is limited to a freezing compartment 2 and a refrigerating chamber in side-by-side arrangement (not shown). The refrigerator 1 comprises doors 16 respectively corresponding to the freezing compartment 2 and the refrigerating chamber. The doors 16 are respectively hinged to one side of the box body 15 via hinges 14, and are capable of rotation around a hinge axis. Usually, the door 16 is closed to prevent cold air from escaping from the freezing compartment 2 and the refrigerating chamber. Sometimes, the user can open the corresponding door 16 to take food out of the freezing compartment 2 or the refrigerating chamber. The user utilizes a handle 18 to open and close the door 16. In the embodiment, one door 16 is used for opening or closing the entire freezing compartment 2 and refrigerating chamber. However, the present invention is not limited to the above-mentioned description; other designs may also be used. For example, in another embodiment, one storage chamber may require two doors 16, that is, one door 16 only opens or closes a portion of the storage chamber.

[0019] The freezing compartment 2 has an ice maker 17 and an ice storage unit 19. The ice maker 17 has a cubic ice tray for holding water so that the water in the tray can be turned into ice with corresponding shapes. The ice storing unit 19 has an ice storage container 3 for receiving and storing the ice made by the ice maker 17. The bottom front end of the ice storing unit 19 has a release hole 20 for releasing ice. The ice storage unit 19 has an ice removing device 8 for pushing the ice towards the release hole 20 and a first motor 9 for driving the ice removing device 8. In the embodiment, the ice removing device 8 is an auger 28 installed in the ice storage container 3. The auger 28 is driven by the first motor 9 to push the ice forward towards the release hole 20.

[0020] The ice storage unit 19 has an ice crushing chamber 27 connected to the ice storage container. The ice crushing chamber 27 is disposed in front of the ice storage container 3. The release hole 20 is set on the bottom wall of the ice crushing storage 27. Consequently, an ice removal path is formed in the ice crushing chamber 27 between the front wall of the ice storage container 3 and the release hole 20. The ice crushing chamber 27 has an ice crushing device 25 for crushing or breaking ice cubes; when the ice crushing device 25 is turned on, the ice cubes from the ice storage container 3 are crushed in the ice crushing chamber 27.

[0021] The ice crushing device 25 includes an ice crushing blade 26 connected to one end of the auger 28 and a rotor plate 29 corresponding to the ice crushing blade 26. When the auger 28 rotates, the ice crushing blade 26 rotates with the rotation of the auger 28. In the embodiment, the ice crushing device 25 is controlled by the rotor plate 29.

[0022] The rotor plate 29 is substantially arc-shaped and disposed along the ice crushing blade 26. The rotor plate 29 rotates between a first position and a second position. In the first position, the rotor plate 29 faces away from the ice crushing blade 26 in order to maintain the size of the ice removal path, allowing ice to pass. In the second position, the rotor plate 29 is close to the ice crushing blade 26 and reaches into the ice removal path; therefore, the larger-sized ice cubes are blocked, and the blocked ice cubes are crushed by the ice crushing blade 26 and the rotor plate 29 before being released from the ice storage unit 19. The crushed ice passes through the reduced the ice removal path and is released from the ice storage unit 19.

[0023] One door 16 of the refrigerator 1 has a dispenser 4; therefore, the user can obtain the ice stored in the ice storage container 3 without opening the door 16. In the embodiment, the dispenser 4 is also configured for dispensing water stored in a water tank in the refrigerating chamber. In the embodiment, the dispenser 4 is disposed on the door 16 corresponding to the freezing compartment 2. It will be appreciated, however, that the dispenser 4 may also be disposed on the door corresponding to the refrigerating chamber.

[0024] The dispenser 4 has an ice delivery channel 23 passing through the door 16. One end of the ice delivery channel 23 is connected to the release hole 20 of the ice storage unit 19, and another end is connected to the dispensing chamber 13.

[0025] The dispensing chamber 13 is exposed at the front surface of the door 16, and suitably configured for receiving an external container, such as a cup or a glass. In the embodiment, the dispensing chamber 13 is a concave curve to a predetermined depth from the front surface of the door 16. The upper wall of the dispensing chamber 13 has an illumination device 12 for illuminating the dispensing chamber 13.

[0026] The ice delivery channel 23 has an internal door component 7 for opening or closing the ice delivery channel 23. The door component 7 is able to rotate between a closed position and an opened position. The door component 7 is usually configured in the closed position to close the ice delivery channel 23 and prevent outside air from passing through the ice delivery channel 23 into the freezing compartment 2. When the door component 7 is in the opened position, the ice delivery channel 23 is opened and allows passage of ice cubes or crushed ice. In the embodiment, the door component 7 is rotated by a second motor 24 disposed adjacent to the door component 7.

[0027] Please refer to FIG. 3 in conjunction with FIG. 1. The refrigerator 1 includes a control panel 22 disposed on the door 3. The control panel 22 is set close above the dispensing chamber 13. A printed circuit board (not shown) is installed behind the control panel 22. The control panel 22 includes a display 21 and several switches 5, 6, 10 and 30 for controlling the dispenser 4. The switches 5, 6, 10 and 30 are connected to the printed circuit board. The display 21 is capable of showing messages, such as the status of the refrigerator 1 and/or selectable parameters. The switches 5, 6, 10 and 30 are disposed below the display 21, and therefore they are closer to the dispensing chamber 13 than the display 21. In the embodiment, these switches 5, 6, 10 and 30 are touch-sensitive switches.

[0028] The ice cube dispensing switch 5 and the crushed ice dispensing switch 6 are respectively configured for supplying ice cubes and crushed ice. In order to assist the user in correctly selecting the desired type of ice, the control panel 22 has a first label 31 and a second label 32 corresponding to the ice cube dispensing switch 5 and the crushed ice dispensing switch 6. The first label 31 and the second label 32 represent the corresponding types of ice. In the embodiment, the first label 31 and the second label 32 are located on touch sensors corresponding to the ice cube dispensing switch 5 and the crushed ice dispensing switch 6.

[0029] The water dispensing switch 10 is used for supplying water. A touching sensor corresponding to the water dispensing switch 10 has a third label 33 representing water. An illumination switch 30 is used for controlling the illumination device 12 illuminating the dispensing chamber 13 and is disposed next to the water dispensing switch 10.

[0030] The illumination switch 30 also has a corresponding label (not shown).

[0031] In the embodiment, the first, second and third labels 31, 32, 33 are text; however, in other embodiment, the labels may be patterns, or a combination of text and patterns. These labels may not be located on the corresponding switches; in other embodiments the labels may be located adjacent to the corresponding switch, or may be represented by shapes of the switches.

[0032] In accordance with a preferred embodiment of the present invention, FIG. 4 shows a structural schematic drawing of the refrigerator. As shown in FIG. 4, the refrigerator 1 includes a control unit 34 adapted to control the dispensing system. The control unit 34 includes a microprocessor.

[0033] The ice cube dispensing switch 5, the crushed ice dispensing switch 6, the water dispensing switch 10 and the illumination switch 30 are respectively electrically connected to an input terminal of the control unit 34. An output terminal of the control unit 34 is connected to the first motor 9, the second motor 24, the ice crushing device 25 and the illumination device 12. The control unit 34 controls the corresponding elements based on the inputs from the ice cube dispensing switch 5, the crushed ice dispensing switch 6 and the water dispensing switch 10.

[0034] When the ice cube dispensing switch 5 is turned on, the ice cube dispensing switch 5 generates and sends a first supplying signal s1 to the control unit 34. The control unit 34 responds to the first supplying signal to turn on the first motor 9 and the second motor 24. The door component 24 driven by the first motor 24 opens the ice delivery channel 23 and keeps the ice delivery channel 23 in the opened position.

[0035] The auger 28 driven by the first motor 9 rotates to push the ice cubes towards the ice crushing chamber 27; the ice cubes channel through the release hole 20, move into the ice delivery channel 23 located on the door 16, and are released into the external container in the dispensing chamber 13.

[0036] When the ice cube dispensing switch 5 is turned off, the control unit 34 turns off the first motor 9 and the second motor 24; therefore, the auger 28 stops pushing the ice and the ice delivery channel 23 is closed.

[0037] When the crushed ice dispensing switch 6 is turned on, the crushed ice dispensing switch 6 generates and sends a second supplying signal to the control unit 34. The control unit 34 responds to the second supplying signal and turns on the first motor 9 and the second motor 24.

[0038] During this procedure, since the crushed ice dispensing switch 6 is turned on, the rotor plate 29 also moves to the second position. The ice crushing device 25 is turned on, and the ice cubes are crushed in the ice crushing chamber 27. The crushed ice enters into the ice delivery channel 23 from the release hole 20 and is released into the dispensing chamber 13. When the user turns off the crushed ice dispensing switch 6, the first motor 9 and the second motor 24 are turned off; the rotor plate 29 moves back to the first position, and the door component 7 closes the ice deliver channel 23.

[0039] Preferably, during the dispensing procedure of the ice cubes or the crushed ice, the second motor 24 is turned on before the first motor 9, which ensures that, before the ice is released, the ice deliver channel 23 is already opened. Preferably, the first motor 9 is turned off before the second motor 24, which ensures that the ice released from the ice storage unit 19 is smoothly released into the dispensing chamber 13.

[0040] When the water supply switch 10 is operated,

the water supply switch 10 generates a third supplying signal. The control unit 34 receives the third supplying signal and opens a water supplying valve 11 for controlling water dispensed in accordance with the third supplying signal.

[0041] In the embodiment, the ice cube dispensing switch 5, the crushed ice dispensing switch 6 and the water supply switch 10 are automatic resetting switches, which are activated under an external force, and when the external force is removed they automatically re-set back to their original state. Therefore, based upon the refrigerator 1 in the embodiment, when the user wants to get ice or water from the ice dispensing device 4, the user needs to keep activating the ice cube dispensing switch 5, the crushed ice dispensing switch 6 or the water supply switch 10 until the user receives sufficient ice or water. When the user stops activating the ice or water dispensing switches 5, 6 and 10, their corresponding dispensing actions stop.

[0042] When the Illumination switch 30 is turned on, the illumination device 12 for illuminating the dispensing chamber 13 is turned on. The illumination switch 30, preferably, is not an automatic resetting switch; therefore, after the Illumination switch 30 is turned on, the illumination device 12 stays on until the illumination switch 30 is turned off by the user.

[0043] Preferably, whether the illumination switch 30 is turned on, when the ice cube dispensing switch 5, the crushed ice dispensing switch 6 or the water dispensing switch 10 is turned on, the illumination device is also turned on. Hence, the user can check the amount of received ice or water, thereby making it easier to control the ice or water dispensing switch. The illumination device preferably is turned off following a predetermined time period (ex. 15 seconds) when an ice or water dispensing process is finished.

Element marks

[0044]

1 refrigerator

2 freezing compartment

3 ice storage container

4 dispenser

5 ice cube dispensing switch

6 crushed ice dispensing switch

7 door component

8 ice removing device

9 first motor

10 water dispensing switch

11 water supplying valve

12 illumination device

13 dispensing chamber

14 hinge

15 box body

16 door

17 ice maker

18 handle

19 ice storage unit

20 ice removal hole

21 display

22 control panel

23 ice delivery channel

24 second motor

25 ice crushing device

26 crushed ice blade

27 ice crushing chamber

28 auger

29 rotor plate

30 illumination switch

31 first lable

32 second lable

33 third lable

34 control unit

Claims

1. A refrigerator operating method, the refrigerator (1) comprising a storage space (2), an ice storage container (3) placed in the storage space (2), and an ice dispensing device (4) for dispensing ice from the ice storage container (3) to outside of the storage space

(2); wherein the ice dispensing device (4) is configured for dispensing at least two types of ice; the refrigerator (1) further comprising switches (5, 6) for selecting a type of ice to supply; **characterized in that** the method comprises: when one of the switches (5, 6) is activated, the ice dispensing device (4) responds to the operation of the switch (5, 6) and dispenses the ice type selected via the switches (5, 6).

2. The method as claimed in claim 1, further **characterized in that** when one of the switches (5, 6) is turned on, a motor (9) for driving the ice removing device (8) to remove the ice from the ice storing container (3) is activated.

3. The method as claimed in claim 1 or 2 further **characterized in that** when one of the switches (5, 6) is turned on, a door component for opening or closing an ice delivery pass (23) is opened.

4. The method as claimed in claim 1, wherein when one of the switches (5, 6) is turned on, the motor (9) for driving the ice removing device (8) to remove the ice from the ice storage container (3) is activated and opens a door component (7) that is used for opening or closing an ice deliver channel (23); wherein the step of opening the door component (7) is performed before the step of activating the motor (9).

5. The method as claimed in any one of the above claims, further **characterized in that** the at least two types of ice includes ice cubes, and crushed ice generated by an ice crushing device (25) crushing the ice cubes; wherein when the switch (6) corresponding to the crushed ice is turned on, the ice crushing device (25) is activated.

6. The method as claimed in any one of the above claims, further **characterized in that** the refrigerator comprises a water dispensing switch (10) for selecting water dispensing, the ice dispensing device (4) including a water supplying valve (11) for controlling water dispensing, wherein when the water dispensing switch (10) is turned on, the water supplying valve (11) is opened for water dispensing.

7. The method as claimed in any one of the above claims, further **characterized in that** when one of the switches (5, 6) is turned on an illumination device (12) for illuminating the dispensing chamber is turned on.

8. A refrigerator (1) comprising an ice storage container (3) placed in a storage space (2), and an ice dispensing device (4) for dispensing ice from the ice storage container (3) to outside of the storage space (2); wherein the ice dispensing device (4) is configured for dispensing at least two types of ice; the refrigerator (1) further comprising switches (5, 6) for selecting the type of ice for supplying and a control unit (34) connected to the switches (5, 6); **characterized in that** the control unit (34) is used for performing the method as claimed in any one of the above claims.

9. The refrigerator (1) as claimed in claim 8, further **characterized in that** the ice dispensing device (4) includes a dispensing chamber (13) for placement of an external container, and the switches (5, 6) are disposed external to the dispensing chamber (13).

10. The refrigerator (1) as claimed in claim 8 or 9, further **characterized in that** the switches (5, 6) are automatic resetting switches.

Fig.1

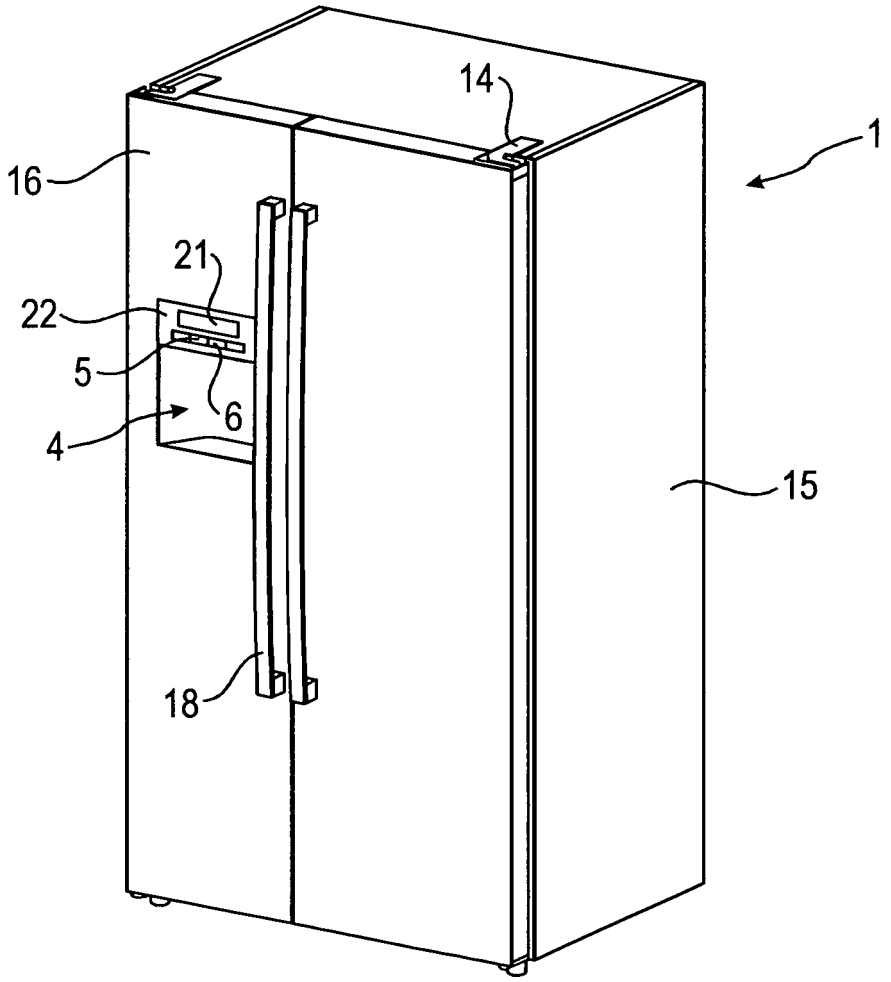


Fig.2

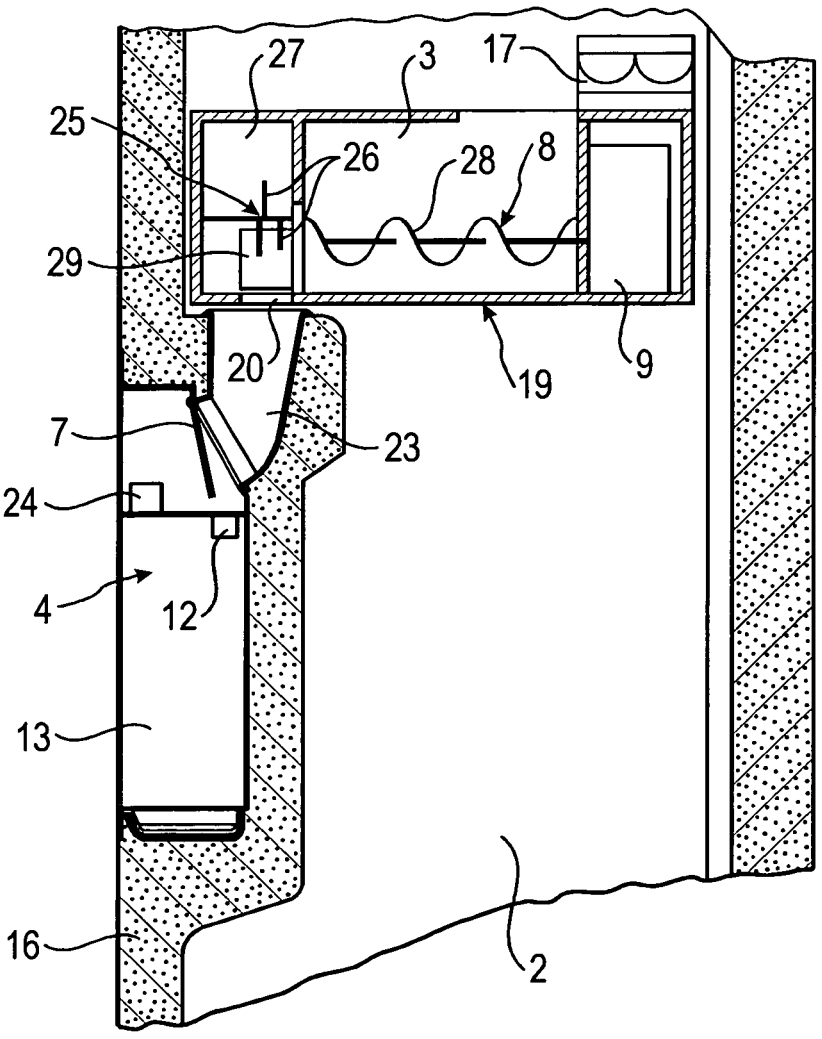


Fig.3

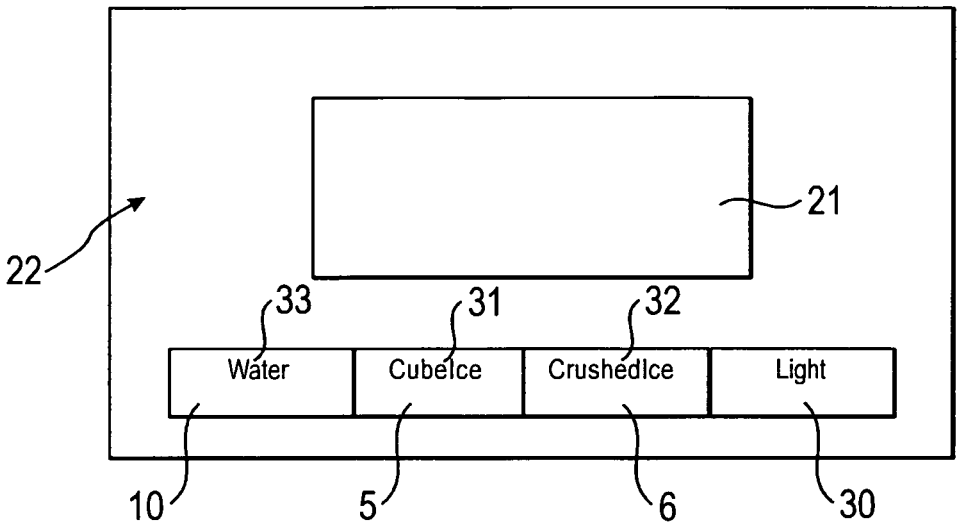
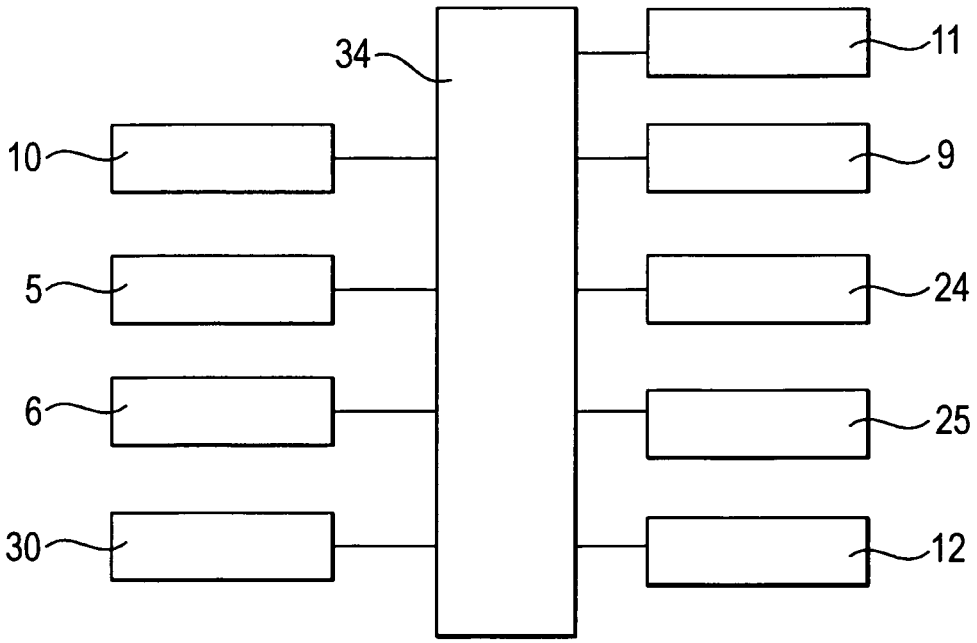

21
22
33
31
32
Water
CubeIce
CrushedIce
Light
10
5
6
30

Fig.4


34
11
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12

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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