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Description

Technical Field

[0001] The invention relates to a refrigerator, especially to a household or commercial refrigerator which is provided with a dispenser.

Background Art

[0002] The freezing compartment of a refrigerator can usually reach a temperature of lower than minus ten °C or more. The refrigerator body and the door of the refrigerator are provided with heat insulating layers to avoid losing of cold energy caused by heat exchange between the cold air within the refrigerator and the surrounding environment. However, as the increase in the refrigerator's volume and in the number of the components of the refrigerator door (for example, a dispenser for dispensing water or ice), some portions of the refrigerator door which are exposed to the atmosphere may have relatively low temperature under the influence of the storage compartment. When the difference between the temperature of the surface exposed to the atmosphere and the atmosphere temperature reaches dew point temperature, condensation will appear on the surface.

[0003] It is known in prior art that the particular surface temperature of the refrigerator can be increased by providing a heating element so as to prevent the generating of condensed water. US patent No. 6,862,891 B1 discloses a refrigerator which has a heating element located near an ice dispensing means and a control unit connected with the heating element. The control unit is configured such that the voltage supplied to the heating element is variable, so that the heating element may operate at different non-zero voltages for reducing energy consumption. This patent, when describing related background art, also mentions that the manufacturer may mount two dew preventing heaters, one of the heaters serving as a backup heater to be used when the other heater is defective. A refrigerator according to the preamble of claim 1 is known from US 5 442 933.

[0004] Whether a refrigerator will dew or generate condensate depends not only on environmental conditions (for example, temperature and humidity) and the temperature of a particular surface of the refrigerator, but also on the operation and using conditions of the refrigerator. Where only an automatically controlled dew preventing heater is provided, some times it cannot precisely prevent the dewing phenomenon and / or the dew preventing heater generates excessive heat. For a refrigerator used in a country or district where weather variation is great, these defects are even more significant. Further, if all the related factors (for example, ambient temperature, ambient relative humidity, refrigerator surface temperature, working condition of the refrigerator's cooling system, and the like) are taken into consideration, the configuration of the refrigerator will become significantly compli-

cated and some components of the refrigerator, such as the microprocessor and the memory unit of the control unit, may have to be upgraded.

Summary of the Invention

[0005] In view of these factors, an object of the invention is to solve at least one of the technical problems found in the prior art, so that the dewing phenomenon can be prevented or the condensate that has been generated can be removed at a relatively low cost.

[0006] The invention in one aspect relates to a refrigerator, comprising: a refrigerator body defining at least one storage space; a door connected to the refrigerator body for closing at least a part of the storage space; a dispenser provided in the door, the dispenser comprising a dispenser casing; a first heater for supplying heat to the dispenser casing; and a control unit, the control unit being configured to automatically control the operation of the first heater, wherein the operation of the first heater comprises at least turning on and turning off the first heater, characterized in that the refrigerator further comprises a second heater arranged near the first heater, and in a manually initiated auxiliary heating mode the second heater is turned on for supplying extra heat to the dispenser casing.

[0007] By the combination of the above intelligent and manual means, the control unit of the invention may have a relatively simple configuration, so that dewing prevention / condensate removing functions can be achieved in different weather conditions and / or different using conditions at relatively low cost. Further, in the condition that dewing cannot occur, the second heater can be directly closed by the user or be kept in a closed state. Thus, unnecessary energy consumption can be reduced, and dew preventing / condensate removing efficiencies can be increased.

[0008] Other features which are disclosed individually or in combination as features of the invention are defined in attached claims.

[0009] According to a particular preferred embodiment of the invention, the refrigerator comprises switching means connected with the second heater, wherein the second heater is turned on by an operation of manually controlling the switching means, so as to initiate the auxiliary heating mode.

[0010] According to a particular preferred embodiment of the invention, the second heater is turned off by an operation of manually controlling the switching means. In an alternative embodiment, the refrigerator further comprises timing means, the timing means being configured to generate a signal for turning off the second heater, after the second heater has been turned on for a predetermined time.

[0011] Particularly preferably, the power of the second heater is lower than the power of the first heater.

[0012] According to a particular preferred embodiment of the invention, the refrigerator further comprises a sens-

ing unit, the sensing unit being configured to sense at least one environmental parameter and feed the parameter to the control unit, and the control unit being configured to control the first heater based on the sensed environmental parameter... Particularly preferably, the environmental parameter comprises ambient temperature and / or ambient relative humidity.

[0013] According to a preferred embodiment of the invention, the first heater and / or the second heater is disposed on the inner side of the dispenser casing, the inner side of the dispenser casing being adjacent to the heat insulating layer of the door.

[0014] Since the door generally has an irregular shape at a location corresponding to a dispenser casing, the dewing possibilities in different areas may be different with each other. For this end, according to a preferred embodiment of the invention, the dispenser casing comprises a first area and a second area near the first area, the first heater being provided in the first area, and the second heater being provided in the second area. Thus, it is possible that the dewing prevention / condensate removing operations of the dispenser casing in different areas are controlled differently to increase dewing prevention / condensate removing efficiencies.

[0015] According to a preferred embodiment of the invention, the dispenser comprises an ice transfer passage extending through the door, the dispenser casing comprises a through hole forming a part of the ice transfer passage, and at least a part of the first heater is arranged along the through hole. Although the temperature in the area around the ice transfer passage is relatively low, by means of the above provision, the possibility of generating condensed water in that area can be significantly reduced. In addition, in the condition that the ice transfer passage is blocked by a closure element which closes a through hole, the condition that the closure element is frozen and thus cannot be opened can be advantageously avoided by means of the first heater provided adjacent to the ice transfer passage.

[0016] According to a preferred embodiment of the invention, a heat conducting element is provided on the inner side of the dispenser casing, the heat conducting element being configured to transmit heat from the first heater and / or the second heater to the dispenser casing. Thus, the heat generated by the heater can be evenly transmitted to the dispenser casing, by means of which, an amount of the heat generated by the heater and transmitted toward the storage space will be reduced to some extent.

[0017] According to a particular preferred embodiment of the invention, the dispenser casing defines a dispensing cavity for receiving at least a part of an outside container, and the heat conducting element covers at least a major portion of a longitudinal wall of the dispensing cavity. Thus, it is possible to effectively prevent dewing on the longitudinal wall in the condition that the longitudinal wall of the dispensing cavity is not equipped with any heater or the heater is arranged only on a part of the

longitudinal wall (such as on an edge area which is not likely to be touched by the user).

[0018] Particularly preferably, the heat conducting element comprises a metal foil having a high heat conductivity, the metal foil establishing face-to-face contacting with the dispenser casing.

[0019] According to a preferred embodiment of the invention, the first heater comprises two heating segments which are spaced from each other by a predetermined distance, and at least a part of the second heater is arranged between the two heating segments. Thus, when the second heater is not activated, the area in which the second heater is disposed can be effectively covered by the heat generated by the first heater covers.

[0020] According to a preferred embodiment of the invention, the refrigerator further comprises a third heater for supplying heat to a longitudinal side wall of the door, so that it can prevent the longitudinal side wall of the door from dewing or remove any condensate that has been generated.

[0021] The structure and other objects and advantages of the invention will be apparent from the description to the preferred embodiments with reference to the drawings.

Brief Description of the Drawings

[0022] The invention will be further understood by reading the following detailed description with reference to the drawings which are incorporated herein as a part of the description and illustrate the invention and in which:

Figure 1 is a schematic perspective view of a refrigerator according to a preferred embodiment of the invention.

Figure 2 is a schematic partial sectional view taken along a direction indicated by line I-I of Figure 1.

Figure 3 is a schematic view of a partly assembled door of the according to the preferred embodiment of the invention.

Figure 4 is a schematic layout of a heating unit of a dispenser casing according to a preferred embodiment of the invention.

Figure 5 is a schematic block diagram of the refrigerator according to a preferred embodiment of the invention.

Detailed Description of Preferred Embodiments

[0023] Please refer to the drawings, in particular Figures 1 and 2. A refrigerator 1 comprises a refrigerator body 2 and two doors 3 connected to the refrigerator body 2, as shown in Figures 1 and 2.

[0024] The refrigerator body 2 comprises an outer shell

11, an inner shell 12 and a heat insulating layer 6 disposed between the outer shell 11 and the inner shell 12. In this embodiment, the heat insulating layer 6 is a foam-based insulating layer and is formed by foaming a heat insulating foam material. The refrigerator body 2 defines at least one storage space for storing food. In this embodiment, the storage space comprises a freezing compartment 7 and a refrigerating compartment (not shown) which are juxtaposed with each other.

[0025] The doors 3 are pivotably connected to the refrigerator body 2 by hinges 4 respectively, and are rotatable about their corresponding rotation axes which are parallel to a vertical axis. As shown in Figure 2, it is also provided with a foam-based insulating layer 6 inside each of the doors 3. The doors 3 are usually closed to avoid escape of cold air from the freezing compartment 7 and the refrigerating compartment. When desired, the user may open the corresponding door 3 to perform an operation, such as taking out food from the freezing compartment or refrigerating compartment, or putting food into a corresponding storage compartment. The user can open or close the doors 3 by means of handles 5.

[0026] In this embodiment, each door 3 is configured to completely open or completely close a corresponding storage compartment. It can be understood that the invention is not limited thereto, and other embodiments are also possible. For example, in an alternative embodiment, one of the storage compartments may be opened or closed by two doors 3. That is to say, each door 3 may only open or close a part of such a storage compartment.

[0027] The door 3 which is corresponded to the freezing compartment 7 (hereinafter referred to as freezing compartment door) is equipped with a dispenser 8 to allow a user to take out ice and/or beverage (for example water), such as ice stored in the freezing compartment and water stored in a water tank arranged in the refrigerating compartment, without opening the door 3. Although in this embodiment the dispenser 8 is arranged in the door 3 which is corresponded to the freezing compartment, it shall be appreciated that it is also possible to arrange the dispenser 8 in a suitable way in the door 3 which is corresponded to the refrigerating compartment.

[0028] As shown in Figures 2 and 3, the freezing compartment door 3 comprises a door panel 13 forming its front surface and an inner lining 23 facing towards the freezing compartment 7 when the freezing compartment door 3 is in its closed position. In this embodiment, the door panel 13 is made of a sheet metal material, and both sides of the door panel 13 are bent backwardly and extend to form into first and second longitudinal sidewalls 48 and 49 respectively. The heat insulating layer 6 is in tight contact with the door panel 13 and the first and second longitudinal sidewalls 48 and 49.

[0029] The door panel 13 has an opening 9 corresponding to the dispenser 8, which opening 9 having a substantially square or rectangular shape. The dispenser 8 comprises a dispenser casing 10 received between the

door panel 13 and the inner lining 23. The dispenser casing 10 forms a cavity 14 which is inwardly recessed and has a front open end. The shape and dimension of the front open end of the inner cavity 14 correspond to that of the opening 9 substantially. The inner lining 23 protrudes toward the freezing compartment 7 at the location corresponded to the dispenser casing 10, with a predetermined distance between the protruding portion of the inner lining 23 and the dispenser casing 10 for disposing the heat insulating layer 6.

[0030] The dispenser 8 comprises a partition plate 15 within the inner cavity 14. The partition plate 15 is parallel to a horizontal plane and separates the inner cavity 14 into upper and lower portions. The portion of the inner cavity 14 located below the partition plate 15 forms into a dispensing cavity 16 whose front end is kept open. The dispensing cavity 16 is configured to accept at least a part of an external container such as a cup. In this embodiment, the dispensing cavity 16 is recessed backwardly from the front surface of the door 3 with a certain curvature to a predetermined depth.

[0031] The dispensing cavity 16 has a substantially flat support wall 17 for stably putting the external container thereon. The support wall 17 has a plurality of thin through holes (not shown), through which any liquid that is splashed out or overflows accidentally during an ice or water dispensing process flows into a water gathering slot 19 arranged below the support wall 17.

[0032] The refrigerator 1 comprises a control panel 20 arranged on the freezing compartment door 3, and the control panel 20 comprises a display screen 21 and a plurality of buttons or a touch area 22 for controlling the refrigerator 1. The display screen 21 can display the state of the refrigerator 1 and/or selectable parameters, etc.

[0033] In this embodiment, the control panel 20 is arranged along the upper end of the opening 9, closely adjacent to the dispensing cavity 16. The portion of the opening 9 located above the partition plate 15 is adapted to be conformed to the out profile of the control panel 20, such that the control panel 20 can be engaged by the corresponding edge of the opening 9. The portion of the inner cavity 14 located above the partition plate 15 is shielded by the control panel 20.

[0034] The dispenser casing 10 comprises a cavity wall delimiting the inner cavity 14. The cavity wall comprises a first portion 24 located below the partition plate 15. The first portion 24 comprises a longitudinal wall 30 for forming a longitudinal boundary of the dispensing cavity 16. The longitudinal wall 30 is perpendicular to the horizontal plane and has a substantially arc-shaped cross-section. The longitudinal wall 30 has a rear surface which is closely adjacent to the heat insulating layer 6 and an outer surface which is exposed to the atmosphere.

[0035] The first portion 24 further comprises a bottom wall 31 which is connected to the lower end of the longitudinal wall 30 and extends forwardly. The bottom wall 31 is located below the support wall 17 and spaced from the support wall 17 by a certain distance so as to form

the above-mentioned water gathering slot 19.

[0036] The cavity wall of the dispenser casing 10 further comprises a second portion 25 which is connected to the upper end of the first portion 24 and is located above the partition plate 15. The second portion 25 comprises an inclined wall 26 which extends from the longitudinal wall 30 and is inclined forwardly. The inclined wall 26 comprises a through hole 27 which allows ice to pass therethrough. The through hole 27 is configured as a part of an ice transfer passage 29. The ice transfer passage 29 is used for transferring ice from an ice storage unit 28 located within the freezing compartment 7 to the dispensing cavity 16. The second portion 25 further comprises a top wall 32 which forms the upper boundary of the inner cavity 14. The second portion 25 has a hole 33 through which a water supply pipe (not shown) passes, which water supply pipe transmitting drinkable water to the dispensing cavity 16.

[0037] An ice discharge pipe 34 forming a major part of the ice transfer passage 29 is embedded in the freezing compartment door 3. One end of the ice discharge pipe 34 is connected to the second portion 25 and is in communication with the through hole 27. The other end of the ice discharge pipe is oriented towards a discharge outlet of the ice storage unit 28 within the freezing compartment 7 when the freezing compartment door 3 is closed. Thereby, the ice discharged from the ice storage unit 28 enters into the ice discharge pipe 34, and then is guided to the dispensing cavity 16 by means of an ice outlet 18 provided in the partition plate 15.

[0038] As shown in Figure 2, the portion of the inner cavity 14 which lies above the partition plate 15 is shielded by the control panel 20; however, the second portion 25 of the dispenser casing 10 still communicates with the atmosphere, that is, the second portion 25 is still exposed to the atmosphere, because the partition plate 15 is provided with the ice outlet 18 which is in communication with the portion of the inner cavity 14 which lies above the partition plate 15.

[0039] To prevent air within the freezing compartment 7 from escaping from the freezing compartment 7 through the ice transfer passage 29 or prevent outside air from entering into the freezing compartment 7 through the ice transfer passage 29, the dispenser 8 is equipped with a closure element 36 for opening or closing the ice transfer passage 29. Usually, the ice transfer passage 29 is closed by the closure element 36. When there is a need for dispensing ice, the ice transfer passage 29 is opened by means of the closure element 36 to allow the transfer of ice. The shape and dimension of the closure element 36 are substantially corresponded to that of the through hole 27, such that in the closed position the closure element closes the through hole 27 and thus closes the ice transfer passage 29. In this embodiment, the closure element 36 is connected to the second portion 25 of the dispenser casing 10 and is received in the inner cavity 14.

[0040] Under the influence of the freezing compartment 7, the temperature of the dispenser casing 10 is

usually lower than room temperature/ambient temperature. When the difference between ambient temperature and the temperature of the dispenser casing 10 reaches dew point temperature, condensate drops will be generated on the dispenser casing 10. The condensation possibility is relatively high due to the fact that the second portion 25 of the dispenser casing 10 is close to the ice discharge pipe 34 and forms a part of the ice transfer passage 29. For this end, the refrigerator I is provided with a heating unit 37 for increasing the surface temperature of the dispenser casing 10. As shown in Figure 2, the heating unit 37 is arranged between the dispenser casing 10 and the heat insulating layer 6.

[0041] Figure 4 is a schematic diagram of the heating unit 37 according to a preferred embodiment of the invention. As shown in Figure 4, the heating unit 37 comprises a first heater 38 and a second heater 39 adjacent to the first heater 38, for supplying heat to the dispenser casing 10. The first heater 38 and the second heater 39 are preferably resistance heaters, i.e. performing heating by resistors.

[0042] In order to evenly transmit the heat generated by the first heater 38 and the second heater 39 to the dispenser casing 10, the heating unit 37 further comprises a first heat conducting element 40 for transmitting the heat generated by the first heater 38 and the second heater 39 to the dispenser casing 10. In this embodiment, the first heat conducting element 40 is an aluminum foil having a high heat conductivity.

[0043] The first heat conducting element 40 has a hole (not shown) which is corresponded to the through hole 27. The first heater 38 and the second heater 39 can be arranged according to the distribution characteristics of condensate drops on the dispenser casing 10. In this embodiment, the first heater 38 comprises a plurality of arc-shaped heating segments 35 arranged around the hole. The second heater 39 is arranged close to the first heater 38 and preferably comprises a portion located between heating segments 35 of the first heater 38. Preferably, this portion has a shape that corresponds to the heating segment 35.

[0044] After the first heater 38 and the second heater 39 are arranged in a predetermined pattern on one side of the first heat conducting element 40, the other side of the first heat conducting element 40 is closely attached to the inner side of the dispenser casing 10.

[0045] The heating unit 37 is adhered to the inner side of the dispenser casing 10 by means of adhesive means (not shown), with the hole of the first heat conducting element 40 being aligned with the through hole 27. The first heat conducting element 40, the first heater 38 and the second heater 39 all are flexible and deformable, such that the portion of the heating unit 37 located between line A and line B is arranged on the inclined wall 26, the portion thereof located above line A is bent and then is adhered to the top wall 32 of the dispenser casing, and the portion thereof located below line B is bent and then is connected to the upper end of the longitudinal wall 30.

Thereby, in this embodiment, the first heater 38 is mainly arranged on the inclined wall 26 and the top wall 32 of the dispenser casing 10. The lower end portion of the first heater 38 extends to the upper end of the longitudinal wall 30. The heating segment 35 most close to the through hole 27 is arranged around the through hole 27. The major portion of the second heater 39 is arranged on the inclined wall 26. The portion located below line B of the second heater extends to the upper end of the longitudinal wall 30 together with that of the first heater 38.

[0046] In this embodiment, the first heater 38 and the second heater 39 are disposed on a first region 51 and a second region 52 of the dispenser casing 10 respectively. The first region 51 is adjacent to the second region 52, but they do not overlap each other. The first region 51 comprises the majorities of the inclined wall 26 and the top wall 32 as well as the upper end portion of the longitudinal wall 30 which is close to the inclined wall 26. The second region 52 has an area smaller than the first region 51 and is surrounded by the first region 51.

[0047] Preferably, the power of the second heater 39 is lower than that of the first heater 38. Preferably, the power density of the second heater 39 is configured in such a way that the dispenser casing 10 is not subjected to overheating even if the second heater 39 is turned on for a long time or always turned on.

[0048] According to a preferred embodiment of the invention, the side of the longitudinal wall 30 which faces the heat insulating layer 6 is provided with a second heat conducting element 50, the upper end of which is connected to the first heater 38 and the second heater 39 or connected to the first heat conducting element 40. Thereby, the first and second heaters 38 and 39 and/or the first heat conducting element 40 serve as a heat source for the second heat conducting element 50.

[0049] Since the second heat conducting element 50 is of a high heat conductivity, the heat generated by the first and second heaters 38 and 39 is also transmitted to other portions of the longitudinal wall 30 that are not equipped with any heating element, such that the temperature of the whole longitudinal wall 30 can be increased so as to avoid the presence of condensate drops. Since the longitudinal wall 30 is located relatively distant from the ice transfer passage 29, such a configuration allows to avoid the presence of condensate drops on the longitudinal wall 30 without arranging any heater on the longitudinal wall 30 or merely by arranging a heater on the marginal region of the longitudinal wall 30 where is not easy to be touched by the user. Thus, energy consumption can be lowered. In addition, the situation that the user touches the high temperature region of the longitudinal wall 30 can be avoided.

[0050] Preferably, the second heat conducting element 50 comprises a metal foil of a high heat conductivity, such as aluminum foil. In a particularly preferable embodiment, the second heat conducting element 50 covers at least substantially most of the longitudinal wall 30. For

example, the longitudinal wall 30 is entirely covered by the second heat conducting element 50. The second heat conduction element 50 is preferably adhered to the inner side of the longitudinal wall 30.

[0051] In order to prevent the portions of the longitudinal wall 30 which are easy to be touched by the user from reaching a temperature which is greatly higher than ambient temperature, only an edge area of the second heat conducting element 50 contacts the first and second heater 38 and 39. Particularly preferably, the upper end of the second heat conducting element 50 contacts the first and second heater 38 and 39.

[0052] In the above embodiments, the first and second heater 38 and 39 extend to the upper end of longitudinal wall 30. However, the invention is not limited thereto. For example, in an alternative embodiment, the first and second heater 38 and 39 do not extend to the longitudinal wall 30; rather, the heat conducting element 50 may extend to a extend that is beyond the longitudinal wall 30 (such as extending to the inclined wall 26) so as to be contacted with the first and second heater 38 and 39 which lie outside the longitudinal wall 30.

[0053] The first longitudinal sidewall 48 of the freezing compartment door 3 is located adjacent to the rotation axis of the freezing compartment door 3, so that the second longitudinal sidewall 49 opposite to the first longitudinal sidewall 48 is located distant from the rotation axis of the freezing compartment door 3 and close to the door of the refrigerating compartment. According to a preferred embodiment of the invention, the freezing compartment door 3 is provided with a third heater 47 for supplying heat to the second longitudinal sidewall 49, so as to avoid the presence of condensate drops on the second longitudinal sidewall 49 due to the difference between surface temperature and the atmosphere temperature. In this embodiment, the third heater 47 is attached to the inner side of the second longitudinal sidewall 49.

[0054] The second longitudinal sidewall 49 is provided with a third heat conducting element 54 attached to the inner side thereof. The third heat conducting element 54 is located between the third heater 47 and the inner surface of the second longitudinal sidewall 49 to evenly transmit the heat generated by the third heater 47 to the second longitudinal sidewall 49. Preferably, the third heat conducting element 54 is attached to the inner surface of the second longitudinal sidewall 49 by adhesive means (for example, an adhesive tape).

[0055] It is most preferably to arrange the third heater 47 and/or the third heat conducting element 54 on a region of the second longitudinal sidewall 49 which is corresponded to the dispenser 8 in the longitudinal direction.

[0056] Preferably, the third heater 47 at least partially overlaps the dispenser 8 in a transverse direction.

[0057] Figure 5 shows a structural schematic diagram of the refrigerator according to a preferred embodiment of the invention. Now a control method of the first heater 38 and the second heater 39 will be described with reference to Figure 5.

[0058] The refrigerator 1 comprises a control unit 41, and an input unit 43 and a display unit 44 coupled to the control unit 41 respectively, wherein the input unit 43 comprises the buttons or touch area 22 located on the control panel 20, and the display unit 44 comprises the display screen 21 located on the control panel 20. The control unit 41 comprises a microprocessor and a memory unit, such that some components of the refrigerator 1 such as the first heater 38 can be automatically controlled by means of a program stored in the memory unit.

[0059] The refrigerator 1 further comprises a sensing unit 42 for detecting at least one environmental parameter. The sensing unit 42 is coupled to the control unit 41 and feeds back the detected parameter to the control unit 41. In this embodiment, the sensing unit 42 comprises a temperature sensor for detecting ambient temperature. The sensing unit 42 controls the operation of the first heater 38, including turning on and turning off the first heater 38, based on the detected ambient temperature.

[0060] In a preferred embodiment, when the detected ambient temperature is lower than zero °C, the first heater 38 is turned off. When the detected ambient temperature is between 0 °C and 10 °C, the first heater 38 operates at a first output power and/or operates at a duty cycle of lower than 0.3. When the detected ambient temperature is between 10 °C and 15 °C, the first heater 38 is turned on at a second output power, or the first heater 38 is turned on and off in an alternative manner at a second duty cycle (for example, 0.4). When the detected ambient temperature is between 15 °C and 25 °C, the first heater 38 is turned on at a third output power and/or operates at a predetermined third duty cycle (for example, 0.5).

[0061] In an alternative embodiment, the sensing unit 42 further comprises a humidity sensor for detecting ambient relative humidity. The control unit 41 controls the operations of the first heater 38 based on the detected ambient temperature, ambient relative humidity and other factors.

[0062] The second heater 39 is controlled independently of the first heater 38. According to the invention, the second heater 39 is turned on only in an auxiliary heating mode, which is only manually initiated by the user. Thus, the user can, according to the dewing phenomenon on the refrigerator 1, make an active decision as to whether the second heater 39 should be actuated to increase heat for removing or preventing dewing.

[0063] In a preferred embodiment, the auxiliary heating mode is actuated by means of switching means 45 arranged on the freezing compartment door 3. The switching means 45 is preferably arranged on the dispenser 8 or near the dispenser 8. Particularly preferably, the switching means 45 is arranged on the partition plate 15.

[0064] In an embodiment, the switching means 45 is electrically connected to the second heater 39, and the turning on and off states of the second heater 39 is determined by the switching on and off states of the switching means 45. Preferably, when the switching means 45 is in the switching off state and the refrigerator 1 operates

in a normal mode, the first heater 38 is turned on or off based on an instruction from the control unit 41, and the second heater 39 is turned off. When the user operates the switching means 45 to switch on it, the refrigerator 1 actuates the auxiliary heating mode, the second heater 39 is turned on to supply extra heat to the dispenser casing 10, and at the same time the first heater 38 is turned on or off based on an instruction from the control unit 41.

[0065] The switching means 45 can be provided independently of the control unit 41. For example, there is no coupling between the switching means 45 and the microprocessor of the control unit 41. In an alternative embodiment, the switching means 45 is connected to the control unit 41. For example, the display unit 44 can display whether the refrigerator 1 is under the normal heating mode or the auxiliary heating mode, or the user can select the parameters displayed on the display unit 44 by means of the switching means 45 in order to initiate the auxiliary heating mode.

[0066] The second heater 39 can be turned off by manually switching off the switching means 45, so that the auxiliary heating mode is ended. In an alternative embodiment, the second heater 39 can also be automatically turned off. For example, the control unit 41 is configured in such a manner of automatically turning off the second heater 39 after the second heater 39 has been turned on for a predetermined time, such as 15 minutes. This can be achieved by virtue of timing means connected to the control unit 41. The timing means is configured in such a way that it generates a signal when the second heater 39 has been turned on for a predetermined time, and then the second heater 39 is turned off based on this signal. Under the condition that the switching means 45 is not coupled with the microprocessor of the control unit 41, this can be achieved by timing means connected to the switching means 45 or timing means embedded the switching means 45.

[0067] In the embodiment shown in Figure 5, the control manner of the third heater 47 is the same as that of the first heater 38, that is, being automatically controlled by the control unit 41 based on detected parameters. In a preferred embodiment, the parameter comprises ambient temperature, ambient relative humidity and/or the temperature of the sidewall 49, such that the control unit 41 can control the third heater 47 based on the ambient temperature, the ambient relative humidity and/or the temperature of the sidewall 49, so as to for example determine whether or not the third heater 47 should be turned on, or determine the frequency of turning on and off or the duty cycle of the third heater 47.

Claims

1. A refrigerator (1) comprising:

a refrigerator body (2) defining at least one storage space (7);

- a door (3) connected to the refrigerator body (2) for closing at least a part of the storage space (7); a dispenser (8) provided in the door (3), the dispenser (8) comprising a dispenser casing (10); a first heater (38) for supplying heat to the dispenser casing (10); and
 a control unit (41), the control unit (41) being configured to automatically control the operation of the first heater (38), wherein the operation of the first heater (38) comprises at least turning on and turning off the first heater (38),
characterized in that the refrigerator further comprises a second heater (39) arranged near the first heater (38), and in a manually initiated auxiliary heating mode the second heater (39) is turned on for supplying extra heat to the dispenser casing.
2. The refrigerator (1) of claim 1, **characterized in that** the refrigerator comprises switching means (45) connected with the second heater (39), wherein the second heater (39) is turned on by an operation of manually controlling the switching means (45), so as to initiate the auxiliary heating mode.
3. The refrigerator (1) of claim 2, **characterized in that** the second heater (39) is turned off by an operation of manually controlling the switching means (45), so as to end the auxiliary heating mode.
4. The refrigerator (1) of claim 1 or 2, **characterized in that** the refrigerator further comprises timing means, the timing means being configured to generate a signal, after the second heater (39) has been turned on for a predetermined time, for turning off the second heater (39).
5. The refrigerator (1) of any one of preceding claims, **characterized in that** the power of the second heater (39) is lower than the power of the first heater (38).
6. The refrigerator (1) of any one of preceding claims, **characterized in that** the refrigerator further comprises a sensing unit (42), the sensing unit (42) being configured to sense at least one environmental parameter and feed the parameter to the control unit (41), and the control unit (41) being configured to control the first heater (38) based on the sensed environmental parameter.
7. The refrigerator (1) of claim 6, **characterized in that** the environmental parameter comprises ambient temperature and / or ambient relative humidity.
8. The refrigerator (1) of any one of preceding claims, **characterized in that** the first heater (38) and / or the second heater (39) is disposed on the inner side of the dispenser casing (10), the inner side of the dispenser casing (10) being adjacent to the heat insulating layer (6) of the door (3).
9. The refrigerator (1) of any one of preceding claims, **characterized in that** the dispenser casing (10) comprises a first area (51) and a second area (52) near the first area (51), the first heater (38) being provided in the first area (51), and the second heater (39) being provided in the second area (52).
10. The refrigerator (1) of any one of preceding claims, **characterized in that** the dispenser (8) comprises an ice transfer passage (29) extending through the door (3), the dispenser casing (10) comprises a through hole (27) forming a part of the ice transfer passage (29), and at least a part of the first heater (38) is arranged along the through hole (27).
11. The refrigerator (1) of any one of preceding claims, **characterized in that** a heat conducting element (40, 50) is provided on the inner side of the dispenser casing (10), the heat conducting element (40) being configured to transmit heat from the first heater (38) and / or the second heater (39) to the dispenser casing (10).
12. The refrigerator (1) of claim 11, **characterized in that** the dispenser casing (10) defines a dispensing cavity (16) for receiving at least a part of an outside container, and the heat conducting element (50) covers at least a major portion of a longitudinal wall (30) of the dispensing cavity (16).
13. The refrigerator (1) of claim 11 or 12, **characterized in that** the heat conducting element (50) comprises a metal foil having a high heat conductivity, the metal foil establishing face-to-face contacting with the dispenser casing (10).
14. The refrigerator (1) of any one of preceding claims, **characterized in that** the first heater (38) comprises two heating segments (35) which are spaced from each other by a predetermined distance, and at least a part of the second heater (39) is arranged between the two heating segments (35).
15. The refrigerator (1) of any one of preceding claims, **characterized in that** the refrigerator further comprises a third heater (47) for supplying heat to a longitudinal side wall (49) of the door (3).

Patentansprüche

1. Kühlschrank (1), welcher umfasst:
- ein Kühlschrankgehäuse (2), welches mindestens einen Speicherraum (7) definiert;

- eine Tür (3), die mit dem Kühlschrankgehäuse (2) verbunden ist, zum Schließen wenigstens eines Teils des Speicherraums (7);
einen Spender (8), der in der Tür (3) vorgesehen ist, wobei der Spender (8) ein Spendergehäuse (10) umfasst;
eine erste Heizeinrichtung (38) zum Zuführen von Wärme zu dem Spendergehäuse (10); und
eine Steuereinheit (41), wobei die Steuereinheit (41) dafür ausgebildet ist, den Betrieb der ersten Heizeinrichtung (38) automatisch zu steuern, wobei der Betrieb der ersten Heizeinrichtung (38) wenigstens das Einschalten und Ausschalten der ersten Heizeinrichtung (38) umfasst, **dadurch gekennzeichnet, dass** der Kühlschrank ferner eine zweite Heizeinrichtung (39) umfasst, die nahe der ersten Heizeinrichtung (38) angeordnet ist, und dass in einer manuell ausgelösten Hilfs-Heizbetriebsart die zweite Heizeinrichtung (39) eingeschaltet wird, um dem Spendergehäuse zusätzliche Wärme zuzuführen.
2. Kühlschrank (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Kühlschrank Schaltmittel (45) umfasst, die mit der zweiten Heizeinrichtung (39) verbunden sind, wobei die zweite Heizeinrichtung (39) durch einen Vorgang des manuellen Steuerns der Schaltmittel (45) eingeschaltet wird, um die Hilfs-Heizbetriebsart auszulösen.
 3. Kühlschrank (1) nach Anspruch 2, **dadurch gekennzeichnet, dass** die zweite Heizeinrichtung (39) durch einen Vorgang des manuellen Steuerns der Schaltmittel (45) ausgeschaltet wird, um die Hilfs-Heizbetriebsart zu beenden.
 4. Kühlschrank (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Kühlschrank ferner Zeitsteuerungsmittel umfasst, wobei die Zeitsteuerungsmittel dafür ausgebildet sind, ein Signal zu erzeugen, nachdem die zweite Heizeinrichtung (39) eine vorbestimmte Zeit eingeschaltet war, um die zweite Heizeinrichtung (39) auszuschalten.
 5. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Leistung der zweiten Heizeinrichtung (39) niedriger als die Leistung der ersten Heizeinrichtung (38) ist.
 6. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kühlschrank ferner eine Erfassungseinheit (42) umfasst, wobei die Erfassungseinheit (42) dafür ausgebildet ist, mindestens einen Umgebungsparameter zu erfassen und den Parameter in die Steuereinheit (41) einzuspeisen, und wobei die Steuereinheit (41) dafür ausgebildet ist, die erste Heizeinrichtung (38) auf der Basis des erfassten Umgebungsparameters zu steuern.
 7. Kühlschrank (1) nach Anspruch 6, **dadurch gekennzeichnet, dass** der Umgebungsparameter die Umgebungstemperatur und/oder die relative Umgebungsfeuchtigkeit umfasst.
 8. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die erste Heizeinrichtung (38) und/oder die zweite Heizeinrichtung (39) auf der Innenseite des Spendergehäuses (10) angeordnet ist, wobei die Innenseite des Spendergehäuses (10) der wärmeisolierenden Schicht (6) der Tür (3) benachbart ist.
 9. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Spendergehäuse (10) einen ersten Bereich (51) und einen zweiten Bereich (52) in der Nähe des ersten Bereiches (51) umfasst, wobei die erste Heizeinrichtung (38) in dem ersten Bereich (51) vorgesehen ist und die zweite Heizeinrichtung (39) in dem zweiten Bereich (52) vorgesehen ist.
 10. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Spender (8) einen Eisübergabekanal (29) umfasst, der sich durch die Tür (3) hindurch erstreckt, das Spendergehäuse (10) ein Durchgangsloch (27) umfasst, das einen Teil des Eisübergabekanals (29) bildet, und mindestens ein Teil der ersten Heizeinrichtung (38) entlang des Durchgangsloches (27) angeordnet ist.
 11. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** ein wärmeleitendes Element (40, 50) auf der Innenseite des Spendergehäuses (10) vorgesehen ist, wobei das wärmeleitende Element (40) dafür ausgebildet ist, Wärme von der ersten Heizeinrichtung (38) und/oder der zweiten Heizeinrichtung (39) auf das Spendergehäuse (10) zu übertragen.
 12. Kühlschrank (1) nach Anspruch 11, **dadurch gekennzeichnet, dass** das Spendergehäuse (10) einen Ausgabehohlraum (16) zur Aufnahme wenigstens eines Teils eines äußeren Behälters definiert und das wärmeleitende Element (50) wenigstens einen Hauptteil einer Längswand (30) des Ausgabehohlraums (16) bedeckt.
 13. Kühlschrank (1) nach Anspruch 11 oder 12, **dadurch gekennzeichnet, dass** das wärmeleitende Element (50) eine Metallfolie mit einer hohen Wärmeleitfähigkeit umfasst, wobei die Metallfolie einen Anlagekontakt mit dem Spendergehäuse (10) herstellt.

14. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die erste Heizeinrichtung (38) zwei Heizsegmente (35) umfasst, welche einen vorbestimmten Abstand voneinander aufweisen, und wenigstens ein Teil der zweiten Heizeinrichtung (39) zwischen den zwei Heizsegmenten (35) angeordnet ist.

15. Kühlschrank (1) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Kühlschrank ferner eine dritte Heizeinrichtung (47) zur Zuführung von Wärme zu einer Längsseitenwand (49) der Tür (3) umfasst.

Revendications

1. Réfrigérateur (1) comprenant :

- un corps de réfrigérateur (2) définissant au moins un espace de stockage (7) ;
- une porte (3) reliée au corps de réfrigérateur (2) pour fermer au moins une partie de l'espace de stockage (7) ;
- un distributeur (8) prévu dans la porte (3), le distributeur (8) comprenant un boîtier de distributeur (10) ;
- un premier élément chauffant (38) pour fournir de la chaleur au boîtier de distributeur (10) ; et
- une unité de commande (41), l'unité de commande (41) étant configurée pour commander automatiquement le fonctionnement du premier élément chauffant (38), dans laquelle le fonctionnement du premier élément chauffant (38) comprend au moins la mise en et hors circuit du premier élément chauffant (38), **caractérisé en ce que** le réfrigérateur comprend en outre un deuxième élément chauffant (39) agencé à côté du premier élément chauffant (38) et, dans un mode de chauffage auxiliaire initié manuellement, le deuxième élément chauffant (39) est mis en circuit pour fournir de la chaleur supplémentaire au boîtier du distributeur.

2. Réfrigérateur (1) selon la revendication 1, **caractérisé en ce que** le réfrigérateur comprend des moyens de commutation (45) reliés au deuxième élément chauffant (39), dans lequel le deuxième élément chauffant (39) est mis en circuit par un fonctionnement de commande manuelle des moyens de commutation (45), de manière à initier le mode de chauffage auxiliaire.

3. Réfrigérateur (1) selon la revendication 2, **caractérisé en ce que** le deuxième élément chauffant (39) est mis hors circuit par un fonctionnement de commande manuelle des moyens de commutation (45),

de manière à arrêter le mode de chauffage auxiliaire.

4. Réfrigérateur (1) selon la revendication 1 ou 2, **caractérisé en ce que** le réfrigérateur comprend en outre des moyens horaires, les moyens horaires étant configurés pour générer un signal, une fois que le deuxième élément chauffant (39) a été mis en circuit pendant une durée prédéterminée, pour mettre hors circuit le deuxième élément chauffant (39).

5. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la puissance du deuxième élément chauffant (39) est inférieure à la puissance du premier élément chauffant (38).

6. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réfrigérateur comprend en outre une unité de détection (42), l'unité de détection (42) étant configurée pour détecter au moins un paramètre environnemental et charger le paramètre dans l'unité de commande (41), et l'unité de commande (41) étant configurée pour commander le premier élément chauffant (38) à partir du paramètre environnemental détecté.

7. Réfrigérateur (1) selon la revendication 6, **caractérisé en ce que** le paramètre environnemental comprend une température ambiante et/ou une humidité relative ambiante.

8. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le premier élément chauffant (38) et/ou le deuxième élément chauffant (39) est disposé sur le côté intérieur du boîtier de distributeur (10), le côté intérieur du boîtier de distributeur (10) étant adjacent à la couche d'isolation thermique (6) de la porte (3).

9. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le boîtier de distributeur (10) comprend une première zone (51) et une seconde zone (52) à côté de la première zone (51), le premier élément chauffant (38) étant prévu dans la première zone (51), et le deuxième élément chauffant (39) étant prévu dans la seconde zone (52).

10. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le distributeur (8) comprend un passage de transfert de glace (29) s'étendant à travers la porte (3), le boîtier de distributeur (10) comprend un trou débouchant (27) formant une partie du passage de transfert de glace (29), et au moins une partie du premier élément chauffant (38) est agencée le long du trou débouchant (27).

11. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'un** élément conducteur de chaleur (40, 50) est prévu sur le côté intérieur du boîtier de distributeur (10), l'élément conducteur de chaleur (40) étant configuré pour transmettre la chaleur du premier élément chauffant (38) et/ou du deuxième élément chauffant (39) vers le boîtier de distributeur (10). 5
12. Réfrigérateur (1) selon la revendication 11, **caractérisé en ce que** le boîtier de distributeur (10) définit une cavité de distribution (16) pour recevoir au moins une partie d'un contenant extérieur, et l'élément conducteur de chaleur (50) couvre au moins une majeure partie d'une paroi longitudinale (30) de la cavité de distribution (16). 10 15
13. Réfrigérateur (1) selon la revendication 11 ou 12, **caractérisé en ce que** l'élément conducteur de chaleur (50) comprend une feuille métallique présentant une conductibilité thermique élevée, la feuille métallique établissant un contact en face-à-face avec le boîtier de distributeur (10). 20
14. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le premier élément chauffant (38) comprend deux segments chauffants (35) qui sont espacés l'un de l'autre d'une distance prédéterminée et au moins une partie du deuxième élément chauffant (39) est agencée entre les deux segments chauffants (35). 25 30
15. Réfrigérateur (1) selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le réfrigérateur comprend en outre un troisième élément chauffant (47) pour fournir de la chaleur à une paroi latérale longitudinale (49) de la porte (3). 35

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Abb. 1

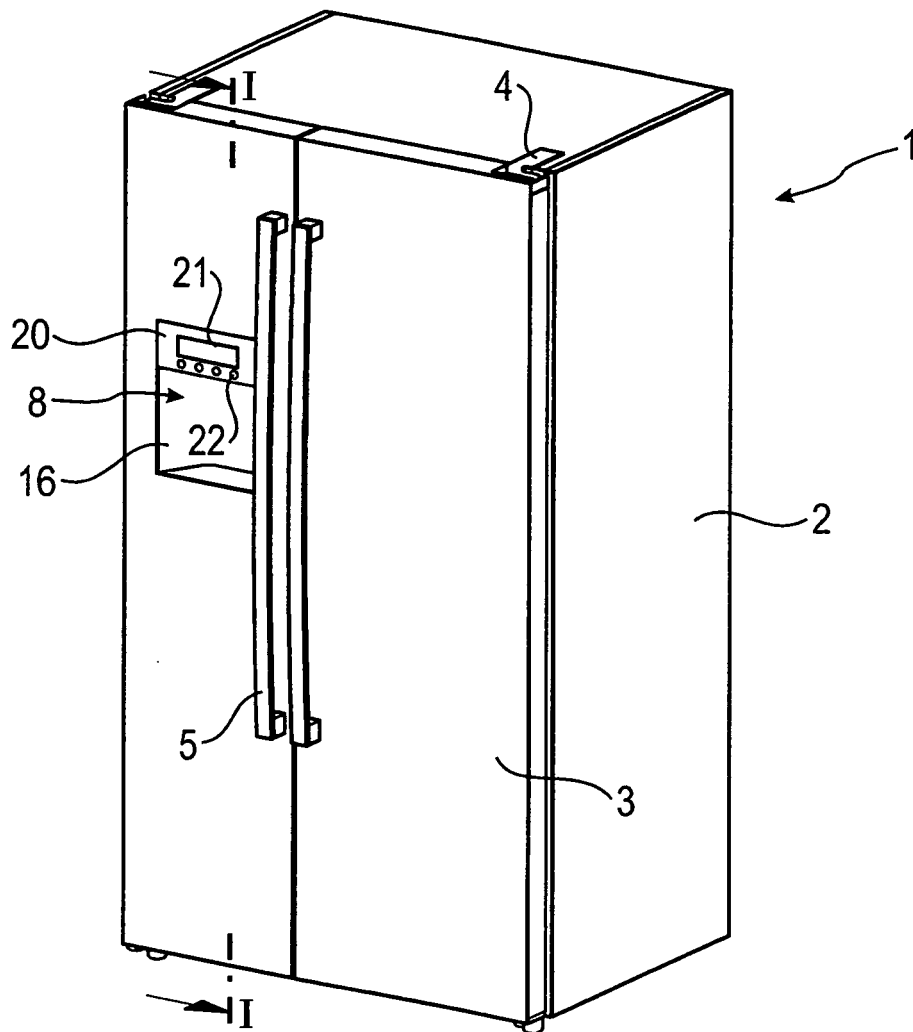


Abb. 2

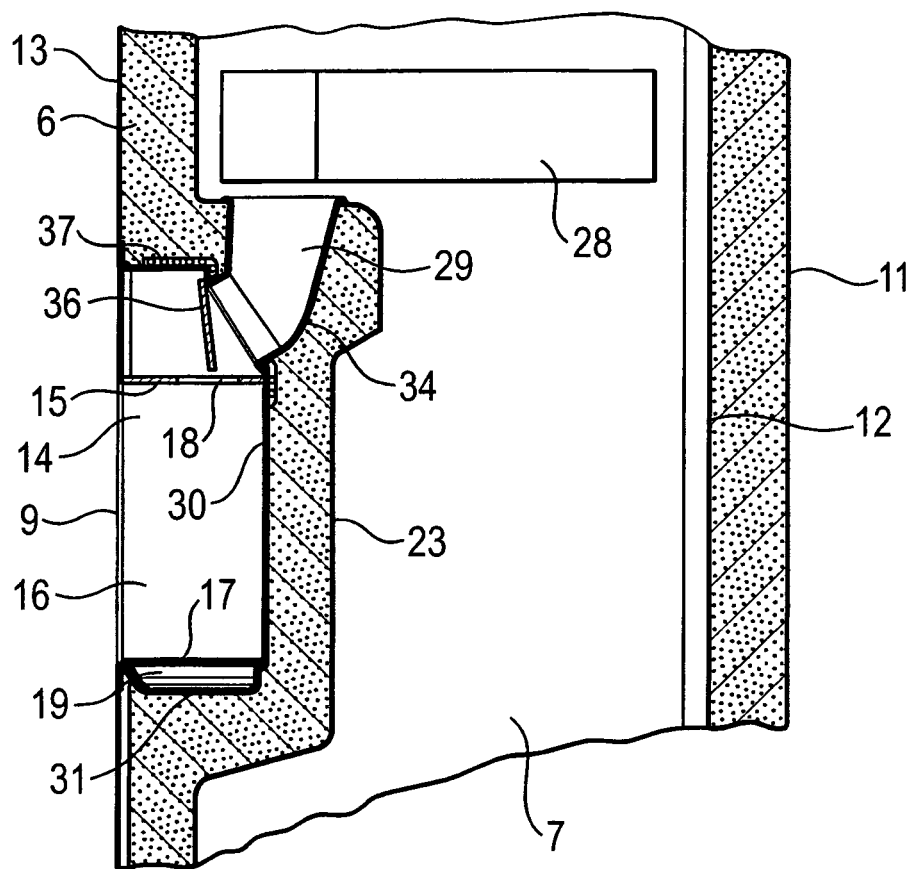


Abb. 3

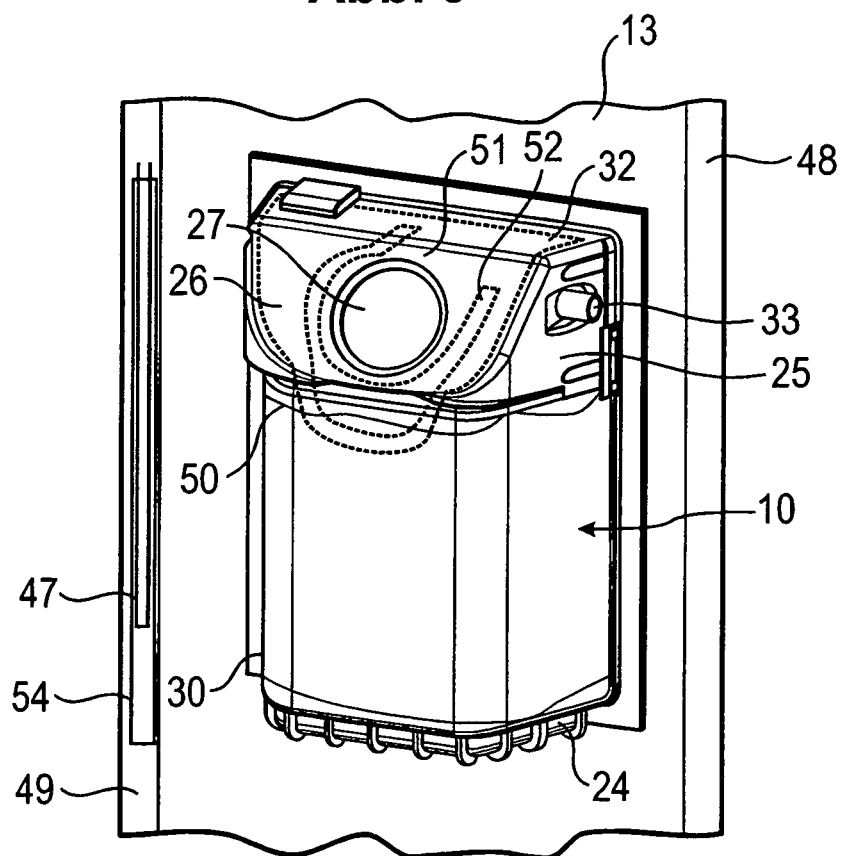


Abb. 4

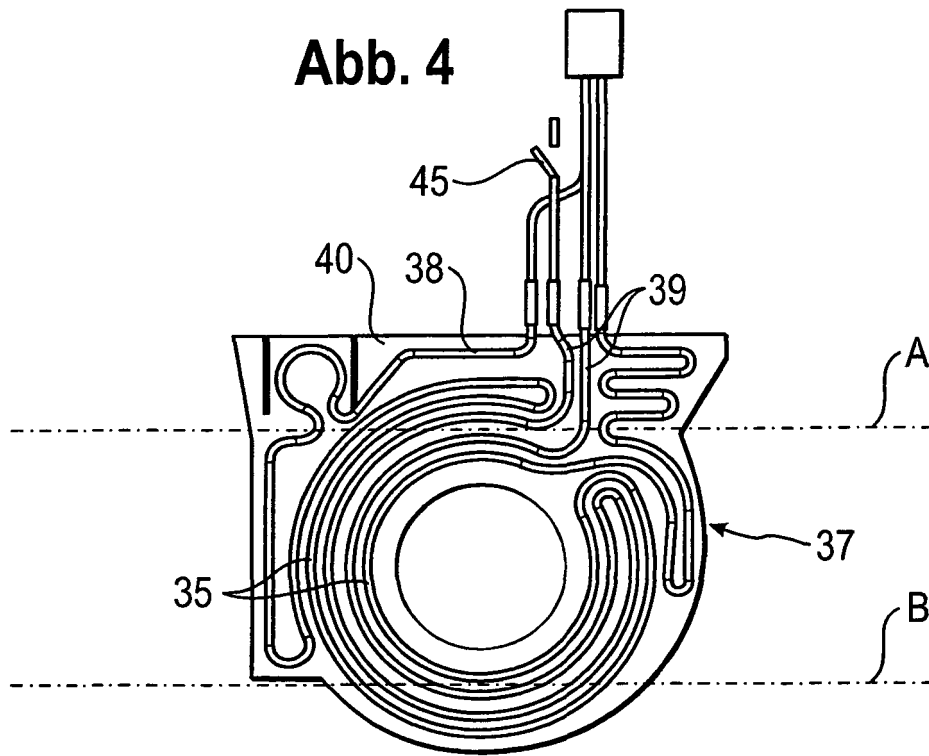
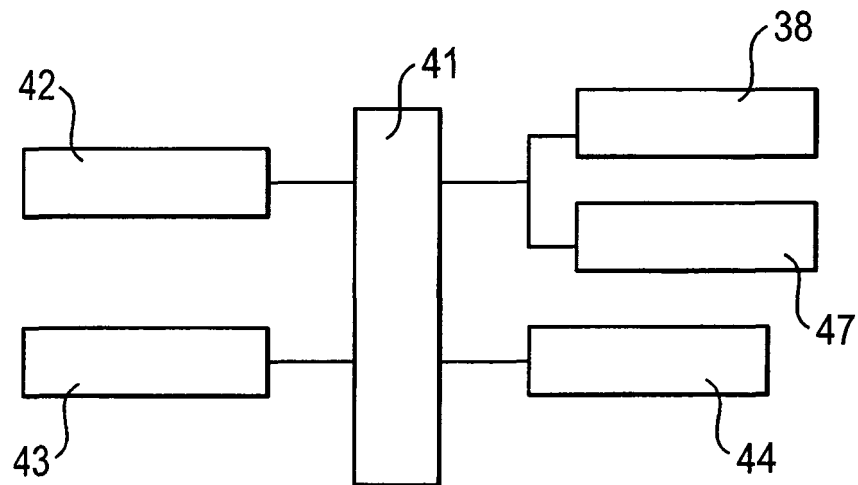


Abb. 5



REFERENCES CITED IN THE DESCRIPTION

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