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(54) Heater control unit for cooler devices

(57) In the cooler device (1) of the invention, during the rapid freezing process of the freezing compartment (2), there is at least one heater (8) having a time control that ensures the temperature to be fixed at required level inside the said unit (2) within the normal cooling compartment (2). The performance of the heater (8) is controlled by at least one main time counter (11), at least one control element (12) and one control unit (9) comprising at least one switch (13).

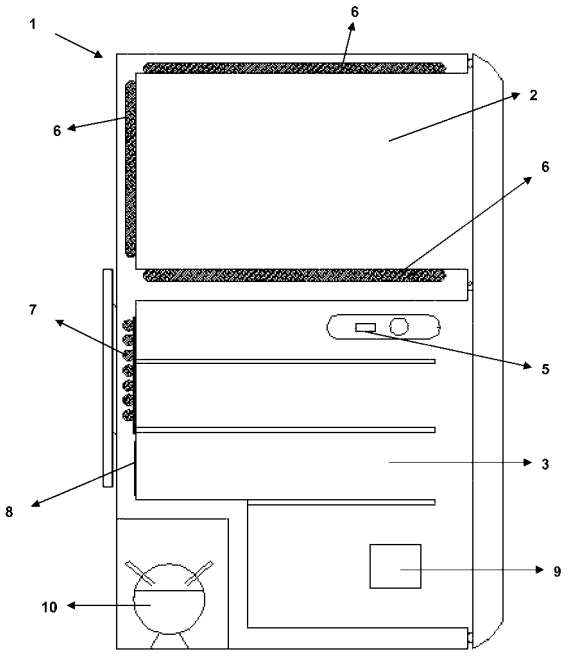

Figure 1

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Description

Technical Field

[0001] This invention relates to the cooler devices with time- controlled heaters.

Prior Art

[0002] As it is known, the cooling cycle of the cooler devices usually comprises compressor, condenser, capillary tube and cooling element units. Compartments of the cooler devices divided into different compartments depending on the intended use may have different temperature from each other by various optimizations of the said cooling cycle.

[0003] For example, in a cooler device that comprises at least one freezer compartment and at least one cooler compartment, the amount of the cooler fluid that reaches the cooling elements can be taken under control by adjusting the operating performance of the compressor and thus the temperature of the compartments can be controlled.

[0004] When the food in room temperature is placed inside the freezing compartment of the cooler device that comprises at least one freezing compartment and at least one normal cooling compartment in which food products are stored; it is required to adjust the temperature of the freezing compartment to the level that can freeze the food. During this process, the compressor is operated for a longer period of time and much more fluid reaches the cooling elements of the freezing compartment. Thus the temperature level of the freezing compartment is adjusted to the desired level. However, with the operation of the compressor, the cooling fluid firstly reaches to the evaporator of the freezer compartment and then reaches to the evaporator of the normal cooling compartment. In that case, the great amount of cooling fluid provided for the performing of the freezing process in the freezing compartment, also passes through the evaporator of the normal cooling compartment and that causes more than required cooling at the cooling compartment. For this reason; the food required to be kept in the normal cooling compartment also freeze in parts.

[0005] In the known state of the art, there are various embodiments developed for solving the above mentioned problem that are faced by the users. In the said embodiments, a heater placed in the normal cooling compartment is used to solve this problem.

[0006] In the patent document No GB1494217 (A) of the known state of the art developed by using the said solution method; a combined refrigerator is disclosed comprising two compartments one of which is used as a freezer and the other one as a normal cooler and a cooler circuit comprising two evaporators that are fed by the compressor unit with a temperature regulator control. In the cooling compartment of the said refrigerator; there are electrical heater resistances that are connected in parallel lines with each other, a control temperature regulator and a control unit comprising a switch. The resistance is fed by a current regulator. Thus, depending on the operation of the cooling compartment; the effect of the heater is adjusted. The control circuit is in a series connection with the compressor engine. Thus, depending on the operation performance of the compressor engine; the switch located on the control circuit is turned on and off manually and so the operation of the heater is taken under control.

[0007] In another patent document No EP0045728 (B1) of the known state of the art; a similar refrigerator is disclosed. The refrigerator disclosed in the patent document with No EP0045728 (B1) also comprises at least two compartments comprising one cooling and one freezer compartment. Within the cooling cycle of the compartments mentioned above, there are at least two evaporators connected to each other in a series and a regulator that arranges the temperature of the compartments. Other than the usual temperature regulator, the regulator is located within the normal cooling compartment, and it also comprises a thermal resistance in the inner section where the air is the coldest. The thermal resistance has such a switching system that is capable of stopping the engine of the compressor when the compressor is operated for a long time. Thus, the freezing of the food within the normal cooling compartment is avoided.

[0008] In yet another patent document No W00075582 (A1), a method maintaining the optimum level temperature for the cooling compartment of the device during the rapid freezing process of the freezer compartment in two-door refrigerators having freezing and cooling compartments is disclosed. In addition, the said refrigerator comprises a control unit which determines when and what temperature the compressor is to be operated for the rapid freezing process, and the operation duration of the heater located into the cooler compartment required to prevent temperature of cooling compartment from decreasing under the temperature level desired after the rapid freezing process, and the temperature level of cooling compartment in which the heater is not operated. While the freezer compartment is in the rapid freezing process, a temperature sensor located inside the cooling compartment measures the temperature of the cooling compartment continuously. When the temperature is below the threshold value of the desired temperature, the electrical heater located inside the cooling compartment starts and the temperature of the cooling compartment is increased above the threshold value. There is no disclosure about how these operations are performed in the patent application No W00075582 (A1).

[0009] In another patent document No W02005093346 (A1) of the known state of the art; the operating principle of the heater placed in the cooling compartment and operated periodically for energy saving while the freezer compartment is in engaged in rapid freezing process in a cooler device comprising one cooling compartment and one freezer compartment, and the

conditions of process of taking the compressor into and out of operation in accordance with the said system. In the said patent application, the operation of the heater is controlled manually.

[0010] Within the known state of the art, when the freezer compartment is filled with food for the purpose of freezing it, the heater is operated after the user selects freezing option, and during the process of freezing, heat is provided for the normal cooling compartment so as to keep the temperature of the said compartment in normal level. However, when the freezing process is completed, the heater continues to operate and the user is required to turn off the heater manually. In case the user forgets to turn off the heater; the temperature balance of the normal cooling compartment becomes unbalanced. For this reason, the food sometimes go bad and the electricity consumption of the cooler device can increase to higher levels.

Brief Description of the Invention

[0011] The cooler device developed by the present invention, comprises an automatic controlled heater developed to decrease the temperature of the normal cooling compartment during the process of freezing of the freezer compartment and to prevent the temperature of the normal cooling compartment from exceeding the required values following the process of freezing of the freezer.

[0012] The cooler device mentioned hereinabove comprises at least one freezer compartment, at least one normal cooling compartment, at least one each evaporator connected to each other within the said compartments and within the same cooling cycle, at least one control system controlling the operation of the cooler device, at least one freezer switch having at least two positions in order to start the process of rapid freezing, at least one heater located in the normal cooling compartment and working during the process of rapid freezing, and at least one control unit connected to the control system that determines the operation of the heater and the position of the switch. The said control unit comprises at least one timer operating in accordance with the duration of rapid freezing process, at least one solenoid to bring the freezer switch back to its first position, and at least one switch to deactivate (stop the operation thereof) the heater after the end of the freezer process and to commission (start the operation thereof) the solenoid.

The Objective of the Invention

[0013] The aim of the present invention is to provide a cooler device that comprises a time controlled heater that ensures the temperature of the cooling compartment to remain at the desired level during the rapid freezing process of the freezer compartment.

[0014] Another aim of the present invention is to provide a cooler device that comprises a heater that can be controlled by a timer.

[0015] Yet another aim of the present invention is to prevent energy consumption by turning off the heater after the process of rapid freezing.

Description of Figures

[0016] An exemplary cooler device and a control unit of the subject matter of the invention are shown in the annexed figures, wherein;

Figure 1 is a sample view of the cooler device that contains a time controlled heater.

Figure 2 is the schematic view of the unit which controls the heater.

[0017] The parts in the figures are individually numbered and the corresponding meanings of these reference numbers are as follows:

The cooler device	(1)
The freezer compartment	(2)
Normal cooling compartment	(3)
The freezer switch	(5)
The freezer compartment evaporator	(6)
The cooler compartment evaporator	(7)
The heater	(8)
The control unit	(9)
The compressor	(10)
The time counter	(11)
The control element	(12)
The switch	(13)
The switch positions	(a, b)

The Disclosure of the Invention

[0018] The cooler devices, in which food products are kept, can be divided into various compartments depending on the intended use. As it is known, in general terms, a cooling system comprising a compressor for the cooling cycle, a condenser, capillary tubes and the cooling element (evaporator) are provided in the refrigerating devices mentioned. The control of the elements in the said cooling system is performed by a control system located in the device. In the cooler devices divided into at least two compartments as freezers and the normal cooling compartment; each one of the compartments are kept at certain temperatures by individual evaporators in the two compartments. When food is kept inside the freezer compartment of the cooler device for the purposes of freezing food, the compressor of the cooling device is operated for a longer period of time in order to decrease the temperature of the said compartment. In this way, much more cooling fluid reaches to the evaporators of the freezer compartment of the cooler device. However, within the cooling cycle, after the cooling fluid passes through the evaporator of the freezer compartment, it also reaches

to the evaporators of the normal cooling compartment and also causes freezing in the cooling compartment. Within the scope of the present invention a cooler device is developed comprising a time controlled heating device to solve this problem of freezing.

[0019] The cooler device (1) given as an example in Figure 1 comprises at least one freezer compartment (2) that has the capability of rapid freezing and at least one normal cooling compartment (3). Since the aim is to provide different temperatures in each one of the compartments (2, 3) of the cooler device; the said cooler device (1) comprises at least two evaporators (6, 7) one of which is belonging to the freezer unit (2) and the other one is belonging to the normal cooling compartment (3). After at least one compressor (10) placed in the cooler device (1) is operated, the cooler fluid is transferred to the evaporators (2, 3). Since the said evaporators (6, 7) are connected to each other within the cooling cycle, after the cooling fluid passes through the evaporator (6) of the freezer unit (2); it reaches to the evaporators (7) of the normal cooling compartment (3).

[0020] In order to start the rapid freezer process of the freezer compartment (2); there is a freezer switch (5) placed on the cooler device (1). This switch (5) has at least two functions for starting and completing the operation of the rapid freezer process. The starting function of the freezer switch (5) is the function where rapid freezer process is not performed. For the rapid freezer function to be performed, the other function is required to be selected by using the freezer switch (5). When the rapid freezer function is selected by the freezer switch (5), the compressor (10) is operated for a longer period of time. The longer operation of the compressor (10) causes the cooling fluid cycle to be maintained for a longer period of time and the food kept in the freezer compartment (2) to freeze.

[0021] The cooling cycle of the cooler device (1) is controlled by a control system (that is not shown in the figures) placed in the device (1). By means of the freezer switch (5) other function, in which the rapid freezing process starts, is selected the control system is given the order to initiate the rapid freezing function. Thus, the control system ensures the operation of the compressor (10) for a longer time and the temperature of the cooler device (1) is kept under control.

[0022] However, at the stage where the food is frozen, since the evaporator (7) of the normal cooling compartment (3) and the evaporator (6) of the freezer compartment (2) are connected to each other, much more cooling fluid reaches to the evaporator (7) of the normal cooling compartment (3) as well. Since the said situation causes freezing in the normal cooling compartments (3); a heater (8) is used inside the normal cooling compartments (3).

[0023] When the rapid freezing function is selected by the freezer switch (5)the heater (8) starts operating along with the compressor (10) since the order to initiate the rapid freezing process is conveyed to the control system, , as a result. When the rapid freezing process in the freezer compartment (2) is completed, a control unit (9) is designed connected to the control system to ensure the heater (8) to be deactivated (to be stopped); The control unit (9) shown in Figure 2 comprises at least one main time counter (11), at least one control element (12) and at least one electrical switch (13) that has the functions of turning on and turning off. Control of the selection of the heater (8) or the control element (12) is performed by the said switch (13) connected to the time counter (11). The said switch (13) has two positions providing a connection with the main time counter (11) and the control element (12) or the heater (8). When the switch (13) is in the "a" position; the heater (8) is connected with the time counter (11) and when the said switch is in the "b" position, the control element (12) is connected with the main time counter (11).

[0024] After the selection of the rapid freezer function by the freezer switch (5) the control system ensures the compressor (10) to operate and the rapid freezer function to be started. When the rapid freezer process is initiated, since the switch (13) is in the "a" position (in operation), the heater (8) starts to operate, too. Since the rapid freezer process is performed in a certain period of time, at the same time, the control system conveys the message that the rapid freezer process is initiated to the main time counter (11) in the control unit (9) and the counter (9) starts counting the certain period of time thereby.

[0025] When the required period of time for the rapid freezer process elapses; the time counter (11) deactivates (turn off) the heater (8) by shifting the position of the switch (13) that connects the heater (8) to the control system through the control unit (9) from position "a" as shown in Figure 2 to position "b" in order to cut the connection of the heater (8) with the control system. At the same time, as the switch (13) shifts to position "b", the control element (12) is activated and operated. In this way, the freezer switch, the rapid freeze function (5) of which is selected to start the process of rapid freeze, turns back to its initial function (the function in which the rapid freeze process is not performed).

[0026] However, as the heater (8) is deactivated, it does not operate for the next process of rapid freeze. In order to avoid such a situation, the main time counter (11) counts for a period of time that is much shorter than what is required for the rapid freeze process when the switch (13) is in the "b" position. After the said short period of time elapses, the switch (13) gets back to the position "a" by which it can activate the heater (8)... In this way, the heater (8) is set ready for the next rapid freeze process.

[0027] The function selection of the freezer switch (5) can be done by changing the position of the said switch, and the same can also be done by conveying the signal of the relevant function to the control system. In other words, for the selection of function, both the freezer switch (5)the position of which can be changed by a turning or pushing movement and a freezer switch (5) that sends a signal to the control system without changing its

position as mentioned above can be utilized.

[0028] As the freezer switch (5) is switch the position of which is changeable, the control element (12) is defined as an element (12) that transmits electrical energy into mechanical energy (for example solenoid) (for example the switch that remains in its pushed position by a spring mechanism installed into it, to get back to the pushed up position after the completion of the rapid freezer process, in other words, back to its position in which it is not pushed). In this way, when the switch (5) is taken from the initiating position in which the rapid freeze process is not realized to the position in which the rapid freezer process is realized, the position of the switch remains fixed. After the rapid freeze process is completed, the turning back of the switch (5) to its first position is ensured by the said control element (12).

[0029] As an alternative, when the rapid freeze process is completed, an additional time counter (11) can also be added into the control unit (9) to control the operation duration of the control element (12). In that case, the main time counter (11) counts only the period of time that is required for the heater (8) to be operated during the rapid freezer process. When the said duration is over, the switch (13) gets back to "b" position and the control element (12) is activated and the additional time counter counts the short period of time that is required for the control element (12) to remain as activated (in operation) (for the switch (13) to remain in position "b"), and the freezer switch (5) gets back to its initial function. At the end of the said period, the switch (13) gets back to its position "a" and the heater (8) is connected to the system. In this manner, the heater (8) is set ready for the next rapid freeze process.

Claims

1. This is a cooler device (1) comprising at least one freezer compartment (2); at least one normal cooling compartment (3); at least two individual evaporators (6, 7) which are connected to each other and belonging to the said compartments (2, 3); a control system that controls the operation of the cooler device (1); at least one freezer switch (5) that initiates the rapid freeze process and that has at least two functions; at least one heater (8) that is located in the normal cooling compartment and operates during the rapid freezer process; at least one control unit (9) that regulates the operation of the heater (8) and adjusts the position of the switch (5) and **characterized in that** the said control unit (9) comprises

   • at least one control element (12) that ensures the freezer switch (5) gets to the initial function where the freezing process is not performed after the rapid freezer process,
   • at least one main time counter (11) that counts the required time during which the heater (8) should remain connected to the control system during the rapid freezer process and that counts the required time during which the control element (12) should remain connected to the control system after the rapid freezer process,
   • at least one switch (13) that deactivates the heater (8) and activates the control element (12) after the rapid freezer process is completed.

2. A cooler device (1) according to Claim 1 **characterized in that** it comprises at least one additional time counter which is placed in the control unit (9) and which counts the required time during which the control element (12) should remain connected to the control system, and which ensures the connection between the heater (8) and the control system (9) for the reuse of the heater (8) after the completion of the process of rapid freezer period.

3. A cooler device (1) according to Claim 1 **characterized in that** the freezer switch (5) is a switch the position of which can be changed.

4. A cooler device (1) according to Claim 3 **characterized in that** the control element (12) that brings position of the freezer switch (5) back to its initial function is solenoid.

5. A cooler device (1) according to Claim 1 **characterized in that** the freezer switch (5) is a switch that sends a signal to the control system for the selection of function without changing its position.

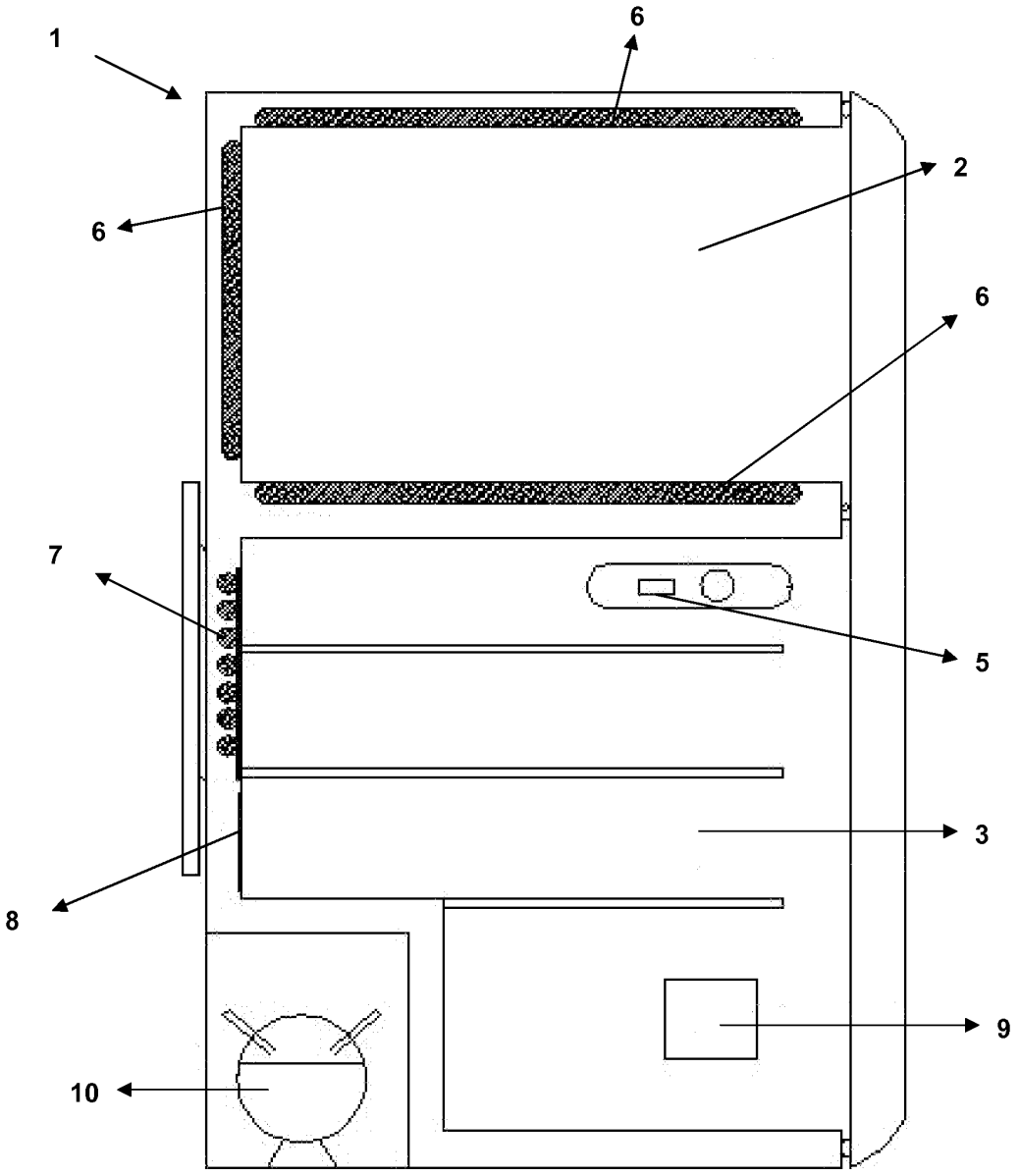

Figure 1

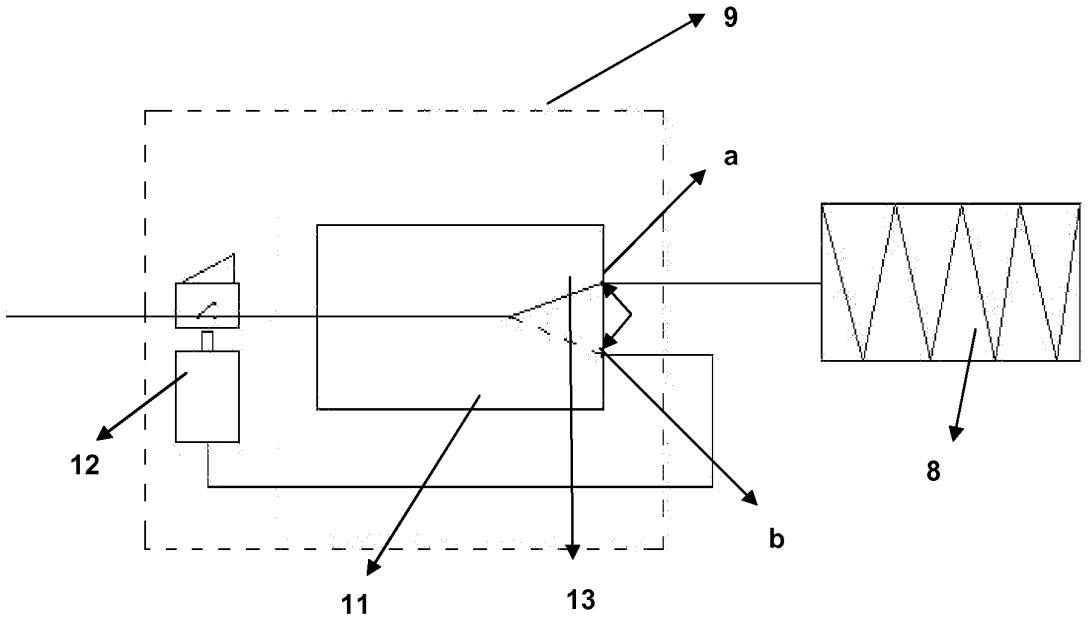

Figure 2

REFERENCES CITED IN THE DESCRIPTION

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- EP 0045728 B1 **[0007]**
- WO 0075582 A1 **[0008]**
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