(19) Europäisches Patentamt
European Patent Office
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(11) **EP 2 397 795 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.12.2011 Bulletin 2011/51

(51) Int Cl.:
F25B 47/02 *(2006.01)* ***F25B 39/00*** *(2006.01)*

(21) Application number: **11168656.4**

(22) Date of filing: **03.06.2011**

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **18.06.2010 TR 201004948**

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(54) **A defrosting method**

(57) The present invention develops an alternative method for defrosting the ice accumulating on the evaporator-1 (3) of a cooler device (S), provided with at least one cooling compartment (2) and at least one freezing compartment (1) that comprises compressor (5), condenser (6), evaporator (3, 4) and capillary tube units. There is at least one additional condenser (7) which is to be included in the cooling cycle of the said cooler device (S) when defrost operation is active. The said additional condenser (7) and the main condenser (6) are connected to the compressor (5) via at least one valve (9b). Thus, the valve (9b) breaks the connection between the compressor (5) and the additional condenser (7) when defrost operation is inactive, and it is ensured that the refrigerant completes the regular cooling cycle through the main condenser (6). The valve (9b) includes the additional condenser (7), positioned on the evaporator-1 (3) the ice of which is to be defrosted, in the cooling cycle by breaking the connection of the compressor (5) with the main condenser (6) when defrost operation is active.

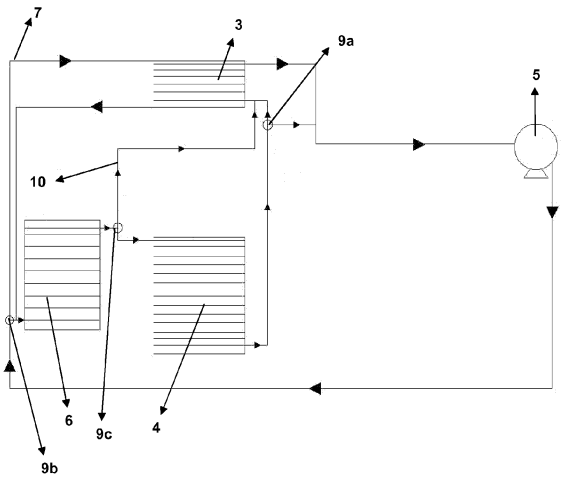

Figure 2

EP 2 397 795 A2

Description

Technical Field

[0001] This invention relates to a method developed for defrosting the ice accumulating on the cooling elements (evaporators) of cooler devices that comprise such an element.

Prior Art

[0002] The cooling cycle of cooler devices conventionally comprises a compressor, a condenser, a capillary tube and an evaporator. Accordingly, the refrigerant that flows hot out from the compressor gives off heat while passing through the condenser and therefore condenses and cools. Then, the refrigerant, which has passed through the capillary tube and lost pressure, visits the evaporator. The refrigerant here evaporates into gas easily thanks to its low pressure and the heat it takes from the compartment. The refrigerant, which enables cooling of the compartment owing to the heat it takes from the compartment, returns to the compressor. The known cooling cycle is completed and cyclically continued.

[0003] The refrigerant that has visited the evaporator causes frosting on the evaporator while evaporating, owing to the heat it takes from the compartment, into gas. In the known art, the ice accumulating on the evaporator is defrosted by means of a heater positioned on or around the evaporator. However, this situation results in extra energy consumption.

[0004] An alternative solution for defrosting is to use the heat of a condenser which is a part of the cooling cycle. The patent document KR20090075280 A of the prior art discloses a defrosting method by using heat of a condenser preferentially not depending on a defrosting heater. This method includes the following steps of: determining a defrost operation condition; operating a valve which is formed on a capillary tube between an evaporator and a condenser in the case that defrost operation condition is satisfied; performing a defrosting process through the valve; detecting temperature of the evaporator after predetermined time; confirming the temperature of the evaporator with defrost ending temperature; and turning off the valve when the temperature of the evaporator is reached to the defrost ending temperature.

Brief Description of the Invention

[0005] The present invention discloses a cooler device the cooling cycle of which includes an additional condenser positioned on the cooler element (evaporator) the ice of which is to be defrosted. The said cooler device comprises at least one compressor that performs the cooling cycle, at least one evaporator, a capillary tube and a condenser. In this cycle, the compressor is connected to both condensers via at least one valve. Thus, the additional condenser is excluded from the cooling cycle when defrost operation is inactive, and it is ensured that the refrigerant is directed to the main condenser by means of the valve provided there. When defrost operation is active, the refrigerant, which flows out from the compressor at high temperatures, is directed to the additional condenser by means of the said valve, transfers its heat to the ambient environment, condenses there and ensures that the ice on the evaporator is defrosted. The refrigerant flowing out from the additional condenser is directed to the main condenser and the regular cooling cycle continues.

Objective of the Invention

[0006] The aim of this invention is to develop a cooler device that comprises an alternative application for defrosting the ice accumulating on the cooling element.

[0007] Another aim of this invention is to develop a cooler device that comprises an additional condenser for defrosting the ice accumulating on the cooling element.

[0008] Another aim of this invention is to develop a cooler device that has cooling elements the interconnection of which is established by the valve.

[0009] Another aim of this invention is to develop a cooler device that comprises an additional condenser included in the cooling cycle when defrost operation is active.

Description of Drawings

[0010] An exemplary cooler device of the invention and the cooling cycle elements therein are illustrated in the annexed figures wherein;

Figure 1 is the perspective view of the cooler device.

Figure 2 is the view of the cooling cycle elements and the cooling cycle.

[0011] The parts in the drawings are individually enumerated and the corresponding meanings of the reference numbers are as follows:

Cooler device	(S)
Freezing compartment	(1)
Cooling compartment	(2)
Evaporator-1	(3)
Evaporator-2	(4)
Compressor	(5)
Main condenser	(6)
Additional condenser	(7)
Control unit	(8)
Valve	(9a, 9b, 9c)
Capillary tube	(10)

Disclosure of the Invention

[0012] The invention discloses an alternative defrosting method developed for defrosting the ice accumulating on a cooling element (evaporator) provided on cooler devices. As known, the cooling cycle in cooler devices is performed by compressor, condenser, capillary tube and evaporator units. Figure 1 shows an exemplary cooler device (S) comprising at least one freezing compartment (1), at least one cooling compartment (2), at least one evaporator-1 (3) used to cool the freezing compartment (1), at least one other evaporator-2 (4) used to cool the cooling compartment (2). The refrigerant, which flows out hot from at least one compressor (5) in the cooler device (S), transfers its heat to the ambient environment, condenses and cools there. Then, the refrigerant, which has passed through the capillary tube (10) and lost pressure, visits the evaporator (3, 4). The refrigerant here evaporates into gas easily thanks to its low pressure and the heat it takes from the compartment (1, 2). In the evaporator (3, 4), the refrigerant, which enables cooling of the compartment (1, 2) owing to the heat it takes from the compartment (1, 2), returns to the compressor (5). The known cooling cycle is completed and cyclically continued. During this cooling cycle, however, frosting may occur on the evaporator (3, 4). In order to defrost this ice, the cooling cycle of the cooler device (S) shown in Figure 1 is provided with at least one additional condenser (7) which is connected to the compressor (5) and positioned on the evaporator-1 (3) the ice of which is to be defrosted.

[0013] Figure 2 illustrates an exemplary cooling cycle that comprises an additional condenser (7). The operation of the cooling cycle elements is controlled by at least one control unit which is not shown in the figures. The additional condenser (7) and the main condenser (6) are connected to the compressor (5) via at least one valve (9b). The control unit breaks the connection of the valve (9b) with the compressor (5) and the additional condenser (7) during the regular cooling cycle when defrost operation is not performed. Thus, it is ensured that the refrigerant flowing out from the compressor (5) is directed to the main condenser (6). The connection between this condenser (6) and the evaporators (3, 4) belonging to the compartments (1, 2) is established by at least one other valve (9c). The operation of this valve (9c) is also controlled by the control unit. When only the freezing compartment (1) is desired to be cooled, the control unit breaks the connection of the valve (9c) with the evaporator-2 (4) of the cooling compartment (2) and ensures that the refrigerant is directed to the other evaporator-1 (3) which enables cooling of the freezing compartment (1). The refrigerant that flows out from this evaporator-1 (3) is directed to the compressor (5) and the cooling cycle is completed. When the cooling compartment (2) is desired to be cooled, the refrigerant that visits the condenser (6) is firstly directed to the evaporator-2 (4) which enables cooling of the cooling compartment (2). The refrigerant that comes out from this evaporator-2 (4) is then directed to the other evaporator-1 (3) which enables cooling of the freezing compartment (1). In this case, the valve (9c), which establishes connection between the condenser (6) and the evaporators (3, 4), breaks the connection of the condenser (6) with the evaporator-1 (3) of the freezing compartment (1) and ensures that the refrigerant is passed to the evaporator-2 (4) of the cooling compartment (2). There is at least one valve (9a) interposed

between the evaporator-2 (4) of the cooling compartment (2) and the evaporator-1 (3) of the freezing compartment (1), which establishes connection between these evaporators (3, 4) and which is controlled by the control unit. The connection between the evaporator-2 (4) of the cooling compartment (2) and the compressor (5) is also established by means of this valve (9a). This valve (9a) breaks the connection between the evaporator-2 (4) of the cooling compartment (2) and the compressor (5) when defrost operation is inactive, and it is ensured that the refrigerant is directed from the evaporator-2 (4) of the cooling compartment (2) to the evaporator-1 (3) of the freezing compartment (1). The refrigerant that flows out from this evaporator-1 (3) directed to the compressor (5) and the regular cooling cycle is completed.

[0014] When a defrost operation is to be performed, the valve (9b) breaks the connection between the compressor (5) and the main condenser (6). Thus, the compressor (5) and the additional condenser (7) are connected, and the additional condenser (7) is included in the cooling cycle. The refrigerant that flows out hot from the compressor (5) is directed to the additional condenser (7). The refrigerant transfers its heat to the ambient environment at this condenser (7), condenses and cools there. Since the said condenser (7) is positioned on the evaporator-1 (3) the ice of which is to be defrosted, the ice accumulating on the evaporator-1 (3) is defrosted by the heat given off. Next, the refrigerant that flows out from the additional condenser (7) is directed to the main condenser (6). Since defrost operation is active, the valve (9c), which establishes connection of this condenser (6) with the compartments (3, 4), breaks the connection of the condenser (6) with the evaporator-1 (3) of the freezing compartment (1) and ensures that the refrigerant is directed to the evaporator-2 (4) of the cooling compartment (2). Thus, the cooling compartment (2) is cooled. Since defrost operation is active, the valve (9a), which establishes connection of this evaporator-2 (4) with the other evaporator-1 (3) and with the compressor (5), breaks the connection between these evaporators (3, 4) and ensures that the refrigerant that flows out from this evaporator-2 (4) is directed to the compressor (5) and the cooling cycle is completed.

[0015] The cooling cycle of the cooler device (S) of the invention comprises at least one compressor (5), at least one condenser (6), at least one additional condenser (7) for defrost operation, a capillary tube and evaporator units (3, 4). The operation of these units is controlled by at least one control unit. The connection of the compressor (5) with the main condenser (6) and with the additional condenser (7) is established by at least one valve (9b). Thus, depending on the active/inactive status of defrost operation, the control unit controls the operation of the valve (9b), and the connection of the compressor (5) with the main condenser (6) or with the additional condenser (7) is established. The connection of the main condenser (6) with the evaporators (3, 4) is established by at least one other valve (9c). In a cooler device comprising at least one evaporator-1 (3) enabling cooling of the freezing compartment (1) and at least one other evaporator-2 (4) enabling cooling of the cooling compartment (2), the connection of the main condenser (6) with the evaporator (3, 4) to which the refrigerant is to be directed is established by controlling this valve (9c), depending on the active/inactive status of defrost operation. The connection of these two evaporators (3, 4) to each other is established by at least one other valve (9a). This valve (9a) also establishes the connection of the evaporator-2 (4), in which no defrost operation is performed, with the compressor (5). Thus, the valve (9a) interconnects these two evaporators (3, 4) by breaking the connection of the evaporator-2 (4) with the compressor (5) when defrost operation is inactive in a cooler device (S) comprising at least two evaporators (3, 4). When defrost operation is active, this valve (9a) breaks the interconnection of these evaporators (3, 4) and ensures that the cooling cycle is completed by connecting the evaporator-2 (4), in which no defrost operation is performed, with the compressor (5).

Claims

1. A cooler device (S) comprising at least one freezing compartment (1); at least one cooling compartment (2); a cooling cycle comprising at least one compressor (5), at least one main condenser (6), at least one additional condenser (7), at least one evaporator-1 (3) of freezing compartment (1), at least one evaporator-2 (4) of the cooling compartment (2), a capillary tube (10) interposed between these evaporators (3, 4) and the main condenser (6) **characterized in that** it comprises

   - at least one valve (9b) that establishes connection of the compressor (5) with the main condenser (6) and with the additional condenser (7),
   - another valve (9c) that establishes connection between the main condenser (6) and the evaporators (3, 4),
   - at least one other valve (9a) which establishes connection of the evaporator-2 (4) of the cooling compartment (2) with the evaporator-1 (3) of the freezing compartment (1) and with the compressor (5).

2. A cooler device (S) according to Claim 1 **characterized in that** it comprises a control unit which controls the operation of the cooling cycle elements and of the valves (9a, 9b, 9c).

3. A cooler device (S) according to Claim 1 **characterized in that** the additional condenser (7) is positioned on the evaporator-1 (3) of the freezing compartment (1).

4. An operation method for a cooler device (S) comprising at least one freezing compartment (1); at least one cooling compartment (2); a cooling cycle comprising at least one compressor (5), at least one main condenser (6), at least one additional condenser (7), at least one evaporator-1 (3) of freezing compartment (1), at least one evaporator-2 (4) of the cooling compartment (2), a capillary tube (10) interposed between these evaporators (3, 4) and the main condenser (6) **characterized in that** it comprises the steps of

- breaking the connection between the compressor (5) and the additional condenser (7) by a valve (9b) which establishes connection of the compressor (5) with the main condenser (6) and with the additional condenser (7),
- directing the refrigerant, which flows out from the compressor (5), to the main condenser (6),
- breaking the connection between the main condenser (6) and the evaporator-2 (4) of the cooling compartment (2) by other valve (9c), which establishes connection between the main condenser (6) and the evaporators (3, 4), when the freezing compartment (1) is desired to be cooled only; directing the refrigerant, which flows out from the main condenser (6), to the evaporator-1 (3) of the freezing compartment (1); and completion of the cooling cycle after the refrigerant reaches to the compressor (5),
- breaking the connection between the main condenser (6) and the evaporator-1 (3) of the freezing compartment (1) by the other valve (9c), which establishes connection between the main condenser (6) and the evaporators, when the freezing compartment (1) is desired to be cooled together with the cooling compartment (2); directing the refrigerant, flowing out from the main condenser (6), to the evaporator-2 (4) of the cooling compartment (2); breaking the connection between the compressor (5) and the said evaporator-2 (4) by a valve (9a), which establishes connection of the evaporator-2 (4) of the cooling compartment (2) with the evaporator-1 (3) of the freezing compartment (1) and with the compressor (5); reaching of the refrigerant, flowing out from the said evaporator-2 (4), to the other evaporator-1 (3) and the completion of the cooling cycle after directing the refrigerant to the compressor (5),

when defrost operation is inactive, and steps of

- breaking the connection between the compressor (5) and the main condenser (6) by the valve (9b) which establishes connection of the compressor (5) with the main condenser (6) and with the additional condenser (7),
- performing defrost operation after the refrigerant, flowing out from the compressor (5), reaches the additional condenser (7),
- directing the refrigerant that flows out from the said condenser (7) to the condenser (6),
- breaking the connection between the said condenser (6) and the evaporator-1 (3) of the freezing compartment (1) by the valve (9c) which establishes connection between the main condenser (6) and the evaporators (3, 4),
- directing the refrigerant that flows out from the main condenser (6) to the evaporator-2 (4) of the cooling compartment (2),
- breaking the connection between the said evaporator-2 (4) and the other evaporator-1 (3) by the valve (9a) which establishes connection of the said evaporator-2 (4) with the evaporator-1 (3) of the freezing compartment (1) and with the compressor (5),
- directing the refrigerant that flows out from this evaporator-2 (4) to the compressor (5)

when defrost operation is active.

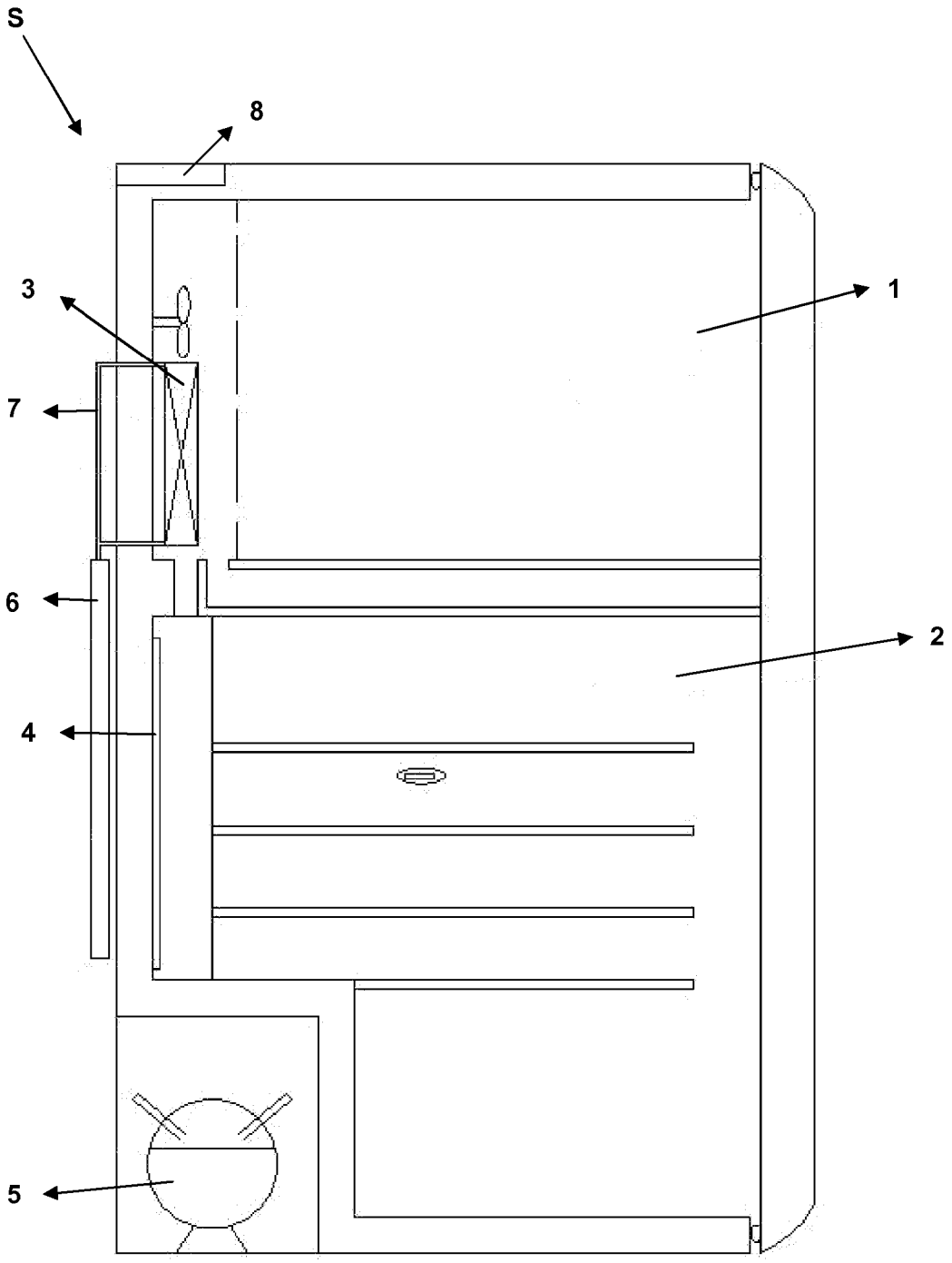

Figure 1

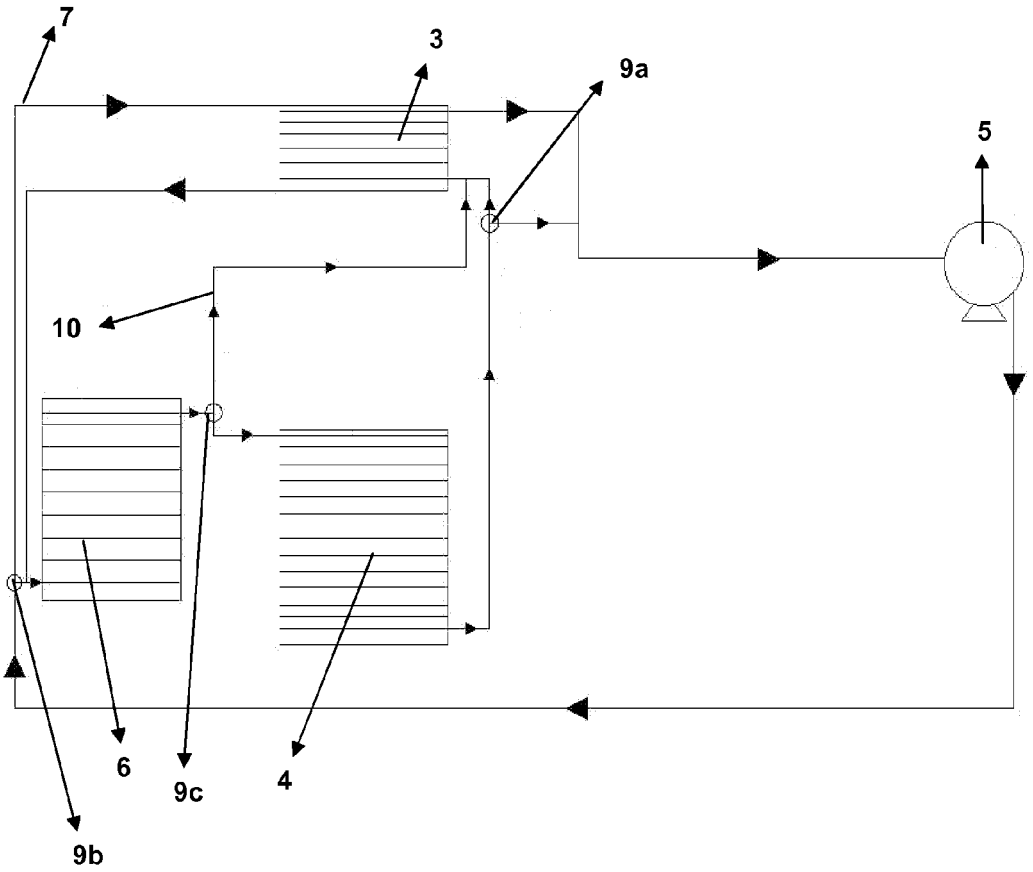

Figure 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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