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(54) Defrosting system for cooling devices

(57) Incorporated into known cooling system (1) of cooling devices, the defrosting system (2) of the invention has been developed for defrosting the frost accumulated on the evaporator (7). When the system (2) is activated, the hot refrigerant, which passes through the valve (8 or 16) at the outlet of the compressor (3), is directly directed to at least one condenser (9) in the freezing compartment. The condenser (9) here exchanges heat with the evaporator (7) in the cooling system (1). Since the temperature of the gas that passes through the condenser (9) is higher than the temperature of the evaporator (7), the condenser heats the evaporator (7) and defrosts the frost accumulated on the evaporator.

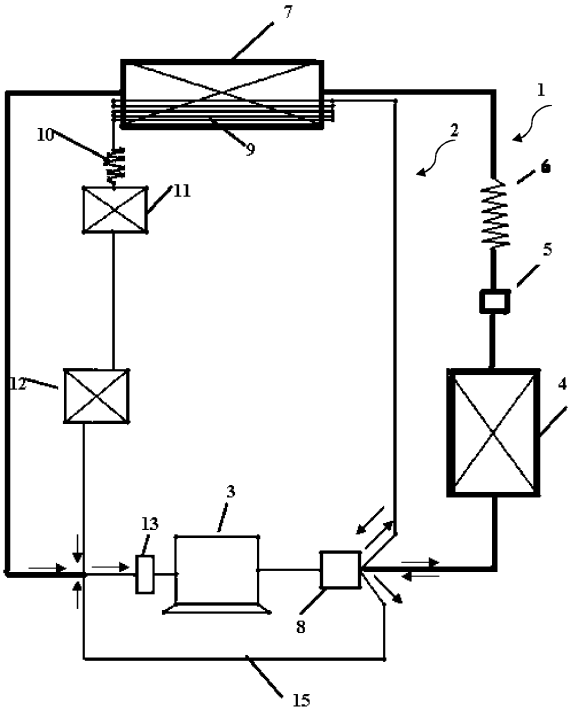

Figure - 1

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Description

Technical Field

[0001] This invention relates to defrosting systems used in cooler type white goods.

Prior Art

[0002] As known, white goods such as refrigerators, deep freezers are utilized to store the food stuff for long periods without spoiling. Frosting occurs in the freezing compartments (that carry out cooling under 0°C) of such cooling devices due to the ambient air humidity. The layers of ice accumulated on evaporators provided in these compartments prevent the evaporator from effectively cooling the compartment in which it is provided.

[0003] Therefore, the cooling devices should undergo defrosting process at certain times. For the defrosting process; such actions as shutting off the cooler device, leaving the doors of the freezing compartments open etc. were commonly applied in the past. The published patent application No W02009006139 of the prior art discloses a system wherein the frost formed on the evaporator is defrosted by the hot gas pipe that extends out from the compressor and reaches the evaporator. This system, however, stops the cooling process of the refrigerator during defrosting.

[0004] The utility model application No CN201145456 of the prior art prevents frosting on the evaporator by heating the evaporator by means of the electric heaters. This system, on the other hand, consumes extra energy for the defrosting process.

Brief Description of the Invention

[0005] Incorporated into known cooling systems of cooling devices, the defrosting system of the invention has been developed for defrosting the frost accumulated on the evaporator. When the defrosting system is activated, the hot refrigerant passing through the valve at the outlet of the compressor is directly directed to the condenser in the freezing compartment. The condenser exchanges heat with the evaporator in the cooling system. Since the temperature of the gas that passes through the condenser is higher than the temperature of the evaporator, the condenser heats the evaporator and defrosts the frost accumulated on the evaporator.

[0006] Another property of the defrosting system is that the cooling of the compartments in the cooling device continues during defrosting. To this end, a capillary tube and an evaporator in the freezing compartment and an evaporator in the cooling compartment are used. The refrigerant passing through the condenser in the freezing compartment is this time passed through a capillary tube and the evaporator of the freezer, and the cooling of the freezing compartment continues.

[0007] The refrigerant flowing out from the freezing compartment is also passed through the evaporator in the cooling compartment. Therefore, increase in the temperature of the cooling compartment is prevented.

The objective of the Invention

[0008] The aim of the invention is to defrost the frost accumulated on evaporators provided in cooling devices by a defrosting system incorporated to a cooling system.

[0009] Another aim of the invention is to develop a defrosting system that performs defrosting process without halting the cooling function of the cooling device.

[0010] A further aim of the invention is to ensure that there is no considerable temperature increase in the interior compartments of the cooling device during defrosting process.

[0011] Another aim of the invention is to ensure that defrosting process is performed with minimum equipment.

[0012] Yet another aim of the invention is to develop a defrosting system that carries out the defrosting process without consuming extra energy.

[0013] The aim of this invention is to develop a cheap, easy-to-produce and reliable defrosting system for cooler type white goods.

Description of the Drawings

[0014] The defrosting system of the invention and the relevant cooling system are illustrated in the annexed figures wherein;

Figure 1 is an exemplary scheme of the defrosting and cooling systems of the invention.

Figure 2 is another exemplary scheme of the defrosting and cooling systems of the invention.

[0015] The parts in the figures are individually enumerated and the corresponding meanings of these references are as follows:

Cooling system (1)
Defrosting system (2)
Compressor (3)
Condenser (4)
Filter unit (5)
Capillary tube (6)
Evaporator of the freezing compartment (7)
Valve (8)
Condenser (9)
Capillary tube (10)
Evaporator of the freezing compartment (11)
Evaporator of the cooling compartment (12)
Adapter (13)
Valve suction pipe (15)
Valve (16)

Disclosure of the Invention

[0016] As known, cooling system used in cooling devices basically comprises a compressor, a condenser, a filter unit, a capillary tube and an evaporator. The cooling system (1) shown in Figure 1 (illustrated with bold lines) comprises the same equipment. In the cooling system (1) accordingly, the refrigerant flowing hot out from the compressor (3) gives heat to outer environment while passing through the condenser (4), condenses and cools down to an extent. Then, the refrigerant, which passes through the filter unit (5), leaves the humidity and foreign materials on this unit (5). Next, the refrigerant, which has passed through the capillary tube (6) and been depressurized, reaches the evaporator in the freezing compartment (7) of the device. Here, the refrigerant evaporates and turns into gas thanks to the heat it takes from the compartment and its low pressure. In the evaporator (7) the refrigerant, which ensures cooling of the compartment owing to the heat it takes from the compartment, returns to the compressor (3) and the known cooling cycle is completed. This cycle is carried on cyclically.

[0017] Incorporated into the above mentioned cooling system (1), the defrosting system (2) of the invention is developed for defrosting the frost accumulated on the evaporator (7). As shown in Figure 1 and 2, the cooling device is provided with a valve (8 or 16) which diverts the refrigerant, which flows out from the compressor (3), to the cooling system (1) or to the defrosting system (2).

[0018] The defrosting system (2) in the cooling device is activated periodically or depending on user preferences. The cooling function of the cooling device is performed even when the defrosting system (2) is operated.

[0019] When the defrosting system (2) is activated, the hot refrigerant, which passes through the valve (8 or 16) at the outlet of the compressor (3), is directly directed to at least one condenser (9) in the freezing compartment. The condenser (9) here exchanges heat with the evaporator (7) in the cooling system (1). Since the temperature of the gas that passes through the condenser (9) is higher than the temperature of the evaporator (7), the condenser heats the evaporator (7) and defrosts the frost accumulated on the evaporator. Thus, the layers of ice accumulated on the evaporator (7) are defrosted. A decrease occurs in the temperature of the gas passing through the condenser (9).

[0020] Another property of the defrosting system (2) is that the cooling of the volume in the cooling device continues during defrosting. To this end, at least one capillary tube (10) and at least one evaporator (11) in the freezing compartment are used. The refrigerant passing through the condenser (9) is this time passed through the capillary tube (10) and the evaporator (11) of the freezer, and the cooling of the freezing compartment continues.

[0021] Another property of the defrosting system (2) is that the refrigerant that flows out from the freezing compartment is passed through the evaporator in the cooling compartment (12) (the temperature of the cooling compartment is higher than the freezing compartment). Thus, any increase in the temperature of the cooling compartment is prevented.

[0022] The operations of the evaporator in the freezing compartment (11) and the evaporator of the cooling compartment (12) may be arranged depending on the user preferences. In other words, these two evaporators (11, 12) can operate together or separately. To this end, a diverter valve may be employed at the inlets of the evaporator of the freezing compartment (11) and/or the evaporator of the cooling compartment (12).

[0023] At least one three-way valve (Figure 1 shows a four-way valve (8), Figure 2 shows a three-way valve (16)) is employed at the outlet of the compressor (3) in order to divert the refrigerant that flows out from the compressor (3) to the cooling system (1) or to the defrosting system (2).

[0024] The three way valve (16) illustrated in Figure 2 has three ways one of which comes from the outlet of the compressor (3), one of which goes to the condenser (4) in the cooling system (1), and one of which goes to the condenser (9) in the defrosting system (2). In accordance with the process to be applied (cooling or defrosting), the valve (16) sets its position and diverts the refrigerant coming from the compressor (3) to the cooling system (1) or to the defrosting system (2). In the case that a three way valve (16) is employed, a certain amount of refrigerant remains in the cooling system (1) and the defrosting system (2). Figure 1 illustrates a structure wherein less refrigerant can be used.

[0025] The four way valve shown in Figure 1 has four ways one of which comes from the outlet of the compressor (3), one of which goes to the condenser (4) in the cooling system (1), and one of which goes to the condenser (9) in the defrosting system (2), and one of which goes to the inlet of the compressor (3) (valve suction pipe (15)). In this structure, one of the systems (1 or 2) stops operation while the other one (1 or 2) is operated thanks to the valve (8), the refrigerant remaining in the system which stopped operation is suctioned by means of the compressor (3). During this process, the refrigerant coming from the condenser (4) in the cooling system (1) or from the condenser (9) in the defrosting system (2) passes through the valve (8), and reaches the inlet of the compressor (3) through the valve suction pipe (15). In other words, the refrigerant is suctioned by means of the compressor (3) from the condenser (4 or 9) of the system that stops operation (1 or 2), is passed through the compressor (3) and is again supplied to the operating system through the valve (8). By utilizing the refrigerant remaining in the system which stopped, cooling and defrosting is performed with less refrigerant than the structure with three way valve (16) uses.

[0026] One of the advantages of the defrosting system (2) of the invention is to prevent the freezing and/or cooling compartments from being heated while the defrosting process is performed. Moreover, no extra energy is consumed during this process. To this end, it is ensured that

only one compressor (3) in the device is used, and both cooling and freezing processes are performed by this compressor (3). In addition, a simple and reliable system is obtained by employing minimum equipment (valve (8 or 16), condenser (9), capillary tube (10), evaporator (11 and/or 12), adapter (13)) for defrosting and cooling processes. Furthermore, an adapter (13), which always directs the incoming refrigerant to the compressor in gaseous phase, is employed at the outlet of the compressor (3), and it is ensured that all of the incoming ways pass through this adapter (13). Therefore, it is guaranteed that only gaseous refrigerant enters into the compressor.

Claims

1. A cooling device comprising a cooling system (1) wherein the refrigerant flowing out from the compressor (3) is cyclically passed through the condenser (4), the capillary tube (6) and the evaporator of the freezing compartment (7) and is returned to the compressor (3); and a defrosting system (2) for defrosting the frost on the evaporator (7) **characterized in that** it comprises
   a valve that selectively diverts the refrigerant flowing out from the compressor (3) to the cooling system (1) or to the defrosting system (2),
   and that the defrosting system (2) comprises
   a condenser to which the hot refrigerant is directed and which exchanges heat with the evaporator (7);
   a capillary tube (10) through which the refrigerant flowing out from the condenser (9) passes,
   an evaporator of the freezing compartment (11) to which the refrigerant that has passed through the capillary tube (10) is directed.

2. A cooling device according to Claim 1 **characterized in that** the defrosting system (2) comprises the evaporator in the cooling compartment (12) to which the refrigerant flowing out from the freezing compartment is directed.

3. A cooling device according to Claim 2 **characterized in that** the evaporator in the freezing compartment (11) and/or the evaporator in the cooling compartment (12) are each provided with a diverter valve at their inlets so that the evaporators (11, 12) operate selectively.

4. A cooling device according to Claim 1 **characterized in that** the said valve has at least three ways.

5. A cooling device according to Claim 4 **characterized in that** the said valve is a three way valve (16) one of the ways of which comes from the outlet of the compressor (3), one of the ways of which goes to the condenser (4) in the cooling system (1), and one of the ways of which goes to the condenser (9) in the defrosting system (2).

6. A cooling device according to Claim 4 **characterized in that** the said valve is a four way valve (8) one of the ways of which comes from the outlet of the compressor (3), one of the ways of which goes to the condenser (4) in the cooling system (1), and one of the ways of which goes to the condenser (9) in the defrosting system (2), and one of the ways of which goes to the inlet of the compressor (3).

7. A cooling device according to Claim 6 **characterized in that** the valve (8) is connected to the inlet of the compressor (3) with the valve suction pipe (15).

8. A cooling device according to Claim 7 **characterized in that** in the case that one of the systems (1 or 2) is stopped while the other one (1 or 2) is operated, the refrigerant remaining in the stopped system enters into the compressor (3) through the valve (8) and the valve suction pipe (15).

9. A cooling device according to Claim 1 **characterized in that** an adapter (13) which always directs the incoming refrigerant to the compressor in gaseous phase is provided at the inlet of the compressor (3).

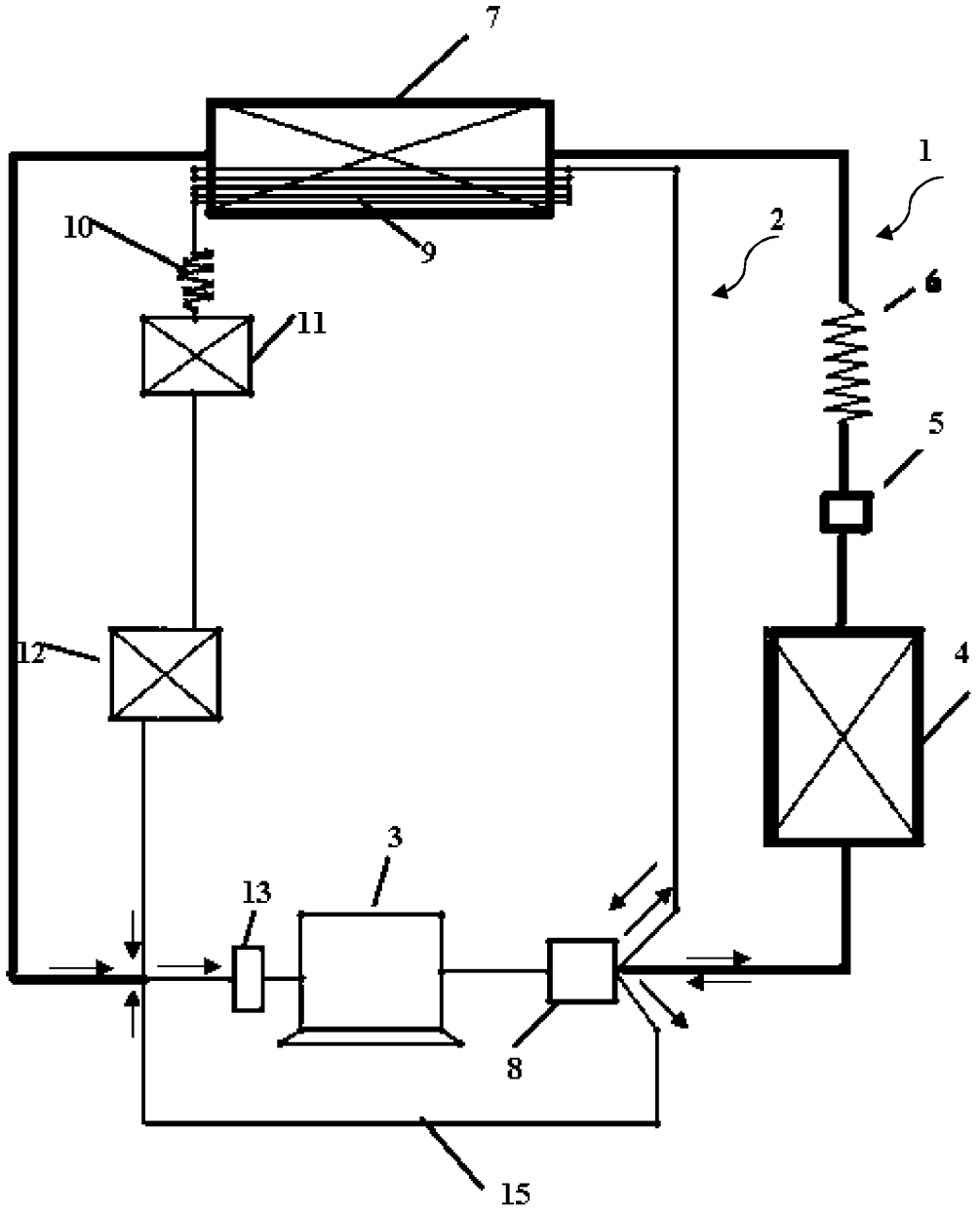

Figure - 1

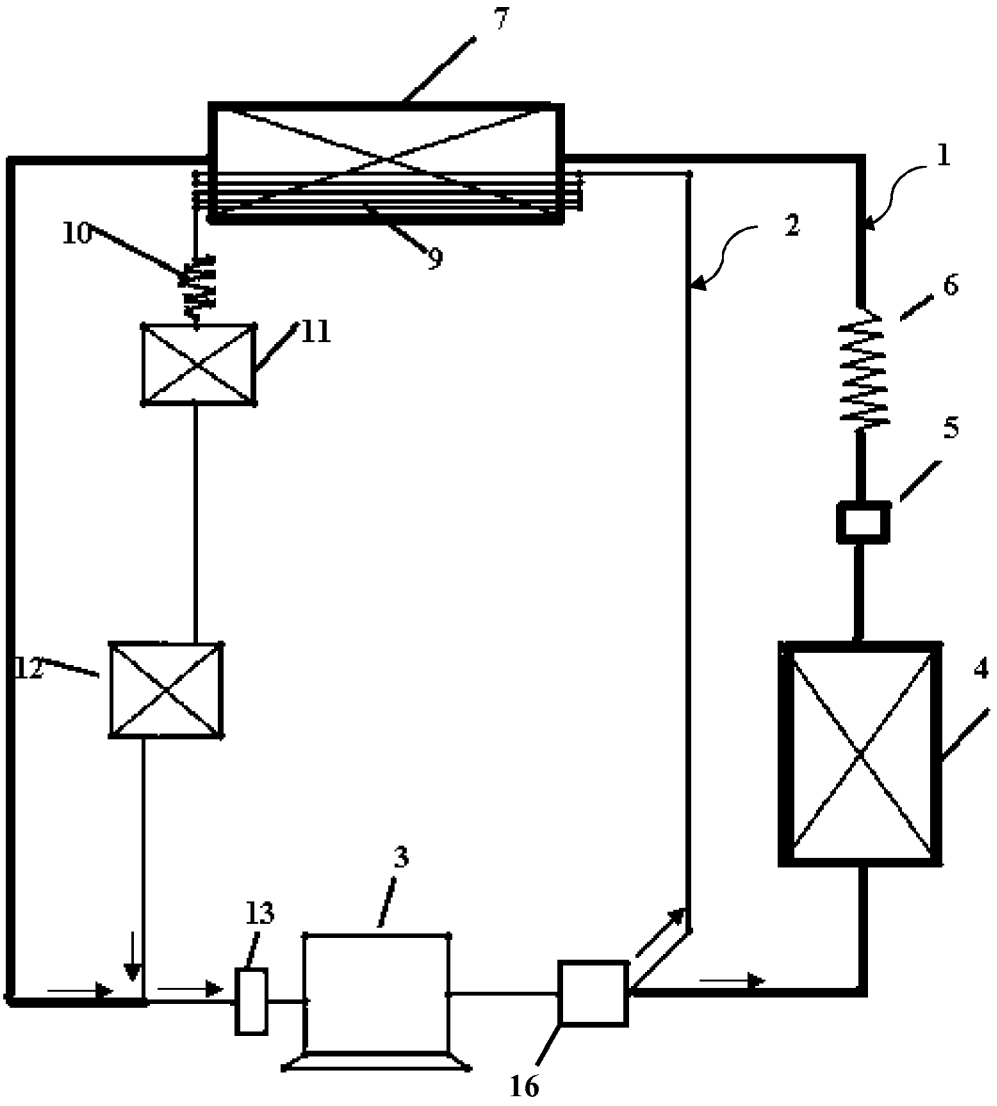

Figure – 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2009006139 A **[0003]**
- CN 201145456 **[0004]**