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(71) Applicant: **Vestel Beyaz Esya Sanayi Ve Ticaret A.S.**
45030 Manisa (TR)

(72) Inventors:
- **Kayikci, Bora**
  45010 Manisa (TR)
- **Kayikci Murat**
  45030 Manisa (TR)
- **Gazioglu, Alperen**
  45030 Manisa (TR)
- **Muminoglu, Fatih**
  45030 Manisa (TR)
- **Pekguzelsu, Mustafa**
  45030 Manisa (TR)
- **Deger, Mahir Erdem**
  45010 Manisa (TR)
- **Karayilan, Tekin**
  45010 Manisa (TR)
- **Aktas, Oner**
  45030 Manisa (TR)

(74) Representative: **Cayli, Hülya**
Paragon Consultancy Inc.
Koza Sokak No: 63/2
GOP
06540 Ankara (TR)

(54) An operation method for cooling devices

(57) This invention discloses an operation method for a cooling device (A). This device (A) comprises at least one compartment (2) for storing foodstuff; at least one cooling member (4); a fan arrangement (5) transferring the air it sucks from the cooling member (4) to said storage compartment (2); a cooling member chamber (1) in which a damper arrangement (8) is situated that opens/closes an airflow channel (10) between said chamber and the storage compartment (2); at least one heating member on the cooling member (4) for the defrost operation, and a control unit for the device. In the operation method of the device (A), the damper arrangement (8) is operated periodically so that any ice present on the arrangement (8) is broken down and that a damper (9) provided in this arrangement (8) opens the airflow channel (10) after a certain time following the completion of a defrost operation.

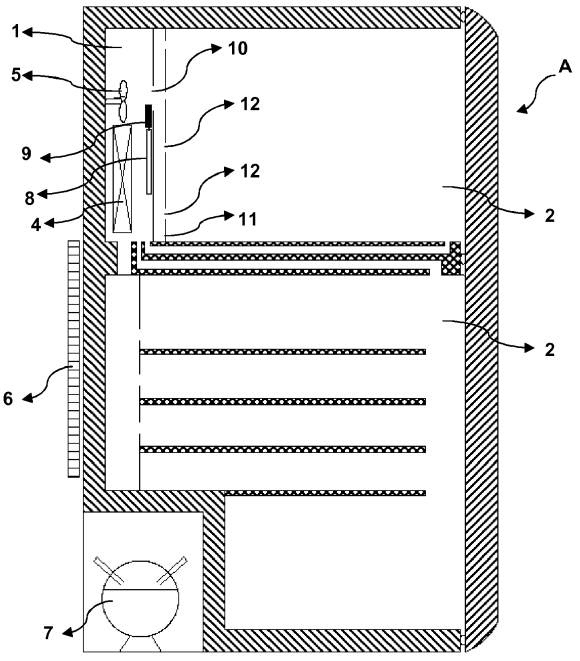

Figure – 1

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Description

Technical Field

[0001] This invention relates to a method of operation the damper and fan members which are in connection with a cooling member in cooling devices with defrost capability.

Prior Art

[0002] The most common problem encountered in the operation of cooling devices used in storing foodstuffs is frost formation on cooling members, e.g. evaporators, employed for the cooling operation. The ambient humidity in the chamber where the cooling member is situated leads to frost formation thereon and reduces the cooling efficiency thereof. For this reason, the frost on the cooling member must be removed, i.e. it has to be defrosted. As for the defrost operation, either the cooling device is shut down, or a heating member disposed on the cooling member is used for this purpose. In both cases, the temperature in the cooling device and therefore the temperature of foodstuff stored therein are raised up accordingly. This causes a greater problem particularly for the foodstuff stored in the device.

[0003] In order to prevent humid and hot air evaporated by means of the heating member from the cooling member from reaching the foodstuff storage compartments in the device, damper arrangements are employed separating the chamber where the cooling member is situated from these compartments. Damper arrangements close some airflow channels to avoid air transfer to said compartments during a defrost operation. Evaporated humid air, however, also condenses on the movable parts of damper arrangements and interfere their proper operation.

[0004] Another problem met in these devices is that air is blown by means of a fan from the chamber where the cooling member is situated to said compartments as soon as a defrost process is completed. This, in turn, causes humid air therein to be circulated back and to condense on unwanted components.

[0005] The published patent application US2006005566 can be cited as an example for the use of a damper arrangement according to the prior art. In that application, a damper arrangement is disclosed that opens/closes the front of an evaporator fan, but no operation method is described in that application for that arrangement that would solve the aforesaid problems.

Brief Description of Invention

[0006] As for the present invention, here is proposed a solution for the operation method of a fan and damper arrangement in cooling devices, which closes a section between the chamber where the cooling member is situated and the compartments in which foodstuffs are stored while a defrost operation is conducted on the cooling member.

[0007] The cooling device comprises at least one compartment where foodstuffs are stored; at least one cooling member; a fan arrangement transferring the air it sucks from the cooling member to said storage compartment; a cooling member chamber in which a damper arrangement is situated that opens/closes an airflow channel between said chamber and the storage compartment; at least one heating member on the cooling member for the defrost operation, and a control unit for the device. In the method of operating the device, the damper is operated periodically so that any ice thereon is broken down and that the damper in the arrangement opens the airflow channel after a certain time following the completion of the defrost operation.

Objective of Invention

[0008] The object of this invention is to develop an operation method for a damper arrangement that closes the section between the chamber where the cooling member is situated and the compartment where foodstuff is stored during a defrost operation.

[0009] Another object of this invention is to avoid any frost formation on the damper arrangement with the method developed.

[0010] A further object of this invention is to avoid the condensation of water from humid air at undesired places in a cooling device by operating a fan arrangement after humid air therein drops down to a certain level following a defrost operation.

[0011] Still a further object of this invention is to maintain the temperature equilibrium of the foodstuff storage compartment during and after a defrost operation and so to provide energy saving.

[0012] Yet a further object of this invention is to implement an easily-applicable and reliable operation method for cooling devices.

Description of Figure

[0013] An illustrative embodiment of the interior of a cooling device is shown in the annexed figure briefly described hereunder.

[0014] Figure 1 is a cross-sectional illustration of a cooling device.

[0015] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below.

Cooling device (A)
Chamber of the cooling member (1)
Foodstuff storage compartment (2)
Cooling member (4)
Fan arrangement (5)
Condenser (6)
Compressor (7)

Damper arrangement (8)
Damper (9)
Airflow channel (10)
Inner wall (11)
Airflow channel (12)

Description of Invention

[0016] Figure 1 gives a cross-sectional view of a cooling device (A). The cooling device (A) comprises at least one compartment (2) for storing foodstuff (the compartments (2) illustratively shown in Figure 1 can be used as a freezer compartment and cooler compartment) and at least one cooling member (4). The cooling member (4) may be in the form of an evaporator used together with a compressor (7) and condenser (6), or of a thermoelectric cooler (e.g. Peltier).

[0017] The device (A) is further provided with a cooling member chamber (1), in which are disposed said cooling member (4), a fan arrangement (5) transferring the air it sucks from said member (4) to the storage compartment (2), and a damper arrangement (8) opening/closing an airflow channel (10) between the chamber and the storage compartment (2). Air coming from the chamber (1) of the cooling member is transferred to the storage compartment by the fan arrangement (5) either directly, or by means of at least one airflow channel (12) provided on at least one inner wall (11) in the storage compartment.

[0018] Frost formation sometimes occurs on the cooling member (4) provided in the device (A) and a defrost operation is used to remove this frost from the cooling member (4). For the defrost operation, at least one heating member (not illustrated in figures) is used on the cooling member (4) so as to evaporate the frost. On the other hand, in order to prevent the generated water vapor from reaching the interior of the storage compartment (2) from the cooling member chamber (1), the front of the airflow channel (10) is closed by a damper arrangement (8).

[0019] Frost formation on the cooling member (4) sometimes effects the damper arrangement as well. Under a normal operation condition of the device, frost formation can also occur on the damper arrangement (8), like the case of the cooling member (1). In addition to this, when the damper (9) closes the airflow channel, it becomes possible that water particles evaporated from the cooling member (1) condenses on the damper arrangement (8) and creates an ice layer thereon. Even if no ice formation occurs on the damper arrangement (8), it affects the operative functions of the damper arrangement, e.g. the damper (9) cannot open or close the channel (10).

[0020] Another negative circumstance due to the defrost operation is that humid and hot air already present in the chamber of the cooling member (1) is transferred into the storage compartment (2) by means of the fan arrangement (5). In this case, humid and hot air passes through the airflow channels (10 and/or 12) and reaches the storage compartment (1), so as to increase the temperature of foodstuff, and since the storage compartment (2) is still relatively cooler, it may lead to frost formation in the channels (10 and/or 12). As a result of frost formation in the channels (10 and/or 12), the sections where through air passes are narrowed and accordingly the performance of the cooling device reduces.

[0021] These negative cases are avoided with the operation method according to the present invention. For this purpose, the damper arrangement (8) is periodically operated during normal operation and/or defrost operation and the damper (9) opens/closes the channel (10), thereby breaking down any low amount of ice formed on the arrangement (8). In this manner, ice accumulation on the damper arrangement (8) is prevented so that its negative effect on the arrangement (8), i.e. rendering the latter nonfunctional, is eliminated. Another feature of this method is that the damper (9) does not open and/or the fan arrangement (5) does not start blowing air just when a defrost operation is completed. A certain time, or duration, is allowed for this purpose, this time being required for the humidity at the chamber of the cooling member (1) to condense back to a certain extent. This time can either be a duration predetermined at the control unit (not illustrated in the Figure) of the device (A), or a duration to be determined by at least one sensor in connection with the control unit measuring the temperature and/or humidity of the chamber of the cooling member (1) (the control unit regulates the operation of all parts and units in the device (A)).

Claims

1. An operation method for a cooling device (A) comprising at least one compartment (2) for storing foodstuff; at least one cooling member (4); a fan arrangement (5) transferring the air it sucks from the cooling member (4) to said storage compartment (2); a cooling member chamber (1) in which a damper arrangement (8) is situated that opens/closes an airflow channel (10) between said chamber and the storage compartment (2); at least one heating member on the cooling member (4) for the defrost operation, and a control unit for the device, **characterized in that**
ice formed on the flap arrangement (8) is broken down by operating this arrangement (8) periodically; and
a damper (9) in this arrangement (8) opens the airflow channel (10) after a certain duration following the completion of a defrost operation.

2. The method according to Claim 1, **characterized in that** the fan arrangement (5) starts blowing air after a certain duration following the completion of a defrost operation.

3. The method according to Claim 1 or 2, **characterized in that** said duration is a duration that is pre-

determined at the control unit.

4. The method according to Claim 1 or 2, **characterized in that** said duration is a duration that is determined by at least one sensor in connection with the control unit measuring the temperature and/or humidity in the cooling member chamber (1).

5. The method according to Claim 1, **characterized in that** the damper arrangement (8) is operated periodically during the normal operation of the device (A).

6. The method according to Claim 1, **characterized in that** the damper arrangement (8) is operated periodically during the defrost operation of the device (A).

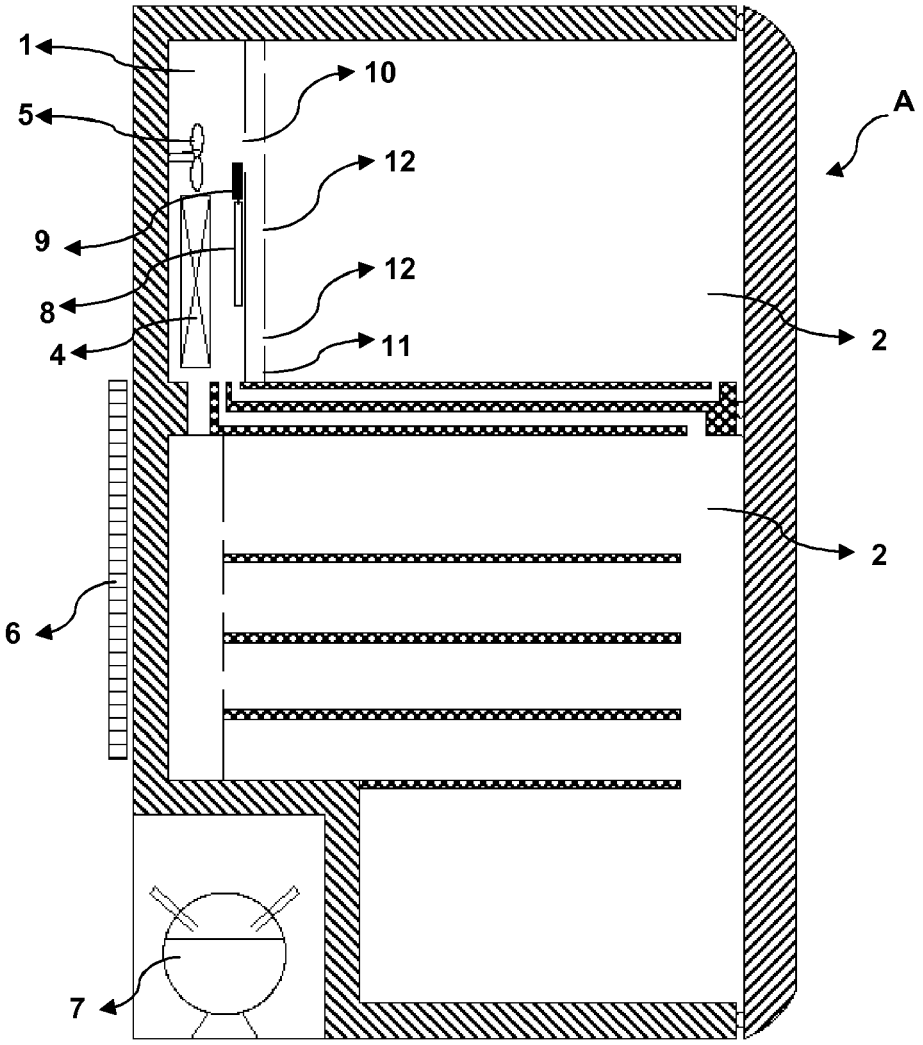

Figure – 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2006005566 A **[0005]**