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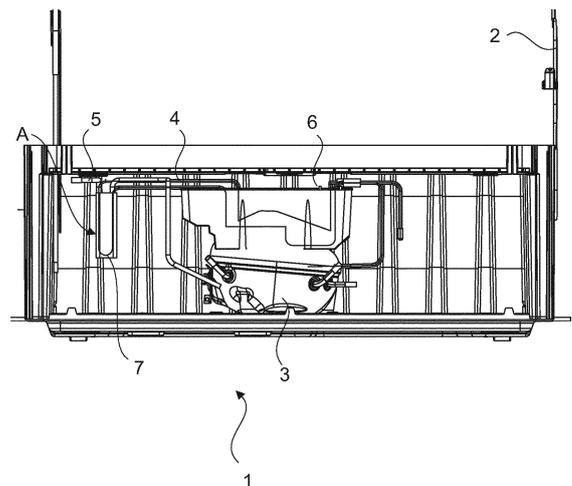
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(54) **A COOLING DEVICE**

(57) The present invention relates to a cooling device (1) comprising a cabinet (2); a compressor (3) which moves the refrigerant fluid in the refrigeration cycle; a condenser which condenses the refrigerant fluid; a capillary tube; an evaporator which draws the thermal energy to cool down the inner volume of the body; an evaporation tray (6) which collects the water melting during the defrosting to be evaporated; a heater (4) which provides the evaporation of the water in the evaporation tray (6), which connects the compressor (3) outlet to the condenser inlet and which provides the transfer of the refrigerant fluid from the compressor (3) to the condenser; a return tube which (5) is connected to the compressor (3) inlet and a connection member (7) which connects the return tube (5) to the heater (4) so as to contact each other. In the embodiment of the present invention, the direction of the heat transfer is from the refrigerant fluid leaving the compressor (3) to the refrigerant fluid returning to the compressor (3).

Figure 1



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Description

[0001] The present invention relates to a cooling device wherein the problem of sweating on the return tube is eliminated.

[0002] In cooling devices, when the compressor is started, the refrigerant fluid is transferred from the condenser to the capillary, then to the evaporator via the capillary, and finally, returns to the compressor via the return tube to be pumped back into the system. The refrigerant fluid is at the coldest state at the evaporator inlet and absorbs the heat inside the fresh food compartment and/or the freezing compartment while passing through the evaporator. Thus, the refrigerant fluid flowing through the return tube is enabled to reach an optimized temperature. However, depending on the cooling system, the heat provided by the capillary is not always sufficient to heat the refrigerant fluid to a temperature exceeding the dew point temperature thereof at the operating ambient conditions of the cooling device. As a result, if the return pipe coming out from the bottom of the cabinet is cold, the problem of sweating at the outlet, in other words, the problem of condensation of water on the surface of the return tube under the cooling device is encountered. This causes user complaints.

[0003] In the state of the art European Patent Application No. EP0541343, a cooling system is disclosed, wherein a heat exchanger is connected to the return tube carrying the refrigerant fluid, thus increasing the efficiency of the refrigerant fluid by intercooling/pre-cooling during the compressor stages. In this document, the heat exchanger is located between the condenser outlet and the compressor inlet, and the direction of heat transfer is from the refrigerant fluid returning to the compressor to the refrigerant fluid leaving the condenser, aiming to increase efficiency by cooling the return tube.

[0004] The aim of the present invention is the realization of a cooling device wherein the problem of sweating on the return tube is eliminated.

[0005] The cooling device realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims thereof, comprises a heater which provides the evaporation of the water in the evaporation tray, which connects the compressor outlet to the condenser inlet and which provides the transfer of the refrigerant fluid from the compressor to the condenser; a return tube which is connected to the compressor inlet and a connection member which connects the return tube to the heater so as to contact each other. In the embodiment of the present invention, the direction of the heat transfer is from the refrigerant fluid leaving the compressor to the refrigerant fluid returning to the compressor.

[0006] By means of the present invention, when the compressor is operated, the refrigerant fluid is hot, and the heater, which provides the evaporation of the water in the evaporation tray, contacts the cold return tube by means of the connection member, thus the return tube

is heated and the problem of condensation on the return tube, hence the problem of sweating in the cabinet, is eliminated.

[0007] The compressor compresses the refrigerant fluid absorbed from the suction line and pumps the same into the condenser as superheated vapor. The refrigerant, which condenses in the condenser by dissipating its heat, reaches the capillary tube. At the same time, the heater used to evaporate the water in the evaporation tray placed on the compressor located under the body evaporates the water in the evaporation tray. The refrigerant fluid, which is sprayed to the evaporator with the pressure thereof being reduced at the outlet of the capillary tube, evaporates by drawing heat from the inner volume of the body. Thus, the inner volume of the body is cooled down. The evaporating refrigerant fluid is sucked by the compressor via the return tube and the refrigeration cycle is repeated. Since the return tube and the heater contact each other by means of the connection member, it is ensured that the return tube is sufficiently heated above the dew point temperature to prevent the formation of droplets due to condensation that occurs because of the coldness of the return tube.

[0008] In the preferred embodiment of the present invention, the connection member is a macaroon tube. Macaroon is a special insulation cover and has a special structure which shrinks to a certain extent when being subjected to heat and thanks to this shrinkage, fixes, covers and closes the area where the same is used. Thus, the two tubes, which are the heater and the return tube, are mechanically connected to each other so as to have a direct contact zone therebetween to allow heat exchange. Thus, it is ensured that the return tube and the heater fully contact each other to be effectively grouped.

[0009] In another embodiment of the present invention, the connection member may be a rubber tube, band, clamps or a combination thereof.

[0010] The evaporation tray is a container where the water melting during the defrosting is accumulated to be evaporated, and is disposed in the vicinity of the compressor, preferably on the compressor, so as to be affected by the waste heat of the compressor.

[0011] The heater is formed by being bent in various forms and placed into the evaporation tray, and provides the transfer of the refrigerant fluid from the compressor to the condenser, while providing the evaporation of the water accumulated in the evaporation tray by utilizing the heat of the refrigerant fluid flowing therethrough.

[0012] In an embodiment of the present invention, the contact zone where the heater and the return tube are connected to each other by means of the connection member is bent in the form of a U. Thus, the heater and the return tube are enabled to contact each other at a surface as wide as possible.

[0013] By means of the present invention, the return tube is enabled to mechanically contact the heater by means of the connection member such that heat transfer occurs therebetween so as to heat the return tube above

the dew point temperature and the droplets are prevented from forming on the return tube.

[0014] A cooling device realized in order to attain the aim the object of the present invention is illustrated in the attached figures, where:

Figure 1 - is the view of the bottom of a cooling device cabinet.

Figure 2 - is the perspective view of the heater.

Figure 3 - is the perspective view of the return tube.

Figure 4 - is the sideways view of the connection member, the evaporation tray, the heater and the return tube.

Figure 5 - is the perspective view of the connection member, the evaporation tray, the heater and the return tube.

[0015] The elements illustrated in the figures are numbered as follows:

1. Cooling device
2. Cabinet
3. Compressor
4. Heater
5. Return tube
6. Evaporation tray
7. Connection member

A - Contact zone

[0016] The cooling device (1) of the present invention comprises a cabinet (2); a compressor (3) which moves the refrigerant fluid in the refrigeration cycle; a condenser which condenses the refrigerant fluid; a capillary tube; an evaporator which draws the thermal energy to cool down the inner volume of the body; an evaporation tray (6) which collects the water melting during the defrosting to be evaporated; a heater (4) which provides the evaporation of the water in the evaporation tray (6), which connects the compressor (3) outlet to the condenser inlet and which provides the transfer of the refrigerant fluid from the compressor (3) to the condenser; a return tube which (5) is connected to the compressor (3) inlet and a connection member (7) which connects the return tube (5) to the heater (4) so as to contact each other. In the embodiment of the present invention, the direction of the heat transfer is from the refrigerant fluid leaving the compressor (3) to the refrigerant fluid returning to the com-

pressor (3) (Figure 1).

[0017] By means of the present invention, when the compressor (3) is operated, the refrigerant fluid is hot, and the heater (4), which provides the evaporation of the water in the evaporation tray (6), contacts the cold return tube (5) by means of the connection member (7), thus the return tube (5) is heated and the problem of condensation on the return tube (5), hence the problem of sweating on the bottom of the cabinet, is eliminated.

[0018] The compressor (3) compresses the refrigerant fluid absorbed from the suction line and pumps the same into the condenser as superheated vapor. The refrigerant, which condenses in the condenser by dissipating its heat, reaches the capillary tube. At the same time, the heater (4) used to evaporate the water in the evaporation tray (6) placed on the compressor (3) located under the cabinet (2) evaporates the water in the evaporation tray (6). The refrigerant fluid, which is sprayed to the evaporator with the pressure thereof being reduced at the outlet of the capillary tube, evaporates by drawing heat from the inner volume of the cabinet (2). Thus, the inner volume of the cabinet (2) is cooled down. The evaporating refrigerant fluid is sucked by the compressor (3) via the return tube (5) and the refrigeration cycle is repeated. Since the return tube (5) and the heater (4) contact each other by means of the connection member (7), it is ensured that the return tube (5) is sufficiently heated above the dew point temperature to prevent the formation of droplets on the return tube (5).

[0019] Thus, by means of the connection member (7), the two tubes, which are the heater (4) and the return tube (5), are mechanically connected to each other so as to have a direct contact zone (A) therebetween to allow heat exchange. In the preferred embodiment of the present invention, the connection member (7) is a macaroon tube. Macaroon is a special insulation cover and has a special structure which shrinks to a certain extent when being subjected to heat and thanks to this shrinkage, fixes, covers and closes the area where the same is used. Thus, it is ensured that the return tube (5) and the heater (4) fully contact each other to be effectively grouped (Figure 3).

[0020] In another embodiment of the present invention, the connection member (7) may be a rubber tube, band, clamps or a combination thereof.

[0021] The evaporation tray (6) is a container where the water melting during the defrosting is accumulated to be evaporated, and is disposed in the vicinity of the compressor (3), preferably on the compressor (3), so as to be affected by the waste heat of the compressor (3).

[0022] The heater (4) is formed by being bent in various forms and placed into the evaporation tray (6), and provides the transfer of the refrigerant fluid from the compressor (3) to the condenser, while providing the evaporation of the water accumulated in the evaporation tray (6) by utilizing the heat of the refrigerant fluid flowing therethrough (Figure 2).

[0023] In an embodiment of the present invention, the

contact zone (A) where the heater (4) and the return tube (5) are connected to each other by means of the connection member (7) is bent in the form of a U. Thus, the heater (4) and the return tube (5) are enabled to contact each other at a surface as wide as possible (Figure 4 and Figure 5).

[0024] By means of the present invention, the return tube (5) is enabled to mechanically contact the heater (4) by means of the connection member (7) such that heat transfer occurs therebetween so as to heat the return tube (5) above the dew point temperature and the droplets are prevented from forming on the return tube (5).

Claims

1. A cooling device (1) **comprising** a cabinet (2); a compressor (3) which moves the refrigerant fluid in the refrigeration cycle; a condenser which condenses the refrigerant fluid; a capillary tube; an evaporator which draws the thermal energy to cool down the inner volume of the body; and an evaporation tray (6) which collects the water melting during the defrosting to be evaporated, **characterized by** a heater (4) which provides the evaporation of the water in the evaporation tray (6), which connects the compressor (3) outlet to the condenser inlet and which provides the transfer of the refrigerant fluid from the compressor (3) to the condenser; a return tube which (5) is connected to the compressor (3) inlet and a connection member (7) which connects the return tube (5) to the heater (4) so as to contact each other.
2. A cooling device (1) as in Claim 1, **characterized by** the connection member (7) which connects the heater (4) and the return tube (5) to each other mechanically so as to have a direct contact zone (A) therebetween to allow heat exchange.
3. A cooling device (1) as in Claim 1 or 2, **characterized by** the connection member (7) which is a macaroon tube.
4. A cooling device (1) as in Claim 1, 2 or 3, **characterized by** the connection member (7) which may be a rubber tube, band, clamps or a combination thereof.
5. A cooling device (1) as in Claim 1, **characterized by** the evaporation tray (6) wherein the water melting during the defrosting is accumulated to be evaporated, and which is disposed in the vicinity of the compressor (3) so as to be affected by the waste heat of the compressor (3).
6. A cooling device (1) as in Claim 5, **characterized by** the evaporation tray (6) which is placed on the compressor (3).
7. A cooling device (1) as in Claim 1, **characterized by** the heater (4) which is formed by being bent in various forms and placed into the evaporation tray (6), and which provides the transfer of the refrigerant fluid from the compressor (3) to the condenser, while providing the evaporation of the water accumulated in the evaporation tray (6) by utilizing the heat of the refrigerant fluid flowing therethrough.
8. A cooling device (1) as in any one of the above claims, **characterized by** the heater (4) and the return tube (5) which are connected to each other by means of the connection member (7) at the contact zone (A) which is bent in the form of a U.

Figure 1

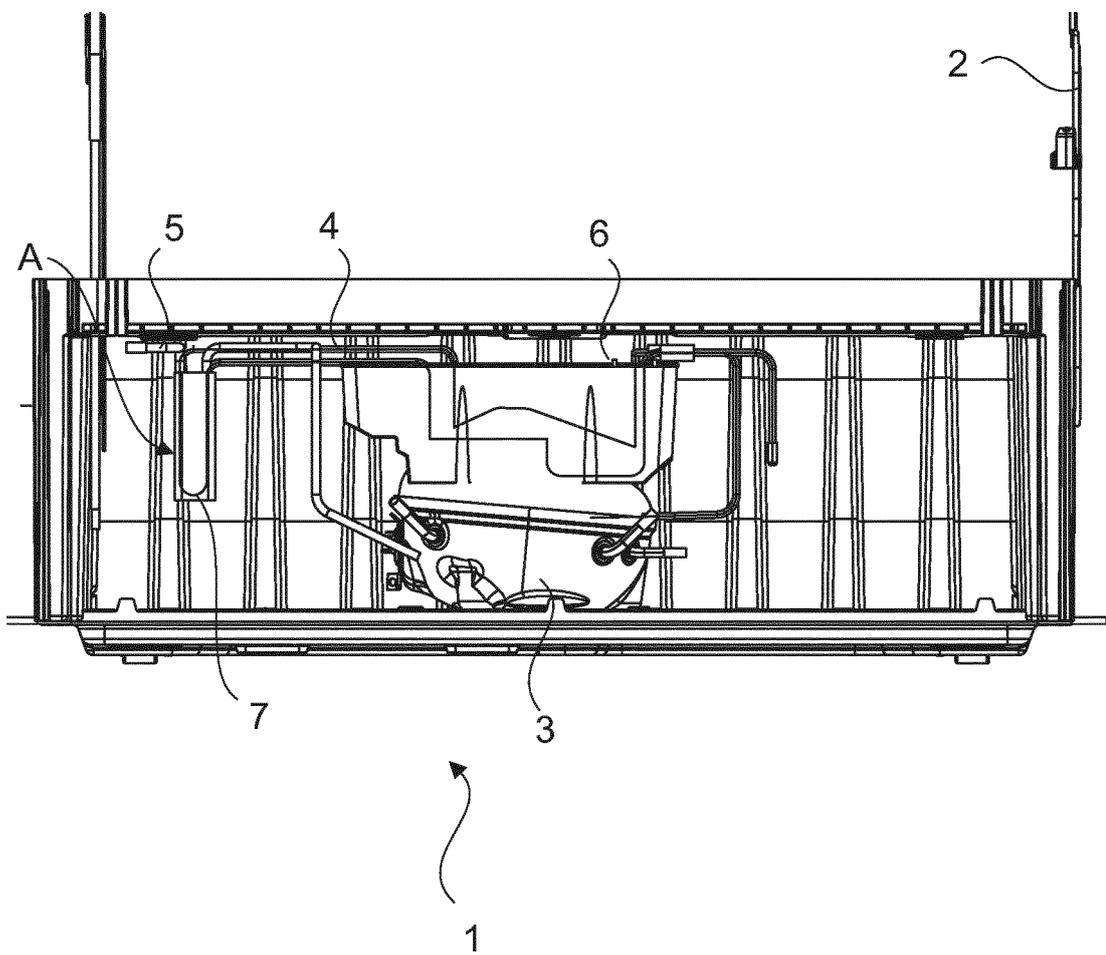


Figure 2

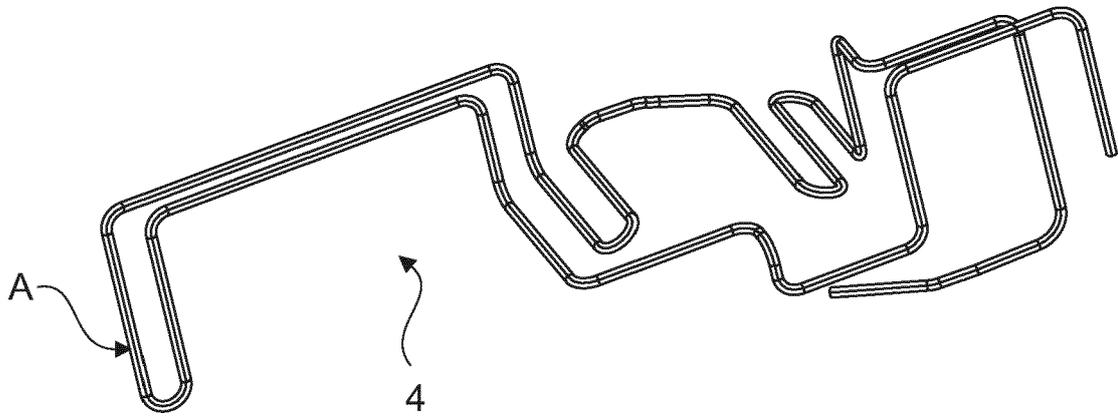


Figure 3

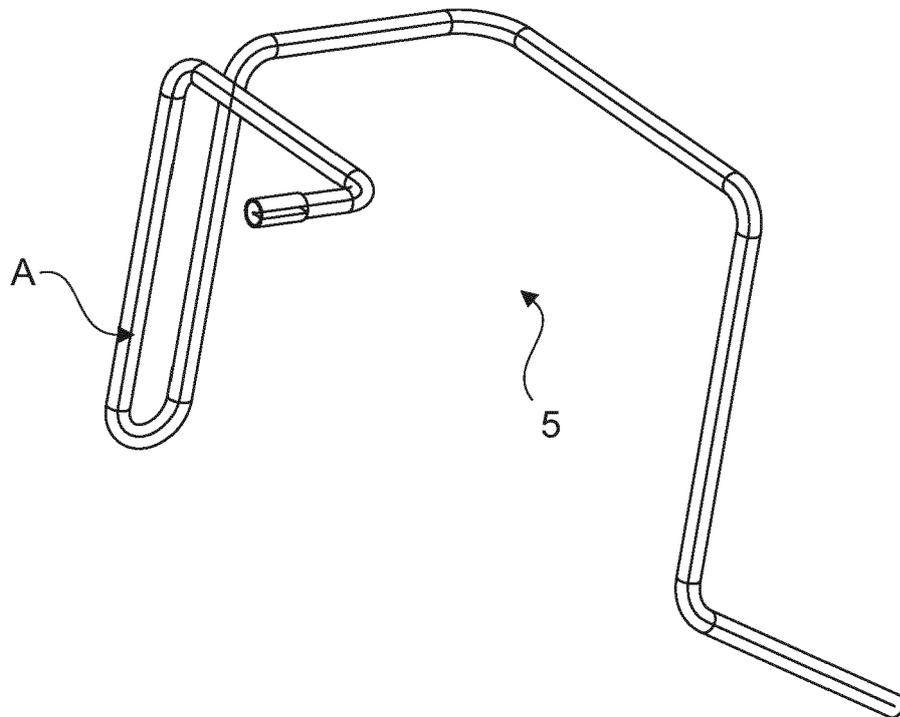


Figure 4

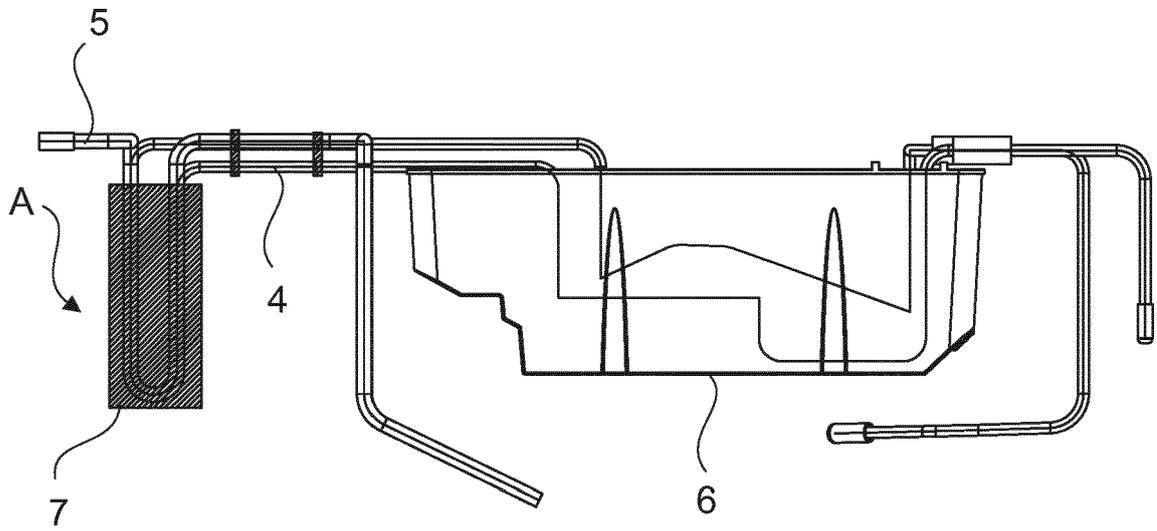
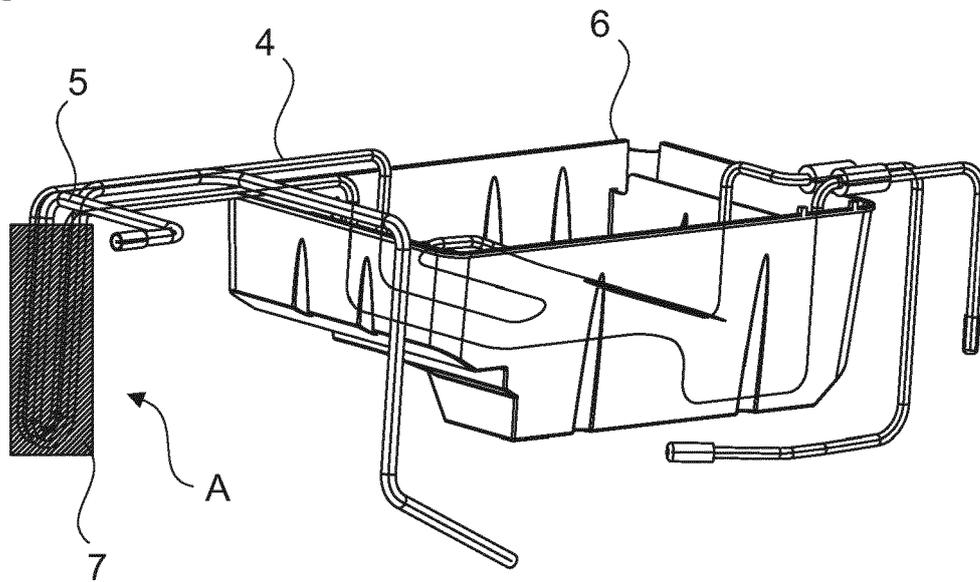


Figure 5





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Application Number

EP 22 21 0201

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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