(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 945 271 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.02.2022 Bulletin 2022/05

(21) Application number: **21188212.1**

(22) Date of filing: **28.07.2021**

(51) International Patent Classification (IPC):
F25D 23/00 *(2006.01)* ***F25D 21/14*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F25D 23/003; F25D 21/14

(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
Designated Validation States:
KH MA MD TN

(30) Priority: **29.07.2020 TR 202012072**

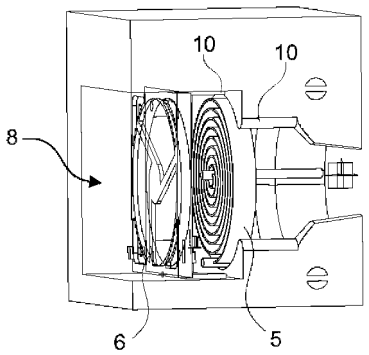
(71) Applicant: **Arçelik Anonim Sirketi**
34445 Istanbul (TR)

(72) Inventors:
- **ATAKURU, Seren**
  34445 ISTANBUL (TR)
- **TASKIN, Mert Can**
  34445 ISTANBUL (TR)
- **ERDOGAN, Koray**
  34445 ISTANBUL (TR)
- **ATSIZ, Tayfun**
  34445 ISTANBUL (TR)
- **KARAKAYA, Erkan**
  34445 ISTANBUL (TR)

(54) **A COOLING DEVICE**

(57) The present invention relates to a cooling device (1) comprising at least one cabinet (2) wherein the foodstuffs to be cooled are placed; a compressor (3) which compresses a refrigerant fluid; at least one evaporator (4) which provides the heat transfer between the refrigerant fluid and the cabinet (2) which is cooled; a condenser (5) which condenses the refrigerant fluid; a fan (6) which blows air onto the condenser (5) so as to provide forced thermal convection; and a receptacle (7) wherein the defrost water coming from the evaporator (4) is collected so as to be evaporated.

Figure 3



EP 3 945 271 A1

Description

[0001] The present invention relates to a cooling device wherein the arrangement of the components in the machine room is improved.

[0002] In the refrigerant cycle performed in cooling devices, the thermal energy drawn from the cooling cabinet is discharged by means of forced convection provided by the air blown by a fan onto the condenser. At the same time, a defrost process is performed to remove the frost formed on the refrigeration system. The water thawed during the defrost process is collected in a receptacle to be evaporated by heat. In order to perform evaporation, a sufficient amount of heat must be transferred to the receptacle. In state of the art embodiments, the fan and the condenser are fixed to the base of the machine room so as to be close to each other, and the receptacle is disposed close to the components of the refrigerant line which heats up so as to benefit from the waste heat. However, a problem encountered in the state of the art embodiments is that the evaporation rate remains low as a result of failing to efficiently transfer the waste heat of the components of the refrigerant line to the receptacle. Another problem is that the arrangement of the components of the refrigerant line and the receptacle is limited due to the volume of the machine room.

[0003] In the state of the art International Patent Application No. WO2015062661, a cooling device is disclosed, wherein the structural relation between the heat exchanger and the defrost water collection receptacle is improved.

[0004] The aim of the present invention is the realization of a cooling device wherein the amount of heat transferred to the receptacle is increased.

[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 an air duct which is in the form of a tunnel provided on a receptacle wherein the defrost water fills, and which receives the condenser and the fan. Thus, the waste heat is efficiently used to evaporate the defrost water and ease of arrangement is provided.

[0006] In an embodiment of the present invention, the air duct and the receptacle are separated from each other by means of a curved wall which protrudes into the receptacle. Thus, the volume of the receptacle wherein the water is collected surrounds the air duct and the amount of heat transferred to the water in the receptacle is increased.

[0007] In another embodiment of the present invention, the air duct has a structure which at least partially narrows down in the flow direction of the air. Thus, the airflow in the air duct is regulated so as to increase the amount of heat transferred to the receptacle.

[0008] In another embodiment of the present invention, at least one step against which the condenser bears at the sides thereof is provided on the inner side of the air duct. The step determines the position of the condenser in the air duct and supports the condenser. Thus, ease of assembly is provided and formation of noise is prevented.

[0009] In another embodiment of the present invention, a plurality of steps each having a different width are provided on the inner side of the air duct. Thus, the air duct is made suitable for the placement of condensers in different sizes depending on the capacity of the cooling device.

[0010] In another embodiment of the present invention, the fan is attached to the air duct by means of a movable connection which allows the adjustment of the distance between the condenser and the fan. Thus, the position of the fan is adjusted depending on the position of the condenser placed into the body, and the air flow delivered onto the condenser can be adjusted.

[0011] By means of the present invention, thanks to the integrated structure of the receptacle and the air duct, ease of arrangement is provided and the amount of heat transferred to the receptacle is increased.

[0012] The cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the rear view of the cooling device related to an embodiment of the present invention.

Figure 2 - is the perspective view of the receptacle related to an embodiment of the present invention.

Figure 3 - is the schematic view of the air duct, the condenser and the fan related to another embodiment of the present invention.

Figure 4 - is the schematic view of the air duct related to another embodiment of the present invention.

[0013] The elements illustrated in the figures are numbered as follows:

1. Cooling device
2. Cabinet
3. Compressor
4. Evaporator
5. Condenser
6. Fan
7. Receptacle
8. Air duct
9. Wall
10. Step
11. Machine room

[0014] The cooling device (1) comprises at least one cabinet (2) wherein the foodstuffs to be cooled are placed; a compressor (3) which compresses a refrigerant fluid; at least one evaporator (4) which provides the heat transfer between the refrigerant fluid and the cabinet (2) which is cooled; a condenser (5) which condenses the refrigerant fluid; a fan (6) which blows air onto the condenser (5) so as to provide forced thermal convection; and a receptacle (7) wherein the defrost water coming

from the evaporator (4) is collected so as to be evaporated. The receptacle (7) is disposed into a machine room (11) of the cooling device (1). The defrost water coming from the evaporator (4) fills into the receptacle (7).

[0015] The cooling device (1) of the present invention comprises an air duct (8) which is in the form of a cut-out provided on the receptacle (7) and wherein the fan (6) and the condenser (5) are placed. The receptacle (7) is in the form of a container with open top. The water coming from the evaporator (4) is collected in the receptacle (7). The air duct (8) is configured in the form of a cut-out extending along the receptacle (7) from one end of the receptacle (7) to the other end thereof. The fan (6) and the condenser (5) are fixed into the air duct (8). The air which is passed over the condenser (5) by means of the fan (6) and which draws the heat of the condenser (5) flows through the air duct (8). By means of the compact and integrated structure of the receptacle (7) and the air duct (8), the amount of heat transferred is increased, providing an advantage of arrangement.

[0016] In an embodiment of the present invention, the air duct (8) recesses into the receptacle (7). The air duct (8) is positioned at the lower side of the receptacle (7) and recesses into the receptacle (7) wherein the water is collected. A wall (9) which at least partially surrounds the air duct (8) recesses into the receptacle (7). The wall (9) has a U-shaped cross-section so as to surround the top and the sides of the air duct (8). By means of the structure of the air duct (8) recessing into the receptacle (7), a wide surface is formed between the receptacle (7) and the air duct (8), in other words, the surface area of the wall (9) separating the volume of the receptacle (7) wherein the water is collected from the air duct (8) is widened, thus increase the amount of heat transferred to the water in an advantageous manner.

[0017] In an embodiment of the present invention, the part of the air duct (8) after the condenser (5) in the flow direction of the air has a narrowing form. The part of the air duct (8) after the condenser has a conical form which narrows down. Thus, the air flow is regulated, and the amount of noise which may be generated during the operation of the fan (6) is decreased.

[0018] In another embodiment of the present invention, at least one step (10) against which the condenser (5) bears at the sides thereof is provided on the inner wall of the air duct (8). The step (10) is in the form of a protrusion on the inner surface of the air duct (8), which decreases the diameter of the air duct (8). The condenser (5) is placed into the air duct (8) so as to bear against the step (10). The step (10) ensures the easy placement of the condenser (5).

[0019] In another embodiment of the present invention, a plurality of steps (10) are arranged one after the other. The steps (10) are in the form of protrusions which are arranged one after the other so as to create passages with different widths in the air duct (8) and to decrease the diameter of the air duct (8). Thus, each step (10) enables a condenser (5) in different size to be attached into the air duct (8) so as to bear against the step (10). Thus, the condensers (5) in different sizes are allowed to be placed into the air duct (8).

[0020] In another embodiment of the present invention, the fan (6) is movably attached onto the air duct (8) so as to allow the adjustment of the air flow sent onto the condenser (5). The fan (6) is attached to the air duct (8) so as to move forwards/backwards in the air duct (8) so as to enable the distance between the condenser (5) and the fan (6) to be changed or in a pivoting manner so as to enable the angle of the air sent onto the condenser (5) to be changed. Thus, the air flow is regulated by adjusting the distance between the fan (6) and the condenser (5) and the angle of the air reaching the condenser (5).

[0021] By means of the present invention, thanks to the integrated structure of the receptacle (7) and the air duct (8), ease of arrangement is provided and the waste heat of the condenser (5) is enabled to be efficiently transferred to the receptacle (7).

Claims

1. A cooling device (1) comprising at least one cabinet (2) wherein the foodstuffs to be cooled are placed; a compressor (3) which compresses a refrigerant fluid; at least one evaporator (4) which provides the heat transfer between the refrigerant fluid and the cabinet (2) which is cooled; a condenser (5) which condenses the refrigerant fluid; a fan (6) which blows air onto the condenser (5) so as to provide forced thermal convection; and a receptacle (7) wherein the defrost water coming from the evaporator (4) is collected so as to be evaporated, **characterized by** an air duct (8) which is in the form of a cut-out provided on the receptacle (7) and wherein the fan (6) and the condenser (5) are placed.

2. A cooling device (1) as in Claim 1, **characterized by** the air duct (8) recessing into the receptacle (7).

3. A cooling device (1) as in Claim 1 or 2, **characterized by** the air duct (8) of which the part after the condenser (5) in the flow direction of the air has a narrowing form.

4. A cooling device (1) as in any one of the above claims, **characterized by** at least one step (10) which is provided on the inner wall of the air duct (8) and against which the condenser (5) bears.

5. A cooling device (1) as in Claim 4, **characterized by** a plurality of steps (10) which are arranged one after the other.

6. A cooling device (1) as in any one of the above claims, **characterized by** the fan (6) which is movably attached to the air duct (8).

Figure 1

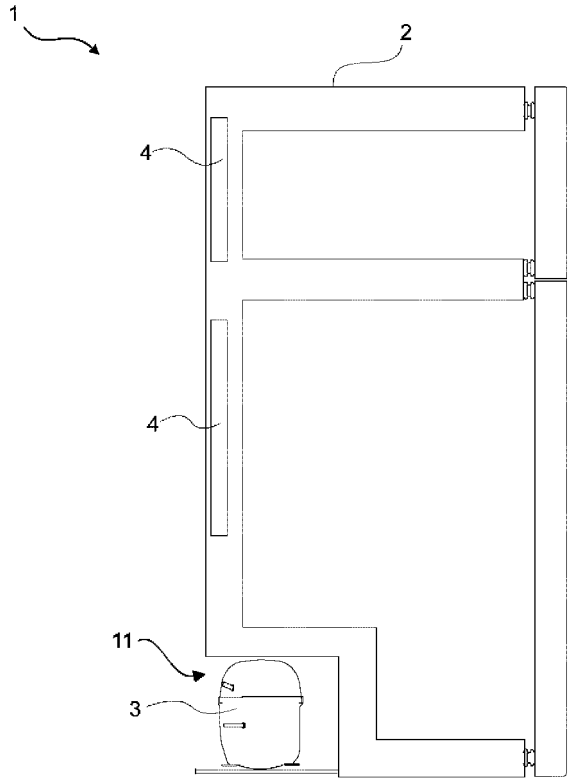


Figure 2

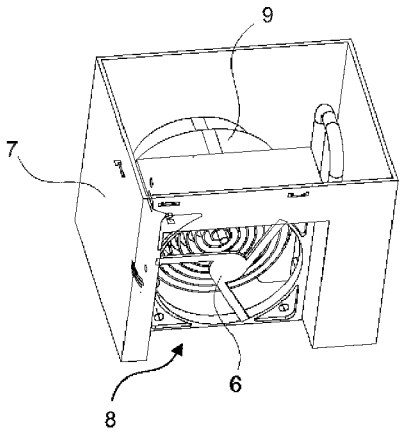


Figure 3

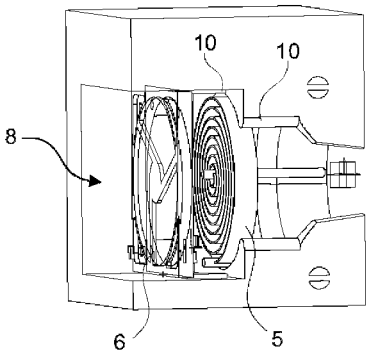
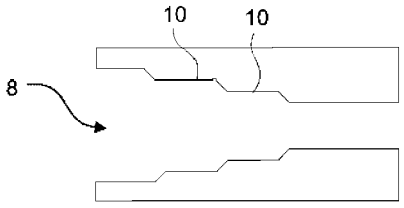


Figure 4



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 18 8212

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2017 213972 A1 (BSH HAUSGERAETE GMBH [DE]) 14 February 2019 (2019-02-14) * figures 1-3 *	1-6	INV. F25D23/00 F25D21/14
X	KR 101 870 266 B1 (LOTTE ALUMINIUM CO LTD [KR]) 22 June 2018 (2018-06-22) * figures 1,2 *	1	
X	KR 2005 0102814 A (DAEWOO ELECTRONICS CORP [KR]) 27 October 2005 (2005-10-27) * figure 1 *	1-6	
E	WO 2021/224060 A1 (BSH HAUSGERAETE GMBH [DE]) 11 November 2021 (2021-11-11) * figures 1-4 *	1	

TECHNICAL FIELDS SEARCHED (IPC)
F25D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 December 2021	de Graaf, Jan Douwe

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 18 8212

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.

09-12-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102017213972 A1	14-02-2019	CN 109387017 A	26-02-2019
		DE 102017213972 A1	14-02-2019
KR 101870266 B1	22-06-2018	NONE	
KR 20050102814 A	27-10-2005	NONE	
WO 2021224060 A1	11-11-2021	DE 102020205750 A1	11-11-2021
		WO 2021224060 A1	11-11-2021

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2015062661 A **[0003]**