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(54) **A COOLING DEVICE**

KÜHLVORRICHTUNG

DISPOSITIF DE REFROIDISSEMENT

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(56) References cited:

WO-A1-2021/224060 DE-A1-102017 213 972

KR-A- 20050 102 814 KR-B1- 101 870 266

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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. DE102017213972A1 is disclosing a cooling apparatus comprising a related defrost water collection receptacle.

[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 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 air flow 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 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; a receptacle (7) wherein the defrost water coming from the evaporator (4) is collected so as to be evaporated 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 and a wall (9) that at least partially surrounds the air duct (8) and separates the air duct (8) from the receptacle (7) **characterized by** the wall (9) that forms a recess towards the inside of the receptacle (7) wherein the volume of water collected in the receptacle (7) surrounds the air duct (8).
2. A cooling device (1) as in Claim 1, **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.
3. 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.
4. A cooling device (1) as in Claim 3, **characterized by** a plurality of steps (10) which are arranged one after the other.

5. 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).

Patentansprüche

1. Ein Kühlgerät (1) **umfasst** mindestens einen Schrank (2), in dem die zu kühlenden Lebensmittel platziert sind; einen Kompressor (3), der ein Kühlfluid komprimiert; mindestens einen Verdampfer (4), der für die Wärmeübertragung zwischen dem Kühlfluid und dem zu kühlenden Schrank (2) sorgt; einen Kondensator (5), der das Kühlfluid kondensiert; einen Lüfter (6), der Luft auf den Kondensator (5) bläst, um eine erzwungene thermische Konvektion bereitzustellen; einen Auffangbehälter (7), in dem das vom Verdampfer (4) kommende Tauwasser gesammelt wird, um verdunstet zu werden, einen am Auffangbehälter (7) vorgesehenen Luftkanal (8) in Form einer Aussparung wobei der Lüfter (6) und der Kondensator (5) angeordnet sind und eine Wand (9), die den Luftkanal (8) zumindest teilweise umgibt und den Luftkanal (8) von dem Behälter (7) trennt, **gekennzeichnet ist es dadurch**, dass die Wand (9) eine Aussparung zum Auffangbehälter (7) hin bildet, wobei das im Auffangbehälter (7) gesammelte Wasservolumen den Luftkanal (8) umgibt.
2. Ein Kühlgerät (1), wie in Anspruch 1 aufgeführt, **ist dadurch gekennzeichnet, dass** der Luftkanal (8) dessen Teil nach dem Kondensator (5) in Strömungsrichtung der Luft eine sich verengende Form hat.
3. Ein Kühlgerät (1), wie in einem der vorherigen Ansprüche aufgeführt, **ist dadurch gekennzeichnet, dass** an der Innenwand des Luftkanals (8) mindestens eine Stufe (10) vorgesehen ist, an der der Kondensator (5) anliegt.
4. Ein Kühlgerät (1), wie in Anspruch 3 aufgeführt, **ist dadurch gekennzeichnet, dass** mehrere Stufen (10) hintereinander angeordnet sind.
5. Ein Kühlgerät (1), wie in einem der vorherigen Ansprüche aufgeführt, **ist dadurch gekennzeichnet, dass** der Lüfter (6) beweglich am Luftkanal (8) befestigt ist.

Revendications

1. Un dispositif de refroidissement (1) **comportant** au moins une armoire (2) dans laquelle sont placées les denrées alimentaires à refroidir ; un compresseur (3) qui comprime un fluide réfrigérant ; au moins un évaporateur (4) qui assure le transfert de chaleur

entre le fluide réfrigérant et l'armoire (2) qui est refroidie ; un condenseur (5) qui condense le fluide réfrigérant ; un ventilateur (6) qui souffle de l'air sur le condenseur (5) de manière à assurer une convection thermique forcée ; un réceptacle (7) dans lequel est recueillie l'eau de dégivrage provenant de l'évaporateur (4) afin d'être évaporée un conduit d'air (8) en forme de découpe prévu sur le réceptacle (7) et dans lequel le ventilateur (6) et le condenseur (5) sont placés. un conduit d'air (8) qui a la forme d'une découpe prévue sur le réceptacle (7) et dans lequel le ventilateur (6) et le condenseur (5) sont placés et une paroi (9) qui entoure au moins partiellement le conduit d'air (8) et sépare le conduit d'air (8) du réceptacle (7), **caractérisé par** la paroi (9) qui forme un évidement vers l'intérieur du réceptacle (7) dans lequel le volume d'eau collecté dans le réceptacle (7) entoure le conduit d'air (8).

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Figure 1

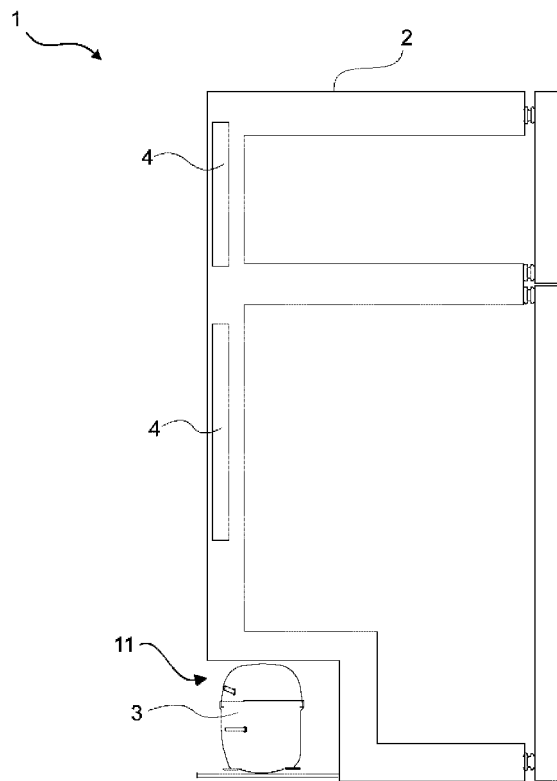


Figure 2

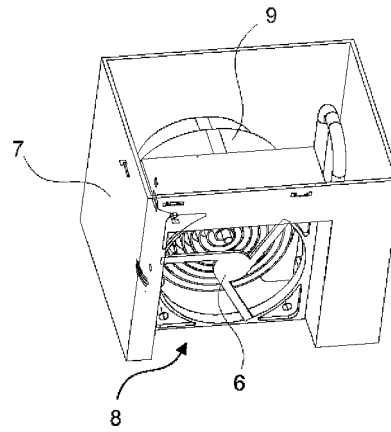


Figure 3

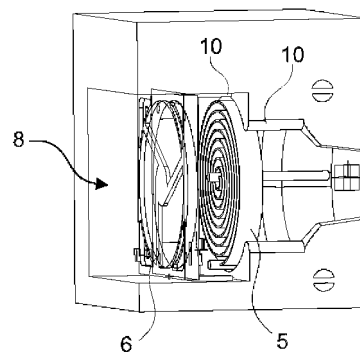
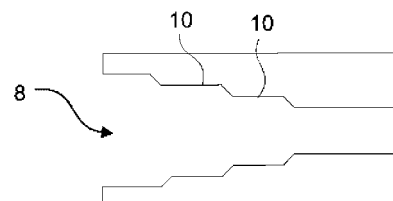


Figure 4



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2015062661 A [0003]
- DE 102017213972 A1 [0003]