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(54) **REFRIGERATION APPLIANCE HAVING AN IMPROVED DEFROST WATER COLLECTION
RECEPTACLE**

KÄLTEVORRICHTUNG MIT VERBESSERTEM TAUWASSERSAMMELBEHÄLTER

**APPAREIL DE RÉFRIGÉRATION COMPORTANT UN RÉCEPTACLE AMÉLIORÉ DE RECUEIL
D'EAU DE DÉGIVRAGE**

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Description

[0001] The present invention relates to a refrigeration appliance having a heat exchanger with an improved structural relationship with a defrost water collecting receptacle.

[0002] It is well-known that in the refrigerant cycle effected in refrigeration appliances, the thermal energy absorbed from the inner cabin of the appliance is discharged by means of a condenser. The refrigerant fluid is accordingly circulated between a condenser, an expansion valve such as capillary tube and an evaporator. The refrigerant fluid undergoes a phase transition from the liquid phase into the gas phase by way of absorbing the ambient heat of the foodstuff preserved within the cabin while passing through the evaporator. Subsequently, the pressurized refrigerant fluid releases its heat on the condenser surface.

[0003] A condenser may be a static one that is operable by natural heat convection or a forced heat convection method can alternatively be adapted. The refrigeration cabin's bottom region, so-called machine room, in a refrigeration appliance may accommodate the compressor and a fan to fulfill the forced heat convection operation. Heat transfer from the condenser to the outer environment can hence be accomplished in a pretty efficient manner such that removal of the heat by enforced convection is provided via a fan blowing air over the condenser. Further, the defrost process should be performed in order to deice the frost formed and accumulated on the evaporator surfaces. A water collection receptacle is employed in this respect for accumulating and evaporating the defrost water in the refrigeration appliance.

[0004] Among others, a prior art patent publication relevant to the technical field of the present invention can be referred to as WO2012139956, disclosing an evaporation device for evaporating thaw water of a refrigerator, the latter having a condenser intended to be arranged in a coolant circuit of the refrigerator as a heat source and having an evaporation container designed on the condenser for receiving the thaw water.

[0005] US2010/037645A1 discloses a refrigerator appliance according to the preamble of claim 1.

[0006] JP H0320581A and JP2000 018800 A disclose further examples of refrigerator appliances provided with defrost water receptacle assemblies.

[0007] The present invention, on the other hand, proposes a refrigeration appliance according to claim 1, provided with a heat exchanger, such as a mini-channel heat exchanger, having an improved structural relationship with a defrost water collecting receptacle.

[0008] Primary object of the present invention is to provide refrigeration appliance with a heat exchanger having an improved structural relationship with a defrost water collecting receptacle and that is structurally designed to enhance both heat transfer performance. Further an object of the invention is to provide a defrost water collecting receptacle with an increased capacity.

[0009] The present invention proposes a household cooling appliance such as a refrigerator with a heat exchanger or condenser having a refrigerant flow tube in serpentine form. The refrigerant flow tubes typically serve to the purpose of circulating the refrigerant fluid pressurized by a compressor such that thermal energy is dissipated by the heat exchanger, i.e. the condenser of the household appliance. A fan is structurally integrally provided to effect forced heat convection. The condenser is disposed against a fan that is provided to effect forced heat convection for cooling said condenser by blowing air thereon. A defrost water receptacle assembly with two vessels are provided to collect the defrost water and to evaporate the same with the help of the heat energy transferred from the condenser.

[0010] Although the two vessels of the defrost water receptacle assembly are integrally connected according to the invention, they are separate entities and they are individually connected with the condenser to establish a multiple-axis mechanical connection.

[0011] The mechanical inter-engagement relationship between the defrost water receptacle assembly and the condenser is continual on a plurality of engagement axes in the sense that continual linear condenser slots along the first and second vessels receive a first and a second bracket being integral to the condenser. One further condenser slot is provided along a vertical line extending so as to connect the two vessels.

[0012] An intermediate space restricted in between the two vessels from above and below acts as an air passageway guiding the air blown by the fan in the direction of the compressor through the condenser. The first vessel can be extended over the compressor such that the upper wall of the air guide fully covers the passageway.

[0013] The first vessel establishes a fluid communication with the second vessel only after it reaches a certain level of water, at which point, a channel inlet elevation no more prevents flow of water into an intermediate channel in between the two vessels.

[0014] The first and second brackets of the condenser and the condenser body itself have respectively a first and a second set of wings having different distance ranges in between two neighboring wings such that heat exchange capacity of the brackets being in direct contact with the vessels is enhanced.

[0015] The machine room of the refrigeration appliance is separated from the inner compartment thereof by an inner compartment wall such that an insulation material is provided between the same and the intermediate channel, therefore constituting a thermal barrier between the inner compartment and the condenser.

[0016] Accompanying drawings are given solely for the purpose of exemplifying a refrigeration appliance whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0017] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope

identified in said claims without recourse to the technical disclosure in the description of the present invention.

Fig. 1 demonstrates a general perspective view of the machine room of a refrigeration appliance according to the present invention.

Fig. 2 demonstrates a general perspective view of the defrost water receptacle assembly according to the present invention.

Fig. 3 is a general perspective view of the machine room of a refrigeration appliance demonstrating the mechanical connection thereof with a cover according to the present invention.

Fig. 4 demonstrates a general perspective view of the condenser according to the present invention.

Fig. 5 demonstrates a general perspective view of the defrost water receptacle assembly together with the condenser according to the present invention.

Fig. 6 demonstrates a general perspective view of the defrost water receptacle assembly and the condenser while the latter is being mounted in said receptacle according to the present invention.

Fig. 7 demonstrates a general perspective view of the condenser while mounted in the defrost water receptacle assembly according to the present invention.

Fig. 8 demonstrates a general perspective view of the machine room of a refrigeration appliance with the condenser and the fan disposed therein according to the present invention.

Fig. 9 demonstrates a side view of the machine room of a refrigeration appliance with the condenser, the defrost water receptacle assembly and the fan according to the present invention.

[0018] The following numerals are used in the detailed description:

1. Machine room cover
2. Compressor
3. Condenser
4. Fan
5. Fan motor
6. Defrost water receptacle assembly
7. Fixation protrusion
8. First vessel
9. Second vessel
10. Intermediate channel
11. Intermediate channel outlet
12. Channel inlet elevation
13. Condenser slot
14. Fixation slot
15. Additional fixation means
16. First bracket
17. Second bracket
18. First set of wings
19. Second set of wings
20. Insulation material

21. Inner compartment wall

[0019] The present invention proposes a refrigeration appliance having a machine room comprising a compressor (2) pressurizing a refrigerant fluid, a condenser (3) condensing the refrigerant fluid through refrigerant flow tubes in serpentine form where the refrigerant flow is provided, said machine room further comprising a fan (4) disposed against said condenser (3) to effect forced heat convection by blowing air thereon and a defrost water receptacle assembly (6) employed for accumulating and evaporating the defrost water.

[0020] The defrost water receptacle assembly (6) of the invention comprises a first vessel (8) and a second vessel (9) that is physically apart from said first vessel (8) such that each of the two vessels (8, 9) is separately in mechanical inter-engagement relationship with the condenser (3). This structural relation provides that the defrost water receptacle assembly (6) and the condenser (3) are securely attached with each other at two separate connection axes in an inter-fixed assembled relation. Presence of two physically separate vessels (8, 9) further increases the evaporation surface and the total amount of water to be collected.

[0021] According to an embodiment of the present invention, the mechanical inter-engagement relationship between the defrost water receptacle assembly (6) and the condenser (3) is not provided by means of individual locational connection means but by means of continual inter-engagement structures in the form of condenser slots (13) on a plurality of engagement axes so as to enhance thermal exchange capacity in between the condenser (3) and the defrost water receptacle assembly (6) whereby heat energy can be more effectively transferred from the condenser (3) to the defrost water receptacle assembly (6).

[0022] In an embodiment of the invention, the first and second vessels (8, 9) of the defrost water receptacle assembly (6) defines an intermediate space remaining in between the two vessels (8, 9) and forms an air passageway by which said fan (4) communicates with said compressor (2) through said condenser (3). The advantageous configuration of the two vessels (8, 9) with regard to the respective positions of the compressor (2) and the fan (4) therefore functions as a housing and provides an air guide in the form of a delimited channel passing through and over the condenser (3).

[0023] Preferably the first vessel (8) of the defrost water receptacle assembly (6) can be designed to partly extend over the compressor (2) to provide a fully delimiting upper wall in the direction of the compressor (2). This will at the same time lead to an increased evaporation surface for the first upper vessel (8).

[0024] Preferably the first vessel (8) of the defrost water receptacle assembly (6) is designated as the default defrost water collection container and the second vessel (9) is employed only after the first vessel (8) is full with water. To this end, the first vessel (8) establishes a fluid

communication with the second vessel (9) only after it is full.

[0025] Preferably the first vessel (8) comprises a channel inlet elevation (12) preventing flow of collected water into an intermediate channel (10) by means of which the two vessels (8, 9) communicate.

[0026] In a further embodiment of the present invention, the two continual inter-engagement structures in the form of condenser slots (13) are disposed along the first and second vessels (8, 9) so as to receive a first and a second bracket (16, 17) of the condenser (3), the latter brackets (16, 17) structurally supporting the condenser (3) in an integral manner.

[0027] In a still further embodiment of the present invention, one of the continual inter-engagement structures is formed in the form of a condenser slot (13) neighboring the intermediate channel (10) so as to receive a lateral body portion of the condenser (3).

[0028] In a still further embodiment of the present invention, the first and second brackets (16, 17) of the condenser (3) comprises a first set of wings (18) having a certain degree of inter-space configuration while a second set of wings (19) of the condenser (3) body is configured in a less narrowly-spaced manner. This ensures that an enhanced heat exchange capacity is imparted to the brackets (16, 17) that are in direct physical contact with the first and second vessels (8, 9).

[0029] Preferably the machine room of the refrigeration appliance comprises a machine room cover (1) located at the reverse side of the front door of the refrigeration appliance so as to delimit the machine room in front of a rear wall against which the refrigeration appliance is placed. The refrigeration appliance comprises a machine room cover (1) with a plurality of openings to allow for more aeration and with connection means, namely a fixation slot (14) mating with a fixation protrusion (7) of the first vessel (8) and additional fixation means (15) with a similar function. The connection means in this respect require no special instruments for establishing the mechanical connection.

[0030] In a yet still further embodiment of the present invention, the machine room is separated from the inner compartment of the refrigeration appliance by means of an inner compartment wall (21) and an insulation material (20) is provided in the region directly between said inner compartment wall (21) and the rear surface of the intermediate channel (10).

[0031] In a nutshell, the refrigeration appliance of the invention is advantageous in that the heat exchanger, i. e. the condenser (3) has an improved structural relationship with the defrost water collecting receptacle (6) in terms of heat transfer performance, evaporation surface, amount of water to be collected and effectiveness of the forced heat convection.

Claims

1. A refrigeration appliance having a machine room comprising a compressor (2) pressurizing a refrigerant fluid, a condenser (3) condensing the refrigerant fluid through refrigerant flow tubes in serpentine form where the refrigerant flow is provided, said machine room further comprising a fan (4) and a defrost water receptacle assembly (6) employed for accumulating and evaporating the defrost water, wherein said defrost water receptacle assembly (6) comprises a first vessel (8) and a second vessel (9) that is physically apart from said first vessel (8), the fan (4) is disposed against said condenser (3) to effect forced heat convection by blowing air thereon and in that each of the two vessels (8, 9) is separately in mechanical engagement relationship with the condenser (3), wherein the first and second vessels (8, 9) of the defrost water receptacle assembly (6) defines an intermediate space remaining in between the two and forms an air passageway by which said fan (4) communicates with said compressor (2) through the condenser (3) **characterized in that** the mechanical inter-engagement relationship between the defrost water receptacle assembly (6) and the condenser (3) is provided by means of continual inter-engagement structures in the form of condenser slots (13) on a plurality of engagement axes so as to enhance thermal exchange capacity in between the same.
2. A refrigeration appliance as in Claim 1, **characterized in that** the first vessel (8) establishes a fluid communication with the second vessel (9) only after it is full with water.
3. A refrigeration appliance as in Claim 2, **characterized in that** the first vessel (8) comprises a channel inlet elevation (12) preventing flow of collected water into an intermediate channel (10) by means of which the two vessels (8, 9) communicate.
4. A refrigeration appliance as in Claim 1, **characterized in that** two of the continual inter-engagement structures in the form of condenser slots (13) are formed along the first and second vessels (8, 9) so as to receive a first and a second bracket (16, 17) of the condenser (3), the latter brackets (16, 17) structurally supporting the condenser (3) in an integral manner.
5. A refrigeration appliance as in Claim 1 and 3, **characterized in that** one of the continual inter-engagement structures is formed in the form of a condenser slot (13) neighboring the intermediate channel (10).
6. A refrigeration appliance as in Claim 4, **characterized in that** the first and second brackets (16, 17) of the condenser (3) comprises a first set of wings

(18) having a certain degree of inter-space configuration while a second set of wings (19) of the condenser (3) body is configured in a less narrowly-spaced manner.

7. A refrigeration appliance as in Claim 1, **characterized in that** a machine room cover (1) with at least one connection means in the form of fixation slot (14) mating with a fixation protrusion (7) of the first vessel (8).
8. A refrigeration appliance as in Claim 3, **characterized in that** the machine room is separated from the inner compartment of the refrigeration appliance by means of an inner compartment wall (21) and an insulation material (20) is provided in the region directly between said inner compartment wall (21) and the rear surface of the intermediate channel (10).

Patentansprüche

1. Ein Kühlgerät umfasst einen Maschinenraum, der einen Kompressor (2) besitzt und der Kältemittelfluid und Druck setzt; einen Kondensator (3), der das Kältemittelfluid durch Kältemittelflussrohre in Serpentinform kondensiert, worin der Kältemittelfluss bereitgestellt wird; wobei der Maschinenraum darüber hinaus einen Ventilator (4) und eine Auffangvorrichtung (6) für das Abtauwasser aufweist, damit dort das Abtauwasser gesammelt und verdampft wird; wobei die Auffangvorrichtung (6) für das Abtauwasser einen ersten (8) und zweiten (9) Behälter aufweist, der physikalisch von dem ersten Behälter (8) getrennt ist; der Ventilator (4) ist an dem Kondensator (3) angeordnet, um eine erzwungene Wärmekonvektion durch Blasen von Luft darauf zu bewirken und dass jedes der beiden Behälter (8, 9) separat in mechanischer Eingriffsbeziehung mit dem Kondensator (3) stehen, wobei der erste und zweite Behälter (8, 9) der Auffangvorrichtung (6) des Abtauwassers einen Zwischenraum definieren, der zwischen denen verbleibt und einen Luftdurchgang bilden, durch den der Ventilator (4) mit dem Kompressor (2) durch das Gebläse in Verbindung mit dem Kondensator (3) steht, gekennzeichnet ist es dadurch, dass die mechanische Eingriffsbeziehung zwischen der Auffangvorrichtung (6) des Abtauwassers und dem Kondensator (3) mithilfe von durchgehenden Eingriffsstrukturen in Form von Kondensatorschlitzten (13) auf mehreren Eingriffsachsen hergestellt wird, damit die Wärmeaustauschkapazität dazwischen verbessert wird.
2. Ein Kühlgerät, wie in Anspruch 1 aufgeführt, ist **dadurch gekennzeichnet, dass** der erste Behälter (8) erst eine Fluidverbindung mit dem zweiten Behälter (9) herstellen kann, wenn es mit Wasser gefüllt ist.

3. Ein Kühlgerät, wie in Anspruch 2 aufgeführt, ist **dadurch gekennzeichnet, dass** der erste Behälter (8) eine Kanaleinlasserhebung (12) umfasst, die das Strömen von gesammeltem Wasser in einen Zwischenkanal (10) verhindert, über den die beiden Behälter (8, 9) in Kontakt sind.
4. Ein Kühlgerät, wie in Anspruch 1 aufgeführt, ist **dadurch gekennzeichnet, dass** zwei von den durchgehenden ineinandergreifenden Strukturen in Form von Kondensatorschlitzten (13) entlang des ersten und des zweiten Behälters (8, 9) ausgebildet sind, damit eine erste und zweite Halterung (16, 17) des Kondensators aufzunehmen Kondensator (3) hergestellt wird, wobei die beiden Halterungen (16, 17) den Kondensator (3) in integraler Weise strukturell tragen.
5. Ein Kühlgerät, wie in Anspruch 1 und 3 aufgeführt, ist **dadurch gekennzeichnet, dass** eine der durchgehenden Eingriffsstrukturen in Form von einem dem Zwischenkanal (10) benachbarten Kondensatorschlitzes (13) ausgebildet ist.
6. Ein Kühlgerät, wie in Anspruch 4 aufgeführt, ist **dadurch gekennzeichnet, dass** die erste und die zweite Halterung (16, 17) des Kondensators (3) einen Satz Flügeln (18) aufweisen, die einen bestimmten Grad an Zwischenraumkonfigurationen aufweisen, während ein zweiter Satz von Flügeln (19) des Kondensatorkörpers (3) auf solch eine Weise konfiguriert ist, die weniger eng beabstandet ist.
7. Ein Kühlgerät, wie in Anspruch 1 aufgeführt, ist **dadurch gekennzeichnet, dass** eine Abdeckung des Maschinenraumes (1) mit mindestens einem Verbindungsmittel in Form eines Befestigungsschlitzes (14) vorgesehen ist, der mit einem Befestigungsvorsprung (7) des ersten Behälters (8) zusammenpasst.
8. Ein Kühlgerät, wie in Anspruch 3 aufgeführt, ist **dadurch gekennzeichnet, dass** der Maschinenraum durch eine Innenfachwand (21) vom Innenfach des Kältegeräts getrennt ist und in diesem Bereich direkt zwischen der Innenfachwand (21) und der Rückseite des Zwischenkanals (10) ist ein Isoliermaterial (20) vorgesehen.

Revendications

1. Un appareil de réfrigération avec une salle de machines comprenant un compresseur (2) pressurant un fluide frigorigène, un condenseur (3) condensant le fluide frigorigène à travers des tubes d'écoulement de réfrigérant sous forme de serpentin où est prévu l'écoulement du réfrigérant, ladite salle de machines comprenant en outre un ventilateur (4)

- et un ensemble de réceptacle de l'eau de dégivrage (6) utilisé pour accumuler et évaporer l'eau de dégivrage, dans lequel ledit ensemble de réceptacle de l'eau de dégivrage (6) comprend un premier réservoir (8) et un deuxième réservoir (9) qui est physiquement séparé du premier réservoir (8), le ventilateur (4) est disposé contre ledit condenseur (3) pour effectuer une convection de chaleur forcée par soufflage d'air sur celui-ci et dans lequel chacun des deux réservoirs (8, 9) est séparément en relation d'engrenage mécanique avec le condenseur (3), où le premier et le deuxième réservoir (8, 9) de l'ensemble de réceptacle de l'eau de dégivrage (6) délimitent un espace intermédiaire restant entre eux et forment un passage d'air par lequel ledit ventilateur (4) est en lien avec ledit compresseur (2) à travers le condenseur (3) **caractérisé en ce que** la relation d'engrenage mécanique entre l'ensemble de réceptacle de l'eau de dégivrage (6) et le condenseur (3) est prévue au moyen de structures à engrènement continu sous forme de fentes condenseurs (13) sur une pluralité d'axes d'engagement de manière à améliorer la capacité d'échange thermique entre ceux-ci.
2. Un appareil de réfrigération selon la Revendication 1, **caractérisé en ce que** le premier réservoir (8) établit une communication fluïdique avec le deuxième réservoir (9) uniquement après qu'il soit rempli d'eau.
3. Un appareil de réfrigération selon la Revendication 2, **caractérisé en ce que** le premier réservoir (8) comprend une élévation d'entrée de canal (12) qui empêche l'écoulement de l'eau collectée dans un canal intermédiaire (10) par lequel communiquent les deux réservoirs (8, 9).
4. Un appareil de réfrigération selon la Revendication 1, **caractérisé en ce que** deux des structures à engrènement continu sous forme de fentes de condenseur (13) sont présentes le long des premier et second réservoirs (8, 9) de manière à recevoir un premier et un second support (16, 17) du condenseur (3), ces derniers supports (16, 17) supportant structurellement le condenseur (3) de manière intégrale.
5. Un appareil de réfrigération selon les Revendications 1 et 3, **caractérisé en ce qu'une** des structures à engrènement continu se présente sous forme d'une fente de condenseur (13) adjacente au canal intermédiaire (10).
6. Un appareil de réfrigération selon la Revendication 4, **caractérisé en ce que** les premier et second supports (16, 17) du condenseur (3) comprennent un premier ensemble d'ailerons (18) ayant un certain degré de configuration inter-espace tandis qu'un second ensemble d'ailerons (19) du corps du condenseur (3)

est configuré d'une façon moins espacée.

7. Un appareil de réfrigération selon la Revendication 1, **caractérisé par** un couvercle de la salle des machines (1) avec au moins un moyen de raccordement sous forme d'une fente de fixation (14) s'accouplant avec une protrusion de fixation (7) du premier réservoir (8).
8. Un appareil de réfrigération selon la Revendication 3, **caractérisé en ce que** la salle des machines est séparée du compartiment intérieur de l'appareil de réfrigération au moyen d'une paroi de compartiment intérieur (21) et qu'un matériau isolant (20) est prévu dans la région située directement entre ladite paroi de compartiment intérieur (21) et la surface arrière du canal intermédiaire (10).

Fig. 1

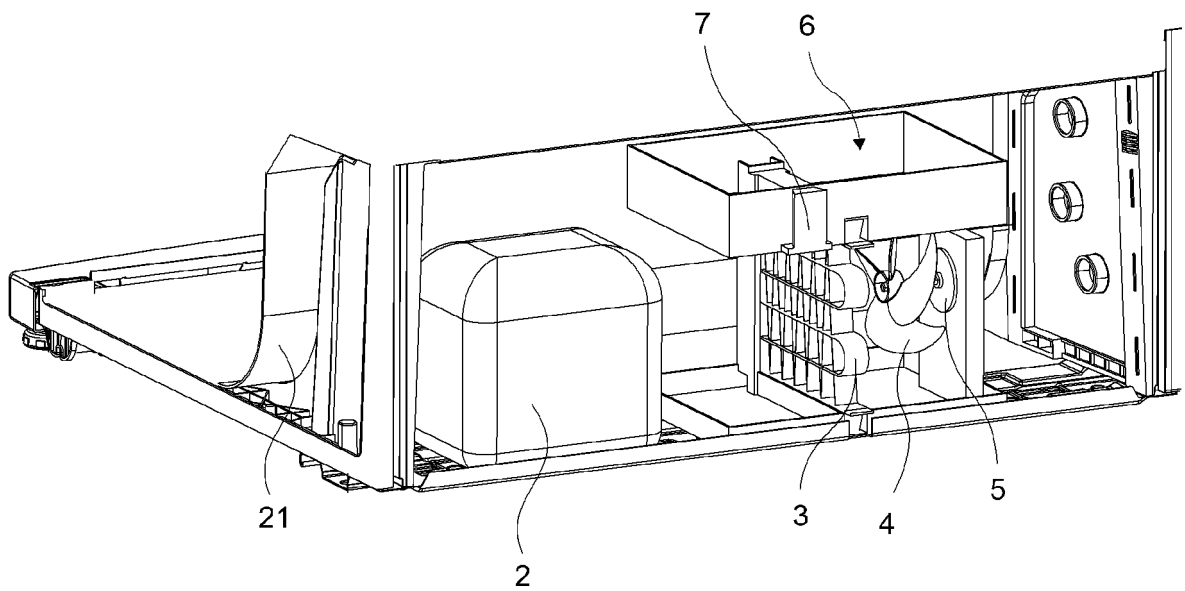


Fig. 2

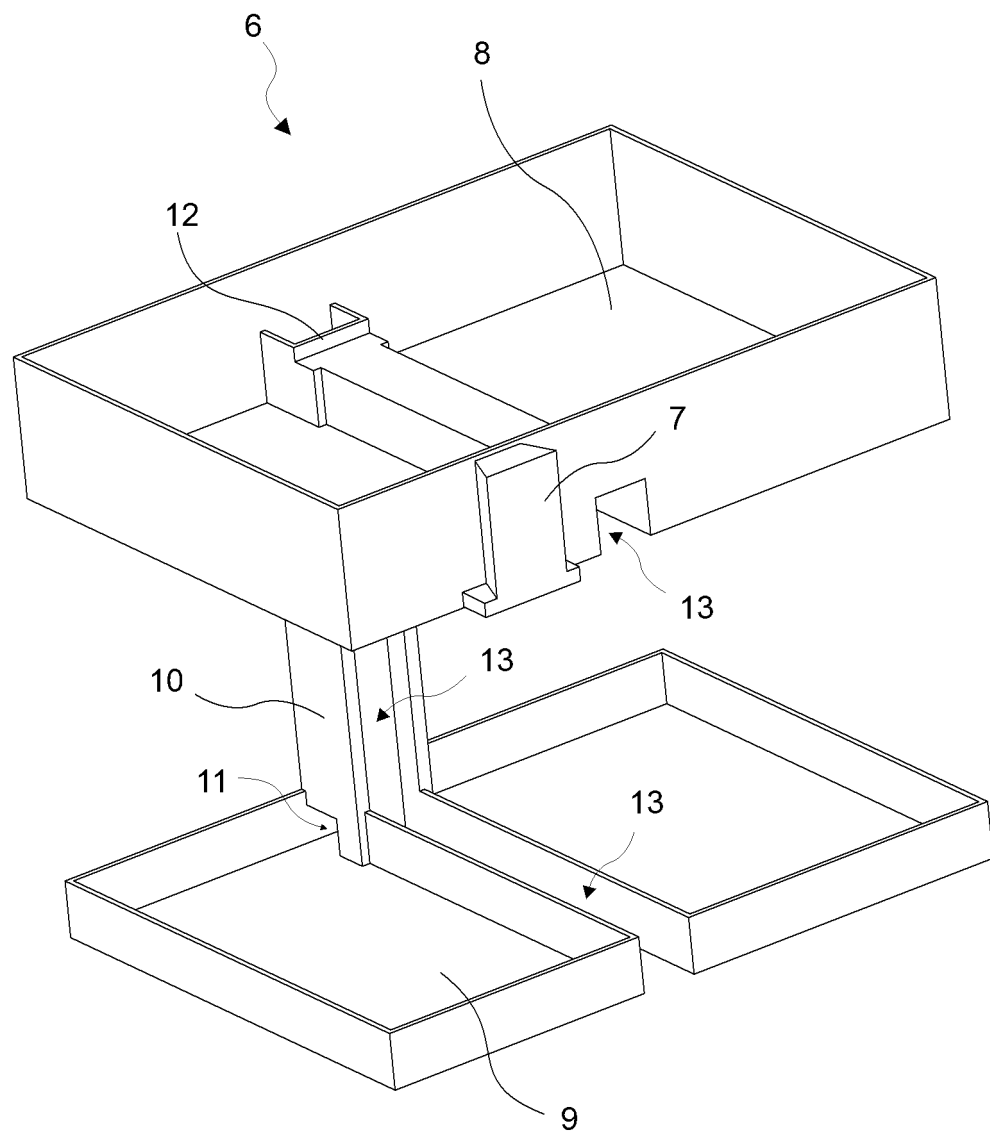


Fig. 3

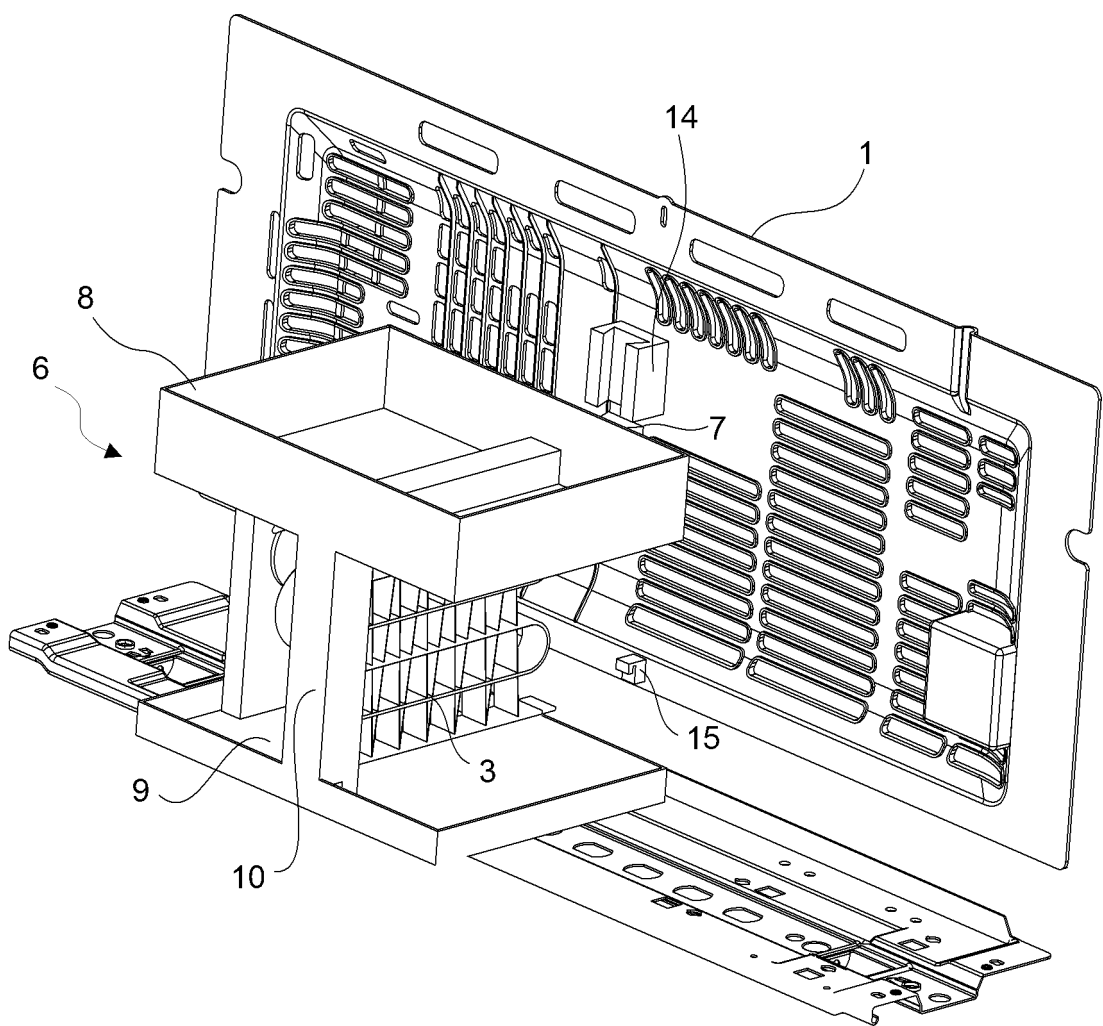


Fig. 4

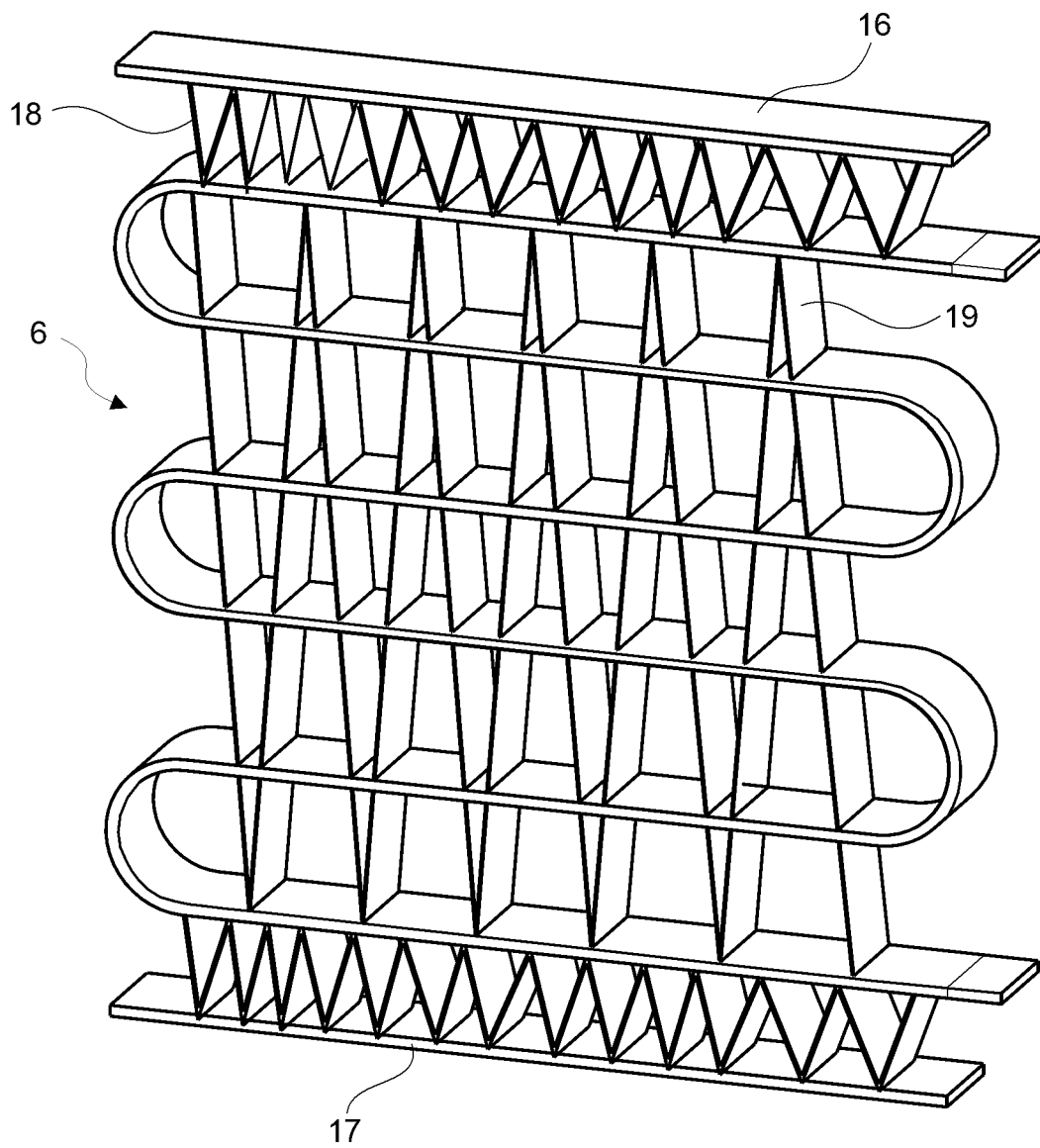


Fig. 5

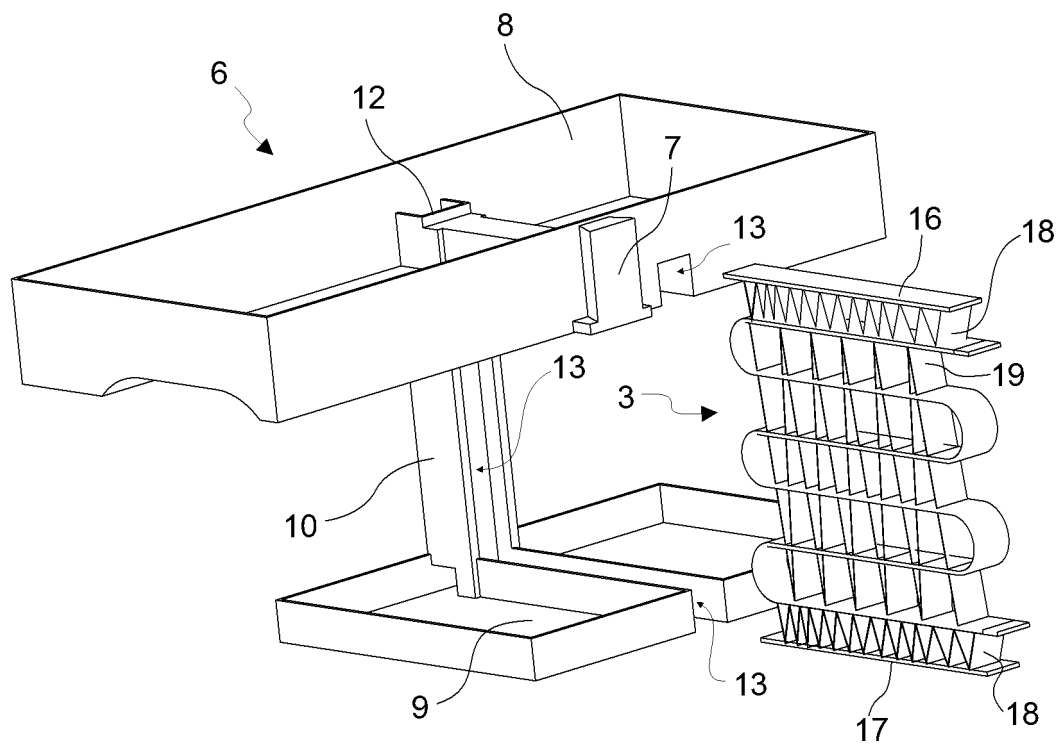


Fig. 6

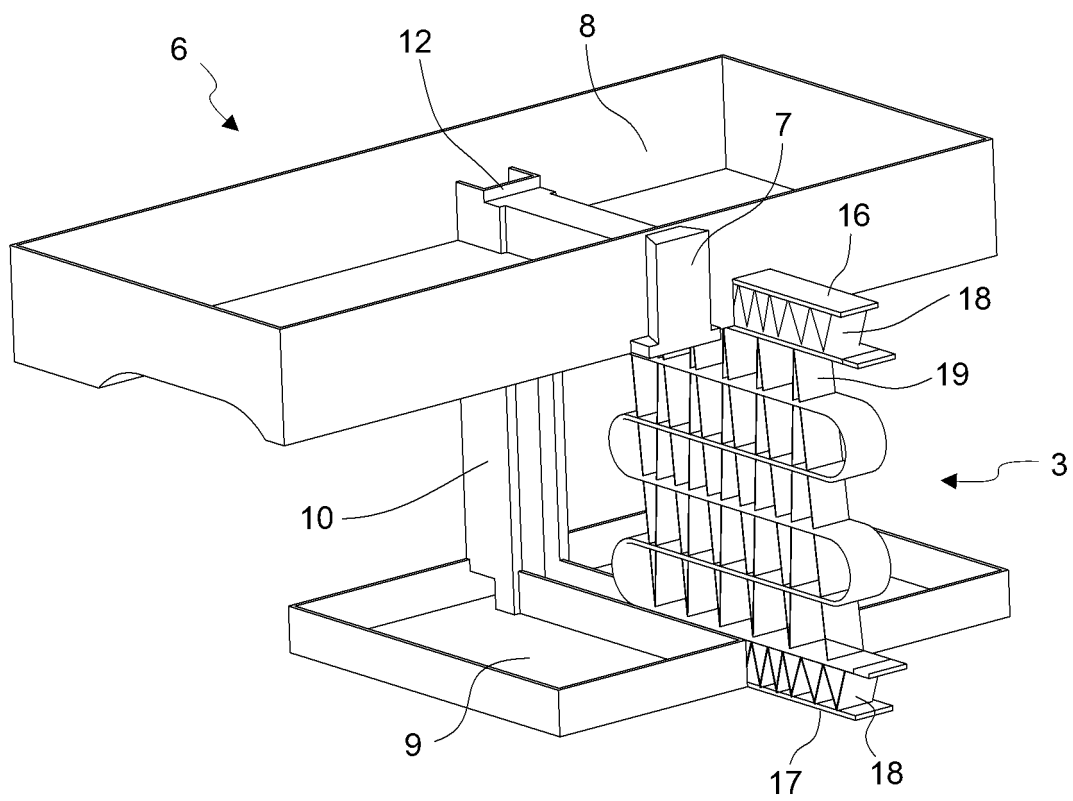


Fig. 7

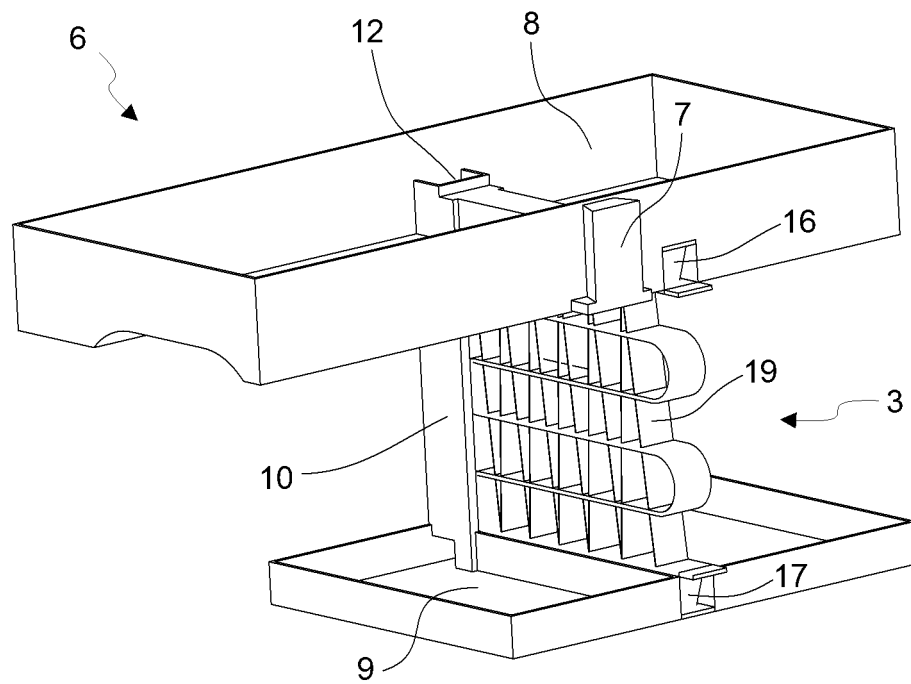


Fig. 8

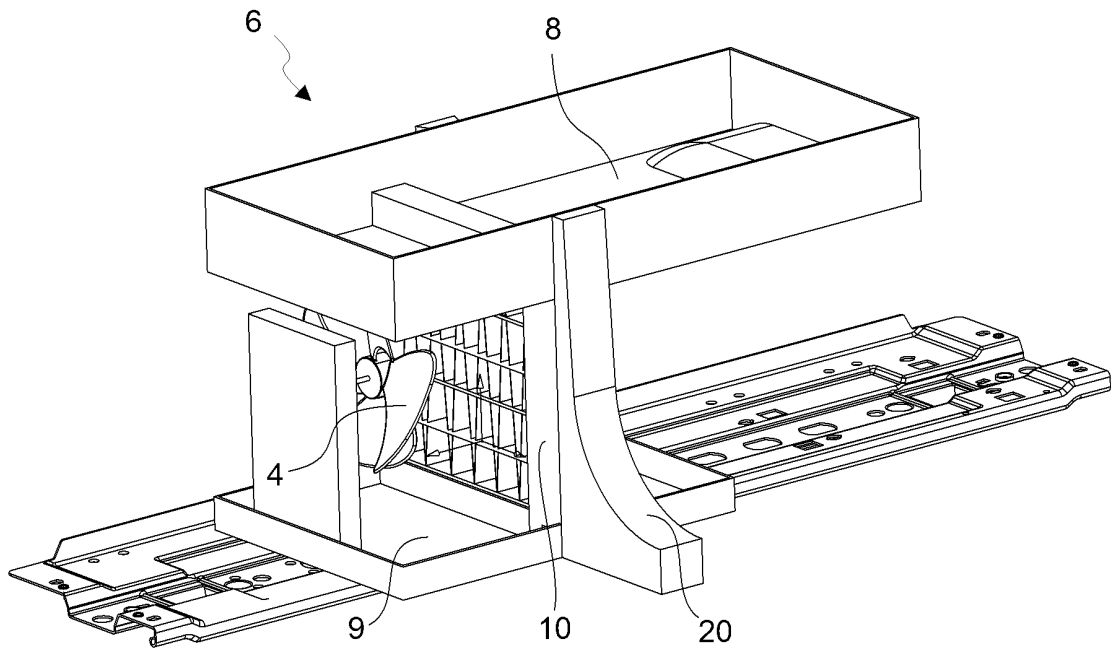
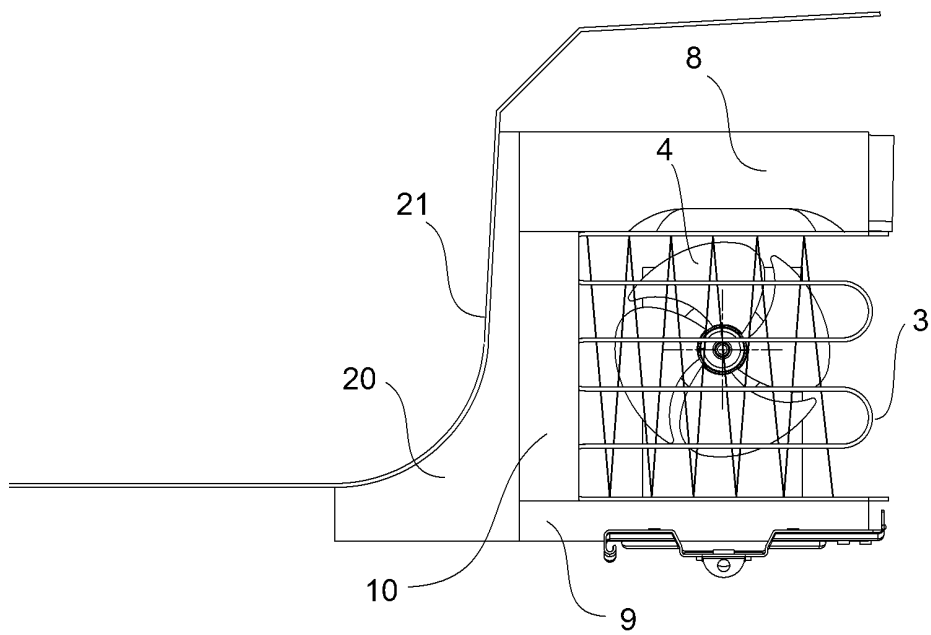


Fig. 9



REFERENCES CITED IN THE DESCRIPTION

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