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(72) Inventors:

- **YASAR, Mehmet**
34445 ISTANBUL (TR)
- **AKSIN, Yasin**
34445 ISTANBUL (TR)
- **ERCAN, Veysi**
34445 ISTANBUL (TR)
- **TOSUN, Mert**
34445 ISTANBUL (TR)
- **ATAKURU, Seren**
34445 ISTANBUL (TR)

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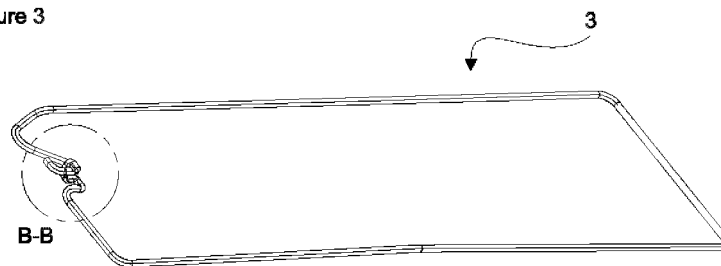
(71) Applicant: **Arçelik Anonim Sirketi**
34445 Istanbul (TR)

(54) **AN EVAPORATOR HEATER FIXING MEANS AND COOLING APPLIANCE HAVING THE SAME**

(57) The present invention relates to a cooling appliance comprising: a body having a refrigerating chamber; an evaporator (1) configured to cool a flow of air by cycling a refrigerant compressed by a compressor; a heater (2)

configured to heat the evaporator (1) to prevent frosting of the same; a fixing means (3) to attach the heater (2) onto the evaporator (1), the fixing means (3) having a first end (4) and a second end (5).

Figure 3



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Description

[0001] The present invention relates to a fixing means, in particular to a fixing means having improved fixing ability.

[0002] In cooling appliances, frost occurring on the surface of the evaporator as a result of moisture in the air must be removed on a regular basis. De-frosting is realized by means of a heater at least partially surrounding the evaporator. The heater is activated by a control unit depending on the frost accumulation on the surface of the evaporator. The frost accumulation is detected by different methods including but not limited to visual sensors or temperature sensors. A method of removing frost is simply achieved by activating the heater on predetermined time intervals. Removal of frost is crucial to increase the energy efficiency of the cooling appliance. Heaters are placed onto the evaporators by means of retaining clips wherein the retaining clips retain the heater on the evaporator by keeping the heater next to the fins of the evaporator. Such application requires use of multiple retaining clips at dozen different location making the application costly due to increased assembly time. Another problem faced with such applications is that the retaining clips tend to fall after assembly, especially if the heater and evaporator assembly must be moved after the assembly process. As a result, the heater separates from the fins of evaporator which in turn reduces the efficiency of the defrost process.

[0003] A prior art publication in the technical field of the present invention may be referred to as US3783635 among others, the document disclosing a replaceable defrost heater for fin and tube evaporator and spring retaining clip for same.

[0004] A prior art publication in the technical field of the present invention may be referred to as EP1022528A2 among others, the document disclosing a fixing system designed for accommodating the heating rods of an evaporator.

[0005] An objective of the present invention is to provide a fixing means wherein the fixing means provides fixing of heater onto the evaporator in a convenient manner.

[0006] Another objective of the present invention is to provide a fixing means having a monolithic structure providing a rigid fixing of fixing means onto the evaporator.

[0007] The method realized to achieve the aim of the present invention and disclosed in the first claim and the dependent claims comprises a cooling appliance. The cooling appliance comprises a body wherein the body encloses at least one refrigerating chamber into which the articles to be cooled are placed. An evaporator is provided at a location close to the rear of the cooling appliance wherein the evaporator is configured to cool a flow of air passing through the evaporator. The refrigerant is compressed by a compressor. A heater is provided adjacent to the evaporator. The heater is an electrical resistance and is energized by means of a control unit.

The heater is energized for predetermined time intervals and according to the frost formation level on the evaporator. The heater abuts against the fins of the evaporator. The heater runs parallel to the evaporator. The fins of the evaporator are provided with a canal into which the heater is seated. Upon placing the heater inside the said canal, the heater and the fins of the evaporator forms an almost flush surface. A fixing means is provided to attach the heater onto the evaporator. The fixing means is provided with a first end and a second end. The fixing means is configured to form a loop around the evaporator such that the first end and the second end join and close the loop. The fixing means forms the loop around the evaporator fixing the heater with respect and on to the evaporator.

[0008] In an embodiment of the invention, the fixing means is in the form of a wire. The fixing means that is in the form of a wire occupies a small cross-sectional area. As a result, the fixing means does not obstruct the flow of air through the evaporator.

[0009] In an embodiment of the invention, the first end and the second end are produced as an integral part of the fixing means. This provides easy production of the fixing means. Another advantageous effect provided by the integral structure is that the fixing means has a rigid structure.

[0010] In an embodiment of the invention, the first end and the second are shaped as hooks. By means of the hook shaped first end and the second end, the assembly line operator slides the evaporator inside the fixing means, twists the hook shaped first end and the second end thereby fixing the fixing means with respect to the evaporator. Hook shaped ends provides ease of assembly.

[0011] In an embodiment of the invention, the loop is shaped so as to match the circumferential shape of the evaporator.

[0012] In an embodiment of the invention, the cross-sectional area of the evaporator is rectangular. The loop shape of the fixing means is rectangular, and form fittingly matches the shape of the evaporator.

[0013] In an embodiment of the invention, the fixing means has recessed areas. The recessed areas match the location of the heater when the fixing means is placed onto the evaporator. By means of the recessed areas, bumps on the fixing means is prevented.

[0014] According to a second aspect of the invention, a method of producing the fixing means is provided. In order to produce the fixing means, a wire is provided. The wire is then bent into a predetermined shape. The predetermined shape is configured to match the shape of the circumference of the evaporator. By bending the wire, a loop is formed. The ends of the wire are bent so as to form a pair of hooks at each end. The evaporator is then inserted inside the fixing means. The hooks are interlocked, therefore fixing the heater relative to the evaporator.

[0015] In the cooling appliance of the present inven-

tion, the heater is attached onto the evaporator by means of the fixing means. The fixing means reduces the number of parts required to successfully attach the heater onto the evaporator.

[0016] 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 the claims without recourse to the technical disclosure in the description of the present invention.

Figure 1 - is a front view of the evaporator along with the heater and the fixing means

Figure 2 - is a side view of the evaporator along the dashed A-A lines in Figure 1

Figure 3 - is an isolated view of the fixing means

Figure 4 - is an enlarged view of dashed lines B-B in Figure 3

[0017] The following numerals are assigned to different parts demonstrated in the drawings and referred to in the present detailed description of the invention:

1. Evaporator
2. Heater
3. Fixing means
4. First end
5. Second end

[0018] The present invention relates to a cooling appliance comprising: a body having a refrigerating chamber; an evaporator (1) configured to cool a flow of air by cycling a refrigerant compressed by a compressor; a heater (2) configured to heat the evaporator (1) to prevent frosting of the same; a fixing means (3) to attach the heater (2) onto the evaporator (1), the fixing means (3) having a first end (4) and a second end (5).

[0019] The present invention relates to a cooling appliance wherein the fixing means (3) is configured to form a closed loop around the evaporator (1) whereby the said ends (4,5) join. The evaporator (1) is preferably provided with canals running along the length of the evaporator (1) into which the heater (2) is placed. The heater (2) is an electrical heater. Upon being placed inside the said canal, the heater (2) forms an almost flush surface with the surface plane of the fins of the evaporator (1). Afterwards the fixing means (3) which has a monolithic structure is slidably placed onto the evaporator (1) extending along the periphery of the evaporator (1) and fixing the heater (2) inside the canal. As a result, the heater (2) is rigidly fixed with respect to the evaporator (1). Upon being placed onto the evaporator (1), the first end (4) and the second end (5) of the fixing means (3) are remain next to each other. The first end (4) and the second end (5) are then connected to each other therefore closing the loop and ensuring that the fixing means (3), and the heater (2), is fixed onto the evaporator (1). Thanks to the monolithic structure of the fixing means (3), a single fixing means (3) is sufficient to retain the heater (2) onto the

evaporator (1). By this means, assembly line workers do not need to use multiple fixing means (3) which reduces the time spent for assembly. Another advantageous effect provided by the fixing means (3) is that the first end (4) and the second end (5) removably interlocks with each other in a manner sufficient to ensure that the heater (2) remains on the evaporator (1) during the transport of the evaporator (1). A further advantage provided by fixing the heater (2) onto the evaporator (1) is that the heater (2) remains adjacent to the evaporator (1) which eliminates the possibility of the heater (2) being separated from the evaporator (1), eliminating the possibility of a fire occurring due to contact between the heater (2) and the rear panel of the cooling appliance.

[0020] In an embodiment of the invention, the fixing means (3) is in the form of a wire. The fixing means (3) is the form of a wire and surrounds the evaporator (1). By means of the fixing means (3) being in the form of a wire, flow of air through the evaporator (1) is not obstructed. Another advantageous effect of the fixing means (3) being a wire is that the production of the fixing means (3) is economical.

[0021] In an embodiment of the invention, the said end (4,5) are integral with the fixing means (3). The first end (4) and the second end (5) are an integral part of the fixing means (3). The said ends (4,5) are formed by bending the fixing means (3) towards its end points. This provides convenience in production meaning that the production of the said ends (4,5) along with the fixing means (3) is economical. Another advantageous effect of said ends (4,5) is that the integral embodiment provides a rigid structure. A further advantageous effect of said ends (4,5) being integral with the fixing means (3) is that a single fixing means (3) is sufficient to hold the heater (2) in place. As a result, use of multiple fixing means (3) becomes obsolete which in turn reduces man hour required for assembly of the fixing means (3).

[0022] In an embodiment of the invention, the said ends (4,5) are shaped as hooks. The hook shaped ends (4,5) are easy to assemble. The assembly line operator simply needs to slide the evaporator (1) into the fixing means (3). Afterwards by using the hook shaped ends (4,5) the fixing means (3) is fixed onto the evaporator (1). The said ends (4,5) not only provides easy assembly but also allows the fixing means (3) to be removed from the evaporator (1) in a convenient manner should the need arise.

[0023] In an embodiment of the invention, the loop is configured to match the circumferential shape of the evaporator (1). By the loop being configured to match the circumferential shape of the evaporator (1), it is ensured that the heater (2) remains always adjacent to the evaporator (1). As a result, the energy efficiency of the defrost process is improved.

[0024] In an embodiment of the invention, the loop is in the shape of a rectangular.

[0025] In an embodiment of the invention, the fixing means (3) comprises recessed areas configured to

match the shape of the heater (2). The recesses areas on the fixing means (3) provides a seating surface for the heater (2). By means of the recessed areas, the fixing means (3) extends linearly and does not comprise any bumps. Apart from this, another advantageous effect of the recessed areas is that they act as a guide for the assembly line operator indicating the intended location of the fixing means (3) on the evaporator (1).

[0026] According to a second aspect of the invention, there is provided the method of producing a fixing means (3) comprising the steps of: providing a wire; bending the wire to form a loop; bending the ends of the wire to form hooks; inserting an evaporator inside the loop; interlocking the hooks.

- providing a wire;
- bending the wire to form a loop;
- bending the ends of the wire to form hooks
- inserting an evaporator inside the loop;
- interlocking the hooks.

Claims

1. A cooling appliance comprising:
 - a body having a refrigerating chamber;
 - an evaporator (1) configured to cool a flow of air by cycling a refrigerant compressed by a compressor;
 - a heater (2) configured to heat the evaporator (1) to prevent frosting of the same;
 - a fixing means (3) to attach the heater (2) onto the evaporator (1), the fixing means (3) having a first end (4) and a second end (5);
 - characterized in that** the fixing means (3) is configured to form a closed loop around the evaporator (1) whereby the said ends (4,5) join.
2. A refrigerator according to claim 1, **characterized in that** the fixing means (3) is in the form of a wire.
3. A refrigerator according to any preceeding claim, **characterized in that** the said end (4,5) are integral with the fixing means (3).
4. A refrigerator according to any preceeding claim, **characterized in that** the said end (4,5) are shaped as hooks.
5. A refrigerator according to any preceeding claim, **characterized in that** the loop is configured to match the circumferential shape of the evaporator (1).
6. A refrigerator according to any preceeding claim, **characterized in that** the loop is in the shape of a rectangular.
7. A refrigerator according to claim 1, **characterized in that** the fixing means (3) comprises recessed areas configured to match the shape of the heater (2).
8. A method of producing a fixing means (3) according to any preceeding claim, the method comprising:

Figure 1

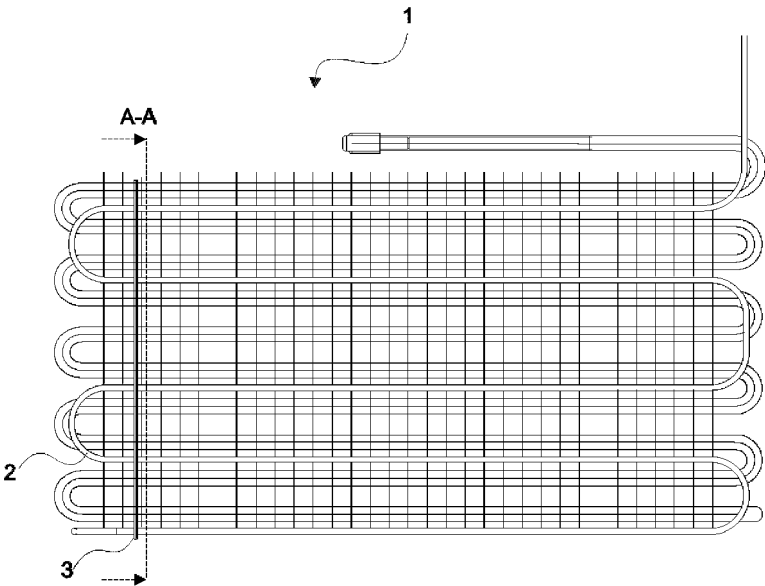


Figure 2

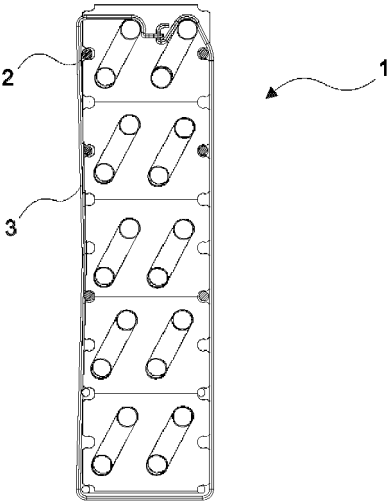


Figure 3

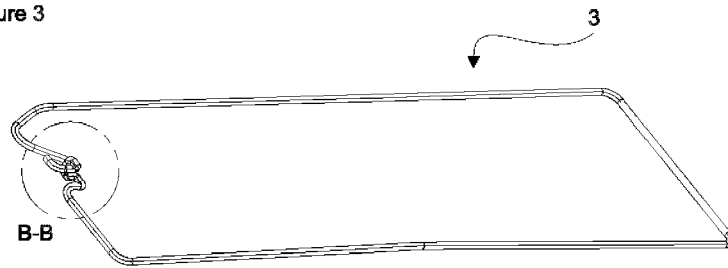
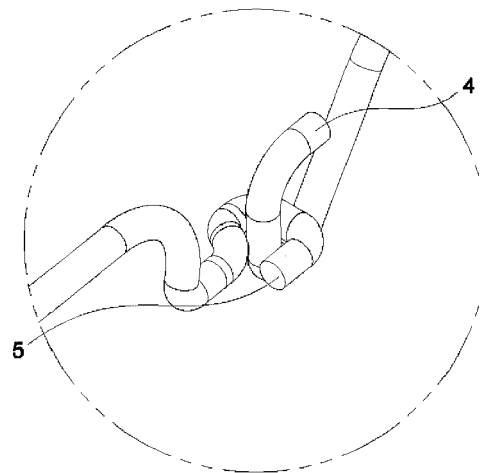


Figure 4





EUROPEAN SEARCH REPORT

Application Number
EP 21 16 5711

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 September 2021	Examiner 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			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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
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