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(54) **A COOLING DEVICE**

(57) The present invention relates to a cooling device (1) wherein the air is homogeneously distributed in the freezing compartment (2). The cooling device (1) comprises a freezing compartment (2) wherein the foodstuffs to be frozen are placed; an evaporator (3); a fan (4) which blows the air around the evaporator (3) into the freezing compartment (2); at least one freezing compartment wall (5) which separates the evaporator (3) and the inner volume of the freezing compartment (2); and a first opening (6) which is provided on the freezing compartment wall (5) so as to be aligned with the fan (4) and which enables the air blown by the fan (4) to be delivered into the freezing compartment (2).

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## Description

**[0001]** The present invention relates to a cooling device wherein the air is homogeneously distributed in the freezing compartment.

**[0002]** Cooling devices such as refrigerators comprises a fresh food compartment which provides the cooling of foodstuffs and at least one freezing compartment which is kept at much lower temperatures than the fresh food compartment and which preferably provides the freezing of foodstuffs. The freezing compartment comprises an opening through which the cold air around an evaporator in the cooling device is transferred into the freezing compartment. Behind said opening, a fan is provided, which transfers the air around the evaporator to the freezing compartment through the opening. For security purposes, a lid is disposed on the opening to prevent the user from directly reaching the fan. However, in the state of the art, the structure of the lids provided on the opening prevents the homogeneous distribution of the cold air coming through the opening in the freezing compartment. Therefore, some parts of the freezing compartment cannot be cooled at the desired level, which may cause the foodstuffs to get spoiled.

**[0003]** In the Turkish Patent Document No. TR2017/21428, a refrigerator is disclosed, which can be safely used and wherein the air is homogeneously distributed in the body.

**[0004]** The aim of the present invention is the realization of a cooling device wherein the air is homogeneously distributed in the freezing compartment.

**[0005]** The cooling device realized in order to attain the aim of the present invention, explicated in the independent first claim and the respective claims thereof, comprises at least one lid which is provided in the freezing compartment, which is configured so as to close a first opening, through which the relatively cold air sucked by the evaporator by means of the fan is delivered into the freezing compartment, so as not to be seen from the outside and which is also configured such that a gap remains between the lid and the freezing compartment wall so as to allow the air to be delivered into the freezing compartment by means of the air flow on a first plane by means of a gap remaining between the lid and the freezing compartment wall, and which comprises at least one second opening allowing the air coming through the first opening to be delivered into the freezing compartment by means of the air flow on a second plane different than the first plane. In the preferred embodiment of the present invention, the plane where the freezing compartment wall extends and the first plane are almost parallel to each other and the second plane is almost perpendicular to the first plane and the plane where the freezing compartment wall extends. In other words, the air flow into the freezing compartment by means of the lid is provided in two opposite lateral directions by means of the gap remaining between both sides of the lid and the freezing compartment and in a direction perpendicular to said lateral directions by means of the second opening. Thus, the freezing compartment is enabled to be cooled by means of the air flow provided in three different directions such that the air coming through the first opening is enabled to be homogeneously distributed in the freezing compartment. Consequently, by ensuring that the entire freezing compartment volume is evenly cooled, the need for cooling more the parts which are cooled less is eliminated, providing savings in energy and allowing the foodstuffs in the freezing compartment to be kept almost at the same temperature.

**[0006]** In an embodiment of the present invention, the lid comprises at least one plate having a first end fixed to the freezing compartment wall and extending almost parallel to the freezing compartment wall such that a gap remains between the plate and the freezing compartment wall and the first opening is closed, and a headpiece which is fixed to the wall from one point thereof, which is provided with the second opening thereon and which extends between the freezing compartment wall and the plate by being fixed from a part other than the part fixed to the wall to a second end of the plate opposite to the first end thereof fixed to the freezing compartment wall. In this embodiment, the air coming through the first opening by means of the fan is distributed into the freezing compartment by flowing in two opposite lateral directions by means of the gap between the two sides of the plate and the freezing compartment wall and a forward direction opposite to said lateral sides by means of the second opening provided on the headpiece such that the volume of the freezing compartment is enabled to be homogeneously cooled by means of the air flow in three different directions. Moreover, in this embodiment, by means of the simple structure of the lid having only a simple plate and a headpiece with the second opening thereon, the products cost of the lid is decreased while ensuring an easy and quick production process.

**[0007]** In an embodiment of the present invention, the first end of the plate has an almost concave structure with respect to the freezing compartment wall, and the second end thereof fixed to the headpiece has an almost convex structure with respect to the freezing compartment wall. In another words, the first end has a structure which is curved so as to extend from the plate to get close to, and even contact, the freezing compartment wall while the second end has a structure curved so as to move away from the freezing compartment wall. In other words, the first end and the second end of the plate have an almost S shape defining the curved parts. In this embodiment, while the air coming through the first opening towards the first end is directed towards headpiece by means of the curved structure of the first end, the second opening is positioned farther than the first opening such that the flow rate of the air passing through the second opening is increased and the headpiece is fixed onto the second end more securely so as to be supported more safely by the plate.

**[0008]** In an embodiment of the present invention, the

headpiece has at least one beam which divides the second opening into at least two. In an embodiment of the present invention, said beam is configured to be almost perpendicular to the direction of the forward air flow passing through the second opening, and in another embodiment, is configured to make a different angle with the direction of said air flow. By dividing the second opening into a plurality of smaller openings by means of the beam, the flow rate of the air flow passing through said plurality of smaller openings is higher than that of the air flow passing through a single second opening, and thus the volume of the freezing compartment is enabled to be cooled more quickly with the air flowing faster, providing savings in energy.

**[0009]** In an embodiment of the present invention, the lid further comprises at least one plate wall which has a certain thickness and which extends between the plate and the freezing compartment wall along at least a part of the plate starting from at least one side of the first end of the plate. In the preferred embodiment of the present invention, the thickness of the plate wall is equal to the width of the gap between the plate and the freezing compartment wall. Thus, the width of the gap between the plate and the freezing compartment wall at the side of the plate with the plate wall thereon is decreased, enabling the air to flow faster into the freezing compartment. In the preferred embodiment of the present invention, said plate wall is positioned on one of the two sides of the plate depending on the direction of rotation of the fan. Thus, by positioning the plate wall at the side opposite to the side depending on the direction of rotation of the fan where the air flows faster, the flow rate of the air at this side is also increased, ensuring that the air flows almost at the same speed by both sides of the plate. Consequently, by supplying the volume of the freezing compartment with the lateral air flows at almost the same speed despite the unidirectional rotation of the fan, the relatively cold air is enabled to be homogeneously distributed in the freezing compartment.

**[0010]** In an embodiment of the present invention, the plate wall comprises at least one guiding surface which enables the air coming through the first opening to be guided in the gap between the plate and the freezing compartment wall so as to be delivered into the freezing compartment. In the preferred embodiment of the present invention, said guiding surface has an inclined structure and increases the flow rate of the air while guiding the air flow. Thus, the air between the plate and the freezing compartment wall at the side of the plate with the plate wall thereof is guided by means of the guiding surface so as to increase the flow rate thereof. Consequently, by supplying the volume of the freezing compartment with the lateral air flows at almost the same speed despite the unidirectional rotation of the fan, the relatively cold air is enabled to be homogeneously distributed in the freezing compartment.

**[0011]** By means of the present invention, by means of the lid closing the first opening provided on the freezing compartment wall in a cooling device such as a refrigerator, the cold air around the evaporator is enabled to be delivered into the freezing compartment by flowing in preferably three different directions over different planes such as at least one first plane and a second plane such that the air is homogeneously distributed in the freezing compartment and the cooling performance of the freezing compartment is improved.

**[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 partial perspective view of the cooling device of the present invention.

Figure 2 - is the front perspective view of the lid of the cooling device of the present invention.

Figure 3 - is the rear perspective view of the lid of the cooling device of the present invention.

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

1. Cooling device
2. Freezing compartment
3. Evaporator
4. Fan
5. Freezing compartment wall
6. First opening
7. Second opening
8. Lid
9. Plate
10. Headpiece
11. Beam
12. Plate wall

S1. Guiding surface

**[0014]** The cooling device (1) comprises a freezing compartment (2) wherein the foodstuffs to be frozen are placed; an evaporator (3); a fan (4) which blows the air around the evaporator (3) into the freezing compartment (2); at least one freezing compartment wall (5) which separates the evaporator (3) and the inner volume of the freezing compartment (2); and a first opening (6) which is provided on the freezing compartment wall (5) so as to be aligned with the fan (4) and which enables the air blown by the fan (4) to be delivered into the freezing compartment (2). In the cooling device (1), the fan (4) is periodically operated so as to cool down the inner volume of the freezing compartment (2) so as to safely preserve the foodstuffs placed into the freezing compartment (2), and the cold air sucked by the evaporator (3) is delivered into the freezing compartment (2) through the first opening (6). Thus, the freezing compartment (2) is enabled to be cooled with the air delivered into the freezing compartment (2).

**[0015]** The cooling device (1) of the present invention comprises at least one lid (8) which is configured so as

to close the first opening (6) and which is also configured such that a gap remains between the lid (8) and the freezing compartment wall (5) so as to allow the air blown through the first opening (6) by the fan (4) to be delivered into the freezing compartment (2) by means of the air flow on a first plane by means of a gap remaining between the lid (8) and the freezing compartment wall (5), and which comprises at least one second opening (7) allowing the air coming through the first opening (6) by the fan (4) to be delivered into the freezing compartment (2) by means of the air flow on a second plane different than the first plane. In the preferred embodiment of the present invention, the first plane is almost parallel to the plane where the freezing compartment wall (5) extends while the second plane is almost perpendicular to the plane where the freezing compartment wall (5) extends. The cold air around the evaporator (3) blown by the fan (4) upon the operation of the fan (4) is delivered into the gap between the lid (8) and the freezing compartment wall (5) through the first opening (6), and from there, enter the freezing compartment (2) by flowing over a first plane by means of the gap between the sides of the lid (8) and the freezing compartment wall (5) and a second plane by means of the second opening (7). Thus, the cold air is delivered into the freezing compartment (2) by flowing over different planes and the volume of the freezing compartment (2) is homogeneously cooled.

**[0016]** In an embodiment of the present invention, the lid (8) comprises at least one plate (9) having a first end fixed to the freezing compartment wall (5) and extending almost parallel to the freezing compartment wall (5) such that a gap remains between the plate (8) and the freezing compartment wall (5), and a headpiece (10) which is fixed to the wall (5) from one end thereof, which is provided with the second opening (7) thereon and which extends between the freezing compartment wall (5) and the plate (9) by being fixed from the end opposite to said end to a second end of the plate (9) almost opposite to the first end thereof fixed to the freezing compartment wall (5). By means of the simple structure of the lid (8) composed of only a single plate (9) and a headpiece (10) having a second opening (7) thereon, the production cost of the lid (8) is decreased while ensuring an easy and quick production process.

**[0017]** In an embodiment of the present invention, the end of the plate (9) fixed to the freezing compartment wall (5) has an almost concave structure with respect to the freezing compartment wall (5), and the end thereof fixed to the headpiece (10) has an almost convex structure with respect to the freezing compartment wall (5). In the preferred embodiment of the present invention, the plate (9) is almost in the form of an S. By means of the concave structure of the first end of the plate (9) fixed to the freezing compartment wall (5) with respect to the freezing compartment wall (5), part of the air coming through the first opening (6) onto the first end is guided towards the headpiece (10) so as to be delivered into the freezing compartment (2) through the second opening (7). By means of the convex structure of the second end of the plate (9) opposite to the first end with respect to the freezing compartment wall (5), a wide connection surface for fixing the headpiece (10) is obtained and thus a safe connection is provided between the plate (9) and the headpiece (10). Moreover, the convex structure of the second end with respect to the freezing compartment wall (5) serves as a base limiting the second opening (7), and thus, the need for forming a base for the headpiece (10) limiting the second opening (7) is eliminated, providing production and cost advantage.

**[0018]** In an embodiment of the present invention, the headpiece (10) comprises at least one beam (11) which divides the second opening (7) into at least two. In an embodiment of the present invention, the beam (11) is configured to be perpendicular to the air flow through the second opening (7), and in an alternative embodiment of the present invention, the beam (11) is configured to make an angle with said air flow. Thus, the second opening (7) is divided into a plurality of smaller second openings (7), and the flow rate of the air passing through the second opening (7) is increased, which in turn increases the rate of cooling.

**[0019]** In an embodiment of the present invention, the lid (8) further comprises at least one plate wall (12) which has a certain thickness and which extends between the plate (9) and the freezing compartment wall (5) along at least a part of the plate (9) starting from at least one side of the first end of the plate (9). By means of the certain thickness of the plate wall (12), the width of the gap between the plate (9) and the freezing compartment wall (5) at the side of the plate (9) with the plate wall (12) thereon is decreased, enabling the air to flow faster into the freezing compartment (2). Thus, the flow rate of the air is increased, which in turn increases the rate of cooling.

**[0020]** In an embodiment of the present invention, the plate wall (12) comprises at least one guiding surface (S1) which enables the air coming through the first opening (6) to be guided in the gap between the plate (9) and the freezing compartment wall (5) so as to be delivered into the freezing compartment (2). In the preferred embodiment of the present invention, said guiding surface (S1) has an inclined structure. Thus, the air between the plate (9) and the freezing compartment wall (5) at the side of the plate (9) with the plate wall (12) thereof is guided by means of the guiding surface (S1) so as to increase the flow rate thereof. Thus, the flow rate of the air is increased, which in turn increases the rate of cooling.

**[0021]** By means of the present invention, by means of the lid (8) in a cooling device (1) such as a refrigerator, the cold air around the evaporator (3) is enabled to be delivered into the freezing compartment (2) by flowing over different planes such as at least one first plane and a second plane such that the air is homogeneously distributed in the freezing compartment (2) and the cooling performance of the freezing compartment (2) is im-

proved.

## Claims

1. A cooling device (1) **comprising** a freezing compartment (2) wherein the foodstuffs to be frozen are placed; an evaporator (3); a fan (4) which blows the air around the evaporator (3) into the freezing compartment (2); at least one freezing compartment wall (5) which separates the evaporator (3) and the inner volume of the freezing compartment (2); and a first opening (6) which is provided on the freezing compartment wall (5) so as to be aligned with the fan (4) and which enables the air blown by the fan (4) to be delivered into the freezing compartment (2), **characterized by** at least one lid (8) which is configured so as to close the first opening (6) and which is also configured such that a gap remains between the lid (8) and the freezing compartment wall (5) so as to allow the air blown through the first opening (6) by the fan (4) to be delivered into the freezing compartment (2) by means of the air flow on a first plane by means of a gap remaining between the lid (8) and the freezing compartment wall (5), and which comprises at least one second opening (7) allowing the air coming through the first opening (6) by the fan (4) to be delivered into the freezing compartment (2) by means of the air flow on a second plane different than the first plane.

2. A cooling device (1) as in Claim 1, **characterized by** the lid (8) comprising at least one plate (9) having a first end fixed to the freezing compartment wall (5) and extending almost parallel to the freezing compartment wall (5) such that a gap remains between the plate (8) and the freezing compartment wall (5), and a headpiece (10) which is fixed to the wall (5) from one end thereof, which is provided with the second opening (7) thereon and which extends between the freezing compartment wall (5) and the plate (9) by being fixed from the end opposite to said end to a second end of the plate (9) almost opposite to the first end thereof fixed to the freezing compartment wall (5).

3. A cooling device (1) as in Claim 2, **characterized by** the plate (9) having the first end which has an almost concave structure with respect to the freezing compartment wall (5) and the second end which has an almost convex structure with respect to the freezing compartment wall (5).

4. A cooling device (1) as in Claim 2 or 3, **characterized by** the headpiece (10) comprising at least one beam (11) which divides the second opening (7) into at least two.

5. A cooling device (1) as in any one of the claims 2 to 4, **characterized by** the lid (8) comprising at least one plate wall (12) which has a certain thickness and which extends between the plate (9) and the freezing compartment wall (5) along at least a part of the plate (9) starting from at least one side of the first end of the plate (9).

6. A cooling device (1) as in Claim 5, **characterized by** the plate wall (12) comprising at least one guiding surface (S1) which enables the air coming through the first opening (6) to be guided in the gap between the plate (9) and the freezing compartment wall (5) so as to be delivered into the freezing compartment (2).

Figure 1

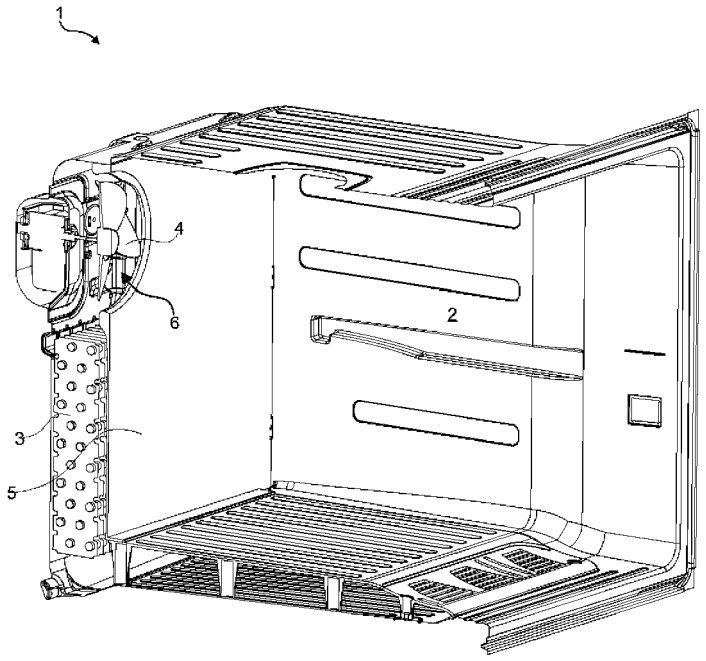


Figure 2

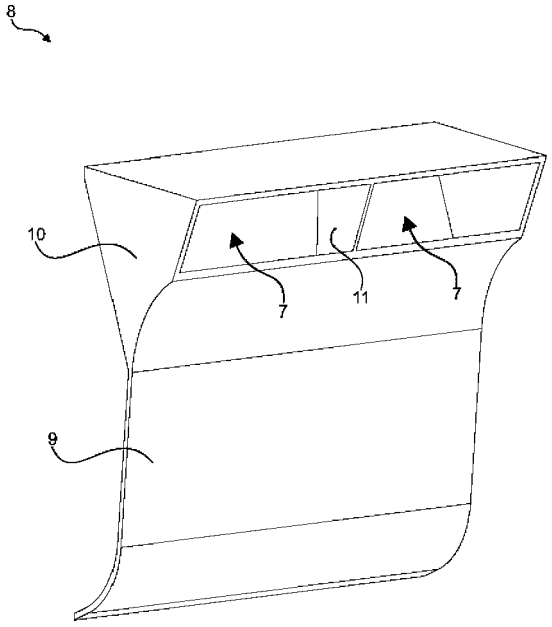
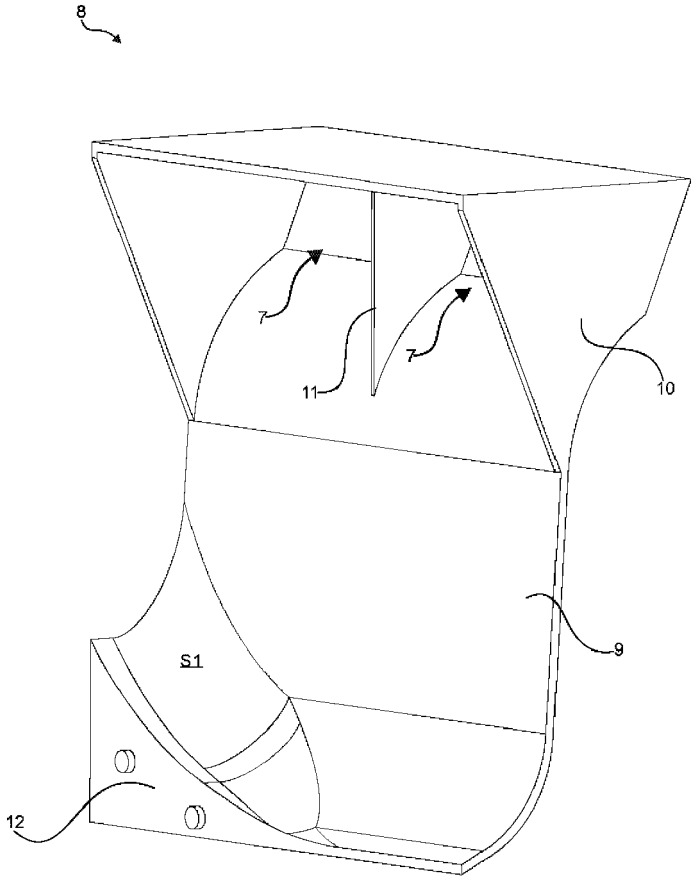


Figure 3



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Application Number
EP 21 15 1823

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
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CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 15 1823

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