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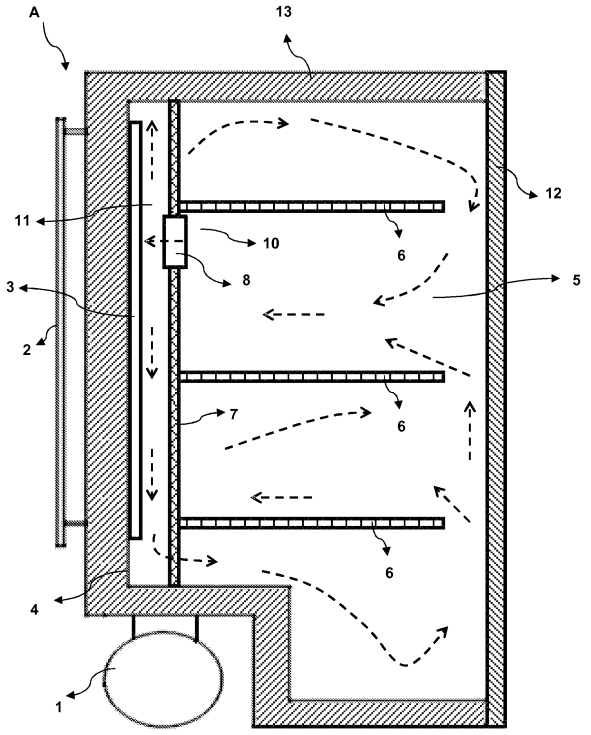
(54) A cooling device

(57) The cooling device according to the present invention is developed for storing food products and comprises a compressor (1), condenser (2) and evaporator (3) for the refrigeration cycle. The device (A) according to the present invention comprises at least one plate (7) with low heat conductivity, covering partially or entirely at least one internal wall (4) thereof; a gap (11) between the inner wall (4) and plate (7) for the placement of evaporator (3); at least one air blowing unit (8), which is disposed at a certain distance to the evaporator (3) surface, and sucks the air in the device (A) interior (5) and guides it directly to any region on the evaporator (3); and at least one hole (9), through which cooled air hitting the evaporator (3) and propagating accordingly is passed to the internal volume (5).



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Description

Field of Invention

[0001] This invention relates to cooling devices used for storing foodstuffs.

Prior Art

[0002] As is known, a refrigeration cycle is usually carried out by means of a compressor, condenser, capillary tube, and evaporator in cooling devices used in storing food products. Hot fluid, output from the compressor in pressurized form is condensed in the condenser, thereby giving off some of its heat and pressure; thereafter it is passed through capillary tubes and delivered to the evaporator under very low pressure. The evaporator is employed for cooling the device interior (i.e. internal volume), so that as refrigerant passes through it, it evaporates due to its low pressure and the temperature of the internal volume, resulting in cooling on the evaporator surface. This cooling effect aids in cooling down the device's internal volume. At the end of the cycle, the refrigerant is guided back to the compressor and all processes are repeated.

[0003] In order to maintain the temperature stability of the internal volume that is brought to low temperatures in these cooling devices, the refrigeration cycle is kept continuing and some heat insulations are made on the device. Particularly for lowering the energy consumption due to the refrigeration cycle, the insulation thickness and the amount of refrigeration fluid used in the device may be increased, and more efficient compressors may be preferred. It is further devisable to change the size of components (e.g. evaporator, condenser, etc.) used in the refrigeration cycle. Refrigerants and insulation materials used for this purpose, however, are harmful against the environment; hence any increase in their amounts creates a further potential damage against the environment.

[0004] With respect to known and widely-applied techniques, air is sucked from the evaporator surface by means of a fan unit and is distributed into the internal volume of the device, such that the device interior is uniformly cooled down with the cooled evaporator surface. As a relevant example, the published patent application KR20020015242 discloses an arrangement, in which a fan providing in-refrigerator air circulation is disposed on an evaporator. According to this arrangement, the fan sucks a mass of air from the evaporator surface, so that the air mass is uniformly distributed within the refrigerator. The published patent application KR20010065919, in turn, discloses an arrangement, in which a mass of air mass sucked from an evaporator surface by means of a fan is distributed within a cooler with the aid of a second fan.

Brief Description of Invention

[0005] The cooling device according to the present invention is developed for storing food products and comprises a compressor, condenser, and evaporator for the refrigeration cycle. The device according to the present invention comprises at least one air blowing unit, which is situated at a certain distance to the evaporator surface, and sucks the air in the device interior and guides it directly to any region on the evaporator; at least one plate with low heat conductivity, covering partially or entirely at least one wall thereof; a gap between the inner wall and plate for the placement of evaporator; and at least one hole, through which cooled air hitting the evaporator and propagating accordingly is passed to the internal volume.

[0006] Said plate is particularly made of a material with low heat conductivity (heat insulation). Any frost formation thereon is thus prevented. Thus, no frosting occurs in said gap, except the outer surface of the evaporator. For this reason, the plate can be kept as close as possible to the evaporator so that the useful space of the device interior is increased. It is further possible with the present invention to provide a certain level of temperature distribution within the internal volume by guiding air to any region on the evaporator, situated at a certain distance to the evaporator surface.

Object of Invention

[0007] This invention aims to enhance the refrigeration performance of cooling devices used for storing food products and to provide energy saving.

[0008] Another object of the present invention is to increase the refrigeration performance by directly guiding air onto the evaporator in the device.

[0009] A further object of the present invention is to form a cooling device so that a free air-flow is provided around the evaporator.

[0010] Yet a further object of the present invention is to embody a cooling device which is not harmful against the environment.

[0011] Still a further object of the present invention is to embody a easy-to-produce and inexpensive, reliable cooling device, which can achieve the aforesaid objects.

Description of Figures

[0012] An illustrative embodiment of the subject cooling device is illustrated in annexed figures briefly described hereunder.

Figure 1 is a cross-sectional illustration of a sample cooling device.

Figure 2 is a front illustration of the sample cooling device's interior.

[0013] The parts in said figures are individually enumerated as following.

Cooling device (A)

Compressor (1)

Condenser (2)

Evaporator (3)

Device internal wall (4)

Internal volume (i.e. the interior) (5)

Shelf (6)

Plate (7)

Air blowing unit (8)

Hole (9)

Hole (10)

Gap (11)

Door (12)

Body (13)

Description of Invention

[0014] The cooling device (A) used for storing food products (either by refrigerating or freezing the same) according to the present invention, as illustrated in figures 1 and 2, is developed to provide energy saving and enhancement of refrigeration efficiency. Said device (A) comprises a compressor (1), condenser (2), evaporator (3) units to conduct the refrigeration cycle known in the relevant art. It is aimed with the present invention to cool the internal volume (5) of the device (A) in a more efficient manner. The device (A) internal volume (5) is provided with fixed or removable shelves (6), formed for placing food products thereon. The internal volume (5) may also be separated into different compartments (e.g. cooling, freezing compartments, vegetable compartment etc.; not illustrated in figures). At least one door (12) (e.g. cooler and freezer compartment doors) is provided to give access into the internal volume (5). A heat-insulation material is provided at the device (A) body (13) and door (12) to prevent heat exchange between the internal volume (5) and the exterior.

[0015] With the air blowing unit (8) of the device (A) according to the present invention, air at a high flow rate is hit onto the evaporator (3) and it is distributed over the evaporator (3) surface, such that heat transfer (i.e. amount of heat which the evaporator absorbs from the internal volume) occurring at the evaporator (3) is increased. The refrigerant (3) in the evaporator evaporates, with the heat it takes, into the gaseous phase. With an increase in the heat absorbed by the refrigerant in the evaporator (3) while it changes phase with the aid of air guided to the evaporator, more efficient use is made from the refrigerant. The amount of heat which the refrigerant absorbs from the internal volume (5) is increased and the operation time of the compressor (1) is reduced, therefore energy consumption is decreased by 28-35% as compared to the prior art, as determined from the results of tests performed. This fact means that advancement is achieved by at least one class in refrigerator energy classes according to European (EU Directive 94/2 EC) standards. Additionally, by creating an angle of 30 degrees at least, between the direction of air guided onto the evaporator (3) and the evaporator (3) surface, most efficient cooling is obtained (according to the results of tests performed).

[0016] As an exemplification of the present invention, at least one internal wall (4) of the cooling device (A) is closed partially or entirely with at least one plate (7), and at least one evaporator (3) is disposed in the gap (11) remaining between the wall (4) and the plate (7) (referring to Figure 1, the evaporator (3) is illustrated to be placed at an internal wall (4) of the device (A)). The internal wall (4) may be any wall on the device body (13) and/or door (12) (a vertical rear wall is shown in the figures for this purpose). According to this sample embodiment, said plate (7) separates the evaporator (3) from the internal volume (5). The evaporator (3) may either be placed on the internal wall (4) or plate (7), or be situated so as to separate said gap (11) into two. The plate (7) is particularly made from a material with low heat conductivity (heat insulation). Thus, any frost formation thereon is prevented. Therefore no frosting occurs in said gap (11), except the outer surface of the evaporator (3). For this reason, the plate (7) can be kept as close as possible to the evaporator 83) so that the useable space of the device (A) interior (5) is increased.

[0017] In this sample embodiment (A), air is guided onto the evaporator to cool down the device (A) interior (5), such that air cooled down here is propagated through said gap (11) and is fed into the internal volume (5) (air flow is illustrated by dashed arrows) through at least one hole (9) provided on the plate (7) and/or on at least one wall (4) (the hole is illustratively shown on the plate (7) in Figure 2). At least one air blowing unit (8) (situated at a certain distance to the evaporator (3) surface) used to guide air onto the evaporator (3) sucks air from the internal volume (5) and guides it directly onto the evaporator (3) (to any region on the evaporator (3), e.g. to a region on the evaporator (3) at a certain distance to the center of the evaporator (3) surface). It is one of the preferred embodiments according to the present invention to create an angle of 30 degrees at least, between the direction of air guided onto the evaporator (3) and the evaporator (3) surface.

[0018] The air blowing unit (8) may be situated on the plate (7) (as representatively illustrated in Figure 1), on the internal wall (4), or on the evaporator (3). The air blowing unit (8) may suck and blow the air either coming from at least one hole (10) on the plate (7); or, if the unit is situated on the internal wall (4), from at least one channel (not illustrated in figures), which may be provided on at least one internal wall (4) and connected with the internal volume (5). Said air blowing unit (8) may be a fan unit or an air pump.

Claims

1. A cooling device (A) for food products, comprising a compressor (1), condenser (2) and evaporator (3), **characterized in that**
said device (A) comprises at least one air blowing unit (8), which is situated at a certain distance to the evaporator (3) surface and which sucks the air within the internal volume (5) of said device (A) and delivers it to any region on the evaporator (3) surface.

2. A cooling device (A) according to Claim 1, **characterized by** comprising at least one plate (7) having low heat conductivity and closing at least one internal wall (4) of said device (A) partially or completely.

3. A cooling device (A) according to Claim 2, **characterized by** comprising a gap (11) between the internal wall (4) and the plate (7) for the placement of evaporator (3).

4. A cooling device (A) according to Claim 2, **characterized by** comprising at least one hole (9), through which cooled air hitting the evaporator (3) and propagating accordingly is passed to the internal volume (5).

5. A cooling device (A) according to Claim 2, **characterized in that** said plate (7) is situated in front of any internal wall (4) of the cooling device (A) so as to allow the air surrounding itself to pass by at least one side thereof.

6. A cooling device (A) according to Claim 4, **characterized in that** said hole (9) is provided on the plate (7) and/or on at least one internal wall (4).

7. A cooling device (A) according to Claim 1, **characterized in that** said evaporator (3) is situated at the internal wall (4).

8. A cooling device (A) according to Claim 2, **characterized in that** said evaporator (3) is situated on the plate (7).

9. A cooling device (A) according to Claim 3, **characterized in that** said evaporator (3) is situated so as to separate said gap (11) into two.

10. A cooling device (A) according to Claim 2, **characterized in that** said air blowing unit (8) is disposed on said plate (7).

11. A cooling device (A) according to Claim 1, **characterized in that** said air blowing unit (8) is disposed on the internal wall (4).

12. A cooling device (A) according to Claim 2, **characterized by** comprising at least one hole (10) on the plate (7), through which said air blowing unit (8) sucks the air present in the internal volume.

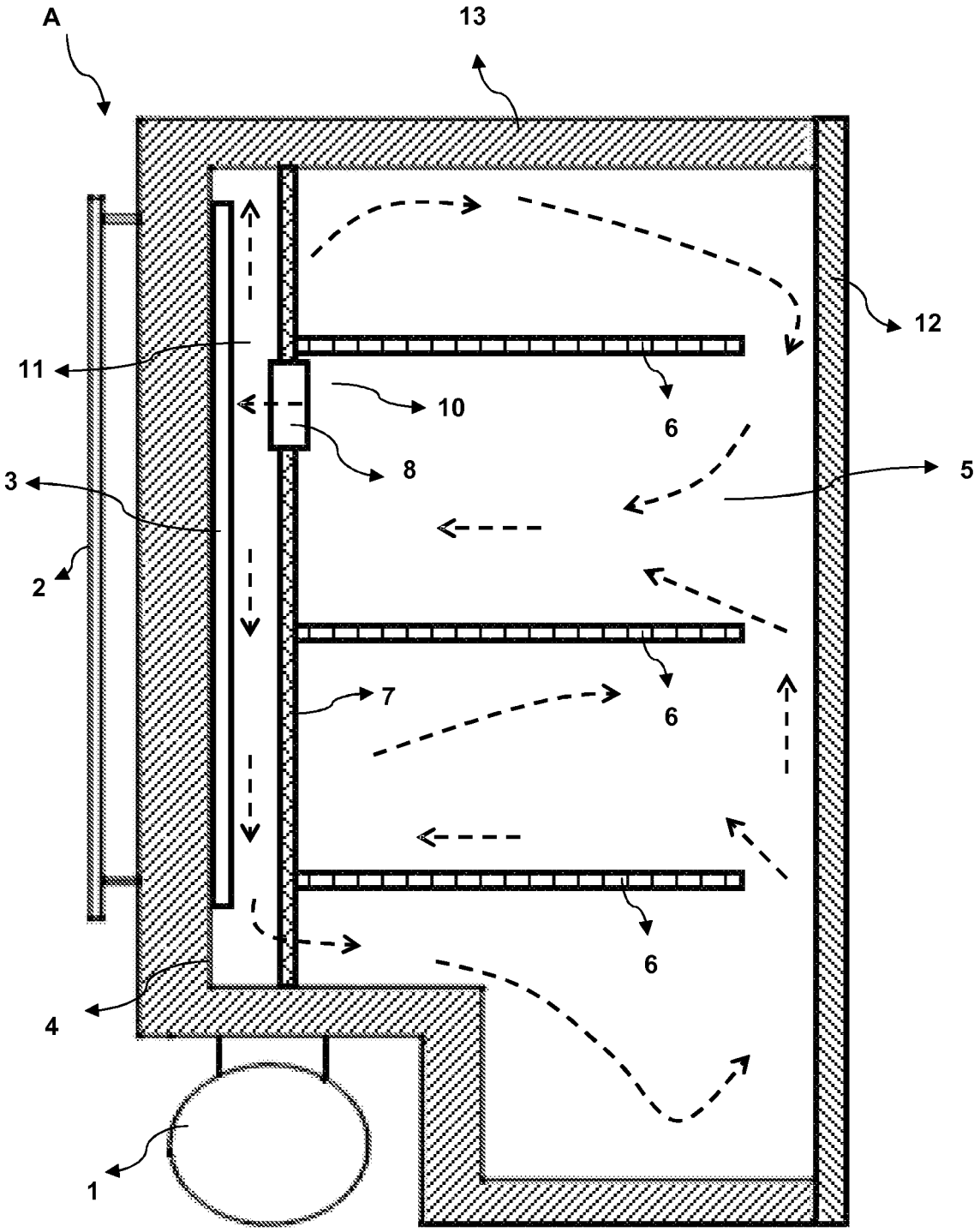
13. A cooling device (A) according to Claim 2, **characterized by** comprising at least one channel, by which said air blowing unit (8) sucks the air present in the internal volume, said channel being provided on at least one internal wall (4) and connected with the internal wall (5).

14. A cooling device (A) according to Claim 1, **characterized in that** an angle of at least 30 degrees is created between the direction of air guided onto the evaporator (3) and the evaporator (3) surface.

15. A cooling device (A) according to Claim 1, **characterized in that** said air blowing unit (8) blows air to a region on the evaporator (3), situated at a certain distance to the center of the evaporator (3) surface.

16. A cooling device (A) according to Claim 1, **characterized in that** said air blowing unit (8) is a fan unit.

17. A cooling device (A) according to Claim 1, **characterized in that** said air blowing unit (8) is an air pump.



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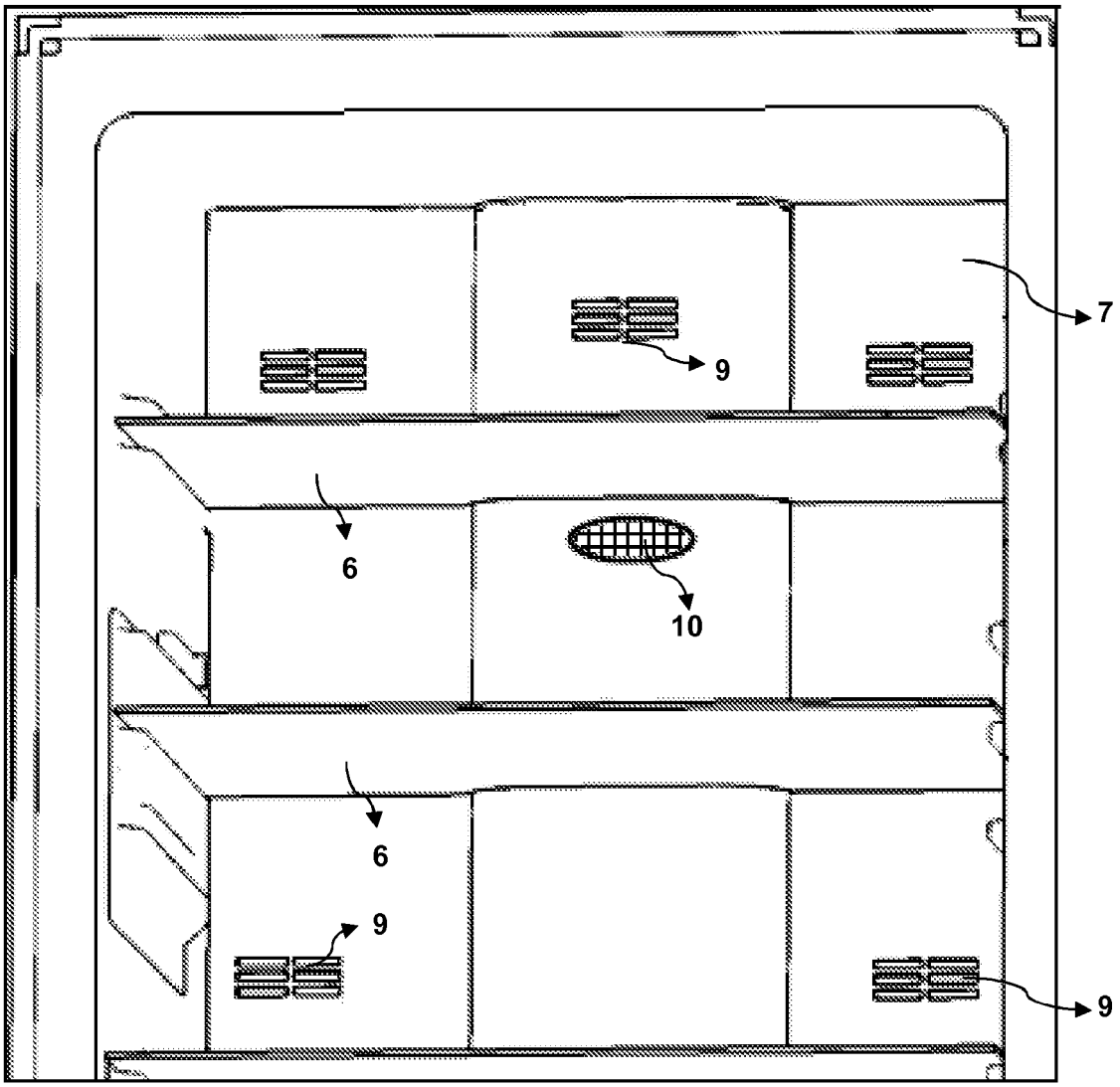

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 9257

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 295 02 800 U1 (BOSCH SIEMENS HAUSGERAETE [DE]) 20 April 1995 (1995-04-20) * the whole document *	1-7, 10-17	INV. F25D17/06
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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
Munich	7 July 2010	Jessen, Flemming

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 15 9257

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

REFERENCES CITED IN THE DESCRIPTION

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