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(54) **A cooling device**

(57) The cooling device (S) of the present invention comprises at least one air compartment (15) in the device (S), into which one sides of air transfer channels (7a, 7b) open; at least one blown air channel (8a) located between the evaporator (4) outlet and air compartment (15); at least one returning air channel (9b) located between the

air compartment (15) and evaporator (4) inlet; at least one air directing unit (16) located within the said compartment (15), which is movable periodically between the first section (15a) where one (7a) of the air transfer channels (7a, 7b) open into the compartment (15) and the second section (15b) where the other channel (7b) opens into the said compartment (15).

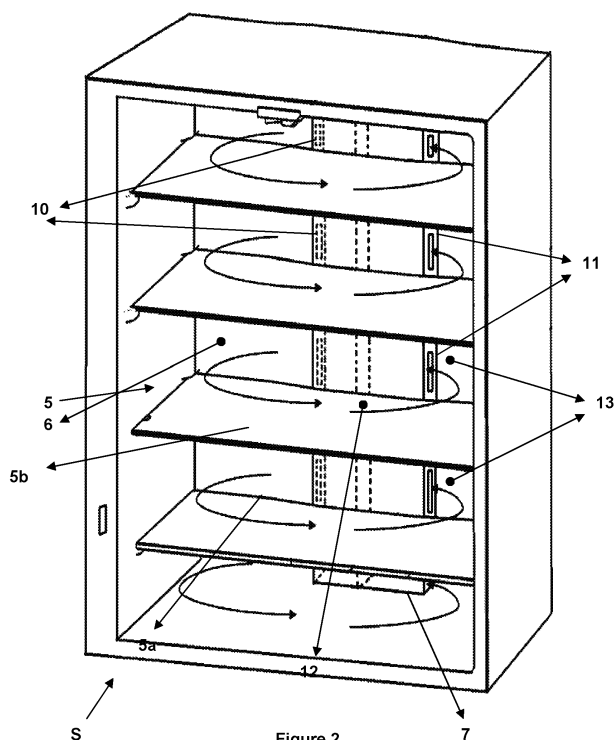


Figure 2

EP 2 426 441 A2

Description**Technical Field**

5 **[0001]** This invention relates to the air circulation between the cooler element and the chamber located in the cooling devices.

Prior Art

10 **[0002]** Refrigeration (cooling) cycle in cooling devices is carried out generally by compressor, condenser, capillary pipe and cooler element (evaporator) units. In accordance with this, in a cooling system, the refrigerant coming hot out of the compressor transfers its heat to the medium and condenses while passing through condenser, so cools down. The refrigerant, after passing through capillary pipe which reduces its pressure, reaches the evaporator. The refrigerant is transferred to gas phase upon evaporation easily because of the heat it absorbs from the chamber and because of
15 the low pressure. The refrigerant which cools the chamber by absorbing heat from the chamber in evaporator comes to compressor again so that the known cooling cycle is completed, and this cycling is continued alternately.

[0003] In order to ensure an effective cooling and equal heat distribution, there's air circulation between the evaporator and the chamber. Various embodiments are present explaining this air circulation. One of these embodiments is described in the patent application US3702544A which is a part of the state of the art. In the cooling device explained in this document, the air cooled by the evaporator is directed into the air channels whose one end reaches the evaporator while
20 the other end opens into the chamber. The air that comes to the chamber through this channel is directed towards evaporator by means of a fan located near the evaporator and by passing through the air holes between the evaporator and the chamber and in this way, air circulation between the evaporator and the chamber is ensured.

[0004] The state of the art patent application CA2694962A1 discloses a cooling system which transfers the air cooled in the cooler unit through the channels into the chamber which is to be cooled. The chamber which is to be cooled by this system comprises two openings for the passage of air located on the rear wall of the chamber, one in a region close to the upper part of the chamber and the other one in a region close to the lower part of the chamber. This cooling system comprises a main air channel whose one end is connected with the air outlet of cooler unit and the other is connected to the air inlet of this unit and a channel system comprising two air channels one of which is connected to the opening
30 on the upper part of the chamber wall while the other one is connected to the opening on the lower part of the chamber wall. These air lines are in connection with the main channel at the same time, a valve providing for linking the air line connected with the upper opening to the main channel and another valve providing a link with the main channel at another side of the said air line. In accordance with the positions of these valves, the cool air coming out of the cooler unit comes into the chamber trough the upper or lower opening and returns back to the cooler unit through the upper or
35 lower opening. This way in the chamber, an air circulation is provided in the chamber either coming from the upper opening into the chamber and returning through the lower opening back to the cooling unit or coming from the lower opening into the chamber and returning through the upper opening back to the cooling unit. Therefore in the chamber, air circulation in different directions is ensured.

40 **Brief Disclosure of the Invention**

[0005] Present invention describes a cooling device in which a circular air circulation in the chamber is provided. Said device comprises at least one chamber, at least one carrier element arranged in the said chamber, at least one compressor, at least one evaporator, at least one air blowing unit directing the air cooled in the evaporator towards the chamber through at least one air channel, at least one separator located within the channel and along the channel, at
45 least two transfer channels provided by the said separator within the channel, at least one air hole which provides a connection between the chamber and one of the air transfer channels and which is located in this area for the air circulation in the upper part created by the carrier element and at least one other air hole providing for the connection between the chamber and the other air transfer channel, at least one air hole which provides a connection between the chamber and one of the air transfer channels and which is located in this area for the air circulation in the lower part created by the carrier element and at least one other air hole providing for the connection between the chamber and the other air transfer channel, at least one air compartment into which at least one ends of said air transfer channels open in the device, at least one blown air channel located between the evaporator outlet and the air compartment, at least one returning air channel located between air compartment and the evaporator inlet, and in the compartment, at least
50 one air directing unit which is in a structure that will allow it to move periodically between the first section where one of the air transfer channels reaches the said compartment and the second section where the other air transfer channel reaches the said compartment.

[0006] The cool air coming out of the evaporator passes through the blown air channel by means of air blowing device

to reach air compartment. The cool air coming from the compartment passes into the chamber by means of the air directing unit located in one of the regions where air transfer channels open into the said compartment and by means of a transfer channel that opens into the region where the said air directing unit is located, through the air hole which connects the said channel to the chamber. The air warmed by the heat it absorbs from the chamber passes through another air hole and turns back to the air compartment by means of the other air transfer channel; the returning air goes back to evaporator through the channel. In this way, the air circulation between chamber and the evaporator and within the chamber is ensured to continue for a certain period. At the end of this certain period, the directing unit moves from the location it had in the compartment (for example from first section) towards another location (for example second section). Therefore, the cool air coming from the evaporator to the compartment reaches the chamber through the air transfer channel which opens into the second section in which the directing unit is located (the air transfer channel which transfers the warm air from the chamber into the compartment while the directing unit is in the first section), and through the air hole which connects the said channel to the chamber; and the air warmed in the chamber goes to the compartment through the other transfer channel (the channel that directs the cool air coming from the compartment into the chamber while the directing unit is in the first section) and through the air hole connecting the said channel and the chamber. The air that comes to the compartment goes back to evaporator by means of the returning air channel. Thus, the air circulation that is carried out when the directing unit is in the first section is reversed and continues for a certain period. After this period, the directing unit re-locates in the other region (in the first section) and this movement of directing unit repeats at certain intervals periodically. Therefore, the direction of the circular air circulation between the chamber and the evaporator and the direction of the air circulation within the chamber is altered periodically, which in return increases the effectiveness of cooling operation within the chamber. In addition to this, with the altering of air circulation, equal heat distribution between the lower and upper parts defined by the carrier element in the chamber.

Objective of the Invention

[0007] The aim of this invention is to provide a cooling device in which a circular air circulation in the chamber is ensured.

[0008] Another aim of this invention is to provide a cooling device in which an alterable air circulation is ensured within the chamber.

[0009] A further aim of this invention is to provide a cooling device whose chamber is cooled effectively.

[0010] Still a further aim of this invention is to provide a cooling device in whose chamber equal heat distribution is achieved.

[0011] Yet a further aim of this invention is to provide a cooling device which allows the food placed in the chamber to come into contact with more air.

[0012] Yet another aim of this invention is to prevent the air from concentrating in a certain area within the chamber of the cooling device.

[0013] Yet another aim of this invention is to provide a cooling device in which a separate air circulation in the lower and upper part of the carrier element located in the chamber.

Description of Drawings

[0014] An exemplary cooling device of this invention and the air circulation elements therein are shown in the accompanying figures of which:

Figure 1; is a view of the air circulation elements and the air circulation.

Figure 2; is a perspective view of an embodiment of cooling device.

Figure 3; is a detailed view of the air circulation of cooling device shown in Figure 2.

Figure 4; is a perspective view of another embodiment of cooling device.

Figure 5; is a detailed view of the air circulation in cooling device shown in Figure 4.

[0015] All the parts illustrated in the figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed.

Cooling device (S)

Compressor (1)

	Condenser	(2)
	Capillary tube	(3)
5	Cooler element	(4)
	Chamber	(5)
	Lower part	(5a)
10	Upper part	(5b)
	Wall	(6)
15	Air channel	(7)
	Air transfer channel	(7a, 7b)
	Blown air channel	(8)
20	Returning air channel	(9)
	Air inlet hole	(10)
25	Air outlet hole	(11)
	Separator	(12)
	Carrier element	(13)
30	Air blowing unit	(14)
	Air compartment	(15)
35	First section	(15a)
	Second section	(15b)
	Air directing unit	(16)
40	Motor	(17)
	Shaft	(18)

45 **Disclosure of the Invention**

[0016] In cooling devices (S) (shown in Figures 2 and 4), the cooling system, shown in Figure 1, generally comprises at least one compressor (1), at least one condenser (2), capillary tube (3) and at least one cooler element (evaporator) (4). Figure 2 and Figure 4 shows an exemplary cooling device (S) which comprises at least one chamber (5) and at least one cooler element (evaporator) (4) used to cool the said chamber (5). The refrigerant coming hot out of the compressor (1) located in this cooling device (S) cools by transferring its heat to the outside atmosphere and condenses while passing through the condenser (2). The refrigerant whose pressure decreases upon passing through capillary tube (3) then reaches the evaporator (4). There, the refrigerant passes to gas phase by easily evaporating due both to the low pressure and to the heat it absorbs from the chamber (5). The refrigerant which cools the chamber (5) owing to the heat it absorbs from the chamber (5) in the evaporator (4) comes back to the compressor (1) again, thus completing the known cooling cycle and this circulation is continued alternately.

[0017] In the cooling device (S) of this invention an exemplary embodiment of which is illustrated in Figures 2 and 4, the air flow between the evaporator (4) and the chamber (5) is carried out by means of at least one air channel (7) located

on at least one wall (6) of the device. Through the air holes (10, 11) arranged in this channel (7), air circulation between the chamber (5) and evaporator (4). The said air holes (10, 11) are preferably located on the sides of air channel (7); circular air circulation within the chamber (5) is carried out in a way that the air coming into the chamber (5) through a hole (10) located on one side of the channel (7) fills in the chamber and leaves the chamber through another hole (11) located on the other side of the channel (7).

[0018] Within the said air channel (7), at least one separator (12) is located along the air channel (7). This separator (12) divides the air channel (7) into two parts, creating two air transfer channels (7a, 7b) for inlet and outlet of air (shown in Figure 3 and Figure 5). The said separator (10) is in an air-tight form and prevents air passage between the said two channels (7a, 7b).

[0019] At least one side of these air transfer channels (7a, 7b) opens into at least one air compartment (15) in the device (S) (shown in Figure 3 and Figure 5). At least one air directing unit (16) located in the device (S) (shown in Figure 3 and Figure 5), is movable within the air compartment (15), between the regions (15a, 15b) where the air transfer channels (7a, 7b) opens into the compartment (15) (between the first section (15a) and the second section (15b)). When the directing unit (16) moves from one region (15a, 15b) of compartment towards the other region (15b, 15a) the direction of the air circulation between the evaporator (4) and the chamber (5) and thus the direction of the air circulation within the chamber (5) is altered.

[0020] In Figure 3, a detailed view of the exemplary cooling device (S) shown in Figure 2 is provided. The air cooled by the evaporator (4) in the said device (S) passes through at least one blown air channel (8) located between the outlet of evaporator (4) and at least one air compartment (15) in the device (S), then it comes to air directing unit (16). The air that comes to the directing unit (16) in the first section (15a) reaches the chamber (5) by passing through the air holes (10) which connect the chamber and the channel (7a) by means of the channel (7a) opening into the first section (15a). The air cooling the chamber (5) comes to the air compartment (15) by means of another channel (7b) that opens into a second section (15b) by passing through the air holes (11) which connect the said channel (7b) to the chamber (5) and which are on the said air transfer channel (7b) that is located between the chamber (5) and the air compartment (15). The air there comes to the evaporator (4) by means of at least one returning air channel (9) located between the inlet of the evaporator (4) and air compartment (15) thus ensuring air circulation between the chamber (5) and the evaporator (4). In addition, within the chamber (5) a circular air flow between the holes (10, 11) is ensured so that chamber (5) cooled in a more effective way.

[0021] In Figure 5, a detailed view of the air circulation in the exemplary cooling device (S) illustrated in Figure 4 is provided. In this exemplary embodiment, the directing unit (16) moves from the first section (15a) to the second section (15b). The cool air that comes to the air compartment (15) from the evaporator (4) through the blown air channel (8) is transferred from the compartment (15) into the chamber (5) through an air transfer channel (7b) opening to the said second section (15b) (the transfer channel (7b) that allows the air to pass from the chamber (5) to the compartment (15) when the directing unit (16) is in the first section (15a)). The air warmed in the chamber (5) comes to the air compartment (15) from the chamber (5) through air transfer channel (7a) that opens into the first section (15a) (the transfer channel (7a) which directs the cool air, which comes from evaporator (4) into the compartment (15), towards the chamber (5) when the directing unit (16) is in the first section (15a)) and it is transferred into the evaporator (4) by means of the returning air channel (9). Therefore, the air circulation created upon the location of directing element (16) in the first section (15a) changes its direction when the directing element (16) is located in the other section (15b). Thus, the direction of the air circulation within the chamber (5) is altered. In other words, the air circulation which is directed from left to right in the example in Figure 2 changes its direction from right to left as shown in the example of Figure 4.

[0022] The said movements of directing unit (16) between the sections (15a, 15b) continue periodically. Therefore, equal heat distribution within the chamber (5) is achieved and the cooling efficiency of the cooling device (S) is increased.

[0023] The movement of the directing unit (16) can be carried out in various ways, in the embodiments of the invention shown in figures, this unit (16) is moved by means of at least one motor (17) provided in the device (S) and at least one shaft (18) connecting the said motor (17) to the said unit (16).

[0024] In an exemplary embodiment of the invention, at least one timer (not shown in figures) is provided to control the movement of directing unit (16). This timer counts for a predetermined time period and after the completion of this period, the directing unit (16) changes its position in a way that will alter the direction of air circulation within the chamber (5).

[0025] In the exemplary embodiment of the invention shown in Figures, at least one air blowing unit (14) is provided preferably on the outlet of evaporator (4). This blowing unit (14) directs the air that is cooled in the evaporator (4) to the blown air channel (8).

[0026] With the embodiment of this invention, the air circulation created in the chamber (5) allows for equal heat distribution within the chamber (5). In addition to this, the food products placed in the device (S) is ensured to have more contact with air and concentration of air within the chamber (5) in a certain area is prevented.

[0027] In the exemplary embodiment of this invention shown in figures, the holes (10, 11) are arranged in such a way that they will stay in the lower part (5a) or upper part (5b) of the carrier element (13) (shelf may be given as an example of a carrier element (13)) in the chamber (5). In other words, the air circulation in the parts (5a, 5b) created by the carrier

element (13) in the chamber (5) is carried out independently from each other with separate holes (10, 11). Thus, the food located on the carrier element (13) are cooled in a much more effective way and thanks to the air circulation, the cool air reaches all the food products equally. Along with this, the location of holes (10, 11) between the carrier elements (13) ensures equal heat distribution in the area between these elements.

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Claims

1. A cooling device (S) comprising at least one chamber (5); at least one carrier element (13) seated in this chamber (5); at least one compressor (1); at least one evaporator (4); at least one air blowing unit (14) that directs to the chamber (5) through at least one air channel (7) that is cooled in the evaporator (4); at least one separator (12) that is located along the channel (7) in the said channel (7); at least two air transfer channels (7a, 7b) that is created by this separator (12) in the channel (7); located in the area (5b) for air circulation in the upper part (5b) created by the carrier element (13), at least one air hole (10) that provides the connection of one (7a) of the air transfer channels (7a, 7b) with the chamber (5) and at least one other air hole (11) that connects the other air transfer channel (7b) to the chamber (5); located in the area (5a) for air circulation in the upper part (5a) created by the carrier element (13), at least one air hole (10) that provides the connection of one (7a) of the air transfer channels (7a, 7b) with the chamber (5) and at least one other air hole (11) that connects the other air transfer channel (7b) to the chamber (5); **characterized in that** the device (S) comprises
 - in the device (S) at least one air compartment (15) into which at least one sides of said air transfer channels (7a, 7b) open;
 - at least one blown air channel (8) located between the evaporator (4) outlet and air compartment (15);
 - at least one returning air channel (9) located between the air compartment (15) and the evaporator (4) inlet;
 - at least one air directing unit (16) which can move periodically between the first section (15a) where one (7a) of the air transfer channels (7a, 7b) within this compartment (15) opens into the said compartment (15) and the second section (15b) where the other transfer channel (7b) opens into this compartment (15).
2. A cooling device (S) according to Claim 1, **characterized in that** air channel (7) is located on at least one wall (6) of the device (S).
3. A cooling device (S) according to Claim 1, **characterized in that** it comprises at least one motor (17) controlling the said movement of air directing unit (16), located in the device (S).
4. A cooling device (S) according to Claim 3, **characterized in that** the said motor (17) comprises at least one shaft (18) providing a connection with air directing unit (16).
5. A cooling device (S) according to Claim 1, **characterized in that** the said separator (12) is air-tight.
6. A cooling device (S) according to Claim 1, **characterized in that** the directing unit (16) comprises a timer providing its movement for predetermined periods.
7. A cooling device (S) according to Claim 1, **characterized in that** the said holes (10, 11) are located at the sides of air channel (7).

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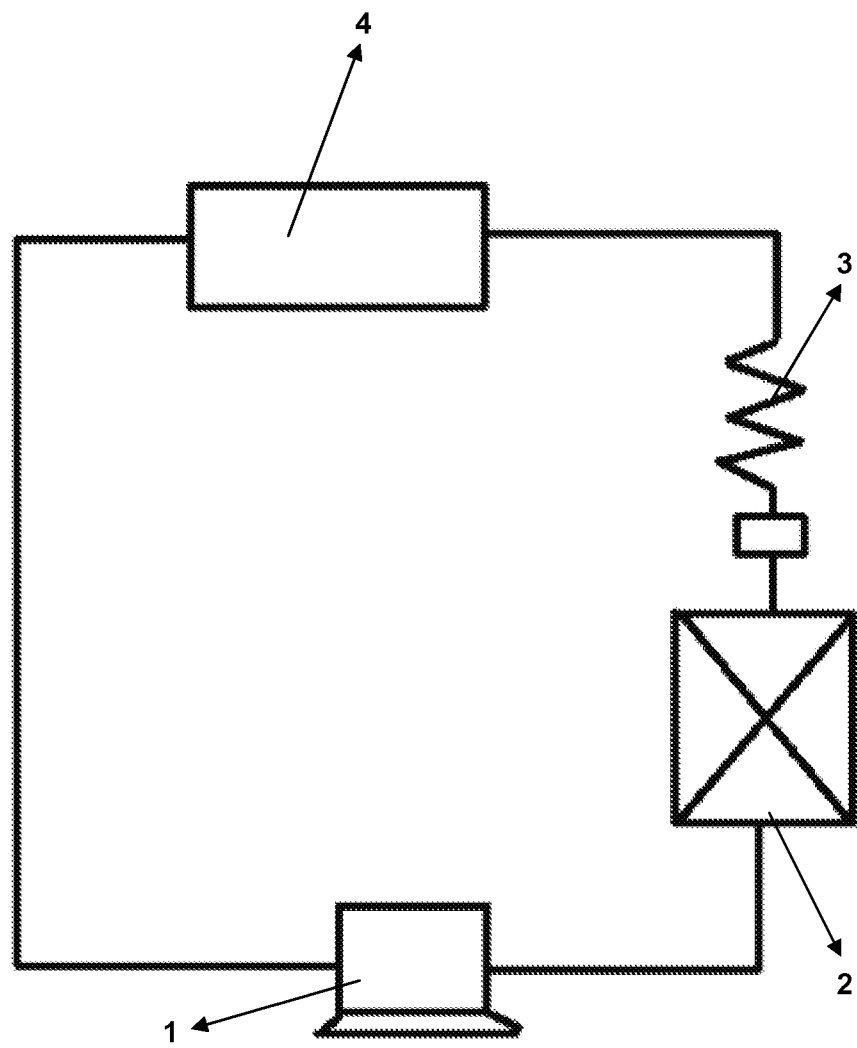


Figure 1

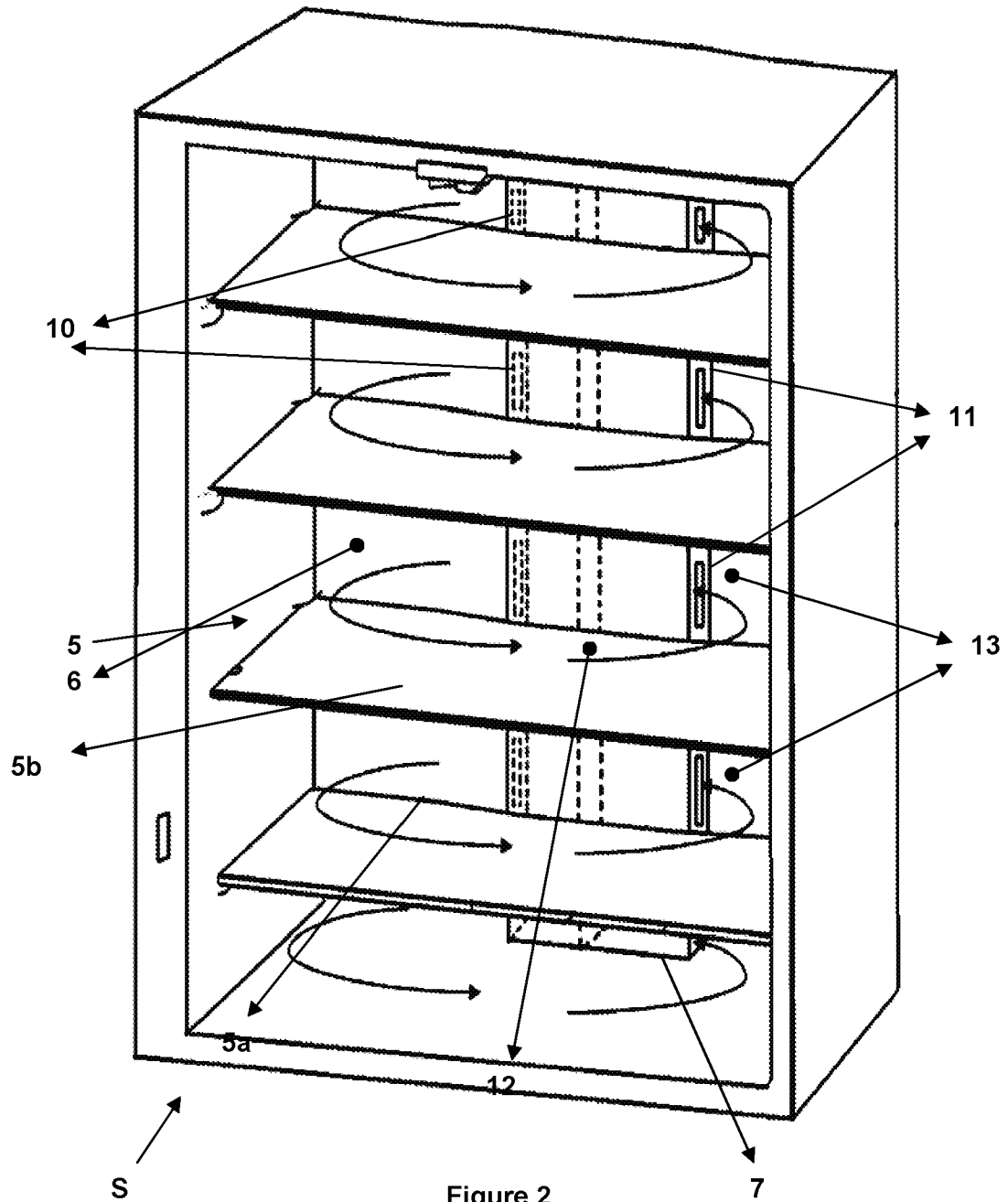


Figure 2

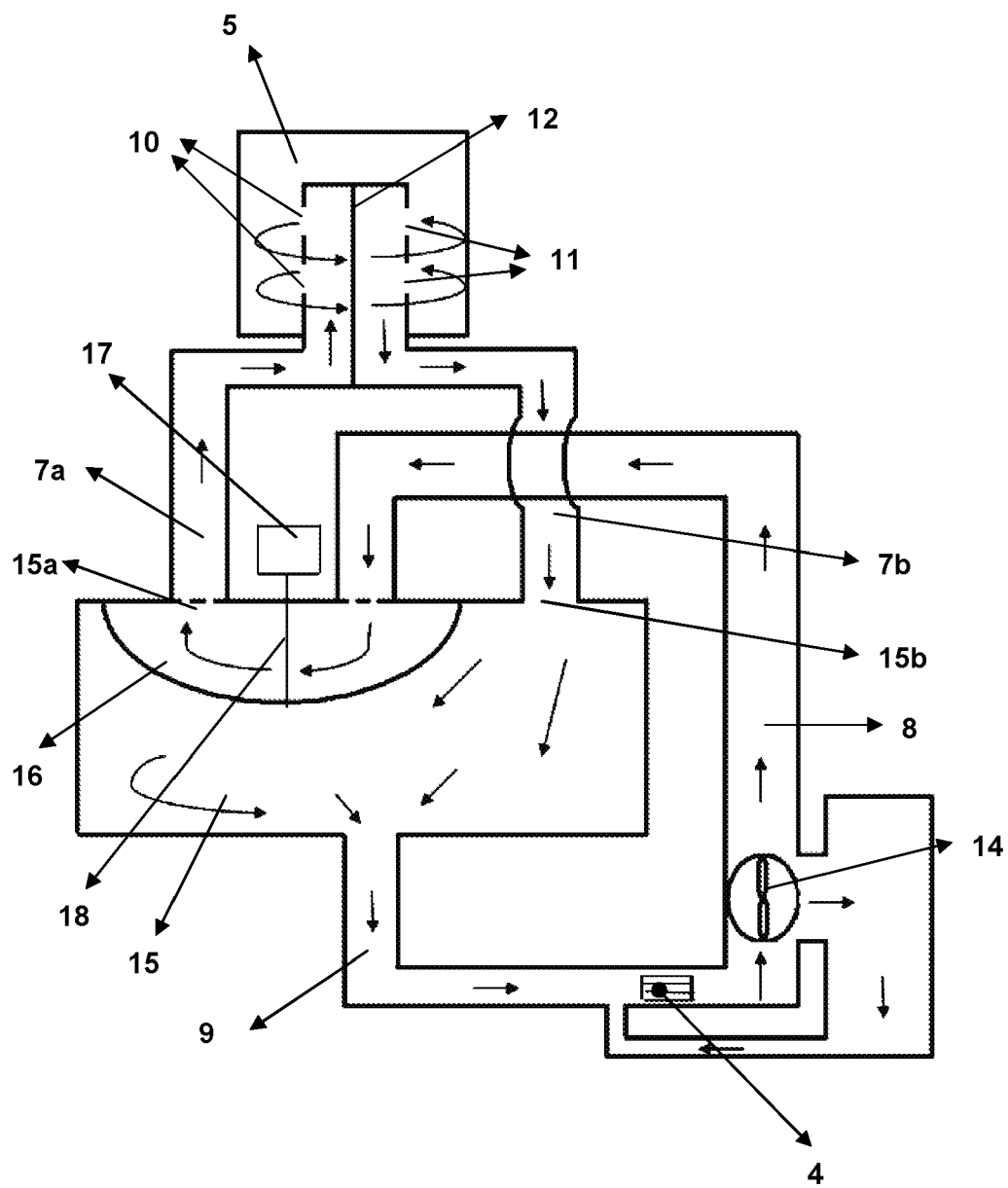


Figure 3

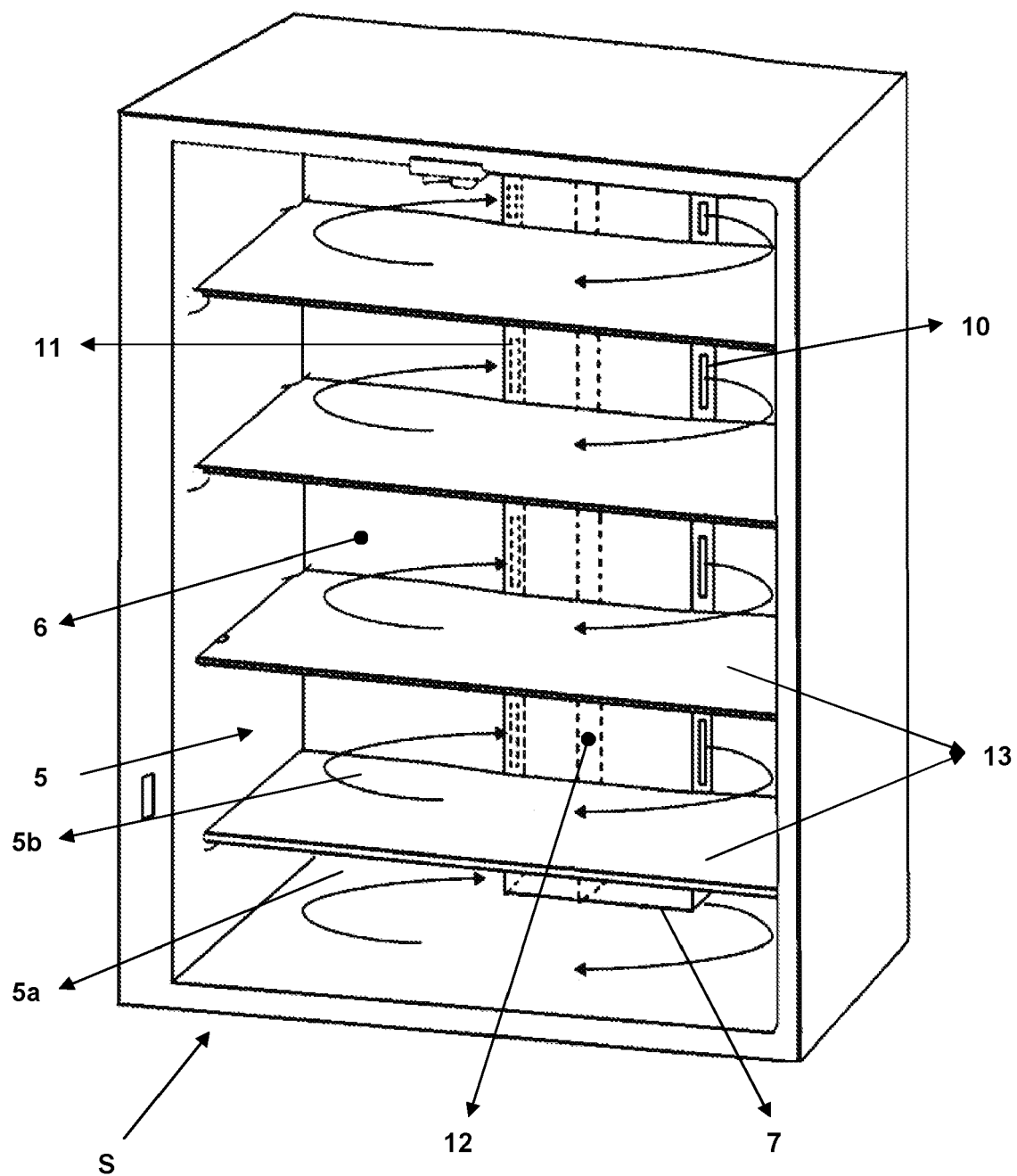


Figure 4

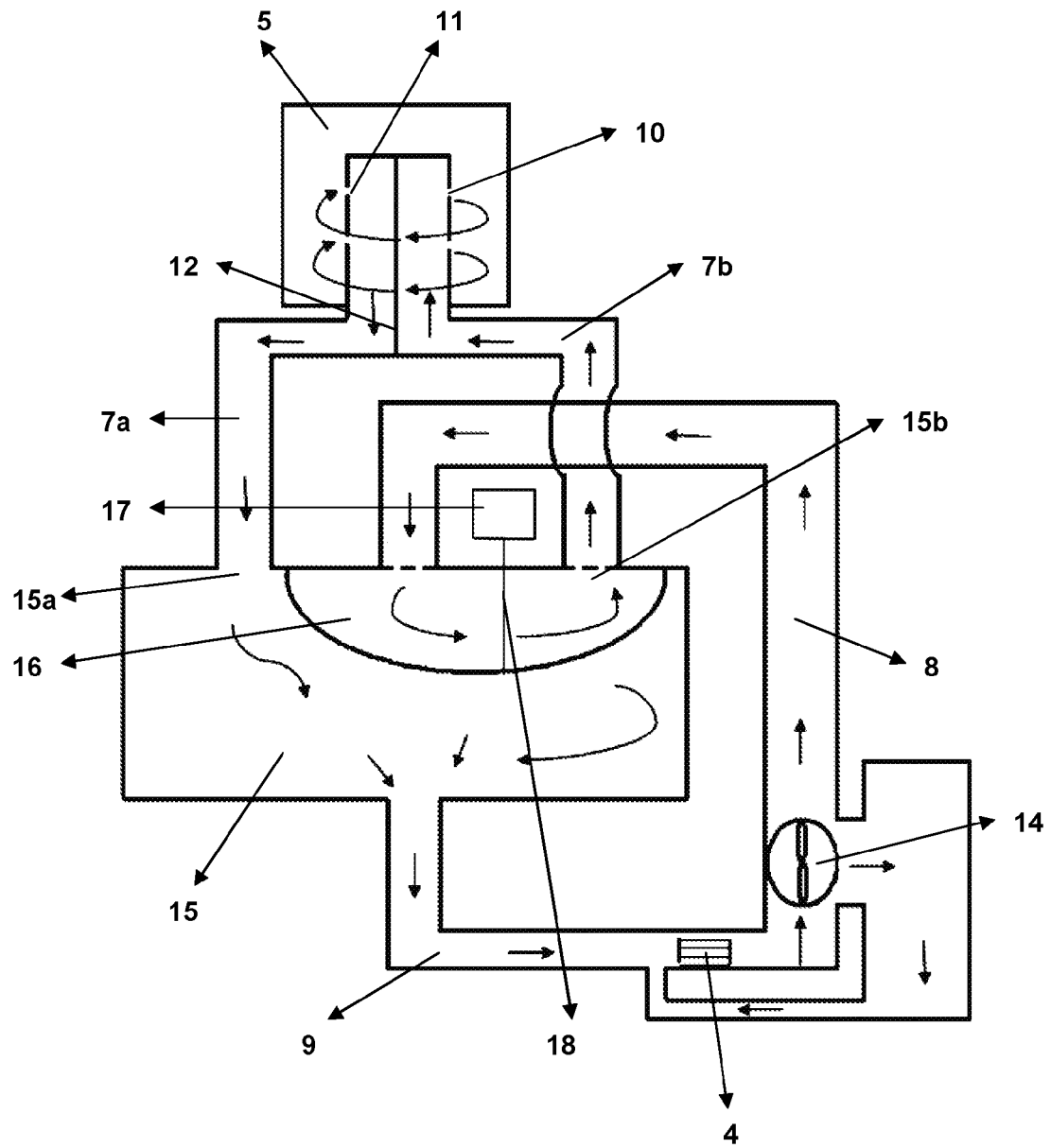


Figure 5

REFERENCES CITED IN THE DESCRIPTION

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