(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 423 624 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.02.2012 Bulletin 2012/09

(51) Int Cl.:
F25D 17/06 *(2006.01)*

(21) Application number: **11174512.1**

(22) Date of filing: **19.07.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **27.08.2010 TR 201007211**

(71) Applicant: **Vestel Beyaz Esya Sanayi ve Ticaret A.S.**
45030 Manisa (TR)

(72) Inventors:
- **Turan, Halil**
  45030 Manisa (TR)
- **Asik, Rüstem**
  45030 Manisa (TR)

(74) Representative: **Cayli, Hülya**
Paragon Consultancy Inc.
Koza Sokak No: 63/2
06540 G.O.P.
Ankara (TR)

(54) **A cooling device**

(57) The cooling device (S) developed by present invention comprises at least one chamber (5); one carrier element (12) placed in the chamber (5); one compressor (1) and one evaporator (4) which cools said chamber (5); one air blowing unit (11) canalizing air cooled in the evaporator (4) to the chamber (5) by means of at least one air channel (7); one separator (10), which is provided in the channel (7), and then separates said channel (7) into at least two portion as air forward channel (7a) and air return channel (7b); one air inlet (8), which is in connection with the air forward channel (7a) transferring air coming from the evaporator (4) to the chamber (5); one air outlet (9), which is in connection with air return channel (7b) transferring hot air coming from the chamber (5) to the evaporator (4).

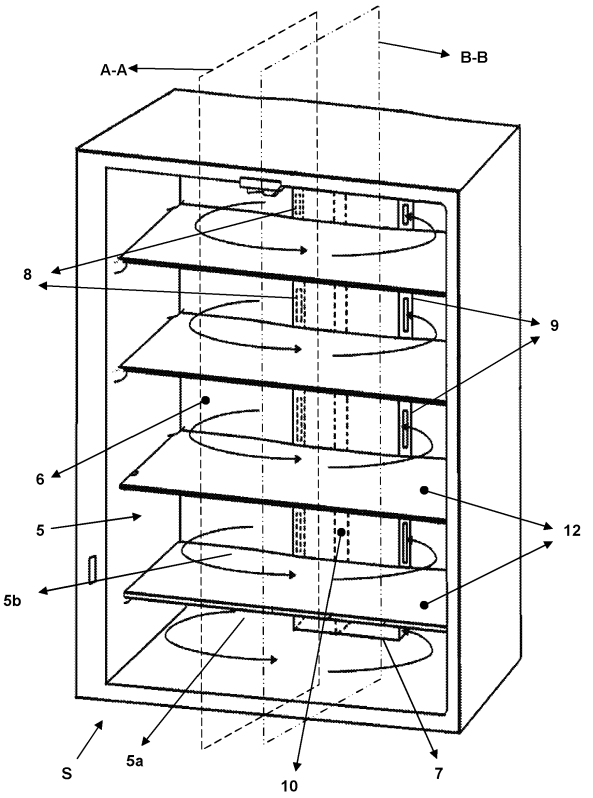


Figure 2

EP 2 423 624 A2

Description

Technical Field

[0001] Present invention relates to air circulation between chamber and cooling element provided in cooling devices.

Prior Art

[0002] Cooling cycle is generally carried out in cooling devices by units of compressor, condenser, capillary tube and cooling element (evaporator). Accordingly, in cooling system, refrigerant coming out of the compressor as hot is condensed after it releases its heat to external ambient and it gets cooled to some extent. Then, refrigerant, whose pressure decreases after it passes through the capillary tube, comes to evaporator. Herein, after the refrigerant vaporizes easily by both heat it takes from the chamber and low pressure it has, it gasifies. In evaporator, the refrigerant, which cools the chamber by taking heat from the chamber, comes to the compressor again, and then, cooling cycle known in state of art is completed and it is maintained in a cyclic way.

[0003] Air circulation is created between the chamber and the evaporator in order to provide an efficient cooling and equal temperature distribution within the chamber provided in the cooling devices. There are various embodiments for said air circulation. One of these embodiments is disclosed in a patent application No.US3702544A in prior art. In the device disclosed in this document, air cooled by means of the evaporator is guided to the air channels, whose one end corresponds with the evaporator and other end corresponds with the chamber. Air coming to the chamber by means of said channel firstly passes through the air passages provided between the chamber and the evaporator, secondly returns to the evaporator and finally, air circulation is created between the chamber and the evaporator.

[0004] In the cooling device disclosed in patent document No.KR20030052103A in state of art, air cooled by the evaporator is sent to the chamber by means of an air channel. Air heated in the chamber returns to the evaporator by means of another air channel provided on its port and air circulation is created within the chamber.

Brief Disclosure of the Invention

[0005] The present invention discloses a cooling device, in whose chamber cyclic air circulation is ensured. Said device comprises at least one chamber; at least one carrier element placed in this chamber; at least one compressor and one evaporator serving for cooling of said chamber; at least one air blowing unit canalizing air, which is cooled in evaporator, to the chamber by at least one air channel; at least one separator, which is provided in the channel and throughout the air channel, and then separates said channel into at least two portion as air forward channel and air return channel; at least one air inlet, which is provided in an upper portion formed by carrier element for the aim of ensuring air circulation in said portion and which is in connection with the air forward channel transferring cool air coming from the evaporator to the chamber; at least one air outlet, which is in connection with air return channel transferring hot air coming from the chamber to the evaporator; at least one air inlet, which is provided in lower portion formed by carrier element for the aim of ensuring air circulation in said portion and which is in connection with the air forward channel transferring cool air coming from the evaporator to the chamber; at least one air outlet, which is in connection with air return channel transferring hot air coming from the chamber to the evaporator.

[0006] Cool air coming from the evaporator gets in the chamber through the air inlets and by passing through air forward channel by means of air blowing device. Air, temperature of which increases due to heat of chamber, passes from the air outlets to the air return channel, finally returns to the evaporator. Thus, air circulation is created between the chamber and the evaporator. After cooled air gets in the chamber through air inlets and leaves the chamber through air outlets, cyclic air circulation is created. This ensures the chamber to be cooled in a more effective way and prevents air to accumulate in a certain point in the chamber. In addition, thanks to cyclic air circulation, equal temperature distribution is ensured within the chamber and stuff in the chamber is cooled in a more effective way.

Objective of the Invention

[0007] An aim of the invention is to develop a cooling device, in whose chamber cyclic air circulation is created.

[0008] Another aim of the invention is to develop a cooling device, whose chamber is cooled in an efficient way.

[0009] A further aim of the invention is to develop a cooling device, in whose chamber equal temperature distribution is obtained.

[0010] Still a further aim of the invention is to develop a cooling device, which ensures foodstuff placed in the chamber to contact with air for much longer time.

[0011] Yet a further aim of the invention is to prevent air to accumulate in a certain portion in the chamber provided in the cooling device.

Description of the Figures

[0012] An exemplary cooling device of the invention and cooling cycle elements therein are illustrated in annexed figures, wherein;

Figure 1 is view of the cooling cycle elements and cooling cycle.

Figure 2 is perspective view of the cooling device.

Figure 3 is a view of A-A cross-section of the cooling device illustrated in Figure 2.

Figure 4 is a view of B-B cross-section of the cooling device illustrated in Figure 2.

[0013] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

Cooling device	(S)
Compressor	(1)
Condenser	(2)
Capillary tube	(3)
Cooling element	(4)
Chamber	(5)
Lower portion	(5a)
Upper portion	(5b)
Wall	(6)
Air channel	(7)
Air forward channel	(7a)
Air return channel	(7b)
Air inlet	(8)
Air outlet	(9)
Separator	(10)
Air blowing unit	(11)
Carrier element	(12)

Disclosure of the Invention

[0014] Cooling system in cooling devices (shown in figures 2-4) generally comprises at least one compressor (1), at least one condenser (2), at least one capillary tube (3) and at least one cooling element (evaporator) (4) shown in Figure 1. An exemplary cooling device (S) comprising at least one chamber (5) and at least one cooling element (evaporator) (4) used for cooling said chamber (5) is illustrated in Figure 2. Refrigerant coming out of the compressor (1), which is provided in said cooling device (S), as hot transfers its heat to external ambient while it passes through the condenser (2) and thus, it is condensed and cooled to some extent. Then, refrigerant, whose pressure is decreased after it passes through the capillary tube (3), comes to the evaporator (4). Refrigerant gasifies by evaporating easily due to both heat it takes from the chamber (5) and low pressure it has. In the evaporator (4), refrigerant, which cools the chamber (5) due to heat it takes from the chamber (5), comes to compressor (1) again, and cooling cycle known in state of art is completed and it is maintained in a cyclic way.

[0015] In the device (S) of the invention illustrated in Figure 2, air flow between the evaporator (4) and the chamber (5) is carried out by means of at least one air channel (7) positioned on at least one wall (6). At least one side of this channel (7) corresponds with the evaporator (4) and by means of air inlet and outlet (8, 9) in the channel (7) air circulation is created between the chamber (5) and the chamber (4). Said air inlet and outlet (8, 9) are preferably provided on sides of the air channels (7), and thus cyclic air circulation is created within the chamber (5) after air coming from the air inlet (8) to chamber (5) leaves the chamber (5) by means of air outlet (9).

[0016] Said air channel (7) is divided into at least two portions as air forward channel (7a) (shown in Figure 3) and air return channel (7b) (shown in Figure 4) by means of at least one separator (10) positioned throughout the channel (7) in the channel (7). Said separator (10) is in air-tight structure and air passage between two channels (7a, 7b) is prevented. Cool air leaving the evaporator (4) provided in the cooling device (S), whose A-A cross-section is illustrated in Figure 3, comes to the chamber (5) after it passes through the air forward channel (7a) by means of at least one air inlet (8), which connects said channel (7a) and the chamber (5). Air, whose temperature increases by heat it takes from the chamber (5), comes to air return channel (7b) by means of at least one air outlet (9), which connects the chamber (5) and air return channel (7b) as shown in Figure 4, and then it reaches the evaporator (4) by passing through in said channel (7b). Therefore, cyclic air circulation is created between inlet and outlet (8, 9) within the chamber (5) and also, the chamber (5) is cooled in a much efficient way.

[0017] In an exemplary embodiment of the invention illustrated in figures, there is provided at least one air blowing unit (11) positioned output of the evaporator (4). Said air blowing unit (11) canalizes air cooled in evaporator (4) to air forward channel (7a).

[0018] In the embodiment developed by said invention, cyclic air circulation in the chamber (5) ensures equal temperature distribution in the chamber (5). In addition to this, thanks to this system, foodstuff provided in the device (S) is ensured to contact with air for much longer time and air is prevented to accumulate in a certain portion of the chamber (5).

[0019] In an exemplary embodiment of the invention, inlet and outlet (8, 9) are positioned so as to they are present at lower portion (5a) and upper portion (5b) of at least one carrier element (12) (a rack may set example for the carrier element (12)) provided in the chamber (5). In other words, cyclic air circulation within the portions (5a, 5b) formed by the carrier element (12) placed in the chamber (5) is maintained in separate inlet and outlet (5a, 5b) as independently from each other. Thus, foodstuff placed on the carrier element (12) is cooled more efficiently and thanks to cyclic air circulation, cool air reaches to food in equal amount. Moreover, since inlet and outlet (8, 9) are positioned between the carrier elements (12), equal temperature distribution is ensured in that portion between these elements.

Claims

1. A cooling device (S) comprising at least one chamber (5); at least one carrier element (12) placed in said chamber (5); at least one compressor (1) and at least

one evaporator (4) used for cooling said chamber (5); at least one air blowing unit (11) canalizing air cooled in the evaporator (4) to the chamber (5) by means of at least one air channel (7) **characterized in that** it comprises

- at least one separator (10), which is provided in the channel (7) and positioned throughout the channel (7), and then separates said channel (7) into at least two portion as air forward channel (7a) and air return channel (7b);
- at least one air inlet (8), which is provided in upper portion (5b) formed by carrier element (12) for the aim of ensuring air circulation in said portion (5b) and which is in connection with the air forward channel (7a) transferring cool air coming from the evaporator (4) to the chamber (5); at least one air outlet (9), which is in connection with air return channel (7b) transferring hot air coming from the chamber (5) to the evaporator (4);
- at least one air inlet (8), which is provided in lower portion (5a) formed by carrier element (12) for the aim of ensuring air circulation in said portion (5a) and which is in connection with the air forward channel (7a) transferring cool air coming from the evaporator (4) to the chamber (5); at least one air outlet (9), which is in connection with air return channel (7b) transferring hot air coming from the chamber (5) to the evaporator (4).

2. A cooling device (S) according to Claim 1 **characterized in that**, the air channel (7) is positioned on at least one wall (6) of the device (S).

3. A cooling device (S) according to Claim 1 **characterized in that**, at least one side of said air channel (7) faces the evaporator (4).

4. A cooling device (S) according to Claim 1 **characterized in that**, said separator (10) has air-tight structure.

5. A cooling device (S) according to Claim 1 **characterized in that**, said inlet and outlet (8, 9) are provided on sides of air channel (7).

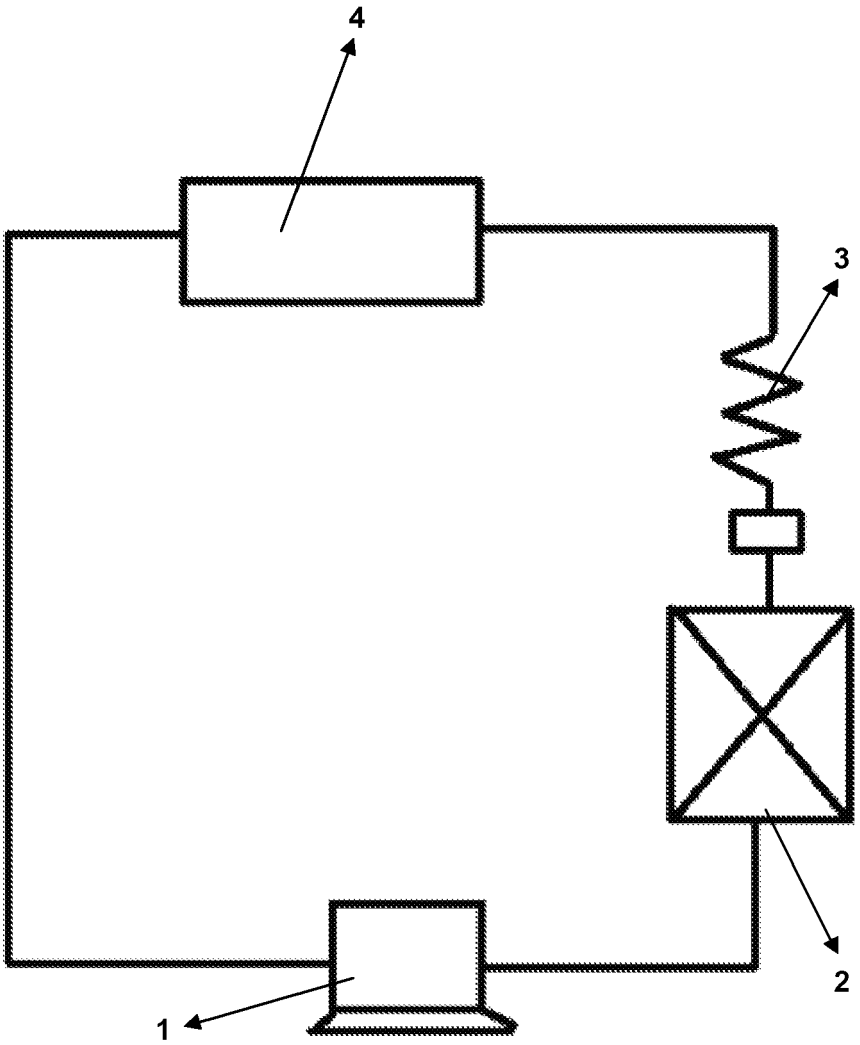


Figure 1

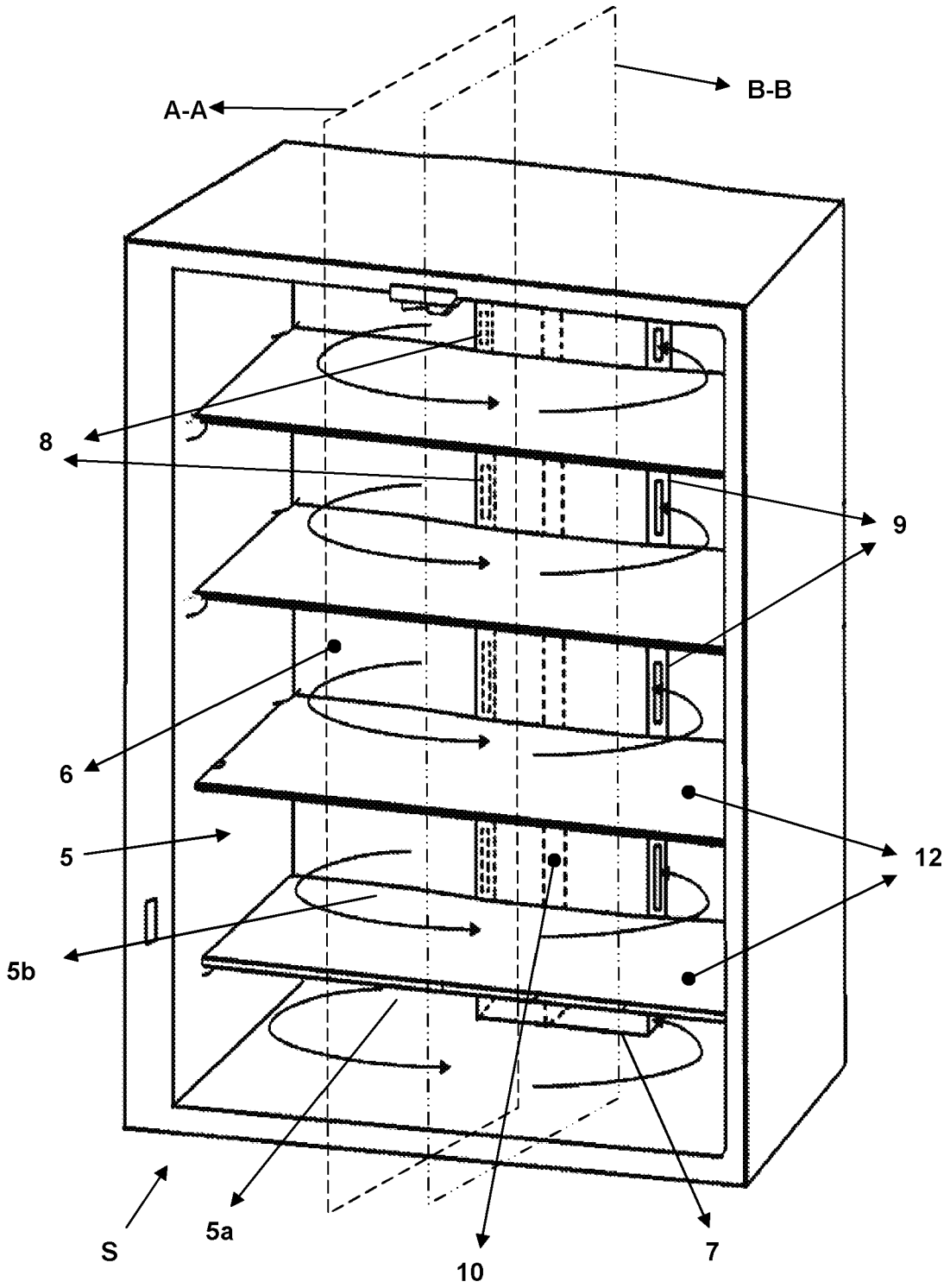


Figure 2

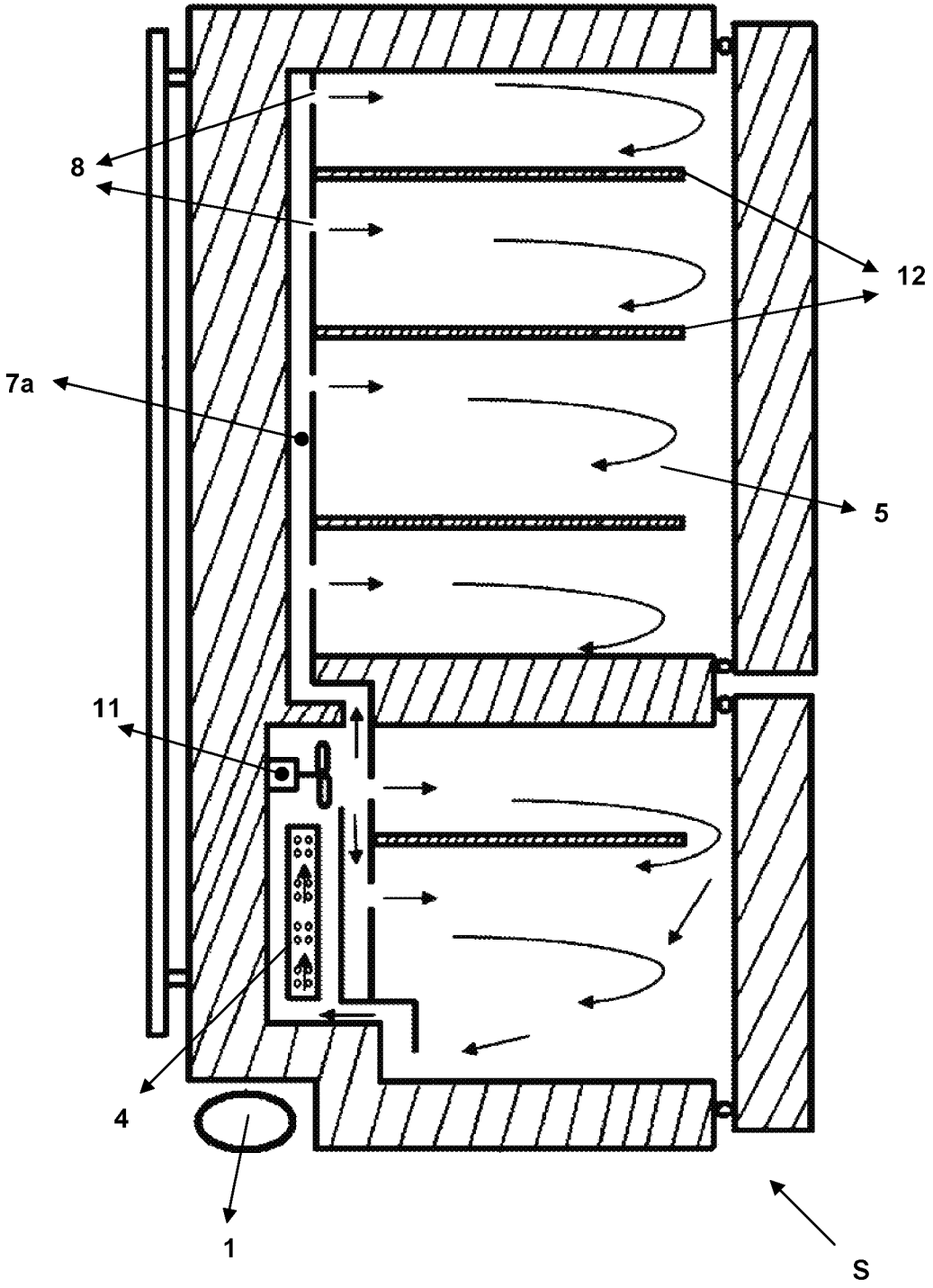


Figure 3

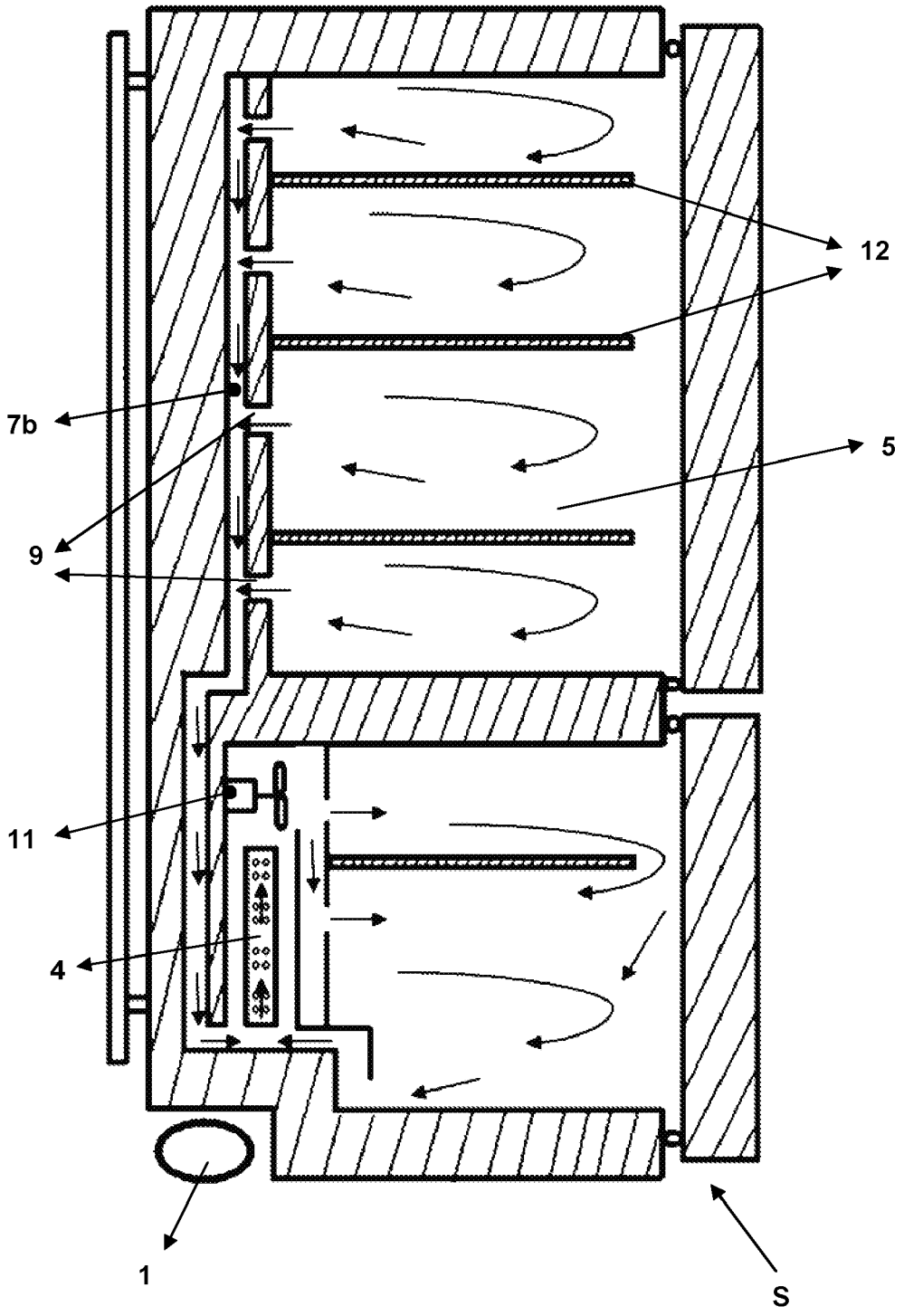


Figure 4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3702544 A **[0003]**
- KR 20030052103 A **[0004]**