

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
13 January 2005 (13.01.2005)

PCT

(10) International Publication Number
WO 2005/003659 A1

(51) International Patent Classification⁷: **F25D 17/06**

(21) International Application Number:
PCT/SE2004/001073

(22) International Filing Date: 1 July 2004 (01.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0302001-3 4 July 2003 (04.07.2003) SE

(71) Applicant (for all designated States except US): **ELECTROLUX HOME PRODUCT CORPORATION N.V.**
[BE/BE]; Belgicastraat 17, B-1930 Zaventem (BE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BONFANTI, Alessio** [IT/IT]; Via Marconi, 69, I-31053 Pieve di

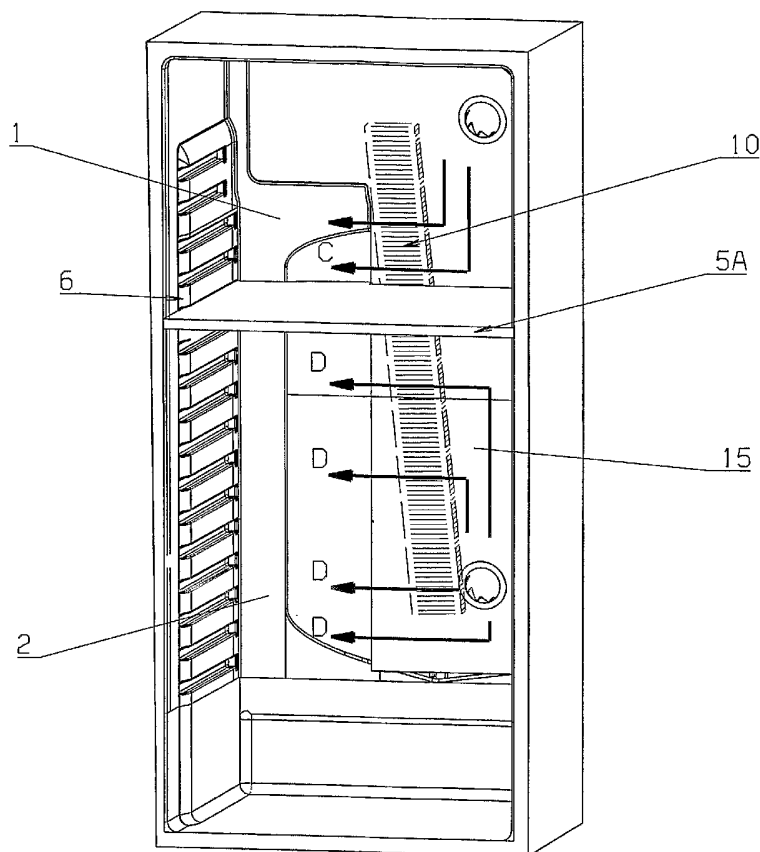
Soligo (IT). **FAVRETTI, Enrico** [IT/IT]; Via Giuseooo Mazini, 19, I-31013 Codogno (IT). **NILSSON, Per, Olof** [SE/IT]; Via Matteotti, 8, I-31058 Susegana (IT). **HSIN, Huang** [IT/IT]; Via ari, 21-Condominio Katia, I-31020 San Vendemmiano (IT). **NARDIN, Luca** [IT/IT]; Via S. Giacomo, 3, I-33077 Sacile (IT).

(74) Agent: **FORNEHEIM, David**; AB Electrolux, Group Intellectual Property, S-105 45 Stockholm (SE).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

[Continued on next page]

(54) Title: FAN ASSISTED REFRIGERATOR



(57) Abstract: The present invention relates to a different temperature refrigeration apparatus, particularly for home use, comprising a first compartment (1) for storing food at a predefined temperature and at least a second compartment (2) for storing food at a corresponding temperature that may be different from said pre-defined temperature. Said apparatus comprising at least one partition wall (5A) defining and separating two of said compartments (1, 2). Said apparatus also comprises an evaporator (10) consisting at least two portions, each one of these portions being arranged in a respective one of said compartments (1, 2). Said apparatus also comprising at least two fans working in a respective one of said compartments (1, 2) and adapted to activate a respective airflow (C, D) through a respective one of said evaporator portions.

WO 2005/003659 A1



(84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Published:

— with international search report

Fan assisted refrigerator**TECHICAL FIELD**

The present invention relates to a different temperature refrigeration apparatus, particularly for home use, comprising a first compartment for storing food at a pre-defined temperature and at least a second compartment for storing food at a corresponding temperature that may be different from said pre-defined temperature. At least one partition wall defining and separating two of said compartments. Said apparatus also comprises an evaporator consisting at least two portions, each one of these portions being arranged in a respective one of said compartments. Said apparatus also comprising at least two fans working in a respective one of said compartments and adapted to activate a respective air flow through a respective one of said evaporator portions.

BACKGROUND

Largely known in the art are refrigeration appliances provided with two storage compartments that are cooled in an interdependent manner by two portion, connected in series, of a same evaporator, said portions being arranged in one or in both of said storage compartments and exposed to a flow of forced air, in such a manner as to enable the resulting cooled air to be forced into flowing, via appropriate conduits, through both said compartments and on the relevant evaporator-portion in a sequence.

In these appliances it is often requested to use a standard temperature compartment (about +6°C) and a compartment at a temperature of about 0°C; furthermore as the using of said compartment is quite similar, that is the food in there contained have to be maintained for something short periods. As consequently the relevant temperatures are close to each other, it comes that it would be quite useful to be able to modify the volumes of said compartments so that said volumes can be at least partially interchangeable each other, in the sense that said compartments do maintain the relevant temperatures, but their volumes can be increased or decreased.

In these appliances it is also often needed to design a cooling system to be used for this specific cabinet. Such a cooling system takes time to develop. Moreover, since a special

cooling system is used the cost for manufacturing will also increase. It would therefore be useful to use the same cooling system for different kind of cabinets, for instance cabinets with temperature compartments as disclosed in the present patent application.

5 Known from the disclosure in US 5,678,416 is a refrigeration apparatus comprising a lower refrigerating compartment and an upper freezing compartment, i.e. cold storage compartment, in which said two compartments are provided with a relevant fan and are separated from each other by a horizontal partition wall. However said wall is fixed and therefore the volume and shape of the two compartments cannot be modified and
10 adapted to different and changing requirements.

The US 5,678,416 solution also has a cooling system developed for this specific apparatus. This means that the cooling system had to be fully adapted to this specific solution with two separated compartments, meaning for instance that the evaporator is
15 divided and that the channels for enabling air circulation is designed in a specific way.

In order to cause the cold air to circulate in the two compartments they are provided with appropriate relevant fans. The control of the temperatures in the two compartments is ensured by means of at least two thermostats provided in the respective compartments
20 and appropriately connected with the control arrangement provided to switch the fans on and off.

Such a solution, however, implies the problem that the control of the widely differing temperatures in the two compartments cannot be always effectively ensured and
25 maintained to the required extent of accuracy by simply balancing the operation of the evaporator based on the temperatures prevailing in the two compartments.

From WO 9942770A1 a similar refrigeration apparatus is shown, therefore, for sake of conciseness it is not here described; however the mayor drawback of this solution is
30 that, apart that the temperature control cannot be very precisely trimmed, the lack of interchangeability between the volumes of the two compartments, even because said two compartments offer different functions, make said apparatus less usable from a general point of view, and so less "user friendly". Also in this solution a mayor

drawback is the specific cooling system needed for this specific solution.

It therefore would be desirable, and it is actually a main purpose of the present invention to provide a refrigeration apparatus, preferably for residential use, i.e. of the household type, that is provided with at least two distinct storage compartments arranged close of each other, i.e. an upper storage compartment and a lower compartment for storing food at a lower temperature, preferably at approx. 0°C, which do away with all of the afore described drawbacks, while at the same time enabling the possibility of interchanging the volumes of the two compartments, and also through the use of a single evaporator and by forcing the air to individually circulate throughout both compartments. It would also be desirable to provide a refrigerator apparatus with said at least two distinct storage compartments, which apparatus uses a standard cooling system platform to enable temperature storage compartments.

In addition, such an apparatus shall be capable of being easily implemented and manufactured with the use of existing, readily available techniques, and shall be competitive in both its construction and its use. In particular it shall be capable of using a single and same refrigerating circuit as a source of cold.

SUMMARY OF THE PRESENT INVENTION

The present invention relates to a different temperature refrigeration apparatus, particularly for home use, comprising a first compartment for storing food at a pre-defined temperature and at least a second compartment for storing food at a corresponding temperature that may be different from said pre-defined temperature. Said apparatus comprising at least one partition wall defining and separating two of said compartments. Said apparatus also comprises an evaporator consisting at least two portions, each one of these portions being arranged in a respective one of said compartments. Said apparatus also comprising at least two fans working in a respective one of said compartments and adapted to activate a respective airflow through a respective one of said evaporator portions.

BRIEF DESCRIPTION OF THE DRAWINGS

According to the present invention, these aims are reached in a particular type of refrigeration apparatus that is suitably provided with a single evaporator and at least two compartments and a related channel for circulating the forced air flow, so as this is described below by mere way of non-limiting example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic prospective front view of an embodiment of a refrigerator according to the present invention,

10

Fig. 2 is a simplified front view of the two compartment of the refrigerator of fig. 1, in different configuration of the partition walls,

Fig. 3 is a schematic view of a preferred embodiment of an evaporator according the invention,

15

Fig. 4 is a schematic front view of the evaporator in fig. 3, after its mounting into the refrigerator according to the invention,

Fig. 5 is the view along the horizontal Z-Z section of fig. 1, with the partition wall partially extracted,

20

Fig. 6 is a symbolic simplified representation of the airflows through the evaporator illustrated in the previous figures,

Fig. 7 corresponds to fig. 5 but with the partition wall fully inserted,

25

Fig. 8 and Fig. 9 do show corresponding symbolic views of the airflow paths with different positioning of a partition wall,

Fig. 10 shows a view of a preferred embodiment of the mounting of the evaporator,

30

Fig. 11 shows a symbolic view of a simplified embodiment of the evaporator and of the positioning of the partition walls,

Fig 12 shows a general view of the refrigerator in fig. 1, but with some parts and components partially exploded or transparent.

5 Fig. 13 is a simplified front view of a second embodiment with three compartment of the refrigerator according to the present invention.

Fig. 14 shows symbolic views of the airflow paths with different positioning of a second embodiment with two partition walls,

10

DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

With reference to Fig. 1, a first embodiment of a refrigeration apparatus according to the present invention comprises an upper storage compartment 1, a lower storage compartment 2, an outer casing provided with an insulated rear wall 3, at least a door 4 providing access to said compartments, said compartment being separated from each other by a partition wall 5.

Such a partition wall is fully removable and can be displaced vertically into a plurality of distinct positions 5A, 5B and 5C lying above each other, for instance by providing to such a purpose appropriate pairs of slide grooves 6, 7, 8, or similar support provisions, arranged above each other vertically on the internal side walls of said two compartments and adapted to support said partition wall (see Figure 2).

In substance, said two compartments form jointly a single main compartment, which is subdivided in a variable manner into said two compartments by selectively displacing said partition wall 5 accordingly.

In the rear wall 3 of said main compartment there is arranged a single evaporator 10; such evaporator is provided with following characteristics (see Figures 3 and 4):

- 30
- it is a vertically arranged element having a markedly elongated shape along a rectilinear axis;
 - it is a continuous element, in the sense that each portion thereof, even a limited one, along said axis is constituted by an evaporating means;

- it is preferably made using the largely known technique of evaporator batteries, which, if associated to an appropriate ventilation, are commonly known in the art to ensure a far higher refrigerating capacity than conventional evaporators, even fan-assisted ones, for a same space requirement (although it can be readily appreciated that such an evaporator may also be made according to any such other technique as widely known and used in the art).

With reference to Figures 1 and 5, on the rear wall 3 thereof, the main compartment formed by said two separate compartments 1 and 2 is provided with an evaporator as described above and a planar covering member 11, which covers said evaporator on the surface thereof from the interior of the compartment, and which also covers a portion 3A of said rear wall 3 lying on a single side of said evaporator.

In practice, said planar covering member 11 covers, at a certain distance "d" corresponding to the thickness of the evaporator 10, a side vertical section of said rear wall, including said evaporator, and can join up with a single side wall 9 delimiting said two compartments laterally.

Furthermore, between the upper and lower portions of said planar covering member 11, the section of the rear wall that is covered by said covering member, the upper and lower end portions of said evaporator and the side wall 9 which said planar covering member 11 joins up with, there are of course obtained two respective opposite mouths 21, 22 adapted to enable the air to flow therethrough from the interior of the compartment into a duct 15 that is delimited by a portion of said rear wall, said evaporator and that portion of said covering member 11 which does not delimitate the evaporator (see Figure 6).

The evaporator itself is free laterally, in the sense that a flow of air is capable of passing over and through it horizontally from the sides thereof, as this is indicated by way of example by the arrow "A" in Figures 5 and 6.

The zone indicated at 3B lying in front of said rear wall, on the other side of said planar covering member 11, is free and accessible (Figure 5).

The partition wall 5 is substantially illustrated in Figure 5, showing a plan view thereof, and has a rectangular shape with a co-planar, itself rectangular appendix 12 provided on an edge thereof and facing said rear wall.

5 The dimensions of said partition wall and said appendix 12 thereof are such that, when said partition wall is fully inserted in a pair of said side support grooves 6, 7, 8, it completely separates said main compartment, thereby delimiting said two compartments 1, 2, with the rear edge 13 thereof abutting against said planar covering member 11, while said appendix 12 is able to extend into said zone 3B of said main compartment
10 which is delimited laterally by said evaporator and the portion of rear wall that is not covered by said planar covering member 11. A configuration as illustrated symbolically in Figure 7 is thus obtained.

Finally, and with reference to Figures 1 and 6, in correspondence of said mouths 21, 22
15 of said duct 15, and inside the latter, there are provided two respective fans 16, 17 adapted to take in air from the interior of the compartment and blow it into said duct. Anyway, owing to said fans being provided on the opposite sides of said duct 15, the flows of air generated by them will most obviously be blown to follow opposite directions, as well.

20 A main scope of the invention is to design the covering member 11 in a suitable way to achieve a cabinet having compartments with different temperatures. The cooling system of the cabinet is preferably a standard dynamic cooling system platform widely used in different kind of cabinets. In such a standard system as disclosed as a preferred
25 embodiment in the present application an evaporator 10 is used, the evaporator being positioned at the rear wall of the cabinet. Such a standard system is further described in WO 0212809 A1. The covering member in the WO document has only one fan providing circulation of cooled air.

30 In order to achieve compartments with different temperature, the covering member 11 can easily be adapted for the specific cabinet type. Comparing WO 0212809 with the solution according to fig. 1 disclosed in the present application, the covering member in fig. 1 is adapted to be used when the cabinet is separated into at least two different

compartments. Instead of one fan, the member has two fans 16 and 17. By only develop a new covering member the costs savings are dramatic since there is no need for a new design of the cooling system (evaporator, tubes etc.). Instead the standard cooling system platform is used and a new covering member is introduced. Together with this
5 new member, extra temperature sensors are implemented to control the fans in order to achieve the proper temperature. Moreover, the control system is adapted to handle the dividing of the compartment. See also fig. 12 and 13.

It is also obvious for the person skilled in the art that another design of the covering
10 member 11 also falls within the scope of the invention. For instance in fig. 13 the member has three fans 16,17,18 providing an appliance with three compartments instead of two. Moreover, a solution within the scope if the invention is to position at least one of the fans on the other side of the evaporator. This means that the fan instead will pull the air through the evaporator through the evaporator. The advantage is that the
15 airflow that passes through the fins of the evaporator is controlled in a better way. Such a solution could improve the functionality of the cooling system. In such a solution the air from the compartment could for instance flow back to the evaporator through an opening in the same compartment 1 or 2. In another embodiment within the scope of the invention, the air instead flows back to the evaporator via one of the other fans. In such
20 a case, at least one air duct will enable said flow.

Another advantage with the disclosed solution is that the covering member 11 is not designed to cooperate with the shape of a specific evaporator. This means that the member is substantially flat without any shaping that needs to correspond with the
25 shape of the evaporator. This solution provides the option to position the fans and air inlets/outlets on the member more freely. The space 15 formed between the covering member and the rear wall 3 enables for a free flow of air depending on how the member is designed.

30 In fig. 12 it is also shown that the covering member 11 may constitute in more than one part. Such a system could preferably be used to make the manufacturing or design easier. Moreover, one great advantage is that different standard covering member modules can be combined to provide a specific cabinet. For instance in fig. 12, the

member is divided into two parts. In relation to fig. 13-14 three standard modules may be used instead.

Despite how the fans 16,17,18 are positioned in relation to the evaporator 10, it is
5 crucial to make sure that the air is evenly spread into the compartment 1,2,3. In the disclosed solution of fig. 1, the covering member enables such an effect since the air flows out as illustrated by arrow A, see fig. 5 (bottom drawing). In other embodiments within the scope of the present invention, the same effect could be achieved by providing a larger inlet back to the evaporator. As an alternative, drawers could be used
10 around which the air flows. The crucial issue is to avoid that the air takes a shortcut back to the evaporator. This could be enabled in different ways.

The partition wall 5A, 5B, 5C is preferably movable. However, in one embodiment within the scope of the invention, the wall could preferably not be movable. In such an embodiment the wall may or may not be removable. In case of a removable shelf, the
15 manufacturing is simplified, while in case of a fixed shelf more time needs to be spent. The advantage with a partition wall in general is that the inner liner is kept unchanged, while the wall designed to separate the compartment is simply inserted during manufacturing.

The operation of the above described refrigerator apparatus is as follows: in a first
20 configuration thereof (see Figure 8), the partition wall 5 is positioned so as to lie in a first position 5A thereof on the respective side support grooves 6, the two fans 16 and 17 are energized and generate two respective flows of air taken in from the interior of the compartment and blown into said duct 15; as already hinted above, these two air flows follow mutually opposite directions and are indicated by the reference letters C
25 and D, respectively.

These two flows can be noticed to move over, by passing through it, a respective portion of evaporator, from which they are then again taken in by the action of the fans to flow through the respective compartment and re-start the cycle. However, they occur
30 to also come across, i.e. meet with each other at a central zone, so as to be then mutually diverted by the opposite flow. The point at which said two flows are diverted will of course be the point corresponding to the position of said partition wall.

In fact, said partition wall also determines in general the duct or channel through which each single airflow has to pass. It is in fact not possible for a part of an air flow to be capable to enter said duct in the zone of said partition wall, since this would practically cause a part of the air to be transferred from a compartment into the other one, i.e. an impossible occurrence owing to both the pressure differentials that would be brought about and the fact that the movement of each single flow is actually determined by not only the pushing action of the respective fan, but also the related intake force.

The partition wall, therefore, does not actually only perform as a member to separate the compartments, but also as an air-flow separator to divert said air flows into the respective compartments; in addition, it can be readily appreciated that the actual portion of evaporator being affected by the individual flow of air depends on the position of the partition wall, so that a substantially direct, although not linear correspondence is established between the volume of each compartment and the related portion of evaporator transferring cold into said compartment.

In a second configuration, as illustrated in Figure 9, the partition wall is placed in a second position 5B. It can be readily appreciated that, even in this case, the two flows of air generated by the two fans will again part from each other in correspondence of the position of said partition wall and, as a result, the portion of evaporator cooling down the airflow of each compartment will again be automatically modified in a direct relation to the actual position of the partition wall.

Ultimately, such a partition wall 5 does in this way not only separate the two compartments, but also determines the corresponding volume thereof by varying the positioning thereof; at the same time it also determines the portions of evaporator that are involved in cooling down said compartments according to the actual volume ratio thereof.

Such a solution allows for a number of advantageous improvements: a first one of these improvements refers to the manner in which said evaporators can be controlled. Owing to the fact that an evaporator, in particular a battery-type one, is adapted to transfer cold in a manner that is closely dependent on the kind of air circulation which it is exposed

to, it of course proves advantageous and effective to provide a device or arrangement that is capable to control the rotating speed or the operating time of each fan in accordance with the temperature that should desirably be established in the corresponding compartment.

5

In turn, such an arrangement will most suitably be triggered, i.e. operated by a further electronic control device, to which all input data concerning both the temperature set by the user and the temperature that is actually detected to prevail in the related compartment are properly sent. Devices of this kind are anyway largely known in the art, so that they shall not be described here any further.

10

A second improvement is directed at the evaporator itself. Since said evaporator can be defrosted cyclically, in view of being able to most simply and effectively collect the resulting defrost water it is arranged in a slightly slanting manner within said hollow space delimited by said rear wall 3 and said planar covering member 11, as this is shown by way of example in Figure 10.

15

A kind of "gutter effect" is in this way obtained, which facilitates defrost water dripping off the evaporator and then collecting into a pan that is suitably provided there below, from which it can be conveniently let off.

20

It will be appreciated that a number of further, simplified embodiments of the invention are possible. So, for instance, a main compartment may be thought of, in which the partition wall can be alternatively displaced merely into two positions 5A and 5B, as shown schematically and by way of example in Figure 11. In this case, the evaporator can be divided into three distinct portions 10A, 10B and 10C connected to each other by two non-evaporating conduits 101 and 102.

25

With reference to Fig. 13 - 14, a second embodiment of a refrigeration apparatus according to the present invention comprises an upper storage compartment 1, a lower storage compartment 2, a middle storage compartment 3, outer casing provided with an insulated rear wall 3, at least a door 4 providing access to said compartments, which are separated from each other by partition walls 5A and 5C. The use of three compartments

30

requires three mouths 21 – 23, each with a fan, instead of two. The partition walls are correspondingly fully removable and can be displaced vertically into a plurality of distinct positions lying above each other. Said three compartments form jointly a single main compartment, which is subdivided in a variable manner into said compartments by
5 selectively displacing said partition wall 5 accordingly.

In this embodiment, the same kind of single evaporator 10 is used as the one disclosed earlier in this document. Moreover, the planar covering member 11 corresponds to the one earlier used, which covers said evaporator on the surface thereof from the interior of
10 the compartment, and which also covers a portion 3A of said rear wall 3 lying on a single side of said evaporator. A single sidewall 9 correspondingly delimits said compartments laterally. Three respective mouths 21, 22, 23 are adapted to enable the air to flow through said covering member from the interior of the compartment into the duct 15 mentioned earlier.

15

The zone 3B has the same properties as in the earlier mentioned embodiment, which also is the case with the partition walls 5A and 5C, which has corresponding appendix 12 by which said compartments are separated. Finally, said mouths 21, 22 and 23 of said duct 15, and inside the latter are provided with three respective fans 16, 17, 18
20 adapted to take in air from the interior of the compartment and blow it into said duct. Here the middle placed fan 18 will instead blow air into both directions, causing these flows to meet the airflows generated by fans 16 and 17.

These flows C, D, E can be noticed to move over, by passing through it, a respective portion of evaporator 10, from which they are then again taken in by the action of the
25 fans to flow through the respective compartment and re-start the cycle. However, they occur to also come across, i.e. meet with each other at zones, so as to be then mutually diverted by the opposite flow. The point at which two opposite flows are diverted will of course be the point corresponding to the position of said partition walls. Corresponding to the earlier mentioned embodiment, there is not possible for a part of
30 an air flow to be capable to enter said duct in the zone of said partition wall, since this would practically cause a part of the air to be transferred from a compartment into the other ones, i.e. an impossible occurrence owing to both the pressure differentials that would be brought about and the fact that the movement of each single flow is actually

determined by not only the pushing action of the respective fan, but also the related intake force.

The partition walls, therefore, does not actually only perform as a member to separate
5 the compartments, but also as an air-flow separator to divert said air flows into the
respective compartments; in addition, it can be readily appreciated that the actual
portion of evaporator being affected by the individual flow of air depends on the
position of the partition walls, so that a substantially direct, although not linear
correspondence is established between the volume of each compartment and the related
10 portion of evaporator transferring cold into said compartment.

Anyway, the most general solution, which at the same time is also the most
advantageous one, consists of course in providing a substantially continuous evaporator
extending as far as possible into both compartments, since this allows for a better
15 adjustability of the volume ratio of the two compartments, as well as an easier, more
convenient manufacturability of a suitable continuous-type evaporator.

CLAIMS

1. Different temperature refrigeration apparatus, particularly for home use, comprising a
5 first compartment (1) for storing food at a pre-defined temperature and at least a second
compartment (2,3) for storing food at a corresponding temperature that may be different
from said pre-defined temperature, said apparatus comprising at least one partition wall
(5A, 5C) defining and separating two of said compartments (1, 2,3), said apparatus also
10 comprising an evaporator (10) consisting at least two portions, each one of these
portions being arranged in a respective one of said compartments (1, 2,3) **characterized
in that** said apparatus also comprising at least two fans (16, 17) working in a respective
one of said compartments (1,2,3) and adapted to activate a respective air flow through a
respective one of said evaporator portions.
- 15 2. Apparatus according to claim 1, **characterized in that** each one of said partition
walls is fully removable and capable of being displaced into different positions (5A, 5B,
5C ...) so that the volumes of said compartments can be varied accordingly in relation
to each other, and the extent to which each one of said evaporator portions extend into
the respective compartments changes depending on the actual positioning of said
20 partition wall (5).
3. Apparatus according to any of the preceding claims **characterized in that** there is
provided a duct (15) open on one side thereof and provided at the opposite end portions
thereof with at least two respective air intake mouths (21, 22, 23) opening into said first
25 and at least said second compartment (1, 2, 3), respectively, said duct being arranged
substantially along a wall (3) which is common to said compartments and is divided by
said partition wall,
- said evaporator is accommodated laterally inside said duct (15), along said open side
thereof,
30 - there are provided a fan (16, 17, 18) in correspondence of and immediately inside
each of said air intake mouths (21, 22, 23), said fan being adapted to take in air from the
interior of the respective compartments (1, 2,) and blow it in opposite directions into
said duct (15),

- at least one of said partition walls is so made and shaped (12) as to entirely delimit said compartments in such a manner as to ensure that no passage of air can take place therebetween, with the exception of the possible flow of air through said evaporator and/or said duct (15), regardless of the position (5A, 5B, 5C) in which said partition
5 wall may also be.

4. Apparatus according to claim 3, **characterized in that** said duct (15) is delimited rearwards by at least said wall (3) constituting the rear wall, and forwards by a preferably planar covering member (11) that covers said evaporator and a vertical
10 section of said wall (3).

5. Apparatus according to claim 4 **characterized in that** said covering member constitute in more than one piece.

15 6. Apparatus according to any of the preceding claims, **characterized in that** said evaporator is a continuous evaporator, in the sense that each single fraction thereof is capable of performing as an evaporating means.

7. Apparatus according to any of the preceding claims, **characterized in that** said
20 evaporator is of the finned-tube battery type.

8. Apparatus according to any of the preceding claims 3 to 7, **characterized in that** said fans (16, 17, 18) are adapted to be controlled and operated independently of each other.

25 9. Apparatus according to claim 8, **characterized in that** said fans (16, 17, 18) are adapted to be controlled and operated by selectively varying the respective operating time or the respective rotating speed.

10. Apparatus according to any of the preceding claims 3 to 9, **characterized in that**
30 said evaporator (10) has an elongated shape, extends rectilinearly and is arranged in a sloping manner with respect to the axis or directrix of extension thereof.

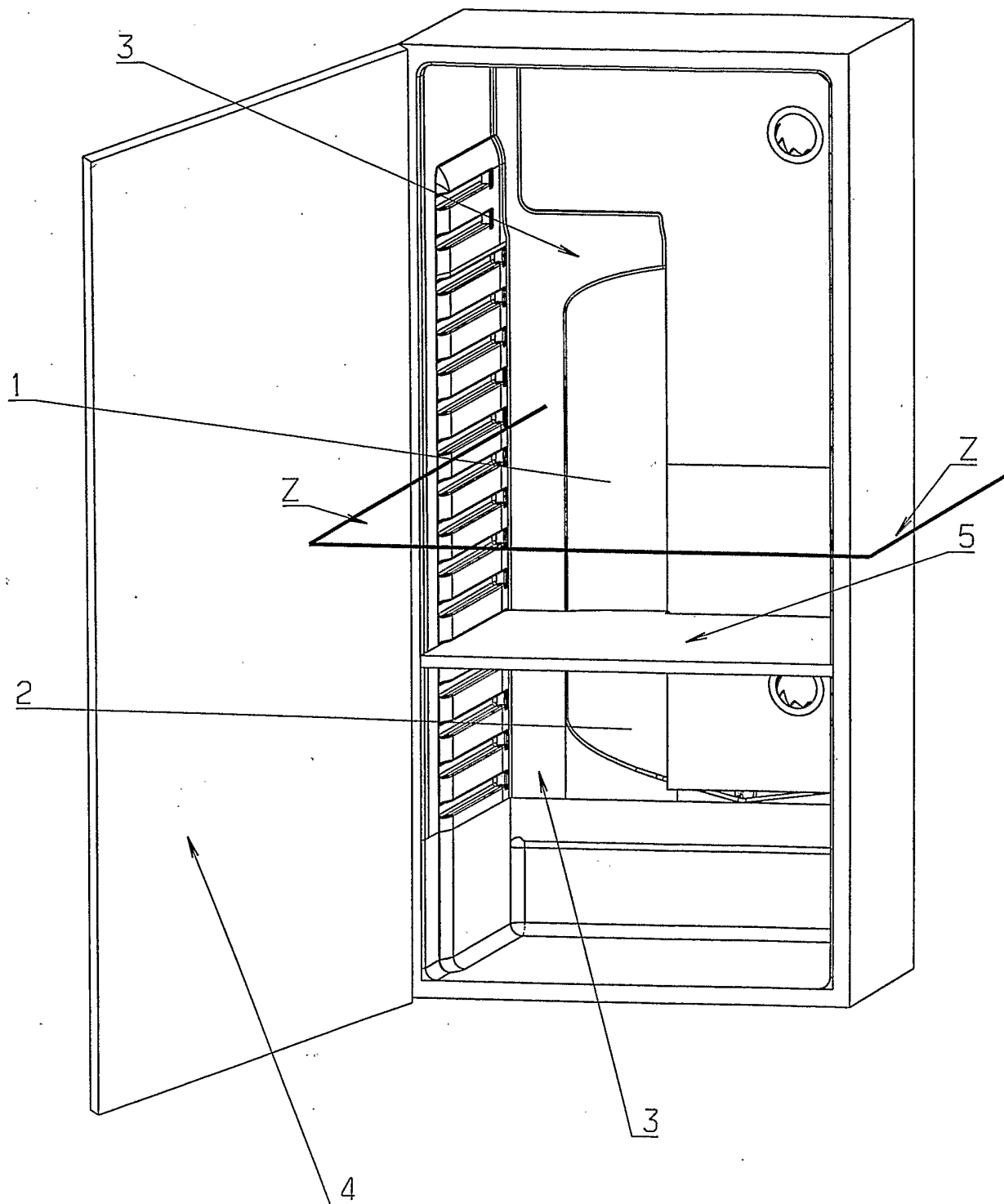


FIG. 1

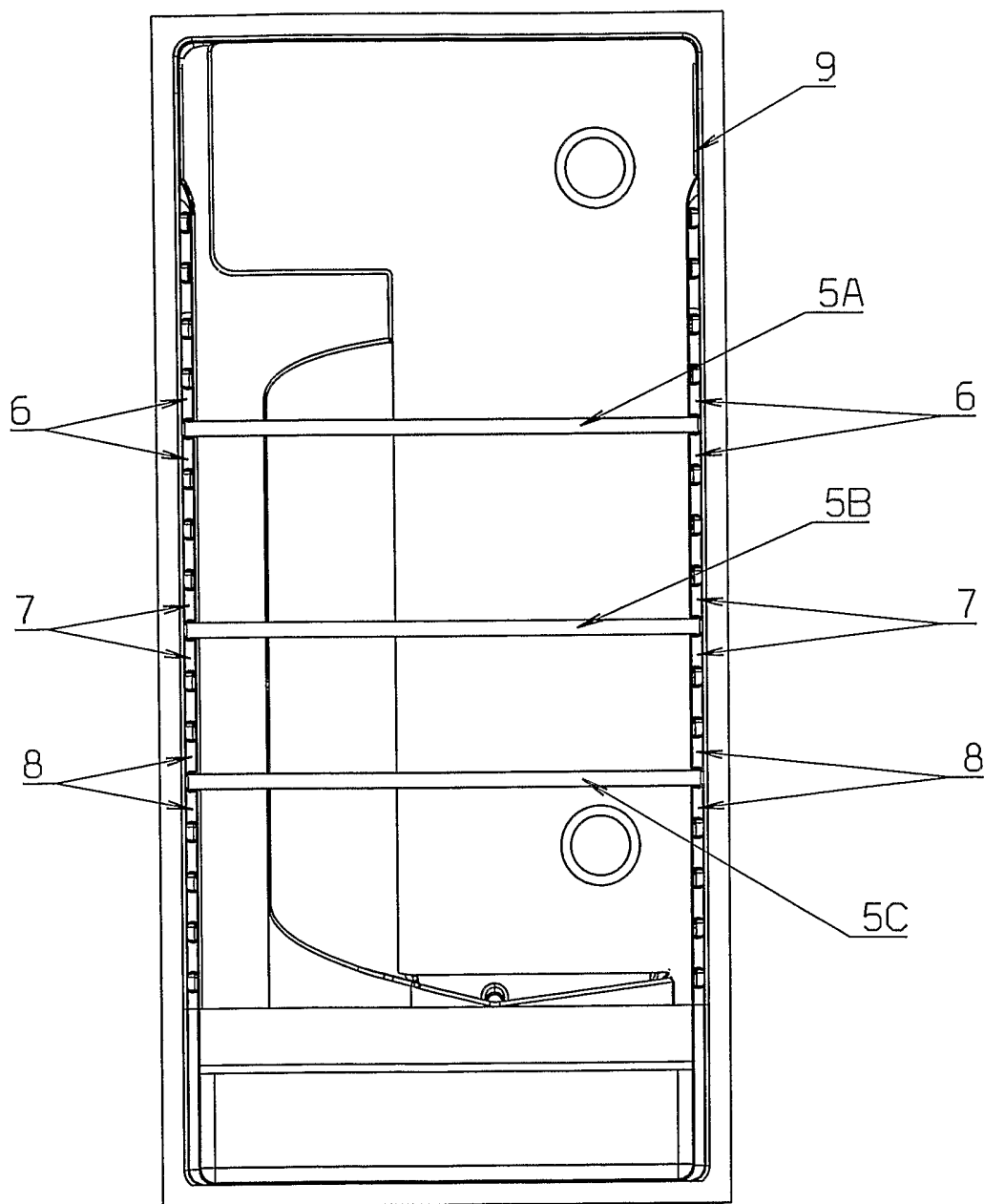
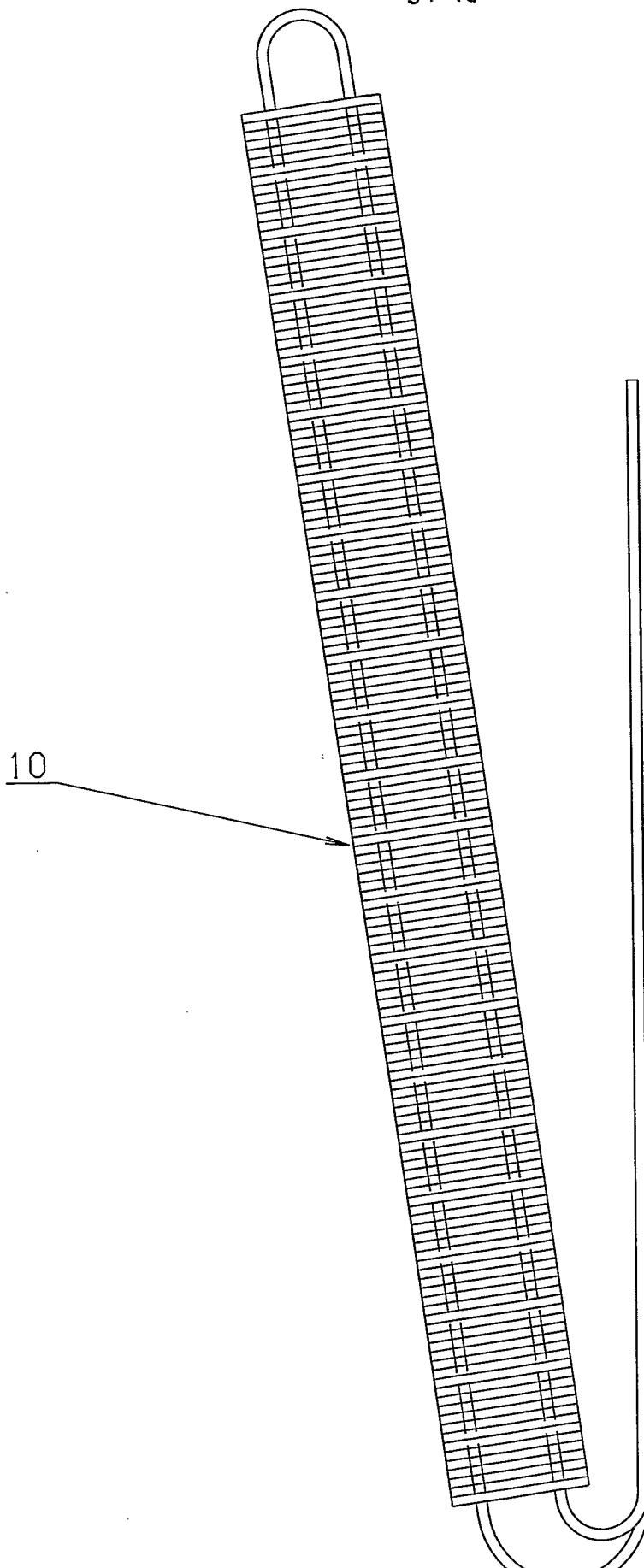


FIG. 2

3 / 12



SUBSTITUTE SHEET (RULE 26)

FIG. 3

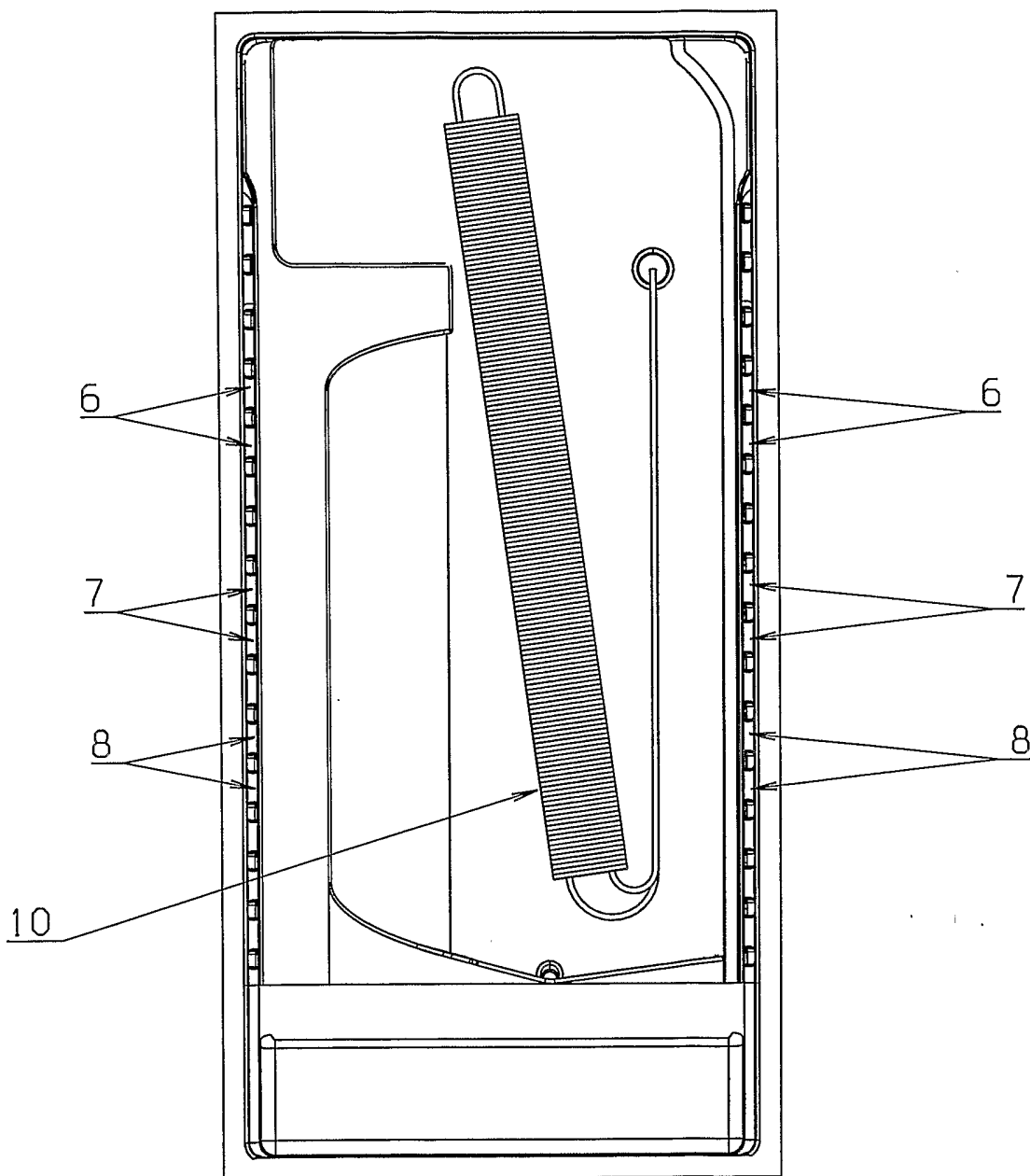
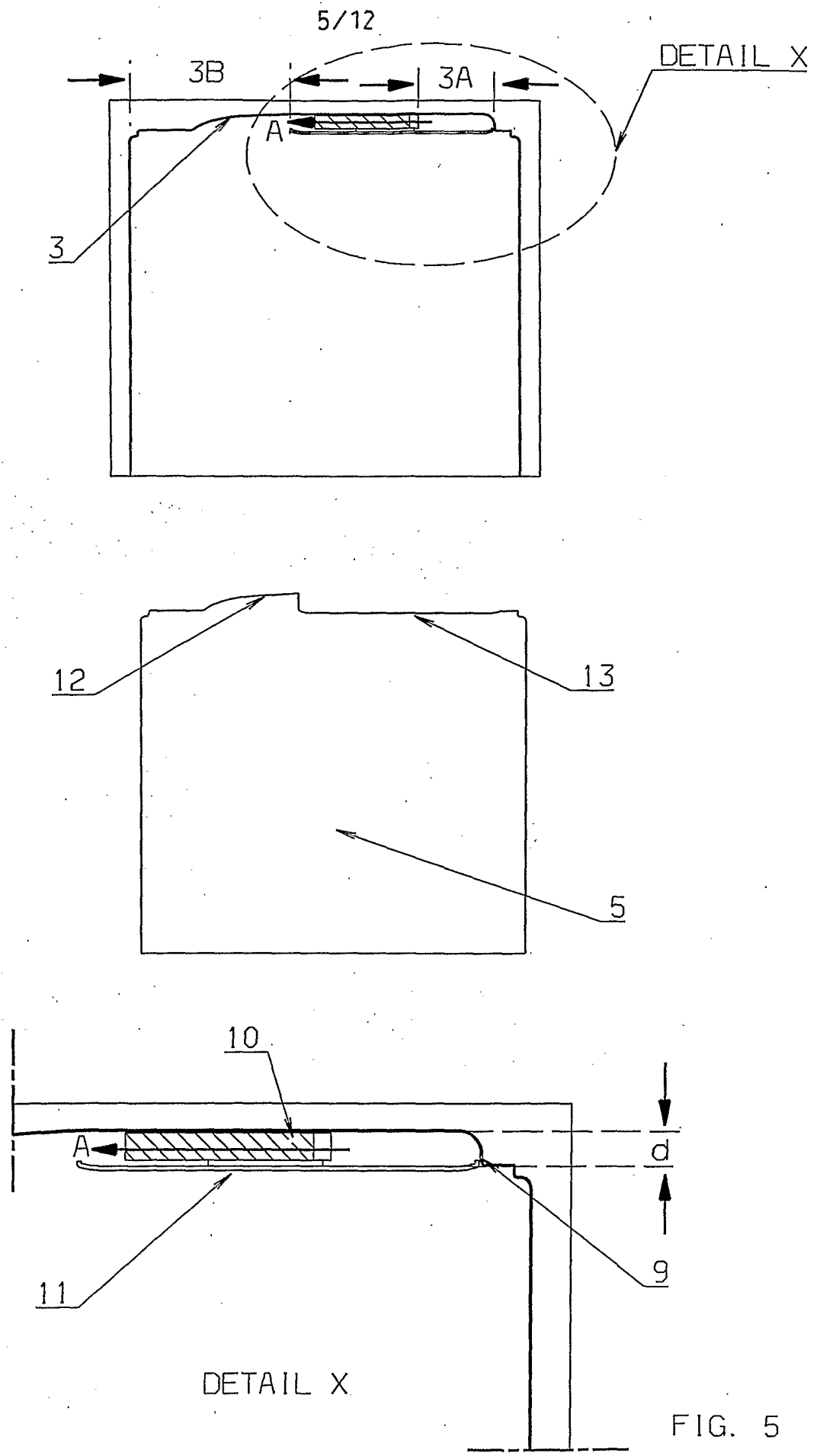


FIG. 4



DETAIL X

FIG. 5

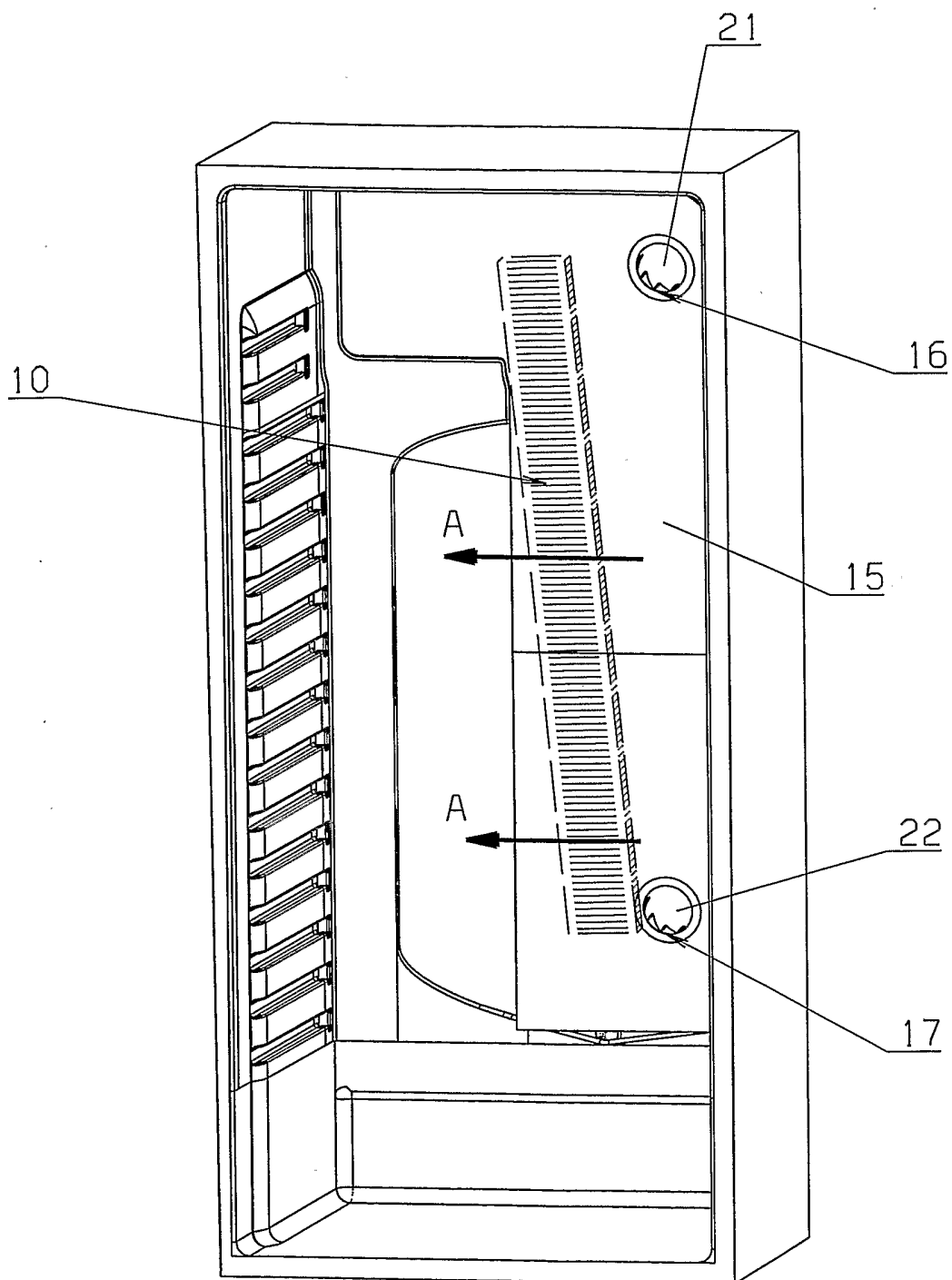


FIG. 6

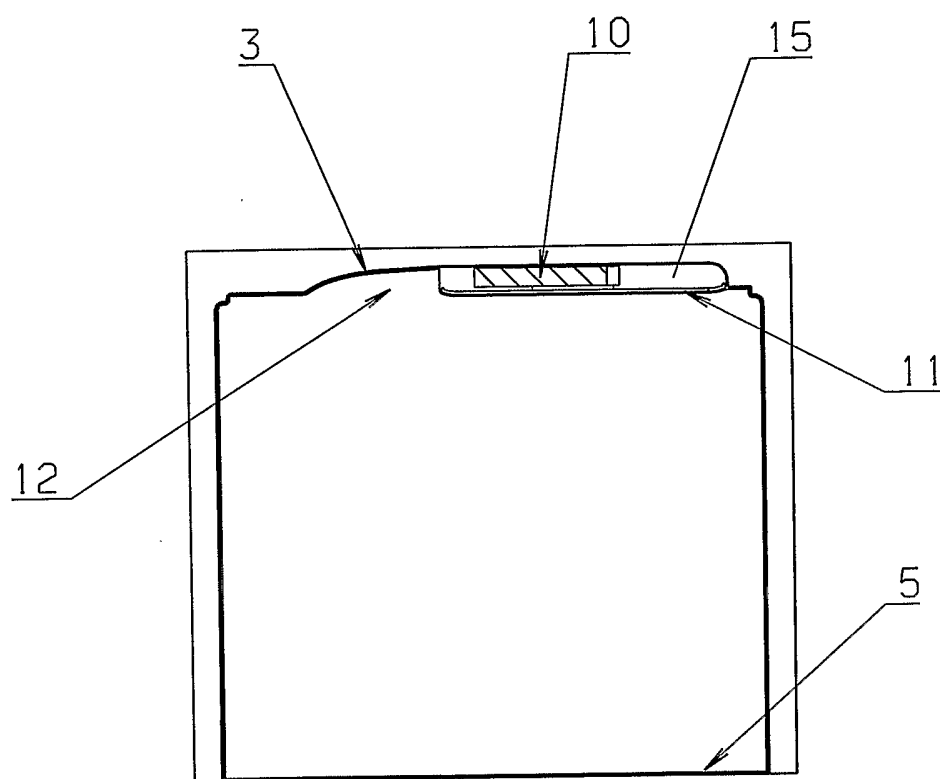


FIG. 7

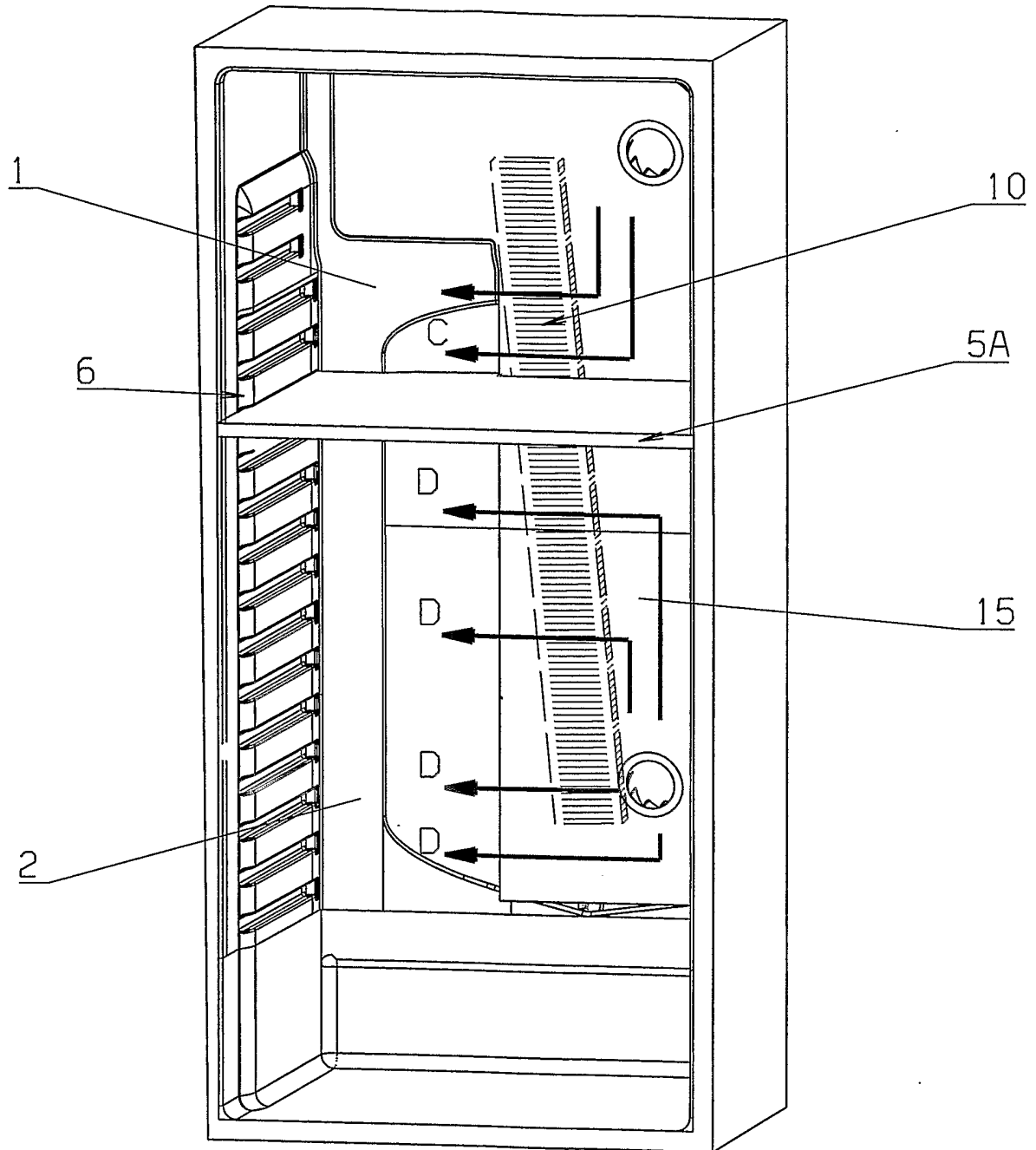


FIG. 8

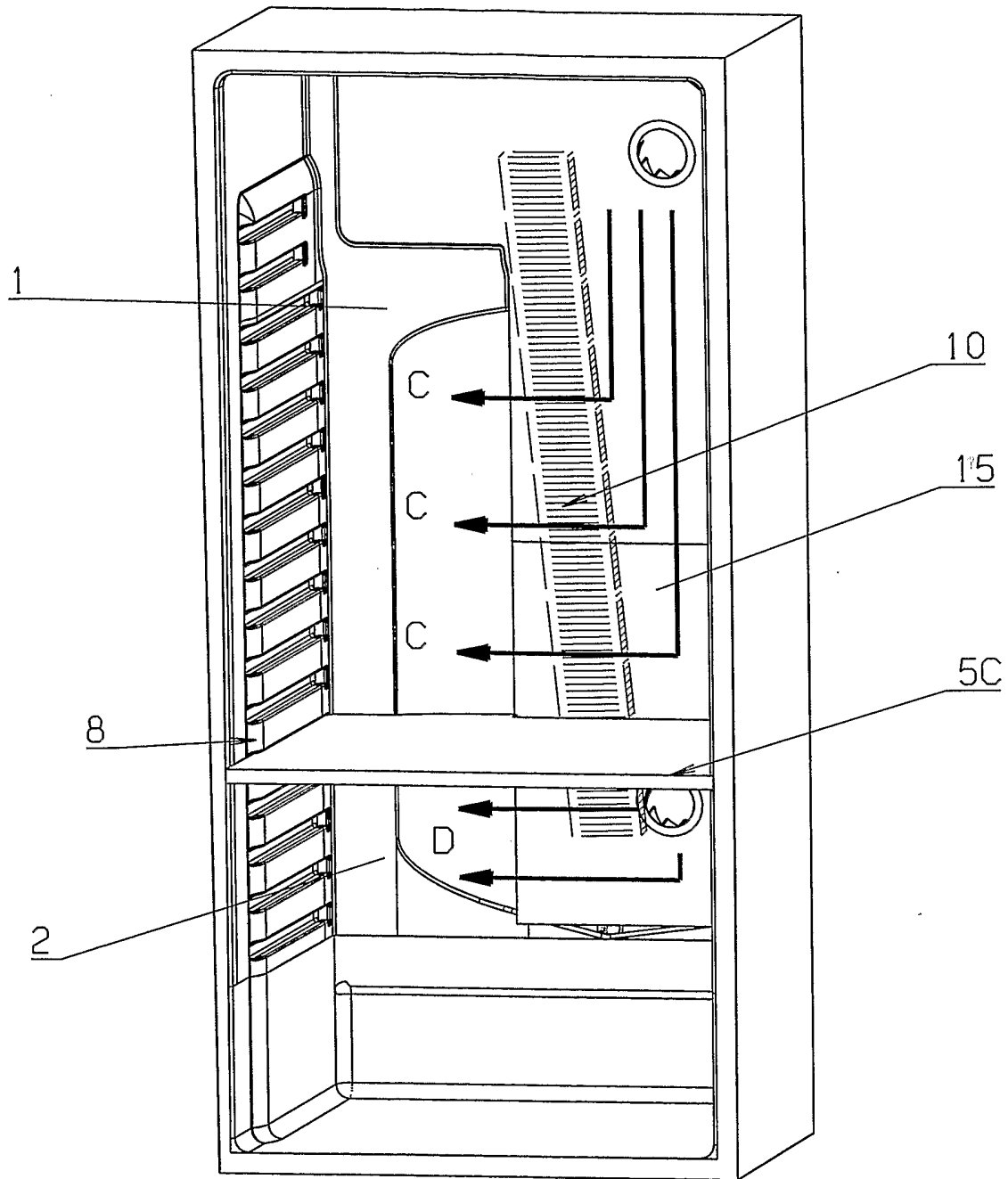


FIG. 9

10/12

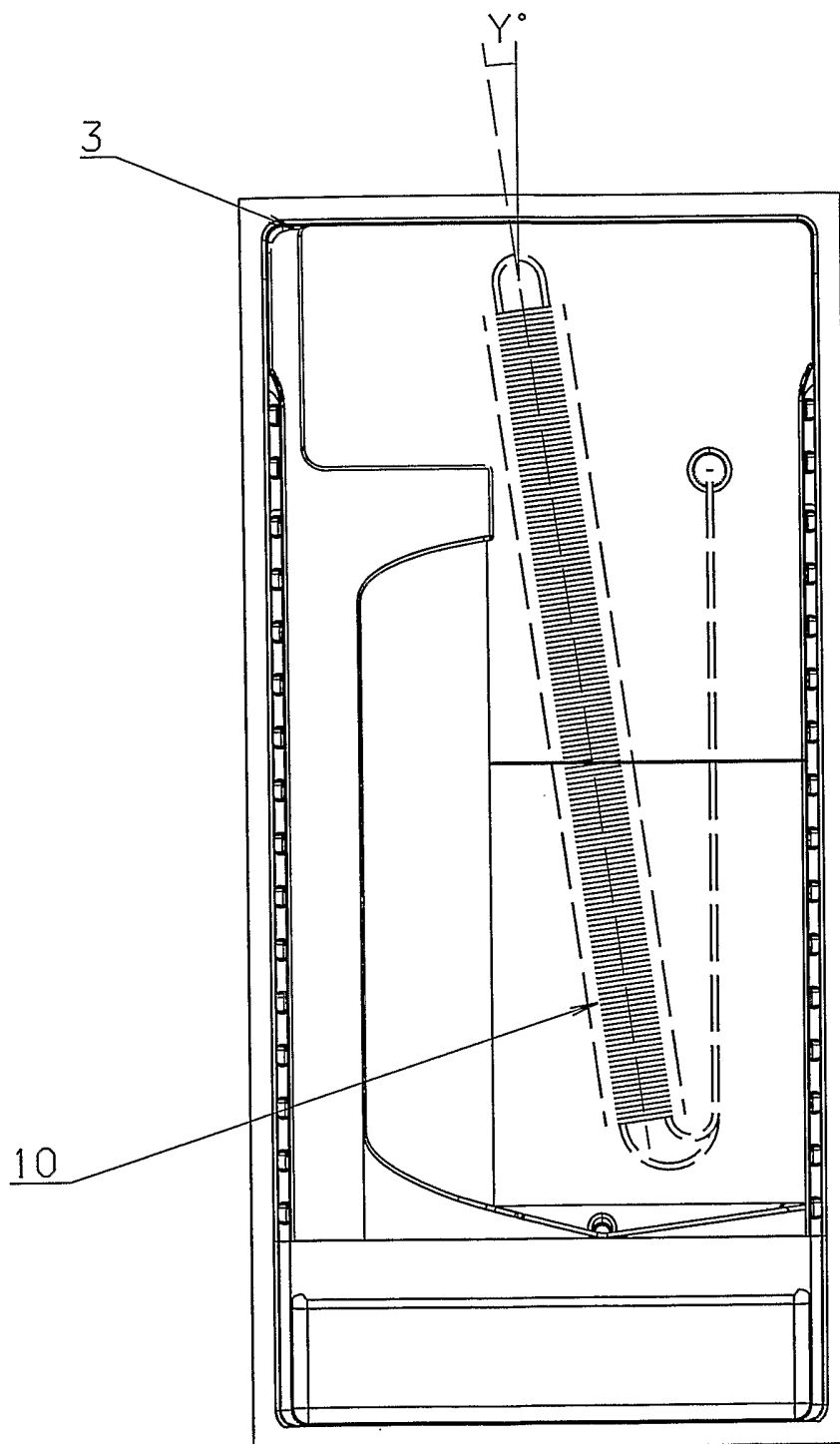


FIG. 10

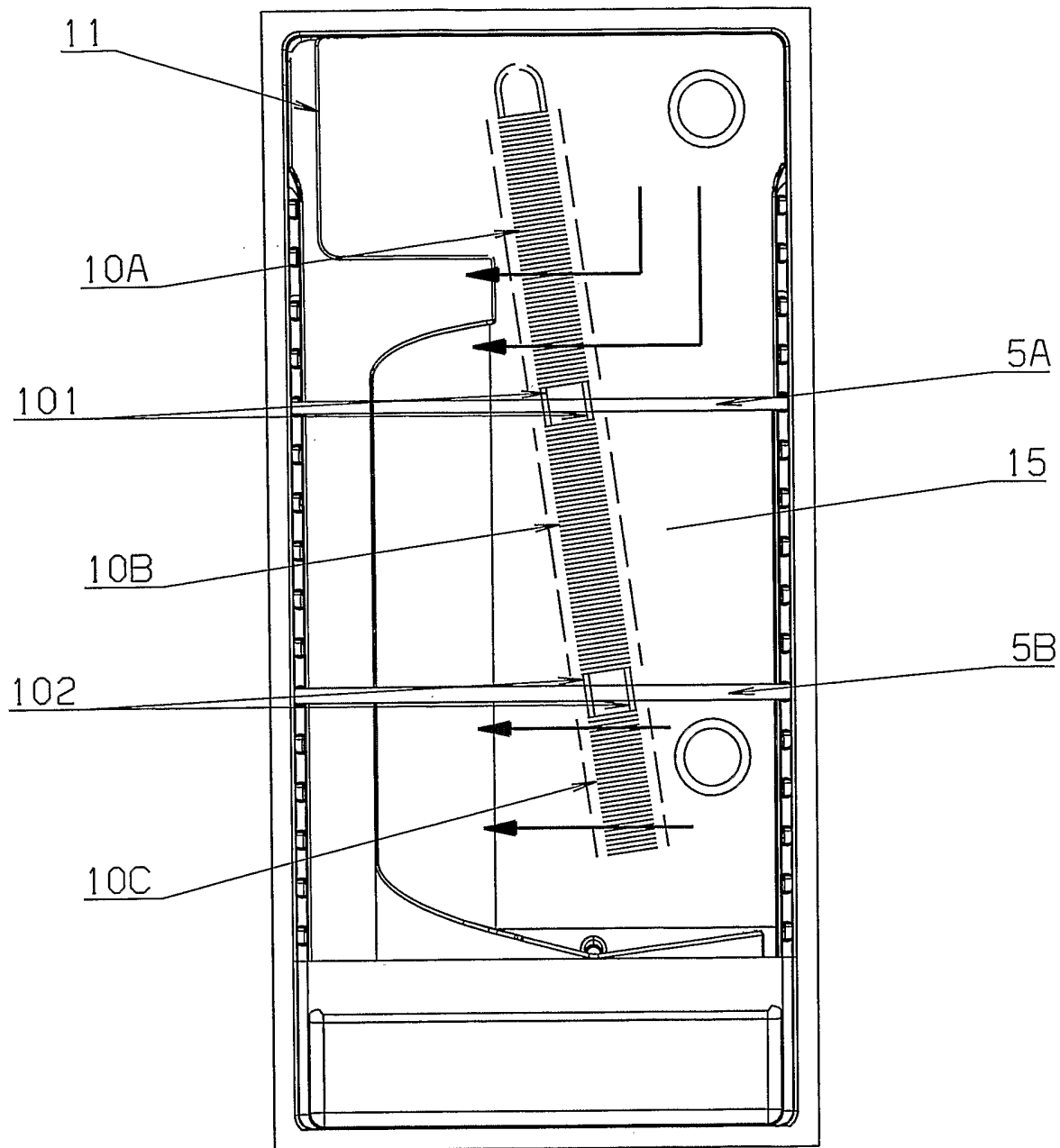


FIG. 11

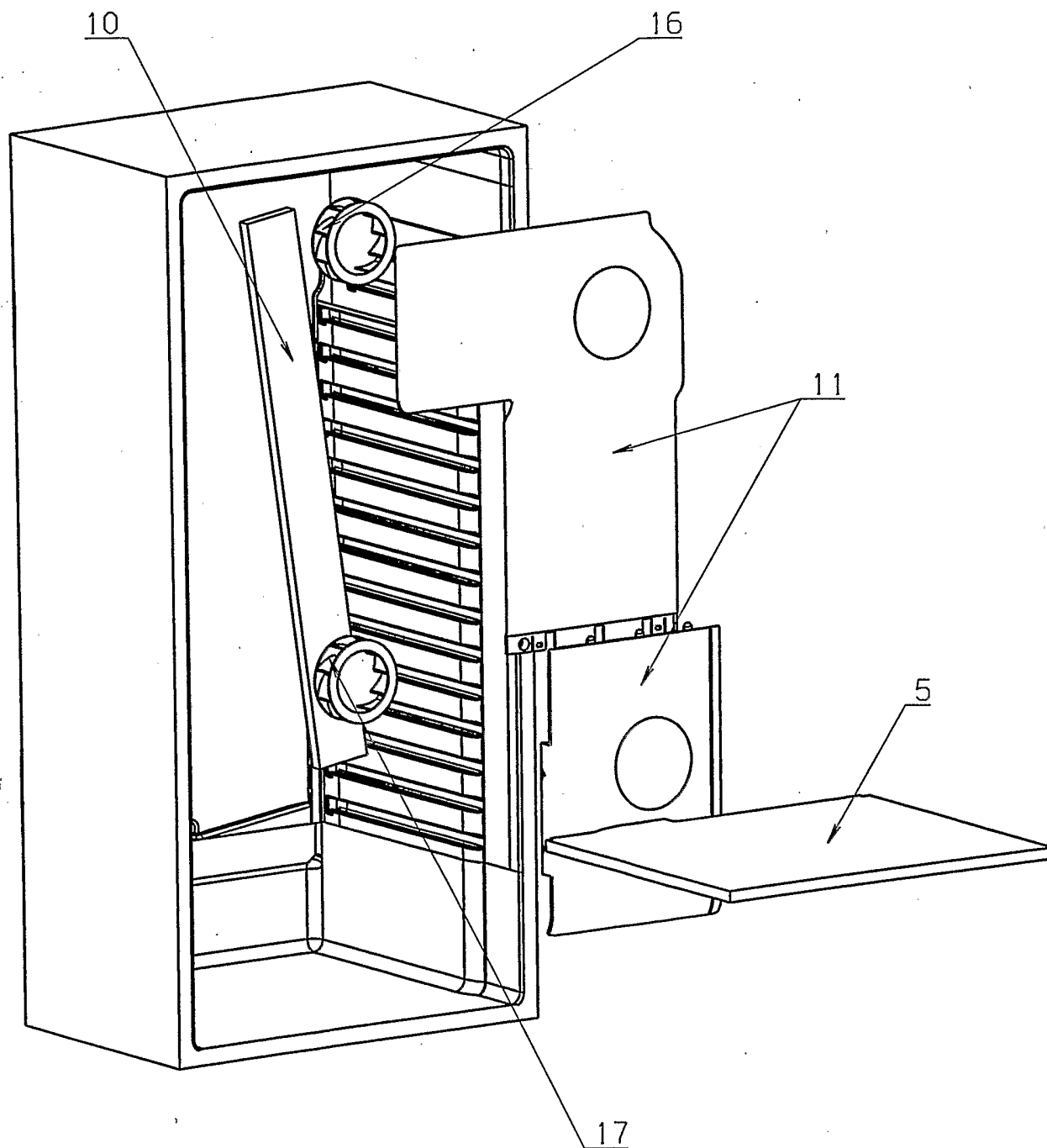


FIG. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2004/001073

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F25D 17/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F25D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03042613 A1 (WHIRLPOOL CORPORATION), 22 May 2003 (22.05.2003), page 4 - page 8, figures 1-3, page 10, third paragraph	1-9
Y	--	10
X	US 4876860 A (NEGISHI), 31 October 1989 (31.10.1989), whole document	1
Y	WO 0212809 A1 (AKTIEBOLAGET ELECTROLUX), 14 February 2002 (14.02.2002), fig. 1,4 and adherent text	10
	--	

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 Sept 2004

Date of mailing of the international search report

22-09-2004

Name and mailing address of the ISA/

Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Inger Löfving / JA A
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/001073

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3590594 A (RAYMOND AREND), 6 July 1971 (06.07.1971), whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

31/07/2004

International application No.

PCT/SE 2004/001073

WO	03042613	A1	22/05/2003	IT	MI20012427 A	16/05/2003
US	4876860	A	31/10/1989	NONE		
WO	0212809	A1	14/02/2002	AU	8035701 A	18/02/2002
				CN	1446307 T	01/10/2003
				EP	1307695 A	07/05/2003
				HU	0301624 A	28/08/2003
				JP	2004506172 T	26/02/2004
				NO	20030666 A	10/02/2003
				SE	517085 C	09/04/2002
				SE	0002858 A	10/02/2002
				US	2004065108 A	08/04/2004
US	3590594	A	06/07/1971	BE	750295 A	16/10/1970
				CH	519148 A	15/02/1972
				DE	2023172 A	19/11/1970
				ES	194606 Y	01/05/1975
				FR	2050388 A,B	02/04/1971
				LU	60898 A	16/07/1970
				NL	7006830 A	17/11/1970