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(54) **Production method of vertical freezers**

(57) Method of construction of a plurality of different models of vertical freezers, comprising the steps of construction of a plurality of freezing compartments (C1,C2,C3) of different heights, construction of a plurality of evaporating batteries (B1,B2,B3) functionally and univocally associated to and contained in respective said compartments (C1,C2,C3), and placed on a respective upper wall (4), implementation of containment means of each of said evaporating batteries, said evaporating batteries (B1,B2,B3) and respective means being inclined with the related front portions upwards; according to said method, the construction of said containment means consists in the realization of one model only of an outer envelope (Nx). Preferably said evaporating batteries (B1,B2,B3) do show the same width and length, and respective different heights.

The upper wall (4) of said compartments is provided towards the relevant evaporating battery (2) of a respective cavity whose front side is inclined upwards.

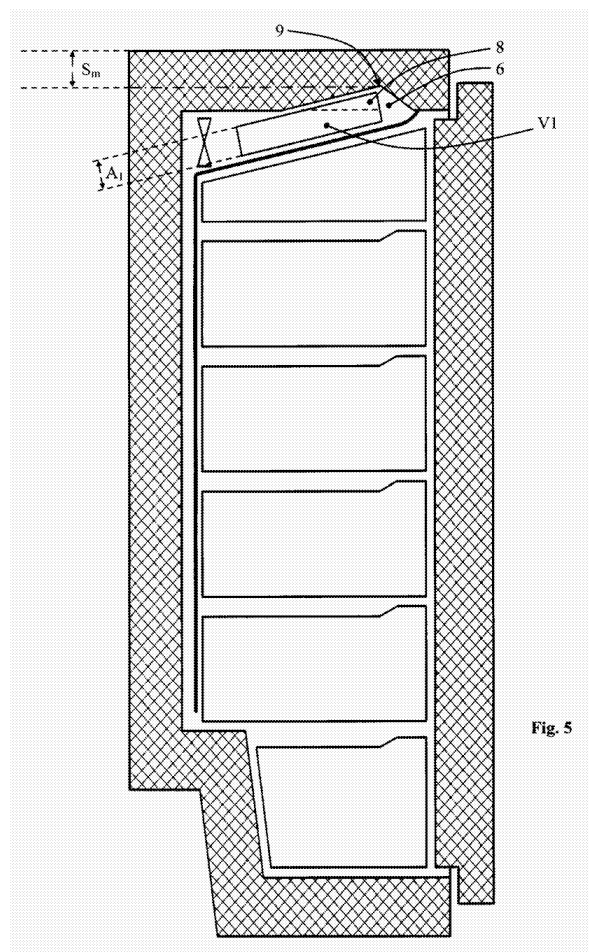


Fig. 5

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Description

[0001] The invention regards an improved method for producing freezing compartments of vertical freezers, particularly for household use, implemented by a special combination of components which allow an high interchangeability and modularity.

[0002] In the following of this description it will be referred to a freezing compartment wherein the evaporator is being made of a compact and preferably ventilated battery, which is mounted in correspondence of the upper portion of the same compartment, but it will be intended that what explained may be identically implemented and so valid even for more general use, where a wide interchangeability between the mounting and the containment devices of the evaporating batteries is appreciated.

[0003] The fast market growth of vertical freezers has led to a progressive utilization of the technology of ventilated evaporating batteries, and to a progressive replacement of conventional solutions by evaporating "towers" or flat and not ventilated evaporators, and therefore showing a poor ability of transferring heat.

[0004] Due to the coming of the ventilated evaporating batteries, the mainly productive problem of implementing in the cheapest and most rational way the whole production process of freezing compartments, included the related evaporation means, has raised.

[0005] Therefore a number of types of evaporating batteries have been developed and proposed, which have to maintain a basically similar mechanical solution, and in the same time have to be designed to be combined both from the point of view of the mechanical interface to the relevant different freezing compartments, and of their performances.

[0006] With ref. to fig. 1, a compartment 1 of a vertical freezer, according to the prior art and to the type that the instant invention intends to improve and replace, is basically composed by:

- a fan 3 firmly mounted on the back zone of said battery,
- an upper wall 4 of said compartment 1,
- an evaporating battery 2 placed immediately below said upper wall 4.

[0007] Moreover said battery is supported, and for esthetical reasons even closed, by an outer envelope 5 closing it at least frontally and from the bottom, and usually also laterally.

[0008] The working and physical configuration of said types of batteries and related envelopes is known and therefore it will not remembered.

[0009] Said type of vertical freezers, even if reliable and easy to be produced, however do show two remarkable drawbacks:

a) the overall cost

[0010] As a matter of facts the production of a normally diversified range of vertical freezers in the same production factory necessarily implies the production of a corresponding number of:

- vertical compartments (i.e. the moulded walls),
- refrigeration circuits properly designed and arranged on the requested performances, and which obviously comprise specific and different evaporating batteries inside the corresponding compartments,
- outer specific envelopes, whose sizes are sized to contain respective evaporating batteries.

[0011] Apparently such a specialization and productive differentiation causes remarkable inefficiencies and burdens of several naturee, which are well known to the man skilled in the art, and therefore will not be repeated.

b) interchangeability of the same evaporating assembly in different freezers

[0012] If one wishes to implement a defined amount of thermal exchange (i.e. a cold transfer from a generic evaporator to an outer environment) in a plurality of types of freezer compartments, the most used and up to now obliged way of proceeding is to provide a specific evaporating battery and a respective specific envelope, to be mounted inside a respective compartment.

[0013] However it is a common case that a same cooling power has to be installed inside compartments having respective different sizes; in such a circumstance, even if the cooling power is the same, it is not possible to simply install in the various compartments the same physical battery/envelope as any other component, and as a conclusion a certain evaporating battery cannot be freely interchanged from a compartment to another one even if having the same cooling power; it is so needed to implement a number of different ad specific evaporating batteries and corresponding envelopes, which from a strictly operating point of view looks as a contradiction, and which from a productive point of view causes burdens and additional costs due to the missed production standardization.

[0014] It would be then desirable, this being the purpose of the present invention, to implement a method to produce the compartments of vertical freezers and the related evaporating batteries and envelopes, able to radically reduce, or to eliminate, the just described drawbacks.

[0015] This purpose, together with further ones, will be described and obtained implementing a method for the production of the compartments of vertical freezers and related envelopes, and for the engineering of the productive standardization, according to the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- fig. 1 shows a simplified and transversal sectional view of the compartment of a vertical freezer, according to the prior art,
- fig. 2 symbolically shows a schematic of the logical assembly of some main components of the freezer compartment of fig. 1,
- fig. 3 symbolically shows a schematic of the logical assembly of the main components of the freezer compartment according to the present invention,
- figures 4a and 4b show respective simplified exploded views of two possible different embodiments of this invention,
- figures 5 and 6 show respective vertical and transversal section views of two further embodiments of the invention.

[0016] With ref. to fig. 2, in order to show out in the simplest and understandable way the invention, it is remembered that according to the prior art the production of freezing compartments of vertical freezers comprises the steps of:

- production of the various types of compartments C1, C2, C3 according to the prior art,
- production of the various types of evaporating batteries B1, B2, B3 according to the requirements of the performances respectively requested, according to the prior art,
- production of the various types of envelopes N1, N2, N3 so that each envelope is able to the double function both of containment of the respective evaporating battery B1, B2 B3, and of its mounting to a respective type of compartment C1, C2, C3, as exemplarily and schematically shown in fig. 2.

[0017] According to the method of the instant invention, as shown in fig. 3, the steps of:

(when in the following it is referred to operations or methods which are identical between the prior art and the instant invention, the same identification numbers and/or symbols are used)

- implementation of the various types of compartments C1, C2, C3, and
- implementation of the various types of evaporating batteries B1, B2, B3 according to the requirements of the respectively requested performances,

are still carried out as per the prior art.

[0018] With reference to the implementation of the envelopes, it essentially consists in the designing and engineering of a unique type of envelope Nx, having proper size to lodge a pre-defined range of different evaporating batteries, and able to be identically mounted on the upper wall of a pre-defined plurality of freezing compartments.

[0019] It will be obviously understood that, in the broadest case, it will not possible to define only one type of envelope Nx, which is valid both for all the evaporating

batteries and for all the freezing compartments, as some inconsistencies of mechanical or encumbrance nature may happen, f. i. between a very high or wide evaporating battery and an envelope too small to contain it.

[0020] However the man skilled in the art is perfectly able of defining the reciprocal limits of mechanical and operating compatibility, and so of identifying that type of envelope Nx able of lodging the pre-defined range of evaporating batteries, and which in the same time can be lodged in one again pre-defined range of freezing compartments.

[0021] It will be now observed that the just explained solution is not simply limited to the designing of "an envelope Nx large enough to contain all the evaporating batteries (within certain limits), but small enough to be properly contained in (within certain limits) all the considered compartments".

[0022] As a matter of facts such a solution may also be partially compromised by the fact that some evaporating batteries may exist which, due to different reasons, which here it is not worthwhile to investigate, even if offer the same performance of thermal exchange, do show the relevant outer size which badly cope with only one lodging envelope.

[0023] The present solution therefore offers an useful solution to review the design and the industrial engineering of the evaporating batteries which are to be included in the instant method, so as to increase the number of said batteries which can take advantage of the production standardization and optimization.

[0024] As a fact, such method consists in the design of some evaporating batteries so that they show basically the same size in width and in length, but not in height; this allows to achieve the greatest difference between the thermal exchange of the less powerful battery and the thermal exchange of the most powerful battery.

[0025] An therefore, if a range of evaporating batteries having progressively increasing power is defined, and the difference of thermal exchange between two batteries, whose cooling power is closer each other, is also defined, it comes out that the number types of different batteries which can be associated to an unique type of envelope is increased, with apparent design and production advantages.

[0026] The figures 4a and 4b do show in a simplified way an example of a common envelope Nx associated to two different evaporating batteries B1, B2, showing respective different heights H1, H2.

[0027] With reference to figure 1, it will be noted that the evaporating battery 2 is mounted so that its front side shows a slight inclination upwards; such a feature is due to the fact that, in this simple, cheap and safe way the defrost water of the evaporator 2 is automatically conveyed by gravity in a proper gutter placed in the back side of the compartment, from where it is being discharged to the outside by known means.

[0028] However such a solution implies that an about prismatic room

(seen as a triangle 5 in fig. 1) is created between said evaporating battery and the upper wall 4 of the compartment 1.

[0029] It is apparent that such room is not entirely used with regard to the compartment freezing volume, with consequent penalization, particularly in the consumer market.

[0030] In order to mitigate such a drawback, and with reference to fig. 5, an improvement of the invention consists in implementing a cavity 6 in said upper wall, which is open downwards and having geometry, size and position able of lodging inside it an upper portion 8 of the underlying evaporating battery 2.

[0031] It has been actually observed that if only a small portion 9 of the upper insulating wall 4 of the compartment 2 is sacrificed to create said cavity 6, the reduction of the overall insulating ability of said insulating wall 4 is quite low and tolerable, compared to the apparent technical and commercial advantages due to the possibility of offering an actual and not negligible increase of the compartment usable inner volume that can be used.

[0032] This circumstance can also be explained considering that the average thickness **Sm** of said upper insulating wall 4, provided with said cavity 6, is only slightly reduced with respect to the thickness **S** of the same insulating wall (fig. 4) without said cavity.

[0033] Such circumstance is still more appreciated if it is only considered that the width of said cavity is only a portion of the whole compartment width, as its width is the same width of the evaporating battery.

[0034] Moreover the fig. 6 shows a different embodiment of the compartment of fig. 5, wherein in the same cavity 6 two different envelopes, here identified with **V1** and **V2** and with different heights **A1** and **A2**, can be lodged; this means that, reciprocally to what previously explained, in the same cavity 6 a plurality of envelopes can be associated as well, in addition to the circumstance that one envelope only may contain a plurality of evaporating batteries showing different heights (provided that said heights are limited to a certain difference).

[0035] It will be now apparent to the man skilled in the art that the best use of this invention is achieved if said cavity is placed on said insulating wall 10 in freezing compartments which have been produced according to the before explained productive standardization methods; as a matter of facts, should said envelope **Nx** be the envelope that has been selected as the common one for a plurality of types of evaporating batteries, it will also be possible to coherently standardize, (with adequate constructional arrangements which can be perfectly identified and organized by the man skilled in the art, and therefore here not here discussed), also the production, moulds included, of said cavities 6, what can generate a further reduction in the production costs.

[0036] Therefore, thanks to the fully commonality, and so to the interchangeability of said envelopes **Nx**, but not of the evaporating batteries therein lodged, and in their operation, it is possible of obtaining a number of freezing

compartments having different functional features and sizes, but improved in the respective overall performances, and produced through the use of partially common components and methods, which as a conclusion do optimize their economic value.

Claims

1. Method of construction of a plurality of different models of vertical freezers, comprising the following steps:

- construction of a plurality of freezing compartments (C1, C2, C3) of different heights,
- construction of a plurality of evaporating batteries (B1, B2, B3) functionally and univocally associated to and contained in respective said compartments, and placed below the respective upper wall (4),
- implementation of containment means of each of said evaporating batteries,

wherein said evaporating batteries and respective envelopes are inclined with the related front portions upwards,

characterized in that the construction of said containment means is carried out through the construction of only one model of outer envelope (**Nx**).

2. Method of construction of a plurality of different models of vertical freezers according to claim 1, **characterized in that** said evaporating batteries do show the same width and length, and respective different heights (H1, H2).

3. Freezing compartment of a vertical freezer provided with:

- an upper wall (4),
- an evaporating battery (2) contained in a respective outer envelope (**Nx**) mounted on the bottom side of said upper wall, the front sides of respective said battery and said envelope being inclined upwards, **characterized in that** said upper wall (4) of said compartment is provided towards the respective evaporating battery of a respective cavity (6) whose front side is inclined upwards.

4. Freezing compartment of a vertical freezer according to claim 3, **characterized in that** said respective cavity (6) is able of partially lodging an upper portion (8) of the respective evaporating battery (2) and/or of the respective outer envelope (**Nx**).

5. Freezing compartment of a vertical freezer according to claim 4, **characterized in that** said outer en-

velope (x) is implemented according any of the claims 1 or 2.

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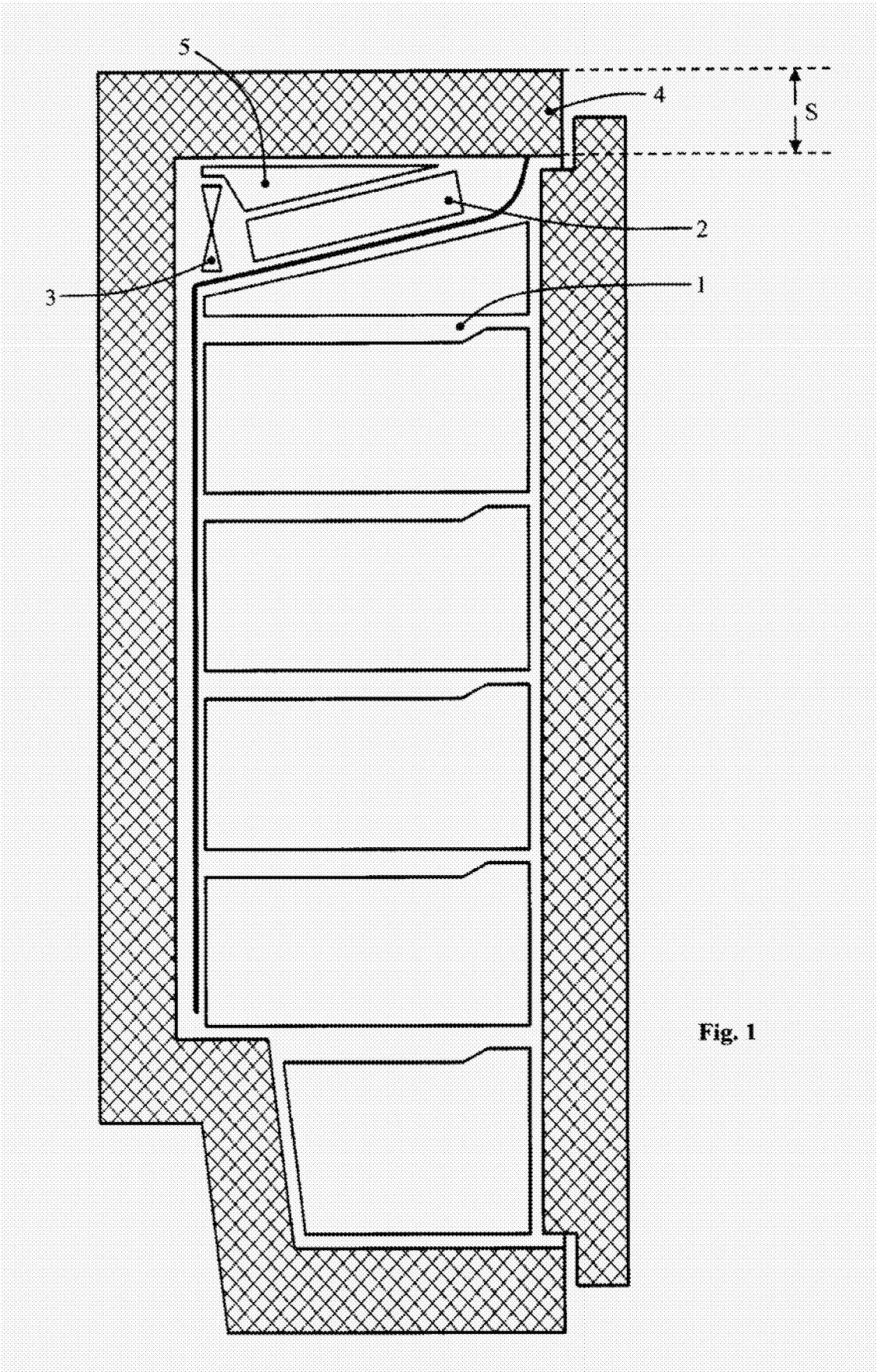


Fig. 1

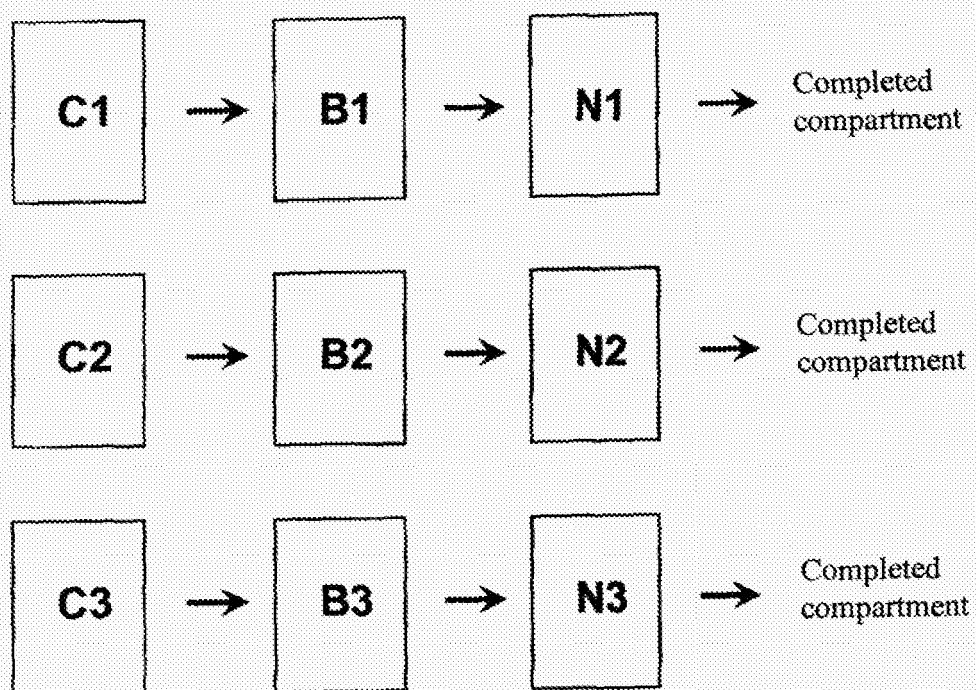


Fig. 2

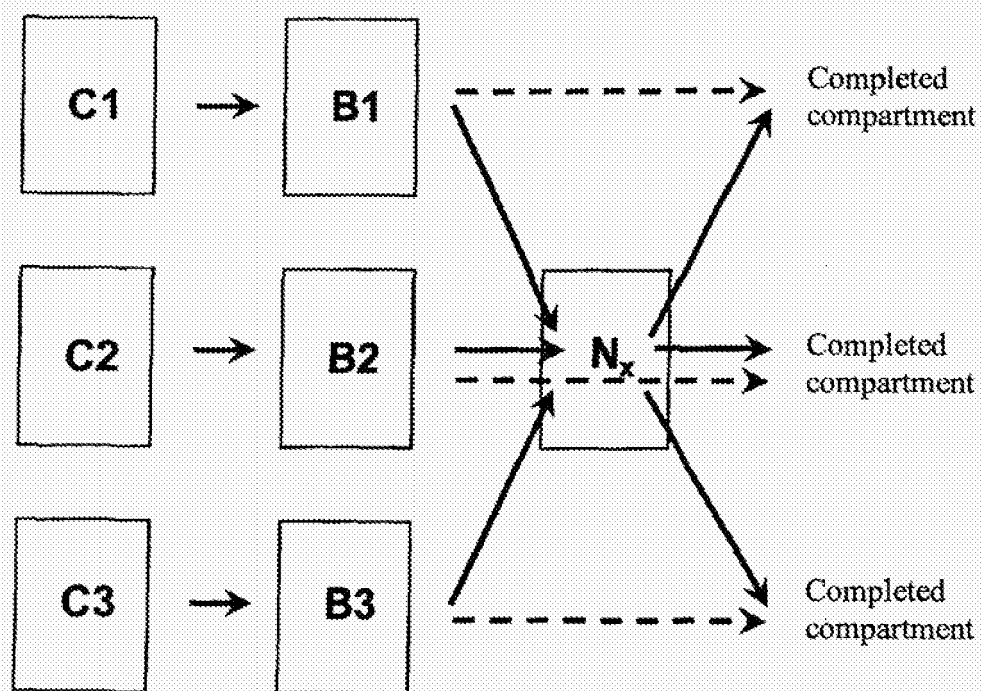
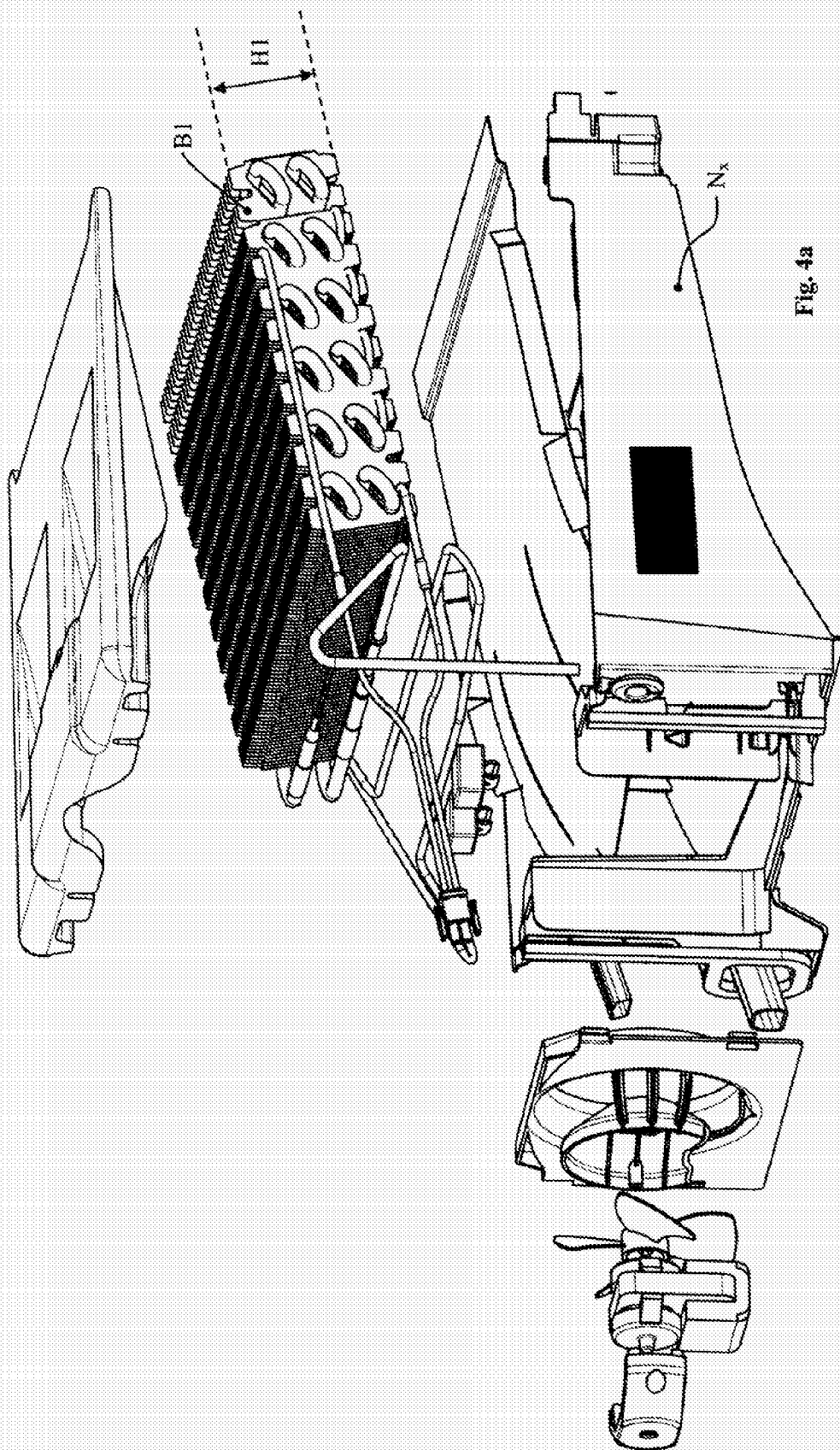
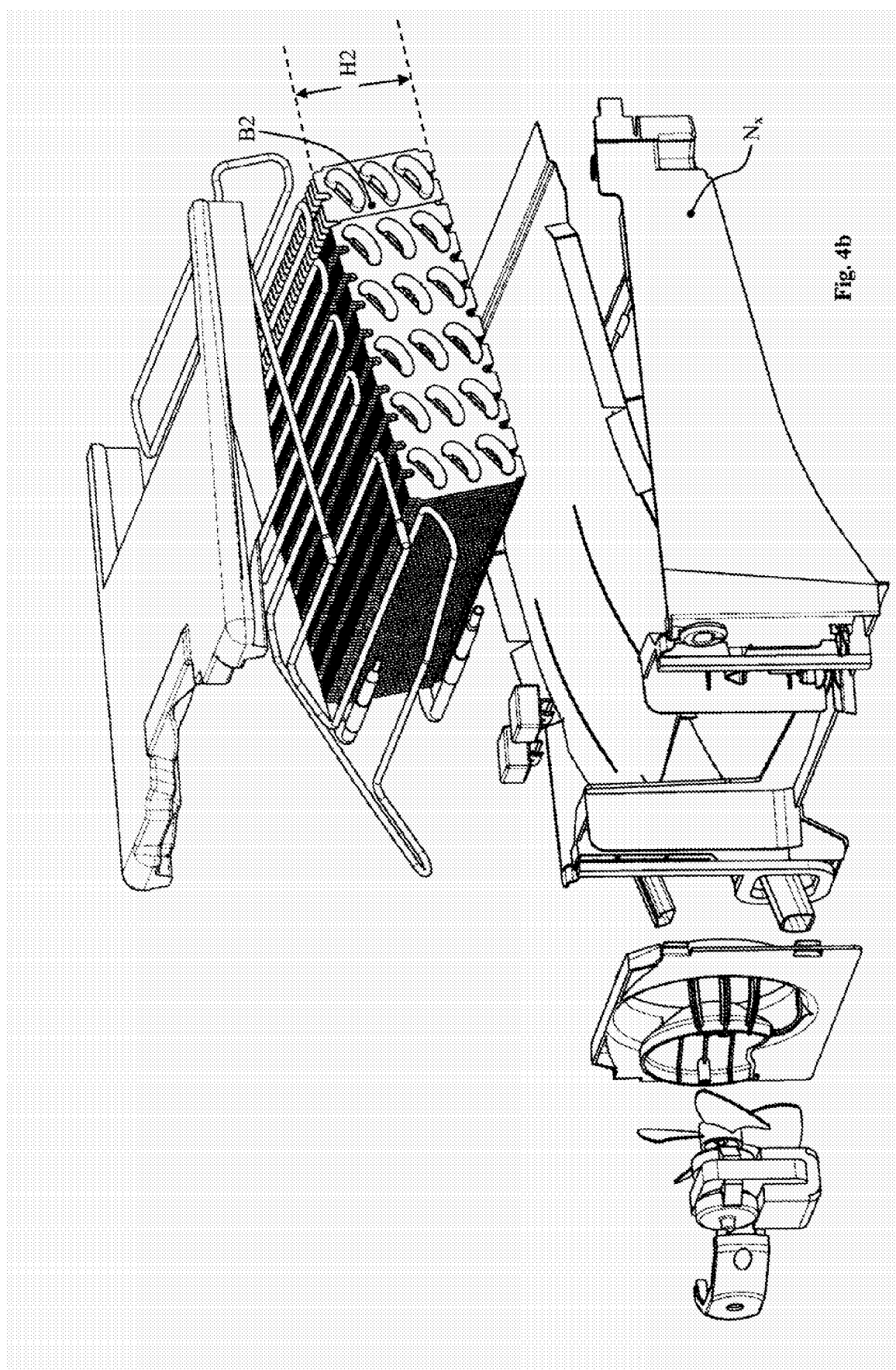


Fig. 3





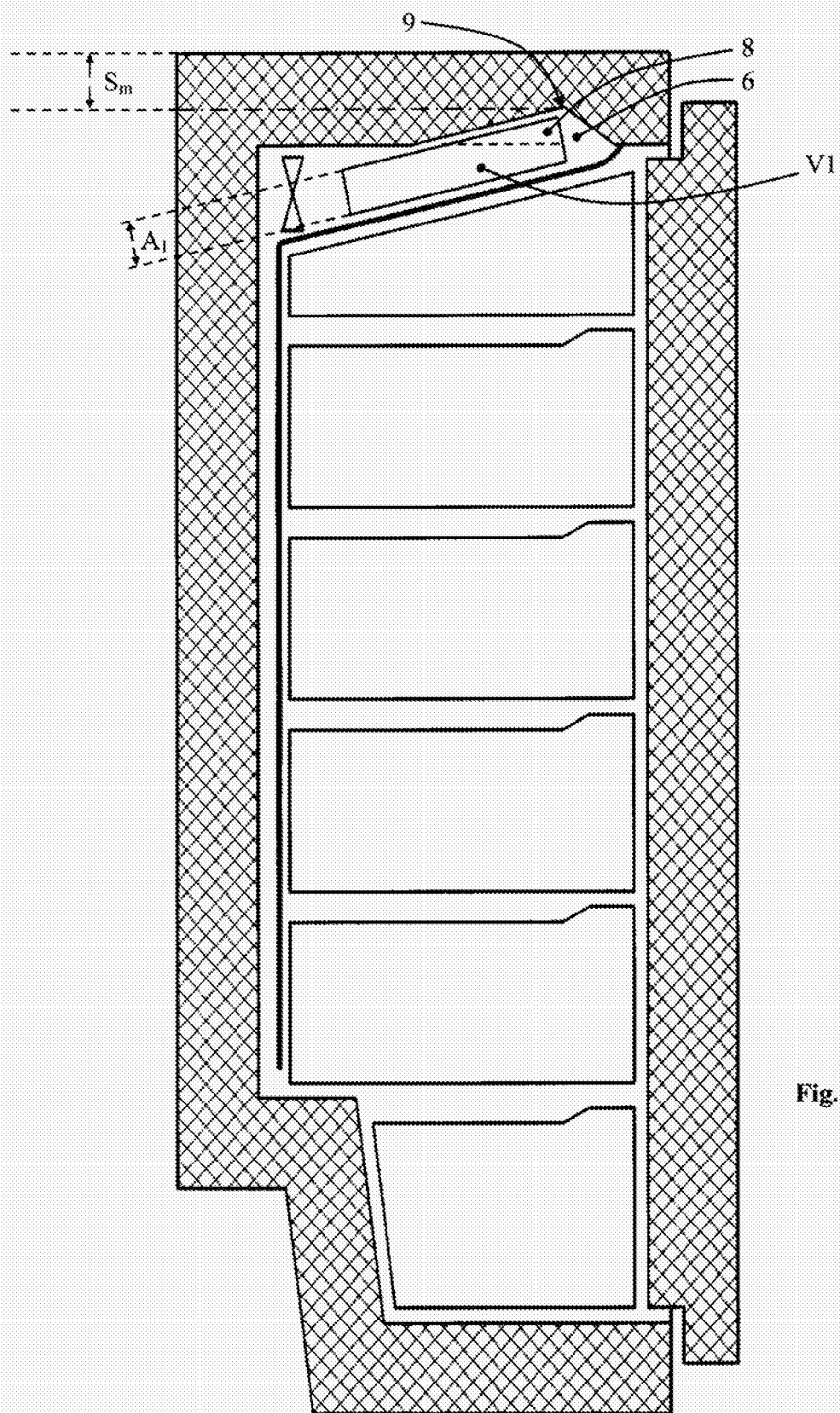


Fig. 5

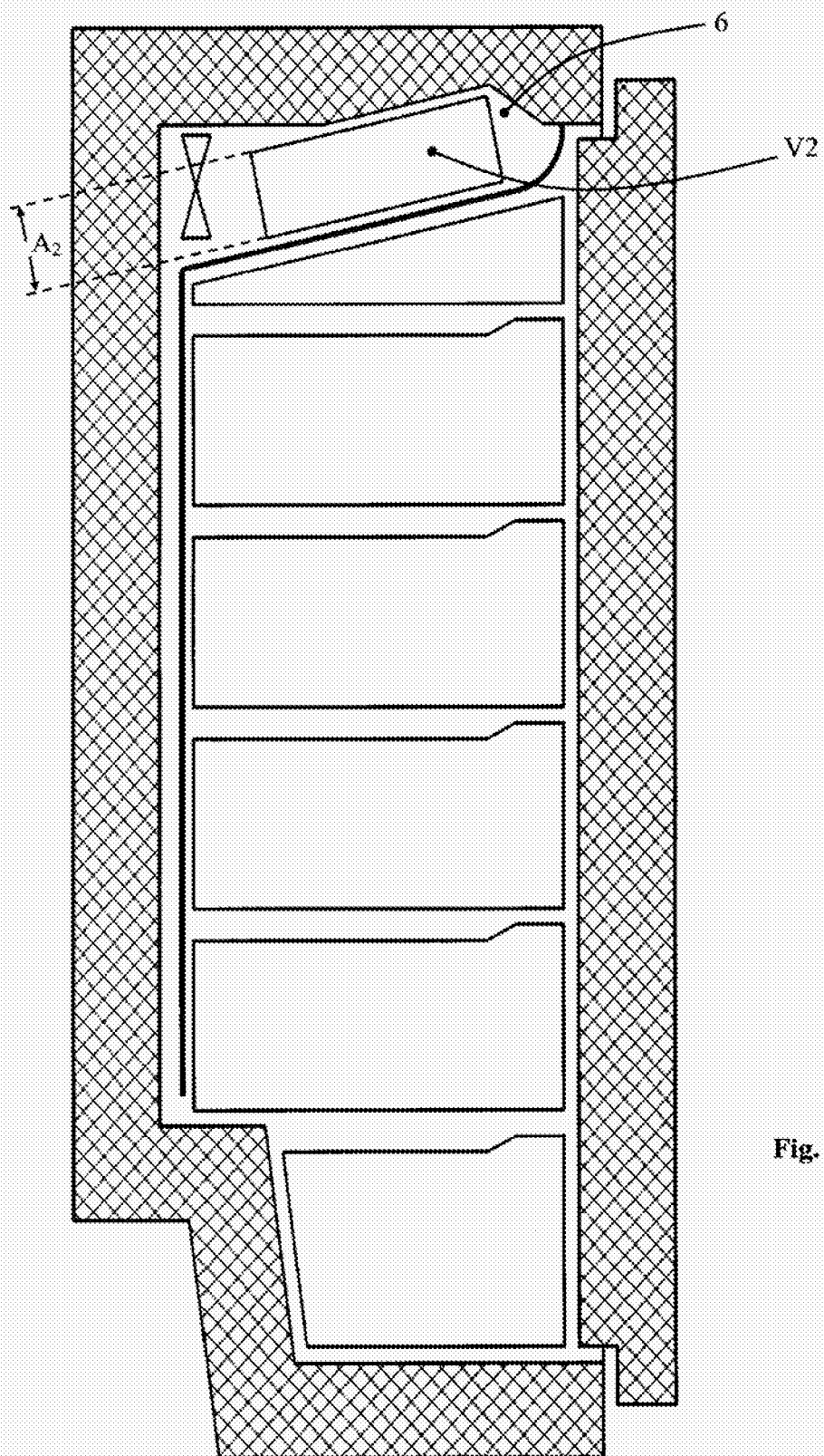


Fig. 6



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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 1125

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 August 2007	Examiner Jessen, Flemming
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)



European Patent
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Application Number

EP 06 12 1125

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 06 12 1125

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-2

Method of construction of a plurality of different models of vertical freezers.

2. claims: 3-5

Freezing compartment with a cavity in the upper wall.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 12 1125

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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