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(54) Production method of vertical freezers

Verfahren zur Herstellung von Vertikalgefrierern

Procédé pour la production des congelateurs armoires

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Description

[0001] The invention regards a vertical freezer, particularly for household use.

[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] An example of a freezer comprising an evaporator mounted in correspondence of an upper portion of a freezing compartment is illustrated in DE 87 12 962, which discloses a freezer, comprising an housing, thermally insulated with rigid plastic foam, whose front opening is lockable by a door; inside the housing there is an inner container where there is placed a box evaporator, under which is placed a drip tray.

[0004] 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.

[0005] 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.

[0006] EP 1 479 987 discloses a refrigerator provided with a preservation compartment and with an evaporator formed from extendable spiral-wound tube of engineering polymer, such as to be able to be elastically lengthened, i.e. in the manner of a spring; this enables the user to obtain a required (for example different) temperature distribution within the refrigerator. This solution provides a refrigerator having a evaporator which, when in use, is able to assume different locations and sizes based on the practical utilization requirements of the refrigerator.

[0007] JP 2001 272152 discloses a freezer provided with a cooler chamber in which a cooling unit and a fan is placed; as can be seen in Figure 2 of JP 2001 272152, the thermal insulation of the upper wall of the cooler chamber is reduced in correspondence to the whole cooling unit and to the fan.

[0008] JP 11 101562 disclosed a refrigerator provided with a compartment according to the preamble of claim 1, in which upper part it is defined a cooling section comprising a cooler and a fan.

[0009] 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 perform-

ances.

[0010] 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.

[0011] 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.

[0012] The working and physical configuration of said types of batteries and related envelopes is known and therefore it will not be remembered.

[0013] Said type of vertical freezers, even if reliable and easy to be produced, however do show two remarkable drawbacks:

a) the overall cost

[0014] 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.

[0015] Apparently such a specialization and productive differentiation causes remarkable inefficiencies and burdens, 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

[0016] 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.

[0017] 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 and 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.

[0018] It would be then desirable, this being the purpose of the present invention, to radically reduce, or to eliminate, the just described drawbacks.

[0019] This purpose, together with further ones, will be described and obtained implementing 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,
- figures 4a and 4b show respective simplified exploded views of two possible different embodiments,
- figures 5 and 6 show respective vertical and transversal section views of two embodiments of the invention.

[0020] With ref. to fig. 2, in order to show 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 N 1, 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.

[0021] According to the method, as shown in fig. 3, the steps of:

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

- implementation of the various types of compartments C1, C2, C3, and
- implementation 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.

[0022] 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.

[0023] 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, e.g. between a very high or wide evaporating battery and an envelope too small to contain it.

[0024] 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.

[0025] 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".

[0026] As a matter of fact 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.

[0027] 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 method, so as to increase the number of said batteries which can take advantage of the production standardization and optimization.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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.

[0032] 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.

[0033] 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.

[0034] 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 has geometry, size and position able of lodging an upper portion 8 of the underlying evaporating battery 2.

[0035] 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.

[0036] 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.

[0037] 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.

[0038] 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).

[0039] It will be 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 fact, 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.

[0040] 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. Freezing compartment of a vertical freezer provided with:

- an upper wall (4),
- an evaporating battery (2) contained in an outer envelope (Nx) mounted on a bottom side of said upper wall (4), the front sides of said evaporating battery (2) and said outer envelope (Nx) being inclined upwards,
- said upper wall (4) of said freezing compartment being provided, towards the evaporating battery (2), with a cavity (6) having a front side inclined upwards, said cavity (6) partially lodging an upper portion of said evaporating battery (2),

characterised in that said cavity (6) is defined by a reduction of the thickness of said upper wall (4), and **in that** said thickness of said upper wall (4) is substantially constant in front of and behind said cavity (6).

2. Freezing compartment of a vertical freezer according to claim 1, **characterized in that** said front side of said cavity (6) which is inclined upwards faces a first side of the evaporating battery (2), and **in that** the cavity (6) has another side inclined downwards and facing a second side of the evaporating battery (2).

3. Freezing compartment of a vertical freezer according to claim 2, **characterized in that** said cavity (6) has substantially the same width as said evaporating battery (2).

Patentansprüche

1. Gefrierfach eines Vertikalgefrierers, das mit Folgendem versehen ist:

- einer oberen Wand (4),
- einer Verdampfungsbatterie (2), die in einem äußeren Mantel (Nx) enthalten ist, der auf einer Unterseite der oberen Wand (4) angebracht ist, wobei die Vorderseiten der Verdampfungsbatterie (2) und der äußere Mantel (Nx) nach oben geneigt sind,
- wobei die obere Wand (4) des Gefrierfachs zur Verdampfungsbatterie (2) hin mit einem Hohlraum (6) mit einer nach oben geneigten Vorderseite versehen ist, wobei der Hohlraum (6) teilweise einen oberen Teil der Verdampfungsbatterie (2) aufnimmt,

dadurch gekennzeichnet, dass der Hohlraum (6) durch eine Reduzierung der Dicke der oberen Wand (4) definiert wird und dass die Dicke der oberen Wand (4) vor und hinter dem Hohlraum (6) im Wesentlichen konstant ist.

2. Gefrierfach eines Vertikalgefrierers nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vorderseite des Hohlraums (6), die nach oben geneigt ist, einer ersten Seite der Verdampfungsbatterie (2) zugekehrt ist und dass der Hohlraum (6) eine andere Seite aufweist, die nach unten geneigt ist und einer zweiten Seite der Verdampfungsbatterie (2) zugekehrt ist.

3. Gefrierfach eines Vertikalgefrierers nach Anspruch 2, **dadurch gekennzeichnet, dass** der Hohlraum (6) im Wesentlichen die gleiche Breite wie die Verdampfungsbatterie (2) aufweist.

caractérisé en ce que ladite cavité (6) est définie par une réduction de l'épaisseur de ladite paroi supérieure (4), et **en ce que** ladite épaisseur de ladite paroi supérieure (4) est sensiblement constante devant et derrière ladite cavité (6).

2. Compartiment congélation d'un congélateur armoire selon la revendication 1, **caractérisé en ce que** ledit côté avant de ladite cavité (6), qui est incliné vers le haut, fait face à un premier côté de la batterie d'évaporation (2), et **en ce que** la cavité (6) présente un autre côté incliné vers le bas et faisant face à un second côté de la batterie d'évaporation (2).

3. Compartiment congélation d'un congélateur armoire selon la revendication 2, **caractérisé en ce que** ladite cavité (6) présente sensiblement la même largeur que ladite batterie d'évaporation (2).

Revendications

1. Compartiment congélation d'un congélateur armoire, comprenant:

- une paroi supérieure (4),
- une batterie d'évaporation (2) contenue dans une enveloppe extérieure (Nx) montée sur un côté inférieur de ladite paroi supérieure (4), les côtés avant de ladite batterie d'évaporation (2) et de ladite enveloppe extérieure (Nx) étant inclinés vers le haut,
- ladite paroi supérieure (4) dudit compartiment congélation comportant, en direction de la batterie d'évaporation (2), une cavité (6) présentant un côté avant incliné vers le haut, ladite cavité (6) logeant partiellement une partie supérieure de ladite batterie d'évaporation (2),

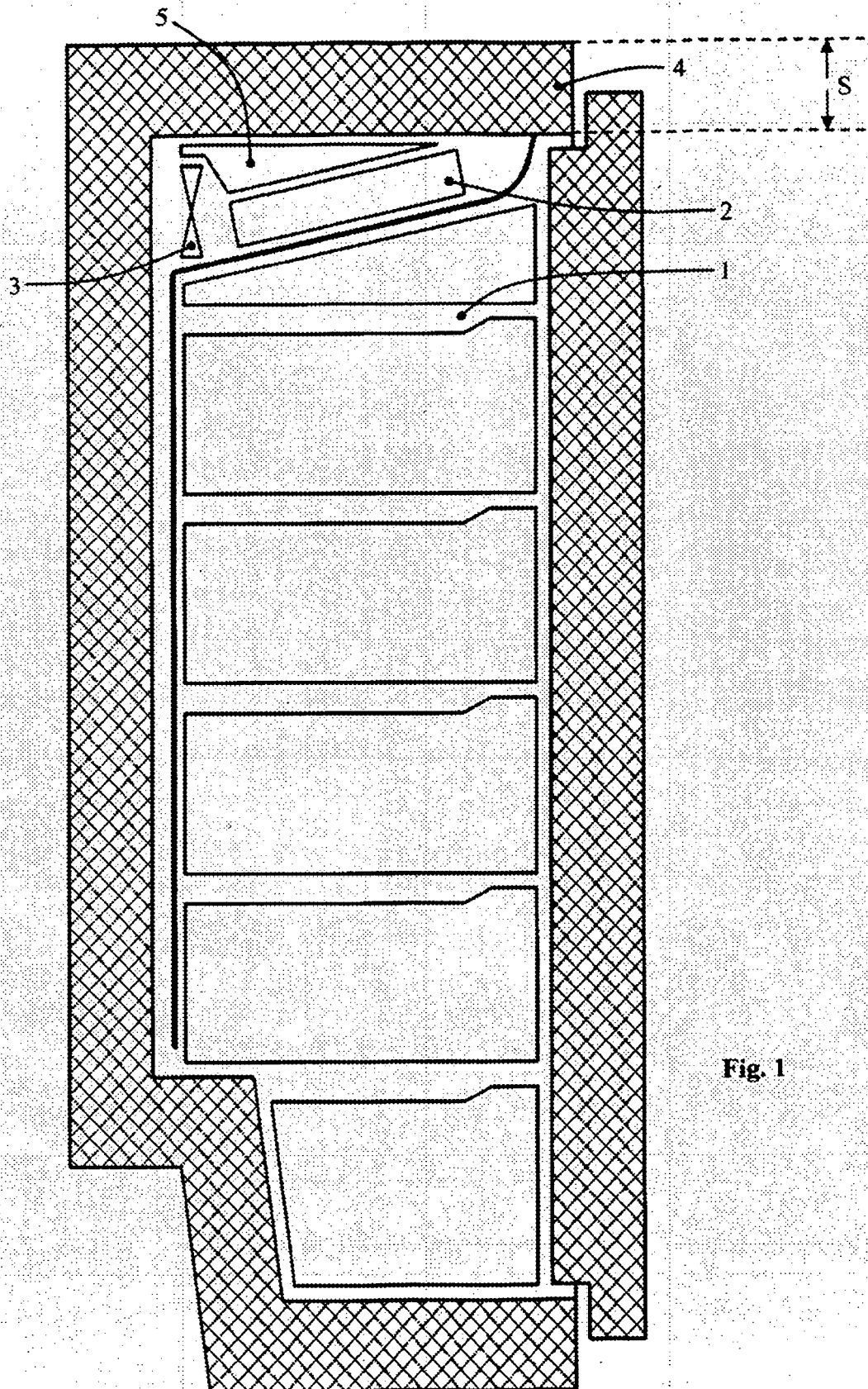


Fig. 1

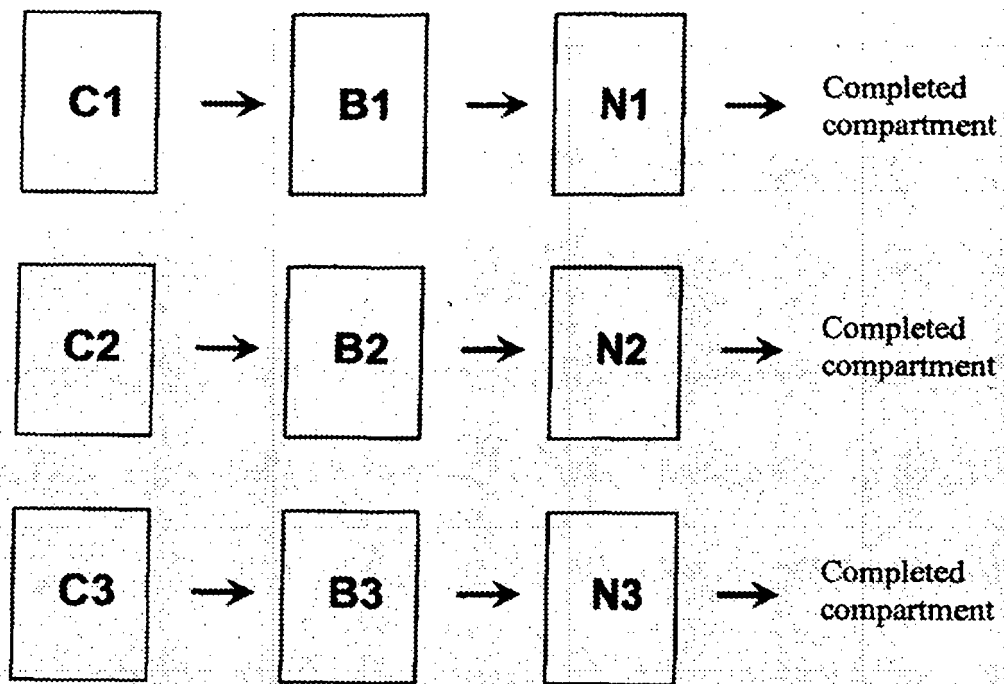
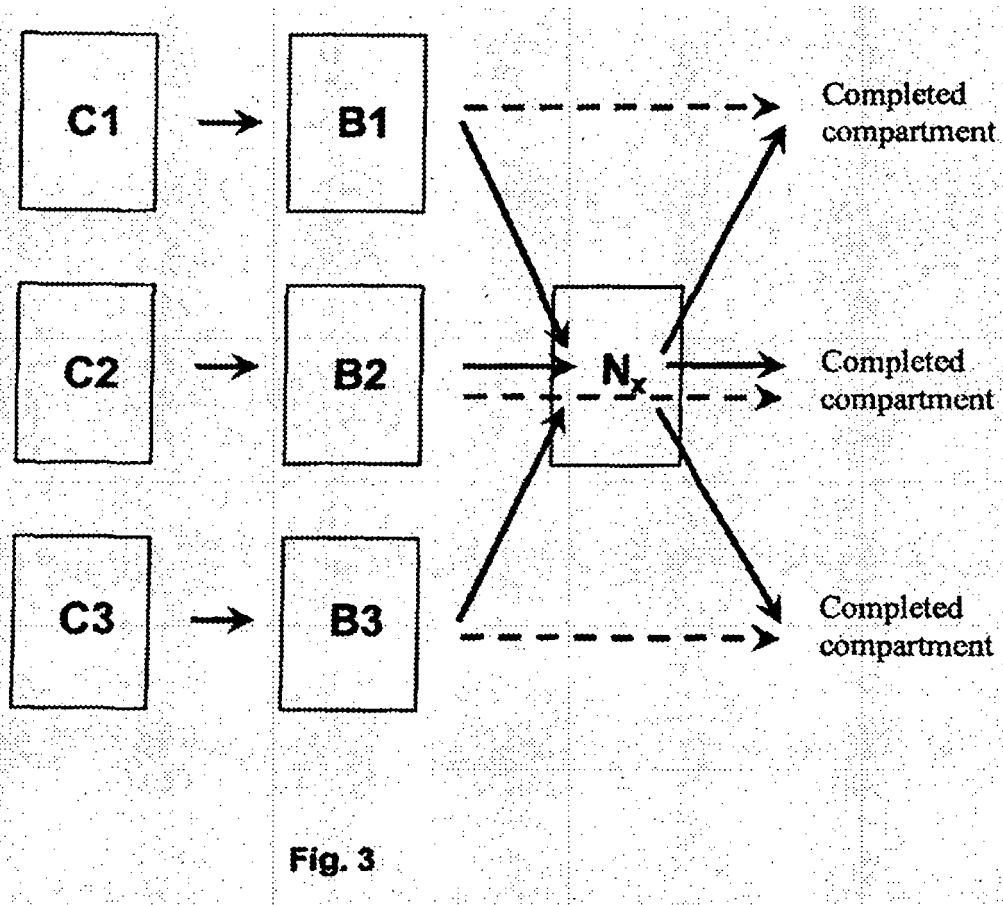


Fig. 2



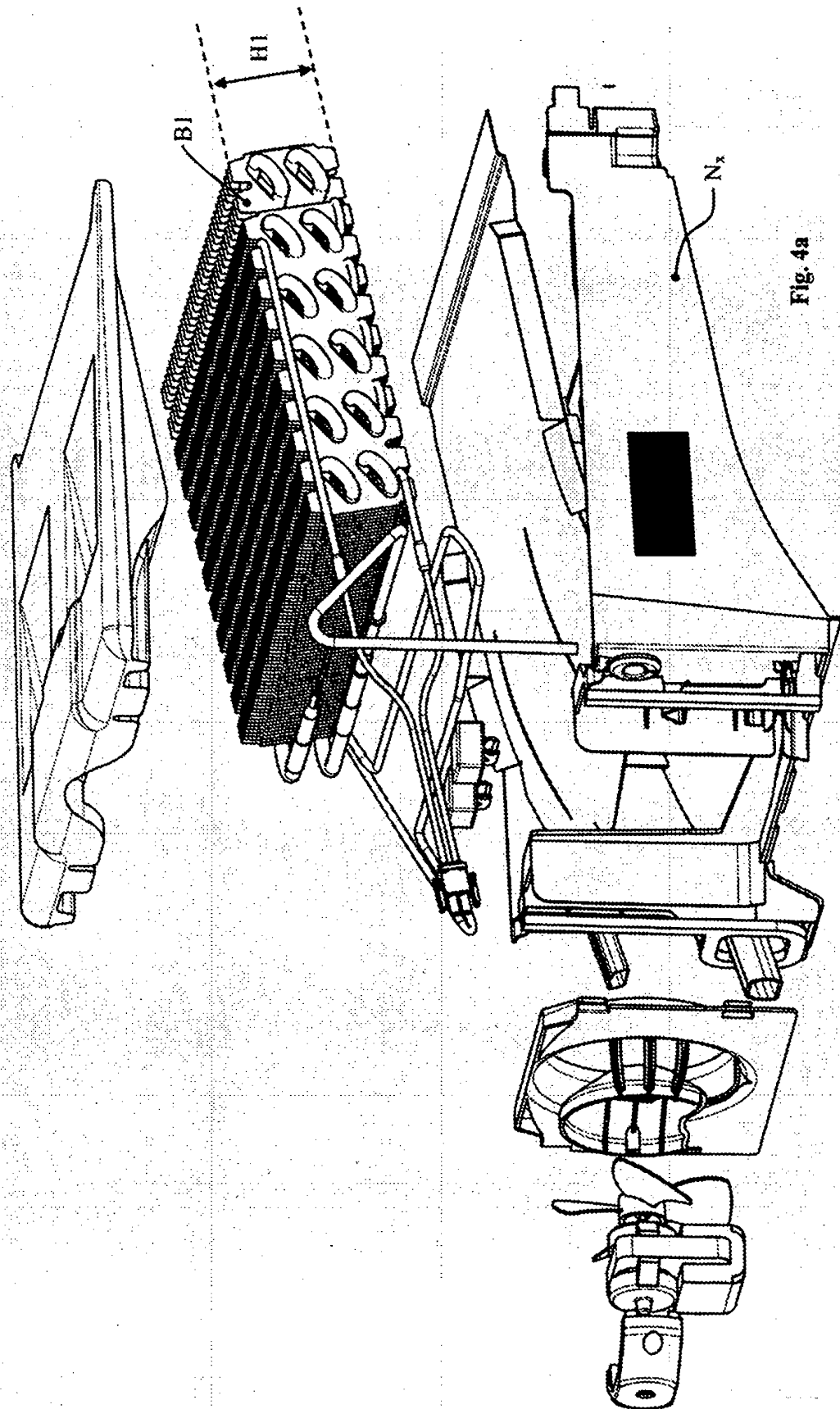
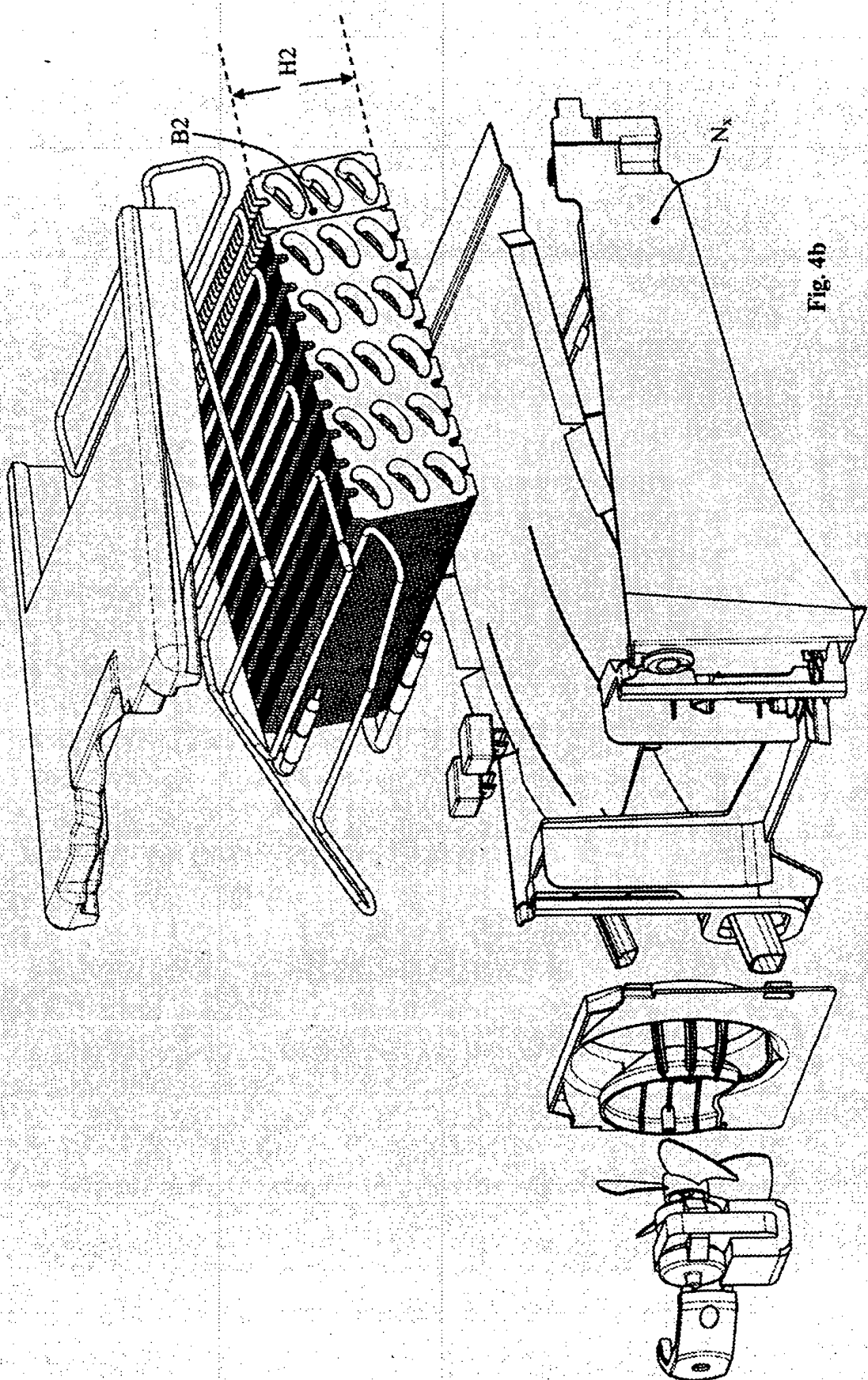


Fig. 4a



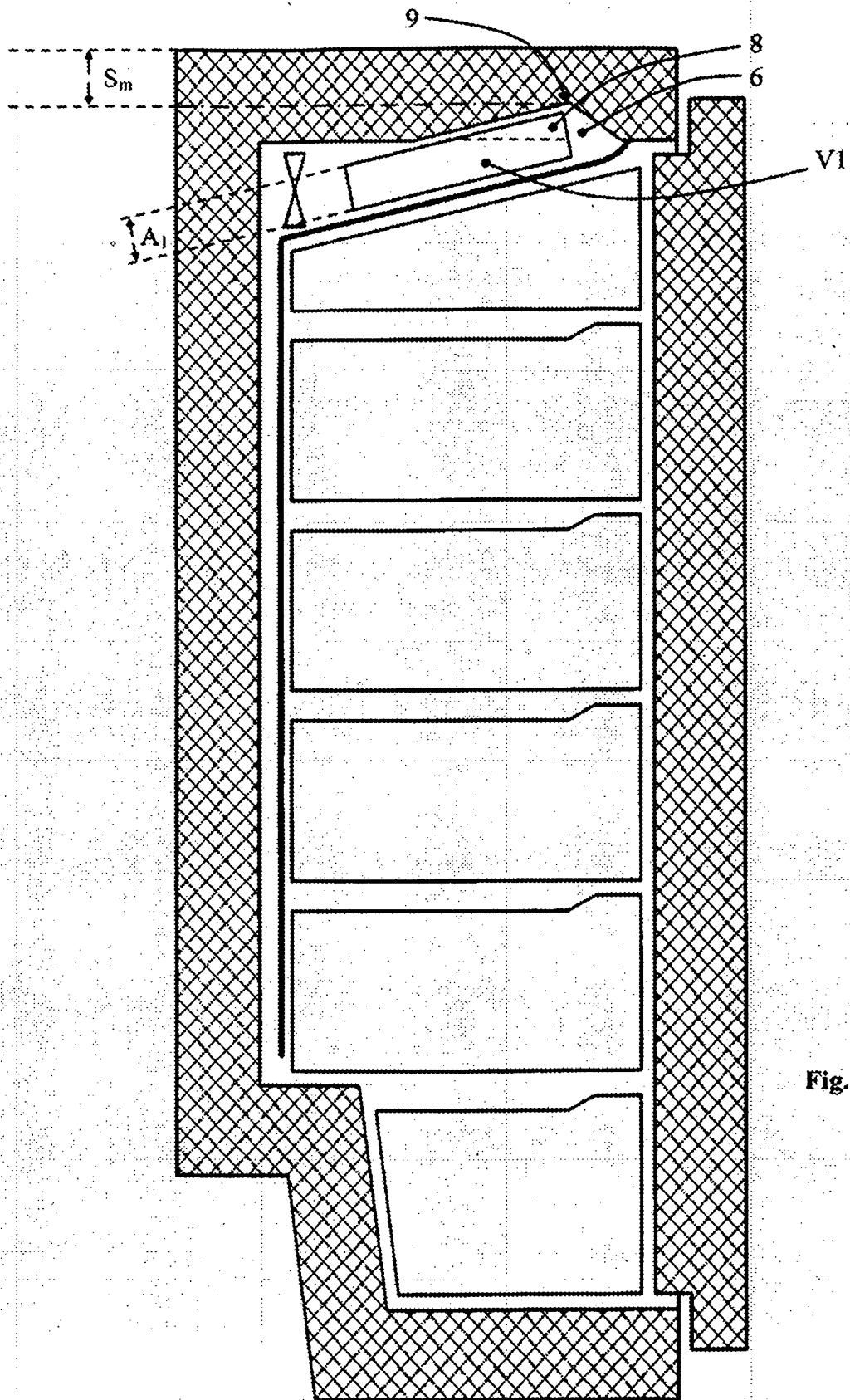


Fig. 5

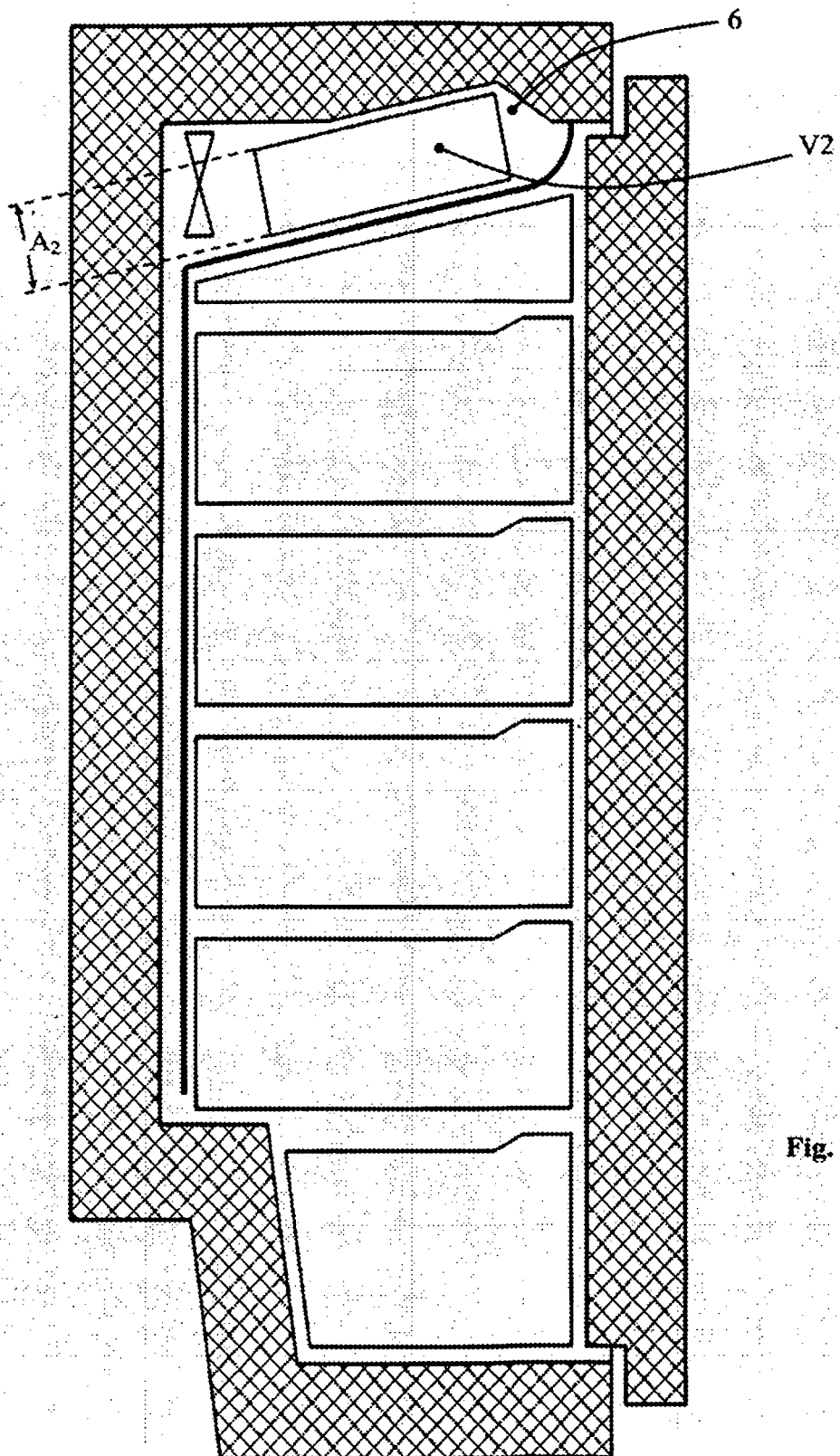


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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