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(54) **Refrigerated vending machine**

(57) A refrigerated vending machine, comprising a containment frame (2) which comprises a rear closure wall (3), two side walls (4a,4b) and a front panel (5) that has at least one portion (5a) that is at least partially transparent, the containment frame (2) forming a refrigeration chamber (6), which is delimited laterally by two lateral shoulders (7) and inside which at least two trays may be provided, which are at least partially superimposed to support products to be dispensed. The refrigerated vending machine further comprises a refrigeration device (11) that has, at one lateral shoulder (7), at least one duct (12) for delivery of refrigerated air and, at the other lateral shoulder (7), at least one intake duct (13), a connecting duct (14) being provided between the refrigerated air delivery duct (12) and the intake duct (13) and being provided with air refrigeration means (15) and ventilation means (17) for forcing the air through the refrigeration means (15) from the intake duct (13) toward the refrigerated air delivery duct (12), the refrigerated air delivery duct (12) and the intake duct (13) having respective portions (12a,13a) for fluid connection to the refrigeration chamber (6), having a plurality of respective delivery openings (12b) and intake openings (13b).

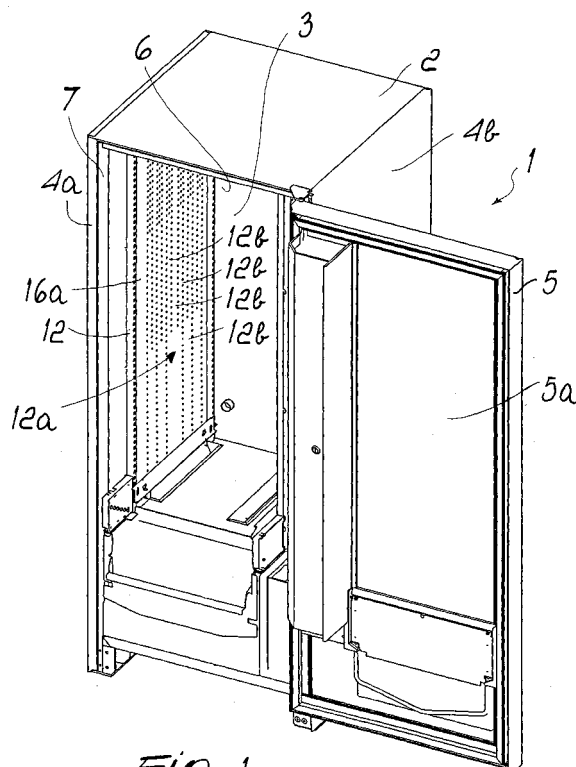


Fig. 1

EP 1 588 650 A1

Description

[0001] The present invention relates to a refrigerated vending machine.

[0002] Refrigerated vending machines are currently widely used commercially which allow the user to remove the selected product and ensure that such product, while inside the vending machine, remains in optimum temperature conditions for its preservation.

[0003] In particular, as regards vending machines of the type with trays stacked inside a refrigeration chamber, the refrigeration devices that are generally used are constituted by a refrigeration unit, which is arranged below the containment frame and through which the stream of air intended to be introduced in the refrigeration chamber is forcedly fed.

[0004] In general, the refrigerated air stream is forcedly fed through a delivery duct, which is formed at the rear wall of the containment frame. The delivery duct has, at one of its walls directed toward the refrigeration chamber, a plurality of openings designed to be crossed by the stream of refrigerated air, so as to allow such stream to pass through the refrigeration chamber, keeping the products arranged on the trays at the optimum temperature.

[0005] It is evident that the stream of refrigerated air, after passing through the refrigeration chamber, strikes the front wall of the containment frame, which is generally made of glass in order to allow the user to view the products that can be dispensed by the vending machine.

[0006] Although these refrigeration devices are widely used in vending machines, they are not devoid of drawbacks.

[0007] First of all, it has in fact been found that the glass pane that constitutes the front panel, by being struck internally by a stream of air at a temperature that is significantly lower than the external temperature, is subject to formation of condensation at its surface that faces the outside of the refrigeration chamber.

[0008] It is evident that this situation entails, in addition to "aesthetic" problems such as the difficulty for the user to clearly view which products are arranged on the trays, other disadvantages such as excessive energy consumption.

[0009] Firstly, it is in fact noticed that formation of dew reduces the energy efficiency of the refrigeration device.

[0010] Secondly, a further increase in energy consumption is caused by the fact that the refrigerated air stream that strikes the glass pane tends to take off additional heat, also because the glass pane, despite being insulated, has a high heat exchange coefficient, which facilitates this phenomenon.

[0011] The aim of the present invention is to eliminate or at least reduce drastically the drawbacks noted above in known types of refrigerated vending machines.

[0012] Within this aim, another object of the present invention is to provide a refrigerated vending machine that allows to optimize refrigeration.

[0013] Another object of the present invention is to provide a refrigerated vending machine that is capable of ensuring that no condensation forms at the external surface of the glass pane that constitutes the front panel.

[0014] Another object of the invention is to provide a refrigerated vending machine that allows to differentiate simply and effectively the temperature of various regions of the refrigeration chamber.

[0015] Another object of the present invention is to provide a refrigerated vending machine that has a very simple structure, is highly durable, easy to use and competitive in terms of production cost, so that its use is advantageous also from an economical standpoint.

[0016] This aim and these and other objects that will become better apparent hereinafter are achieved by a refrigerated vending machine according to the invention, which comprises a containment frame provided with a rear closure wall, two side walls and a front panel that has at least one portion that is at least partially transparent, the containment frame forming a refrigeration chamber, which is delimited laterally by two lateral shoulders and inside which there are at least two trays, which are at least partially superimposed for supporting products to be dispensed, said refrigerated vending machine being characterized in that it comprises a refrigeration device that comprises, at one of said lateral shoulders, at least one duct for delivery of refrigerated air and, at the other lateral shoulder, at least one intake duct, a connecting duct being provided between said at least one refrigerated air delivery duct and the intake duct and being provided with air refrigeration means and ventilation means for forcing the air through said refrigeration means from said intake duct toward said refrigerated air delivery duct, the refrigerated air delivery duct and the intake duct having respective portions for fluid connection to the refrigeration chamber, provided, respectively, with a plurality of delivery openings and intake openings.

[0017] Further characteristics and advantages of the invention will become better apparent from the description of some preferred but not exclusive embodiments of a refrigerated vending machine according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a refrigerated vending machine according to the invention, in which the front panel is open for the sake of clarity; Figure 2 is a view that is similar to Figure 1 but taken from another viewpoint;

Figure 3 is a sectional view, taken along a substantially transverse plane, of the vending machine shown in Figures 1 and 2; and

Figure 4 is a sectional view, similar to Figure 3, in which the refrigeration means have been omitted for the sake of greater clarity.

[0018] In the examples of embodiments that follow, in-

dividual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other examples of embodiments.

[0019] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0020] With reference to the figures, a refrigerated vending machine, generally designated by the reference numeral 1, comprises a containment frame 2, which has a rear closure wall 3, two side walls 4a and 4b, and a front panel 5.

[0021] Usually, the front panel 5 is provided with at least one at least partially transparent portion 5a, generally constituted by a glass pane.

[0022] The containment frame 2 defines internally a refrigeration chamber 6, which is formed laterally by two lateral shoulders 7 and in which there are at least two trays (not shown in the figures), which lie on a substantially horizontal plane and are superimposed.

[0023] According to the embodiment illustrated in Figures 1 to 3, it is possible for at least one of the two lateral shoulders 7 to coincide with a side wall (for example the side wall 4a).

[0024] The trays can be supported slidably, for example, by vertical posts, but also directly by the lateral shoulders 7 or by the rear closure wall 3, and are intended to support the products to be dispensed.

[0025] Conveniently, said trays are associated with conventional movement means (for example of the spiral type) for the products to be dispensed.

[0026] Generally, the user introduces money or a prepaid key in a control panel and selects the intended product by entering a corresponding numeric code.

[0027] Following payment and selection, the movement means convey the selected product at the edge of the tray, which supports the product to be dispensed, so that it is directed toward the front panel until said product falls inside a collecting pocket, which is generally arranged below the containment frame 2.

[0028] According to the present invention, the refrigerated vending machine 1 is provided with a refrigeration device 11, which comprises, at a lateral shoulder 7, at least one delivery duct for the refrigerated air 12 and, at the other lateral shoulder 7, at least one intake duct 13.

[0029] A connection duct 14 is provided between the refrigerated air delivery duct or ducts 12 and the intake duct or ducts 13, and is provided with means 15 for refrigerating the air and with ventilation means 17, which are intended to forcedly feed the air through the refrigeration means 15 from the intake duct 13 toward the refrigerated air delivery duct 12.

[0030] Both the refrigerated air delivery duct 12 and the intake duct 13 have a respective fluid connection portion 12a and 13a, which is designed to provide a fluid connection between the respective ducts and the refrigeration chamber 6, and respectively have a plurality of delivery openings 12b and intake openings 13b.

eration chamber 6, and respectively have a plurality of delivery openings 12b and intake openings 13b.

[0031] Conveniently, the side walls 7 are provided with a respective fluid isolation portion 16a and 16b, which is arranged between the front panel 5 (when closed) and the respective fluid connection portions 12a and 13a.

[0032] Advantageously, the fluid isolation portions 16a and 16b lie along a substantially vertical direction at least at the region proximate to the front panel 5 that is provided with the substantially transparent portion 5a.

[0033] In greater detail, the fluid isolation portions 16a and 16b may reach substantially the edge (directed toward the front panel) of the trays, so that the air stream that exits from the delivery openings can strike completely the products arranged on the trays 10.

[0034] With particular reference to the cross-section shown in Figure 4, it can be seen that between the connection duct 14 and the refrigerated air delivery duct 12 there is a connection port 20, which advantageously has a fluid passage section that is larger than the sum of the output sections of the plurality of delivery openings 12b, so as to ensure, inside the refrigerated air delivery duct 12, a slight overpressure, such as to allow the air that passes through the delivery openings 12b to have a certain flow rate along a direction that is substantially perpendicular to the lateral shoulder 7 and therefore parallel to the front panel 5.

[0035] Conveniently, the refrigerated vending machine 1 can comprise means for at least partially closing at least one of the delivery openings 12b, so as to allow adjustment of the stream of air that exits from the fluid connection portion 12a. Such closure means can be provided, for example, by plugs made of an elastic material that are selectively inserted into the holes. Other closure means may obviously be used, such as, diaphragms suitable to cover one or more of the holes.

[0036] It is further possible to differentiate, by using said closure means, the density of the delivery openings in a vertical direction, so as to achieve a variable stream of refrigerated air along said direction and consequently obtain a thermal gradient along said direction inside the refrigeration chamber 6.

[0037] By acting on the opening/closure of the delivery openings 12b, it is further possible to generate a forced thermal gradient region (for example, by closing the delivery openings 12b arranged in the lower part, it has been found that the coldest region, for example at 3-4 °C, is obtained at the intermediate trays, the lower trays can have a temperature of approximately 4-5 °C, and the upper ones can have a temperature of 10-12 °C).

[0038] Moreover, the closure means can also be used to close at least partially some of the intake openings 13b.

[0039] Operation of the refrigerated vending machine according to the invention is clearly evident from what has been described above.

[0040] In particular, when it is necessary to introduce refrigerated air in the refrigeration chamber, the ventilation means forcedly feed the air stream through the refrigeration means and, through the connecting port 20, toward the delivery duct.

[0041] Since the connection port 20 has a larger passage section than the sum of the cross-sections of the plurality of delivery openings 12b, an overpressure is generated inside the delivery duct 12 and ensures a uniform flow of air through said openings 12b.

[0042] Thanks to this overpressure (and of course thanks to the particular shape of said delivery openings), the air streams that pass through the delivery openings assuredly have a direction that is substantially parallel to the front panel, so as to pass through the entire refrigeration chamber until they are "aspirated" by the intake openings 13b formed at the other side wall.

[0043] Thanks to the presence of the fluid isolation portions 16a and 16b, the stream of air that exits from the delivery openings 12b is spaced from the front panel 5, forming a pocket or curtain or layer of stationary air between the front panel 5 and the edge of the trays on which the products to be dispensed are arranged.

[0044] This pocket or curtain or layer of stationary air prevents formation of condensation at the outer surface of the glass pane and also provides the thermal insulation of said glass pane, with a significant reduction of the energy required to refrigerate the refrigeration chamber.

[0045] All the characteristics of the invention described above as advantageous, convenient or the like may also be omitted or be replaced with equivalents.

[0046] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0047] In practice, it has been found that the invention has achieved the intended aim and objects in all its embodiments.

[0048] In particular, it has been found experimentally that thanks to the presence of the insulation portions between the front panel and the fluid connection portions, a stationary air pocket is formed between the trays and the internal surface of the front panel.

[0049] This stationary air pocket acts as a heat insulator, preventing first of all the refrigerated air stream from striking the glass pane and thus preventing formation, between the internal surface of the glass pane and the external surface, of such a thermal gradient as to cause condensation.

[0050] Secondly, the delivery openings (and optionally the intake openings as well) can be more or less densely spaced along the vertical direction, so as to achieve a differentiation of the temperature of the various trays.

[0051] In practice, the materials used, so long as they are compatible with the contingent use, as well as the shapes and dimensions, may be any according to requirements.

[0052] All the details may further be replaced with other technically equivalent elements.

[0053] The disclosures in Italian Patent Application No. VR2004A000060 from which this application claims priority are incorporated herein by reference.

[0054] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

15 Claims

1. A refrigerated vending machine, comprising a containment frame (2) that comprises a rear closure wall (3), two side walls (4a,4b) and a front panel (5) that has at least one portion (5a) that is at least partially transparent, said containment frame (2) forming a refrigeration chamber (6), which is delimited laterally by two lateral shoulders (7) and inside which at least two trays are providable, which are at least partially superimposed for supporting products to be dispensed, said refrigerated vending machine being **characterized in that** it comprises a refrigeration device (11) that comprises, at one of said lateral shoulders (7), at least one duct (12) for delivery of refrigerated air and, at the other lateral shoulder (7), at least one intake duct (13), a connecting duct (14) being provided between said at least one refrigerated air delivery duct (12) and said intake duct (13) and being provided with air refrigeration means (15) and ventilation means (17) for forcing the air through said refrigeration means (15) from said intake duct (13) toward said refrigerated air delivery duct (12), said refrigerated air delivery duct (12) and said intake duct (13) having respective portions (12a,13a) for fluid connection to said refrigeration chamber (6), provided respectively with a plurality of delivery openings (12b) and intake openings (13b).
2. The refrigerated vending machine according to claim 1, **characterized in that** said lateral shoulders (7) comprise respective fluid isolation portions (16a,16b) between said front panel (5) and said fluid connection portions (12a,13a).
3. The refrigerated vending machine according to one or more of the preceding claims, **characterized in that** said isolation portions (16a,16b) lie along a substantially vertical direction.
4. The refrigerated vending machine according to one or more of the preceding claims, **characterized in that** it comprises, between said connection duct

(14) and said refrigerated air delivery duct (12), a connecting port (20), which has a larger passage section than the sum of the output cross-sections of said plurality of delivery openings (12b).

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5. The refrigerated vending machine according to one or more of the preceding claims, **characterized in that** it comprises closure means for at least partially closing at least one of said multiple delivery openings (12b).

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6. The refrigerated vending machine according to one or more of the preceding claims, **characterized in that** it comprises closure means for at least partially closing at least one of said multiple intake openings (13b).

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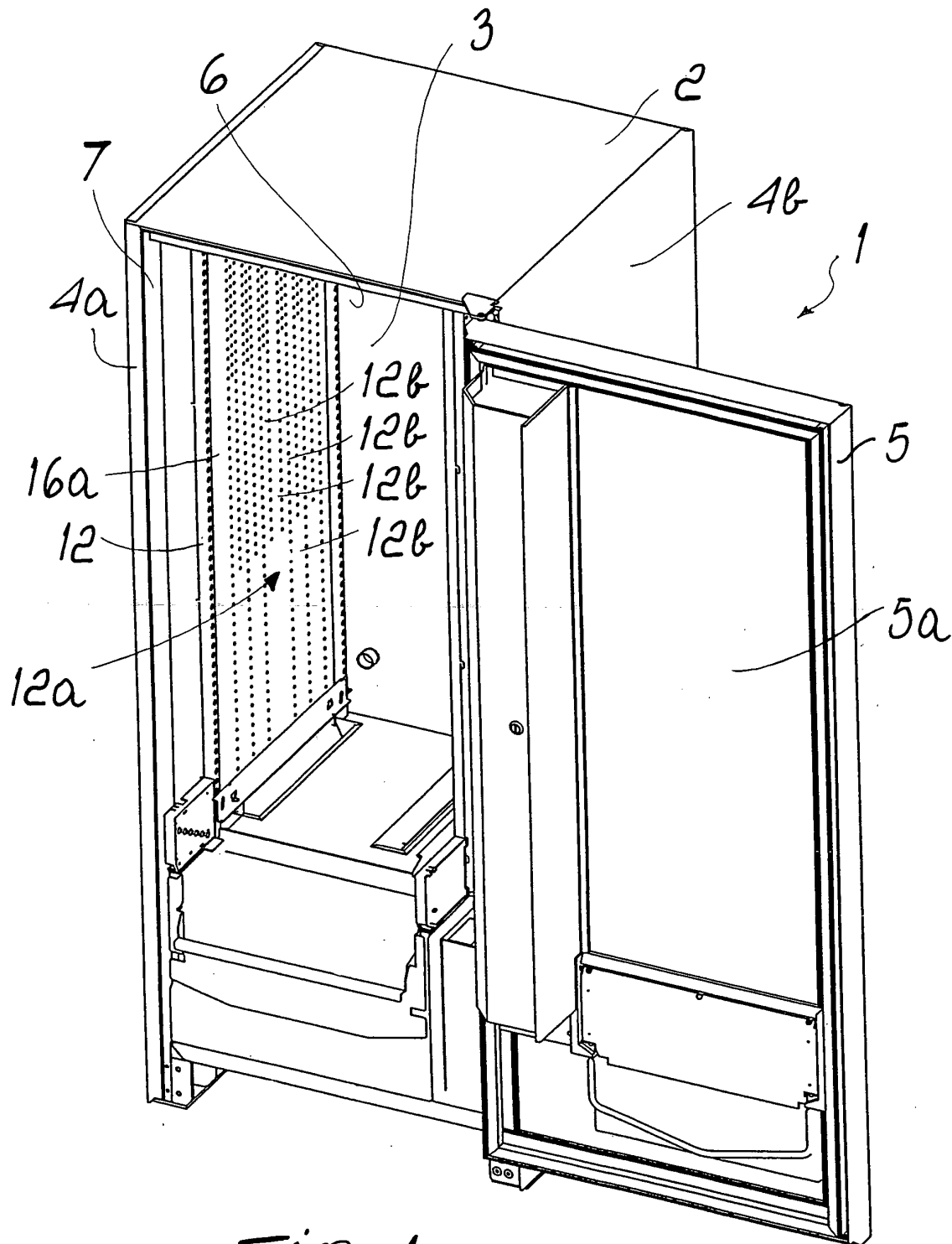
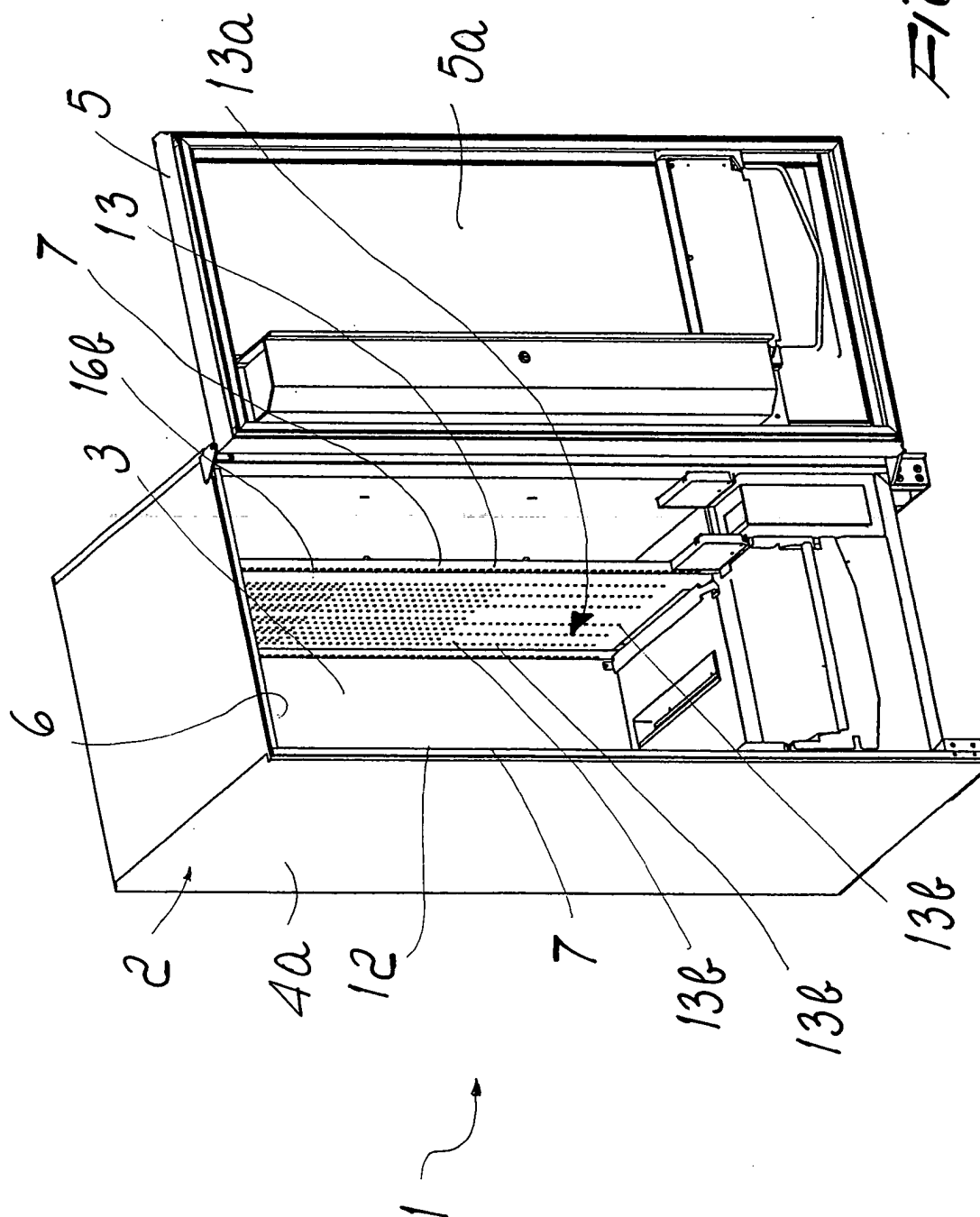


Fig. 1



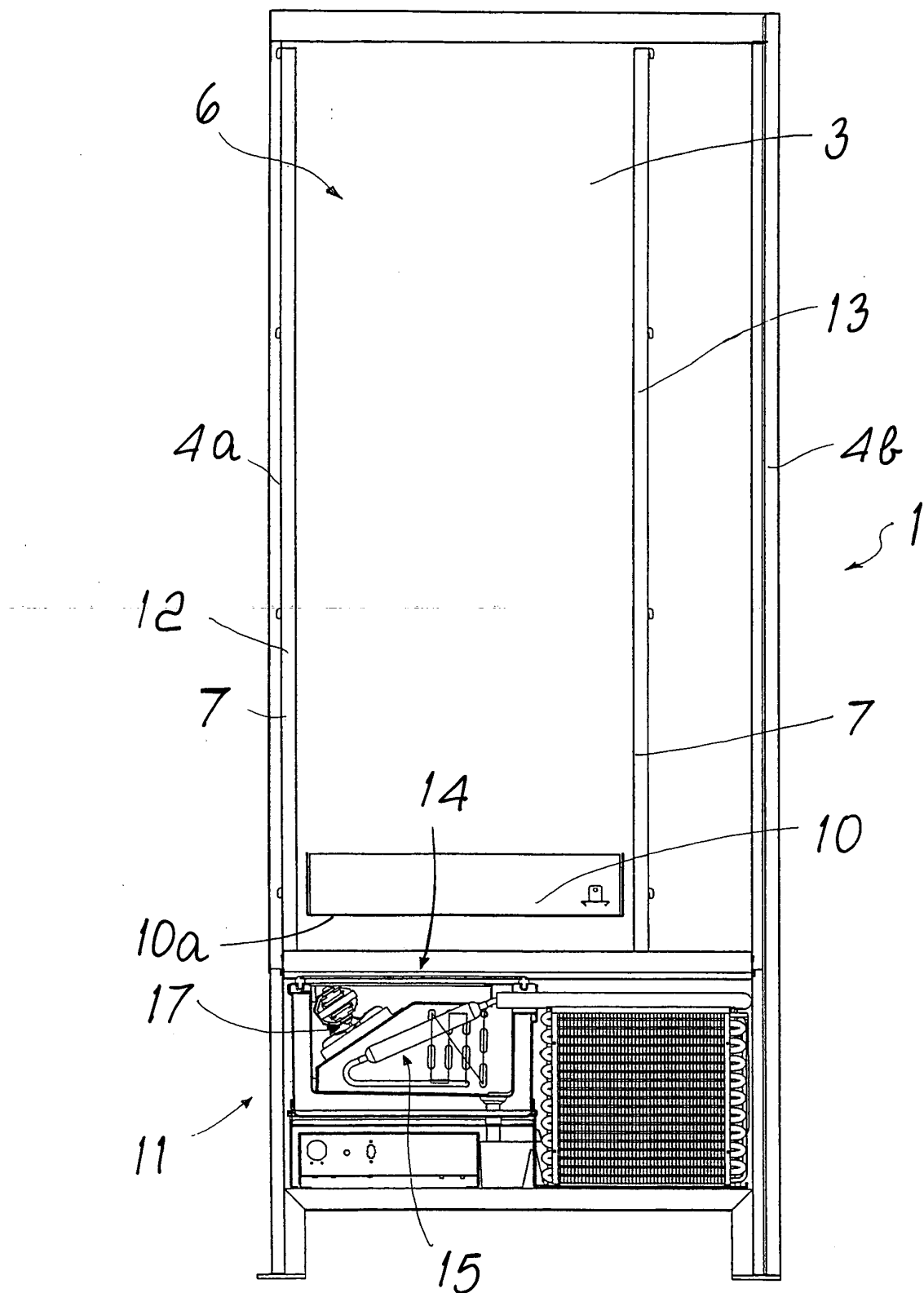


Fig. 3

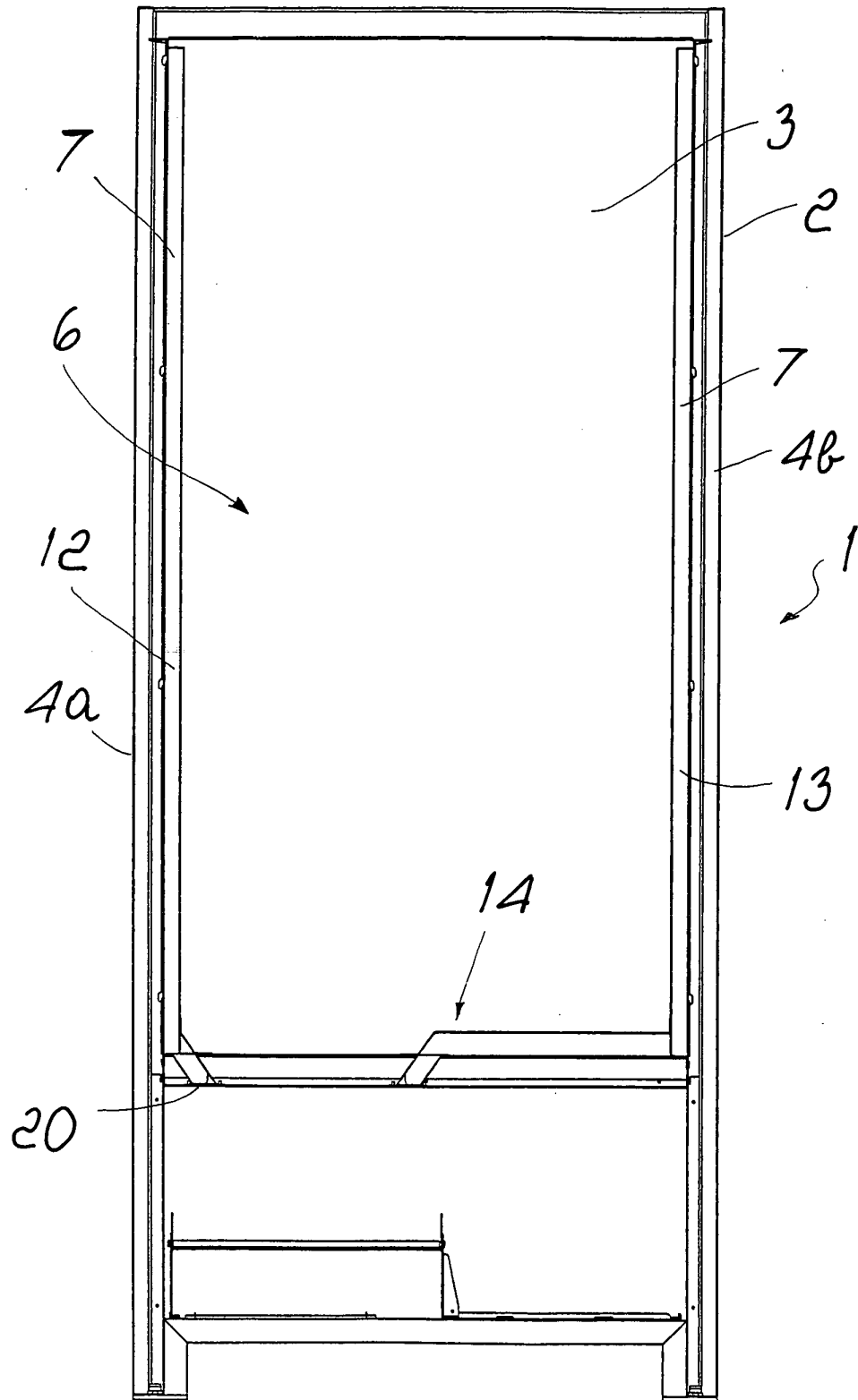


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 00 8193

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 2 533 913 A (BOOTH JOHN S) 12 December 1950 (1950-12-12)	1	A47F3/04 F25D17/08
Y	* column 1, line 1 - column 2, line 38; figures 1,2 *	2-6	

Y	US 2 788 641 A (FRANKLIN ELBERT W ET AL) 16 April 1957 (1957-04-16)	2-6	
	* column 2, line 50 - column 4, line 7; figure 2 *		

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A	* page 1, column 2, line 1 - page 2, column 2, line 15; figure 2 *	5,6	

X	US 2 907 186 A (BARROERO LOUIS F) 6 October 1959 (1959-10-06)	1,5,6	
	* column 2, line 18 - column 3, line 54; figures 1,3 *		

			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			A47F F25D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 June 2005	Examiner Zanotti, L
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 00 8193

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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15-06-2005

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US 2788641	A	16-04-1957	NONE	
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