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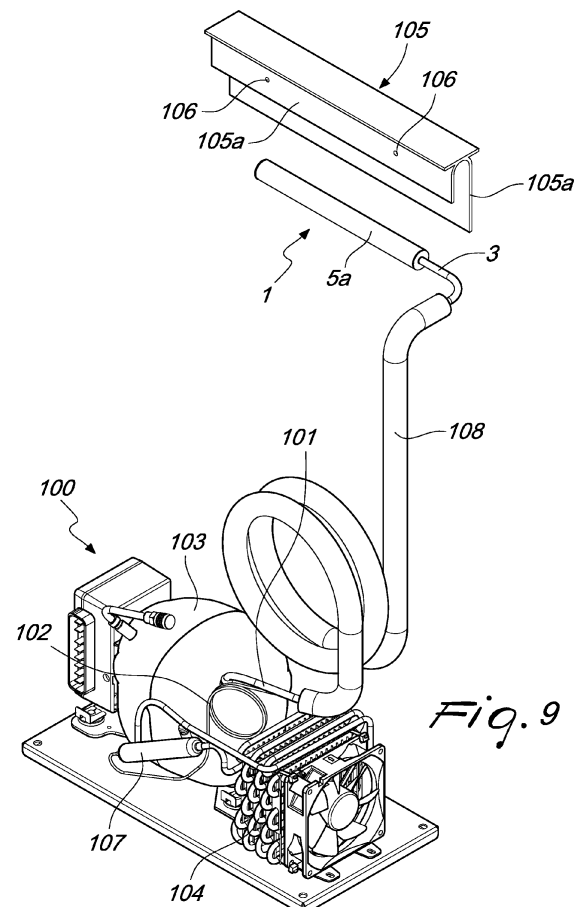
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(54) **EVAPORATOR FOR REFRIGERATION SYSTEMS, AND ASSOCIATED SYSTEM**

(57) An evaporator (1) for refrigeration systems (100), comprising an inlet (2) and an outlet (3) which are connectable to a first branch (101) and a second branch (102), respectively, of a refrigeration circuit of the system (100), which can be crossed by a refrigerant, and leading respectively to a compressor (103) and to a condenser (104).

The evaporator comprises at least three tubular bodies (5a, 5b, 5c) which form respective channels (6a, 6b, 6c) and are arranged inside each other; each channel (6a, 6b, 6c) is connected to the channel (6a, 6b, 6c) of each of the adjacent tubular bodies (5a, 5b, 5c) at respective contiguous ends, in order to form a continuous path for the refrigerant fluid, which comprises in series all the channels (6a, 6b, 6c) and is connectable to the branches (101, 102) respectively with the outermost tubular body (5a) having the maximum transverse cross-section and with the innermost tubular body having the minimum transverse cross-section or vice versa.

*Fig. 9*

Description

[0001] The present invention relates to an evaporator for refrigeration systems and to the associated refrigeration system.

[0002] The refrigeration of temperature-controlled compartments of refrigerators and other cabinets or containers is typically achieved by resorting to a specifically provided system, which has a well-established general configuration.

[0003] In detail, such a system comprises a circuit crossed by a refrigerant fluid, which in series is subjected to the action of a compressor, a condenser, an expansion element or valve, and an evaporator. In particular, in the evaporator the fluid (at low pressure) changes from the liquid state to the gaseous state and removes heat from the surrounding environment (the compartment to be refrigerated), while in the condenser the fluid (at high pressure) changes from the gaseous state to the liquid state, releasing heat to the outside of the compartment.

[0004] In this context, evaporators can be of different types and may have various shapes and allocations, all having one common feature, which makes them easy to identify: they in fact extend more or less significantly inside the compartment to be refrigerated and are at the same time connected to the rest of the system, and to the compressor in particular, usually by means of a through hole provided in the boundary walls of the compartment.

[0005] Besides being used in common refrigerators, this configuration is also used in so-called "refrigeration units," i.e., devices that allow to convert any container provided with a thermally insulated compartment into an actual refrigerator. Such units can be designed for installation inside a storage space appropriately provided for the refrigeration and preservation of food or for converting an existing but hitherto otherwise used compartment to such applications, following the appropriate precautions.

[0006] In a well-known configuration, these units comprise a condensing assembly and an evaporating assembly, which are installed in separate steps and then mutually connected by means of preinstalled quick couplings.

[0007] The two assemblies are provided separately because of the size and bulk of the evaporating assemblies, which can only be placed in the target compartment by providing large cuts or holes in the walls, which might, however, compromise the ability to provide adequate thermal insulation.

[0008] However, such embodiments are not without drawbacks.

[0009] In fact, it should be noted that the units are already filled with the refrigerant fluid during the production and assembly, so that they are sold or installed ready for use. The fluid can be inserted beforehand in only one of the two assemblies or in both; in either case, after connection by means of the quick couplings the fluid is

distributed along the entire circuit to allow the unit to properly operate.

[0010] Refrigerant gases, however, impose special precautions in their management (in particular during connection by means of quick couplings, due to the greater likelihood of leakage or rupture), made even more stringent by the increasingly strict regulations on the subject, so much to resort to a specialized and authorized technician in any case. This is even more true for the most modern refrigerant gases, which are preferred to traditional ones (which are costly and in the process of being abandoned) because of their lower environmental impact but are even more dangerous to handle (due to high levels of flammability and explosive risk).

[0011] Such problems also recur if there is a need to replace or repair an already installed unit, since this entails multiple operations, often of high complexity: extraction of the residual gas, cleaning of the two assemblies, refilling gas in the condensing assembly, new connection by means of quick couplings with subsequent assessment and leak search.

[0012] The drawbacks outlined so far are partly overcome by other known types of units, in which the condensing assembly and the evaporating assembly are connected at the factory by braze welding and then installed monolithically. In this case, however, the predetermined shapes of the evaporator are chosen beforehand to fit standard thermal enclosures and are obviously not customizable, and thus are not at all versatile. Moreover, they require, in any case, the provision of a passage through the walls of the container by means of a cutout, either pre-existing or provided on the spot, formed at the upper edge.

[0013] The aim of the present invention is to solve the above problems by providing an evaporator that can be installed conveniently and easily in any type of compartment.

[0014] Within the scope of this aim, an object of the invention is to provide a refrigeration system that can be installed conveniently and easily in order to control the temperature of any type of compartment.

[0015] Another object of the invention is to provide an evaporator and a refrigeration system that can combine versatility and ease of installation, repair and replacement, without requiring the intervention of a skilled technician for such operations.

[0016] Another object of the invention is to provide an evaporator and a refrigeration system that can be installed without imposing heavy interventions on the compartment for which they are intended.

[0017] Another object of the invention is to provide an evaporator and a refrigeration system that ensure high reliability in operation and are safe to use and install.

[0018] Another object of the invention is to provide an evaporator and a refrigeration system that adopt a technical and structural architecture that is alternative to those of solutions of the known type.

[0019] Not least object of the invention is to provide an evaporator and a refrigeration system that are easily obtainable starting from commonly commercially available elements and materials.

[0020] Still another object of the invention is to provide an evaporator and a refrigeration system that have low costs and are of assured application.

[0021] This aim and these and other objects that will become better apparent hereinafter are achieved by an evaporator according to claim 1 and a refrigeration system according to claim 9.

[0022] Further characteristics and advantages of the invention will become better apparent from the description of some preferred but not exclusive embodiments of the evaporator and refrigeration system according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a perspective view of a first embodiment of the evaporator;

Figure 2 is a lateral elevation view of the evaporator of Figure 1;

Figure 3 is a sectional view of Figure 2, taken along the plane III-III;

Figure 4 is a simplified representation of the sectional view of Figure 3, showing the path of the refrigerant inside the channels;

Figure 5 is a perspective view of a second embodiment of the evaporator;

Figure 6 is a lateral elevation view of the evaporator of Figure 5;

Figure 7 is a sectional view of the evaporator shown in Figure 6, taken along the plane VII-VII;

Figure 8 is a simplified representation of the sectional view of Figure 7, showing the path of the refrigerant inside the channels;

Figure 9 is a perspective view of the refrigeration system according to the invention;

Figure 10 is a perspective view of a first way of installing the evaporator of the system of Figure 9 in the compartment of a container;

Figure 11 is a front elevation view of the evaporator installed in the compartment of the container of Figure 10;

Figure 12 is a sectional view of Figure 11, taken along the plane XII-XII;

Figure 13 is a perspective view of a second way of installing the evaporator of the system of Figure 9 in the compartment of a container;

Figure 14 is a front elevation view of the evaporator installed in the compartment of the container of Figure 13;

Figure 15 is a sectional view of Figure 14, taken along the plane XV-XV;

Figure 16 is a perspective view of a third way of installing the evaporator of the system of Figure 9 in the compartment of a container;

Figure 17 is a sectional view, taken along a vertical

plane, of the evaporator installed in the compartment of the container of Figure 16.

[0023] With reference to the figures, the reference numeral 1 generally designates an evaporator for refrigeration systems, which in turn are designated hereinafter by the reference numeral 100 and are the subject matter of the present description, like the evaporator 1.

[0024] The evaporator 1 comprises an inlet 2 and an outlet 3, which can be connected (either directly or indirectly, i.e., in the latter case, with the interposition of other components) respectively to the first branch 101 and the second branch 102 of a refrigeration circuit of the refrigeration system 100, which can be crossed by a refrigerant. The branches 101, 102 lead to a compressor 103 and to a condenser 104 of the system 100, respectively.

[0025] In practice, therefore, the evaporator 1 is designed to be part of a refrigeration system 100, which comprises, in addition to the evaporator 1, the compressor 103, a condenser 104, and an expansion element (or valve) 4, which are arranged along (and form part of) a closed circuit for carrying out a refrigeration cycle (by means of a gas or other refrigerant fluid, circulating in the circuit and in the piping that composes it and connects the above components to each other).

[0026] The element 4 can be external to the evaporator 1 or be a part of it, as in the solution of the accompanying figures, which is of considerable practical interest and to which one will return in the pages that follow.

[0027] The system 100 can be assigned to refrigerating a compartment A of a refrigerator or any other container B: the evaporator 1 (as the accompanying figures show) is designed to be installed inside the compartment A, to remove heat from it as it is crossed by the low-pressure refrigerant fluid, which changes from the liquid state to the gaseous state, while the other components mentioned above are kept outside. The refrigerant fluid can be chosen from those commonly used in the industry, and more generally it is specified that apart from what will be described hereinafter, the operation of the evaporator 1 and of the system 100 (and in particular the refrigeration cycle that the latter executes) are per se known anyway, and these aspects shall not be dwelt upon further.

[0028] Instead, it is appropriate to point out that the evaporator 1 and the system 100 can be validly employed in a variety of contexts, and for example on refrigerators or refrigeration appliances, or as refrigeration units of compartments A of any kind, whether adapted or not for their refrigeration, and either as a first installation or for replacement of an existing refrigeration apparatus. As will become evident from the description that follows, the particularities of the invention in fact make the evaporator 1 and the system 100 certainly suitable in all the contexts outlined above.

[0029] According to the invention, the evaporator 1 comprises at least three tubular bodies 5a, 5b, 5c that define respective channels 6a, 6b, 6c and are arranged

inside each other. In particular, the tubular bodies 5a, 5b, 5c have parallel or, preferably, coincident longitudinal axes. In fact, in the preferred embodiment the tubular bodies 5a, 5b, 5c are arranged mutually coaxially (and thus, indeed, their longitudinal axes coincide). Both the tubular bodies 5a, 5b, 5c and the channels 6a, 6b, 6c within them preferably but not necessarily have a cylindrical shape.

[0030] Typically, but not necessarily, the tubular bodies 5a, 5b, 5c are rendered integral with each other by welding.

[0031] As can be clearly deduced from Figures 3, 4, 7 and 8, the longitudinal channel 6a, 6b, 6c of each tubular body 5a, 5b, 5c is connected to the channel 6a, 6b, 6c of each of the adjacent bodies 5a, 5b, 5c at respective contiguous ends, so as to define a continuous path (depicted with arrows in Figures 4 and 8) for the refrigerant fluid; said path comprises in series the channels 6a, 6b, 6c of each of the tubular bodies 5a, 5b, 5c and can be connected to the first branch 101 and to the second branch 102 respectively with the outermost body, having the greatest transverse cross-section (and designated by the reference numeral 5a), and with the innermost body, having the smallest transverse cross-section (and designated by the reference numeral 5b), or vice versa.

[0032] Preferably, but not necessarily, the inlet 2 and the outlet 3 are arranged inside each other, mutually coaxially.

[0033] It is specified that there is the option of connecting the inlet 2 (and thus the first branch 101) to the outermost body 5a and the outlet 3 (and thus the second branch 102) to the innermost body 5b (as in the embodiment of Figures 1-4) or, vice versa, it is possible to connect the inlet 2 (and thus the first branch 101) to the innermost body 5b and the outlet 3 (and thus the second branch 102) to the outermost body 5a (as in the embodiment of Figures 5-8).

[0034] The fluid therefore enters the evaporator 1 at the inlet 2, travels through all the channels 6a, 6b, 6c (moving from inside toward the outside or vice versa, with respect to the longitudinal axis), and exits from the outlet 3.

[0035] In other words, therefore, the channels 6a, 6b of the tubular bodies 5a, 5b (the outermost and the innermost) have one end in communication with a channel 6c of an intermediate tubular body 5c (and the other end is closed), while the latter is connected at both ends with respective other channels 6a, 6b, 6c. In turn, the tubular bodies 5a, 5b, 5c are closed at one end and are open (fully or partially) at the other end.

[0036] The term "adjacent" bodies 5a, 5b, 5c in the present description means any pair of bodies 5a, 5b, 5c directly contained within each other without the interposition of other bodies 5a, 5b, 5c; the "contiguous" ends of the channels 6a, 6b, 6c are those arranged or facing the same way with respect to the longitudinal axis of said channels 6a, 6b, 6c. "Connected" channels 6a, 6b, 6c are those communicating with each other (at contiguous ends), in order to allow the fluid to pass from one to

the other along the path.

[0037] The "transverse cross-section" repeatedly mentioned in the present description is the one obtained with a plane that is perpendicular to the longitudinal axis of the tubular bodies 5a, 5b, 5c or of the channels 6a, 6b, 6c.

[0038] In a first possible embodiment, the evaporator 1 comprises indeed tubular bodies 5a, 5b, 5c: an outermost tubular body 5a, an intermediate tubular body 5c, and an innermost tubular body 5b.

[0039] As an alternative, in one way of carrying out the invention that is of considerable practical interest, the evaporator 1 comprises the outermost tubular body 5a, the innermost tubular body 5b, and a plurality (two or more) of additional bodies 5c, indeed intermediate ones, arranged in turn one inside the other. Thus, in this case, the intermediate tubular body 5c with the larger transverse cross-section is (directly) accommodated in the channel 6a of the outermost 5a tubular body, while the innermost 5b tubular body is (directly) accommodated in the channel 6c of the intermediate tubular body 5c with the smaller transverse cross-section.

[0040] In other words, in practice, increasing the number of intermediate tubular bodies 5c allows to provide evaporators 1 with any number of tubular bodies 5a, 5b, 5c greater than three. Figures 1-8 show two possible applications in this regard: the evaporator 1 of Figures 1-4 has five tubular bodies 5a, 5b, 5c (three intermediate tubular bodies 5c, with the innermost tubular body 5b in practice constituted by the outlet duct of the evaporator 1), while the evaporator 1 of Figures 5-8 comprises four tubular bodies 5a, 5b, 5c (two intermediate tubular bodies 5c). It is reiterated that the tubular bodies 5a, 5b, 5c can in any case be even more in number.

[0041] Usefully, and as anticipated earlier, the evaporator 1 may comprise the expansion element 4, interposed between the inlet 2 and either the outermost tubular body 5a or the innermost tubular body 5b (the one that, depending on the configuration chosen for the evaporator 1, is first crossed by the fluid along the path).

[0042] In particular, in an embodiment of considerable practical interest, which however does not limit the invention, the expansion element 4 comprises (or is constituted by) a capillary tube which, as in the accompanying figures, has a transverse cross-section that is smaller than the transverse cross-section of the innermost tubular body 5b, and is at least partially accommodated within the tubular bodies 5a, 5b, 5c (i.e., it is extended over a more or less significant fraction of the longitudinal axis of the channels 6a, 6b, 6c). Thus, as it exits the capillary tube, the fluid encounters a change in cross-section.

[0043] The capillary tube can thus be connected, at one end, to the circuit of the refrigeration system 100 (to the first branch 101) and communicates, with the opposite end, with either the channel 6a of the outermost tubular body 5a (as in Figures 3, 4) or the channel of the innermost tubular body 5b (as in Figures 7, 8).

[0044] In an embodiment of considerable practical interest, which however not limit the invention, the outlet 3 comprises (or is constituted by) an annular sleeve 7, which extends externally from a closed end of the outermost tubular body 5a.

[0045] In turn, the sleeve 7 is placed in communication with the channel 6a of the outermost tubular body 5a (as in Figures 7, 8) or with the channel of the innermost tubular body 5b (as in Figures 3, 4), and in the latter case can in fact be an extension of the innermost tubular body 5b.

[0046] Advantageously, the annular sleeve 7 is provided around the expansion element 4. This obviously ensures maximum compactness and minimum transverse space occupation for the ports 2, 3 and the evaporator 1 in general.

[0047] Thus, in addition to the evaporator 1, a refrigeration system 100 comprising in series a compressor 103, a condenser 104, and an evaporator 1 according to what has been described so far is the subject matter of the protection claimed herein. Moreover, the system 100 comprises the element 4, interposed between the condenser 104 and the evaporator 1.

[0048] In practice, therefore, the present description claims first of all protection on the individual evaporator 1, which is manufactured, supplied, or marketed independently of the rest of the refrigeration system 100 of which it is to be a part (or even intended for other uses). In such a case, the inlet 2 and the outlet 3 may also be fitted with quick couplings or other means for coupling to the branches 101, 102 of the circuit of the system 100 leading to the compressor 103 and to the condenser 104.

[0049] Likewise, the protective scope claimed herein includes the supply, use, manufacture or otherwise utilization of the entire system 100, comprising the evaporator 1. In this case, preferably but not necessarily, the system 100 is supplied as a complete unit, with the circuit hermetically sealed and prefilled (with the chosen refrigerant fluid, even from among those of the known type), already tested by the manufacturer, who can thus ensure its performance and safety.

[0050] Usefully, the system 100 can also comprise a bracket 105 configured for fixing the evaporator 1 to an internal wall of a compartment A to be refrigerated (as shown by the accompanying Figures 9-17 in various practical installation examples).

[0051] In particular, the bracket 105 comprises at least one plate bent into a U-shape (although the use of other shapes is not excluded), so as to form two mutually opposite (and mutually parallel) laminar flaps 105a which delimit, between them, a (protected) receptacle for accommodating the evaporator 1. At least one of the laminar flaps 105a can be configured for anchoring to the inner wall of the compartment B, for example, because it is provided with slots 106 adapted for the insertion of rivets, screws, or nails (not shown, but also of a known type).

[0052] Advantageously, the system 100 may also com-

prise a filter dryer 107, which allows to eliminate unwanted dripping along the circuit.

[0053] The system 100 and/or the evaporator 1 may also comprise an evaporator coil (made of aluminum or other material), possibly also provided with a fan, to increase the cooling effect within the compartment A.

[0054] The installation and operation of the evaporator and of the system according to the invention are as follows.

[0055] The system 100 is preferably but not necessarily supplied in its final configuration, already complete, loaded and tested, and thus with the evaporator 1 already coupled to the compressor 103 and the condenser 104, by means of a connecting pipe 108 that in practice contains the branches 101, 102 (or at least a portion thereof) one inside the other.

[0056] The user therefore simply has to drill a hole in the container B so as to create a pathway for communication with the compartment A of interest and insert the evaporator 1 into it; depending on the length of the connecting pipe 108, the rest of the system 100 (the condensing assembly, comprising in particular the condenser 104 and the compressor 103) can then be arranged as desired and in accordance with the normal rules of ventilation and weather protection. To complete the installation and make the invention ready for use, it is therefore sufficient to seal the newly provided pathway, for example with heat-insulating paste.

[0057] However, the possibility is not excluded of leaving to the installer the task of connecting the various parts, in particular if the evaporator 1 is supplied separate from the rest. Installation in the compartment A can still follow the steps described above.

[0058] Refrigeration of the compartment A occurs by implementing a traditional refrigeration cycle with the fluid circulating in the system 100. What distinguishes the invention is that thanks to the particular configuration previously described, according to which in the evaporator 1 the fluid is circulated (outward or inward) in tubular bodies 5a, 5b, 5c arranged inside each other, it is possible to achieve high (refrigeration) efficiency with small dimensions (much smaller than those required to achieve the same efficiency with known evaporators).

[0059] In greater detail, the small dimensions, which normally come at the expense of cooling performance, in the invention do not impair the latter or operation: the fluid travels (from the inside to the outside or vice versa) through the channels 6a, 6b, 6c arranged one inside the other, and this allows to have a more stable temperature over the entire external surface area used for heat exchange, by virtue of the temperature delta between the external channels 6a, 6c and the internal channels 6b, 6c, as a result of the heat exchange between the fluid present in each pair of connected channels 6a, 6b, 6c.

[0060] The uniformity and stability of the temperature of the outer surface (of the outermost tubular body 5a), used for heat exchange with the compartment A to be refrigerated, allows better operation of the entire eva-

porator 1, making the entire evaporator in turn more stable.

[0061] Thus, the chosen configuration makes it possible to provide an evaporator 1 having the shape of a long, narrow cylinder (in practice, it is the shape of the outermost tubular body 5a), which can be installed on any container B and in any thermally insulated compartment A in a practical and easy way without imposing onerous interventions on the compartment A but merely by providing one hole having minimal dimensions, equivalent to those of the evaporator 1, without the need for specialized/authorized personnel. It is also possible to immerse the evaporator 1 directly in a liquid to be cooled.

[0062] By varying the dimensions, geometry, overall space occupation and number of tubular bodies 5a, 5b, 5c or channels 6a, 6b, 6c, the best performance can be achieved on the basis of the specific compartment A or application.

[0063] The invention is thus able to combine versatility and simplicity of installation, repair and replacement, without requiring the intervention of a specialized technician for such operations.

[0064] It is also evident that the invention can be used effectively in a variety of contexts and in particular, first of all, on any refrigeration appliance, in particular if an evaporator 1 with a compact structure and small size is required or if it is necessary to replace the existing refrigeration unit because it is no longer functioning or because one wishes to increase performance.

[0065] Likewise, the evaporator 1 and the system 100 can be installed on any cabinet, "storage cabinet," or otherwise container B (provided with a compartment A) that lacks its own refrigeration unit and regardless of whether it has been previously prepared for the installation of such a unit, even if it is procured or supplied separately.

[0066] In any case, the invention is well suited for use in DC- or AC-powered applications and can be a valid solution both if the system 100 (the parts outside the compartment A) are to be kept close to said compartment A and in the opposite case, in which said parts are distant from the compartment A.

[0067] The preferred but not exclusive possibility of supplying the 100 system already complete makes it possible to exclude the presence of joints adapted to connect the evaporator 1 to the condenser 104, and in general the various parts of the circuit: this ensures practical and easy installation methods, which do not require the intervention of a specialized technician, since any risk of leakage or spillage of the refrigerant fluid is excluded.

[0068] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the accompanying claims; all the details may furthermore be replaced with other technically equivalent elements.

[0069] In the exemplary embodiments shown, individual characteristics, given in relation to specific exam-

ples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0070] In practice, the materials used, as well as the dimensions, may be any according to the requirements and the state of the art.

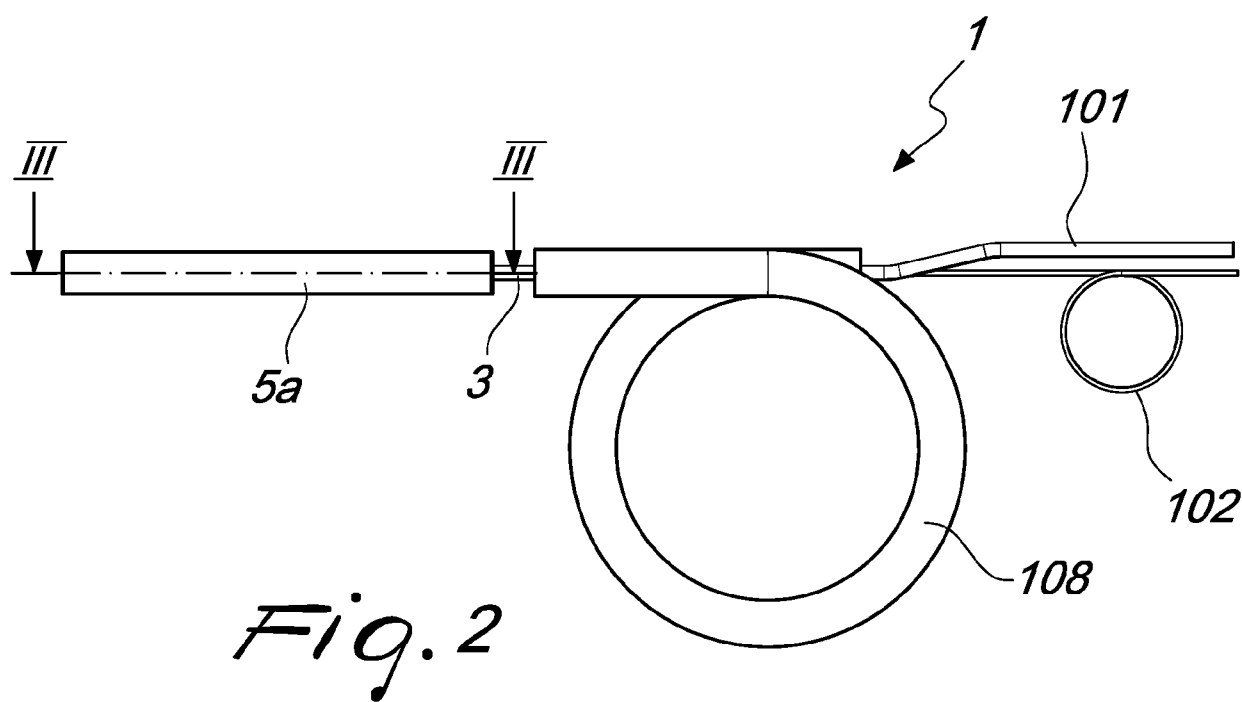
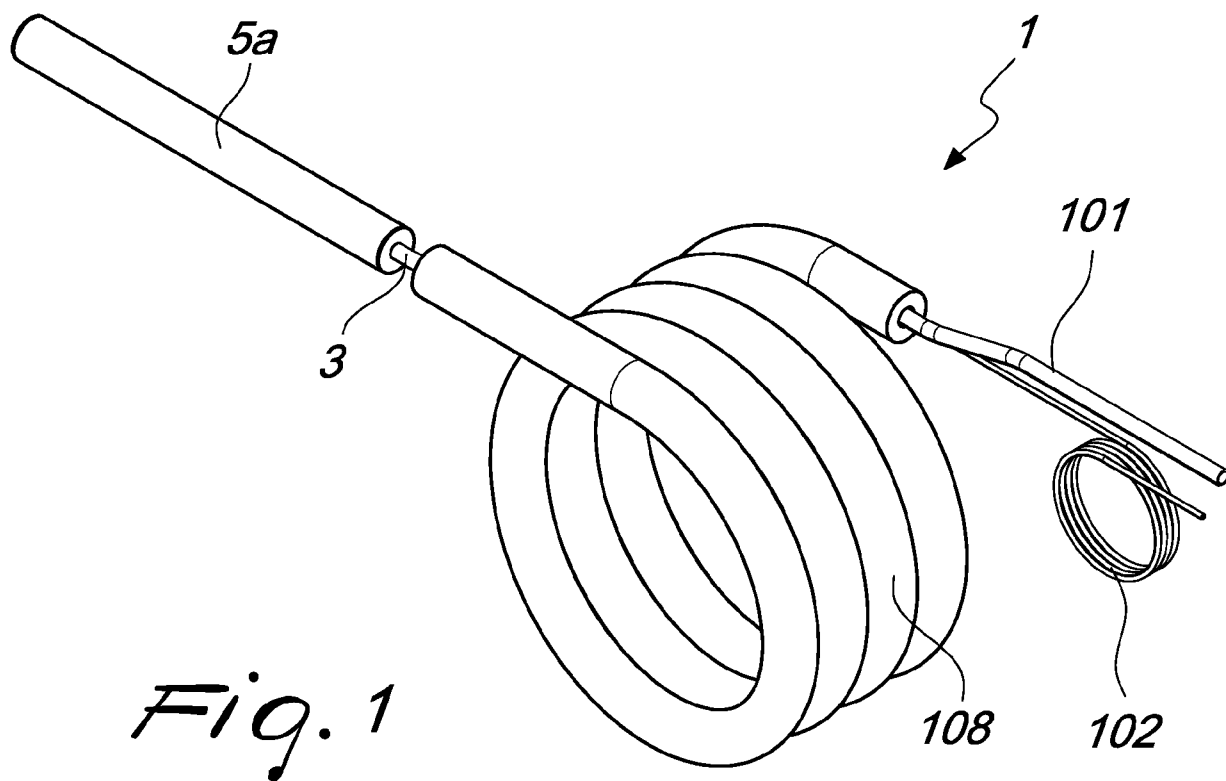
[0071] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An evaporator (1) for refrigeration systems (100), comprising an inlet (2) and an outlet (3) which are connectable to a first branch (101) and a second branch (102), respectively, of a refrigeration circuit of the system (100), which can be crossed by a refrigerant, and leading respectively to a compressor (103) and to a condenser (104), **characterized in that** it comprises at least three tubular bodies (5a, 5b, 5c) which form respective channels (6a, 6b, 6c) and are arranged inside each other, said channel (6a, 6b, 6c) of each of said tubular bodies (5a, 5b, 5c) being connected to said channel (6a, 6b, 6c) of each of said adjacent tubular bodies (5a, 5b, 5c) at respective contiguous ends, in order to form a continuous path for the refrigerant fluid, which comprises in series said channels (6a, 6b, 6c) of each of said tubular bodies (5a, 5b, 5c) and is connectable to the first branch (101) and to the second branch (102) of the refrigeration circuit respectively with said outermost tubular body (5a) having the maximum transverse cross-section and with said innermost tubular body (5b) having the minimum transverse cross-section or vice versa.
2. The evaporator according to claim 1, **characterized in that** said tubular bodies (5a, 5b, 5c) are arranged mutually coaxially.
3. The evaporator according to claim 1 or 2, **characterized in that** said inlet (2) and said outlet (3) are arranged inside each other, mutually coaxially.
4. The evaporator according to one or more of the preceding claims, **characterized in that** it comprises said outermost tubular body (5a), said innermost tubular body (5b), and a plurality of further said intermediate tubular bodies (5c) arranged within each other, said intermediate tubular body (5c) having a larger transverse cross-section being accommodated in said channel (6a) of said outermost tubular body (5a), said innermost tubular body (5b)

being accommodated in said channel (6c) of said intermediate tubular body (5c) having a smaller transverse cross-section.

5. The evaporator according to one or more of the preceding claims, **characterized in that** it comprises an expansion element (4), interposed between said inlet (2) and either said outermost tubular body (5a) or said innermost tubular body (5b). 5
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6. The evaporator according to claim 5, **characterized in that** said expansion element (4) comprises a capillary tube, having a transverse cross-section smaller than the transverse cross-section of said innermost tubular body (5b) and at least partially accommodated in said tubular bodies (5a, 5b, 5c), said capillary tube being connectable, at one end, to the circuit of the refrigeration system (100) and communicating, with the opposite end, with either said channel (6a) of said outermost tubular body (5a) or said channel (6b) of said innermost tubular body (5b). 15
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7. The evaporator according to claim 5 or 6, **characterized in that** said outlet (3) comprises an annular sleeve (7) extending externally from one end of said outermost tubular body (5a), said sleeve (7) being placed in communication with said channel (6a) of said outermost tubular body (5a) or with said channel (6b) of said innermost tubular body (5b). 25
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8. The evaporator according to claim 7, **characterized in that** said annular sleeve (7) is provided around said expansion element (4). 35
9. A refrigeration system comprising in series, along a closed circuit which can be crossed by a refrigerant fluid, a compressor (103), a condenser (104) and an evaporator (1) according to one or more of the preceding claims. 40
10. The system according to claim 9, **characterized in that** it comprises a bracket (105) configured for fixing said evaporator (1) to an internal wall of a compartment (A) to be refrigerated. 45
11. The system according to claim 10, **characterized in that** said bracket (105) comprises at least one plate bent in a U-shape, in order to form two mutually opposite laminar flaps (105a) which delimit a seat for accommodating said evaporator (1), at least one of said laminar flaps (105a) being configured for anchoring to the internal wall of the compartment (A). 50
12. The system according to one or more of claims 9-11, **characterized in that** it comprises a filter dryer (107). 55



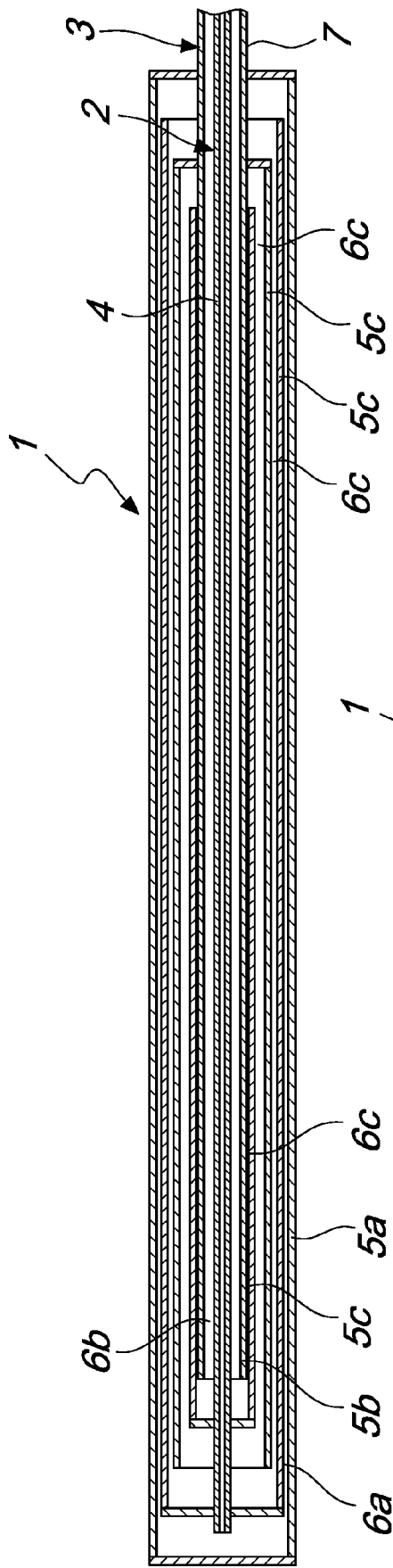


Fig. 3

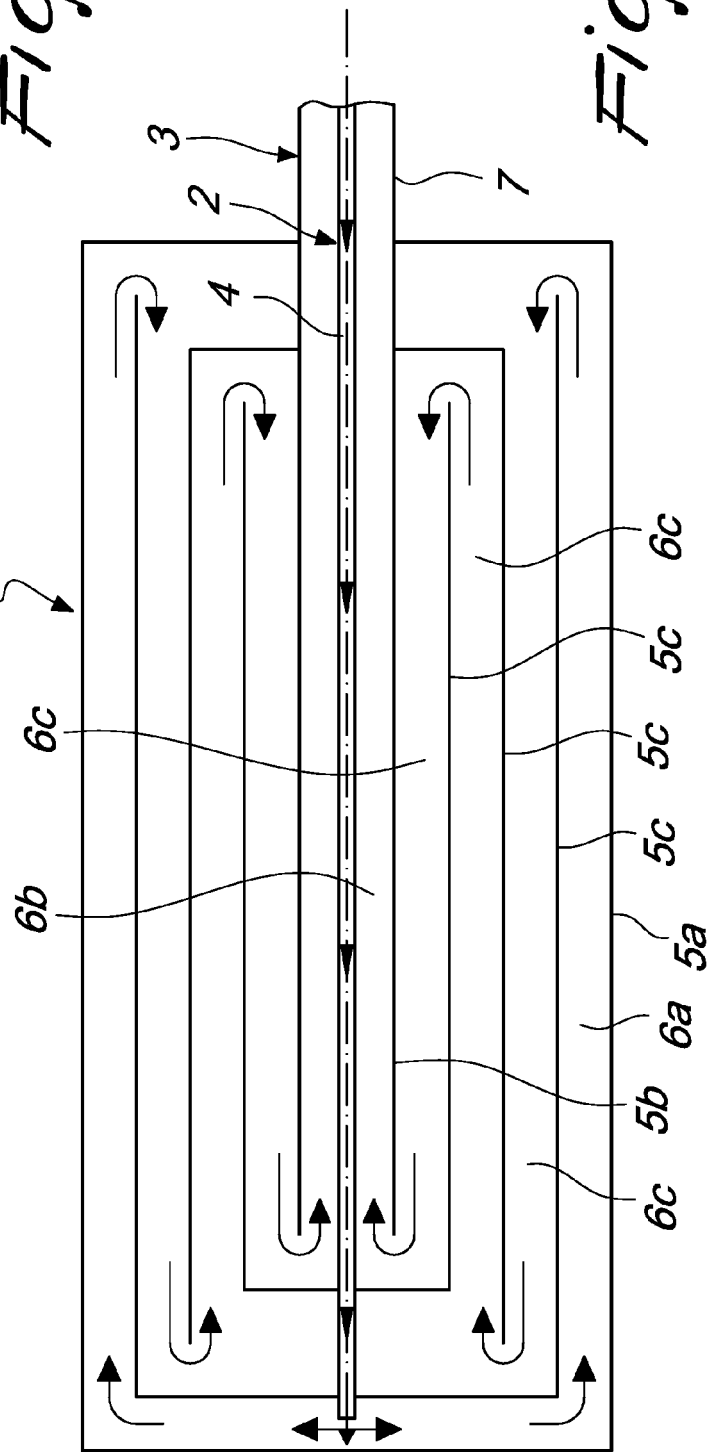
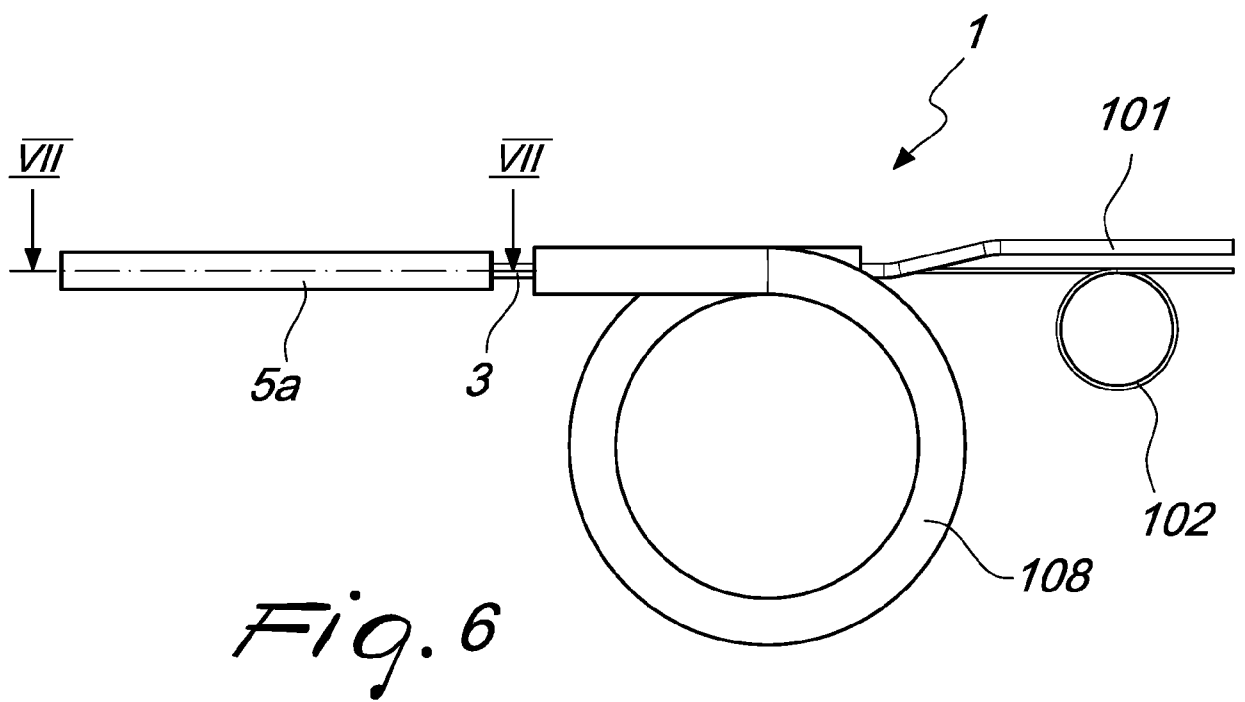
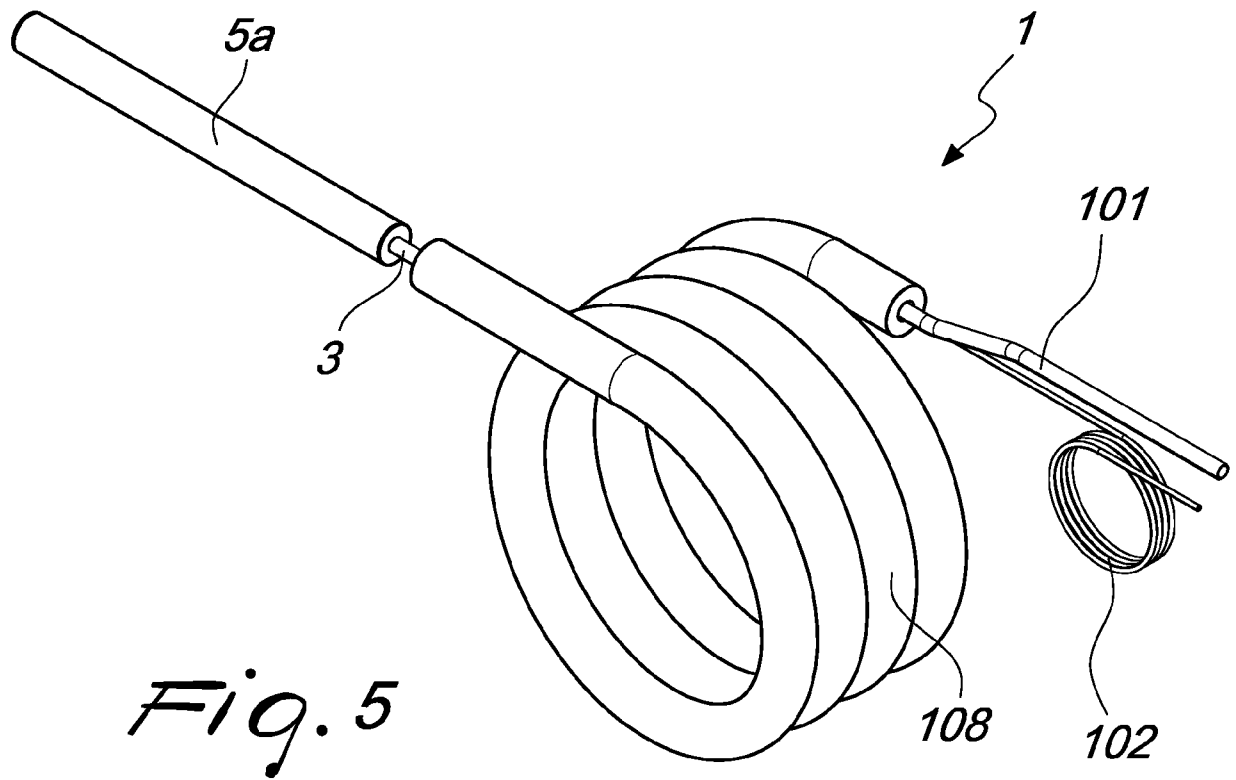


Fig. 4



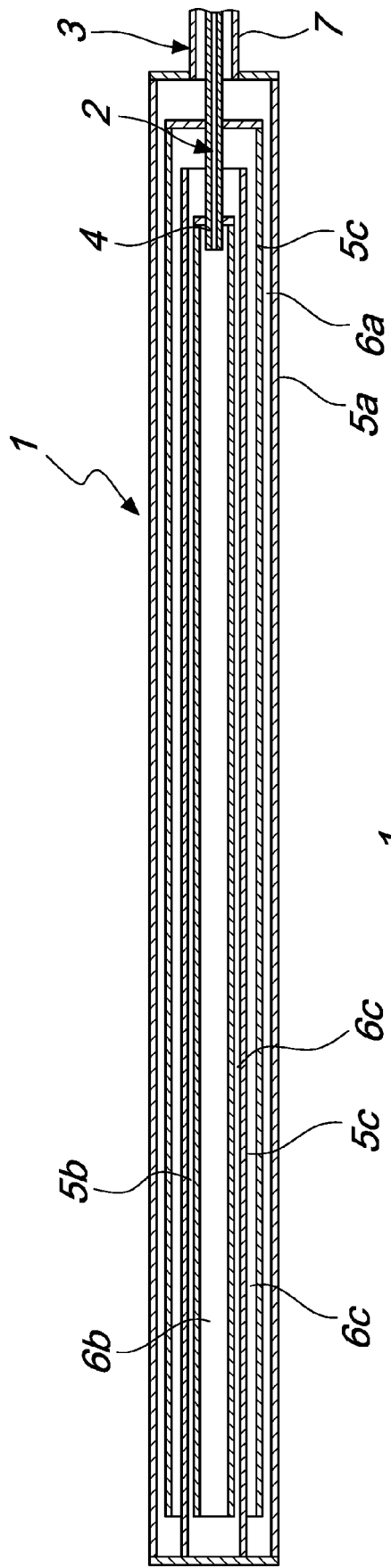


Fig. 7

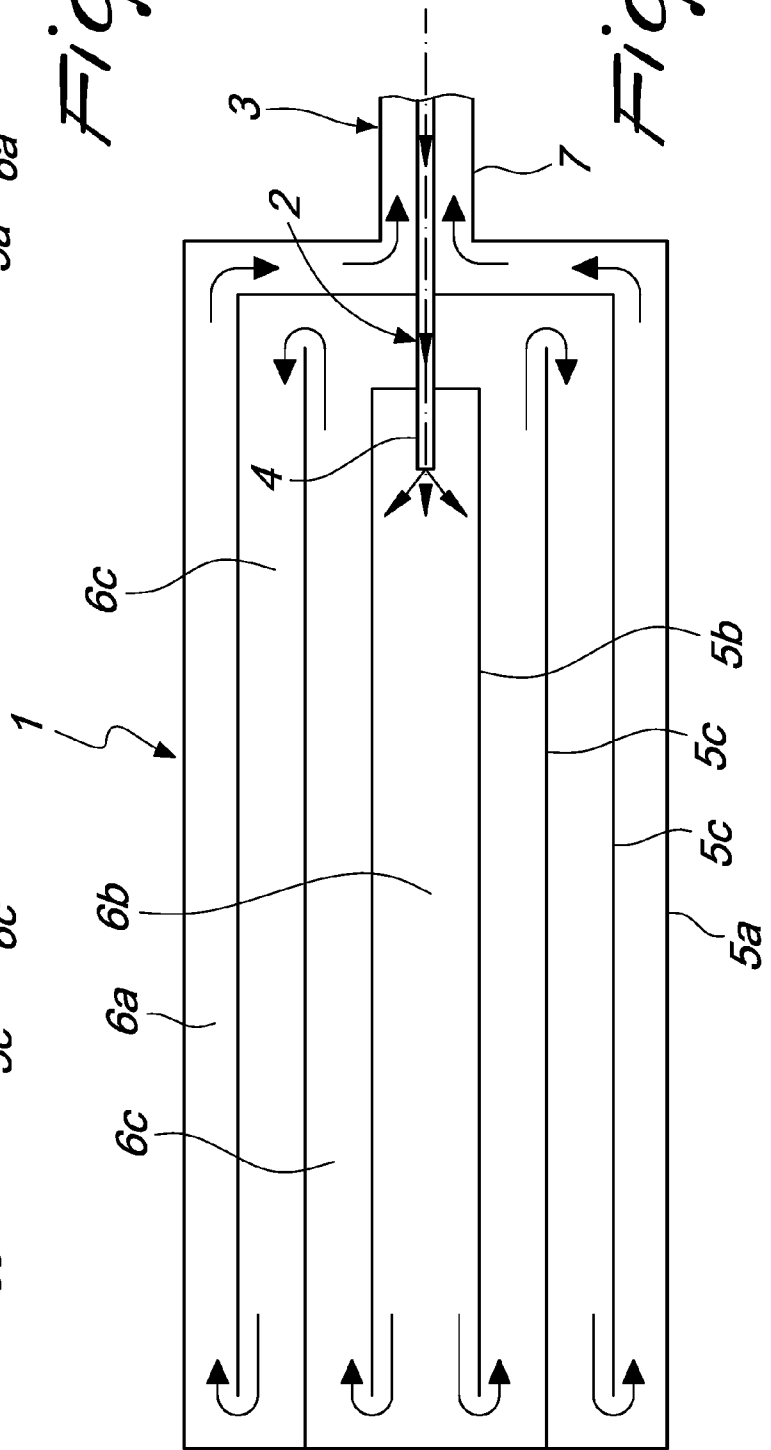
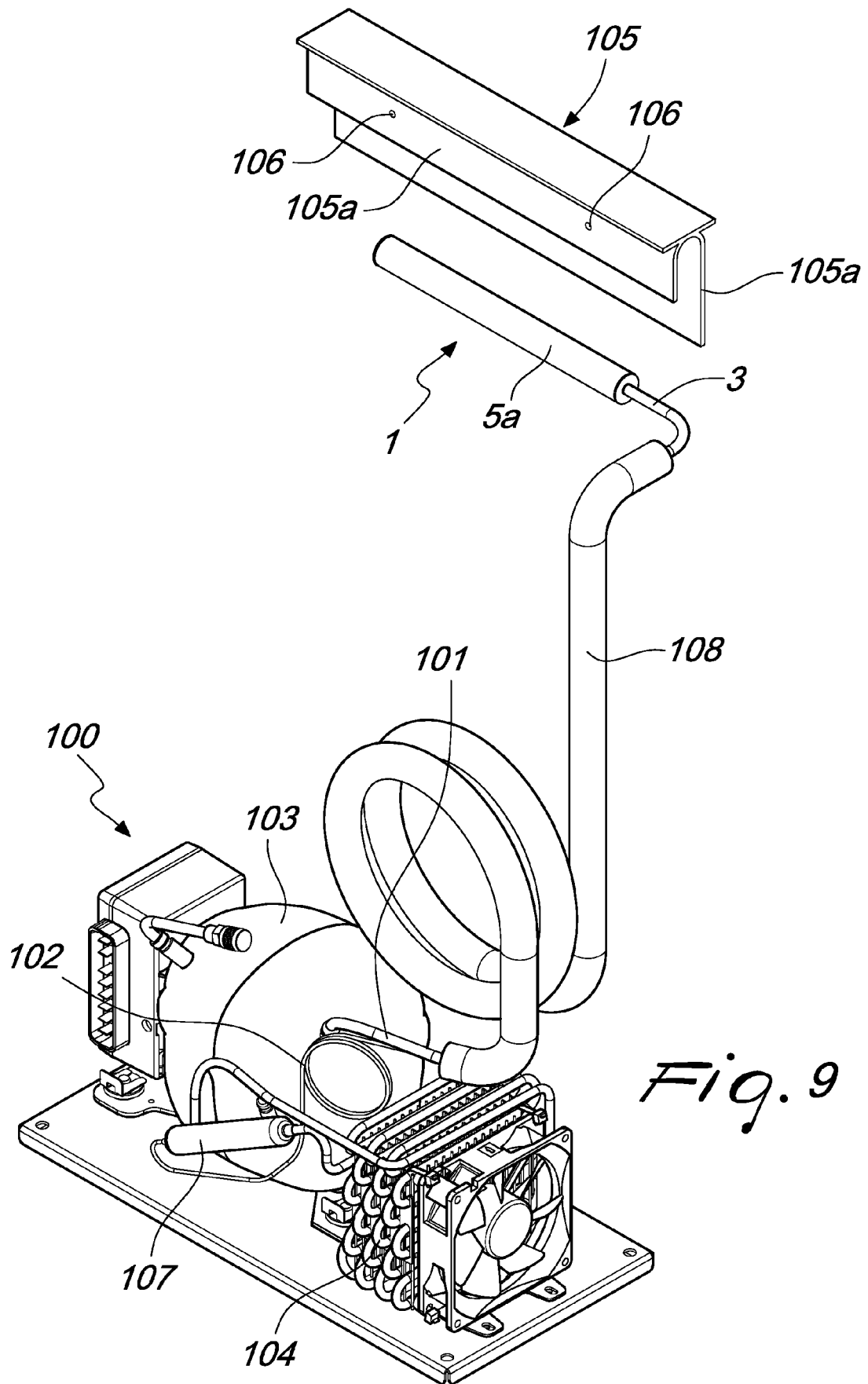


Fig. 8



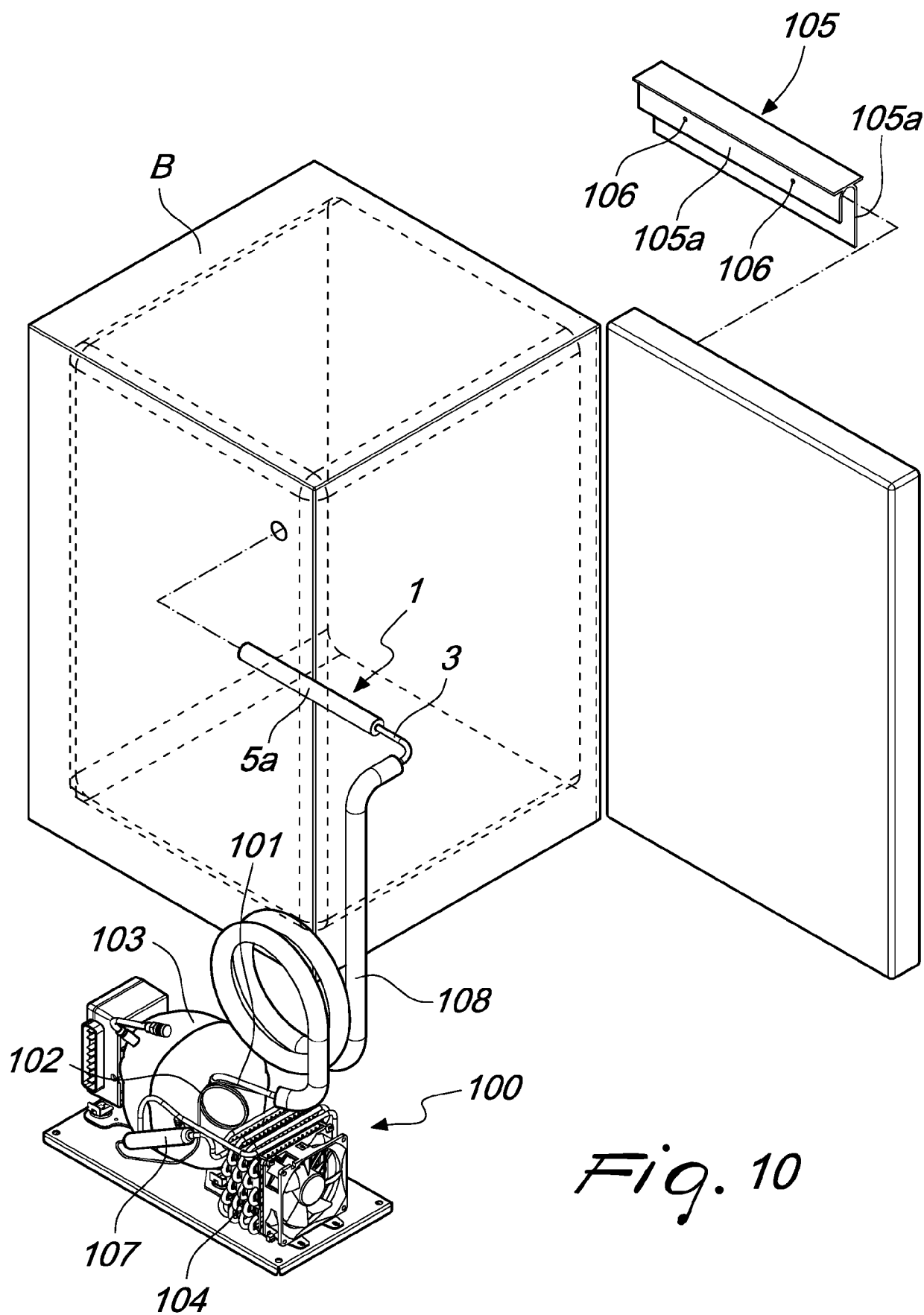
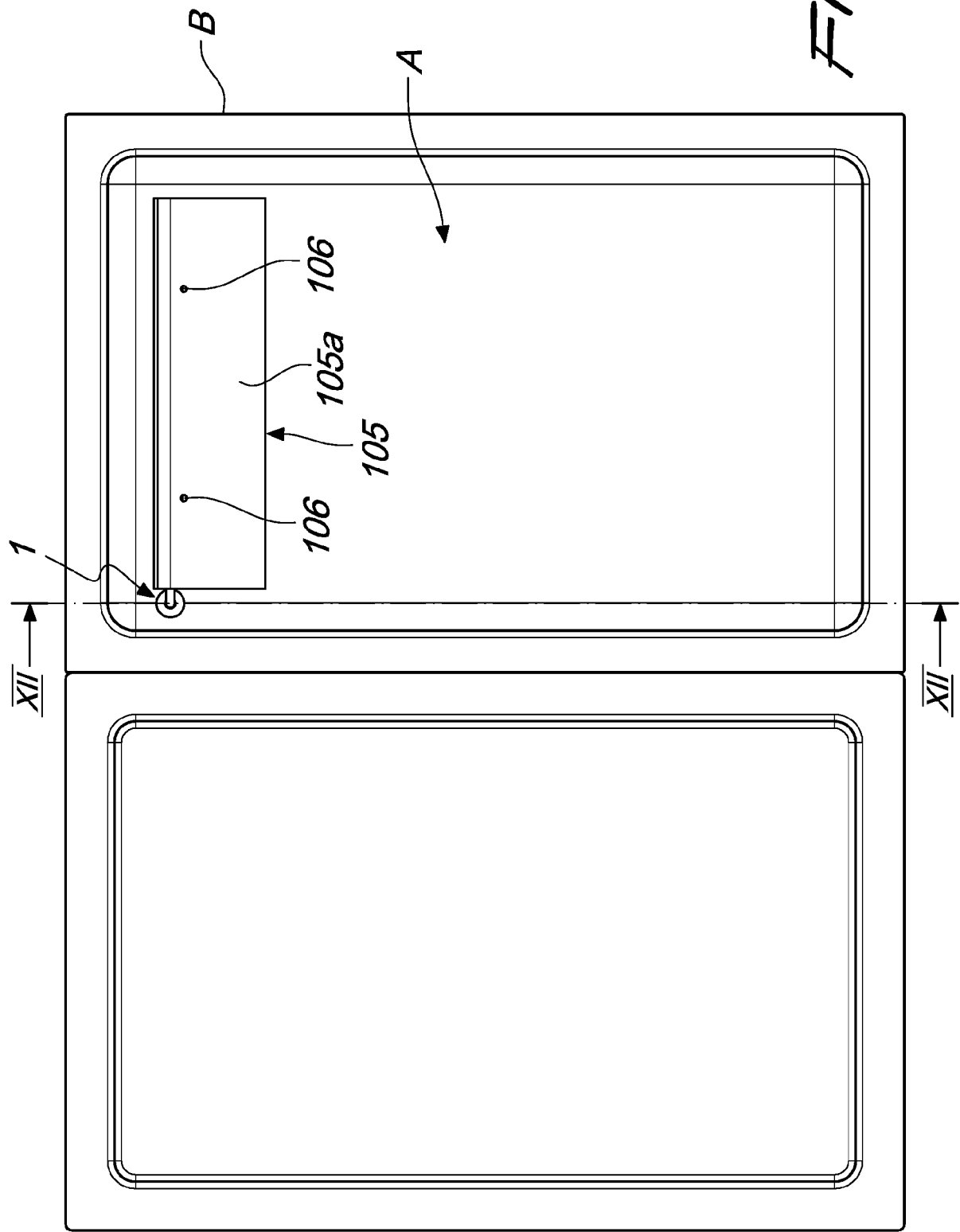


Fig. 10



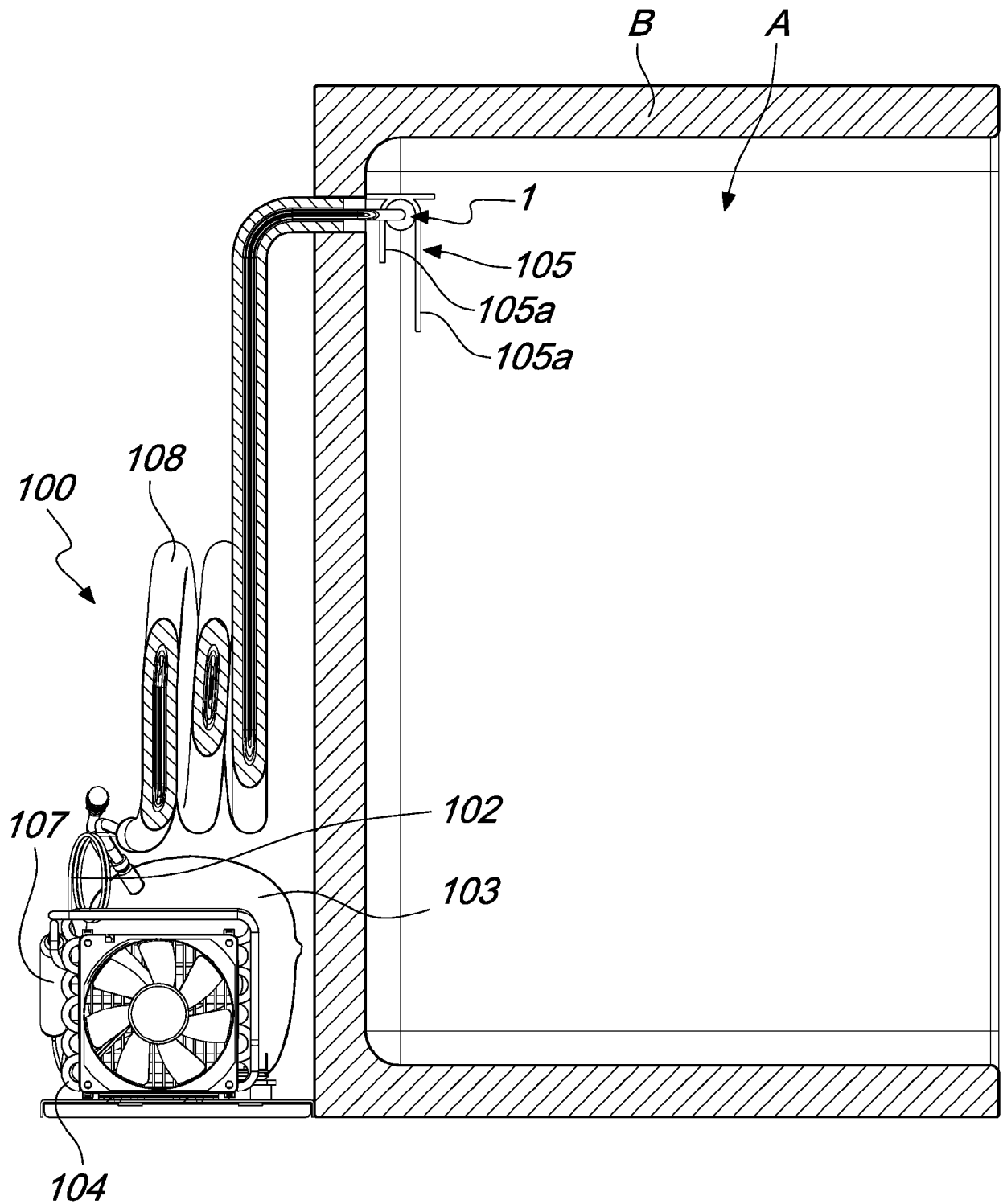
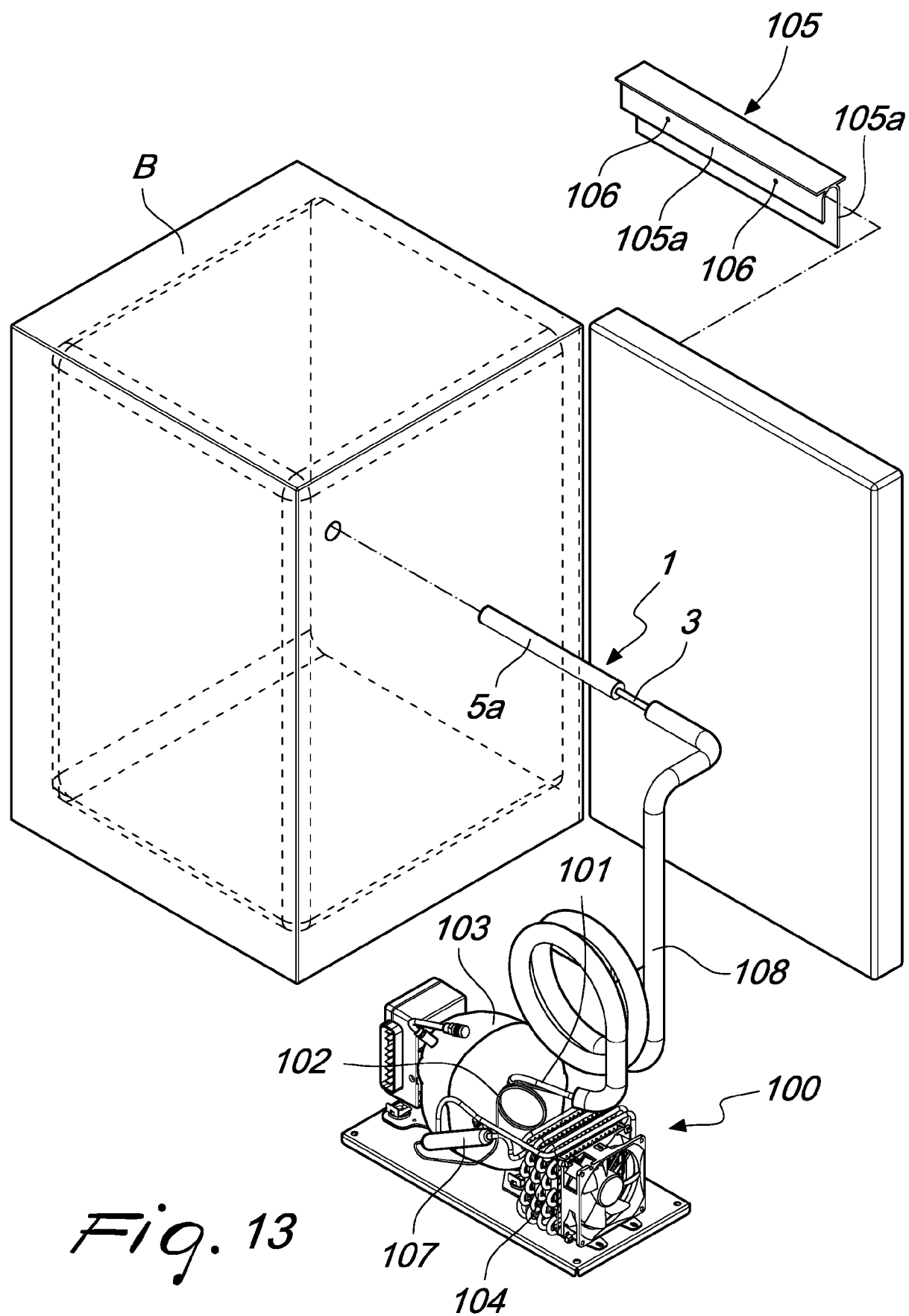


Fig. 12



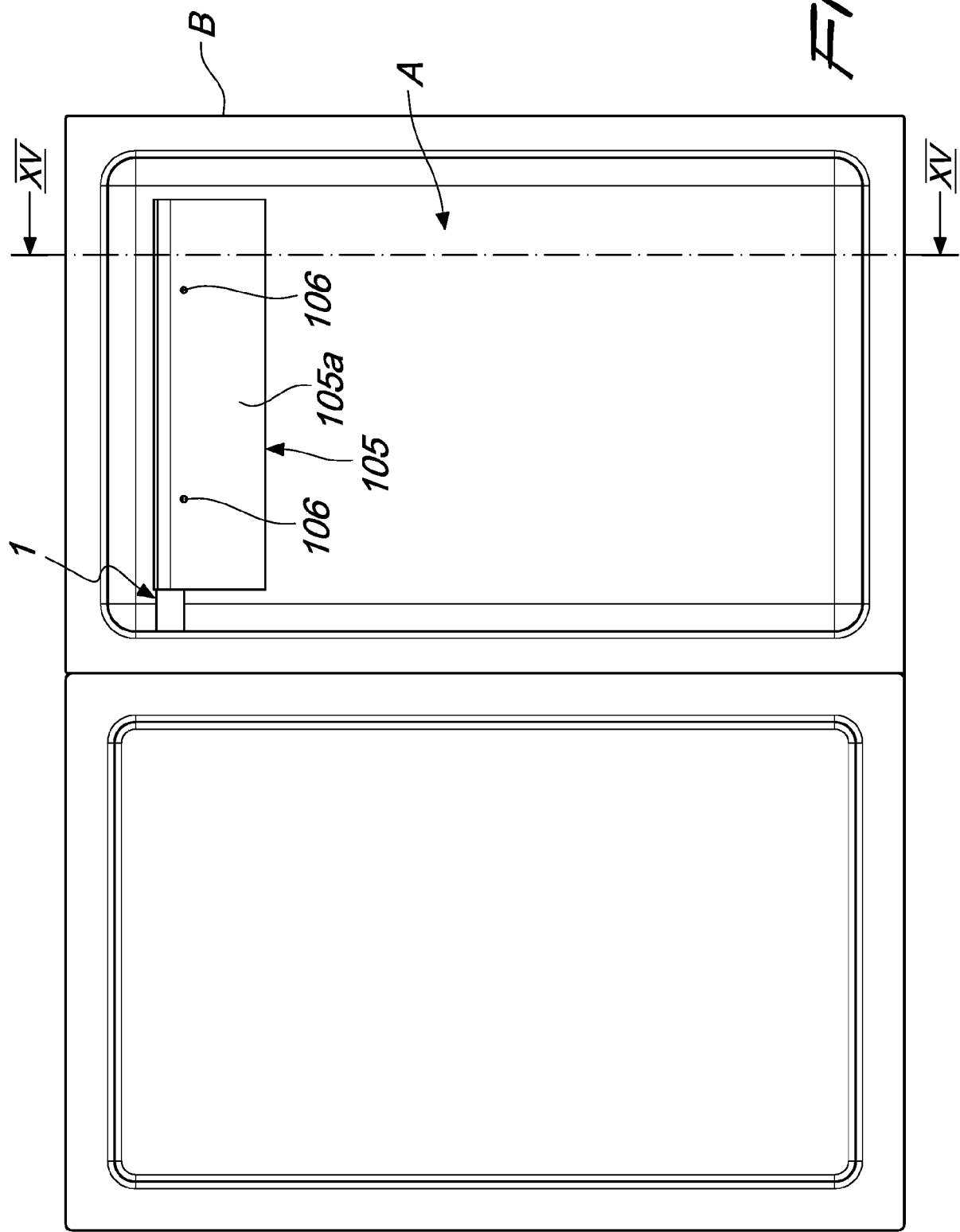


Fig. 14

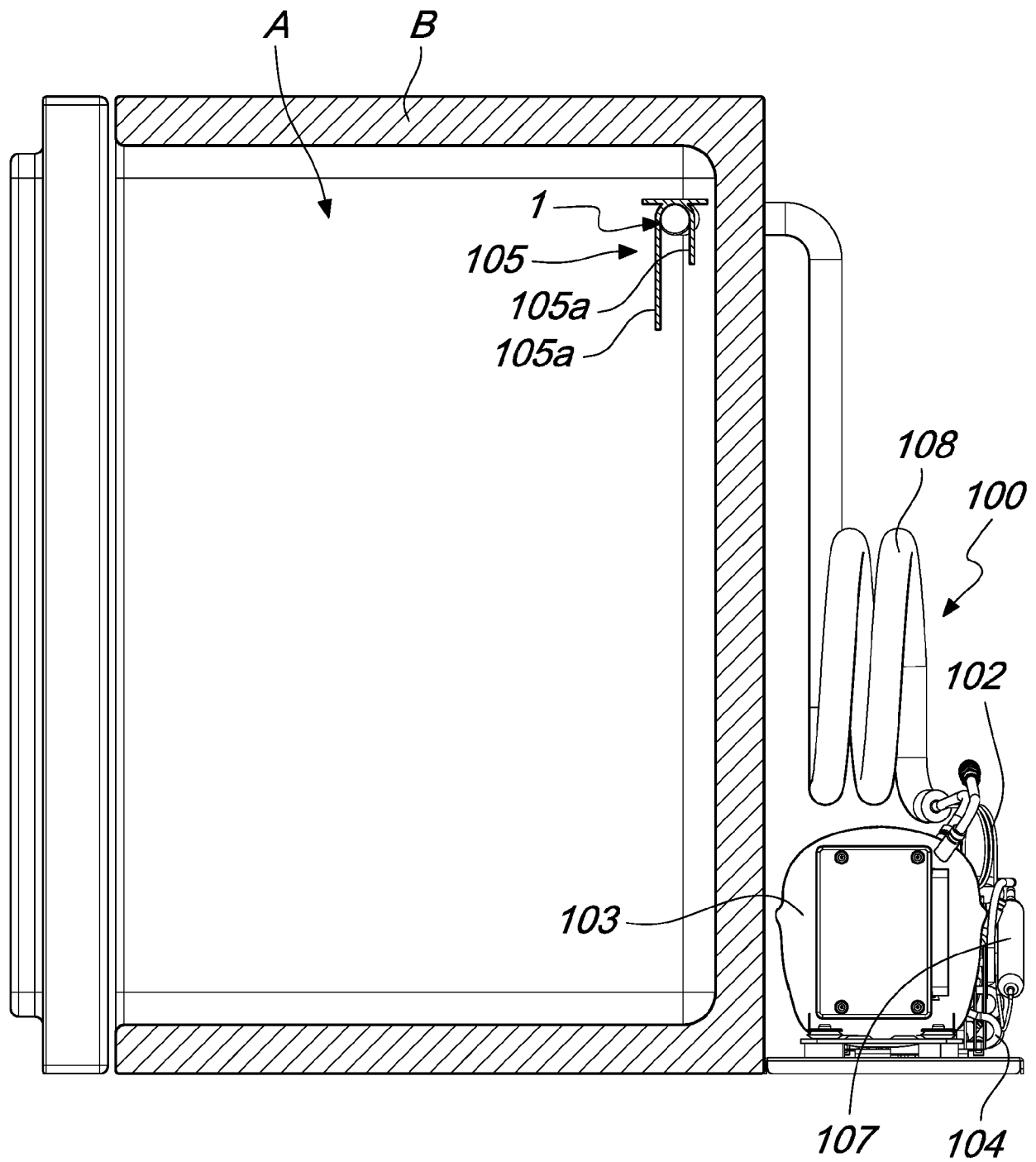
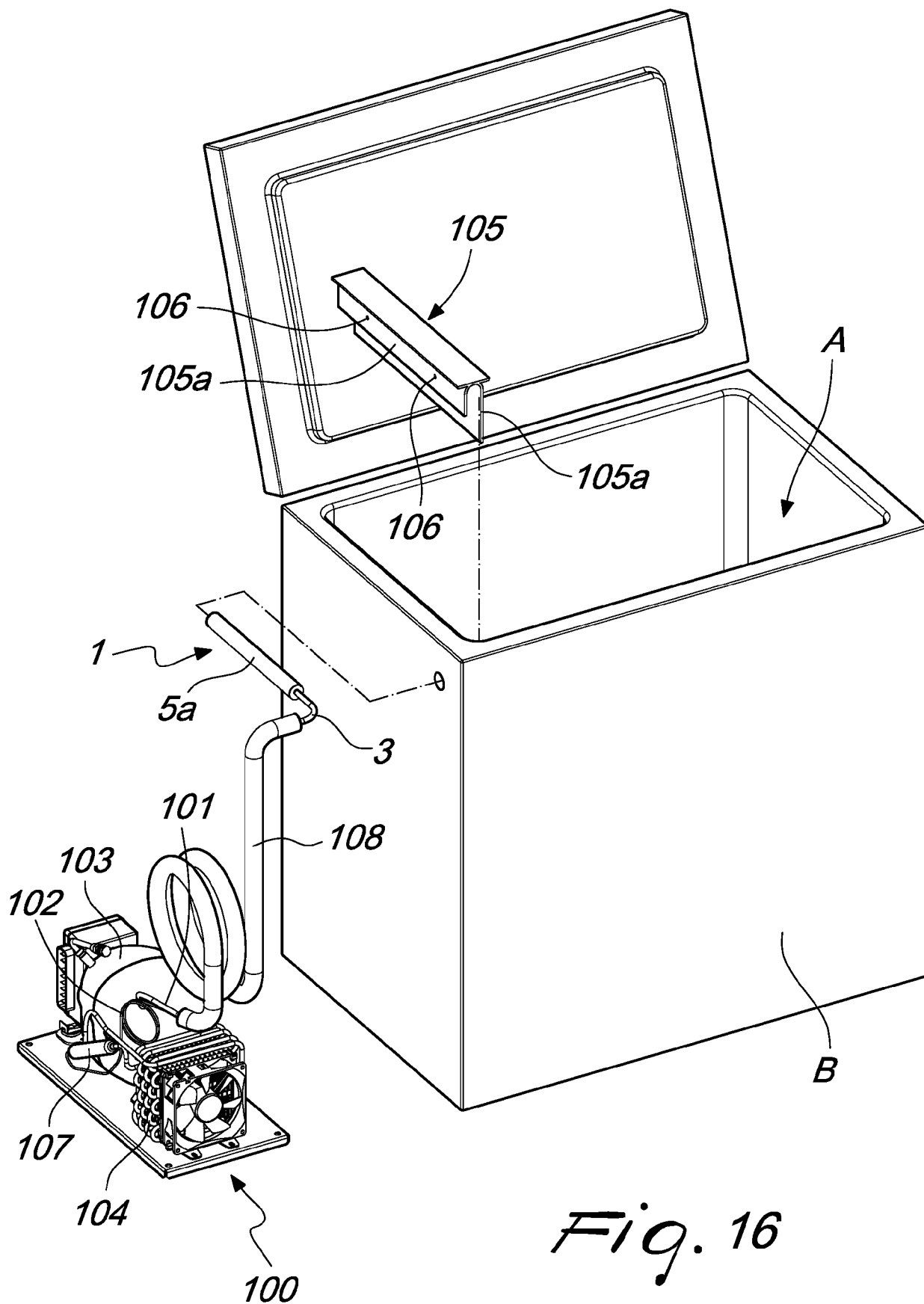
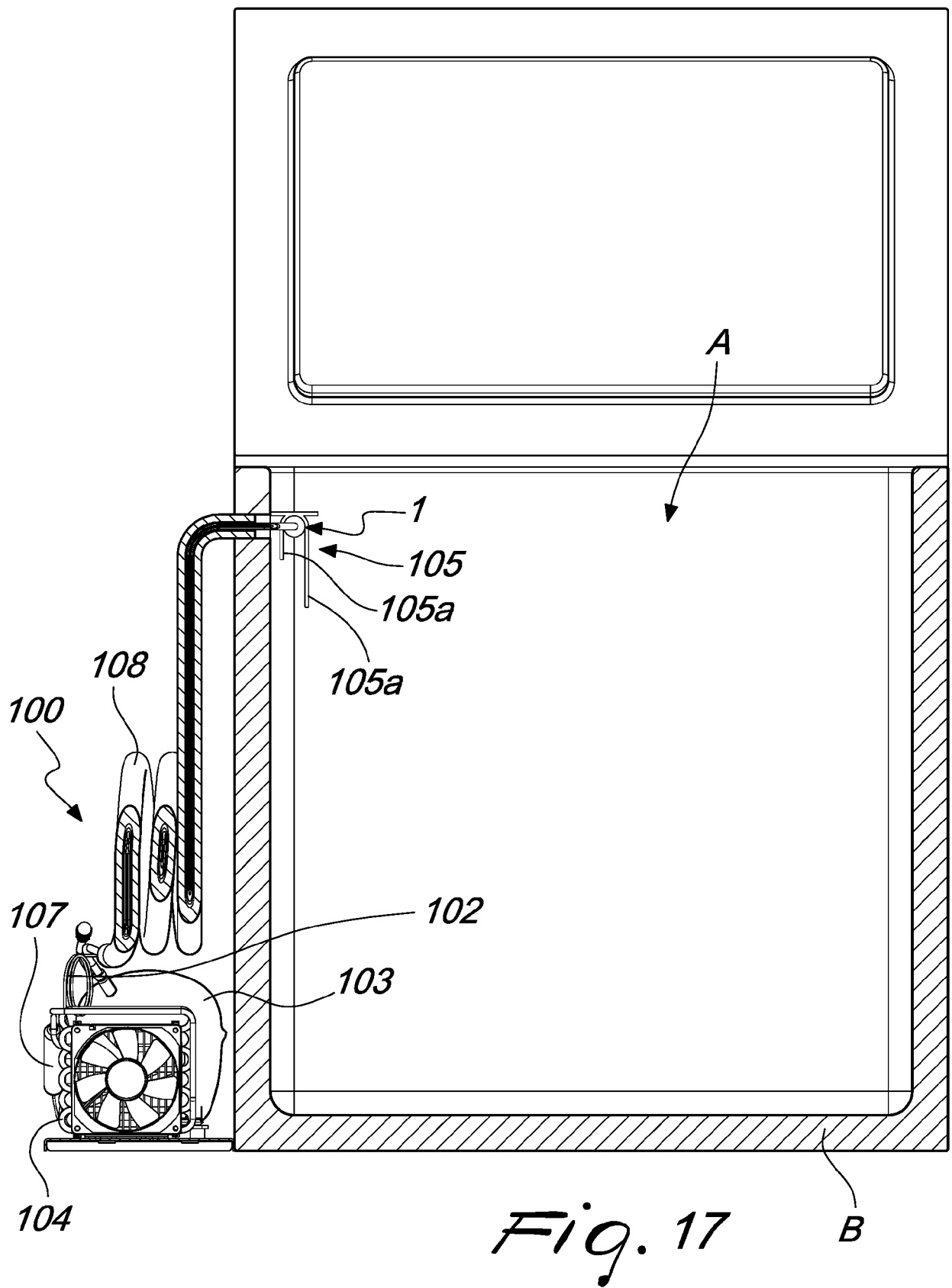


Fig. 15







EUROPEAN SEARCH REPORT

Application Number

EP 23 21 4017

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 749 242 A (MOWERY TIMOTHY W [US]) 12 May 1998 (1998-05-12) * column 1, lines 11-20 * * column 2, line 27 - column 6, line 8; figure 2 *	1-12	INV. F25B39/02 F28D7/12
X	US 3 867 819 A (HARTMAN JACK ET AL) 25 February 1975 (1975-02-25) * column 1, line 37 - column 3, line 6; figures 1-3 *	1,2,4-7, 9-12 3,8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			F25B F28F F28D
Place of search			Examiner
Munich			Weisser, Meinrad
Date of completion of the search			
9 April 2024			
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ON EUROPEAN PATENT APPLICATION NO.

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