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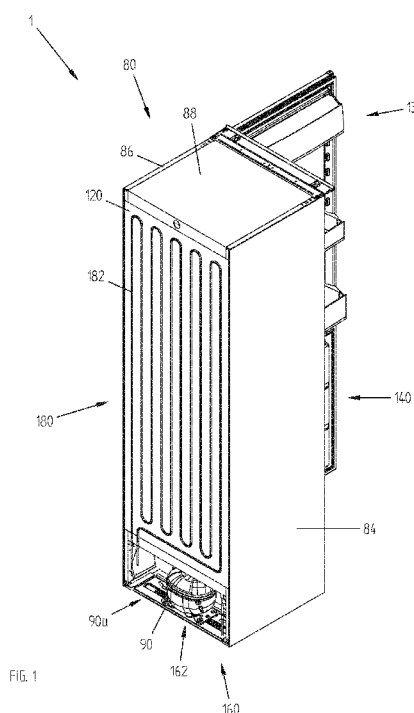
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(54) Title: COOLING APPARATUS COMPRISING A CONDENSER



(57) Abstract: The invention relates to a cooling apparatus (1) comprising an outer casing (80) having side walls (84, 86, 88, 90, 120) which houses at least one compartment (30, 60) for the storage of products to be cooled and a cooling system (160) for cooling an interior atmosphere of said at least one compartment (30, 60) comprising condenser (180) to form a hydraulic circuit for a refrigerant. The condenser (180) comprises a tube (182) which is glued onto an external surface (120a) of one wall (120) of said casing (80), wherein said external surface (120a) is a surface exposed to the external environment.



COOLING APPARATUS COMPRISING A CONDENSER

The present invention generally relates to cooling apparatuses, particularly for food and beverage storage, such as refrigerators and/or freezers for e.g. domestic use.

More specifically, the present invention concerns the arrangement of a condenser for cooling apparatuses in general and for refrigerators/freezers in particular.

BACKGROUND ART

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Refrigerators for foods and beverages generally comprise a cabinet with at least one refrigerator compartment for storing the articles to be kept cool, like for example vegetables, fruit, dairy products, meat, beverages in bottles or cans. The refrigerator compartment is open frontally, or at the top, and a door enables access to the interior of the compartment.

15

A first known model of refrigerators, also indicated as built-in models, comprises an outer casing opportunely shaped so that the refrigerator is apt to be installed in a cabinet, for example a kitchen cabinet. A second known model of refrigerators, also indicated as free-standing model, comprises a casing opportunely shaped so that it represents the exterior of the refrigerator and the refrigerator is freely placed in a room, preferably next a wall.

20

Associated with the casing is a cooling system operable to keep the interior of the casing, particularly the refrigerator compartment, cold. The cooling system typically comprises at least one compressor, one condenser and one evaporator; the compressor, condenser and evaporator which are in fluid communication by means of a piping and altogether form a closed hydraulic circuit, which is circulated through by a refrigerant.

25

In operation, the refrigerant circulates through the closed circuit from the compressor through the condenser and the evaporator and back to the compressor. The refrigerant is first compressed by the compressor, which raises the refrigerant pressure (and temperature). Then, the refrigerant flows to the condenser, where its temperature is decreased, causing it to change phase and pass from the gaseous to the liquid one; in this phase change, the refrigerant releases heat, that is dissipated by the condenser and released to the environment.

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Passing to the evaporator, which is associated to the refrigerator compartment

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(for example formed in the lining of the refrigerator compartment), the refrigerant evaporates, subtracting heat from the atmosphere within the refrigerator compartment and thus cooling the interior thereof.

In refrigerators having also a freezer compartment, for the long-term storage of frozen articles, an additional evaporator is preferably provided for the freezer compartment, or possibly a separate cooling system may be provided for (with a compressor, a condenser and an evaporator dedicated to the freezer).

In a typical refrigerator, the compressor is accommodated in a recess formed in a bottom part of the casing at the back thereof.

Different solutions for arranging the condenser are also known from the prior art. A first type of known condenser essentially comprises a winding tube or serpentine coil (for example of steel) with interconnection fins or wires (also made of steel and spot-welded to the coil) arranged to form a substantially flat grid unit. The unit is mounted vertically to the back of the refrigerator casing, externally and spaced to the latter, using brackets.

Said brackets support the condenser and also advantageously helps to maintain a certain gap between the condenser and the back of the refrigerator, so as to allow air circulation. Moreover, a further gap is typically necessary between the condenser and the cabinet, in case of built-in models, or between the condenser and the wall, in case of free-standing models, for allowing air circulation around the condenser.

A first drawback of this solution is that the use of distinct parts for mounting the condenser increases the parts number (and thus the overall final cost) and the manufacturing time.

Another drawback of this solution is that external arrangement of the condenser at the back of the refrigerator is cumbersome.

In particular, said arrangement requires a relevant space at the back side of the refrigerator that limits the overall size of the refrigerator and hence the internal capacity of the cooling and/or freezer compartment.

Another drawback of this solution lies in that the condenser, highly protruding externally to the cabinet of the refrigerator, risks to be damaged during manufacturing and/or handling of the refrigerator.

A further drawback of this solution is that dust may deposit in interconnection fins or wires and accumulate in somewhat inaccessible areas of the condenser, in particular in the gap between the condenser and the back of the refrigerator,

which is an area quite difficult to reach and clean.

A second type of known condenser used in refrigerators and/or freezers essentially comprises a winding tube or serpentine coil which is connected at the inward side of a panel forming the casing, preferably at the inward side of the back panel of the casing. An adhesive tape is preferably placed above the tube to
5 fix the tube to the inward side of the panel.

The tube with the tape is also embedded in an insulation material, typically a foam material, which is typically interposed between panels forming the casing and internal compartment(s) during manufacturing steps of the refrigerator and/or
10 freezer.

This means that the winding tube has a first heat exchange with the panel, which has a heat exchange with external environment. Due to the small contact area between the tube and the panel, the heat exchange, and therefore the heat dissipation of this kind of condenser, is limited, which could compromise its
15 performances.

Furthermore, the adhesive tape can be not sufficient to keep a perfect adherence of the tube to the panel, so that heat exchange, and therefore the heat dissipation, is further limited.

Another drawback of this solution is that the tube may not adhere adequately to the panel, due to not planarity of the tube and/or of the panel or due to
20 interposition of foam during foaming process. The heat exchange, and therefore the heat dissipation, is further limited.

A further drawback of this solution is that heat is partially transmitted from the tube to the compartment(s) through the foam. The heat that can reach the inside
25 of the compartment can reduce the energy efficiency of the refrigerator or, in other words, causing the refrigerator and/or freezer to require a higher amount of energy to maintain the required temperature value.

Another drawback of this solution is that the presence of the tube between the panels forming the casing and internal compartment(s) reduces the quantity of
30 foam which can be used to thermally insulate the compartment(s) from the external environment, and therefore can reduce the overall energy efficiency.

The main object of the present invention is therefore to overcome said drawbacks.

It is an object of the invention to provide a cooling apparatus with reduced
35 complexity, and therefore easier to assemble, compared to cooling apparatuses of

known type.

It is another object of the invention to provide a cooling apparatus cheaper compared to known systems.

It is a further object of the invention to provide a cooling apparatus more reliable
5 compared to known systems.

It is another object of the invention to provide a cooling apparatus having a higher capacity compared to equivalent known systems.

It is a further object of the invention to provide a cooling apparatus having a higher energy efficiency compared to known systems.

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DISCLOSURE OF INVENTION

Applicant has found that by providing a cooling apparatus equipped with a cooling system for cooling an interior atmosphere of a compartment for the
15 storage of products to be cooled, wherein the cooling system has a condenser bonded onto an external surface of a side of the casing, it is possible to reach the mentioned objects.

In a first aspect thereof the present invention relates, therefore, to a cooling apparatus comprising:

- 20 - a casing comprising side walls which houses at least one compartment for the storage of products to be cooled; and
- a cooling system for cooling an interior atmosphere of said at least one compartment, wherein the cooling system comprises at least one compressor, at least one evaporator and at least one condenser to form a hydraulic circuit for a
25 refrigerant; wherein the condenser comprises a tube which is bonded onto an external surface of one wall of said walls, said external surface being a surface exposed to the external environment.

It is underlined that here external environment means the environment external to the cooling apparatus.

30 In a preferred embodiment of the invention, said one wall is a back wall of said casing.

Preferably, the tube is glued onto the external surface by means of a thermally conductive adhesive.

According to a preferred embodiment of the invention, the cross section of the
35 tube is elliptical or rectangular, preferably with rounded corners.

In a preferred embodiment of the invention, the tube is glued onto the external surface by an adhesive layer laid down onto the external surface in such a way to form a preferably continuous strip or path having the same layout, or substantially the same layout, of the overlaying tube.

- 5 Preferably, the assembly of said tube and said external surface is coated with a lacquer film for protecting it from oxidation.

According to a preferred embodiment of the invention, said one wall comprises at least one thermally conductive layer.

- 10 In a preferred embodiment of the invention, said thermally conductive layer comprises said external surface.

According to a preferred embodiment of the invention, said one wall further comprises at least one thermally insulating layer.

In a preferred embodiment of the invention, said at least one thermally insulating layer is inwardly arranged with respect to said one thermally conductive layer.

- 15 Preferably, the thermally insulating layer comprises one of the materials of the group comprising: bitumen, tar, polyolefin.

According to a preferred embodiment of the invention, an insulating space is defined between said side walls and said at least one compartment, the insulating space being filled with an insulating material.

20

BRIEF DESCRIPTION OF THE DRAWINGS

- These and other features and advantages of the present invention will be made clear by the following detailed description of an embodiment thereof, provided
25 merely by way of non-limitative example, description that should be read in conjunction with the annexed drawings, wherein:

- Figure 1 shows in perspective view from the rear a cooling apparatus equipped with a cooling system according to an embodiment of the present invention;
- Figure 2 shows the perspective view from the front of the cooling apparatus of
30 Figure 1;
- Figure 3 shows a plan view of Figure 2 sectioned along line III°-III° of Figure 2;
- Figure 3A shows an enlarged view of a detail of Figure 3;
- Figure 4 shows some components of Figure 1 in a disassembled configuration;
- 35 - Figure 5 shows a sectioned portion of a component of Figure 4 isolated from

the rest;

- Figure 5A shows an enlarged view of a detail of Figure 5;
- Figures 6 to 8 show successive steps of a manufacturing process of the cooling apparatus of Figure 1;

5 - Figure 9 shows a further preferred embodiment of Figure 5A.

DETAILED DESCRIPTION OF THE INVENTION

10 The present invention has proved to be particularly advantageous when applied to a cooling apparatus of built-in type, as described below. It should in any case be underlined that the present invention is not limited to this type of application. On the contrary, the present invention can be conveniently applied to other type of cooling apparatus, like for example a free-standing cooling apparatus.

15 A cooling apparatus 1 equipped with a condenser 180 according to a preferred embodiment of the invention is described with reference to Figures 1 to 8.

The cooling apparatus 1 illustrated and described herein is a built-in type cooling apparatus 1 that is apt to be installed within a containment structure, not illustrated, like for example a kitchen cabinet. The cooling apparatus 1 is preferably secured to the structure by means of suitable connecting devices (not
20 shown).

The cooling apparatus 1 preferably comprises an outer casing 80 which houses a refrigerator compartment 30 and a freezer compartment 60.

The cooling apparatus 1 here illustrated and described thus refers to a combined solution in which the refrigerator compartment 30 is preferably positioned above
25 the freezer compartment 60.

In different embodiments, not illustrated, the cooling apparatus may preferably comprise a different number and/or combination of refrigerator and/or freezer compartments, possibly even only one refrigerator or freezer compartment.

The refrigerator compartment 30, as known, is preferably capable of keeping the
30 products stored therein at a cooling temperature typically comprised between 1°C and 10°C. The freezer compartment 60, as known in the art, is preferably capable of keeping the products stored therein at a freezing temperature typically comprised between -16 °C and -28 °C.

The cooling apparatus 1 preferably comprises an inner casing 32 with
35 corresponding opening 34 defining said refrigerator compartment 30, and an

inner casing 62 with respective opening 64 defining said freezer compartment 60. Refrigerator compartment 30 and freezer compartment 60 are preferably provided with support shelves and/or drawers.

The inner casings 32, 62 are preferably made of a polymeric plastic material, such as PS (polystyrene). The inner casings 32, 62 are also normally indicated with the term "inner liner".

In the preferred embodiment illustrated and described hereinbelow, the two inner casings 32, 62 are two separate elements placed one above the other. In different embodiments, not illustrated, the two inner casings may be formed as a one-piece monolithic body.

The outer casing 80 preferably comprises side walls externally coupled to the inner casings 32, 62 so as to define a space 82 therebetween.

The outer casing 80 preferably has a parallelepiped shape and comprises lateral panels 84, 86, a top panel 88, a bottom shaped panel 90 and a back panel 120.

All the panels 84, 86, 88, 90, 120 may for example be made of metal sheet or plastic.

It is underlined that in the example illustrated in attached figures, side walls of the outer casing 80 comprise lateral panels 84, 86, a top panel 88, bottom shaped panel 90, and a back panel 120.

The cooling apparatus 1 further preferably comprises an upper door 130 associated with the opening 34 of the refrigerated compartment 30, and a lower door 140 associated with the opening 64 of the freezer compartment 60. In a variant embodiment, a single door may be provided for closing both compartments.

The cooling apparatus 1 further preferably comprises a cooling system 160 comprising a compressor 162, a condenser 180, a pressure lowering device, e.g. a lamination valve (not shown), and two evaporators 166, 168, preferably associated respectively to the refrigerator compartment 30 and the freezer compartment 60, as better visible in Figure 4.

The elements of the refrigeration system 160 are interconnected by means of suitable pipes so as to form a closed hydraulic circuit inside which a refrigerant flows.

The evaporators 166, 168 preferably comprise pipes made of a material having good thermal conductivity (such as aluminum or copper). The pipes are opportunely shaped to interact with the respective compartment to cool or freeze

the same.

In some advantageous embodiments, the tube forming the evaporator externally wraps the inner casing defining the compartment, as it happens in the present embodiment for the freezer compartment 60.

- 5 In some further advantageous embodiments, the tube forming the evaporator is preferably connected to an external side of the inner casing defining the compartment, preferably by means of a supporting panel, as it happens in the present embodiment for the refrigerator compartment 30 where the evaporator 166 is connected to the back side of the inner casing 32 by means of a supporting
10 panel 167. The evaporator 166 is preferably glued to the supporting panel 167. The supporting panel 167 is preferably made of a thermal conducting material, preferably made of aluminium.

- In further advantageous embodiments, the evaporator or evaporators may be associated with the respective compartment in a different way, for example,
15 partially or totally housed inside the compartment.

- In use, the refrigerant fills the closed circuit of the cooling system. When the compressor 162 is actuated (under the control of a control unit, which operates exploiting a thermostat provided within the compartment) the refrigerant circulates through the closed circuit from the compressor 162 through the
20 condenser 180 and the evaporators 166, 168 and back to the compressor 162. The refrigerant is first compressed by the compressor 162, which raises the refrigerant pressure (and temperature). Then, the refrigerant flows to the condenser 180, where its temperature is decreased, causing it to change phase and pass from the gaseous to the liquid one; in this phase change, the refrigerant
25 releases heat, that is dissipated by the condenser 180. Passing to the evaporators 166, 168, which are associated to the compartments 30, 60, the refrigerant evaporates, subtracting heat from the atmosphere within the compartments 30, 60 and thus cooling the interior thereof.

- The compressor 162 is preferably housed at the back of the cooling apparatus 1, preferably outside the casing 80. Preferably, the compressor 162 is housed at the
30 bottom of the cooling apparatus 1, preferably in a seat 90a formed by the bottom shaped panel 90.

The condenser 180 preferably comprises a tube 182, more preferably a serpentine tube, for example made of steel or aluminium.

- 35 According to an advantageous aspect of the present invention, the tube 182 is

preferably glued onto the back panel 120.

More preferably, the tube 182 is preferably glued onto the external surface 120a of the back panel 120, wherein the external surface 120a is the side exposed to the external environment.

- 5 Preferably, the cross section of the tube 182 is elliptical or rectangular, preferably with rounded corners.

In a preferred embodiment of the invention, the tube 182 is glued onto the external surface 120a of the back panel 120 by means of an adhesive 184. In the figures, the adhesive 184 is indicated as a layer. The Figures are not to scale; the size and the positioning of the adhesive layer 184 is opportunely chosen in order to guarantee the best adherence of the tube 182 onto the external surface 120a of the back panel 120.

In a further preferred embodiment, as illustrated in Figure 9, the adhesive layer 284 is laid down onto the external surface 120a of the back panel 120 in such a way to form a preferably continuous strip or path having the same layout, or substantially the same layout, of the overlaying tube 182.

In a preferred embodiment of the invention, the adhesive 184 comprises a resin adhesive.

In a further preferred embodiment of the invention, the adhesive comprises a thermally conductive adhesive.

In a preferred embodiment, the assembly of the tube 182 and the external surface 120a is coated with a film for protecting it from oxidation.

In a preferred embodiment, the assembly of the tube 182 and the external surface 120a is coated with a lacquer film.

25 In a further preferred embodiment of the invention, the protecting film may comprise a suitable paint system.

Advantageously, arrangement of the tube 182 glued onto the external surface 120a of the back panel 120 reduces the assembling complexity compared to known solutions using brackets.

30 Thanks to the present invention, the conventional brackets used for mounting the condenser to the casing are no longer necessary. This simplifies the assemblage of the cooling apparatus, and reduces the number of distinct parts, thereby leading to a reduction of production costs.

Still advantageously, arrangement of the tube 182 glued onto the external surface 120a of the back panel 120 is less cumbersome compared to known solutions

using brackets wherein a gap is created between the condenser and the casing.

The overall size of the refrigerator is then advantageously reduced compared to known system or, under the same size conditions, the capacity of the compartment(s) may be increased.

- 5 Furthermore, advantageously, the condenser does not excessively protrude from the back of the refrigerator thereby reducing possible damages during manufacturing and/or handling of the refrigerator.

Still advantageously, condenser according to the invention may be easily cleaned in case dust accumulates.

- 10 Advantageously, arrangement of the tube 182 onto the external surface 120a of the back panel 120 enhances thermal dissipation of heat from the condenser 180 which is released to the environment compared to known system having the condenser placed inside the casing. Most part of the outer surface of the tube 182, in fact, is exposed to external environment, as visible in Figure 3A, thus
15 increasing heat dissipation.

According to another advantageous aspect of the present invention, the back panel 120 preferably comprises a thermally conductive layer 122, as better illustrated in Figures 3A and 5A. The thermally conductive layer 122 preferably comprises a metal layer, more preferably an aluminium layer.

- 20 The thermally conductive layer 122 is the layer of the back panel 120 exposed to the external environment and, therefore, the external surface 120a of the back panel 120 coincides with the external surface of the thermally conductive layer 122.

- Advantageously, heat to be dissipated is transmitted from the tube 182 to the
25 thermally conductive layer 122 through the adhesive layer 184. The thermally conductive layer 122 acts as a heat-dissipating element for the condenser 180. The thermally conductive layer 122 enhances the thermal efficiency of the condenser 180 thanks to the heat that is further dissipated and released to the environment.

- 30 According to the preferred embodiment illustrated herein, the back panel 120 substantially entirely covers the back side of the cooling apparatus 1.

Furthermore, the serpentine tube 182 according to the preferred embodiment illustrated herein is substantially entirely distributed over the back panel 120.

- In different embodiments, nevertheless, size and shape of the back panel may be
35 different with respect to the size of the back side of the cooling apparatus.

Furthermore, in different advantageous embodiments, shape and length of the tube of the condenser may be different from the preferred embodiment illustrated herein.

According to a further advantageous aspect of the present invention, the back panel 120 preferably further comprises a thermally insulating layer 124, as better
5 illustrated in Figures 3A and 5A. The thermally insulating layer 124 preferably comprises a bituminous layer or a layer comprising another material, like for example tar or polyolefin (FPO), preferably a flexible layer of polyolefin (like the product sold under the name Mapeplan® TM by the company MAPEI).

10 The thermally insulating layer 124 is inwardly arranged with respect to the thermally conductive layer 122.

Advantageously, the thermally insulating layer 124 reduces the quantity of heat which is transmitted from the tube 182 to the compartment(s) compared to known system. The energy efficiency of the refrigerator is therefore increased.

15 In the preferred embodiment illustrated, furthermore, the space 82, called also insulating space, between the outer casing 80 and the inner casings 32, 62 is preferably filled with an insulating material, more preferably an insulating foam. In particular, the insulating material is comprised between the back panel 120 and the inner casings 32, 62.

20 Figures 6 to 8 exemplary show some phases of the assembling process of the cooling apparatus 1.

It has to be noted that the back panel 120 with the condenser 180 glued thereto can be assembled/connected to pre-assembled lateral and top panels 84, 86, 120.

It has thus been shown that the present invention allows all the set objects to be
25 achieved.

The present invention has been here described in one of its possible embodiments, however those skilled in the art will recognize that several modifications to the described embodiment can be made, as well as other embodiments are possible, without departing from the protection scope defined
30 in the appended claims. For example, although in the embodiment described the condenser (tube) is glued onto the back wall of the casing, in alternative invention embodiments the condenser (tube) may be glued to another wall of the casing. For example, although in the embodiment described the panel to which to condenser (tub) is glued comprises a thermally conductive layer and a thermally
35 insulating layer, in alternative invention embodiments, the panel may comprise

only one of the two or a combination thereof.

CLAIMS

1. A cooling apparatus (1) comprising:
- an outer casing (80) comprising side walls (84, 86, 88, 90, 120) which houses at
5 least one compartment (30, 60) for the storage of products to be cooled; and
- a cooling system (160) for cooling an interior atmosphere of said at least one
compartment (30, 60),
wherein the cooling system (160) comprises at least one compressor (162), at
least one evaporator (166, 168) and at least one condenser (180) to form a
10 hydraulic circuit for a refrigerant;
wherein the condenser (180) comprises a tube (182) which is glued onto an
external surface (120a) of one wall (120) of said walls (84, 86, 88, 90, 120), said
external surface (120a) being a surface exposed to the external environment.
- 15 2. The cooling apparatus (1) of claim 1, wherein said one wall (120) is a back
wall of said casing (80).
3. The cooling apparatus (1) of any one of the preceding claims, wherein said
tube (182) is glued onto said external surface (120a) by means of a thermally
20 conductive adhesive (184; 284).
4. The cooling apparatus (1) of any one of the preceding claims, wherein the
cross section of said tube (182) is elliptical or rectangular, preferably with
rounded corners.
- 25 5. The cooling apparatus (1) of any one of the preceding claims, wherein said
tube (182) is glued onto said external surface (120a) by an adhesive layer (284)
laid down onto said external surface (120a) in such a way to form a preferably
continuous strip or path having the same layout, or substantially the same layout,
30 of the overlaying tube (182).
6. The cooling apparatus (1) of any one of the preceding claims, wherein the
assembly of said tube (182) and said external surface (120a) is coated with a
lacquer film for protecting it from oxidation.

35

7. The cooling apparatus (1) of any one of the preceding claims, wherein said one wall (120) comprises at least one thermally conductive layer (122).

8. The cooling apparatus (1) of claim 7, wherein said thermally conductive layer
5 (122) comprises said external surface (120a).

9. The cooling apparatus (1) of any one of the preceding claims, wherein said one wall (120) further comprises at least one thermally insulating layer (124).

10 10. The cooling apparatus (1) of claim 9, wherein said at least one thermally insulating layer (124) is inwardly arranged with respect to said one thermally conductive layer (122).

11. The cooling apparatus (1) of claim 9 or 10, wherein said thermally insulating
15 layer (124) comprises one of the materials of the group comprising: bitumen, tar, polyolefin.

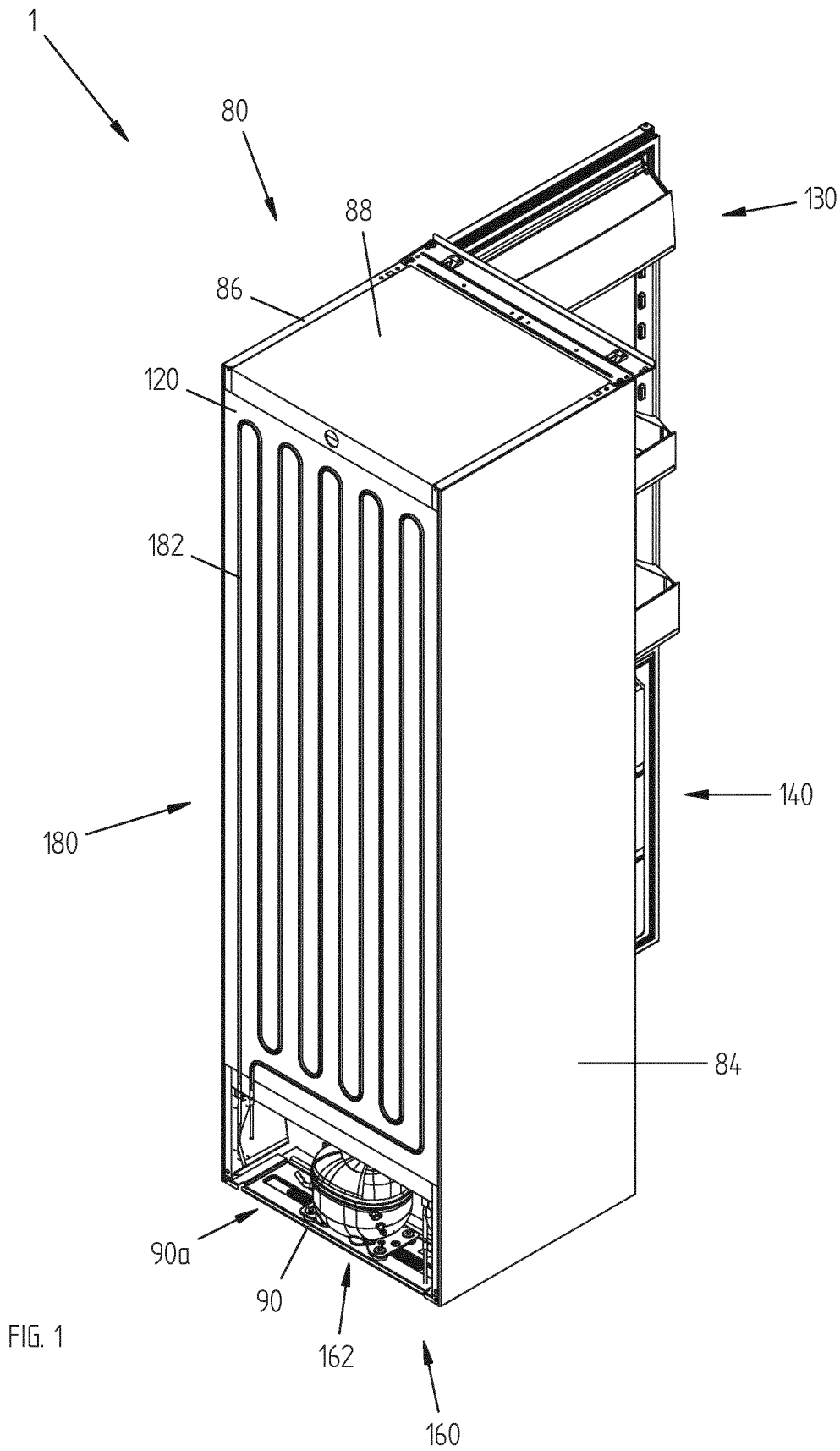
12. The cooling apparatus (1) of any one of the preceding claims, wherein an insulating space (82) is defined between said side walls (84, 86, 88, 90, 120) and
20 said at least one compartment (30, 60), said insulating space (82) being filled with an insulating material.

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1/7



2/7

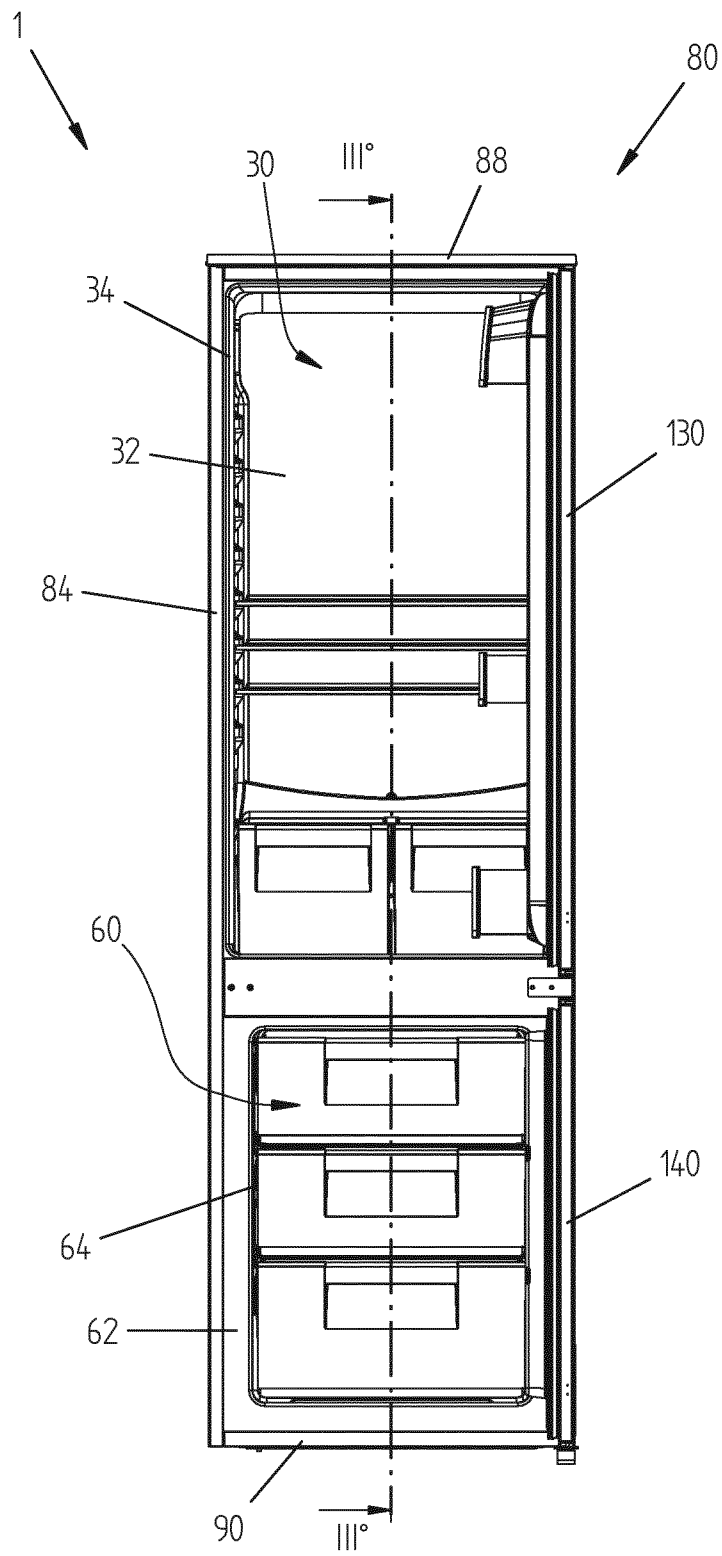


FIG. 2

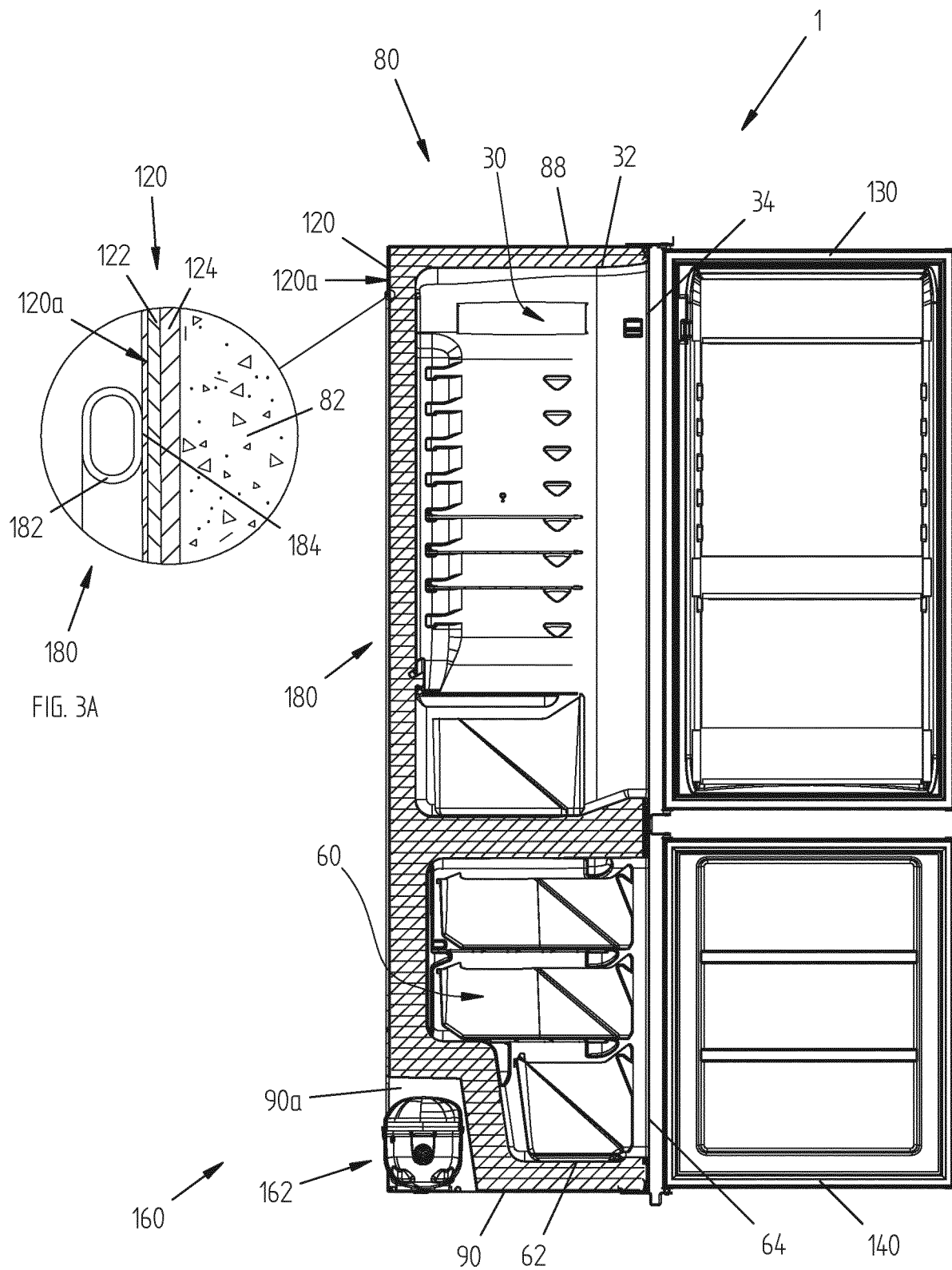


FIG. 3

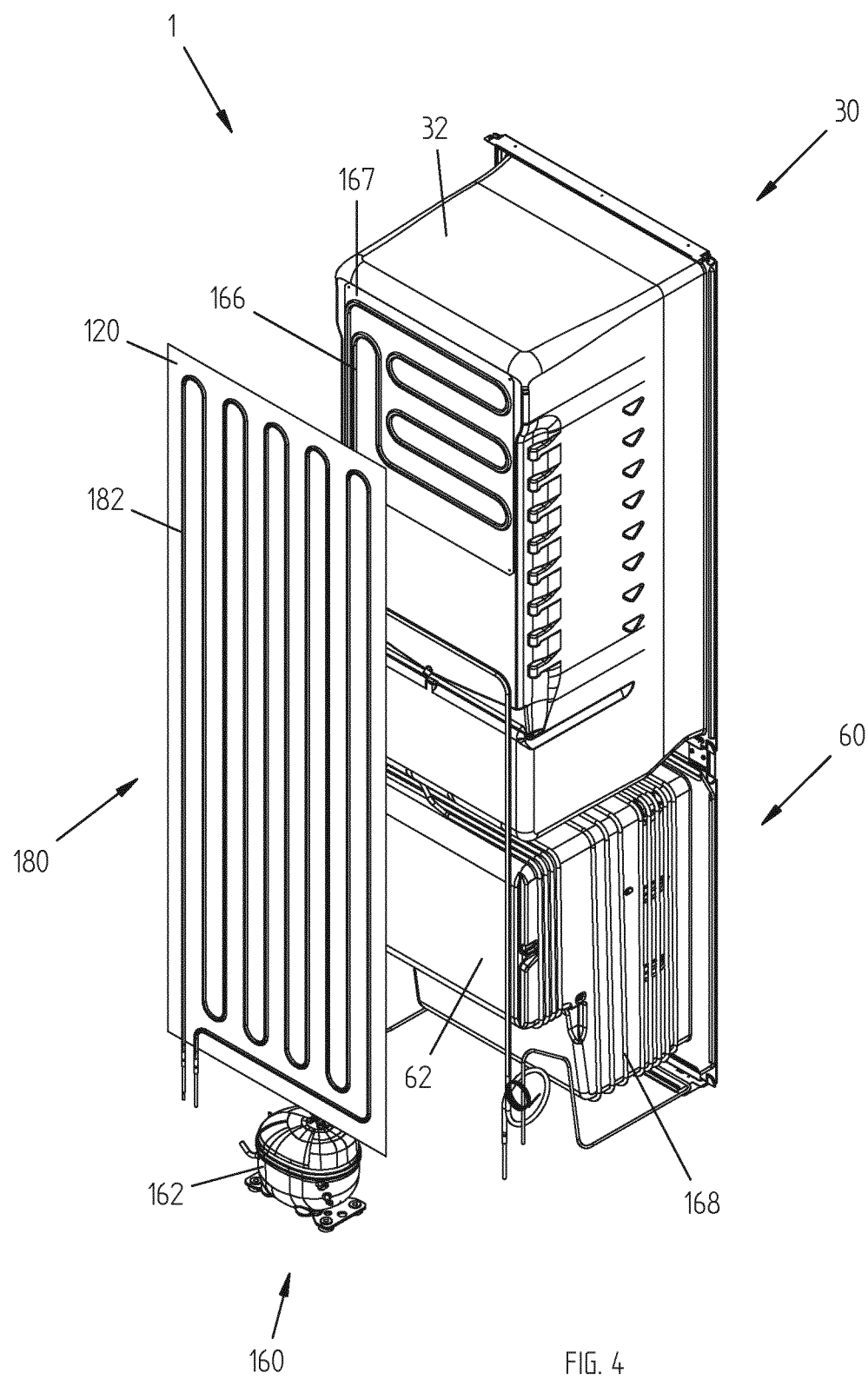
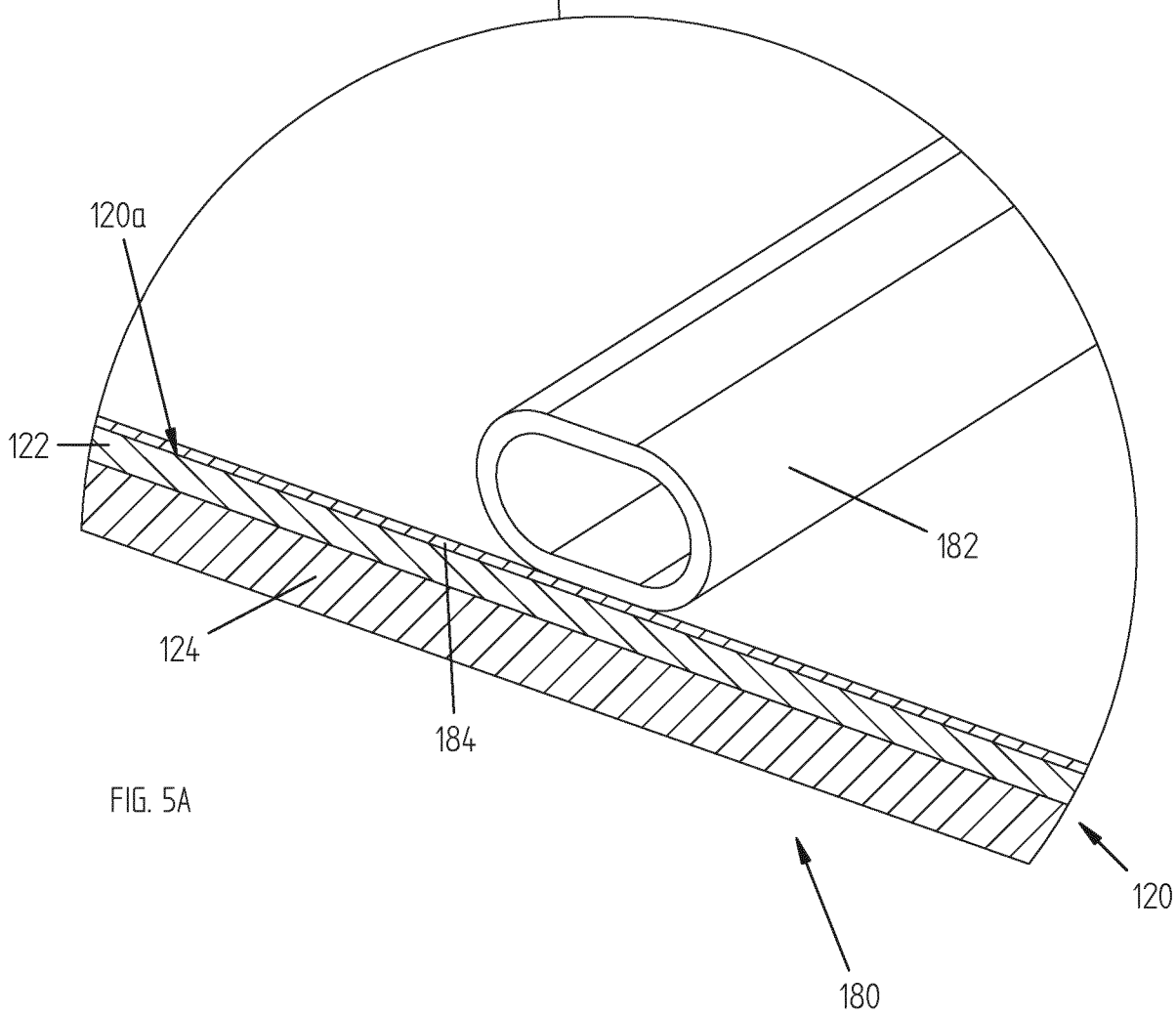
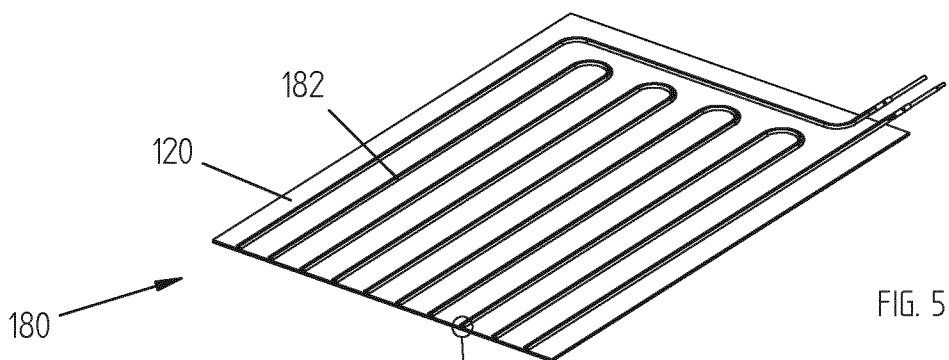
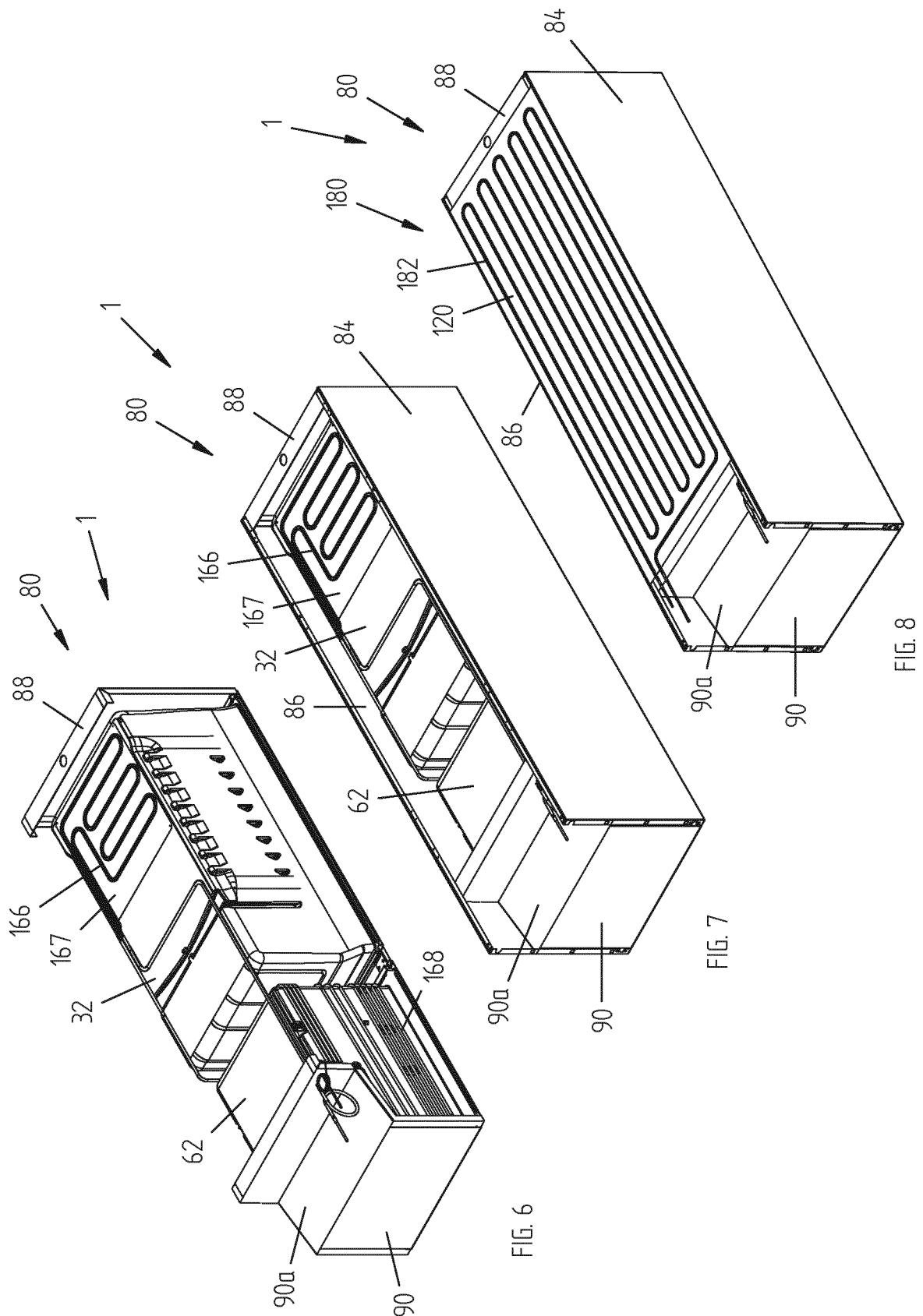
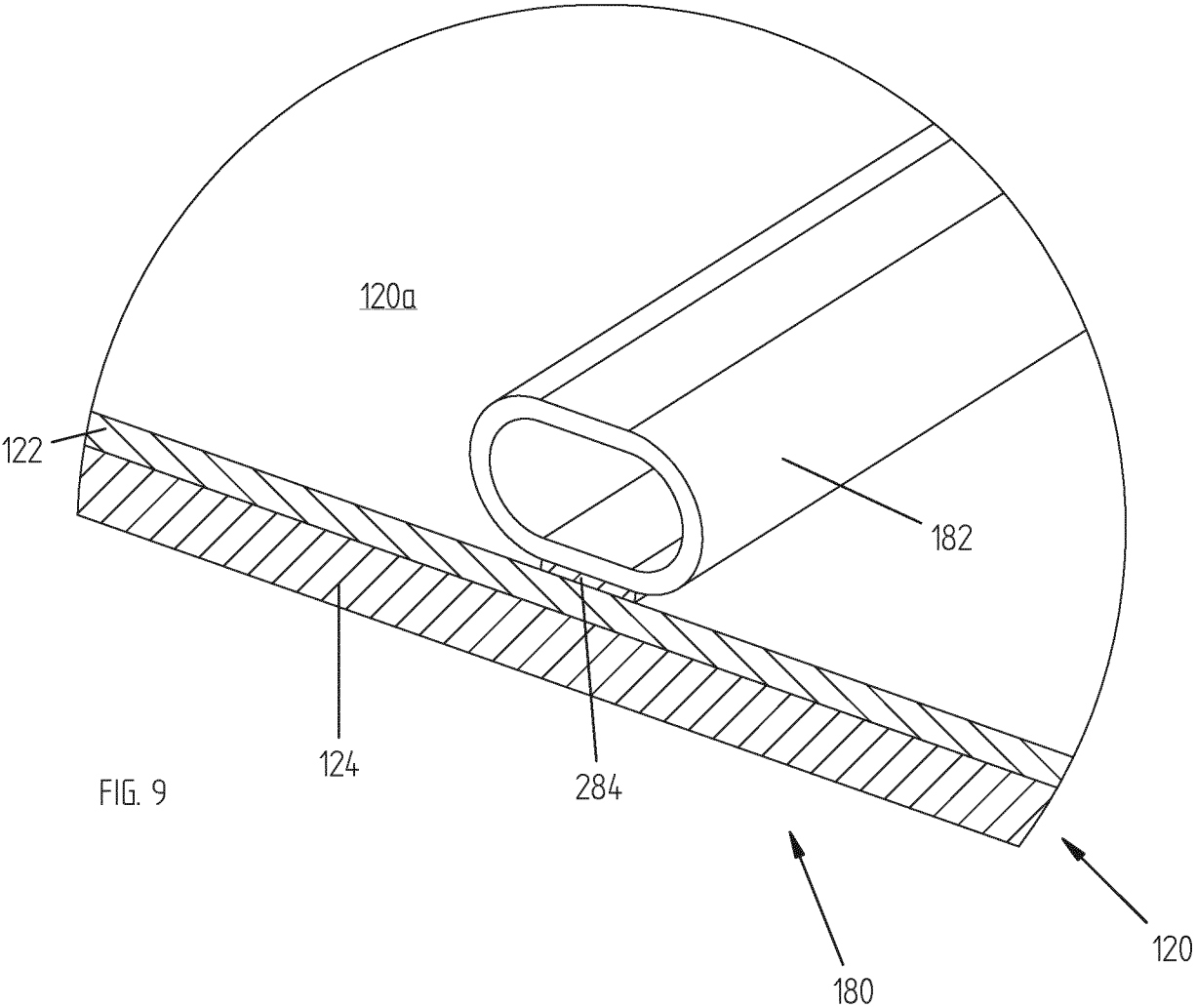


FIG. 4







INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/068823

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F25B39/04 F25D23/06
 ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 F25B F25D

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 10 2006 061154 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 26 June 2008 (2008-06-26)	1,2,5-12
Y	paragraph [0020] - paragraph [0026]; figures 1,2,4	3,4
Y	----- EP 0 438 023 A1 (GRAM BRDR AS [DK]) 24 July 1991 (1991-07-24) column 3, line 27 - line 28	3
Y	----- JP H04 186079 A (HITACHI LTD) 2 July 1992 (1992-07-02) figures 2,5,6,7	4
X	----- DE 10 2009 028179 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 17 February 2011 (2011-02-17) the whole document ----- -/-	1,2



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No

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