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(54) REFRIGERATION APPLIANCE

(57) A refrigeration appliance comprises at least one compartment for the storage of products to be cooled and an outer cabinet (2) enclosing said at least one compartment and a refrigeration system (100; 210) configured to cool said at least one compartment and comprising a closed refrigerating circuit (102; 202) filled with a refrigerant. A working chamber (20) is apt to receive at least one component (102a, 114) of the refrigerating circuit (102; 202) and/or at least one electrical cable (116; 216) for the functioning of the appliance, wherein at least one chamber wall (30A, 30B) at least partially delimits the working chamber (20). The appliance (1; 201) comprises a holding device (50A, 50B) apt to be removably connected to said at least one chamber wall (30A, 30B) and apt to at least temporarily hold said at least one component (102a, 114) of said refrigerating circuit (102; 202) and/or said at least one electrical cable (116; 216).

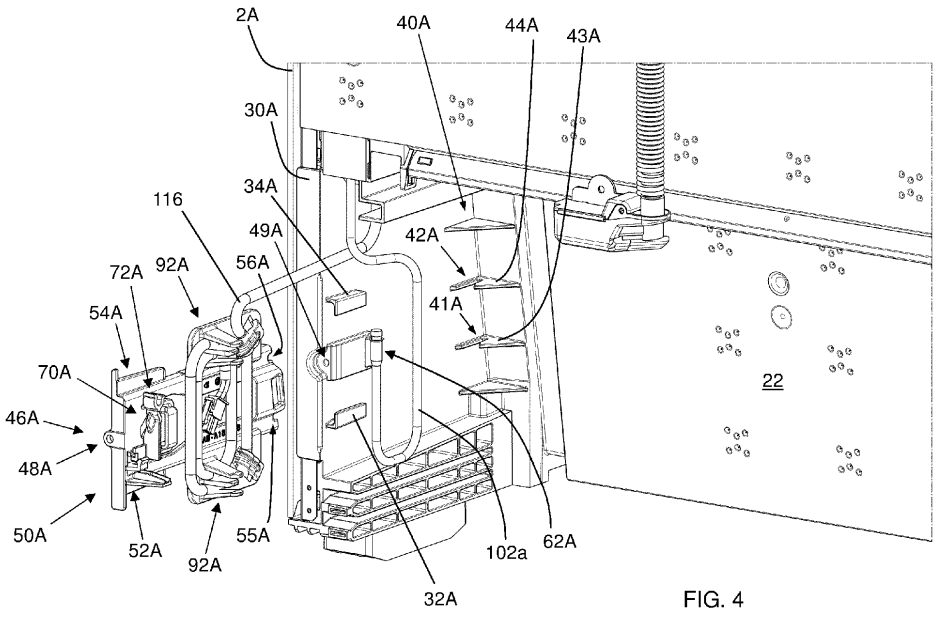

FIG. 4

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a refrigeration appliance, in particular to a refrigeration appliance provided with a working chamber receiving components for the functioning of the appliance.

BACKGROUND ART

[0002] Nowadays refrigeration appliances are extensively used, in particular refrigeration appliances for domestic use. We will refer, in particular, to domestic refrigeration appliances comprising one or more compartments, for example fresh food compartments and/or freezer compartments, for the storage of food and/or beverages.

[0003] A refrigeration appliance, hereinafter indicated simply with the term refrigerator, typically comprises a parallelepiped-shaped outer cabinet apt to place the refrigerator in a standing working position and an inner liner, disposed within the outer cabinet, which defines said one or more compartments.

[0004] The refrigeration is then equipped with a refrigeration system apt to cool the compartments and comprises a closed refrigerating circuit filled with a refrigerant. The refrigeration system preferably comprises an electric motor-driven compressor, a condenser heat exchanger, a capillary tube, an evaporator and a fan for creating a cooling air stream for the compartment/s.

[0005] Part of the components of the refrigeration system are preferably arranged in a proper chamber of the refrigerator, or working chamber. The working chamber and components contained therein, for example the compressor and the capillary tube, are preferably arranged on the bottom of the cabinet at its back side.

[0006] The working chamber also preferably receives one or more electrical cables for the functioning of the appliance, such as power supply electrical cables for the compressor and/or data communication electrical cables, for example cables for data detected from sensors.

[0007] The working chamber is typically defined by lateral sides that laterally delimit the working chamber itself and is preferably open towards the outside so that it can be conveniently accessible in case of maintenance.

[0008] The realization of the appliance implies several manufacturing steps for assembling the components in the correct reciprocal position. A particular attention has to be paid to precisely assembling the components in the correct reciprocal position inside the working chamber.

[0009] Therefore, positioning and fixing of components inside the working chamber have a relevant impact on the manufacturing steps in terms of number of components required and/or complicated components management and/or handling difficulty of the components. This negatively affects time and costs during manufacturing.

[0010] Furthermore, due to the relevant number of components received in the working chamber, maintenance operations may also be difficult.

[0011] One object of the present invention is therefore to overcome the limits posed by the known techniques.

[0012] It is an object of the invention to provide a refrigeration appliance that optimizes assembling operations compared to known techniques.

[0013] It is another object of the invention to provide a refrigeration appliance that simplifies the manufacturing process.

[0014] It is a further object of the invention to provide a refrigeration appliance that simplifies maintenance operations.

DISCLOSURE OF INVENTION

[0015] The applicant has found that by providing a refrigeration appliance having an outer cabinet, a refrigeration system comprising a closed refrigerating circuit filled with a refrigerant and a working chamber apt to receive at least one component of the refrigerating circuit and/or at least one electrical cable for the functioning of said appliance and by providing a holding device apt to be removably connected to at least one chamber wall of the working chamber and apt to at least temporarily hold the component of the refrigerating circuit and/or the electrical cable, it is possible to optimize assembling operations of the appliance.

[0016] According to one aspect of the present disclosure there is provided a refrigeration appliance comprising:

- at least one compartment for the storage of products to be cooled and an outer cabinet enclosing said at least one compartment;
- a refrigeration system configured to cool said at least one compartment and comprising a closed refrigerating circuit filled with a refrigerant;
- a working chamber apt to receive at least one component of said refrigerating circuit and/or at least one electrical cable for the functioning of said appliance;
- at least one chamber wall at least partially delimiting said working chamber; wherein said appliance comprises a holding device apt to be removably connected to said at least one chamber wall and apt to at least temporarily hold said at least one component of said refrigerating circuit and/or said at least one electrical cable.

[0017] Preferably, the holding device is slidingly associated to the chamber wall. Advantageously, the holding device is easily moved for insertion into, or removal from, the working chamber either in assembling of the refrigerator or in case of maintenance operations.

[0018] In a preferred embodiment, the chamber wall comprises at least one slit surface and the holding device comprises at least one respective protruding rib apt to slidingly engage with said one slit surface or the holding

device comprises at least one slit surface and the wall chamber comprises at least one respective protruding rib apt to slidingly engage with said one slit surface.

[0019] According to a preferred embodiment of the invention, the appliance comprises a snap-in device apt to maintain the holding device in a stable position with respect to said at least one chamber wall.

[0020] Advantageously, a quick disconnection of the holding device is also enhanced.

[0021] Preferably, the snap-in device comprises at least one tooth element associated to the chamber wall and at least one respective retaining surface associated to the holding device or at least one tooth element associated to the holding device and at least one respective retaining surface associated to the chamber wall.

[0022] In a preferred embodiment, wherein said one tooth element and/or the retaining surface are arranged inside the working chamber in a position so as to be reachable with a disengaging tool for disengaging said one tooth element from the retaining surface.

[0023] Advantageously, the tooth element is easily reachable from an open side of the working chamber. Assembling or disassembling of the holding device thus advantageously requires only an external handling by an operator.

[0024] According to a preferred embodiment of the invention, said at least one component of the refrigerating circuit comprises a tubular-shaped component, preferably a circulating tube for the refrigerant or a valve or a capillary tube or a fluxmeter or a filter.

[0025] Preferably, the holding device comprises at least one protruding element apt to at least temporarily hold said at least one component of the refrigerating circuit and/or said at least one electrical cable.

[0026] In a preferred embodiment, said at least one protruding element comprises a movable bracket apt to be positioned in a rest position and in an operating position, wherein in the operating position the movable bracket holds said at least one component or said at least one electrical cable.

[0027] Preferably, the movable bracket in the rest position does not hold said at least one component or said at least one electrical cable.

[0028] Advantageously, at least during assembly of the holding device into the working chamber or disassembly of the holding device from the working chamber the movable bracket may be positioned in rest position so that it is not cumbersome. According to a preferred embodiment of the invention, the movable bracket is a rotatable bracket apt to be rotated between the operating position and the rest position.

[0029] Advantageously, the movable bracket in its operating position precisely holds said at least one component or said at least one electrical cable inside the working chamber.

[0030] Furthermore, advantageously, said at least one component or said at least one electrical cable is kept in position inside the working chamber thus avoiding the contact with other components.

[0031] Preferably, in the rest position the rotatable bracket is arranged parallel to the chamber wall and in the operating position the rotatable bracket is inclined with respect to the chamber wall, preferably is perpendicular with respect to the chamber wall.

[0032] In a preferred embodiment, the movable bracket comprises a gripping portion apt to surround said at least one component or said at least one electrical cable, preferably the gripping portion comprises a clip, more preferably a snap-in open clip.

[0033] According to a preferred embodiment of the invention, said at least one protruding element comprises a plurality of tongues, more preferably elastic tongues, apt to define at least one seat to hold, or temporarily hold, said at least one component or said at least one electrical cable.

[0034] Preferably, the appliance further comprises a retaining device apt to keep the holding device in position inside the working chamber.

[0035] In a preferred embodiment, the retaining device comprises one or more recesses provided at the chamber wall and one or more corresponding retaining surfaces provided at the holding device, preferably said or more recesses being defined at reinforcing ribs of the chamber wall.

[0036] According to a further preferred embodiment of the invention, the retaining device comprises a screw insertable in a hole of the holding device and engageable in a hole of the chamber wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of preferred embodiments of the invention, provided with reference to the enclosed drawings. In such drawings:

- Figure 1 shows a rear perspective view of a refrigeration appliance according to a preferred embodiment of the invention;
- Figure 2 shows an enlarged detail of Figure 1;
- Figure 3 shows the detail of Figure 2 from another point of view;
- Figure 4 shows a detail of Figure 2 in a pre-assembled position;
- Figure 5 shows the detail of Figure 4 in a first assembled position;
- Figure 6 shows a plan view of Figure 5;
- Figure 7 shows an enlarged view of a detail of Figure 6 in a final assembled position;
- Figure 8 is a cross section view along line VII°-VII° of figure 6;
- Figure 8A shows the section of figure 8 in a disengaging position;
- Figure 9 shows a detail of Figure 3 in a pre-assembled position;

- Figure 10 shows the detail of Figure 9 in a first assembled position;
- Figure 11 shows an enlarged view of a detail of Figure 10 in a final assembled position;
- Figure 12 shows the enlarged detail of Figure 2 of a refrigeration appliance according to a further preferred embodiment of the invention;
- Figure 13 shows the detail of Figure 12 from another point of view;
- Figure 14 shows a detail of Figure 12 in a pre-assembled position;
- Figure 15 shows a detail of Figure 13 in a pre-assembled position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

[0038] The refrigeration appliance according to the present invention has proved to be particularly advantageous when refers to a refrigeration appliance for domestic use. It should in any case be underlined that the present invention is not limited to this particular embodiment. On the contrary, the present invention conveniently refers to any refrigeration appliance being provided with a working chamber wherein components for the functioning of the refrigeration appliance are arranged.

[0039] Referring to Figure 1 a refrigeration appliance, or refrigerator, in the form of a domestic stand-alone refrigerator is shown, indicated generally as 1. Although the detailed description that follows concerns a domestic stand-alone refrigerator 1, the refrigeration appliance can be embodied by refrigeration appliances other than a domestic refrigerator.

[0040] Furthermore, the embodiments described in detail below refers to a refrigerator comprising one fresh food compartment. However, the refrigerator according to the invention can have any desired configuration, for example a refrigerator comprising only one freezer compartment or a bottom mount refrigerator, i.e. of the type including a freezer compartment disposed vertically below a fresh food compartment, or a top mount refrigerator wherein a freezer compartment is disposed vertically above a fresh food compartment.

[0041] Furthermore, while the present application is described with reference to a stand-alone refrigerator it has to be noted that also a built-in solution may be contemplated.

[0042] The refrigerator 1 preferably comprises a fresh food compartment, not shown in the figures. The refrigerator 1 preferably comprises an outer cabinet 2 and an inner liner (not shown), internally received in the outer cabinet 2, that preferably defines said fresh food compartment.

[0043] A door 15 is preferably pivotally mounted to the outer cabinet 2 and is movable between an open position and a closed position to cover the fresh food compartment.

[0044] A refrigeration system 100 is preferably provided to cool the fresh food compartment, more preferably the refrigeration system 100 is apt to cool down air which is circulated inside the fresh food compartment.

[0045] The refrigeration system 100 preferably comprises components configured to generate said cooling air flow. The refrigeration system 100 preferably comprises a closed refrigerating circuit 102 filled with a suitable refrigerant, for example R12 or R134a. The refrigeration system 100 preferably comprises an electric motor-driven compressor 104, a condenser heat exchanger 106, a pressure device such as a capillary tube or a thermostatic valve and an evaporator. A fan is also preferably used to circulate the cooled air inside the fresh food compartment. The refrigerating circuit 102 is preferably embodied as a plurality tubular-shaped circulating tube portions 102a, 102b, 102c properly connected to form a closed circuit.

[0046] A filter 114 is also preferably arranged along the closed refrigerating circuit 102 to filter impurities that may be present in the refrigerant. The filter 114 is preferably arranged between a condenser heat exchanger 106 and the pressure device.

[0047] The filter 114 is preferably embodied as a tubular-shaped component.

[0048] An electrical cable 116 is provided to supply electrical power to the electric motor 104a of the compressor 104. According to the preferred embodiment shown in Figures 1 to 11, the electric motor 104a is a fixed speed motor 104a. The outer cabinet 2 is preferably parallelepiped-shaped and preferably comprises side walls 2A, 2B, 2C, 2D, preferably two lateral side walls 2A, 2B, a rear side wall 2C and a top side wall 2D.

[0049] In its standing working position, lateral side walls 2A, 2B and the rear side wall 2C are preferably aligned to a vertical direction.

[0050] Some of the above-described components of the refrigeration system 100 are preferably arranged in a working chamber 20 of the refrigerator 1.

[0051] The working chamber 20 is preferably arranged at the back side of the refrigerator 1 and preferably at a bottom part of the rear side wall 2C.

[0052] The working chamber 20 is preferably open towards the outside so that dissipation of heat produced by components inside the working chamber 20 is enhanced, in particular heat produced by the compressor 104 and/or the electric motor 104a. Furthermore, working chamber 20 can be conveniently accessible in case of maintenance.

[0053] The working chamber 20 is preferably defined by one or more chamber walls 30A, 30B, 22.

[0054] Two lateral chamber walls 30A, 30B preferably laterally delimit the working chamber 20 and a rear chamber wall 22 preferably delimits the working chamber 20 in the back-to-front direction.

[0055] The rear chamber wall 22 is preferably embodied as a shaped panel 22 used to also thermally insulating the working chamber 20 with respect to the fresh food compartment.

[0056] The lateral chamber walls 30A, 30B of the working chamber 20 are preferably constituted by respective separated lower parts of the lateral side walls 2A, 2B of the outer cabinet 2.

[0057] In a preferred embodiment, the lateral chamber walls 30A, 30B are therefore preferably constituted by separated base supports 30A, 30B facing each other. The two base supports 30A, 30B are preferably fixedly connected to respective lower portions of the lateral side walls 2A, 2B. Preferably, the base supports 30A, 30B are constituted of plastic bodies.

[0058] The base supports 30A, 30B advantageously support the refrigerator 1 when the latest is positioned in its standing working position.

[0059] In different preferred embodiments, the lateral chamber walls of the working chamber may correspond to the lower part of the lateral side walls of the outer cabinet or, in other words, the lateral chamber walls of the working chamber are not separated parts from the lateral side walls of the outer cabinet.

[0060] Furthermore, the base supports 30A, 30B are opportunely configured to receive a supporting element 24 which is preferably arranged in the lower part of the working chamber 20, preferably to support components inside the working chamber 20. More preferably the supporting element 24 supports the compressor 104 which is preferably fixed with screws 26 to the supporting element 24. According to an aspect of the invention, a holding device 50A, 50B is apt to be removably connected to the base support 30A, 30B to hold, or temporarily hold, at least one component 102a, 114 of the refrigerating circuit 102 and/or an electrical cable 116, as better described later.

[0061] In the preferred embodiment illustrated herein, there are provided two holding devices 50A, 50B removably connected to the respective base supports 30A, 30B, namely a right holding device 50A removably connected to the right supports 30A and a left holding device 50B removably connected to the left support 30B.

[0062] The two holding devices 50A, 50B have substantially the same shape and functionality, as better described later.

[0063] Hereinafter, the description will be firstly focused on the right holding device 50A.

[0064] The right holding device 50A preferably comprises an approximately parallelepiped-shaped body, preferably made of plastic.

[0065] As said above, the right holding device 50A is removably connected to the right support 30A and more preferably the right holding device 50A is removably connected in a sliding way to the right support 30A.

[0066] The right holding device 50A is thus preferably displaceable in at least an extracted position, as illustrated for example in Figure 4, and an inserted or working position, as illustrated for example in Figures 2, 5 and 6.

[0067] The extracted position preferably represents either a possible pre-assembled position of the holding device 50A during assembling of the refrigerator 1 or a position useful in case of maintenance operations.

[0068] The right support 30A preferably comprises two slit surfaces 32A, 34A facing one the other and preferably vertically arranged one above the other. The holding device 50A comprises two respective protruding ribs 52A, 54A apt to slidingly engage with respective slit surfaces 32A, 34A of the right support 30A.

[0069] The right holding device 50A is therefore easily moved for insertion into, or removal from, the working chamber 20 and ribs 52A, 54A advantageously slide along slit surfaces 32A, 34A during said movements.

[0070] One or more retaining devices 40A, 46A are further preferably provided to keep the holding device 50A in the working position.

[0071] A first retaining device 40A preferably comprises one or more recesses 41A, 42A provided at the right support 30A which engage with retaining surfaces 55A, 56A of the right holding device 50A when the holding device 50A in placed in the working position. The recesses 41A, 42A are preferably defined at reinforcing ribs 43A, 44A of the right support 30A. The reinforcing ribs 43A, 44A are preferably realized on the right support 30A at an innermost position inside the working chamber 20. The retaining surfaces 55A, 56A of the right holding device 50A are preferably realized on a head portion of the holding device 50A. A second retaining/fixing device 46A preferably comprises a screw (not shown) insertable in a hole 48A of the right holding device 50A and engageable in a hole 49A of the right support 30A.

[0072] The hole 48A of the right holding device 50A is preferably realized on the right support 30A at an outermost position of the working chamber 20. The screw can be therefore easily screwed and unscrewed, during assembling steps and/or maintenance operations.

[0073] A snap-in device 60A if further preferably provided to maintain the holding device 50A in a stable position with respect to the right support 30A and to allow a quick disconnection of the holding device 50A from the right support 30A, as better described below.

[0074] The snap-in device 60A, better shown in Figure 8, preferably comprises a tooth element 62A associated to the right support 30A and a respective retaining surface 64A associated to the holding device 50A. The tooth element 62A engages the retaining surface 64A when the holding device 50 is in the working position.

[0075] The retaining surface 64A is preferably defined in a bridge portion 66A of the holding device 50A. The bridge portion 66A preferably has a slot 68A which preferably opens towards the open side of the working chamber 20. Advantageously, disengagement of the tooth element 62A from the retaining surface 64A may be carried out by inserting a disengaging tool T thorough the slot 68A, as illustrated in Figure 8A, which partially deforms the bridge portion 66A so that the retaining surface 64A is sufficiently separated from the tooth element 62A allowing its disengagement.

[0076] Advantageously, the tooth element 62A is easily reachable from the open side of the working chamber

20. Assembling or disassembling of the holding device 50 thus advantageously requires only an external handling by an operator.

[0077] In a different preferred embodiment, the snap-in device may comprise a tooth element associated to the holding device and a respective retaining surface associated to right support.

[0078] According to the preferred embodiment described above, the two retaining devices 40A, 46A and the snap-in device 60A enhance the holding device 50A to be safely maintained in the working position and/or to be easily removed from the working chamber 20.

[0079] In different preferred embodiments, nevertheless, only one of the two retaining devices and/or only the snap-in device may be contemplated.

[0080] According to another aspect of the invention, the holding device 50 preferably comprises at least one protruding element 70A, 90A apt to hold, or temporarily hold, at least one component 102a, 114 of the refrigerating circuit 102 and/or an electrical cable 116.

[0081] In a preferred embodiment, the protruding element 70A comprises a movable bracket 70A apt to be positioned between a rest position, as shown for example in Figures 4, 5 and 6, and an operating position, as shown for example in Figures 2 and 7.

[0082] In the operating position the movable bracket 70A preferably holds at least one component of the refrigerating circuit 102 and/or an electrical cable.

[0083] In the preferred embodiment illustrated in the Figures, the movable bracket 70A preferably holds a tube portion 102a of the refrigerating circuit 102.

[0084] In the rest position, the movable bracket 70A does not hold any components or electrical cables.

[0085] Preferably, the movable bracket 70A is embodied as a rotatable bracket. The rotatable bracket 70A is preferably hinged to the holding device 50 at an end thereof. The rotatable bracket 70A is therefore advantageously rotatable to be at least positioned in said rest and operating positions.

[0086] Preferably, in the rest position the rotatable bracket 70A is arranged parallel to the right support 30A, i.e. substantially in vertical position. In the operating position the rotatable bracket 70A is inclined with respect to the right support 30A, preferably is perpendicular with respect to the right support 30A, i.e. substantially arranged in horizontal position.

[0087] In general, inclination of the movable bracket 70A in the operating position depends on the final inclination of component held by the movable bracket 70A. The movable bracket 70A preferably comprises a gripping portion 72A apt to surround the tube portion 102a.

[0088] The gripping portion 72A is preferably configured to match the outer shape of the component to be held. More preferably, the gripping portion 72A is configured to match the tubular shape of the component.

[0089] The gripping portion 72A preferably comprises a clip, more preferably a snap-in open clip.

[0090] The clip preferably has a substantially circular shape with an aperture 74A (Figure 7) through which the tube portion 102a is received when the movable bracket 70A is moved from the resting position to the operating position.

[0091] The clip 72A is also preferably at least partially flexible so that the tube portion 102a is firmly held therein.

[0092] In a further preferred aspect, the at least one protruding element 90A comprises a plurality of tongues, more preferably elastic tongues, apt to define at least one seat 92A to hold, or temporarily hold, at least one component of the refrigerating circuit 102 and/or an electrical cable 116.

[0093] Preferably, according to the embodiment illustrated in the Figures, the seats 92A receive the electrical power supply cable 116 of the electric motor 104a of the compressor 104, more preferably the seats 92A temporarily receive said electrical power supply cable 116, as better described later.

[0094] More preferably, the seats 92A are opportunely arranged so that the final portion of the electrical power supply cable 116 may be wound as a spiral on the holding device 50A, as illustrated in Figures 4 to 6.

[0095] Preferably, there are further provided two fixing points 94A for the electrical power supply cable 116. The two fixing points 94A preferably comprise a retaining tab with an aperture through which the electrical power supply cable 116 may be inserted to be the firmly held therein.

[0096] Hereinafter, a preferred use of the right holding device 50A is described.

[0097] The holding device 50A is firstly advantageously used during assembling steps in manufacturing of the refrigerator 1.

[0098] Figure 4 shows a pre-assembled position of the holding device 50A during manufacturing of the refrigerator 1 wherein components of the refrigeration system 100 are not yet completely assembled/connected therebetween.

[0099] In particular, the tube portions 102a, 102b of the refrigerating circuit 102 are not connected one to the other and also the power supply cable 116 is not electrically connected to the motor 104a of the compressor 104. According to the preferred step of the assembling, the power supply cable 116 is firstly preferably wound as a spiral on the holding device 50A, as shown in Figure 4. More preferably, the power supply cable 116 is inserted in respective seats 92A and fixing points 94A of the holding device 50A.

[0100] At the same time, the rotatable bracket 70A is displaced in the rest position, i.e. preferably in vertical position.

[0101] The holding device 50A is then inserted, through sliding, into the working chamber 20 up to its final working position, as shown in Figures 5 and 6.

[0102] The snap-in device 60A acts to maintain the holding device 50A in stable working position with the tooth element 62A of the right support 30A that abuts the retaining surface 64A of the holding device 50A.

[0103] In this working position, also recesses 41A, 42A

of the right support 30A preferably engage with retaining surfaces 55A, 56A of the right holding device 50A.

[0104] Finally, a screw is inserted/screwed in the hole 49A of the right support 30A to fix the right holding device 50A to the right support 30A.

[0105] The following steps of the assembling further preferably comprises:

- unwinding the final portion of the power supply cable 116 from seats 92A of the right holding device 50A and connection of the power supply cable 116 to the electric motor 104a of the compressor 104, as visible in Figure 2;
- rotating the rotatable bracket 70A from its rest vertical position to the operating position, preferably the horizontal position, so that the gripping portion/clip 72A of the rotatable bracket 70A surrounds and grips the tube portion 102a of the refrigerating circuit 102, as shown in Figure 7.

[0106] From this position, the tube portions 102a, 102b of the refrigerating circuit 102 can be connected therebetween, preferably through welding.

[0107] The rotatable bracket 70A, advantageously, in its operating position precisely holds the tube portion 102c inside the working chamber 20.

[0108] Furthermore, advantageously, the tube portion 102c is kept in position inside the working chamber 20 thus avoiding the contact with other components.

[0109] From the description above, it is clear that the final portion of the power supply cable 116 has been temporarily held by the seats 92A of the right holding device 50A during assembling. The power supply cable 116 is also held in position at the two fixing points 94A.

[0110] Advantageously, the right holding device 50A of the invention optimizes assembling operations and simplifies the manufacturing process of the refrigerator 1.

[0111] Furthermore, preferably, in case of maintenance simple disassembling operations are carried out, for example rotation of the rotatable bracket 70A from its operating position to the rest vertical position, unscrewing of the screw from the respective hole 49A, disengagement of the right holding device 50A by acting on the snap-in device 60A with the disengaging tool T and extraction of the right holding device 50A from the working chamber 20 through sliding.

[0112] Still advantageously, during assembly of the holding device 50A into the working chamber 20 or disassembly of the holding device 50A from the working chamber 20 the rotatable bracket 70A may be positioned in rest vertical position so that it is not cumbersome.

[0113] Hereinafter, the left holding device 50B will be described, being in mind that it has substantially the same shape and functionality of the right holding device 50A.

[0114] The left holding device 50B preferably comprises an approximately parallelepiped-shaped body, preferably made of plastic.

[0115] The left holding device 50B is removably connected to the left support 30B and more preferably the left holding device 50B is removably connected in a sliding way to the left support 30B.

[0116] The left holding device 50B is thus preferably displaceable in at least an extracted position, as illustrated for example in Figure 9, and an inserted or working position, as illustrated for example in Figures 3 and 10.

[0117] The extracted position preferably represents either a possible pre-assembled position of the holding device 50B during assembling of the refrigerator 1 or a position useful in case of maintenance operations.

[0118] The left support 30B preferably comprises two slit surfaces 32B, 34B facing one the other and preferably vertically arranged one above the other. The holding device 50B comprises two respective protruding ribs 52B, 54B apt to slidingly engage with respective slit surfaces 32B, 34B of the left support 30B.

[0119] The left holding device 50B is therefore easily moved for insertion into, or removal from, the working chamber 20 and ribs 52B, 54B advantageously slide along slit surfaces 32B, 34B during said movements.

[0120] One or more retaining devices 40B, 46B are further preferably provided to keep the holding device 50B in the working position.

[0121] A first retaining device 40B preferably comprises one or more recesses 42B provided at the left support 30B which engage with retaining surfaces 55B, 56B of the left holding device 50B when the holding device 50B in placed in the working position. The recesses 42B are preferably defined at reinforcing ribs 43B, 44B of the left support 30B. The reinforcing ribs 43B, 44B are preferably realized on the left support 30B at an innermost position inside the working chamber 20. The retaining surfaces 55B, 56B of the left holding device 50B are preferably realized on a head portion of the holding device 50B.

[0122] A second retaining/fixing device 46B preferably comprises a screw (not shown) insertable in a hole 48B of the left holding device 50B and engageable in a hole 49B of the left support 30B.

[0123] The hole 48B of the left holding device 50B is preferably realized on the left support 30B at an outermost position of the working chamber 20. The screw can be therefore easily screwed and unscrewed, during assembling steps and/or maintenance operations.

[0124] A snap-in device 60B if further preferably provided to maintain the holding device 50B in a stable position with respect to the left support 30B and to allow a quick disconnection of the holding device 50B from the left support 30B.

[0125] The snap-in device 60B substantially corresponds to the snap-in device 60A illustrated and described with respect to the right holding device 50A and therefore not described in detail.

[0126] According to the preferred embodiment described above, the two retaining devices 40B, 46B and the snap-in device 60B enhance the left holding device 50B to be safely maintained in the working position and/or to be easily removed from the working chamber 20.

[0127] In different preferred embodiments, nevertheless, only one of the two retaining devices and/or only the snap-in device may be contemplated.

[0128] According to another aspect of the invention, the holding device 50 preferably comprises at least one protruding element 70B, 90B apt to hold, or temporarily hold, at least one component 114 of the refrigerating circuit 102.

[0129] In a preferred embodiment, the protruding element 70B comprises a movable bracket 70B apt to be positioned between a rest position, as shown for example in Figures 9 and 10, and an operating position, as shown for example in Figures 3 and 11.

[0130] In the operating position the movable bracket 70B preferably holds at least one component 114 of the refrigerating circuit 102 and/or an electrical cable.

[0131] In the preferred embodiment illustrated in the Figures, the movable bracket 70B preferably holds the filter 114 of the refrigerating circuit 102.

[0132] In the rest position, the movable bracket 70B does not hold any components or electrical cables.

[0133] Preferably, the movable bracket 70B is embodied as a rotatable bracket. The rotatable bracket 70B is preferably hinged to the holding device 50B at an end thereof. The rotatable bracket 70B is therefore advantageously rotatable to be at least positioned in said rest and operating positions.

[0134] Preferably, in the rest position the rotatable bracket 70B is arranged parallel to the left support 30B, i.e. substantially in vertical position. In the operating position the rotatable bracket 70B is inclined with respect to the left support 30B, preferably is perpendicular with respect to the left support 30B, i.e. substantially arranged in horizontal position.

[0135] In general, inclination of the movable bracket 70B in the operating position depends on the final inclination of component held by the movable bracket 70B. The movable bracket 70B preferably comprises a gripping portion 72B apt to surround the filter 114.

[0136] The gripping portion 72B is preferably configured to match the outer shape of the component to be held. More preferably, the gripping portion 72B is configured to match the tubular shape of the component.

[0137] The gripping portion 72B preferably comprises a clip, more preferably a snap-in open clip.

[0138] The clip 72B preferably has a substantially circular shape with an aperture 74B (Figure 11) through which the filter 114 is received when the movable bracket 70B is moved from the resting position to the operating position.

[0139] The clip 72B is also preferably at least partially flexible so that the filter 114 is firmly held therein.

[0140] In a further preferred aspect, the at least one protruding element comprises a plurality of tongues, more preferably elastic tongues, apt to define at least one seat 92B to hold, or temporarily hold, at least one component of the refrigerating circuit 102 and/or an electrical cable.

[0141] According to the embodiment illustrated in the Figures 9 to 11, the seats 92B are not eventually used. In different embodiments, as illustrated for example in the preferred embodiment shown in Figures 12 to 15, the seats 92B are preferably configured to receive an electrical cable 216.

[0142] More preferably, the seats 92B are opportunely arranged to temporarily hold the cable 216 during assembling, as better described later.

[0143] Preferably, there are further provided two fixing points 94B for an electrical cable. The two fixing points 94B preferably comprise a retaining tab with an aperture through which the cable may be eventually inserted to be the firmly held therein.

[0144] Hereinafter, a preferred use of the left holding device 50B is described.

[0145] The holding device 50B is firstly advantageously used during assembling steps in manufacturing of the refrigerator 1.

[0146] Figure 9 shows a pre-assembled position of the holding device 50B during manufacturing of the refrigerator 1 wherein components of the refrigeration system 100 are not yet completely assembled/connected therebetween.

[0147] In particular, a tube portion 102c and a temporary cap 114a is initially arranged inside the working chamber 20 while the filter 114 is not yet assembled. According to the preferred step of the assembling, the left holding device 50B does not held any component and at the same time the rotatable bracket 70B is displaced in the rest position, i.e. preferably in vertical position.

[0148] The holding device 50B is then inserted, through sliding, into the working chamber 20 up to its final working position, as shown in Figure 10.

[0149] The snap-in device 60B acts to maintain the holding device 50B in stable working position.

[0150] In this working position, also recesses 42B of the left support 30B preferably engage with retaining surfaces 55B, 56B of the left holding device 50B.

[0151] Finally, a screw is inserted/screwed in the hole 49B of the left support 30B to fix the left holding device 50B to the left support 30B.

[0152] The following step of the assembling preferably comprises the removal of the temporary cap 114a from the tube portion 102c and the connection of the filter 114. The following step further preferably comprises rotating the rotatable bracket 70B from its rest vertical position to the operating position, preferably the horizontal position, so that the gripping portion 72B of the rotatable bracket 70B surrounds and grips the filter 114, as shown in Figures 3 and 11.

[0153] The rotatable bracket 70B, advantageously, in its operating position precisely holds the filter 114 inside the working chamber 20.

[0154] Furthermore, advantageously, the filter 114 is kept in position inside the working chamber 20 thus avoiding the contact with other components.

[0155] Advantageously, the left holding device 50B of

the invention optimizes assembling operations and simplifies the manufacturing process of the refrigerator.

[0156] Furthermore, preferably, in case of maintenance simple disassembling operations are carried out, for example rotation of the rotatable bracket 70B from its operating position to the rest vertical position, unscrewing of the screw from the respective hole 49B, disengagement of the left holding device 50B by acting on the snap-in device 60B with a disengaging tool and extraction of the left holding device 50B through sliding.

[0157] Still advantageously, during assembly of the holding device 50B into the working chamber 20 or disassembly of the holding device 50B from the working chamber 20 the rotatable bracket 70B may be positioned in rest vertical position so that it is not cumbersome.

[0158] Figures 12 to 15 refer to a refrigeration appliance 201 according to a further preferred embodiment of the invention.

[0159] In the drawings, corresponding characteristics and/or components compared to previous preferred embodiment are identified by the same reference numbers. The refrigeration appliance 201 of this preferred embodiment differs from the refrigeration appliance 1 previously described mainly in the different arrangement and/or type of components of refrigerating circuit 202 and/or electrical cables of the refrigeration system 210.

[0160] A first difference is that the compressor 104 is driven through a variable speed electric motor 204a (Figure 12) rather than a fixed speed electric motor, more preferably through an inverter device. The electrical cable 116, therefore, supplies electrical power to the variable speed electric motor 204a.

[0161] A second difference is that the refrigeration system 210 further comprises a diverting valve 214 arranged in the refrigerating circuit 202 and received in the working chamber 20. A diverting valve is preferably used when the refrigerant in a refrigerating circuit system needs to be diverted in two or more different directions.

[0162] An electrical cable 216 preferably supplies electrical power to the diverting valve 214.

[0163] All other components of the refrigeration appliance 201 preferably correspond to the components previously described, in particular the right and left holding devices 50A, 50B are as described above.

[0164] Hereinafter, a preferred use of the right holding device 50A is described.

[0165] The holding device 50A is firstly advantageously used during assembling steps in manufacturing of the refrigerator 201.

[0166] Figure 14 shows a pre-assembled position of the holding device 50A during manufacturing of the refrigerator 201 wherein components of the refrigeration system 210 are not yet completely assembled/connected therebetween.

[0167] In particular, the tube portions 102a, 102b of the refrigerating circuit 202 are not connected one to the other and also the power supply cable 116 is not electrically connected to the motor 204a of the compressor 104.

According to the preferred step of the assembling, the power supply cable 116 is firstly preferably wound as a spiral on the holding device 50A, as shown in Figure 14. More preferably, the power supply cable 116 is inserted in respective seats 92A and fixing points 94A of the holding device 50A.

[0168] At the same time, the rotatable bracket 70A is displaced in the rest position, i.e. preferably in vertical position.

[0169] The holding device 50A is then inserted, through sliding, into the working chamber 20 up to its final working position, as shown in Figure 12.

[0170] The snap-in device 60A acts to maintain the holding device 50A in stable working position inside the working chamber 20.

[0171] In this working position, also recesses 41A, 42A of the right support 30A preferably engage with retaining surfaces 55A, 56A of the right holding device 50A.

[0172] Finally, a screw is inserted/screwed in the hole 49A of the right support 30A to fix the right holding device 50A to the right support 30A.

[0173] The following steps of the assembling further preferably comprises:

- unwinding the final portion of the power supply cable 116 from seats 92A of the right holding device 50A and connection of the power supply cable 116 to the electric motor 204a of the compressor 104, as visible in Figure 12;
- rotating the rotatable bracket 70A from its rest vertical position to the operating position, preferably the horizontal position, so that the gripping portion/clip 72A of the rotatable bracket 70A surrounds and grips the tube portion 102a of the refrigerating circuit 202, as shown in Figure 12.

[0174] From this position, the tube portions 102a, 102b of the refrigerating circuit 202 can be connected therebetween, preferably through welding.

[0175] Hereinafter, a preferred use of the left holding device 50B is described.

[0176] The holding device 50B is firstly advantageously used during assembling steps in manufacturing of the refrigerator 1.

[0177] Figure 15 shows a pre-assembled position of the holding device 50B during manufacturing of the refrigerator 201 wherein components of the refrigeration system 210 are not yet completely assembled/connected therebetween.

[0178] In particular, a tube portion 102c and a temporary cap 114a is initially arranged inside the working chamber 20 while the filter 114 is not yet assembled. Furthermore, the power supply cable 216 is not electrically connected to the to the diverting valve 214.

[0179] According to the preferred step of the assembling, the left holding device 50B does not held any component and at the same time the rotatable bracket 70B is displaced in the rest position, i.e. preferably in vertical

position.

[0180] According to the preferred step of the assembling, the power supply cable 216 is firstly preferably wound as a spiral on the right holding device 50B, as shown in Figure 15. More preferably, the power supply cable 216 is inserted in respective seats 92B and fixing points 94B of the holding device 50B.

[0181] At the same time, the rotatable bracket 70B is displaced in the rest position, i.e. preferably in vertical position.

[0182] The holding device 50B is then inserted, through sliding, into the working chamber 20 up to its final working position, as shown in Figure 13.

[0183] The snap-in device 60B acts to maintain the holding device 50B in stable working position inside the working chamber 20.

[0184] In this working position, also recesses of the left support 30B preferably engage with retaining surfaces 55A, 56A of the left holding device 50B.

[0185] Finally, a screw is inserted/screwed in the hole 49B of the left support 30B to fix the left holding device 50B to the left support 30B.

[0186] The following steps of the assembling further preferably comprises:

- unwinding the final portion of the power supply cable 216 from seats 92B of the left holding device 50B and connection of the power supply cable 216 to the to the diverting valve 214, as visible in Figure 13;
- removing the temporary cap 114a from the tube portion 102c and the connection of the filter 114;
- rotating the rotatable bracket 70B from its rest vertical position to the operating position, preferably the horizontal position, so that the gripping portion 72B of the rotatable bracket 70B surrounds and grips the filter 114, as shown in Figure 13.

[0187] The holding devices 50A, 50B, therefore, optimize assembling operations and simplifies the manufacturing process of the refrigerator.

[0188] From the above descriptions, furthermore, it is clear that same holding devices can be used for different refrigeration appliance models, for example refrigeration appliances with different refrigeration systems, thus reducing manufacturing costs and number of components required.

[0189] While the present invention has been described with reference to the particular components of the refrigerating circuit such as tubes and filter, it should be noted that the present invention is not limited to said specific components and other components may be advantageously held, or temporarily held, by the holding device according to the invention, for example valves, capillary tubes, fluxmeters, etc. Components are preferably tubularly-shaped.

[0190] Analogously, while the present invention has been described with reference to electrical cables supplying electrical power to the compressor motor or to a to the diverting valve, it should be noted that the present invention is not limited to power supply cable and other electrical cable may be advantageously held, or temporarily held, by the holding device according to the invention, such as data communication electrical cables, for example cables for data detected from sensors.

[0191] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, the refrigeration appliance of the invention makes it possible to optimize assembling operations compared to known techniques. While the present invention has been described with reference to the particular embodiments shown in the figures, it should be noted that the present invention is not limited to the specific embodiments illustrated and described herein; on the contrary, further variants of the embodiments described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. A refrigeration appliance (1; 201) comprising:

- at least one compartment for the storage of products to be cooled and an outer cabinet (2) enclosing said at least one compartment;
- a refrigeration system (100; 210) configured to cool said at least one compartment and comprising a closed refrigerating circuit (102; 202) filled with a refrigerant;
- a working chamber (20) apt to receive at least one component (102a, 114) of said refrigerating circuit (102; 202) and/or at least one electrical cable (116; 216) for the functioning of said appliance (1; 201);
- at least one chamber wall (30A, 30B) at least partially delimiting said working chamber (20);

wherein said appliance (1; 201) comprises a holding device (50A, 50B) apt to be removably connected to said at least one chamber wall (30A, 30B) and apt to at least temporarily hold said at least one component (102a, 114) of said refrigerating circuit (102; 202) and/or said at least one electrical cable (116; 216).

2. An appliance (1; 201) according to claim 1, wherein said holding device (50A, 50B) is slidingly associated to said at least one chamber wall (30A, 30B).

3. An appliance (1; 201) according to claim 2, wherein said at least one chamber wall (30A, 30B) comprises at least one slit surface (32A, 34A, 32B, 34B) and said holding device (50A, 50B) comprises at least one respective protruding rib (52A, 54A, 52B, 54B) apt to slidingly engage with said one slit surface (32A, 34A, 32B, 34B) or said holding device comprises at

least one slit surface and said wall chamber comprises at least one respective protruding rib apt to slidingly engage with said one slit surface.

4. An appliance (1; 201) according to any of the preceding claims, wherein said appliance (1; 201) comprises a snap-in device (60A, 60B) apt to maintain said holding device (50A, 50B) in a stable position with respect to said at least one chamber wall (30A, 30B).

5. An appliance (1; 201) according to claim 4, wherein said snap-in device (60A, 60B) comprises at least one tooth element (62A) associated to said at least one chamber wall (30A, 30B) and at least one respective retaining surface (64A) associated to said holding device (50A, 50B) or at least one tooth element associated to said holding device and at least one respective retaining surface associated to said at least one chamber wall.

6. An appliance (1; 201) according to claim 5, wherein said one tooth element (62A) and/or said retaining surface (64A) are arranged inside said working chamber (20) in a position so as to be reachable with a disengaging tool (T) for disengaging said one tooth element (62A) from said retaining surface (64A).

7. An appliance (1; 201) according to any of the preceding claims, wherein said at least one component (102a, 114) of said refrigerating circuit (102; 202) comprises a tubular-shaped component, preferably a circulating tube (102a) for said refrigerant or a valve or a capillary tube or a fluxmeter or a filter (114).

8. An appliance (1; 201) according to any of the preceding claims, wherein said holding device (50A, 50B) comprises at least one protruding element (70A, 90A, 70B, 90B) apt to at least temporarily hold said at least one component (102a, 114) of said refrigerating circuit (102; 202) and/or said at least one electrical cable (116; 216).

9. An appliance (1; 201) according to claim 8, wherein said at least one protruding element (70A, 70B) comprises a movable bracket (70A, 70B) apt to be positioned in a rest position and in an operating position, wherein in said operating position said movable bracket holds said at least one component (102a, 114) or said at least one electrical cable (116; 216).

10. An appliance (1; 201) according to claim 9, wherein said movable bracket (70A, 70B) is a rotatable bracket apt to be rotated between said operating position and said rest position.

11. An appliance (1; 201) according to claim 10, wherein in said rest position said rotatable bracket (70A, 70B) is arranged parallel to said at least one chamber wall (30A, 30B) and in said operating position said rotatable bracket (70A, 70B) is inclined with respect to said at least one chamber wall (30A, 30B), preferably is perpendicular with respect to said at least one chamber wall (30A, 30B).

12. An appliance (1; 201) according to any of the claims 9 to 11, wherein said movable bracket (70A, 70B) comprises a gripping portion (72A, 72B) apt to surround said at least one component (102a, 114) or said at least one electrical cable (116; 216), preferably said gripping portion (72A, 72B) comprises a clip, more preferably a snap-in open clip.

13. An appliance (1; 201) according to any of the claims 8 to 12, wherein said at least one protruding element (90A, 90B) comprises a plurality of tongues, more preferably elastic tongues, apt to define at least one seat (92A, 92B) to hold, or temporarily hold, said at least one component (102a, 114) or said at least one electrical cable (116; 216).

14. An appliance (1; 201) according to any of the preceding claims, wherein it further comprises a retaining device (40A, 46A, 40B, 46B) apt to keep said holding device (50A, 50B) in position inside said working chamber (20).

15. An appliance (1; 201) according to claim 14, wherein said retaining device (40A, 40B) comprises one or more recesses (41A, 42A, 42B) provided at said at least one chamber wall (30A, 30B) and one or more corresponding retaining surfaces (55A, 56A, 55B, 56B) provided at said holding device (50A, 50B), preferably said one or more recesses (41A, 42A, 42B) being defined at reinforcing ribs (43A, 44A, 43B, 44B) of said at least one chamber wall (30A, 30B).

16. An appliance (1; 201) according to claim 14 or 15, wherein said retaining device (46A, 46B) comprises a screw insertable in a hole (48A, 48B) of said holding device (50A, 50B) and engageable in a hole (49A, 49B) of said at least one chamber wall (30A, 30B).

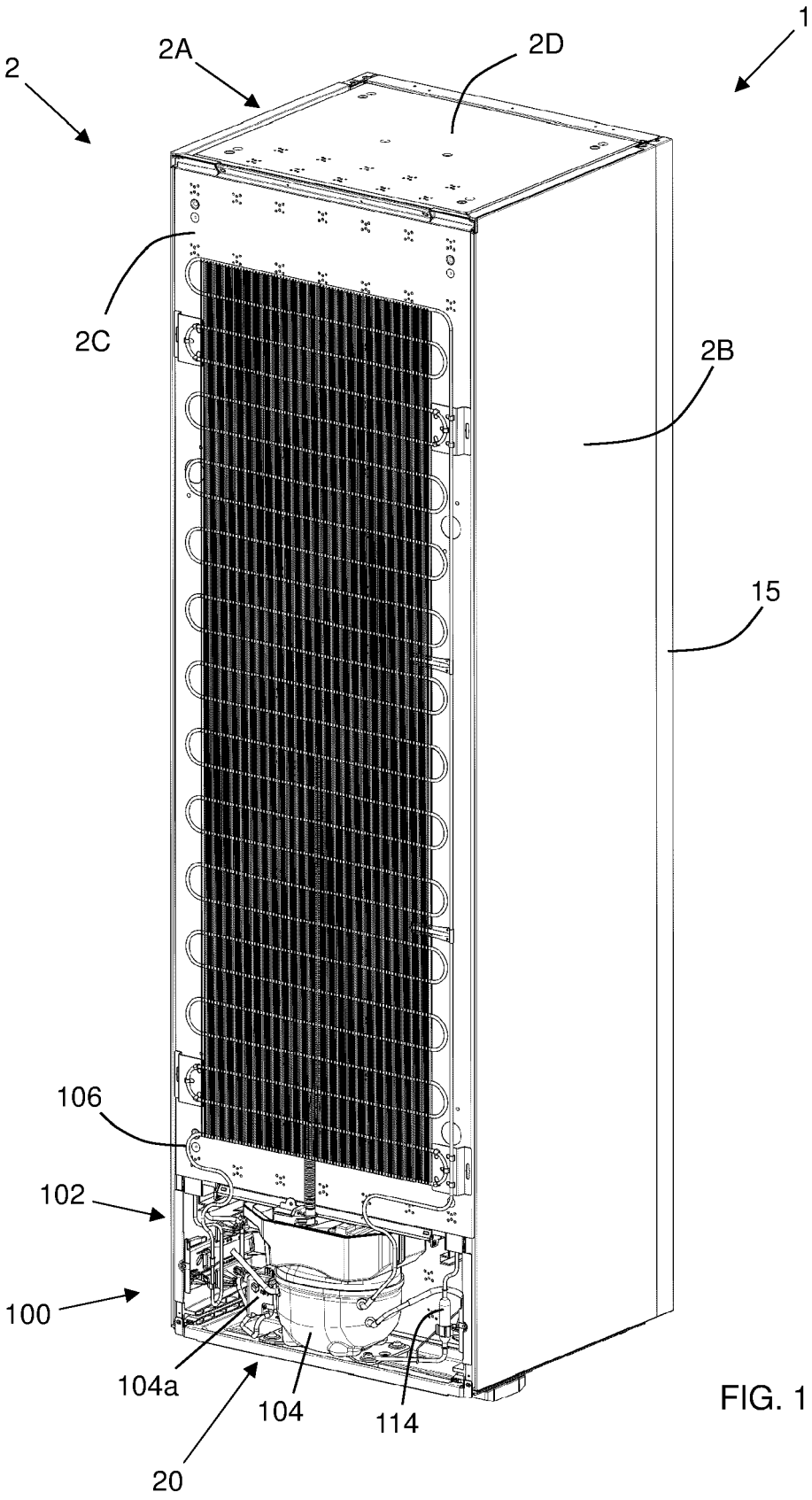

FIG. 1

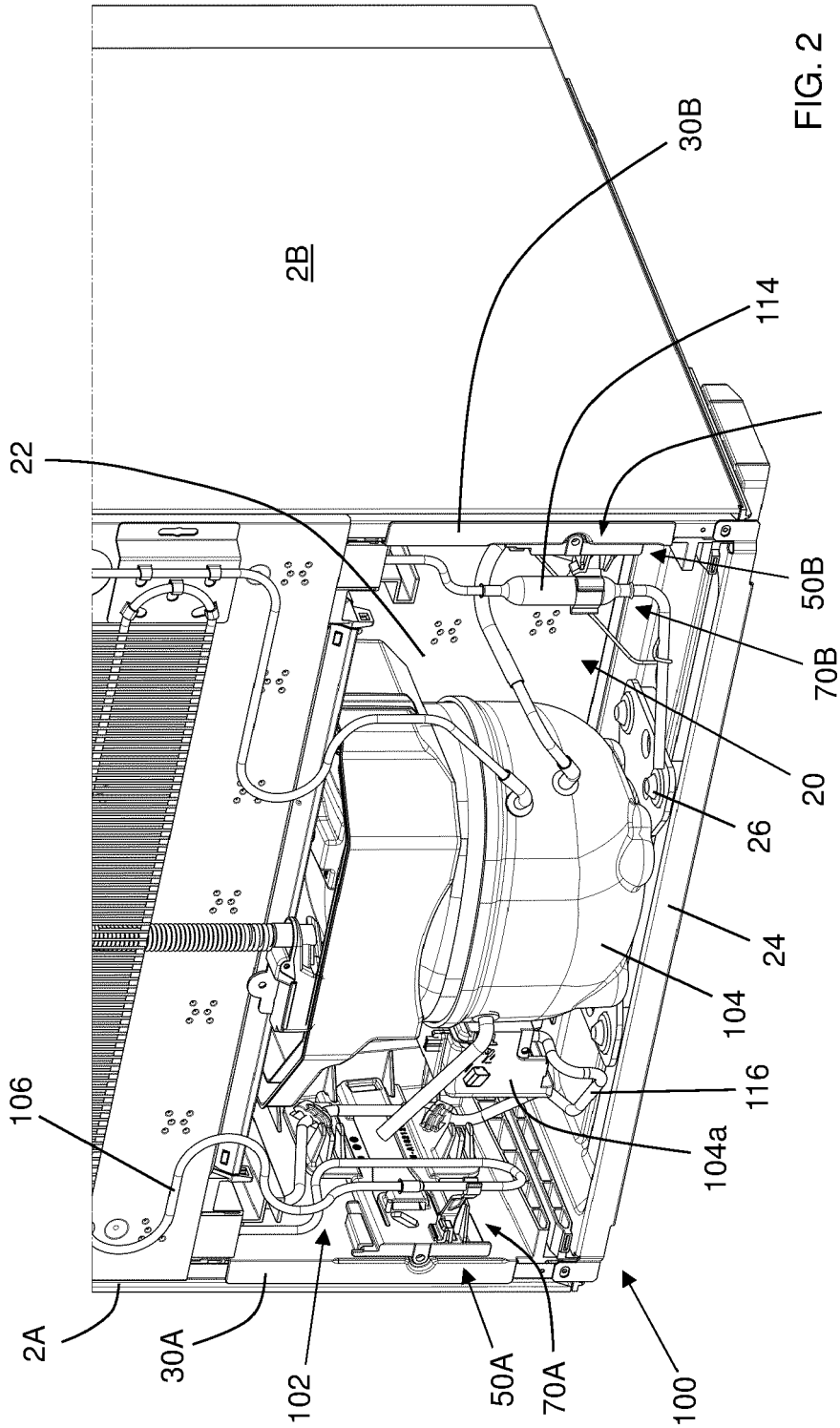
2B
30B
114
22
50B
70B
20
26
24
104
116
104a
106
2A
30A
102
50A
70A
100

FIG. 2

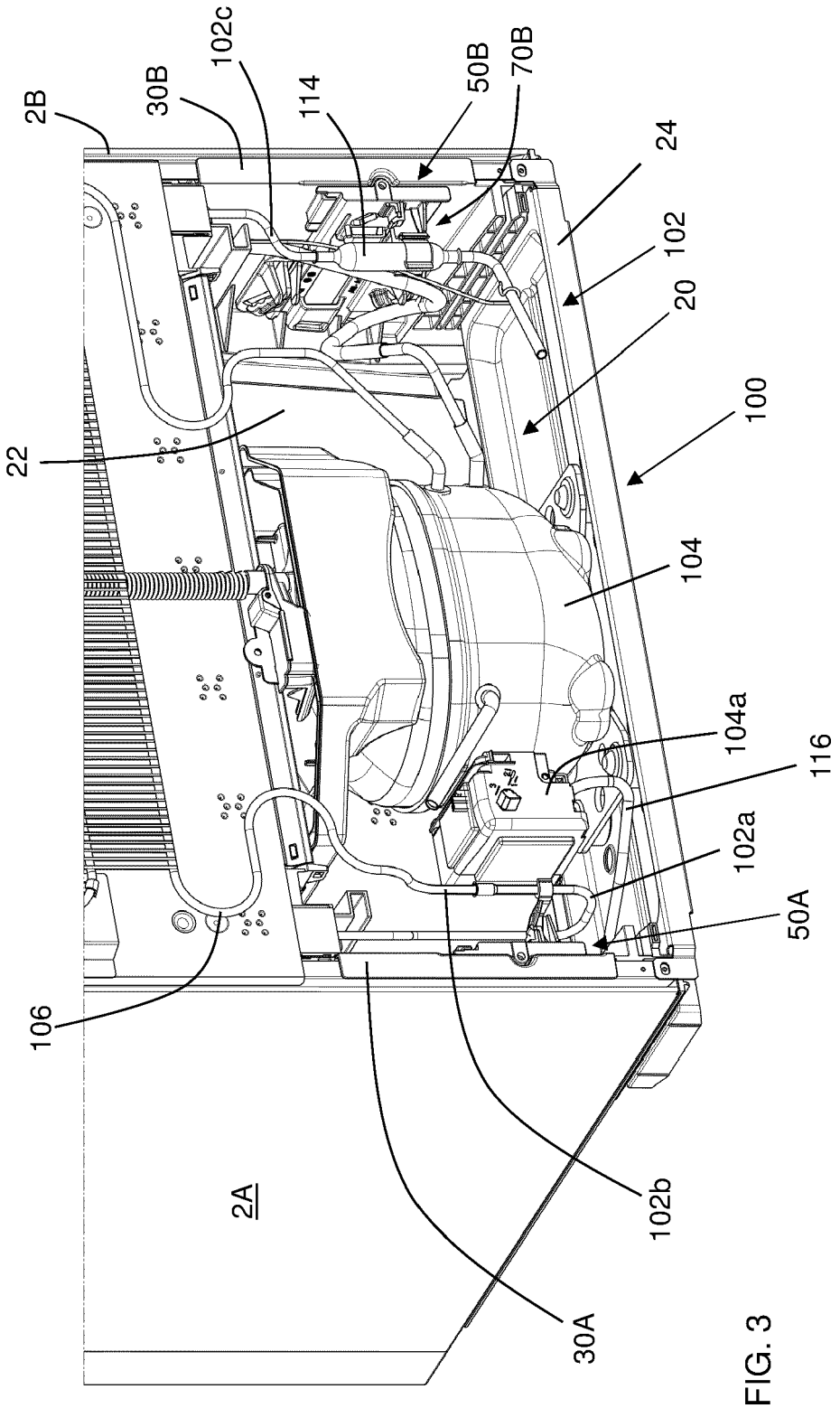
2B
30B
102c
114
50B
70B
24
102
20
100
22
104
104a
116
102a
50A
106
2A
102b
30A

FIG. 3

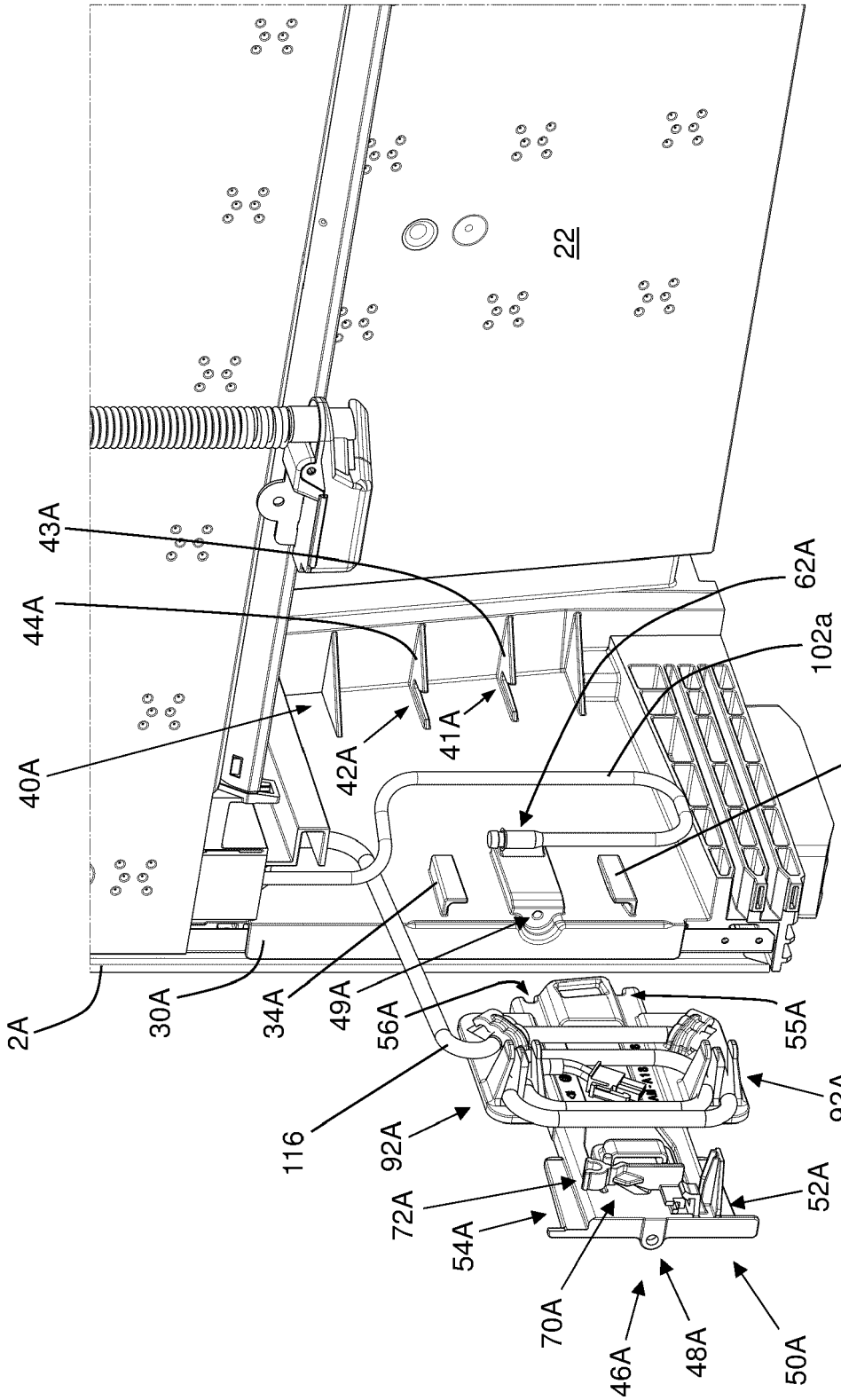
22
43A
44A
40A
42A
41A
62A
102a
32A
2A
30A
34A
49A
56A
55A
116
92A
92A
72A
54A
52A
70A
46A
48A
50A

FIG. 4

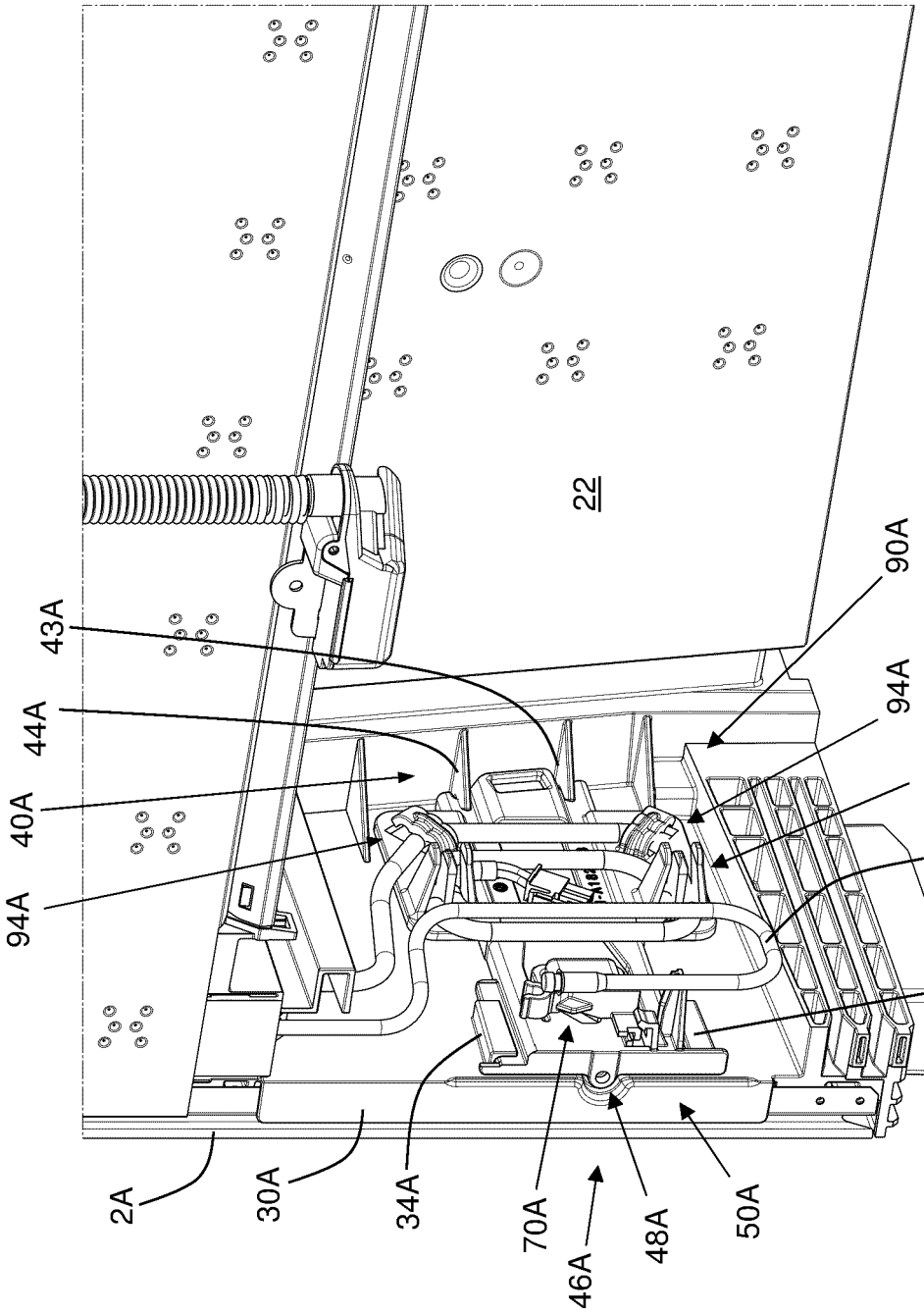
22
43A
44A
40A
94A
90A
94A
92A
102a
32A
2A
30A
34A
70A
46A
48A
50A

FIG. 5

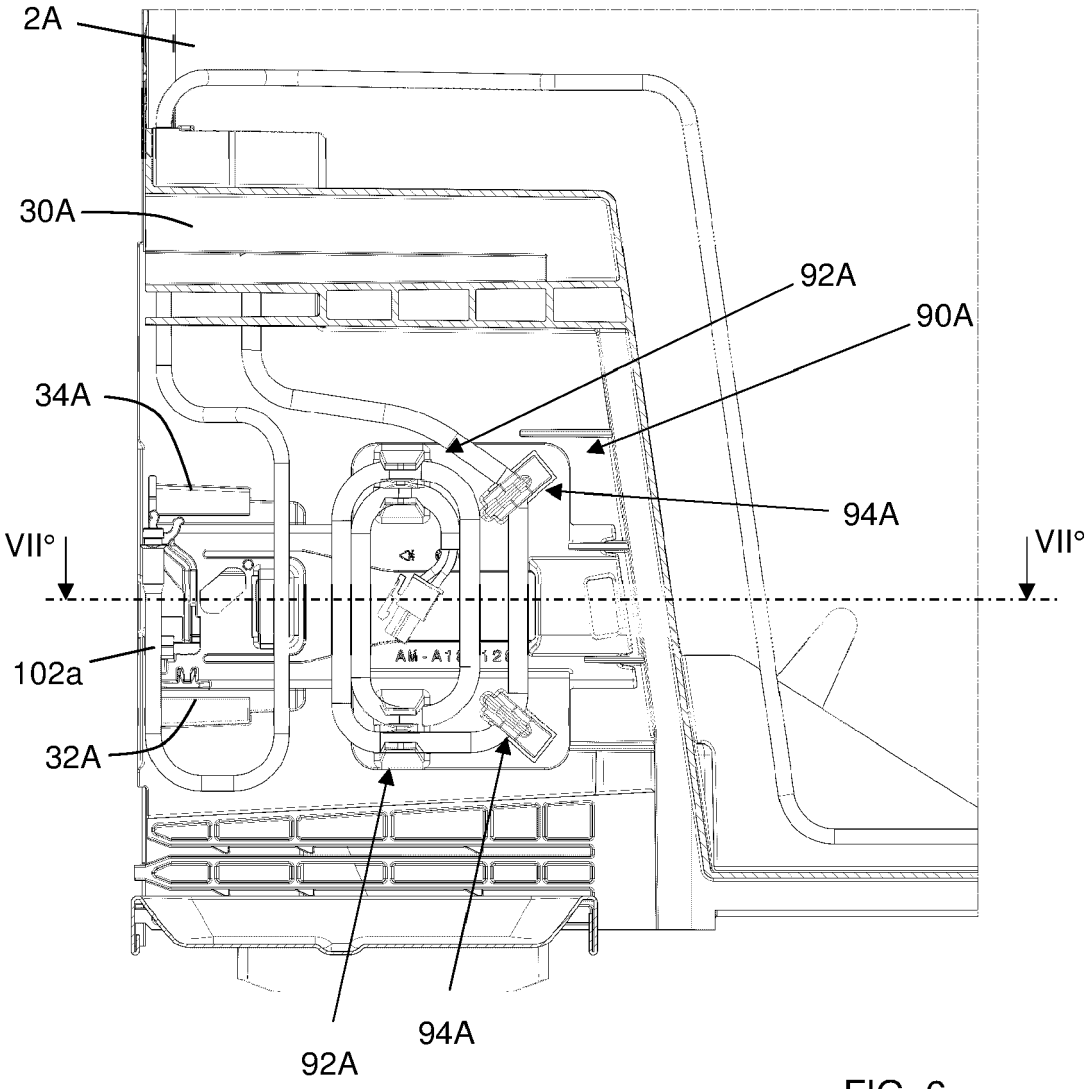

FIG. 6

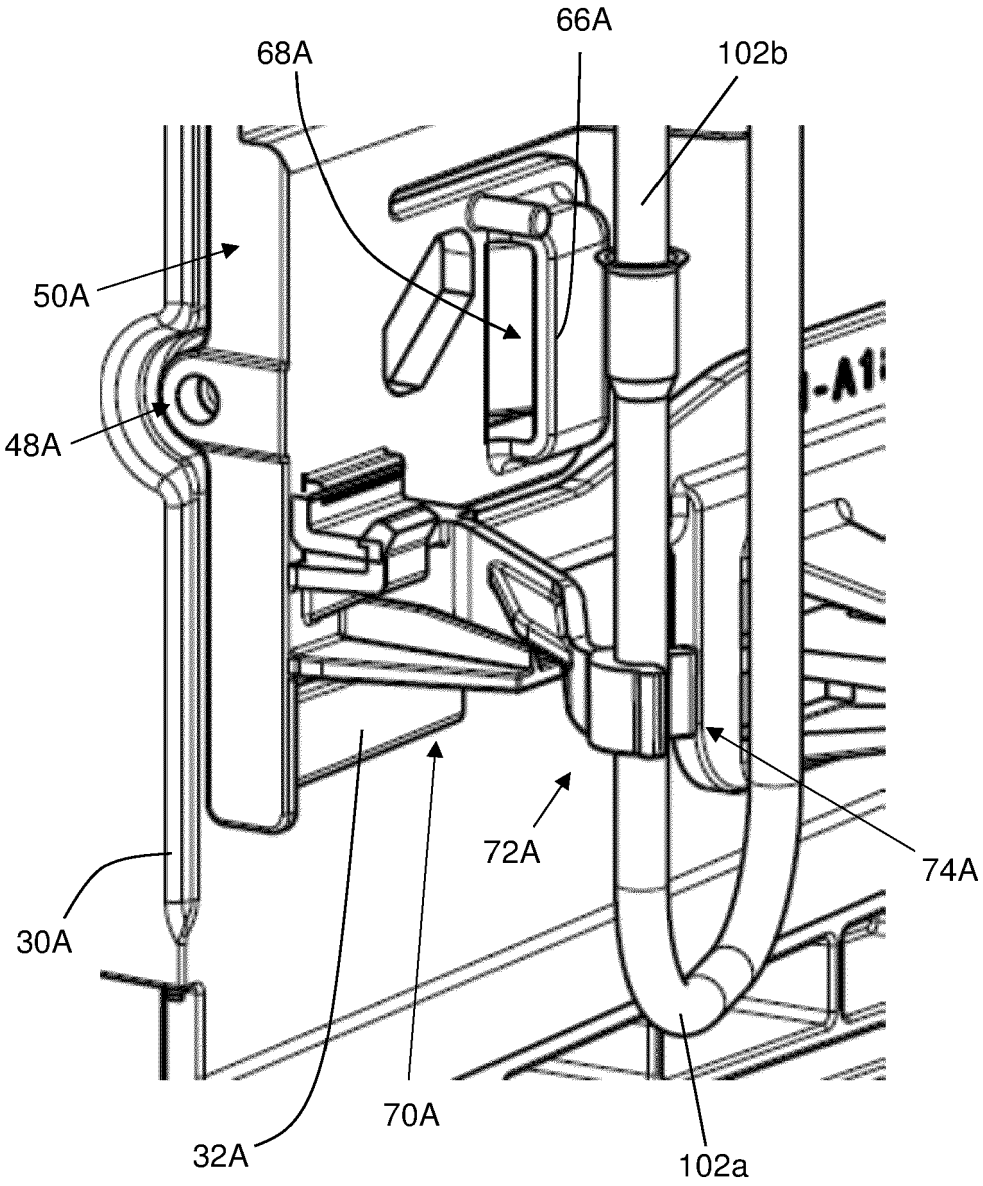

FIG. 7

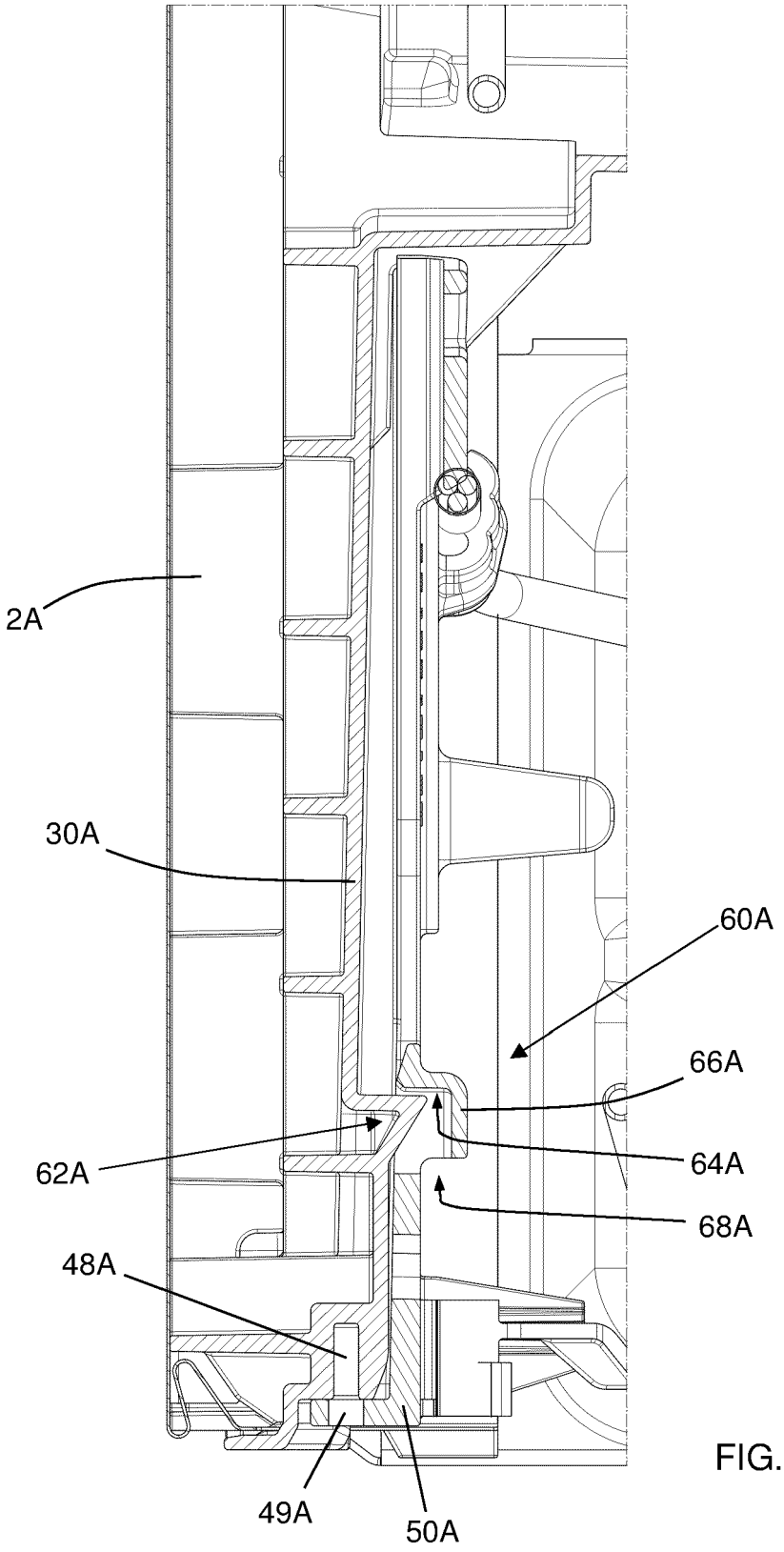

FIG. 8

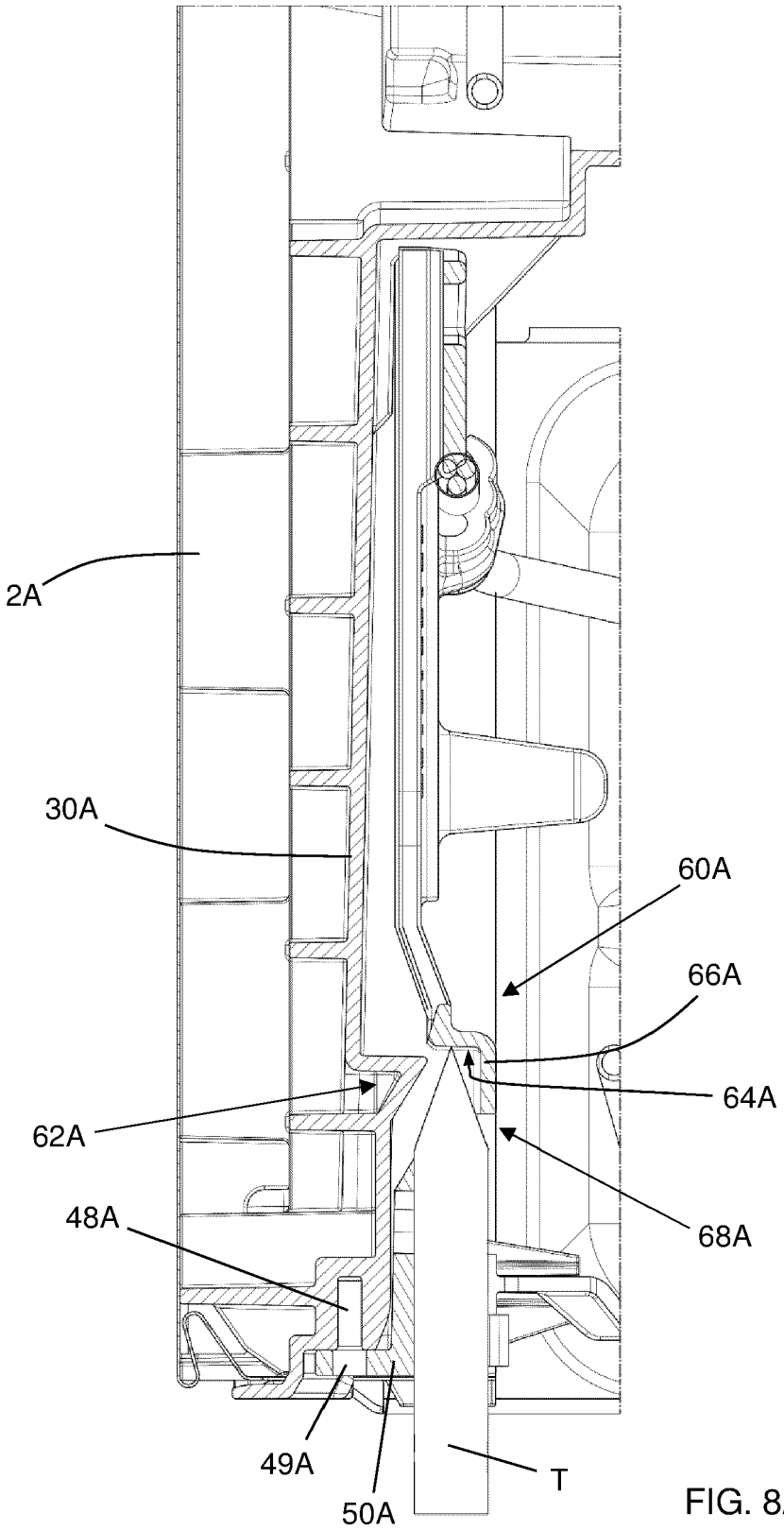

FIG. 8A

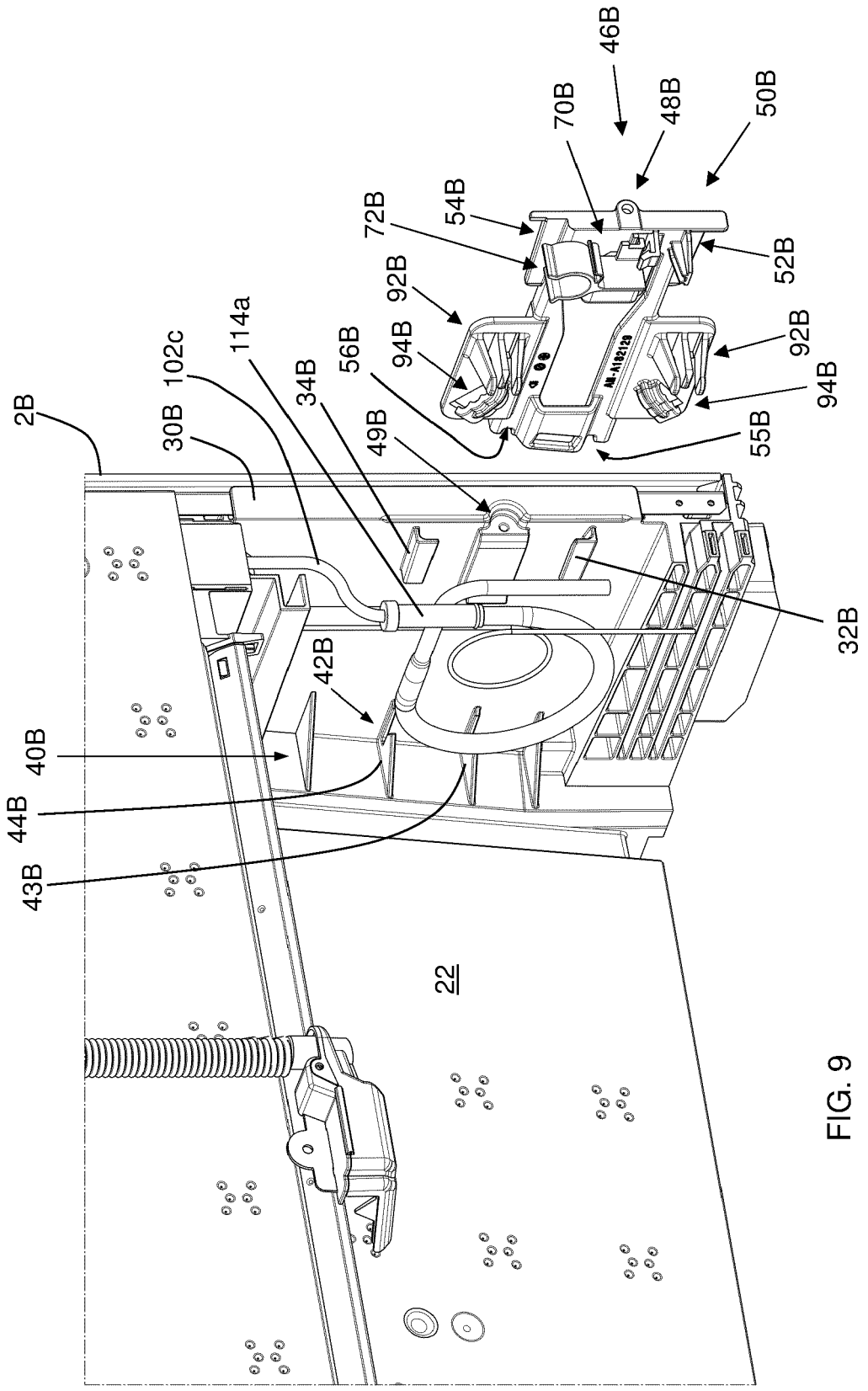
46B
70B
48B
50B
72B
54B
52B
92B
92B
94B
94B
56B
114a
102c
34B
30B
2B
49B
55B
32B
42B
40B
44B
43B
22

FIG. 9

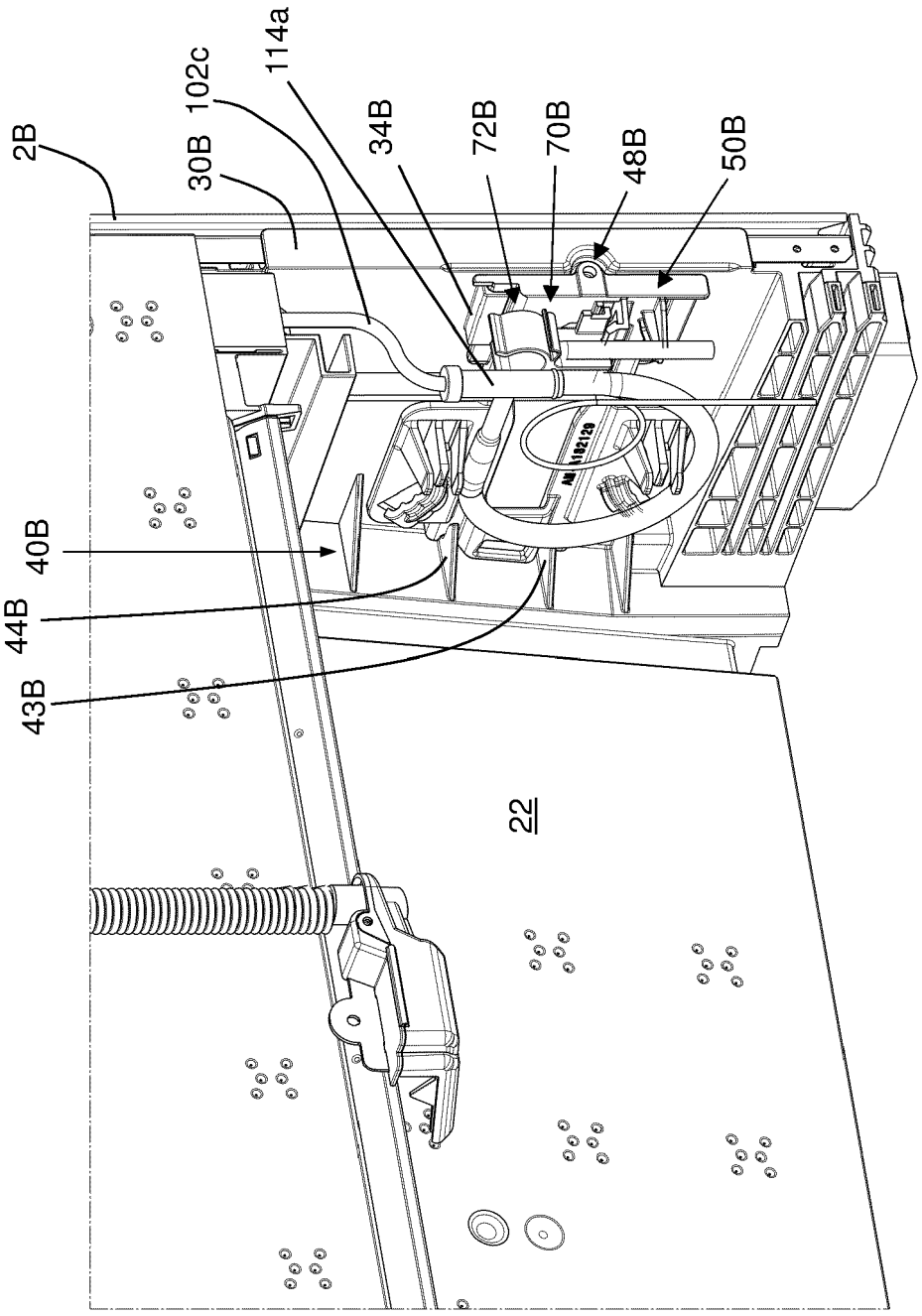

FIG. 10

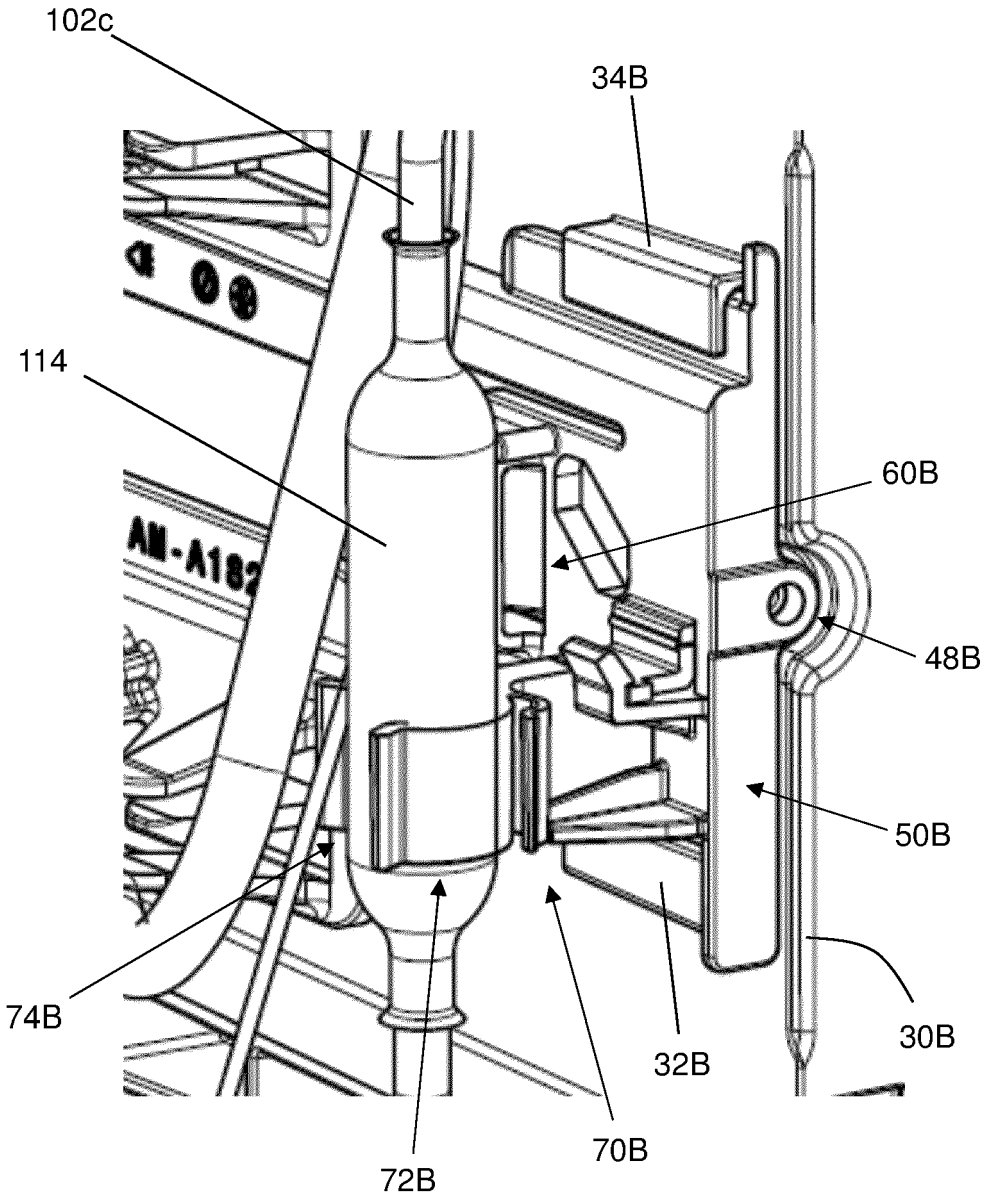

FIG. 11

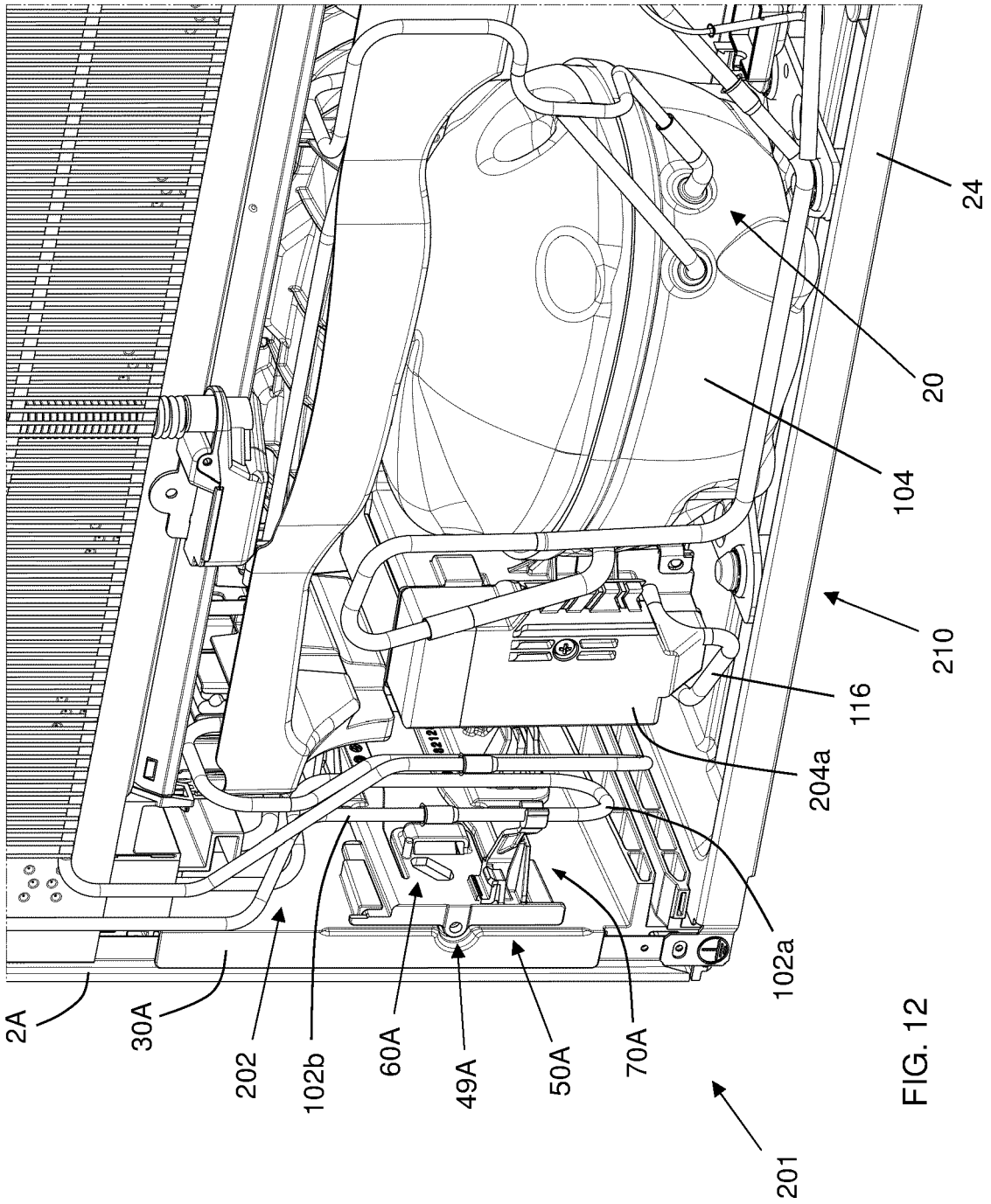

FIG. 12

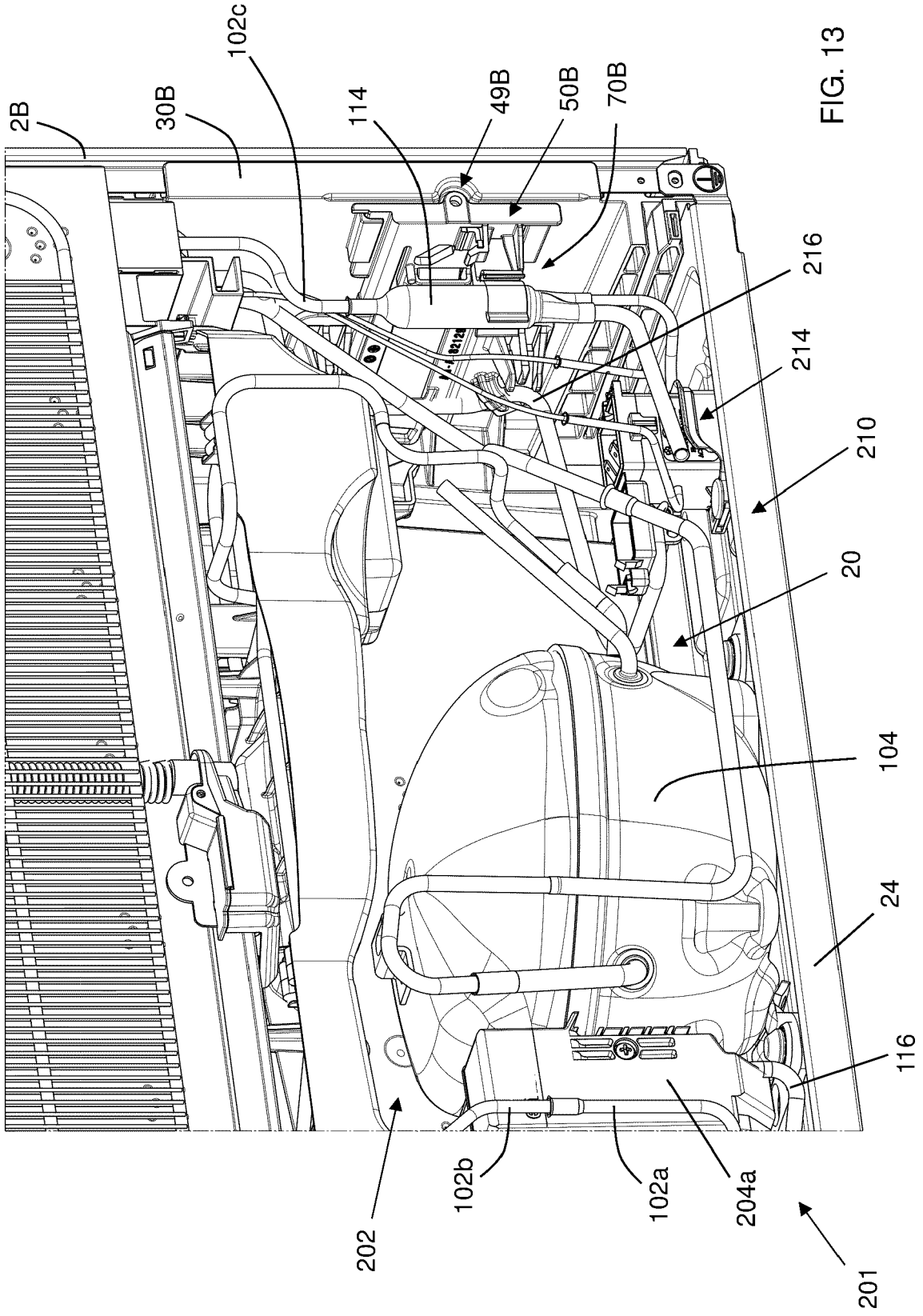
2B
30B
102c
114
49B
50B
70B
216
214
210
20
104
24
116
102b
102a
204a
202
201

FIG. 13

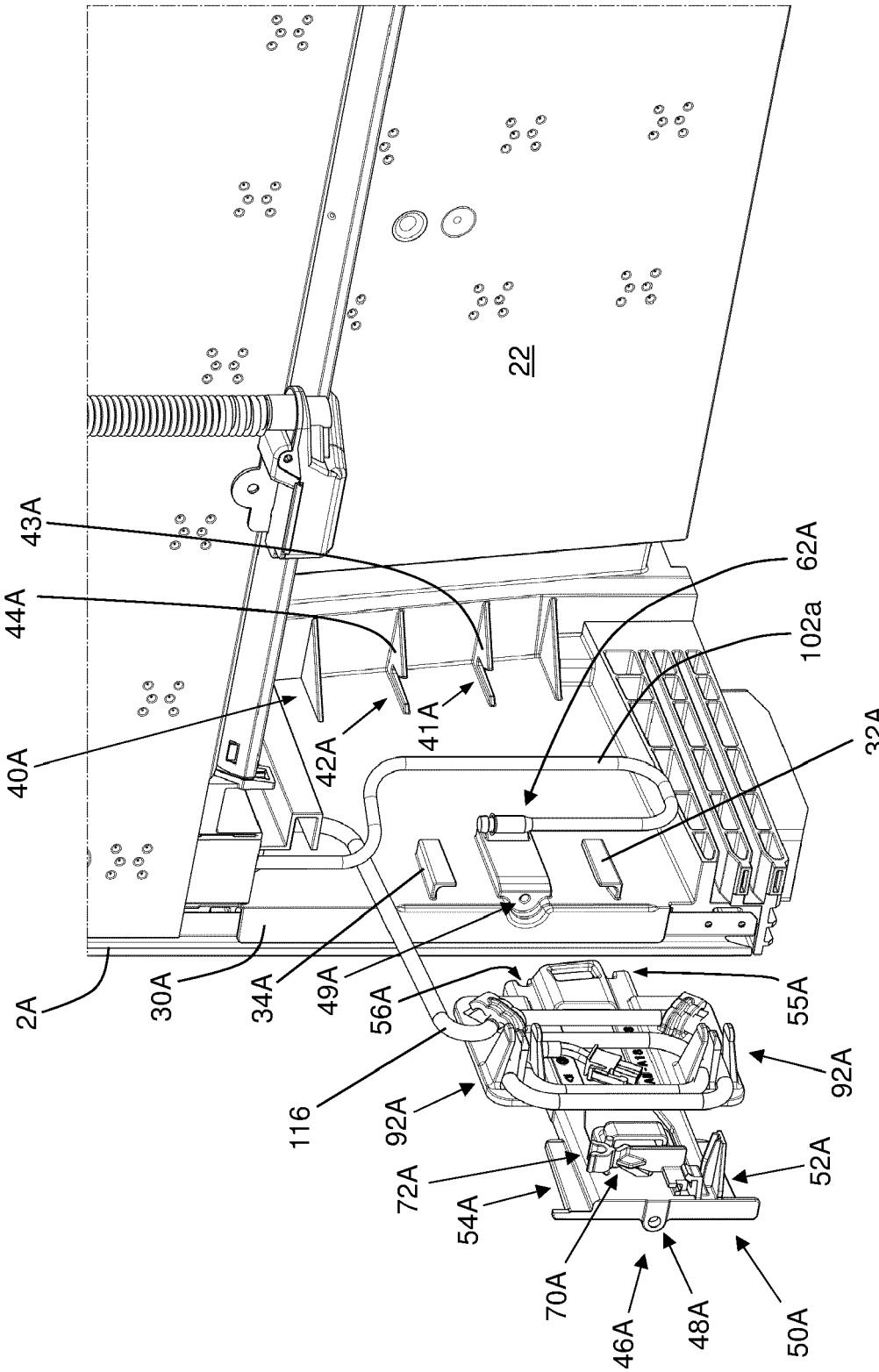
22
43A
44A
40A
42A
41A
62A
102a
32A
2A
30A
34A
49A
56A
55A
116
92A
92A
72A
54A
52A
70A
46A
48A
50A

FIG. 14

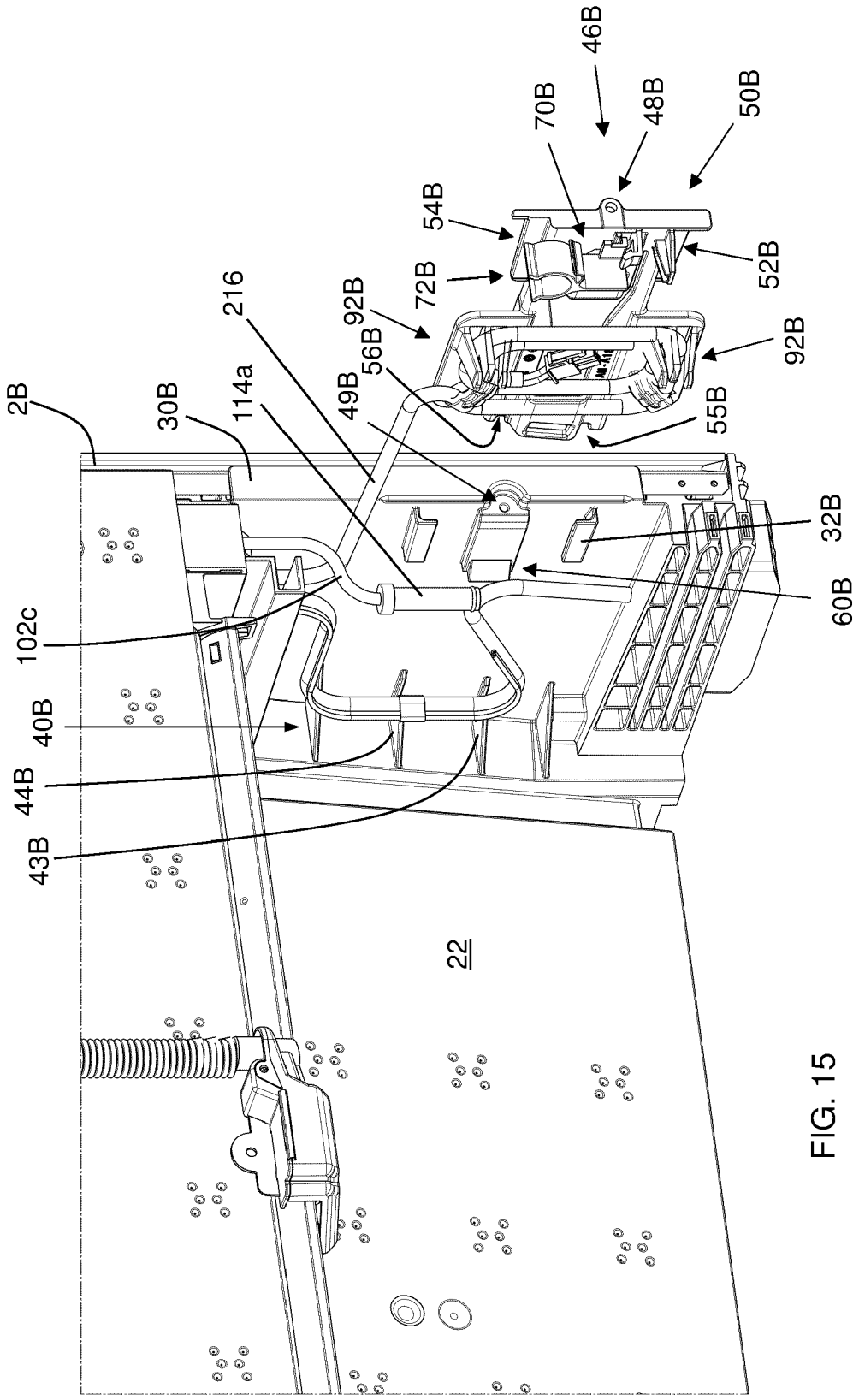
46B
70B
48B
50B
54B
52B
72B
92B
216
92B
56B
49B
114a
30B
2B
55B
32B
60B
102c
40B
44B
43B
22

FIG. 15

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EUROPEAN SEARCH REPORT

Application Number
EP 21 18 4698

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	WO 2012/113630 A2 (BSH BOSCH SIEMENS HAUSGERAETE [DE]; KRAPP MICHAEL [DE] ET AL.) 30 August 2012 (2012-08-30) * figures 3,8,9 *	1-16	INV. F25D23/00
X	DE 10 2017 221904 A1 (BSH HAUSGERAETE GMBH [DE]) 6 June 2019 (2019-06-06) * figures 2,8-13 *	1-16	
X	KR 101 994 688 B1 (LG ELECTRONICS INC [KR]) 1 July 2019 (2019-07-01)	1,7,14	
A	* figures 2,5,6 *	3,5,6, 8-13,15, 16	
X	DE 10 2012 222845 A1 (BSH BOSCH UND SIEMENS HAUSGERÄTE GMBH [DE]) 12 June 2014 (2014-06-12)	1,7,14	
A	* figures 1-4 *	3,5,6, 8-13,15, 16	
			TECHNICAL FIELDS SEARCHED (IPC) F25D

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 December 2021	Kuljis, Bruno

CATEGORY OF CITED DOCUMENTS

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D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 18 4698

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