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(54) **A cooling unit for a climatized cabinet**

Kälteeinheit für einen klimatisierten Schrank

Unité de refroidissement pour une armoire climatisée

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Description**Field of the Invention**

5 **[0001]** The present invention relates to a cooling unit for a commercial cabinet, such as a freezer, cooler or climatized cabinet, comprising at least:

- a base element having a first contact surface for contacting a second contact surface of a commercial cabinet and a third contact surface for contacting at least one top element;
- 10 - where the top element is configured to be placed over at least a part of the base element and has a fourth contact surface for contacting the third contact surface;
- where an evaporator is in communication with at least a first air channel and a second air channel which are configured to lead air from an inlet to the evaporator and further out of an outlet, wherein the inlet and outlet are arranged in the first contact surface;
- 15 - where the evaporator is furthermore in communication with a condensing unit via a fluid channel for leading a condensate, such as water, from the evaporator to the condensing unit;
- where the condensing unit at least comprises a reservoir for receiving and holding the condensate and means, such as a compressor, arranged relative to the reservoir for evaporating the condensate in the reservoir.

20 **[0002]** The present invention also relates to a commercial cabinet, such as a freezer or cooler cabinet, comprising at least one chamber configured to be closed off via one or more front end doors, wherein the cabinet has a first contact surface for contacting a second contact surface of a cooling unit which is configured to circulate the air inside the chamber via at least one inlet and at least one outlet.

25 **Background of the Invention**

[0003] In the food and bioscience industry today, industrial cooling cabinets are often used to cool various items, such as food articles, biologic materials and other relevant items, which need to be stored under controlled conditions. A cooling unit coupled to the climatized chamber inside the cabinet is used to regulate the conditions, such as the temperature and relative humidity inside the climatized chamber.

30 **[0004]** Today, a cooling unit can be divided into floors where the components of the cold side are built into the top of the cabinet and the components of the warm side are arranged on top of the cabinet. An insulated top plate is used to separate the warm and cold sides. This configuration requires a pump to actively lead condensed water from a reservoir located below the evaporator to another reservoir, e.g. located at the warm side, where the water is evaporated or the condensed water is lead to a lower placed reservoir, where the water is evaporated or the condensed water is lead to a drain. Another type is the cassette type system in which the cold side is encapsulated by an insulated cover and the warm side is arranged next to the cover. This configuration increases the risk of mixing the air flows to and from the cold side, since the cold and warm sides each take up one half of the surface area. This also makes servicing of the cooling system more difficult and increases the risk of the components overheating due to its compact size.

35 **[0005]** US 6070424 A discloses a cooling unit located on top of a cooling cabinet where the cooling unit comprises a base plate to which the components of the cooling unit are mounted. The cooling channel is formed by a cover placed on the air inlet, the air outlet and the evaporator. Air is lead into the evaporator using two ventilators placed perpendicularly to the evaporator. Condensed water from the evaporator is guided into a channel extending out under the cover where it accumulates until it spills into a collection pool. A condenser mounted above the collection pool is believed to evaporate the water in the pool due to air being blown over the collected water. The main flow of air is concentrated at the centre of the evaporator due to the position of ventilators and the shape of the cooling channels; this reduces the effect of the evaporator and increases the risk of ice forming along the peripheral areas of the evaporator. The cooling unit has a relative high noise level, since the compressor and the condenser is not encapsulated. This also allows dust, grease and other particles to collect on the exposed components, thus regular service intervals are required in order to allow the unit to function properly. The air flow passing through the condenser is significantly affected by its position relative to the cover; this means that heat is not effectively removed from the cooling unit which could cause a risk of the components to overheat.

40 **[0006]** US 6701739 B2 discloses another cooling unit on top of a cooling cabinet where the cold and warm sides are separated from each other. The cold side is covered by a cover which forms the cooling channel and encapsulates the evaporator. Condensed water from the evaporator is lead via a fluid channel from the cold side to the warm side and into a reservoir located below the compressor. The compressor is then used to heat the collected water in the reservoir. The cooling unit is placed behind another cover located on top of the cabinet having a column of ventilation slots for venting the hot side. The air flow passing through the condenser is recirculated inside the warm side before being lead

out of the compartment due to its compact configuration. The close proximity between the air inlet and air outlet of the cold side means that the warm and cold air flows are likely to mix, and thereby reducing the effect of the cooling unit. Furthermore, the cooling unit has a high noise level, since the warm side is not encapsulated. This allows dust, grease and other particles to collect on the exposed components, thus regular service intervals are required in order to allow the unit to function properly. The ventilator at the cold side is placed over the air outlet and under the evaporator which reduces the suction pressure at the air inlet, this means that the size and effect of the ventilator needs to be increased in order maintain an acceptable suction pressure.

[0007] US 2008/0314072 A1 discloses an air-conditioning unit for a very different purpose, i.e. ventilating a room of a caravan or boat. The unit comprises two shell parts of a foamed material where the components of the unit are encapsulated in the two shell parts. The shell parts can be jointed together using straps. The air inlet and air outlet of the cold side are located next to each other at the same end of the cassette. The air inlet and air outlet of the warm side are also located in close proximity to each other which means that the air flows, in particular at the cold side, are very likely to mix. This reduces the effect of the air-conditioning unit and could cause the components to overheat. This configuration cannot be used for cooling a refrigerator without having to replace at least some of the components. The size and configuration of the compressor used in this unit differs significantly from the compressor normally used in a refrigerator, such as the compressor used in US 6070424 A or US 6701739 B2. Furthermore, the cold side is not designed to be coupled to the chamber inside a cabinet instead it is designed to take in air directly from the room.

[0008] Thus, there is room for improvement of such cooling units as described above and there is a call for development of a new and improved unit which is simple, effective and easy to install.

Object of the Invention

[0009] It is an object of the invention to provide a compact cooling unit that improves the abovementioned drawbacks of the prior art and makes it easier to service the cooling unit.

[0010] Another object of the invention is to provide a cooling unit that allows for a better separation of the air flows at the cold side.

[0011] Another object of the invention is to provide a cooling unit that reduces the turbulence of the air flow passing through the unit.

[0012] Another object of the invention is to provide a cooling unit having a reduced noise level and protects the components from external impacts.

[0013] Another object of the invention is to provide a cooling unit that allows the energy consumption of the cooling unit to be optimised.

Description of the Invention

[0014] As mentioned above, the invention relates to a cooling unit characterised in that:

- the base and top elements are made from a foamed material and comprises mounting elements for receiving and holding at least the evaporator and the condensing unit, wherein the mounting elements are shaped to follow the contours of that unit for fixating that unit relative to the base or top element; and
- that the base and top elements are shaped to form at least two enclosed chambers when assembled in which at least the evaporator and the condensing unit are arranged.

[0015] This provides a compact cooling unit that takes up less space and thereby allows the size of the cabinet to be reduced. This configuration allows the warm and cold sides to be arranged in the same level and reduces the height of the unit while utilising the entire surface area. The cooling unit is configured to be placed relative to a bottom or top surface of the cabinet where openings, i.e. the inlets and outlets, located in that surface and the base element are used to lead air between the chamber inside the cabinet and the cooling unit. The cabinet may be any type of an upright commercial or domestic cabinet, including freezer cabinets, refrigerators or other climatized cabinets, having at least one chamber configured to be closed off via one or more front end doors. When assembled, the cooling unit may have a height of 20-40 cm or 25-35 cm. The width of the cooling unit may be 40-70 cm or 50-60 cm. The length of the cooling unit may be 50-80 cm or 60-70 cm.

[0016] The air channels may be configured as cooling channels for leading air from the chamber inside the cabinet through the cooling unit. The base and top elements may be configured to form two, three or more enclosed chambers in which the components of the warm and cold sides are located respectively. The cooling channels may be defined by channels, e.g. open channels, formed in the base and top elements. The surface of the channels may optionally be coated with water or moisture impermeable material. This provides a cooling unit having a low noise level which also protects the enclosed units from any environmental impacts, such as dust, moisture and external shocks.

[0017] The mounting elements may be configured as mounting platforms or mounting recesses for receiving and holding the components of the cooling unit. The components of the cooling unit are defined as any active and/or passive components needed to carry out the operation of the cooling unit. The mounting elements may be formed in the base element and shaped to follow the contours of the components. The top element may further comprise mounting elements or support elements aligned with the mounting elements of the base element. The mounting elements may be formed in the top element and shaped to follow the contours of the components. The mounting elements may comprise a number of mounting pins or taps configured to engage mounting holes or through holes on the various components, or vice versa. The support elements may be projecting arms or fins formed or coupled to an inner surface of the top element. The projecting arms or fins, e.g. the free end, are configured to contact and fixate the components relative to the top element. This allows the components to be mounted without the use of mounting brackets and fastening means. This provides an easier and faster assembly. The mounting elements and support elements further protect the components from external impacts during handling and transport. This eliminates the need for additional paddings and packing material during transport.

[0018] The top element may be defined by two, three or more sub-elements each having at least one contact surface for contacting the base element and/or a contact surface of an adjacent sub-element. One or more coupling elements, e.g. male and female coupling elements, may be arranged at the contact surfaces for mounting the individual elements together. The coupling elements may be a groove and a tongue, a click-system or a key-and-lock system. This allows for easy assembly of the base and top elements and easy access to various components without having to remove the entire top element. This saves time during assembly and increases the serviceability.

[0019] According to one embodiment, at least a third air channel is arranged relative to at least one of the first and second air channels and is connected to at least a second inlet or outlet, wherein the inlets and outlets are arranged in opposite facing ends of the bottom surface.

[0020] The cold side may comprise two, three or more inlet channels arranged relative to each other for leading relative warm air from the chamber into the cooling unit. The inlet channels may be connected to the evaporator and separate air inlets, e.g. openings, located in the first contact surface, e.g. the bottom surface. The inlet channels may alternatively form a single air channel. Two, three or more outlet channels may be arranged relative to each other for leading cold air out of the cooling unit. The outlet channels may be connected to the evaporator and separate air outlets, e.g. openings, located in that surface. The air inlets and air outlets are arranged in opposite ends and/or opposite corners of that surface. The air inlets and/or air outlets may be formed as rectangular, circular or elliptical openings or combined to form a single opening. This allows air to be extracted from and distributed to the critical areas of the chamber in the cabinet. This further provides a better separation of the warm air and the cold air, since the openings are arranged at the front end and the back end of the cooling unit respectively.

[0021] According to one embodiment, the shape of at least one of the first and second air channels is optimized for reducing the turbulence of the air passing through that air channel.

[0022] The shape of the inlet and/or outlet channels, e.g. the bends, may be optimised to provide a more laminar air flow and to reduce the turbulence. This reduces the loss of air speed in the cooling unit and allows for a higher outlet speed. This further reduces the noise generated in the cooling channels. Alternatively one or more turning vanes may be arranged in the curved sections of the cooling channels which allows for a sharper bend in the cooling channels. The ratio between the centre line radius of the cooling channel and the width or diameter of the cooling channel may be between 1:1 and 3:1. This allows the size of the cooling unit to be reduced even further. The size of the cooling channels may be determined based on a desired air speed and air volume passing through the cooling unit.

[0023] The opening area of the outlets may be smaller than a cross-sectional area of the outlet channels. The outlets may be shaped as a funnel which allows the exit speed of the cold air to be increased. One or more guiding flanges or flaps may be arranged at the inlet openings of the chamber in the cabinet. This allows air located near the front end door to be guided into the cooling unit, since the air is normally warmer at the front end door than in the middle of the chamber. The opening area of the individual inlets may be 50-120 cm² or 70-100 cm². The opening area of the individual outlets may be 50-80 cm² or 60-70 cm².

[0024] The enclosed chamber in which the compressor and condenser are located, i.e. the warm side, is arranged between a first and second channel, e.g. outlet channels, which are jointed at the evaporator. The base and top elements form a wall separating the warm side from the cold side, i.e. the cooling channels. The two channels form a side surface facing the evaporator which may have an optimised shape, e.g. shaped as a bow. This provides a better distribution of the air passing into the two channels and reduces the turbulence generated at the side surface facing the evaporator.

[0025] According to a special embodiment, at least two ventilators are arranged relative to at least two of the first, second and third air channels for actively leading air through the air channels, wherein a first ventilator faces a first section of the evaporator and the second ventilator faces a second section of the evaporator.

[0026] The evaporator may comprise a first and second side surface facing the inlet and outlet channels respectively. The ventilators may be arranged in the inlet or outlet channels where the suction side or pressure side of each ventilator faces a different section of one of the side surfaces. The suction or pressure side may be placed in a parallel position

relative to the side surface or angled so that they form a triangular or concave line relative to the side surface. The ventilator may be an axial ventilator or a radial ventilator. The ratio between the surface area of the evaporator and the combined surface area of the ventilators may be between 1:1 and 4:1 or 1:1 to 2:1. This allows for the air passing through the cooling channels to be guided onto a large surface area of the evaporator, thus increasing the efficiency of the evaporator. This also reduces the risk of ice forming on the evaporator.

[0027] The ventilators may be mounted in one or more removable inserts configured to be inserted into one or more of the cooling channels. The insert may comprise two, three or more slots for receiving and holding the ventilators. Any unused slots may be blocked off by placing a plate in that particular slot. This allows for a quick and easy replacement of the ventilators and allows the number of ventilators to be adapted to the desired air volume and air speed.

[0028] According to one embodiment, the condensing unit comprises a condenser located in a side wall, e.g. a back end, of the top element and one or more ventilators in a top surface of the top element.

[0029] The condenser may be arranged in a side wall, preferably in a back wall, of the top element. One, two or more ventilators may be arranged in a top surface of the top element. The ventilators may be placed in an angled position, e.g. an acute or perpendicular angle, relative to another top surface of the top element. This allows ambient air to be sucked in through the condenser and blown out over the top surface, or vice versa. A chimney extending towards the bottom of the cabinet may be coupled to the condenser for sucking in air from the bottom of the cabinet. The condenser may comprise a filter, e.g. a dust and/or grease filter, for filtering the air passing through the warm side so dirt is prevented from entering the condenser. The filter may be arranged at the front of the condenser, i.e. the side surface facing away from the cooling unit or at the back, i.e. the side surface facing the compressor. This filter may alternatively be placed in the chimney or omitted if air is sucked in from a relative clean environment, e.g. an air-conditioning system. This allows heat from the cooling unit to be removed more effectively, since cold air may be sucked in from the back end and then blown out over the front end.

[0030] The compressor may be arranged above the reservoir formed in the warm side and a pipe loop may optionally extend into the reservoir for heating the collected condensate. This allows more heat from the compressor to be transferred to the condensate, since the compressor is encapsulated by the foamed material. The size of the enclosed chamber partly forces the incoming air around the compressor and partly over the surface of the condensate. This allows for a better heat transfer from the compressor to the reservoir and eliminates the need for additional heating elements.

[0031] A third enclosed chamber may be formed by the base element and the mounting element, e.g. a mounting platform, of the evaporator. The pipe system coupled to the evaporator and the compressor extends into this enclosed chamber through openings in the mounting element and channels or slits formed in the base element. This prevents moisture from forming on the pipe system due to the temperature difference in the fluid passing through the pipe system, thus reducing the risk of moisture and condensate from collecting at areas outside the reservoirs.

[0032] According to one embodiment, a second reservoir is arranged relative to the evaporator for gathering the condensate from the evaporator, wherein the second reservoir is located in a raised position relative to the first reservoir.

[0033] The evaporator may be placed in a perpendicular direction relative to the bottom surface of the base element or the longitudinal direction of the cooling channels. The evaporator may be placed in an angled position, e.g. between 0-30 degrees or 5-15 degrees, relative to the bottom surface of the base element. This allows the condensate to drip off the evaporator and into the reservoir located below the evaporator. The reservoir may comprise at least one inclined surface extending towards the other reservoir. The fluid channel between the two reservoirs may also form an inclined surface so that gravity may lead the condensate into the reservoir in the warm side.

[0034] According to one embodiment, the foamed material is polypropylene.

[0035] The foamed material may be polymer, polyethylene, polypropylene, polystyrene Depron, Neopor, Arcel or another suitable material. The base element and/or the top elements may be extruded, expanded, pressed, foamed or milled into the desired shape. This material provides good insulating properties and good noise reducing properties to the cooling unit. This allows the base and top elements to be formed as single pieces and allows the components of the cooling unit to be mounted without the use of fastening means and mounting brackets. This further allows the components to be shielded from any water splashes or environmental impact that could cause a short circuiting which increases the safety.

[0036] According to one embodiment, at least one pressure valve is arranged in or coupled to one of the air channels for equalising the pressure differential between the ambient air and the cold air inside the cabinet.

[0037] The cooling unit may comprise a pressure valve coupled to one or more of the inlet channels and the ambient air for equalising the pressure differential between the ambient air and the cold air inside the cabinet. The valve may be arranged in a third enclosed chamber which is coupled to an opening on an outer surface of the base or top element. This allows the air pressure inside the chamber to quickly settle at the same pressure as the ambient air. This further reduces the noise generated by the valve during the equalisation process, since it is shielded by foamed material.

[0038] According to one embodiment, the cooling unit further comprises a front end at which an electrical control unit is arranged.

[0039] The front end of the cooling unit may comprise one or more coupling elements for mounting the electrical control

unit to the base and/or top element. The coupling elements may be located on a mounting flange or in a recess formed in the base and/or top element. The coupling elements may be a mounting tap or tongue configured to engage a mounting hole or groove in the control unit, or vice versa. The control unit comprises the electronic components needed to control the operation of the cooling unit. One or more electrical terminals may be arranged at the coupling elements for connecting or disconnecting the control unit. This allows for easy access to the electronic components when servicing the cooling unit.

[0040] One or more sets of grooves or slits may be formed in the contact surface of the base element and/or top element. The grooves or slits may be configured to receive and hold the electrical wire and fluid pipes coupled to the various components of the cooling unit. The electrical wires extending to and from one component, e.g. the control unit, may be arranged in one or more sets which are then coupled to another component in the cooling unit. The fluid pipes may additionally or alternatively be arranged in one or more sets that extend from one component to another component. This allows for a quick and easy overview of the various connections during servicing. This also allows the pipes and electrical wires to be held in place during operation and transport so that the risk of any leakage in the pipe system as well as the risk of an electrical short circuiting are reduced.

[0041] The object of the invention is also active by a commercial cabinet characterised in that the cooling unit is configured as defined above.

[0042] The configuration of the cooling unit makes it well-suited for commercial or industrial cabinets, particularly freezer cabinets, refrigerators, or other climatized cabinets. The compact configuration of the cooling unit allows the volume required for the cooling unit to be reduced thus, allowing the size or height of the cabinet to be reduced. The encapsulation of the evaporator, compressor and condenser means that the noise level can be reduced and allows for a more optimal energy consumption of the cooling unit. The arrangement of components defining the warm side allows for a more effective cooling or heat removal of the cooling unit, since the heated ambient air is blown out over the front end of the cooling unit. This is particularly relevant if the spacing between the cooling unit and the ceiling is reduced to a relative narrow passageway.

[0043] The cabinet may comprise a removable front cover or front door for shielding the cooling unit and for aesthetic purposes. A third wall may be placed at the back end between two side walls for preventing the cooling unit from sliding too far back. An opening in the third wall may be aligned with the position of the condenser so that air can be drawn in from the back end of the cabinet.

[0044] According to one embodiment, the cabinet further comprises at least two side walls extending outwards from the first contact surface, wherein the cooling unit comprises at least side surfaces facing the side walls wherein at least one of the side surfaces is placed in an angled position relative to an adjacent side wall.

[0045] The side surface of the cooling unit may be placed in an angled position, e.g. an acute angle, so that the spacing between the side wall and the side surface is tapered off from the top surface and towards the bottom surface of the cooling unit. The angle of the side surface may be between 0.5-5 degrees or 1-3 degrees. This prevents the formation of ice which otherwise would reduce the insulating properties and contaminate the insulating material.

[0046] According to one embodiment, the cabinet further comprises one or more coupling elements arranged between the side walls and the cooling unit.

[0047] One or more, e.g. two, coupling elements may be arranged along the side walls or the third wall for coupling the cooling unit to the cabinet. One or more, e.g. two, mating coupling elements may be arranged on the cooling unit for engaging the coupling elements of the side walls or third wall. The coupling may be a bracket configured to be mounted to the side or third wall using fastening means, such as screws. The bracket may comprise a deformable flange configured to engage a mating slot or recess in the outer surface of the cooling unit where the flange may be forced out of engagement using an external tool. A flat element having two or more arms for engaging the two side walls may be used to hold the cooling unit in place. Alternatively a click system may define the coupling elements. This allows the cooling unit to be fixated to the cabinet and allows for a quick and easy removal of the cooling unit.

[0048] According to one embodiment, the cabinet further comprises an air guiding plate arranged at a back end of the chamber for guiding air from the cooling unit towards the bottom surface of the chamber.

[0049] A plate or a chimney may be arranged at the back wall of the chamber and comprise a funnel shaped top part for guiding the cold air from the inlet into the spacing between the air guiding plate and the back wall. The air guiding plate may comprise one or more slots or slits, e.g. located towards the top part, for distributing the cold air along the length of the plate. This allows for a better mixing of the fast moving cold air and the slow moving warm air located in the middle of the chamber. This provides a more even temperature profile in the chamber.

Description of the Drawing

[0050] An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 shows a cooling unit according to the invention in a compact state;

Fig. 2 shows the cooling unit shown in fig. 1 with the control unit and a part of the top element removed;
 Fig. 3 shows the base element of the cooling unit;
 Fig. 4 shows a top view of the base element shown in fig. 3;
 Fig. 5 shows a cross-section of the cold side of the cooling unit shown in fig. 1;
 Fig. 6 shows a cross-section of the warm side of the cooling unit shown in fig. 1;
 Fig. 7 shows an exemplary embodiment of a cabinet with the cooling unit seen from the back side; and
 Fig. 8 shows the cabinet of fig. 7 seen from the front side.

[0051] In the following text, the figures will be described one by one, and the different parts and positions seen in the figures will be numbered with the same numbers in the different figures. Not all parts and positions indicated in a specific figure will necessarily be discussed together with that particular figure.

Position number list

1	Cooling unit	7	Side surfaces
2	Base element	8	Bottom surface
3	Top elements	9	Top surface
4	Cabinet	10	Control unit
5	Front end	11	Flange
6	Back end	12	First contact surface
13	Second contact surface	30	Second reservoir
14	Third contact surface	31	Fluid channel
15	Grooves	32	Side surface
16	Pressure valve	33	Side surface
17	Inlet air channel	34	Air flow
18	Outer opening	35	Air flow
19	Inlet opening	36	Pipe system
20	Evaporator	37	Enclosed chamber
21	Ventilators	38	Slits
22	Outlet openings	39	Support element
23	Outlet air channel	40	Back wall
24	Mounting recesses	41	Side walls
25	Mounting platforms	42	Chamber
26	Compressor	43	Spacing
27	Condenser	44	Air guiding plate
28	Ventilators	45	Slits
29	First reservoir		

Detailed Description of the Invention

[0052] Fig. 1 shows a cooling unit 1 according to the invention in a compact state. The cooling unit 1 may comprise a base element 2 and a top element 3 which are configured to form two or more enclosed chambers in which the components of the cooling unit 1 are located. The cooling unit 1 may comprise a width and a length which more or less correspond to the width and length of a commercial cabinet 4, such as a freezer, cooler or other climatized cabinet. The cooling unit 1 may comprise a front end 5 connected to a back end 6 via two side surfaces 7, a bottom surface 8 and a top surface 9.

[0053] The cooling unit 1 may be configured to be placed on top of the cabinet 4 where the bottom surface 8 acts as contact surface for contacting a mating contact surface of the cabinet 4. The mating contact surface may be arranged on a top plate of the cabinet 4. The top plate may be omitted and the bottom surface 8 may comprise another contact surface for contacting a mating contact surface on the cabinet 4, e.g. in the form of a single or double rebate joint.

[0054] An electrical control unit 10 may be arranged at the front end of the cooling unit 1 for controlling the operation of the cooling unit 1. The control unit 10 may comprise one or more electronic components (not shown) configured to control the function of the components encapsulated by the base and top elements 2, 3. The control unit 10 may be coupled to the components arranged inside the base and top element 2, 3 via one or more sets of electrical wires (not shown). The control unit 10 may be removably mounted to the top element 3, e.g. via coupling elements located on the top element 3. A flange 11 located on the top element 3 may be used to mount the control unit 10 to the top element 3.

One or more electrical terminals (not shown) arranged in the control unit 10 and/or on the top element 3 may be used to connect or disconnect the control unit 10.

[0055] Fig. 2 shows the cooling unit 1 with the control unit 10 and a part of the top element 3 removed. The top element 3 may be defined by a number of sub-elements, here two are shown; 3a, 3b which are configured to provide easy access to the different components in the cooling unit 1 without having to remove the entire top element 3. The control unit 10 may be mounted to a first sub-element 3a located at the front end 5 (omitted from fig. 2). At least a second sub-element 3b may be located at the back end 6.

[0056] The base element 2 may comprise a first contact surface 12 for contacting a second contact surface 13 on the top element 3 where the two contact surfaces 12, 13 face each other. The sub-element 3b may further comprise a third contact surface 14 for contacting a mating contact surface (not shown) on the adjacent sub-element 3a. Coupling elements, such as a tongue and a groove, may be arranged in one or more of the contact surfaces 12, 13, 14 between the base and top elements 2, 3 and/or the individual sub-elements 3a, 3b. One or more sets of grooves 15 may be formed in the contact surface 12, 13 of the base element 2. The grooves 15 may be configured to receive and hold the electrical wires and fluid pipes (not shown) coupled to the various components of the cooling unit 1. The electrical wires and fluid pipes may be arranged in one or more sets.

[0057] At least one pressure valve 16 may be arranged in the cooling unit 1, e.g. in the base element 2, and coupled to at least one air channel 17. The pressure valve 16 may further be coupled to an outer opening 18, e.g. located in the front end 5. The pressure valve 16 may be configured to equalise the pressure differential between the ambient air and the cold air inside the cabinet 4.

[0058] Fig. 3 shows the base element 2 of the cooling unit 1. One or more inlets 19 (here one is shown) may be arranged in the bottom surface 8 at the front end 5 for leading air into the cooling unit 1. The inlets 19 may be connected to one or more air channels 17 in the form of cooling channels connected to an evaporator 20 (omitted from fig. 3). One or more ventilators 21 (omitted from fig. 3) may be arranged in the air channel 17 for actively leading air from the inlet 19 to the evaporator 20. The configuration of the evaporator 20 is known and will not be described in details.

[0059] One or more outlets 22 (here two are shown) may be arranged in the bottom surface 8 at the back end 6 for leading the air out of the cooling unit 1. The outlets 22 may be configured as individual openings 22a, 22b, e.g. arranged at adjacent corners of the back end 6. The outlets 22 may be connected to one or more air channels 23 (here two are shown) in the form of cooling channels connected to the evaporator 20.

[0060] The base element 2 may comprise a number of mounting elements 24, 25 for receiving and holding the components of the cooling unit 1. The components may be defined by at least the evaporator 20, the ventilators 21 and a condensing unit. The condensing unit may at least comprise a compressor 26, a condenser 27 and one or more ventilators 28. The mounting elements 24, 25 may be formed as part of the base element 2 and shaped to follow the contours of the components. The mounting elements may be configured as mounting recesses 24a, 24b for mounting the ventilators 21, 28 and a mounting recess for mounting the condenser 27. The mounting elements may be configured as a mounting platform 25a for mounting the evaporator 21 and a mounting platform 25b for mounting the compressor 26.

[0061] Fig. 4 shows a top view of the base element 2. The evaporator 20 and the mounting platform 25a may be placed in an angled position, e.g. an acute angle, relative to the bottom surface 8 of the base element 2. The mounting platform 25a may form a first reservoir 29, e.g. shaped as a trapezoid tray, for gathering the condensate dripped off the evaporator 20. The first reservoir 29 may be connected to a second reservoir 30 located below the first reservoir 29. A fluid channel 31 may be connected to both reservoirs 29, 30 and configured to lead the condensate from the first reservoir 29 to the second reservoir 30.

[0062] The condensing unit may be arranged between two cooling channels 23a, 23b which are jointed at the evaporator 20. The two cooling channels 23a, 23b form a side surface 32 facing the evaporator 20 which may have an optimised dynamic shape for reduces the turbulence generated at the side surface 32 when the air flow passes the evaporator 20.

[0063] Fig. 5 shows a cross-section of the cold side of the cooling unit 1. The cold side may be defined by the cooling channels 17, 23, the evaporator 20 and the ventilators 21. Air (marked with arrows 34) is sucked in at the inlets 19 and passed through the evaporator 20 and further out of the outlets 22. The shape of the cooling channels, e.g. the bends, may be optimised to provide a more laminar air flow and reduces the turbulence. The ratio between a centre line radius of the cooling channels 17, 23 and the diameter of the cooling channels 17, 23 may be between 1:1 and 3:1. The size of the cooling channels 17, 21 may be determined according to a predetermined air speed and air volume passing through the cooling unit 1.

[0064] The cooling channels 17, 23 may be defined by open channels integrally formed in the base and top elements 2, 3. The open channels are aligned with each other so that the top element 3 close off the channels 17, 23 formed in the base element 2. The mounting elements 24, 25 may further be integrally formed in at least the base element 2. The base and top elements 2, 3 may be made of a foamed material, such as polypropylene, which may be expanded into the desired shape.

[0065] The ventilators 21 (here three are shown) each comprise a suction side 21a and a pressure side 21b where the pressure side 21b faces a side surface 33 of the evaporator 20. The ventilators 21 may be arranged relative to each

other, e.g. side-by-side, along a more or less straight line extending parallel with the side surface 33 of the evaporator 20 so that each ventilator 21 faces a different section of the evaporator 20. The ratio between the surface area of the evaporator 20 and the combined surface area of the ventilators 21 may be at least 1:1.

[0066] Fig. 6 shows a cross-section of the warm side of the cooling unit 1. The sub-element 3b and the base element 2 form an enclosed chamber in which the compressor 26 may be arranged. The part of the sub-element 3b which forms the enclosed chamber may optionally be formed by a third sub-element (not shown) which may be coupled to the second sub-element 3b and/or the base element 2. Air (marked with arrows 35) is sucked through the condenser 27 located at the back end 6. The configuration of the warm side forces the air 35 around the compressor 26 and over the condensate. The heated air is then lead out of the cooling unit 1 through the ventilators 28 arranged in the top surface 9. A dust and grease filter (not shown) configured to prevent dirt from entering the condenser 27 may be arranged at the front of the condenser 27, i.e. at the side surface facing away from the cooling unit 1.

[0067] The compressor 26 may be coupled to the evaporator 20 and the condenser 27 via a pipe system 36. One or more pipes (not shown) may extend from the compressor 26 and into the second reservoir 30 for heating the condensate collected in the reservoir. The pipes may then extend further through slits (not shown) formed in the base element 2 and into a third enclosed chamber 37 formed in the base element 2. The pipes may form one or more pipe loops in that area. The pipes may then be guided through slits 38 formed in the mounting platform 25a to the evaporator 20. The mounting platform 25a may be configured as a removable mounting platform for providing access to the enclosed chamber 37.

[0068] The top element 3 may further comprise one or more support elements 39 in the form of fins for receiving and holding one or more of the components in the cooling unit 1, e.g. the compressor 26. The support element 39 may be integrally formed in the sub-element 3b and shaped to follows the contours of the compressor 26. The support element 39 may be configured to fixate the compressor 26 relative to the sub-element 3b and provide support to the compressor 26 during transport and handling.

[0069] Fig. 7 shows an exemplary embodiment of the cabinet 4 with the cooling unit 1 seen from the back side. The cabinet 4 may comprise a front end in the form of a front end door (omitted from fig. 8) connected to a back end 40 via two side walls 41. The front end, the back wall 40 and side walls 41 define a chamber 42 configured to store items, such as food articles or other items, under predetermined conditions. The cooling unit 1 may be arranged at the top of the front end, the back wall 40 and the side walls 41, as shown in fig. 8.

[0070] Each side wall 41 may comprise an outwards extending side wall 41a having a height that more or less corresponds to the height of the cooling unit 1. The side surface 7 of the cooling unit 1 faces the side wall 41a and is placed in an angled position relative to the side wall 41a. The spacing 43 between the side surface 7 and the side wall 41a may be tapered off from the top surface 9 of the cooling unit 1 towards the bottom surface 8 of the cooling unit 1.

[0071] One or more coupling elements (not shown) may be arranged between the side walls 41a and the cooling unit 1 for keeping the cooling unit 1 in place.

[0072] Fig. 8 shows the cabinet 4 and the cooling unit 1 seen from the front end. Relative warm air may be lead into the cooling unit 1 at the front end via the inlets 19 and to the evaporator 20. Heat is then transferred to the refrigerant circulating in the evaporator 20 and moisture condenses and drips into the first reservoir 29 and then flows into the second reservoir 30. The cold air may then be lead back into the chamber 42 at the back wall 40 via the outlets 22. An air guiding plate 44 arranged at the back wall 40 of the chamber 42 may guide the cold air towards the bottom surface of the chamber 42. The air guiding plate 44 may comprise a plurality of slits 45 configured to mix the slow moving air inside the chamber 42 with the fast moving cold air. The slits 45 may be arranged along the length of the plate 44.

Claims

1. A cooling unit for a commercial cabinet, such as a freezer, cooler or other climatized cabinet, comprising at least:

- a base element (2) having a first contact surface (8) for contacting a second contact surface of a commercial cabinet (4) and a third contact surface (12) for contacting at least one top element (3);
- where the top element (3) is configured to be placed over at least a part of the base element (2) and has a fourth contact surface (13) for contacting the third contact surface (13);
- where an evaporator (20) is in communication with at least a first air channel (17) and a second air channel (23, 23a, 23b) which are configured to lead air (34) from an inlet (19) to the evaporator (20) and further out of an outlet (22, 22a, 22b), wherein the inlet (19) and the outlet (22, 22a, 22b) are arranged in the first contact surface (8);
- where the evaporator (20) is furthermore in communication with a condensing unit via a fluid channel (31) for leading a condensate, such as water, from the evaporator (20) to the condensing unit;
- where the condensing unit at least comprises a reservoir (30) for receiving and holding the condensate and means, such as a compressor (26), arranged relative to the reservoir (30) for evaporating the condensate in

the reservoir (30),

characterised in that

- 5 - the base and top elements (2, 3) are made from a foamed material and comprises mounting elements (24, 25) for receiving and holding at least the evaporator (20) and the condensing unit, wherein the mounting elements (24, 25) are shaped to follow the contours of that unit for fixating that unit relative to the base or top element (2, 3); and
- 10 - that the base and top elements (2, 3) are shaped to form at least two enclosed chambers when assembled in which at least the evaporator (20) and the condensing unit are arranged, wherein the inlet (19) and the outlet (22a) are arranged in opposite ends of the first contact surface (8).
2. A cooling unit according to claim 1, **characterised in that** the cooling unit further comprises a third air channel (23b) which is connected to a second outlet (22b) and further jointed with the second air channel (23a) at the evaporator (20), wherein the enclosed chamber in which the condensing unit is located is arranged between the second and third air channels (23a, 23b).
- 15 3. A cooling according to claim 2, **characterised in that** at least a fourth air channel is arranged relative to the first air channel and further connected to at least a second inlet.
- 20 4. A cooling unit according to any one of claims 1 to 3, **characterised in that** the shape of at least one of the first and second air channels (17, 23) is optimized for reducing the turbulence of the air (34) passing through that air channel (17, 23).
- 25 5. A cooling unit according to any one of claims 2 to 4, **characterised in that** at least two ventilators (21) are arranged relative to at least two of the first, second and third air channels (17, 23a, 23b) for actively leading air (34) through the air channels (17, 23), wherein a first ventilator faces a first section of the evaporator (20) and the second ventilator faces a second section of the evaporator (20).
- 30 6. A cooling unit according to any one of claims 1 to 4, **characterised in that** the condensing unit comprises a condenser (27) located in a side wall, e.g. a back end (6), of the top element (3) and a ventilator (28) in a top surface (9) of the top element (3).
- 35 7. A cooling unit according to any one of claims 1 to 6, **characterised in that** a second reservoir (29) is arranged relative to the evaporator (20) for gathering the condensate from the evaporator (20), wherein the second reservoir (29) is located in a raised position relative to the first reservoir (30).
8. A cooling unit according to any one of claims 1 to 7, **characterised in that** the foamed material is polypropylene.
- 40 9. A cooling unit according to any one of claims 1 to 8, **characterised in that** at least one pressure valve (16) is arranged in or coupled to one of the fluid channels (17) for equalising the pressure differential between the ambient air and the cold air inside the cabinet (4).
- 45 10. A cooling unit according to any one of claims 1 to 9, **characterised in that** the cooling unit further comprises a front end (5) at which an electrical control unit (10) is arranged.
- 50 11. A commercial cabinet, such as a freezer, cooler or other climatized cabinet, comprising at least one chamber (42) configured to be closed off via one or more front end doors, wherein the cabinet (4) has a first contact surface for contacting a second contact surface (8) of a cooling unit (1) which is configured to circulate the air inside the chamber (42) via at least one inlet (19) and at least one outlet (22), **characterised in that** the cooling unit (1) is configured as defined in any one of claims 1 to 10.
- 55 12. A commercial cabinet according to claim 11, **characterised in that** the cabinet (4) further comprises at least two side walls (41a) extending outwards from the first contact surface, wherein the cooling unit (1) comprises at least side surface (7) facing the side walls (41a) wherein at least one of the side surfaces (7) are placed in an angled position relative to an adjacent side wall (41a).
13. A commercial cabinet according to claim 11 or 12, **characterised in that** the cabinet (4) further comprises one or

more coupling elements arranged between the side walls (41a) and the cooling unit (1).

14. A commercial cabinet according to claim 11 or 13, **characterised in that** the cabinet (4) further comprises an air guiding plate (44) arranged at a back wall (40) of the chamber (42) for guiding air (34) from the cooling unit (1) towards the bottom surface of the chamber (42).

Patentansprüche

1. Kühleinheit für einen Gewerbeschränk, beispielsweise ein Gefrierschränk, Kühler oder anderer klimatisierter Schränk, umfassend mindestens:

- ein Basiselement (2), das eine erste Kontaktfläche (8) zum Berühren einer zweiten Kontaktfläche eines Gewerbeschranks (4), und eine dritte Kontaktfläche (12) zum Berühren von mindestens einem oberen Element (3) aufweist;
- wobei das obere Element (3) so konfiguriert ist, dass es über mindestens einem Teil des Basiselements (2) angeordnet werden kann, und eine vierte Kontaktfläche (13) zum Berühren der dritten Kontaktfläche (13) aufweist;
- wobei ein Verdampfer (20) in Kommunikation mit mindestens einem ersten Luftkanal (17) und einem zweiten Luftkanal (23, 23a, 23b) steht, die konfiguriert sind, um Luft (34) von einem Einlass (19) zu dem Verdampfer (20), und weiter aus einem Auslass (22, 22a, 22b) heraus zu leiten, wobei der Einlass (19) und der Auslass (22, 22a, 22b) in der ersten Kontaktfläche (8) angeordnet sind;
- wobei der Verdampfer (20) weiterhin über einen Fluidkanal (31) in Kommunikation mit einer Kondensationseinheit steht, um ein Kondensat, wie beispielsweise Wasser, von dem Verdampfer (20) zu der Kondensationseinheit zu leiten;
- wobei die Kondensationseinheit mindestens einen Vorratsbehälter (30) zum Aufnehmen und Halten des Kondensats, und Mittel, wie beispielsweise einen Verdichter (26) umfasst, der im Verhältnis zu dem Vorratsbehälter (30) angeordnet ist, um das Kondensat in dem Vorratsbehälter (30) zu verdampfen,

dadurch gekennzeichnet, dass

- das Basis- und obere Element (2, 3) aus einem Schaumstoff bestehen und Befestigungselemente (24, 25) zum Aufnehmen und Halten von mindestens dem Verdampfer (20) und der Kondensationseinheit umfassen, wobei die Befestigungselemente (24, 25) so geformt sind, dass sie den Konturen der Einheit folgen, um die Einheit im Verhältnis zu dem Basis- oder dem oberen Element (2, 3) zu fixieren; und
- dass das Basis- und obere Element (2, 3) so geformt sind, dass sie mindestens zwei eingeschlossene Kammern ausbilden, wenn sie montiert sind, worin mindestens ein Verdampfer (20) und die Kondensationseinheit angeordnet sind, wobei der Einlass (19) und der Auslass (22, 22a, 22b) an entgegengesetzten Enden der ersten Kontaktfläche (8) angeordnet sind.

2. Kühleinheit nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kühleinheit weiterhin einen dritten Luftkanal (23b) umfasst, der mit einem zweiten Auslass (22b) verbunden, und weiterhin mit dem zweiten Luftkanal (23a) am Verdampfer (20) verbunden ist, wobei die eingeschlossene Kammer, in der die Kondensationseinheit positioniert ist, zwischen dem zweiten und dritten Luftkanal (23a, 23b) angeordnet ist.
3. Kühleinheit nach Anspruch 2, **dadurch gekennzeichnet, dass** mindestens ein vierter Luftkanal im Verhältnis zu dem ersten Luftkanal angeordnet, und weiterhin mit mindestens einem zweiten Einlass verbunden ist.
4. Kühleinheit nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Form von mindestens einem von dem ersten und zweiten Luftkanal (17, 23) zum Reduzieren der Turbulenz der Luft (34) optimiert ist, die durch den Luftkanal (17, 23) hindurchgeht.
5. Kühleinheit nach einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** mindestens zwei Ventilatoren (21) im Verhältnis zu mindestens zwei von dem ersten, zweiten und dritten Luftkanal (17, 23a, 23b) angeordnet sind, um Luft (34) aktiv durch die Luftkanäle (17, 23) zu leiten, wobei ein erster Ventilator einem ersten Abschnitt des Verdampfers (20) zugewandt ist und der zweite Ventilator einem zweiten Abschnitt des Verdampfers (20) zugewandt ist.

6. Kühleinheit nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** die Kondensationseinheit einen Kondensator (27), der in einer Seitenwand, beispielsweise einem hinteren Ende (6) des oberen Elements (3) angeordnet ist, und einen Ventilator (28) in einer oberen Fläche (9) des oberen Elements (3) umfasst.

7. Kühleinheit nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** ein zweiter Vorratsbehälter (29) im Verhältnis zu dem Verdampfer (20) zum Sammeln von Kondensat von dem Verdampfer (20) angeordnet ist, wobei der zweite Vorratsbehälter (29) in einer angehobenen Position im Verhältnis zu dem ersten Vorratsbehälter (30) angeordnet ist.

8. Kühleinheit nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** der Schaumstoff Polypropylen ist.

9. Kühleinheit nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** mindestens ein Druckventil (16) in einem der Fluidkanäle (17) angeordnet, oder damit verbunden ist, um die Druckdifferenz zwischen der Umgebungsluft und der kalten Luft innerhalb des Schrankes (4) auszugleichen.

10. Kühleinheit nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet, dass** die Kühleinheit weiterhin eine Frontpartie (5) umfasst, an der eine elektrische Steuerung (10) angeordnet ist.

11. Gewerbeschrank, beispielsweise ein Gefrierschrank, Kühler oder anderer klimatisierter Schrank, umfassend mindestens eine Kammer (42), die konfiguriert ist, um über eine oder mehrere Frontpartietüren geschlossen zu werden, wobei der Schrank (4) eine erste Kontaktfläche zum Berühren einer zweiten Kontaktfläche (8) einer Kühleinheit (1) aufweist, die konfiguriert ist, um die Luft innerhalb der Kammer (42) über mindestens einen Zulauf (19), und mindestens einen Auslass (22) zu zirkulieren, **dadurch gekennzeichnet, dass** die Kühleinheit (1) nach einem der Ansprüche 1 bis 10 konfiguriert ist.

12. Gewerbeschrank nach Anspruch 11, **dadurch gekennzeichnet, dass** der Schrank (4) weiterhin mindestens zwei Seitenwände (41a) umfasst, die sich von der ersten Kontaktfläche nach außen erstrecken, wobei die Kühleinheit (1) mindestens eine Seitenfläche (7) umfasst, die den Seitenwänden (41a) zugewandt ist, wobei mindestens eine der Seitenflächen (7) in einer abgewinkelten Position im Verhältnis zu einer benachbarten Seitenwand (41a) angeordnet ist.

13. Gewerbeschrank nach Anspruch 11 oder 12, **dadurch gekennzeichnet, dass** der Schrank (4) weiterhin ein oder mehrere Kopplungselemente zwischen den Seitenwänden (41a) und der Kühleinheit (1) umfasst.

14. Gewerbeschrank nach Anspruch 11 oder 13, **dadurch gekennzeichnet, dass** das Gehäuse (4) weiterhin eine Luftleitplatte (44) umfasst, die an einer hinteren Wand (40) der Kammer (42) zum Leiten von Luft (34) aus der Kühleinheit (1) in Richtung der unteren Fläche der Kammer (42) angeordnet ist.

Revendications

1. Unité de refroidissement pour une armoire commerciale tel qu'un congélateur, appareil réfrigérant ou autre armoire climatisée, comprenant au moins :

- un élément de base (2) présentant une première surface de contact (8) pour toucher une deuxième surface de contact d'une armoire commerciale (4) et une troisième surface de contact (12) pour toucher au moins un élément supérieur (3) ;
- où l'élément supérieur (3) est configuré pour être placé sur au moins une partie de l'élément de base (2) et a une quatrième surface de contact (13) pour toucher la troisième surface de contact (13) ;
- où un évaporateur (20) est en communication avec au moins un premier canal d'air (17) et un deuxième canal d'air (23, 23a, 23b) qui sont configurés pour mener de l'air (34) d'une entrée (19) à l'évaporateur (20) et en outre hors d'une sortie (22, 22a, 22b), dans laquelle l'entrée (19) et la sortie (22, 22a, 22b) sont agencées dans la première surface de contact (8) ;
- où l'évaporateur (20) est de plus en communication avec une unité de condensation par le biais d'un canal de fluide (31) pour mener un condensat tel que de l'eau de l'évaporateur (20) à l'unité de condensation ;
- où l'unité de condensation comprend au moins un réservoir (30) pour recevoir et contenir le condensat et des moyens tels qu'un compresseur (26) agencés par rapport au réservoir (30) pour évaporer le condensat dans le réservoir (30),

caractérisée en ce que

- les éléments de base et supérieur (2, 3) sont constitués d'un matériau expansé et comprend des éléments de montage (24, 25) pour la réception et le maintien au moins de l'évaporateur (20) et l'unité de condensation, dans laquelle les éléments de montage (24, 25) sont formés pour suivre les contours de cette unité afin de fixer cette unité par rapport à l'élément de base ou supérieur (2, 3) ; et

- **en ce que** les éléments de base et supérieur (2, 3) sont formés pour réaliser au moins deux chambres fermées lors de l'assemblage dans lesquelles au moins l'évaporateur (20) et l'unité de condensation sont agencés, dans laquelle l'entrée (19) et la sortie (22, 22a, 22b) sont agencées dans des extrémités en regard de la première surface de contact (8).

2. Unité de refroidissement selon la revendication 1, **caractérisée en ce que** l'unité de refroidissement comprend en outre un troisième canal d'air (23b) qui est relié à une seconde sortie (22b) et joint en outre avec le deuxième canal d'air (23a) sur l'évaporateur (20), dans laquelle la chambre fermée, dans laquelle l'unité de condensation est située est agencée entre les second et troisième canaux d'air (23a, 23b).

3. Unité de refroidissement selon la revendication 2, **caractérisée en ce qu'**au moins un quatrième canal d'air est agencé par rapport au premier canal d'air et relié en outre à au moins une seconde entrée.

4. Unité de refroidissement selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** la forme d'au moins un des premier et deuxième canaux d'air (17, 23) est optimisée pour réduire la turbulence de l'air (34) passant par ce canal d'air (17, 23).

5. Unité de refroidissement selon l'une quelconque des revendications 2 à 4, **caractérisée en ce qu'**au moins deux ventilateurs (21) sont agencés par rapport à au moins deux des premier, deuxième et troisième canaux d'air (17, 23a, 23b) pour mener activement de l'air (34) par les canaux d'air (17, 23), dans laquelle un premier ventilateur fait face à une première section de l'évaporateur (20) et le second ventilateur fait face à une seconde section de l'évaporateur (20).

6. Unité de refroidissement selon l'une quelconque des revendications 1 à 4, **caractérisée en ce que** l'unité de condensation comprend un condensateur (27) situé dans une paroi latérale, par exemple une extrémité arrière (6) de l'élément supérieur (3) et un ventilateur (28) dans une surface supérieure (9) de l'élément supérieur (3).

7. Unité de refroidissement selon l'une quelconque des revendications 1 à 6, **caractérisée en ce qu'**un second réservoir (29) est agencé par rapport à l'évaporateur (20) pour collecter le condensat de l'évaporateur (20), dans laquelle le second réservoir (29) est situé dans une position relevée par rapport au premier réservoir (30).

8. Unité de refroidissement selon l'une quelconque des revendications 1 à 7, **caractérisée en ce que** le matériau expansé est du polypropylène.

9. Unité de refroidissement selon l'une quelconque des revendications 1 à 8, **caractérisée en ce qu'**au moins une valve de pression (16) est agencée dans ou couplée à un des canaux de fluide (17) pour égaliser le différentiel de pression entre l'air ambiant et l'air froid dans l'armoire (4).

10. Unité de refroidissement selon l'une quelconque des revendications 1 à 9, **caractérisée en ce que** l'unité de refroidissement comprend en outre une extrémité avant (5), sur laquelle une unité de contrôle électrique (10) est agencée.

11. Armoire commerciale telle qu'un congélateur, un appareil réfrigérant ou autre armoire climatisée, comprenant au moins une chambre (42) configurée pour être fermée par le biais d'une ou plusieurs portes d'extrémité avant, dans laquelle l'armoire (4) a une première surface de contact pour toucher une deuxième surface de contact (8) d'une unité de refroidissement (1) qui est configurée pour faire circuler l'air dans la chambre (42) par le biais d'au moins une entrée (19) et d'au moins une sortie (22), **caractérisée en ce que** l'unité de refroidissement (1) est configurée selon l'une quelconque des revendications 1 à 10.

12. Armoire commerciale selon la revendication 11, **caractérisée en ce que** l'armoire (4) comprend en outre au moins deux parois latérales (41a) s'étendant vers l'extérieur depuis la première surface de contact, dans laquelle l'unité de refroidissement (1) comprend au moins une surface latérale (7) faisant face aux parois latérales (41a), dans

laquelle au moins une des surfaces latérales (7) est placée dans une position anglée par rapport à une paroi latérale adjacente (41a).

5 **13.** Armoire commerciale selon la revendication 11 ou 12, **caractérisée en ce que** l'armoire (4) comprend en outre un ou plusieurs éléments de couplage agencés entre les parois latérales (41a) et l'unité de refroidissement (1).

10 **14.** Armoire commerciale selon la revendication 11 ou 13, **caractérisée en ce que** l'armoire (4) comprend en outre une plaque de guidage d'air (44) agencée sur une paroi arrière (40) de la chambre (42) pour guider l'air (34) de l'unité de refroidissement (1) vers la surface inférieure de la chambre (42).

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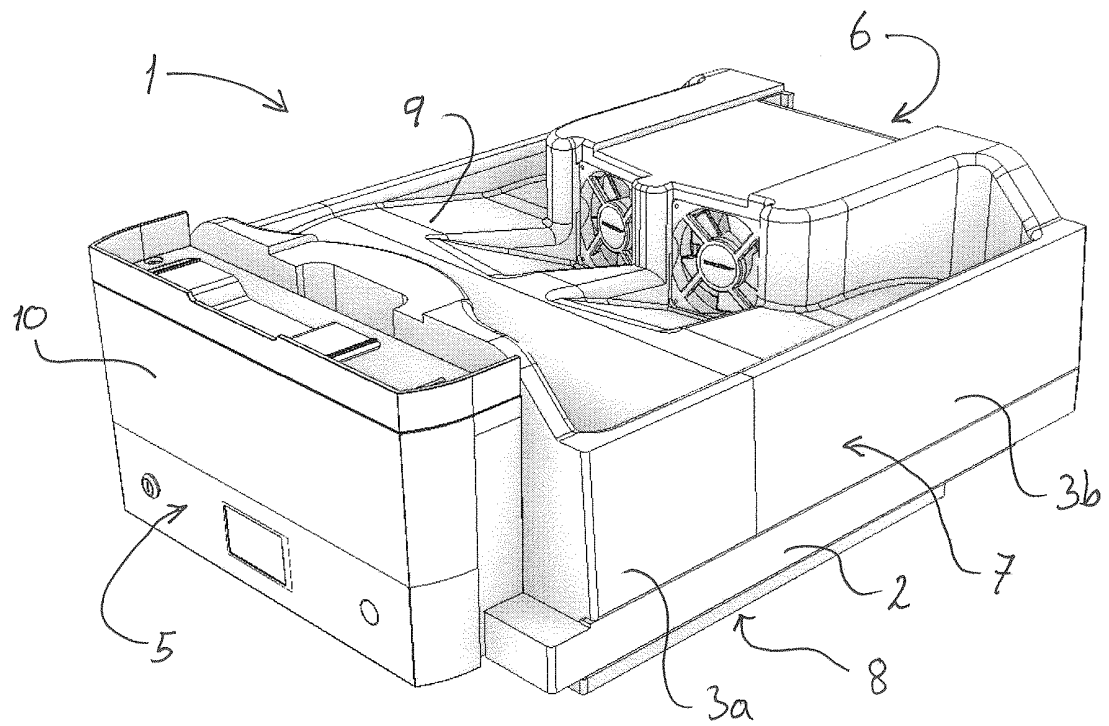


Fig. 1

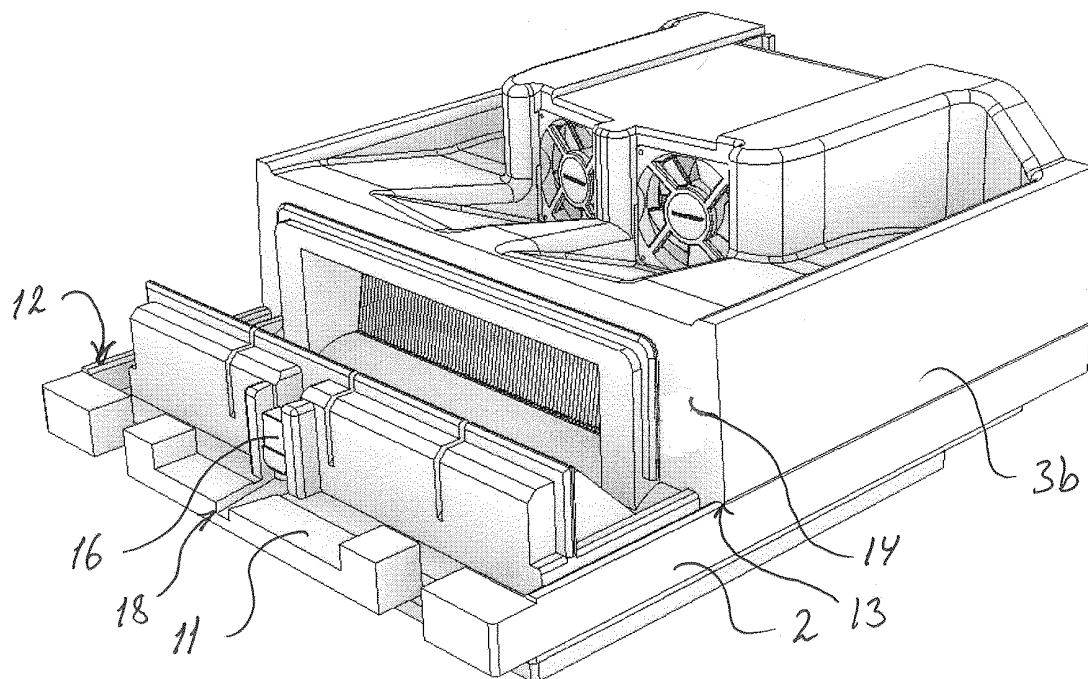


Fig. 2

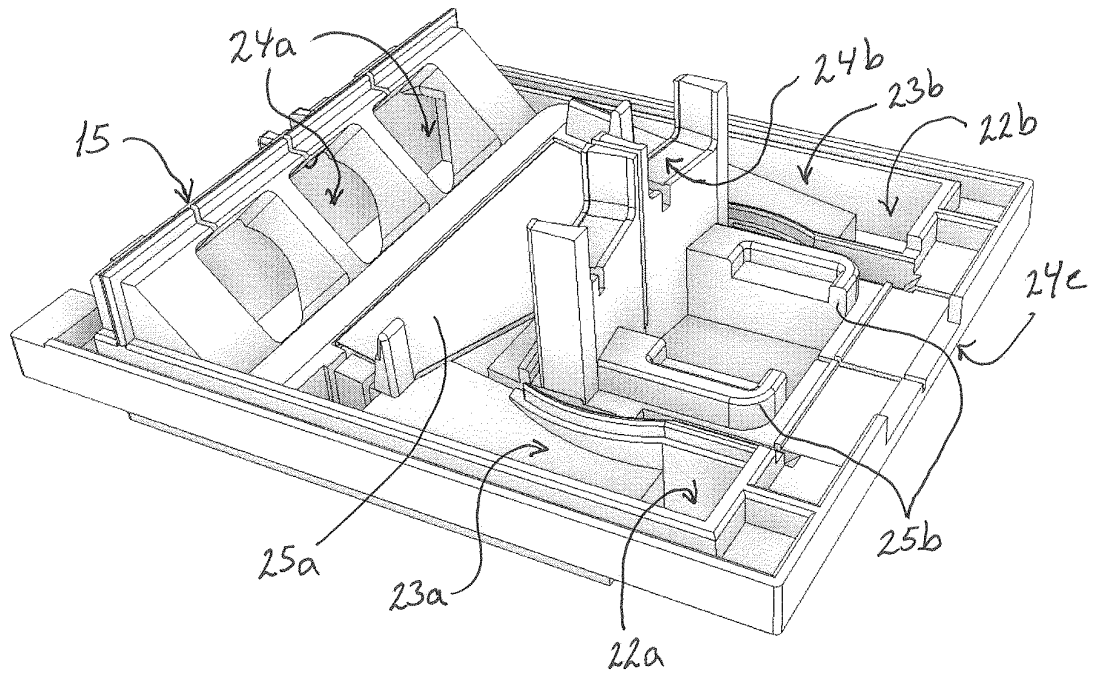


Fig. 3

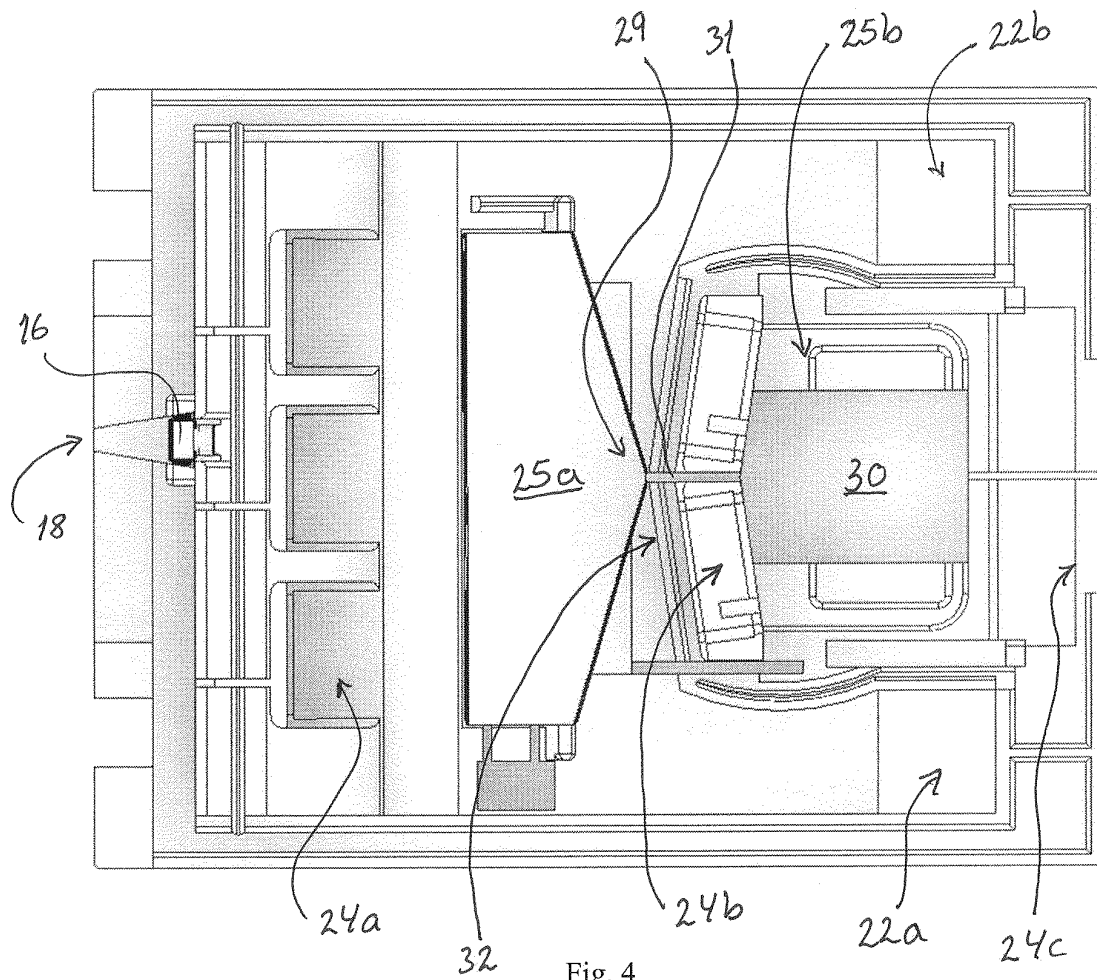


Fig. 4

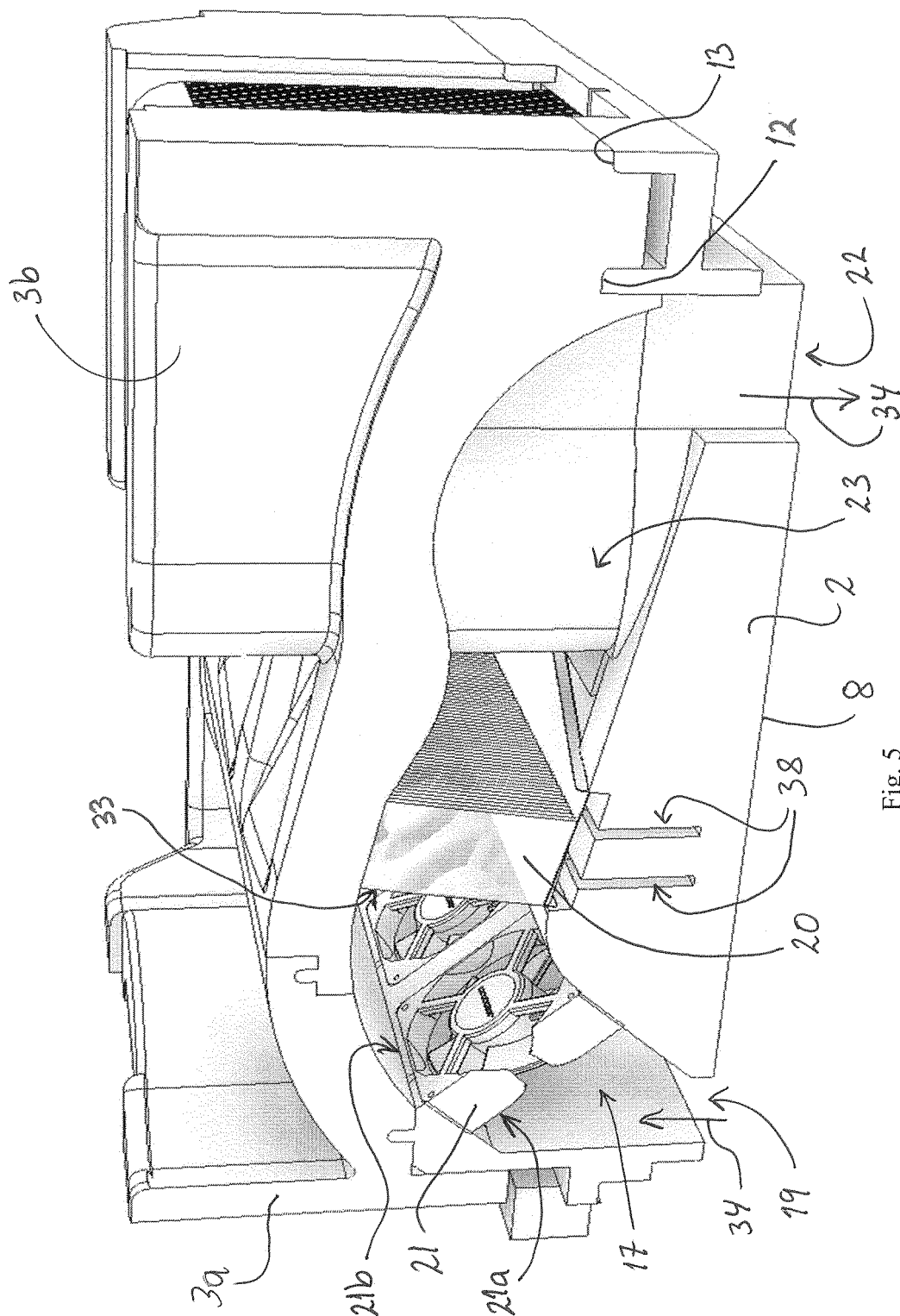


Fig. 5

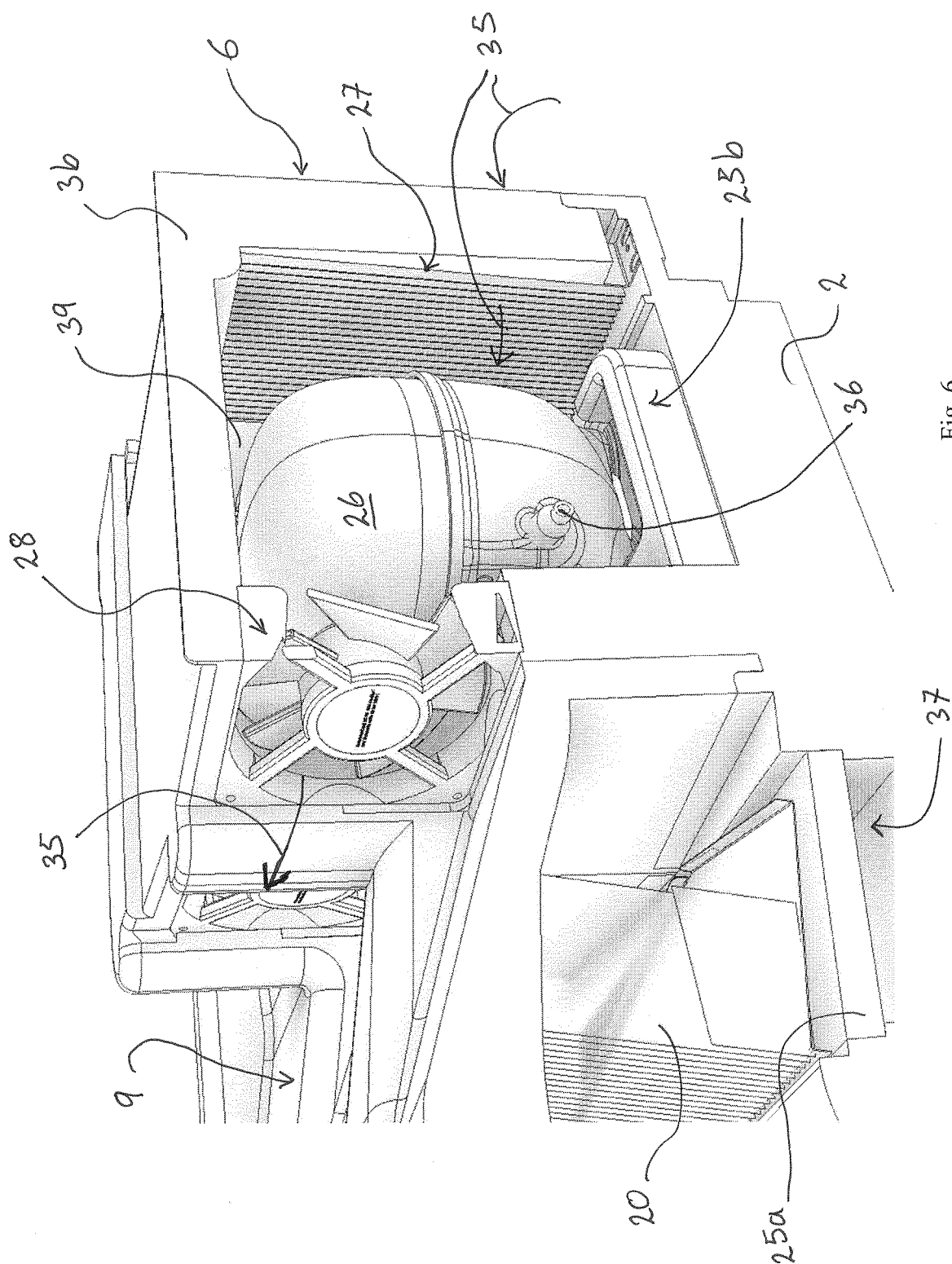


Fig. 6

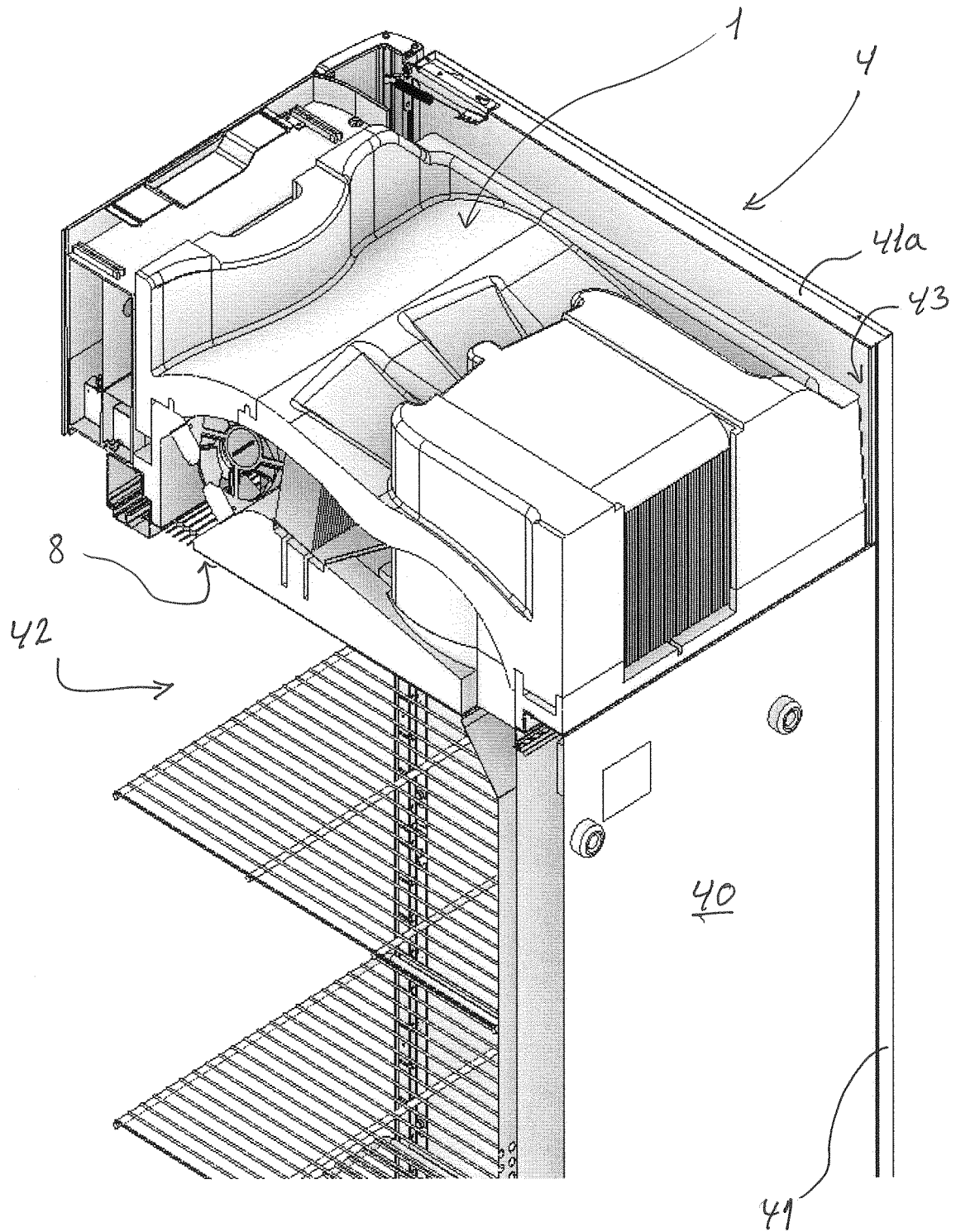


Fig. 7

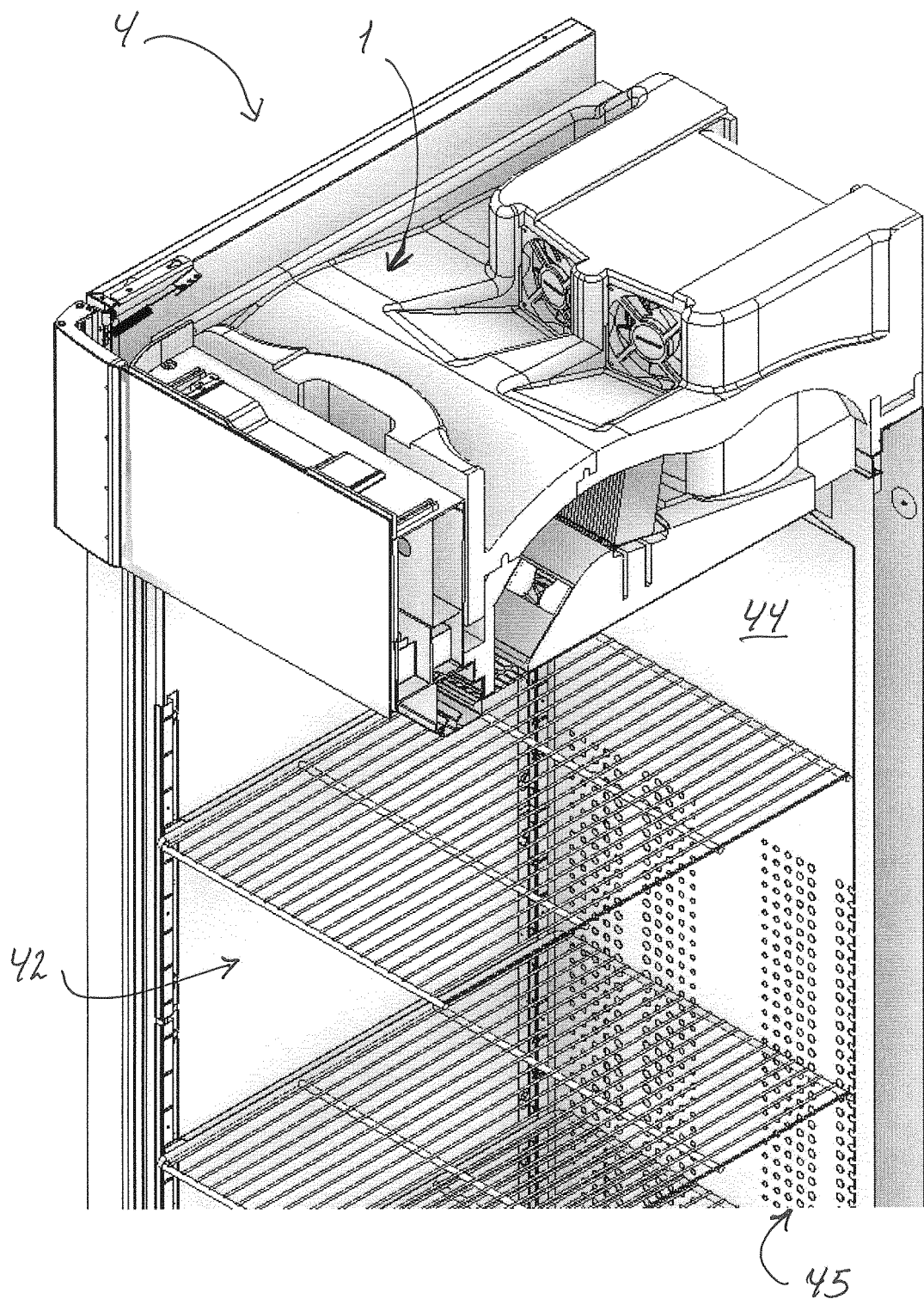


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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