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(71) Applicants:
- **BSH Electrodomésticos España, S.A.**
  50016 Zaragoza (ES)
- **BSH Hausgeräte GmbH**
  81739 München (DE)

(72) Inventors:
- **Florez Mancho, Francisco Javier**
  31610 Villava (Navarra) (ES)
- **Lamuela, Jose Manuel**
  Navarra (ES)
- **Schäfer, Thomas**
  89537 Giengen (DE)

(54) EVAPORATING SET FOR A REFRIGERATING APPLIANCE AND A REFRIGERATING APPLIANCE COMPRISING SAID EVAPORATING SET

(57) An evaporating set installable inside a conduit of a refrigerating appliance through which a process fluid to be cooled down can flow, which comprises a substantially flat evaporator and two fixing elements located on opposite sides of the evaporator, wherein the evaporating set is connectable to opposite sides of the interior of a first conduit, which comprises at least one blocking element, connectable to at least one of the fixing elements in such a manner that the evaporating set is connectable to opposite sides of the interior of a bigger second conduit than the first conduit.

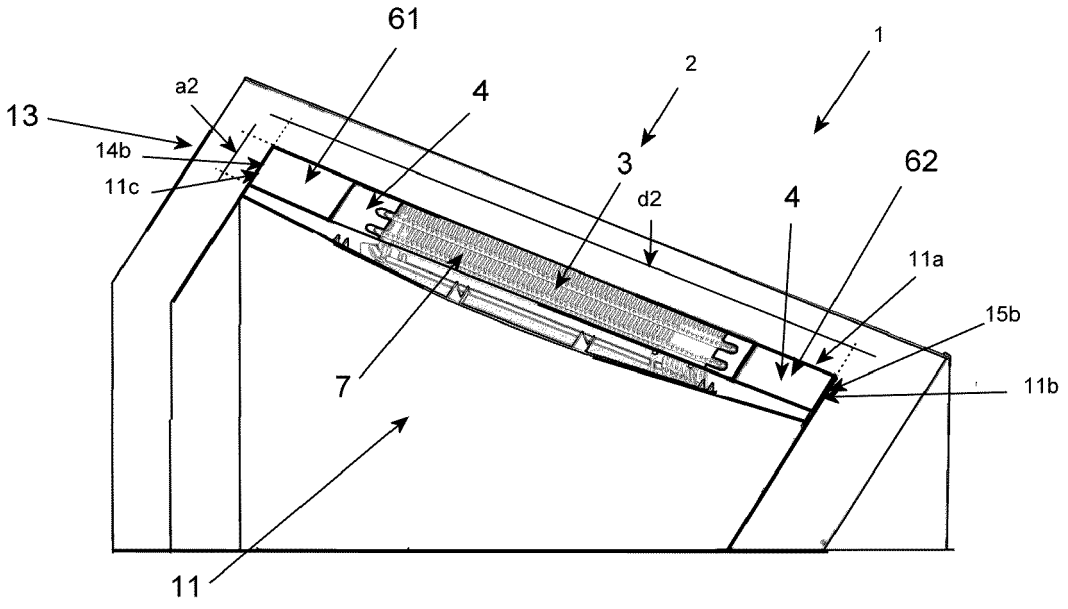

Fig.7

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Description

[0001] The invention relates to an evaporating set installable inside a conduit of a refrigerating appliance through which a process fluid to be cooled down can flow. Furthermore, the invention relates to a refrigerating appliance comprising an evaporating set according to the invention.

[0002] The evaporating sets for refrigerating appliances according to the state of the art comprise a substantially flat evaporator and two fixing elements located on opposite sides of said evaporator. This evaporating set is connectable to the opposite sides of the conduit through which the air to be refrigerated flows.

[0003] However, not every refrigerating appliance has the same size and, therefore, not every conduit through which the air to be refrigerated flows has the same size either. Household refrigerating appliances of different widths in which the conduits through which a process fluid (usually air) to be refrigerated flows have a different width too depending on the total width of the refrigerating appliance are typical. In these refrigerating appliances, different refrigerating sets are arranged comprising the same evaporator but comprising different fixing elements of different sizes, which make them connectable to the opposite sides of the conduit in which they are arranged.

[0004] This has as a consequence that, when the evaporating set needs to be arranged in bigger conduits, bigger fixing elements need to be arranged for the evaporating set to be connectable to the opposite sides of the bigger conduit. Generally, the fixing elements have complex geometries to be adapted to the evaporator. This makes these pieces be expensive and manufacturable in a complex manner. Furthermore, in the factories where these evaporating sets are to be manufactured and mounted, complexity grows due to the fact that as many evaporating sets as conduit sizes need to be managed.

[0005] In addition, some of these evaporating sets comprise a heating element as well, which is arranged near the evaporator to be able to defrost the humidity of the process fluid that condenses and freezes in the evaporator and in areas near the same due to the low temperatures of the evaporator particularly in refrigerating appliances having closed spaces in which temperatures below 0 degrees centigrade need to be reached. In these evaporating sets, the heating element extends from one of the fixing elements and generally extends from the closest side of the fixing element to the inner wall of the conduit. Due to this, if the fixing element is bigger (for example, in width), the heating element needs to be bigger too to be able to encompass the entire evaporator, since it extends from a further location from the same. This makes the heating element be more expensive, since it is not possible to use the same heating element in different conduit sizes and, therefore, this makes the amount of evaporating sets that need to be managed in a factory to be mounted in bigger conduits increase.

[0006] Therefore, there is a need of evaporating sets that can be arranged in conduits of different sizes without the production of new fixing elements for each of these sets adaptable to the sizes of said conduits being necessary. Furthermore, it is required to reduce the complexity of factories in which evaporating sets are manufactured and arranged. In the case of evaporating sets comprising a heating element, there is also a need to be able to utilise evaporating sets with the same heating device in bigger conduits.

[0007] Therefore, it is an object of the present invention to provide an evaporating set, which can be arranged in bigger conduits in an easier and cheaper manner and the complexity in factories in which the production and assembly of these evaporating sets is to be managed being reduced. Furthermore, it is required that the same heating element can be utilised in bigger conduits

[0008] The object of the present invention is an evaporating set installable inside a conduit of a refrigerating appliance through which a process fluid to be cooled down can flow, which comprises a substantially flat evaporator and two fixing elements located on opposite sides of the evaporator, wherein the evaporating set is connectable to opposite sides of the interior of a first conduit, which comprises at least one blocking element, connectable to at least one of the fixing elements in such a manner that the evaporating set is connectable to opposite sides of the interior of a bigger second conduit than the first conduit.

[0009] In this manner, it is achieved that a same heating set can be used in bigger conduits in a very simple and economical manner. The at least one blocking element may have a very simple prism geometry having the function of taking up the rest of the space existing between the evaporating set connectable to the first conduit and the additional space of the bigger second conduit with respect to the first conduit. The at least one blocking element may have a simple geometry easily realisable by diverse means including mould injection, which is much easier than that of the fixing elements, which is advantageous.

[0010] The refrigerating appliances according to the invention comprise a heat pump system. A heat pump system is a thermal machine taking heat from a cold space and transferring it into a warmer one by means of a mechanical work. A heat pump system comprises at least one condenser, one evaporator and one compressor and a refrigerant circulating through a conduit among the components of said heat pump. In most cases, it also comprises a capillary tube and a dehydrating filter.

[0011] The refrigerant in a gaseous state flowing out of the evaporator through the return tube is absorbed by the compressor. The compressor is usually composed of an electric motor and a piston to compress the refrigerant. In the compressor, the refrigerant is compressed and heated. The refrigerant, after flowing out of the compressor, enters the condenser being hot, where the refrigerant begins to cool down. Along the condenser, the refrigerant cools down and condenses and, when flowing out of the

condenser, the refrigerant is almost entirely liquid. For this reason, the condenser is also known as the hot focus of the heat pump system, since it emits heat.

[0012] Subsequently, the refrigerant flows preferably through a dehydrating filter. The dehydrating filter is an element containing a material able to absorb water. It is here where the water and/or humidity that might have penetrated the system is retained, which needs to be eliminated before the refrigerant reaches the capillary, since humidity may cause obstructions in the capillary as a consequence of the frozen water that might have entered the system. The next element flowed through by the refrigerant is the capillary tube. The capillary, which is a tube having a very small inner diameter, makes the liquid refrigerant coming from the dehydrating filter start to evaporate at its outlet (which is the evaporator inlet). The refrigerant starting to evaporate at the end of the capillary flows into the evaporator. Since the diameter of the evaporator tubes is much bigger than that of the capillary, the pressure drops and the evaporation occurs. The evaporation of the refrigerant gas makes it absorb heat from the environment surrounding it and, therefore, the evaporator is the cold focus of the heat pump system, since it is at very low temperatures and, for this reason, it is able to absorb heat.

[0013] Finally, the refrigerant flows back in a gaseous state to the compressor through the return tube and, here, it would start to flow through the entire circuit again.

[0014] It is typical that the evaporator is arranged inside a conduit and connectable to its opposite sides by means of the fixing elements. The fixing elements are elements mainly having a fixing function of the evaporator to opposite sides of the interior of the conduit and, in addition, they preferably prevent the process fluid from flowing through the space taken up by them. In this manner, all the process fluid or the most part of it flows through the evaporator. This improves and optimises the heat exchange between the evaporator and the process fluid.

[0015] Preferably, the process fluid is air.

[0016] A substantially flat evaporator is that in which two of its dimensions are bigger than the third dimension. This has as a consequence that the evaporating element has a substantially rectangular cut section in the longitudinal direction and the process fluid flows through it longitudinally. The evaporator is preferably of tube and fins to optimise the heat exchange between the same and the process fluid flowing through it.

[0017] The second conduit is bigger than the first conduit when at least one of the distances between opposite sides of the interior of the conduit is bigger than the distance between the same opposite sides of the first conduit. The preferred option is that in which the distance between the opposite sides to which the fixing elements are fixed is bigger in the second conduit than in the first conduit. The difference in distance between opposite sides is that taken up by the blocking element and, due to the same, the same evaporating set can be arranged in bigger conduits. Therefore, if the first and the second conduit are arranged vertically, the second conduit can be bigger since it is wider and/or deeper.

[0018] It is a preferred option that the conduit is located in the rear part of the refrigerating appliance, where the evaporating set is located in the vertical direction. This type of appliances is manufactured and sold in different widths such as 45 cm, 50 cm, 55 cm, 60 cm, 65 cm, 70 cm. In that case, it is possible to make an evaporating set that can be arranged in the conduit of the refrigerating appliance with one of the widths and, by means of the invention, the evaporating set can be utilised in a wider conduit. This configuration is described for illustrative purposes and is not limitative since it falls within the scope of protection of the invention that the conduit is arranged on one the sides of the refrigerating appliance in the vertical direction and the refrigerating appliance has different depths.

[0019] It is a preferred option that the fixing elements and/or the at least one blocking element are made of Expanded Polystyrene (EPS). It is also a preferred option that the at least one blocking element and/or the fixing elements are made of a thermoplastic elastomer (TPE).

[0020] In a preferred embodiment, the evaporating set further comprises a heating element to defrost the ice that may accumulate in the evaporator and/or conduit, wherein the heating element extends from one of the fixing elements at least partially over the bottom of the evaporator.

[0021] Refrigerating appliances have at least one cavity to be refrigerated. If the target temperature of that cavity is below zero degrees centigrade, the evaporator will work at lower temperatures and a risk is taken that the humidity contained in the process fluid condenses in the evaporator or in the conduit in close areas to the evaporator. Therefore, it is advantageous to have a heating element that melts the ice accumulated in the evaporator and its surroundings when it is activated. Furthermore, an arrangement of the heating element on its lower part is advantageous since the heat flows up, the entire area of the evaporator being reached more easily in this manner.

[0022] Preferably, the heating element is a tubular electrical resistance that is fixed to one of the fixing elements and, from said fixing element, it extends at least partially over the bottom of the evaporator. Preferably, it extends in parallel to the same.

[0023] The heating element extends preferably from the fixing element, from the closest side to the internal side of the conduit to which it is fixed. In this manner, the electrical connections can be arranged more easily.

[0024] In another preferred embodiment, the evaporating set takes up substantially an entire section of a conduit, wherein both the fixing elements and the blocking element are solid elements that seal and prevent the process fluid from flowing through the part of a section taken up by them.

[0025] This is an advantageous embodiment to minimise the space taken up by the conduit.

[0026] Furthermore, the fact that both the fixing ele-

ments and the blocking element seal and prevent the process fluid from flowing through the section taken up by them is particularly advantageous to increase and optimise the flowing of the process fluid through the evaporator since this improves the performance of the heat transfer between the evaporator and the process fluid.

[0027] In another preferred embodiment, the first conduit and the second conduit are substantially flat.

[0028] This is an advantageous embodiment to minimise the space taken up by the conduit. In this manner, the space available in the refrigerating appliance can be optimised. In this way, the conduit takes up substantially the same space as the evaporating set and leaves the remaining space available for the cavity to be refrigerated.

[0029] In a preferred embodiment, the first conduit and the second conduit have a substantially quadrangular section.

[0030] The quadrangular section is the best adapted section to the section of a substantially flat evaporator. In this manner, the conduit in which the evaporating set is arranged takes up the minimum possible space and leaves the remaining space available for all the other components of the refrigerating appliance including the cavity to be refrigerated.

[0031] As an illustrative and non-limitative example, if both the first conduit and the second conduit have a substantially quadrangular section and, in addition to that, they are located in the vertical direction of the refrigerating appliance, the second conduit will be bigger than the first conduit if the width of the second conduit is bigger than that of the first conduit, or the depth of the second conduit is bigger than the depth of the first conduit or both the width and the depth of the second conduit are bigger than those of the first conduit. The width and depth dimensions will vary according to the orientation and position of the first conduit and of the second conduit.

[0032] In a preferred configuration of a quadrangular section, it is a rectangular section. And preferably and for illustrative and non-limitative purposes again, a preferred conduit section is a rectangular section in which one of the dimensions is substantially bigger than the other one and it is a preferred configuration that the second conduit is bigger than the first conduit because its rectangular section is bigger than the rectangular section of the first conduit.

[0033] In a preferred embodiment, the blocking element comprises a first blocking element connectable to a fixing element and a second blocking element connectable to the other fixing element.

[0034] This configuration has the advantage of helping centre the evaporator in the conduit in which it is arranged. This embodiment is advantageous to facilitate the flowing of the process fluid through the evaporator by distancing it from the walls of the interior of the conduit.

[0035] In a preferred embodiment, the first blocking element and the second blocking element are identical.

[0036] This embodiment has the advantage that the evaporating set can be centred inside the second conduit just with one blocking element reference.

[0037] In a preferred embodiment, the blocking element is connected to the fixing element by a positive connection and/or additional connecting means and/or by welding and/or glueing.

[0038] Positive connections, the additional connecting means, welding and/or glueing are connecting modes between pieces, which are cheap and easy to realise.

[0039] The preferred connecting mode between the fixing element and the blocking element is by a positive connection. This is a simple, robust and economical connecting mode since no additional elements are required and, in addition, it is very flexible since it can be carried out in the own refrigerating appliance production line and at least one blocking element can be connected to the evaporating set or not depending on the size of the conduit of the refrigerating appliance being manufactured at the moment. The dovetail connection is a preferred option too.

[0040] Other connecting modes such as by means of a screw or nut, glueing, soldering/welding with or without a material addition fall within the scope of protection of the invention as well.

[0041] In a preferred embodiment of the invention, the blocking element or the fixing element comprises at least one protuberance and the other out of the blocking element or the fixing element comprises at least one receiving element in such a manner that the protuberance engages the receiving element by a positive connection.

[0042] This embodiment has the advantage of the simplicity of the connection of the at least one blocking element to the fixing element. One of them will have at least one protuberance, while the other one will have at least one receiving element, in such a manner that the protuberance engages the receiving element by a positive connection.

[0043] It is a preferred configuration that the blocking element comprises at least one protuberance and the fixing element comprises at least one receiving element. This configuration has the advantage that the fixing elements seal and prevent the process fluid from flowing through the section taken up by them when the evaporating set is arranged in the first conduit. In this manner, all or almost all the process fluid is forced to flow through the evaporator.

[0044] In a preferred embodiment of the invention, the protuberance and the receiving element extend longitudinally and have the three-side geometry of a rectangular trapezium in such a manner that the protuberance engages the receiving element, or the protuberance and the receiving element have a cylindrical geometry in such a manner that the protuberance engages the receiving element.

[0045] These are two easy and cheap modes for connecting the at least one blocking element to the fixing element.

[0046] It is a preferred configuration that the fixing

element has at least one channel or groove-shaped receiving element extending longitudinally over at least a part of the fixing element, while at the same time the at least one blocking element has at least one protuberance extending longitudinally over at least a part of the blocking element in such a manner that the protuberance engages the receiving element by a positive connection. Furthermore, it is a preferred configuration that the receiving element and the protuberance have the three-side geometry of a trapezium.

[0047] In addition, it is a preferred configuration that the fixing element has at least one cylindrical receiving element, while at the same time the at least one blocking element has at least one likewise cylindrical protuberance in such a manner that the protuberance engages the receiving element by a positive connection.

[0048] It is a preferred option that the fixing element has at least two cylindrical receiving elements and the at least one blocking element has at least two cylindrical protuberances in such a manner that the protuberances engage the receiving elements by a positive connection. Furthermore, this is the preferred configuration when the evaporating set has two blocking elements, wherein the first of them is connected to a fixing element and the second of the blocking elements is connected to the other of the fixing elements. In this manner, it can be achieved easily that two identical blocking elements with a mirror-like geometry are each fixed to a fixing element. Thus, the evaporating set is centred in the conduit and the number of pieces and their complexity are minimised.

[0049] In a preferred embodiment according to the invention, the heating element extends over the entire bottom of the evaporator and substantially in parallel to the same.

[0050] This embodiment has the advantage that the defrosting of the ice is accelerated, which has been produced in the evaporator and near the conduit as a consequence of the low temperatures at which the evaporator is. The bigger the heating element is and the bigger the part of the evaporator encompassed by the same is, the quicker the defrosting of the ice that might have been produced will be. Therefore, it is advantageous that the heating element extends over the entire bottom of the evaporator.

[0051] In addition, it is a preferred configuration that it extends substantially in parallel since, due to this, the distance between the evaporator and the heating element is substantially the same and a quicker and more homogeneous defrosting of the ice that might have accumulated in the evaporator can take place along the entire evaporator.

[0052] Furthermore, an object of the present invention is a refrigerating appliance comprising an evaporating set according to the previously described embodiments.

[0053] In this manner, it is achieved that a same evaporating set can be utilised in bigger conduits in a very simple and cheap way. The at least one blocking element may have a very simple prism geometry having the function of taking up the remaining space existing between the evaporating set connectable to the first conduit and the additional space of the bigger second conduit with respect to the first conduit. The at least one blocking element may have a simple geometry easily realisable by diverse means including mould injection, which is much easier than that of the fixing elements, which is advantageous.

[0054] In a preferred embodiment according to the invention, the refrigerating appliance comprises an inner cavity to be refrigerated, wherein at least three walls of the inner cavity form part of the walls of the conduit.

[0055] This embodiment has the advantage that no additional conduit is required through which the process fluid circulates and, therefore, the available space inside the refrigerating appliance is optimised and a cheaper conduit is achieved.

[0056] It is a preferred configuration that the refrigerating appliance has at least one cavity to be refrigerated having a right-side wall, a left-side wall, a rear-side wall and a front access to said cavity closed by a usable door that can be opened and through which said cavity can be accessed. In this type of refrigerating appliances, a fourth wall can be arranged substantially in parallel to the rear-side wall. In this manner, a space acting as a conduit in which an evaporating set can be arranged and through which the process fluid to be cooled down circulates is delimited.

[0057] It is another preferred configuration that a fourth wall is arranged substantially in parallel to one of the side walls and delimiting a space either next to the right-side wall or next to the left-side wall acting as a conduit, in which the evaporating set can be arranged and the process fluid to be cooled down circulates.

[0058] In a preferred embodiment according to the invention, the refrigerating appliance has a conduit, which is arranged in the rear part of the inner cavity in the vertical direction of the refrigerating appliance.

[0059] This embodiment is particularly advantageous for the optimisation of the space of the refrigerating appliance. It is a preferred configuration that the refrigerating appliance has at least one cavity to be refrigerated having a right-side wall, a left-side wall, a rear-side wall and a front access to said cavity closed by a usable door through which said cavity can be accessed. In this type of refrigerating appliances, a fourth wall can be arranged substantially in parallel to the rear-side wall. In this manner, a space acting as a conduit in which an evaporating set can be arranged and through which the process fluid to be cooled down circulates is delimited.

[0060] It is a preferred option that a fan pushes the process fluid flowing through the evaporating element from the bottom of the evaporator and in the vertical direction flowing through the evaporator longitudinally. In this manner, the contact surface between the process fluid and the evaporator increases. This improves the efficiency of the refrigerating appliance.

[0061] It is a preferred configuration that the conduit

has a substantially rectangular section. In this manner, the space usage in the refrigerating appliance is optimised.

[0062] In a preferred embodiment according to the invention, the refrigerating appliance is a fridge, a freezer or a fridge-freezer.

[0063] In the case of a fridge, it has at least one cavity to be refrigerated in which the target temperature is above zero degrees centigrade. Preferably, the target temperature ranges from two to eight degrees centigrade.

[0064] In another preferred option as a fridge, the target temperature ranges from ten to twenty degrees centigrade, more preferably from twelve to eighteen degrees centigrade and, even more preferably, the target temperature ranges from fourteen to sixteen degrees centigrade.

[0065] In the case of a freezer, it has at least one cavity to be refrigerated in which the target temperature is below zero degrees centigrade. Preferably, the target temperature ranges from minus eighteen to minus twenty-four degrees centigrade.

[0066] In the case of a fridge-freezer (usually named combined appliances as well), it has at least one cavity to be refrigerated in which the target temperature is above zero degrees centigrade and at least another cavity to be refrigerated in which the target temperature is below zero degrees centigrade.

[0067] The target temperatures of the cavities to be refrigerated in a fridge-freezer are preferably the same as those disclosed for a fridge and for a freezer.

[0068] Aspects and embodiments of the invention are subsequently described based on schematic drawings, in which

figure 1 is a view of a refrigerating appliance according to the invention;
figure 1a is a view of an evaporating set arranged in a first conduit according to the state of the art;
figure 2 is a view of an evaporating set arranged in a second conduit according to the state of the art;
figure 3 is a view of an evaporating set according to the invention;
figure 4 is a schematic view of a feasible connection of an evaporator to a fixing element and of a blocking element to a fixing element according to the invention;
figure 5 is a view of an evaporating set arranged in a second conduit according to the invention;
figure 6 is a perspective view of a refrigerating appliance according to the state of the art;
figure 7 is a perspective view of a refrigerating appliance according to the invention;
figure 8 is a top view of the embodiment shown in figure 6;
figure 9 is a top view of the embodiment shown in figure 7;
figure 10 is a view of a feasible connecting mode of a fixing element to a blocking element according to the invention;
figure 11a is another view of a feasible connecting mode of a fixing element to a blocking element according to the invention;
figure 11b is another view of a feasible connecting mode of a fixing element to a blocking element according to the invention
figure 12 is a view of another feasible connecting mode of a fixing element to a blocking element according to the invention;
figure 13a is another view of another feasible connecting mode of a fixing element to a blocking element according to the invention; and
figure 13b is another view of another feasible connecting mode of a fixing element to a blocking element according to the invention.

[0069] Figure 1 shows a schematic view of a refrigerating appliance 1 according to the invention. The refrigerating appliance 1 has a housing 13 and two inner cavities 11 to be refrigerated closed by two doors allowing or closing access to said inner cavities 11. The top inner cavity 11 needs to be refrigerated with a target temperature above 0 degrees centigrade. In addition, it has a lower inner cavity 11 to be refrigerated with a target temperature below 0 degrees centigrade. A second conduit 17, which extends vertically and in which an evaporating set 2 according to the invention is arranged, is arranged in the rear part of the lower inner cavity 11.

[0070] Figure 1a shows a view of an evaporating set 2 arranged in a first conduit 7 according to the state of the art. Figure 1a shows a first conduit 7 of a refrigerating appliance 1 through which a process fluid 10 circulates and in which an evaporating set 2 is arranged. The arrows represent how the process fluid 10 flows through the evaporating set 2 through the space taken up by the evaporator 3. The evaporating set 2 has an evaporator 3 fixed to fixing elements 4 located on opposite sides 34, 35 of the evaporator 3. The fixing elements 4 are connected to opposite sides 14a and 15a of the interior of the first conduit 7. The first conduit 7 shown in figure 1a has a cut section 44a, which, in the represented case, is substantially rectangular and has a first-conduit size defined in this case by the distance d1, which is the distance between the opposite sides 14a and 15a and the depth (not represented in figure 1a) forming the section 44a of the first conduit 7.

[0071] Furthermore, the evaporating set 2 shown in figure 1a has a heating element 5 (preferred option if the inner cavity 11 to be refrigerated has a target temperature below 0° centigrade) extending over the entire evaporator 3 and from the right fixing element 4. The heating element 5 extends from the right fixing element 4 from the closest part to the side 15a of the interior of the first conduit 7. The heating element 5 extends substantially in parallel to the evaporator 3. In this manner, it is easier to control the required time for the ice that may have accumulated in the evaporator 3 to defrost as well as to help all

the ice that may have accumulated in the evaporator 3 to defrost homogeneously.

[0072] The fixing elements 4 shown in figure 1a are solid and prevent the process fluid 10 from flowing through the volume or the section of the first conduit 7 taken up by them.

[0073] The first conduit 7 shown in figure 1a is located in the vertical direction of the refrigerating appliance 1. The first conduit 7 is located in the rear part of the inner cavity 11 to be refrigerated. This is a preferred position of the evaporating set 2.

[0074] Figure 2 shows a view of an evaporating set 2 arranged in a second conduit 17 according to the state of the art. Figure 2 shows a second conduit 17 of a refrigerating appliance 1, which is bigger than the first conduit 7, through which a process fluid 10 circulates and in which an evaporating set 2 is arranged. The arrows represent how the process fluid 10 flows through the evaporating set 2 through the space taken up by the evaporator 3. The evaporating set 2 has an evaporator 3 fixed to fixing elements 4 located on opposite sides 34, 35 of the evaporator 3. The fixing elements 4 are connected to opposite sides 14b and 15b of the interior of the second conduit 17. The second conduit 17 shown in figure 2 has a cut section 44b, which, in the represented case, is substantially rectangular and has a second-conduit size defined in this case by the distance d2 and the depth (not represented in figure 2), which is the section 44b of the second conduit 17. The distance d2 shown in figure 2, which is the distance between the opposite sides 14b and 15b of the second conduit 17, is bigger than the distance d1 shown in figure 1a, which is the distance between the opposite sides 14a and 15a of the first conduit 7.

[0075] Furthermore, the evaporating set 2 shown in figure 2 has a heating element 5 (preferred option if the inner cavity to be refrigerated has a target temperature below 0° centigrade) extending over the entire evaporator 3 and from the right fixing element 4. The heating element 5 extends from the fixing element 4 from the closest part to the side 15b of the interior of the second conduit 17. The heating element 5 extends substantially in parallel to the evaporator 3. In this manner, it is easier to control the required time for the ice that may have accumulated in the evaporator 3 to defrost homogeneously. The heating element 5 according to the state of the art is bigger (length) to be able to extend over the entire bottom of the evaporator 3 since it extends from the right fixing element 4 from the closest area to the side 15b of the interior of the second conduit 17. Therefore, it extends from a further position from the opposite side 34 of the evaporator 3 and, due to this, the heating element 5 needs to be bigger.

[0076] The fixing elements 4 shown in figure 2 are solid and prevent the process fluid 10 from flowing through the volume taken up by them or the section of the space of the second conduit 7 taken up by them. The fixing elements 4 shown in figure 2 are bigger than those shown in figure 1a to make the evaporating set 2 connectable to the opposite sides 14b, 15b of the interior of the second conduit 17.

[0077] The second conduit 17 shown in figure 2 is located in the vertical direction of the refrigerating appliance 1. The second conduit 17 is located in the rear part of the inner cavity 11 to be refrigerated. This is a preferred position of the evaporating set 2.

[0078] Figure 3 shows a view of an evaporating set 2 according to the invention. The evaporating set 2 shown in figure 3 comprises an evaporator 3 having opposite sides 34, 35. Furthermore, it has two fixing elements 4 to which each of the sides 34, 35 of the evaporator 3 are connected. In addition, the evaporating set 2 comprises a first blocking element 61, which is connected to the left fixing element 4, and a second blocking element 62, which is connected to the right fixing element 4.

[0079] Both the fixing elements 4 and the blocking elements 61, 62 are solid elements preventing the process fluid 10 from flowing through the volume or space taken up by them. The evaporator 3 shown in figure 3 is a tube-fin evaporator (preferred option). This helps maximise the contact surface with the process fluid 10.

[0080] Figure 3 also shows a heating element 5 extending from the fixing element 4. For this reason, the same heating element 5 can be utilised in bigger second conduits 17 than the first conduit 7.

[0081] Figure 4 shows a schematic view of a feasible connection of an evaporator 3 (not shown) to a fixing element 4 and of a blocking element 61, 62 to a fixing element 4 according to the invention. Figure 4 shows how the fixing elements 4 have substantially oblique slots 12 in such a manner that the evaporator 3 engages said slots 12 and fixes the evaporator 3 to the fixing elements 4. Furthermore, the fixing elements 4 shown in figure 4 have two protuberances 8 engaging both receiving elements 9 of the blocking element 61, 62 by a positive connection. Figure 4 shows two receiving elements 9 and two protuberances 8 for illustrative purposes, although the number of protuberances 8 and receiving elements 9 as well as the position of the same may vary, provided that there is at least one protuberance 8 engaging at least one receiving element 9 by a positive connection.

[0082] Furthermore, figure 4 shows a heating element 5 extending from the right fixing element 4. Both the fixing elements 4 and the blocking elements 61, 62 are solid elements preventing the process fluid 10 from flowing through the volume or space taken up by them.

[0083] Figure 5 shows a view of an evaporating set 2 arranged in a second conduit 17 according to the invention. Figure 5 shows a second conduit 17 of a refrigerating appliance 1, which is bigger than a first conduit 7, like the one represented in figure 1a, through which a process fluid 10 circulates and in which an evaporating set 2 according to the invention is arranged. The arrows represent how the process fluid 10 flows through the evaporating set 2 through the space taken up by the evaporator 3. The evaporating set 2 has an evaporator 3 fixed to the fixing elements 4 located on opposite sides

34, 35 of the evaporator 3 and it also has a blocking element 61 connected to the left fixing element 4 and a blocking element 62 connected to the right fixing element 4. The blocking elements 61, 62 are connected to opposite sides 14b and 15b of the interior of the second conduit 17. The second conduit 17 shown in figure 5 has a cut section 44b, which, in the represented case, is substantially rectangular and has a second-conduit size defined in this case by the distance d2 and the depth (not represented in figure 5), which is the section 44b of the second conduit 17. The distance d2 shown in figure 5, which is the distance between the opposite sides 14b and 15b of the second conduit 17, is bigger than the distance d1 shown in figure 1a, which is the distance between opposite sides 14a and 15a of the first conduit 7.

[0084] Furthermore, the evaporating set 2 shown in figure 5 has a heating element 5 (preferred option if the cavity to be refrigerated has a target temperature below 0° centigrade) extending over the entire evaporator 3 and from the right fixing element 4. The heating element 5 extends substantially in parallel to the evaporator 3. In this manner, it is easier to control the required time for the ice that may have accumulated in the evaporator 3 to defrost homogeneously. The heating element 5 does not need to be bigger to be able to extend along the entire bottom of the evaporator 3 since it extends from the right fixing element 4 from the same position regardless of the size of the conduit 7, 17.

[0085] The fixing elements 4 and the blocking elements 61, 62 shown in figure 5 are solid and prevent the process fluid 10 from flowing through the volume taken up by them or through the section of the space of the second conduit 17 taken up by them. The fixing elements 4 shown in figure 5 are identical to those shown in figure 1a and the remaining space up to the sides 14b and 15b of the interior of the conduit 17 is taken up by the blocking elements 61 , 62, to make the evaporating set 2 connectable to the opposite sides 14b, 15b of the interior of the second conduit 17.

[0086] The second conduit 17 shown in figure 5 is located in the vertical direction of the refrigerating appliance 1. The second conduit 17 is located in the rear part of the inner cavity 11 to be refrigerated. This is a preferred position of the evaporating set 2.

[0087] Figure 6 shows a perspective view of a refrigerating appliance 1 according to the state of the art. The refrigerating appliance 1 features a housing 13 acting as the outer casing of the refrigerating appliance 1 and an inner cavity 11 to be refrigerated. The refrigerating appliance 1 has a first conduit 7 in which an evaporating set 2 according to the state of the art is arranged. The first conduit 7 is delimited by the walls 11a, 11b and 11cforming part of the cavity 11 to be refrigerated and by a fourth wall substantially parallel to the rear wall 11a of the lower cavity 11 and extending from the wall 11b up to the wall 11c. The first conduit 7 has a first-conduit section 44a, which is substantially rectangular and whose size is defined by the distance d1 and the distance a1. The second conduit 17 will be bigger than the first conduit 7 if the distance d2 or the distance a2 is bigger than the distance d1 or the distance a1. The first conduit 7 is located vertically and in the rear part of the inner cavity 11, which is one of the preferred positions of the conduit 7, 17.

[0088] An evaporating set 2 according to the state of the art is located in the first conduit 7 shown in figure 6 and comprises an evaporator 3 and fixing elements 4 connected to both sides 34 and 35 of the evaporator 3. The fixing elements 4 are connected to the internal sides 14a and 15a of the first conduit 7, which coincide with the walls 11c and 11b of the inner cavity 11 in this case. The fixing elements 4 are solid and avoid the circulation of the process fluid 10 that has to flow through the evaporator 3.

[0089] Figure 7 shows a perspective view of a refrigerating appliance 1 according to the invention. The refrigerating appliance 1 features a housing 13 acting as the outer casing of the refrigerating appliance 1 and an inner cavity 11 to be refrigerated. The refrigerating appliance shown in figure 7 is wider than that shown in figure 6, i.e. the distance d2 is bigger than the distance d1 from figure 6. The refrigerating appliance 1 has a second conduit 17, bigger than the first conduit 7 from figure 6, in which an evaporating set 2 according to the invention is arranged. The second conduit 17 is delimited by the walls 11a, 11b and 11c, which form part of the cavity 11 to be refrigerated, and by a fourth wall, which is substantially parallel to the rear wall 11a of the lower cavity 11 and which extends from the wall 11b up to the wall 11c. The second conduit 17 has a second-conduit section 44b, which is substantially rectangular and whose size is defined by the distance d2 and the distance a2. The distance a2 in the case represented in figure 7 is equal to the distance a1 represented in figure 6. The second conduit 17 is located vertically and in the rear part of the inner cavity 11, which is one of the preferred positions of the conduit 7, 17.

[0090] An evaporating set 2 according to the invention is located in the second conduit 17 shown in figure 7 and comprises an evaporator 3 and fixing elements 4 connected to both sides 34 and 35 of the evaporator 3. The fixing elements 4 are connected to blocking elements 61 and 62, which are those connected to the internal sides 14b and 15b of the second conduit 17, which coincide with the walls 11c and 11b of the inner cavity 11 in this case. The fixing elements 4 and the blocking elements 61 and 62 are solid and avoid the circulation of the process fluid 10 that has to flow through the evaporator 3.

[0091] Figure 8 shows a cut of a top view of the embodiment shown in figure 6. The refrigerating appliance 1 features a housing 13 acting as the outer casing of the refrigerating appliance 1 and an inner cavity 11 to be refrigerated. The refrigerating appliance 1 has a first conduit 7 in which an evaporating set 2 according to the state of the art is arranged. The first conduit 7 is delimited by the walls 11a, 11b and 11c, which form part of

the cavity 11 to be refrigerated, and by a fourth wall, which is substantially parallel to the rear wall 11a of the lower cavity 11 and which extends from the wall 11b up to the wall 11c. The first conduit 7 has a first-conduit section 44a, which is substantially rectangular and whose size is defined by the distance d1, which is the distance between the walls 11b and 11c, and the distance a1, which is the distance between the wall 11a and the wall substantially parallel to the same. The second conduit 17 will be bigger if the distance d2 or the distance a2 is bigger than the distance d1 or the distance a1. The first conduit 7 is located vertically and in the rear part of the inner cavity 11, which is one of the preferred positions of the conduit 7, 17.

[0092] An evaporating set 2 according to the state of the art is located in the first conduit 7 shown in figure 8 and comprises an evaporator 3 and fixing elements 4 connected to both sides 34 and 35 of the evaporator 3. The fixing elements 4 are connected to the internal sides 14a and 15a of the first conduit 7, which coincide with the walls 11c and 11b of the inner cavity 11 in this case. The fixing elements 4 are solid and avoid the circulation of the process fluid 10 through the space taken up by them. This forces the process fluid 10 to flow through the evaporator 3.

[0093] Figure 9 shows a cut of a top view of the embodiment shown in figure 7. The refrigerating appliance 1 features a housing 13 acting as the outer casing of the refrigerating appliance 1 and an inner cavity 11 to be refrigerated. The refrigerating appliance 1 has a bigger second conduit 17 than the first conduit 7 shown in figure 8, in which an evaporating set 2 according to the invention is arranged. The second conduit 17 is delimited by the walls 11a, 11b and 11c forming part of the cavity 11 to be refrigerated and by a fourth wall substantially parallel to the rear wall 11a and extending from the wall 11b up to the wall 11c. The second conduit 17 has a second-conduit section 44b, which is substantially rectangular and whose size is defined by the distance d2, which is the distance between the walls 11b and 11c, and the distance a2, which is the distance between the wall 11a and the wall substantially parallel to the same. The second conduit 17 is bigger than the first conduit 7 shown in figure 8 since the distance d2 is bigger than the distance d1. This difference between the distances d2 and d1 is taken up by the blocking elements 61 and 62. The second conduit 17 is located vertically and in the rear part of the inner cavity 11, which is one of the preferred positions of the conduit 7, 17.

[0094] An evaporating set 2 according to the invention is located in the second conduit 17 shown in figure 9 and comprises an evaporator 3 and fixing elements 4 connected to both sides 34 and 35 of the evaporator 3. The fixing elements 4 are connected to blocking elements 61, 62, which, in turn, are connected to the internal sides 14b and 15b of the second conduit 17. In this case, these coincide with the walls 11c and 11b of the inner cavity 11. The fixing elements 4, likewise the blocking elements 61, 62, are solid and avoid the circulation of the process fluid 10 through the space taken up by them. This forces the process fluid 10 to flow through the evaporator 3.

[0095] Figure 10 shows a view of a feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention. In the example shown in figure 10, the fixing element 4 has two cylindrical receiving elements 9, while the blocking element 6 has two cylindrical protuberances 8 engaging the receiving elements 9 of the fixing element 4 by a positive connection. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with other types of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by a positive connection. The connection by which the receiving elements 9 are in the blocking element 6 and the protuberances 8 are in the fixing element 4 falls within the scope of protection of the invention as well.

[0096] Figure 11a shows a top view of a feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention and the illustration shown in figure 10. In the example shown in figure 11a, the fixing element 4 has two cylindrical receiving elements 9, while the blocking element 6 has two cylindrical protuberances 8, which can engage the receiving elements 9 of the fixing element 4 by a positive connection. Figure 11a shows the fixing element 4 facing the blocking element 6. This is the step preceding their connection. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with other types of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by a positive connection.

[0097] Figure 11b shows another top view of a feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention and the illustrations shown in figures 10 and 11a. In the example shown in figure 11b, the fixing element 4 has two cylindrical receiving elements 9, while the blocking element 6 has two cylindrical protuberances 8, which are connected with the receiving elements 9 of the fixing element 4 by a positive connection. Figure 11b shows the fixing element 4 facing the blocking element 6 once they have been connected to each other. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with othertypes of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by

a positive connection.

[0098] In addition, figure 11b shows the section 4a of the fixing element 4 and the section 6a of the blocking element 6, sections through which the process fluid 10 cannot flow.

[0099] Figure 12 shows a view of another feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention. In the example shown in figure 12, the fixing element 4 has a channel or groove-shaped receiving element 9 with a three-side shape of a trapezium extending longitudinally partially over the fixing element 4, while the blocking element 6 has a protuberance 8 with a three-side shape of a trapezium extending longitudinally partially along the blocking element 6 engaging the receiving element 9 of the fixing element 4 by a positive connection. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with other types of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by a positive connection. The connection by which the receiving element 9 is in the blocking element 6 and the protuberance 8 is in the fixing element 4 falls within the scope of protection of the invention as well.

[0100] Figure 13a shows a top view of another feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention and the illustration shown in figure 12. In the example shown in figure 13a, the fixing element 4 has a channel or groove-shaped receiving element 9 with a three-side shape of a trapezium extending longitudinally partially over the fixing element 4, while the blocking element 6 has a protuberance 8 with a three-side shape of a trapezium extending longitudinally partially along the blocking element 6 and which can engage the receiving element 9 of the fixing element 4 by a positive connection. Figure 13a shows the fixing element 4 facing the blocking element 6. This is the step preceding their connection, which takes place in the vertical direction from the bottom towards the top of the fixing element 4 according to the shown view. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with other types of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by a positive connection.

[0101] Figure 13b shows another top view of another feasible connecting mode of a fixing element 4 to a blocking element 6, 61, 62 according to the invention and the illustrations shown in figures 12 and 13a. In the example shown in figure 13b, the fixing element 4 has a channel or groove-shaped receiving element 9 with a three-side shape of a trapezium extending longitudinally partially over the fixing element 4, while the blocking element 6 has a protuberance 8 with a three-side shape of a trapezium extending longitudinally partially along the blocking element 6, which is connected with the receiving element 9 of the fixing element 4 by a positive connection. Figure 13b shows the fixing element 4 connected to the blocking element 6. Other geometries engaging by a positive connection are possible too such as triangular prisms, rectangular prisms, heptagonal prisms, hexagonal prisms or other regular prisms of n sides. Furthermore, prisms with other types of section such as elliptical or irregular sections fall within the scope of protection of the invention, provided that the section of the protuberance 8 engages the section of the receiving element 9 by a positive connection.

[0102] Furthermore, figure 13b shows the section 4a of the fixing element 4 and the section 6a of the blocking element 6, sections through which the process fluid 10 cannot flow.

Reference numerals

[0103]

1	refrigerating appliance
2	evaporating set
3	evaporator
4	fixing element
4a	section
5	heating element
6	blocking element
6a	section
7	first conduit
8	protuberance
9	receiving element
10	process fluid
11	inner cavity
11a	wall
11b	wall
11c	wall
12	slot
13	housing
14a	opposite side
14b	opposite side
15a	opposite side
15b	opposite side
17	second conduit
34	opposite side
35	opposite side
44a	first-conduit section
44b	second-conduit section
61	first blocking element
62	second blocking element
d1	distance
d2	distance
a1	distance
a2	distance

Claims

1. An evaporating set (2) installable inside a conduit (7, 17) of a refrigerating appliance (1) through which a process fluid (10) to be cooled down can flow, which comprises a substantially flat evaporator (3) and two fixing elements (4) located on opposite sides (34, 35) of the evaporator (3), wherein the evaporating set (2) is connectable to opposite sides (14a, 15a) of the interior of a first conduit (7), **characterised in that** it comprises at least one blocking element (6), connectable to at least one of the fixing elements (4) in such a manner that the evaporating set (2) is connectable to opposite sides (14b, 15b) of the interior of a bigger second conduit (17) than the first conduit (7).

2. The evaporating set (2) according to claim 1, **characterised in that** it further comprises a heating element (5) to defrost the ice that may accumulate in the evaporator (3) and/or conduit (7, 17), wherein the heating element (5) extends from one of the fixing elements (4) at least partially over the bottom of the evaporator (3).

3. The evaporating set (2) according to any of the preceding claims, **characterised in that** the evaporating set (2) takes up substantially an entire section (44) of a conduit (7, 17), wherein both the fixing elements (4) and the blocking element (6) are solid elements that seal and prevent the process fluid (10) from flowing through the part of a section (4a, 6a) taken up by them.

4. The evaporating set (2) according to any of the preceding claims, **characterised in that** the first conduit (7) and the second conduit (17) are substantially flat.

5. The evaporating set (2) according to claim 4, **characterised in that** the first conduit (7) and the second conduit (17) have a substantially quadrangular section (44).

6. The evaporating set (2) according to any of the preceding claims, **characterised in that** the blocking element (6) comprises a first blocking element (61) connectable to a fixing element (4) and a second blocking element (62) connectable to the other fixing element (4).

7. The evaporating set (2) according to claim 6, **characterised in that** the first blocking element (61) and the second blocking element (62) are identical.

8. The evaporating set (2) according to any of the preceding claims, **characterised in that** the blocking element (6, 61, 62) is connected to the fixing element (4) by a positive connection and/or additional connecting means and/or by welding and/or glueing.

9. The evaporating set (2) according to claim 8, **characterised in that** the blocking element (6, 61, 62) or the fixing element (4) comprises at least one protuberance (8) and the other out of the blocking element (6, 61, 62) or the fixing element (4) comprises at least one receiving element (9) in such a manner that the protuberance (8) engages the receiving element (9) by a positive connection.

10. The evaporating set (2) according to claim 9, **characterised in that** the protuberance (8) and the receiving element (9) extend longitudinally and have the three-side geometry of a rectangular trapezium in such a manner that the protuberance (8) engages the receiving element (9), or the protuberance (8) and the receiving element (9) have a cylindrical geometry in such a manner that the protuberance (8) engages the receiving element (9).

11. The evaporating set (2) according to any of claims 2 to 10, **characterised in that** the heating element (5) extends over the entire bottom of the evaporator (3) and substantially in parallel to the same.

12. A refrigerating appliance (1), **characterised in that** it comprises an evaporating set (2) according to any of claims 2 to 11.

13. The refrigerating appliance (1) according to claim 11, **characterised in that** it comprises an inner cavity (11) to be refrigerated, wherein at least three walls (11a, 11b, 11c) of the inner cavity (11) form part of the walls of the conduit (7, 17).

14. The refrigerating appliance (1) according to claim 13, **characterised in that** the conduit (7, 17) is located in the rear part of the inner cavity (11) in the vertical direction of the refrigerating appliance (1).

15. The refrigerating appliance (1) according to any of claims 12 to 14, **characterised in that** the refrigerating appliance (1) is a fridge, a freezer or a fridge-freezer.

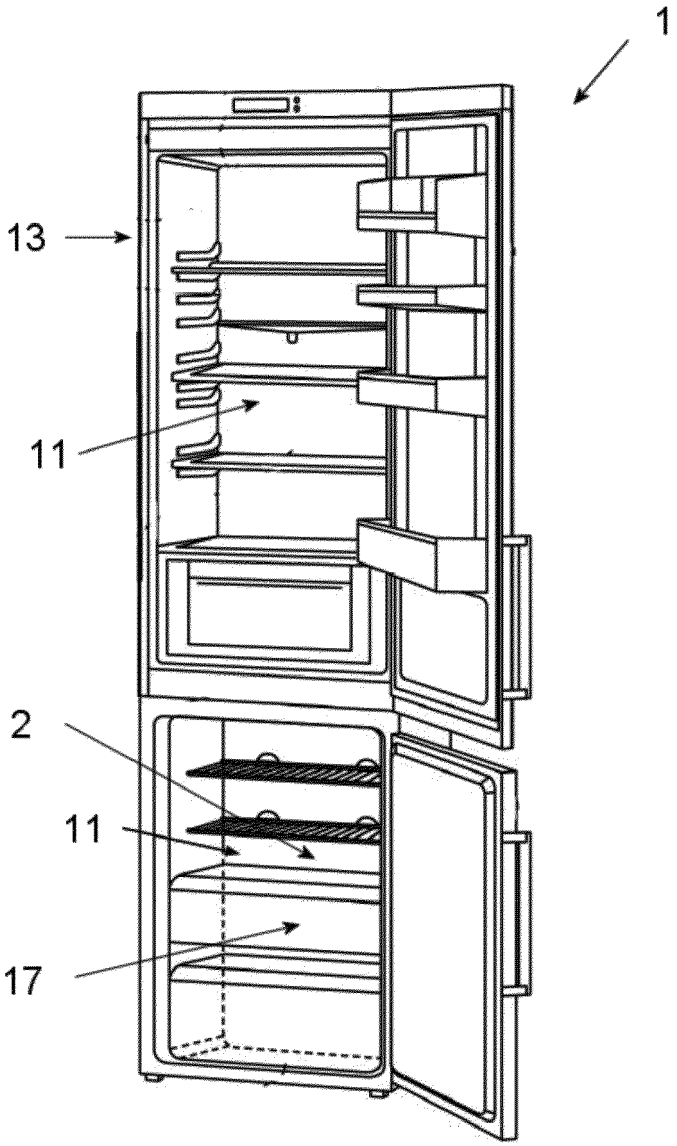

Fig.1

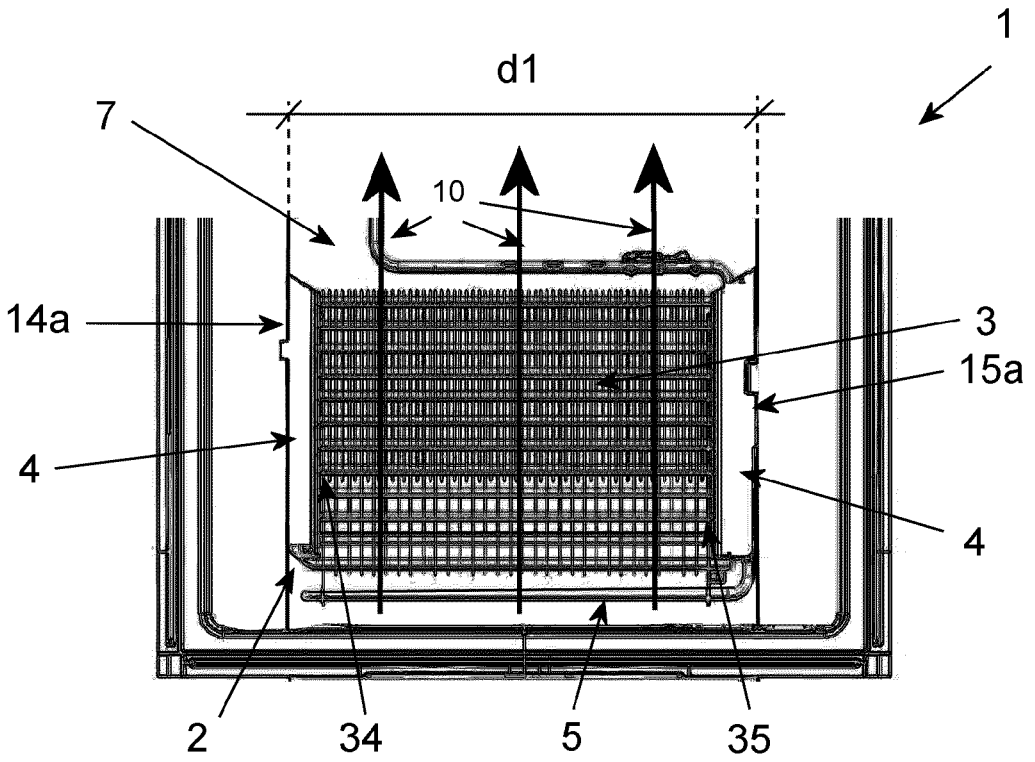

Fig.1a

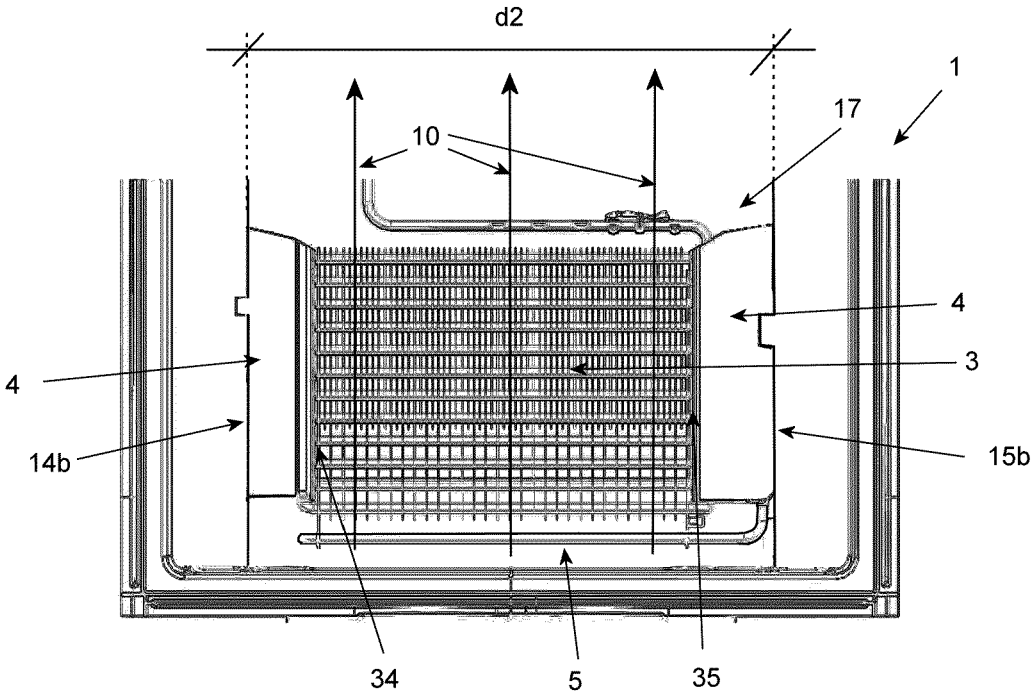

Fig.2

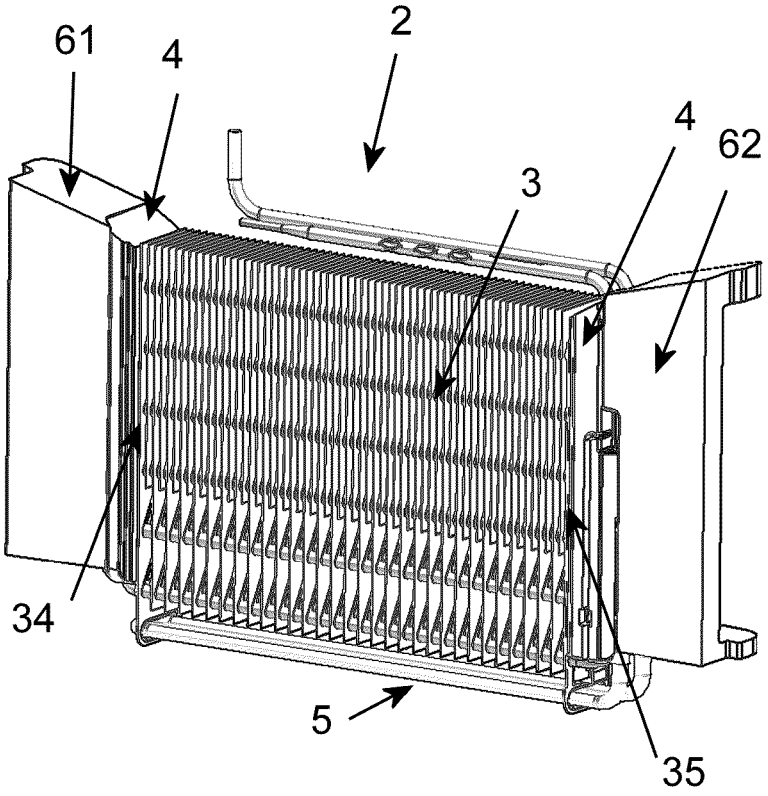

Fig.3

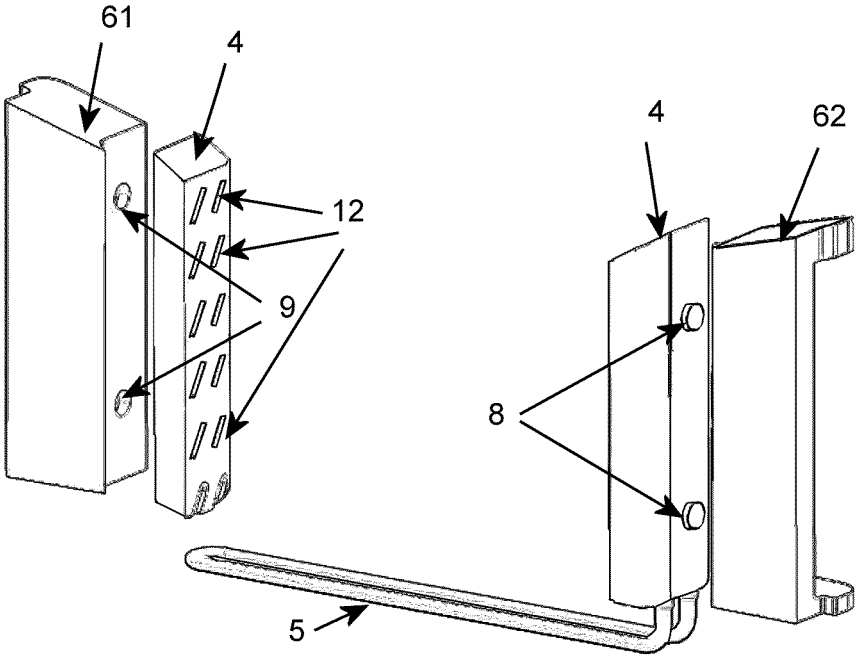

Fig.4

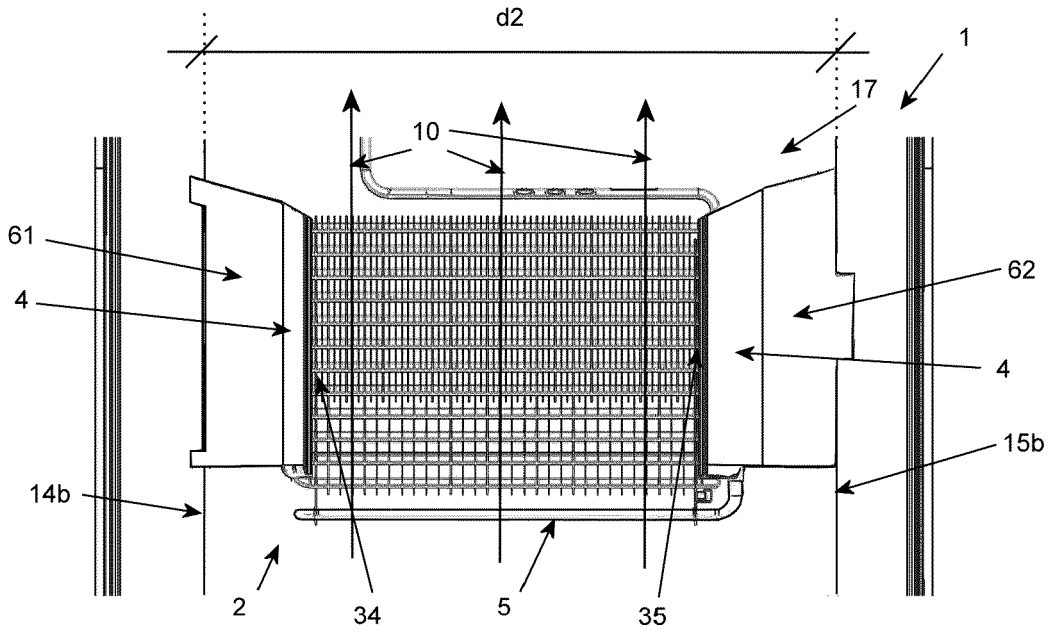
d2
1
17
10
61
4
62
4
15b
14b
2
34
5
35

Fig.5

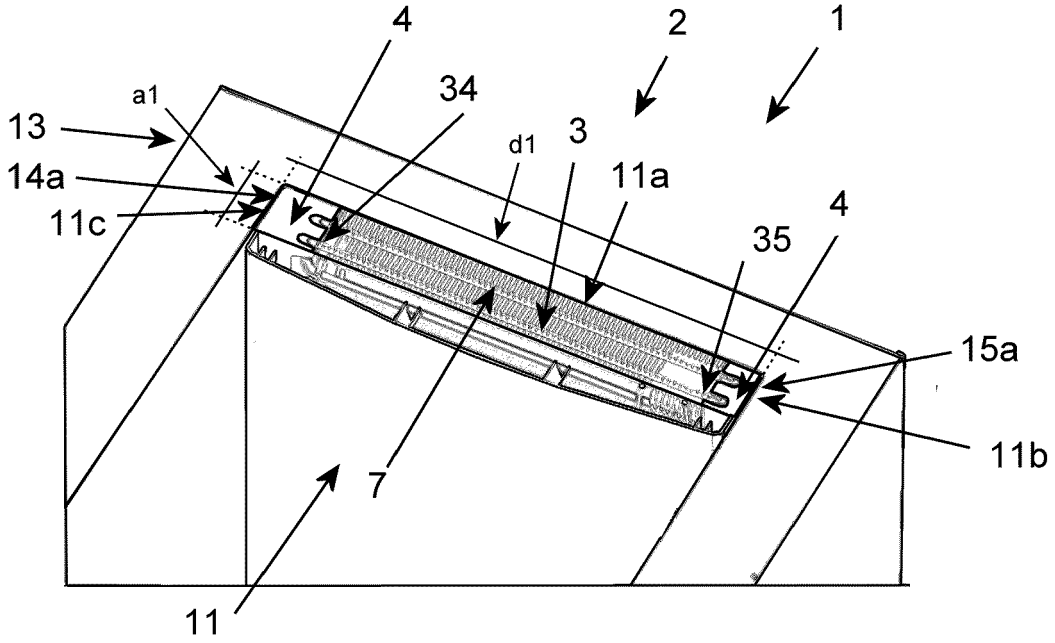
4
2
1
a1
34
13
d1
3
14a
11a
11c
4
35
15a
11b
7
11

Fig.6

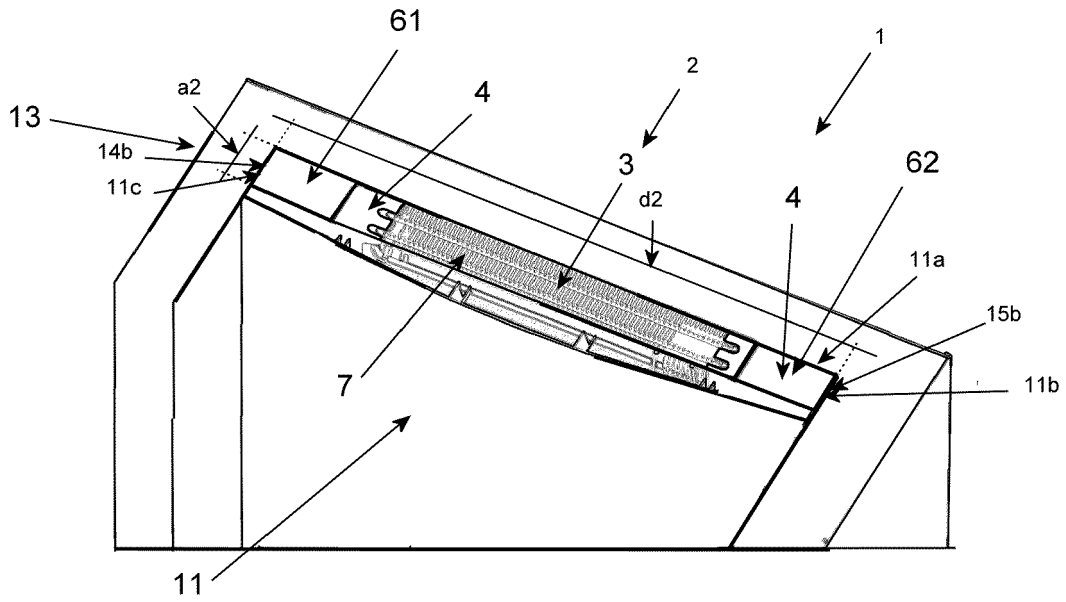
61
1
2
a2
4
13
14b
11c
3
62
d2
4
11a
15b
7
11b
11

Fig.7

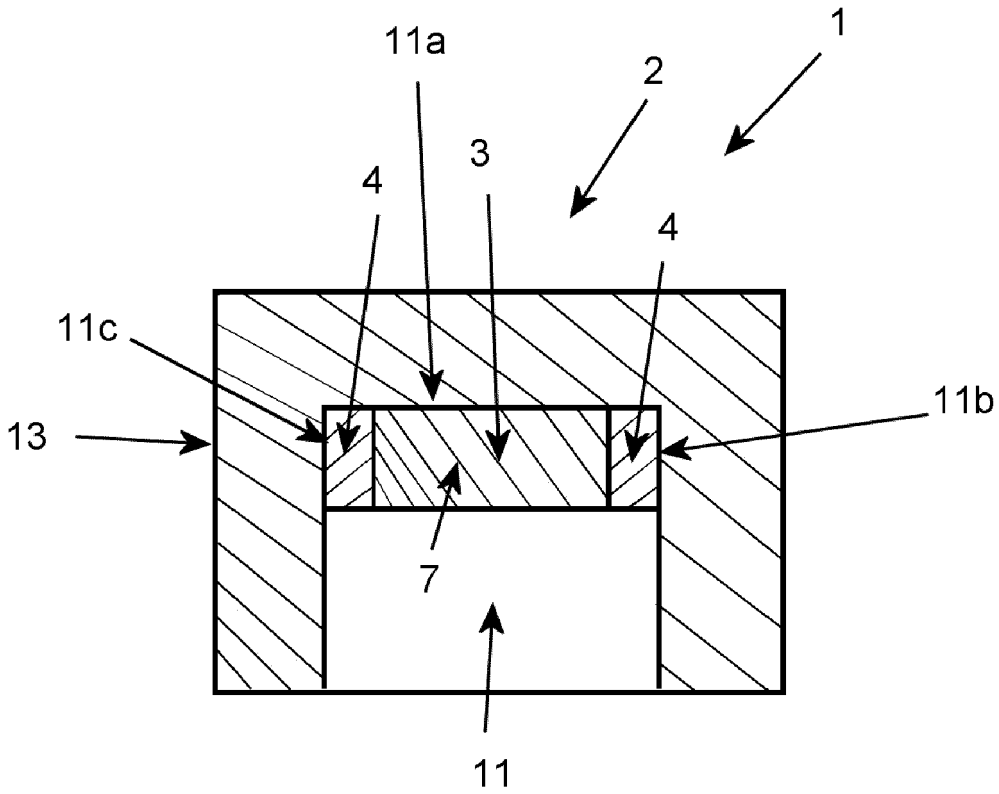
11a
1
2
3
4
4
11c
11b
13
7
11

Fig.8

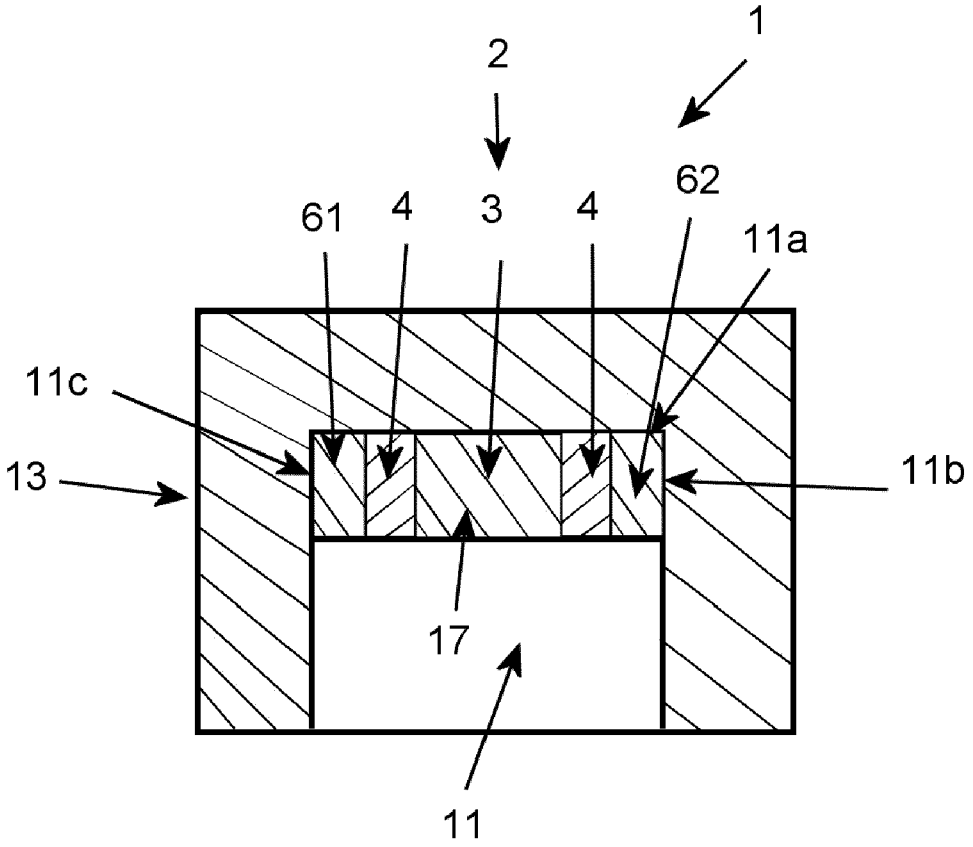

Fig.9

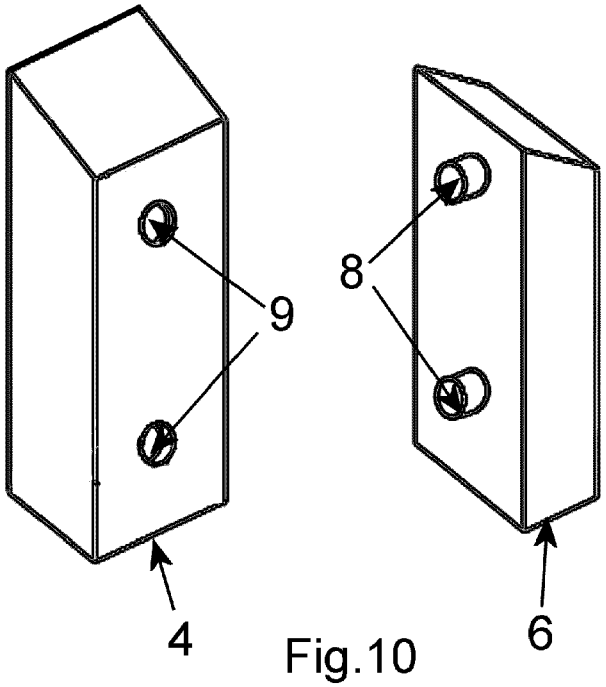

Fig.10

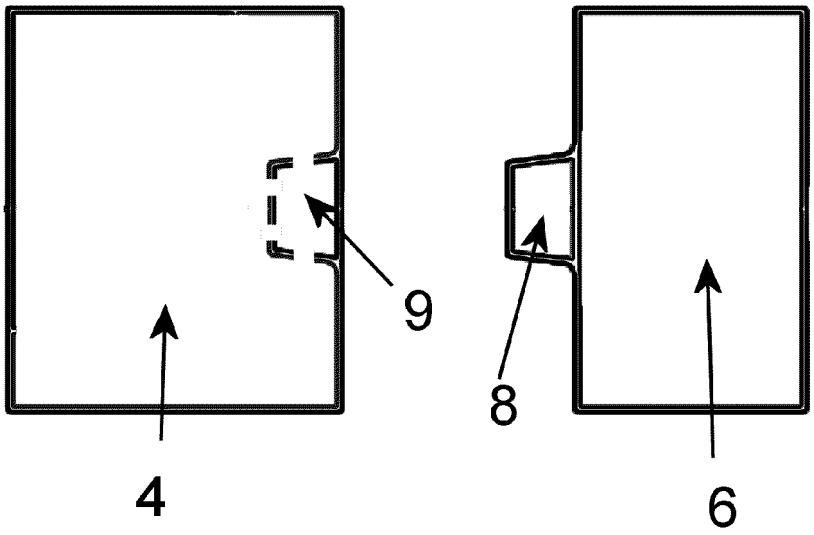

Fig.11a

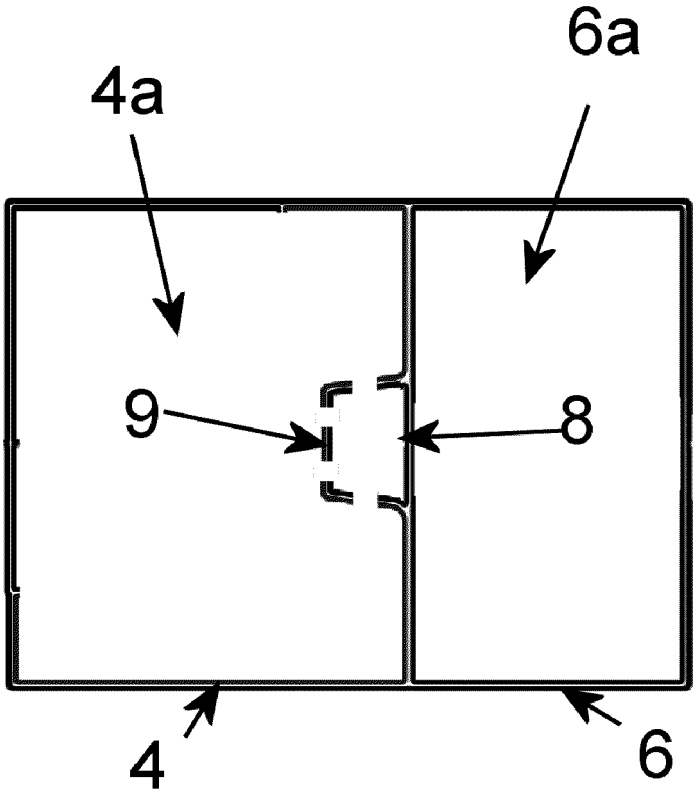

Fig.11b

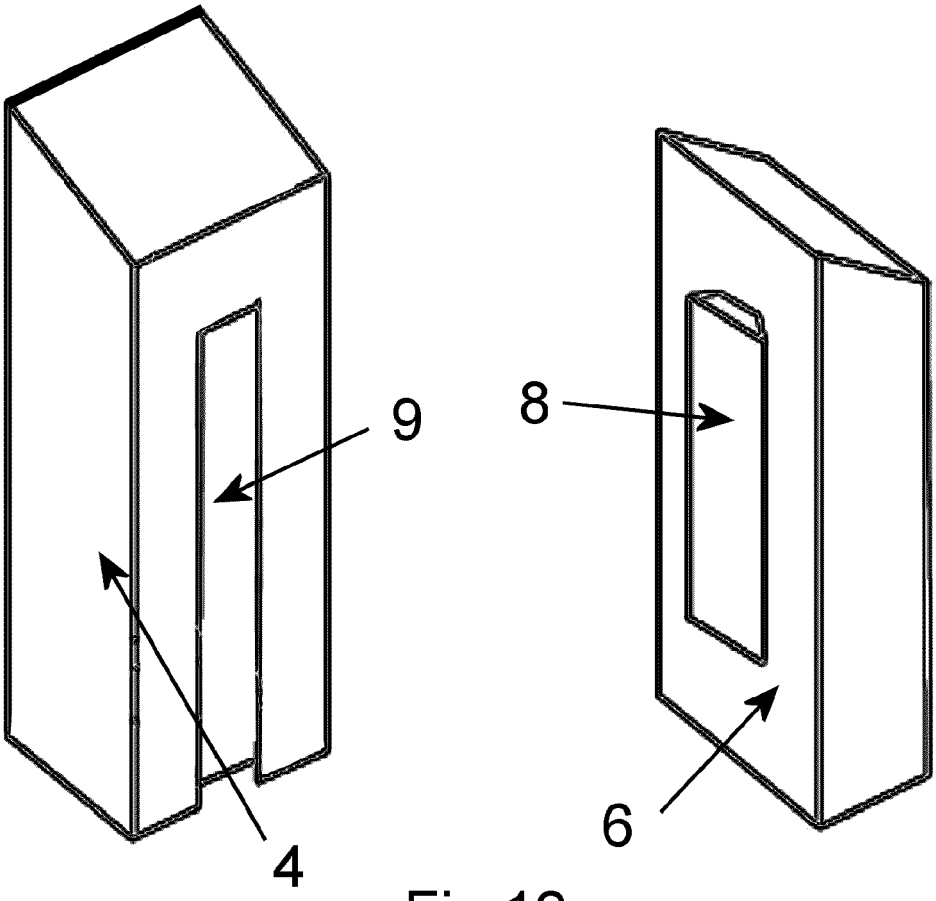

Fig.12

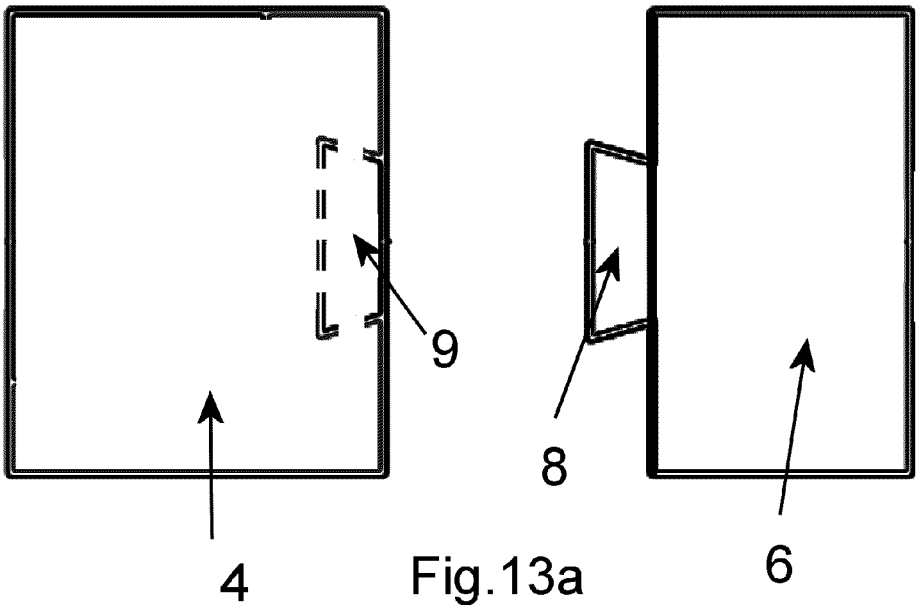

Fig.13a

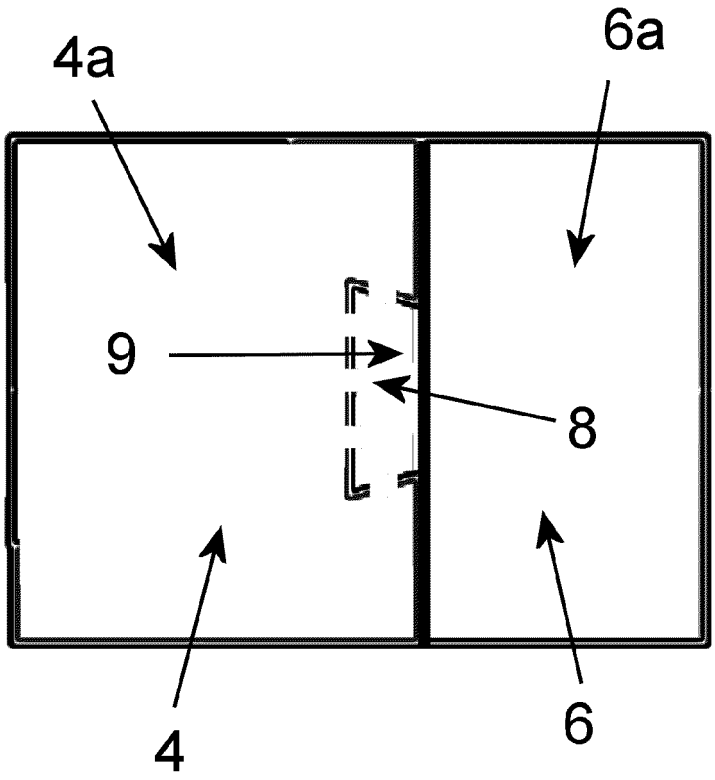

Fig.13b

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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 3335

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 Y	EP 0 507 754 A2 (ELECTROLUX AB [SE]) 7 October 1992 (1992-10-07) * figures 3-5 *	1,6-10 2-5, 11-15	INV. F25D17/06 F25D23/00
Y	CN 107 525 335 A (BSH HAUSGERAETE GMBH) 29 December 2017 (2017-12-29) * figures 5,6 *	2,3,11	
Y	EP 2 264 383 A1 (T EL POLAND SP ZO O [PL]) 22 December 2010 (2010-12-22) * figures 2,3 *	4,5, 12-15	
X	CN 1 932 419 A (SAMSUNG ELECTRONICS CO LTD [KR]) 21 March 2007 (2007-03-21) * figures 5,6 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

F25D
F25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	14 May 2024	Kuljis, Bruno

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 38 3335

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-05-2024

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EP 0507754 A2	07-10-1992	AU 645176 B2	06-01-1994
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