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(54) **Refrigerator with blast chiller and quick freezer**

Kühlschrank mit Gebläsekühler und Schnellgefrierer

Réfrigérateur avec un refroidisseur à air forcé et un congélateur rapide

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US-A- 5 097 897 **US-A- 5 896 753**

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Description

[0001] The present invention refers to a refrigerator with compartment for the quick cooling of the food, more in particular to a refrigerator for home use.

[0002] Current refrigerators for home use normally comprise at least two compartments at a different temperature, one at higher temperature (typically between + 3°C and +6°C) for fresh food and the other at lower temperature (typically - 18°C) for frozen and deep frozen food. Each one of the two compartments is provided with a respective evaporator, or with a respective portion of a same evaporator, that is part of an ordinary refrigeration circuit with compressor and condenser.

[0003] These refrigerators are generally "no frost", that is equipped with means that are suitable to prevent the formation of frost on the wall of the evaporator. For such reason in the compartment with low temperature a so-called "ventilated" evaporator is provided, that is subject to forced air circulation.

[0004] During the stage of the food cooling each food, that has previously been cooked at a temperature higher than or equal to 90°C, begins to deteriorate irreversibly due to the quick proliferation of the bacteria present in the air and of the spores that survived the cooking. The temperature range inside which the maximum bacterial development takes place is comprised between + 70°C and + 3°C. The longer is the permanence in this zone, the higher is the alteration of the product and that happens when a food is let cool at room temperature and/or in a normal refrigerator. In order to avoid that, blast chillers are used that allow to bring the temperature at the core of the food from + 70°C to + 3°C in 90 minutes. In this way it is possible to slow down the process of ageing of the product, that can be preserved in the refrigerator for 5/ 7 days.

[0005] In the same way, in order to assure the food that must be frozen that the initial quality does not get compromised in any way during the freezing stage, it is necessary that the latter takes place quickly. In fact with the quick freezing the food's liquids change into micro-crystals that do not damage the tissue structure of the product in any way. To such purpose quick freezer are used that allow to bring the temperature at the core of the food from + 90°C to - 18°C in 240 minutes.

[0006] Both the blast chillers and the quick freezer are usually part of a single appliance, and this appliance is realised in a way separate from home refrigerators.

[0007] US-A-5 896 753 discloses a refrigerator as defined in the pre-characterizing part of claim 1.

[0008] In view of the state of the art herein described, object of the present invention is to realise a home refrigerator that comprises at least one compartment that functions both as blast chiller and as quick freezer.

[0009] According to the present invention, such object is attained by means of a refrigerator as defined in claim 1.

[0010] Owing to the present invention it is possible to

realise a refrigerator that comprises at least one compartment that serves as a blast chiller and as a quick freezer and that works independently from the other compartments of the refrigerator.

[0011] The characteristics and the advantages of the present invention will become evident from the following detailed description of an embodiment thereof, that is illustrated as a non-limiting example in the enclosed drawings, in which:

Figure 1 shows, in vertical section, a "no frost" type refrigerator with a compartment containing a chamber for the blast chiller and a chamber for the freezer according to the present invention;

Figure 2 shows a section of a lower part of the refrigerator in Figure 1 according to the line II-II;

Figure 3 shows an electric layout relative to the compartment containing the blast chiller and the quick freezer in Figure 1;

Figure 4 shows a refrigerator as the one in Figure 1 but with a compartment containing a blast chiller and a quick freezer that is positioned at a different height in the refrigerator.

[0012] In Figure 1 there is shown a refrigerator having compartments 1, 2, 3 inside a common cabinet 4 that are positioned respectively from the top to the bottom of the cabinet. The compartments 1 and 2, respectively at lower (freezer) and at higher temperature, are separate by a horizontal dividing wall 5 and they are closed by respective independent doors 60 and 6. The third compartment 3, separate from the compartment 2 by means of a horizontal dividing wall 7, comprises two chambers 8 and 9, used respectively as blast chiller and quick freezer which are separate by a vertical dividing wall 10 and they have independent closing doors, as shown more in detail in Figure 2.

[0013] Against the back wall of the third compartment 3 an evaporator 11 is set that is part of a refrigeration circuit 12 different from the refrigeration circuit 13 that provides for the cooling of the compartments 1 and 2. Such refrigeration circuit 12 comprises a compressor 14, a filter 15, a condenser 16 and flow laminators 17.

[0014] A fan 18, that is cyclically operated by an appropriate electric motor 19 and that is placed on top of the evaporator 11, allows the circulation of air inside the compartment 3.

[0015] The chambers 8 and 9 of the compartment 3 are provided with respective separate openings 20 and 21 for the flow of the cold air that is made circulate by the fan 18 and by relative ducts for the outlet of the air 22 and 23 that convey the air through a duct 25 into the evaporator 11. In addition said chambers 8 and 9 are provided with thermostats 26 and 27 the first one of which controls the opening and closing movement of a plug 24 that controls the opening 20 while the second one controls the operation of the motor of the compressor 14, in a such way so as to adjust the temperature

inside the compartments according to an established temperature.

[0016] The correct operation of the compartment 3 is guaranteed by a suitable electric circuit shown in Figure 3, that comprises a pair of feed terminal 28 and 29 between which the motor 19 for the operation of the fan 18 is interposed. To the terminal 28 the parallel of the thermostats 26 and 27 is connected that are in turn connected with the motor of the compressor 14.

[0017] The compartments 1 and 2 are part of a traditional "no-frost" type refrigerator the operation of which is known.

[0018] The compartment 3 works by the following operative way.

[0019] During the operation of both the blast chiller 8 and the quick freezer 9 the thermostats 26 and 27 are in closing position, therefore the compressor 14 is operating and it allows the evaporator 11 to subtract heat from the environment in which it is housed. The thermostat 26 keeps the plug 24 in opening position. The fan 18 is operating and it determines a forced air circulation (shown by the arrows in Figure 1) along the evaporator 11 and in the two chambers 8 and 9, respectively passing through the openings 20 and 21, the chambers 8 and 9 the ducts 22 and 23 and the back flow duct 25. This air circulation prevents the formation of frost.

[0020] When the temperature inside the chamber 8 reaches + 3°C, the thermostat 26 gets to an opening position and it controls the closing of the plug 24 by means of an appropriate actuator. In this way the air circulates only through the chamber 9.

[0021] When the temperature inside the chamber 9 reaches - 18°C, the thermostat 27 gets to the opening position with consequent stopping of the compressor 14 and the refrigeration circuit 12 enters a defrost stage.

[0022] A variation of the embodiment of the present invention described in Figure 4 presents a different positioning of the compartment 3 inside the cabinet 4. In fact in this case the compartment 3 is interposed between the freezer compartment 1 and the compartment 2 with relative solutions in order to prevent the different circulations of air of the compartment 3 and of the compartments 1 and 2 to cross. The operation of the compartment 3 is similar to the one above described.

[0023] For a higher precision in the determination of the temperature of a food that is stored in one of the two chambers 8 or 9, it is possible to use thermometers provided with rod probes to be placed inside the same food.

Claims

1. Refrigerator for home use comprising at least one first freezer compartment (1) and at least one second compartment (2) at a temperature higher than said first freezer compartment that are situated inside a cabinet (4) and relative first refrigeration circuit (13), said refrigerator comprising at least one

third compartment (3) inside said cabinet (4) with relative second refrigeration circuit (12) comprising an evaporator (11) and a fan (18) for the circulation of air that is forced by said fan (18) through said evaporator (11) and inside said at least one third compartment (3),

characterized in that said at least one third compartment (3) is made up of two chambers (8, 9) having the function to operate the one as a blast chiller (8) and the other one as a quick freezer (9) and cooled by means of said circulation of air that is forced by said fan (18) through said evaporator (11) and inside said chambers (8, 9).

2. Refrigerator according to claim 1, **characterized in that** inlet openings (20, 21) and outlet ducts (22, 23) of said chambers (8, 9) are provided for said air circulation
3. Refrigerator according to claim 2, **characterized in that** one of said openings (20, 21) is controlled by a valve means (24) controlled by a first thermostat (26) that closes said valve means (24) for the attainment of the established temperature in said one (8) of said chambers (8, 9).
4. Refrigerator according to claim 3, **characterized in that** a second thermostat (27) is provided that upon the attainment of the established temperature in said other chamber (9) of said chambers (8, 9) stops a compressor (14) belonging to said second refrigeration circuit (12) so as to allow the defrosting of said second refrigeration circuit (12) by means of said air circulation.
5. Refrigerator according to claim 4, **characterized in that** said at least one third compartment (3) is positioned between the bottom of said cabinet (4) containing the refrigerator and said second compartment (2).
6. Refrigerator according to claim 4, **characterized in that** said at least one third compartment (3) is interposed between said first compartment (1) and said second compartment (2) inside said cabinet (4) containing the refrigerator.

Patentansprüche

1. Haushalts-Kühlschrank mit wenigstens einem ersten Gefrierfach (1) und wenigstens einem zweiten Gefrierfach (2), welches eine Temperatur hat, die höher als jene des ersten Gefrierfachs ist, und die innerhalb eines Gehäuses (4) angeordnet sind, sowie ein zugeordneter erster Kühlkreislauf (13), wobei der Kühlschrank wenigstens ein drittes Fach (3) im Innern des Gehäuses (4) mit einem zugeordne-

ten zweiten Kühlkreislauf (12) aufweist, welcher einen Verdampfer (11) und ein Gebläse (18) für die Zirkulation der Luft aufweist, welche mittels des Gebläses (18) durch den Verdampfer (11) und in das Innere des wenigstens einen dritten Fachs (3) geleitet wird, **dadurch gekennzeichnet, daß** das wenigstens dritte Fach (3) zwei Kammern (8, 9) umfaßt, von denen eine als ein Gebläsekühler (8) und das andere als ein Schnellgefrierer (9) betrieben und mittels der zirkulierenden Luft gekühlt wird, die mittels des Gebläses (18) durch den Verdampfer (11) und in das Innere der Kammern (8, 9) geleitet wird.

2. Haushalts-Kühlschrank nach Anspruch 1, **dadurch gekennzeichnet, daß** Einlaßöffnungen (20, 21) und Auslaßleitungen (22, 23) der Kammer (8, 9) für die Luftzirkulation vorgesehen sind.
3. Haushalts-Kühlschrank nach Anspruch 2, **dadurch gekennzeichnet, daß** eine der Öffnungen (20, 21) durch eine Ventileinrichtung (24) gesteuert wird, welche mittels eines ersten Thermostaten (26) geregelt wird, welcher die Ventileinrichtung (24) schließt, um die erhaltene Temperatur in der einen (8) der Kammern (8, 9) aufrecht zu erhalten.
4. Haushalts-Kühlschrank nach Anspruch 3, **dadurch gekennzeichnet, daß** ein zweiter Thermostat (27) vorgesehen ist, welcher beim Erreichen der vorgegebenen Temperatur in der anderen Kammer (9) der Kammern (8, 9) einen Kompressor (14) anhält, welcher zu dem zweiten Kühlkreislauf (12) gehört, so daß ein Abtauen des zweiten Kühlkreislaufs (12) mittels der Luftzirkulation ermöglicht wird.
5. Haushalts-Kühlschrank nach Anspruch 4, **dadurch gekennzeichnet, daß** das wenigstens eine dritte Fach (3) zwischen dem Boden des Gehäuses (4), welches den Kühlschrank umschließt, und dem zweiten Fach (2) angeordnet ist.
6. Haushalts-Kühlschrank nach Anspruch 4, **dadurch gekennzeichnet, daß** das wenigstens eine dritte Fach (3) zwischen dem ersten Fach (1) und dem zweiten Fach (2) im Innern des Gehäuses (4) des Kühlschranks angeordnet ist.

Revendications

1. Réfrigérateur domestique comprenant au moins un premier compartiment freezer (1) et au moins un deuxième compartiment (2) à une température supérieure à celle dudit premier compartiment freezer qui sont situés à l'intérieur d'un meuble (4) et un premier circuit de réfrigération relatif (13), ledit réfrigérateur comprenant au moins un troisième compar-

timent (3) à l'intérieur dudit meuble (4) avec un deuxième circuit de réfrigération relatif (12) comprenant un évaporateur (11) et un ventilateur (18) pour la circulation d'air qui est forcée par ledit ventilateur (18) à travers ledit évaporateur (11) et à l'intérieur dudit au moins un troisième compartiment (3),

caractérisé en ce que ledit au moins un troisième compartiment (3) est constitué de deux chambres (8, 9) ayant pour fonction de faire fonctionner la première en tant que refroidisseur à air pulsé (8) et la deuxième en tant que congélateur (9) et refroidies au moyen de ladite circulation d'air qui est forcée par ledit ventilateur (18) à travers ledit évaporateur (11) et à l'intérieur desdites chambres (8, 9).

2. Réfrigérateur selon la revendication 1, **caractérisé en ce que** des ouvertures d'entrée (20, 21) et des conduits de sortie (22, 23) desdites chambres (8, 9) sont prévus pour ladite circulation d'air.
3. Réfrigérateur selon la revendication 2, **caractérisé en ce que** l'une desdites ouvertures (20, 21) est commandée par une soupape (24) commandée par un premier thermostat (26) qui ferme ladite soupape (24) pour permettre d'atteindre la température établie dans ladite une (8) desdites chambres (8, 9).
4. Réfrigérateur selon la revendication 3, **caractérisé en ce qu'un** deuxième thermostat (27) est prévu, lequel, lorsque la température établie est atteinte dans ladite autre chambre (9) desdites chambres (8, 9), arrête un compresseur (14) appartenant audit deuxième circuit de réfrigération (12) afin de permettre le dégivrage dudit deuxième circuit de réfrigération (12) au moyen de ladite circulation d'air.
5. Réfrigérateur selon la revendication 4, **caractérisé en ce que** ledit au moins un troisième compartiment (3) est positionné entre la partie inférieure dudit meuble (4) contenant le réfrigérateur et ledit deuxième compartiment (2).
6. Réfrigérateur selon la revendication 4, **caractérisé en ce que** ledit au moins un troisième compartiment (3) est intercalé entre ledit premier compartiment (1) et ledit deuxième compartiment (2) à l'intérieur dudit meuble (4) contenant le réfrigérateur.

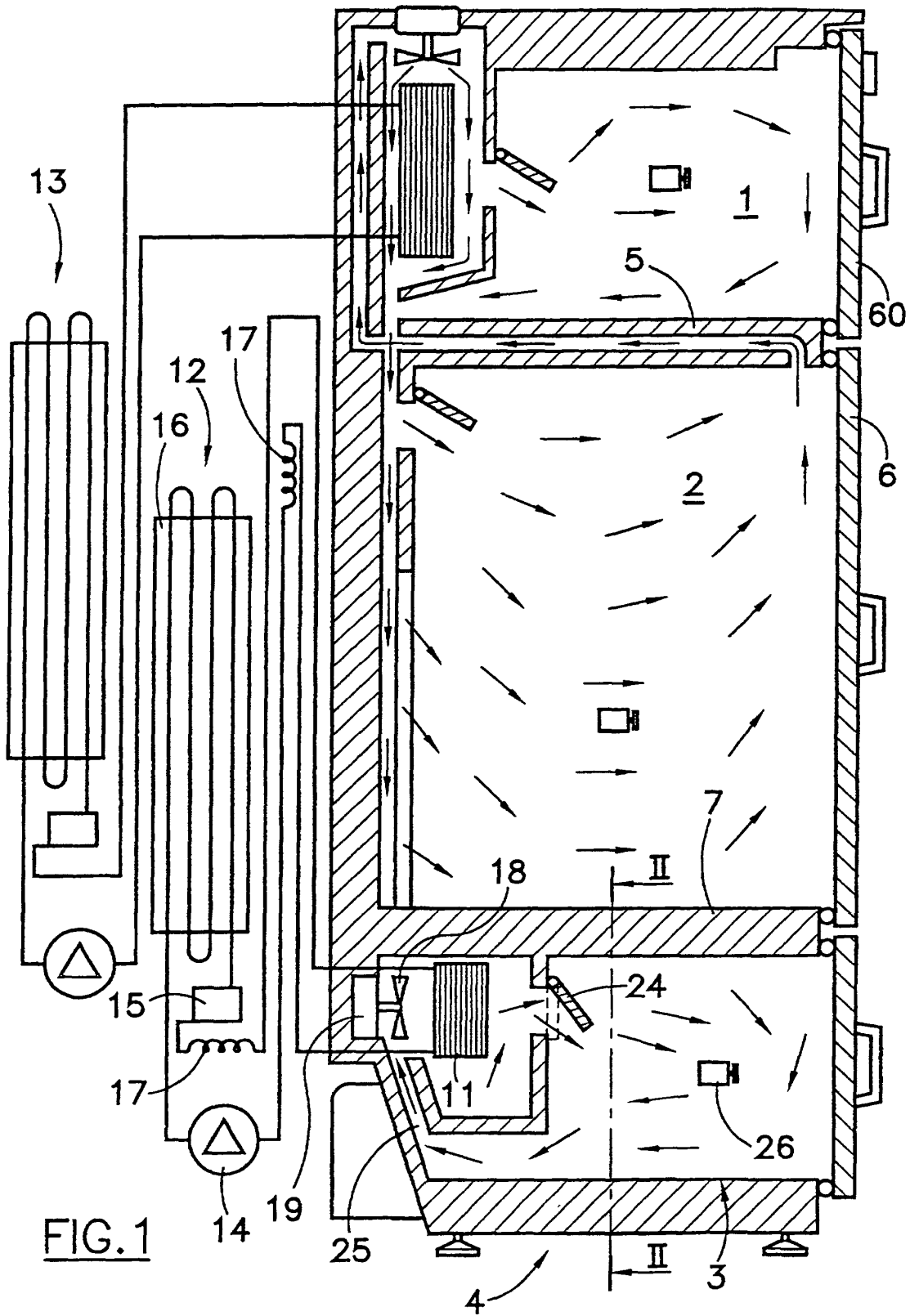


FIG. 1

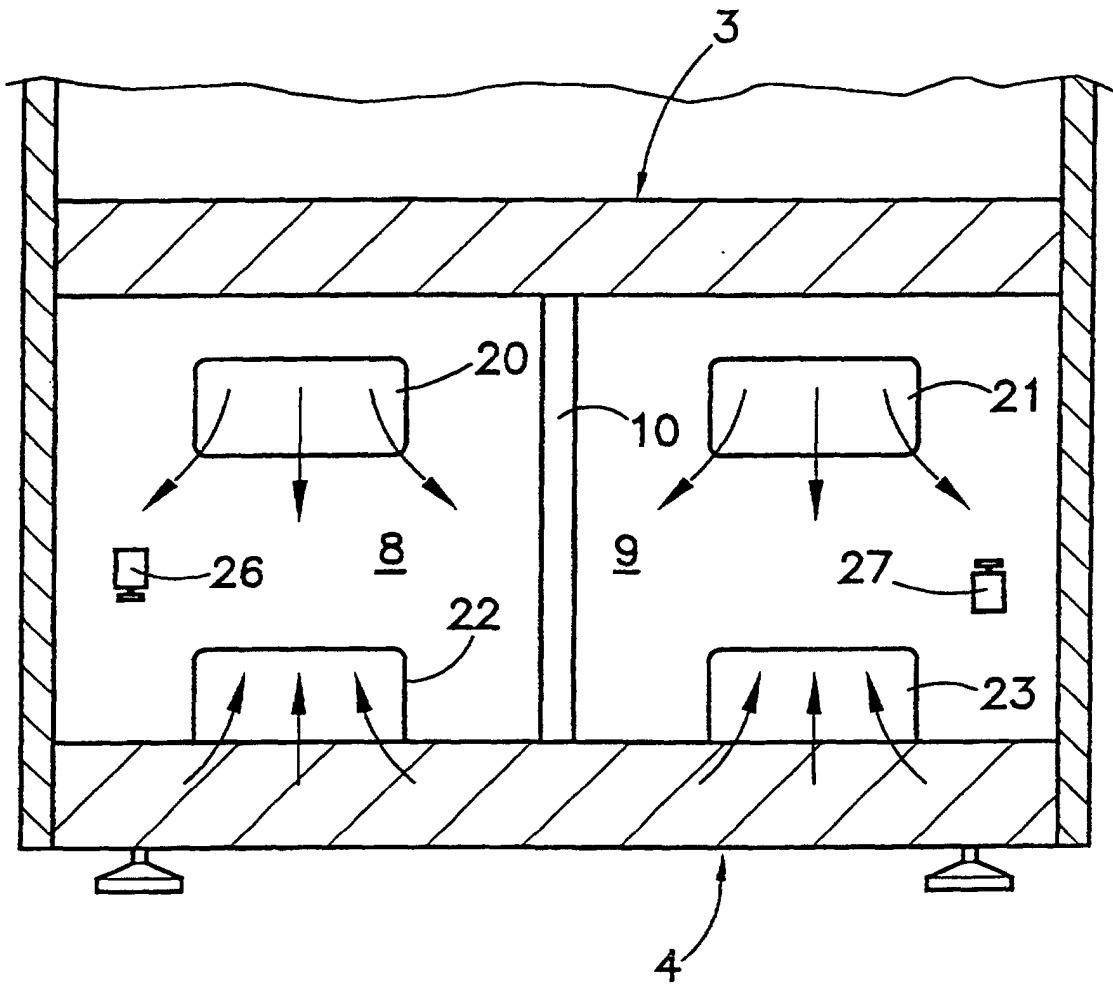


FIG.2

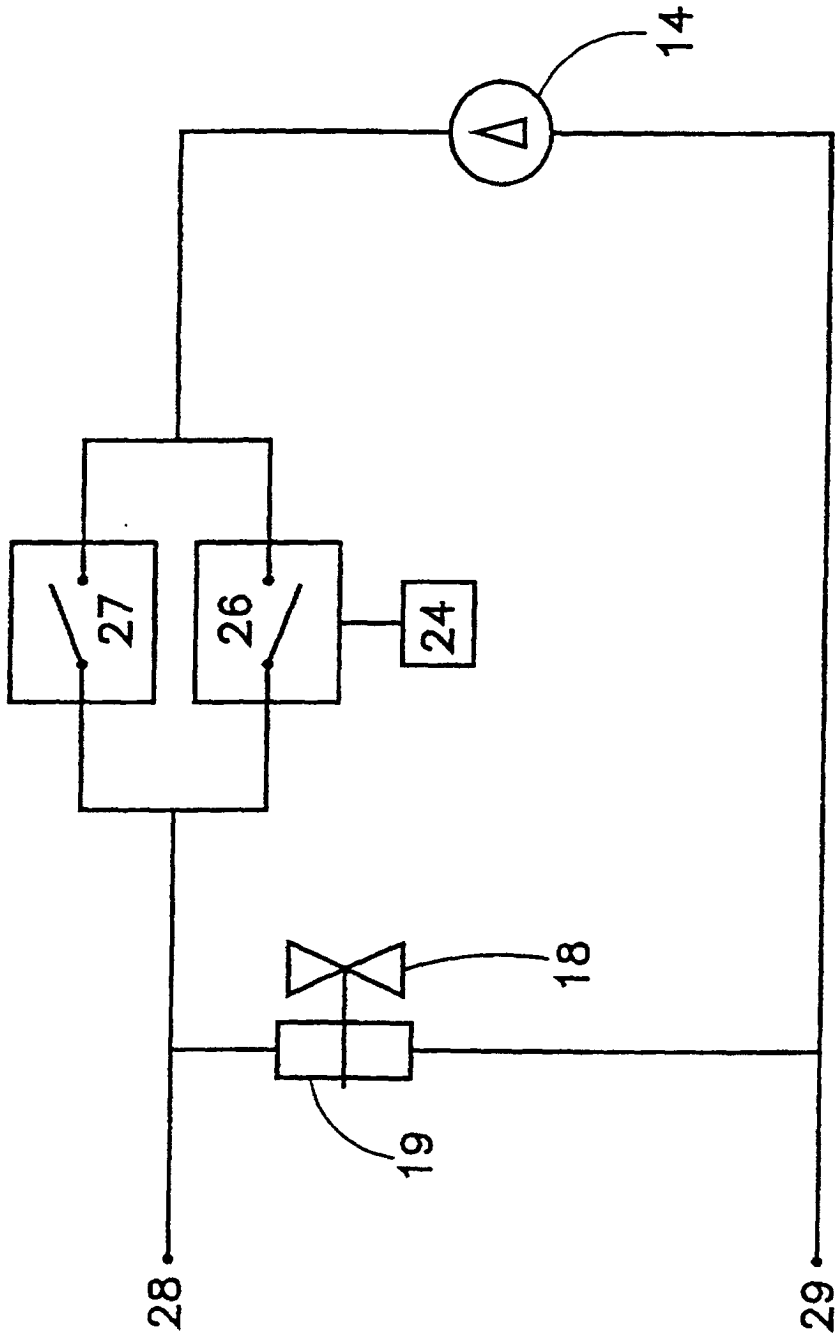


FIG.3

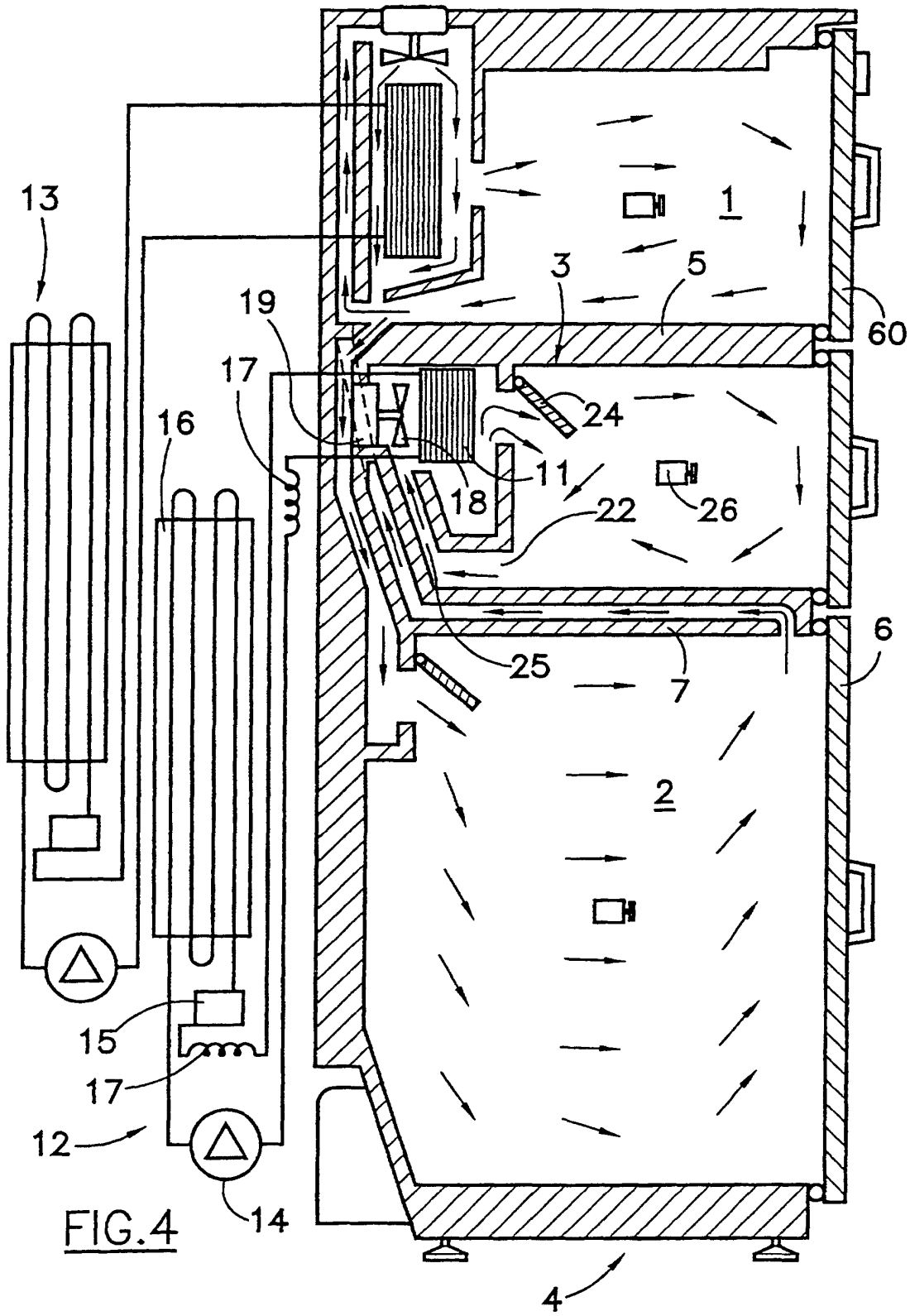


FIG. 4