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(54) **A refrigerating apparatus with a static evaporator and a plurality of compartments with separate temperatures.**

(57) The refrigerating apparatus (3) comprises a cubicle compartment (4) normally held at a first temperature by a static evaporator (8), and a further separate compartment (5) adjacent the cubicle and held at a lower temperature.

The further compartment (5) is thermally insulated from the cubicle (4) and the static evaporator (8) has a heat exchange surface which in part (18) communicates directly with the cubicle and in part (19) communicates directly with the further compartment.

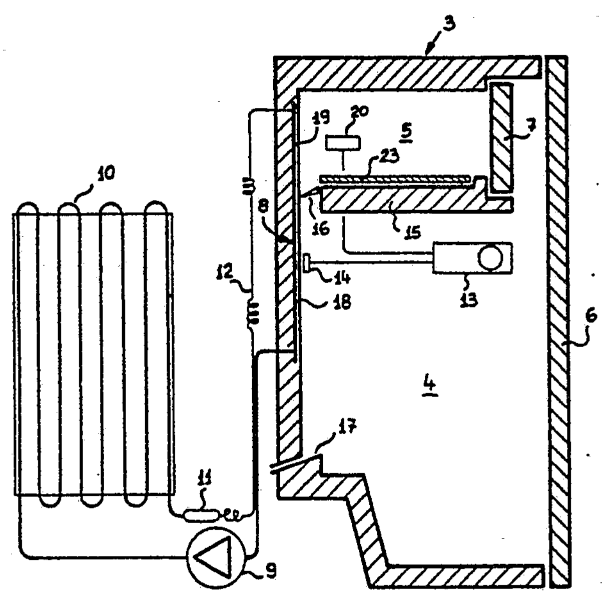

Fig. 1

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A refrigerating apparatus with a static evaporator and a plurality of compartments with separate temperatures

The present invention relates to a refrigerating apparatus equipped with an evaporator of the so-called "static", i.e. unventilated, type and comprising a plurality of compartments held at separate, preferably different, temperatures.

A refrigerating apparatus of this type is known for example from Italian patent application no. 48657 A/85, filed on Oct. 11, 1985. In particular, it comprises a cubicle compartment normally held at approximately +5°C by a static evaporator with several elements, the bottom of which houses on the inside a further compartment geometrically separate from the cubicle but in heat exchange therewith.

The back wall and the bottom wall of the further compartment are associated with a deflector adapted to convey a natural flow of descending air which, after being cooled by the evaporator, acts on the further compartment to cool it in a particularly sensitive way in order to keep it normally at a temperature of approximately 0°C.

The further compartment can be held at such a temperature only due to the fact that it is not substantially insulated thermally with respect to the cubicle (which can adversely affect the constancy of the temperature), is disposed at the lowest and thus coldest point of the cubicle (which is an undesirable geometrical constraint), and is associated with the deflector which expediently conveys the natural flow of colder air (which represents a constructional complication).

On the contrary, it would be favorable, and is the main object of the invention, to have a refrigerating apparatus with a static evaporator having a simple construction and equipped with a plurality of compartments at least one of which can be held at a lower temperature than that of the cubicle and can be disposed in any position with respect to the cubicle.

Another object of the invention is to provide a refrigerating apparatus of the cited type which requires a minimal number of components and is equipped with at least one compartment normally held at a substantially constant temperature of approximately 0°C for conserving particular food.

These objects are obtained in a refrigerating apparatus with a static evaporator and a plurality of compartments with separate temperatures that is realized according to the claims formulated below.

The features and advantages of the invention will become evident from the following description, intended solely by way of a nonrestrictive example, with reference to the adjoined drawings, in which

Fig. 1 shows a schematic cross section of a preferred embodiment of the refrigerating apparatus according to the invention,

Fig. 2 shows an electric circuit for controlling the apparatus of Fig. 1.

Referring to Fig. 1, the refrigerating apparatus according to the invention comprises an insulated cabinet 3 equipped with at least two distinct, adjacent compartments 4 and 5 for conserving food at separate temperatures.

Compartments 4 and 5 are equipped with separate doors of access 6, 7 and compartment 5 (with its own door 7) is housed within compartment 4, preferably at the top for convenient access. However, compartment 5 may also be disposed in a lower position within compartment 4, or the two compartments may be completely independent of each other (for example one above the other or side by side) and in such a case are only accessible independently via respective doors 6, 7.

The refrigerating apparatus is also equipped with one evaporator 8 of the so-called "static", i.e. unventilated, type which is connected to a refrigerant circuit comprising a compressor 9, a condenser 10, a dehydrating filter 11 and a member 12 for laminating the flow of refrigerant.

The apparatus is also provided with a means 13 for thermostatic temperature control (or thermostatic switch) that is known as such and housed for example within compartment 4. Means 13 is associated with at least one probe 14 adapted to detect the temperature of evaporator 8. In the known way, means 13 effects the start and duration of the activated and deactivated phases of compressor 9 so as to hold compartment 4, the cubicle compartment, normally at a mean predetermined temperature for conserving food. According to one aspect of the invention, only a portion 18 of the heat exchange surface of evaporator 8 communicates directly with cubicle compartment 4; the evaporator is prolonged (upward in the example being described) in such a way that a further portion 19 of its heat exchange surface communicates directly with adjacent compartment 5. The latter preferably has a smaller volume than cubicle 4 and is insulated in a particularly accurate way (for example with a thickening of its own walls) so as to be thermally insulated from cubicle compartment 4.

Although surface 19 of evaporator 8 is preferably smaller than surface 18, it is readily possible to provide a dimensional relationship between the two aforesaid surfaces and the volumes of compartments 4, 5 in such a way that compartment 5 (due to its own thermal insulation as well) is normally held at a mean lower temperature than cubicle 4. For example, it has been proven experimentally that, when refrigerant circuit 8-12 is controlled by means 13 to hold cubicle 4 at a mean temperature of +5°C, the temperature of compartment 5 can be readily held at a value of about 0°C for conserving particular food, such as meat and certain types of fruit.

In the known way, corresponding defrosting phases of static evaporator 8 are realized automatically during the deactivated phases of compressor 9, the evaporator preferably being disposed vertically in correspondence with the back wall of the apparatus.

In the example being described, base wall 15 of compartment 5 extends over the entire inside width of the apparatus and rests against evaporator 8 through the intermediary of a sealing lip 16. The latter, being of small dimensions, does not substantially alter the good thermal insulation between compartments 4 and 5 and allows the water produced by the defrosting of upper portion 19 of evaporator 8 to drip to a collecting tray 17 situated below. Evaporator 8 is preferably of the so-called "hidden" type as described for example in Italian utility model no. 201.063; in this way the back inside wall of the apparatus can be perfectly flat, allowing for an optimal seal of sealing lip 16.

Obviously, sealing lip 16 can be omitted if compartments 4 and 5 are side by side.

In any case, the defrosting of portion 19 of evaporator 8 communicating with colder compartment 5 is facilitated by the fact that said portion 19 has a lower mass than portion 18. The latter communicates with warmer compartment 4 and, by conduction, tends to heat evaporator portion 19 during the defrosting phases.

In order to keep the temperature within colder compartment 5 substantially and advantageously constant, the functioning of compressor 9 is preferably controlled by the electric circuit of Fig. 2.

Compressor 9 is connected to heads 21, 22 of a power supply source via control means 13, which substantially comprises a thermostatic switch controlled by probe 14 and by a further probe 20. In this case probe 14, which is preferably, but not exclusively, housed within compartment 4, detects the temperature of evaporator 8 and is adapted to close thermostatic switch 13, thereby activating refrigerant circuit 9-12, when the temperature exceeds a predetermined maximum value. Probe 20, on the other hand, is housed within compartment 5 to detect its ambient temperature and open thermostatic switch 13, thereby switching off compressor 9 and starting a corresponding defrosting phase of evaporator 8, when the temperature drops below a predetermined value (0°C in the example described).

Therefore, the entire refrigerating apparatus functions in accordance with the predetermined mean temperature for the inside environment of compartment 5 while the temperature inside cubicle compartment 4 (whose constancy and precision is less important) is automatically regulated as a consequence, in accordance with the general dimensioning of the apparatus.

According to another aspect of the invention, the inside surface of compartment 5 is made at least in part of a highly heat-conducting material, such as aluminum. For example, the inside surface of base wall 15 (which is the colder one in the example described) is covered with an aluminum layer 23 adapted to distribute uniformly in compartment 5 the thermal energy received by natural convection from surface 19 of evaporator 8. Furthermore, the temperature lag of the mass of heat-conducting layer 23 subsequently keeps the temperature within compartment 5 constant.

Obviously, the refrigerating apparatus described can undergo numerous modifications without going beyond the scope of the invention.

In any case, the constructional simplicity of the refrigerating apparatus is evident, the apparatus advantageously having one refrigerant circuit and one thermostatic control means 13, 14, 20.

Claims

1. A refrigerating apparatus comprising a cubicle compartment normally held at a first temperature by a static evaporator, and at least one further separate compartment adjacent the cubicle compartment and held at a lower temperature, characterized in that the further compartment (5) is thermally insulated from the cubicle compartment (4) and the static evaporator (8) has a heat exchange surface which in part communicates directly with the cubicle compartment and in part communicates directly with the further compartment.

2. The refrigerating apparatus of claim 1, characterized in that the portion (19) of the heat exchange surface of the static evaporator (8) communicating with the further compartment (5) having a lower temperature is smaller than that (18) communicating with the cubicle compartment (4).

3. The refrigerating apparatus of claim 1, wherein the static evaporator is connected to a refrigerant circuit comprising a compressor connected to a power supply source via a thermostatic switch, characterized in that the thermostatic switch (13) is connected by a first and a second probe (14, 20) sensitive to the temperature of the evaporator (8) and to the temperature of the inside environment of the further compartment (5), respectively, to close when the temperature of the

evaporator exceeds a predetermined maximum value and to open when the temperature in the further compartment (5) drops below a predetermined value, respectively.

4. The refrigerating apparatus of claim 1, characterized in that the inside surface of the further compartment (5) is made at least in part of heat-conducting material (23).

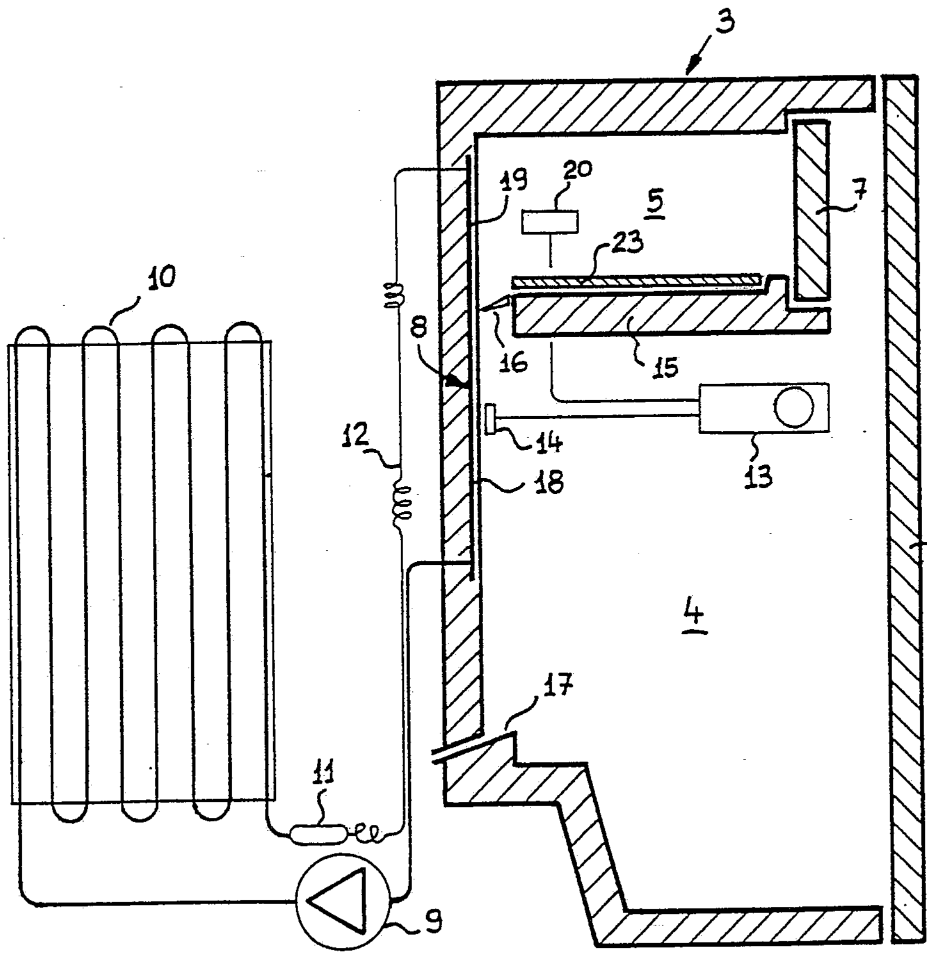

Fig. 1

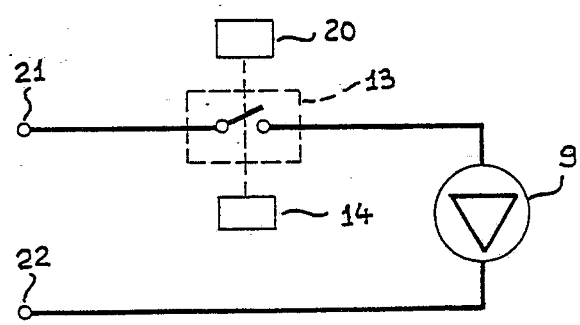

Fig. 2