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(54) **Refrigerator with evaporator positioned within the preservation compartment roof**

(57) A refrigerator with at least one preservation compartment (3) cooled by evaporator means (4, 5) which comprise a part (5) positioned in correspondence with the roof (6) of the preservation compartment (3) and transmitting its cold to said compartment via a eutectic layer.

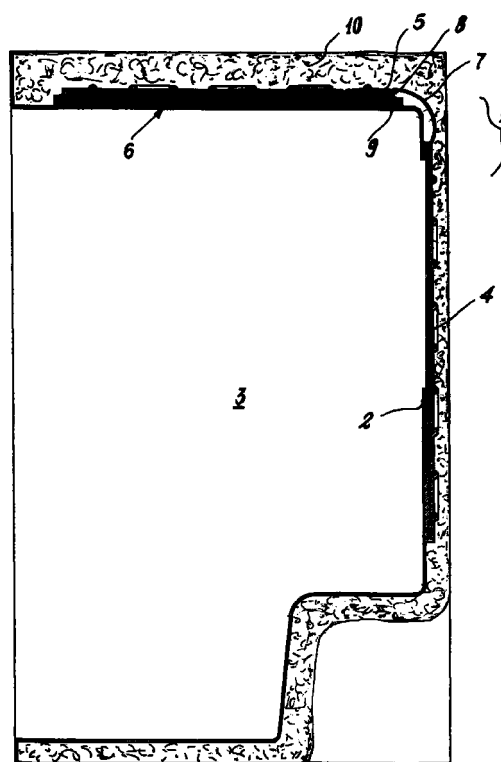


Fig. 1

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Description

[0001] This invention relates generally to a domestic refrigerator comprising at least one preservation compartment cooled by evaporator means. More particularly, the invention relates to a domestic refrigerator with automatic defrosting.

[0002] Refrigerators are known in the most varied constructions, all tending to improve their power consumption and hence their efficiency, and to reduce the thermal load of the evaporator. However a margin always exists for possible improvements to known constructions aimed at achieving further benefits.

[0003] An object of the invention is to improve refrigerators of the indicated type such as to appreciably lower their power consumption.

[0004] This and further objects which will be apparent from the ensuing detailed description are attained by a refrigerator of the indicated type, the inventive aspects of which are defined in the accompanying claims.

[0005] The invention will be more apparent from the detailed description of preferred embodiments thereof given hereinafter by way of non-limiting example and illustrated on the accompanying drawings, on which:

Figure 1 is a schematic vertical section through a refrigerator according to the invention;

Figure 2 is a schematic section through the roof of the refrigerator of Figure 1;

Figure 3 is a schematic perspective view of that shown in Figure 2.

[0006] In the figures, the reference numeral 1 indicates overall a refrigerator shown without its door and other members such as the compressor and condenser as these are conventional and do not concern the invention.

[0007] A conventional evaporator 4 extends in contact with the vertical rear wall 2 and possibly with the side walls which bound the preservation compartment 3 of the refrigerator.

[0008] According to the invention a further evaporator 5 is provided in correspondence with the roof 6 which upperly bounds the preservation compartment. This further evaporator can be a section of the other evaporator or be an evaporator connected to the preceding by a throttling means such as a conventional capillary 7.

[0009] The evaporator 5, whether forming a part or section of the evaporator 4 or whether connected to it via the capillary 7, is positioned upstream of the evaporator 4 with reference to the direction of flow of the refrigerant fluid through the evaporators.

[0010] According to the invention, the evaporator 5 is not in direct contact with the roof of the preservation compartment 3, but is spaced from it in that it rests either directly, or indirectly via a sheet for example of polyethylene or another similar plastic material, on a panel or cushion 9. This latter is preferably divided into

communicating or non-communicating compartments and comprises a flexible or substantially rigid eutectic-containing enclosure of plastic material such as polyethylene, or metal such as aluminium, or aluminized plastic, or plastic filled with a heat conducting material.

[0011] In the case of a substantially rigid enclosure, it can be of a shape such as to compensate any deformation due to the changes of state of the eutectic so as not to deform the roof 6, in addition to the provision of expansion volumes for the eutectic within the enclosure.

[0012] The eutectic is chosen such as to change its state at a temperature of not less than -10°C , preferably 0°C , the layer formed by the eutectic (minus the thickness of the enclosure), ie the quantity of eutectic contained, and the type of eutectic being such that under the refrigerator operating conditions the roof temperature never falls below a value such as to result in formation of condensate or frost on the underside of the roof. A possible electrical resistance element of suitable power, for example positioned on that surface of the eutectic facing the compartment 3, can prevent condensate or frost appearing on said surface. Alternatively the resistance element can be advantageously replaced by a part of the usual capillary tube connecting the usual condenser (not shown) of the refrigeration circuit to said evaporator, and positioned in correspondence with said surfaces of the eutectic. This has the advantage of recovering the energy dispensed by the eutectic in addition to preventing the formation of the condensate or frost. Examples of such eutectics are $\text{KNO}_3/\text{H}_2\text{O}$ and $\text{KCl}/\text{H}_2\text{O}$, or simply H_2O .

[0013] The evaporator 5 upstream of the evaporator 4 can also be bonded to the eutectic cushion 9 by adhesives instead of resting thereon directly or indirectly.

[0014] In the refrigerator example shown on the drawings, the evaporators and the eutectic cushion are conventionally embedded in a mass of expanded polyurethane material 10. Arrangements are however possible, all falling within the scope of the invention, in which the evaporator 4 (ie that on the rear) and any evaporators or sections present on the side walls of the compartment are visible, ie not embedded and hence actually lying within the preservation compartment 3. The roof evaporator 5 can also be provided in an exposed position, but in this case it will be substantially clad by the eutectic cushion.

[0015] The concept on which the invention is based consists of appreciably reducing (as much as by 20-30%) the refrigerator power consumption by virtue of the increase in the evaporating surface, the greater efficiency of the refrigeration cycle in that evaporation can take place at a higher temperature because of the greater evaporating surface, and a lower thermal load on the evaporator.

[0016] The arrangement of the invention is applicable not only to single-compartment refrigerators (such as that shown), but also to multi-compartment refrigerators (combination type), including those with two compres-

sors.

Claims

1. A refrigerator with at least one preservation compartment (3) cooled by evaporator means (4, 5), characterised in that the evaporator means (4, 5) comprise a part (5) positioned in correspondence with the roof (6) of the preservation compartment (3) and transmitting its cold to the compartment (3) via a eutectic layer (9). 5 10
2. A refrigerator as claimed in claim 1, wherein the eutectic is chosen such as to have a solidification temperature of not less than -10°C, preferably 0°C, so that under operating conditions the roof temperature does not fall below a value such as to cause condensate or frost to form on the underside of the roof (6) of the preservation compartment (3). 15 20
3. A refrigerator as claimed in the preceding claims, wherein the eutectic layer (9) is enclosed in an enclosure defining a cushion on which that part (5) of the evaporator means relative to the roof (6) lies either directly or indirectly. 25
4. A refrigerator as claimed in claim 3, characterised in that the enclosure is flexible.
5. A refrigerator as claimed in claim 3, characterised in that the enclosure is rigid. 30
6. A refrigerator as claimed in one or more of the preceding claims, wherein in addition to the part (5) involving the roof (6) of the compartment (3), the evaporator means (4, 5) comprise an evaporator part (4) involving at least one of the vertical walls of the preservation compartment (3), that evaporator part involving the vertical wall or walls being positioned downstream of the other part in the direction of flow of the refrigerant fluid. 35 40
7. A refrigerator as claimed in claim 4, wherein the evaporator parts (4, 5) are connected together via a capillary (7). 45

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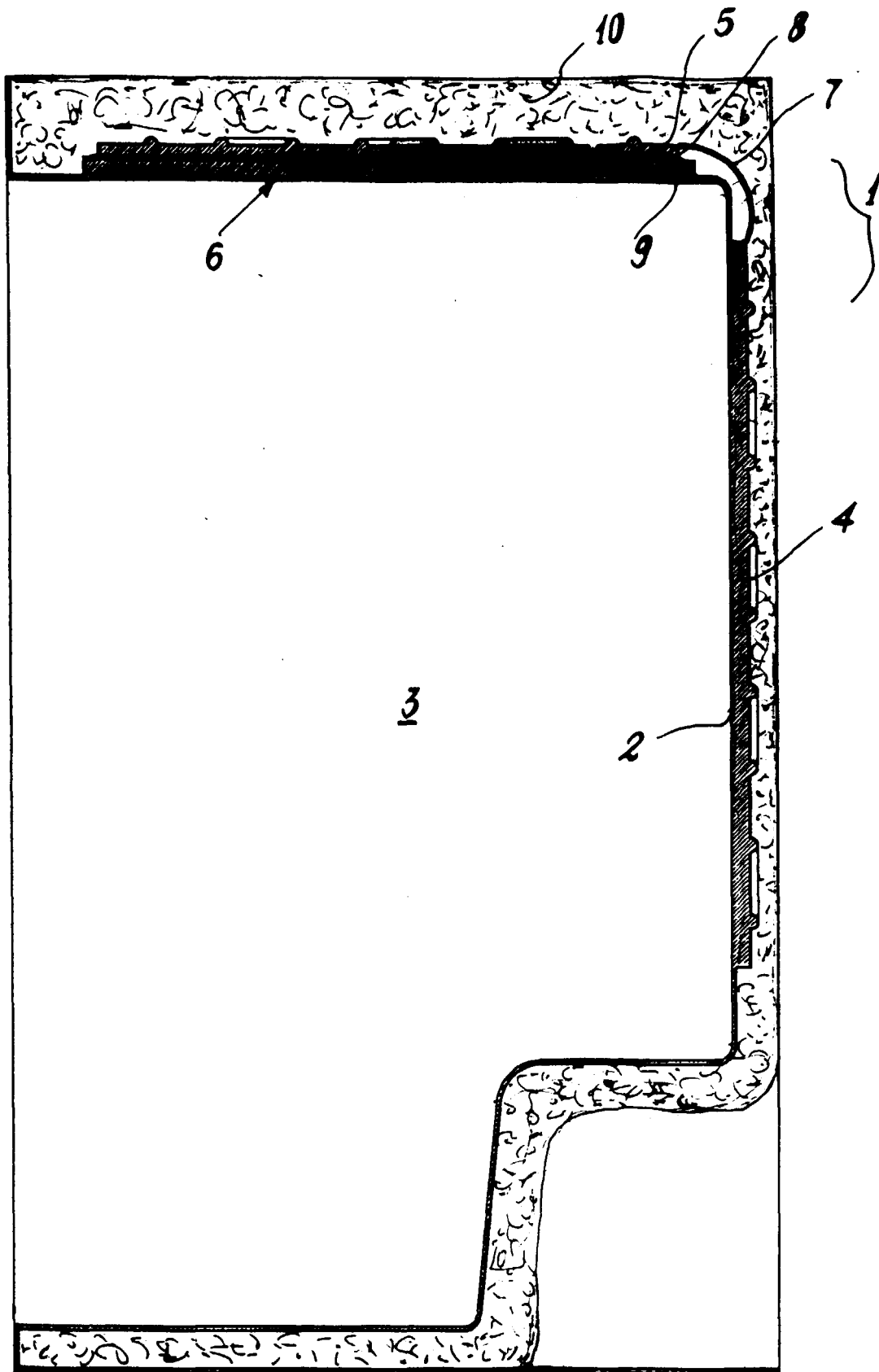


Fig. 1

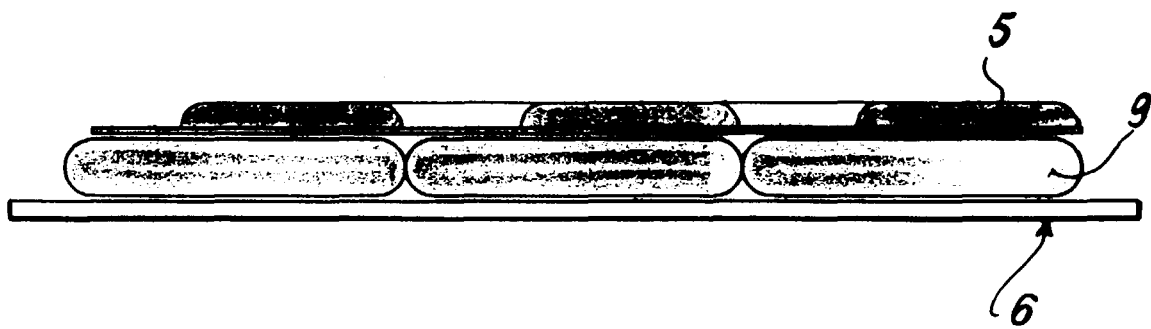


Fig. 2

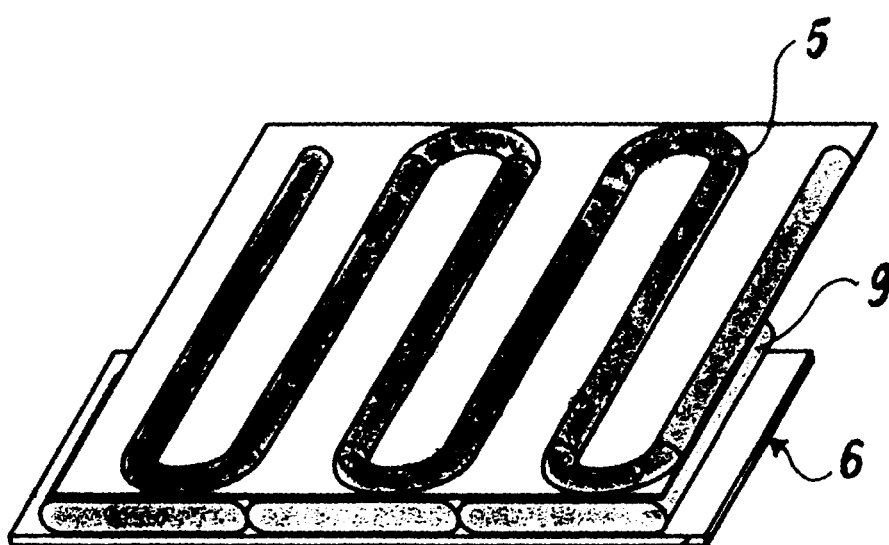


Fig. 3