(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 229 293 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.08.2002 Bulletin 2002/32

(51) Int Cl.[7]: **F25B 39/04**, F25D 23/00

(21) Application number: **02000283.8**

(22) Date of filing: **15.01.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **02.02.2001 IT MI010212**

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(54) Refrigeration circuit condenser particularly for refrigerators, freezers and similar domestic appliances

(57) A refrigeration circuit condenser, particularly for refrigerators, freezers and similar domestic appliances, comprising a flat tubular hairpin coil (2) disposed within a substantially flat heat dissipator, in which the hairpin coil (2) and heat dissipator (3) are contained in a sealed box casing (1) filled with fluid (4) of high specific heat.

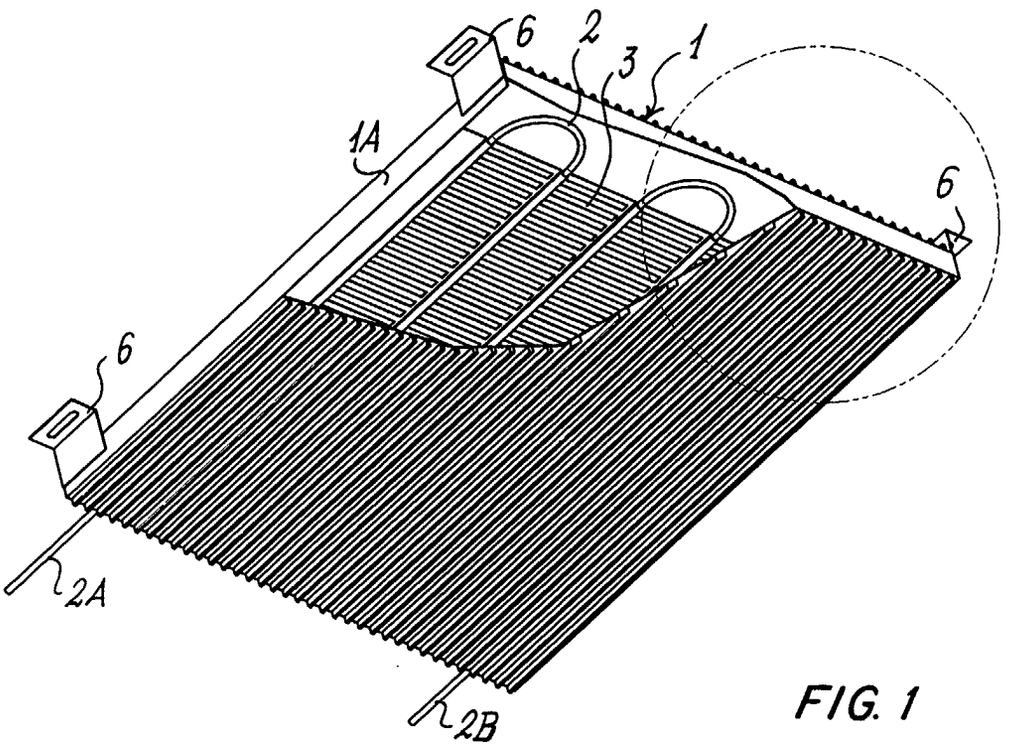

FIG. 1

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Description

[0001] The present invention relates to a refrigeration circuit condenser, particularly for refrigerators, freezers and similar appliances for domestic use. The condenser is of the flat hairpin coil type disposed within a heat dissipator, for example comprising wires, bars, metal plates or a finned sheet metal structure, to increase the dispersing surface.

[0002] In conventional domestic refrigerators (and also in those other domestic appliances incorporating compressor-type refrigeration circuits) the condenser is applied to the rear face of the refrigerator cabinet via spacers (to reduce heat transfer towards that face) and is cooled by convective air movement produced by itself. In other words, its cooling is achieved by environmental air in movement, i.e. by a thermosiphon effect.

[0003] This arrangement is certainly economical to produce, but presents considerable drawbacks in its use.

[0004] Firstly, the operative conditions of the refrigeration circuit are not optimum because they vary depending on how the refrigerator is used (door opening and closure frequency), the environmental conditions, the location of the refrigerator and its load. To this can be added a decrease in the condenser efficiency with time due to the inevitable deposits of dust, grease etc. which are practically irremovable because of the complexity of the shape of a flat condenser.

[0005] The main object of the present invention is to provide an improved condenser which, as practical rests have demonstrated, enables the operative conditions of the refrigeration circuit which incorporates it to be tangibly improved, so reducing its energy consumption for equal conditions.

[0006] An accessory object of the present invention is to provide an improved condenser which can be easily cleaned.

[0007] These and further objects which will be apparent to an expert of the art from the ensuing detailed description are attained by a condenser in accordance with the teachings of the present invention, these teachings being expressed by the accompanying claims.

[0008] The invention will be more apparent from the detailed description of preferred embodiments thereof given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of the condenser according to the invention with a part removed;
Figure 2 is a perspective view on an enlarged scale of that detail of the condenser of vex 1 indicated by X;
Figure 3 is a partial cross-section through the condenser of the invention;
Figures 4A, B, C show in schematic form possible shapes of the outer walls of the condenser shell.

[0009] With reference to the drawings, the condenser of the invention comprises a sealed finned box casing 1 enclosing a flat tubular hairpin coil contained, disposed or mounted in a heat dissipator in the form of a finned structure 3 composed of one or more metal sheets. A fluid 4 having a high specific heat fills the interior of the finned box casing 1.

[0010] The flat tubular hairpin coil 2 (through which the refrigerant fluid flows) plus the finned structure 3 which contains it or in which it is mounted is substantially identical constructionally to the traditional flat air condensers used in domestic refrigeration appliances, such as refrigerators, freezers or ice producers. The novelty lies in the fact of having positioned it in a sealed box casing filled with a liquid of high specific heat.

[0011] The finned sealed box casing is of square or rectangular shape. The relative fins can assume the most varied forms, for example those reproduced schematically in Figures 4A, B, C. The fins are advantageously all parallel and extend vertically (when the condenser is in use), so making it simple to adequately clean the condenser of the invention (this cleaning being necessary to preserve its efficiency); in this manner the condenser of the invention differs from air condensers in which because of the complexity of the shape of the finned sheet metal containing the hairpin coil, adequate cleaning cannot be achieved in practice.

[0012] The box casing presents a closable or sealable aperture or port 5 for introducing the fluid, and a sealed entry passage 2A and exit passage 2B for the tubular hairpin coil 2.

[0013] The box casing 1 also presents conventional angle brackets 6 for fixing the condenser to the cabinet of the refrigeration appliance.

[0014] The box casing can be made of sheet metal (for example steel) or even of plastic material, advantageously so if a good conductor of heat. Its outer faces are preferably black, achieved for example by painting or by pigmentation (in the case of plastic material).

[0015] The box casing can be produced by pressing in two or more pieces to be bonded or welded together after mounting the hairpin coil with the relative finned sheet metal structure in one of them. The finned sheet metal structure can be bonded or welded along two opposite longitudinal edges 3A to the minor lateral walls 1A of the casing 1 (as shown for example in Figure 3).

[0016] The fluid of high specific heat can be of the most diverse types. This fluid can be mains water, its saline solutions, eutectic mixtures, silicone gels, or mixtures or aqueous solutions of cellulose derivatives such as oxymethylcellulose. A particularly useful and advantageous composition X of such a cellulose derivative is the following:

232 g of oxyethylmethylcellulose
725 g of water "X"
43 g of sodium chloride
0.8 g of 6-chlorometacresol

[0017] A comparative test used three refrigerators (in the same environment at a temperature of 25°C) which were identical except that one comprised a conventional air condenser, the second comprised a condenser of the invention with mains water as the filing fluid and the third comprised a condenser of the invention with the aforesaid composition X as the filling fluid. This comparative test provided the following results:

	Air condenser	Water condenser	Condenser with composition X
a) average cell temp. (°C)	5	5	5
b) condenser temp.	46.3	35.5	32.3
c) percent activation (%)	36.5	33.2	31.1
d) power consumption (Wh/24h)	551	509	495
e) consumption difference (%)	reference	7.6	10.2

in which:

a) indicates the average temperature of the refrigerator preservation cell during 24h;
b) indicates the average temperature of the condenser (during the period in which the compressor is activated) evaluated over the same time period by a thermocouple applied to the condenser;
c) indicates the percentage of time (over a 24h period) in which the refrigerator compressor remained active;
d) indicates the energy consumption during the 24h period;
e) indicates the percentage difference in energy consumption.

[0018] The latter quantity shows that with the liquid condenser according to the invention a substantial energy saving was achieved to the extent of 7.6% and 10.2% respectively, with greater functional equilibrium of the relative refrigeration circuit, to be attributed to the thermal stabilizing effect of the condenser filling fluid and the greater heat transfer surface of the condenser itself.

Claims

1. A refrigeration circuit condenser, particularly for refrigerators, freezers and similar domestic appliances, comprising a flat tubular hairpin coil (2) disposed within a substantially flat heat dissipator, **characterised in that** the hairpin coil (2) and heat dissipator (3) are contained in a sealed box casing (1) filled with fluid (4) of high specific heat.

2. A condenser as claimed in claim 1, wherein the box casing (1) is provided with parallel fins.

3. A condenser as claimed in claim 1 or claims 1 and 2, wherein the fluid (4) of high specific heat is selected from the group comprising water, its saline solutions, eutectic mixtures, and mixtures or aqueous solutions of cellulose derivatives.

4. A condenser as claimed in claim 3, wherein the cellulose derivative is oxyethylmethylcellulose.

5. A condenser as claimed in claim 4, wherein the oxyethylmethylcellulose is in composition with water, sodium chloride and 6-chlorometacresol.

6. A condenser as claimed in one or more of the preceding claims, wherein the box casing (1) is at least externally black.

7. A condenser as claimed in one or more of the preceding claims, wherein the box casing (1) is of square or rectangular outline and presents means (6) for its fixing to the appliance.

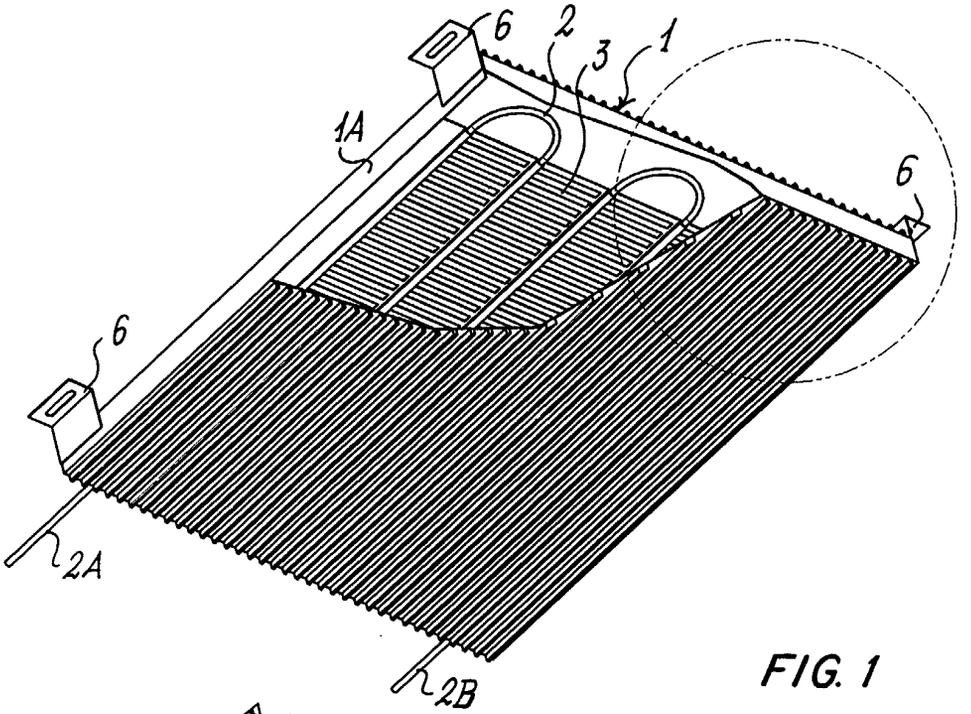

FIG. 1

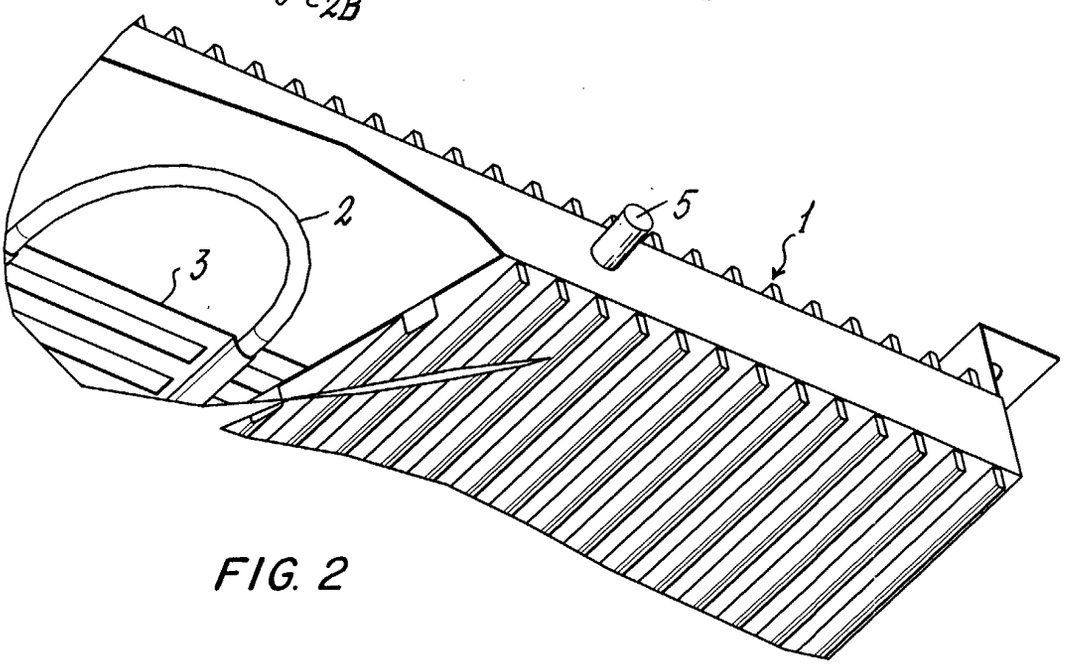

FIG. 2

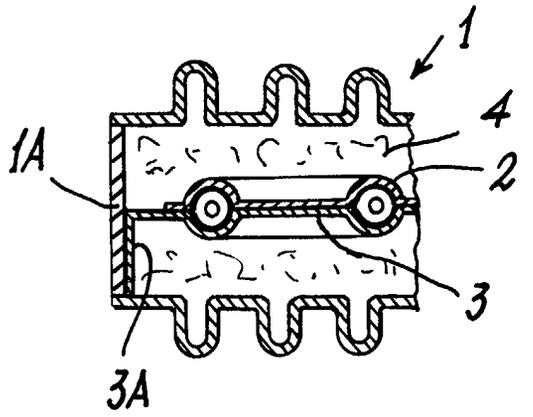

FIG. 3

FIG. 4A

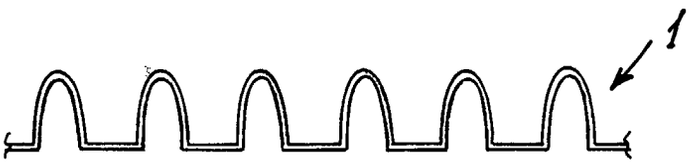

FIG. 4B

FIG. 4C

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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 February 2002	Boets, A

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