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(54) Refrigerating apparatus having a heat exchanger adhesively secured to the wall of the refrigerating compartment.

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Description

The present invention relates to a refrigerating apparatus, particularly of the domestic type, comprising an evaporator acting as a heat exchanger made of metal and adhesively secured to the outer surface of a wall of a refrigerating compartment formed of a plastic material.

In a refrigerator of this type, the rear wall of the refrigerating compartment and the surface of the evaporator participating in the thermal transition process are of planar configuration and connected in close contact with each other by means of a double-faced adhesive sheet or film interposed therebetween.

It is noted that the plastic material of which the refrigerating compartment is made (usually polystyrene) has a thermal expansion coefficient which is about three times that of the material of the evaporator (usually aluminum). Variations of temperature (for instance during transport of the apparatus, on starting operation of the apparatus for the first time, or during normal operation thereof) thus result in different expansion of the two components, which has to be accommodated by the double-faced adhesive film. The latter is selected to have an infinitesimally small thickness (about ten hundredth of a millimeter) so as not to interfere with the thermal exchange process, and also for economical reasons, in that a double-faced adhesive film of greater thickness, and thus more expensive, although ensuring a reliable mechanical connection, would excessively interfere with the thermal exchange process.

In the course of laboratory experiments it has been found that the different expansion of an evaporator made of aluminium and a wall made of polystyrene can be accommodated by this type of double-faced adhesive film only with an evaporator the surface dimensions of which do not exceed a certain value, for instance an area of about 30 × 40 cm.

The different expansion characteristics of these two materials have thus formerly limited the construction of evaporators to the dimensions stated above, or even smaller dimensions. In refrigerators requiring the use of evaporators of greater dimensions, the double-faced adhesive film had to be replaced by more complicated and expensive connection systems. In this context it is known from German Patent No. 3,329,614 to accomplish the connection between the wall of the refrigerating compartment and the heat exchanger or evaporator by interposing therebetween a layer of a gel-type viscous thixotropic material. This solution involves the employ of a difficultly treatable material, of suitable sealing means, and in many cases of additional supply containers for compensating possible losses of the connecting substance. This solution thus complicates the construction of the refrigerator while reducing, although not eliminating, the employ of adhesive substances.

It is therefore an object of the invention to achieve, solely by the employ of the described double-faced adhesive film, an optimum interconnection between a cell made of a plastics material and an evaporator made of metal and having a greater surface area than formerly admissible with regard to the adhesive capacity of the double-faced adhesive film.

According to the invention, this object is attained in a refrigerating apparatus, particularly of the domestic type, comprising a refrigerating compartment having walls of a plastic material, and at least one panel-shaped heat exchanger made of metal and mounted in contact with a wall of said refrigerating compartment by means of a double-faced adhesive film interposed therebetween, characterized in that the thermal transition surface between said heat exchanger panel and the adjacent wall of said refrigerating compartment is provided with discontinuities acting as expansion joints.

The characteristics of the refrigerating apparatus according to the invention will become more clearly evident from the following description, given by way of example with reference to the accompanying drawings, wherein:

fig. 1 shows a diagrammatic front view of a metal evaporator mounted in contact with the refrigerating compartment,

fig. 2 shows an alternative embodiment of the refrigerating apparatus according to the invention, depicting in particular a portion of the wall of the refrigerating compartment from the side not in contact with the evaporator or heat exchanger, and

fig. 3 shows a cross-sectional view of a portion of the refrigerating compartment taken along the line III—III in Fig. 2.

The figures of the drawing refer to a refrigerating apparatus provided with an evaporator/heat exchanger 5 of the so-called "hidden" type secured to the outer face of a rear wall 6 of a refrigerating compartment 7.

Evaporator/heat exchanger 5 is of the "panel" type made by joining two metal sheets, preferably of aluminium, for example by the roll-bond method. The evaporator/heat exchanger may also be formed of a single metal sheet carrying a meandering tubular conduit secured thereto in a suitable manner and acting to convey a refrigerant.

Refrigerating compartment 7 is of box-shaped configuration formed preferably of polystyrene by injection molding, vacuum drawing or a similar process.

The connection between evaporator panel 5 and rear wall 6 is accomplished by the interposition therebetween of a double-faced adhesive film (not shown) of an infinitesimally small thickness and having a surface area at least equalling that of evaporator panel 5.

In one embodiment of the refrigerating apparatus according to the invention, the body of evaporator panel 5 is formed with transversely extending incisions 8A, B passing therethrough (fig. 1). To this purpose, conduits 11 for the refrigerant are formed to follow a course permit-

ting the formation of a cruciform central incision 8A and of four peripheral incisions 8B.

As a result, the expansions and contractions to which evaporator panel 5 is subjected are no longer directly related to the overall dimensions of its entire surface, but only to the dimensions of the partial surface areas defined by incisions 8A, B and the outer boundaries of evaporator panel 5.

The incisions 8 thus permit evaporator panel 5 to adapt itself to the greatest expansions and contractions to which plastic wall 6 may be substituted without surpassing the limits of the adhesion capacity of the double-faced adhesive film joining the two components.

It is thus evident that the provision of the incisions 8A, B in evaporator panel 5 permits the dimensions of the latter to be increased over the limits imposed by the different thermal expansion characteristics of the materials employed and by the adhesion capacity of a double-faced adhesive film of infinitesimally small thickness. Any increase of the dimensions of the surface area of evaporator panel 5 may be accompanied by a corresponding increase of the number of incisions 8A, B acting as expansion joints, and thus of the number of partial surface areas defined therebetween.

Shown in figs. 2 and 3 is an alternative embodiment of the refrigerating apparatus according to the invention. In this case evaporator panel 5 may be of conventional construction, that is, not provided with incisions 8A, B, while rear wall 6 of refrigerating compartment 7 is of a modified construction.

In particular, as shown in the cross-sectional view of fig. 3, the area of rear wall 6 coming into contact with evaporator panel 5 is formed with raised surface portions 9 projecting rearwards of rear wall 6 towards evaporator panel 5. Raised surface portions 9 may by way of example be of quadrangular shape, but may of course also have any other suitable configuration.

In this second embodiment, the different thermic behaviour of the two bonded elements is compensated by peripheral areas 10 of each raised surface area 9. In effect these areas 10 act as deformable diaphragms permitting plastic wall 6 to adapt itself to the smaller expansion and contraction of the metal evaporator panel 5.

Both of the described solutions permit an optimum bond to be achieved between a wall of a plastics material and a metallic heat exchanger by the interposition therebetween of a double-faced adhesive film of infinitesimally small thickness, with the metallic heat exchanger having a surface area of greater dimensions than formerly admissible in view of the adhesion capacity of a double-faced adhesive film of this type and of the different thermal expansion characteristics of the materials joined thereby. It is obvious that both of the described solutions may be employed in one and the same refrigerating apparatus so as to combine their individual advantages.

The object of the invention is thus attained without the employ of complicated and expensive connection systems or materials the processing of which is difficult.

Claims

1. A refrigerating apparatus, particularly of the domestic type, comprising a refrigerating compartment (7) having walls of a plastic material, and at least one panel-shaped heat exchanger (5) made of metal and mounted in contact with a wall (6) of said refrigerating compartment by means of a double-faced adhesive film interposed therebetween, characterized in that the thermal transition surface between said heat exchanger panel (5) and the adjacent wall (6) of said refrigerating compartment (7) is provided with discontinuities (8A, 8B; 10) acting as expansion joints.

2. A refrigerating apparatus according to claim 1, characterized in that said discontinuities are formed as incisions (8A, 8B) passing transversely through the body of said heat exchanger panel (5).

3. A refrigerating apparatus according to claim 1, characterized in that said discontinuities are formed as recessed areas (10) in said wall (6) of said refrigerating compartment (7) at the side facing towards said heat exchanger panel (5) at positions determining interruptions of the continuity between areas (9) of said wall (6) contacting said heat exchanger panel (5) and between said areas (9) and adjacent surfaces of said wall (6) not in contact with said panel (5).

Patentansprüche

1. Kühlgerät, insbesondere für den Hausgebrauch, enthaltend einen Kühlbehälter (7) mit Wänden aus Plastikmaterial und wenigstens einen tafelförmigen Wärmetauscher (5) aus Metall, der in Berührung mit einer Wand (6) des Kühlbehälters mittels eines doppelseitig klebenden, dazwischenliegenden Films montiert ist, dadurch gekennzeichnet, daß die Wärmeübergangsfläche zwischen der Wärmetauschertafel (5) und der benachbarten Wand (6) des Kühlbehälters (7) mit Diskontinuitäten (8A, 8B; 10) versehen ist, die als Dehnungsfugen dienen.

2. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß die genannten Diskontinuitäten als Einschnitte (8A, 8B) ausgebildet sind, die quer durch den Körper Wärmetauschertafel (5) verlaufen.

3. Kühlgerät nach Anspruch 1, dadurch gekennzeichnet, daß die genannten Diskontinuitäten als vertiefte Flächen (10) in der genannten Wand (6) des Kühlbehälters (7) auf der gegen den Wärmetauscher (5) gerichteten Seite an Stellen ausgebildet sind, die Unterbrechungen des Zusammenhangs zwischen Flächen (9) der Wand (6) bilden, die die Wärmetauschertafel (5) berühren und zwischen den genannten Flächen (9) und benachbarten Flächen der Wand (6), die nicht mit der genannten Tafel (5) in Berührung sind.

Revendications

1. Appareil frigorifique, notamment du type domestique, comprenant un compartiment réfrigérant (7) ayant des parois en matière plastique et au moins un échangeur thermique en forme de panneau (5), fait de métal et monté en contact avec une paroi (6) du compartiment réfrigérant au moyen d'un film adhésif double face interposé entre eux, caractérisé en ce que la surface de transition thermique entre le panneau d'échangeur thermique (5) et la paroi adjacente (6) du compartiment réfrigérant (7) présente des discontinuités (8A, 8B; 10) servant de joints de dilatation.

2. Appareil frigorifique selon la revendication 1, caractérisé en ce que ces discontinuités sont formées par des incisions (8A, 8B) passant transversalement à travers le corps du panneau d'échangeur thermique (5).

3. Appareil frigorifique selon la revendication 1, caractérisé en ce que ces discontinuités sont formées sous forme de zones en creux (10) dans la paroi (6) du compartiment réfrigérant (7) sur le côté orienté en direction du panneau d'échangeur thermique (5) en des positions déterminant des interruptions de la continuité entre des surfaces (9) de la paroi (6) en contact avec le panneau d'échangeur thermique (5) et entre ces surfaces (9) et des surfaces adjacentes de la paroi (6) qui ne sont pas en contact avec ce panneau (5).

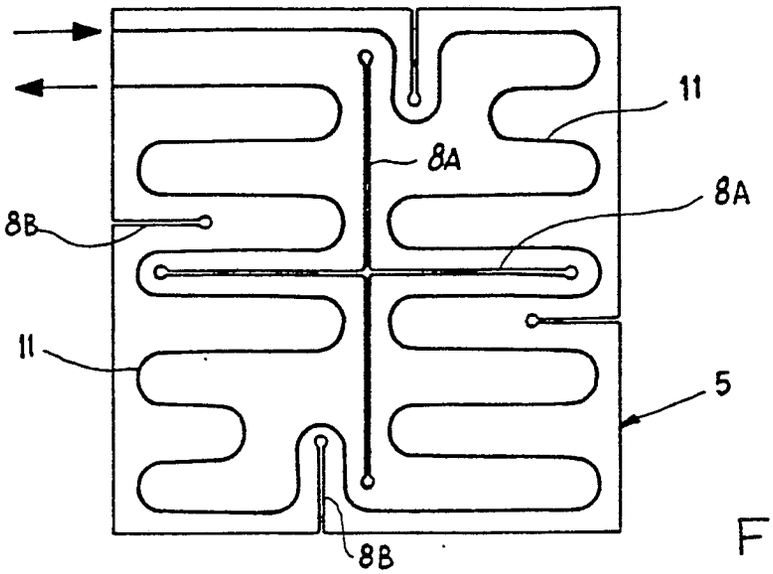

FIG. 1

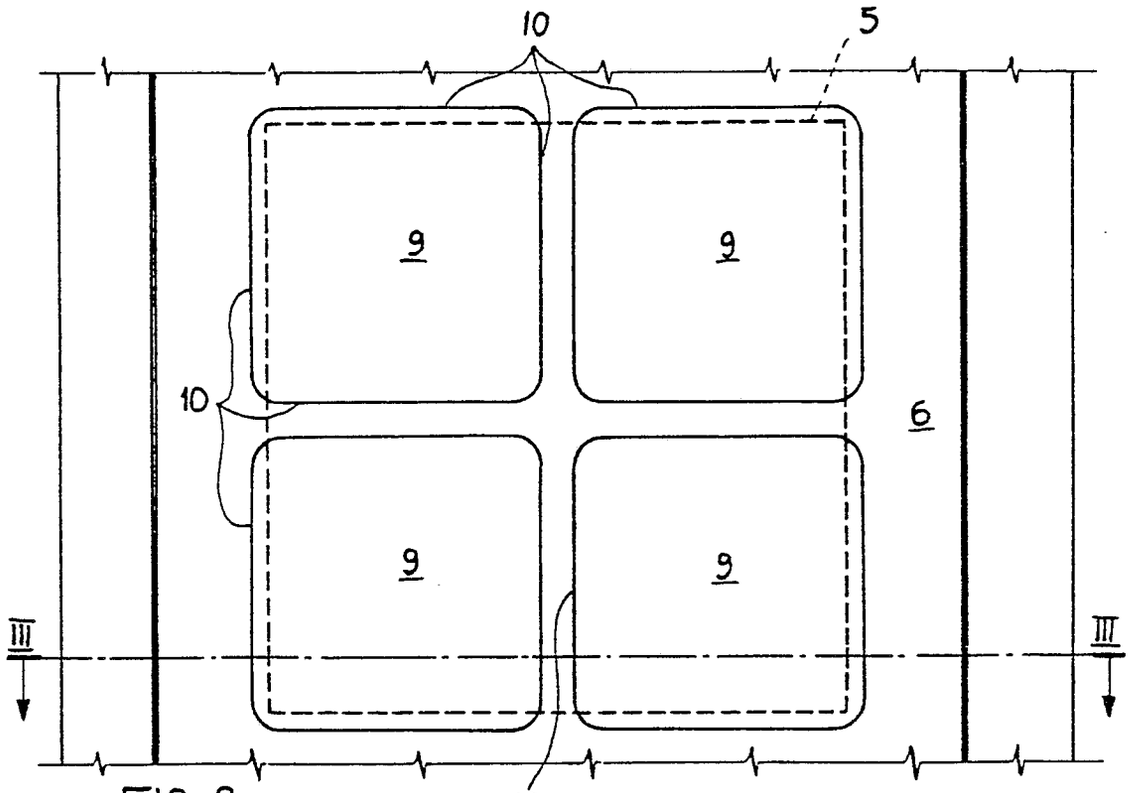

FIG. 2

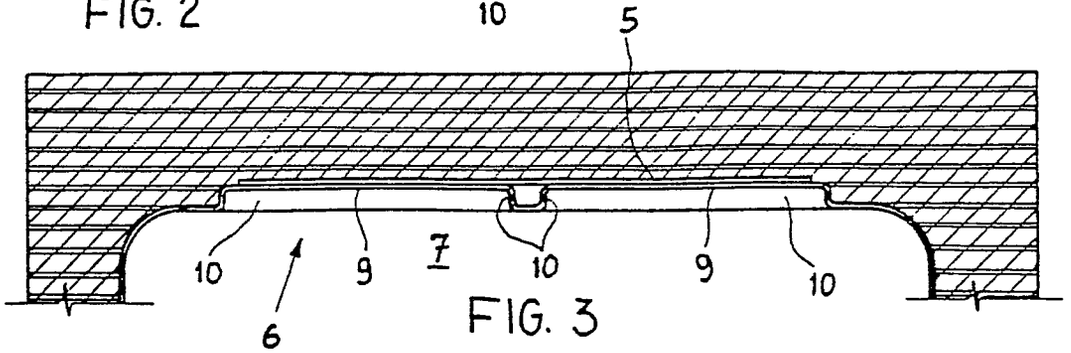

FIG. 3