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(54) An improved refrigerating container and a process for manufacturing the same

(57) A refrigerating container (1) comprising a plastic material container, a cooling coil (3, 13) and a sheet of a heat-conductive material (2, 11) in thermal relationship with said cooling coil (3, 13). A wall (5) of the container (1) is formed with at least one opening (10, 10A, 18) that is closed by at least an aluminium sheet (2, 11, 12), the surface of the aluminium sheet opposed to that on which the cooling coil is disposed facing the inside of said container.

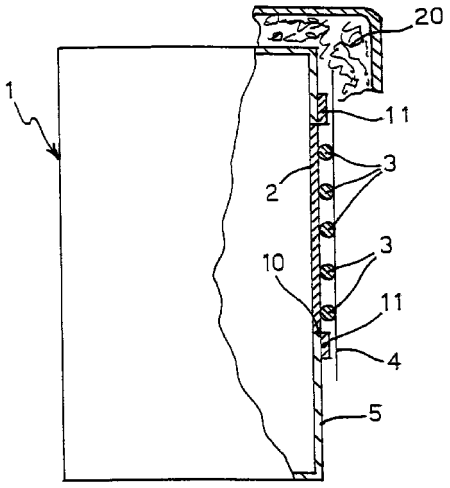

FIG. 1

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Description

[0001] The present invention generally relates to a refrigerating container, i.e. a container of the type used in the manufacture of refrigerating apparatuses, freezers and the like. The invention further relates to a process for manufacturing such an improved refrigerating container.

[0002] A particularly advantageous application of the invention is concerned with refrigerating containers of apparatuses to be used in tropical climates or anyhow at room temperatures that are relatively high, although this condition is not to be meant as limiting the invention applications.

[0003] The presently used refrigerating containers comprise a relatively thin housing - for example a polystyrene housing - for containing the foodstuff to be conserved, and a cooling coil disposed over an aluminium sheet in a relation of heat exchange with said coil. The container is fitted into a suitable structure or frame that is thermally insulated and also contains the compressor, the refrigerant supply, etc.

[0004] In order to refrigerate the container inner space, over the surface underlying the cooling coil there is provided a thin sheet of a heat-conductive material such as aluminium, glued to the outer wall of the apparatus and in relation of heat exchange with the cooling coil. When a gas is expanded within the cooling coil the cold generated by the gas expansion in the cooling coil is uniformly spread over the whole surface of the aluminium sheet acting as a medium for conveying it inside the container housing the foodstuff to be conserved.

[0005] The cooling coil is disposed outside of the plastic material container of the refrigerator, usually on the back of the refrigerating container.

[0006] There are further known (very old) designs in which the cooling coil was located inside the refrigerating container, embedded in a metal plate structure known as roll bond. This solution has been progressively abandoned, both due to the high cost of the roll bond, and because of problems related to condensation and icing, and besides the reduction of the space available inside the container.

[0007] Although they are generally satisfactory in respect of the manufacturing cost and yield, the refrigerating containers equipped with cooling coils mounted externally of the container have nevertheless some drawbacks, and more particularly a far from optimum efficiency since heat is removed from the container through a material that is insulating. Although such drawback could perhaps be acceptable in mild climates, it becomes excessively disadvantageous in tropical climates or when the refrigerating container is employed at a relatively high room temperature, e.g. in the order of 25-30°C.

[0008] It is an object of the present invention to overcome the above illustrated drawbacks, and more particularly to provide a high efficiency refrigerating container that is particularly adapted for tropical climates, and is both simple and cheaper to be manufactured.

[0009] The above object is accomplished through a refrigerating container provided with the characteristics recited by claim 1, and a process as claimed in claim 15. Additional advantageous features are recited in the dependent claims.

[0010] The invention will now be disclosed with reference to the attached drawings illustrating preferred but not limiting embodiments of the invention, in which:

Fig. 1 is a schematic partially cross-sectioned side view of an embodiment of a refrigerating container according to the invention;
Fig. 2 is a schematic rear view of the refrigerating container shown in Fig. 1;
Fig. 3 is a cross-section view illustrating another embodiment of a container according to the invention;
Figures 4 and 5 show two embodiment of the process according to the invention.

[0011] Throughout all the Figures the same numeral references have been used for indicating components that are equal or substantially corresponding.

[0012] With reference to Figures 1 and 2, a refrigerating container comprises a container 1 having a generally parallelepiped shape, formed of a plastic material, such as polystyrene, that is frontally open for introducing and extracting the foodstuff. Cold is created inside the container 1 by means of a cooling coil 3 fixed on the outer surface of a sheet 2 of a heat-conductive material, particularly an aluminium sheet. A protective sheet 4, for example of aluminium, polythene or other suitable material protects the cooling coil, and the so obtained assembly is inserted into a thermally insulated structure 20 to form the finished refrigerating unit.

[0013] According to the embodiment shown in Figures 1 and 2, in the rear wall 5 of the container there is formed an opening 10 having a substantially rectangular shape, in correspondence of which the aluminium sheet 2 is applied and secured to the container, such sheet replacing as a matter of fact a portion of the rear wall of the refrigerating container 1.

[0014] Preferably, the heat-conductive material sheet 2 is an aluminium sheet, either work hardened or annealed, having a thickness comprised between 100 and 500 micron. The aluminium can be either painted or not, and in case provided with an adhesive for fastening the sheet to the container. The cooling coil can be applied in accordance with any of a number of known processes.

[0015] In the embodiment shown in Fig. 1, the sheet 2 of annealed aluminium has a larger size than the opening 10 and its edges 11 are cantilever deformed (that is bent twice at 90 degrees) so that the sheet can be pressed against the edges of the opening 10 until it

becomes integral and flush with the rear wall 5 of the container.

[0016] After the container 1 has been fitted into a supporting structure and has been enveloped by a suitable foam forming a heat insulation partially shown at 20 in Fig. 1, the container 1 and the sheet 2 will form a single block in which the cold transmission towards (the heat removal from) the inside of the container is not hindered by the polystyrene of the container. Of course the opening can be formed in a wall different from the rear one, and two or more openings can be provided, each being closed by a sheet or by a portion of an aluminium sheet, with a portion of the coil being located over each sheet portion. Such embodiments, although not preferred, fall anyhow within the scope of the present invention.

[0017] According to the embodiment shown in Fig. 3, the container 1A is sheared and shaped so as to form an opening 10A with inner edges 12 that form a recessed seat housing (at least partially) the aluminium sheet 2 and the coil, whereby in practice this latter does not protrude from the rear wall 5 of the container.

[0018] With reference to Figures 4 and 5 the process according to the invention will now be illustrated.

[0019] First the rear surface of a relatively thin plastic material container 1 is sheared (cut or formed through other suitable process) to provide at least one opening 18 having a rectangular or squared shape. Of course there could be formed two or more openings, either disposed adjacent to each other or according to various patterns, in case arranged to form a sort of grid. For simplicity sake these embodiments will not be described in detail.

[0020] Then, in accordance with the process shown in Figures 4A and 4B, a first sheet 11 of a heat-conductive material, particularly an aluminium sheet, having a size slightly larger than that of the opening, is applied onto such opening 18 from the inside of the container. Then a second ledge sheet 12, preferably an aluminium sheet, is applied onto said opening from the container outside. Between the two sheets 11, 12 there is located at least an adhesive material 14 and/or 15 that can be deposited over at least one of the sheets, either before or after the sheet has been applied to the housing. Preferably the adhesive is deposited in advance over one of the two sheets.

[0021] The two aluminium sheets can be either hard worked or annealed, have substantially the same configuration of the opening 18, but have a slightly larger size than such opening, so as to abut against the inner edges of this latter. Their thickness is mainly comprised between 40 and 350 micron, and the sheets can be either painted or knurled in advance. The two sheets are then pressed or urged against one another so as to become sealingly joined to the housing. At this point additional protective coatings - as selected by the manufacturer - are applied to the sheet(s), if required.

[0022] In accordance with a not illustrated embodiment, only one sheet (i.e. the inner sheet 11) is applied and such sheet is sealingly bound to the container by gluing, deformation or by other means.

[0023] The cooling coil 13 is then applied from outside the housing 10A, over the ledge sheet 12 (or possibly over that face of the single employed sheet 11 that is facing the container outside). Finally the so formed housing is fitted inside a thermally insulated supporting structure. For simplicity sake such structure has not been shown in Figures 4 and 5.

[0024] In accordance with another embodiment, shown in Figures 5A and 5B in which the same numeral references have been used for indicating similar or corresponding parts, no ledge sheet 15 is provided for, and a protective sheet 16 of a similar material (raw or annealed aluminium having a thickness of 40-350 micron) is applied over the cooling coil 13, thus realising the sealing towards the outside. Such sheet improves the heat-removal efficiency of the cooling coil 13.

[0025] Although the invention has been illustrated with reference to preferred embodiments, it is generally capable of further modifications that are included within the scope of the invention as will become evident to the skilled of the art.

Claims

1. A refrigerating container (1; 1A) comprising a plastic material container, a cooling coil (3) and a first sheet of a heat-conductive material (2, 2A) in relation of heat exchange with said cooling coil (3), characterised in that said refrigerating container (1; 1A) provides for at least one opening (10, 10A) that is closed by said sheet of heat-conductive material (2, 2A), the surface of said heat-conductive material (2, 2A) opposed to that on which said cooling coil is disposed facing towards the inside of said container.

2. A refrigerating container as claimed in claim 1, characterised in that it provides a second sheet of a heat-conductive material (15) disposed between said first sheet (11) and cooling coil (13).

3. A refrigerating container as claimed in claim 1 or 2, characterised in that it further provides a protective sheet (4) applied to said cooling coil outside of said container.

4. A refrigerating container as claimed in the preceding claims, characterised in that at least one of said sheets of heat-conductive material (2, 15) is an aluminium sheet.

5. A refrigerating container as claimed in claim 4, characterised in that the thickness of said aluminium sheet is comprised between 40 and 350 micron.

6. A refrigerating container as claimed in claim 4 or 5, characterised in that said aluminium sheet is an annealed aluminium sheet.

7. A refrigerating container as claimed in claim 4 or 5, characterised in that said aluminium sheet is a work hardened aluminium sheet.

8. A refrigerating container as claimed in claim 3, characterised in that the inner edges (12) of said opening(s) (10A) are recessed and form a seat adapted to house both said first aluminium sheet (2) and said cooling coil (3) so that this latter does not substantially protrude from the container rear wall (5).

9. A refrigerating container according to the preceding claims, characterised in that the size of said opening (s) (10) is slightly smaller than that of said first sheet of heat-conductive material (2), this first sheet being pressed against said opening, and the edges (11) thereof being deformed so that said sheet (2) is coplanar with the container wall.

10. A refrigerating container according to the preceding claims, characterised in that it provides a single opening.

11. A refrigerating container according to the preceding claims, characterised in that said opening(s) is (are) disposed on the rear side of said container (1).

12. A refrigerating container according to the preceding claims, characterised in that said first sheet of heat-conductive material is fixed to the container by means of an adhesive.

13. A refrigerating container according to the preceding claims, characterised in that it is fitted within a thermally insulated supporting structure.

14. A refrigerating container according to the preceding claims, characterised in that it provides two or more openings.

15. A process for manufacturing a refrigerating container, characterised by the steps of:

- forming at least one opening (18) in the surface of the container housing;
- applying a sheet of a heat-conductive material (11) onto said opening (18) from inside of said housing, the size of said sheet being slightly larger than that of said opening (18);
- pressing and sealingly joining said sheet (11) to said housing (1);
- applying from outside said housing, a cooling coil (13) onto the surface of said sheet (11) facing the outside of said container;
- inserting the so formed assembly within a thermally insulated supporting structure (20).

16. A process as claimed in claim 15, characterised in that it provides the additional steps of:

- applying a second ledge sheet (12) onto said opening from outside of said housing, the size of said sheet being slightly larger than that of said opening (18); and
- pressing and joining together said two sheets (11, 12).

17. A process as claimed in claim 16, characterised in that an adhesive material (14, 15) is disposed between said two sheets (11, 12).

18. A process as claimed in claim 17, characterised in that said adhesive has previously been deposed over one of said two sheets (11, 12).

19. A process as claimed in the preceding claims, characterised in that an additional protective sheet (16) is applied over the cooling coil (13).

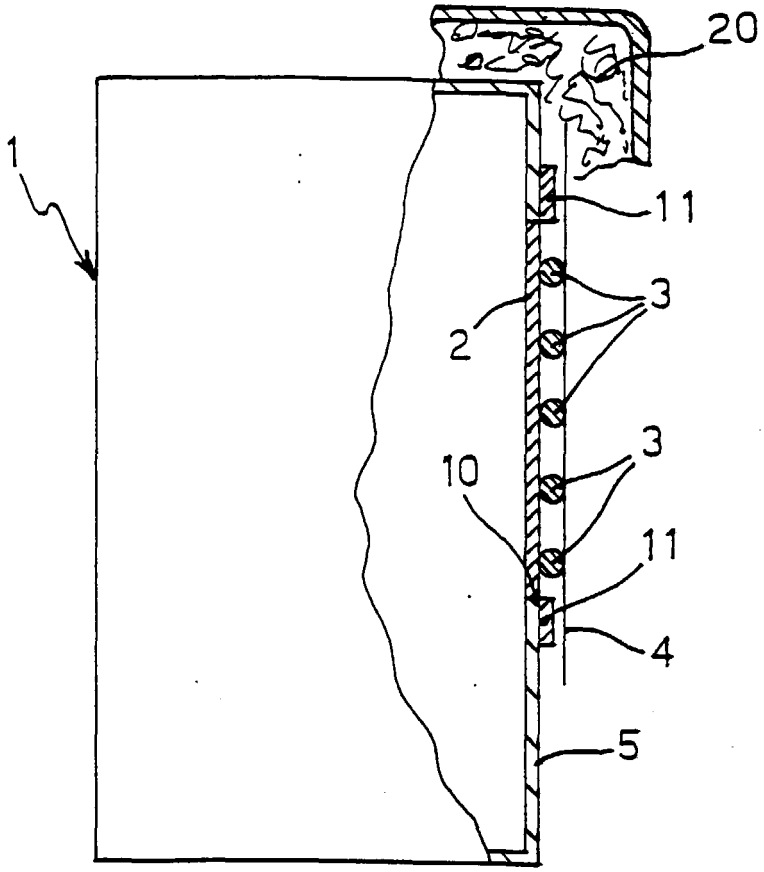
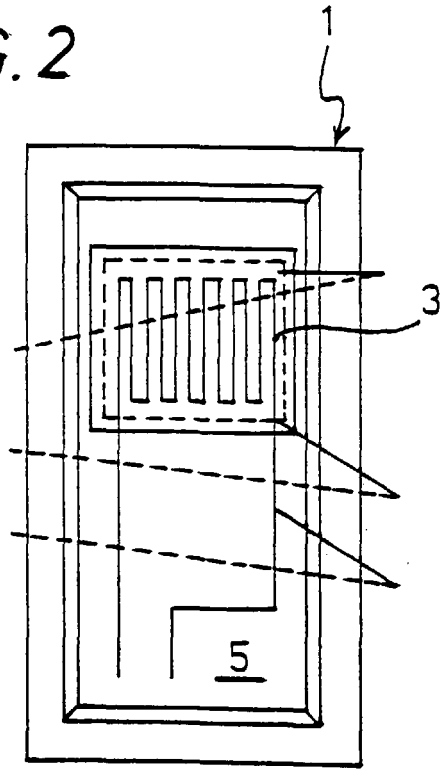


FIG. 1

FIG. 2



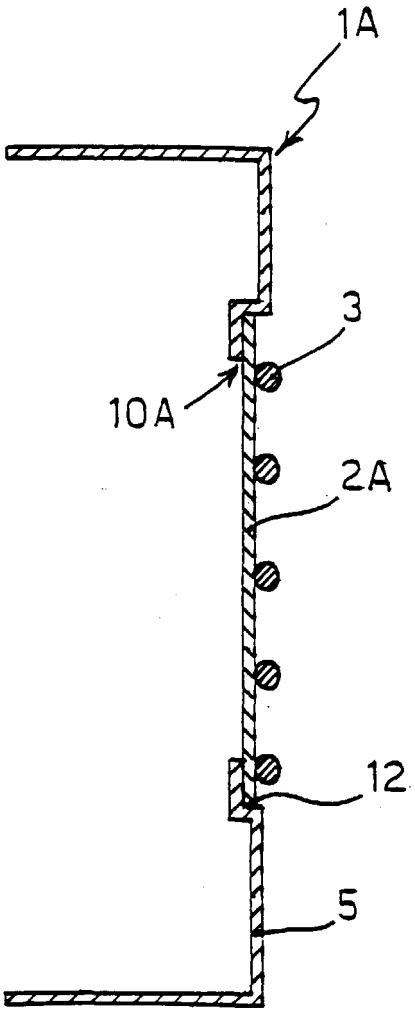


FIG. 3

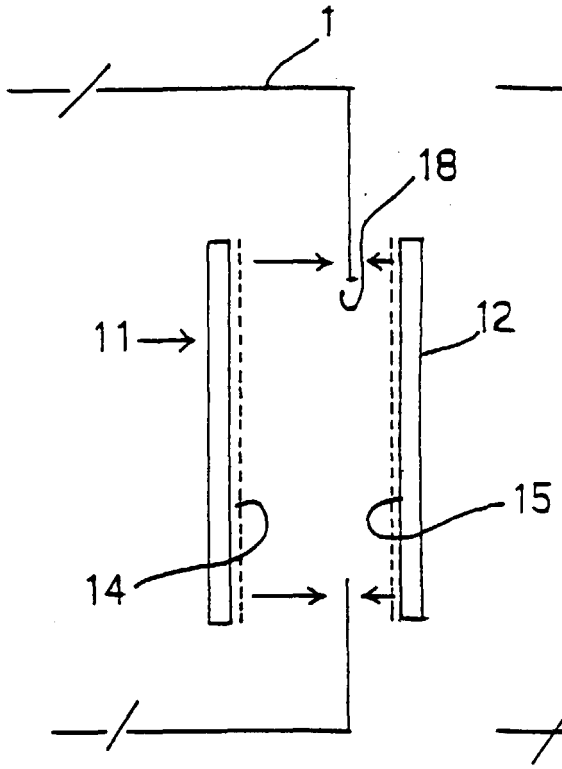


FIG. 4A

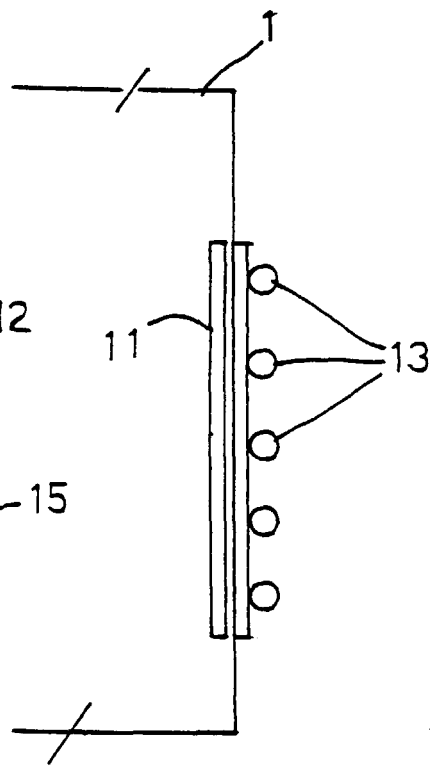


FIG. 4B

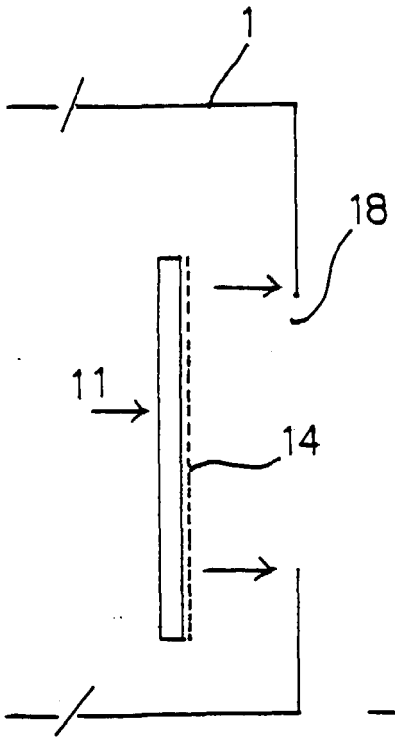


FIG. 5A

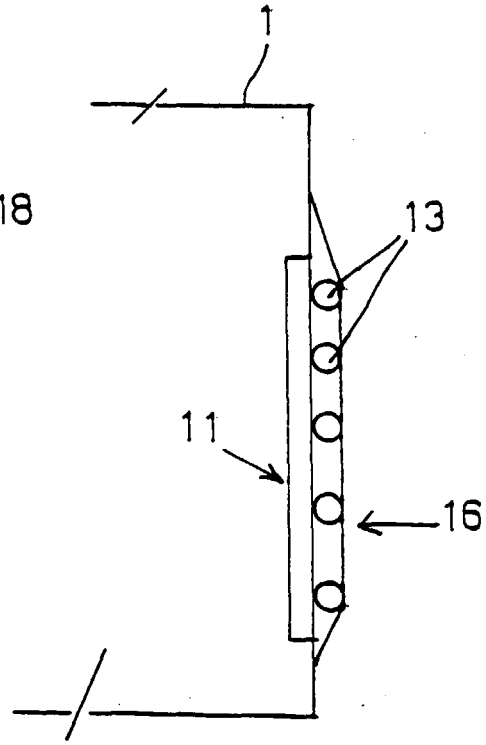


FIG. 5B

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EUROPEAN SEARCH REPORT

Application Number
EP 98 83 0789

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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	9 June 1999	Busuiocescu, B

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