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54 Method of manufacturing a refrigerator with cooling air ducts.

57 A method of manufacturing a refrigerator having an inner wall and an outer wall (2) which together define an interspace and cooling air ducts (17) which are at least partially embedded in the thermal insulation (30) generated in-situ in the interspace between the two walls.

To avoid penetration of insulating material in the ducts via gaps between the ends of the ducts and the wall during the foaming operation, the ducts are formed initially with closed ends (A) by blow-moulding from a plastics material and are fitted to the refrigerator inner wall with the closed ends protruding through apertures in the inner wall, said ends subsequently being removed after the forming of the thermal insulation.

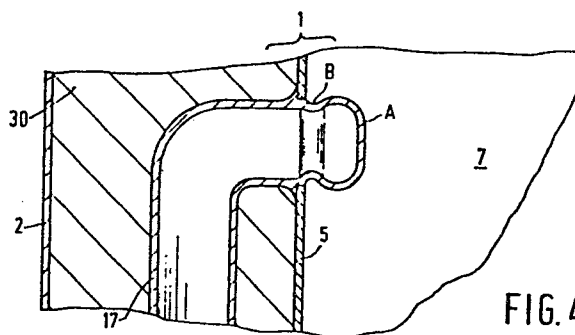


FIG. 4

Method of manufacturing a refrigerator with cooling air ducts.

The invention relates to a method of manufacturing a refrigerator having an inner wall and an outer wall which together define an interspace, and cooling air ducts which are at least partially embedded in the thermal insulation between the two walls. In such
5 refrigerators the cooling air is obtained by means of a motor-driven fan which circulates air from an evaporator compartment to a preservation compartment. In current methods of manufacturing refrigerators of the above type, the ducts which are to remain at least partially embedded in the thermal insulation are formed, especially where they
10 are of complicated extension, by fitting and fixing together less complicated parts generally constructed of injection-moulded and/or extruded plastics material. This requires a relatively high expenditure of labour and material.

In known types of refrigerators it has also been found
15 that during the formation of the insulation, some of this insulation sometimes infiltrate both into the open ends of the ducts and into all those gaps at which the connections have not been properly made. This requires a cleaning operation to be carried out in order to allow connection to other parts, such as nozzles and the like. In order to
20 prevent such infiltration, the open ends of the ducts can be closed with removable covers or plugs, and the connections can be more carefully made. This, however, requires both the fitting and removal of such covers and more time has to be spent on the pre-assembly stage. The quality of the result depends entirely on the diligence of the
25 personnel. Failure to fit or inexact fitting of the covers allows infiltration of the foamed material into ducts and requires subsequent operations to remove this material.

The main object of the present invention is to provide a method which avoids the use of ducts obtained by fitting and fixing
30 elementary parts together, and thus prevent possible infiltration of insulating material into the ends thereof.

According to the invention the ducts are formed initially with closed ends by blow-moulding from a plastics material and are

fitted to said inner wall with the closed ends protruding through apertures in the inner wall, said ends subsequently being removed after the forming of the thermal insulation.

If said ducts are initially hermetically sealed, the trapped
5 air mass also has the advantage of opposing excessive deformation of said ducts, even if smaller thicknesses than those currently employed are used, with an obvious saving in material. The fact that the ducts are initially formed in the closed ends obviates both the possibility of infiltration of thermal insulation material into said ducts and the
10 need to fit covers or plugs to their ends, with the consequences that can result from their being imperfectly fitted.

There is no difficulty in removing the ends of the blow-moulded ducts, especially if their ends comprise weakening lines. They can be opened with a knife or with other simple tools.

15 The invention will be more apparent from the following detailed description of an example, with reference to the accompanying drawings in which:

Figure 1 is a sectional view of an air-circulation refrigerator constructed in accordance with the invention;

20 Figure 2 is a partly sectional front view of the refrigerator of Figure 1;

Figure 3 is a perspective view of two air-conveying ducts of the refrigerator of the preceding figures; and

Figure 4 is a detailed sectional view of an end portion of
25 one of the ducts of Figure 3 after this duct has been embedded in the thermal insulation material.

In the figures, the reference numeral 1 indicates an air-circulation refrigerator which is shown without doors and which comprises an outer wall 2 and an inner wall 3, the latter having two parts
30 4 and 5 defining inner walls of separate preservation compartments 6 and 7 respectively. The refrigerator also comprises a polyurethane thermal insulation mass 30 obtained by in-situ foaming of reactive components, which are introduced into the interspace between said inner and outer walls, and into a horizontal separating wall 8 which separates
35 the two compartments 6 and 7 from each other. Of these compartments the lower compartment 6 is intended for preserving frozen food and thus operates at a lower temperature than the other compartment 7, which is intended for the refrigerator preservation of food.

The refrigerator is also provided with an air-circulation refrigeration circuit comprising: a compressor 8' disposed in an external recess 9 in the refrigerator casing; a condenser 10 situated on the back 11 of the refrigerator and shown schematically in broken lines; an evaporator bank 12 housed in a chamber 13 at the back of compartment 6 and connected to a wall 15; a fan 14, of which the impeller 14A is situated at the level of corresponding apertures in the wall 15 above the bank 12 and feeds air into a manifold 16 extending across the upper part of the wall 15; a rising duct 17 which commences in the manifold 16 and extends mainly in the thermal insulation mass 30 to open into the upper part of the compartment 7 by way of an inserted conveyor member 31; a return duct 32 partially embedded in the thermal insulation mass and commencing at 32A in the lower part of the compartment 7 at one side thereof and terminating at 32B in the chamber 13 below the evaporator bank 12; and one or more apertures 33 connecting the manifold 16 to the compartment 6 in order to convey cold air thereto, and an aperture 34 in the lower part of the wall 15 for drawing the air from the compartment 6 into the chamber 13.

The ducts 17 and 32, and possibly the duct 50 which extends inside the conveyor member 31 and constitutes in effect the outlet of the duct 17, are of plastics construction and are formed by blow-moulding from a plastics material, such as polyethylene, with their ends closed, as shown at A in Figures 3 and 4, so as to trap within the ducts a volume of air which, in conjunction with stiffening ribs if necessary, prevents excessive deformation of the walls of the ducts under the pressures which arise during the in-situ formation of the thermal insulation. When the thermal insulation has been formed and these pressure have disappeared, the ducts are opened by removing their closed ends A, for example with a knife, by cutting along weakening or guide lines B.

In the manufacture of the refrigerator, the outer wall 2 and inner walls 4 and 5, are fitted together in the conventional manner using suitable spacer means so that the interspace to be occupied by the thermal insulation remains defined between the walls. The closed ducts 17 and 32 are disposed in their chosen positions using spacers and adhesive means, so that their closed ends A protrude through apertures provided for the purpose in the walls, as shown in figure 4. The structure resulting from this assembly is then placed in a containing

mould, and the reactive components are introduced into the inter-space through one or more apertures, not shown, in the outer wall, and react to produce the thermally insulating mass 30 of expanded polyurethane. When the thermal insulation has been formed, the refrigerator is removed from the mould and the closed ends A of the ducts are removed. The refrigerator is then passed on to other usual operations in the manufacturing process.

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CLAIMS

1. A method of manufacturing a refrigerator having an inner wall and an outer wall which together define an interspace, and cooling air ducts which are at least partially embedded in the thermal insulation generated in-situ in the interspace between the two walls,
5 characterized in that the ducts are formed initially with closed ends by blow-moulding from a plastics material and are fitted to said inner wall with the closed ends protruding through apertures in the inner wall, said ends subsequently being removed after the forming of the thermal insulation.
- 10 2. A method as claimed in claim 1, characterized in that the closed ends of the ducts are removed at weakened zones of said ducts.

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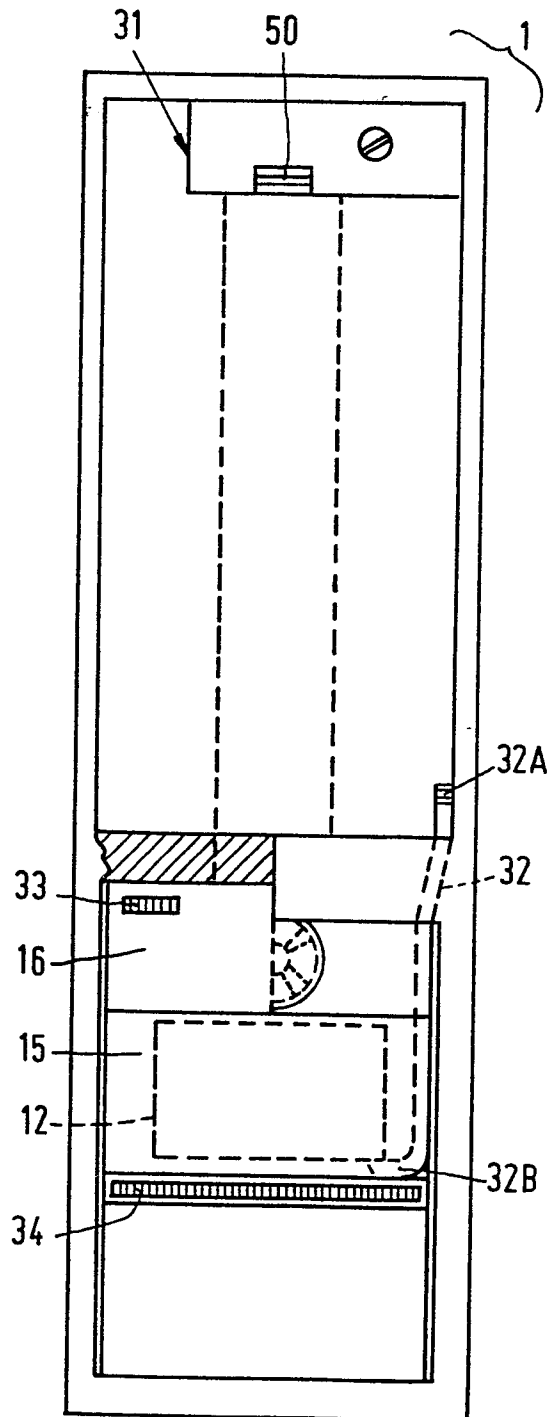


FIG. 2

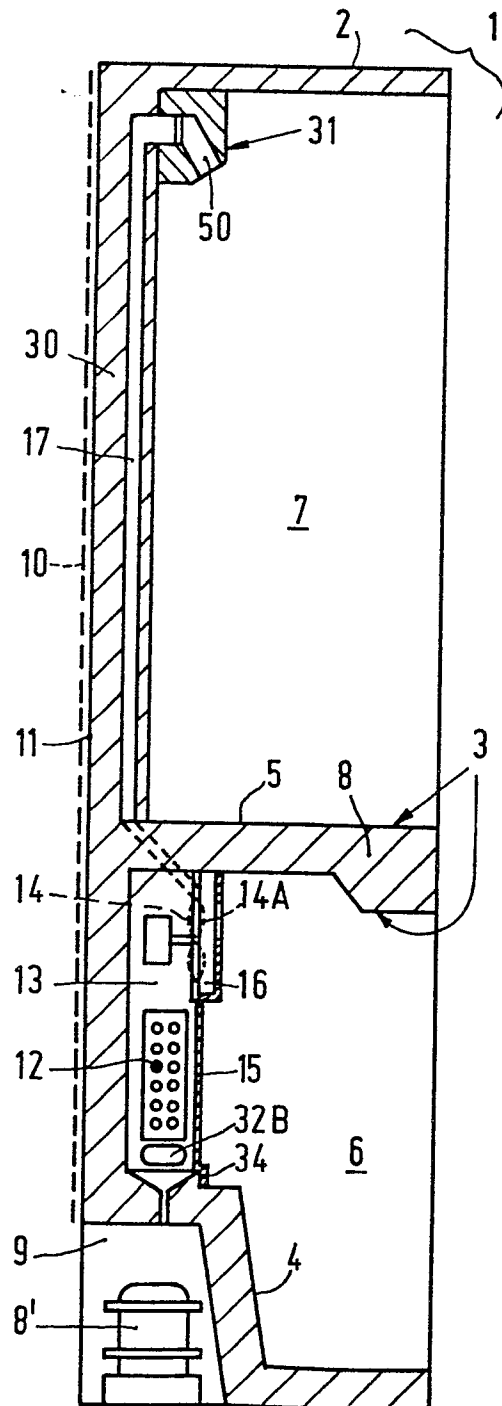


FIG. 1

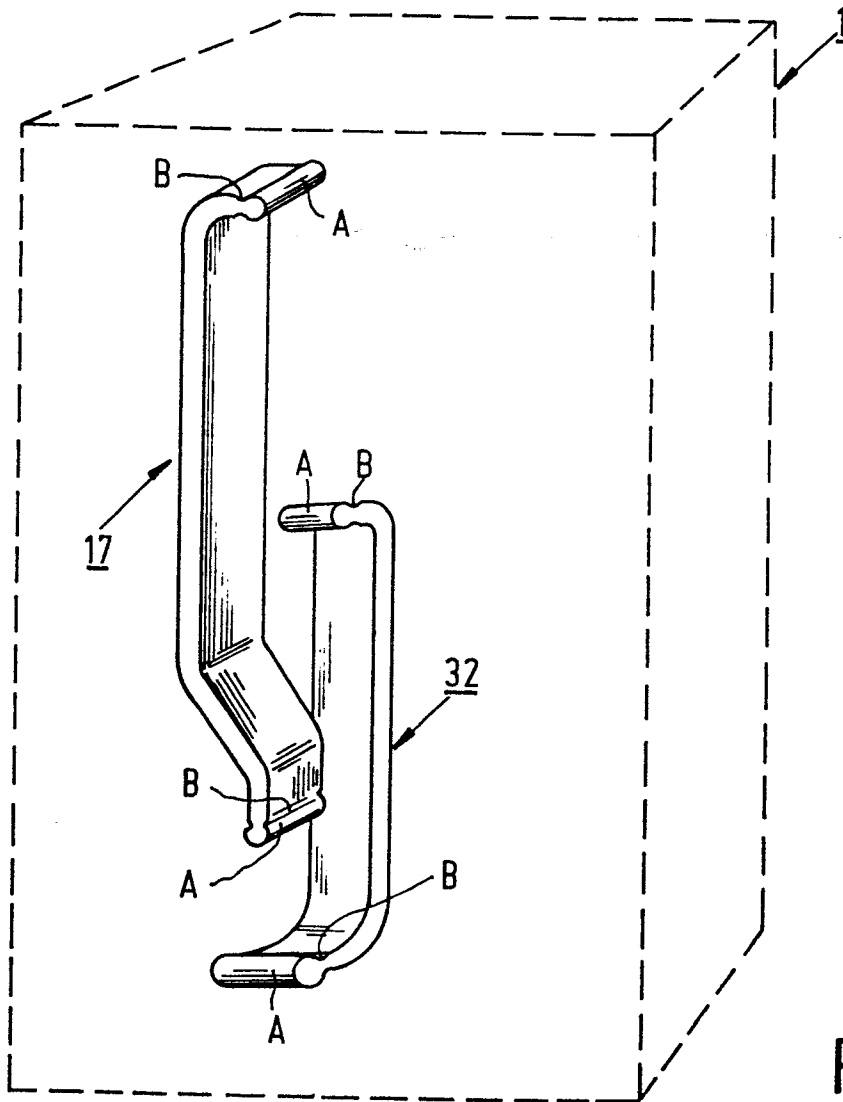


FIG. 3

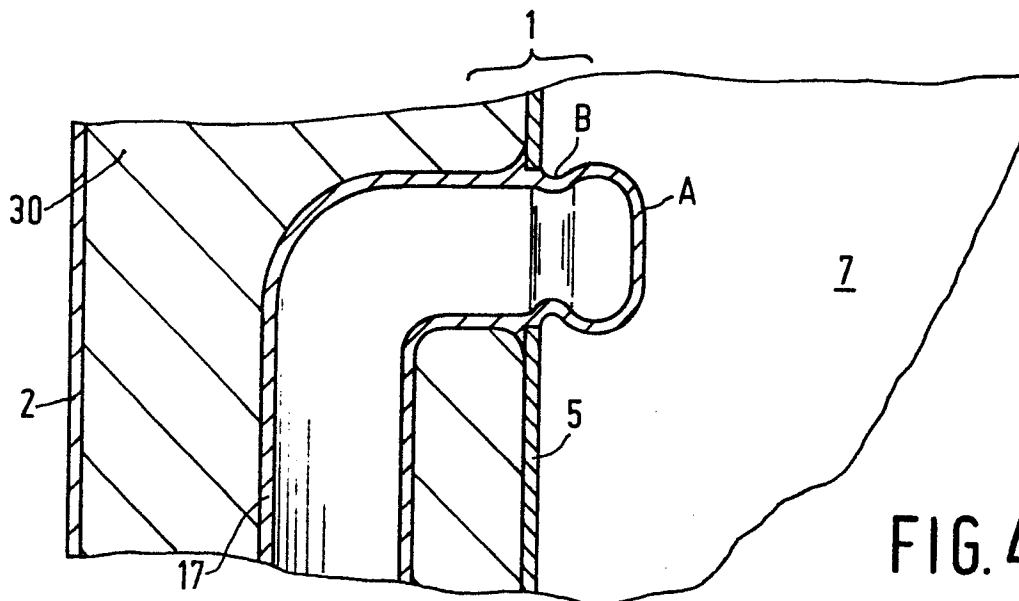


FIG. 4