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(54) **CHEST FREEZER**  
**GEFRIERTRUHE**  
**CONGÉLATEUR COFFRE**

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(56) References cited:  
**EP-A1- 0 805 321 CN-A- 104 864 656**  
**JP-A- H07 190 602 JP-U- S52 164 749**  
**US-A- 3 826 106 US-A1- 2009 151 383**

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## Description

**[0001]** The present invention relates to a chest freezer comprising a cabinet defining at least an inner cavity which can be closed by door and in which said cavity communicates with the ambient by means of a conduit. In this kind of domestic appliances, when the so called "no frost" technology is not used (where an internal evaporator with a fan create thermal exchange avoiding frost formation on the inner liner), it is well known the problem of frost formation on the inside walls, particularly in the region adjacent the opening which is closed by the door. This frost derives from the humidity contained in the ambient air which is sucked into the cavity past the sealing which is normally arranged around the edge of the door.

**[0002]** EP 2520882 discloses an internal and dedicated humidity container placed on an end of the conduit inside the freezer cavity which is quickly removable for eliminating the frost from the container.

**[0003]** EP 1845321 discloses a freezer with a special grid with salt inside where humidity can be absorbed during normal opening/closing of the door. In a similar known solution a filter is placed inside the conduit to absorb humidity in order to postpone defrosting operation.

**[0004]** A solution is also known from EP 494587 in which an external flexible container communicates with the cavity. Such solution, which in theory should prevent or reduce the formation of frost on the inner liner of the freezer, has shown quite low performances in terms of frost reduction.

**[0005]** *Document CN104864656A discloses a chest freezer capable of preventing frosting caused by the breathing effect by providing the chest freezer with a breathing channel and with a dehumidification device.*

**[0006]** it is an object of the present invention to provide a chest freezer which solves the above technical problem in a better way, without any intervention of the user in order to remove frost.

**[0007]** Such object is obtained thanks to the features listed in the appended claims.

**[0008]** This invention is based on a system integrated inside the foam insulated cabinet or the door: the air that normally flows inside the product when the compressor of the chest freezer is turned on (air flow between gasket and cabinet frame causing ice formation) passes through this system. The temperature condition of this system is suitable to condense the humidity in the air. In this way the air that flow inside the cabinet is at least partially dried.

**[0009]** By creating a proper inclination of the system the condensed humidity can be collected by gravity (e. g.: in the condensation tray in compressor compartment).

**[0010]** The main advantage of the system according to the present invention is that it doesn't require heating system to avoid the clogging due to the fact that it works collecting air humidity by condensation (and not as ice/frost).

**[0011]** In the simplest embodiment of the invention the

system is formed by a portion of the conduit which puts the cavity into communication with the outside ambient. Of course there can also be a plurality of conduits or the conduit can be shaped in a serpentine way in order to increase the heat exchange surface.

**[0012]** Further advantages and features according to the present invention will be clear from the following detailed description of an embodiment of the invention, with reference to the attached drawings in which:

- figure 1 is a perspective exploded view of a chest freezer according to the invention where the insulation foam and the outside walls of the freezer have been removed for sake of clarity;
- figures 2 and 3 are perspective view of the chest freezer of figure 1 in two different working conditions.

**[0013]** With reference to figure 1, a chest freezer 2 according to the invention presents a inner liner 4 defining a cavity C, an insulation foam (not shown), and an outer liner 6 whose only the bottom part is shown in figure 1. Other usual components of the chest freezer 2 (door, compressor, condenser, evaporator are present but they are not shown in the drawings for sake of clarity.

**[0014]** According to the invention, the chest freezer 2 presents an air conduit 10 of polymeric material made of different pieces assembled together, and having a first end 10a on a side wall 12 of the cavity C and in communication there to. Such first end 10a is fastened to the wall 12 by means of a flange 13 and counter-flange 15.

The conduit 10 further comprises a first portion 10b, for instance a corrugated tube, substantially parallel to the side wall 12 of the cavity C and a second portion 10c shaped as a coil/serpentine whose end 10d is placed above a condensation tray 14 placed in a compressor compartment of the chest freezer. The second portion 10c of the conduit may be produced for instance by blow-molding or by injection molding; in the second case it may be made in two shells attached together. For maintaining the second portion of the conduit 10c at a proper distance from the inner liner 4, two spacers 8 made of expanded polymeric material are provided with apertures 8a in which ends of the flat second portion 10c of the conduit are inserted. The end 10d of the second portion 10c of the conduit 10 is provided on an L-shaped pipe portion 11 attached to the coil-shaped portion 10c. Figure 2 refers to a working condition where the compressor is switched on. In this condition air flows through the conduit 10 towards the cavity C. According to the working condition of figure 2, air is entering the end 10d of the conduit and by flowing into the coil-shaped second portion 10c the humidity contained therein condensates and can flow by gravity from the end 10d into the tray 14 thanks to a proper inclination or shape of the second portion 10c of the conduit 10. At the same time dried air can flow in the first portion 10b of the conduit 10 and enter the cavity C.

**[0015]** According to the working condition of figure 3, which refers to a situation when the compressor is

switched off, dry air can flow in a reverse direction from the cavity C to the ambient, therefore facilitating the flow of humid air present in the second portion 10c out of the conduit 10.

**[0016]** The technical solution according to the invention takes advantage of the natural "breathing" of the cavity, making air flow into the cavity through a specific conduit, after being dried by a sort of heat exchanger which exploits the temperature in the compressor's area. The position of the second portion 10c of the conduit 10 is chosen so that the temperature condition of this system is suitable to condense the humidity in the air, i.e. it is slightly above 0°C. This position can be easily chosen depending on the thickness of the insulation (not shown), on the average temperature of the inner liner 4 and on the average ambient temperature. The condensed water which drips out from the conduit 10 to the tray 14 is evaporated thanks to heat in the compressor compartment.

**[0017]** The invention relates to a chest freezer. In an example which is not part of the claimed invention, the same solution can be used for upright (vertical) freezer as well. Moreover, even if the above description refers to a freezer in which the temperature is adjusted by turning on and off the compressor, the same solution can be applied also to freezers which have a variable speed compressor. The conduit 10 is embedded within the foam insulation of the cabinet. In an example which is not part of the claimed invention, it can be housed in the cabinet as well, particularly in case the conduit is associated to a refrigerator.

## Claims

1. A chest freezer (2) comprising a foam insulated cabinet defining an inner cavity (C) closable by a door, and in which said cavity (C) communicates with the ambient by means of an air conduit (10) embedded in the foam, wherein said air conduit (10) is made of different pieces assembled together, wherein the air conduit (10) comprises a first end (10a) fastened on a side wall (12) of said cavity (C), said first end (10a) being in communication with the cavity (C), wherein such air conduit (10) comprises a first portion (10b) arranged parallel to the side wall (12) of the cavity (C) and a second portion (10c) having a coil/serpentine shape placed between the bottom of the cavity (C) and a zone of the chest freezer where a compressor is placed, said second portion (10c) being maintained at a proper distance from an inner liner (4) defining such cavity (C) by means of at least one spacer (8), the second portion (10c) being in a zone at a temperature so that humidity of the air flowing in the second portion (10c) of the air conduit (10) can condense and be removed  
characterised in that said air conduit (10) is of polymeric material and in that two spacers (8) made of expanded polymeric material are provided with ap-

ertures (8a) in which ends of the flat second portion (10c) of the conduit are inserted.

2. Chest freezer according to claim 1, wherein an open end (10d) of the conduit (10) is placed above a tray (14) adjacent the compressor so that condensed water can drip into said tray (14).
3. Chest freezer according to claim 1 or 2, wherein said second portion (10c) of the air conduit (10) presents a predetermined inclination so that humidity condensed therein can be removed by gravity.

## 15 Patentansprüche

1. Gefriertruhe (2), umfassend einen mit Schaumstoff isolierten Schrank, der einen inneren Hohlraum (C) definiert, der mit einer Tür verschlossen werden kann und in dem der Hohlraum (C) mit der Umgebung über eine Luftleitung (10) kommuniziert, die in den Schaumstoff eingebettet ist, wobei die Luftleitung (10) aus unterschiedlichen Teilen hergestellt ist, die untereinander zusammengebaut sind, wobei die Luftleitung (10) ein erstes Ende (10a) umfasst, das an einer Seitenwand (12) des Hohlraums (C) befestigt ist, wobei das erste Ende (10a) mit dem Hohlraum (C) in Kommunikation steht, wobei die Luftleitung (10) einen ersten Abschnitt (10b) umfasst, der parallel zu der Seitenwand (12) des Hohlraums (C) angeordnet ist, und einen zweiten Abschnitt (10c), der eine Spiral-/Serpentinenform aufweist, die zwischen dem Boden des Hohlraums (C) und einem Bereich der Gefriertruhe, in dem ein Kompressor positioniert ist, positioniert ist, wobei der zweite Abschnitt (10c) durch mindestens einen Abstandhalter (8) in einem geeigneten Abstand von einer Innenverkleidung (4) gehalten wird, die den Hohlraum (C) definiert, wobei der zweite Abschnitt (10c) in einem Bereich bei einer solchen Temperatur liegt, dass Feuchtigkeit in der Luft, die in den zweiten Abschnitt (10c) der Luftleitung (10) strömt, kondensieren und abgeleitet werden kann  
dadurch gekennzeichnet, dass die Luftleitung (10) aus polymerischem Material ist, und dadurch, dass zwei Abstandhalter (8), die aus polymerischem Schaumstoff hergestellt sind, mit Öffnungen (8a) bereitgestellt sind, in die Enden des flachen zweiten Abschnitts (10c) der Leitung eingesetzt sind.
2. Gefriertruhe nach Anspruch 1, wobei ein offenes Ende (10d) der Leitung (10) über einer Wanne (14) angrenzend zu dem Kompressor positioniert ist, sodass Kondenswasser in die Wanne (14) tropfen kann.
3. Gefriertruhe nach Anspruch 1 oder 2, wobei der zweite Abschnitt (10c) der Luftleitung (10) eine vor-

bestimmte Neigung vorweist, sodass darin kondensierte Feuchtigkeit durch Schwerkraft abgeleitet werden kann.

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## Revendications

1. Congélateur bahut (2) comprenant une armoire isolée par de la mousse définissant une cavité intérieure (C) pouvant être fermée par une porte, et dans lequel ladite cavité (C) communique avec l'environnement au moyen d'un conduit d'air (10) intégré dans la mousse, dans lequel ledit conduit d'air (10) est réalisé avec différentes pièces assemblées ensemble, dans lequel le conduit d'air (10) comprend une première extrémité (10a) fixée sur une paroi latérale (12) de ladite cavité (C), ladite première extrémité (10a) étant en communication avec la cavité (C), dans lequel un tel conduit d'air (10) comprend une première portion (10b) agencée parallèlement à la paroi latérale (12) de la cavité (C) et une seconde portion (10c) présentant une forme de bobine/serpentin placée entre le fond de la cavité (C) et une zone du congélateur bahut dans laquelle un compresseur est placé, ladite seconde portion (10c) étant maintenue à une distance appropriée d'un revêtement intérieur (4) définissant ladite cavité (C) au moyen d'au moins un écarteur (8), la seconde portion (10c) étant dans une zone à une température telle que l'humidité de l'air s'écoulant dans la seconde portion (10c) du conduit d'air (10) puisse se condenser et être retirée, **caractérisé en ce que** ledit conduit d'air (10) est en un matériau polymère et **en ce que** deux écarteurs (8) réalisés en matériau polymère expansé sont dotés d'ouvertures (8a) dans lesquelles des extrémités de la seconde portion plate (10c) du conduit sont insérées.
2. Congélateur bahut selon la revendication 1, dans lequel une extrémité ouverte (10d) du conduit (10) est placée au-dessus d'un bac (14) adjacent au compresseur de sorte que de l'eau condensée puisse goutter dans ledit bac (14).
3. Congélateur bahut selon la revendication 1 ou 2, dans lequel ladite seconde portion (10c) du conduit d'air (10) présente une inclinaison prédéterminée de sorte que l'humidité condensée dedans puisse être retirée par gravité.

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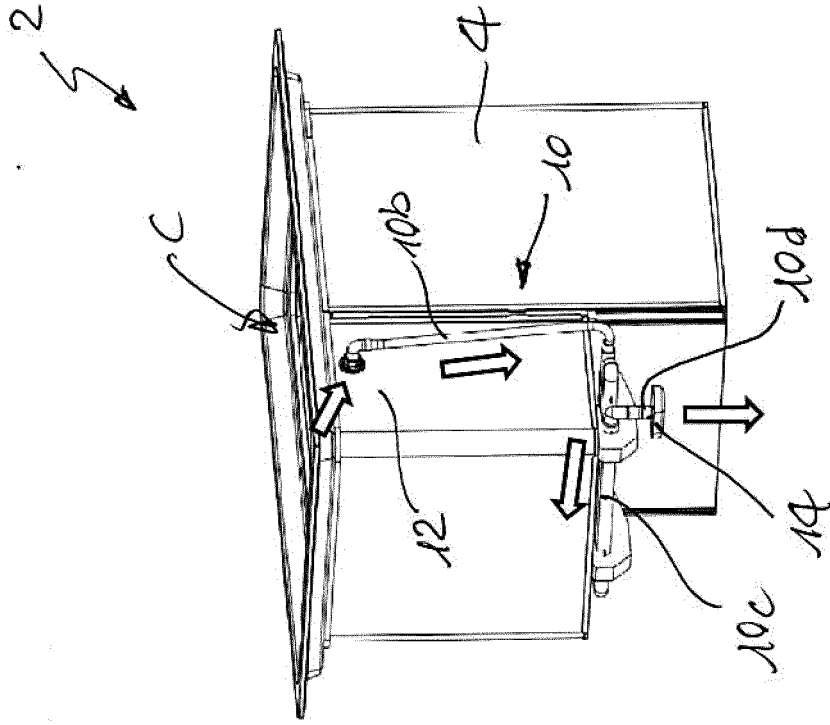


FIGURE 3

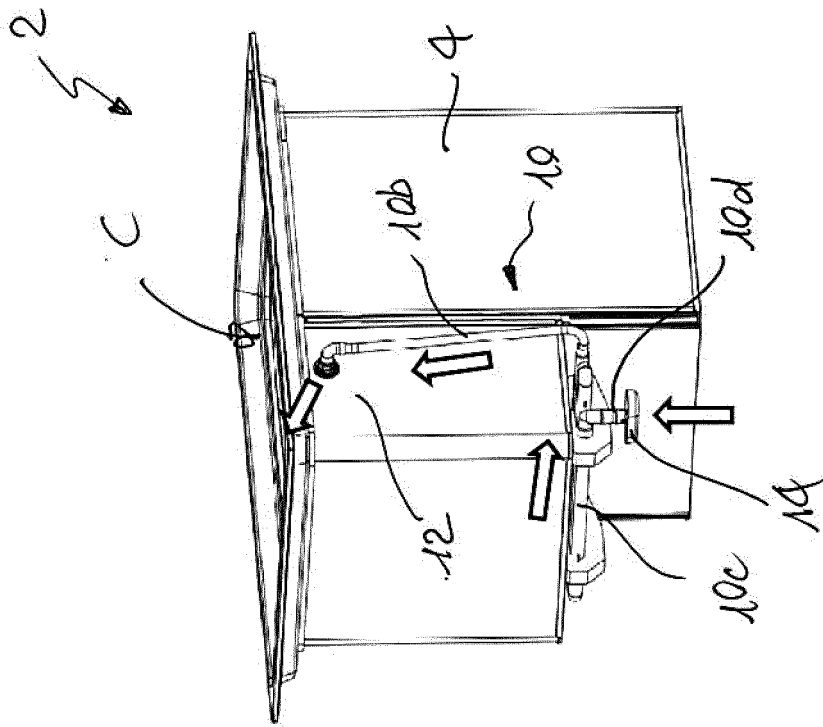


FIGURE 2

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- EP 2520882 A [0002]
- EP 1845321 A [0003]
- EP 494587 A [0004]
- CN 104864656 A [0005]