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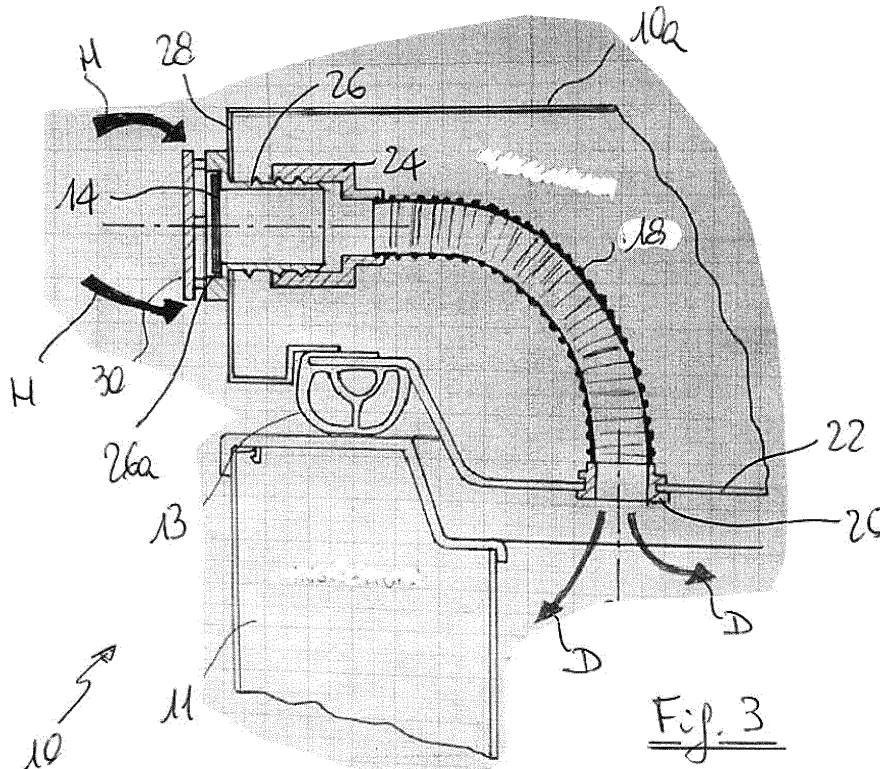
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(54) COOLING APPLIANCE WITH PRESSURE EQUALIZING VALVE

(57) A Cooling appliance (10,16) comprises a cabinet (11) and a conduit (12,18) traversing a wall of said cabinet and having pressure equalization means configured to avoid pressure differences between the inside

(A) of the cabinet and the outside (B), such equalization means comprises a semi permeable membrane (14) preferably placed at an end of the conduit on the ambient side thereof.



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Description

[0001] The present inventions relates to a cooling appliance comprising a cabinet and a conduit traversing a wall of said cabinet and having pressure equalization means configured to avoid pressure differences between the inside to the cabinet and the outside.

[0002] With the term "cooling appliance" we deem any kind of domestic refrigerator, including freezers (either in form of cavities distinct from a fresh food compartment or in form of a chest freezer or vertical freezer). With the term "wall" we mean either whatever wall of the cabinet or the door or lid thereof.

[0003] The above technical problem of pressure equalization has been solved by using a pressure equalizing valve as disclosed by EP 2618081 and by KR2001047232.

[0004] The use of such known valves may involve reliability problems since the movable part of such valves can be blocked and therefore does not provide the correct result, either by failing to avoid a pressure below atmospheric pressure in the cavity of the cabinet or by creating a free passage between the inside and the outside of the cabinet. Moreover known construction can be quite complex (involving the use of different components including springs or the like), and therefore they contribute to increase the overall cost of the domestic appliance.

[0005] It is an object of the present invention to provide a cooling appliance which does not present the above drawbacks. Such object is reached thanks to the feature listed in the appended claims.

[0006] According to the invention, the traditional pressure equalization valve is replaced by a semi permeable membrane in the conduit. With the term semi permeable membrane we mean a selectively permeable membrane, a partially permeable membrane or a differentially permeable membrane that will allow certain molecules to pass through it, particular oxygen and nitrogen, while other molecules, particular water vapor, are prevented from passing through it due to their bigger dimension.

[0007] During the opening and closing of the door of the cooling appliance and between a working cycle and the other subsequent cycle, air is sucked from the ambient towards the cavity with its load of humidity, which tends to condensate either as frost or liquid droplets. The use of a semi permeable membrane according to the invention allows pressure equalization and the passage of dry air towards the cavity which prevents any condensation of water vapor on the wall of the cavity.

[0008] Semi permeable membranes can be polymeric membranes or ceramic membranes. Many polymeric materials can be used as semi permeable membrane for the use according to the present invention, and preferably they are selected in the group consisting of cellulose esters, cellulose acetate, nitrocellulose, polyether block amides, polysulfides, polymethylsiloxanes, polysulfones, polyether sulfone, polyacrylonitrile, polyamides, polyimides, polyethylene and polypropylene, poly-

tetrafluoroethylene, polyvinylidene fluoride, and polyvinylchloride. The preferred material for the membrane is based on polyamides, cellulose esters, polyether block amides, polysulfides and polymethylsiloxanes.

[0009] The membrane is generally supported on a rigid porous substrate having pores preferably from 0,1 and 1 μm . The polymeric membrane may be deposited as a thin layer on the substrate, or it may be polymerized and/or co-polymerized thereon ("in situ" polymerization).

[0010] Further advantages and features according to the present invention will become clear from the following detailed drawings, provided by way of non limiting example, with reference to the attached drawings in which:

- Figure 1 is a schematic section view of a chest freezer according to the invention;
- Figure 2 is a schematic section view of a vertical freezer according to the invention;
- Figure 3 is an enlarged view of a detail of figure 1;
- Figure 4 is a prospective view of the component used in the solution of figure 3; and
- Figure 5 is an exploded view of the component shown in figure 4.

[0011] With reference to the drawings, a chest freezer 10 presents an upper lid 10a with two conduits 12 which put into communication the inside of the cavity, indicated with the reference A, to the outside of the cavity, indicated with reference B. Each of the conduits 12 is provided with a semi permeable membrane 14.

[0012] A similar solution is disclosed with reference to a vertical freezer 16 (figure 2), where the conduits 12 are still placed in a door 16a of the freezer.

[0013] Figure 3 refers to a specific example used in the chest freezer 10 of figure 1, where a corrugated flexible tube 18 is fastened, at one end, to a first flange 20 fixed to an inside wall 22 of the lid 10a and, at another end, to a second flange 24 snap-engaged or screwed onto a tubular plastic portion 26 which is mounted on a side wall 28 of the lid 10a and is provided with a seat 26a for the semi permeable membrane 14. Between the lid 10a and a side wall 11 of the freezer cabinet a rubber deformable gasket 13 is interposed. The membrane 14 is kept in the correct position by means of a cap 30 which is mounted on the end of the tubular plastic portion 26 by snap engagement or other similar system, assuring an air passage 32 towards the semi permeable membrane 14. This solution does not need any maintenance and does not undergo aging or wearing problem. Of course around the flexible tube 18 insulation foam (not shown) is injected which also assures a fix position of the tube 18.

[0014] When the cooling appliance is working, the low pressure inside the cabinet prompts an air flow from the ambient (humid air indicated with arrows H in the figures). The semi permeable membrane blocks water vapor molecules so that an air dry flow is entering the cavity (such dry air flow is indicated with arrows D in the figures).

[0015] Even if in the above examples the conduit is

provided in the lid or in the door of the appliance, the same advantage can be obtained by placing the conduit across a wall of the refrigerator or freezer.

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Claims

1. Cooling appliance (10, 16) comprising a cabinet (11) and a conduit (12, 18) traversing a wall of said cabinet and having pressure equalization means configured to avoid pressure differences between the inside (A) of the cabinet and the outside (B), **characterized in that** such equalization means comprises a semi permeable membrane (14) 10
2. Cooling appliance according to claim 1, wherein the semi permeable membrane (14) is placed at an end of the conduit (12, 18) on the ambient side thereof. 15
3. Cooling appliance according to claim 2, wherein the semi permeable membrane (14) is protected by a removable cover (30). 20
4. Cooling appliance according to any of the preceding claims, wherein the cooling appliance is a chest freezer (10) and the conduit (12) comprises a flexible pipe (18) located in the lid (10a) of the chest freezer (10). 25
5. Cooling appliance according to claim 4, wherein the flexible pipe (18) is interposed between a first flange (20) fastened to a lower face (22) of the lid (10a) and a second flange (24) fastened to a tubular portion (26) mounted on a side wall (28) of the lid (10a), such tubular portion (26) having a seat (26a) for the semi permeable membrane (14). 30
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6. Cooling appliance according to any of the preceding claims, wherein the material of the semi permeable membrane (14) is selected in the group consisting of cellulose esters, cellulose acetate, nitrocellulose, polyether block amides, polysulfides, polymethylsiloxanes, polysulfone, polyether sulfone, polyacrylonitrile, polyamides, polyimides, polyethylene and polypropylene, polytetrafluoroethylene, polyvinylidene fluoride, and polyvinylchloride. 40
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7. Cooling appliance according to claim 6, wherein the material of the semi permeable material is selected in the group consisting of polyamides, cellulose esters, polyether block amides, polysulfides and polymethylsiloxanes. 50

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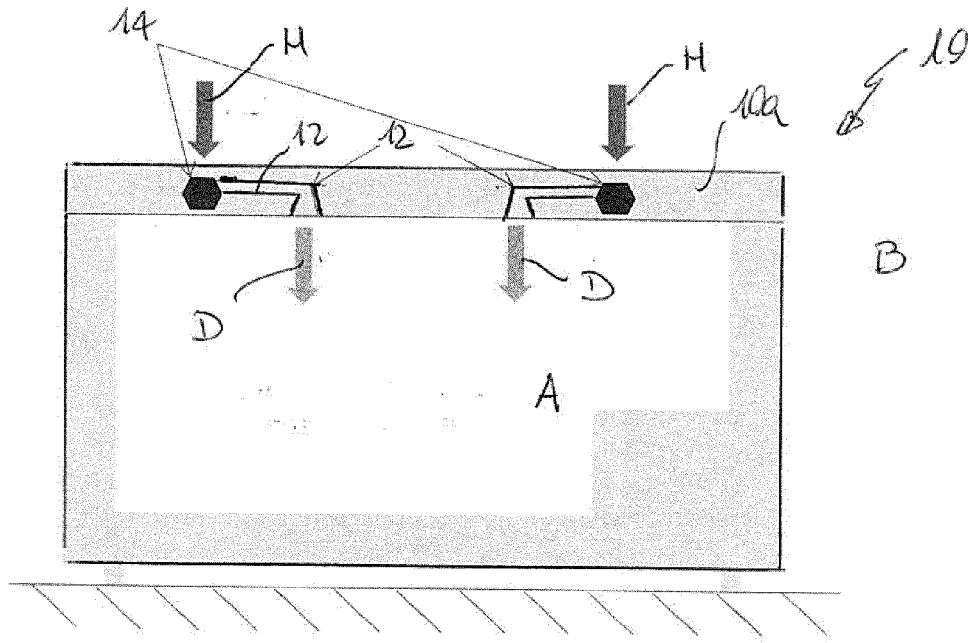


Fig. 1

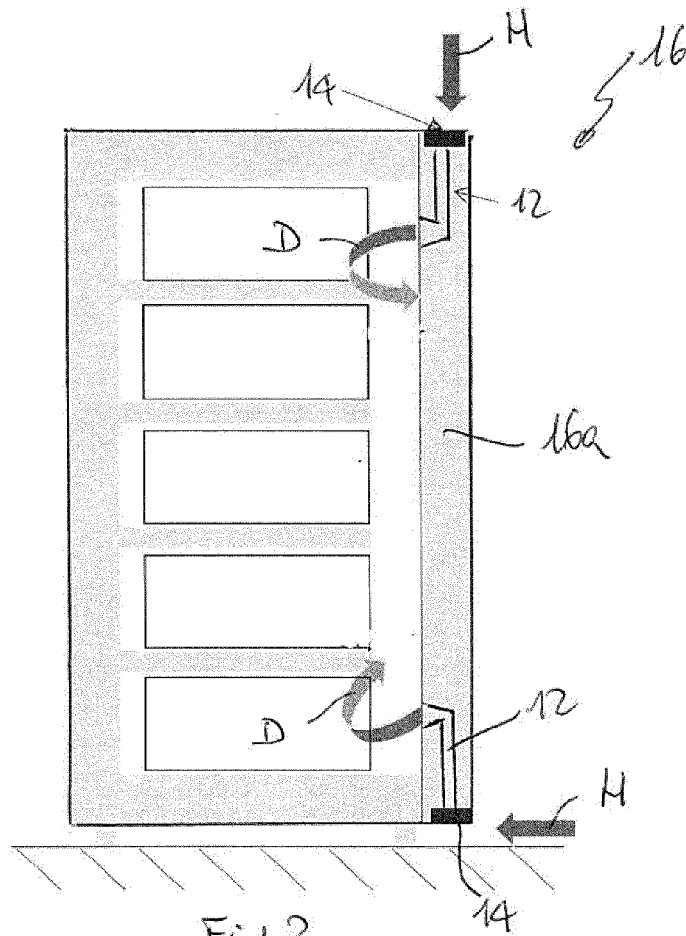
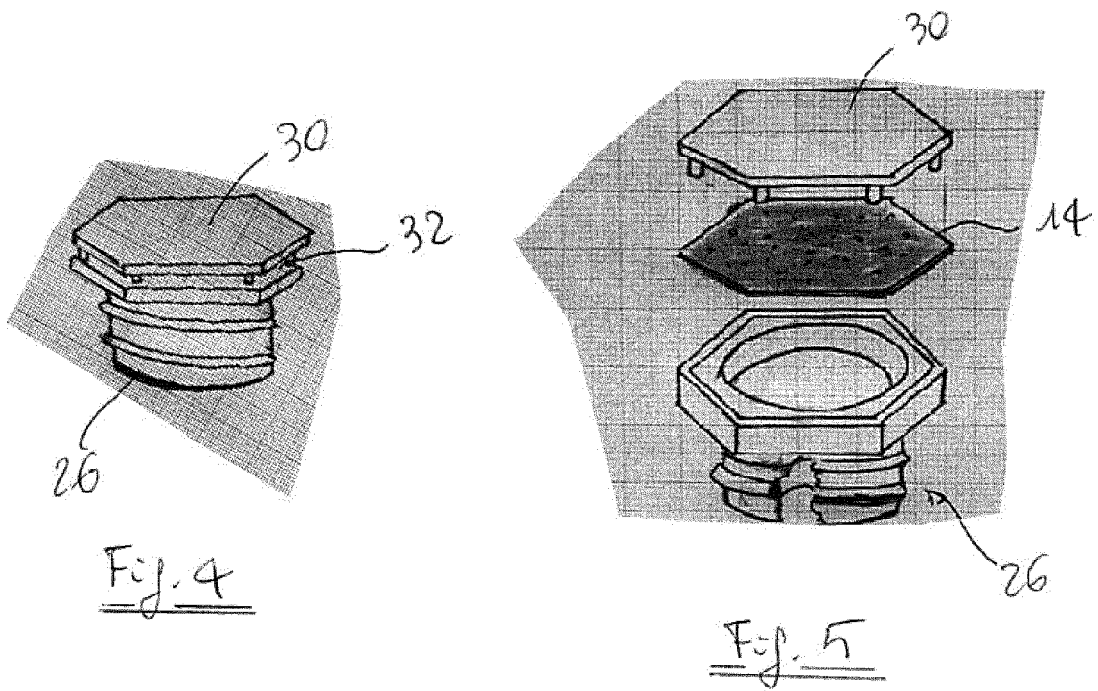
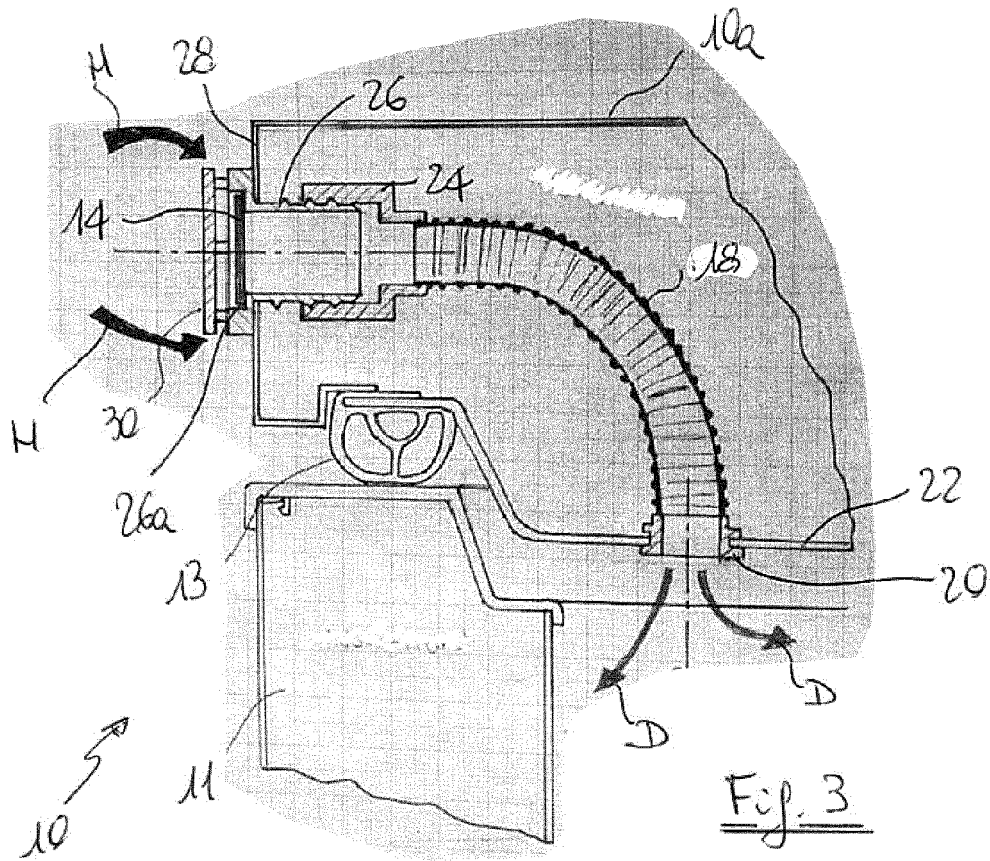


Fig. 2





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Application Number
EP 15 16 5705

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 October 2015	Examiner Vigilante, Marco
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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