

12

EUROPEAN PATENT APPLICATION

21 Application number: 80850170.4

51 Int. Cl.³: F 25 D 21/04
 F 25 D 17/06

22 Date of filing: 12.11.80

30 Priority: 29.11.79 SE 7909844

43 Date of publication of application:
 01.07.81 Bulletin 81/26

84 Designated Contracting States:
 CH DE FR GB IT LI

71 Applicant: AKTIEBOLAGET ELECTROLUX
 Luxbacken 1
 S-105 45 Stockholm(SE)

72 Inventor: Andersson, Karl Folke
 Söravägen 259
 S-184 00 Akersberga(SE)

72 Inventor: Eriksson, Bolik Anders Gottfrid
 Lindevägen 17
 S-121 63 Johanneshov(SE)

72 Inventor: Castwall, Lennart Wilhem
 Roslagsvägen 99
 S-183 65 Täby(SE)

74 Representative: Hagelbäck, Evert Isidor et al,
 c/o AB Electrolux Patentavdelningen
 S-105 45 Stockholm(SE)

54 Arrangement for keeping a freezer frost-free.

57 In a freezer cabinet with cooled surfaces in a freezing chamber for storing of food frost appears on the surfaces and on the food. On defrosting the chamber has to be emptied of food and be heated so that the frost melts. Water is formed which has to be collected. The invention relates to a freezer cabinet operating without frost. An arrangement according to the invention is characterized by a circulation path (32,40) for air including a moisture-absorbing means and a motor-driven fan (38).

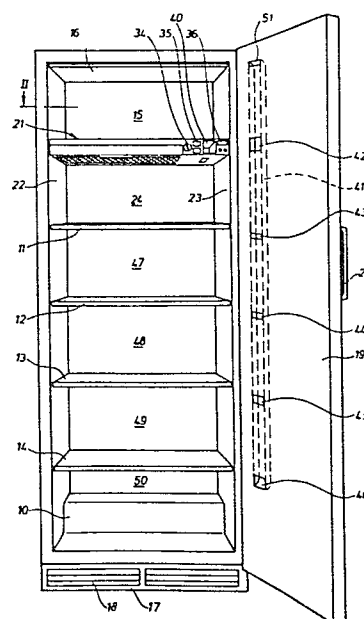


Fig.1

Both types of cabinet thus have considerable drawbacks.

The object of the present invention is to remove these drawbacks and provide a freezer cabinet which operates without frost. Further, the heat insulated volume of the cabinet should to largest possible extent
5 be used for storing of food and no expensive extra equipment beside the refrigerating apparatus should be required. Last but not least, the cabinet should be energy saving. This is achieved by the arrangement according to the invention as defined in the claims.

The invention will be described more in detail in the following
10 with reference to a freezer cabinet with storage surfaces consisting of cooled shelves and shown schematically by way of example in the drawings. Fig. 1 is a perspective view of the freezer cabinet seen from the front with open door, Fig. 2 is a horizontal section through the cabinet along the line II-II of Fig. 1, Fig. 3 is a vertical section through the upper-
15 most shelf in the cabinet along the line III-III of Fig. 2, and Fig. 4 is a similar vertical section through the shelf along the line IV-IV of Fig. 2.

The freezer cabinet shown in Fig. 1 is operated by a compressor-driven refrigerating apparatus which may be of a type known per se and
20 therefore is not shown in the Figure. The compressor is situated below the stepped bottom 10 of the cabinet and has cooling coils in the shelves 11, 12, 13, 14 of the cabinet. In the uppermost space 15 of the freezer chamber the top 16 is formed by a cooling coil,

The cabinet stands on a base 17 with vent openings 18 for cooling
25 air to the refrigerating apparatus. The cabinet has a heat-insulated door 19 with a handle 20,

According to the invention a shelf 21 of particular design is arranged in the freezing chamber. It can be mounted on the heat-insulated side walls 22, 23 of the chamber in a manner known per se, but it has to
30 give a free space on the sides and against the rear wall so that air from the uppermost space 15 can freely flow past the shelf 21 down to a lower space 24. Therefore the shelf 21 of Fig. 2 is shown schematically with gaps 25 between the shelf and the side walls 22, 23.

The shelf 21 has a whole upper surface of heat-conductive material,
35 for instance aluminium sheet, which forms a plane 26 for goods and prevents spilled liquid from entering into the shelf. The sheet is folded on the sides 27, 28 and suitably also on the rear side, whereas the

Arrangement for keeping a freezer frost-free

The present invention relates to an arrangement in a freezer cabinet for storing of food in a freezing chamber with cooled surfaces for keeping these surfaces frost-free.

5 The freezer cabinets in use in household for extended storing of food are mainly of two types. One type is the so-called frost-free freezer cabinet, i.e. a cabinet having a chamber for goods and a vertical channel or a space, usually at the rear side of the chamber, containing a cooling element, a heating element and a fan. During operation the cooling element and the fan are active, and gradually frost is
10 formed on the cooling element. Then the fan and the cooling element are disconnected and a heating element is connected. One receives melt-water which is conducted away. The heating element thereafter is disconnected and the cooling element and the fan are started.

15 In the other type of freezer cabinet, the chamber has cooled surfaces. Then, during operation relatively large quantities of frost are formed on the coldest surfaces and also to some extent on the goods in the chamber. Defrosting is made manually at long intervals, the refrigerating apparatus of the freezer being disconnected and the goods removed from the chamber and stored at some other place while the frost in the
20 cabinet is caused to melt. The water formed can be collected in different ways but this always causes inconveniences.

The frost-free cabinet has less frost in the chamber, and it is easier to remove the melt-water than in the other cabinet, but the channel or the space surrounding the cooling element requires a considerable extra space in the cabinet. Further, heating elements with adequate
25 power have to be mounted for the defrosting which entails on one hand a cost for installation and on the other hand that the heat supplied after defrosting has to be transported away by the refrigerating apparatus. This results in a large total energy consumption for the operation.

front side is open. At the underside of the box thus formed, which is open downwardly, two guides 29, 30 are arranged. On these a moisture-absorbing means in the form of a filter 31, for instance containing silica-gel, is insertible. The filter has the shape of a thin flat plate with largest possible extension, and it fits into an opening in the front of the shelf 21. The filter 31 is situated with its upper side at a distance below the plane 26 for goods, and a space 32, which is formed between the filter 31 and the plane 26 for goods, extends to the right as far as to the side wall 28 of the shelf 21, at least in the rear part of the shelf as shown in Fig. 4. In the front part, as shown in Fig. 3, a box 33 is located, which contains control means, known per se, for the freezer. This box can i.a. at the front side, which forms part of the front of the shelf 21, have a thermostat knob 34, control lamps 35 and door switch 36.

In Fig. 2, in which the rear right-hand corner of the plane 26 for goods is cut away, a circle in the bottom of the space 32 at the right-hand side is seen which indicates an air intake 37 to a fan with a motor 39 (Fig. 4). From the fan 38 an air conduit 40 goes below the space 32 in the direction of the front of the shelf.

In the door 19 of the freezer cabinet a vertical air distribution channel 41 having an inlet 42 is so designed that the inlet 42 will be situated in front of the conduit 40 when the door is closed. The air from the fan 38 is thus forced into the distribution channel 41, and the latter has outlet openings 43, 44, 45, 46 to spaces 47, 48, 49, 50 in the freezing chamber. To the uppermost space 15 an outlet opening 51 is arranged,

It is possible by means of a fan motor 39 of extremely small power to force the air in the freezing chamber to pass from below the filter 31, where moisture contents of the cold air are almost completely given off, and thereafter back to all spaces in the freezing chamber. Hereby the air is caused to flow over all cold surfaces in the chamber and over all goods which are in direct contact with the air and therefore are subject to formation of frost. The air forced by the fan into the spaces in the freezing chamber has due to the removal of moisture in the filter a lower relative humidity than that at which water is precipitated at the temperatures prevailing on the surface of the goods and on the cooled

surfaces in the chamber. Therefore, as a rule no frost at all is formed in the chamber in the normal case, i.e. when the door is closed. In use of a freezer cabinet, however, the door is opened from time to time in order to place goods in the chamber or to remove goods therefrom, and then the freezing chamber air is more or less exchanged for air of room temperature and a moisture content corresponding thereto. Then occasionally frost may be formed at the coldest surfaces in the chamber. However, it is insignificant and is not followed by a continuous build-up of more frost, but on the contrary the continuing but faint air circulation in the cabinet is sufficient in a short while to remove all frost and to transport the moisture forming the frost to the filter. The frost in a certain point is sublimed on the spot to water vapour which by the air is transported to the filter where it is collected.

The procedure described is so effective that it is not necessary to have the fan operate continually. It may be suitable to control the procedure so that defrosting proceeds during operation or during non-operation of the compressor. It is also possible to control the fan motor over a hygrostat, which reacts and starts the fan motor when the relative humidity of the air in a given point of the cabinet exceeds a given limit.

The filter can be regenerated by heating to 180 °C under ventilation.

The invention has been described above in connection with a freezer cabinet having cooled shelves. However, it can to equal advantage be applied to a freezer cabinet having cooling coils at the outside of the inner lining of the walls.

C l a i m s

1. Arrangement in a freezer cabinet for storing of food in a freezing chamber with cooled surfaces for keeping these surfaces frost-free, c h a r a c t e r i z e d by a circulation path (32,40) for air arranged in the cabinet and comprising a moisture-absorbing means and
5 a fan (38).
2. Arrangement according to Claim 1, c h a r a c t e r i z e d in that the means is formed by an exchangeable filter (31) containing a substance having moisture-absorbing properties.
3. Arrangement according to Claim 2, c h a r a c t e r i z e d in
10 that the filter (31) contains regenerative substance, for instance silica-gel.
4. Arrangement according to Claim 2, c h a r a c t e r i z e d in that the filter (31) is arranged in a shelf (21) for goods in the chamber.
- 15 5. Arrangement according to Claim 4, c h a r a c t e r i z e d in that the shelf (21) comprises a plane (26) for goods, that the plane is in the shape of an upper whole sheet of heat-conductive material, that it has a downwardly open space for a filter (31) insertible from the front, that a part (32) of the air path goes inside the shelf (21) from
20 the rear side of the filter to the fan (38) and another part (40) from the fan (38).
6. Arrangement according to Claim 5, c h a r a c t e r i z e d in that the first part (32) of the air path in the shelf (21) from the filter (31) to the fan (38) is arranged in contact with mainly the whole
25 plane (26) for goods.
7. Arrangement according to Claim 5, c h a r a c t e r i z e d in that the refrigerating apparatus of the freezer is thermostatically controlled and has a sensor for the thermostat sensing the temperature of the plane (26) for goods.
- 30 8. Arrangement according to any of Claims 4 - 7, c h a r a c t e r i z e d in that the second part (40) of the air path is arranged to conduct the air into a distribution channel (41).
9. Arrangement according to Claim 8, c h a r a c t e r i z e d in that the channel (41) goes between the upper part and the bottom of the
35 chamber and that it has inlet openings (43-46, 51) to separate spaces (15,24, 47-50) in the chamber.

10. Arrangement according to Claim 9, characterized in that the channel (41) is arranged in the door (19) of the cabinet.

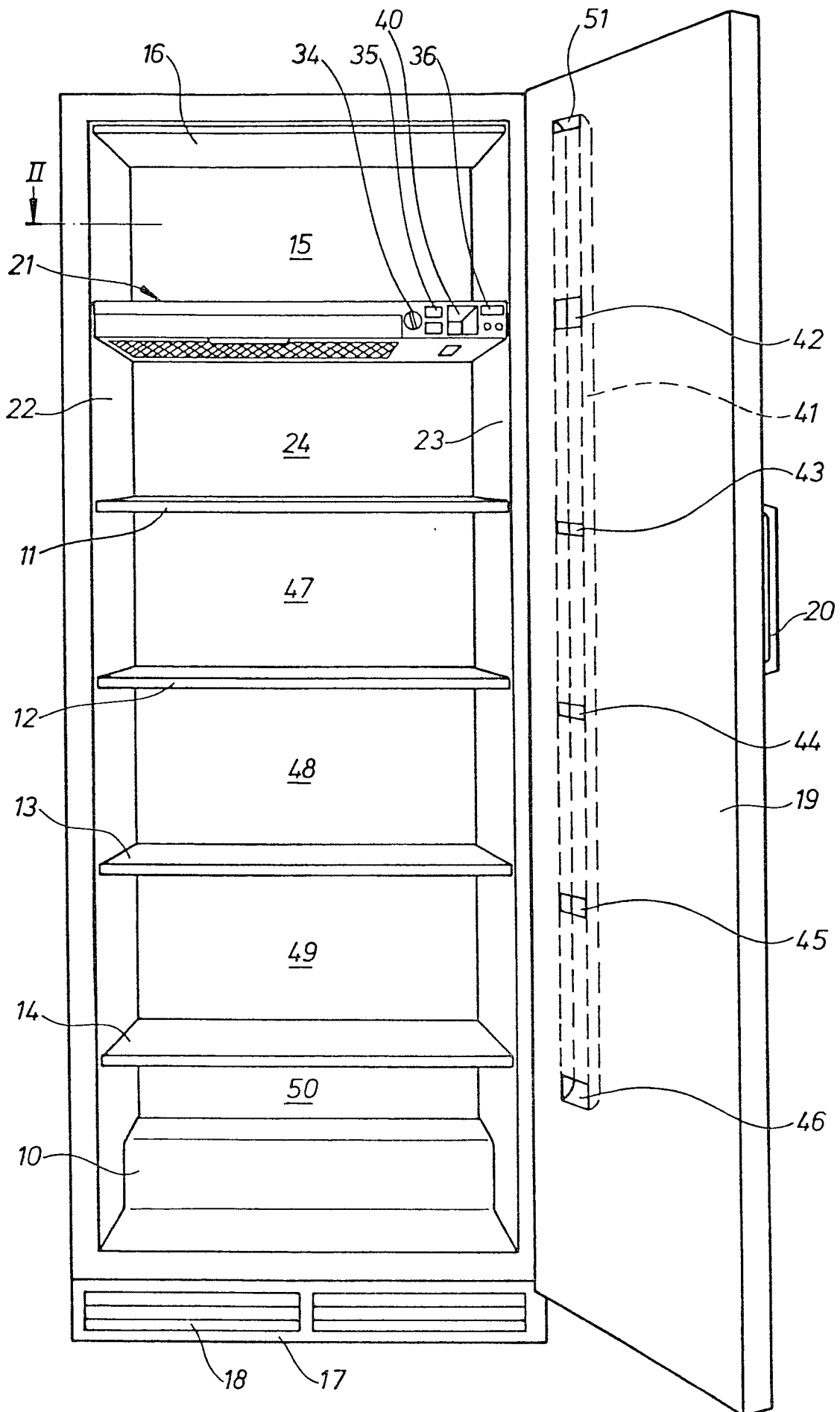


Fig.1

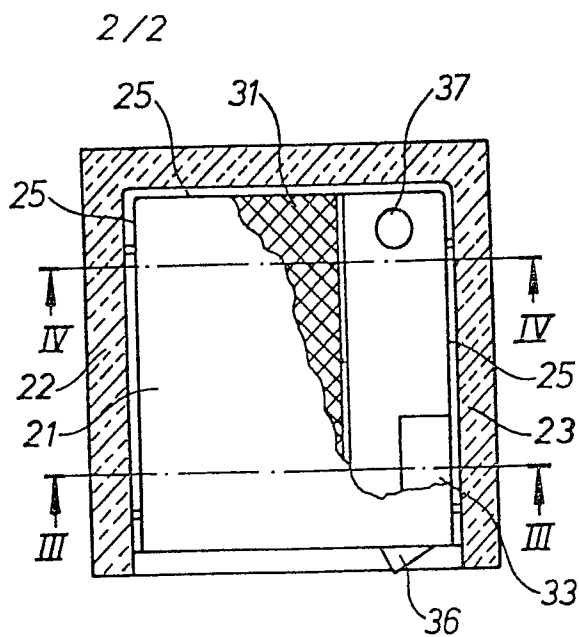


Fig. 2

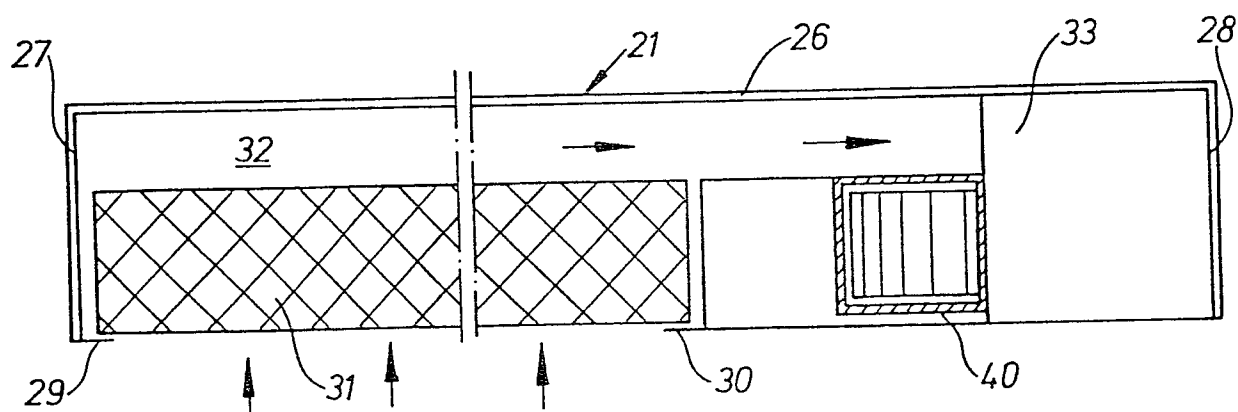


Fig. 3

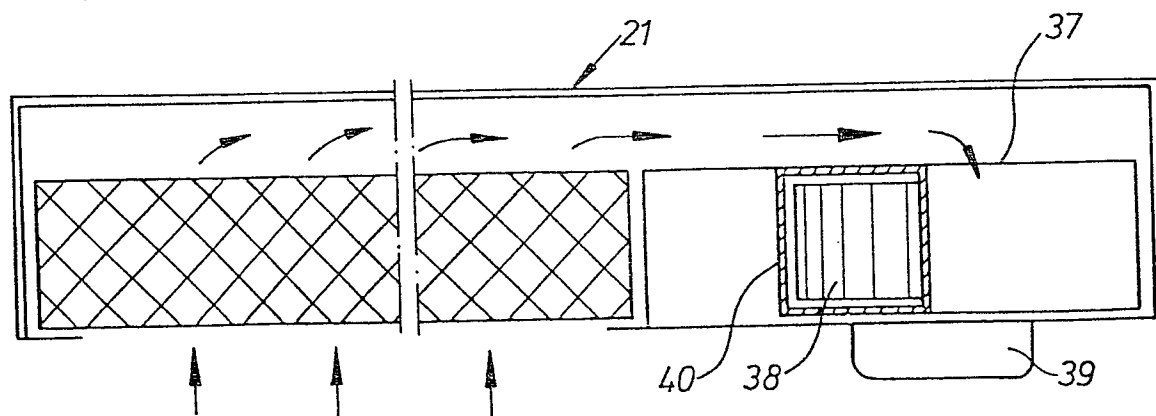


Fig. 4