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54 Method and arrangement of defrosting a freezer chamber.

57 In freezers with cooled surfaces frost is successively formed, which impairs the freezing capacity. Therefore to remove the frost a heating element (24) in a means (19) under and close to a cooled surface (13) is used. At first the frost on this surface (13) melts and the water formed is collected in the means (19). The water is vapourized and the vapour is spread all over the freezing chamber in which it delivers heat to frosty places. Water formed during the defrosting time is collected on the bottom of the freezing chamber (17) and is drained to a vessel (38) by a drain conduit (21).

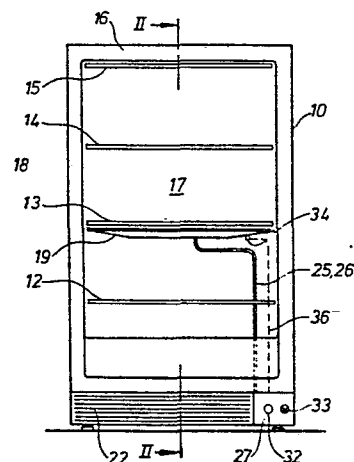


Fig.1

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The invention will be described below with reference to an embodiment of a freezer shown in the drawings. Fig. 1 is a front view of the cabinet without door, Fig. 2 is a vertical cross section of the same cabinet on the line II - II of Fig. 1, Fig. 3 is a top view of a vessel placed in the cabinet, and Fig. 4 is a vertical cross section of the vessel on the line IV - IV of Fig. 3.

Figs. 1 and 2 show a freezer cabinet 10 operated by a compressor 11 and having cooled shelves 12, 13, 14 and a cooling element 15 inside the freezing chamber 17 under the top wall 16 of the cabinet. The cabinet has a door 18, which however is not shown in Fig. 1. A shallow vessel 19 is placed under a shelf 13. The vessel is shown to an enlarged scale in Figs. 3 and 4 and will be described below. In the bottom 20 of the cabinet is provided a drain conduit 21 whose upper opening is covered by a removable plug, not shown, preventing air from flowing through the conduit when the cabinet is in operation. Under the door the cabinet has a vent louvre 22 to an air channel, through which cooling air is supplied to the compressor 11 and to a condenser 23 at the rear side of the cabinet.

The surface of the vessel 19 covers almost the entire cross sectional area of the freezing chamber. A heating element 24 in the form of an electric heating coil is heat-conductively connected to the bottom of the vessel and is fed with current through wires 25, 26 from a control means 27, which as shown in Fig. 1 can be placed under the door 18. This means may be placed in the freezing chamber or somewhere else together with control means for the normal operation of the freezer. The means 27 is fed with current through wires 28 from an electric mains and includes a switch with two contacts 29, 30, one switch 30 being disposed on an arm 31 arranged to snap between two positions. The arm is shown in Fig. 3 with the switch in its off-position. The switch can be caused to close the circuit by depressing a push button 32. Then a lamp 33 lights and indicates that the heating element 24 is active. The control means 27 also includes a thermostat 34 which disconnects the switch. The thermostat 34 has a sensor 35 in heat-conductive contact with the vessel 19 and an impulse conduit 36 therefrom to the control means 27. When vapour is being formed the temperature of the vessel is abt. 100 °C nearest the element and lower at a distance from it. When the supply of water ceases, the temperature of the vessel increases rapidly which is used for interruption of the defrosting by the thermostat whose sensor reacts on a temperature which is above the operation temperature in the point in which the sensor is placed.

Method and arrangement of defrosting a freezer chamber

This invention relates to a method of defrosting a freezing chamber in a freezer, preferably in a freezer cabinet, and to an arrangement for carrying out the method.

Methods which have until now been used to defrost a household freezer
5 are primitive and far from satisfactory. Usually when defrosting is to be carried out the frozen items are removed from the cabinet and are wrapped in a provisional heat-insulation. The freezer door is left open so that warm ambient air is allowed to act on the frost on the shelves in the cabinet. This takes a long time which may cause the items to be damaged by an in-
10 creased temperature. Only exceptionally is another freezer available for provisional storing of the items. The defrosting time can be shortened by heat supply, for example a pan with hot water can be put into the cabinet or a hair dryer be placed so as to blow hot air into the cabinet. Also the water formed during defrosting involves great inconveniences. It has been
15 tried to improve the conditions during the collection of water, for example, by placing a vessel on the bottom of the cabinet and a funnel-shaped tray of plastics over the vessel. Part of the water will be collected in this way but the majority will escape and flow over the bottom of the cabinet and out in front of it. There are several other proposals for collecting the water
20 but it is still difficult to avoid spreading of water on the floor.

An object of this invention is to provide a method of defrosting which considerably reduces the time required for the process and at the same time makes it possible in a better way than previously to collect the water formed during defrosting. For this purpose the invention is generally charac-
25 terized by the features defined in the characterizing part of the following Claim 1. An arrangement according to the invention is characterized by the features defined in the characterizing part of Claim 6.

is again started so that the items can be put in. The vessel 38 can also be permanently located in place and an apparatus part which is warm during operation can be used in known manner to evaporate the water collected in the vessel.

5 When designing a freezer cabinet so that water can be collected during defrosting by a drain conduit 21 in the cabinet bottom 20, the bottom surface should be formed so as to conduct the water flowing down to this drain. It can be suitable to make the front edge and also the upwardly nearest cabinet edge with a slightly marked border which leads the water
10 towards the bottom or prevents water from flowing towards the opening of the cabinet. A smaller water drain can also be placed like a screen on the inside of the door in its lower part to prevent water possibly condensed on the door from flowing straight down to the sealing strip of the door without passing over the bottom of the cabinet.

15 The embodiment shown and described should not be considered as a limitation of the invention to solely this example but the invention can be modified within the scope of the following claims. The invention has been described in connection with a freezer cabinet with cooled shelves for example of metal plate or grating with cooling tubes therein. As appears from the
20 above description the vapour formed during defrosting is spread over the entire freezing chamber. Thus also vertical conduits and vertical cooling surfaces inside the chamber can be defrosted in accordance with the proposed method. A condition is, however, that the means for collecting the water with heating element for vapourizing the water can be placed under a surface in
25 the cabinet on which there is such a great quantity of frost that sufficient quantities of water can be delivered to the collecting vessel.

To make the heating element 24 capable of vapourizing water in the vessel 19 the latter is designed so that not more than a given maximum quantity of water can be collected in the vessel. For this reason holes 37 with flanged edges are made in the bottom of the vessel in the shown embodiment.

5 Defrosting of the above described freezer cabinet is carried out in the following manner. The refrigerating apparatus of the freezer is disconnected and the cabinet is emptied of items. These are placed outside the cabinet and are shrouded by some insulation or in some other manner protected against temperature increase during the defrosting. The plug in the
10 drain conduit 21 in the bottom 20 of the cabinet is removed and a water collecting vessel 38 is placed under the opening of the drain conduit. The cabinet door is closed and the electric current to the heating element 24 is switched in by depressing the push button 32.

The heat supply to the vessel 19 results in the first hand in that
15 ice and frost on the nearest shelf 13 above the vessel 19 melt so that water drops into the warm vessel 19 and is vapourized. The vapour thus formed goes to the coldest places in the chamber, i.e. those covered by ice. Thus distribution of heat in the entire chamber is obtained in a natural way in spite of the fact that heat is supplied only to a very
20 limited part. The vapour condenses and causes a substantial supply of heat to the desired places. Thereby melting of ice on all cooling coils in the chamber is achieved and fresh melt water drops into the vessel from the shelf 14 higher up and from the cooling element 15 at the top wall 16 of the cabinet. During the whole time of water supply from shelves disposed
25 higher up fresh vapour is formed in the vessel. Should more water be supplied to the vessel than the quantity which can be vapourized therein, it flows out through the holes 37. The water flows onto the shelves below the vessel and contributes to melting ice thereon. The holes are meant to prevent large quantities of water from collecting at the heating element
30 24 thereby obstructing or delaying the desired effective vapourization.

When the ice in the chamber has melted and water is no longer supplied to the vessel 19 its temperature will rapidly increase from the vapourizing temperature, abt. 100 °C. The result is that the sensor 35 of the thermostat 34 reacts and gives an impulse to the thermostat to disconnect the supply
35 of current to the heating element 24. At the same time the current to the signal lamp 33 is disconnected and the lamp goes out, thereby indicating that defrosting is accomplished. The collecting vessel 38 is removed and emptied of water. It can then be used to store items in the cabinet, which

C l a i m s

1. Method of defrosting a freezing chamber in a freezer, preferably in a freezer cabinet, c h a r a c t e r i z e d in that the freezing chamber (17) is emptied of items whereafter the door (18) is closed, and that a means (19) designed to collect water flowing down and being provided with a heating element (24) and disposed under a cooled surface (13) is supplied with heat so that ice and frost on the cooled surface (13) melt and fall into the collecting means (19), in which a part is vapourized and a part is drained off in the form of water, and that the vapour formed is spread in the chamber (17) where it is caused to deliver heat to frost on different places in which water is formed, the water being drained through a bottom outlet (21) in the chamber (17).
2. Method according to Claim 1, c h a r a c t e r i z e d in that the water is collected in a means which is a vessel (19) placed under and close to a cooled shelf, the water being collected to a height defined by an overflow so that the water will keep a temperature sufficient for good vapourization.
3. Method according to Claim 2, c h a r a c t e r i z e d in that the water from the overflow is led to shelves (12) situated under the vessel (19).
4. Method according to Claim 1, c h a r a c t e r i z e d in that the temperature increase of the vessel (19) after the supply of water has ceased is used to discontinue the supply of energy to the heating element (24).
5. Method according to Claim 4, c h a r a c t e r i z e d in that defrosting is discontinued automatically by a thermostat (34) coupled to a wire (25,26) to the heating element (24), the thermostat having a sensor (35), disposed near the vessel (19), which disconnects the supply of current to the element (24) when the temperature of the vessel (19) rises above a given value.
6. Arrangement in a freezer, preferably in a freezer cabinet, with a freezing chamber for carrying out the method according to Claim 1, c h a r a c t e r i z e d by a means (19) arranged under a cooled surface (13) to collect water flowing down, the means (19) having an electric heating element (24) whose output is such that the quantity of water collected in the means (19) can vapourize.

7. Arrangement according to Claim 6, characterized in that the means (19) is a vessel disposed under and close to a horizontal shelf (13).
8. Arrangement according to Claim 6, characterized in that the heating element (24) is in the form of a coil in the vessel (19).
9. Arrangement according to Claim 7, characterized in that the vessel (19) has an overflow in the form of several holes (37) with flanged edges.
10. Arrangement according to Claim 6, characterized in that the freezing chamber (17) has a bottom drain (21) to an outer collecting means (38).
11. Arrangement according to Claim 6, characterized in that a thermostat (34) is included in a conduit (25,26) to the heating element (24) in the vessel (19), the sensor (35) of the thermostat being disposed near the vessel and having a disconnecting temperature which is some degrees above the operation temperature at the same location.
12. Arrangement according to any preceding Claim, characterized in that the heating element (24) is connected via a timer by which defrosting can be started and the refrigerating apparatus of the freezer be rendered inactive.
13. Arrangement according to Claim 11, characterized in that the thermostat (34) includes means (32) for manual switching in of the heating element (24).
14. Arrangement according to any preceding Claim, characterized in that a signal lamp (33) is connected in parallel with the heating element (24).

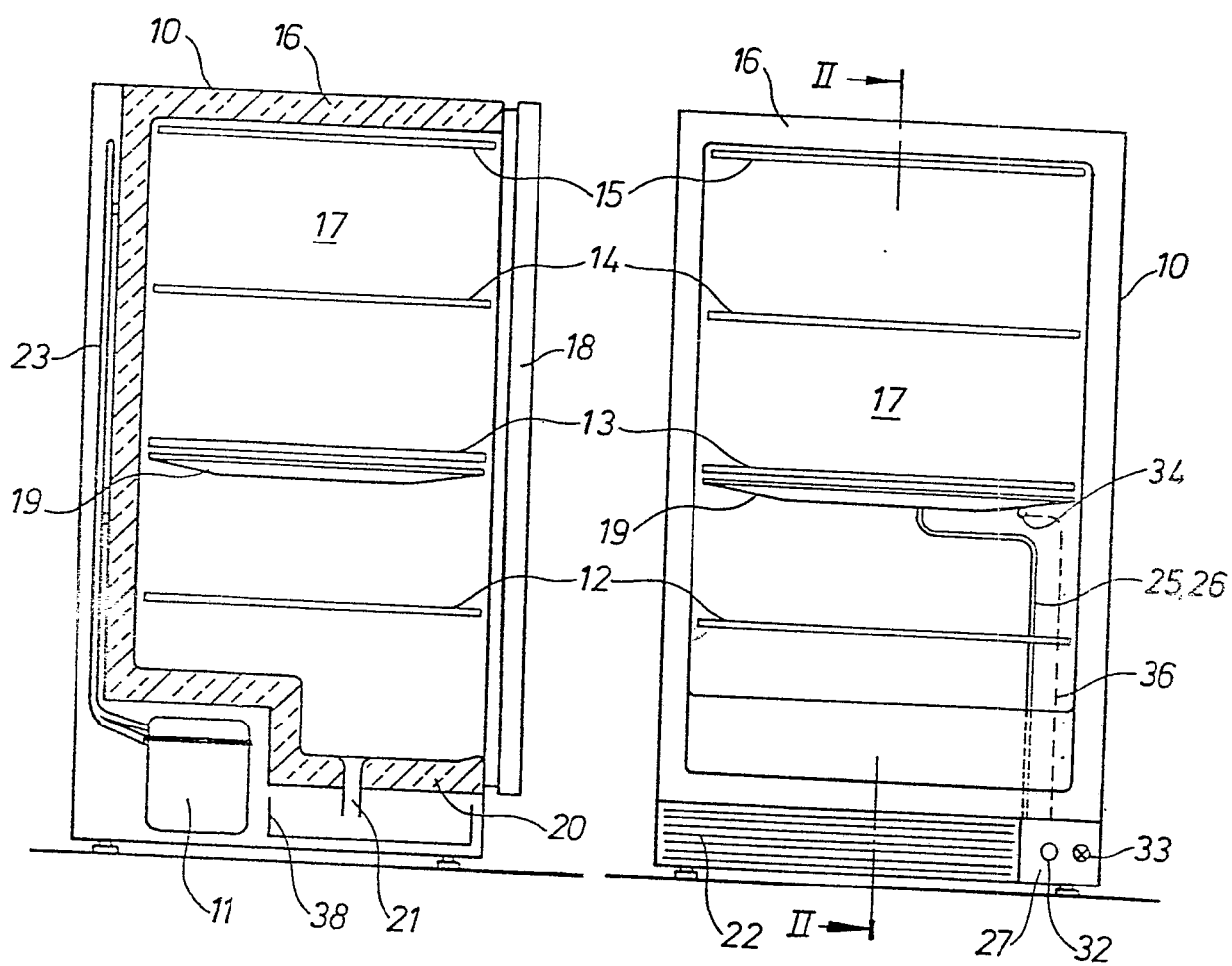


Fig. 2

Fig. 1

Fig. 4

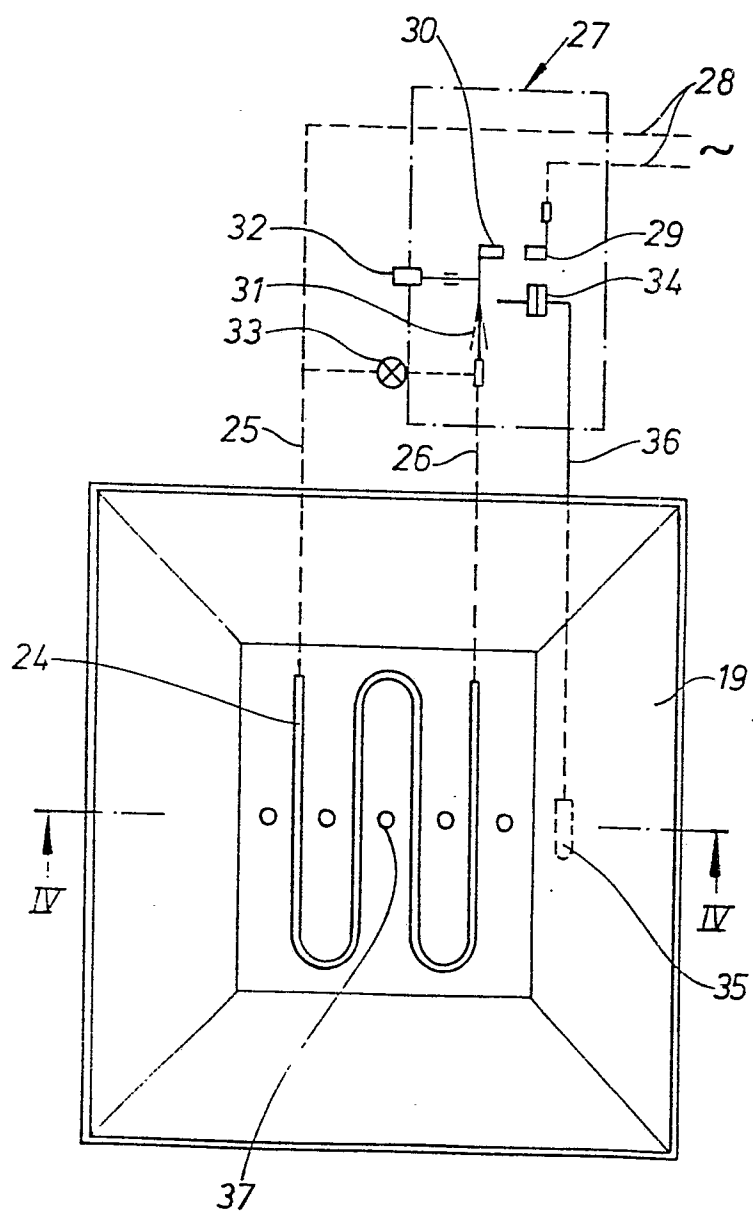
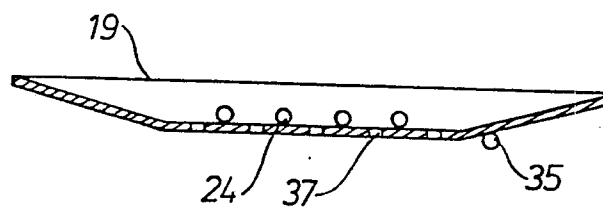


Fig. 3



European Patent
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EUROPEAN SEARCH REPORT

0017633

Application number

EP 80 85 0026

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 2 780 925 (McGREW)</u> * Column 2, line 52 - column 7, line 14; figures 1-4 *	1,2,5,6,7,8,11,12	F 25 D 21/06
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	<u>US - A - 3 033 967 (HIRD)</u> * Column 1, line 7 - column 2, line 54; figures 1-3 *	1	
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	<u>US - A - 2 751 197 (HERRMAN)</u> * Column 2, line 33 - column 6, line 70; figures 1-7 *	1,2,6,8,10	TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
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	<u>US - A - 2 090 413 (GOULD)</u> * Page 1, left-hand column, line 44 - page 3, left-hand column, line 40; figures 1,2 *	1,2,6,10	F 25 D
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	<u>US - A - 2 647 375 (ZEARFOSS)</u> * Column 4, line 22 - column 8, line 24; figures 1-4 *	1,2,6,7,8,9,12,13	
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	<u>US - A - 2 959 936 (MANN)</u> * Column 2, line 38 - column 5, line 75; figures 1-9 *	1,5,6,10,11	CATEGORY OF CITED DOCUMENTS
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	<u>US - A - 2 718 765 (JANSEN)</u> * Column 2, line 26 - column 4, line 46; figures 1-5 *	1,2,6,7,8	X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
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	The present search report has been drawn up for all claims		&: member of the same patent family, corresponding document
Place of search	Date of completion of the search	Examiner	
The Hague	26-08-1980	BOETS	



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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<u>US - A - 2 466 479</u> (ROACH)		
A	<u>US - A - 2 553 657</u> (LA PORTE)		
A	<u>GB - A - 866 624</u> (SEARLE)		
A	<u>FR - A - 2 244 146</u> (DUCHAMP)		
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