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54 **Refrigerated display cabinet.**

57 In a refrigerated display cabinet having shelves for goods (20) arranged above each other on a rear wall (24) of the cabinet, the goods being cooled partly by air of freezing temperature entering the spaces between the shelves through openings (60) in the rear wall (24) and partly by a front air curtain (52) of freezing temperature, means are arranged to heat the air admitted through the openings (60). The means to heat the air can be constituted of an electric heating cable (30) arranged in the rear wall (24) or of fluorescent tubes (68) located below the shelves, the heating cable (30) being able to heat the air in the night and the fluorescent tubes (68) being able to heat the air in the daytime.

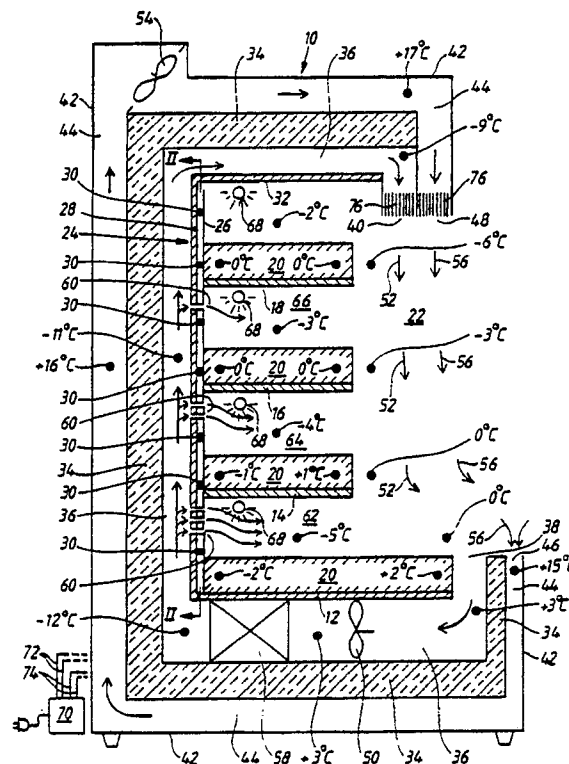


Fig.1

Refrigerated display cabinet

The invention refers to a refrigerated display cabinet showing a substantially vertical rear wall, a plurality of shelves for goods arranged above each other along the wall, a first air duct extending from a first place at the front edge of the lowest shelf, in substantially horizontal direction under the lowest shelf, in substantially vertical direction behind the rear wall and in substantially horizontal direction above the uppermost shelf to a second place above the front edge of the uppermost shelf, a fan to circulate air through the duct to the second place, from where the air moves downwards in an air curtain in front of the front edges of the shelves to the first place, a refrigerating apparatus to cool the air circulating through the duct to freezing temperature, and openings in the rear wall to bring about air flows from the duct through the spaces formed between the shelves. The object of the invention is to bring about a temperature of all the goods in such a refrigerated display cabinet, which temperature is as close as possible to the freezing-point of the goods without the goods becoming frozen. For meat this freezing-point is about -2° C. This object is attained in the refrigerated display cabinet according to the invention by means for heating said air flows so that the goods on the shelves does not freeze. By the means to heat the air flows, which have freezing temperature when they enter the spaces between the shelves from the duct, the goods at the rear wall is prevented from freezing. The goods at the front edge of the shelves, which goods is exposed to heat radiation from the surroundings in front of the cabinet and to an air flow which has been heated by the goods on its passage through the spaces between the shelves, is prevented from becoming too warm by the air curtain which has freezing temperature when it leaves the duct. As a consequence of heat absorption from the goods the temperature of the air curtain will increase during its movement in direction downwards, goods at the front edge of shelves located at a lower level thereby becoming warmer than goods at the front edge of shelves located at a higher level. According to a further development of the invention goods at the front edge of shelves located at a lower level is prevented from becoming too warm by means to cause greater air flows through spaces located at a lower level than through spaces located at a higher level. According to another development of the invention the means to heat the air flows is constituted of an electric heating cable arranged in the rear wall and heating a metal sheet forming the inner wall surface of the cabinet. By this a simple device to heat the air flows is obtained. According to a further development of the invention the means to heat the air flows is in

addition constituted of electric fluorescent tubes arranged in the spaces and simultaneously illuminating the goods, means being arranged to activate the fluorescent tubes in the daytime and the heating cable in the night. By this one obtains in the daytime illumination of the goods and heating of the air flows simultaneously by the same means, i.e. by the fluorescent tubes. In the night, the heating cable heats the air flows instead of the fluorescent tubes. An embodiment of a refrigerated display cabinet according to the invention will be described below with reference to the attached drawings, where Fig. 1 shows a vertical sectioned view of the cabinet and Fig. 2 shows a sectional view according to the marking II - II in Fig. 1. By 10 is designated a refrigerated display cabinet showing a plurality of heat insulating shelves 12, 14, 16 and 18 for offering goods which is available through an opening 22 of the cabinet. The three upper shelves 14, 16 and 18 are fastened to a rear wall 24 constituted of a metal sheet 26 and a heat insulating sheet 28 located behind the metal sheet. An electrically heatable cable 30 is located between the sheets 26 and 28, the cable 30 heating the sheet 26. A horizontal heat insulating sheet 32 is connected to the upper end of the sheet 28. The shelf 12, the sheet 28 and the sheet 32 are surrounded by a heat insulating intermediate wall 34 with an intermediate air duct 36 extending from a place 38 at the lower front end of the cabinet to a place 40 at the upper end of the cabinet. The intermediate wall 34 is in its turn surrounded by an outer wall 42 with an intermediate air duct 44 extending from a place 46 at the lower front end of the cabinet to a place 48 at the upper front end of the cabinet. A fan 50 is arranged to circulate air through the duct 36 from the place 38 to the place 40, from where the air moves in a curtain 52 in front of the front edges of the shelves downwards to the place 38. A fan 54 is arranged to circulate uncooled air through the duct 44 from the place 46 to the place 48, from where the air moves in a curtain 56 outside the curtain 52 downwards to the place 46. The air in the duct 36 is cooled by a refrigerating apparatus 58 cooling the air to freezing temperature, i.e. to a temperature below the temperature at which the goods freezes. The air still has freezing temperature when it passes the place 40. Measured air and goods temperatures in different places of the cabinet are noted directly in the figure. Openings 60 are arranged in the rear wall 24 to let air of freezing temperature into the spaces 62, 64 and 66 between the four lowest shelves 12, 14, 16 and 18. The openings 60 are such, that the air flow becomes greatest through the space 62, smaller through the space 64 and smallest through the space 66. The

sheet 26 heats the air flows when they enter the spaces 62, 64 and 66, so that the goods adjacent to the wall 24 does not freeze. With a sheet 26 of the height of 1,4 metres between the sheet 32 and the shelf 12 and a width of 2,7 metres (= the inner width of the cabinet), the even temperature distribution in the goods has according to the invention been obtained at a power of the heating cable 30 of totally 170 watt. The air flows can also be heated by electrical fluorescent tubes 68 simultaneously illuminating the goods. The tubes 68 are located so close to the wall 26 that the goods adjacent to this wall does not freeze. A timer 70 can be provided to activate the heating cable 30 in the night via electric wires 72 and activate the tubes 68 in the daytime via electric wires 74, so that the air flows in the night are heated solely by the heating cable and in the daytime solely by the fluorescent tubes. The heating of the air flows through the spaces 62, 64 and 66 can alternatively be achieved by arranging ducts to conduct air of ambient temperature through the wall 24. The uncooled air curtain 56, which is located outside the cold air curtain 52, protects the cold air curtain from being mixed with ambient air. The curtains 52 and 56 are formed by guide vanes or so-called honeycomb cells 76, the object of which being to bring about a laminar flow in the curtains, this also in order to decrease the mixing-in of ambient air into the curtains. Such honeycomb cells and air curtain arrangements are known per se through e.g. U.S. patent No. 3,256,799.

Claims

1. Refrigerated display cabinet (10) showing a substantially vertical rear wall (24), a plurality of shelves (12,14,16,18) for goods (20) arranged above each other along the wall, a first air duct (36) extending from a first place (38) at the front edge of the lowest shelf (12), in substantially horizontal direction under the lowest shelf, in substantially vertical direction behind the rear wall and in substantially horizontal direction above the uppermost shelf to a second place (40) above the front edge of the uppermost shelf (18), a fan (50) to circulate air through the duct (36) to the second place (40), from where the air moves downwards in an air curtain (52) in front of the front edges of the shelves to the first place (38), a refrigerating apparatus (58) to cool the air circulating through the duct (36) to freezing temperature, and openings (60) in the rear wall (24) to bring about air flows from the duct through the spaces (62,64,66) formed between the shelves, **characterized** by means (30;68) for heating said air flows so that the goods (20) on the shelves does not freeze. 2. Refrigerated display cabinet according to claim 1, **characterized** by means (60) to cause greater air flows

through spaces located at a lower level than through spaces located at a higher level. 3. Refrigerated display cabinet according to claim 2, **characterized** in that the means to heat the air flows is constituted of an electric heating cable (30) arranged in the rear wall (24) and heating a metal sheet (26) forming the inner wall surface of the cabinet. 4. Refrigerated display cabinet according to claim 3, **characterized** in that the means to heat the air flows is in addition constituted of electric fluorescent tubes (68) arranged in the spaces (62,64,66) and simultaneously illuminating the goods (20), means (70) being arranged to activate the fluorescent tubes (68) in the daytime and the heating cable (30) in the night.

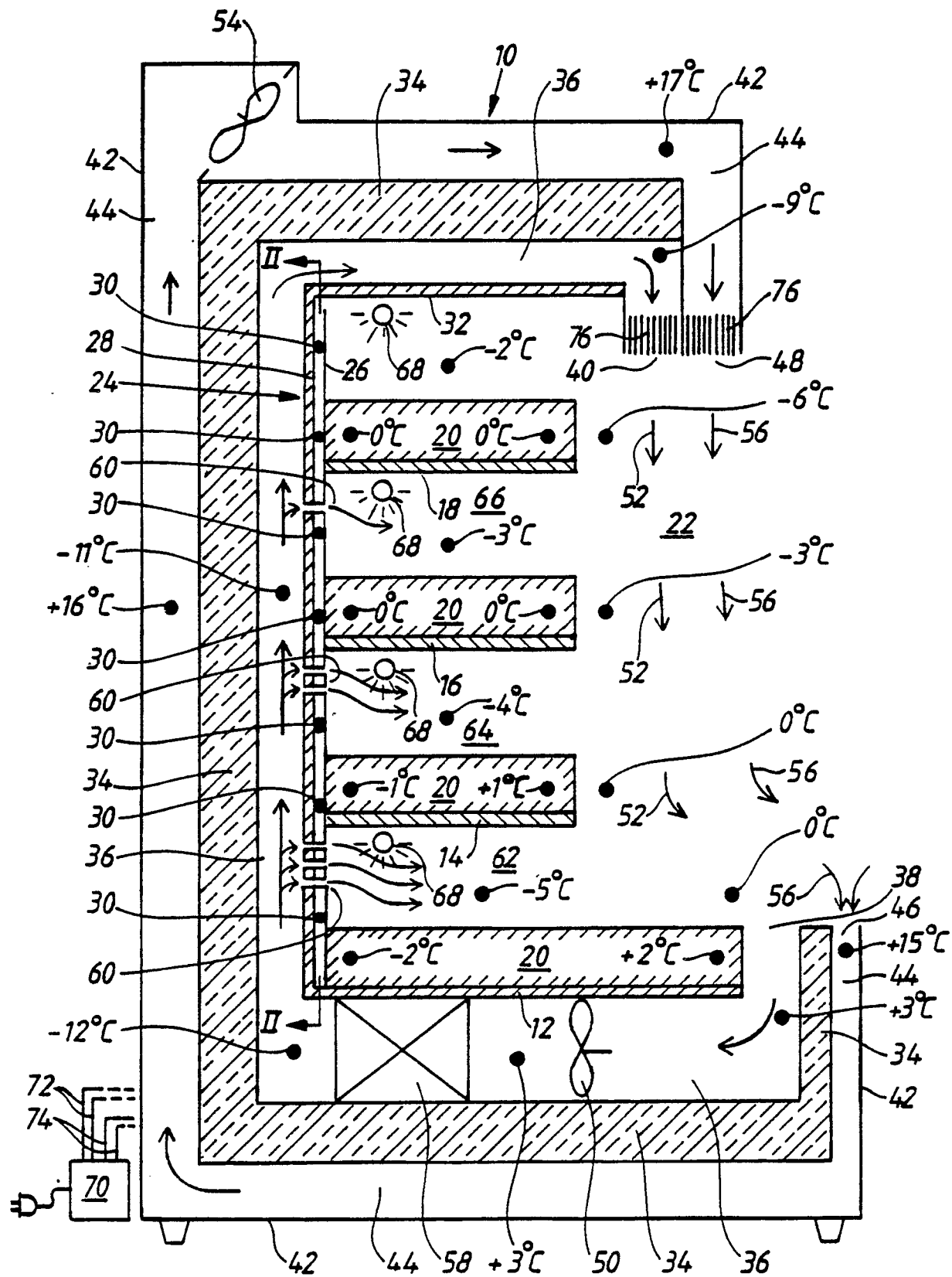


Fig.1

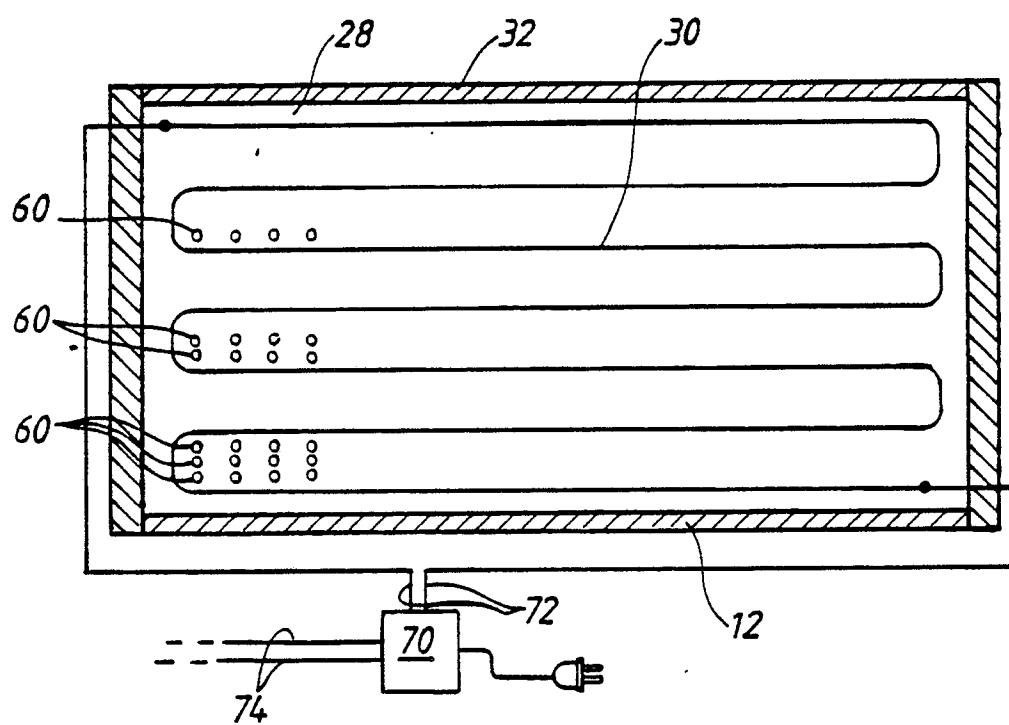


Fig. 2



DOCUMENTS CONSIDERED TO BE RELEVANT			EP 90850232.1
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.)
A	<u>DE - A1 - 3 113 571</u> (LINDE AG) * Page 7, line 2 - page 8, line 9; fig. 1 * --	1	A 47 F 3/04
A	<u>CH - A5 - 661 856</u> (TYLER REFRIGERATION GMBH) * Abstract; page 3, left column, lines 6-14, right column, lines 46-65; fig. 2 * --	1	
A	<u>AT - B - 380 330</u> (MAY) * Page 3, line 53 - page 4, line 25; fig. 2,3,4 * --	3	
A	<u>US - A - 4 341 089</u> (IBRAHIM) * Column 4, line 37 - column 5, line 9; fig. 1 * --	3,4	
A	<u>US - A - 4 750 335</u> (WALLACE) * Totality, see especially the abstract; column 4, lines 55-64; column 5, lines 31-44; fig. 2 * ----	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.) A 47 F 3/00 F 25 D 23/00
Place of search VIENNA		Date of completion of the search 17-08-1990	Examiner VELINSKY-HUBER
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	