July 13, 1954 W. SCHMIDT 2,683,355

OPEN-TOP REFRIGERATOR DISPLAY CASE

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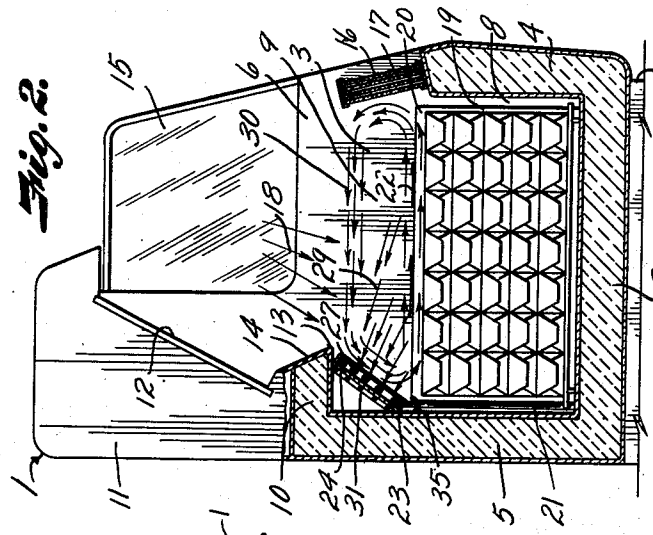

Fig. 2.

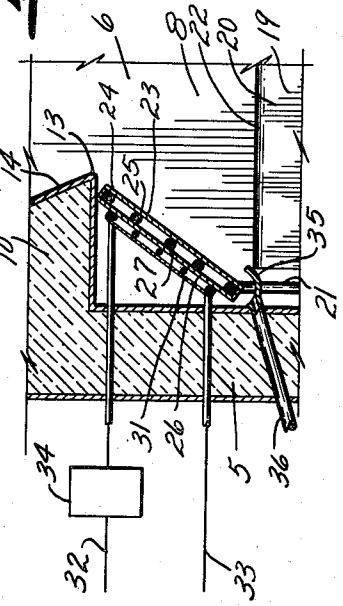

Fig. 3.

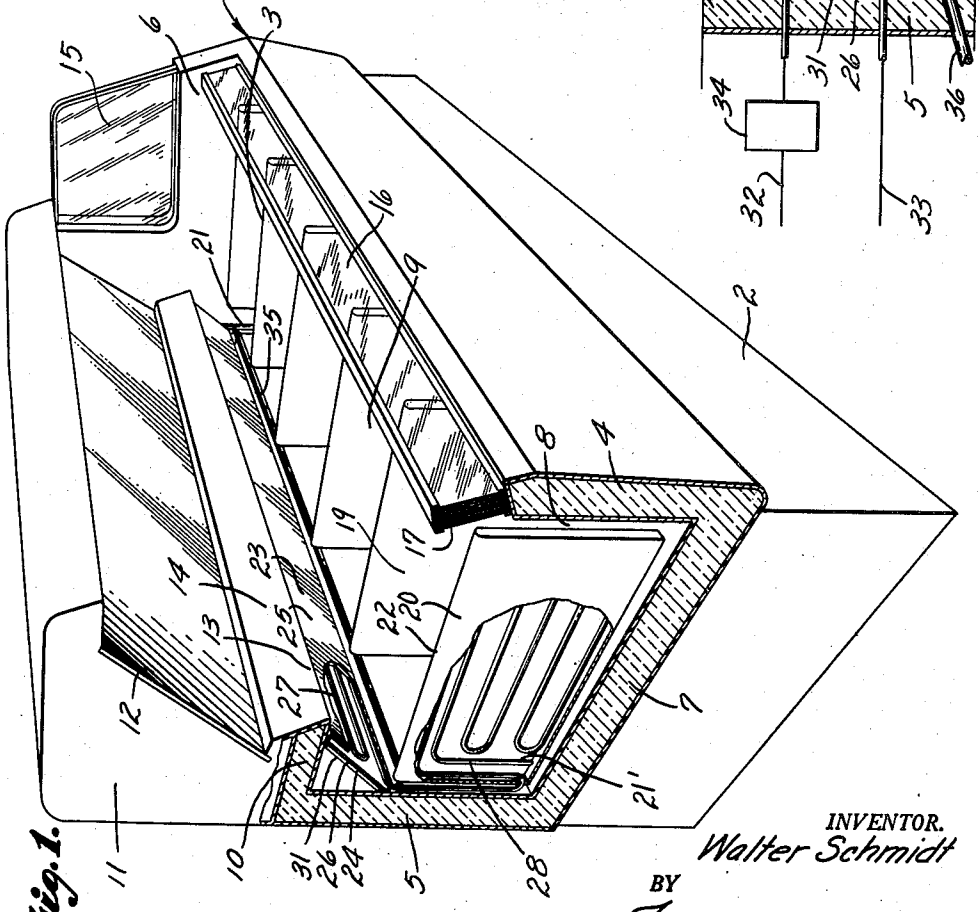

Fig. 1.

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OPEN-TOP REFRIGERATOR DISPLAY CASE

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2 Claims. (Cl. 62—89.5)

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This invention relates to open top refrigerator display cases and particularly those utilizing natural convection currents in effecting refrigeration of the articles on display. Cases of this character are particularly desirable for self-service stores, but they have presented many problems such as display of the merchandise at a too great a depth below the open top of the case, frosting over of the merchandise and refrigerating surfaces, defrosting of the refrigerating surfaces without first removing the merchandise on display, too high temperature of the merchandise on display, inability of maintaining a body of chilled air over the merchandise and for many other reasons well known to refrigerator manufacturers.

It is the purpose of the present invention to overcome these difficulties by providing such cases with an auxiliary refrigerating element located in an out-of-way position within the display case and arranged for effecting transfer of heat from the exposed surfaces of the articles on display to the refrigerating element by radiation and convection; to provide the auxiliary refrigerating element with surfaces in proximity to warm, moisture-laden exterior air that may enter the open top of the refrigerated display case and on which the moisture collects in the form of frost before contact thereof with the exposed surfaces of the merchandise on display and/or surfaces of the main refrigerating elements; to provide for easy and automatic removal of the frost without interference with removal or damage to the merchandise on display; and to provide for an optimum and effective circulation of convection currents over the exposed surfaces of the displayed merchandise.

In accomplishing these and other objects of the invention as hereinafter pointed out, I have provided improved structure the preferred form of which is illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective cross sectional view of an open top display case constructed in accordance with the present invention.

Fig. 2 is a cross section through the display case particularly illustrating the convection currents set up by the auxiliary refrigerating element and heat radiation from the articles on display when the case is in operation.

Fig. 3 is an enlarged fragmentary cross section, particularly illustrating the auxiliary refrigerating element and the heater to effect defrosting thereof.

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Referring more in detail to the drawings:

1 designates a refrigerator display case constructed in accordance with the present invention and which includes a base 2 supporting a display section 3 comprising suitably insulated front, rear, and end walls 4, 5, 6, and a bottom 7 to form a display compartment 8 having an open top 9. The rear wall 5 extends above the front wall 4 and terminates in an insulated top wall portion 10 that extends forwardly over a portion of the display compartment. The top portion 10 carries a canopy section 11 which has an upwardly and forwardly inclined mirror panel 12 for reflecting the merchandise on display in the display compartment. A portion of the canopy extends forwardly of the upper portion of the mirror panel to house an illuminating element (not shown) as in conventional practice. The forward edge portion 13 of the horizontal wall 10 carries a rearwardly inclined horizontal rail 14 adapted to carry price tags or other information concerning the merchandise on display.

The end walls 6 extend upwardly substantially in plane with the horizontal wall portion 10 and carry transparent wings 15, as best shown in Figs. 1 and 2. Extending along the upper edge of the front wall 4 is a transparent wall extension 16 formed by a frame carrying a plurality of spaced transparent panels 17 to promote display of the articles in the refrigerating compartment, the upper edge of the transparent panels terminating substantially in plane with the lower part of the horizontal wall portion 10 as best shown in Fig. 2. The space between the rail 14 and the transparent panel section 17 provides a top opening 9 through which the merchandise on display is inserted and removed from the display compartment. The display compartment is divided transversely into a plurality of spaces 19 by means of plate type refrigerating elements 20 having refrigerant supply and return ducts 21 and 21' connected with a suitable refrigerating unit that may be contained in the base 2. The articles to be displayed are contained within the respective spaces up to substantially the level of the upper edges 22 of the main refrigerating elements 20, as best shown in Fig. 2.

The problems in the structure thus far described is that of providing sufficient refrigeration for the top or exposed surface of the articles or products being displayed. This is particularly true of frozen food and ice cream because of the large difference between ambient temperature conditions or those outside of the display case and the temperature required for the proper stor-

age of such products. The temperature of the product can be partially controlled by limiting the filling of the spaces 19 so that the exposed surfaces of the display are considerably below the open top of the case. However, this defeats the purpose of an open type display case since the advantage thereof is the display of the goods in such a manner that they can be readily seen and easily reached by the customers in a self service store.

It is therefore obvious that a successful display case must be a good product preserver and yet have the top surface of the displayed articles close to the top opening of the fixture and to maintain the exposed surface of the products under adequate refrigeration to maintain the required temperature.

The present invention provides for these requirements in a simple and efficient manner primarily by simple convection and radiation so that fans for forced convection or large finned refrigerator coils which are usually located above the refrigerating elements are not necessary.

In carrying out the invention, the display case is provided with an auxiliary refrigerating element 23 that is located within the angle formed between the rear wall 5 and the horizontal wall portion 10 of the case and which extends the full length thereof so that it is effective in preserving surface temperatures in the upper portions of all of the display spaces. In the illustrated instance, the auxiliary refrigerating element is of the plate type including a preferably metallic jacket 24 having front and rear walls 25 and 26 interconnected at the sides and upper and lower edges to form an enclosure having a refrigerating coil 27. The coil 27, in the illustrated instance, is shown as connected between the refrigerant supply duct 21 and the coils 28 of the main refrigerating elements. The auxiliary refrigerating element is located and arranged at an angle above the exposed surfaces of the merchandise on display so as to remove heat by radiation from the exposed surfaces as indicated by the arrows designated 29 in Fig. 2. The position of the auxiliary refrigerating element also effects a natural convection current of air in the direction of the arrows designated 30 to pick up heat from the produce surface and carry it to the refrigerated surface of the auxiliary heating element. As the convection currents pass over the refrigerating surface any moisture received from the outside air entering the case, indicated by the arrows designated 18, is first carried over the surface of the coil so that it is deposited thereon in the form of frost. Therefore, the air which moves across the surface of the products on display is dehydrated and free of moisture so that there is little or no deposit on the main refrigerating elements or on the exposed surfaces of the merchandise. The circulation of the air and radiation as thus described is sufficient to maintain the desired temperature of the surfaces of the products on display so as to assure the temperature required in preserving such products as ice cream, frozen foods and the like.

It is thus obvious that the auxiliary coil collects the moisture in the form of frost and minimizes or excludes frost accumulation on the main refrigerating elements; consequently, there is no necessity of defrosting the main refrigerating elements. The auxiliary element may be connected in series with the corresponding coils of the main refrigerating elements and the temperature thereof is preferably maintained at a lower temperature so as to assure the moisture to collect on the colder surfaces thereof. However, if the auxiliary plate temperature is equal to or slightly higher than the main refrigeration elements, the auxiliary element will still collect frost because of its proximity to the entering moist air. The frost accumulates on the surface of the auxiliary refrigerating element and is readily removed by means of an electrical heater 31 that is carried in contact with the rear surface of the auxiliary element and which is supplied with a suitable electric current through conductors 32 and 33. Connected into one of the conductors is a time control switch 34 so as to automatically and periodically establish the current flow through the heating element so as to melt off any frost that has accumulated between the time periods. The melted frost flows down the refrigerating surface and collects in a trough 35 that is positioned co-extensively with the auxiliary refrigerating element and from which the water is discharged through a drain pipe 36, as best shown in Fig. 3.

Tests indicate that a display case operating with the auxiliary refrigerating element in conjunction with the main refrigerating elements can hold exposed surface temperatures of the product at 0° F., while without the auxiliary refrigerating element and all other conditions being the same, the temperature is approximately +9° F. This is effected through transfer of heat from the product on display to the refrigerated surface of the auxiliary element by radiation, convection and conduction.

It is also obvious that the auxiliary refrigerating element provides a surface for the accumulation of frost and dehydrates the convection currents of air. The accumulative frost may be readily removed therefrom either automatically, as shown, or manually with the use of a scraper (not shown).

What I claim and desire to secure by Letters Patent is:

1. A display case having front, rear and end walls and a top wall terminating inwardly from the rear wall in the direction of the front wall to cooperate with upper portions of said side and front walls in forming an opening to a display compartment within said case, refrigerating elements in the display compartment having upper portions terminating substantially at the surface level of goods to be contained in said display compartment, and an auxiliary refrigerating element extending along the rear wall and having a substantially flat readily conductive surface inclined upwardly from the rear wall substantially at the level of said upper portions of the refrigerating elements and terminating substantially at the terminal edge of said top wall in direct contact by exterior air that enters the open top of the compartment to relieve said entering air of moisture in the form of frost on said surface of the refrigerating element for diverting the dried air downwardly over said surface of the goods for circulation within said open top by convection currents, said surface of the auxiliary refrigerating element being arranged relatively to a horizontal plane through said case for absorbing heat reflected from the surface of goods in said plane.

2. A display case having front, rear and end walls and a top wall terminating inwardly from the rear wall in the direction of the front wall to cooperate with upper portions of said side and front walls in forming an opening to a display

compartment within said case, refrigerating elements in the display compartment having upper portions terminating substantially at the surface level of goods to be contained in said display compartment, an auxiliary refrigerating element extending along the rear wall and having a substantially flat readily conductive surface inclined upwardly from the rear wall substantially at the level of said upper portions of the refrigerating elements and terminating substantially at the terminal edge of said top wall in direct contact by exterior air that enters the open top of the compartment to relieve said entering air of moisture in the form of frost on said surface of the refrigerating element and for diverting the dried air downwardly over said surface of the goods for circulation within said open top by convection currents, said surface of the auxiliary refrigerating element being arranged relatively to

a horizontal plane through said case for absorbing heat reflected from the surface of goods in said plane, said auxiliary refrigerating element forming with said top and rear wall a closed space, and a heating element in said space to heat the auxiliary refrigerating element to melt the frost therefrom.

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