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A. E. KNAPP

1,979,625

REFRIGERATED DISPLAY CASE

Filed Sept. 18, 1930

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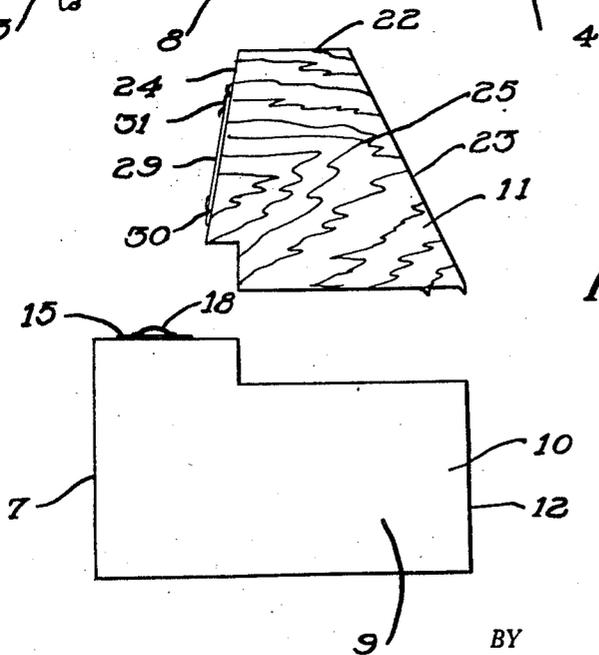
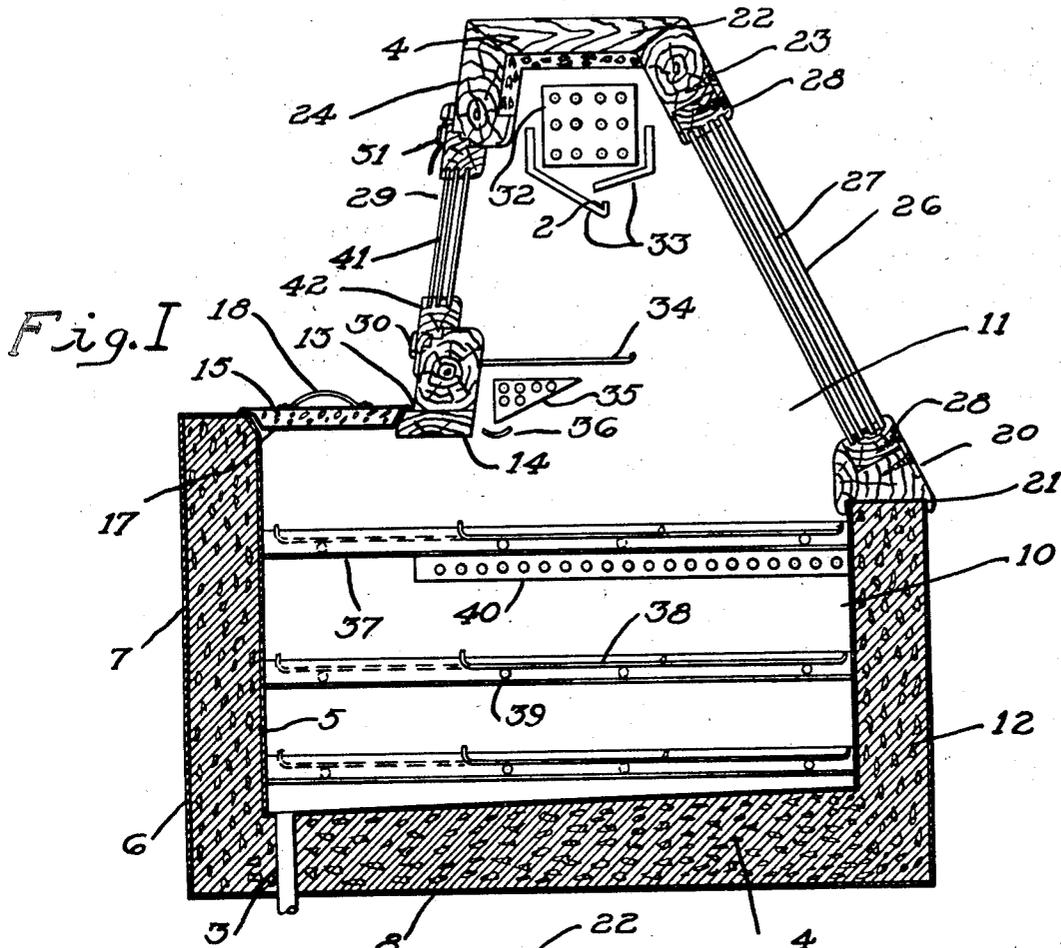


Fig. II

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2 Sheets-Sheet 2

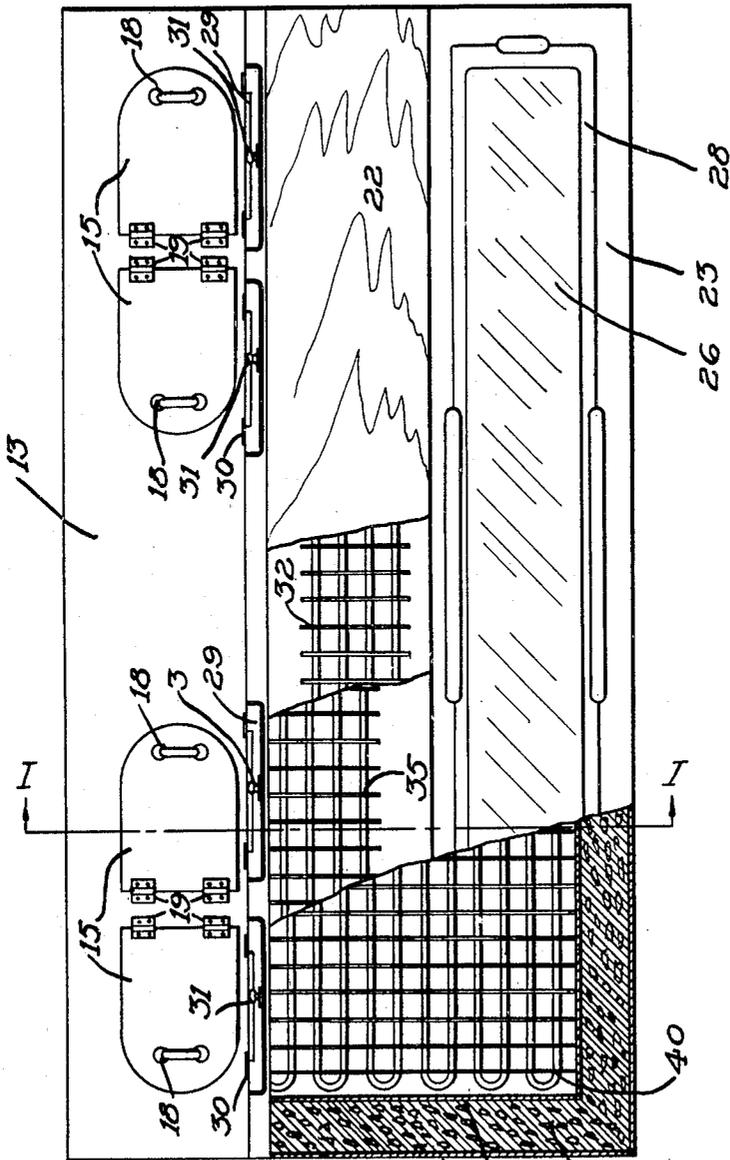


Fig. III

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# UNITED STATES PATENT OFFICE

1,979,625

## REFRIGERATED DISPLAY CASE

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Application September 18, 1930, Serial No. 482,732

5 Claims. (Cl. 62—89.5)

This invention relates to refrigerating apparatus and more particularly to refrigerated display cases.

Heretofore, the primary function of refrigerated display cases has been to preserve foods and other supplies adversely affected by atmospheric temperature, at a suitable low temperature normally considerably above a freezing temperature. Recently a new art of preserving and merchandising food has become popular. This art is based upon freezing certain foods and keeping them in that condition until delivered to the ultimate consumer. A need has therefore arisen for display cases adapted to preserve such supplies in a frozen condition. At the same time, there still exists a need for refrigerated display cases to store and display foods which should be kept at a normally refrigerated temperature, that is, a temperature somewhat above freezing.

The principal object of this invention is to provide a refrigerated display case adapted to store and display not only normally refrigerated foods but also frozen supplies.

Another object of the invention is the provision of a refrigerated display case adapted to be manufactured in two parts, which parts can be readily assembled or disassembled.

Still a further object of the invention is to provide a refrigerated display case designed to be maintained at below freezing temperature which will not permit a rapid loss of the cold air from the inside when supplies are being placed therein or taken therefrom.

Another object of the invention is the provision of a plurality of vertically spaced storage shelves in a refrigerated display case, each of which is accessible from an opening above the shelves.

Other objects of the invention, more or less ancillary or incidental to the foregoing, will appear from the following description in connection with the accompanying drawings.

For a better understanding of the invention reference may now be had to the attached drawings, in which:

Figure 1 is a cross section taken on line 1, 1 of Figure 3 of a refrigerated display case embodying this invention;

Figure 2 is an end view in elevation of the refrigerated display case shown in Figure 1 with the top and bottom sections separated;

Figure 3 is a plan view of the case shown in Figures 1 and 2, with parts broken away.

The display case embodying this invention consists of a base 10 and a top section 11. The base is defined by a bottom wall 8, side walls 9,

front wall 12, rear wall 7, and a partial top wall 13. The bottom wall and side walls are provided with an inner lining 5 and an outer casing 6. Suitable insulation material 4 is disposed between the inner lining and the outer casing. The upper surface of the bottom wall 8 inclines downwardly from the front wall to the rear wall and is provided adjacent the rear wall with an opening through which a drain pipe 3 extends. The top section 11 is provided with suitable insulated end walls 25, a rearwardly extending front wall 23, a top wall 22, and a forwardly extending rear wall 24. The front wall 23 is provided with a window section 26 consisting of a plurality of spaced plates of glass 27 sealed about their edges in a frame 28. The inner surface of the top wall 22 and the upper portion of the inner surface of the rear wall 24 are provided with suitable insulation 4.

The upper extremity of the front wall 12, the lateral frame member 14 carried on the forward edge of the partial top wall 13, and the upper extremities of the side walls 9 of the base 10 are of suitable construction to securely engage the lower extremities of the corresponding walls of the top section 11. The lower extremity 20 of the front wall 23 of the top section 11 is provided with a lateral groove 21 adapted to receive the upper extremity of the front wall 12 of the base 10. Suitable securing means, not shown, which may be of any standard construction, are used to removably secure the lower extremities of the walls of the top section to the upper extremities of the walls of the base.

The provision for removably attaching the top section to the base not only greatly facilitates the transportation of applicant's display case but also effects a considerable saving in the construction thereof. Other advantages, such as accessibility for repairs, are also incidental to this type of construction.

Access to the interior of the upper portion of the display case is provided by means of doors 29, positioned in the rear wall 24 of the top section 11. The doors consist of a plurality of plates of glass 41 sealed about their edges in a door frame 42. Hinges 30 operatively connect the doors 29 to the lower portion of the rear wall 24 and permit the opening of the doors rearwardly and downwardly. The upper edges of the doors and the rear wall 24 adjacent thereto are provided with suitable latch equipment 31 for securing the doors in closed position. Access to the interior of the lower part of the display case is provided by means of openings 17 in the partial top wall

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13. Suitably insulated doors 15, secured to the top wall 13 by means of hinges 19, are adapted to close the openings 17. Handles 18, by which the doors 15 may be raised and swung back upon their hinges, are carried on the upper surface of the doors on the edges thereof remote from the hinges.

One of the most common causes for inefficient operation of refrigerated display cases is the loss of cold air from the inside of the case when the doors are opened for the insertion or withdrawal of supplies kept therein. I have utilized the well known fact that cold air is heavier than warm air, in overcoming this loss. This has been accomplished by so positioning the doors that the air inside the case would have to rise in order to escape through the door openings. The doors 29 are hinged at their lower edges, so that when partially opened for normal use they will act as a baffle or obstruction to keep the air from tumbling out of the case. The doors 15 are located in a horizontal wall so that the heavier air inside the case has no opportunity to escape through the openings made when they are swung back upon their hinges. This provision for keeping the cold air within the case also keeps the warm air out thereby preventing clouding of the windows of the case resulting from condensation when warm air strikes their cold surface.

The base 10 is provided at intervals throughout its length with a set of three vertically spaced angle irons or rails 37 extending from the front wall to the rear wall thereof. The angle irons 37 are adapted to support, on their upper surface, shelves 38 equipped with rollers 39. The shelves 38 are of such proportions that when their forward edges are against the inner side of the front wall 12 their rear edges are remote from the rear wall 7. Access may be had to each of the shelves through the opening 17 by sliding the shelves along the angle irons 37 toward the rear wall 7. This arrangement permits the convenient utilization of a greater amount of storage space within the display case than would be possible in a case of similar construction if fixed shelves were used. The upper portion or the top section of the display case is equipped with a shelf 34 secured to the rear wall 24 below the doors 29. The shelf 34, disposed in the upper portion of the display case, and the top series of slidable shelves 38, disposed in the base 10, expose their contents to the view of prospective purchasers through the window 26. The supplies displayed on the top series of shelves 38 may be replenished when necessary from supplies stored on the lower shelves without exposing the supplies to the warmer outside air.

Refrigerant evaporators 32, 35 and 40 are disposed in the uppermost extremity of the display case, beneath the shelf 34 adjacent the rear wall of the top section 11, and beneath the topmost angle iron 37, respectively. Baffle plates 33 are positioned at the lower sides and beneath the evaporator 32 to direct the circulation of air about the evaporator. The lower extremity of one of the baffle plates 33 is folded back upon itself to form a trough 2 communicating with a waste disposal pipe for carrying off the moisture resulting from the defrosting of the evaporator 32. Similarly a baffle plate 36 is positioned below the evaporator 35 to influence the direction of the air circulating about that evaporator. The evaporator 40 may be secured to the lower surface of the uppermost angle iron 37. Each of the evaporators 32, 35 and 40 extend through-

out the entire length of the display case. Three separate evaporators are shown disposed in the display case presented in the drawings made a part of this specification, but it should be understood that the purposes of this invention could be equally well served by eliminating the evaporator 35 or by the installation of additional evaporators. All of the evaporators are operatively connected to a refrigerant compressor-condenser structure, not shown, by means of suitable refrigerant conduits comprising a suction line and a liquid line.

Although the evaporators herein described are designed to be operated from a single compressor-condenser structure, it is to be understood that they may also be operated by separate compressor-condenser structures.

Suitable well known valve structures are associated with the refrigerant lines connecting the evaporators to the compressor-condenser apparatus, for causing the refrigerant to evaporate at different temperatures in the respective evaporators mentioned above.

The evaporator 32 disposed in the upper portion of the case is designed to operate between wide temperature limits that are relatively high, and to maintain the air adjacent thereto at a temperature somewhat above the freezing point. The evaporators 35 and 40 are designed to operate between narrow temperature limits and to maintain the air adjacent thereto at a temperature considerably below the freezing point. The base section 10 of the case is adapted to be used for the storage and display of the new frozen foods while supplies required to be kept at normally refrigerated temperatures may be displayed on the shelf 34 in the top section 11.

It is essential to the satisfactory preservation of the frozen foods that they be kept in a frozen state until ready for use. A refrigerated display case suitable for the preservation of such foods must therefore be kept constantly at a temperature below the freezing point. Considerable difficulty has been experienced heretofore in keeping display cases at a constant low temperature because the evaporators used in such cases acquire a deposit of frost on their surfaces as a result of the condensation of moisture from the air. As this frost accumulates through the addition of warm air from time to time, it impairs the efficiency of the evaporator to such an extent that ultimately it becomes necessary to interrupt the operation of the refrigerating apparatus to permit the frost to melt. While the evaporators are being defrosted, the temperature within the case of course rises to a relatively high value.

Applicant has arranged the evaporators in his display case in such a manner that it is not necessary to defrost those in the low temperature compartment. This is made possible by the fact that the air confined in the display case at a given time does not contain enough moisture when deposited on the evaporators in the form of frost to materially effect their efficiency. Applicant's case is so constructed that once a low temperature is obtained in the base section and the moisture contained in that section is deposited on the evaporators 35 and 40, no further substantial amount of warm air or moisture laden air is admitted thereto so long as the refrigerating apparatus continues to operate even though the doors 15 are frequently opened. Any warm air or moisture laden air that does get into the box through leakage or through the doors will rise to the top of the case and give up its moisture to

the evaporator 32 in the form of frost deposited on the surface thereof. Inasmuch as this evaporator operates between temperature limits that are relatively high, it will be defrosted on each off cycle and the moisture resulting therefrom will be carried away by the trough 2 formed at the lower extremity of the baffle 33.

It will be apparent from the foregoing description that the evaporator 40 will keep the air confined beneath it at a relatively low temperature, and that that air will circulate beneath the evaporator but will not have an opportunity to rise above it. The refrigerating surfaces of the evaporator 40, including the tubes and fins, are juxtaposed and cooperate with the shelf thereabove to form in effect a wall or barrier for resisting convection of air currents between the compartments or sections of the case. Likewise, the evaporator 35 will cause the air adjacent thereto to circulate beneath it and permit but little to pass above it, while the evaporator 32 will supply the necessary temperature difference for the circulation of warmer air in the top section 11. The evaporator 32 will also collect on its surface in the form of frost, the excess moisture for the entire case, thereby eliminating the necessity for frequently defrosting the evaporators 35 and 40.

It will be apparent to those skilled in the art that the structure disclosed herein is merely illustrative of the invention and that many modifications and changes may be made in such structure without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. In a refrigerated display case having an opening in the top wall thereof, a plurality of vertically spaced shelves slidably positioned in said case beneath said opening, horizontally positioned heat absorbing means disposed directly below one of said shelves and above another of said shelves, and closure means for said opening.

2. A refrigerated display case comprising an insulated base, a top section provided with a transparent wall, a plurality of vertically spaced shelves disposed in said base section and being arranged to be moved laterally to expose the upper surface of a lower shelf, and horizontally posi-

tioned heat absorbing means disposed between two of said shelves.

3. A refrigerated display and storage case having storage and display compartments arranged one above the other and in open communication with each other, a refrigerant evaporator disposed in the upper compartment for cooling articles stored in said compartment at temperatures above the freezing point of water, a refrigerant evaporator disposed immediately below the opening between said compartment for cooling articles stored therebelow at temperatures below the freezing point of water, a shelf disposed in said lower compartment for supporting articles immediately above said latter evaporator, said upper compartment being provided with a transparent wall so that the contents of the upper compartment and the articles stored on said shelf are visible through said opening, and a refrigerant evaporator disposed directly over at least a portion of said shelf for cooling the air therebelow at temperatures below the freezing point of water, said second named evaporator preventing any of the air thereabove from passing into contact with articles stored therebelow before first contacting with said evaporator.

4. A refrigerated case having food storage compartments arranged adjacent and in open communication with each other, means for cooling said compartments to different temperatures including an evaporator disposed in one of said compartments, and means including a second evaporator having juxtaposed refrigerating surfaces disposed immediately adjacent the opening between said compartments, said last means forming a barrier for resisting convection of air between said compartments.

5. A refrigerated case having food storage compartments arranged one above the other and in open communication with each other, means for cooling said compartments to different temperatures including an evaporator disposed in the upper compartment, and means including a second evaporator having juxtaposed refrigerating surfaces disposed immediately adjacent the opening between said compartments, said last means forming a barrier for resisting convection of air between said compartments.

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