Oct. 29, 1940. A. W. BIRELEY 2,219,912

REFRIGERATED DISPLAY CASE

Filed June 15, 1938 2 Sheets-Sheet 1

Fig. 1.

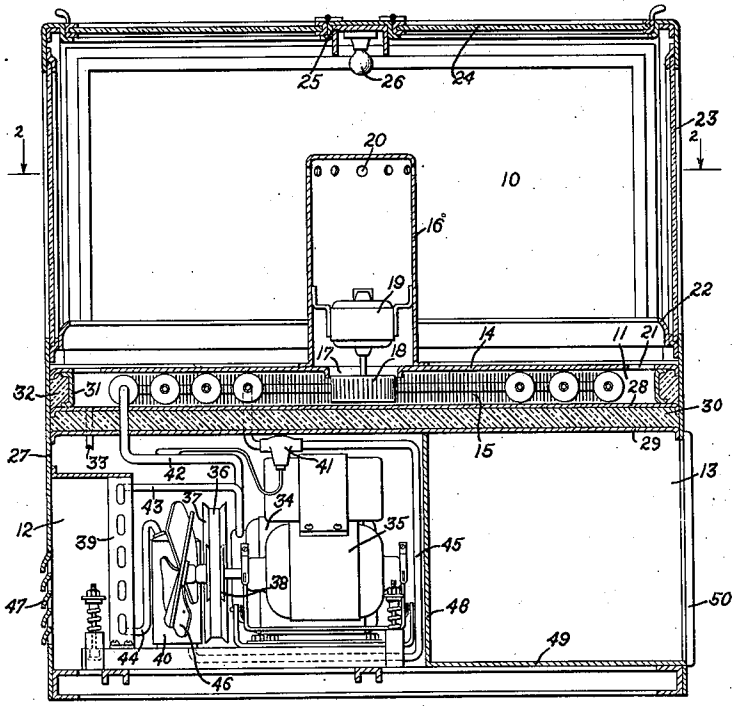
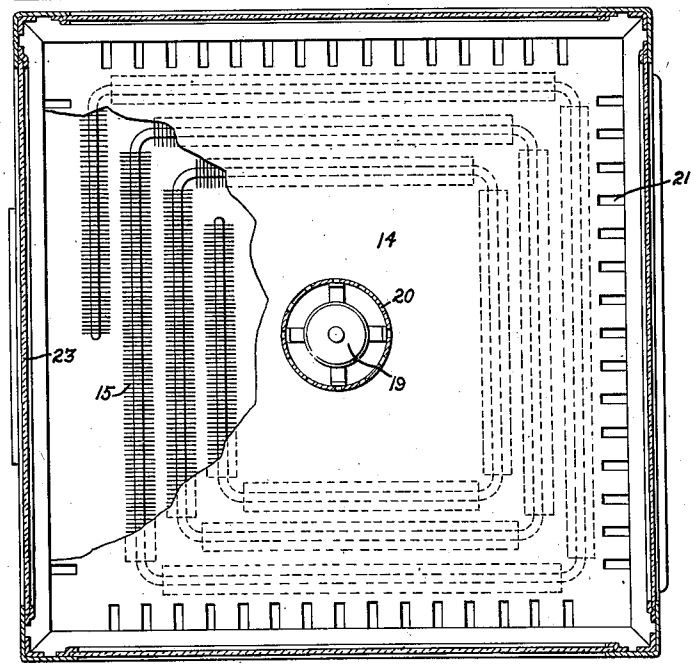


Fig. 2.



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Fig. 3.

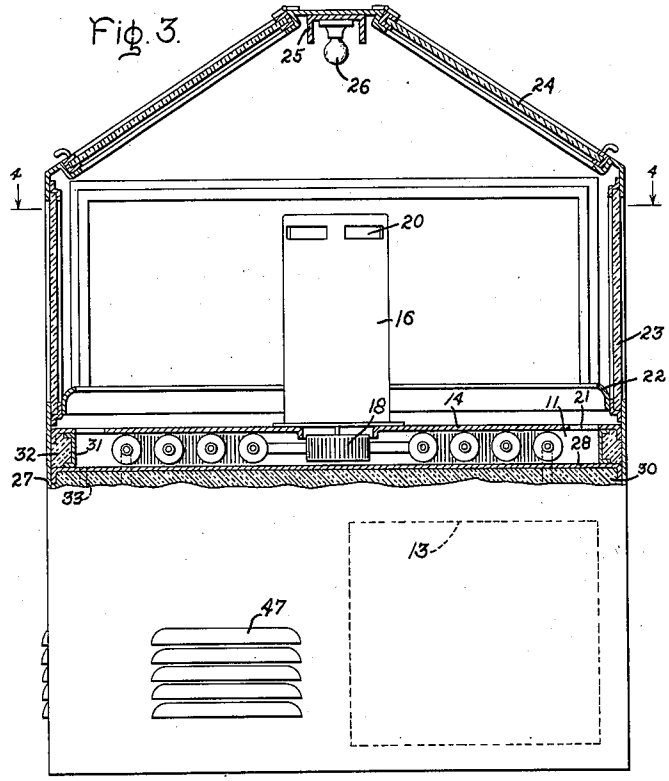
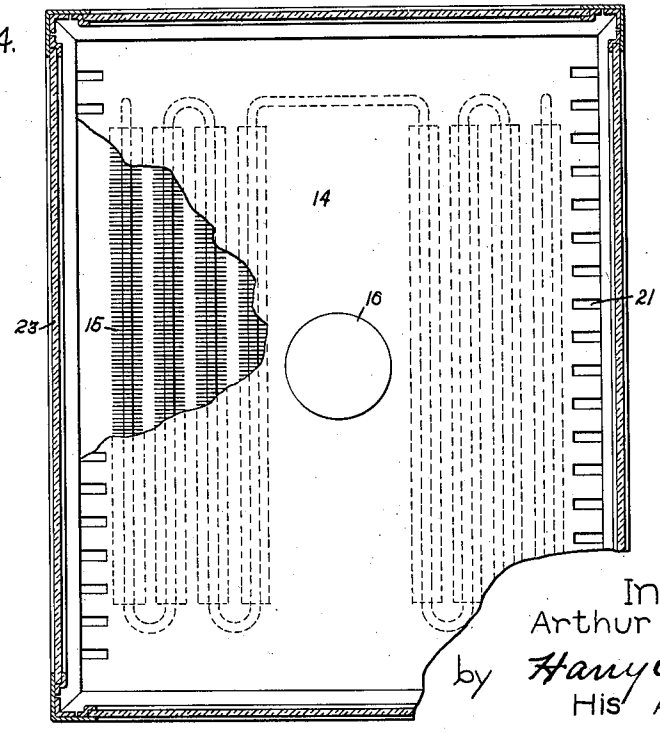


Fig. 4.



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Patented Oct. 29, 1940 2,219,912

UNITED STATES PATENT OFFICE

2,219,912

REFRIGERATED DISPLAY CASE

Arthur W. Bireley, Fort Wayne, Ind., assignor to General Electric Company, a corporation of New York

Application June 15, 1938, Serial No. 213,894

9 Claims. (Cl. 62—89.5)

My invention relates to a display case and more particularly to the refrigeration of an island type display case.

It is an object of my invention to provide an improved apparatus for the display of products requiring refrigeration.

It is a further object of my invention to provide an improved apparatus for circulating air through a display cabinet.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a side view, partly in section, of an embodiment of my invention. Fig. 2 is a plan view, partly in section, of the embodiment illustrated in Fig. 1. Fig. 3 is a side view, partly in section, of an alternative form of the invention illustrated in Figs. 1 and 2, and Fig. 4 is a plan view, partly in section, of the display case illustrated in Fig. 3.

In accordance with my invention I have provided a refrigerated display case including a display chamber 10, a cooling chamber 11, a refrigerating machinery compartment 12, and a storage compartment 13. A substantially horizontal baffle or wall 14 separates the display chamber 10 and the cooling chamber 11. An evaporator or cooling coil 15 is provided in the cooling chamber 11. For most efficient cooling it is desirable to withdraw the warm air which naturally rises into the upper portion of the display case and to replace the air withdrawn with cooler air. In order to accomplish this purpose I have provided a conduit 16 extending from an opening 17 in the baffle 14 into the upper portion of the display chamber 10. In order to insure a positive circulation of air I have provided a centrifugal fan 18 driven by a motor 19. When the fan is in operation warm air is drawn into the conduit 16 through a plurality of openings 20 in the upper end of the conduit 16. The air exhausted by the fan 18 is directed outwardly in all directions from the fan across the evaporator 15 and the under side of the baffle 14. The cooled air is returned to the display chamber 10 through openings 21 around the outer edges of the baffle 14. A deflecting baffle 22 is arranged above the openings 21 in order to direct the air flow across the articles on display. The conduit 16 may be located substantially centrally of the baffle 14 with the openings 21 along the edges of the baffle 14, as shown in Fig. 2, in order to obtain an equal distribution of cold air which it is well recognized is a difficult problem in refrigerated showcases although substantial benefits will be obtained so long as the inlet is spaced inwardly from the marginal edges of baffle 14.

In the embodiment of my invention illustrated in Figs. 1 and 2, I have provided display chamber 10 with transparent panels 23 in the side walls and transparent panel 24 on the top wall thereof. Preferably, the material used for the panels is glass supported in a suitable frame. I have illustrated the doors in the top wall as being hinged to a central channel member 25 but obviously the doors may be arranged in any desired fashion for ready access to the interior of the display case. For example, siliding doors may be used or even doors which may be lifted out of the case. In order to provide illumination for the interior of the case, I provide lamp 26.

The refrigerating machinery compartment 12 and storage compartment 13 are contained within the shell 27 beneath cooling chamber 11. A heat insulated wall separates the refrigerating machinery and storage compartments from the cooling chamber 11. This wall comprises plates 28 and 29 suitably joined to shell 27 and separated by heat insulation 30. Baffle plate 14 is suitably secured at the outer edges to the shell 27. In order to restrict conduction of heat from the cooling chamber through the shell 27, I have provided an inner shell 31 extending between plate 28 and baffle 14 separated from shell 27 by heat insulation 32.

Conduit 16 extends above the food supporting surface of plate 14 into the display chamber 10 a sufficient distance to reach the warm air which rises to the upper portion of the display chamber. I have shown a plurality of openings 20 around the upper end of conduit 16 in order to permit heated air to be drawn into the conduit from all directions. While I have shown circular openings in Fig. 1 and slots in Fig. 3, it will be obvious that any shape of opening may be provided and, if desired, the conduit can be left entirely open at the upper end. The driving motor 19 for the fan 18 is supported in the conduit 16 in any suitable manner. Evaporator 15 comprises, in the embodiment shown in Figs. 1 and 2, a finned tube arranged in a substantially rectangular coil.

The openings 21 for the return of the cooled air

to the display chamber 10 may take the form of slots on all sides of the baffle plate 14 as shown in Fig. 2. Openings of any shape and spacing may be employed, however. For example, a single rectangular opening may be provided along substantially the entire length of each edge of the baffle, or, if desired, the baffle plate could be spaced apart from the shell 27 around its entire perimeter being supported from the shell 27 by separate bracket members.

The path of circulated air has been briefly described above. The operation of the fan decreases the air pressure in the conduit 16 thereby causing air in the upper portion of chamber 10 to flow into the conduit 16 through openings 20 in the upper end thereof. The flow is then downwardly across the motor 19, thereby cooling the motor, to the fan 18. As previously described, the fan 18 operates to force the circulating air through cooling chamber 11 in all directions in contact with the finned tubes constituting the cooling coil 15. The air circulated in chamber 11 is thus cooled and, since no heat insulation is inserted between baffle 14 and chamber 11, the baffle is cooled also, by the flow of air across its lower side. The cooled air flows through the openings 21 back into the chamber 10. It should be noted that the deflecting member 22 not only directs the return stream of cooled air across the articles on display but it also serves to direct the current of air towards the upper end of conduit 16 and it also deflects the cooled air away from the glass panels 23 thereby minimizing condensation of moisture on the glass. In order to dispose of any condensate which may have resulted from either defrosting the evaporator or from the normal operation of the apparatus I construct plate 28 in such a way that it slopes toward a drain 33.

I have provided refrigerating apparatus including a compressor 34 driven by a motor 35 by means of a belt 36 and pulleys 37 and 38. I have also shown a condenser 39, a liquid receiver 40, and an expansion valve 41. Refrigerant vapor is withdrawn from evaporator 15 through conduit 42 by the compressor 34. The exhaust from the compressor 34 is conducted to the condenser 39 through a conduit 43. The condensed refrigerant then flows to the liquid receiver 40 through a conduit 44 and flows back to the evaporator through a conduit 45 and the expansion valve 41. The condenser is air-cooled and a fan 46 is provided to increase the cooling capacity. The refrigerating compartment is open at the bottom so that air is drawn into the refrigerating compartment by the fan, blown across the condenser, and exhausted to the atmosphere through louvers 47 in the side wall of the casing 27.

All of the space below the display compartment which is not occupied by the refrigerating machinery is utilized for storage space. When so used the storage compartment is enclosed by a wall 48 and a shell 27. A bottom wall 49 is provided to complete the storage compartment enclosure. A door 50 is provided in one wall of the shell 27 to provide access to the storage compartment. If desired, this storage compartment 13 may be refrigerated, in which case an evaporator coil, not shown, would be placed within the storage compartment 13 in series with the evaporator coil 15.

In Figs. 3 and 4 I have shown a modification of the above embodiment of my invention. As illustrated in Fig. 4, the display case is made rectangular in shape. Furthermore, the slots or openings 21 are provided on only two edges of the baffle plate 14 so that the return air is circulated in only two directions. The equivalent of air circulation in four directions is obtained by drawing air into the vertical conduit 16 from all sides of the conduit. Instead of the rectangular coil arrangement illustrated in Fig. 2, the evaporator coils illustrated in Fig. 4 are placed lengthwise of the case on each side of the fan 18. The top of the case illustrated in Fig. 3 is made sloping thus making it impossible to place objects on the door panels 24 and to make the doors more readily accessible. The display case shown in Figs. 3 and 4 is in all other respects similar to that shown in connection with Figs. 1 and 2.

While I have shown and described my invention as applied to a refrigerated display cabinet, I do not desire my invention to be limited to the particular construction shown and described and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. In a refrigerated display counter, an upper portion having transparent side and top walls, a substantially horizontal baffle member in said upper portion constructed from heat conducting material dividing said portion into a display chamber and a cooling chamber, a cooling coil extending substantially throughout the extent of said cooling chamber, a refrigerating machinery compartment beneath said cooling chamber, a storage chamber beneath said cooling chamber, a substantially vertical conduit extending through an opening in said baffle into the upper portion of said display chamber, said baffle having outlet openings in at least two edges thereof, a motor within said conduit, blower means driven by said motor to continuously circulate air from said chamber downwardly through said conduit, across said cooling coil and across the under side of said baffle and through said openings back into said display chamber, and means to deflect the cooled air away from said walls of said chamber across the articles on display.

2. In a refrigerated display counter, an upper portion having transparent side and top walls, a substantially horizontal baffle member in said upper portion constructed from heat conducting material dividing said portion into a display chamber and a cooling chamber, a cooling coil extending substantially throughout the extent of said cooling chamber, a refrigerating machinery compartment beneath said cooling chamber, a storage chamber beneath said cooling chamber and adjacent to said machinery compartment, a substantially vertical conduit extending through an opening in said baffle into the upper portion of said display chamber, said conduit having a plurality of openings near the top thereof around substantially the entire circumference of said conduit, said baffle having a plurality of slots in at least two edges thereof, a motor within said conduit, blower means driven by said motor to continuously circulate air from said chamber downwardly through said conduit, across said cooling coil and across the under side of said baffle and through said slots back into said display chamber, and means to deflect the cooled air away from said walls of said display chamber across the articles on display.

3. In a refrigerated display case, a display

chamber, a cooling chamber, a wall separating said chambers, a cooling coil extending substantially throughout the extent of said cooling chamber, said wall having an inlet passage therethrough, a substantially vertical conduit extending from said inlet passage into the upper portion of said display chamber, said conduit having a plurality of openings near the top thereof, means located near the lower end of said conduit to induce the circulation of air, said wall having slots in at least two opposite edges thereof, said means causing warm air to be withdrawn from the upper portion of said display chamber through said conduit into said cooling chamber and into contact with said cooling coil, said means causing cooled air to be returned through said slots into said display chamber, and means to deflect the cooled air away from the walls of said display chamber and toward the upper end of said conduit whereby condensation of moisture on said walls of said display chamber is minimized.

4. In a refrigerated display case, the combination of a substantially horizontal baffle member dividing said case into a display chamber and a cooling chamber, cooling means in said cooling chamber, said baffle member being provided with an opening located substantially centrally of said baffle member, said member being imperforate except for said opening, said baffle member also serving as a food supporting surface, means including a blower for conducting air around an edge of said baffle member in a circuit including said opening and said cooling chamber.

5. In a refrigerated display case, the combination of a substantially horizontal baffle member dividing said case into a display chamber and a cooling chamber, cooling means in said cooling chamber, said member being provided with an opening substantially centrally of said member and an opening at an edge of said member, said member being imperforate except for said openings, said baffle member also serving as a food supporting surface, and means including a blower for drawing air from said display chamber through one of said openings, circulating said air through said cooling chamber and in contact with said cooling means and returning the cooled air to said display chamber through the other of said openings.

6. In a refrigerated display case, the combination of a substantially horizontal baffle member dividing said case into a display chamber and a cooling chamber, cooling means in said cooling chamber, said baffle member being provided with an inlet opening located substantially centrally of said baffle member, said member being imperforate except for said opening, said baffle member also serving as a food supporting surface, means including a blower for drawing air from said display chamber through said inlet and circulating said air through said cooling chamber in contact with said cooling means and toward an edge of said baffle member, and returning the cooled air to said display chamber around an edge of said baffle member.

7. In a refrigerated display case, the combination of a substantially horizontal baffle member dividing said case into a display chamber and a cooling chamber, cooling means in said cooling chamber, said member being provided with an inlet opening substantially centrally of said member and an outlet opening at an edge of said member, said member being imperforate except for said openings, said baffle member also serving as a food supporting surface, and means including a blower for drawing air from said display chamber through said inlet opening, circulating said air through said cooling chamber and in contact with said cooling means toward said edge of said member and returning the cooled air to said display chamber through said outlet opening.

8. In a refrigerated display case, a substantially horizontal baffle member formed of relatively good heat conducting material dividing said case into a display chamber and a cooling chamber, a cooling coil in said cooling chamber, a conduit in communication with an opening in said baffle member into the upper portion of said display chamber, said member having an outlet opening at an edge thereof, blower means for circulating air from said display chamber downwardly through said conduit, across said cooling coil and across the under side of said member and through said outlet opening back into said display chamber.

9. In a refrigerated display case, the combination of a substantially horizontal baffle member dividing said case into a display chamber and a cooling chamber, cooling means in said cooling chamber, said baffle member being provided with an opening located substantially centrally of said baffle member, said member being imperforate except for said opening, said baffle member also serving as a food supporting surface, a conduit extending from said opening into the upper portion of said display chamber, and means including a blower for conducting air around an edge of said baffle member in a circuit including said conduit and said cooling chamber.

ARTHUR W. BIRELEY.