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REFRIGERATED DISPLAY CASE

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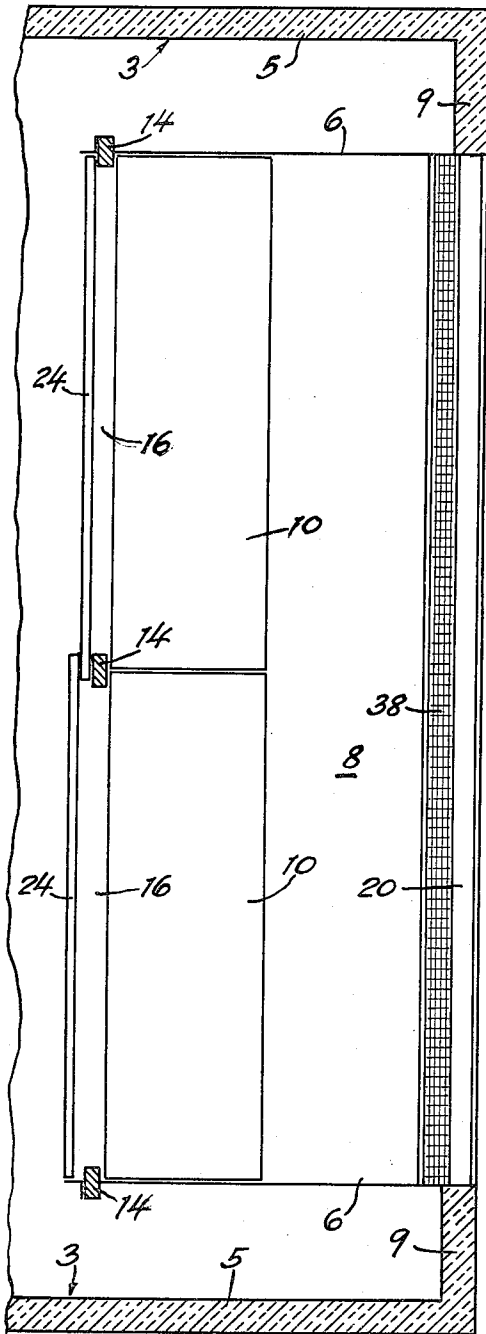


Fig. 2.

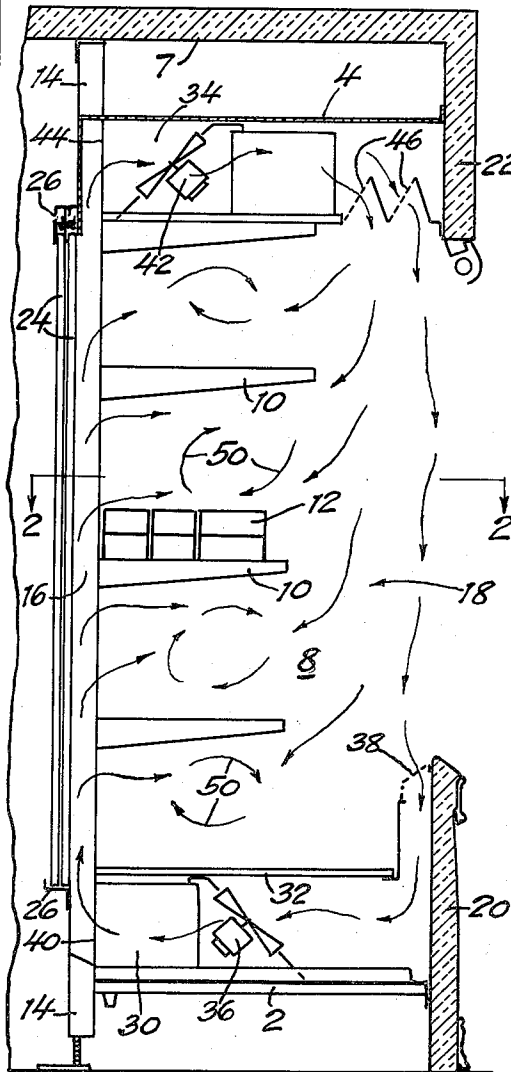


Fig. 1. INVENTOR.

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1

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REFRIGERATED DISPLAY CASE

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This invention relates to refrigerated display cases of the type which have a plurality of shelves therein and are open at the front to permit customers to have ready access to the articles on the shelves. The present invention is particularly directed to display cases of the character described which are also provided with a door or doors at the rear of the case to permit clerks to replenish the articles on the shelves from the rear of the case without interfering with customers in front of the case.

It has been suggested heretofore that a refrigerated display case which is open at the top might be provided with a rear door for filling the display space. However, such open top cases afford only limited area for display of the articles being refrigerated. Moreover, the construction is such that when the door is opened, air is directed across the door and passes upward out of the open top of the case and is not recirculated through the display space. Thus, much of the refrigerated air is lost and it is not possible to maintain the articles at a constant low temperature when the door is open.

It has also been suggested that display cases which are open at the front and have several shelves for the display of articles might be provided with doors at the rear which open into a refrigerated chamber such as a "walk-in cooler." However, in such cases, the refrigerated air is circulated through both the open display space and the refrigerated chamber or cooler. It is found in practice that such arrangements are not always desirable or satisfactory in operation since the refrigeration requirements of the display case and the cooler often differ considerably.

In accordance with the present invention, a new type of self-service display case is provided which is open at the front for access to customers and is provided with one or more doors at the rear for access to the case by clerks and other authorized persons. However, the display case is designed and constructed so that loss of refrigeration will not occur when the door is opened. Moreover, the operation of the display case is independent of any storage case and functions as a self contained unit.

Display cases embodying the present invention are provided with air curtains located adjacent the rear door for directing air across the opening which is normally closed by the door so that when the door is opened, the refrigerated air within the display case cannot pour out of the case but continues to circulate through the display space in a normal manner so that the articles on display may be continuously maintained at a substantially constant temperature whether the door is open or not.

In the preferred embodiment of the invention herein described, the display case is, in fact, provided with two oppositely directed air curtains, one of which serves to direct air across the open front of the case in a manner to prevent or diminish the flow of warm air inward at the front of the case and the other serves to direct air across the rear portion of the case adjacent the rear door so as to prevent or diminish the flow of air either into or out of the display space when the rear door is opened. The oppositely directed air curtains cooperate to set up a rotary movement of the refrigerated air between the front and rear air curtains and about the articles on shelves within the case assuring effective and substantially uni-

2

form refrigeration of the articles at all times whether the rear door of the case is opened or not.

Accordingly, the principal object of the present invention is to provide a self-service display case which is normally open at the front for access to customers and is provided with one or more doors at the rear thereof with means located adjacent said doors for preventing or diminishing the flow of air into and out of the case when the door is opened.

Another object of the invention is to provide a refrigerated display case which is open for access at the front with oppositely directed air curtains at the front and rear of the display space so as to assure substantially uniform refrigeration of articles located on shelves in the display space even when an access door at the rear of the case is opened.

These and other objects and features of the present invention will appear from the following description thereof wherein reference is made to the figures of the accompanying drawing.

In the drawing:

FIG. 1 is a vertical sectional view through a typical form of refrigerated display case embodying the present invention; and

FIG. 2 is a horizontal sectional view through the display case of FIG. 1 taken on the line 2—2 thereof.

In that form of the invention chosen for purposes of illustration in the drawing, the display case has a bottom 2, a top 4 and end walls 6. As shown, the display case may be embodied in a refrigerated chamber or walk-in cooler indicated at 3 and having insulated end walls 5 and an insulated top 7. Insulated panels 9 extend inward from the end walls 5 of the chamber 3 to the end walls 6 of the display case. In this way, the display case is, in effect, set into the refrigerated chamber so that the top, bottom and end walls of the display case can be formed of metal panels and need not be provided with further insulation.

The display space 8 within the case is provided with one or more horizontally extending shelves 10 arranged in vertically spaced relation to receive the articles 12 to be refrigerated. The shelves 10 are supported by vertically extending supporting members 14 located at the rear of the case and spaced apart horizontally so as to cooperate in forming a plurality of vertically extending air conducting flues 16 at the rear of the shelves 10.

The front of the case is provided with an access opening 18 through which customers may reach to help themselves to the articles 12 on the shelves 10. The front of the case has a lower insulated front wall portion 20 below the access opening 18 and an upper insulated front wall portion 22 above the opening 18. The rear of the case is provided with one or more doors 24 which as shown are sliding doors movable along tracks 26 positioned approximately level with the upper and lower portions of the display space 8.

The display space 8 is refrigerated by suitable refrigerating means. As shown, one refrigerating unit 30 is located in the lower portion of the case below a lower article support 32 and behind the lower front wall portion 20 whereas a second refrigerating unit 34 is located above the display space 8 and at the rear of the upper front wall portion 22. A blower 36 is associated with the lower refrigerating unit 30 and serves to draw air downward through the air inlet throat 38 located directly behind the upper edge of the lower front wall portion 20. Openings also may be formed in the lower article support 32 if desired to allow air to pass therethrough to the lower refrigerating unit 30. The air refrigerated by unit 30 is directed upwardly through an air outlet 40 adjacent the lower edge of the rear doors 24 and through

the vertically extending flues 16 at the rear of the shelves 10.

The upper refrigerating unit 34 is also provided with a blower as shown at 42. This blower serves to draw air upward through the flues 16 to an air inlet 44 located adjacent the upper edge of the door 24 and directs the air over the upper refrigerating unit 34. The air refrigerated by the unit 34 flows forward and downward through one or more air outlets 46 behind the upper front wall portion 22 of the display case.

The construction thus provided serves to establish two air curtains which flow in the opposite direction at opposite sides of the display space 8. The front air curtain consists of the stream of air which is directed downwardly adjacent the front of the shelves 10 and across the access opening 18 from the air outlets 46 adjacent the top of said opening to the air inlet throat 38 adjacent the bottom of said opening. The rear air curtain consists of the streams of air directed upwardly through the flues 16 at the rear of the shelves 10 from the air outlet 40 adjacent the lower edge of the door 24 to the air inlet 44 adjacent the upper edge of the door 24.

The flues 16 are in open and direct communication with the spaces between the shelves 10. This not only permits free access to the shelves from the rear of the case when the door 24 is open, but also causes a portion of the air from the rear air curtain to flow upwardly and forwardly from the flues 16 into contact with the lower surfaces of the shelves 10. At the same time a portion of the air from the front air curtain flows inwardly and downwardly into contact with the articles 12 supported on the upper surfaces of the shelves 10. The portions of the air from the oppositely flowing air curtains thus cooperate to set up independent rotating currents of air 50 located between each pair of the vertically spaced shelves 10. These currents create increased turbulence in the air which actually contacts the articles on the shelves and the shelves themselves whereby the most effective heat transfer to the articles is accomplished and they are maintained at a constant temperature whether the door 24 is open or not.

When the door 24 is open, the clerk at the rear of the case has the same unobstructed access to the shelves 10 as the customers at the front of the case. At the same time, the rear air curtain acts in the same manner as the front air curtain to prevent the external air, whether colder or warmer than that of the display case, from flowing in through the door opening to mingle with the air being circulated in the display space. As a result, the air which comes into contact with the articles on display is maintained at a substantially uniform temperature under all conditions of use and operation of the case.

The construction illustrated serves to establish a downwardly flowing air curtain at the front of the case and an upwardly flowing air curtain at the rear thereof. While this arrangement is preferred, the direction of flow of the air curtains may be reversed.

While the embodiment of the invention shown in the drawing is designed to be used in combination with a refrigerated chamber such as a walk-in cooler, the self contained character of the invention is such that it is possible to use the invention in display cases that are designed to be operated independently of any storage chamber. In such constructions, the bottom 2, top 4 and ends 6 of the display case as well as the doors 24 should be provided with suitable insulation to reduce the loss of heat therethrough. However, the construction and operation of the display case itself will be in the same in either application of the invention.

These and other changes and modifications in the construction and operation of display cases embodying the present invention may be made without departing from the spirit of the invention. In view thereof, it should be understood that the particular embodiment of the invention shown in the drawing and described above is intended

to be illustrative only and is not intended to limit the scope of the invention.

I claim:

1. A refrigerated display case having a display space therein provided with a top, a bottom and end walls, the front of the display space being open for access to customers, the rear of the display space being provided with a door, shelves arranged in vertically spaced relation within the display space and spaced from the front and rear thereof, said shelves being accessible through said open front and through said door when the latter is opened, means for circulating air in the form of air curtains flowing in opposite directions at the front and rear of said display space past said shelves, and means for refrigerating the air circulated to form said air curtains.

2. A refrigerated display case having a display space therein provided with a top, a bottom and end walls, the front of the display space being open for access to customers, the rear of the display space being provided with a door, shelves arranged in vertically spaced relation within the display space and spaced from the front and rear thereof, said shelves being accessible through said open front and through said door when the latter is opened, means of circulating air in the form of air curtains directed downwardly between the front edges of said shelves and the open front of the case and directed upwardly between the rear edges of said shelves and the door, and means for refrigerating the air circulated to form said air curtains.

3. A refrigerated display case having a display space therein provided with a top, a bottom and end walls, said display space having a front which is open for access to customers, a door at the rear of the display space providing access thereto, shelves arranged in said display space in vertically spaced relation, the front edges of said shelves being spaced inward from said open front of the display space and the rear edges of said shelves being spaced inward from said door, refrigerating means located in said display case below the display space, other refrigerating means located in the display case above the display space, a blower associated with each of said refrigerating means for circulating air over said means, and air directing inlets and outlets located adjacent the front and rear of the display space at the top and bottom thereof and communicating with said blowers, said air inlets and outlets cooperating with said blowers to establish air curtains flowing in opposite directions past the front and rear edges of said shelves from one of said refrigerating means to the other.

4. A refrigerated display case having a display space provided with a top, a bottom and end walls, a lower front wall portion terminating adjacent the lower portion of the display space, an upper front wall portion terminating adjacent the upper portion of said display space, said front wall portions cooperating to define a fixed opening for access to the display space from the front of the case, the rear of said case having a door therein for access to the display space from the rear of the case, vertically extending members located in said case at the rear thereof and in front of said door, said members being spaced apart horizontally and cooperating to form vertically extending air flues adjacent but in front of said door, vertically spaced shelves supported by said members and extending forwardly therefrom, the forward edges of said shelves being spaced inward from the plane of said upper and lower front wall portions, an upper refrigerating means located in the display case at the rear of said upper front wall portion and above the top of the display space, a lower refrigerating means located at the rear of said lower front wall portion and below the bottom of the display space, an upper blower for circulating air over the upper refrigerating means, a lower blower for circulating air over the lower refrigerating means, an air outlet communicating with the upper blower and located adjacent but at the rear of said upper front wall portion, an air

5

inlet communicating with the lower blower and located adjacent but at the rear of said lower front wall portion, an air outlet communicating with the lower blower and with the lower ends of said flues, and air inlet means communicating with the upper ends of said flues and the upper blower, said blowers and said air inlets and outlets co-operating to establish an air curtain flowing downwardly adjacent the front of the display space behind said front wall portions and another air curtain flowing upwardly adjacent the rear of said shelves and in front of said door.

5. A refrigerated display case of the character defined in claim 1 wherein a refrigerated storage chamber extends about the ends and rear of the display case and the ends of the display case and the door are not insulated.

6. A refrigerated display case having a display space therein provided with a top, a bottom, and end walls, the front of the display space being open for access to customers, the rear of the display space having means which normally serve to close the rear of the display space,

6

shelves arranged in vertically spaced relation within the display space, said shelves having the front edges spaced inwardly from the front of the display space, the rear edges of said shelves being spaced from said means at the rear of the display space, the space between the rear edges of the shelves and said rear means defining a vertically extending air-conducting flue and said shelves being in open communication with said flue, means for circulating air in the form of air curtains flowing in opposite directions through said flue and past the front of said shelves, said air curtains serving to establish rotating currents of air in the spaces between adjacent vertically spaced shelves and about articles supported thereon, and means for refrigerating the air circulated in said air curtains.

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