July 7, 1964 H. T. JARVIS 3,139,738

REFRIGERATED DISPLAY FIXTURE

Filed April 3, 1963

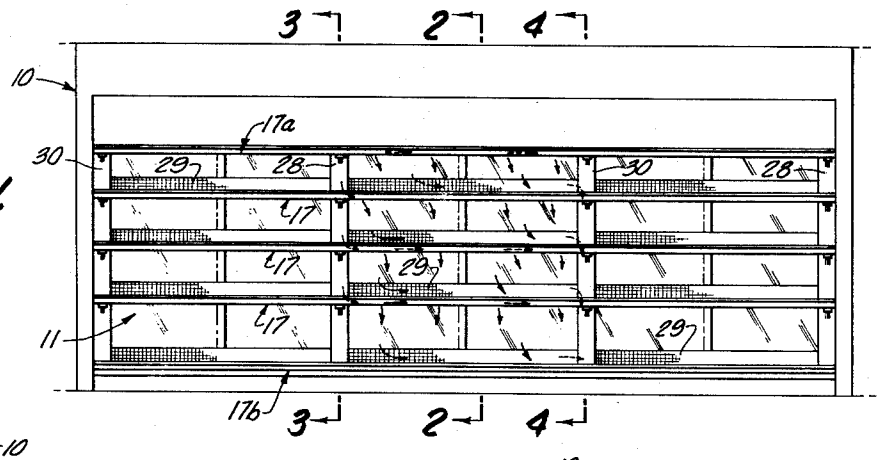


FIG. 1.

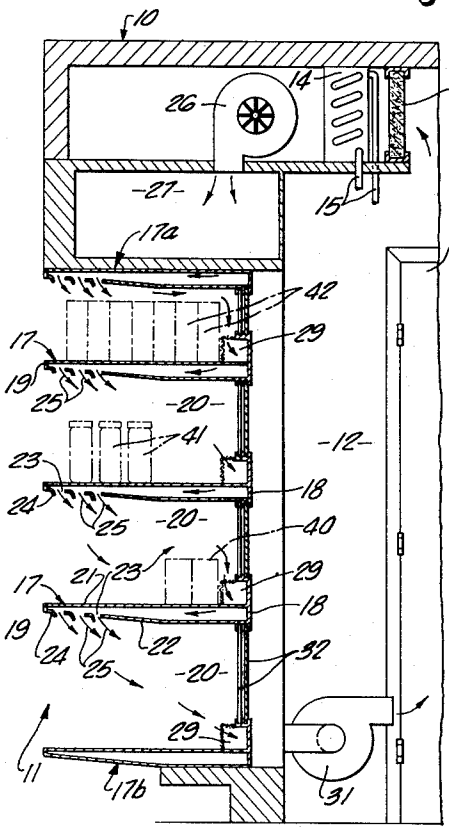


FIG. 2.

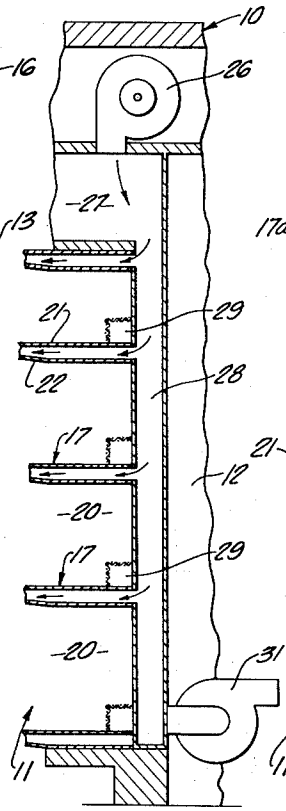


FIG. 3.

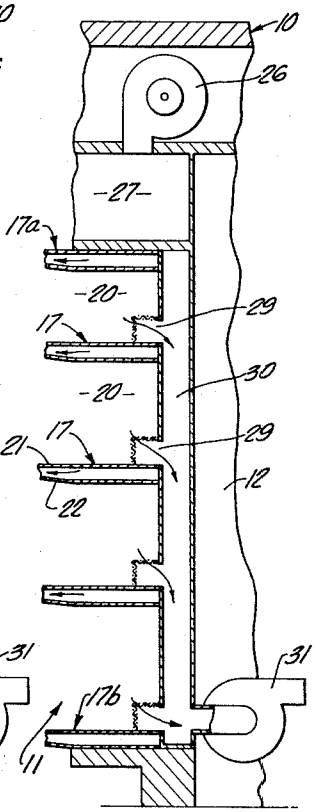


FIG. 4

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REFRIGERATED DISPLAY FIXTURE

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This invention relates to a refrigerated display fixture of the upright type having a plurality of product shelves and, in particular, is directed to an open-front fixture of this type having an improved manner of circulating cold air to refrigerate the displayed products.

There are numerous well known advantages in using open front upright display cases in supermarkets and the like, such as the unimpeded customer access to products and the increased quantity of products that may be properly displayed for a given area of floor space. Further, it has been found advantageous, although not essential, to position this type of display case along a wall in combination with a conventional walk-in refrigerated box behind the display case and the products stored in the box may be loaded onto the shelves of the display case through access doors provided in the rear of the display case.

The various types of conventional open-front upright display cases employ various arrangements of apparatus for continually circulating refrigerated air within the case to maintain the displayed products at the proper temperature. Generally, the referigerated air is circulated either downwardly or upwardly between the vertically spaced shelves and even in front of the shelves to establish the desired cold environment for the displayed products. Usually a combination of air-handling blowers are provided for both forcing the refrigerated air in the desired direction and drawing the refrigerated air in that direction within the display case in an attempt to maintain a desired continuous circulation of cold air, minimize the intrusion of room air, and minimize the quantity of cold air that spills out of the open front of the display case. The spillage of cold air out the front of the display case is objectionable for several reasons such as the inefficiency and therefore the increased cost of refrigerating the display case, the unpleasantly cold atmosphere that will be produced near the display case, etc.

One arrangement employed for the purpose of producing this downward or upward circulation of cold air is to provide the display case shelves with perforated upper and lower surfaces and a divider between such surfaces. The cold air either is urged downwardly from the perforate bottom surface of one shelf toward the next lower shelf and is, in theory, drawn in through the perforate upper surface of that shelf or is urged upwardly from the upper surface of one shelf to the bottom surface of the next higher shelf. However, under normal operation conditions, products of various sizes and shapes will be positioned on such perforate upper surface of the shelf and will substantially inhibit the flow of air into or out of the shelf. For example, if products in square or rectangular packages, such as milk cartons, are positioned on the shelf without spaces between the packages the perforate surface will be completely blocked thereby preventing the desired continuous circulation of cold air past the products. Further, as a result the air discharged will tend to be spilled out the open front of the display case thereby producing the heretofore mentioned undesirable conditions.

Accordingly, it is a principal object of this invention to provide an improved form of open-front refrigerated display fixture wherein the continuous circulation of refrigerated air is not appreciably inhibited by positioning products on the shelf regardless of the shape, orientation or spacing of the products.

Another object of this invention is to provide a novel form of open front refrigerated display fixture having a plurality of vertically spaced shelves wherein refrigerated air is discharged downwardly from near the front edge of each shelf and is drawn downwardly and rearwardly into a duct positioned at the rear of the next lower shelf so that refrigerated air is continuously circulated from the front to the rear above each shelf.

A further object of this invention is to provide a novel form of open-front refrigerated display fixture wherein the coldest air being circulated is circulated within the shelves and in contact with the product-supporting portion of the shelf to enhance the refrigeration of the product by heat conduction.

Still another object of this invention is to provide an open-front refrigerated display case having a novel arrangement for and manner of circulating refrigerated air wherein the refrigerated air circulates downwardly and rearwardly between the shelves into a duct positioned at the rear of each shelf and the passing of air into such duct is not substantially inhibited or obstructed by the positioning of products on the shelf. A still further object of this invention is to provide a display case having this novel air-circulating arangement wherein the air always circulates over the upper surfaces of the products and will circulate between the products if adequate spacing between products is provided. Another object is to provide such an air-circulating arrangement whereby the spillage of cold air out the front of the display case is minimized under all operating conditions.

Other and more detailed objects and advantages of this invention will appear from the following description and the accompanying drawings.

In the drawings:

FIGURE 1 is front elevation view of a typical open-front shelf type refrigerated display case employing the arrangement of this invention.

FIGURE 2 is a sectional elevation taken substantially on the line **2—2** shown in FIGURE 1 and illustrating the air circulating path of any typical section along the display fixture of this invention.

FIGURE 3 is a fragmentary sectional elevation taken substantially on the line **3—3** shown in FIGURE 1 and illustrating the arrangement for conducting refrigerated air to the shelves of the fixture.

FIGURE 4 is a fragmentary sectional elevation taken substantially on the line **4—4** shown in FIGURE 1 and illustrating the arrangement for drawing air past the displayed products.

Referring now to the drawings, the illustrated refrigerated fixture, generally designated **10**, is comprised of an open-front display case, generally designated **11**, provided in the front of a substantially conventional walk-in type box or storage chamber **12**. However, it is to be understood and will readily appear to those skilled in the art, that display case **11** may be provided as a separate unit without chamber **12** and refrigerated air supplied from a remote location through appropriate ducts, etc. In the illustrated unit the storage chamber **12** may be of any convenient type adapted for storing the products that are to be displayed in the display case **11** and is provided with a door **13** for permitting employee access to the storage chamber. In a normal installation of the illustrated unit in a supermarket the display case **11** will be facing the public area of the market and door **13** will be accessible from the storage area of the market.

Means are provided for refrigerating the air that is circulated through both the display case **11** and the storage chamber **12** and, as shown in the drawings, these means may include an evaporator coil **14** connected through appropriate conduits **15** to a conventional refrigeration system compressor and condenser, both of which are not

shown for simplicity of illustration. Air from the storage chamber 12 is drawn through a filter 16 and past the coils of evaporator 14 to cool the air in a well known conventional manner and the air is then passed through the display case 11 as hereinafter described.

The display case 11 is provided with a plurality of generally horizontal shelves 17 that are vertically spaced from each other the desired distance for accommodating the products that are to be positioned on the shelves. The shelves 17 extend the entire lateral width of the display case and for appearance are preferably supported at the rear 18 of the shelves although other support braces or brackets, not shown, may be provided at spaced locations along the front edge 19 of the shelves and elsewhere as is necessary to obtain proper structural support. A refrigerated shelf area, generally designated 20, is formed between each vertically adjacent pair of shelves 17 for receiving the products that are to be displayed and refrigerated. The plurality of shelves 17 may be substantially identical except that it is to be noted that the uppermost shelf 17*a* does not serve as a supporting "shelf" for displayed products, but merely functions as an air-conducting plenum as hereinafter described. Further, the lowermost shelf 17*b* need not be provided with a means for conducting refrigerated air therethrough as will hereinafter become apparent from a consideration of the detailed description of the path of air circulation within the display case 11.

Each of the shelves 17 are constructed to permit circulation of refrigerated air therethrough and as shown in the drawings, the shelves may be hollow and comprised of an upper or product-supporting surface 21 and a bottom surface 22. The bottom surface 22 of each shelf is provided with a plurality of openings 23 positioned near the front edge 19. Openings 23 may be of any convenient size and configuration and are positioned across the entire lateral extent of each shelf. Openings 23 are omitted from the lowermost shelf 17*b* since there are no products displayed below shelves 17*b* to require the circulating cold air. Deflectors or vanes 24 may be provided adjacent openings 23 to cause the air discharged from those openings to be directed rearwardly as well as downwardly with respect to the front edge 19 of that shelf as indicated by arrows 25.

Means are provided for supplying refrigerated air under a positive pressure to the interior of each shelf 17 so that such refrigerated air is continuously discharged from openings 23 as heretofore described. As shown in the drawings, these means may include a blower 26 for drawing air past evaporator 14 and discharging that air into a plenum 27 extending substantially the width of display case 11. Referring now more particularly to FIGURE 3, a supply conduit or duct 28 communicates with plenum 27 and is connnected to an opening in the rear of each hollow shelf 17 to provide a continuous supply of refrigerated air to the interior of each shelf. A plurality of supply ducts 28 may be provided for any particular display case 11, two ducts 28 having been shown, and the number of ducts provided will depend on various factors such as the lateral width of the particular display case and the necessary spacing between ducts 28 to obtain the proper circulation of air within shelves 17.

Means are provided in each shelf area 20 for both receiving the air discharged through openings 23 in that shelf area and serving to draw that air toward the bottom rear portion of that shelf area and, as shown in the drawings, these means include a laterally extending duct 29 positioned on top and at the rear of each shelf 17. These ducts 29 may be of any convenient type having apertures in the upper and preferably the front sides of the duct. Thus, while the drawings illustrate the front and upper sides of each duct 29 as being comprised of a close mesh wire screen, it is to be understood and will readily appear to those skilled in the art that these sides may also be comprised of sheet metal with appropriate apertures provided therein. Further, it is also to be noted that a combination of a perforated sheet metal duct 29 with a screen guard surrounding same to limit the proximity of products positioned on the shelf 17 may be used for reasons that will become apparent from considering the detailed description of air circulation presented below. Referring now more particularly to FIGURE 4, a vertical suction conduit or duct 30 is provided and communicates with each duct 29 and a blower 31 for drawing air from the plurality of ducts 29 through duct 30 and discharging the air into storage chamber 12. A plurality of suction ducts 30 are provided, two being shown, in spaced relationship along display case 11 and the spacing between ducts 30 that is adopted is determined for accomplishing the desired suction air circulation much the same as spacing between ducts 28 is adopted to accomplish the desired circulation of supply air.

Thus, it may be seen that with respect to ambient air pressure a positive air pressure is created in supply ducts 28 for forcing air out the openings 23 in the shelves and a negative air pressure is created in suction ducts 30 for drawing air from shelf areas 20 into ducts 29. By appropriately balancing the capacities of blowers 26 and 31, taking into consideration the air flow characteristics of the various ducts and openings, it may be seen that a substantially continuous flow of refrigerated air through each shelf area 20 from openings 23 to duct 29 is maintained. This air flow is relatively uncontaminated by the drawing in of outside air or disturbed by the spillage of refrigerated air out the front of the display case.

Referring particularly to FIGURE 2, a consideration of the lowermost shelf area 20 which happens to have products positioned thereon illustrates the probable air flow pattern directly from openings 23 to duct 29 that will be established. A consideration of the next higher shelf wherein products 40 are positioned only immediately in front of duct 29 illustrates how the probable air flow established will constitute a combination of some air flowing merely over the tops of products 40 and some air flowing first in front of and then over the tops of products 40. A consideration of the next higher shelf area 20 gives a ready indication of how products 41 when positioned in spaced relationship on the supporting surface 21 of the shelf will permit the circulation of refrigerated air downwardly and rearwardly between the products for maintaining the proper refrigerated condition. A consideration of the highest shelf area 20 illustrates the positioning of products 42 in an unspaced relationship and shows that the resultant air flow is across the tops of products 42 to the duct 29. This last-described air flow pattern is to be contrasted with that which would occur with the heretofore described conventional type display cases wherein solid covering of the support surface which is also the intake surface would cause the downwardly directed refrigerated air to merely spill out the front of the display case. Thus, it may be seen that regardless of the types, sizes, orientation, or arrangement of products on the shelves of the display case of this invention, the desired circulation of refrigerated air through each refrigerated shelf area 20 is continually maintained. The flowing air continually seeks an open path whether it be around or over the displayed products. It is also to be noted that the refrigerated supply air continually passes in intimate contact with the inside of support surface 21 and, therefore, cools the products thereon by heat conduction through surface 21.

Furthermore it is to be noted that since the loss of cold air out the front of display case 11 and intrusion of room air are minimized the cooling of storage chamber 12 is enhanced and therefore the overall efficiency of the fixture is improved.

In order to permit loading of products onto the shelves 17 from the storage chamber 12, as is generally desirable,

sliding doors **32** are provided at the rear of each shelf and above each duct **29**. Where desirable, doors **32** may be of glass, as illustrated, to permit visual observation of the shelves from within the storage chamber **12** so that the quantity of products displayed on the shelves may be replenished as the need is observed.

Having fully described my invention it is to be understood that I do not wish to be limited to the details herein set forth or to the details illustrated in the drawings, but my invention is of the full scope of the appended claims.

I claim:

1. A refrigerated display fixture comprising a plurality of vertically spaced hollow shelves having front and rear portions; each of said shelves having an imperforate upper surface each of said shelves except the lowermost shelf having openings on the bottom near said front portion; a perforate duct positioned on top of and at the rear portion of each said shelf except the uppermost shelf; each said perforate duct substantially spaced from the said shelf thereabove; and means for conducting refrigerated air to said shelves, for discharging the air out said openings, for drawing into each of said perforate ducts the air discharged from the shelf thereabove, and for conducting the air out of said ducts.

2. A refrigerated display fixture comprising a plurality of vertically spaced hollow shelves having front and rear portions, each vertically adjacent pair of said shelves having openings on the bottom near said front portion of the upper shelf of said pair of shelves, a perforate duct positioned on top of and at the rear portion of the lower shelf of said pair of shelves, and air circulating and conduit means for conducting refrigerated air to the upper shelf of each said pair of shelves and discharging that air out said openings and for drawing that discharged air into said perforate ducts and conducting the air out of said ducts.

3. A refrigerated fixture comprising a storage chamber and a display case, said display case having a plurality of vertically spaced hollow shelves having front and rear portions, each of said shelves except the lowermost shelf having openings on the bottom thereof near said front portion, a perforate duct positioned on top of and at the rear portion of each said shelf except the uppermost shelf, refrigeration means for cooling air, blower means for drawing air from said storage chamber and past said refrigeration means, conduit means for conducting the cooled air discharged by said blower to said shelves and discharging the air out said openings, and second blower means and conduit means for drawing that discharged air into said perforate ducts and conducting the air to said storage chamber.

4. A refrigerated display fixture comprising a plurality of vertically spaced hollow shelves having front and rear portions, each of said shelves except the lowermost shelf having openings on the bottom thereof only near said front portion, deflecting means adjacent said openings for urging air discharged from said openings in a downward and rearward direction, a perforate duct positioned on top of and at the rear portion of each said shelf except the uppermost shelf for receiving the air discharged from the said openings in the shelf positioned thereabove, and blower and conduit means for conducting refrigerated air to said shelves and discharging the air out said openings and for drawing that discharged air into said perforate ducts and conducting the air out of said ducts.

5. A refrigerated display fixture comprising a plurality of vertically spaced hollow shelves having front and rear portions, each of said shelves except the lowermost shelf having openings on the bottom thereof near said front portion, a duct positioned on top of and at the rear portion of each said shelf except the uppermost shelf, each said duct extending the lateral width of the associated shelf and having perforations in both the upper and front sides thereof for receiving the air discharged from the said openings in the shelf positioned thereabove, and blower and conduit means for conducting refrigerated air to said shelves and discharging the air out said openings and for drawing that discharged air into said ducts and conducting the air out of said ducts.

6. A refrigerated display fixture comprising a plurality of vertically spaced hollow shelves having front and rear portions, each of said shelves except the lowermost shelf having openings on the bottom thereof only near said front portion, deflecting means adjacent said openings for urging air discharged from said openings in a downward and rearward direction, a duct positioned on top of and at the rear portion of each said shelf except the uppermost shelf, each said duct extending the lateral width of the associated shelf and having perforations in both the upper and front sides thereof for receiving the air discharged from the said openings in the shelf positioned thereabove, and blower and conduit means for conducting refrigerated air to said shelves and discharging the air out said openings and for drawing that discharged air into said ducts and conducting the air out of said ducts.

7. A refrigerated fixture comprising a refrigerated storage chamber and a refrigerated open-front display case along one side of said storage chamber; said display case having a plurality of product refrigerating shelf areas extending laterally and positioned one above another; each said shelf area having a product supporting surface and a hollow shelf positioned above and spaced from said surface, each said hollow shelf having openings along the lateral extent and positioned on the bottom and only near the front of said shelf, a perforate duct positioned on the rear of each said supporting surface and extending the lateral extent of said surface, means for forcing refrigerated air from said storage chamber to said hollow shelves and out said openings into each said shelf area, and means for drawing the air in each said shelf area into the associated perforated duct and discharging that air into said storage chamber.

8. A refrigerated fixture comprising a refrigerated storage chamber and a refrigerated open-front display case along one side of said storage chamber; said display case having a plurality of product refrigerating shelf areas extending laterally and positioned one above another; each said shelf area having a product supporting surface and a hollow shelf positioned above and spaced from said surface, each said hollow shelf having openings along the lateral extent and positioned on the bottom and only near the front of said shelf, a perforate duct positioned on the rear of each said supporting surface and extending the lateral length of said surface, first conduit means operably connected to said hollow shelves, second conduit means operably connected to said perforated ducts, means for refrigerating the air from said storage chamber, means for forcing that refrigerated air through said first conduit means to said hollow shelves and out said openings into each said shelf area, and means for drawing the air in each said shelf area into the associated perforated duct and discharging that air through said second conduit means into said storage chamber.

9. A refrigerated fixture comprising a refrigerated storage chamber and a refrigerated open-front case along one side of said storage chamber; said display case having a plurality of product refrigerating shelf areas extending laterally and positioned one above another; each said shelf area having a product supporting surface and a hollow shelf positioned above and spaced from said surface, said hollow shelf of one of said shelf area defining the said supporting surface of the said shelf area immediately thereabove, each said hollow shelf having openings along the lateral extent and positioned on the bottom and only near the front of said shelf, a perforate duct positioned on the rear of each said supporting surface and extending the lateral length of said surface, first conduit means operably connected to said hollow shelves, second conduit means operably connected to said perforated ducts, means for refrigerating the air from said storage chamber, means for forcing that refrigerated air through said first conduit

means to said hollow shelves and out said openings into each said shelf area, and means for drawing the air in each said shelf area through the associated perforated duct into said second conduit means and discharging that air into said storage chamber.

10. A refrigerated fixture comprising a refrigerated storage chamber and a refrigerated open-front display case along one side of said storage chamber; said display case having a plurality of product refrigerating shelf areas extending laterally and positioned one above another; each said shelf area having a product supporting surface and a hollow shelf positioned above and spaced from said surface, said hollow shelf of one of said shelf area defining the said supporting surface of the said shelf area immediately thereabove, each said hollow shelf having openings along the lateral extent and positioned on the bottom and only near the front of said shelf, deflecting means adjacent said openings for urging air discharged from said openings in a downward and rearward direction within the shelf area, a perforate duct positioned on the rear of each said supporting surface and extending the lateral length of said surface, each said duct having perforations in both the upper and front sides thereof whereby products positioned on said supporting surface do not obstruct said perforations, first conduit means operably connected to said hollow shelves, second conduit means operably connected to said perforated ducts, means for refrigerating the air from said storage chamber, means for forcing that refrigerated air through said first conduit means to said hollow shelves and out said openings into each said shelf area, and means for drawing the air in each said shelf area through the associated perforated duct into said second conduit means and discharging that air into said storage chamber.

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