

Dec. 24, 1963

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3,115,019

SELF-SERVICE REFRIGERATED DISPLAY CASE

Filed Sept. 26, 1960

3 Sheets-Sheet 1

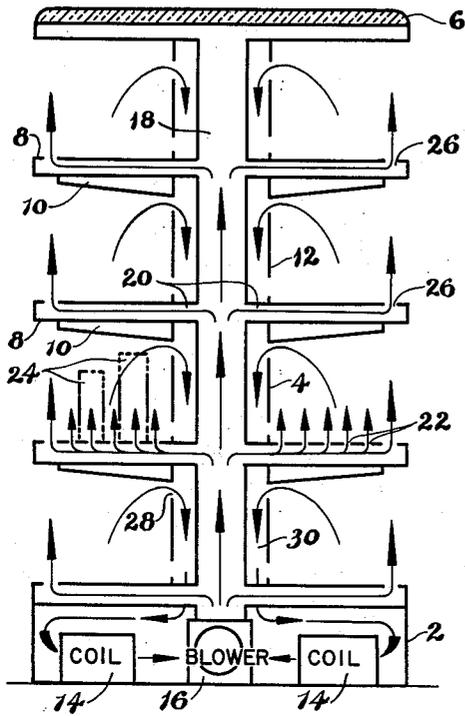


Fig. 1

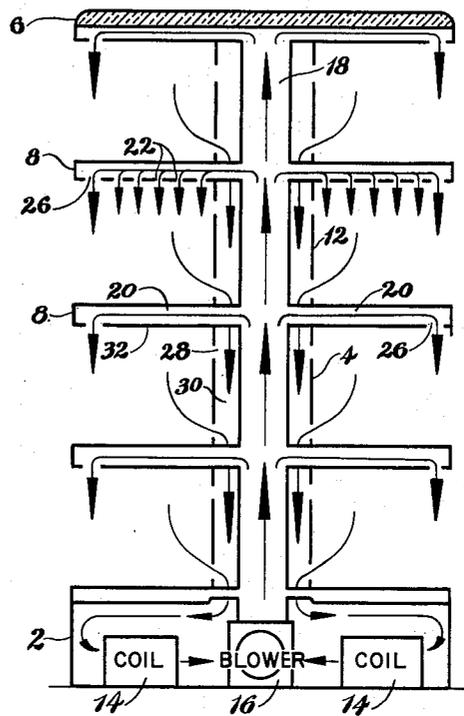


Fig. 2

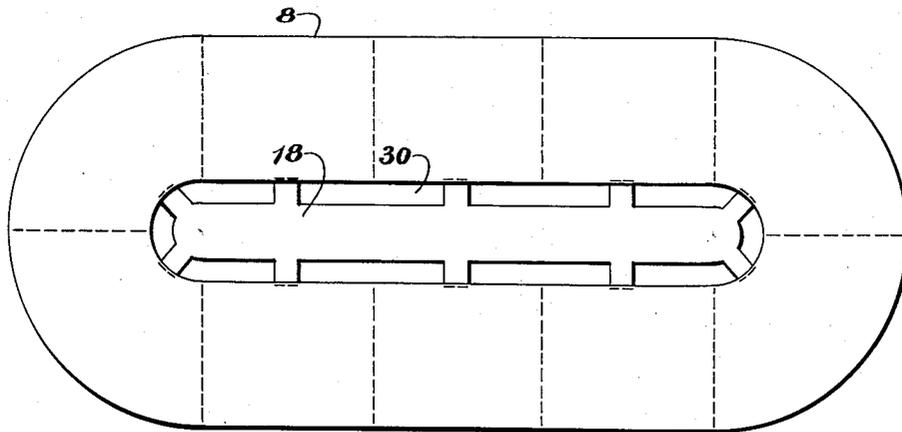


Fig. 3

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3 Sheets-Sheet 2

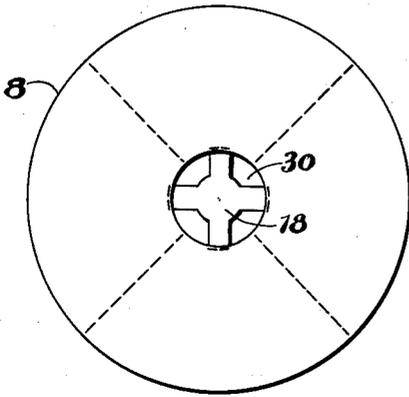


Fig. 4

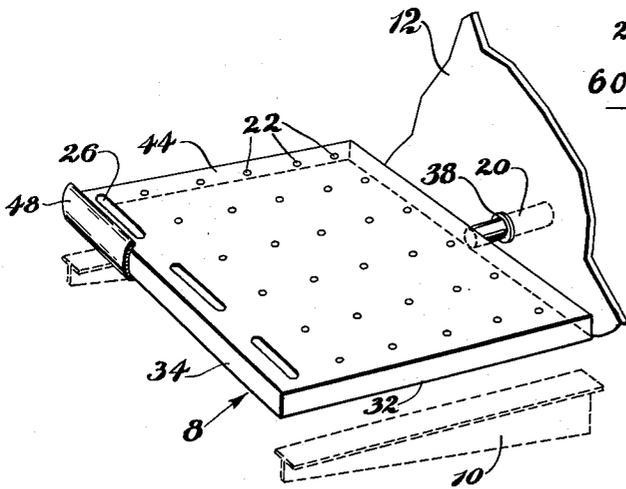


Fig. 6

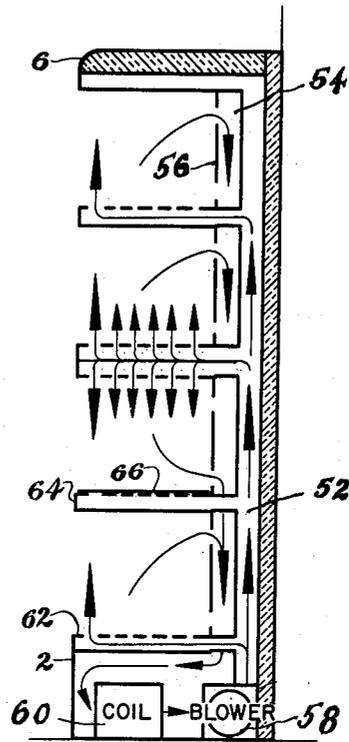


Fig. 5

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3 Sheets-Sheet 3

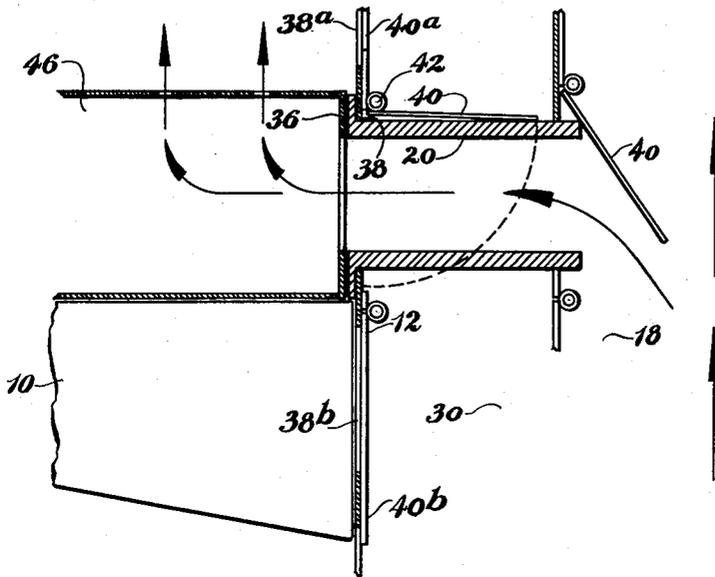


Fig. 7

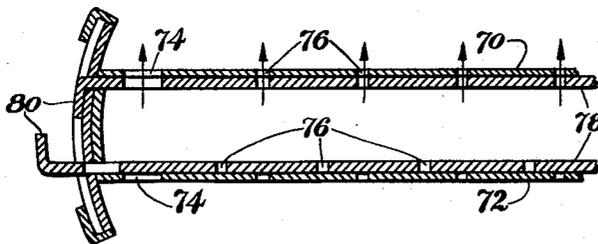


Fig. 8

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SELF-SERVICE REFRIGERATED DISPLAY CASE
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 5 Claims. (Cl. 62-256)

This invention relates to self service refrigerated display cases and is directed particularly to constructions wherein refrigerated air is circulated in a closed cycle over articles arranged on each of a plurality of shelves.

It has been common practice heretofore to provide self service refrigerated display cases with a plurality of shelves each of which has an upwardly extending front wall that serves to convert the shelf into a bin in which refrigerated air is circulated to cool the products on display. However, the upwardly extending front walls on the shelves render it difficult to remove articles from upper shelves in the case and interfere with the vision of the customer. In the alternative, some self service display cases are constructed without an upwardly projecting wall on the shelf but are provided with a rapidly flowing stream of air which travels across the access opening in front of the shelves so as to protect the articles from the warm air which might otherwise enter the display space through the access opening. However, when the access opening is relatively large, as it must be to permit customers to reach articles arranged on two or more shelves, the distance which the air must travel in establishing an air curtain is relatively great with the result that the temperature of the air forming the air curtain is raised considerably by contact with the ambient air and the entraining of warm moist air with the air forming the air curtain. Large amounts of moisture are then deposited on the coils and fins of the refrigerating means and the substantial increase in temperature of the air places a heavy load on the refrigerating equipment.

In accordance with the present invention these objections to constructions of the prior art are overcome and means are provided whereby the upwardly extending front wall is not required for the shelves so that the articles on display are readily accessible to customers. On the other hand, the distance which the refrigerated air is caused to travel in contact with ambient air and about the articles to be refrigerated is relatively short so that the temperature of the air is increased but very little and only a minimum of moisture is picked up or entrained during the circulation thereof. In this way the refrigerating load imposed on the equipment is reduced and the articles are effectively refrigerated while being presented in a manner affording ready access.

These advantages are preferably attained by providing each shelf with its own air curtain and path of circulation for the refrigerated air and by supplying and returning the refrigerated air in a closed cycle through paths which serve to reduce the transfer of heat to the refrigerated air to a minimum. The present invention also renders it possible to use a novel type of shelf construction which is reversible to permit air to be circulated in either an upward or a downward direction over the articles on display.

Accordingly, the principal object of the present invention is to provide a novel type of self service refrigerated display case wherein there are a plurality of vertically spaced shelves together with means affording separate paths for the circulation of air over the articles on each shelf.

Another object of the invention is to provide a refrigerated display case having vertically spaced shelves each of which has a separate air curtain protecting the articles on display from contact with ambient air.

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A further object of the invention is to provide self service display cases which have vertically spaced shelves with air circulating means establishing air circuits which are relatively short as compared to the size of the access opening through which the shelves are accessible.

A specific object of the invention is to provide a display case with a shelf through which air may be circulated either upwardly or downwardly over articles on display.

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

In the drawings:

FIG. 1 is a diagrammatic vertical cross section through a typical form of refrigerated display case embodying the present invention;

FIG. 2 is a view similar to FIG. 1 illustrating a reversal in the direction in which the air is circulated over the articles on display;

FIG. 3 is a diagrammatic horizontal sectional view through the refrigerated display cases of FIGS. 1 and 2;

FIG. 4 is a horizontal sectional view through an alternative form of refrigerated display case embodying the present invention;

FIG. 5 is a diagrammatic vertical sectional view through a wall type of self service display case illustrating alternative air circulating paths which may be provided in accordance with the present invention;

FIG. 6 is a perspective illustrating a novel type of shelf construction which may be employed in accordance with the present invention;

FIG. 7 is a diagrammatic sectional view showing the manner in which a shelf of the type shown in FIG. 6 may be employed; and

FIG. 8 is a sectional view through a portion of an alternative type of shelf construction which may be employed in the practice of the present invention.

In that form of the invention chosen for purposes of illustration in FIGS. 1, 3 and 7, the display case is provided with a base 2, a central column 4 and a top 6. Shelves 8 are arranged in vertically spaced relation so as to project outwardly from the column 4 on opposite sides thereof and are supported by horizontally spaced shelf brackets 10 which may be adjustably mounted on the outer member 12 of the column 4.

Within the base 2 of the display space are located refrigerating means which, as shown, may consist of two separate evaporators 14 located on opposite sides of a blower 16. The blower is arranged to draw air inward over the evaporator coils and to force the resulting refrigerated air upward under pressure through the central air supply duct 18. From the duct 18 the air flows through the inlet tube 20 into the shelves 8 which are hollow and are provided with outlet openings 22 on one face of the shelf. As indicated in FIG. 1, the air may be forced upward through the openings 22 and about the articles 24 supported on the shelf. Further, the shelves 8 may be provided adjacent their outer ends or edges with larger openings 26 which serve to direct the major portion of the air issuing from the shelf in a direction upward and slightly inward so as to establish an air curtain at the front of the shelf to shield the articles on display from the ambient air. The air thus circulated about and in front of the articles 24 flows upward and inward to the screened air inlet openings 28 in the outer member 12 of the central column 4. The openings 28 are positioned below the shelf above and beneath the top 6 of the display case so that each shelf is provided with its own independent air curtain and air circulating system.

The members 12 at the opposite sides of the column 4 are spaced from the central air supply duct 18 and co-

operate therewith to form return air ducts 30 through which air flows from the inlet openings 28 to the inlet side of the evaporators 14 in the base 2 of the display case.

In this way the construction provides a closed cycle of circulation for the air while providing each individual shelf with its own air curtain and air circulating system. The length of the path of the air circulation for each shelf is relatively small despite the fact that the access opening through which the articles on the shelves are available is relatively large and may extend throughout substantially the entire area of each side of the case. Therefore, even though the articles are exposed for ready removal from the shelves, the air being circulated about the articles does not undergo a substantial increase in temperature or tend to pick up or entrain substantial amounts of the ambient air. As a result, the air returning to the evaporators through the return air ducts is still relatively cold and dry and but little further cooling of the air is required in order that it may be recycled. The load imposed on the refrigerating equipment is thus greatly reduced. This effect is further enhanced by the shielding and insulating effect afforded by the return air ducts 30 since they surround the central air supply duct 18 and serve to insulate and shield the refrigerated air against absorption of heat from the exterior of the case.

The construction thus provided renders it possible to reduce the amount of thermal insulation employed in constructing the display case. In fact, when the display case is of the "island type," as illustrated in horizontal cross section in FIGS. 3 and 4, the only thermal insulation required is that which may be necessary to prevent undue heat transfer through the walls of the base 2 and through the top 6 of the display case.

The shelves 8 which are employed in the display case are preferably of the type shown in FIGS. 6 and 7. Such shelves are hollow and are enclosed at the bottom by the bottom member 32 and at the front by the closure member 34. The rear of the shelf is also closed by a member 36 which is provided with one or more inlet tubes 20. The inlet tubes are of sufficient length to extend through openings 38 in the outer member 12 of the central column 4 and across the air return duct 30 into the air supply duct 18. Closure plates 40 are pivotally mounted on the inner surface of the outer member 12 of the column 4 and are urged downward toward a closed position by a spring hinge connection 42. In a similar way, closure plates may be positioned on the inner surface of the air supply duct 18 so that each shelf may be placed in communication with the central air supply duct 18 by inserting the air inlet tubes in the openings 38. The article supporting surface of the shelf 8 is in the form of a flat sheet 44 in which the air outlet openings 22 and slots 26 are formed.

The brackets 10 which support the shelves 8 are positioned to hold the shelves in place when the inlet tubes are inserted in the openings 38. However, the brackets may be adjusted in vertical position relative to each other and with respect to the outer member 12. Any suitable means may be provided for providing the desired communication between the shelf 8 and the air supply duct 18 and the air return duct in the various adjusted positions of the shelves. For example, as shown in FIG. 7, the outer member 12 and the central duct 30 may be provided with a series of vertically aligned openings for permitting insertion of the inlet tube 20 of the shelf in various selected positions. The openings 38A and 38B with their closure plates 40A and 40B are arranged above and below the opening indicated at 38 and corresponding openings are formed in the air supply duct 18. With this construction, the shelf may be located in selected vertical positions.

The supporting plate 44 of the shelf 8 cooperates with the bottom member 32, the closure member 34 and the rear member 36 to form an air distributing chamber 46 from which the air issues through the outlet openings 22

and slots 26. In some instances, only the slots 26 at the front of the shelf are necessary, in which case the articles supported on the shelf are cooled by the air forming the air curtain and by conduction through the supporting plate 44. However, in most instances the smaller outlet openings 22 are provided so as to prevent the formation of any dead air pockets and to assure the most effective refrigeration of the articles on display.

The shelves further may be provided with a tag molding or article retaining rail 48 which extends along the front edge of the shelf. Such a tag molding may be inclined rearwardly and positioned adjacent the outlet openings 26 so as to deflect the air forming the air curtain inwardly in a manner to prevent it from flowing outward beneath the shelf above and aid in directing it toward the air inlet openings which communicate with the air return duct 30.

If desired, the outlet openings 22 and 26 on different shelves may be of different size so that either more or less refrigerated air may be circulated about and over the articles on one shelf than on another. It is, therefore, possible to maintain different temperatures or conditions of refrigeration on different shelves as may be desired for the preservation and display of any type of article.

As shown in FIG. 2, the position of the shelves on their brackets may be reversed to provide a display case in which the air curtain and the air circulation takes place in a downward direction. The imperforate bottom member 32 of the shelf then serves to support the articles on display whereas air for refrigerating the articles is supplied from the bottom of the shelf above. This arrangement is sometimes preferred particularly when the articles are vegetables upon which the condensation of moisture is of advantage in keeping them fresh. The downward and rearward direction of the flow of air then permits a limited amount of moist ambient air to flow in above the shelf on which articles are supported and into contact with the articles on display.

While the constructions described above are of particular advantage when used in "island type" display cases, the novel features of the present invention may also be used in connection with wall type display cases or those which are employed in combination with walk-in coolers or storage chambers. Thus, as shown in FIG. 5, the display case may have an insulated rear wall 50 with an air supply duct 52 extending upward adjacent the inner face thereof. The air return duct 54 is positioned in front of the air supply duct and directly behind the outer member 56 which corresponds in construction and function to the outer member 12 of the form of the invention shown in FIG. 1. The refrigerated air then is forced up through the supply duct 52 by the blower 58 and returns through the air return duct 54 to the refrigerating means 60.

FIG. 5 further serves to illustrate further possible applications and uses of the present invention. Thus, as shown the air may be circulated upwardly about the articles on display on the lower shelf 62 and may be circulated downwardly about articles supported on the shelf 64. The latter shelf may be composed of two shelves arranged with their perforated surfaces face to face so as to prevent circulation of air in either direction from the shelf or as shown, a cover plate 66 may be placed over a shelf having upwardly facing holes to prevent the discharge of air therefrom.

Where it is anticipated that the direction of air flow about the articles on any particular shelf will be varied, the shelf may be constructed as shown in FIG. 8. This shelf is provided with an upper supporting plate 70 and a bottom plate 72 each of which is provided with an air outlet opening 74 near the front of the shelf for establishing an air curtain and may be provided with smaller air outlet openings 76 for eliminating dead air spaces about the articles. Closure means 78 are provided ad-

jacent each plate and as shown are in the form of a slide being movable by the handle 80 to open and close the air outlet openings 74 and 76.

With this construction the shelf may be used to direct air in either or both directions from the shelf or the slides may both be closed to prevent the flow of air in either direction therefrom. Moreover, the effective size of the openings in any shelf can be varied by adjustment in the position of either or both of the slides 78 to cause more or less air to be circulated about the articles on any particular shelf. Furthermore, the direction, amount, or occurrence of air circulation about the articles on any shelf can be changed or regulated at will by a clerk standing in front of the case without removing the articles from the shelf or changing its position in the assembly.

Each of the forms of the invention shown in the drawings and described above assures the most effective refrigeration of articles while presenting them for ready access to customers through an access opening of extended area. At the same time, the load imposed on the refrigerating means is reduced to a minimum and the cost of the equipment is reduced. The invention also is characterized by the greatest flexibility of operation so that the same display case may be employed in many different applications and to meet different conditions of usage.

Although various typical forms of the invention have been shown in the drawings and described above, the elements of the assembly may be changed in construction, design and arrangement without departing from the spirit of the invention. In view thereof, it should be understood that the particular embodiments of the invention disclosed herein are intended to be illustrative only and are not intended to limit the scope of the invention.

I claim:

1. A self service refrigerated display case having a base, a top, a member extending vertically from said base to said top, air supply and air return ducts in said vertically extending member, means for forcing air through said air supply duct and for drawing air into said air return duct, a plurality of hollow shelves arranged in vertically spaced relation within said case and each communicating with said air supply duct, the vertically extending member having openings therein communicating with the space between said shelves and said air return duct, said shelves having openings therein adjacent the outer edges of the shelves, and means for refrigerating the air forced through the air supply duct to each shelf to produce an independent air curtain adjacent the front of each shelf, the air from said air curtain flowing rearwardly through the space between said shelves from the front to the rear of the shelves so as to be drawn through the openings in the vertically extending member to said air return duct.

2. The combination set forth in claim 1 wherein means are provided for supporting said shelves in various selected positions, said vertically extending member and air ducts are provided with a plurality of vertically ar-

ranged tube receiving openings arranged to correspond to the selected positions of said shelf supporting means, and said shelves are each provided with an air inlet tube insertable into a selected one of said tube receiving openings.

3. An island type self service refrigerated display case having a base, a top, a central column extending from the base to the top, an air supply duct in said column, an air return duct in said column substantially surrounding said air supply duct, a blower supplying air to said air supply duct and receiving air from said air return duct, means for refrigerating said air, a plurality of hollow, vertically spaced shelves extending outward from said column, each of said shelves communicating with said air supply duct and having openings therein for the discharge of refrigerated air therefrom in the form of an air curtain in front of the space between said shelves, said column having openings therein communicating with the spaces between said shelves and with said return air duct and cooperating with the openings in the shelves to provide a separate air curtain and path of air circulation for the space between each shelf.

4. The combination set forth in claim 3 wherein each shelf has an air supply tube extending through an opening in the air return duct and into the air supply duct.

5. A self service refrigerated display case having an access opening therein, a plurality of vertically spaced shelves accessible to customers through said access opening, each of said shelves being hollow and having an opening near the front edge thereof, means for forcing air through said shelf and the opening near the front edge thereof to establish an independent air curtain for each shelf directed substantially vertically across the front of the space between said shelf and an adjacent shelf, said display case having a substantially vertical wall located at the rear of said shelves and from which said shelves project toward said access opening, air return openings in said vertical wall at the rear of said shelves through which air from said air curtain may be drawn inward through the space between the shelves and about articles supported thereon, and means for refrigerating the air thus circulated.

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