Oct. 19, 1943. C. B. SHREVE 2,332,174

DISPLAY REFRIGERATOR

Filed June 19, 1941 2 Sheets-Sheet 1

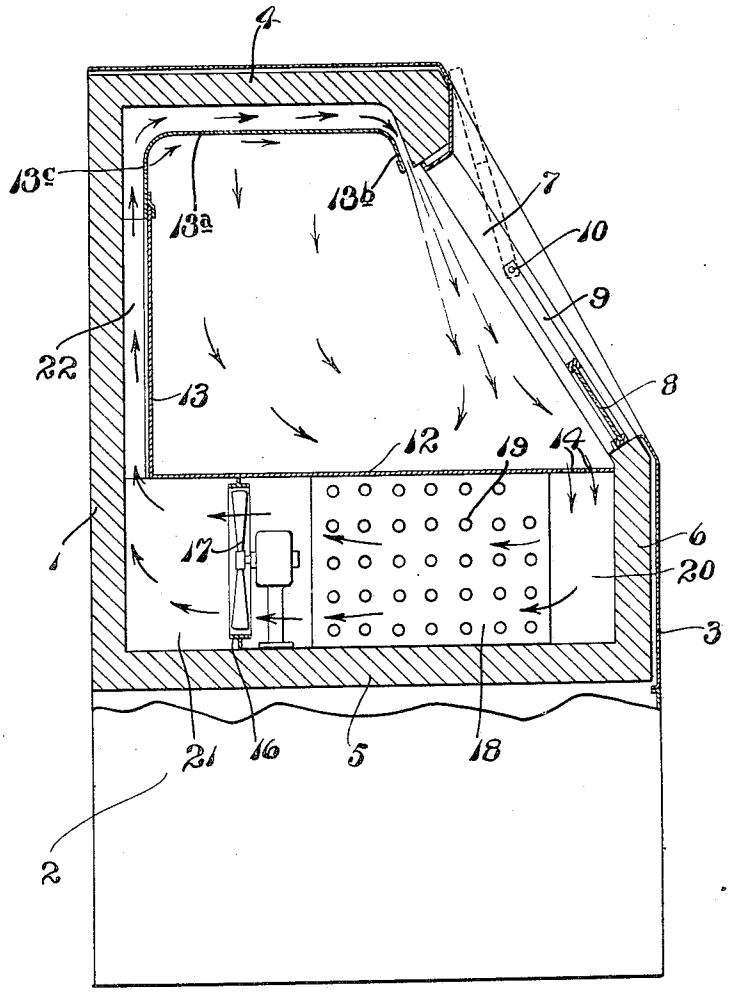


Fig. 1.

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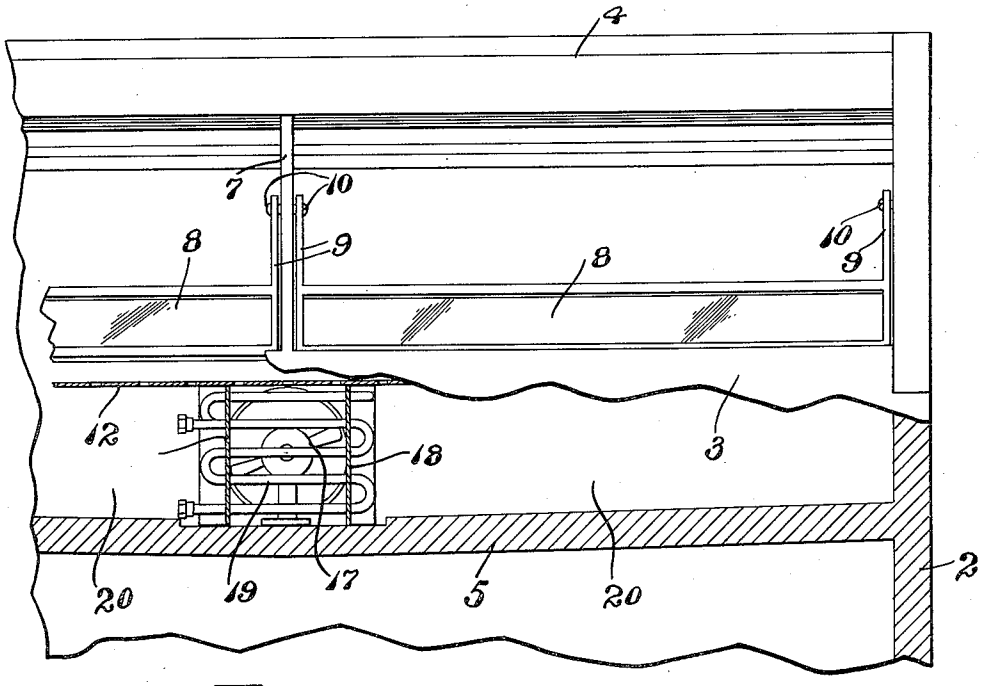


Fig. 2.

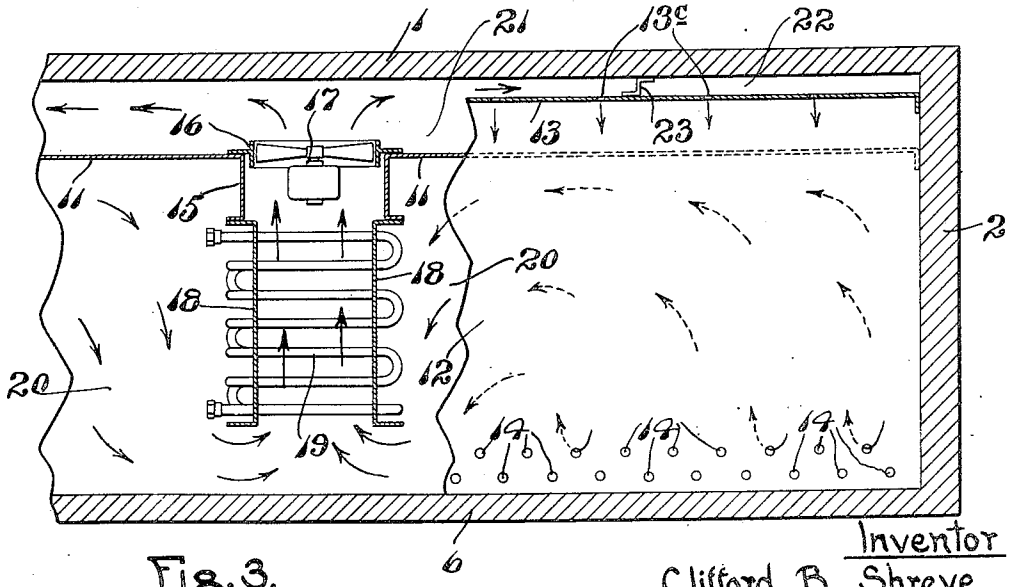


Fig. 3.

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DISPLAY REFRIGERATOR

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7 Claims. (Cl. 62—89.5)

This invention relates to display refrigerators, particularly useful for keeping articles of merchandise in a cool and refrigerated condition and at the same time permit ready and free access to such merchandise by the customer. That is, the articles which are maintained in a cold and refrigerated condition are not in an enclosed space, but the compartment holding the merchandise is open at one side so that the merchandise is readily accessible for removal by the customer.

The present invention is directed to a novel construction of the kind indicated wherein such open accessible side of the merchandise holding compartment is blanketed with a continuous circulating blanket of cold air which maintains the merchandise in its proper cold condition and excludes heat from the outside air which if it gained access to the merchandise would lessen and greatly impair proper maintenance of its cold and refrigerated condition.

The present invention has for its object and purpose a novel construction and method of refrigeration for practically and effectively attaining the ends above stated, as well as many others not at this time enumerated but which will appear as an understanding of the invention is had from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is a transverse vertical section from front to rear through a refrigerating display case made in accordance with my invention.

Fig. 2 is a fragmentary front elevation thereof with parts broken away and in section for a better disclosure, and

Fig. 3 is a horizontal section and plan through said refrigerating display case.

Like reference characters refer to like parts in the different figures of the drawings.

The case includes a vertical back 1, vertical ends 2 and a front covering 3 which extends upwardly from the lower end of the case only a part of its height. A top 4, narrower in width than the bottom width of the case is provided. From the back 1, a distance above the bottom of the case, a horizontal member 5 extends forward and at its front edge has an upwardly extending vertical front portion 6 which is back of the outside front metallic covering 3 which is used over the ends and top of the case and at the front from the lower end of the case upwardly to the upper end of the part 6. This leaves a longitudinal rectangular opening extending between the ends of the case from the upper end of the part 6 to the forward edge of the top 4.

Said opening in the disclosure shown is divided between its ends by an inclined bar 7 thus dividing the opening into two sections. In each of the opening sections a relatively narrow glass panel 8 properly mounted in an elongated frame is carried by end arms 9 which extend upwardly and inwardly from the ends of the frame part way toward the top 4 and are pivotally connected at 10 to said dividing bar 7 and the ends of the case, as best shown in Fig. 2. Thus the lower portion of the open front of the display case is normally partially closed by the panels 8 which, however, may be turned upwardly to the position indicated in dotted lines in Fig. 1 whenever necessary for making easier access into the case for purposes of loading quantities of merchandise by the clerks. When the panel is in its normal closed position, the merchandise is still accessible as far as customers are concerned and the panel also forms a baffle to cut down and practically eliminate spillage of cold air out of the front of the case.

A vertical metal partition 11 is located lengthwise of the refrigerator above the horizontal portion 5 and between such part 5 and an overhead horizontal metal shelf 12. Said vertical partition 11 is located a distance in front of the rear edge of the shelf 12 which rear edge is likewise located a short distance in front of the back 1 of the refrigerator. A vertical plate 13 which may be a continuation of the shelf 12 extends upwardly parallel to the back 1 and a short distance in front thereof and terminates a short distance below the top 4 (Fig. 1), providing a relatively narrow flue between the plate and the back, it being understood that the plate 13 extends the full length of the case.

In addition to the plate 13, a portion 13*a* is utilized which may either be secured to the plate 13 as indicated in Fig. 1 or be made integral therewith. The part 13*a* extends upwardly and then forwardly toward the front of the case and is spaced downwardly from the top 4. At its forward end this portion is extended downwardly and forwardly as at 13*b* and terminates closely adjacent the upper part of the front opening in the case. The part 13*a* also extends the full width of the case. The discharge opening provided between the terminal portion 13*b* and the forward end of the top 4 imparts a force to the air being discharged into the case and provides a directional stream of air which acts as a curtain and keeps the outside air from getting into

the case. Additional efficiency is also provided by the use of this upper duct because it acts in the manner of a coil in the top of the case and a certain amount of the air is cooled by coming in contact with it which air drops straight down, thereby aiding in cooling the inside of the case. It has been found in practice when this curtain of air is used, that a temperature of 40° has been maintained inside the open case in a 90° room.

Near the top of the back plate 13, or in the vertical portion of the part 13a a plurality of small openings 13c are provided which permit a slight seepage of the cold air from the rear duct into the case. In practice it has been found that the seepage of cold air through these openings eliminates any tendency on the part of the overhead duct 13a to sweat and have drops of moisture fall onto the merchandise within the case. The shelf 12 at its forward portion is provided with a plurality of holes 14, as shown in Fig. 3, thereby making communication between the forward lower portion of the compartment above the shelf 12 and the chamber below said shelf.

The vertical plate 11 at substantially midway between its ends has a circular opening therethrough associated with which is a short forwardly extending cylindrical sleeve 15 (Fig. 3). At the rear end of the sleeve and mounted in said opening in the plate 11 is a ring 16 in which an electric motor driven fan 17 is positioned.

At the front end of the sleeve 15 two spaced apart vertical plates 18 are located extending between the parts 5 and 12 and terminating a distance back of the front member 6. Such plates support a refrigerating coil 19 shown of pipe return-bent to make a continuous coil through which refrigerating fluid may be circulated.

The chamber 20 which has the shelf 12 as its upper cover, with a front at 6, a back provided by the plate 11 and the bottom by the member 5 is an air supply chamber from which air is drawn and greatly reduced in temperature by passing through the refrigerating coil 19. The fan 17 will cause the air to circulate through the coil, said air entering at the front between the side plates 18 and being forced into the chamber 21 which is back of the vertical plate 11 and which has as its outlet the vertical flue 22 provided between the back 1 of the case and the vertical metal plate 13. As shown in Fig. 3 the flue may be divided into sections by vertical Z-bars 23 which also aid in supporting and reinforcing the plate 13.

The chamber 21 therefore is supplied with refrigerated air under pressure which is forced upwardly through the flue at 22 and out at the discharge opening at the end 13b, from which by gravity it tends to drop into the merchandise holding chamber above the shelf 12. Such air returns to the chamber 20 through the openings 14 thus setting up a continuous circulation of air. As mentioned before, some of the air also passes through the openings 13c.

It is evident that the air flows downwardly and forwardly for example, in the direction indicated by the arrows in Fig. 1 in the merchandise holding chamber, and that a current of cold air is continuously passing back of the open entrance side to the merchandise holding compartment. The relatively narrow closing panels 8 at the lower side of said entrance opening prevent the cold air from passing outwardly and over the upper edges of the part 6 of the case and cause it to be drawn through the openings 14 into the air supply chamber 20. Thus, the merchandise in the upper compartment of the refrigerator is protected against heat from the outside, there being a continuous flow of cold air downwardly and at the outer front portion of said merchandise holding compartment, thus maintaining the merchandise in its cold and refrigerated condition.

The merchandise which may be held in the display compartment of the case may consist of various food articles, vegetables, dairy products or any other articles which require protection against normal atmospheric temperatures particularly in the warmer seasons of the year. The construction is very practical and useful and has so proven in practice.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. In a construction of the class described, a case having a compartment with a substantially horizontal bottom, a substantially vertical back, a top and a substantially vertical front of less height than the back, providing an entrance opening to the compartment between the upper edge of said front and forward edge of said top, a panel disposed lengthwise of and at the lower portion of said opening, arms extending from the ends of the panel, means for pivotally mounting the upper ends of said arms whereby said panel may be turned to an upper position, a horizontal shelf located and spaced above the bottom of said compartment, and means for circulating refrigerated air located below said shelf, combined with means for directing said air upwardly at the rear and to the upper part of said compartment and thence coming back to below said shelf at the forward portion thereof, whereby a continuous current of refrigerated air is passing downwardly and forwardly immediately back of said front opening, said shelf at its forward portion having passages for the return of the air.

2. A refrigerator comprising, a compartment having a partially open front, means for refrigerating and circulating air, means for directing said refrigerated air downwardly past said front opening and within the compartment and for returning said air to said refrigerating and circulating means from near the front and bottom of said compartment and a removable plate partially closing the bottom part of said opening.

3. A construction of the class described, having a compartment with a bottom, back and ends, a horizontal top, and a front extending upwardly from the forward portion of the bottom a distance less than the height of said back thereby providing an opening at the front upper portion of the case for access to the compartment, a substantially horizontal shelf across the compartment a distance above the bottom thereof, a refrigerating coil below the shelf, a power driven fan for providing a forced circulation of air through the coil, outlet means at the rear portion of the shelf through which the air is forced and is guided to the upper part of said compartment, means for directing said air downwardly past said front opening and within said compartment, said shelf at its front portion being provided with a plurality of air entrance openings in its length for passage of the return of air, and a substantially vertical plate located between the under side of said shelf and the bottom of the compartment back of said refrigerating coil, said plate having a central passage therethrough in which the fan is mounted, as specified.

4. A refrigerator comprising, a compartment having a substantially horizontal bottom, a top, a substantially vertical back and a front having a substantial opening therein, a conduit extending upwardly adjacent said back and forwardly adjacent said top and terminating at its forward end near the upper edge of said front opening, said conduit being of heat conducting material and exposed to said compartment and extending over a substantial area of said back and top, means for refrigerating air and for forcibly passing it through said conduit upwardly at the back and forwardly at the top, outlet means at the forward end of said conduit for directing said air downwardly past said front opening and within said compartment and means for returning said air from said compartment near the bottom and front only thereof to said refrigerating and circulating means.

5. The combination of elements defined in claim 4, combined with a plurality of openings near the upper end of said conduit for seepage of refrigerated air therefrom, whereby moisture is prevented from forming on said forwardly extending portion.

6. The elements in combination defined in claim 4, combined with a removable plate partially closing the bottom part of said opening.

7. The elements in combination defined in claim 4 in which said bottom is of heat conducting material and said return air circulates in contact with a considerable portion of the under side of said bottom for cooling the same.

CLIFFORD B. SHREVE.