Sept. 12, 1950 E. F. BRILL ET AL 2,522,090

REFRIGERATED DISPLAY CASE

Filed March 29, 1947 2 Sheets-Sheet 1

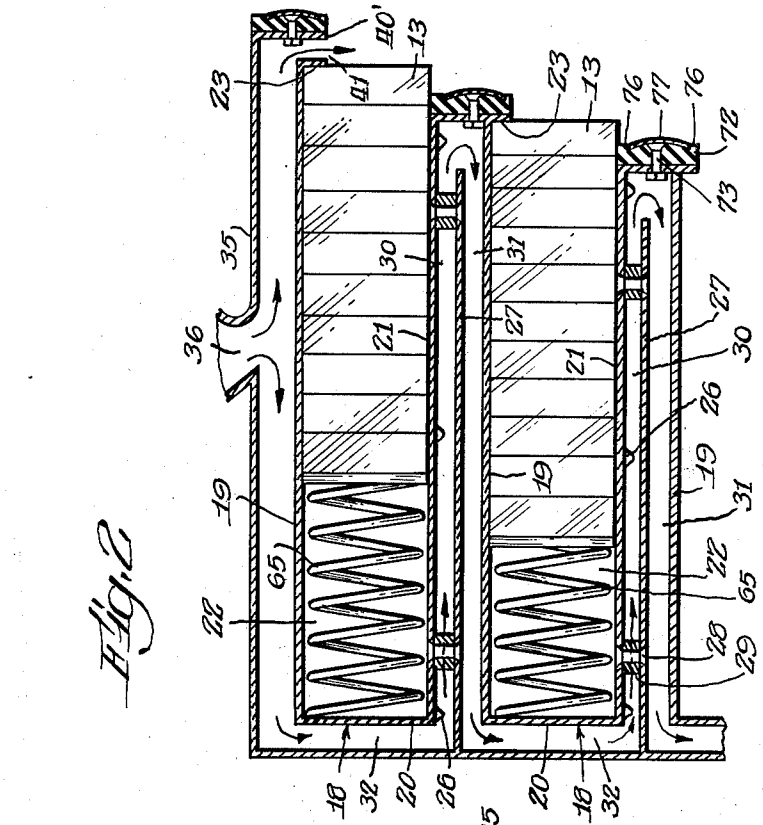


Fig. 2

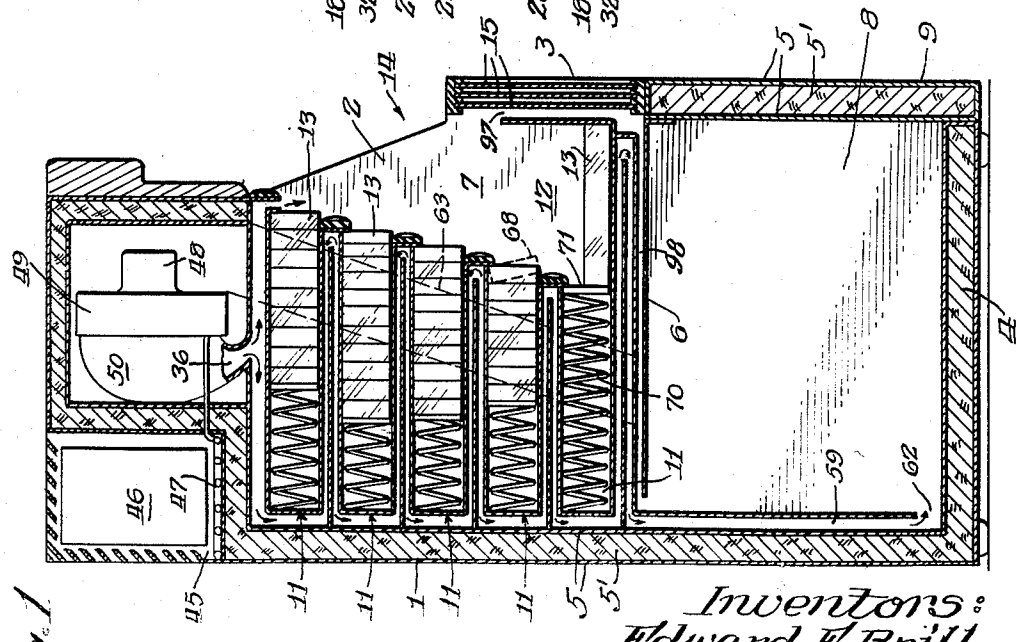


Fig. 1

Inventors:
Edward F. Brill
Orval Schroeder
By Brown, Jackson, Boettcher & Dunn Attys

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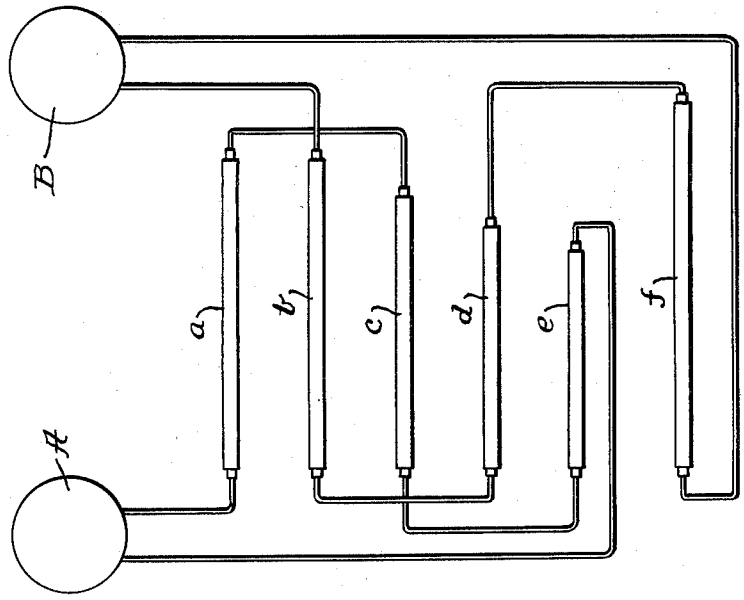


Fig. 4

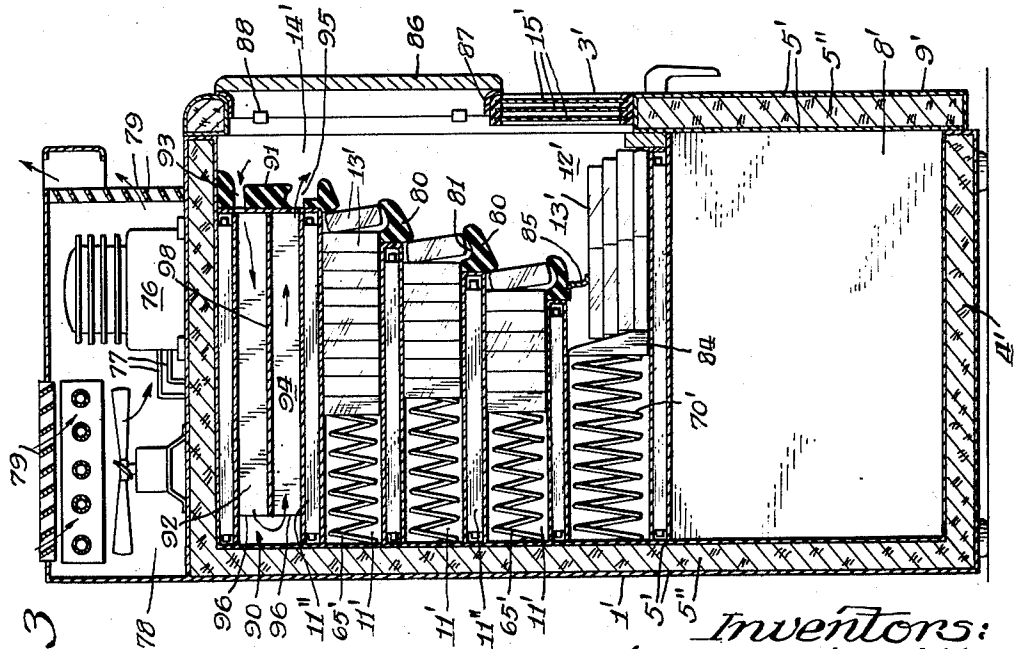


Fig. 3

Inventors:
Edward F. Brill
Orval Schroeder
By Brown, Jackson, Boettcher & Dienner
Attys.

Patented Sept. 12, 1950 2,522,090

UNITED STATES PATENT OFFICE

2,522,090

REFRIGERATED DISPLAY CASE

Edward F. Brill and Orval Schroeder, Milwaukee, Wis.; said Schroeder assignor to said Brill

Application March 29, 1947, Serial No. 738,182

6 Claims. (Cl. 62—89.5)

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This invention relates, in general, to refrigerated display cases and has particular relation to improvements in refrigerated display cases which are adapted to contain and display articles of merchandise, such as frozen foods and the like, and to keep the merchandise in a cool and refrigerated condition and at the same time permit effective display of the articles or packages of frozen food or the like, and free and convenient access to the same by the customer.

While the particular display case which we shall describe hereinafter in connection with the drawings is, in general, of the type in which the refrigerated compartment for the articles of merchandise may, when in service, be open at one side, for example, at the front, it is to be understood that the invention is not limited in all respects to this particular type of case, but may be embodied in other cases as suitable or desired.

In prior refrigerated display cases for self-service of frozen foods and the like, difficulties have been encountered in keeping the articles of merchandise in a cool and refrigerated condition and, at the same time, in position for effective and satisfactory display and for ready and free access by the customer for removal from the case. Difficulty has also been encountered in sealing the case against the entry of warm air and in preventing the collection of moisture and frosting, particularly on the exposed surfaces of the articles or packages within the case and on the adjacent parts of the case. Moreover, prior cases of this sort have not had provision for supporting, for example on shelves, regular or other shaped articles that may be so supported and displayed in combination with one or more wells for irregular or other shaped articles not adapted to be so supported and displayed and in such manner that the customer may have a complete view or survey of all of the articles—those on the shelves and those in the wells—from the front of the case.

In one prior scheme the case has had a compartment for the articles or packages of frozen food or the like, provided with an entrance opening at the front combined with means for directing cold or refrigerated air upwardly at the rear to the upper part of the compartment, and for passing the refrigerated air downwardly and forwardly immediately back of the front opening to exclude heat from the outside air. Cases of this sort have not displayed the articles of merchandise on overlying shelves, and, where the articles are stacked in the merchandise holding compartment, have relied solely on the stream

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of refrigerated air at the back and top and along the open front to maintain the articles in cold or refrigerated condition.

One of the main objects of the present invention is to provide in a case of the character described having shelves for supporting the articles or packages of frozen food or the like in overlying rows in the refrigerated display compartment, the combination with such case of means for circulating a refrigerating medium through the shelves, combined with means for passing cold or refrigerated air under pressure from position in proximity to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles or packages on the shelves.

Another object of the invention is to provide a refrigerated display case of the character described wherein there are ducts not only at the rear and top of the compartment, but also within the shelves, combined with means for directing cold or refrigerated air under pressure upwardly along the rear and through the shelves to the upper part of the compartment, and for passing this refrigerated air from position in proximity to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves, for the purposes described.

Another object of the invention is to provide a refrigerated display case of the character described wherein the shelves are in the form of cold plates through which a suitable refrigerant or refrigerating medium is circulated, combined with means for passing refrigerated air from position in proximity to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves for the purpose described.

Another object of the invention is to combine one or more wells with the shelves, in the manner more fully disclosed in our copending application Serial No. 738,180, filed Mar. 29, 1947, issued as Patent Number 2,499,088 on February 28, 1950, and to provide for directing downwardly into or toward the one or more wells the stream of cold or refrigerated air which is directed downwardly over the front sides of the articles from the top of the compartment.

Another object of the invention is to provide at the top of the refrigerated merchandise holding compartment a removable auxiliary air cooler

and dehydrater for producing a natural flow of cold or refrigerated air downwardly over the fronts of the articles on the shelves.

Another object of the invention to provide, particularly for the type of case in which the shelves are in the form of cold plates, an improved dual or multiple form of refrigerant circulating system wherein, for example, freezing of a bearing in one compressor, or tube rupture, freezing of a valve, or other failure will not result in complete failure of the refrigerant circulating system, and wherein partial cooling or refrigeration will take place under such conditions.

Another object of the invention is to provide a refrigerated self-service display case of the character described having various features of novelty and advantages, and which is particularly characterized by its simplicity in construction, its economy in manufacture, and its effectiveness in use.

Further objects and advantages of the invention will appear from the following detailed description, taken in connection with the accompanying drawings which illustrate the manner of constructing, operating and using illustrative embodiments of the present invention.

In the drawings:

Figure 1 is a vertical transverse and more or less diagrammatic sectional view showing one form of case embodying the present invention;

Figure 2 is a fragmentary detail section showing one way in which the cold or refrigerated air may be circulated through the shelves;

Figure 3 is a view similar to Figure 1, showing another form of case embodying the present invention; and

Figure 4 is a view showing diagrammatically the improved dual or multiple form of refrigerant circulating system.

Referring first to the embodiment of the invention shown in Figure 1, this form of case comprises a vertical back wall 1, vertical end walls 2, a vertical front wall part 3, and a bottom wall 4. The walls 1, 2, and 4 are heat insulated, for example, by forming them of metallic outer and inner shells 5 with suitable heat insulating material 5' filling the space between the shells, or otherwise as desired.

The interior of the case is divided, for example, by a horizontal wall 6 into an upper refrigerated merchandise holding compartment 7 and a lower storage space. The storage space may comprise one storage compartment 8, or it may be divided into two or more storage compartments. The storage compartment 8 has doors 9 hinged at their outer ends to the front ends of the end walls 2. When closed, the doors 9 constitute, with the front wall part 3, a front wall of less height than the back wall 1. The doors 9 are preferably heat insulated, for example, as described in connection with the walls 1, 2, and 4, or otherwise as desired.

A plurality of vertically spaced shelves 11 extend forwaradly from the back wall 1 to positions spaced rearwardly from the plane of the front wall an amount to provide at the bottom of the front of the refrigerated mechandise holding compartment 8 a well for articles or packages 13 of merchandise of irregular or other shape unsuitable for support on the shelves 11. The well 12 may be divided lengthwise of the case into a plurality of well parts, if desired. The spacing of the front ends of the upper shelves 11 rearwardly of the plane of the front wall of the case permits free and convenient access to the merchandise 13 through the dispensing opening 14 at the front of the case.

A window extends upwardly from the bottom of the well 12 to approximately the top of the front wall part 3. This window preferably comprises a plurality of spaced transparent sheets 15 so as to provide insulation against heat conduction therethrough, and through which the articles of merchandise in the well 12 and the articles of merchandise on the lower shelves 11 are attractively displayed in such manner that the customer may have a complete view or survey of all of the articles from the front of the case. The articles of merchandise on the shelves 11 above the front wall part 3 are, of course, visible through the dispensing opening 14. The opening 14 may be covered at night, or when the case is otherwise not in service, by a suitable cover (not shown) which may be removed or opened during the day or otherwise when the case is in use.

As shown more or less diagrammatically and in detail in Figure 2, each row of articles or packages 13 is preferably enclosed within a box-like container or vessel 18. Each vessel 18 is formed, for example, of sheet metal and has a top wall 19, rear wall 20, bottom wall 21, and end or side walls 22. The front end of the bottom wall 21 of each vessel is shown turned down at 23 to form an article or package stop for the foremost article or package within the underlying vessel. The vessel 18, shown at the top in Figure 2, is the vessel for the uppermost row of articles within the compartment 7. The front ends of the top walls 19 of the vessels 18 beneath the upper vessel are shown abutting the downturned flanges 23 to close the forward ends of the ducts or spaces between the vessels. This may, of course, be accomplished in any other suitable manner.

The vessels 18 are preferably sealed except for the opening at the front through which the packages are inserted into the vessels 18 and withdrawn by the customer as described. The vessels 18 may be supported in overlying spaced relation, for example, by lugs 26 (Figure 2) turned inwardly from the inner shells of the opposite side or end walls 2, preferably without piercing the same. The spaces between the bottom wall 21 of each vessel and the top wall 19 of the immediately underlying vessel are preferably divided by plates or partitions 27. The partitions 27 may be secured, for example, by rivets 28, spot welding or the like, to the bottom walls 21 of the vessel 18. Spacers 29 are provided between the walls 21 and the partitions 27.

The partitions 27 divide the space between the bottom walls 21 and the top walls 19 into upper and lower ducts or passages 30 and 31, and are shown extending at their rear ends to the inner surface of the rear wall 1 of the case. The forward ends of the lower ducts 31 open into the forward ends of the upper ducts 30. The rear walls 20 of the containing vessels are spaced from the inner surface of the rear wall 1 to form ducts or passages 32, each of which places the rear end of the adjacent duct 31 in communication with the rear end of the adjacent duct 30.

The top wall 19 of the uppermost containing vessel 18 has spaced above the same a wall 35 provided with an opening 36 for the admission of cold or refrigerated air, as will presently appear. The wall 35 is shown as extending at the rear to the inner surface of the rear wall of the case. The forward end of the wall 35 is turned down at 40', with the downturned part 40' spaced from the downturned end of the adjacent wall 19 to

provide at the forward end of the top of the shelves an outlet duct 41 for discharging cold or refrigerated air downwardly across the front ends of the foremost articles on the shelves and into or toward the well 12.

Above the wall 35 is a compartment 45, the walls of which house part of the refrigerating apparatus. This apparatus per se may be of any suitable or preferred type well known in the art. Suffice it to state that it is shown as comprising a compressor unit 46, evaporator pan 47, fan motor 48, and blast cooler 49 which, in operation, delivers cold air of a temperature adapted to maintain the articles or packages of merchandise in the desired cold or refrigerated condition through a duct 50 and the opening 36 into the upper duct 40.

In operation, the cold stream of air entering the upper duct 40 through the opening 36 circulates as shown by the arrows in Figure 2. Upon entering the duct 40 a part of the cold air flows forwardly and is discharged through the outlet 41 downwardly across the front sides of the articles or packages 13 within the compartment 7. The remainder of the cold air passes rearwardly through the duct 40 and then downwardly through the duct 32 into the upper duct 30.

Upon entering the upper duct 30 the cold air passes forwardly through this duct. At the forward end of the duct 30 the cold air passes into the forward end of the underlying duct 31 and then rearwardly through this duct into the duct 32 and downwardly into the ducts within the next lower shelf. Upon entering the lowermost duct 31 the cold air passes rearwardly to the upper end of a vertical duct 59 adjacent the inner side of the rear wall 1 of the case. The lower end of the duct 59 opens at 62 into the storage compartment 8. Rising through the compartment 8 the cold air continues to rise through side ducts one of which is shown in dotted lines at 63 in Figure 1, and is returned through these ducts 63 to the blast cooler 49 where it is cooled or refrigerated and recirculated as described.

The stream of cold air discharged downwardly through the outlet 41 blankets the open accessible side of the refrigerated merchandise holding compartment with cold air. This effectively prevents the collection of moisture and frosting, particularly on the exposed foremost surfaces of the merchandise and the adjacent portions of the case. Heat and moisture from the outside are thus excluded, and the merchandise is maintained in its proper cold and refrigerated condition. The cold air which enters the well 12 may pass upwardly and into a duct 97 in the front part 3, and upon entering this duct the cold air may be passed downwardly into a horizontal duct 98 and rearwardly to the upper end of the vertical duct 59.

The storage compartment 8 is cooled by the circulation of cold air through the overlying duct; also by the cold air circulating downwardly along the back of the same through the duct 59 and by the circulation through the compartment 8 to the ducts 63.

The packages 13 in the respective rows are yieldingly forced forwardly against the stops 23 by coiled springs 65, in general, in the manner disclosed in the copending application of Edward F. Brill, Serial No. 662,396, filed April 15, 1946. The springs 65 are shown interposed and acting between the inner side of the rear wall 1 and the rear side of the rearwardmost packages in the respective rows. These rearwardmost packages may be dummy packages fastened to the springs or to spring followers to prevent their removal from the case.

As shown in Figure 1, the shelves 11 are preferably arranged with their downturned front ends 23 extending forwardly increasing distances from the bottom row to the top row. The lower sides or bottoms of the foremost packages in their respective rows extend forwardly from the walls 21. This permits the customer to conveniently grasp the forwardmost package 13 in any desired row, and to remove the same from the case, for example, by tilting the package, as shown in dotted lines at 68 in Figure 1.

The downturned forward ends 40' and 23 extend continuously in a horizontal direction across the front of the shelved portion of the refrigerated merchandise holding compartment for the articles or packages 13. Outer facing pieces 72 are secured by screws 73 to the downturned forward ends 40' and 23. These pieces or strips 72 extend horizontally and continuously across and cover the forward sides of the depending flanges 40' and 23. The pieces 72 are preferably formed of rubber, wood, plastic, or other non-frosting material. The heads at the outer ends of the screws 73 are also preferably formed of or covered with rubber, wood, plastic, or other non-frosting material.

The outer surface of each piece 72 has grooves 76 set at an angle so that price markers 77 may be flexed to arcuate form and secured in place in front of the respective rows or articles by springing the ends of the markers 77 into the grooves 76.

The articles or packages 13 in the well 12 may be yieldingly forced outwardly against the inner side of the front wall part by one or more coiled springs 70 acting, for example, against a suitable follower 71.

In the form of case shown in Figure 3 the shelves 11' are formed by cold plates provided, for example, with internal coils, such as shown in detail in the copending application before referred to, through which a suitable refrigerant is circulated. The parts of the case shown in Figure 3 which are like or similar to parts of the case shown in Figure 1 are designated by primed reference characters corresponding with the reference characters used in Figure 1.

Where the shelves 11' are in the form of cold plates with refrigerant coils therein, the coils are connected in series with the refrigerating apparatus except for the condenser designated in its entirety at 76 by suitable tubes, as more fully disclosed in the previously identified application of Edward F. Brill, or otherwise as desired. Suffice it to state that the tubes 77 connect the refrigerating apparatus 76 with the refrigerant inlet of the upper cold plate overlying the upper row of packages 13', the outlet of this plate with the inlet of the next lower plate, the outlet of this next plate with the inlet of the next plate, the outlet of this next plate with the inlet of the next plate, the outlet of this next plate with the inlet of the bottom plate, and the outlet of the bottom plate with the refrigerating apparatus 76.

The refrigerating apparatus 76 is housed, for example, within a compartment 78 at the top of the case. The walls of the compartment 78 have louvers 79 through which air may circulate into and from the compartment.

The cold plate 11'' above the upper row of articles is spaced downwardly from the cold plate

at the top of the compartment 7, and it and the cold plates 11'' overlying the other rows of articles have package stops 80 suitably secured to their forward ends. The package stops 80 cooperate with the upper outer sides of the foremost articles 13' in the underlying rows and are scooped or hollowed out at 81 for access to the lower portions of the articles in the overlying rows. The stops 80 are preferably formed of rubber, wood, plastic or other non-frosting material.

The articles or packages 13' in the respective rows may be forced forwardly against the stops 80 by springs 65' as in the preceding embodiment of the invention. The articles or packages 13' in the well 12' may be forced outwardly by springs 70', also as in the preceding embodiment of the invention. A follower for the articles in the well 12' is shown at 84. An air seal, for example, in the form of a flexible rubber or rubber-like drop curtain 85 may be secured along the bottom of the forward marginal edge of the lower shelf 11' to depend into sealing engagement with the articles in the well 12' to seal the rearwardmost of such articles against entry of heat, warm air, or moisture, if desired.

In Figure 3 the front opening 14' is shown provided with a removable cover 86 for closing this opening at night or whenever the case is not in use. The cover 86 is shown as reduced at its inner end at 87 to enter the opening 14', and is provided with snap catches 88 for securing it in place. The cover 86 is removed bodily.

In Figure 3 the space between the upper and downwardly spaced cold plates 11'' is provided with an auxiliary air cooler and dehydrater 90 which is adapted to be removed by sliding it from between the cold plates for defrosting or the like. Secured to the front end of the air cooler 90 is a member 91 which extends continuously across the front of the same.

The air cooler 90 has a plurality of upper ducts 92 opening inwardly from the front of the case through an opening 93 in the member 91; also a plurality of underlying ducts 94 discharging from the front of the case through a discharge outlet or discharge outlets 95 opening through the member 91. The member 91 is preferably formed of rubber, wood, plastic or other non-frosting material. The rear ends of the ducts 92 open downwardly into the rear ends of the ducts 94 for circulation of air through these ducts, as indicated by the arrows. Rearwardly extending fins 96 between the upper ducts 92 and similar rearwardly extending fins 96 between the lower ducts 94 constitute a unitary part of the auxiliary air cooler and dehydrater and provide a radiator-like construction, and thereby maximum cooling surface for the air passing through the ducts 92 and 94. A horizontal and rearwardly extending partition 98 separates the upper ducts from the lower ducts.

In operation, as the auxiliary air cooler and dehydrater 90 is cooled or refrigerated, a natural flow of air is produced therethrough. The warmer air enters through the upper openings 93 and passes into the upper duct 92. As this air is cooled or refrigerated, it passes rearwardly and down into the lower duct 94 and flows forwardly and is discharged through the openings 95. The stream or streams of air discharged from the opening or openings 95 passes, by reason of its cooled or refrigerated condition, downwardly over the front sides of the rows of packages on the shelves 11' and blankets the open

accessible side of the refrigerated mechandise holding compartment with cold air. This effectively prevents the collection of moisture and frosting, particularly on the exposed foremost surfaces of the merchandise and the adjacent portions of the case. Heat and moisture from the outside are thus excluded, and the merchandise is maintained in its proper cold and refrigerated condition. At the same time the cold plates or shelves 11' cool or refrigerate the space within the blanket of cold air so that relatively low temperatures may be maintained and moisture collection and frosting eliminated without in anywise reducing the effectiveness of the air stream over the forward sides of the packages.

In the diagram shown in Figure 4, six cold plates or shelves are indicated at *a*, *b*, *c*, *d*, *e*, and *f*. They may be placed, for example, in the refrigerated merchandise holding compartment of the case, as previously described.

Separate refrigerating, or refrigerating and condensing, or refrigerant circulating units are shown at A and B. The cold plates *a*, *c*, and *e* are connected in series to the refrigerating or refrigerant circulating unit A and the alternate cold plates *b*, *d*, and *f* are connected to the refrigerating or refrigerant circulating unit B. Thus freezing of a bearing in one compressor or tube rupture, or freezing of a valve or other failure in one of the refrigerant circuits will not result in complete failure. At least partial cooling will be provided by the other circuit, and the cold plates or refrigerating devices therein and the merchandise holding compartment of the case will be cooled or refrigerated thereby.

The embodiments of the invention shown in the drawings are for illustrative purposes only, and it is to be expressly understood that said drawings and the accompanying specification are not to be construed as a definition of the limits or scope of the invention, reference being had to the appended claims for that purpose.

We claim:

1. A refrigerated display case comprising a cabinet having a merchandise holding compartment, spaced apart shelves for supporting articles in overlying rows in said compartment, interconnected distribution ducts at the rear and top of the compartment and between said shelves; also a duct overlying the upper row of articles, with outlet means at the forward end of said last duct, and means for supplying refrigerated air to rear duct and to the ducts between said shelves and into said overlying duct, a portion of the refrigerated air discharging only from the outlet means at the forward end of said overlying duct downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles.

2. A refrigerated display case comprising a cabinet having a merchandise holding compartment, spaced apart shelves for supporting articles in overlying rows in said compartment, distribution ducts for conveying a refrigerating medium between the shelves and including a duct having an outlet for passage of refrigerated air from position in proximity only to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles, a storage compartment beneath said merchandise holding compartment with additional duct means communicating with said first distribution ducts

for conveying the refrigerated air along the wall of said storage compartment for refrigerating the same and means for delivering a refrigerating medium to said ducts.

3. A refrigerated display case according to claim 1 wherein the ducts between the shelves except for the overlying duct are closed against discharge of the refrigerated air from the forward ends thereof.

4. A refrigerated display case comprising a cabinet having a merchandise holding compartment, spaced apart shelves for supporting articles in overlying rows in said compartment, distribution ducts for conveying a refrigerating medium between the shelves, means for discharging refrigerated air from position in proximity to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles, said last means comprising an auxiliary air cooler and dehydrater removable from the case for defrosting, and means for delivering a refrigerating medium to said first named ducts.

5. A refrigerated display case comprising a cabinet having a merchandise holding compartment, spaced apart shelves for supporting articles in overlying rows in said compartment, distribution ducts for conveying a refrigerating medium between the shelves, means for discharging refrigerated air from position in proximity to the forward end of the top of the upper row of articles downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles, said last means comprising an auxiliary air cooler and dehydrater having a duct opening inwardly from the front of the case and extending to the rear of the case, with the rear end of said duct opening into an underlying duct extending to and discharging from the front, said ducts overlying said shelves, and means for delivering a refrigerating medium to said first named ducts.

6. A refrigerated display case comprising a cabinet having a merchandise holding compartment, spaced apart shelves for supporting articles in overlying rows in said compartment, distribution ducts for conveying a refrigerating medium between the shelves, means for discharging refrigerated air from position in proximity to the forward end of the top of the upper row or articles downwardly over the front sides of the articles on the shelves to exclude heat from the outside and to prevent moisture collection and frosting of the articles, said last means comprising an auxiliary air cooler and dehydrater having ducts opening inwardly from the front of the case and extending to the rear of the case, with the rear ends of said ducts opening into underlying ducts extending to and discharging from the front, said ducts overlying said shelves, and fins between the upper ducts and the lower ducts for providing maximum cooling surface for the air passing therethrough, and means for delivering a refrigerating medium to said first named distribution ducts.

EDWARD F. BRILL.
ORVAL SCHROEDER.

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