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F. C. GRILLEY ET AL

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REFRIGERATED FOOD DISPLAY CABINETS

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2 Sheets-Sheet 2

Fig. 3.

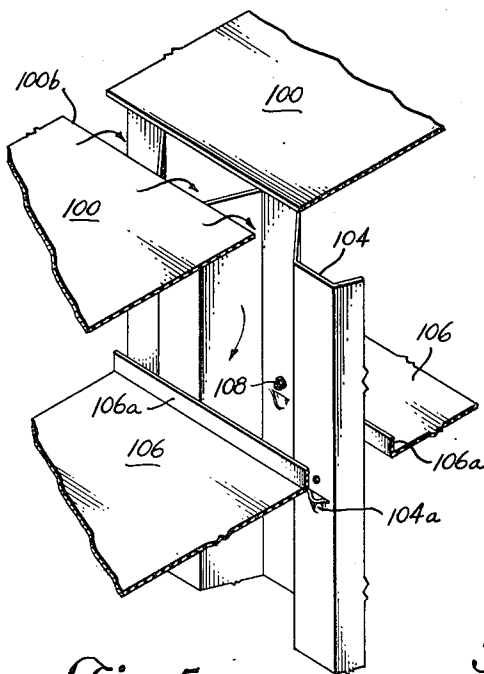
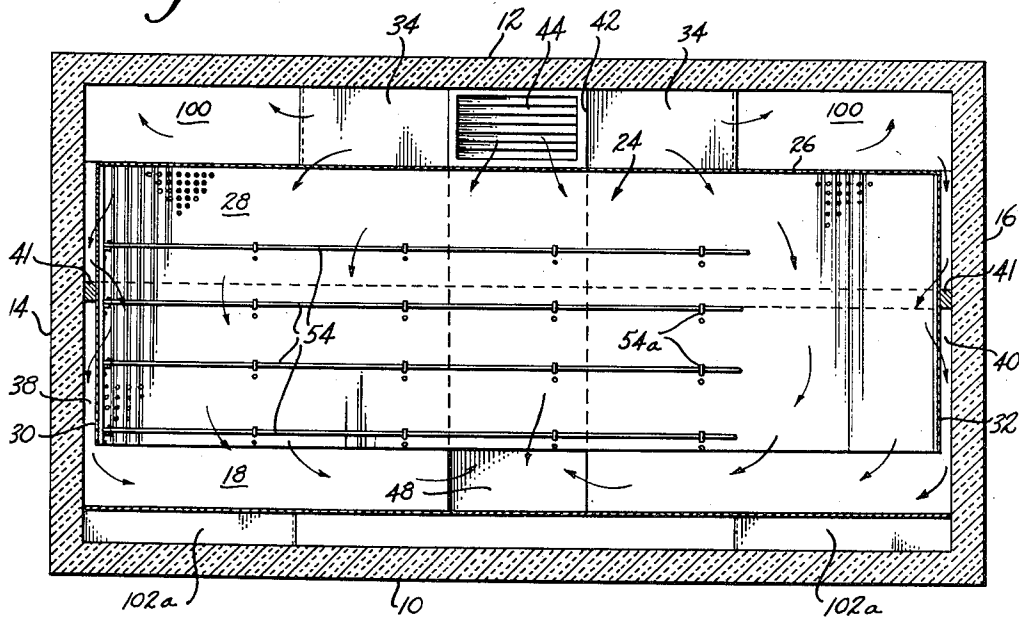


Fig. 5

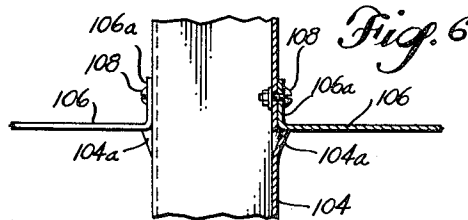
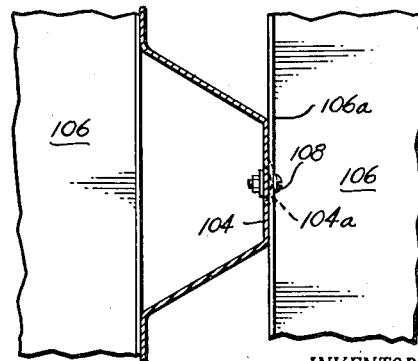


Fig. 6

Fig. 7



INVENTORS.
FRANK C. GRILLEY
MORRIS M. SMITH
BY
Reynolds, Beach & Christensen
ATTORNEYS

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REFRIGERATED FOOD DISPLAY CABINETS

Frank C. Grilley and Morris M. Smith, Tacoma, Wash., assignors to Room-Temp Lockers, Inc., Tacoma, Wash., a corporation of Washington

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10 Claims. (Cl. 62—89.5)

This invention relates to an improved refrigerated food display cabinet of the upright type as distinguished from the chest type. The invention is herein illustratively described by reference to the presently preferred form thereof for application as a frozen food merchandising cabinet in grocery stores and the like, and is herein disclosed in combination with banks of frozen food storage lockers; however, it will be evident that the invention is not limited in its application to such combinations. Further it will be recognized that certain variations and modifications with respect to details of construction and arrangement of components are possible within the scope of the invention.

Refrigerated upright display cases for grocery store merchandising applications have important advantages over chest type units. However, upright display cases constructed in accordance with conventional designs present special problems one of which is that the frequent opening and closing of doors by customers at varying intervals has a tendency to cause the door glass to frost. Also it makes difficult the maintenance of uniform temperatures within the cabinet. It is particularly important that the air circulation characteristics of such a cabinet permit the interior immediately to recover its thermal equilibrium throughout and to produce immediate clearing of the door glass following one or more openings and closings of the cabinet doors.

The present invention is directed to an improved refrigerated food display cabinet or the like which is relatively simple and inexpensive to manufacture, compact, efficient, and which generally provides a highly satisfactory solution to the foregoing and related problems.

A more specific object of the invention is a refrigerated food display cabinet which with a refrigerating unit of minimum capacity is capable of maintaining uniformity of temperature throughout the cabinet interior and of producing immediate recovery of thermal equilibrium within the cabinet following the opening and closing of doors, and more especially which is effective by reason of a novel air circulation arrangement to provide for substantially instantaneous clearing of the door glass should there be a fogging tendency.

A related object is such a refrigerated display cabinet which with a minimum of parts, simply fabricated, provides wall ducts, refrigerated air distribution channels, and a highly convenient means for the mounting of display shelves or racks rigidly yet adjustably at selected heights within the cabinet.

Preferably the top, rear and opposite-end inner walls of the cabinet are formed of perforated fiberboard or suitable structural perforated panel material, which, at least in the rear and end wall panels, is of corrugated form with the corrugations extending vertically, the wall panel perforations serving as air distribution openings and as securing holds for removable rack supporting elements, which permit adjusting the position of the racks heightwise of the cabinet. As an important additional feature, horizontally extending baffles interposed in the rear and

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opposite-end wall ducts between the tops and bottoms thereof divert descending refrigerated air in these ducts into the interior of the display cabinet through the wall perforations for controlled distribution therein with air settling or forced downwardly into the interior through the perforated top inner wall, the combined action being conducive to efficient air circulation for achieving the above stated objects. In addition to providing strength by which to support the heavy weight of the display racks within the cabinet, the corrugated form of the inner wall panels has the additional advantage of maintaining air circulation paths between the food articles stacked immediately adjacent to or in contact with the inner walls so that dead air spaces do not exist behind or adjacent these articles tending to impair their proper refrigeration.

These and other features, objects, and advantages of the invention will become more fully evident from the following description thereof by reference to the accompanying drawings illustrating the preferred embodiment and application of the inventive concepts.

Figure 1 is a perspective view with parts broken away illustrating the novel refrigerated display cabinet, the view being taken from a location in front of and above the cabinet to show its cooperative arrangement with two banks frozen food storage locker units.

Figure 2 is a transverse vertical sectional view through the display cabinet, the view showing one bank of locker units.

Figure 3 is a longitudinal vertical sectional view through the display cabinet itself.

Figure 4 is a top sectional detail view showing the display cabinet wall construction and the manner of supporting the storage racks from the inner wall panels.

Figure 4a is a sectional side view showing certain details of the rack supporting arrangement, supplemental to the showing in Figure 4.

Figure 5 is a perspective fragmentary detail view of the frozen food storage locker construction.

Figure 6 is a fragmentary vertical section through a portion of the structure shown in Figure 5.

Figure 7 is a horizontal fragmentary sectional view complementary to Figure 6 for purposes of illustration.

Referring to the drawings, the combined novel display cabinet and cold storage locker structure in plan are arranged in the form of a U, with the display cabinet interconnecting corresponding ends of the parallel banks of cold storage locker units, as seen best in Figure 1. The combined structure has an insulating base 10 and top or ceiling 12. The display cabinet opposite-end walls 14 and 16 and rear wall 18, together with the top and bottom walls 12 and 10 form the display case closure which is completed by the front wall 20 having one or more access doors 22 of the type having glass panels 22a permitting visibility into the interior of the display case where the frozen food articles are stored. It will be recognized that these outer-closure walls may be of any suitable insulated construction, a preferred example being the use of glass fiber bat retained between plywood sheets, with or without foil liners.

Within the closure formed by the outer walls described above, a storage compartment 24 is formed by top, rear and opposite-end inner wall panels 26, 28, 30 and 32, respectively. These inner wall panels are suitably mounted within the closure parallel to and spaced inwardly from the corresponding outer walls to form wall air ducts therebetween. Thus the top inner panel 26 spaced downwardly from the top wall 12 forms a top wall duct or plenum chamber 34 extending the full width and length of the display cabinet, the rear inner wall panel 28 spaced forwardly from the rear outer wall 18 forms the rear wall duct 36 extending across the full length and height of the storage cabinet, and the op-

posite inner wall panels 30 and 32 spaced inwardly from the corresponding outer walls 14 and 16, form the opposite-end wall ducts 38 and 40, respectively. The details of the mounting structure by which the inner wall panels are thus positioned within the closure are not illustrated since they are deemed of secondary importance and may vary depending upon design preference. It is important, however, that the top, rear and opposite-end inner wall panels be of perforate form to permit air to flow freely through them over substantially their entire area. Preferably these panels are fiberboard of the type known as hardboard and have rows of closely spaced circular apertures which in a typical case are $\frac{3}{16}$ inch in diameter and spaced apart about an inch, extending in rows across both width and breadth of the panels. The rear wall panel 28 and the opposite-end wall panels 30 and 32 are preferably corrugated, with the corrugations extending vertically.

In accordance with an important aspect of the invention, circulation of refrigerated air through the storage compartment is influenced not only by the perforated inner walls surrounded by the wall ducts as previously described, but by the provision of baffle means extending generally horizontally in the rear and opposite-end wall ducts, such baffle means being designated 41 in the illustration and serving to block descent of air in these wall ducts at a location generally intermediate the top and bottom thereof. As a result of the presence of such a baffle means, air descending or forced downwardly in the rear and opposite-end wall ducts is induced to flow through the inner wall perforations into the storage compartment 24 above the baffle means for commingling of such air with air descending through the compartment from the top thereof, and is induced to flow outwardly through the perforations in the inner wall panels back into such ducts below such baffle means.

The display cabinet rear wall 18 has a central opening 42 at the top thereof through which refrigerated air is forced by the blower (not shown) of the refrigeration unit 44. The latter is conveniently mounted on a bracket 46 directly behind such opening. The air thus forced into the display cabinet closure enters the top wall duct 34 and the rear and opposite-end wall ducts 36, 38 and 40, respectively, which directly communicate with the top duct 34 at their upper ends. The refrigerated air which enters through the opening 42 into the top duct 34 descends into the interior of storage compartment 24 through the perforations in the top inner wall panel 26 both as a result of the positive pressure created by the blower of the refrigeration unit 44, and as a result of the suction created on the return side of the blower. The blower return circuit is formed by an opening 48 located centrally in and near the bottom of rear wall 18. A return duct 50 interconnects the entrance and discharge openings 42 and 48 and therefore provides a closed circuit for refrigerated air circulated through the display case by the refrigeration unit 44. Thus, the discharge opening 48 from the interior of the display case collects the refrigerated air descending in the rear and opposite-end wall ducts and that which descends through the interior of the storage compartment 24 for return of such air to the refrigeration unit 44. The usual drip pan 52 and other incidental features of an operating refrigeration unit of the circulated air type are, of course, implied although all are not shown in the drawings.

Within the storage compartment 24 formed by the perforate inner walls of the display case, a plurality of perforate display racks 54 are mounted in generally horizontal position spaced apart vertically. Conveniently, these display racks are of open-grid construction formed by welding parallel steel rods or the like to a steel frame. As another feature of the invention these racks are supported directly by the inner walls 28, 30 and 32, with or without supplemental supports at their front edges from the front wall 20 at locations between and beside the access doors 22. Referring to Figure 4 it will be noted

that a rack 54 is supported by the clips 54a lodged in selected horizontally aligned apertures 28a in the rear inner wall panel 28. A similar group of clips to support the display rack edges may be used at the ends of the storage compartment. Moreover, these clips, being removable from the supporting apertures in the inner wall panel, permit locating and relocating the storage racks at any desired positions heightwise of the display cabinet. (See Figures 4 and 4a.)

A bank of cold storage lockers extends rearwardly from the back side of the display case at each end thereof. Refrigerated air to each of the two illustrated banks of cold storage lockers is delivered through top ducts 100 communicating with the display case top wall duct 34 through openings 100a in the opposite ends thereof at the rear of the display case. Spent refrigerated air circulated through the cold storage units is returned to the refrigeration unit 44 through the bottom ducts 102 communicating with the bottom of the display case closure through the discharge openings 102a located at the rear of the display case near the opposite ends thereof.

Each bank of cold storage locker units through which refrigerated air is circulated between the feed and return ducts 100 and 102 comprises a horizontal row of cabinets formed between the upright corrugated sheet metal panels 104 and having horizontally disposed sheet metal storage shelves therein 106 at different heightwise locations. A separate door (not shown) for each such shelf is provided in the front wall of the locker structures. The corrugations of these panels extend vertically as shown. The shelves 106 are mounted directly on the corrugated panels 104. The method preferred for mounting such sheet metal shelves appears in Figures 5, 6 and 7. Each shelf 106 has upturned side flanges 106a which are apertured at suitable intervals to receive the supporting bolts 108 which pass through apertures in the adjacent surfaces of the corrugated divider strips 104. Additional support for the weight carried by the shelves 106 is provided by slitting the corrugated dividers 104 horizontally and forcing the metal below the slit outwardly to form a ledge 104a upon which the edges of the shelves may rest and from which they are prevented from dislodgement by the bolts 108 located directly above the ledges.

The top ducts 100 are furnished with transverse slots 100b at the locations of the corrugated divider panels 104 to permit refrigerated air to descend along the channels defined by the corrugations of each such divider panel, on both sides thereof. The top wall of the bottom duct 102 is similarly slotted at the locations of the divider panels. Air which thus descends along the channels or troughs defined by the vertically extending corrugations in these divider panels is distributed into the respective storage spaces defined between and above and below the horizontal storage racks 106 very uniformly, it being evident that the use of these corrugated dividers or partitions, therefore, serves multiple purposes, both structural and as air-directing or channeling elements.

It is found from experience that the novel display case arrangement is highly effective in achieving the stated objectives. The feature comprising the combination of perforate inner wall panels and the horizontal baffle means generally intermediately positioned in the wall ducts is of paramount importance in this combination for that purpose. The inwardly and then outwardly directed flow of air above and below the baffle means 41 combines with the descending air already passing downwardly through the interior of the storage compartment 24 to give the desired uniformity of temperature within the storage compartment and to clear the door glass panels 22a almost instantly upon reclosure of the doors following access to the interior of the cabinet by store customers. The provision of corrugated rear and opposite-end inner wall panels 28, 30 and 32, respectively, adds strength to the rack-supporting structure by reason of the stiffness im-

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parted to these panels by the vertically extending corrugations. Thus, the load-bearing capacity of the wall structure which holds the shelves is largely independent of the selected location of the shelves heightwise of the storage compartment, which locations or relocations of the shelves at any time is permitted by the fact that the shelves are supported by clips which lodge in the apertures in such inner wall panels. It is therefore unnecessary to provide separate stiffeners for these wall panels at the different locations at which the shelves may be located, and in consequence the wall ducts at the rear and at the ends of the display case are relatively unobstructed, as is the storage compartment, to flow of air freely throughout all regions thereof. Another distinct advantage of the corrugated form of these rear and opposite end wall panels is the assurance which is afforded that there will be no dead air spaces behind or along frozen food articles stored in the shelf immediately adjacent to these panels. In other words, because of the corrugations it is not possible for frozen food articles to lie in full surface-to-surface contact with the wall panels since contacts will be made only with the inside ridges of the corrugated panels, whereas the valleys or depressions will be left open to permit flow of refrigerated air downwardly therethrough and along the adjacent surfaces of the frozen food articles stored against such walls.

These and other features and advantages of the invention will be evident from the illustration constituting the preferred example of the invention.

We claim as our invention:

1. A refrigerated article storage case comprising top, bottom, rear and opposite-end outer walls forming an insulating closure, said closure having a front wall including at least one access door therein permitting access into said closure, top, rear and opposite-end inner walls mounted in said closure at respective locations spaced inwardly thereof from the corresponding outer walls, thereby to form a storage compartment accessible through said door, and thereby also to form top, rear and opposite-end wall air ducts between corresponding outer and inner walls of said closure, said inner walls comprising rigid material panels of perforate form permitting passage of air freely therethrough over substantially their entire area adjoining said storage compartment, a plurality of perforate storage racks mounted generally horizontally in said storage compartment at successively different heights therewithin to support refrigerated articles thereon to be stored, means for introducing refrigerated air into the top wall duct and into the upper ends of the rear and opposite-end wall ducts, means to withdraw refrigerated air from the bottoms of said rear and opposite-end air ducts and from the bottom of said storage compartment, and baffle means extending generally horizontally across substantially the full widths respectively of said rear and opposite-end wall ducts generally intermediate the tops and bottoms thereof for blocking descent of refrigerated air therein, thereby to divert such air through said perforate rear and opposite-end inner walls into said storage compartment above said baffles and to induce the withdrawing of refrigerated air into said rear and opposite-end wall air ducts below said baffles by said withdrawal means.

2. The refrigerated display case defined in claim 1, wherein at least the rear and opposite-end inner wall panels comprise corrugated sheets having perforations therein at interval locations extending over substantially their entire length and breadth adjoining the storage compartment.

3. The refrigerated display case defined in claim 2, wherein the corrugations extend vertically and the storage racks include supporting elements removably lodged in selected perforations of the rear and opposite-end inner wall panels to support such racks thereby at selected relative heights in the storage compartment.

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4. The refrigerated display case defined in claim 1, wherein the storage racks include supporting elements removably lodged in selected perforations of the rear and opposite-end inner wall panels to support such racks thereby at selected relative heights in the storage compartment.

5. A refrigerated article storage case comprising a closure having upright outer walls, upright inner walls spaced inwardly from said outer walls to form air ducts between such inner and outer walls and to form an interior storage compartment, a plurality of perforate storage shelves mounted within said storage compartment, said shelves extending substantially to said upright inner walls and having elements supportingly connecting them to said upright inner walls, means for introducing refrigerated air into said ducts at the top of said closure, and means for withdrawing refrigerated air from the bottom of said compartment, said inner walls comprising corrugated perforate material sheets having their corrugations extending generally vertically.

6. A refrigerated article storage case comprising a closure having upright outer walls, upright inner walls spaced inwardly from said outer walls to form air ducts between such inner and outer walls and to form an interior storage compartment, a plurality of perforate storage shelves mounted within said storage compartment, said shelves having elements supportingly connecting them to said upright inner walls, means for introducing refrigerated air into said ducts at the top of said closure, substantially horizontally disposed baffles mounted in said ducts between the top and bottom thereof to block descent of air therein and means for withdrawing refrigerated air from the bottom of said ducts, said inner walls comprising perforate material sheets permitting airflow therethrough at locations above and below said baffles.

7. The refrigerated article storage case defined in claim 6, wherein at least the rear and opposite-end inner wall panel sheets are corrugated and the corrugations thereof extend generally vertically.

8. A refrigerated food display cabinet comprising top, bottom, rear and opposite-end outer walls forming an insulating closure, said closure having a front wall including at least one transparent panel access door therein permitting visibility and access into said closure, top, rear and opposite-end perforate inner walls mounted in said closure at respective locations spaced inwardly thereof from the corresponding outer walls, thereby to form a storage compartment accessible through said door, and thereby also to form top, rear and opposite-end wall air ducts between corresponding outer and inner walls of said closure, the perforations in said inner walls permitting passage of air freely therethrough over substantially their entire area adjoining said storage compartment, a plurality of perforate display racks mounted generally horizontally in said storage compartment at successively different heights therewithin to support refrigerated food articles thereon, means for introducing refrigerated air into the top wall duct and into the upper ends of the rear and opposite-end wall ducts, means to withdraw refrigerated air from the bottoms of said rear and opposite-end air ducts and from the bottom of said storage compartment, and baffle means extending generally horizontally across substantially the full widths respectively of said rear and opposite-end wall ducts generally intermediate the tops and bottoms thereof for blocking descent of refrigerated air therein, thereby to divert such air through said perforate rear and opposite-end inner walls into said storage compartment above said baffles and to induce the withdrawing of refrigerated air into said rear and opposite-end wall air ducts below said baffles by said withdrawal means.

9. The refrigerated display case defined in claim 8, wherein at least the rear and opposite-end inner wall panels comprise corrugated sheets having perforations therein at interval locations extending over substantially

their entire length and breadth adjoining the storage compartment.

10. The refrigerated display case defined in claim 9, wherein the corrugations extend vertically and the storage racks include supporting elements removably lodged in selected perforations of the rear and opposite-end inner wall panels to support such racks thereby at selected relative heights in the storage compartment.

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