Nov. 13, 1962 E. A. FANICK, JR., ET AL 3,063,255

REFRIGERATED DISPLAY CABINETS

Filed March 31, 1961 3 Sheets-Sheet 1

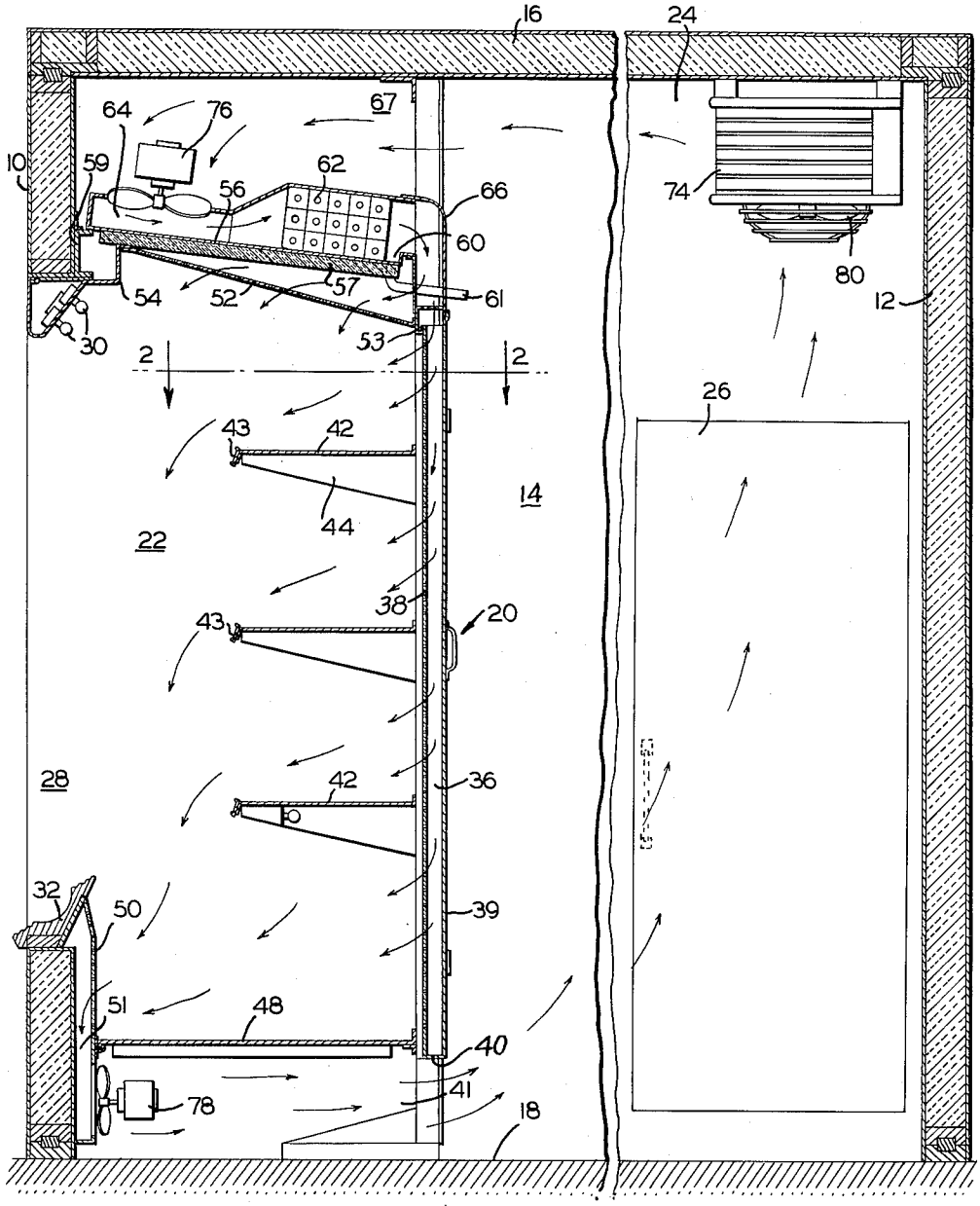

FIG. 1.

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REFRIGERATED DISPLAY CABINETS

Filed March 31, 1961 3 Sheets-Sheet 2

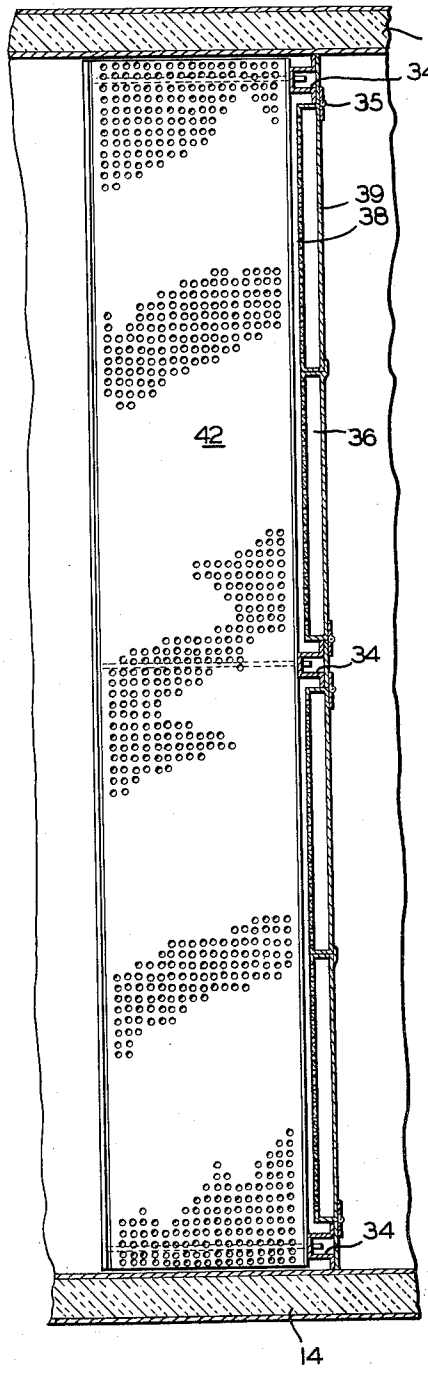

FIG. 2.

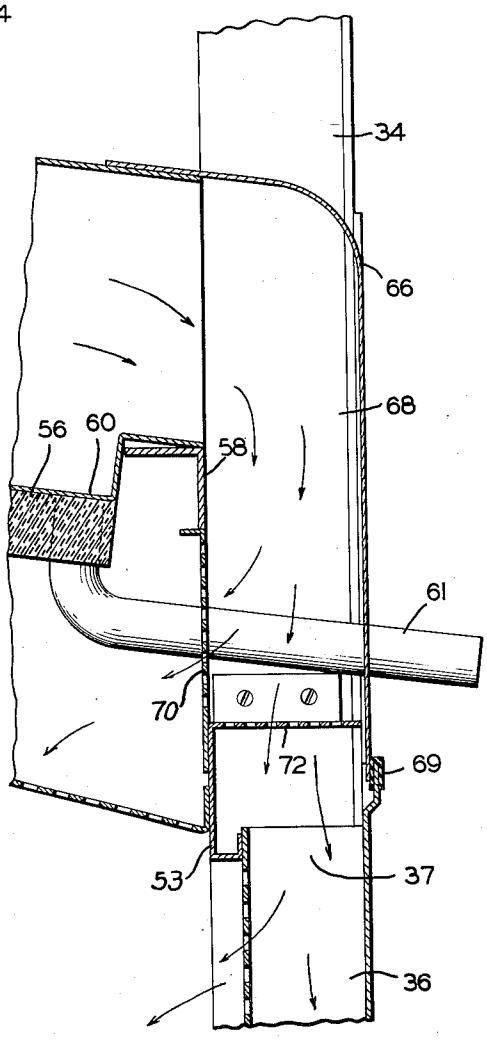

FIG. 3.

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Filed March 31, 1961 3 Sheets-Sheet 3

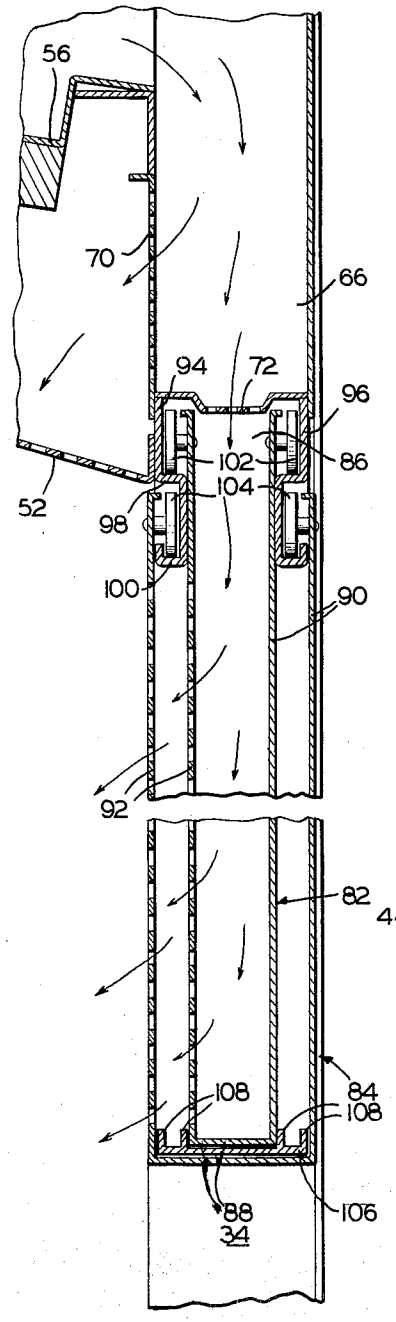

FIG. 4.

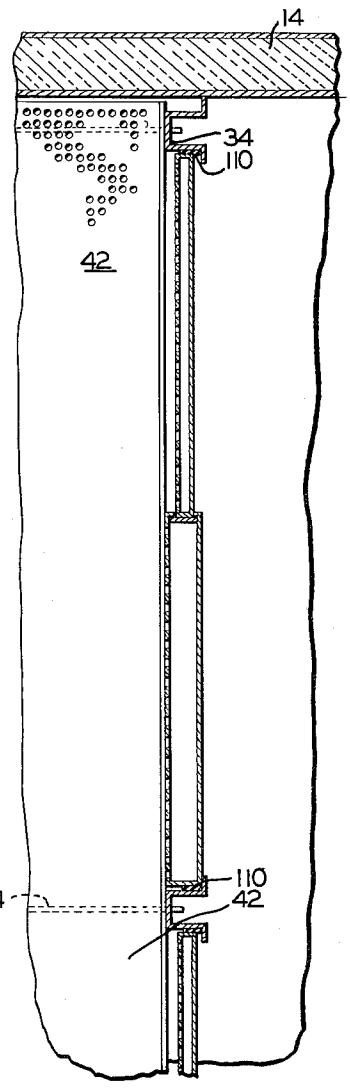

FIG. 5.

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REFRIGERATED DISPLAY CABINETS

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This invention relates to refrigerated display cabinets and more particularly, to refrigerated cabinets of the display-storage type, wherein refrigerated items in a display area are accessible through an opening in the front wall of the cabinet, while reserve items retained in a storage area may be placed in the display area through doors separating the two areas.

In recent years, the advances in refrigeration techniques have permitted the consuming public to purchase many perishable food items formerly not available. Not only have the developments in frozen food processing aided considerably in this respect, but also, the present ability of processors, suppliers and retailers to keep perishable items under refrigeration at all times during the marketing process has been very helpful. Yet, the present facilities available are not altogether without fault, particularly those available to the retailer who must under present day "self-service" marketing techniques keep the perishable items refrigerated, and in addition, display them properly to the consuming public. More basically, it might be said that the retailers' problem is due to the necessity of an enclosure for refrigerating the items he places on sale as contrasted with the desirability of an open and freely accessible display arrangement from the standpoint of consumer marketing appeal.

In the past, the retailer has had available to him two basic types of display cabinets or cases to facilitate the sale of perishable items which must be kept under refrigeration. The first of these is in the form of an open top receptacle into which the refrigerated items are placed and kept under refrigeration without the need for a cover since cold air is heavier than warm air and thus retained about the items with little heat loss in this type of receptacle or cabinet. While a refrigerated cabinet is thus provided which is also freely accessible from the outside without having to open a closure of any sort, a critical problem is presented in displaying the various items within the cabinet, since they must be stacked one over the other, thereby hiding much of the goods from the consumers' view. The other approach presently in common usage is to arrange the refrigerated items in a cabinet on shelves, spaced vertically one over the other and accessible through doors, usually glass doors, in the front wall of the cabinet. The necessity in this instance for the doors is due to the difficulty in keeping refrigerated an enclosure open on one side thereof since the cold air attempts to fall through the bottom of such an opening while warm air circulates in through the top. While the doors present an obstacle insofar as access to the displayed goods by the consumer is concerned, nevertheless the vertical arrangement of items on shelves compensates for this obstacle due to the more appealing display possible.

To some extent, the problems referred to with regard to the vertical or open front type of display cabinet have been overcome by the use of "air curtains." Such "air curtains" are effected by the emission of a high velocity jet of air along one side of the access opening on the interior thereof to a return duct or the like on the other side of the access opening. However, the turbulence necessarily incurred with the use of such an "air curtain" not only makes difficult the maintenance of proper cold storage conditions, due to the drawing of warm air into the cabinet enclosure, but the high velocity of the air

stream is readily detectable to one's touch when reaching across or through the air curtain to obtain an item in the cabinet, and to many people this is uncomfortable and objectionable.

In addition to the display cabinet feature, it is highly desirable for retailers to have a concealed storage area in close proximity to the display cabinets so that the refrigerated goods may be placed in the storage area and from there to the display cabinets as needed. Of course, the storage area must also be refrigerated in order to keep the reserve perishable items therein at the required low temperature. This latter feature, however, in order to be accomplished in an efficient and economical manner, requires circulation of refrigerated air between the display cabinet and the storage area, which circulation adds to the problem of retaining the refrigerated air within the open front display cabinet. For this reason, designs of such display-storage cabinets have, in the past, sacrificed some efficiency of refrigeration in order to prevent escape of cold air from the display cabinet.

Accordingly, an object of this invention is to provide a new and unique refrigerated display cabinet by which the problems heretofore encountered are substantially and effectively overcome.

Another object of this invention is the provision of a refrigerated display cabinet having particular utility in the retailing of perishable food items and arranged such that these items may be displayed on vertically spaced horizontal shelves which are freely accessible through an unobstructed opening in the front of the cabinet.

A further object of this invention is the provision of a display cabinet of the type aforementioned having a system for circulating cold refrigerated air in such a manner as to insure adequate, improved refrigeration for items placed therein as well as to eliminate undesirable condensation from falling on the items, and further which provides for a completely unhampered access opening in the front of the display cabinet through which the items displayed therein are accessible.

Another object of this invention is to provide a new and unique refrigerated display-storage cabinet wherein the display area thereof is completely accessible through an unrestricted opening in the front of the cabinet, and yet both the display and storage areas effectively refrigerated in an exceedingly economical manner.

A still further object of this invention is the provision of a refrigerated display-storage cabinet of the type referred to, provided with extremely effective access doors between the storage and display areas.

Other objects and further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. It should be understood, however, that the detailed description, while indicating preferred embodiments of the invention, is given by way of illustration only, since it will become apparent to those skilled in the art from this description, that various changes and modifications can be made without departing from the true spirit and scope of this invention.

In general, the aforementioned objects are accomplished by an open front display cabinet, having a plurality of vertically spaced overlying shelves, arranged on the front side of a hollow partition provided with a perforated forward face through which refrigerated air may be circulated to flow out and cascade over each of the shelves and items placed thereon. Preferably, the partition is in the form of either swinging or sliding doors interposed within the cabinet enclosure and between the display area thereof and a storage area to enable access to the display area from the storage area. Also, a blower means is provided in the lower forward portion of the display area so that as the cold refrigerated air is cascaded over each of the shelves, it is drawn past the

front opening thereof, downwardly and into the storage area to be circulated upwardly therethrough and back to refrigeration units positioned preferably in the upper portion of the cabinet. In addition, a portion of the refrigerated air is distributed through a perforated inner ceiling member in the display cabinet to prevent warm air contact with the ceiling and resulting droplets of condensation which may damage the items on display.

A more complete understanding of the refrigerated storage cabinet of this invention and its method of use may be had by referring to the accompanying drawings in which:

FIG. 1 is a fragmentary side elevation in cross section, showing the overall construction of the display cabinet of this invention;

FIG. 2 is a fragmentary cross sectional view taken along line of FIG. 1;

FIG. 3 is an enlarged fragmentary cross sectional view in elevation illustrating the refrigerated air supply plenum of the storage cabinet of this invention;

FIG. 4 is an enlarged fragmentary cross sectional view in elevation showing an alternative form of doors which may be used between the display and storage areas of the cabinet of this invention; and

FIG. 5 is a fragmentary plan view in cross section of the alternative embodiment illustrated in FIG. 4.

Referring now to the drawings, and particularly to FIG. 1 thereof, the display-storage cabinet of this invention is shown having a front wall **10**, a rear wall **12**, side walls **14**, a top wall **16** and a bottom wall or floor **18**. Partition means, designated generally by the numeral **20** separates the cabinet into a forward or display area **22**, and a rear or storage area **24**. The storage area is accessible through a door **26** in one side of the cabinet, while the front wall **10** is formed having an access opening **28**. As shown, the access opening **28** extends over practically the entire central portion of the front wall **10** of the cabinet and preferably is substantially as wide as the front wall. Also, suitable lighting **30** may be provided along the upper edge of the access opening, and decorative molding **32** or the like around the other portions thereof.

In the embodiment of FIGS. 1 through 3, the partition **20** includes a plurality of upstanding posts, **34**, preferably channel shaped in cross section though other shapes might be used. Suspended from the posts **34** on hinges **35**, are a plurality of hollow swinging doors **36** having an open top **37**, a perforated forward face **38**, an imperforate rear face **39** and a closed bottom **40**. As can be seen by reference to FIG. 1 of the drawings, the bottom of the doors **36** is elevated from the floor **18** to provide an air passageway **41** thereunder in a manner which will be described more fully hereinafter. Immediately adjacent the front perforated face of the doors **36** are mounted in vertically spaced relation a plurality of shelves **42** having forward edges **43** supported on brackets **44**, adjustably anchored to the upright posts **34** upon which the doors are hung. The forward edge **43** of each of the shelves is spaced horizontally from the front wall **10**, as shown in FIGURE 1 to provide for a generally vertical passageway although it is to be noted that the shelves are positioned close enough to the front wall **10** so as to be freely accessible through the opening **28** provided therein.

In the lower portion of the display area there is provided a bottom panel **48** which extends from the partition **20** to a perforated wall **50** that is spaced inwardly of the front wall **10**, and generally coextensive with the portion thereof under the access opening **28** to form with the front wall a passageway **51**. The upper portion of the display area **22** is covered by a perforated ceiling panel **52** that extends from a generally angle-shaped door jamb **53** connected to the posts **34** to a rectangularly shaped housing **54** on the interior of the front wall **10** contiguous with the access opening **28**. If desired, electrical heating elements (not shown) may be disposed within the housing **54** for purposes of reducing condensation at this portion of the display area, though the need for such heating means is reduced by the passage of cold air through the perforate ceiling panel **52** as will be described more fully below. An imperforate panel **56** having a blanket of thermal insulation **57** on the under side thereof is provided above and spaced from the perforated panel **52** and rests at its rearward edge on an angle member **58** extending between and supported by the upright posts **34**. The forward edge of the panel **56** is supported by a channel member **59** extending along the inner face of the front wall **10** adjacent the housing **54**. A sump **60** is formed along the rearward edge of the panel **56** from which a drain tube **61** extends and communicates with a suitable drain (not shown).

Supported by the imperforate panel **56** is a refrigeration system cooling coil **62** having an intake or return air duct **64** disposed forwardly thereof and an elongated cold air supply plenum **66** communicating with the upper edge of the hollow partition **20**. It will be noted that the upper wall of the air duct **64** and of the plenum **66** are spaced from the top wall **16** to afford an air passageway **67** over the top of the partition **20**.

Referring to FIG. 3 of the drawings, wherein an enlarged cross section of the plenum **66** is shown, it will be seen that the plenum is generally L-shaped having a downwardly turned portion **68**, the rearward wall of which is abutted by a gasket **69** on the upper rear face edges of the doors **36**. To provide for the proper distribution of air between the hollow partition and the perforate panel **52**, a restrictor plate **70** is provided in the forward face of the lower leg **68** of the plenum. As shown, it is in the form of a plate welded or otherwise suitably affixed at its lower edge to the forward face of the door jamb **53** and at its upper edge to the angle **58**, though other forms of restrictor plates may be used to accomplish this purpose. A second restrictor plate is provided between the plenum and the opening thereof into the upper end of the door **36** by way of the perforated horizontal flange **72** of the angle-shaped door jamb **53**.

In addition to the coil **62**, additional cooling is effected by a cooling coil **74** suspended from the rear of the ceiling or top wall **14** in the storage area **24**. As will be understood more clearly from the description which follows, the coil **74** functions to remove some of the heat from air circulated back from the display area **22**.

To bring about proper circulation of the refrigerated air within the cabinet, a plurality of blowers are employed. One of these blowers or fans is shown at **76** in the return air duct **64** for directing air over the refrigeration coil **62**. Another blower or fan is provided at the lower forward portion of the cabinet below the display area bottom panel **48**, and designated by the numeral **78**, while a third fan **80** is suspended beneath the cooling coil **74** in the storage area **24**. While the arrangement of these fans or blowers as shown in FIG. 1 of the drawings is preferred, it is contemplated that other specific arrangements of fans might also be used without departing from the present invention.

In use, perishable items of food or other items requiring refrigeration are mounted on the shelves **42** in the display area **22**, the shelves having been first properly adjusted to present an attractive display surface or area to one in front of the cabinet looking through the access opening **28**. Of course, initially, the items may be placed on the shelves through the opening **28** if desired. However, as the items are removed from the shelves by purchasers during store hours, an attendant might enter the storage area **24** through the door **26** therein, open the hollow doors **36** and replenish the items upon the shelves from stock supplies in the storage area.

To maintain both the items in the display area **22** and storage area **24** in a refrigerated condition, the blowers **76**, **78** and **80** are turned on and return air is circulated

by the fan 76 into the duct 64 and over and around the cooling coils 62, thereby depriving this air of its heat. From the cooling coil 62, the cold refrigerated air passes through the elongated plenum 66, and for the most part is introduced into the open top 37 of the hollow door 36. This cold air will then pass within the hollow door 36 and through the perforated front face 38 thereof onto and over each of the shelves 42. Because of the natural tendency for cold air to settle and also because of the blower unit 78 under the bottom display panel 48, the cold refrigerated air is caused to cascade over each of the front edges 43 of the shelves downwardly between the shelves and the front cabinet wall 10 through the perforated panel 50 into the passageway 51 and back into the storage area 24 through the passageway 41. It will be noted that the path taken by the cold air as it passes the cooling coils 62 not only utilizes the natural tendency for cold air to settle, but also makes maximum efficiency of the cooled air since the first objects it meets in passing through the perforated face 38 are the perishable items positioned on the shelves 42. The air, after passing through the passageway 41, is drawn upwardly through the storage area 24 by the fan 80 and past the cooling coil 74. This coil, as aforesaid, removes some of the heat from the used air prior to its return to the coils 62 through the duct 64.

While the largest portion of the cold air emanating from the refrigeration coils passes into and through the hollow partition 20, due to the restrictor plates 70 and 72, a portion of the cold air is fed outwardly through the plate 70 and panel 52 and into the display area. The purpose of this cold air distribution through the ceiling of the display area is to keep warm air away from this panel and thus eliminate the possibility of condensation forming thereon, and the resulting problems due to the spillage of such condensation onto the items displayed.

Referring now to the alternative embodiment illustrated in FIGS. 4 and 5 of the drawings, it is noted that the same overall organization illustrated in FIG. 1 applies, except that in this instance horizontally sliding or rolling inner and outer telescopic doors 82 and 84 respectively are employed. These doors, like the doors in the embodiment of FIGS. 1 to 3 are formed having an open top 86, an imperforate or closed bottom 88, and imperforate back wall 90 and perforated front wall 92. To support the doors 80 and 84, front and rear track sections 94 and 96 respectively are supported between the upright posts 34 in the same approximate location as the door jamb of the embodiment of FIGS. 1 through 3. Each of the track sections are formed having an upper roll way 98 and a lower roll way 100, vertically spaced one over the other on which the door 82 and 84 are guided. To facilitate horizontal movement of the doors during opening and closing thereof, the inner and outer doors 82 and 84 mount rollers 102 and 104 respectively at their upper ends. As shown, the rollers 102 on the inner door project outwardly and engage the upper way 98 in the track section while the rollers 104 on the outer door 84 project inwardly and are supported in the lower ways 100, thereby guiding the upper portion of the telescopic doors. The lower edge of these doors is guided by an extruded section 106, also extending between the upright post 34 and having spaced rib portions 108 for properly guiding the bottom of the doors.

Distribution of air in the embodiment of FIGS. 4 and 5 is substantially identical with the distribution of refrigerated air as described with respect to the embodiment of FIGS. 1 through 3, and accordingly no further description thereof is deemed necessary. It is to be noted, however, that due to the particular shape of the track sections 96 and 98, as well as the manner in which the doors 82 and 84 are suspended therefrom, regardless of whether the doors 82 are completely telescoped within one another or extended as shown in FIG. 5, there remains a hollow partition having a forward perforated face through which cold air may be distributed over the

shelves 42. Also, as will be understood by those familiar in the art, seals such as gaskets 110 on the upright post 34 may be used to assure proper distribution of air.

Thus, it will be seen that by this invention, the aforementioned objectives are completely fulfilled. The provision of a hollow partition having a perforated forward face at the rear of the display area assures that the items displayed on the shelves 42 will at all times be enveloped by cold refrigerated air immediately after it emerges from or passes over the cooling coil. Moreover, a completely open unobstructed front access opening 28 is possible because of the fact that the natural tendency for cold air to fall is exploited by the cascading of the cold air over each of the shelves and between the front edges thereof and the front wall. This cascading effect is facilitated greatly by the provision of the blower unit 78 disposed in the lower front portion of the display area by which air is drawn through the passage 51 afforded between the panel 50 and the front wall 10 and circulated under the bottom display area panel 48 into the storage area 24. Also, the distribution of a portion of the air through the perforated panel 52 operates to prevent the formation of condensation in the upper interior of the display area, thereby eliminating possible damage to the displayed items due to water dropping thereon.

While the aforementioned statements are applicable to the display area alone, it is to be noted that also because of the new and unique door constructions in both embodiments of the invention, the cold air circulation described is possible without in any way impairing service access to the display area 22 from the storage area 24. Also, the desirable features of the present invention all may be achieved at a minimum expense because of the highly desirable manner in which the air is circulated between the front or display area and the back or storage area. Yet the means by which the air is circulated is simple and economical, taking utmost advantage of the tendency for cold air to settle and the inherent cabinet structure essential to the proper display and storage of items on sale.

Since the foregoing description is given by way of illustration only and not by way of limitation, the true scope of the invention is to be determined by the appended claims.

We claim:

1. A refrigerated display cabinet comprising a front wall having an access opening therein; a hollow partition spaced therefrom to define a display area, a plurality of display shelves positioned in vertical spaced relation adjacent the forward face of said partition and accessible through said access opening, the forward edges of said shelves being spaced horizontally from said front wall, the forward face of said partition having spaced openings provided therein to allow passage of air from the interior thereof to said display area, means for circulating refrigerated air into said partition, outwardly through the spaced openings provided in the forward face thereof and downwardly over each of said shelves to form a cascade of cold refrigerated air between said shelves and the access opening in said front wall, an imperforate ceiling panel extending between said partition and said front wall, a perforated ceiling panel spaced below said imperforate ceiling panel, the level of said panels being above the level of said access opening and the upper most one of said shelves, an elongated plenum opening into the space between said ceiling panels and into the top of said partition, and means in said plenum for controlling the distribution of air into said partition and between said ceiling panels.

2. A refrigerated display storage cabinet comprising side, front, rear, bottom, and top walls, said front wall having an access opening formed therein, hollow partition means between said front and rear walls to define a front display area and a rear storage area, the forward face of said partition means being perforated to allow

passage of air therethrough and at least part of the lower portion of said partition being opened to permit passage of air thereunder, a plurality of display shelves adjustably positioned in vertical spaced relation adjacent the forward face of said partition and accessible through said access opening, the forward edges of said shelves being spaced horizontally from said front wall, air cooling means in the cabinet, and means for circulating air past said air cooling means, into said hollow partition, forwardly through the perforated face thereof, into said display area downwardly over the forward edges of said shelves and past the open portion of said partition into said storage area whereby a cascading curtain of cold refrigerated air is formed between said shelves and the access opening in said front wall, said last mentioned means including an elongated plenum opening into the top of said partition, and in which said partition includes at least one hollow door, said door having a perforated face on the display area side thereof and having an open top communicating with said plenum.

3. The combination recited in claim 2 including a plurality of upright posts and a plurality of doors hingedly mounted on said posts.

4. The combination recited in claim 2 in which said door includes a plurality of horizontally movable telescopic sections.

5. A refrigerated display storage cabinet comprising: front, bottom, top and rear walls, said front wall having an access opening formed therein; a plurality of hollow

doors between said front and rear walls to define a front display area and a rear storage area, the front faces of said doors being perforated to permit the passage of air therethrough; means for supporting said doors so that the bottoms and tops thereof are spaced from said bottom and top walls respectively; a plurality of vertically spaced shelves in said display area supported on said last mentioned means adjacent to the perforated front faces of said doors; a ceiling for said display area and extending from the top of said doors to said front wall above the access opening therein; a bottom panel for said display area extending from the bottom of said doors to a point short of said front wall below the access opening therein; refrigeration means positioned above said ceiling; and means for circulating air past said refrigeration means into said hollow doors, forwardly through the perforate faces of said doors, over said shelves, downwardly between said shelves and said front wall, past said bottom panel and upwardly into said storage area.

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