

Rainwater

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[54] **OPEN REFRIGERATED DISPLAY CASE
WITH ROLL-IN DISPLAY RACKS**

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[51] **Int. Cl.**.....A47f 3/04

[58] **Field of Search**.....62/237, 256, 250

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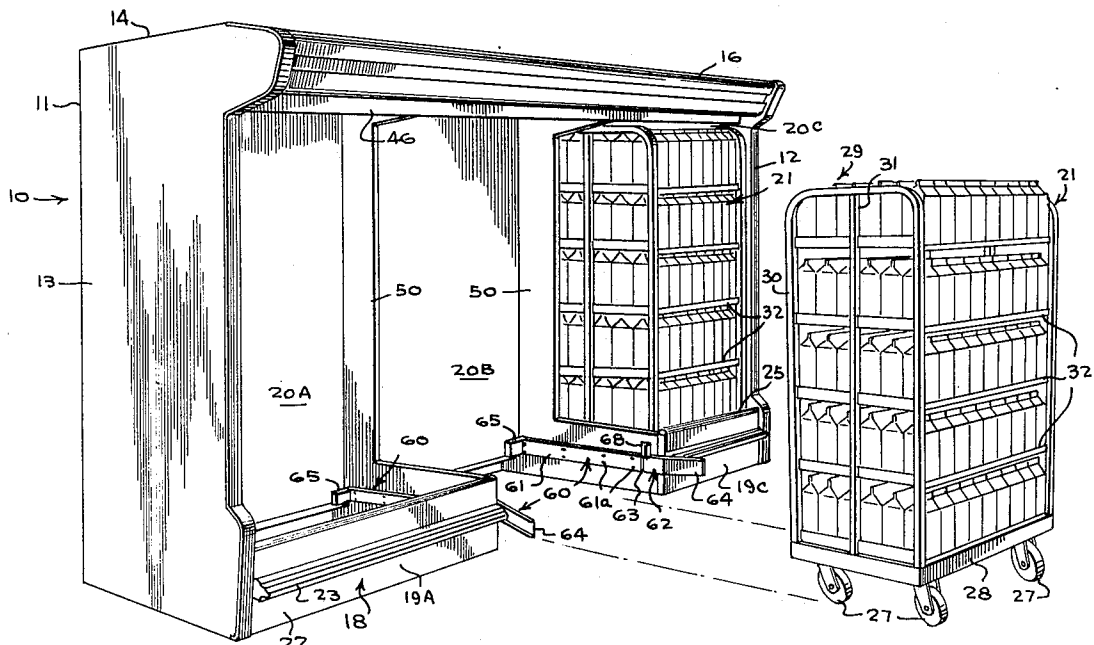
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[57] **ABSTRACT**

An open front refrigerated display case for storage and display of products on mobile rack carts, wherein a top wall, vertical end and rear walls, and interior divider walls paralleling the end walls define plural forwardly opening bays or stalls into which the rack carts may be rolled along the store floor. Removable lower front wall sections spaced forwardly of the carts in the stalls define air inlet ducts for leading return air beneath the carts into a rear return duct and to a refrigeration compartment above the stalls.

18 Claims, 4 Drawing Figures



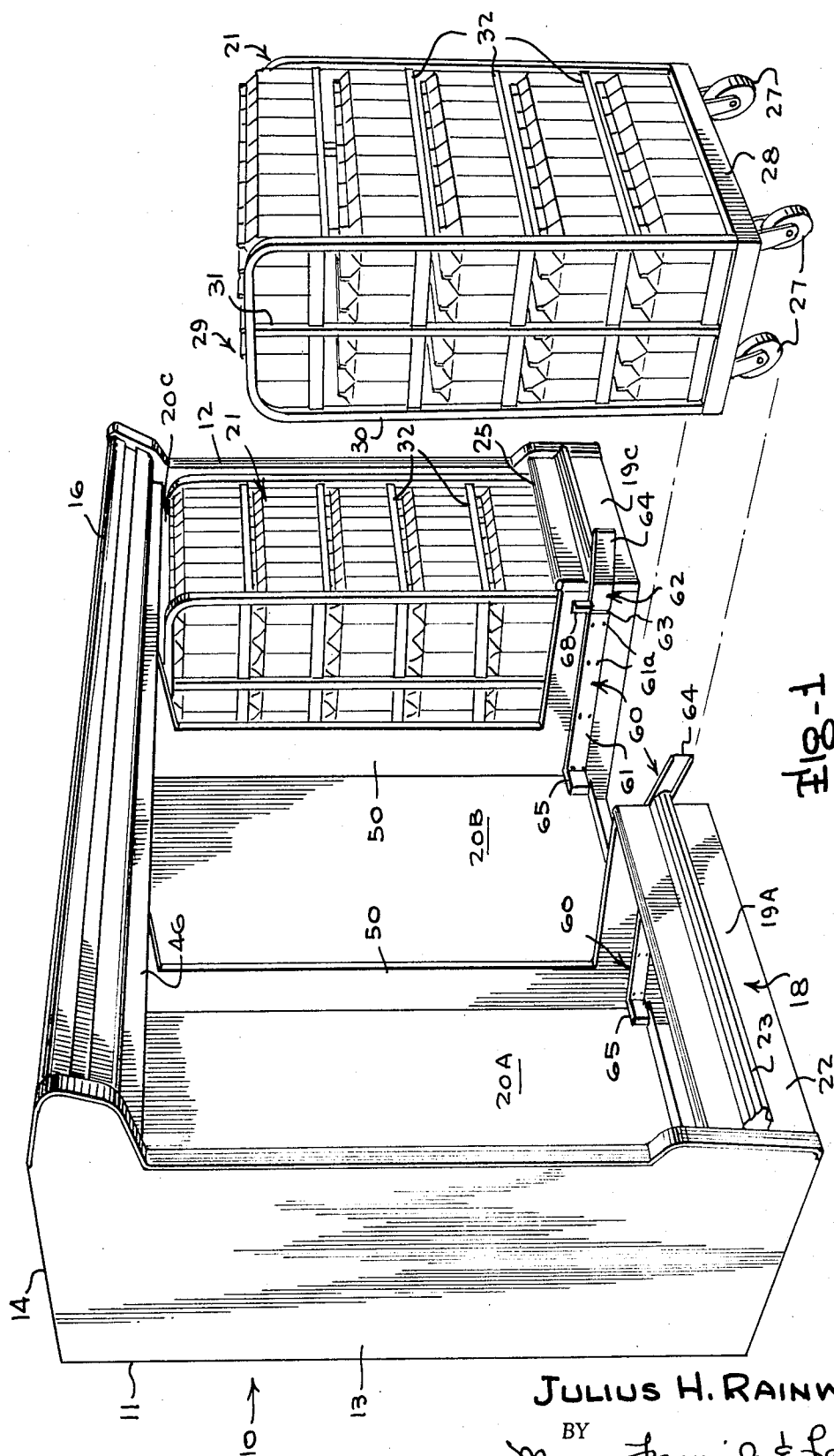


Fig. 1

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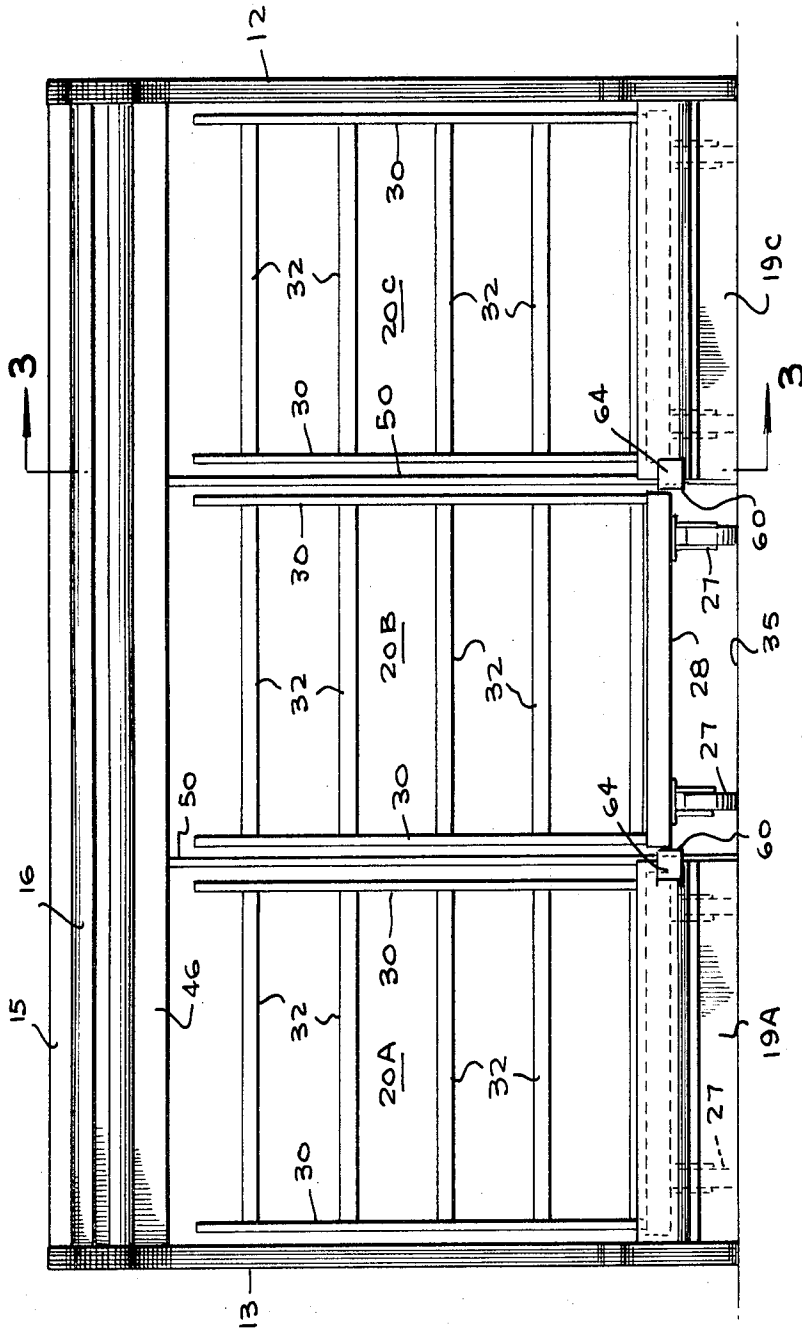


Fig-2

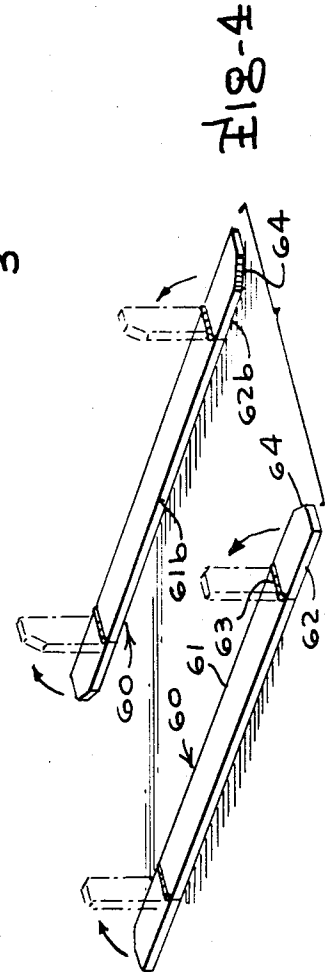
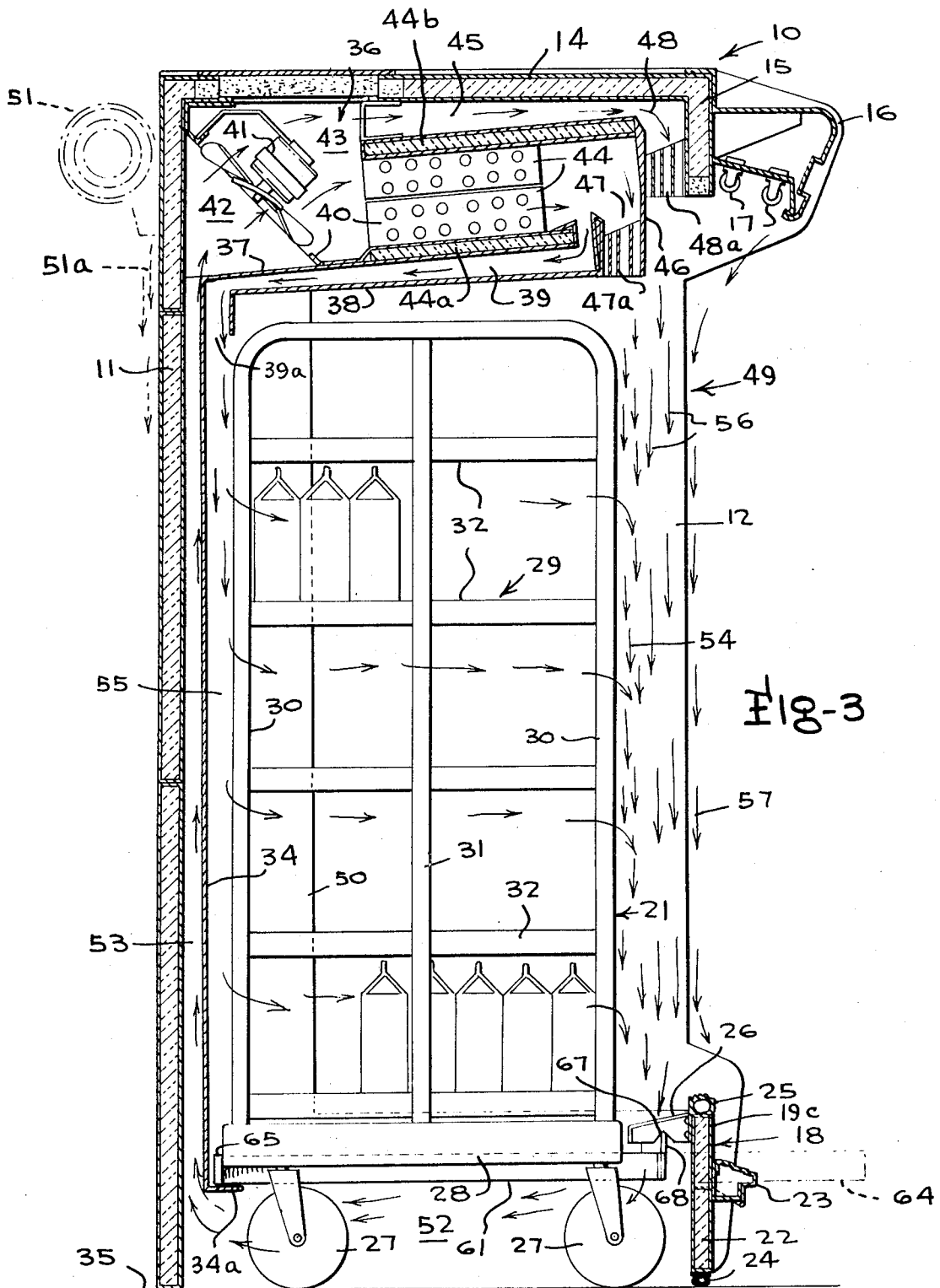


Fig-4

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OPEN REFRIGERATED DISPLAY CASE WITH ROLL-IN DISPLAY RACKS

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates in general to refrigerated display cases of the open front type, and more particularly to open front refrigerated display cases constructed so as to facilitate movement of loaded mobile racks or carts into position in the display case and arranged for circulation of cooling air about the product on the shelves of the mobile rack or cart to preserve the perishable products in properly refrigerated condition.

Conventional refrigerated display cases for storing products, particularly such as dairy products and the like, in retail food stores are normally of the stationary type having vertically spaced fixed shelves on which the products must be loaded by bringing them to the vicinity of the refrigerated display case in hand trucks or carts, and manually transferring the products to the shelves in the interior of the display case. This transferring operation, of course, requires considerable time and labor, and in the case of certain products, such as produce, the transferring operation may adversely affect the produce by repeated handling. When the manual transferring operation is required during business hours to restock a depleted case, the blocking of at least a portion of the case and the adjacent aisle while the stock is being replenished interferes with sales and with the normal flow of customer traffic.

An object of the present invention is the provision of a refrigerated display case of the open front type having means for providing an air curtain of cooling air extending generally vertically at the open front of the case, wherein the case is constructed so that roller racks or carts which may be preloaded with the product to be displayed and refrigerated, such as with cartons of milk, beer, eggs, cheese, bakery products, produce, meat and the like, may be readily rolled into position within the case to effect stocking of the case.

Another object of the present invention is the provision of a novel open front refrigerated display case of the type described in the preceding paragraph, wherein a series of laterally arranged free standing mobile racks or carts each with vertically spaced shelves thereon constitute the product supporting shelf surfaces for the display case and are rolled directly along the fixed store floor into bays or stalls within the display case for loading the display case.

Another object of the present invention is the provision of a novel open front refrigerated display case of the type described in the preceding paragraph, wherein a lower removable front structure forming a return air grille section is provided for each bay designed to receive one of the product supporting carts, and special guidance means is provided which may be temporarily extended forwardly beyond the cabinet exterior walls to permit a single person to push a fully loaded cart into position without damaging adjacent parts of the display case.

Another object of the present invention is the provision of a novel open front refrigerated display case of the type described in the preceding paragraph, wherein the bottom is omitted allowing for greater sanitary conditions since the building floor is more easily cleaned as

compared to a refrigerated display case having an insulated bottom containing cooling devices.

Other objects, advantages and capabilities of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings illustrating a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 is a perspective view of a refrigerated display case constructed in accordance with the present invention, and illustrating one of the preloaded product supporting carts in the course of being rolled from the front of the display case into storage position therein;

FIG. 2 is a fragmentary front elevation view of the display case, with one of the lower removable front sections withdrawn;

FIG. 3 is a vertical transverse section view through the display case, taken along the line 3—3 of FIG. 2; and

FIG. 4 is a fragmentary perspective view illustrating the guidance means for guiding carts into the respective bays.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawings, wherein like reference characters designate corresponding parts throughout the several figures, the open front refrigerated display case of the present invention comprises a horizontally elongated cabinet, generally designated by the reference character 10, which includes an upright insulated back wall generally indicated by the reference character 11, a pair of insulated upright end walls 12 and 13, and an insulated top wall 14. An upper front wall section 15 depends from the front edge of the top wall 14 for a short distance and is fixed thereto, and supports an ornamental outwardly projecting trim cap 16 which carries plural incandescent lamps 17 as shown in the preferred embodiment illustrated. A removable lower front structure generally indicated at 18 is also provided made up of similar removable lower front sections, 19A and 19C of which are shown, to be associated with the product display bays or stalls 20A, 20B, and 20C spaced longitudinally of the display case. It will be observed that there is no bottom wall to the display cabinet 10, the store floor serving as the bottom of the product compartments or bays 20A, B, and C in the unit so that the store floor remains free for a roll-in display rack or cart, generally indicated at 21, for each of the compartments or bays.

The lower front sections 19A and 19C, and the like section for stall 20B, each comprise an upright insulated panel 22 of planar rectangular configuration supporting an ornamental molding unit 23 on its front face and having a deformable rubber sealing gasket 24 at its bottom edge to engage the floor in sealing relation, and having a suitable trim strip 25 at its upper edge. A metallic grille member 26 is supported on and extends rearwardly from the upper portion of the panel 22 of each respective lower front section, terminating at a position just forwardly of the front edge of the roll-in display rack cart 21 for its respective product compartment or bay, and defines a return grille for return of the air curtain and descending refrigerating air to the space

immediately rearwardly of the lower front section panels 22 and below the grille member 26. Each of the previously described walls 11 to 15 and the panel 22 are preferably formed of outer and inner shells, usually constructed of sheet metal, between which a body of insulating material is disposed, in accordance with usual construction practice in manufacturing refrigerated display cases.

Each of the roll-in display rack carts 21 are preferably of a construction similar to that illustrated in the drawings, wherein a plurality of caster type wheels 27 extend below and are supported for swinging movement about vertical mounting axes in the base platform 28 of the cart. The cart may conveniently be formed of a pair of side frames, indicated generally at 29, each formed of an inverted, U-shaped frame member 30, for example formed of rectangular cross-section tubular metal, reinforced by a center upright post 31 of similar construction, and having horizontal shelves 32 at vertically spaced locations above the base platform 28. The ends of the shelves are secured to the side frames 29 and include, for example, end strips which extend transversely between the vertical legs of the U-shaped frame members 30 which are secured, as by welding, to such vertical legs and to the center upright post 31 of each side frame 29. In the illustrated example, the cart 21 is designed to support cartons of milk, fruit juice or similar beverages in standard size cartons, for example half-gallon cartons, and accordingly the shelves 32 are spaced vertically from each other a distance slightly greater than the height of such standard size cartons.

A rear inner panel 34, for example, of sheet metal, is spaced forwardly from the back wall 11 and occupies a position spaced a sufficient distance rearwardly of the rear of the rack cart 21 to define air flow ducts, to be later described, both to the front and rear of panel 34. The panel 34 has a forwardly projecting flange 34a at its bottom located for example substantially at the horizontal level of or just below the base platform 28 of the mobile rack or cart 21, to abut or closely approach the platform 28 and shut off air flow from back of the cart 21 to the zone below the platform 28 and the panel rises to a level just above the top of the mobile rack, leaving a space above the top of the racks for a refrigeration compartment 36 of selected height immediately below the top wall 14. The top of the refrigeration compartment is defined by the top wall 14, and its bottom wall is defined by panel or sheet metal portions 37 which extend forwardly from the rear inner panel 34 along a slightly upwardly inclined plane to a position near but spaced rearwardly from the lower edge of the upper front wall section 15. Another panel or sheet metal portion 38 spaced slightly downwardly from the sheet metal portions 37 extend from the forward end thereof to a location near the rear inner panel 34 and terminates in a short downturned lip, defining a cool air supply duct 39 at the top of the product compartment or bay in which the mobile rack is stored for delivering a portion of the cooler air to the rear upper corner of the bay to be discharged downwardly immediately forwardly of the rear inner panel 34 along the back of the cart 21.

An inclined partition 40 having plural openings and fans or blowers 41 spaced along the length of the case for circulating air therethrough divides the rear portion

of the refrigeration compartment 36 into an inlet plenum area 42 upstream or to the rear of the inclined partition 40, and a downstream or pressurized plenum area 43 immediately forwardly of the partition 40. A cooling coil 44 is supported in the front portion of the refrigeration chamber 36 between a lower shorter insulated panel 44a and an upper longer insulated panel 44b. The panel 44b is spaced below the top wall 14 and extends to a location approximately midway between the vertical plane through the forward end of the duct 39 and the upper front wall section 15 to define a bypass duct 45 for air discharged from the fan 41 and downstream plenum 43. A divider member 46 depends from the forward end of the upper panel 44b to separate the region between the forward end of the cooling coil 44 and the upper front wall section 15 into rear discharge duct portion 47 and front discharge duct portion 48 paralleling each other and extending longitudinally substantially the length of the display case at the top of the front access opening 59. Each of the rear and front discharge ducts 47, 48 terminate in honeycomb nozzles 47a and 48a for discharging the air passing therethrough downwardly in a pair of parallel air curtains descending across the front opening 49 of the display case to return through the grille 26 immediately rearwardly of the bottom of the access opening 49.

Between each bay or stall 20A, 20B and 20C for the mobile racks, structural supports or frames 50 may be provided, which may be open skeleton frames, or may be substantially L-shaped members as shown, to lend structural strength to the case and provide convenient attachment surfaces for applications of fixed shelving where mobile racks are not used. When all of the mobile racks are positioned in the bays or stalls at locations similar to that illustrated in FIG. 3, the product rests on the individual shelves which are multi-tiered and are accessible to the shopper through the front access opening 49.

The rear wall 11 may, if desired, be made into a swinging or sliding door assembly to allow rear placement of the mobile display racks from a walk-in storage refrigerator, or the back wall 11 and panel 34 may be completely eliminated and a fan such as indicated in broken lines at 51 may be provided on the upper rear of the display case, when it is arranged as the front of a walk-in storage refrigerator, so as to draw in cold air from the walk-in refrigerator and form a rear protective air curtain 51a to allow the mobile racks to be placed into the display stalls without any obstruction.

In the preferred embodiment illustrated, and referring particularly to FIG. 3, the air returning from the food compartment travels through the return grille 26 into what may be described as an air return duct portion 52 and travels beneath the base platform 28 of the roll-in rack or cart 21 between the base platform and the floor 35, to the full length rear duct 53 defined between the rear inner panel 34 and the back wall 11. The warmer returning air is drawn upwardly through the rear duct 53 to the inlet plenum area 42, where the fans 41 exhaust the air into the pressurized plenum area 43. The air delivered to the pressurized plenum area 43 divides into two portions, one of which travels through the cooling coil 44 where it is cooled to a lower temperature suitable for properly protecting the particular

perishable product on display, such as meat, dairy products, vegetables, frozen foods, ice cream and the like. The other portion of the air passes through the by-pass duct 45 above the cooling coil where its temperature is not further reduced, although this by-passed air is at a lower temperature than room air due to its parallel flow and mixing action with the refrigerated air. The air passing through the cooling coil 44 cooled by thermal exchange with the refrigerant in the coil then passes into the rear discharge duct area 47 and is distributed through the honeycomb nozzle 47a where it enters the display case opening to form a high velocity curtain, indicated by air path 54. The remaining portion of the air from the rear discharge duct area 47 enters the duct 39 where it is delivered to the opening 39a at the rear upper corner of the display rack stalls or bays. The air from the duct 39 has a relatively low temperature and thus falls downwardly through the zone 55 between the rear inner panel 34 and the back of the cart 21 and the food product stacked thereon. The air flow space 55 back of the cart 21 is closed at its bottom by the flange 34a, and the air in this zone flows forwardly across the product on the shelves toward the front of the display rack stalls and again joins and mixes with the air curtain 54. Since the air from the duct 39 is not fully exposed to an outside heat influence, it tends to help maintain lower temperature at the lower end of the air curtain 54 than would otherwise be possible.

The air which passes through the by-pass duct 45 passes to the front discharge duct area 48 and is distributed through the honeycomb nozzle 48a into a second air curtain 56. This second protective air curtain 56 separates the colder air in the inner or rearmost air curtain 54 and the air discharged into the product bays from the duct 39 from the entrained room air forwardly adjoining the front air curtain 56, the entrained air being indicated by the air stream arrows 57. The air mixtures gather and return through the grille 26 to complete the circuit. Because of the air curtain and some air flowing across the products on display, the food products are surrounded by a cold atmosphere and remain at safe temperatures which preserve them for long periods of display time.

As illustrated in FIGS. 1-3 and 4, fore-and-aft elongated guide members 60 are secured to the structural frames 50 (FIGS. 1-3) or to the store floor 35 (FIG. 4) at the lateral portions of each of the bays or stalls 20A, 20B and 20C to guide the mobile rack or cart wheels 27 during movement of the racks into and out of the stalls. These guide members may take the form of elongated blocks or channels or rectangular cross-section tubes providing a fixed section 61 extending from a location near but spaced rearwardly from the front plane of the display case to a location near the rear wall 11, which is secured to the structural frames 50 or to the floor 35, as by screws 61a. In the front loading display case, a hinged extension guide 62 having a cross-section similar to that of the fixed section 61 is coupled, as by hinge 63, to the front edge of the section 61 and has a length such that when it is folded outwardly, in the form of FIGS. 1-3, or downwardly in the FIG. 4 form, the front end portion of the extension guide is spaced forwardly from the front plane of the display case. The front end portion of the pair of extension guides for each stall or bay will preferably be shaped to define

outwardly diverging inclined wall portions 64 along the confronting vertical walls of the companion guide members for each stall to facilitate initial entry of the sides of the base platform 28 or the cart wheels into guided contact with the confronting vertical walls 61b, 62b. The confronting vertical walls 61b, 62b are spaced in their rectilinear regions a distance just greater than the distance between the outer surfaces of the platform 28 or, of the wheels 27 at the left and right sides of the mobile racks or carts when the wheels are in parallel fore-and-aft positions, to facilitate guiding the racks into the bays or stalls. Vertical stop flanges, as indicated at 65, are secured to the floor or to the guide members at proper positions to abut the platform 28 or the rearmost wheels of each mobile rack when the rack has reached the proper rearward position in the stall or bay such that the rear of the rack is spaced slightly away from the rear inner panel 34 to provide the space for falling refrigerated air to freely circulate downwardly and outwardly across the product. When the racks or carts has been moved to their proper loaded positions wherein the rear wheels abut the vertical stop flanges 65, the front extension guides 62 can then be swung inwardly, for the form of FIGS. 1-3, or upwardly for the FIG. 4 form, about the hinges 63, and the removable lower front section, such as 19A or 19C, can then be reinstalled on the display case. These removable lower front sections may be removably coupled to the display case structure in any desired manner, such as, for example, by providing inverted V-shaped notches 67 on the opposite end walls of the return grilles 26 on the lower front section panels 22 near the opposite lateral edges of the panels 22 which may be hooked onto keeper shoulders 68, formed for example of right angular sheet metal members 69 on the vertical partitions 50 or the inner surfaces of the end wall 12.

What is claimed is:

1. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members including a top wall, vertical end walls and vertically spaced upper and lower front wall sections collectively forming an elongated enclosure defining a product display zone extending along a longitudinal reference axis perpendicular to the end walls and having an access opening at the front of the display case extending the length thereof between said vertically spaced front wall sections, a plurality of interior divider walls in said product display zone paralleling the end walls and subdividing the display zone into product stalls spaced along said reference axis, the store floor forming the bottom of each of said product stalls, a plurality of mobile rack carts each having wheels and a base platform and vertically spaced product shelves for supporting the products thereon, the carts being movable along the floor into the respective stalls to a selected storage position therein, the base platform of each cart at said position being spaced a selected distance from the lower front wall section and store floor defining downwardly and rearwardly extending return duct legs therebetween for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct leg immediately rearwardly of the

carts occupying said selected position, means defining a refrigeration compartment above said stalls including air circulating fans and cooling coils for circulating return air from said return duct legs and cooling a portion thereof, nozzle means at the top of said access opening communicating with said refrigeration compartment for discharging, downwardly as an air curtain across said access opening air having a temperature lower than room temperature, and means for defining unobstructed cart passages for movement of the carts along the floor into and from each stall, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, and said refrigeration compartment including means defining a first air channel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, the cooling coils being located in the path of the remaining air discharged from the fans, and means communicating air passing through said cooling coils to said inner nozzle.

2. A refrigerated display case as defined in claim 1, including partition means defining a cooled air duct having an inlet communicating with air exiting from the cooling coils and an outlet at the upper rear corner of the stalls for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said stalls.

3. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members including a top wall, vertical end walls and vertically spaced upper and lower front wall sections collectively forming an elongated enclosure defining a product display zone extending along a longitudinal reference axis perpendicular to the end walls and having an access opening at the front of the display case extending the length thereof between said vertically spaced front wall sections, a plurality of interior divider walls in said product display zone paralleling the end walls and subdividing the display zone into product stalls spaced along said reference axis, the store floor forming the bottom of each of said product stalls, a plurality of mobile rack carts each having wheels and a base platform and vertically spaced product shelves for supporting the products thereon, the carts being movable along the floor into the respective stalls to a selected storage position therein, the base platform of each cart at said position being spaced a selected distance from the lower front wall section and store floor defining downwardly and rearwardly extending return duct legs therebetween for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct leg immediately rearwardly of the carts occupying said selected position, means defining a refrigeration compartment above said stalls including air circulating fans and cooling coils for circulating return air from said return duct legs and cooling a portion thereof, nozzle means at the top of said access opening communicating with said refrigeration compartment for discharging, downwardly as an air curtain across said access opening air having a temperature lower than room temperature, and means for defining

unobstructed cart passages for movement of the carts along the floor into and from each stall, including partition means defining a cooled air duct having an inlet communicating with air exiting from the cooling coils and an outlet at the upper rear corner of the stalls for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said stalls.

4. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members including a top wall, vertical end walls and vertically spaced upper and lower front wall sections collectively forming an elongated enclosure defining a product display zone extending along a longitudinal reference axis perpendicular to the end walls and having an access opening at the front of the display case extending the length thereof between said vertically spaced front wall sections, a plurality of interior divider walls in said product display zone paralleling the end walls and subdividing the display zone into product stalls spaced along said reference axis, the store floor forming the bottom of each of said product stalls, a plurality of mobile rack carts each having wheels and a base platform and vertically spaced product shelves for supporting the products thereon, the carts being movable along the floor into the respective stalls to a selected storage position therein, the base platform of each cart at said position being spaced a selected distance from the lower front wall section and store floor defining downwardly and rearwardly extending return duct legs therebetween for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct leg immediately rearwardly of the carts occupying said selected position, means defining a refrigeration compartment above said stalls including air circulating fans and cooling coils for circulating return air from said return duct legs and cooling a portion thereof, nozzle means at the top of said access opening communicating with said refrigeration compartment for discharging, downwardly as an air curtain across said access opening air having a temperature lower than room temperature, and means for defining unobstructed cart passages for movement of the carts along the floor into and from each stall, said wall members including a rear wall extending between said end walls, said lower front wall sections being formed in longitudinally spaced segments each extending across the front of a respective stall, and means for removably coupling each lower front wall section to walls of the case adjacent the opposite ends of the respective segment, including a pair of rectilinear guide rails secured to the store floor in each respective stall, disposed in parallelism with the end walls and having confronting guide surfaces spaced apart along said reference axis a distance to engage the laterally outwardly facing vertical surfaces of the pairs of wheels of each cart and maintain them in parallelism with the end walls to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from upwardly inclined storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending

forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

5 5. A refrigerated display case as defined in claim 1, wherein said wall members include a rear wall extending between said end walls, said lower front wall sections being formed in longitudinally spaced segments each extending across the front of a respective stall, and means for removably coupling each lower front wall section to walls of the case adjacent the opposite ends of the respective segment, including a pair of rectilinear guide rails fixed in each stall adjacent the opposite sides thereof disposed in parallelism with the end walls and having confronting guide surfaces spaced apart along said reference axis a distance to engage laterally outwardly facing vertical surfaces of parts of each cart to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

6. A refrigerated display case as defined in claim 2 wherein said wall members include a rear wall extending between said end walls, said lower front wall sections being formed in longitudinally spaced segments each extending across the front of a respective stall, and means for removably coupling each lower front wall section to walls of the case adjacent the opposite ends of the respective segment, including a pair of rectilinear guide rails secured to the store floor in each respective stall, disposed in parallelism with the end walls and having confronting guide surfaces spaced apart along said reference axis a distance to engage the laterally outwardly facing vertical surfaces of the pairs of wheels of each cart and maintain them in parallelism with the end walls to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from upwardly inclined storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

7. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising a top wall, vertical end walls, a vertical rear wall, and vertically spaced upper and lower front wall sections collectively forming an elongated enclosure defining an open front product display zone extending along a longitudinal reference axis perpendicular to the end walls and having an access opening at the front of the display case extending the length thereof between said vertically spaced front wall sections, a plurality of interior divider structural members in said product display zone paralleling the end walls and subdividing the display zone into product stalls forwardly of said rear wall spaced along said reference axis, the store floor forming the bottom of each of said product stalls, a plurality of mobile rack carts each having two laterally

spaced pairs of caster wheels and a base platform and vertically spaced product shelves for supporting the products thereon, the carts being movable along the floor into the respective stalls to a selected storage position therein, the base platform of each cart at said position being spaced a selected distance from the lower front wall section and store floor defining downwardly and rearwardly extending return duct legs therebetween for return of air along an air recirculation circuit from the bottom of said access opening, a rear inner panel spaced forwardly of the rear wall defining an upwardly extending return duct leg immediately rearwardly of the carts in said stalls, an upper panel projecting forwardly from the top of said rear inner panel and spaced below said top wall defining a refrigeration compartment above said stalls, an inclined partition in the rear portion of said refrigeration compartment having openings therein and fans associated with said opening defining a lower pressure plenum zone at the top of said return duct leg and a higher pressure plenum zone downstream from said inclined partition, cooling coils communicating with said higher pressure plenum zone for circulating a portion of the return air and cooling the same, nozzle means at the top of said access opening communicating with said refrigeration compartment for discharging downwardly as an air curtain across said access opening air having a temperature lower than room temperature, and means for defining unobstructed cart passages for movement of the carts along the floor into and from each stall, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, and said refrigeration compartment including a divider panel at the top of said cooling coils spaced below said top wall and defining a first air channel above the divider panel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, and a second air channel below the divider panel intercepted by the cooling coils, and means communicating air passing through the second channel and said cooling coils to said inner nozzle.

8. A refrigerated display case as defined in claim 7, including partition means defining a cooled air duct having an inlet communicating with air exiting from the cooling coils and an outlet at the upper rear corner of the stalls for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said stalls.

9. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising a top wall, vertical end walls, a vertical rear wall, and vertically spaced upper and lower front wall sections collectively forming an elongated enclosure defining an open front product display zone extending along a longitudinal reference axis perpendicular to the end walls and having an access opening at the front of the display case extending the length thereof between said vertically spaced front wall sections, a plurality of interior divider structural members in said product display zone paralleling the end walls and subdividing the display zone into product stalls forwardly of said rear wall spaced along said reference axis, the store floor

forming the bottom of each of said product stalls, a plurality of mobile rack carts each having two laterally spaced pairs of caster wheels and a base platform and vertically spaced product shelves for supporting the products thereon, the carts being movable along the floor into the respective stalls to a selected storage position therein, the base platform of each cart at said position being spaced a selected distance from the lower front wall section and store floor defining downwardly and rearwardly extending return duct legs therebetween for return of air along an air recirculation circuit from the bottom of said access opening, a rear inner panel spaced forwardly of the rear wall defining an upwardly extending return duct leg immediately rearwardly of the carts in said stalls, an upper panel projecting forwardly from the top of said rear inner panel and spaced below said top wall defining a refrigeration compartment above said stalls, an inclined partition in the rear portion of said refrigeration compartment having openings therein and fans associated with said opening defining a lower pressure plenum zone at the top of said return duct leg and a higher pressure plenum zone downstream from said inclined partition, cooling coils communicating with said higher pressure plenum zone for circulating a portion of the return air and cooling the same, nozzle means at the top of said access opening communicating with said refrigeration compartment for discharging downwardly as an air curtain across said access opening air having a temperature lower than room temperature, and means for defining unobstructed cart passages for movement of the carts along the floor into and from each stall, including a pair of rectilinear guide rails, fixed in each stall adjacent the opposite sides thereof disposed in parallelism with the end walls and having confronting guide surfaces spaced apart along said reference axis a distance to engage the laterally outwardly facing vertical surfaces of parts of each cart to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

10. A refrigerated display case as defined in claim 7, including a pair of rectilinear guide rails, fixed in each stall adjacent the opposite sides thereof disposed in parallelism with the end walls and having confronting guide surfaces spaced apart along said reference axis a distance to engage the laterally outwardly facing vertical surfaces of parts of each cart to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

11. A refrigerated display case as defined in claim 8, including a pair of rectilinear guide rails secured to the store floor in each respective stall, disposed in parallelism with the end walls and having confronting guide

surfaces spaced apart along said reference axis a distance to engage the laterally outwardly facing vertical surfaces of the pairs of wheels of each cart and maintain them in parallelism with the end walls to guide the carts into and from the stalls, and guide rail extensions hinged to the front ends of said guide rails within the stalls for swinging movement from upwardly inclined storage positions rearwardly of the lower front wall section to horizontal positions forming forward rectilinear continuations of the guide rails extending forwardly of the normal locations of the lower front wall sections when the associated segment of the latter is removed.

12. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, mobile rack carts for supporting products thereon movable along the store floor into the display enclosure, the base platform of each cart being elevated to form part of a return duct for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct portion in the back of said enclosure, a refrigeration compartment including air circulating fans and cooling coils for circulating return air from said return duct and cooling a portion thereof, nozzle means at the top of said access opening for discharging cooled air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, said refrigeration compartment including a first air channel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, the cooling coils being located in the path of the remaining air discharged from the fans, and means communicating air passing through said cooling coils to said inner nozzle; a cool air duct having an inlet communicating with air exiting from the cooling coils and a downward outlet at the upper rear corner of the display zone for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said display zone.

13. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, mobile rack carts for supporting products thereon movable along the store floor into the display enclosure, the base platform of each cart being elevated to form part of a return duct for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct portion in the back of said enclosure, a refrigeration compartment including cooling coils for cooling a portion of return air from said return duct, nozzle means at the top of said access opening for discharging air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, means

communicating air passing through said cooling coils to said inner nozzle fan means for advancing air from around said cooling coils to and out of said inner nozzle and for advancing air to and out of said outer nozzle, a cool air duct having an inlet communicating with air exiting from the cooling coils and a downwardly oriented outlet at the upper rear corner of the display zone for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said display zone.

14. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, said enclosure being open at the bottom to allow the store floor to form the bottom, mobile rack carts for supporting products thereon movable along the store floor into the display enclosure, the base platform of each cart being elevated to form part of a return duct for return of air along an air recirculation circuit from the bottom of said access opening, means defining an upwardly extending return duct portion in the back of said enclosure, a refrigeration compartment including air circulating fans and cooling coils for circulating return air from said return duct and cooling a portion thereof, nozzle means at the top of said access opening for discharging cooled air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, said refrigeration compartment including a first air channel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, the cooling coils being located in the path of the remaining air discharged from the fans, and means communicating air passing through said cooling coils to said inner nozzle.

15. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products comprising wall members collectively forming an elongated product display enclosure having an access opening at the front means for supporting products thereon in said display enclosure, means defining an upwardly extending return duct portion in the back of said enclosure, a refrigeration compartment including air circulating fans and cooling coils for circulating return air from said return duct and cooling a portion thereof, nozzle means at the top of said access opening for discharging cooled air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, said refrigeration compartment including a first air channel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, the cooling coils being located in the path of the remaining air discharged from the fans, and means communicating air passing through said cooling coils to said inner nozzle; a cool air duct having an inlet communicating with air exiting from the cooling coils and a downward outlet at the upper rear corner of the display zone for con-

veying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of the carts in said display zone.

16. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, mobile rack carts for supporting products thereon movable along the store floor into the display enclosure, a refrigeration compartment including cooling coils, nozzle means at the top of said access opening for discharging air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, means communicating air passing through said cooling coils to said inner nozzle fan means for advancing air from around said cooling coils to and out of said inner nozzle and for advancing air to and out of said outer nozzle, a cooled air duct having an inlet communicating with air exiting from the cooling coils and a downwardly oriented outlet at the upper rear corner of the display zone for conveying a portion of the air passing through the cooling coils to said outlet and discharging the same downwardly adjacent the rear of said display zone.

17. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products on mobile rack carts, comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, mobile rack carts for supporting products thereon movable along the store floor into the display enclosure, a refrigeration compartment including air circulating fans and cooling coils for circulating return air from said return duct and cooling a portion thereof, nozzle means at the top of said access opening for discharging cooled air downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, said refrigeration compartment including a first air channel for conveying air discharged from said fans to the outer nozzle, in by-passing relation to the cooling coils, the cooling coils being located in the path of the remaining air discharged from the fans, and means communicating air passing through said cooling coils to said inner nozzle.

18. A refrigerated display case of the open front type to be located on the floor of a store for refrigerated storage and display of products comprising wall members collectively forming an elongated product display enclosure having an access opening at the front, means for supporting products thereon in said display enclosure, means defining a single upwardly extending return duct in the back of said enclosure, a refrigeration compartment including cooling coils, said compartment being located in the top of said case in communication with said return duct, a single set of air circulating fans spaced along the length of the case for circulating return air through said return duct and said compartment to cool a portion thereof, nozzle means at the top of said access opening for discharging air

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downwardly as an air curtain across said access opening, said nozzle means including an inner nozzle and an outer nozzle extending in adjacent parallelism along the length of the access opening, said refrigeration compartment including a first air channel for conveying noncooled air discharged from said single return duct by said fans to the outer nozzle, in by-passing relation to all cooling coils, the cooling coils being located in the path of the remaining air discharged from the sin-

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gle return duct by said fans, and means including a second air channel communicating air passing through said cooling coils to said inner nozzle; said return duct having a common air inlet at the lower end thereof, the air from said inner and outer nozzles being directed across said access opening and into said common return duct inlet.

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