

Feb. 20, 1962

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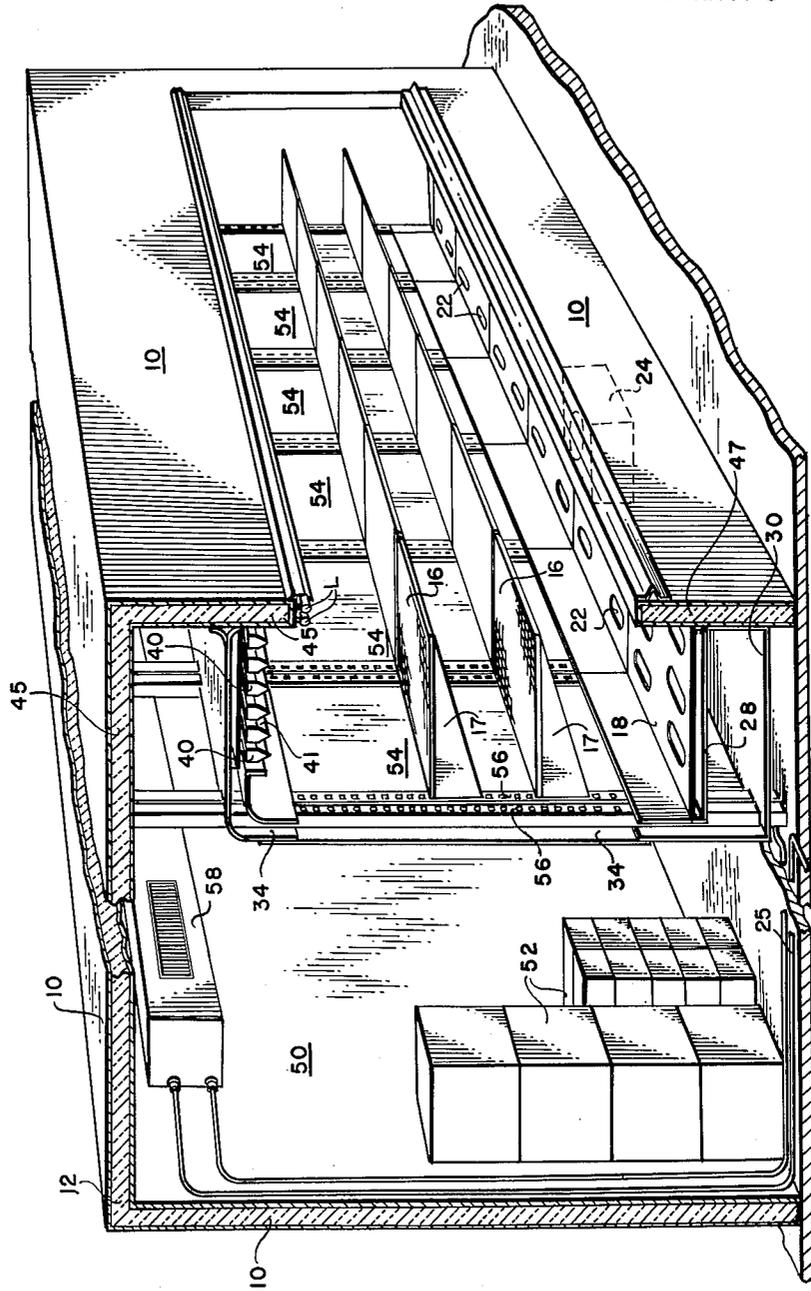
3,021,691

AIR CURTAIN REACH-IN DISPLAY COOLER

Filed Feb. 23, 1960

3 Sheets-Sheet 1

FIG. 1



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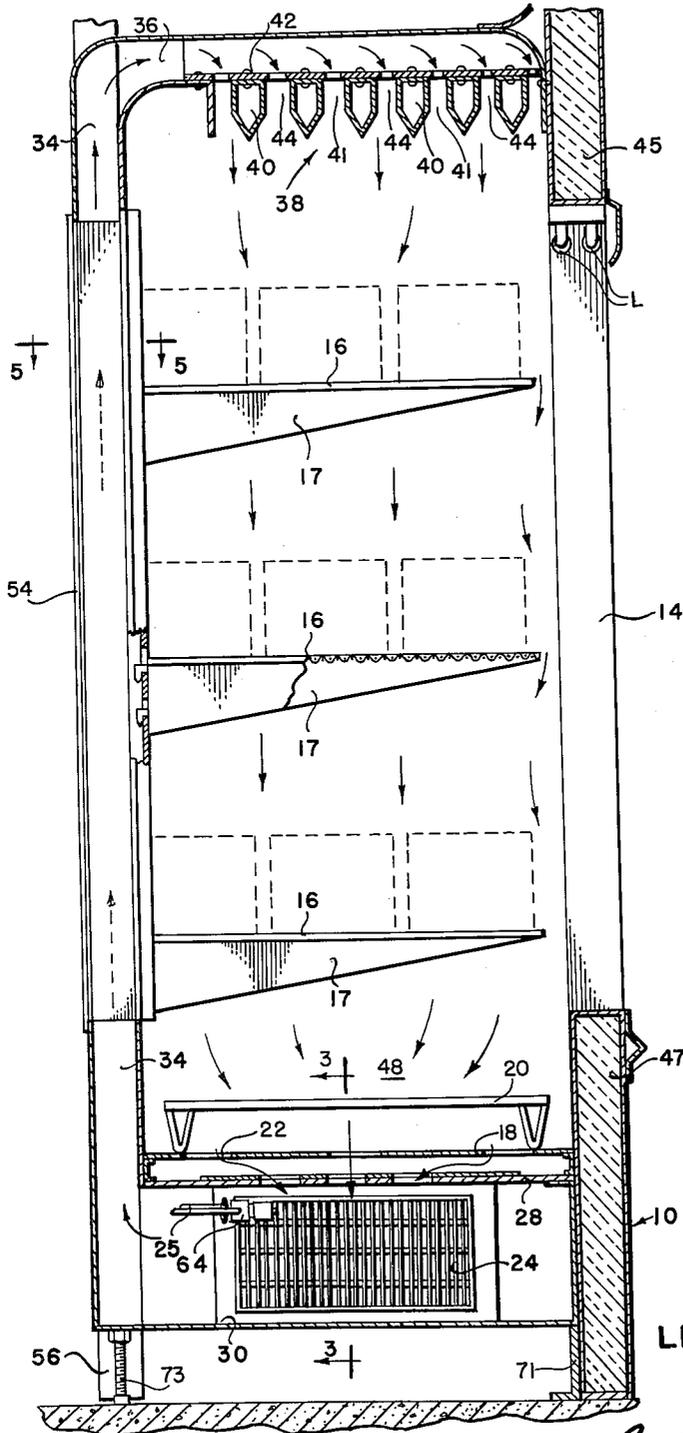


FIG. 2

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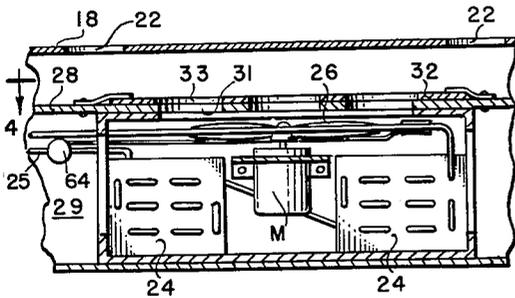


FIG. 3

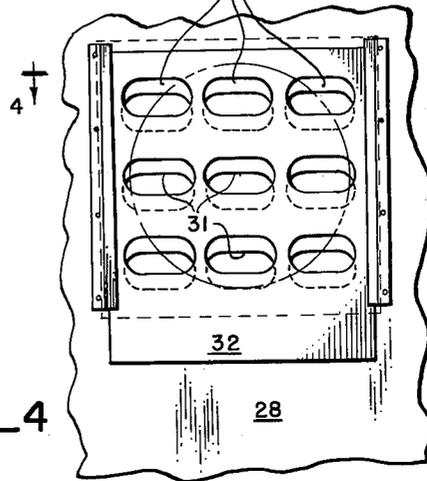


FIG. 4

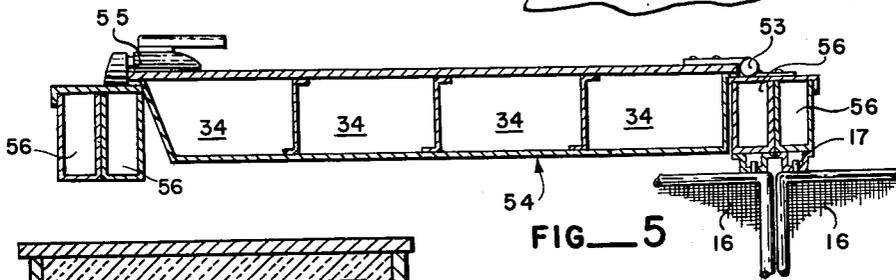


FIG. 5

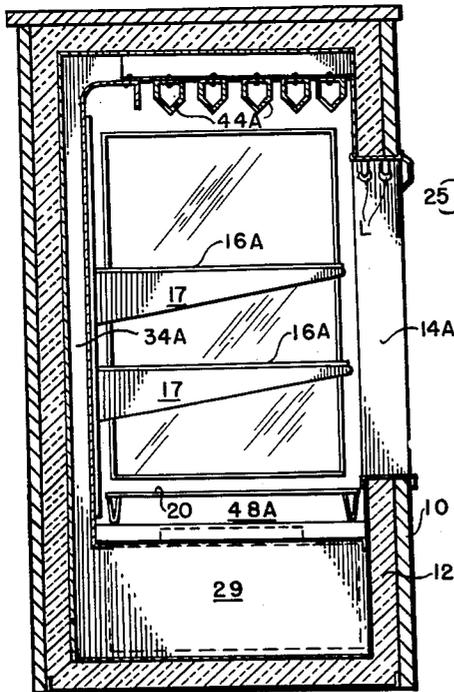


FIG. 6

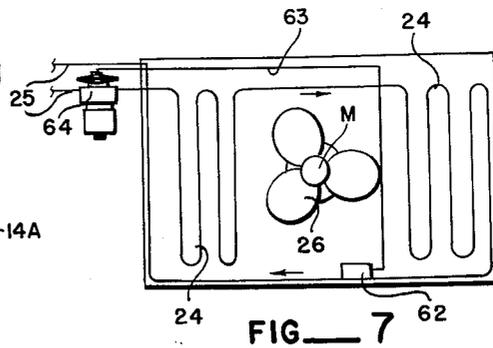


FIG. 7

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AIR CURTAIN REACH-IN DISPLAY COOLER

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This invention relates to the general art of food storage and display cases and more especially to open display cases wherein a plurality of vertically disposed shelves are provided upon which food and beverage products may be stacked for display and customer self-service purposes. Refrigerated air is directed downwardly from the top of the cabinet and flows over the goods, maintaining a temperature normally of 34° F. to 38° F. A collecting means is provided at the bottom of the cabinet which also houses refrigerating coils and a pressure blower. The blower provides cold air circulation by forcing the air up the back to the top of the cabinet where it is distributed through louvers and projected downwardly. The slow downward flow of the refrigerated air is aided by gravity and by the suction of the fan in the lower portion of the collecting compartment to provide, in effect, a curtain of refrigerated air. This cold air curtain effectively replaces the glass door formerly employed in similar cabinets.

The self-service stores commonly referred to as "supermarkets" place food products of various kinds on shelves and the customers make their own selections and with carts and the like convey their selected goods to a check stand near the exit of the building. This form of merchandising is alleged to have many advantages in reducing handling costs and giving the customer a much wider selection from which to choose. This self-service feature, however, requires special means to handle refrigerated goods.

For some time open topped bins have been commonly employed for the storage of frozen products requiring a low basic temperature and these have often been used with modifications of the temperature setting for the storage of refrigerated products, as distinct from frozen products. Such merchandise normally consists of the full range of dairy products and bottled beverages. These products are generally very bulky and must be supplied by the average super-market in a wide range of container sizes, types, and brands. This presents a problem which is not very well solved by any cabinets currently available and it is the purpose of the equipment disclosed in this application to provide a more practical method of handling and further one which provides for convenient servicing with fresh stock during the shopping periods.

A principal object of this present invention, therefore is to provide an open display and sales compartment having a plurality of vertically disposed shelves for food and beverage products requiring refrigeration and achieving the refrigeration by directing refrigerated air over the goods from the top downwardly and collecting the refrigerated air at the bottom of the compartment for re-cooling and recirculation.

A further object of this invention is to provide a plurality of louvers over the display shelves and to provide means whereby the spacing of the louvers can be individually changed so as to give full control over the release of the refrigerated air.

A further object of this invention is to provide an open display compartment having a plurality of vertically disposed shelves in which the entire cabinet is made of a plurality of modular units, with each modular unit equipped with a lower air collecting bin which is in turn provided with refrigeration and blower means to cool

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and recirculate the refrigerated air previously poured over the goods being protected.

A further object of this invention is to provide means whereby vertically disposed air ducts are provided in doors giving access to the rear side of the vertically disposed shelving to facilitate convenient re-serving of the shelves with additional goods as they become depleted during the shopping period.

A further object of this invention is to provide, in association with the open display compartment, a rear storage cooler which is refrigerated and which communicates with the display compartment by a plurality of relatively narrow openable door so the shelves may be re-supplied with goods with a minimum of effort on the part of the store employees and with no interference with the shoppers.

Further objects, advantages and capabilities will be apparent from the description and disclosure in the drawings, or may be comprehended or are inherent in the device.

FIGURE 1 is a perspective view which is broken away and sectioned, in part, to illustrate the various components employed in making up my open display cabinet.

FIGURE 2 is a typical cross-sectional view as though taken on a vertical plane passing transversely through the cabinet of FIGURE 1.

FIGURE 3 is a fragmentary cross-sectional view taken along the line 3-3 of FIGURE 2.

FIGURE 4 is a fragmentary plan view taken along the line 4-4 of FIGURE 3 and illustrating the air controlling damper means.

FIGURE 5 is a horizontal sectional view taken along the line 5-5 of FIGURE 2.

FIGURE 6 is a vertical cross-sectional view similar to FIGURE 2 but showing a modified form of my cabinet which is particularly designed for the refrigerated display of a small amount of food products, such as might be used in restaurants for the display of pies, pastries and the like.

FIGURE 7 is a diagrammatic view illustrating one of the plenum installed cooling units and showing the control means for the refrigerant.

Referring to the drawings, throughout which like reference characters designate like parts, the numeral 10 designates the insulated enclosure for my open display compartment and the storage cooler associated therewith. This insulated enclosure has the usual inner and outer wall made of materials which are suitable and may vary in accordance with the location in which it is to be used or may be of a type that will blend well with the decor of the establishment of which it will be a part. Any form of approved insulation 12 may similarly be employed.

In the preferred form of my equipment, as illustrated especially in FIGURES 1 and 2, it will be noted that the portion of the front wall immediately in front of the goods being displayed for sale and self-service by the shoppers is entirely open at 14 so that the customer may reach in for any item displayed. The merchandise may be displayed on any of the plurality of vertically disposed, shelves 16 which may be formed of openwork and supported on vertically adjustable shelf bracket 17, on a self-supporting openwork rest 20 or possibly resting upon the bottom plate 18 of the compartment 48. This is considered an important feature of this cabinet as there are no doors to be opened to gain access to the food products or beverages and no interference with the customer's vision of the products, so that they are displayed in a manner permitting greater ease for viewing and selection by the customer. Marginal lights L are provided.

The foods or beverages offered for sale within this cabinet are cooled by refrigerated air flowing over them from

the top downwardly to the bottom of the cabinet. The air is cooled by more or less conventional means, employing a cooling coil 24 which normally is fed by tubing 25 from a circulating source of coolant provided by a refrigerating unit outside of the cabinet. Each cooling coil is provided with its own electrically driven air circulating fan 26. The spent refrigerated air, after it has passed over the display, is collected within the plenum chamber 29 formed by the bottom 30 of the cabinet and the upper shelf or partition plate 28 which is perforated at 31 for ingress of the spent air. The bottom plate 18 of the storage compartment is perforated, except immediately over fan 26, with a plurality of holes 22 so as to admit the air from the compartment into fan 26 located in the plenum chamber 29 and still prevent a customer possibly being struck by fan 26. Circulation may be controlled by a sliding damper 32 which is normally also perforated by openings 33 arranged in the same manner as partition 28 but slidable with respect to the same so that the solid portions of the damper between the perforations 33 actually serve as a damper for the holes 31 in partition 28.

When air pressure has been built up within the plenum chamber 29 by fan 26, the refrigerated air is caused to flow upwardly through a plurality of vertically positioned air ducts 34. It has been found that by having a plurality of air ducts of reduced size the air will be properly distributed throughout the length of the display space in the compartment. When the refrigerated air reaches the top of the compartment it passes over the longitudinally disposed bend 36 and is distributed to a louver system indicated generally at 38. The louvers are probably best illustrated in FIGURE 2 and consist of individual louver members 40 having upper parallel sides and terminating in a wedge shaped lower edge and which members extend for their modular length longitudinally of the cabinet. These individual louvers are held in place by suitable fastenings 42, so that the spaces 44 are provided between the louvers. Thus the refrigerated air is controlled in its distribution as it is released into the compartment. The generously proportioned wedge-shaped ends of the individual louver members 40 provide in effect inverted expansion slots 41 between each louver member 40 so that a drop in pressure of the refrigerated air is made at this point and the air is still under control at the point of release, thus insuring better control of the flow through the goods to the collecting bin at the bottom of the cabinet.

It will be noted, particularly in FIGURES 1 and 2, that the insulated wall 10 extends downwardly appreciably below the louvers 38 at 45 thus preventing outside air currents from creating a turbulence that might interfere with the waterfall-like flow of the refrigerated air. At the bottom of the compartment, it will also be noted that the refrigerated wall 47 is raised appreciably above the bottom 18 of the display compartment so as to give in effect an air collecting bin 48. This has been found to be very desirable, permitting a very high percentage of recovery of the refrigerated air so that it may most efficiently again be lowered in temperature and recirculated.

Referring to FIGURE 1, it will be noted that a refrigerated, insulated cooler or storage room is provided at 50. This room should have sufficient depth transversely of the display compartment so that the estimated daily sales of the goods placed on the display and service shelves can be stored immediately behind that portion of the cabinet as indicated at 52. Access is obtained to the display compartment from the rear by means of the hinged doors 54 which substantially form the rear wall of the display compartment, these being hinged at 53 to the vertical supporting frame members 56 and the opening side latched at 55 to said frame member. Each of the doors 54 has a cross section corresponding to that illustrated in FIGURE 5 in which the various vertical air conduits 34 are provided.

The width of doors 54 is a matter of choice. However, it has been found most economical to adopt some

standard module such as approximately two feet. This makes it possible to combine two, three, or more of these two foot spaces into a four or six foot module cabinet section. The adoption of this modular plan is a great convenience and saving in manufacture as it is possible thereby to produce modular units of the cabinets which can be fitted together in any number necessary to give the display length required for any particular refrigerated sales compartment installation. In carrying out this plan it is common to provide in each modular unit, a complete circulatory system. This is composed of the cooling coils 24, together with the fan 26 required to move the air through the coils and build up sufficient air pressure in the plenum chamber to cause the air to flow up through the air ducts 34 and out between the louvers 40. It is therefore expedient to employ a single refrigeration unit which will supply the necessary coolant to the various air refrigerating coils 24. Usually the unit refrigeration plant will also supply the cooling coils 58. For the holding or storage chamber 50 such an arrangement is normally most expeditious and economical.

Referring to FIGURE 6 of the drawings, I have illustrated a smaller and modified form of my cabinet. It employs generally all the features of the large cabinet except that it is serviced with food products from the front and is particularly useful for the restaurant trade for the holding of bakery goods of the type requiring refrigeration. This includes pies, especially cream pies, and cream or custard filled pastries of various kinds. The smaller display unit is provided with the usual shelves as 16a which may be made in a variety of forms but it is preferable as in the larger cabinets that the shelves be openwork wood or metal so that the cold air may pass down through the shelving and thus maintain the desirable low temperatures in the food products. As in the larger units the air is discharged out between louvers 44a and as it drops down is collected in the collecting bin 48a formed by the upwardly extending portion 47 of wall 10. Here the air is taken downwardly, through openings as illustrated in FIGURE 3, into the plenum chamber 29a where it is cooled by a fan and coil arrangement similar to 24 and 26 illustrated in FIGURE 2. The air under pressure then passes up through a plurality of vertically disposed ducts 34a to the louvers 44a which complete the cycle of the air circulation. It is to be noted that a cabinet of this order carries its complete insulation entirely around the cabinet except for the access opening 14a.

In FIGURE 7 is illustrated, diagrammatically, one of the module air cooling and circulating units and the temperature control means therefor. This equipment is largely shown also in FIGURE 3. The cooling coil 24 is installed preferably in two substantially equal portions, one on each side of the motor M for fan 26. A temperature sensing unit 62 is secured in contact with a portion of the first section through which the coolant passes. If the temperature, which indicates the amount of coolant present, is not at the preferred level a fluid pressure is transmitted to valve unit 64 through tube 63 which will open or close to the degree necessary to change the rate of flow of the refrigerant coolant to re-establish the desired air temperature in the compartment. These sensing and valve units are standardized fluid actuated components readily available on the market.

The ability to space the air discharge controlling louvers 40, and particularly near the open side of the cabinet, makes it possible to adapt the air flow to the shape of the goods and to adjust the cold air flow so there will be substantially no loss of the cooling out of the circulating system. The pointed or wedge-shape form of the louvers prevents condensation collecting on them.

This display cooler because it is made in modular units of length is often employed as a replacement cabinet. Under these conditions the existing insulation walls and cover 10 are employed together with the coolant supply

from tubing 25. In order to facilitate installation in such instances a supporting front structural member 71 is employed along the length of each modular unit and a series of leveling screws 73 are employed to adjust the level of the rear wall of the replacement cabinet.

It is believed that it will be clearly apparent from the above description and the disclosure in the drawings that the invention comprehends a novel construction of air curtain reach-in display cooler.

Having thus disclosed my invention, I claim:

1. A reach-in refrigerated display and self-service cabinet for foods and beverages, comprising: a cabinet composed of a plurality of modular compartments joined together and enclosed in an insulated enclosure; a rear wall, having vertical supporting frame members disposed at spaced intervals and a plurality of vertical air conducting ducts positioned between the vertical frame members; a double-walled top for said cabinet providing a horizontal air conducting flue having downwardly directed air discharge louver means; a bottom for each modular compartment of said cabinet in the form of an air collecting bin having enclosing sides and end walls and a perforated top plate forming a separate plenum chamber for each compartment; said insulated enclosure for said cabinet having an opening in the front of the cabinet, at the food or beverage display level, but providing an upper wall portion extending downwardly below the level of said air discharge louvers and an upwardly extending wall portion extending above the said top plate of said plenum chamber to form an air collecting bin; a plurality of vertically spaced shelves disposed at the display level and adjustably secured to said vertical supporting frame members; refrigerating coils disposed in each plenum chamber and a motor driven fan for each plenum chamber disposed to pass the spent refrigerated air through said coils and build up sufficient pressure in said plenum chamber to cause the air to flow up the said vertical air ducts.

2. A reach-in refrigerated display and self-service cabinet for foods and beverages, comprising: a rear wall, having vertical supporting frame members disposed at spaced intervals and a plurality of vertical air conducting flues secured to said frame members; a top for said cabinet having spaced apart sheet material walls providing a horizontal air conducting flue and having downwardly directed air discharge louver means; a bottom for said cabinet in the form of an air collecting bin having enclosing sides and end walls and perforated top plates, forming a plenum chamber; a double-walled insulated enclosure for said cabinet which is open in the front of the cabinet at the food or beverage display level but providing an upper wall portion extending downwardly below the level of said air discharge louvers and an upwardly extending wall portion extending above the said perforated top plates of said plenum chamber to form an air collecting bin; a plurality of vertically spaced shelves disposed at the display level and adjustably secured to said vertical supporting frame members; said cabinet constructed in modular lengths with end walls at each end of the plenum chamber; refrigerating coils disposed in each plenum chamber and a motor driven fan disposed to pass the spent refrigerated air through said coils and build up sufficient pressure in said plenum chamber to cause the air to flow up the vertical air ducts; said louver consists of a plurality of louver elements disposed lengthwise of said cabinet and in spaced apart parallel relationship said louver members having upper parallel sides and wedge shaped lower edges to provide inverted air expansion slots between each of the louver members; and air discharge ports in the lower wall of said horizontal air conducting flue and positioned to discharge air between the louver elements.

3. A reach-in refrigerated display and self-service cabinet for foods and beverages, comprising: a rear wall, having vertical supporting frame members disposed at spaced intervals and a plurality of vertical air conducting flues

secured to said frame members; a top for said cabinet having spaced apart sheet material walls providing a horizontal air conducting flue and having downwardly directed air discharge louver means; a bottom for said cabinet in the form of an air collecting bin having enclosing sides and end walls and perforated top plates, forming a plenum chamber; a double-walled insulated enclosure for said cabinet which is open in the front of the cabinet at the food or beverage display level but providing an upper wall portion extending downwardly below the level of said air discharge louvers and an upwardly extending wall portion extending above the said perforated top plates of said plenum chamber to form an air collecting bin; a plurality of vertically spaced shelves disposed at the display level and adjustably secured to said vertical supporting frame members; said cabinet constructed in modular lengths with end walls at each end of the plenum chamber; refrigerating coils disposed in each plenum chamber and a motor driven fan disposed to pass the spent refrigerated air through said coils and build up sufficient pressure in said plenum chamber to cause the air to flow up the vertical air ducts; said louver elements have substantially parallel vertical side walls which converge to form a pointed longitudinally extending ridge and means to secure said louver elements, in position, to said lower wall of said horizontal flue.

4. The subject matter of claim 1 in which said perforated top partition plate of said plenum chamber is provided with slidable damper means perforated similarly to said top plate and adapted to serve as a damper when moved transversely of said top plate and a bottom plate of said air collecting bin disposed above and spaced from said partition plate and having air openings except over said motor driven fan.

5. The subject matter of claim 1 in which an access door is provided between said vertical frame members and adapted to provide entry to the display compartment from the rear and facilitate re-supplying goods to said shelves; a plurality of said vertical air conducting ducts secured to each door and adapted to conduct refrigerated air upwardly when the door is closed.

6. The subject matter of claim 1 in which a refrigerated storage room is provided in rear of said compartments and communicating therewith by means of said doors.

7. The subject matter of claim 1 in which said vertical air conducting flues are secured to openable doors operably supported by the said vertical supporting frame members of the rear wall of said cabinet.

8. The subject matter of claim 1 in which an access door is provided between said vertical frame members and adapted to provide entry to the display compartment from the rear and facilitate resupplying goods to said shelves.

9. A refrigerated display case having a display space therein, said case having a lower front wall portion and an upper front wall portion, the upper edge of said lower front wall portion and the lower edge of said upper front wall portion being spaced apart to provide an access opening to said display space at the front of the case, the rear of said case having a door therein movable to provide access to the display space from the rear of the case, the lower portion of said display case at the rear of said lower front wall portion having a chamber therein provided with an air inlet opening below the upper edge of the lower front wall portion of the case, air distributing means above the lower edge of the upper front wall portion of the case for directing air into the upper portion of said display space, said door having a vertically extending duct therein which, when the door is closed, communicates at its lower end with said chamber and communicates at its upper end with said air distributing means, refrigerating means located in said chamber and means in said chamber for circulating air from the lower portion of the display space through said air inlet to said chamber and refrigerating means and from said chamber to the vertically extending duct in the

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door and thence to the upper portion of said display space.

10. A refrigerated display case having a display space therein, the front of said display case having an opening therein providing access to said display space from the front of the case, the rear of said display case having a door therein movable to provide access to said display space from the rear of the case, the lower portion of said display case having a chamber therein provided with an air inlet opening communicating with the lower portion of the display space, the upper portion of the display case having a horizontally extending flue with a plurality of downwardly directed air discharge openings therein communicating with the upper portion of the display space and controlling the distribution of air thereto, said door having a vertically extending duct therein which, when the door is closed, communicates at its lower end with said

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chamber and communicates at its upper end with said horizontally extending flue, refrigerating means located in said chamber and means for circulating air from the lower portion of the display space through said air inlet to said chamber and refrigerating means, and from said chamber to the vertically extending duct in the door and thence to said horizontally extending flue and through the discharge openings therein to the upper portion of said display space.

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