Aug. 30, 1949. M. RIFKIN 2,480,339

FORCED AIR REFRIGERATED DISPLAY CABINET

Filed Feb. 27, 1945 3 Sheets-Sheet 1

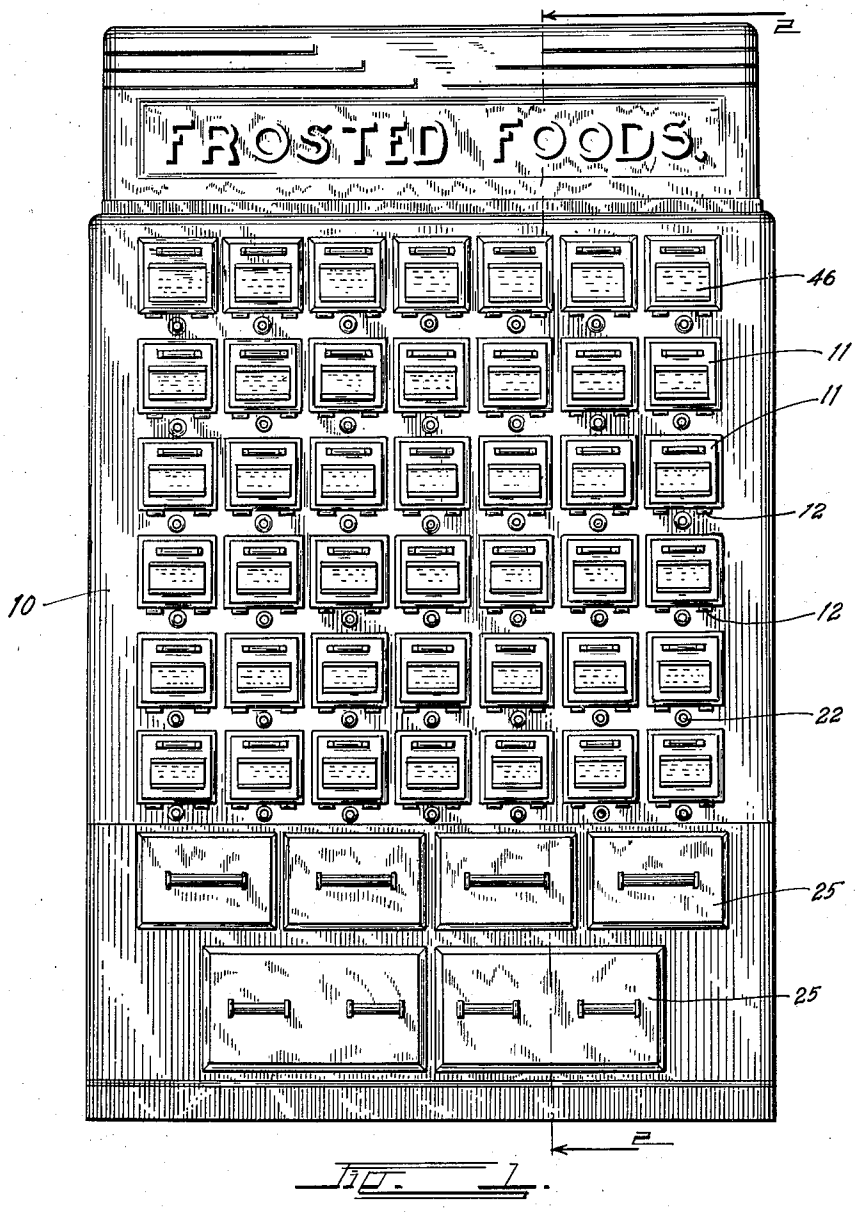

FIG. 1.

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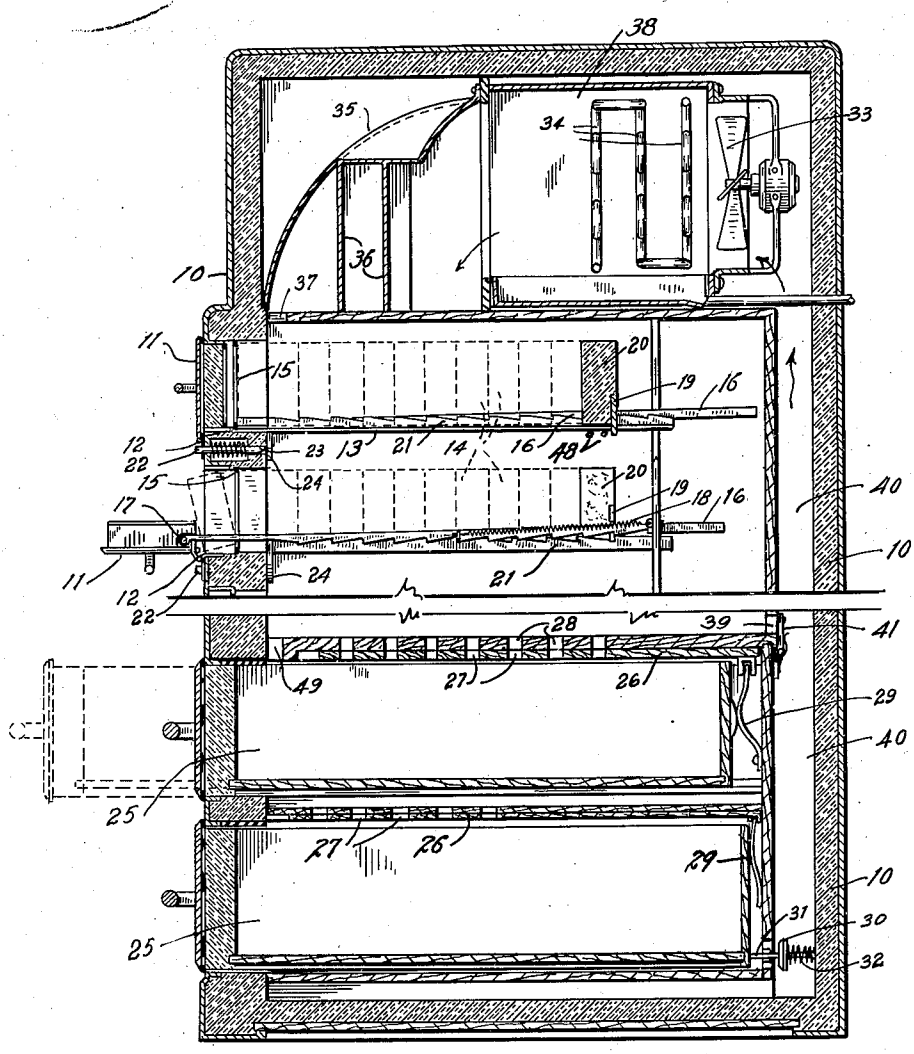

Fig. 2.

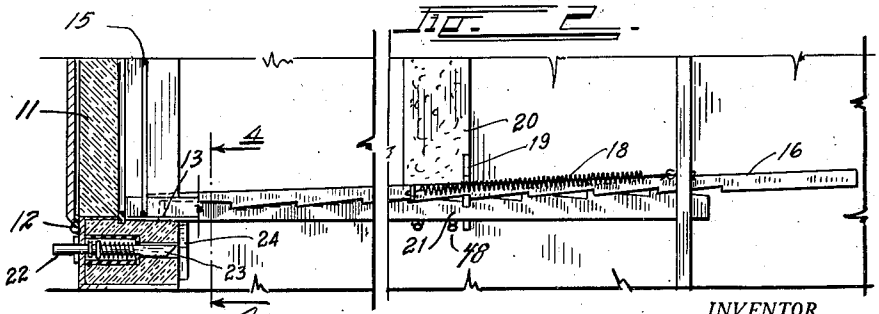

Fig. 3.

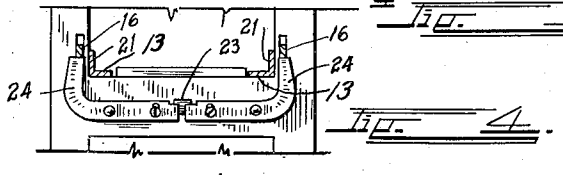

Fig. 4.

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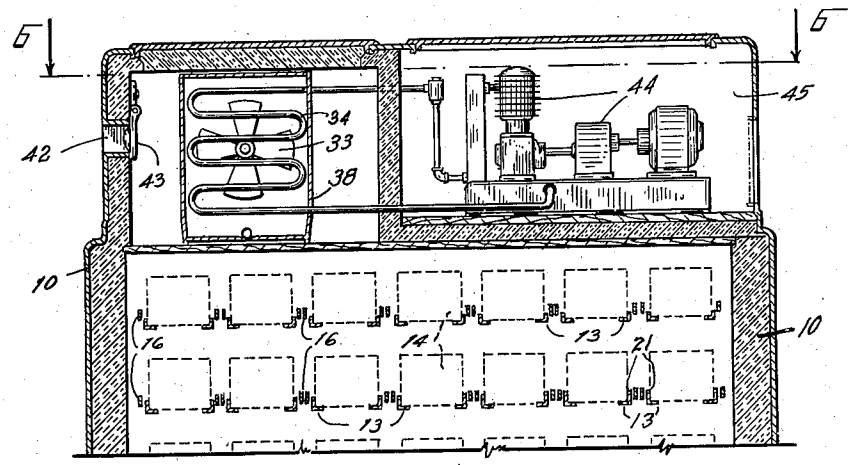

Fig. 5.

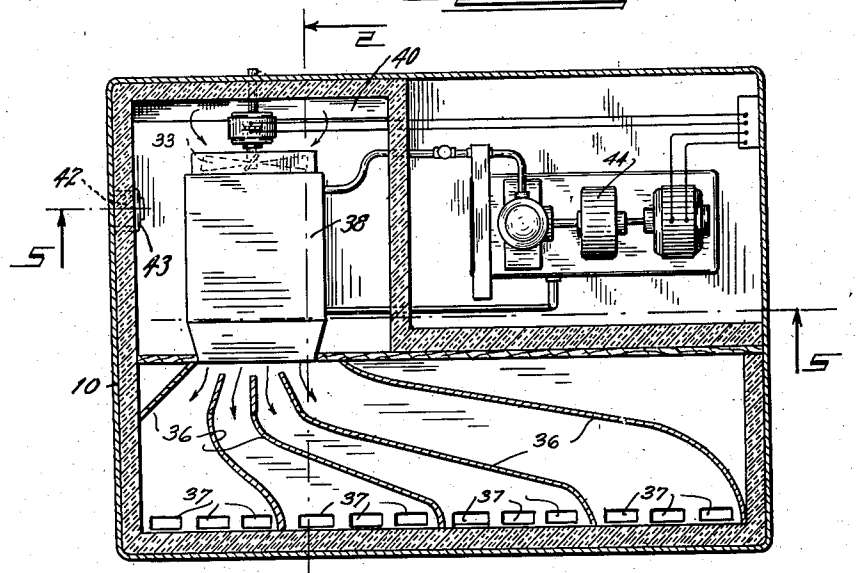

Fig. 6.

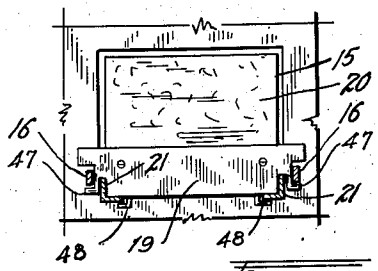

Fig. 7.

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Patented Aug. 30, 1949 2,480,339

UNITED STATES PATENT OFFICE

2,480,339

FORCED AIR REFRIGERATED DISPLAY CABINET

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Application February 27, 1945, Serial No. 579,937

10 Claims. (Cl. 62—102)

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This invention relates to a frozen food dispensing cabinet. Frozen foods are dispensed in waterproof packages which must be maintained at a temperature below freezing at all times.

In the usual cabinet the foods are placed in a refrigerated box to which access is had by means of hinged or sliding doors. In self-serve grocery stores and the like, this is very unsatisfactory, since the entire box must be opened by each customer and the packages handled in order to locate the desired one. This damages the packages and makes it exceedingly difficult to maintain a freezing temperature in the box.

The principal object of this invention is to provide a refrigerated container which will deliver a package of any chosen merchandise to the customer and yet will maintain the refrigerated compartment sealed against the escape of cold air and the entrance of warm air at all times.

Another object of the invention is to provide a method and means for completely dehydrating all air entering the merchandise compartment of the dispenser, thus avoiding the formation of frost on the packages and the metallic parts of the cabinet.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

Fig. 1 is a front view of the improved cabinet;

Fig. 2 is an enlarged vertical fragmentary section therethrough taken on the line 2—2, Fig. 1;

Fig. 3 is a still further enlarged detail section illustrating the operation of the package slides;

Fig. 4 is a detail view taken on the line 4—4, Fig. 2, illustrating the slide-releasing mechanism;

Fig. 5 is a detail section taken on the line 5—5, Fig. 6;

Fig. 6 is a similar section taken on the line 6—6, Fig. 5; and

Fig. 7 is a detail view of the rear face of a package-pushing block employed in the invention.

The improved cabinet comprises an outer insulated cabinet 10. The front of the cabinet 10 is formed with a plurality of merchandise openings, each of which is closed by means of a door 11. The doors 11 are mounted at their bottom edges on suitable hinges 12 and may be provided with suitable labels 46 to designate the contents.

Within the cabinet and in alignment with each opening at each door 11 are two angle slides 13 for supporting a row of packages, indicated at 14, in alignment with the door opening. A flexible sealing frame 15 of rubber or other resilient

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material surrounds each door opening in spaced relation to the inside face of the door. The internal opening of the frame 15 is smaller than the size of the package so that each successive package must be forced through the flexible frame. Thus, each successive package forms a seal for the cabinet to prevent air from entering or discharging while the preceding package is being removed through the open door.

The packages 14 are pulled forwardly along each pair of slides 13 by means of a pair of upper ratchet bars 16, there being one bar at each side of each row of packages. The forward extremities of the ratchet bars 16 are connected, as shown at 17, to the doors. The ratchet bars 16 are constantly pulled inwardly by means of tension springs 18, which maintain the doors closed, and are pulled forwardly by the doors as they are opened. The ratchet bars 16 are formed with outwardly acting ratchet teeth on their lower edges, which engage hooked ears 47 formed on a ratchet plate 19 which is secured to the back of a pusher block 20. The pusher block 20 also rides on the angle slides 13 with the packages 14, it being provided with hooks 48 in its bottom to maintain it in place on the slides 13. The teeth in the ratchet bars 16 are spaced to correspond to the width of the packages 14.

Each time a door is opened, the pusher block 20 corresponding to that door will move forwardly the width of one of the packages 14. The block 20 is prevented from returning, as the door closes, by means of a pair of fixed locking ratchet bars 21 having ratchet teeth in their upper edges against which the ratchet plates 19 strike to prevent return of the block 20.

Thus, as each door is opened, the foremost package will be forced through the sealing frame 15 and will fall against the door, as shown in Fig. 2, within easy reach of the customer. The next successive package will be automatically and simultaneously brought into sealing contact with the sealing frame 15 to maintain the case sealed. When all of the packages have been used, the last ratchet notches in the bars 16 will force the pusher block 20 into the sealing frame 15 to seal the cabinet, regardless of the opening of the door 11.

In order to replace packages on the angle slides 13, it is necessary to disengage the ratchet plate 19 from the locking ratchet bars 21. This is accomplished by means of releasing buttons 22, one of which is positioned below each of the doors 11. Each of the buttons 22 acts to force an inclined dog 23 inwardly over the extremities of two lifting levers 24. The levers terminate below the ratchet bars 16 so that when the button is forced inwardly, the ratchet bars 16 are elevated to lift the ratchet plates 19 out of engagement with the teeth in the bars 21. As each

new package is forced through the sealing frame, the pusher block 20 is forced inwardly. It will be noted that each new package being placed in the cabinet replaces a package in the sealing frame so that the cabinet remains sealed even during the filling operation. The buttons 22 serve no other purpose than to allow refilling of the angle slides 13.

A plurality of drawers 25 are positioned in the bottom of the cabinet 10 for storage purposes and for holding larger articles, such as frozen poultry and the like. Each drawer slides into an enclosure separating it from the interior of the cabinet. The enclosure is provided with a valve plate 26 having a plurality of air openings 27 therein. When the drawer is closed, these openings align with air ports 28 to allow cold air to circulate through the drawer contents. When the drawer is opened, a leaf spring 29 forces the valve plate 26 forwardly to position the openings 27 out of register with the ports 28 so that there is no loss of cold air through the drawer opening.

A check valve 30 is positioned opposite the lowermost drawer to create downward circulation through the drawers when the latter are closed. This valve is provided with a stem 31 against which the drawer contacts to force the valve open when the drawer is closed. A spring 32 is provided to force the valve closed when the drawer is opened. A permanent cold air opening 49 may be provided to supply a limited amount of cold air to the drawer while open to prevent warm air from entering.

One of the principal features of this cabinet resides in the fact that a slight pressure is always maintained on the cold air within the food compartments. In other words, the pressure within the compartments is slightly in excess of atmospheric pressure. This prevents warm air from leaking into the cabinet at any point, for should there be any leakage the cold air will seep through, the leak preventing the entrance of warm air. The cold air is completely dehydrated, as will be later described, so that there will be no frost formation, and since the moisture-laden warm air cannot enter at any point, frost formation is entirely eliminated.

The pressure is maintained by means of a blower or fan 33, preferably positioned in the upper portion of the cabinet 10. The fan forces air through a cold coil 34 which is chilled by any standard refrigerating unit such as indicated at 44. The coil is of such size and arrangement to chill the passing air well below freezing temperature. The refrigerating mechanism may be located at any desired point, such as within a cover 45 on the cabinet. Any moisture in the air is condensed onto the coil 34. The cold dry air from the coil 34 enters a distributing hood 35, from which it is distributed evenly by means of baffles 36 to a plurality of cold air ports 37. The ports 37 are positioned above the inside of the front wall of the housing to force a moving curtain of cold dry air downwardly into the food compartments of the cabinet.

This cold air flows through and around all of the packages 14 on the angle slides and then discharges through one or more discharge ports 39 to a return duct 40 extending upwardly across the back of the cabinet 10. The duct 40 opens at its top to the intake side of the fan 33. A pressure relief valve 41 of any desired type controls the discharge ports 39. This valve is arranged so that it will not open until the pressure in the food compartment has reached a predetermined pressure in excess of atmospheric pressure.

Should a vacuum form in the return duct 40 or about the fan 33 due to a loss of air from the cabinet, or due to the fact that the pressure therein is being built up to the desired point, outside air will be drawn in through an outside port 42 controlled by means of a check valve 43. This fresh outside air must pass through the cooling coil 34, where it will be dehydrated before it enters the food compartments.

There will always be a slight loss of pressure of cold air due to the removal of the packages and to the opening of the drawers, etc. This loss is always automatically compensated for by outside air entering through the port 42, but this air is always dehydrated before it enters the cabinet, and since at all other points the internal air is at higher pressure than the external, no external air can enter, and the formation of frost upon the doors and upon the operating mechanism is entirely eliminated.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. A frozen food dispensing device comprising a cabinet, a normally closed food compartment in said cabinet, a refrigerating coil, an intake compartment, fan means for forcing air from said intake compartment through said coil to dehydrate and chill the air, means for conducting the chilled air to the food compartment, means for controlling the passage of air from the food compartment to the intake compartment to establish a condition of super-atmospheric pressure therein, and a port in said intake compartment opening to the atmosphere to admit atmospheric air into said intake compartment when the pressure in said compartment goes below atmospheric pressure.

2. A frozen food dispensing device comprising a cabinet, a normally closed food compartment in said cabinet, a refrigerating coil, an intake compartment, fan means for forcing air from said intake compartment through said coil to dehydrate and chill the air, means for conducting the chilled air to the food compartment, means for returning the air from the food compartment to the intake compartment, means for controlling the passage of air from the movable food compartment to the intake compartment to establish a condition of super-atmospheric pressure in said food compartment, said intake compartment being provided with a port opening to the atmosphere, and a check valve for closing said port when the pressure in the intake compartment reaches atmospheric pressure.

3. A frozen food dispensing device comprising: a cabinet having a normally closed food compartment in its interior; openings in the wall of said housing through which food may be withdrawn; means for closing said openings; a fan; a dehydrating and cooling coil in the path of the air from said fan; means for conducting the dehydrated cooled air to the food compartment; means for returning air from the food compartment to the fan; means for controlling the passage of air from the food compartment to the fan to maintain a condition of super-atmospheric

pressure in said food compartment, said air traveling in a closed circuit from the fan to the food compartment and thence back to the fan; and means for admitting outside air to said fan only when the pressure on the suction side thereof drops below atmospheric pressure.

4. In a frozen food dispensing cabinet, an air intake chamber, a food chamber, a refrigerated heat exchange device interposed between said intake chamber and said food chamber, a return air passage communicating between said food chamber and said intake chamber, a fan positioned to force air from said intake chamber through said refrigerated heat exchange device into said food chamber whereby chilled dehydrated air is delivered to said food chamber, and means for admitting outside air to said intake compartment when the pressure in the latter falls below atmospheric pressure.

5. In a frozen food dispensing cabinet, an air intake chamber; a food chamber; a refrigerated heat exchange device separating said intake chamber from said food chamber; a return air passage communicating between said food chamber and said intake chamber; a fan positioned to force air from said intake chamber through said refrigerated heat exchange device into said food chamber; and a pressure relief valve arranged to allow air to pass from said food chamber to said intake chamber only after the pressure in the food chamber has reached a predetermined point.

6. A method of refrigeration which comprises, establishing a pressure differential of the air within a closed compartment, to cause a movement of air therein, passing said moving air into heat interchange relationship with a refrigerating medium to reduce the temperature of said air and reduce the moisture content thereof, passing said refrigerated air into a second closed compartment containing articles to be refrigerated, withdrawing the air in said second compartment at a point remote from its introduction thereto and controlling the rate of withdrawal to establish a condition of superatmospheric pressure in said second compartment, returning said air withdrawn from said second compartment to the low pressure zone of said first compartment, and introducing atmospheric air from without said first compartment to the low pressure zone of said compartment when the pressure within said second compartment is reduced to approximately atmospheric pressure.

7. A method of refrigeration which comprises, establishing a pressure differential of the air within a substantially closed compartment to cause movement of air therein, moving said air into heat interchange relationship with a refrigerating medium to reduce the temperature of said air and reduce its moisture content, passing said refrigerated air into heat interchange contact with articles to be refrigerated, withdrawing said air so passed at a point remote from its initial contact with said articles and returning said withdrawn air to the low pressure zone of said compartment, and replenishing air lost in said circuit by passing atmospheric air from the exterior of said compartment to the low pressure zone of said compartment.

8. A frozen food dispensing device comprising a cabinet having a normally closed food compartment in its interior, the wall of said cabinet being provided with openings through which food may be withdrawn, means for closing said openings, a fan, a dehydrating and cooling coil in the path of the air from said fan, means for conducting the dehydrated cooled air to the food compartment and discharging said air adjacent said food-withdrawing openings, means for returning the air from the food compartment to the fan, means for controlling the passage of air from the food compartment to the fan to maintain a condition of super-atmospheric pressure in said food compartment, said air travelling in a closed circuit from the fan to the food compartment and thence back to the fan, and means for admitting outside air to said fan only when the pressure on the suction side thereof drops below atmospheric pressure.

9. A method of refrigerating a frozen food dispensing cabinet having a plurality of food dispensing openings closed by movable doors which comprises, establishing a pressure differential of air within a substantially closed compartment within said cabinet to cause movement of air therein, moving said air into heat interchange relationship with a refrigerating medium to reduce the temperature of said air and reduce its moisture content, passing said refrigerated and de-moisturized air adjacent said food dispensing openings and doors into said interchange contact with articles in said cabinet to be refrigerated, withdrawing said air so passed at a point remote from its initial contact with said articles, controlling the withdrawal of said air to establish a condition of superatmospheric pressure adjacent said food dispensing openings, and returning said withdrawn air to the low pressure zone of said compartment, and replenishing air lost in said circuit by passing atmospheric air from the exterior of said compartment to the low pressure zone of said compartment.

10. A method of refrigeration which comprises establishing a pressure differential of the air within a substantially closed compartment to cause movement of air therein, moving said air into heat interchange relationship with a refrigerating medium to reduce the temperature of said air and reduce its moisture content, passing said refrigerated air with reduced moisture content into heat interchange contact with articles to be refrigerated maintained in a zone having a dispensing opening, said air being passed as a curtain of chilled substantially dehydrated air adjacent said dispensing opening, withdrawing said air so passed at a point remote from its initial contact with said articles and returning a portion of said withdrawn air to the low pressure zone of said compartment, and replenishing air lost in said circuit by drawing atmospheric air from the exterior of said compartment to the low pressure zone of said compartment.

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