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D. F. ALLGEYER ETAL

3,306,068

REFRIGERATED OPEN FRONT MERCHANDISER

Filed Dec. 2, 1965

2 Sheets-Sheet 1

FIG. 1.

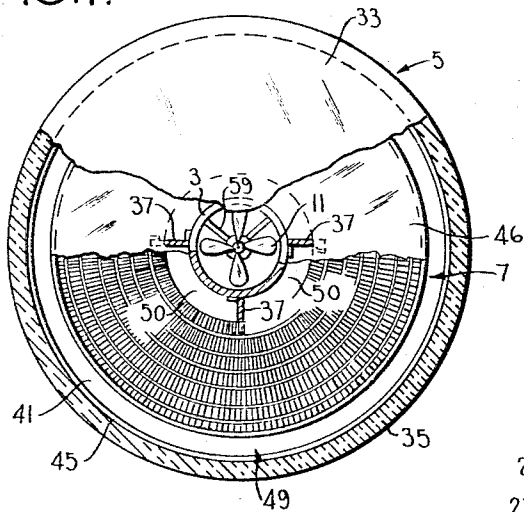


FIG. 2.

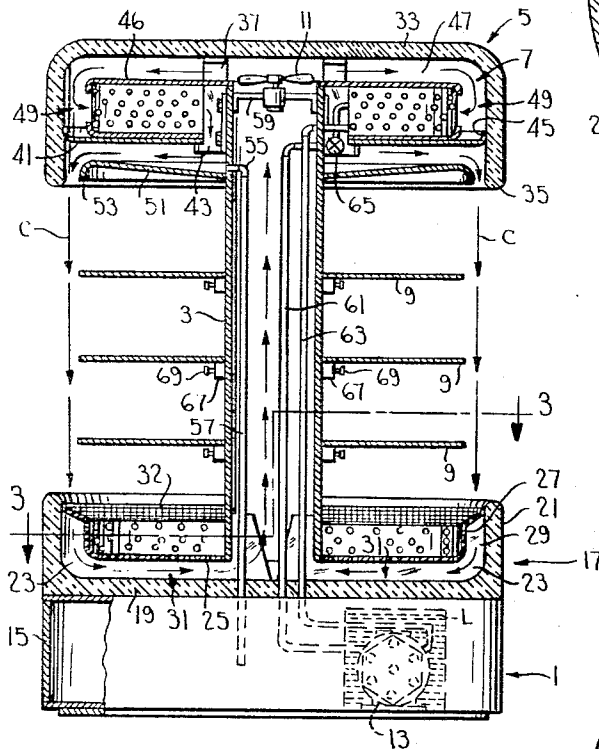


FIG. 3.

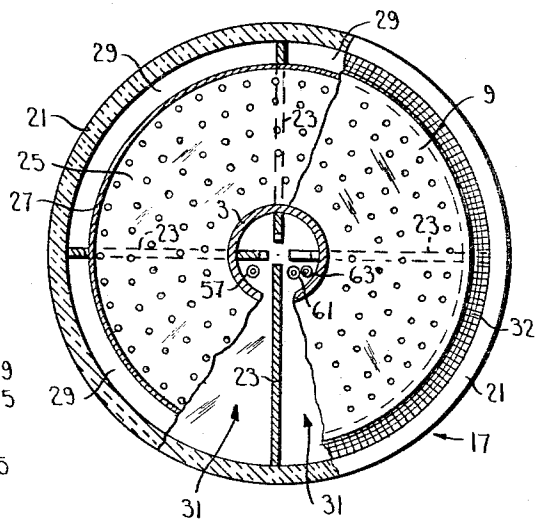
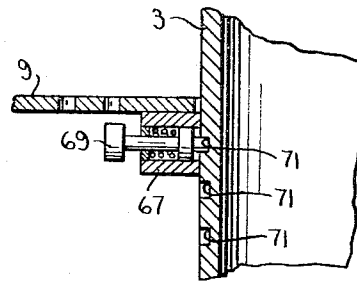


FIG. 4.



David F. Allgeyer,
Lester F. Reifeiss,
Inventors.

Koenig, Senniger, Powers and Leavitt,
Attorneys.

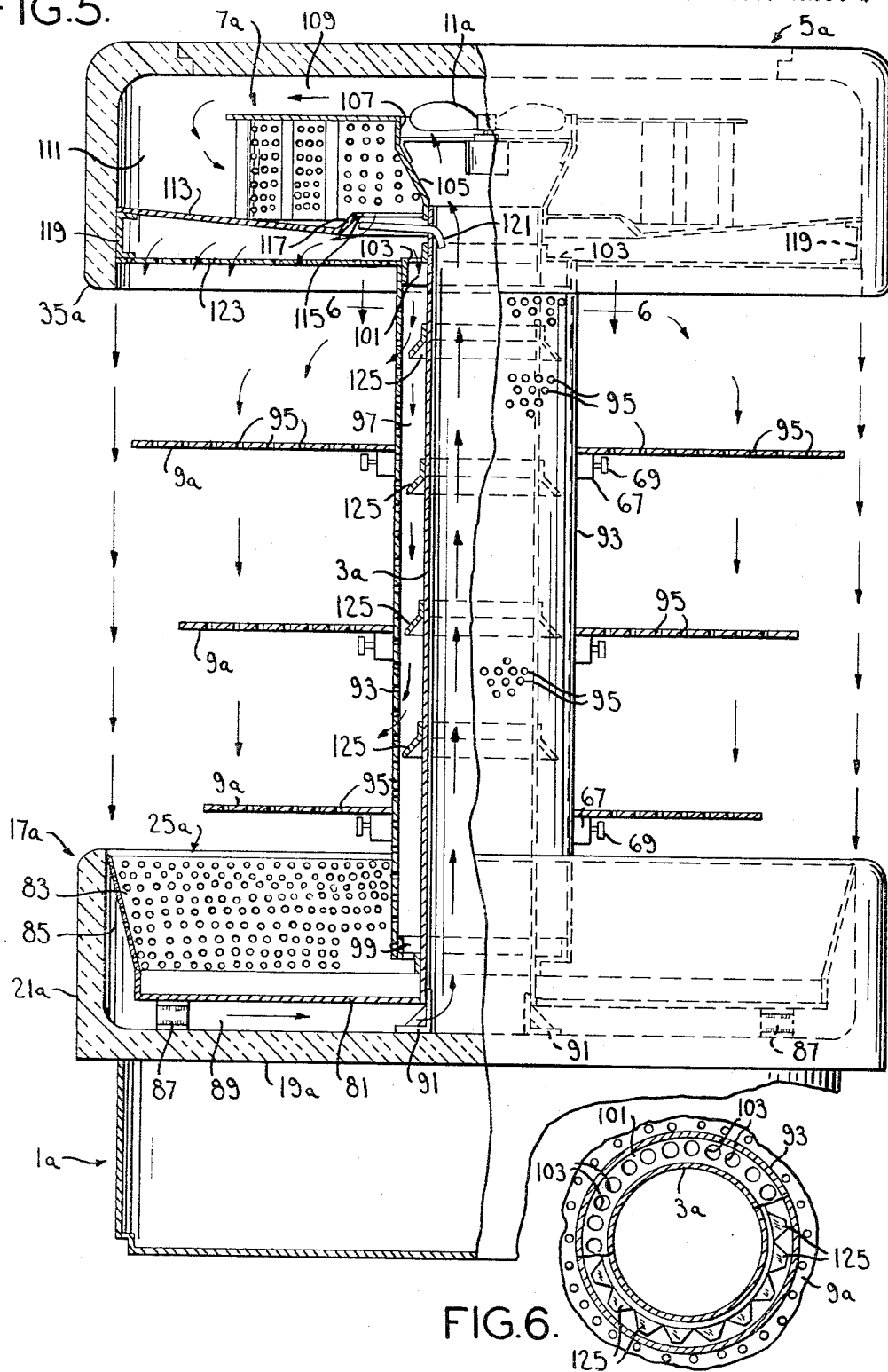
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FIG. 5.



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REFRIGERATED OPEN FRONT MERCHANDISER
David F. Allgeyer and Lester F. Reifeiss, Conway, Ark.,
assignors to Universal Match Corporation, St. Louis,
Mo., a corporation of Delaware
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Among the several objects of the invention may be noted the provision of an improved merchandiser of the class described in which the merchandise is freely accessible to the consumer without any necessity for opening doors, lids or covers, while being effectively held under refrigeration; the provision of a merchandiser such as described in which the merchandise is maintained under refrigeration by a flow of refrigerated air and wherein the arrangement is such as to provide for the flow of refrigerated air with a minimum of air distribution problems, utilizing the tendency of cold air to flow downward; the provision of a merchandiser such as described of a type that may be referred to as the island type, adapted to be located away from the walls of the room; and the provision of a merchandiser such as described which is economical to manufacture. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIG. 1 is a plan of a merchandiser of this invention, with parts broken away and shown in section;

FIG. 2 is a view partly in elevation and partly in vertical section of the merchandiser;

FIG. 3 is a horizontal section in part on line 3-3 of FIG. 2;

FIG. 4 is an enlarged fragmentary view showing a shelf latching detail;

FIG. 5 is a view partly in elevation and partly in vertical section showing another version of the merchandiser of this invention; and

FIG. 6 is a horizontal section on line 6-6 of FIG. 5.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a merchandiser constructed in accordance with this invention is shown to comprise a base 1, a tubular column 3 extending upward from the base, and a hood 5 at the top of the column. In the hood is an evaporator coil 7 in surrounding relation to the column adjacent its upper end. The column is adapted for entry of air at its lower end and exit of air from its upper end into the hood. The column carries shelves 9 for holding merchandise in an array around the column. A blower 11 is provided for pulling air up through the column and blowing it into the hood. The air passes through the coil 7, which cools it, and then passes down in a curtain as indicated at C around the shelves, thence into the lower end of the column.

As shown herein, the base 1 is formed to provide an enclosure for a refrigerant compressor unit 13, although it will be understood that unit 13 may be provided at a remote location, in which case the base may be used for storage. Also as shown herein, the base is circular in plan, having a cylindrical peripheral wall 15, which may be louvered as indicated at L for entry and exit of cooling air for the condenser of the compressor unit 13. On top of the base is a circular pan 17 having a circular bottom 19 on the base and an upstanding peripheral cylindrical wall 21. This pan is formed of thermal insulation material to insulate the space above the base from the heat

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generated by the compressor unit 13 and from the ambient air.

Mounted on the bottom 19 of the pan 17 are U-shaped vertical plates 23 which extend radially outward from the center of bottom 19 of the pan to the peripheral wall 21 of the pan. These plates support the column 3 with its lower end spaced above the bottom of the pan and also support a circular bottom shelf or basket 25 with the latter spaced above the bottom of the pan. This bottom shelf or basket 25 is of smaller diameter than the internal diameter of the wall 21 of the pan, and has an upwardly directed cylindric peripheral wall 27. As shown, the shelf or basket is made of perforated sheet metal. It could be made of wire. The wall 27 of the shelf or basket 25 is spaced inward of the wall 21 of the pan 17 to provide vertical channels as indicated at 29 for downward flow of air between the supporting plates 23. Channels 29 lead to horizontal radial channels 31 between the plates 23 for flow of air radially inward below the bottom of the basket to the lower end of the column 3. A grille 32 may be provided around the top of vertical channels 29.

The hood 5 is of inverted pan shape, having a circular top 33 which, as shown, may be generally of the same diameter as pan 17. It is provided with a downwardly extending peripheral cylindric wall or rim 35. The hood is formed of thermal insulation material for insulation of the coil 7 from the ambient air. Mounted on the outside of the upper end portion of the column 3 are radial plates 37. These extend up above the upper end of the column and support the hood with the top of the hood spaced above the upper end of the column to provide space for exit of air from the upper end of the column radially outward into the hood via the spaces between the plates 37.

The evaporator coil 7 is of annular form, having an internal diameter somewhat greater than the external diameter of the column 3, and an external diameter somewhat less than the internal diameter of the rim 35 of the hood. The coil is supported on an annular plate 41 which, at its inner margin, bears on feet 43 on the plates 37 and which, at its outer margin, has an upstanding rim 45 secured to the rim 35 of the hood. Plate 41 supports the coil with the top of the coil 46 below the top of the hood to provide space 47 above the coil through which air exiting from the top of the column 3 may flow radially outward to the annular space 49 between the outer periphery of the coil and the rim of the hood. The air then passes radially inward through the coil from the periphery of the coil to the spaces 50 between the radial plates 37 below the top of the coil and thence downward. The top of the coil extends inward between the plates 37 to the upper end of the column to close off the top of spaces 50. Mounted on the column below the plate 41 is a circular drain pan 51. This converges downward to the column 3 and has a downturned annular rim 53. Defrost water dripping down from the coil is caught in the pan and drains out through an elbow 55 to a drain pipe 57 extending downward in the column.

The blower 11, shown as an electric motor driven fan, is mounted adjacent the upper end of the column on a bracket 59, positioned to draw air upward in the column and blow it up against the hood for flow of air radially outward in the space 47 above the coil 7. The compressor unit 1 is interconnected with the evaporator coil 7 via refrigerant delivery and return pipes 61 and 63 which extend through the column, an expansion valve 65 being shown in the refrigerant delivery line.

The shelves 9 are circular shelves of a diameter smaller than the internal diameter of wall 21 of the pan 17 and rim 35 of the hood. Each shelf 9 has a collar 67 around a central opening therein having a sliding fit on the col-

umn, and spring latches such as indicated at 69 in the collar receivable in one of a vertical series of annular peripheral grooves 71 in the column. With this arrangement, each shelf 9 may be vertically adjusted on the column and rotated around the column in any position of adjustment. The shelves 9 may be made of perforated or slotted sheet metal or could be made of wire.

With the compressor unit 13 in operation to cool the evaporator coil 7, and with blower 11 in operation, flow of air up through the tubular column 3 occurs by convection as well as by the operation of the blower, out of the upper end of the column, radially outward in all directions from the upper end of the column through the spaces between the plates 37 and the space 47 above the top of coil 7, down through the annular space 49 between the outer periphery of the coil and the rim 35 of the hood 5, radially inward through the coil 7 to the spaces 50 between the plates 37, down through these spaces to the space between the drain pan 51 and the bottom of the coil 7, radially outward in all directions in the latter space, thence downward through the space between the rim 53 of the drain pan and the rim 35 of the hood 5 in curtain C surrounding the shelves 9 to the vertical channels 29 defined by the wall 21 of the pan 17, the wall 27 of the basket 25 and the plates 23, and through the channels 31 between plates 23 to the lower end of the column. Discharge of air from the upper end of the column is substantially uniform all around 360° in the space above the coil 7. Similarly, flow of air through the coil, and the space between the drain pan 51 and the bottom of the coil and thence downward in the air curtain C around the shelves, and through spaces 29 and channels 31 to the lower end of the column is substantially uniform all around 360°. Thus, the air is efficiently circulated, the symmetry of the arrangement minimizing problems of air distribution.

Products on shelves 9 and in the basket 25 are refrigerated by convective movement of cold air downward from the coil to the drain pan, from the drain pan down to the upper shelf 9, from the upper shelf down to the next shelf, etc. The column and shelves are also cooled by heat exchange with the coil, and this also tends to keep the products on the shelves refrigerated. The air curtain C in effect blocks off the products from heat exchange with the ambient atmosphere, while permitting free access to the products on the shelves and products in the basket, thereby eliminating any necessity for the use of doors to close off the products from the ambient atmosphere. The use of the annular coil 7 with flow of air from the outside to the inside is highly advantageous for effective heat exchange as between the air and the coil. In this regard, it will be observed that the coil presents a maximum of cooling surface area around its outer periphery, for heat-exchange contact by air at its warmest starting to flow through the coil from the annular space 49 around the coil.

It will be understood that coil 7 may be defrosted in conventional manner by shutting the unit off, or by reverse cycling, or by providing electrical defrost heaters, etc. On defrosting, defrost water is collected in the drain pan 51 and drained out through pipe 57.

It is contemplated that, in smaller merchandisers, and where the products on the shelves and in the basket need not be maintained at lower temperatures, the blower 11 may be omitted. Flow of air upward through the column 3, through the coil 7 and downward in air curtain C then occurs by convection only.

FIG. 5 illustrates a modification in which a jacket is provided surrounding the tubular column, this jacket defining with the column an annular passage for downward flow of cold air, and having openings for exit of cold air to flow over products on the shelves, and wherein cold air exiting from the evaporator coil is directed to flow downward in this annular passage. In FIG. 5, the base is designated 1a, the tubular column 3a, the hood 5a,

the evaporator coil 7a, the shelves 9a, the blower 11a, the pan 17a, and the basket 25a. The bottom of the pan is designated 19a and the wall of the pan 21a. The basket is of somewhat different form from the basket 25, having a circular bottom portion 81 of smaller diameter than the internal diameter of wall 21a and a conical perforated upper section 83 which flares outward to the top of wall 21a, providing an annular space 85 around section 83. The basket is supported as indicated at 87 in raised position above the bottom 19a of the pan to provide a space 89 for flow of air from space 85 to the lower end of the column, which is supported in raised position by braced angle members 91.

The jacket, which is designated 93, consists of a cylindrical tube having openings as indicated at 95, of larger diameter than the column 3a. It is mounted in position coaxial with and surrounding the column, providing an annular passage 97 therebetween. As shown, the jacket is supported at its lower end on a collar 99 on the column, and its upper end is held in centered relation with respect to the column by a collar 101 on the column. Collar 101 is apertured as indicated at 103 (see also FIG. 6) for entry of air to annular passage 97, and collar 99 may be similarly apertured. Shelves 9a are mounted on the jacket, instead of on the column as in the species of FIGS. 1-4.

As shown in FIG. 5, the evaporator coil 7a is of annular form, having a flared annular internal wall 105 defining a flared central opening 107. The lower end of the flared annular wall 105 (which is its smaller end) is mounted on the upper end of column 3a. Blower 11a is mounted in the flared opening 107 at its upper end and is adapted to draw air upward through the column and blow it out into the hood, the top of the coil being below the top of the hood to provide a space 109 above the coil for outward flow of air. The external diameter of the coil is less than the internal diameter of the rim 35a of the hood to provide a space 111 for flow of air radially inward through the coil from its outer periphery. The coil, at its outer periphery, is supported on a drain pan 113 which is of annular dish form, having a relatively large central opening 115 bounded by an upwardly extending flange 117. Opening 115 constitutes an exit for air to flow downward from the coil, enter the annular passage 97 provided by the jacket 93 and also spread outward beneath the drain pan.

The drain pan bears at its outer periphery on the upper flange of a channel 119 extending around the inside of rim 35a of the hood and slopes down to the flange 117. Defrost water dripping down from the coil collects in the drain pan around the flange 117, and drains out through a drain pipe 121 extending through the flange. Below the drain pan is a horizontal circular grille 123 having its outer margin attached to the bottom flange of channel 119. This grille has a central opening and its inner margin around the opening bears on the upper end of the jacket 93. Deflectors 125 (see FIGS. 5 and 6) are provided on column 3a in annular passage 97 to deflect air flowing downward therein outward through the openings 95 in the jacket.

In the FIG. 5 version of the merchandiser, air flows up through column 3a, radially outward in all directions from the upper end of annular internal wall 105 of the coil 7a through the space 109, down through the space 111, radially inward through the coil, down from the coil through central opening 115 of the drain pan 113, thence through openings 103 into annular passage 97 defined by jacket 93 and also outward in the space between grille 123 and the drain pan 113. The air entering passage 97 flows downward therethrough and is deflected outward through openings 95 in jacket 93 to the space around the jacket. Air also flows downward through grille 123 generally as indicated by the arrows in FIG. 5. The air ultimately flows through the open-

ings in basket 25a and returns via space 89 to the lower end of column 3a.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A merchandiser for merchandise requiring refrigeration comprising a base, a tubular column extending upward from the base, a hood at the top of the column, an evaporator coil in the hood in surrounding relation to the column adjacent its upper end, shelves mounted between the base and the hood, the column being adapted for entry of air at its lower end and exit of air from its upper end into the hood, air exiting from the column being adapted to flow through the coil, thence downward, and ultimately back into the lower end of the column.

2. A merchandiser as set forth in claim 1 wherein the shelves surround the column.

3. A merchandiser as set forth in claim 2 wherein the shelves are vertically adjustable on the column.

4. A merchandiser as set forth in claim 1 wherein the base is formed as an enclosure for a refrigerant compressor unit which is interconnected through the column with the coil.

5. A merchandiser as set forth in claim 1 having a jacket on the outside of the column providing passage on the outside of the column for downward flow of air therethrough and having openings for exit of air.

6. A merchandiser as set forth in claim 5 wherein jacket surrounds the column and the shelves surround the jacket and are vertically adjustable thereon.

7. A merchandiser as set forth in claim 5 having means in said passage for deflecting air outward through the openings in the jacket.

8. A merchandiser as set forth in claim 1 wherein the coil is an annular coil adapted for flow of air from its outside periphery toward the inside and downward, and wherein the coil is mounted in the hood with its top spaced downward from the top of the hood and its outside periphery spaced inward from the periphery of the hood for flow of air exiting from the top of the column outward through the space between the top of the coil and the top of the hood, inward through the coil and thence downward.

9. A merchandiser as set forth in claim 8 having a drain pan below the coil, and a drain from the drain pan extending within the column.

10. A merchandiser as set forth in claim 1 having a blower for positively causing flow of air upward through the column and out of the upper end of the column.

11. A merchandiser as set forth in claim 1 wherein the coil is an annular coil adapted for flow of air from its outside periphery to its inside periphery, the coil is mounted in the hood with its top spaced downward from the top of the hood, its outside periphery spaced inward from the periphery of the hood, and its inside periphery spaced from the column, and a drain pan is provided on the column spaced downward from the bottom of the coil, for flow of air exiting from the top of the column outward through the space between the top of the coil and the top of the hood, inward through the coil, downward through the space between the inside periphery of the coil and the column, and thence outward through the space between the drain pan and the bottom of the column.

12. A merchandiser as set forth in claim 1 wherein the coil is an annular coil adapted for flow of air from its outside periphery toward the inside and downward, wherein the coil is mounted in the hood with its top

spaced downward from the top of the hood and its outside periphery spaced inward from the periphery of the hood for flow of air exiting from the top of the column outward through the space between the top of the coil and the top of the hood, inward through the coil and thence downward, having a drain pan below the coil with a central opening in the pan for downward flow of air from the coil, and a jacket surrounding and spaced from the column providing an annular passage around the column for downward flow of air therethrough and having openings for exit of air.

13. A merchandiser for merchandise requiring refrigeration comprising a base, a pan of thermal insulation material having a bottom on the base and an upwardly extending peripheral wall, a tubular column extending upward from the center of the bottom of the pan, a basket surrounding the lower end portion of the column in the pan, said basket having a bottom and an upstanding peripheral wall, means supporting the column and basket above the pan with the lower end of the column and the bottom of the basket spaced above the bottom of the pan and providing passage between the bottom of the pan and the bottom of the basket for flow of air to the lower end of the column, a hood of thermal insulation material at the top of the column in centered relation to the column having a top and a downwardly extending peripheral wall surrounding the column, means on the column supporting the hood with the top of the hood spaced above the upper end of the column and providing for passage of air outward from the upper end of the column, an evaporator coil in the hood in surrounding relation to the column adjacent its upper end, and shelves mounted in position surrounding the column between the basket and the hood, air exiting from the upper end of the column flowing through the coil and thence downward and ultimately back into the lower end of the column and upward through the column.

14. A merchandiser as set forth in claim 13 wherein the shelves are mounted on the column and slidably adjustable up and down thereon.

15. A merchandiser as set forth in claim 13 having a jacket surrounding and spaced from the column providing an annular passage around the column for downward flow of air therethrough and having openings for exit of air, the shelves being mounted on the jacket.

16. A merchandiser as set forth in claim 13 wherein the base is formed as an enclosure for a refrigerant compressor unit which is interconnected through the column with the coil.

17. A merchandiser as set forth in claim 13 wherein the coil is an annular coil adapted for flow of air from its outside periphery toward its inside and downward, and wherein the coil is mounted in the hood with its top spaced downward from the top of the hood and its outside periphery spaced inward from the periphery of the hood for flow of air exiting from the top of the column outward through the space between the top of the coil and the top of the hood, inward through the coil and thence downward.

18. A merchandiser as set forth in claim 17 having a drain pan below the coil, and a drain from the drain pan extending within the column.

19. A merchandiser as set forth in claim 13 having a blower at the upper end of the column for positively causing flow of air upward through the column and out of the upper end of the column.

20. A merchandiser as set forth in claim 13 wherein the coil is an annular coil adapted for flow of air from its outside periphery to its inside periphery, the coil is mounted in the hood with its top spaced downward from the top of the hood, its outside periphery spaced inward from the periphery of the hood, and its inside periphery spaced from the column, and a drain pan is provided on the column spaced downward from the bottom of the coil, for flow of air exiting from the top of the column

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outward through the space between the top of the coil and the top of the hood, inward through the coil, downward through the space between the inside periphery of the coil and the column, and thence outward through the space between the drain pan and the bottom of the column. 5

21. A merchandiser as set forth in claim 13 wherein the coil is an annular coil adapted for flow of air from its outside periphery toward the inside and downward, wherein the coil is mounted in the hood with its top spaced 10 downward from the top of the hood and is outside periphery spaced inward from the periphery of the hood for flow of air exiting from the top of the column outward through the space between the top of the coil and the top of the hood, inward through the coil and thence downward, having a drain pan below the coil with a central opening in the pan for downward flow of air from the coil, 15

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and a jacket surrounding and spaced from the column providing an annular passage around the column for downward flow of air therethrough and having openings for exit of air.

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WILLIAM J. WYE, *Primary Examiner.*