July 27, 1965 H. L. BUFFINGTON 3,196,632

REFRIGERATED CABINET

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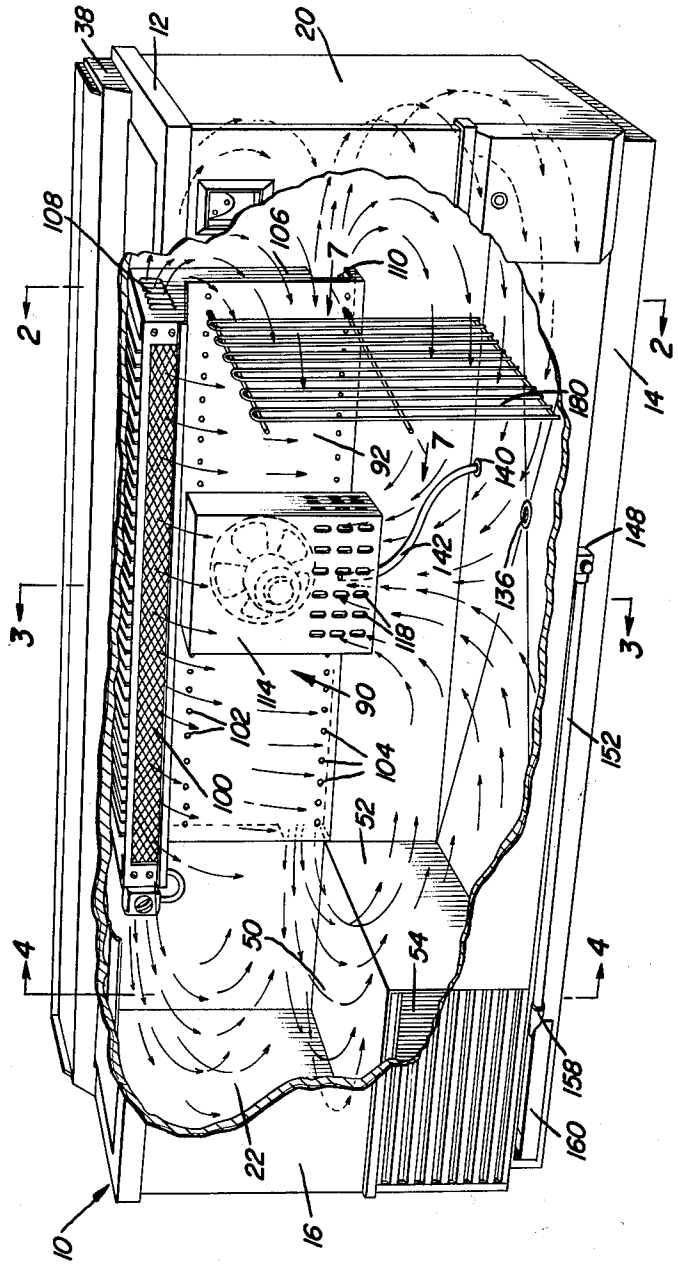


Fig. 1

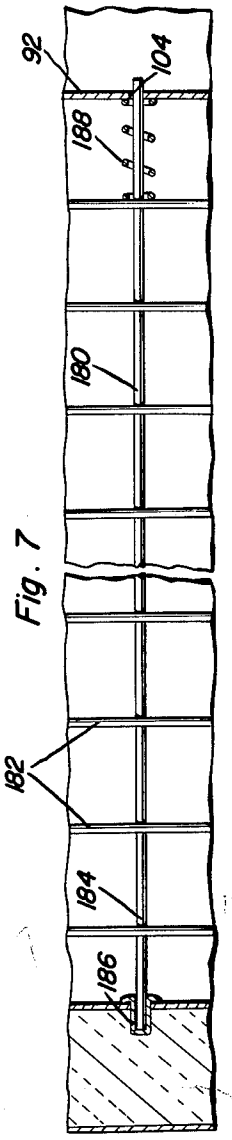


Fig. 7

Herman L. Buffington

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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Fig. 3

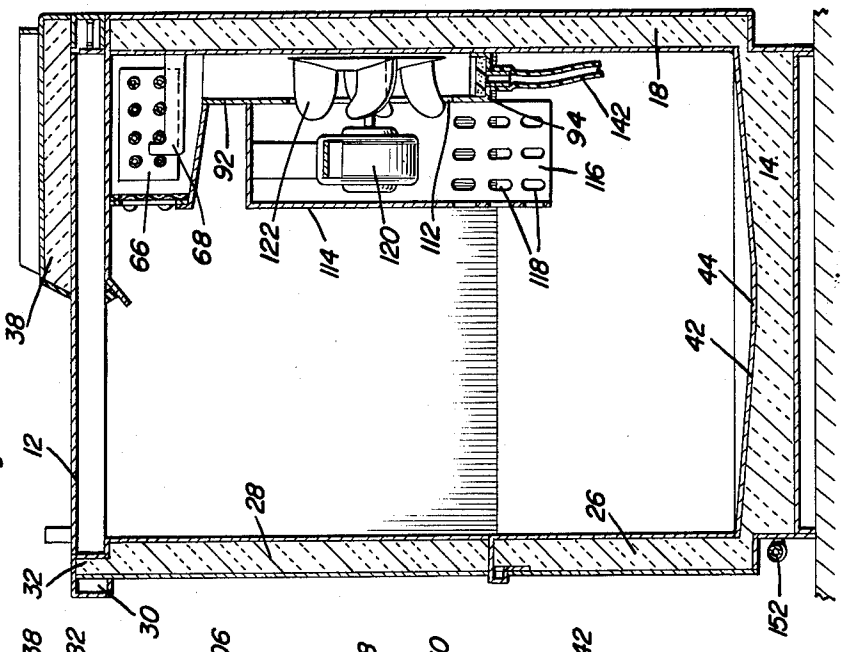
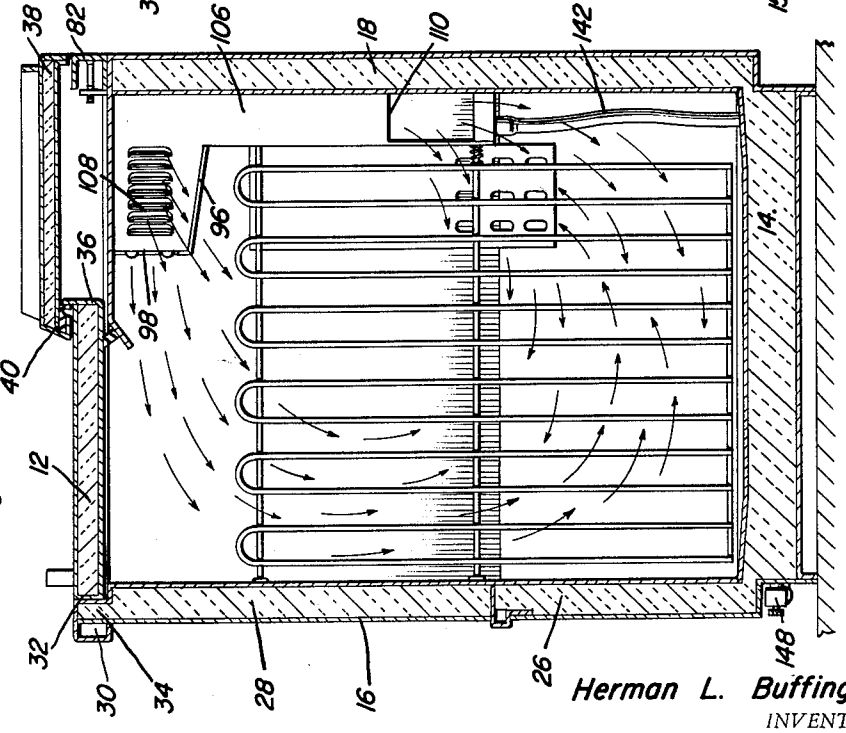


Fig. 2



Herman L. Buffington
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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REFRIGERATED CABINET

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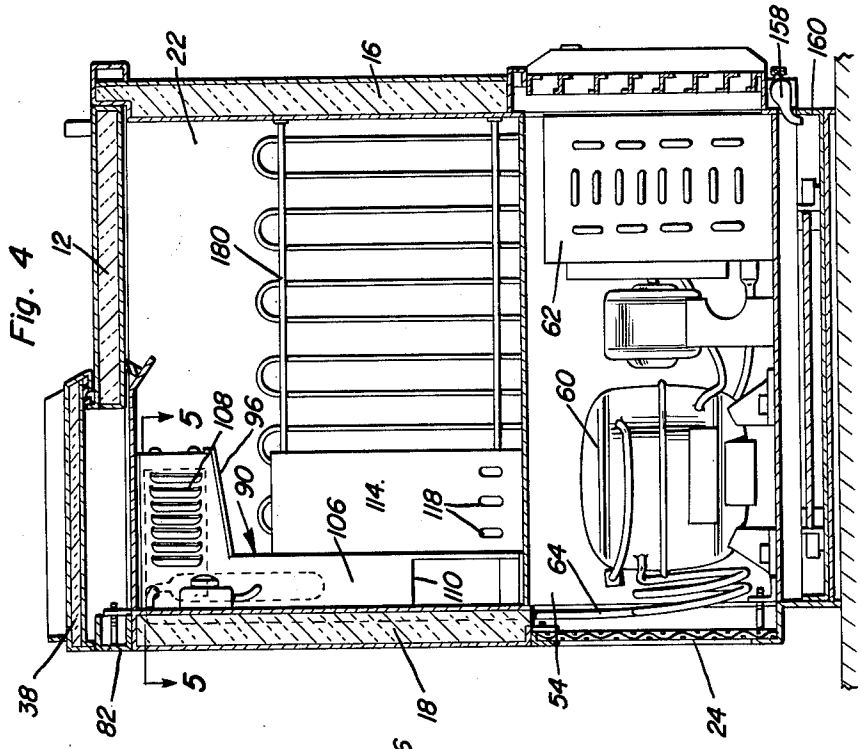


Fig. 4

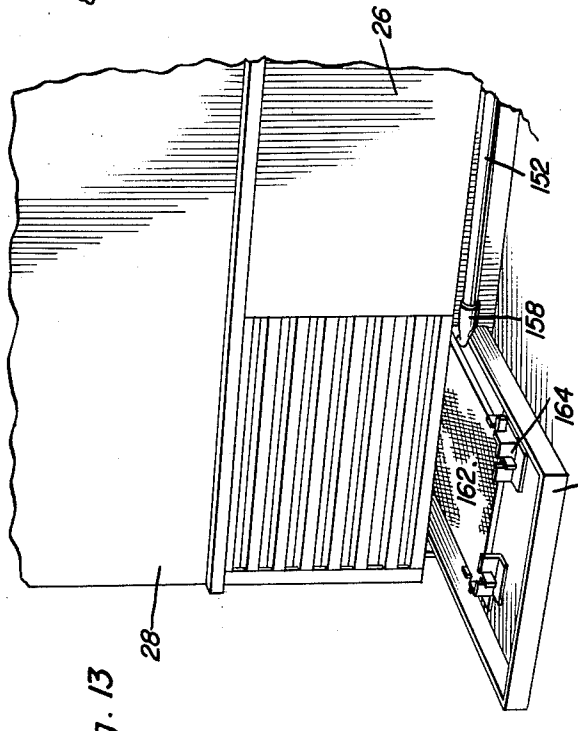


Fig. 13

Herman L. Buffington

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

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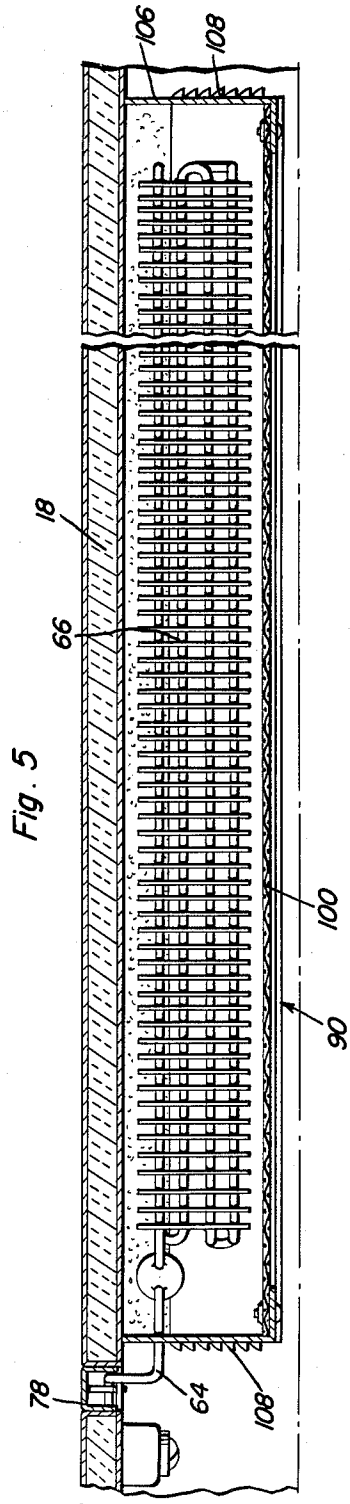


Fig. 5

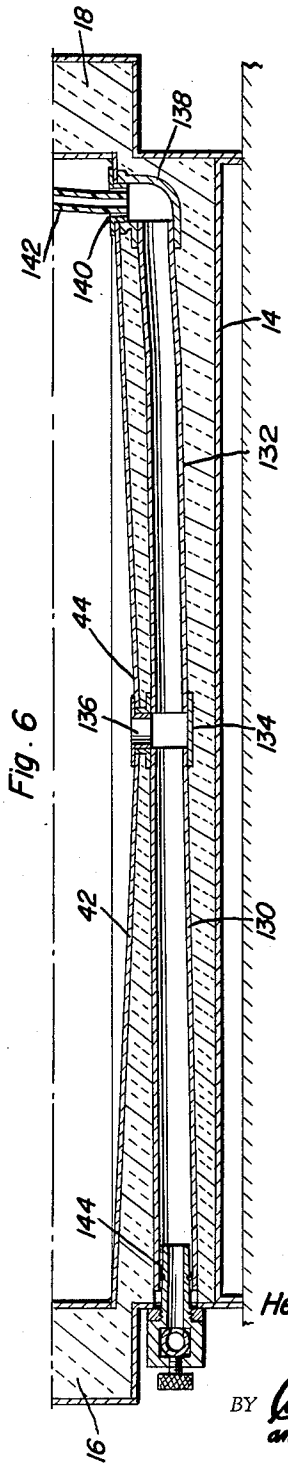


Fig. 6

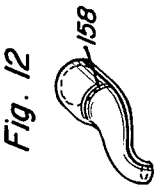


Fig. 12

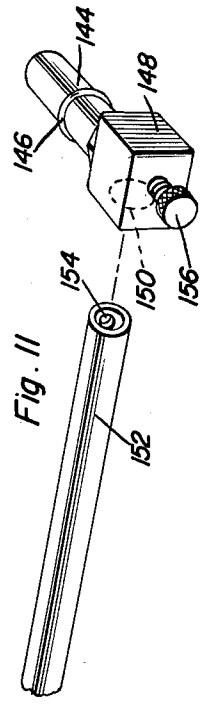


Fig. 11

Herman L. Buffington
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

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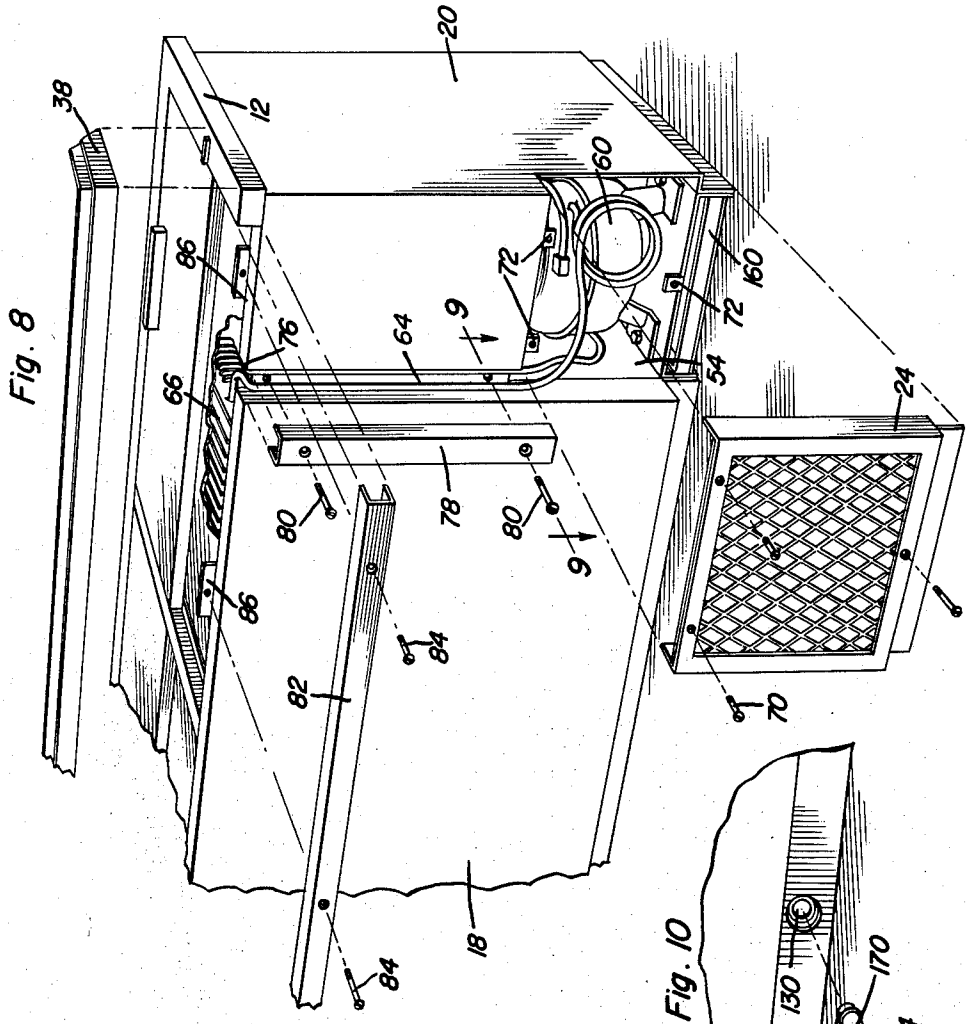


Fig. 8

Fig. 10

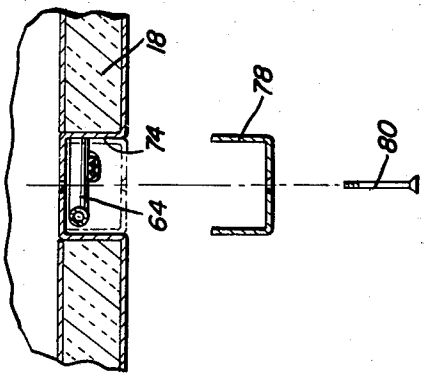


Fig. 9

Herman L. Buffington

INVENTOR.

BY Johnson & O'Brien and Harvey B. Jacobson Attorneys

United States Patent Office 3,196,632 Patented July 27, 1965

3,196,632

REFRIGERATED CABINET

Herman L. Buffington, P.O. Box 1981, Spartanburg, S.C.

Filed Dec. 30, 1963, Ser. No. 334,225
10 Claims. (Cl. 62—281)

The invention comprises a novel and useful refrigerated cabinet and more particularly pertains to a thermally insulated cabinet having a mechanical refrigerating system housed therein together with the provision of means effecting a forced circulation of cooling air throughout the cooling chamber of the cabinet.

The principal object of the invention is to provide a refrigerated cabinet having means effecting an improved and more efficient forced circulation of the cooling air within the cabinet.

A further object of the invention in accordance with the preceding object, is to provide a forced air circulating system within a refrigerated cabinet in which the cooling air is directed primarily to the last introduced and uppermost layer of bottles or other containers stored within the cabinet to thereby greatly reduce the time required to fully cool the newly introduced containers.

A further object of the invention according to the preceding objects is to provide a refrigerating system wherein the refrigerating effect thereof will be more uniformly applied throughout the volume of the cooling chamber and will be rendered more rapid in its action by effecting the heat exchange relation with the contents of the cabinet through a rapid circulation of refrigerated air throughout the cabinet.

Yet another object of the invention is to provide a cabinet in accordance with the foregoing objects which shall have a more compact and yet readily accessible refrigerating system therein.

An additional object of the invention in accordance with the immediately preceding object is to provide a refrigerating system consisting of a unitary or package installation which may be readily applied, removed or replaced as a unitary assembly by relatively unskilled labor and within a minimum of time.

Still another object of the invention is to provide a cabinet in accordance with the preceding objects which shall be provided with an improved adjustable divider assembly permitting easy re-proportioning of the volume of the interior of the cabinet into segregated chambers and yet which will not interfere with the forced circulation of cooling air throughout the entire interior of the cabinet.

An additional object of the invention is to provide a cabinet having an improved condensate and drain means for its interior.

Still another object of the invention is to provide a cabinet in accordance with the immediately preceding object which shall include means permitting an easy and efficient washing and cleansing of the cabinet interior by the introduction of a cleaning fluid such as water thereto by connecting a garden hose or other source of fluid to the drain system.

And a final important object of the invention to be specifically enumerated herein resides in the provision of a cabinet as set forth in the foregoing objects which shall include an efficient and compact water-absorbing or evaporative-type wafer to facilitate the cooling of the condenser component of the refrigerating system and which shall be connected to the cabinet drainage system.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a front perspective view of an exemplary embodiment of a referigerated cabinet in accordance with this invention, parts being broken away and parts being shown in section, the forced circulatory flow of cooling air within the cooling chamber of the cabinet being indicated by arrows;

FIGURES 2–4 are views in vertical transverse section taken upon an enlarged scale and substantially upon the planes indicated respectively by the section lines 2—2, 3—3 and 4—4 of FIGURE 1;

FIGURE 5 is a view in horizontal section, parts being broken away, taken through the top of the evaporator unit housing substantially upon the plane indicated by the section line 5—5 of FIGURE 4;

FIGURE 6 is a detail view in vertical transverse section through the bottom portion of the cabinet and showing the condensate drainage system of the cabinet;

FIGURE 7 is a detail view of an adjustable divider and its mounting, parts being broken away and being taken upon an enlarged scale and substantially upon the plane indicated by the section line 7—7 of FIGURE 1;

FIGURE 8 is a fragmentary exploded perspective view of the rear of the cabinet and showing particularly the motor-compressor compartment and the easy access channel for the ducts and wiring of the refrigerating system;

FIGURE 9 is an assembly detail view in horizontal section taken substantially upon the plane indicated by the section line 9—9 of FIGURE 8;

FIGURE 10 is an exploded perspective detail view of a hose connector adapter for the exterior fitting of the condensate drainage system for flushing or cleaning the cabinet;

FIGURE 11 is an exploded perspective detail view of the external fittings of the condensate drainage system of the cabinet;

FIGURE 12 is a perspective view of a terminal nozzle of the condensate drainage system of the cabinet; and,

FIGURE 13 is a fragmentary perspective view of the removable evaporation-type cooling wafer for the condenser component of the refrigerating system of the cabinet.

Referring first to FIGURES 1–4 it will be observed that the refrigerated cabinet indicated generally by the numeral 10 is a relatively long and relatively low rectangularly shaped housing or cabinet having a top wall 12, a bottom 14, front and back side walls 16 and 18 together with a pair of end walls each designated by the numeral 20. These walls are preferably constructed of double thickness metal sheets with a thermal insulating material disposed therebetween to thereby thermally insulate the entire cabinet interior indicated by the numeral 22 and which comprises the cooling chamber of the cabinet.

Although the back wall is preferably of one piece construction, except for a removable screened section 24 at a lower end portion as shown in FIGURES 4 and 8, the front wall 16 is preferably of a two piece construction consisting of a lower portion 26 extending across the entire length of the cabinet and an upper portion 28 which is removably seated upon the lower portion and completes the front wall. The top wall 12 has a flanged rim 30 providing a longitudinally extending channel 32 on its underside which is adapted to embrace an upstanding rim or lip portion 34 of the upper section 28 to thereby retain the latter in its assembled relation as shown in FIGURES 2–4. The top wall 12 is further provided with an access opening 36 therein which is covered by a removable thermally insulated closure 38 slidably mounted thereon and which includes a sealing member 40 to facilitate the establishing of a termally insulated seal between the closure and the top wall.

As indicated in FIGURES 2 and 3, the back wall 18, the bottom wall 14 and the lower front wall portion 26 may

be of integral construction, if desired. The interior bottom wall of the cabinet is preferably sloping as indicated at 42 towards a low point or sump 44 with which the drainage system communicates, to be later described.

Referring next to FIGURE 1, it will be observed that the interior of the cabinet is provided at one end with a horizontally extending shelf or platform 50 having a vertical side wall 52 depending therefrom which platform and side wall are joined respectively to the adjacent end wall and to the front and back walls and bottom wall as shown to enclose a separate compartment 54, see FIGURES 1, 4 and 8, which serves to house components of the mechanical refrigerating system. Thus, referring to FIGURE 4, it will be observed that an electric motor-compressor unit indicated generally by the numeral 60 together with a refrigerant condenser 62 are disposed in this compartment 54 and are connected by the appropriate ducts 64 with an evaporator unit consisting of an assembly of coils together with suitable heat-exchange fins and indicated best in FIGURE 3 by the numeral 66. Suitable support brackets 68 carried by the back wall 18 serve to removably support the evaporator unit 66.

It will be observed that the evaporator unit 66 is disposed at the uppermost portion of the interior of the cabinet and against the back wall thereof for a purpose to be subsequently set forth.

It should be here noted that the evaporator, the duct assembly 64 and the motor, compressor, condenser components are permanently secured together to form a unitary or package assembly which may be inserted into or removed from the refrigerated cabinet in a convenient and readily accessible manner as set forth hereinafter.

The screened opening 24 is removably secured as by fastening bolts or the like 70 to threaded lugs 72 provided within the compartment 54 to enable ready access to the refrigerating unit compartment when necessary. In order to facilitate removability of the refrigerating system as a unit from the cabinet, the back wall is preferably provided with a vertically extending channel or recess 74 therein, see FIGURES 8 and 9, whose lower end communicates with the upper edge of the compartment 54 and its upper end intersects with a transverse notch or slot 76 in the top edge of the back wall 18 to thereby receive the conduit or duct assembly 64 which connects the evaporator unit 66 with the motor-compressor unit 60.

A removable closure for the recess or channel 74 consists of a channel member 78 removably secured as by fastening bolts 80. A further top channel member 82 is secured as by fasteners 84 engaged in threaded lugs 86 at the top of the back wall below the top 12 thereof in a manner which is readily apparent from FIGURES 2–4 in conjunction with FIGURE 8.

A housing 90 removably encloses the evaporator unit 66. This housing has a vertical front wall 92 whose lower end has a horizontal inturned bottom wall 94 abutting against the interior of the rear wall 18 and whose upper end has an upwardly and outwardly inclined wall 96 terminating in a laterally displaced vertical wall 98. The upper edge of this wall 98 engages the underside of the top wall 12.

The vertical wall 98 is provided with a grating or screen 100 extending along its entire length. The front wall 92 is also provided with a series of longitudinally and horizontally spaced upper set of air discharge openings 102 and a corresponding lower set 104. The upper set is disposed closely adjacent the top wall at the upper portion of the cooling chamber 22, while the lower set is disposed adjacent but slightly below the vertical mid-portion of the chamber and along the length thereof.

The housing further includes vertical end walls as at 106 which at the opposite ends thereof are provided with louvered discharge openings 108 at the upper portion and with discharge openings 110 at their lower portions.

Referring next specifically to FIGURE 3, it will be observed that centrally of the vertical wall 92 of the housing 90 there is provided an opening 112 which constitutes the air inlet means for the housing. Secured to the exterior of the vertical wall 92 is a further housing or casing 114 comprising an air inlet duct having an open lower end as at 116 disposed in the lower portion of the cooling chamber 22. A plurality of inlet openings 118 are also formed in the side walls of the lower portion of the duct for the intake of air thereinto from all portions of the interior of the cabinet.

Mounted within the duct 114 in any suitable manner is an electric motor 120 to which is connected an impeller fan 122 which is disposed in the opening 112 and in the interior of the housing 90. The arrangement is such that upon operation of the fan air will be drawn from all directions from the interior of the chamber 22, will pass up through the intake duct 114 and be discharged through the opening 112 into the housing 90 from whence it will pass across the cooling coils of the evaporator unit 66 and be discharged therefrom in various directions as indicated by the arrows in FIGURES 1 and 2.

In this forced air circulation within the cabinet chamber, it will be observed that air is discharged horizontally from the housing at the uppermost portion of the chamber through the screen 100 directly across the housing towards the front wall thereof, and is also discharged from the housing end walls 106 through the louvers 108 at the upper ends thereof in a direction both transversely outwardly and transversely and downwardly of the chamber 22 at the opposite ends thereof. Air is further discharged from the upper and lower sets of openings 102 and 104 horizontally outwardly of the housing and transversely thereacross, while additional air is discharged longitudinally of the housing from the openings 110 at the opposite ends of the housing towards the adjacent end walls of the cabinet. Thus, the refrigerated or chilled air is propelled by the fan outwardly of the housing to all portions of the chamber to thus ensure a uniform distribution of the chilling air throughout the volume of the chamber.

As a result of this arrangement, when the bottles and containers to be refrigerated have their upper surface below the lowermost outlet openings 104 and 110, they will be subjected to all of the cooling air discharged by the housing. However, when the stored bottles and containers have their upper surfaces above the openings 110 and 104, the discharge of chilled air will be primarily from the upper series of openings 108, 102 and 100. Thus, when the supply of containers within the cabinet is replenished, the replenished supply will receive the full benefit and chilling effect of the circulating refrigerated air thereby greatly increasing the rapidity with which the bottles are cooled to the desired temperature. Thus, the circulating air system is selectively and automatically operable to more rapidly chill newly added bottles than if all of the air supply were delivered with equal force to the already chilled bottles at the bottom of the cabinet.

As previously mentioned, there is provided a condensate drain means for removing any drippings or liquid spilled in the interior of the cabient or any condensate dripping from the evaporator unit. For this purpose there is provided, referring especially to FIGURE 6 a transversely extending drain conduit assembly. This includes a pair of aligned conduits 130 and 132 which are embedded in the bottom wall 14 and have their adjacent extremities connected to a T-fitting 134 whose upper end terminates in an orifice or drain opening 136 opening into the sump portion 44 of the sloping bottom wall 42 of the cabinet interior. An elbow fitting 138 is connected at the end of the conduit 132 and has a bushing 140 in its open upper end in the floor of the cabinet for the detachable reception of a conduit or hose 142 which is removably seated therein and whose upper end, as shown in FIGURE 3, enters the bottom wall 94 of the housing 92 for removing condensate collecting thereon. The outer end

of the conduit section 130, see FIGURES 1, 6 and 11 receives a fitting in the form of a sleeve 144 extending through the side of the bottom wall 14 and which sleeve is provided with a packing ring 146 or the like to establish a fluid-tight engagement in the conduit 130. The sleeve has a box-like housing 148 on its exterior and upon the exterior of the cabinet provided with an opening 150 in which is received one extremity of a drain conduit 152, the latter being provided with a port 154 registering with the interior of the sleeve 144. A setscrew as at 156 serves to releasably secure the conduit 152 into the fitting 148 and enables the drain to be unstopped by inserting a wire or small brush through the screw hole to drain openings 136 and 140.

At its other end, the conduit 152 receives a terminal discharge nozzle 158, see FIGURES 1, 4, 12 and 13, which discharges into a condensate tray 160. The latter is suitably supported upon guide rails, not shown, in the base of the cabinet and is positioned below the condenser element 62 of the compartment 54. As shown in FIGURE 13, this tray may be slid outwardly from the cabinet to obtain access thereto as for discharging the accumulation of condensate therein.

The tray itself has mounted thereon a horizontally spaced plate-like body 162 of a glass fiber composition which is highly liquid-absorbent. This composition block is supported above the base of the tray upon supporting members 164 so that there is an air space both above and below this block. The block serves to absorb condensate discharged into the tray by the nozzle 158 thereby preventing the accumulation of obnoxious odors and the like which would contaminate the interior of the cabinet.

FIGURE 10 designates an arrangement which greatly facilitates the cleansing of the cabinet. For this purpose there is provided an adapter nipple 170 which is provided with a sealing ring in the form of an O-ring 172 to engage in the drain conduit 130 previously mentioned and which has an internally threaded end portion 174 upon the exterior of the cabinet adapted to receive a conventional garden hose or other conduit 176 by which a source of cleaning fluid such as water may be supplied under pressure to the drain conduits and thus flush out the interior of the cabinet. In order to use this cleansing means, it is merely necessary to disengage the setscrew 156, then remove the sleeve 144 from its seat in the conduit 130 and from its engagement with the conduit 152 and replace this fitting with the adapter nipple 170 as previously mentioned.

Referring next to FIGURES 1, 2 and 7 it will be observed that adjustable transversely extending dividers in the form of gratings 180 are utilized. The gratings include vertical members 182 fixedly secured to transversely extending horizontal but vertically spaced cross members 184. The ends of the latter are detachably engaged in a series of appropriately spaced seats or sockets 186 formed in the front wall 16 and in some of the openings 104 or 102 aligned therewith in the housing front wall 92. Springs as at 188 encircle one end of the members 184 and abut against the housing wall 92 to yieldingly retain the separators in their mounted positions. Thus, the interior of the cabinet can be divided by the separators into compartments of various volumes as may be desired and this without interfering with the forced air circulation within the cabinet.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A refrigerator comprising a cabinet including top, bottom, side and end walls defining a cooling chamber therein together with a refrigeration machinery compartment separated from said cooling chamber, a mechanical refrigerating system housed within said cabinet, said refrigerating system including an evaporator unit mounted within the top portion of said cooling chamber and refrigeration machinery enclosed in said compartment in the lower portion of said cabinet, air circulating means in said cabinet comprising a housing mounted in the upper portion of said cooling chamber, said housing enclosing said evaporator unit and extending along one of said side walls, and having an air inlet opening, an air inlet duct establishing communication from said cooling chamber into said housing through said air inlet opening for effecting chilling of air by said evaporator unit, an impeller mounted in said air inlet duct, said housing having vertically and longitudinally spaced air outlet ports discharging air horizontally from said housing both longitudinally and transversely of said cooling chamber, an air inlet duct mounted on said housing and surrounding said inlet opening, said duct having a downwardly opening inlet end extending centrally of said cooling chamber and below the mid-portion thereof together with inlet ports in said duct at said inlet end opening horizontally through the sides of said duct both longitudinally and transversely of said cooling chamber and substantially midway of the vertical height of the latter.

2. A refrigerator comprising a cabinet including top, bottom, side and end walls defining a cooling chamber therein together with a refrigeration machinery compartment separated from said cooling chamber, a mechanical refrigerating system housed within said cabinet, said refrigerating system including an evaporator unit mounted within the top portion of said cooling chamber and refrigeration machinery enclosed in said compartment in the lower portion of said cabinet, air circulating means in said cabinet comprising a housing mounted in the upper portion of said cooling chamber, said housing enclosing said evaporator unit and extending along one of said side walls and having an air inlet opening, an air inlet duct establishing communication from said cooling chamber into said housing through said air inlet opening for effecting chilling of air by said evaporator unit, an impeller mounted in said air inlet duct, said housing having vertically and longitudinally spaced air outlet ports discharging air horizontally from said housing both longitudinally and transversely of said cooling chamber, means draining condensate and liquid from the interior to the exterior of said cabinet and including a conduit having an inlet communicating with the interior of said cooling chamber through said bottom wall and also communicating with said housing through the bottom of said housing.

3. The combination of claim 2 including a condensate collection tray mounted upon the exterior of said cabinet and into which said draining means discharges, said draining means conduit including a removable fitting disposed accessibly exteriorly of said cabinet and which is replaceable by a cleaning source adapter.

4. A refrigerator comprising a cabinet including top, bottom, side and end walls defining a cooling chamber therein together with a refrigeration machinery compartment separated from said cooling chamber, a mechanical refrigerating system housed within said cabinet, said refrigerating system including an evaporator unit mounted within the top portion of said cooling chamber and refrigeration machinery enclosed in said compartment in the lower portion of said cabinet, air circulating means in said cabinet comprising a housing mounted in the upper portion of said cooling chamber, said housing enclosing said evaporator unit and extending along one of said side walls, and having an air inlet opening, an air inlet duct establishing communication from said cooling chamber into said housing through said air inlet opening for effecting chilling of air by said evaporator unit, an impeller mounted in said air inlet duct, said

housing having vertically and longitudinally spaced air other ends of said dividers being detachably engaged ing both longitudinally and transversely of said cooling chamber, adjustable dividers comprising gratings disposed in said cooling chamber and extending transversely thereacross, seats for one end of said dividers in the side wall of said cabinet which is opposite to said housing, the other ends of said dividers being detachably engaged in and supported by said housing outlet ports.

5. The combination of claim 4 wherein said gratings have transverse members slidably received in selected seats and outlet ports resilient means engaging said gratings and urging said grating toward said seats.

6. A refrigerator comprising a cabinet including top, bottom, side and end walls defining a cooling chamber therein together with a refrigeration machinery compartment separated from said cooling chamber, a mechanical refrigerating system housed within said cabinet, said refrigerating system including an evaporator unit mounted within the top portion of said cooling chamber and refrigeration machinery enclosed in said compartment in the lower portion of said cabinet, air circulating means in said cabinet comprising a housing mounted in the upper portion of said cooling chamber, said housing enclosing said evaporater unit and extending along one of said side walls and having an air inlet opening, an air inlet duct establishing communication from said cooling chamber into said housing through said air inlet opening for effecting chilling of air by said evaporator unit, an impeller mounted in said air inlet duct, said housing having vertically and longitudinally spaced air outlet ports discharging air horizontally from said housing both longitudinally and transversely of said cooling chamber, means draining condensate and liquid from the interior of said cooling chamber to the exterior of said cabinet, said draining means comprising a drain conduit embedded in the floor of said cabinet and having an inlet opening through the floor of said cooling chamber, a removable condensate tray, disposed in said cabinet below said floor, a connecting means delivering condensate from said drain conduit to said tray.

7. The combination of claim 6 wherein said tray includes an absorbent plate-like body supported therein in spaced relation to its bottom wall.

8. A refrigerator comprising a cabinet including top, bottom, side and end walls enclosing a cooling chamber and with at least one of said side and end walls being fixed and stationary, said cabinet having a refrigeration machinery compartment separated from said cooling chamber, a mechanical refrigerating system removable from and insertable into said cabinet as a unitary assembly, said refrigerating system including an evaporator unit mounted within the top portion of said cooling chamber and refrigeration machinery enclosed in said compartment, a housing enclosing said evaporator unit and having an air inlet means opening into the lower portion of said cooling chamber with air outlet means opening into and discharging air horizontally into said cooling chamber, means causing flow of air into said inlet means and outwardly from said outlet means, conduit means connecting said evaporator unit and said refrigeration machinery into a sealed refrigerating system, said fixed and stationary wall having recessed into its exterior surface an open channel with a removable closure therefor and removably receiving said conduit means, said channel having longitudinally spaced portions continuously communicating with said cooling chamber adjacent said housing and with said compartment, access openings together with covers therefor for said cooling chamber and compartment and respectively adjacent said channel portions whereby when said covers are removed said evaporator unit and refrigeration machinery with said conduit means still connected may be installed in or removed as a unitary assembly from said cabinet.

9. The combination of claim 8 wherein said cabinet top wall includes said cooling chamber access opening, said fixed and stationary wall constituting a vertical wall, said evaporating unit being disposed at the upper end of said vertical wall, one of said channel portions consisting of a notch in the upper edge of said vertical wall, the other of said channel portions and said compartment cover being disposed upon the lower portion of said vertical wall.

10. The combination of claim 9 wherein said channel closure comprises a member which is U-shaped in cross-section with an elongated web having marginal flanges disposed in side by side relation and embracing said conduit means therebetween while being removably recessed into said channel.

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WILLIAM J. WYE, *Primary Examiner.*

ROBERT A. O'LEARY, *Examiner.*