

Jan. 23, 1968

D. COHEN ET AL
REFRIGERATOR APPARATUS

3,364,694

Filed Dec. 2, 1966

3 Sheets-Sheet 1

FIG. 1

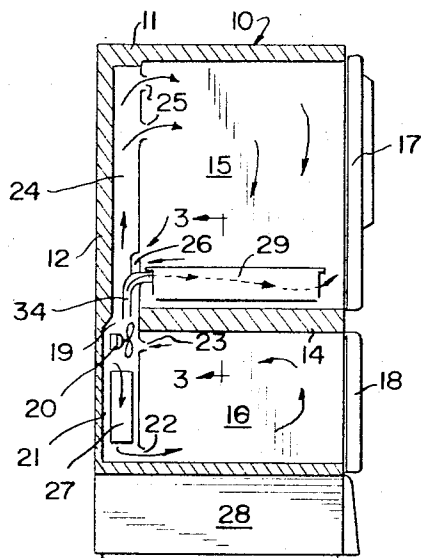


FIG. 2

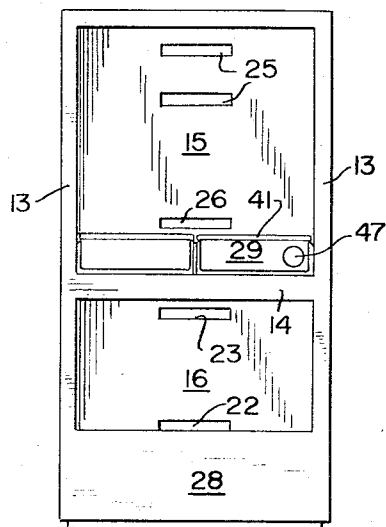


FIG. 3

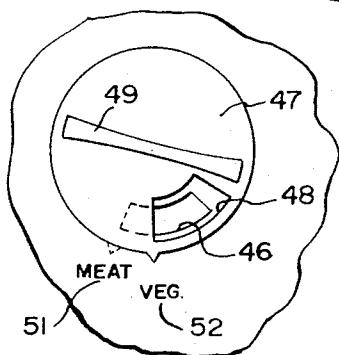
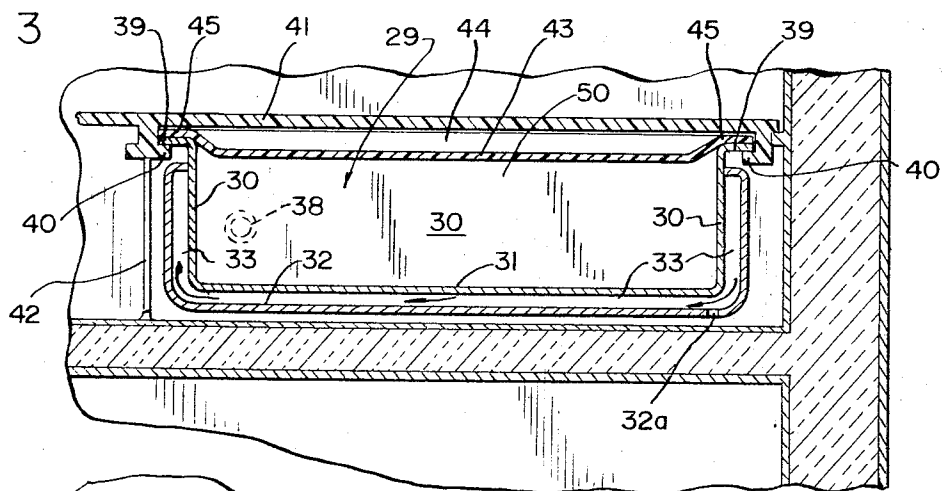


FIG. 6

INVENTORS
DAVID COHEN
JOHN N. MCGILL
Hoffgren, Wiegman, Allen,
BY Stillman & McConel.
ATTORNEYS

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FIG. 4

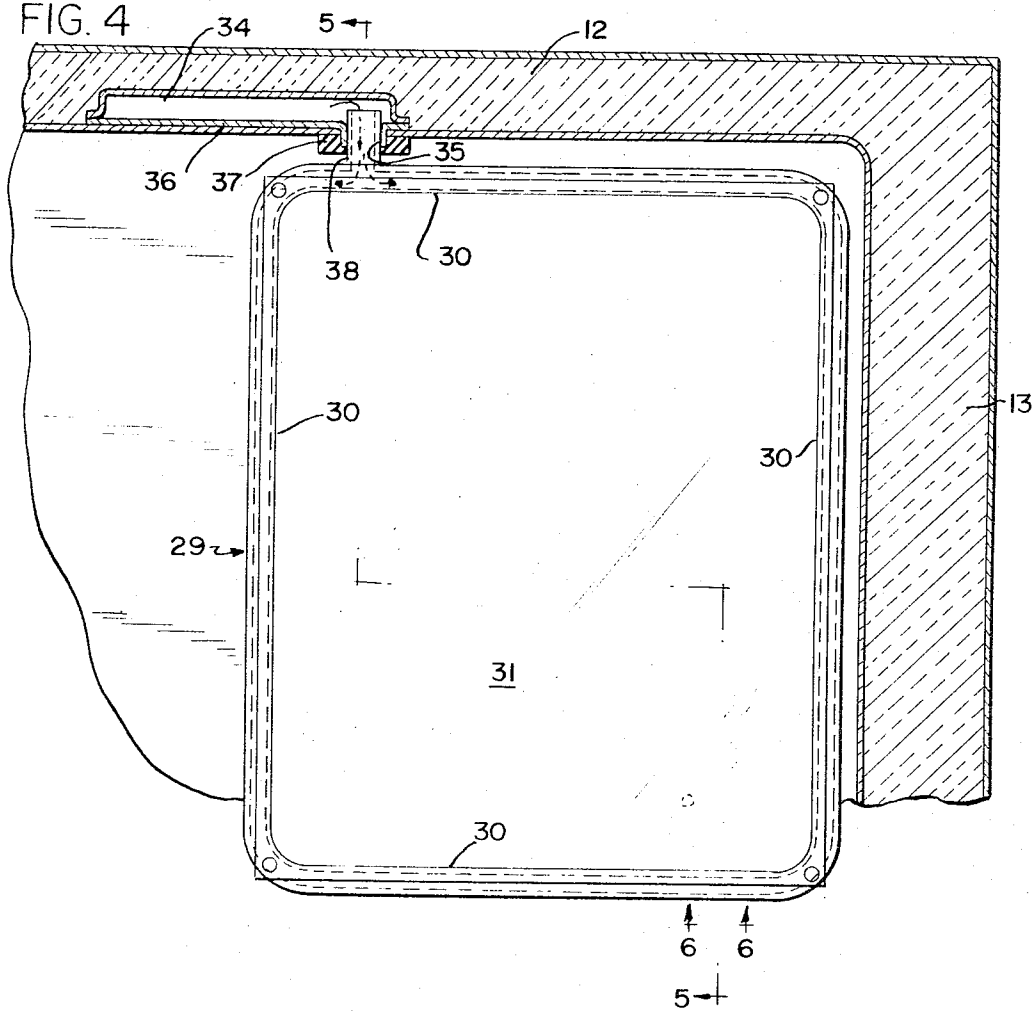
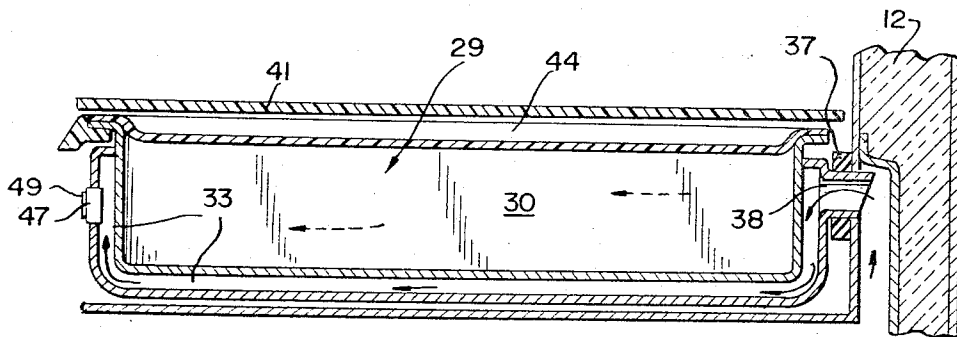


FIG. 5



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FIG. 7

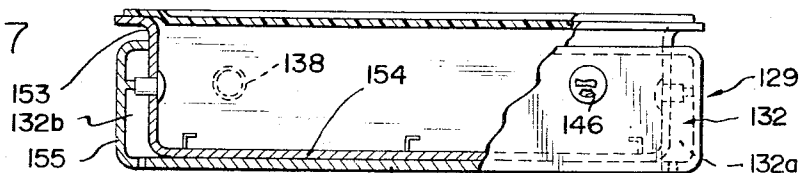


FIG. 8

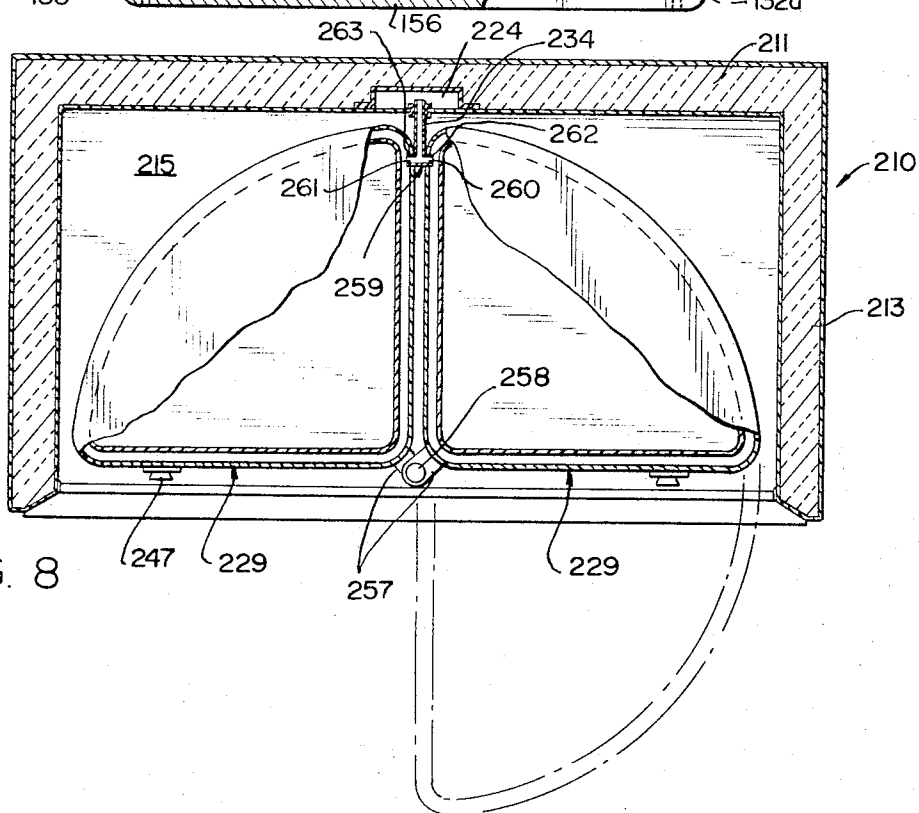
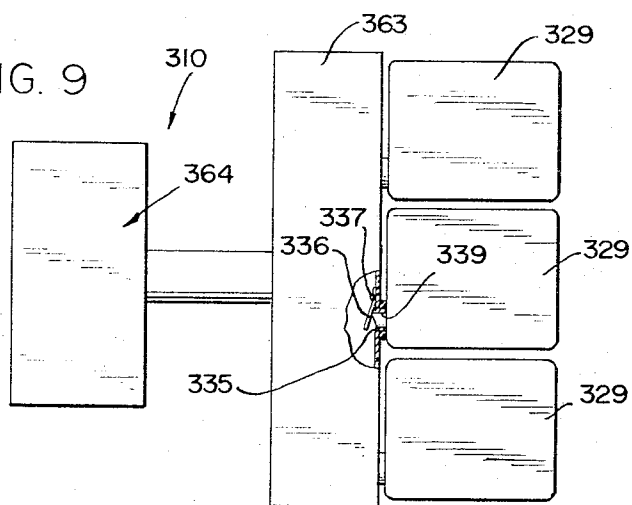


FIG. 9



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REFRIGERATOR APPARATUS

David Cohen and John N. McGill, St. Joseph, Mich., assignors to Whirlpool Corporation, a corporation of Delaware

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20 Claims. (Cl. 62—265)

This invention relates to a refrigerator apparatus such as is used for the storage of food.

It is customary in refrigerators particularly of the household type to have a refrigerated area or space adapted to be maintained at above freezing temperatures for the temporary storage of food materials and a freezer space maintained at a sub-freezing temperature for storing frozen food materials usually for longer periods of time.

One of the features of this invention is to provide a refrigerator apparatus including a storage compartment having side and bottom walls in the form of an enclosing hollow jacket together with conduit means for directing chilled air from an outlet thereof to the hollow interior of the jacket for flow of chilled air into the jacket so that material stored in this compartment will be maintained in chilled condition by the heat conducting walls of the jacket without direct contact of the chilled air with the material.

Another feature of the invention is the provision of such a refrigerator apparatus having a new and improved hollow jacket construction.

A further feature of the invention is the provision of such a refrigerator apparatus having new and improved means for supporting the storage compartment for selective connection to and disconnection from the chilled air supply.

Another feature of the invention is the provision of such a refrigerator apparatus having means for closing the outlet from the chilled air supply upon disconnection of the storage compartment therefrom.

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIGURE 1 is a vertical sectional view showing semi-diagrammatically a refrigerator apparatus embodying the invention.

FIGURE 2 is a front elevational view of the refrigerator apparatus of FIGURE 1 but with the doors removed.

FIGURE 3 is an enlarged fragmentary vertical sectional view taken substantially along line 3—3 of FIGURE 1.

FIGURE 4 is an enlarged plan view of a storage compartment embodying the invention and adjacent parts of the refrigerator.

FIGURE 5 is a vertical sectional view taken substantially along line 5—5 of FIGURE 4.

FIGURE 6 is a fragmentary front elevational view enlarged and looking substantially from the line 6—6 of FIGURE 4.

FIGURE 7 is a fragmentary vertical sectional view of a modified form of storage compartment embodying the invention.

FIGURE 8 is a horizontal sectional view of a modified refrigerator apparatus embodying the invention having means for pivotally supporting a pair of storage compartments for selective connection and disconnection to the chilled air supply.

FIGURE 9 is a plan view showing semi-diagrammatically a modified form of refrigerator apparatus embodying the invention and including means for closing the outlet upon disconnection of a storage compartment from the chilled air supply.

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In the embodiment of the invention shown in FIGURES 1 through 6 of the drawings, the refrigerator apparatus 10 includes a cabinet having insulated walls 11, 12 and 13 and an interior horizontal wall or mullion 14 dividing the interior into an above freezing refrigerator space 15 and a below freezing freezer space 16. Each of these spaces is normally closed by a door 17 and 18, respectively.

Adjacent the rear wall 12 there is provided a chamber 19 in which is located a motor driven blower or fan 20. The front or right-hand side of the fan as viewed in FIGURE 1 is the blower inlet while the rear or left-hand side is the blower outlet.

Leading from the blower outlet side is a first duct means 21 having an exit 22 emptying into the bottom of the freezer space 16. At the top of the freezer space, there is provided an access means 23 in the form of an elongated horizontal opening as shown in FIGURE 2 leading from the freezer space 16 to the inlet side of the blower 20.

Also leading from the outlet side of the blower 20 is a second duct means 24 extending upwardly along the rear wall 12 and having vertically spaced horizontal exit openings 25 emptying into the top of the refrigerator space 15. In order to return air from the refrigerator space 15 to the inlet side of the blower, there is provided a second access means 26 in the form of a short duct leading from adjacent the bottom of the refrigerator space 15 to the inlet or front side of the blower 20.

In order to chill the air, there is provided sub-freezing refrigerating means which may be a refrigerant evaporator 27 in the first duct means 21. This evaporator 27, as illustrated, is a part of a conventional compressor-condenser-evaporator type of refrigeration system, certain of whose components are concealed in the bottom machine compartment 28.

Positioned in the refrigerator space 15 adjacent the bottom thereof is a storage compartment 29 which is shown in detail in FIGURES 3 through 6 inclusive. One or more compartments 29 could be used in the refrigerated space 15 for storing either meat or vegetables. As is shown here, this compartment which is located within the cabinet 10 is provided with side walls 30 and a bottom wall 31 and an enclosing jacket 32. As is shown in FIGURES 3 and 5, this jacket defines a hollow interior 33 substantially coinciding with the side and bottom walls 30 and 31 of the compartment 29. Weep hole 32a may be provided in the bottom of the jacket 32 for eliminating condensation which may form within the hollow space 33.

In order to supply chilled air to this hollow interior 33, there is provided on the outlet or rear side of the blower 20 an upwardly extending chilled air outlet 34. This outlet 34 is provided with conduit means releasably joining the outlet 34 to the hollow interior 33 of the jacket 32 for flow of the chilled air into and through the jacket. In the illustrated embodiment, this releasable conduit means comprises a flanged opening 35 in the front wall 36 of the chilled air outlet 34 surrounded by a resilient gasket such as rubber sealing gasket 37. The flanged opening comprises one cooperating section on the conduit means while another cooperating section is a rearwardly extending nozzle 38 on the rear wall of the jacket 32 of compartment 29. When the compartment is in normally operating position within the cabinet, the nozzle 38 extends into the flanged opening 35 and is sealed thereto by the gasket, all as shown in FIGURE 4. It is, of course, obvious that the nozzle 38 instead of being on the compartment could be an extension of the chilled air outlet 34 if desired, and in that situation, the sealed opening 35 would then be on the compartment 29.

In order to support the compartment 29 in operating

position within the refrigerator cabinet 10 and to permit its withdrawal for loading, unloading and cleaning and reinsertion, the top of the compartment 29 is provided with an outwardly extending flange 39 at the side thereof which is slidably supported on downwardly extending parallel side brackets 40 which are preferably made of a plastic material and integral with an overlying shelf 41 also of plastic material. The center of the shelf 41 is supported in the customary way by vertical metal posts 42.

Overlying the interior of the compartment 29 is a removable low heat conductive or insulated cover 43. In the illustrated embodiment, this cover 43 is recessed (FIGURE 3) or hollow so as to provide a dead air space 44 and has side flanges 45 overlying and supported by the flanges 39 of the compartment 29. With this arrangement both the compartment and cover are movable on the parallel side supporting brackets 40 and once the compartment has been withdrawn forwardly, or to the right as shown in FIGURE 1, the cover may then be removed to provide access to the interior of the compartment.

As is shown in FIGURE 4, the chilled air from the outlet 34 in the insulated rear wall 12 of the refrigerator cabinet enters adjacent one corner of the generally rectangular illustrated compartment 29. Symmetrically arranged therewith and opposite this chilled air inlet is a chilled air outlet shown most clearly in FIGURE 6. This outlet is in the form of an opening 46 that may be uncovered to any degree desired as by means of a rotatable valve or shutter 47 which is itself provided with an opening 48 and a handle 49 for rotating the valve.

When the valve 47 is rotated until the entire exit opening 46 is exposed, flow through the hollow interior 33 of the compartment jacket is at a maximum so that the lowest possible temperature will be maintained in the interior 50 of the compartment. Then, as the valve 47 is rotated to close off greater and greater portions of the exit opening 46, the rate of flow falls and the temperature on the interior 50 is thereby raised. Thus, the compartment 29 may be used for storing many different types of materials at temperatures that are most ideal for the materials. In the illustrated embodiment, as shown in FIGURE 6, there are two settings provided with one, 51, being for meat storage when the exit opening 46 is at its widest and, therefore, the temperature the lowest, and the other, 52, being for vegetables when the opening 46 is partially closed so that a higher temperature is maintained in the compartment interior.

The refrigerator apparatus of this invention has a number of very important advantages. Thus, food material stored in the interior of the storage compartment is kept quite cold because the walls 30 and 31 are constructed of a heat conducting material so that the chilled air in the hollow spaces 33 chills the food material without coming in contact with it. This materially reduces moisture loss of the material and, further, any moisture that does evaporate from the material tends to recondense on the inner surfaces of the walls 30 and 31 so as to be available for rehumidification of the stored material. The temperature within the compartment 29 has a high degree of uniformity because the side walls 30 and bottom wall 31 tend to be chilled to substantially the same temperature. The preferred structure wherein the inlet to the chilled air space 33 and the outlet therefrom are arranged substantially symmetrically opposite each other enhances this uniformity.

Because the chilled air into the spaces 33 surrounding the storage interior of the compartment 29 is taken substantially directly from the freezer space 16, the efficiency of chilling is quite high. As is shown in FIGURE 1, this chilled air is drawn immediately into the blower 20 and is then projected immediately into the air flow spaces 33 around the compartment because of the short and direct chilled air outlet conduit 34.

The insulated cover 43 across the top of the compartment performs primarily two very important functions. It

retards the escape of moisture from the compartment during the storage period and also insulated against substantial heat losses through the top of the compartment.

The temperature regulating feature of the valve 47 is of very great importance as it permits regulating the temperature of the storage compartment 29 depending upon the demands of the food material being stored. Thus, in one embodiment of the invention, by merely rotating the shutter of the valve 47 a storage temperature of 28-31° F. in the compartment 29 was obtained which is very useful for the storage of meat. Then, by turning the shutter of the valve to the position shown in FIGURE 6 to throttle the chilled air flow through the air spaces 33, the temperature of storage was raised to the ideal vegetable storing temperature of 32-34° F. In both instances, the relative humidity on the interior of the storage compartment 29 was about 90% which of course is very efficient in retarding moisture loss from the material being stored.

Turning now to FIGURE 7 of the drawing, a modified form of storage compartment generally designated 129 is shown to comprise a storage compartment generally similar to storage compartment 29, but including an inner receptacle portion 153 having a horizontal bottom wall 154, and an outer enclosure portion 155 having a bottom wall 156 underlying bottom wall 154 and in facial engagement therewith. Thus, storage compartment 129 provides a hollow jacket 132 defining a pair of air flow paths 132a and 132b which diverge from the inlet nozzle 138 at the rear thereof to extend around the receptacle 153 to rejoin at the front opening 146.

Turning now to FIGURE 8, a further modified form of refrigerator apparatus generally designated 210 is shown to comprise a pair of storage compartments 229 generally similar to storage compartment 29, but having a generally pie-wedge shape in plan view. Each of the storage compartments is provided with a bracket 257 for pivotally mounting the storage compartment on an upright post 258 within the refrigerator space 215. A chilled air outlet 234 is provided with a T-shaped end portion 259 defining a pair of oppositely opening tubular connectors 260 and 261. In the retracted position of the storage compartments 229 as shown in FIGURE 8, the projecting connectors 260 and 261 extend sealingly into corresponding openings 262 and 263 of the respective storage compartments.

Thus, when it is desired to have access to either of the storage compartments 229, the user merely need swing the selected compartment outwardly of the pivot post 258 such as to the dotted line position of the right-hand storage compartment, as shown in FIGURE 8. The brackets 257 and pivot post 258 cooperatively define means for guiding the respective storage compartments back into the retracted position wherein the respective storage compartments are in joined connection association with the outlet 234.

Turning now to FIGURE 9, a further modified form of refrigerating apparatus generally designated 310 is shown to include a plurality of storage compartments 329. The connection flange 339 of each of the storage compartments is arranged to be selectively connected to a manifold 363 arranged to receive the chilled air from a suitable forced air supply generally designated 364. Each of the outlet openings 335 of the manifold 363 is provided with a suitable check valve such as flap valve 336 provided with suitable biasing means 337 for biasing the valve to the closed position when the storage compartment 329 is disconnected from the outlet opening 335. Thus, where the storage compartments 329 are disposed in a nonrefrigerated space, the chilled air is effectively prevented from being spilled into the ambient atmosphere when the storage compartments are disconnected from the manifold 363.

The structures of the modified embodiment of the invention disclosed in FIGURES 7 through 9 are similar to the structure of the form shown in FIGURES 1 through 6, except where otherwise noted. Elements of the em-

embodiment of FIGURE 7 similar to those of FIGURES 1 through 6 are identified by similar reference numerals but one hundred higher; elements of the embodiment of FIGURE 8 are identified by reference numerals two hundred higher; and elements of the embodiment of FIGURE 9 are identified by reference numerals three hundred higher.

Having described our invention as related to the embodiments shown in the accompanying drawings, it is our intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Refrigerating apparatus, comprising:
means defining a source of chilled air having an outlet;
means defining a storage compartment having boundary walls in the form of a hollow jacket; and
connection means releasably joining said outlet to said hollow jacket for flow of said chilled air from said source into said jacket.
2. The apparatus of claim 1 wherein said storage compartment is provided with supporting means permitting ready removal of the compartment from said apparatus and an insulated releasable cover removable with the compartment.
3. The apparatus of claim 2 wherein said connection means comprises cooperating sections at said outlet and on said jacket releasable on said removing of said compartment and means for rejoining said sections on return of said compartment to its operating position.
4. The apparatus of claim 1 wherein outlet means are provided from said jacket spaced from said connection means for flow of air from said jacket.
5. The apparatus of claim 4 wherein said jacketed boundary walls include side and bottom walls, and said connection means and said outlet means are located on opposite sides of said jacket so that the chilled air flows around said side and bottom walls prior to exit through said outlet means.
6. The apparatus of claim 1 wherein outlet means are provided from said jacket spaced from said connection means for flow of air from said jacket, said outlet means having valve means for regulating volume flow of air through said outlet means and thus through said jacket.
7. The apparatus of claim 1 wherein said boundary walls comprise a pair of walls having confronting portions in facial engagement.
8. The apparatus of claim 1 wherein said hollow jacket defines a plurality of separate flow paths diverging from said connection means.
9. The apparatus of claim 1 wherein outlet means are provided from said hollow jacket spaced from said connection means for flow of air from said hollow jacket, said hollow jacket defining a plurality of separate flow paths diverging from said connection means to said outlet means.
10. The apparatus of claim 1 including means for pivotally supporting said storage compartment means.
11. The apparatus of claim 1 wherein means are provided for movably supporting said storage compartment means and including means for guiding said storage compartment means into joined connection association with said outlet in one position of support.
12. The apparatus of claim 1 including means for selectively closing said outlet.
13. The apparatus of claim 1 including valve means closing said outlet when said hollow jacket is disjoined from said outlet.
14. The apparatus of claim 1 further including a valve member for closing said outlet, means for biasing said valve member to said outlet.
15. Refrigerator apparatus, comprising:

a cabinet having means defining a storage space;
wall means defining a source of chilled air having an outlet at one side of said storage space;
means defining a storage compartment having side and bottom walls in the form of an enclosing hollow jacket and positioned in said storage space;
conduit means releasably joining said outlet to said hollow jacket for flow of said chilled air from said space into said jacket; and
outlet means from said jacket spaced from said conduit means for flow of air from said jacket into said storage space.

16. The apparatus of claim 15 wherein said storage compartment is provided with supporting means permitting ready removal of the compartment from said apparatus and an insulated releasable cover removable with the compartment, said conduit means comprises cooperating sections at said outlet and on said jacket releasable on said removing of said compartment and means for rejoining said sections on return of said compartment to its operating position, and said outlet means having valve means for regulating volume flow of air through said outlet means and thus through said jacket.

17. The apparatus of claim 16 wherein said conduit means and outlet means are substantially symmetrically arranged on opposite sides of said compartment.

18. Refrigerator apparatus, comprising:

a cabinet having wall means defining an above freezing refrigerator space and a below freezing freezer space;
a storage compartment in said cabinet adjacent said refrigerator space having side and bottom walls in the form of an enclosing hollow jacket;
an air circulating blower chamber means adjacent said wall means;
an air circulating blower in said chamber means having an inlet and an outlet;
first duct means from said blower outlet to said freezer space;
subfreezing refrigerating means in heat exchange relationship with said first duct means for chilling the air flowing therein to subfreezing temperatures;
access means from said freezer space to said blower inlet;
second duct means from said blower outlet to said refrigerator space;
second access means from said refrigerator space to said blower inlet;
means forming a chilled air outlet from said blower;
conduit means releasably joining said chilled air outlet to said hollow jacket for flow of said chilled air from said source into said jacket; and
jacket outlet means spaced from said conduit means for flow of air from said jacket into said refrigerator space.

19. The apparatus of claim 18 wherein said storage compartment is provided with supporting means permitting ready removal of the compartment from said apparatus and an insulated releasable cover removable with the compartment, said conduit means comprises cooperating sections at said outlet and on said jacket releasable on said removing of said compartment and means for rejoining said sections on return of said compartment to its operating position, said outlet means having valve means for regulating volume flow of air through said outlet means and thus through said jacket, and said conduit means and outlet means are substantially symmetrically arranged on opposite sides of said compartment.

20. The apparatus of claim 18 wherein said blower is located adjacent said freezer space to receive chilled air substantially directly therefrom, and said compartment jacket is adjacent said blower to receive chilled air substantially directly therefrom.

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WILLIAM J. WYE, *Primary Examiner.*