April 17, 1934. J. W. HILL 1,955,186

REFRIGERATION APPARATUS

Filed Aug. 2, 1929

FIG. 1.

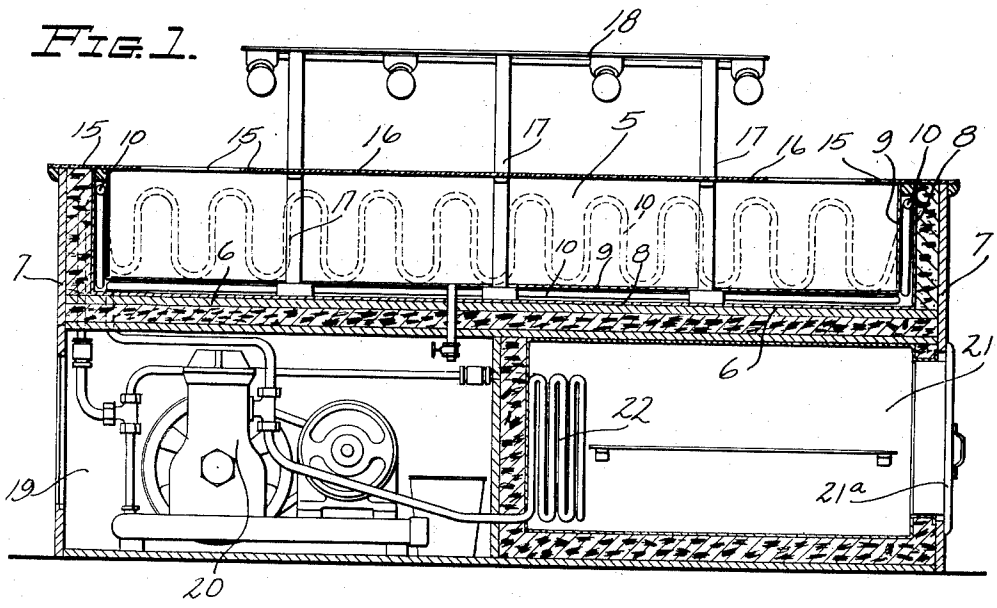
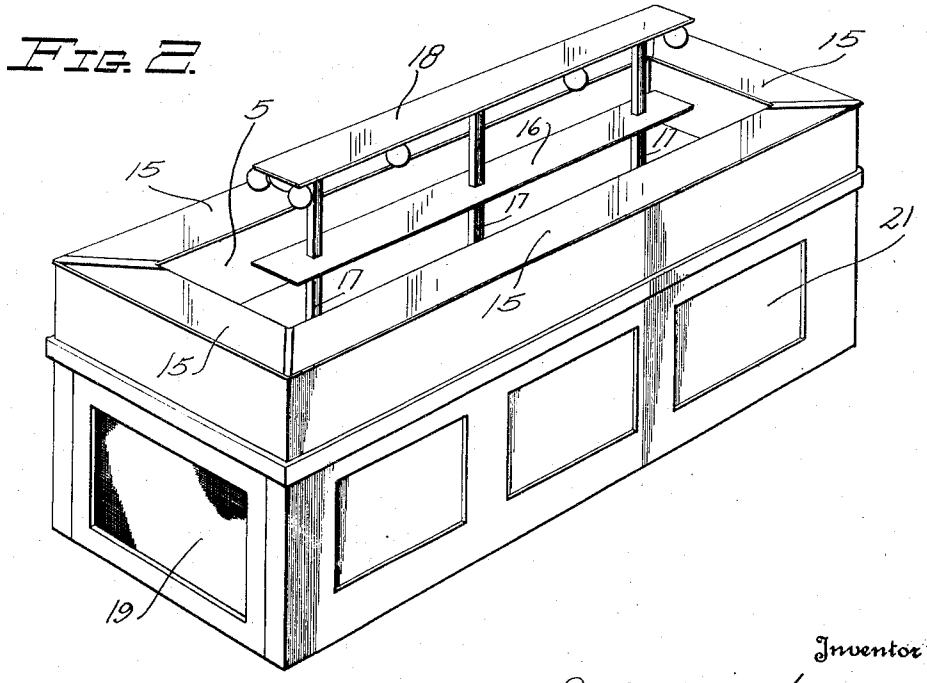


FIG. 2.



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REFRIGERATION APPARATUS

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7 Claims. (Cl. 62—89.5)

This invention relates to improvements in the art of refrigeration.

It is an object of the invention to provide a refrigerated table on which foods requiring refrigeration can be displayed in the open where they will be directly accessible without requiring the opening of doors.

In making retail sales of food products and particularly in making such sales in self-service stores considerable difficulty has heretofore been experienced in connection with products requiring refrigeration. The repeated opening of the door in a refrigerator involves extensive introduction of heat into the refrigerator due to air currents set up by the movement of the door itself. When the door is opened a large body of air is drawn by the door out of the refrigerator and this body of air is replaced by warm air entering the refrigerator. This constant exchange of air created by movements of the door makes refrigeration very uncertain and expensive under all circumstances where access must often be had to refrigerated articles enclosed by a door.

The success of the self-service store is founded upon easy access to the goods exposed for sale. It is well known by those conducting such stores that there is a relatively very high sales resistance in connection with goods shut up in the ordinary refrigerator. Customers are reluctant to open the door of the refrigerator themselves and usually ask the help of the attendant when refrigerated articles are desired.

It is a purpose of the present invention to provide refrigeration or a refrigerator in a form to substantially remove both of the difficulties above described.

It is also my object to accomplish the feature of direct accessibility of the refrigerator contents with less ingress of heat than would be achieved under like conditions of extensive use by the ordinary door-equipped refrigerator.

But where the contents of a refrigerator may remain undisturbed for considerable intervals as for instance in the storage of a stock of materials to be drawn upon for display and sale in the refrigerator mentioned above, it is probably more economical to refrigerate such stock in the usual types of refrigerators with well insulated doors. At least it is more economical in the matter of original cost and floor space.

Another object is, therefore, to combine a refrigerator or unit such as previously described with another refrigerator or unit having doors, whereby such other unit may be housed or positioned in space otherwise wasted, and preferably underneath the refrigerator or unit previously described.

Another object is generally to simplify and improve the construction and operation of refrigerators, particularly refrigerators for easy accessibility of contents, and still other objects will be apparent from the specification.

The invention consists in the construction and combination of elements herein illustrated, described and claimed, and in such modifications thereof as may be equivalent to the claims.

In the drawing:

Figure 1 is a longitudinal vertical section through a refrigerated table made in accordance with this invention.

Figure 2 is a perspective view of the table on a slightly reduced scale.

Like parts are identified by the same reference characters throughout the several views.

An upper compartment 5 comprises a shallow box supported at a suitable level about the floor and provided across its bottom 6 and its sides 7 with suitable insulation. The sides are of uniform height to provide a substantially horizontal upper opening.

The box is provided with spaced lining walls 8 and 9 between which the refrigerating coils 10 are disposed. Instead of being concentrated in one corner of the refrigerated compartment as is the case with a standard refrigerator the coils 10 in the present device are distributed substantially to encircle the periphery of the refrigerated compartment and also substantially to cover the bottom thereof. Such arrangement of coils provides substantially uniform refrigeration for both the sides and bottom of the upper compartment 5 and is extremely desirable in order to minimize or eliminate convection currents caused by unequal temperatures. It will be obvious that if any circulation of air were established within the compartment some of the circulating air would be projected through the open top and replacement air would be drawn in from above.

As above indicated the upper margin of the box is preferably horizontal. A finish that is attractive and at the same time serves the purposes of this invention is provided by a marginal plate of glass shown at 15 which extends around the perimeter of the box and overhangs the walls thereof to some extent to reduce the size of the opening. These plates 15 assist in establishing a cleavage plane between the cold air which is held by gravity within the box 5 and the warmer air at room temperatures which lies thereabove,

Co-operating with plates 15 in establishing a cleavage plane and in reducing the area of the horizontal opening, I preferably employ a plate 16 supported on posts 17 in the same horizontal plane as the marginal plates 15. If desired these posts may be carried up to support a display shelf 18 and suitable lighting fixtures for the illumination of the contents of the refrigerator.

Plate 16 has also another function. With certain food stuff it is preferable that no dust be permitted to settle thereon. Such food may be positioned underneath the plate 16 which then serves as a protection against dust. The marginal plates 15 also answer the same purpose, but with somewhat less favorable position of the food for display purposes and for accessibility from both sides of the box.

Beneath the compartment 5, I provide a compartment 19 for the refrigerating unit 20 and a storage refrigerator 21, which may be provided at one end with the usual form of expansion coil 22 and at the other end with an ordinary closure such as a door 21A, preferably hinged. There is thus provided unitarily with the special purpose box 5 a considerable refrigerated space which may be used for any desired purposes and served by the same refrigerating unit, and with no extra floor space required.

In operation the bottom of the refrigerated box 5 receives the article to be kept refrigerated and at the same time exposed for sale. Ordinarily any article in the box will not only be visible but directly accessible without moving other articles therein. A degree of accessibility is obtained which cannot exist in any other type of refrigerator.

The air within the box 5, being chilled, has a higher specific gravity than the warm air on the outside and hence, because of the uniform height of the walls of the box, is held within the box, the plates 15 and 16 materially assisting in such effect. Heat transfer through the sides and bottom of the box is substantially prevented by the insulation. The operation of this unit is, therefore, exceptionally efficient both for cost of operation and in providing refrigeration throughout the interior of the box at the desired temperature.

It is, of course, understood that the box will not be subjected to extraordinary air currents such, for instance, as might be induced by an electric fan immediately above the box. Ordinary drafts are cared for in a satisfactory manner by the plane surfaces 15 and 16 which establish a cleavage plane across which currents of air can move horizontally without creating any material circulation of air within the box or between the box and the air overlying it.

As an instance of the result obtained from the method of refrigeration utilized in the box 5, it may be stated that with a room temperature of 90° F. a temperature difference of only four degrees has been observed between top and bottom of compartment 5 during normal continuous use of the device, the temperature being maintained at 36° F. at the bottom of the box and at 40° F. at a point just below the plane defined by plates 15 and 16. The entire temperature drop between room temperatures and those existing in the box 5 is accomplished very sharply at the zone defined by the plane of plates 15 and 16.

It is to be noted that for the box 21 the refrigeration is localized whereby a continuous circulation of moving air is induced. For a completely enclosed box this type of refrigeration is believed preferable. For the box 5, however, the refrigeration is distributed to the greatest practicable extent whereby circulation or movement of air is substantially eliminated. There is thus provided a unitary combination of two boxes each provided with a fundamentally different type of refrigeration best adapted for the purposes to be met, and together particularly adapted both for the storage of a considerable volume of reserve food stuff, and for the accessible display of other food stuff for immediate sale.

I claim:

1. A refrigerator comprising a box closed at its sides and bottom and continuously open at its top, and refrigerating means within the box uniformly distributed to avoid the creation of convection currents, said box being provided at its upper margins with overhanging ledge means for protecting the air within the box from disturbances originating in the air outside thereof and the interior of the box being free of mechanically operated parts whereby the air therein is retained quiescent.

2. A refrigerator comprising the combination with a box, of refrigerating means distributed about said box to maintain substantially uniform temperatures at all sides thereof whereby to avoid convection currents therein, said box being continuously open at its top and adapted to retain solely by gravity the air refrigerated therein, together with substantially planiform means continuous about the top of the box overhanging the sides thereof for establishing a substantially horizontal cleavage plane between air in said box and extraneous air all of the mechanism for the operation of said refrigerator being outside of said box whereby air in the interior of said box is kept quiescent.

3. A refrigerator comprising the combination with a box, of refrigerating means distributed about said box to maintain substantially uniform temperatures at all sides thereof whereby to avoid convection currents therein, said box being continuously open at its top and adapted to retain solely by gravity the air refrigerated therein, together with means at the top of the box for establishing a substantially horizontal cleavage plane between air in said box and extraneous air, said means inwardly overhanging the box whereby to limit the area of the opening in the top of the box.

4. A refrigerator comprising the combination with a box closed at its bottom and having sides of substantially uniform height, of refrigerating means distributed about said box and adapted to maintain substantially uniform temperatures at all sides thereof whereby to minimize convection currents therein, and plate means extending about the upper margin of the box and overhanging the sides thereof, said box being continuously open at its top, internally free of air disturbing movable parts, and adapted to retain quiescent refrigerated air therein by gravity.

5. A box having refrigerating means extending substantially continuously about its sides and having its sides finished at substantially the same horizontal plane at their upper margins in combination with a plate disposed substantially in said plane and spaced between said margins whereby to afford a continuously open space at the top of the box through which its contents are accessible.

6. A refrigerator comprising a box provided with uniformly distributed refrigerating means and having closed bottom and side wall portions

of substantially uniform depth and a continuously open top, in combination with centrally disposed means for restricting the area of the opening in the top and for defining a plane of cleavage between refrigerated air in the box and extraneous air.

7. A refrigerator comprising a box provided with refrigerating means and having closed bottom and side wall portions and a continuously open top, in combination with means for restricting the area of the opening in the top and for defining a plane of cleavage between refrigerated air in the box and extraneous air, said means comprising a central plate and marginally disposed peripherally extending plates in spaced relation to said central plate and substantially in a common horizontal plane whereby to provide a circuitously extending opening relatively narrow at any given point.

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