July 22, 1947. W. H. BUCKNELL 2,424,434

HEAT INSULATED RECEPTACLE

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Fig. 1.

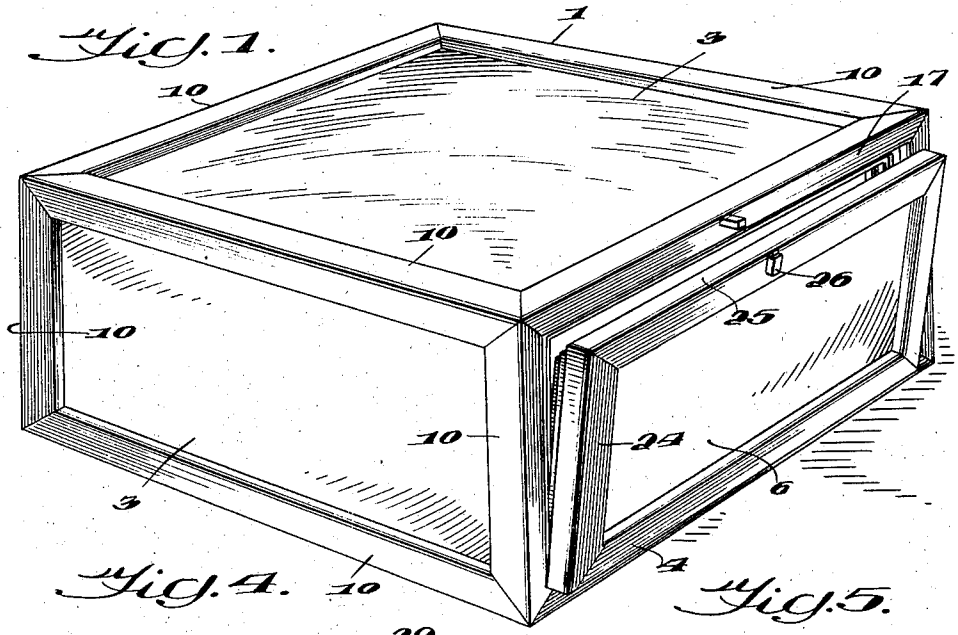


Fig. 4.

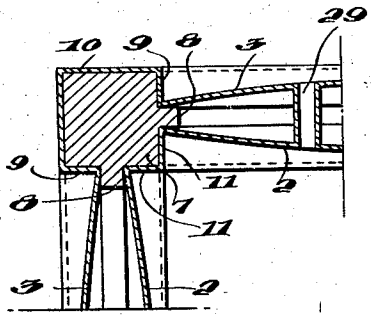
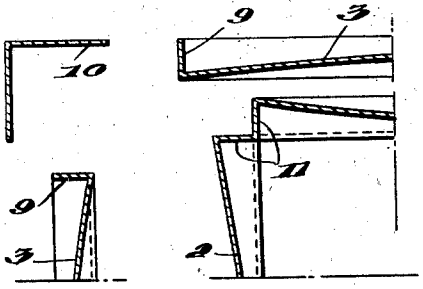


Fig. 5.



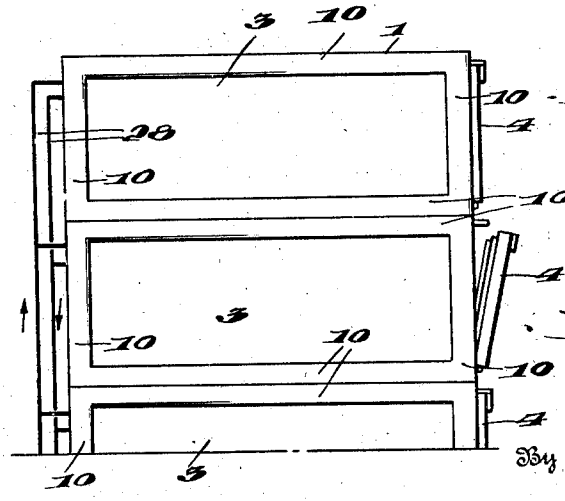


Fig. 6.

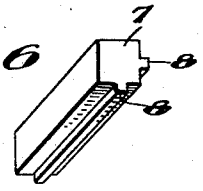


Fig. 7.

Inventor

William H. Bucknell

By Ritter, Meehler & Mann

Their Attorneys

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Fig. 2.

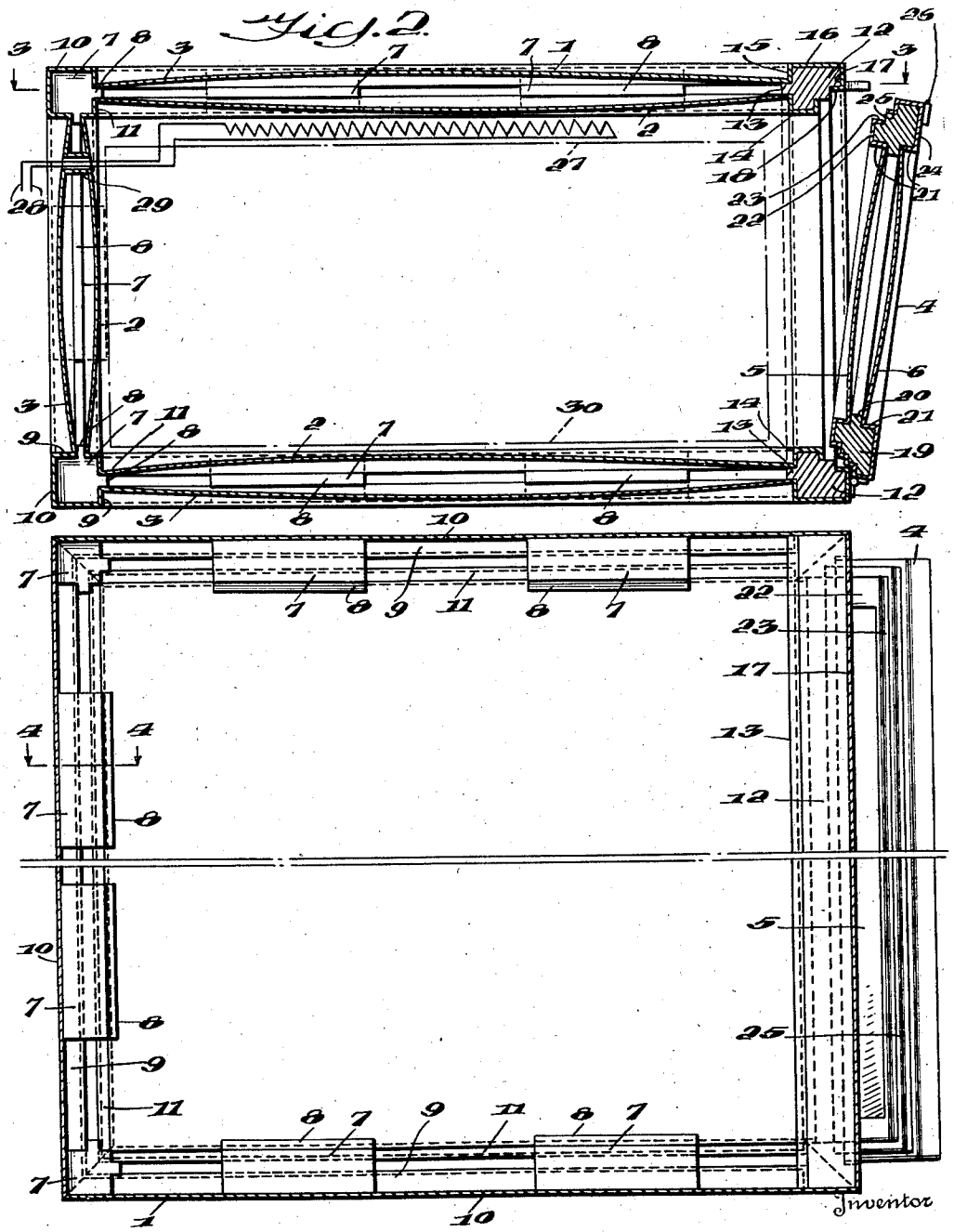


Fig. 3.

Inventor
William H. Bucknell
By Ritter, Mueller & Thurs
Attorneys

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UNITED STATES PATENT OFFICE

2,424,434

HEAT INSULATED RECEPTACLE

William H. Bucknell, Norwalk, Conn., assignor of one-half to Anita R. Bucknell, Norwalk, Conn.

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6 Claims. (Cl. 220—15)

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The invention relates to insulated receptacles and it has for one of its objects the production of such a receptacle which may be used as a refrigerator or deep freeze unit and is so constructed that it may be assembled with other similar units or sections, either by stacking them on each other or placing them side by side, to provide an assembly having the freezing or storage capacity which may be required from time to time.

The primary feature of the invention consists in providing a heat insulated receptacle with a plurality of walls and a hinged door wherein each of the walls is formed by a pair of laterally spaced substantially rigid convexo-concavo metal plates with their concave sides facing each other.

Other features of the invention consists in providing a receptacle having the convexo-concavo walls with sub-atmospheric pressure between the walls and in providing relative short insulating blocks for maintaining the respective plates of the walls in spaced relation so that the spaces between the plates of all walls will be in open communication and a reduction of pressure between the plates of one of the walls will result in an equal reduction in pressure between the plates of all walls.

Other specific features of the invention residing in advantageous forms, combinations and relations of parts will hereinafter appear and be pointed out in the claims.

In the drawings,

Figure 1 is a perspective view of the refrigerating receptacle.

Figure 2 is a vertical section through the receptacle showing the door partly open.

Figure 3 is a sectional view on line 2—2 of Figure 2.

Figure 4 is a detail sectional view adjacent one edge of the receptacle taken on a line corresponding to line 4—4 of Figure 3.

Figure 5 is a disassembled view of the plates of the receptacle seen in Figure 4.

Figure 6 is a perspective view of one of the insulating blocks.

Figure 7 is a side elevational view showing a battery or stack of the receptacles.

Referring more particularly to the drawings, 1 indicates the receptacle as a whole having walls formed of inner and outer plates 2 and 3 respectively. The hinged door 4 of the receptacle is provided with similar inner and outer plates 5 and 6, respectively.

The two plates of each wall are convexo-concavo and the plates are arranged with their concave sides facing each other. At their edges

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the plates of each pair are maintained in spaced relation by one or more insulating blocks 7. These blocks are arranged at the meeting edges of the plates of the different walls and each is formed with two projecting portions or ribs 8, one rib extending between the plates of one wall and the other rib projecting between the plates of the other wall.

The insulating blocks may advantageously be of substantially square or rectangular shape in cross section and the edges of the plates of each wall are flanged in opposite directions so as to engage the face of the block from which the spacing rib 8 projects. The outwardly extending flanges 9 of the outer plates may be advantageously connected to the adjoining flanges 9 of adjacent outer plates by an angle member 10 and the inner edges of the inwardly extending flanges 11 of the inner plates may be connected directly to the adjoining flanges 11 of adjacent inner sheets. Thus the edges of corresponding plates of the walls are connected and at the same time the inner plates of the receptacle are maintained in spaced relation to the outer plates.

The box-like construction of each corner and edge of the receptacle lends to it the required rigidity for durability and permanence and also to permit stacking of the receptacles one on the other as shown in Figure 7.

Bounding the door opening of the receptacle is a solid frame 12 of insulating material. On its inner face the frame has a rib 13 which projects between the inner and outer plates of each of the adjacent walls of the receptacle. The edge portions of each of the inner plates which cooperate with the frame 12 are preferably of channel shape, as designated at 14 so as to extend across the inside face of the frame and terminate in a flange which overlaps a part of the outer face of the frame. The edge portions of the outer plates which cooperate with the door frame may be conveniently formed with an outturned flange 15, similar to the flange 9. This is connected by welding, for example, to the inner end of a leg 16 of a channel-shaped member 17 whose web overlies the front face of the frame and its inner flange 18 engages the inner face thereof.

After the receptacle has thus been made, air within the spaces of the walls is evacuated by a vacuum pump (not shown). The pump need only be connected with the space between one wall for the space of each is in communication with the other and a simultaneous reduction of pressure in the space between all walls will, therefore,

occur. The inner faces of the walls may be plated with any metallic or desired type of coating to decrease thermal transfer between the plates and increase the degree of insulation.

Interposed between the edges of the plates 5 and 6 of the door is a continuous frame 19 of insulation material for maintaining the plates in spaced relation. It is preferably formed with an inwardly extending rib 20 projecting between the plates and at the outer edge portion of its inner face it is formed with a stepped construction to cooperate with a corresponding stepped construction in the door frame and thus afford the usual labyrinth type of closure. The outer edges of the door plates have oppositely extending portions 21 which engage the inside of the frame. Rigid with the portions 21 of the inner door plate are angle-shaped portions 22 which terminate in flanges 23 arranged in overlapping engagement with a part of the stepped construction of the frame; while rigid with the portion 21 of the outer plate are angularly shaped members 24 which cover the outside of the frame and have inwardly extending portions 25 which conform to a part of said stepped construction but which terminate short of the flange 23 of angle 22, whereby a space is maintained between the extremities of these flanges to prevent transfer of heat from one to the other. The door may be held in closed position by any suitable latch construction 26 and gaskets or the like may be employed between the door and door frame to effect a tighter seal.

The air between the plates of the door may be evacuated by connecting a vacuum pump (not shown) to one of the plates thereof in any suitable manner. When air is evacuated between the plates of the door and of the walls, the atmospheric pressure, being greater than the pressure between the plates, tends to cause the plates of each pair to approach each other. The rigidity of the plates themselves however, tends to resist such movement, but since they are spherically curved or dished in opposite directions and their edges are held in spaced relation, the force that results from a reduction of pressure between the plates causes the flanges around the edges of the plates to more tightly engage the insulating members with which they cooperate. The insulating blocks 7 will, therefore, be prevented from being displaced from their intended positions by the pressure of the edge flanges of the plates 2 and 3 thereon and such a seal is, therefore, obtained between the sheets 2 and 3 and the door frame 12 and between the sheets 5 and 6 and the member 19 of the door that no leakage will occur. The insulating material of the door frame and of the door itself is, of course, of such non-porous material that air cannot seep through.

The receptacle may be provided on its interior with any desired arrangement of refrigerating coils; for example, coils which are shown diagrammatically at 27 may be located as shown adjacent the top wall. The refrigerant supply and return lines 28 connecting the refrigerating coil to the compressor (not shown) may conveniently extend into the receptacle through a small conduit as indicated at 29 connecting the inner and outer plates of the rear wall. A wire tray or the like 30 designated by the dot and dash lines in Figure 2 may be used within the receptacle in which the material to be refrigerated is placed. When two or more receptacles are to be stacked on each other, a single supply line and a single return line each having branches or cut-offs may be employed as illustrated in Figure 7.

It is thus to be seen that with receptacles or units of such compact character the capacity of a refrigerator assembly may be increased or decreased simply by employing a greater or a less number of the individual units without making any change in motor compressor arrangement, except in cases where a radical change of capacity is to be made. Furthermore, a refrigerating assembly which includes a plurality of separate and independent units or sections enables different temperatures to be maintained in different units, merely depending upon the design of refrigerating coils or on thermostatic arrangements. Such an assembly also permits cleaning, defrosting, or access to any individual unit without affecting operation of the other units. Moreover, they may be produced in quantity as a standard unit which can be readily assembled with others to produce a refrigerator assembly having the desired shape and capacity.

It will, of course, be appreciated that the insulated receptacle or unit is not limited in its use as a refrigerator but, on the contrary, may be used in most any service where a receptacle with insulated walls is required. Moeover, it will be apparent that the spaces between the sheets of the walls and of the door may be filled with any suitable insulating material.

Various modifications and changes in the details of construction of the unit illustrated and described may, of course, be made without departing from the scope and spirit of the invention as defined in the appended claims.

What I claim is:

1. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid spherically curved convexo-concavo metal plates wherein the concave sides of the plates face each other, laterally spaced means respectively connecting adjacent edges of corresponding plates of adjoining pairs and the edge portions of the plates of each pair being arranged in spaced relation, and insulating members interposed between said laterally spaced means and said plates, the space between each pair of plates being in open communication with the space between adjoining pairs of plates and the pressure therein being substantially less than atmospheric pressure, said reduced pressure forcing the edges of said plates laterally against said insulating members.

2. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid spherically curved convexo-concavo metal plates arranged with their concave sides facing each other, insulating means having portions interposed between each pair of plates for maintaining the edges of each pair in spaced relation, means overlapping one side of the insulating means connecting adjacent edges of the outer plates of adjoining pairs, means at the inner portions of said insulating means connecting adjacent edges of the inner plates of adjoining pairs, the pressure in the space between the plates of each of said pairs being substantially less than atmospheric pressure, said reduced pressure causing the side edges of said plates to be forced laterally against said insulating means.

3. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid convexo-concavo metal plates arranged with their

concave sides facing each other and the pressure between the plates being substantially less than atmospheric pressure, flanged means connecting adjacent edges of the outer plates of adjoining pairs, and insulating blocks inside of said means having portions respectively extending between the plates of adjoining pairs of plates, the edges of said plates being forced laterally against said insulating blocks by the reduced pressure between the plates.

4. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid convexo-concavo metal plates arranged with their concave sides facing each other and the pressure between the plates being substantially less than atmospheric pressure, and insulating blocks arranged at the adjacent edges of adjoining pairs of plates, said blocks having means projecting between the outer edge portions of the plates of each pair to maintain them in spaced relation, the plates of each pair having oppositely extending offset portions respectively adapted to bear against said insulating blocks said offset portions being maintained in engagement with said blocks by the reduced pressure between the plates.

5. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid spherically curved convexo-concavo metal plates arranged with their concave sides facing each other and the pressure between the plates being substantially less than atmospheric pressure, insulating blocks arranged at the meeting edges of adjoining pairs of plates and respectively having portions extending between the plates of each pair to maintain them in spaced relation, and angle members embracing said insulating blocks extending substantially coextensively with said plates respectively connecting adjacent edges of the outer plates of adjoining pairs, the reduced pressure between the plates causing the edges thereof to be forced against said blocks in directions substantially parallel to a median plane between the plates.

6. A heat insulated receptacle comprising a plurality of walls and a hinged door, each of said walls including a pair of substantially rigid convexo-concavo metal plates arranged with their concave sides facing each other and the pressure between the plates being substantially less than atmospheric pressure, and insulating blocks arranged at the meeting edges of the plates of adjoining pairs and having portions maintaining the plates of each pair in spaced relation, and laterally spaced means connecting adjacent edges of corresponding plates of each of said pairs, said blocks each being of less length than the edge of the plates with which it cooperates whereby the space between the plates of each pair is in open communication with the spaces between plates of adjoining pairs, the reduced pressure between the plates causing the edges thereof to move sidewise into clamping engagement with said blocks.

WILLIAM H. BUCKNELL.

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