Jan. 31, 1933. R. P. FARRINGTON 1,896,046

REFRIGERATOR

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Fig. 2.

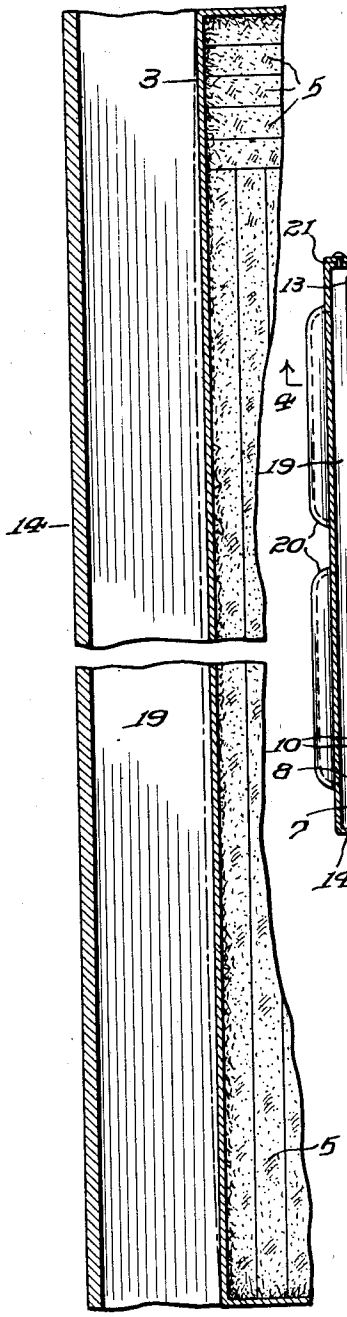


Fig. 1.

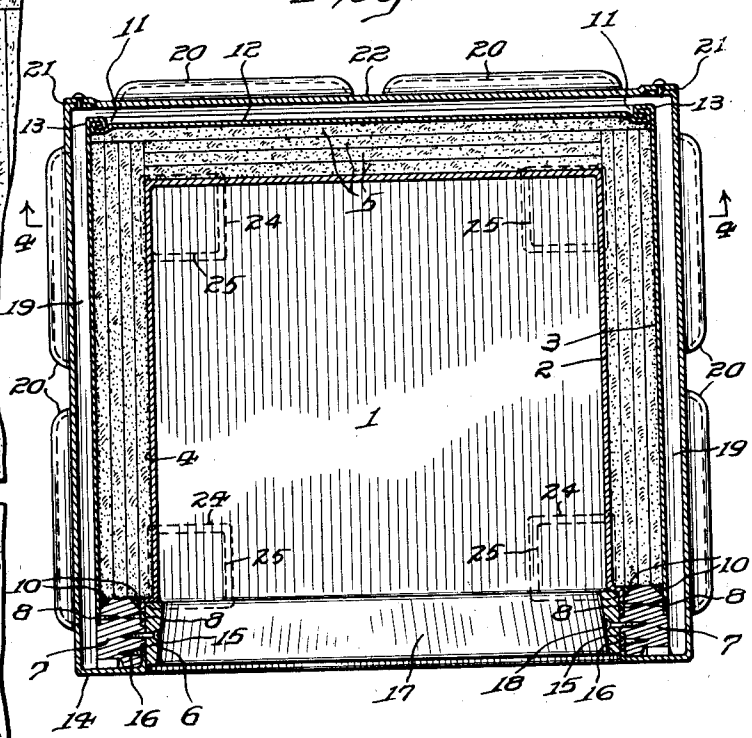
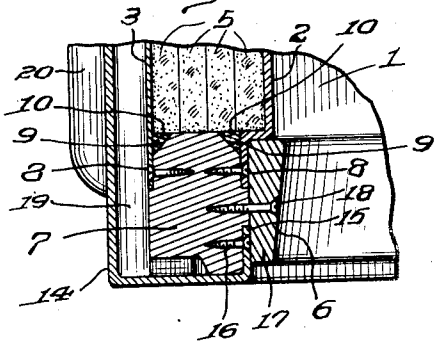


Fig. 3.



WITNESS

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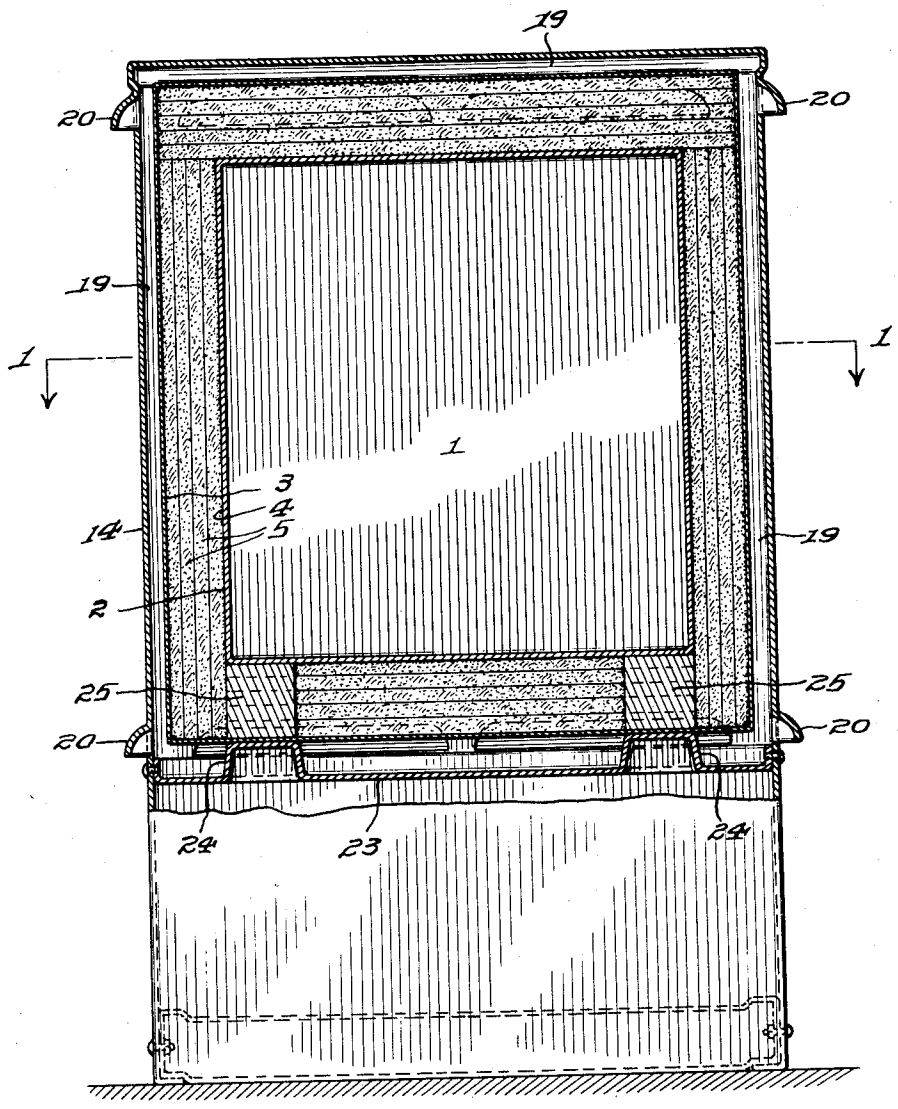
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Fig. 4.



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UNITED STATES PATENT OFFICE

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REFRIGERATOR

Application filed August 19, 1927. Serial No. 213,991.

The present invention relates to refrigerators and the like, and particularly to the construction of the insulated walls thereof.

In refrigeration the problem of insulation is one of considerable difficulty so far as moisture is concerned, as it is well known that moisture has a tendency to travel toward the coldest surfaces and to keep collecting as time elapses. If atmospheric air enters the insulation chamber or space within a refrigerator wall it carries with it more or less moisture which, owing to the relatively low temperature within the wall, is condensed therein, tending to be absorbed by the insulating material and sometimes to form mold. It is also possible to have ice formed, which may loosen or disintegrate the insulation. In any event, the presence of moisture within the wall results not only in the deterioration of the wall and its enclosed insulation but is especially objectionable in that it reduces the insulating efficiency.

The difficulty in overcoming this problem is increased on account of the fact that the average temperature of the air within the different portions of the insulation space varies with the changes in the respective temperatures inside and outside of the refrigerator, which occur from time to time when the refrigerator is in service and also to some extent when the refrigerator is out of service. As the volume of the air confined within the wall is constant, its pressure varies with such variations in its temperature and increases or decreases relatively to the pressure of the atmosphere. This causes a tendency to open and "breathe" through the joints in the wall and also to "breathe" through the material forming the wall, if it is permeable, with the result that the outside or atmospheric air is likely, after a short time, to work its way into the insulation space.

An object of the present invention is to exclude moisture from the interior of a refrigerator wall and its enclosed insulation by hermetically sealing the insulation within the wall, and to provide a hermetical seal which is effective at all times notwithstanding the variations in the average temperature of the air confined within the insulation space.

Another object of the invention is to provide means for compensating for variations in the average temperature of the air confined within the insulation space, by permitting such confined air to vary in volume with its changes in temperature, so that there is little or no change in its pressure and the latter is maintained at all times substantially equal to atmospheric pressure, whereby to obviate the tendency to open the joints and "breathe" through the wall, and reduce to a minimum the likelihood of atmospheric air entering the wall and carrying moisture into the interior thereof.

Another object of the invention is to interpose the insulating material between inner and outer air-tight casings, and to provide in one of such casings a diaphragm that is responsive to changes in the volume of the air confined within the insulation space.

A further object of the invention is to provide insulating material of such character and so arranged within the insulation space, as not to interfere with the free action of the diaphragm.

And a still further object of the invention is to provide means for supporting the casings and at the same time insulating them from each other at their point of support and hermetically closing at this point the insulation space between the casings.

With these and other objects in view, the invention comprises certain novel features of construction, combinations of elements and arrangements of parts, which will be exemplified in the device hereinafter set forth, and pointed out in the appended claims.

Referring to the accompanying drawings—

Figure 1 is a horizontal section of a refrigerator cabinet embodying my invention, the section being taken on the line 1—1 of Fig. 4.

Fig. 2 is an enlarged diagrammatic view illustrating the diaphragm action.

Fig. 3 is an enlarged detail view of a front corner of the device showing the supporting member and the parts associated therewith; and

Fig. 4 is a transverse vertical section, the section being taken on the line 4—4 of Fig. 1.

According to the present embodiment of my invention the refrigerating compartment 1 has a double or hollow wall structure and is constructed of inner and outer casings 2 and 3 which are spaced apart to provide an intervening insulation chamber or space 4 that contains suitable insulating material 5. The casings are in the form of box-like, nested shells, the inner of which serves as a lining for the refrigerating compartment, and the outer of which as a jacket. The shells are open at the front so as to provide a doorway 6 affording access to the interior of the refrigerating compartment.

The front portions or ends of the shells are fitted against, and secured in spaced relation to each other to, a supporting member 7 which is in the form of a frame extending around the doorway 6 and adapted to support not only the refrigerating compartment but also the door therefor (not shown). In mounting the shells on the supporting member they are preferably fastened respectively to the inner and outer faces thereof, as by screws 8, with the front portion of the supporting member projecting forwardly beyond the shells for a purpose to be hereinafter pointed out.

The supporting member is constructed of wood or other suitable material that has structural strength but is sufficiently porous to be heat non-conducting. It therefore serves to insulate the inner and outer casings or shells from each other at their point of support, avoiding the conducting of heat from the outside to the inside of the refrigerating compartment, which would result if these shells were in contact.

The supporting member 7 also serves to close the insulation space 4, which is open between the front portions or ends of the shells. In order to close the space hermetically, the supporting member 7 is waterproofed, as by being treated with hot paraffin or asphalt paint, or is otherwise sealed air-tight either before or after the assembling of the parts, to prevent air from permeating the wood and working through the pores thereof. The joints between the respective shells and the supporting member are also sealed air-tight in any suitable manner as, for instance, by bevelling the inner corners of the supporting member as indicated at 9, and filling the angular seats thus formed between the same and the shells, with hydrolene or like sealing material 10.

The inner and outer casings or shells 2 and 3 are formed of metal or other suitable impermeable material to insure against the passage of air therethrough. The inner casing 2 is stiff and rigid, while the outer casing 3 is soft and flexible and preferably formed of terne-plate, so as to constitute a diaphragm which permits the volume of the air confined within the insulation space to change from time to time with variations in its average temperature. As above pointed out, these variations result from the changes in the respective temperatures inside and outside the refrigerator, which occur when the refrigerator is in service and to some extent when it is out of service. The diaphragm compensates for such variations in the average temperature of the air within the insulation space, so that they cause little or no change in its pressure and the latter is maintained at all times substantially equal to the atmospheric pressure of the outside air. This obviates the tendency to open and "breathe" through the joints and to "breathe" through the material forming the wall. The seals applied to the wooden supporting member 7 and between the same and the respective casings 2 and 3 are thus protected against excessive strain, and their effectiveness is maintained under the varying temperatures of the air within the insulation space, to exclude atmospheric air from the interior of the wall and prevent it from carrying moisture thereto and reducing the insulating efficiency.

It is to be noted that the insulation 5 is of such character, and is so arranged, as not to interfere with the effective action of the diaphragm freely movable with respect to such insulating material. To this end the insulation, in the present embodiment of the invention, is in the form of boards of cork, celotex, or other suitable material which is self-sustaining and maintains itself in position without settling. The boards are fitted within the insulation space substantially parallel to the corresponding sides of the shells and are substantially coextensive with such sides, so as to exert little, if any, lateral stress upon the diaphragm.

For convenience in assembling the parts, the back of the outer shell 3 is preferably open, as indicated at 11, to afford access to the insulation space 4. This permits the sealing material 10 to be placed in position after the shells have been mounted on the supporting member 7. The boards of insulating material 5 may then be inserted in the insulation space, after which the opening 11 is hermetically closed by a panel 12 secured in position with suitable air-tight joints 13.

The refrigerating compartment 1 is enclosed by a separate cabinet 14 which is constructed of sheet metal or other suitable material and is open at the front in registry with the doorway 6. The wood frame or supporting member 7 is suitably secured to the cabinet 14 to mount the refrigerating compartment therein. In the present instance the cabinet is provided around the doorway with a rearwardly projecting flange 15 to which the front portion of the supporting member is secured by screws 16 or the like. By reason of the front portion of the supporting member projecting forwardly beyond the shells 2 and 3, the supporting mem-

ber serves to insulate the same from the cabinet. The flange 15 abuts against the inner surface of the supporting member 7 in front of and in spaced relation to the inner shell 2, the space between the two being covered by a moulding strip 17 of wood or other insulating material, which extends around the doorway and is fastened in place by nails or screws 18 passing through this space and into the supporting member.

The cabinet 14 protects the diaphragm formed by the soft and flexible outer shell 3 and is spaced therefrom so as not to interfere with its action. The intervening air chamber 19 thus provided preferably contains atmospheric air which is freely admitted thereto as through louvres 20 in the cabinet. The back of the cabinet is open as indicated at 21 to permit the refrigerating compartment to be inserted therethrough when the parts are being assembled, the opening being subsequently closed by a removable back plate or panel 22.

In order to assist in supporting the refrigerating compartment within the cabinet the latter may be provided beneath the former with a horizontal wall 23 and with one or a plurality of projections 24 suitably located upon and upstanding from the wall and having the refrigerating compartment resting thereon. Opposite each of the points of contact a block 25 of wood or other material having both heat insulating qualities and structural strength, is arranged within the insulating material 5 and fits between the inner and outer shells 2 and 3 to provide a firm support.

From the foregoing description the operation of the invention will be obvious. By virtue thereof the insulation is kept dry and the insulation space is kept in a sanitary condition.

The invention is susceptible of use in different types of refrigerators, whether cooled mechanically or by ice, is simple and durable in construction, may be easily and cheaply manufactured, and is not likely to get out of order.

It is to be understood that the outer casing may be so constructed as to serve either wholly or in part only as a diaphragm, that a diaphragm may be embodied in the inner casing in addition to or in substitution for the diaphragm in the outer casing, that the casings may be of various sizes and shapes, that the insulating material may be arranged in other ways than that herein disclosed, and that various other changes may be made in the details of construction without departing from the spirit and scope of the invention as defined in the appended claims.

Having thus described my invention, I claim and desire to protect by Letters Patent of the United States—

1. In a refrigerator, a double wall structure having an enclosed hermetically sealed insulation chamber, and insulating material within said chamber, said double wall structure embodying a flexible member exposed on its opposite sides, respectively, to the air confined within said insulation chamber and to the atmosphere, and freely movable with respect to said insulating material to substantially equalize at all times the pressures of said confined air and of the atmosphere under varying temperature conditions.

2. In a refrigerator, a double wall structure comprising inner and outer sheet metal casings spaced apart with a hermetically sealed insulation space therebetween, one of such casings being soft and flexible and constituting a diaphragm subject to, and movable to substantially equalize, the pressures of atmospheric air and of the air confined within said insulation space.

3. In a refrigerator, a double wall structure having an enclosed hermetically sealed insulation chamber, self-sustaining insulating material within said chamber, and a diaphragm embodied in a wall of said chamber and freely movable with respect to said insulating material to substantially equalize the pressures of atmospheric air and of the air confined within said chamber.

4. In a refrigerator, a double wall structure comprising casings spaced apart with a hermetically sealed insulation chamber therebetween, an insulating board mounted within said chamber, and a diaphragm embodied in one of said casings and freely movable with respect to said insulating board to substantially equalize the pressures of atmospheric air and of the air confined within said chamber.

5. In a refrigerator, the combination of a refrigerating compartment having inner and outer shells spaced apart with an intervening hermetically sealed insulation chamber, the outer shell embodying a diaphragm subject to, and movable to substantially equalize, the pressures of atmospheric air and of the air confined within the insulation chamber, and a cabinet enclosing said refrigerating compartment and spaced therefrom to afford free play for said diaphragm.

6. In a refrigerator, a double wall structure comprising casings spaced apart with an intervening insulation chamber open at one end and otherwise air tight, a member closing said end of the insulation chamber and supporting and insulating from each other the adjacent ends of the casings, and hermetically sealed joints between the respective casings and said member, one of said casings embodying a diaphragm subject to, and movable to substantially equalize, the pressures of atmospheric air and of the air confined within said insulation chamber.

7. In a refrigerator, a double wall structure comprising air impervious casings

spaced apart to form an intervening insulation chamber open at one end, a porous, heat non-conducting member closing said end of the insulation chamber and supporting and insulating from each other the adjacent ends of said casings, a hermetical seal applied to said member to prevent air from passing through the pores thereof into said chamber, one of said casings embodying a diaphragm subject to, and movable to substantially equalize, the pressures of atmospheric air and of the air confined within said insulation chamber.

8. In a refrigerator, a double wall structure comprising casings spaced apart with an intervening insulation chamber open at one end and otherwise air tight, a member of insulating material having structural strength, closing said end of the insulation chamber and supporting and insulating from each other the adjacent ends of said casings, hermetically sealed joints between the respective casings and said member, and a hermetical seal applied to said member to prevent air from passing therethrough into said chamber, one of said casings embodying a diaphragm subject to, and movable to substantially equalize, the pressures of atmospheric air and of the air confined within said insulation chamber.

9. In a refrigerator, a refrigerating compartment comprising inner and outer nested shells spaced apart to provide an intervening insulation chamber open at one end, a member closing said open end of the chamber and supporting and insulating from each other the adjacent ends of said shells, and a cabinet enclosing said compartment and secured to and supporting said member and insulated thereby from the adjacent end of said inner shell.

In testimony whereof, I have signed my name to this specification.

RAY P. FARRINGTON.