May 11, 1943. G. B. BROWN 2,318,744

METHOD OF INSULATING

Filed Nov. 30, 1939

Fig. 1.

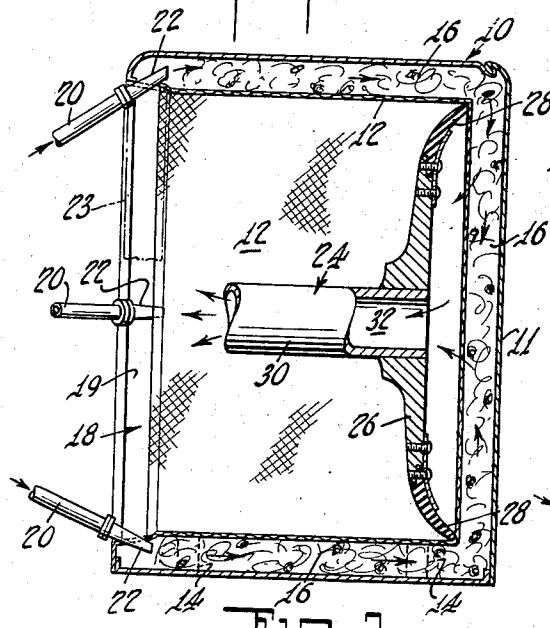


Fig. 2.

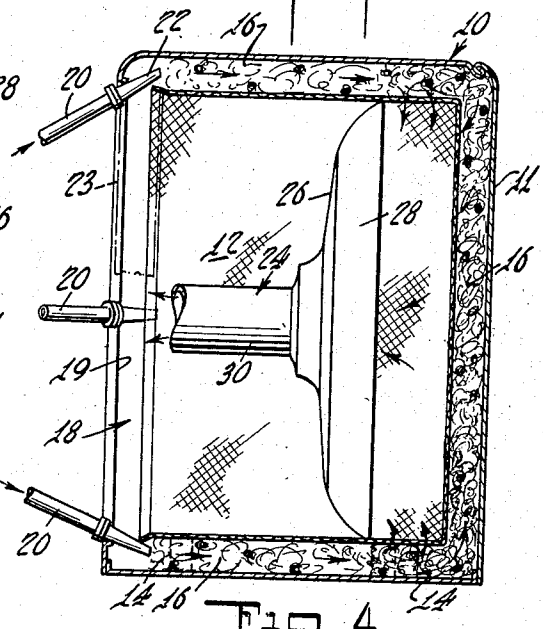


Fig. 3.

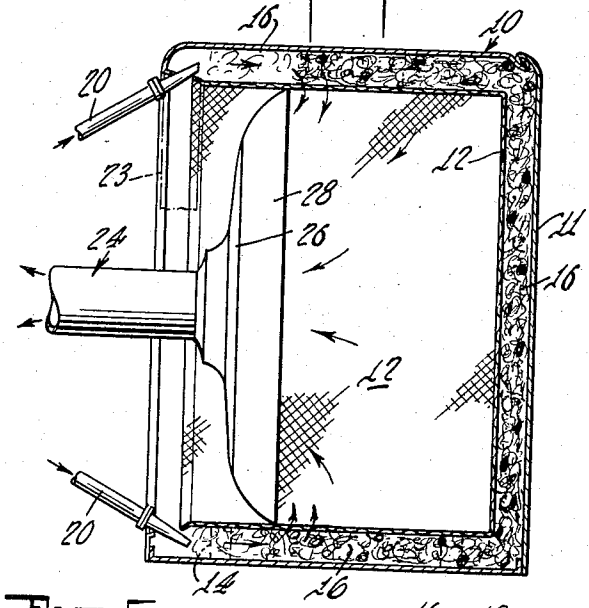


Fig. 4.

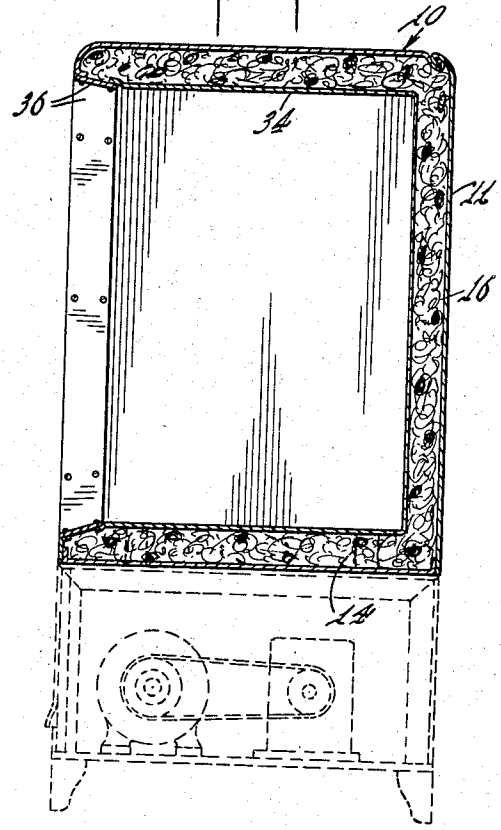
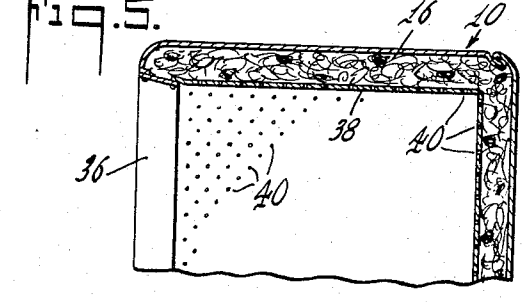


Fig. 5.



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UNITED STATES PATENT OFFICE

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METHOD OF INSULATING

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Application November 30, 1939, Serial No. 306,812

10 Claims. (Cl. 226—19)

The present invention relates to the insulating of refrigerator cabinets, and other structures including wall spaces in which insulating material is disposed. For the purposes of illustration, the invention will be specifically described in connection with refrigerator cabinets, but it will be understood that the invention is applicable to such other similar structures.

Refrigerator cabinets as conventionally made comprise an inner shell or liner defining a food compartment, preferably formed of a unitary or one-piece structure, an outer casing or shell and insulating material filling the spaces between the shells. The inner shell is supported in a suitable manner in spaced relationship to the outer shell, as by blocks or framing members. Suitably, the inner and outer shells are secured together at the door opening by the door frame members composed of a substantially non-conducting material.

A principal object of the present invention is the provision of an improved insulating method involving the pneumatic conveying or blowing of a comminuted or loose insulating material into the space between the walls of the inner and outer shells of a cabinet of the type referred to above.

Another object of the invention is the provision of a pneumatic insulating method for cabinets or the like which will insure the filling of the space between the inner and outer cabinet walls to a uniform and desired density.

A further object of the invention is the provision of a method for insulating refrigerator cabinets in which the insulating material is blown into the space between the inner and outer walls, while at the same time the air is exhausted from the space at successive locations where the insulating material is deposited.

Briefly stated, my invention resides in a process in which a comminuted insulating material is preferably pneumatically conveyed or blown into the spaces between an air-pervious temporary or permanent inner liner and an outer cabinet casing. Simultaneously with the introduction of the insulating material, the air is withdrawn through the pervious liner by a suitable suction device arranged to concentrate its air withdrawal action at the rear of the cabinet, whereby sufficient force is exerted on the insulating material to cause it to carry to and completely fill the space at such location. The means for withdrawing the air is gradually moved outwardly toward the front of the cabinet as the insulating material is introduced to cause the insulating material to become deposited at successive locations in the cabinet walls until the spaces are completely filled.

My invention will be more fully understood and further objects and advantages thereof will become apparent when reference is made to the more detailed description thereof which is to follow and to the accompanying drawing, in which:

Fig. 1 is a sectional view of a refrigerator or like cabinet in the course of assembly illustrating the method of the instant invention;

Fig. 2 is a similar view illustrating a later point in the operation of the method;

Fig. 3 is a view similar to Figs. 1 and 2 illustrating the insulating operation when nearing completion;

Fig. 4 is a sectional view of a completed refrigerator or similar cabinet; and

Fig. 5 is a view illustrating a modification of the invention.

Referring now to the drawing, a refrigerator or similar cabinet in the course of manufacture is indicated generally at **10**, comprising an outer shell **11** which may be suitably in one piece or formed of a multiplicity of separate plates welded or otherwise secured together. In accordance with the preferred practice of the invention, a temporary liner or inner casing **12**, having substantially the dimensions of the permanent liner later to be employed, is inserted within the outer casing **11** and spaced therefrom by blocks **14** or other suitable discontinuous framing members conventionally employed in cabinets of this type. The temporary inner liner is formed of a suitable air-pervious foraminous material which may, for example, be a fine mesh screen. The outer casing **11** and inner liner **12** define therebetween at the back, sides, top and bottom, spaces **16** to be filled with a suitable insulating material. The liner and outer casing terminate at the door opening **18**, leaving, at this stage in the operations, a slot **19** communicating with the spaces **16** and suitably extending completely around the door opening **18**.

In accordance with the method of the instant invention, the cabinet **10**, preferably while on the assembly line, has the spaces **16** filled with a suitable comminuted or granular insulating material, preferably comprising nodulated mineral wool, which is the form of mineral wool made, for example, by melting and fiberizing rock or slag, collecting the fibres in the form of a loose felt, disintegrating the felt, and then tumbling the material with the result that small pellets or nodules are formed. The nodules may be waterproofed in any suitable manner, if desired. In lieu of this

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material, loose mineral wool or other loose or comminuted insulating materials may be employed.

The insulating material is drawn from any suitable source of supply and forced or blown under air pressure or the like into the spaces 16 through one or more hoses 20, having nozzles 22 adapted to be inserted in the slot 19. Suitably, a number of the hoses may be employed to simultaneously introduce the insulating material into the spaces at the top, bottom and side walls of the cabinet, as diagrammatically illustrated in the drawing. However, the introduction of the insulating material may take place at as many locations around the door opening as desired. A temporary gasket 23 of any suitable type, although not essential, may be advantageously employed to seal off the slot 19, except at the points of entry of nozzles 22.

To act in conjunction with the insulation introducing devices, there is provided an air withdrawal mechanism indicated diagrammatically at 24. This mechanism comprises a piston head 26 of a configuration to fit loosely within the cabinet, suitably of rectangular shape for the ordinary cabinet, and a sealing lip or packing 28 extending from the periphery of the piston head and of sufficient width to lie in sealing engagement with the inner surfaces of the liner 12. The sealing member 28 may be formed of rubber or other similar flexible material. Piston 26 is carried by a hollow piston rod 30, the hollow interior 32 of which is in communication with the space between the rear wall of the cabinet and the piston head when the piston is in operative position within the cabinet. The piston 26, carried by piston rod 30, may be inserted within and withdrawn from the interior of the cabinet in any suitable manner. Thus, this may be accomplished by manual operation or by any desired type of mechanical means. The hollow interior 30 of the piston rod is connected to any suitable source of suction, which may, for example, be the intake side of the air pump employed in connection with the blowing operation.

In the operation of the method as thus far described, the temporary liner 12 is placed within the interior of the outer shell 11 and supported on the blocks 14 or other discontinuous framing members in proper spaced relationship to the outer shell. The hose nozzles are inserted through slot 19 and the remainder of the slot sealed off by gasket 23, if desired. The piston 26 is moved into the cabinet until its sealing gasket 28 is pressed against the top, bottom and side walls adjacent the rear wall of the cabinet (see Fig. 1). Air is then drawn from the space 16 at the rear of the box through the hollow piston rod 30 by the suction source previously referred to. Continuously with the removal of the air, the comminuted or loose insulating material is introduced to the spaces 16 through one or more of the hoses 20 and nozzles 22. The insulating material, through the velocity imparted to it in the blowing operation and the suction created by the withdrawal of the air through the piston 26 and piston rod 30, is carried to the space 16 at the rear of the cabinet to compactly and uniformly fill said space, irrespective of minor obstructions which may be present. When this initial space has been filled, the piston is gradually moved outwardly (see Figs. 2 and 3), the air now being withdrawn through the side, top and bottom walls of the foraminous inner liner to deposit the insulating material in the top, bottom and side wall spaces. Similarly as before, the operation provides for a uniform and compact deposition of the insulating material. The operation is continued, with the piston gradually being moved outwardly, until all the spaces 16 are completely filled with the insulating material. Thereafter, the temporary gasket 23 and inner liner 12 are removed and a permanent impervious inner liner 34 (see Fig. 4) inserted.

The packing of the insulation in position, through the combined action of the blowing operation and the suction, forms a firm, self-sustaining insulating layer with the ability to withstand the withdrawal of the temporary liner and the insertion of the permanent line 34. After the insertion of the inner liner, the door framing pieces 36 are secured in position by any conventional means and the insulated cabinet thus completed. The finished cabinet has been illustrated in Fig. 4, with the machinery compartment and supporting base indicated in dotted lines, and other appurtenances omitted, as they form no part of the instant invention. The cabinet door is not shown, but it will be understood that it may be of any suitable type and may, if desired, have insulating material installed between spaced walls thereof in a similar manner to that described above.

As has been mentioned, the movements of piston 26 and also the rate of introduction of the insulating material may be under manual control. However, these operations may be automatically controlled in timed relationship so that the piston is drawn through the cabinet at a rate to cause the deposition of the insulating material at the desired density.

According to the modification of the invention illustrated in Fig. 5, no temporary liner is employed and a permanent liner 38 is inserted within the outer casing 10 prior to the installation of the insulation. In this case, the permanent inner liner is provided with a multiplicity of minute openings or perforations 40, closely and preferably uniformly spaced throughout the walls of the liner. Suitably, the perforations 40 are made extremely minute, such as only to permit the passage of air therethrough, but are provided in such number as to have an aggregate area in any portion of the liner to adequately provide for the withdrawal of the air from the space between the cabinet walls. With the use of a liner of this type, after the insulation has been installed, the cabinet is completed by assembling the door framing pieces, without the necessity of removing the liner, or the door framing pieces may be assembled prior to introduction of the insulation, with the exception of small sections to provide openings for the entry of the hose nozzles. In the latter case, the assembled frame pieces serve the function of the temporary gasket 23 employed in the method illustrated in Figs. 1 to 3.

The construction of Fig. 5 has the additional advantage that the minute openings 40 provide means for permitting breathing between the interior cold chamber and the insulated space to prevent the condensation of moisture upon the insulating material.

Having thus described my invention in rather full detail, it will be understood that these details need not be strictly adhered to, but that various changes and modifications will suggest themselves to one skilled in the art, all falling within the scope of the invention as defined by the subjoined claims.

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What I claim is:

1. A method of insulating structures including walls defining an insulation-receiving space therebetween, said method comprising conveying insulating material within said space and withdrawing air from said space at successive locations of deposition of said insulating material by moving air-exhausting means along said space in substantially timed relationship to the deposition of the insulating material.

2. A method of insulating structures including spaced walls, one of which is pervious to air, comprising providing an opening to the space between the walls for the entry of insulating material thereto, conveying insulating material through said opening into said space, withdrawing air from said space through said pervious wall at a location remote from said opening by the application of exhausting means to said location, whereby the insulating material is caused to completely fill the space at said location, and withdrawing air from said space at successive locations approaching said opening as said space fills with insulating material, by moving said air-exhausting means along said pervious wall in substantially timed relationship to the deposition of the insulating material.

3. A method of insulating a space defined on one side by an air-pervious wall comprising pneumatically conveying insulating material into said space, withdrawing air from said space through said pervious wall at a confined location remote from the place of entry of said insulating material by the application of air-exhausting means at said location, whereby the insulating material is caused to completely fill the space at said location, and withdrawing air from said space at successive confined locations as said space fills with the insulating material by moving said air-exhausting means along said air-pervious wall in substantially timed relationship to the deposition of the insulating material.

4. A method of insulating a cabinet including a relatively air-impervious outer casing, said method comprising supporting within said casing an air-pervious liner defining a continuous space with the walls of said outer casing, conveying bulk insulating material into said space, withdrawing air from said space through said pervious linear at a confined location remote from the place of entry of said insulating material by the application of air-exhausting means at said location, whereby the insulating material is caused to completely fill the space at said location, and withdrawing air from said space at successive confined locations as said space fills with insulating material by moving said air-exhausting means along said liner in substantially timed relationship to the deposition of the insulating material.

5. A method of insulating a cabinet including a relatively air-impervious outer casing, said method comprising supporting within said casing a foraminous temporary liner defining a continuous space with the walls of said outer casing, conveying bulk insulating material into said space, withdrawing air from said space through said foraminous liner at a confined location remote from the place of entry of said insulating material by the application of air-exhausting means to said location, whereby the insulating material is caused to completely fill the space at said location, and withdrawing air from said space at successive locations as said space fills with the insulating material by moving said air-exhausting means along said liner in substantially timed relationship to the deposition of the insulating material.

6. A method of insulating a cabinet including a relatively air-impervious outer casing, said method comprising supporting within said casing a foraminous temporary liner defining with said casing a continuous space having an opening adjacent the front of the cabinet, pneumatically conveying insulating material into said space through said opening, withdrawing air from said space through said foraminous liner at a confined location remote from the opening by the application of air-exhausting means to said location, whereby the insulating material is cause to completely fill the space at said location, and withdrawing air from said space at successive confined locations as said space fills with the insulating material by moving the air-exhausting means along said liner in substantially timed relationship to the deposition of said insulating material.

7. A method of insulating a cabinet comprising a relatively air-impervious outer casing, said method comprising inserting within said casing a temporary air-pervious liner to define a space with the walls of said outer casing, pneumatically conveying insulating material into said space, withdrawing air from said space through said temporary pervious liner at a confined location remote from the place of entry of said insulating material by the application of air-exhausting means to said location, whereby the insulating material is caused to completely fill the space at said location, withdrawing air from said space at successive confined locations until said space is filled with insulating material by moving said air-exhausting means along said liner in substantially timed relationship to the deposition of the insulating material, removing said temporary liner and securing a permanent inner liner against said insulating material.

8. A method of insulating a cabinet including a relatively air-impervious outer casing, said method comprising supporting within said casing a temporary foraminous liner defining with said casing a space having an opening in the front of the cabinet, securing a sealing means over said opening in a manner to leave apertures for the introduction of insulating material into said space, introducing insulating material into said space, withdrawing air from said space through said temporary foraminous liner at a confined location remote from said apertures by the application of air-exhausting means at said location, whereby the insulating material is caused to completely fill the space at said location, withdrawing air from said space at successive confined locations as said space fills with the insulating material by moving said air-exhausting means along said liner in substantially timed relationship to the deposition of said insulating material, removing said temporary liner and said opening sealing means, and securing a permanent inner liner against said insulating material.

9. A method of insulating a cabinet including a relatively air-impervious outer casing and an inner liner having a multiplicity of closely spaced minute perforations distributed throughout its area, said casing and liner defining a space therebetween, and said cabinet including an opening to said space at the front thereof, the method comprising conveying insulating material into said space through said opening, withdrawing air from said space through said perforated liner at a con-

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fined location remote from said opening by the application of air-exhausting means at said location, whereby the insulating material is caused to completely fill the space at said location, and withdrawing air from said space at successive confined locations as said space fills with insulating material by moving said air-exhausting means in substantially timed relationship to the deposition of the insulating material.

10. A method of insulating a cabinet including a relatively air-impervious outer casing and an inner liner having a multiplicity of closely spaced minute perforations distributed throughout its area, said casing and liner defining a continuous space therebetween, and said cabinet including an opening to said space at the front thereof, the method comprising conveying insulating material into said space through said opening, withdrawing air from said space through said perforated liner at a confined location remote from said opening by the application of air-exhausting means at said location, whereby the insulating material is caused to completely fill the space at said location, withdrawing air from said space at successive confined locations as said space fills with the insulating material until the space is completely filled by moving said air-exhausting means along said liner in substantially timed relationship to the deposition of said insulating material, and securing framing pieces in position to close said opening.

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