May 30, 1933. F. L. CHASE 1,911,432

REFRIGERATING APPARATUS

Filed Feb. 19, 1930 2 Sheets-Sheet 1

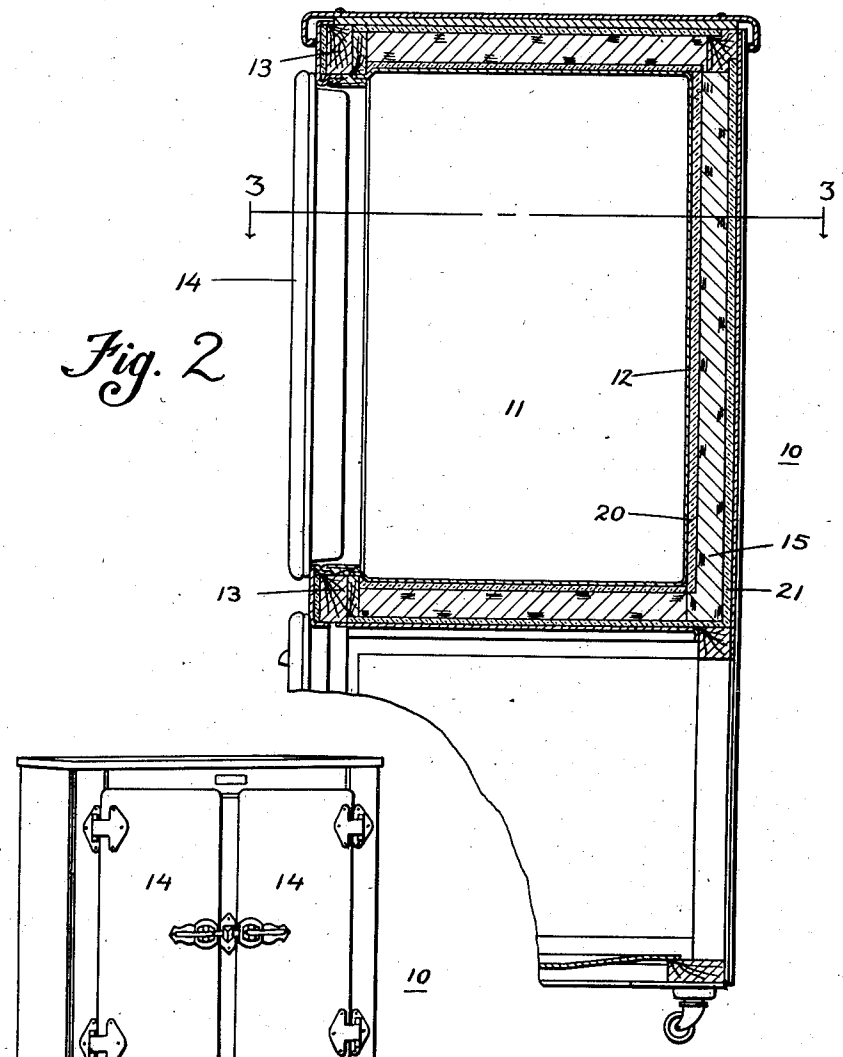


Fig. 2

Fig. 1

Frederic L. Chase INVENTOR

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REFRIGERATING APPARATUS

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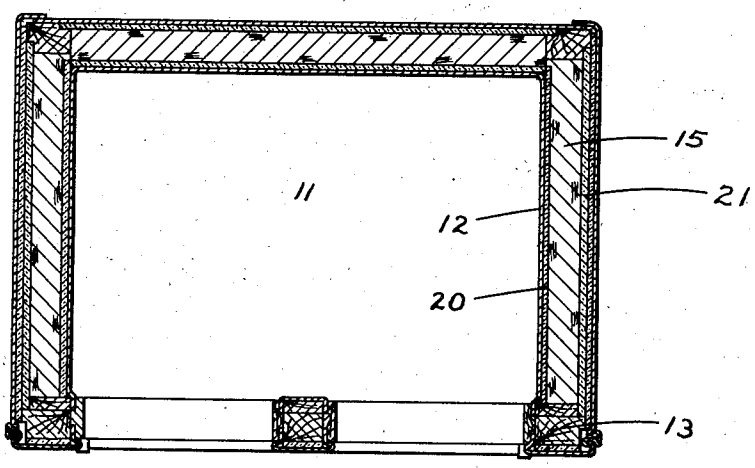


Fig. 3

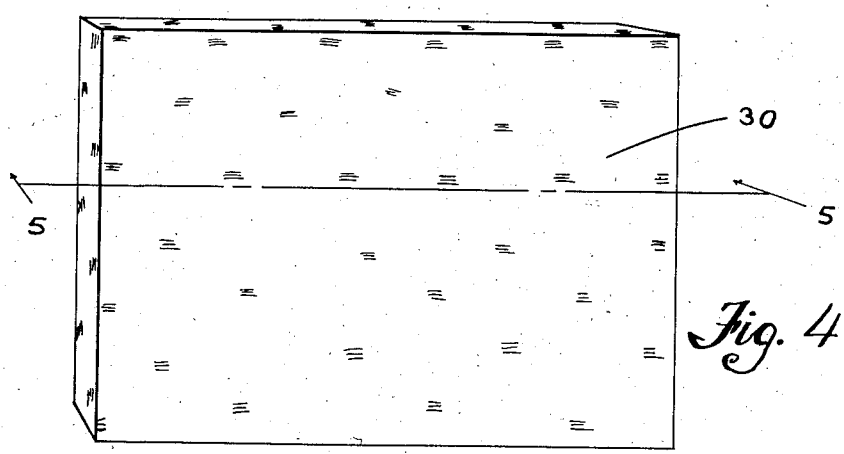


Fig. 4

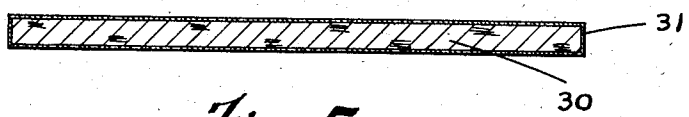


Fig. 5

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Patented May 30, 1933 1,911,432

UNITED STATES PATENT OFFICE

FREDERIC L. CHASE, OF DAYTON, OHIO, ASSIGNOR TO FRIGIDAIRE CORPORATION, OF DAYTON, OHIO, A CORPORATION OF DELAWARE

REFRIGERATING APPARATUS

Application filed February 19, 1930. Serial No. 429,750.

This invention relates to refrigerating apparatus and more particularly to insulating material and a method of manufacturing said insulating material for use in the wall of refrigerator cabinets, employing refrigerating apparatus.

One of the objects of this invention is to provide an improved insulating material and more particularly to provide a method of manufacturing the improved insulating material.

A further object of this invention is to provide a self-sustaining heat insulating board having as its basic constituent rock or slag wool which may be coated with an asphaltic material to prevent condensation of moisture within the insulating material. More particularly to provide a heat insulating material of the above type, which will prevent the penetration of the asphaltic material into the insulating material to any substantial degree, thereby preserving the insulating qualities of the material.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a perspective view of a refrigerator cabinet embodying features of this invention;

Fig. 2 is a view in vertical section through the refrigerator cabinet;

Fig. 3 is a view in horizontal section on the line 3—3 of Fig. 2;

Fig. 4 is a perspective view of one slab of the insulating material, and

Fig. 5 is a diagrammatic sectional view on the line 5—5 of Fig. 4.

In the drawings, I have disclosed a refrigerator cabinet for the purpose of presenting more clearly the use and purpose of my improved insulating material. The cabinet is shown generally at 10 and includes a refrigerated food compartment 11, the walls of which are heat insulated to prevent the in-flow of heat to the compartment. This compartment is shown as comprising a metal lining 12 which, for the purposes of this invention, may be attached to the framework 13 of the cabinet in any known manner. The particular type of cabinet herein disclosed has been described and illustrated in the copending application of Henry P. Braeutigam and William C. Holbrook, Serial No. 257,989, filed February 29, 1928, and reference thereto may be had for a more detailed description of the cabinet and its associated parts.

It should be understood that the metal lining 12 extends around five sides of the compartment 11, the front being open to allow access thereto through the door members 14. Slabs of insulating material 15 are secured to the lining, as more fully disclosed hereinafter. In this connection, it should be noted that the boards are cut to conform substantially to the shape of the walls, that is, there is a board for the top, one for each side and one for the bottom. Or, if desired, a plurality of slabs may be used for the walls of the larger cabinets.

The insulating material herein disclosed is a self-sustaining insulating board containing as its basic ingredient a substance known as rock or mineral wool. This substance is a product of rock or slag which has been heated to the melting point, and which has been treated at that temperature by a stream of air or steam to form the slag into fibrous material. Many methods for manufacturing this slag or rock wool are already known, and undoubtedly many new methods will be developed, any one of which may be used as an auxiliary factor in this invention.

The rock or mineral wool obtained by any known process is then made into a self-sustaining board. This may also be accomplished in any of the known ways. For reasons that will be hereinafter more fully set forth, however, I prefer to form the self-sustaining board by the process of coating the individual rock or slag fibers with an asphaltic or bituminous cement. The treated fibers should then be pressed into the desired shape and dried to force out the moisture. Or if so desired, the moisture

may be driven off before the treated fibers are pressed into the desired shape.

Such self-sustaining board-like substances as above described, have been heretofore used in the construction of refrigerator cabinets. In such constructions great care must be taken to prevent the spoiling of the insulating material which may be caused by condensation of atmospheric moisture within the insulating material, due to the low temperature within the compartment 11. One method of preventing such spoiling of the insulating material has been to coat the material with a pitch-like bituminous cement which may be a refined petroleum product having a softening point between 180–200° F. This material has been applied in various ways such as for example, by dipping the board into the hot bituminous cement and thereafter, applying the treated board to the refrigerator lining. Another method and probably the preferred one has been to coat the exterior surface of the refrigerator lining 12 with the pitch-like material and then to apply the board to the treated lining. Thereafter to completely seal the insulating material, another layer of asphaltic or bituminous cement has been, heretofore, applied to the wall structure. By the aid of the drawings, Figures 2 and 3, such a construction may be visualized. Therein, the lining 12 is shown as coated with the asphaltic material 20 to which the slabs of the insulating boards, made as above set forth, are attached. Around the outside of the insulating material, a second layer of the asphaltic material is shown at 21. It should be noted that the insulating material is made completely water or moisture proof in that it is completely sealed by the asphaltic material and the frame work of the cabinet.

In actual practice it has been found in cabinets made as above that the bituminous or asphaltic material penetrates into the insulating board and this invention is concerned with an insulating material which will prevent such penetration.

It has been found in actual tests that at an asphaltic temperature of 375° F., a normal penetration of the asphalt into the insulating material is obtained. By normal penetration is meant a penetration of between $\frac{1}{32}$ and $\frac{3}{32}$ of an inch on each face of the insulating material. Such a penetration amounts in effect to a substantial decrease of efficiency of the insulating material since the asphalt is a better conductor. With higher penetrations this decrease will obviously be greater and the amount of asphalt necessary to give a satisfactory coating will also be increased. In addition, it will readily be seen that the actual amount of insulating material necessary will be increased.

To prevent this penetration I have discovered that a solution or emulsion of certain materials such as a starch paste or flour paste is particularly effective. This may be applied by spraying solutions of flour or starch paste with or without fillers onto the insulating board. The addition of the filler is not necessary to stop the penetration of the asphalt but aids materially in showing just where the material has been sprayed and consequently when a complete covering has been obtained. In the use of these materials it is, of course, necessary to drive out the moisture before coating or applying the hot asphalt. This may be accomplished by heating to a temperature of 300° F. for approximately 15 minutes.

Such sealing solutions of starch or flour capable of completely preventing the penetration of hot asphalt may be made up in accordance with the following formulæ.

1

20 grams flour in 400 cc. cold water
1 gram $CuSO_4$ (copper sulfate) fungicide, for preventing fungus growth
Heat until it thickens, stirring constantly.

2

50 grams Gilders whiting (filler)
500 cc. tap water
150 cc. of solution #1

3

100 cc. sodium silicate 40° Bé.
100 cc. 3% starch solution

An extremely thin coating, or in fact nothing more than a spray of any of the above solutions will prevent penetration of the hot asphalt to a certain degree, while a good coating will totally prevent such penetration.

In all cases the above mixtures may be applied by means of a spray and the material may be oven dried to drive off the moisture.

In Figures 4 and 5, an attempt has been made to diagrammatically show this step. The insulating board in the form of self-sustaining material made from rock wool as above set forth is shown at 30 and the coating (greatly exaggerated for illustrative purposes) is shown at 31.

It should be understood that this insulating material, thus treated, may be applied to the cabinet in either of the two ways set forth above or any other way. Either way, it may be sealed by the asphalt and there will be no penetration of the asphalt into the insulation.

I have also found other embodiments that are available for preventing to a slight degree, the penetration of the asphalt above described. For example, emulsified asphalt will stop the penetration to a certain extent.

There are the objections, however, to emulsified asphalt that if the moisture is not completely removed from the coating, there will be a bubbling of the hot asphalt when it is applied over the emulsified asphalt. Then in case the emulsified asphalt is thoroughly dried by heat, this heat will cause the emulsified asphalt to soften and it will penetrate into the insulating board.

Still another method of preventing the penetration of the asphalt to a certain extent is in the use of a solution of asphalt in mineral solvents. This remedy is only about as effective as the emulsified asphalt, however, and is open to the same objections.

Calcium carbonate in powdered form when sifted over the surface of the insulating board, will stop the penetration to a certain extent but it is difficult to apply, and results in a rather poor adherence of the hot asphalt to the insulating board.

Sodium silicate solutions are also effective to a certain extent in preventing the penetration of the asphalt and there is no bubbling when the heated asphalt is applied. Sodium silicate is rather difficult to spray, however, and also has a tendency to crawl on the surface of the insulating board. This latter defect, however, may be eliminated to a certain extent by the addition of clay or some other collodial agent.

Of all the above substances named, the flour or starch paste is the preferred material for preventing the pentration of the asphalt and is particularly desirable when mixed with a filler to indicate when the surface has been completely covered.

It should be noted that the particular problem, namely the prevention of the penetration of the asphalt, is a problem of considerable importance and that this invention provides a new insulating material and a new method of making such an insulating material capable of preventing the penetration of the asphalt into the insulating material.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. For a refrigerator including insulating walls, the insulation of which is sealed against the condensation of moisture therein, a slab of insulating material including as its basic constituent, a rock wool product compressed into a self-sustaining form, said product being treated with a substance capable of preventing the penetration of the sealing medium into the slab.

2. For a refrigerator including insulating walls, the insulation of which is sealed against the condensation of moisture therein by a covering of asphalt, a slab of insulating material including as its basic constituent a rock wool product compressed into a self-sustaining form and treated with a substance capable of preventing the penetration of the asphalt into the slab.

3. For a refrigerator including insulating walls, the insulation of which is sealed against the condensation of moisture therein by a covering of asphalt, a slab of insulating material including as its basic constituent a rock wool product compressed into a self sustaining form and treated with a starch or flour paste capable of preventing the penetration of the asphalt into the slab.

4. For a refrigerator including insulating walls, the insulation of which is sealed against the condensation of moisture therein by a covering of asphalt, a slab of insulating material including as its basic constituent a rock wool product compressed into a self-sustaining form and treated with a starch paste containing a filler for preventing the penetration of the asphalt into the slab.

5. For a refrigerator including insulating walls, the insulation of which is sealed against the condensation of moisture therein, a slab of insulating material compressed into a self-sustaining form and treated with a substance capable of preventing the penetration thereinto of the material used for sealing the slab.

In testimony whereof I hereto affix my signature.

FREDERIC L. CHASE.