

June 27, 1933.

R. H. McKEE

1,915,940

ART OF THERMAL INSULATION

Filed Aug. 19, 1929

Fig. 1.

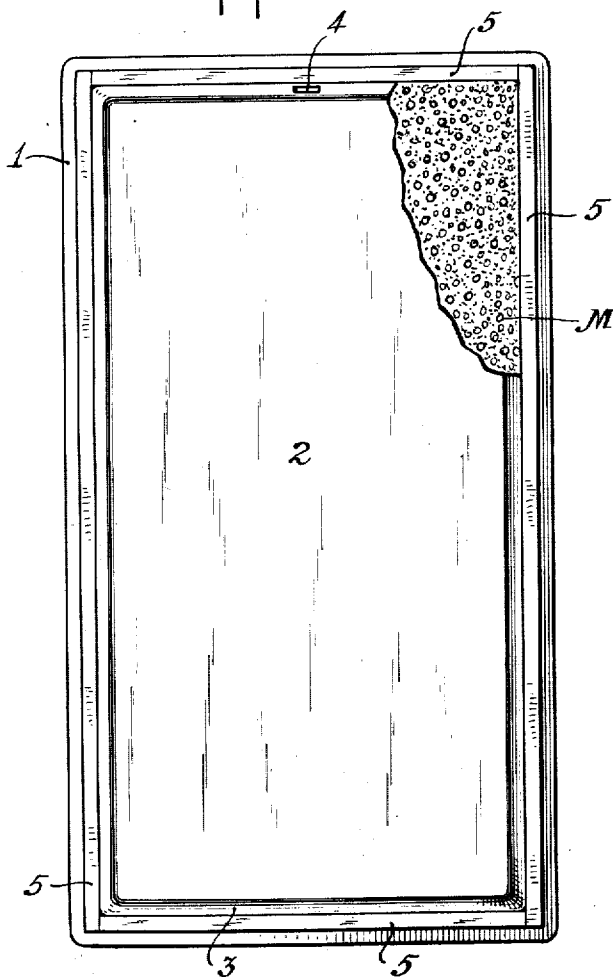
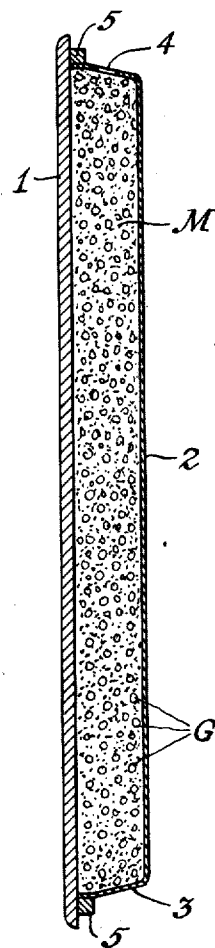


Fig. 2.



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ART OF THERMAL INSULATION

Application filed August 19, 1929. Serial No. 337,021.

The present invention relates to the art of thermal insulation and more particularly to a thermal insulator and a process of making the same.

Heretofore many types of insulators have been proposed and used in apparatus such as ice-boxes, refrigerating systems and the like for retaining the cold within the ice-box and keeping the heat from the surrounding environment from entering the interior of the box. Among the materials previously used may be mentioned cork board, cork dust, cotton batting, etc. These materials have many disadvantages but one of the main disadvantages is that when they are placed in the wall of a refrigerator such as a refrigerator freight car, storehouse or even a household refrigerator, the space filled with the insulating material breathes in and out due to changes in temperature and in atmospheric pressure. Moist air goes in the space and the moisture condenses on the cold surfaces so that only dry air is exhaled from the said space. Due to this condensation within the insulated space a collection of moisture takes place within the space. It is commonly known that such insulating walls decrease approximately 20% in insulation value the first three months after installation. Many attempts have been made to remedy the shortcomings of prior insulating materials but none as far as I am aware, has provided the art with an economical, practical, and satisfactory material for commercial purposes.

I have discovered a thermal insulator for cold systems which is free from the objections of prior materials and which can be manufactured and used on an economical and practical scale. In addition my invention has the object of providing the art with an extremely light insulator which has a porous cellular structure and which self-heals, if cracked. It is also within the contemplation of my invention to provide an insulator which does not breathe so that a space between the walls of a refrigerator can be filled completely and sealed hermetically. Other objects and advantages of the invention will become apparent from the following descrip-

tion taken in conjunction with the accompanying drawing, in which:

Fig. 1 is a front elevation of a refrigerator door embodying my invention, parts being broken away for purposes of clarity; and

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

A typical example which is illustrative of my invention is as follows:—

Pitch from coal tar or petroleum, for instance, is hard and solid at ordinary temperatures but will melt at moderate temperatures, say somewhat below the boiling point of water. When pitch of the aforesaid type is molten, I have found that when it is treated with gases under pressure, for instance carbon dioxide or other non-combustible gas under 300 pounds of pressure, considerable quantities of these gases are dissolved in the molten pitch. With higher pressure more gas is dissolved. The resulting solution of gas in the molten pitch can be run into a container where the dissolved gas will be released and a porous cellular mass of excellent insulating material is produced. The specific gravity of these porous pitch insulating structures has been found to vary from 0.50 to 0.75 whereas the specific gravities of the original pitches varied from 1.15 to 1.30.

The solution of the gas in the molten pitch is not instantaneous and it was found that a period of from one to two hours of contact of the gas under pressure with the pitch is a satisfactory period of time. The longer the period of time the more nearly complete saturation of the molten pitch with gas is achieved.

When the pressure on the gas is increased, more gas will be dissolved and more cells will subsequently be formed in the mass of material. The greater the number of cells in the solidified pitch, the lower is the density of the product. Porous, cellular pitch masses can be made with densities as low as 0.25. Masses having such low densities have excellent insulating qualities but have weak mechanical strength.

Instead of using a gas directly to saturate the mass of molten pitch, substances liberat-

ing a gas can be mixed with the molten pitch and then heated to liberate gas which will blow up the mass of pitch. For instance, sodium bicarbonate or ammonium sesquicarbonate can be mixed with molten pitch and then heated somewhat to drive off the gas from the carbonates. Of course, other compounds readily evolving a gas can serve in place of the carbonates but sodium bicarbonate is one of the best as well as one of the cheapest salts to use for this purpose.

Since my improved insulating material can be melted very easily, it can be poured into the wall of a refrigerator and allowed to solidify. The "poured insulator" when set and hardened is a desirable, efficient and inexpensive insulator for refrigerating systems and the like.

In any cases where it is desirable and appropriate ground cork, pumice stone or similar substances can be mixed with molten pitch and then the mixture treated with gas as described hereinabove.

When it is desired to obtain an insulator with a large amount of gas maintained therein, the walls of the container or the like can be chilled with cold water. For instance, the door of a household refrigerator is made of steel and has a filling opening in the upper corner or at one side. Molten pitch carrying the dissolved gas is run through the opening into the interior of the door and the escaping gas makes the mass porous and cellular so that the interior of the door is filled with my improved porous, insulating material. If it is desirable to retain more gas in the insulating mass, the outside of the steel door can be chilled with running water or can be dipped in a water bath. In either event the poured insulator will contain more gas than if no chilling were used. The opening in the door may be left without any special cover or may be covered and painted after the molten pitch has solidified.

In the handling of my improved material, the poured insulator may be made in the place where it is required or the material can be made in one place and shipped to the point of use. In the preferred method of carrying out the last mentioned procedure, pitch is melted in a shipping container and gas under pressure is run in until the required amount of gas has been dissolved in the pitch. The gas pressure is maintained on the molten pitch while the latter is solidifying in the container. The solidified pitch can be shipped in the container and, when required for use, can be heated up to the melting point. This molten mass can then be poured into the walled space to be filled with the insulating material and on pouring, it becomes porous.

Another use of my improved insulating material is for insertion into the wall of a house by pouring the material between parts of the wall. For this purpose there is best

introduced a considerable proportion of inorganic porous material like granular pumice stone or pieces of low density porous gypsum.

My improved insulating material can be used in conjunction with walled spaces or chambers of various types. In the present instances, a refrigerator door embodying the invention will be described and illustrated merely by way of a typical example.

Referring more particularly to Fig. 1, the numeral 1 designates the front wall of a refrigerator door of a household refrigerator, for instance. The front face is usually plain and is provided with hinges and a handle which are so well known that they have not been illustrated.

On the rear face of wall 1 a casing or lining 2 which is preferably made of metal, is affixed by suitable means such as welding, screws, bolts, rivets, or other appropriate means. The casing may have any suitable shape but I prefer to employ a rectangular configuration with sloping sides 3. In the present instance, the rear face of wall 1 constitutes the back portion of the casing, although it is to be understood that the back portion can be made integral with the front and side walls of the casing.

An opening 4 of, say, rectangular cross section is provided on the top side of the casing through which the latter may be filled with my new insulating material. After the casing is filled, the opening may be painted or otherwise closed to finish off the top in a smooth and attractive manner.

Surrounding the sides of the casing and affixed to the rear face of wall 1 is a plurality of strips 5 of a cushioning material such as rubber, wood, or the like. These strips insure a tight joint between the inside of the door and its frame in the refrigerator when the door is in a closed condition.

The procedure involved in filling the casing of the refrigerator door with my improved insulating material is obvious to those skilled in the art. A mass of my material is heated sufficiently to convert it into a fluid condition or state so that it can flow or can be poured readily and conveniently from a container. When the material is in this condition, it is poured into the casing until the latter is preferably completely filled. Upon cooling and setting, the insulating material will seal the interior of the casing hermetically and will prevent air from passing into and out of the casing with the deposition of moisture. In other words the objectionable process of "breathing" referred to hereinabove is eliminated and all of the disadvantages incident thereto are eliminated.

It is to be noted that due to the self-heating nature of my new insulating material, a walled space or chamber can be maintained in a sealed condition permanently because the material heals any cracks or fissures or the

like, which may tend to develop due to shocks, handling, etc.

It is to be further noted that the presence of carbon dioxide bubbles will tend to render the insulating material non-inflammable.

I claim:—

1. A thermal insulator comprising a poured non-water absorbing, non-brittle, plastic, cohesive pitch material having a porous, cellular structure containing a non-combustible gas and having the property of self-healing.

2. A thermal insulator comprising a substantially homogeneous mass of non-brittle, plastic, cohesive pitch containing a multiplicity of cells imprisoning a non-combustible gas and incapable of "breathing" in a walled space, said pitch being capable of self-healing.

3. A thermal insulator for cold systems comprising a mass of non-brittle, plastic, cohesive pitch of a porous and cellular structure having a non-combustible carbon-containing gas enclosed within said structure, said pitch being capable of self-healing.

4. A thermal insulator for cold systems comprising a mass of non-brittle, plastic, co-

hesive pitch of a porous and cellular structure having carbon dioxide gas incorporated in said mass of pitch, said pitch being capable of self-healing.

5. A walled space containing a mass of non-brittle, plastic, cohesive pitch having a multiplicity of cells imprisoning a non-combustible gas incorporated therein, the said pitch sealing the said space hermetically and preventing "breathing" and being capable of self-healing.

6. A refrigerator door having a lining containing a porous, non-brittle, plastic, cohesive pitch mass filled with bubbles of a non-combustible gas and sealing the said lining hermetically, said pitch being capable of self-healing.

7. A refrigerator door having a lining containing a porous, non-brittle, plastic, cohesive pitch mass filled with gas bubbles of carbon dioxide and sealing the said lining hermetically, said pitch being capable of self-healing.

In witness whereof I have hereunto set my hand.

RALPH H. McKEE.

CERTIFICATE OF CORRECTION.

Patent No. 1,915,940.

June 27, 1933.

RALPH H. McKEE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 126, for "self-heat-" read "self-heal"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of October, A. D. 1933.

F. M. Hopkins

(Seal)

Acting Commissioner of Patents.

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