

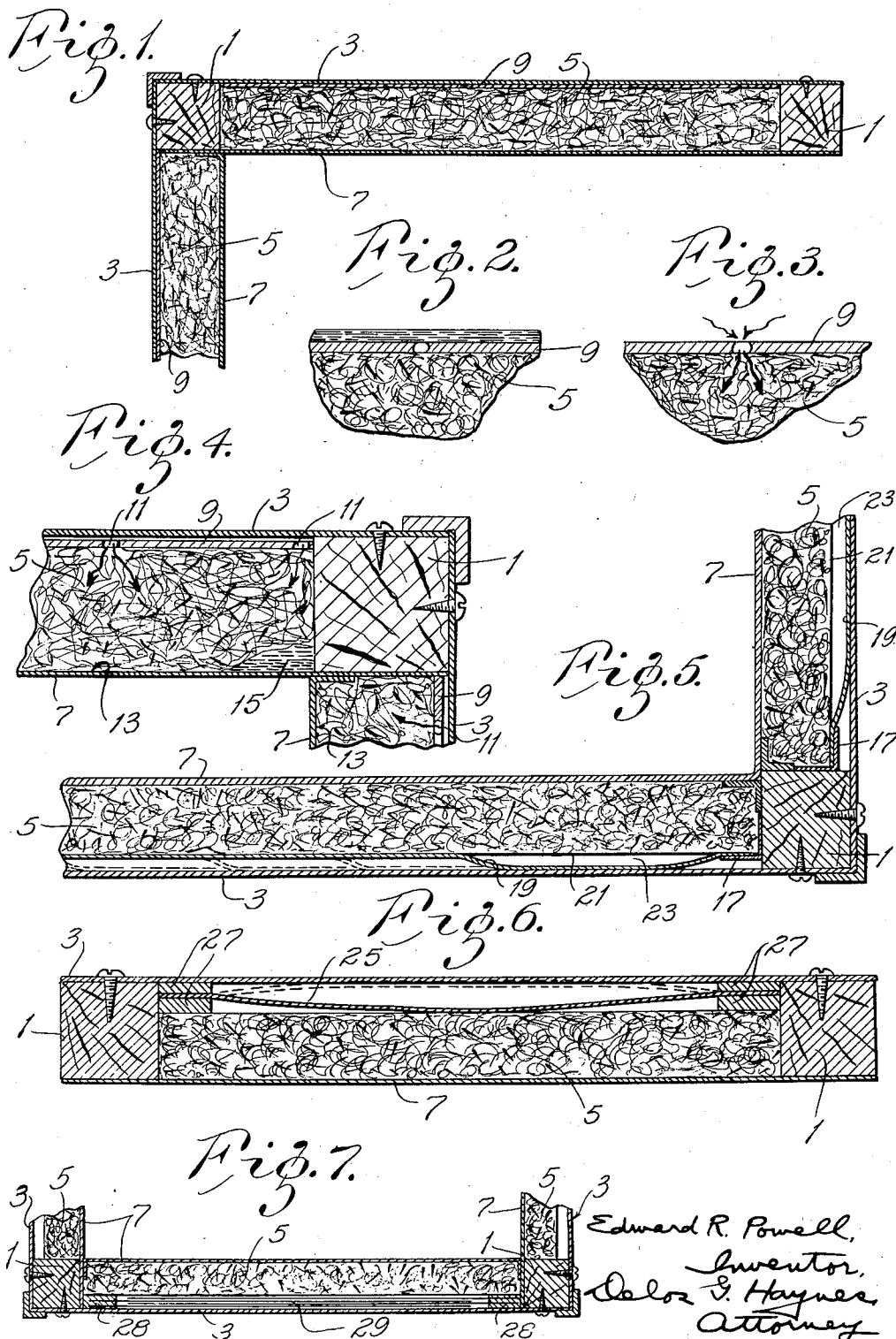
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HEAT INSULATING WALL CONSTRUCTION

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HEAT INSULATING WALL CONSTRUCTION

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This invention relates to improvements in heat-insulating wall constructions and the like, and particularly to means for the prevention of the accumulation of moisture within refrigerator walls.

Among the several objects of this invention may be noted the establishment of means for positive exclusion of moisture-laden air from the air-cells which make the insulation effective, the provision of an insulated wall which will permit so-called breathing freely and, at the same time, be air-tight, the provision of means for permitting free expansion of air into and out of an insulating block without permitting moisture-laden air to contact with its cold inner surfaces so as to cause condensation, and the provision of an insulated wall of the class described which can be easily and cheaply constructed and which is durable. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing in which are illustrated three of various possible embodiments of the invention,

Fig. 1 is a sectional view of a wall, preferably a refrigerator wall;

Fig. 2 is an enlarged sectional view of a portion of the insulation shown in Fig. 1;

Fig. 3 is an enlarged sectional view of the insulation under different conditions than exist in Fig. 2;

Fig. 4 is a sectional view illustrating the condensation of moisture-laden air on an insulated wall;

Fig. 5 is a sectional view illustrating one embodiment of the invention;

Fig. 6 is a sectional view illustrating a second embodiment of the invention; and,

Fig. 7 is a sectional view of a third embodiment. Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Referring now more particularly to the drawing, Fig. 1 illustrates in section a conventional refrigerator wall construction, in which numeral 1 indicates a wooden corner post, 3 indicates an exterior sheet metal casing, 5 indicates an insulating material and 7 indicates an interior sheet metal lining. This illustration is exemplary of the refrigerator construction in common use today. It has several notable disadvantages, which will be set out hereinafter. The insulation material 5, whether it be cork board, rock cork, hair felt or any of the other fibrous insulating materials is absorbent towards water; but in order to

keep it at its best insulating value, it is desirable that it be kept dry. On the other hand expanded rubber of certain kinds has such a well-defined cellular structure and the cells are so nearly air-tight that breathing effects are not always present. But these breathing effects with their prior disadvantages are always present in an insulation of fibrous character whether the fibers are coated or uncoated, loose or molded into blocks. For this purpose the insulation is generally coated with asphalt, as illustrated at 9, on the side which is not in tight connection with an air-tight sheet metal lining. This construction is assumed to be waterproof because if water is poured on the asphaltized surface, it runs off immediately and does not wet the surface. However, it is not altogether true that this asphalt coating is waterproof, as will appear hereinafter.

When the air contained in the pores of the insulating material is subjected to change in temperature, the air expands and contracts, undergoing an appreciable change of volume. Under confined conditions, the effect is an appreciable change of pressure. It may be mentioned that in the average heat insulating material approximately eighty to ninety per cent of the total volume is occupied by air; therefore, the expansion is for all practical purposes the same as if there were no insulating material present. In consequence, the heat insulating material must have an outlet for the increased volume of air contained therein, and the air frequently enters and enlarges minute holes or pores in the asphalt coating. When the temperature drops, and the volume inside contracts, there is created at these minute pores a suction or negative pressure, and any film of water which may be upon the surface is drawn inwardly to dampen the insulating material (see Fig. 2). If there is no film water on the asphalt surface, moisture-laden air may be drawn in, accomplishing the same deleterious end, as is illustrated in Fig. 3. As stated, this is deleterious to the insulation, and renders it in fact almost useless. The alternate giving out and taking in of air, as described, is commonly called "breathing".

Fig. 4 illustrates how a slab of insulation which admits air at a few places 11 quickly becomes saturated with water. The cold inner surface 13 of the refrigerator condenses the water in the moisture-laden air and saturates the insulation, as is illustrated at 15. As a result of this action the insulation quickly becomes useless for insulating purposes. It has been found that at times the so-called waterproofing does more harm than good.

It is not commercially feasible to build refrigerators with the insulation in absolute air-tight panels which enclose a substantially constant volume. Such panels would probably have

to be built of thin metal sheets with all seams soldered or welded, and would need to be tested for air-tightness. As a result it would be extremely difficult to produce a number of containers that were entirely air-tight without a large percentage of the number being rejected; thereby increasing the production costs. In addition, such a metal container would not be entirely practicable to use, as it probably would be unable to withstand the pressures generated, which, it has been shown, amount to over two hundred pounds per square foot with a temperature change or increment of sixty degrees Fahrenheit. This pressure would be more than sufficient to buckle a thin sheet of metal and destroy soldered or welded seams.

My invention comprises the provision of means for allowing for a free expansion of air into and out of the insulating material without permitting moisture-laden air to contact with the cold inner surface and condense to effect the ruination of the insulation.

Fig. 5 illustrates one form of the invention. In this form the asphalt coating 9 is entirely eliminated. The insulation block 5 composed of rock cork or cork board or other fibrous insulating materials is so cut as to fit snugly against the inner sheet metal lining 7 and the wood corner post 1. An angular flashing strip 17 is placed between the wooden post and the insulation material with its upper end overlapping the top of the block of insulation. This flashing strip continues substantially all the way around the block of insulation and provides the means for holding to the edge thereof a flexible air-tight diaphragm 19. This flexible air-tight diaphragm is formed with a reflex, curved surface which may expand or be flexed, for example, as illustrated in the alternative positions (in dotted lines) so as to allow a large increase in volume of contained gases, and at the same time prevent admission on contraction of any moisture-laden air. The principle on which this operates is that the surface 21 of the insulation, being unhampered by the presence of an asphalt or other coating, "breathes" freely into the open space 23 between said surface 21 and the diaphragm 19 pushing out said diaphragm. As a result there is little or no excess pressure set up, the volume increasing substantially so as to accommodate any or excessive increase in pressure and maintain the total pressure substantially equal to the exterior pressure. As a result there is no tendency to leak at the inner surfaces and edges of the block of insulation.

Fig. 6 illustrates an alternative form and second embodiment of the invention which comprises a flexible air-tight tough, coated paper diaphragm 25 constructed with a concave formation, with which it is possible to take up the expansion of air and take an over-centered, expanded, bulged or buckled position illustrated by the dotted line. In this embodiment the diaphragm is supported at each side by block supports 27, which hold the diaphragm at a suitable distance from the insulation surface.

Fig. 7, illustrating a third embodiment of the invention, shows a trap made of layers of paper 29, laid in piled position and alternately joined at opposite ends to the end supporting members 28 so as to permit expansion but retard or pre-

vent to a great extent by providing a tortuous path the mixing of the cold dry air in the insulation with the relatively warm moist air outside.

The layers of paper constitute a flexible sealing diaphragm secured at its outer edges and provided in the midportion with means for facilitating flexing, including discontinuous overlapping portions.

The principle set forth is that a diaphragm is in some fashion held to the surface of the insulation so as to permit expansion of the air therein without substantial increase in pressure therein, and at the same time prevent the entrance of warm moist air into the insulation block.

The three embodiments set forth are merely exemplary of the range of modification of panel construction which is comprehended by this invention. For example, the diaphragm may be made of cloth or paper saturated with rubber, oils, waxes, and asphalts and such materials. Flexibility is desirable, so that the response to increased pressure will be immediate, eliminating opportunities for the air to be dissipated at the edges. This invention comprehends the simultaneous use of two or more diaphragms in a structure, such as, for example, a combination of modifications shown in Figs. 5 and 7. In this instance it is desirable that the third embodiment be placed adjacent to the insulation inside of the first embodiment. With this structure, if the exterior diaphragm for some reason broke down, the interior diaphragm would serve as a seal and diffusion would be substantially prevented.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. The heat insulating wall construction which comprises spaced interior and exterior sheets of protective sheathing, heat insulating material disposed therebetween, a diaphragm having a reflex surface attached to the exterior surface of said insulation material and defining a space with the exterior sheathing and adapted to buckle under conditions of increased pressure within said insulation material and substantially accommodate said increase in pressure.

2. The heat insulating wall construction which comprises interior and exterior protective sheathings, insulation material therebetween affixed to said inner protective sheathing, a diaphragm with reflexed curvature attached by means of a flashing strip extending around the edge of the insulation to said insulation material, defining a space with the exterior sheathing, and adapted to increase the space between said diaphragm and said insulation material when an increased pressure is set up within said insulation material, and at the same time substantially prevent any flow of air or other fluid from the exterior surrounding into the insulation material.

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