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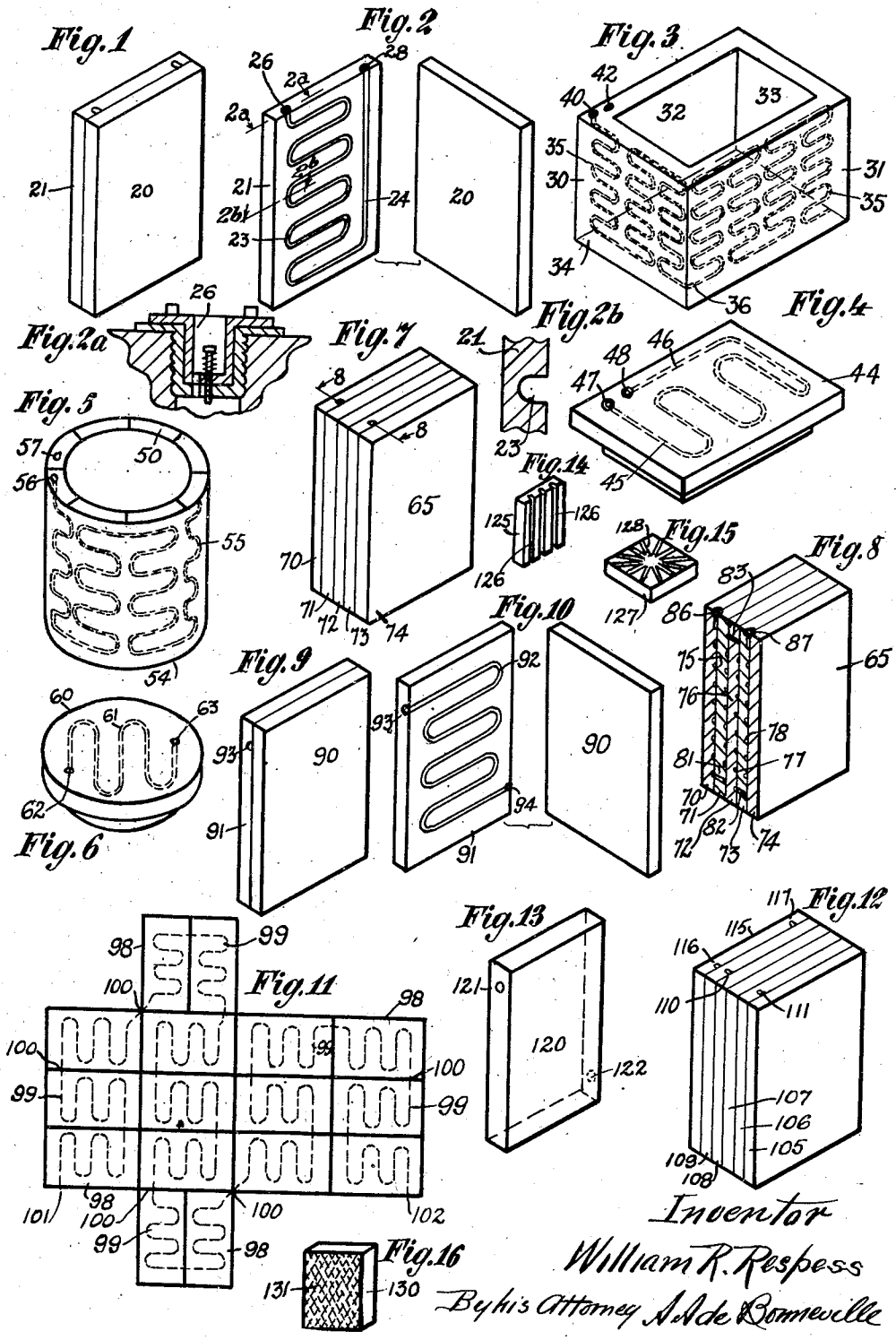

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HEAT, COLD, AND SOUND INSULATING MATERIAL

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This invention relates to a heat, cold and sound cellular insulating material, formed into pads, boards, slabs and sheets of various forms and thicknesses, which also function as cushioning agents for receptacles and the like.

The object of the invention is the production of insulating material, which by reason of its special construction, and the material composing it, produces an insulator for heat, cold and sound, of high efficiency. The second object of the invention is the production of an insulating material which can easily be permeated with warm air to dry it. The third object of the invention is the production of an insulating material which can be permeated with cold air to chill all portions thereof. The fourth object of the invention is the production of an insulating material in the interior of which a partial vacuum is easily produced, to obtain the highest efficiency for the material as a heat, cold and sound insulator. The fifth object of the invention is the production of an insulating material specially applicable in the construction of refrigerators, buildings, containers, and the like.

In the accompanying drawings, Fig. 1 represents a perspective view of an exemplification of a pair of sheets of the material having incorporated therein interconnecting cells; Fig. 2 represents the pieces of material indicated in Fig. 1, separated from each other showing additional structure; Fig. 2^a indicates an enlarged section of Fig. 2 on the line 2^a, 2^a; Fig. 2^b shows an enlarged section of Fig. 2 on the line 2^b, 2^b; Fig. 3 represents a perspective view of a box, or container constructed of the improved insulating material; Fig. 4 shows a perspective view of a cover for the box; Fig. 5 shows a perspective view of a cylindrical container or box constructed of the improved insulating material; Fig. 6 shows a perspective view of a cover; Fig. 7 shows a perspective of a block comprising a plurality of the sheets of the insulating material; Fig. 8 represents a section of Fig. 7 on the line 8, 8; Fig. 9 represents a perspective view of a block composed of a pair of sheets of the improved material with a modification; Fig. 10 represents a perspective view of the blocks indicated in Fig. 9 separated from each other; Fig. 11 shows a plan view of the walls of a container before being assembled in place; Fig. 12 indicates a perspective view of a modification of a block of the insulating material; Fig. 13 indicates a perspective view of the sheet of insulating material with a modification; Fig. 14 shows a perspective view of a modified sheet of the insulating material for one of the walls of a container; Fig. 15 represents a cover and Fig. 16 shows a perspective of another modification of the sheet of material.

Referring to Figs. 1 and 2 the insulating material is, in this instance, indicated to consist of a block comprising the sheets 20 and 21. Each sheet in this instance consists of interconnecting cellular material, such as newspaper pulp, wood pulp, eel grass, corn stalk pulp, wood, gypsum, clays, vegetable fibers, cork, hair and the like. In fact various fibrous or porous materials may be used. Each of the sheets is coated with a practically air and water proof material made of, preferably, cotton seed oil pitch. If the blocks are to be used in the construction of a container, for the protection of a cold product, the outer faces of the blocks comprising the container has mixed with its coating of pitch white clay and the like, and the inner faces of the blocks comprising the container has mixed with its coating of pitch, aluminum powder. The special coating on the outside of the blocks prevents absorbtion of heat from the outside to the inside of the container, and the special coating on the inside faces of the blocks prevents radiation to the inside of container, providing a barrier against the passage of any heat and moisture which may have entered the sheets of the material. If the container is used for the preservation of warm material the coatings just described above are reversed. Either the white clay or aluminum may be incorporated with the coating on either side of the sheet. Spar varnish, asphalt and various other water proofing materials may be used instead of the cotton seed oil pitch above referred to, and it is understood that the pitch coatings can be used without the addition of aluminum and white clay.

The material which is the essential subject matter of this invention, is cellular in construction from its very nature and method of manufacture, the said cells connecting with one another. After the material constituting the sheets is made, it is heated to dry out and remove the air and moisture therefrom, and then the sheet is immediately dipped in the pitch or coating which effects a partial vacuum in each sheet after the coating has dried.

When a plurality of the sheets are connected together to constitute a block of the material, the adjoining faces are covered with the coating of the pitch to bind them together.

Referring particularly to Fig. 2, the sheets of material are again indicated at 20 and 21. The sheet 21 has formed on its inner face a serpentine channel or conduit indicated at 23 with a longitudinal member 24. The pitch covering is applied to all the faces of said block 21, but does not enter the serpentine channel or its longitudinal member 24. The cross sections of the serpentine channel and its longitudinal member 24 are practically semi-circular in cross section. An inlet valve 26 is connected to the serpentine channel at its inlet end and a similar outlet valve indicated at 28 is connected to the outlet end of longitudinal member 24.

When the sheet 21 is thus prepared and the sheet 20 has also been coated with the pitch coating, the adjoining faces of the sheets are connected with some of the coating.

Referring to Fig. 3, a box or container is shown, comprising the vertical walls 30, 31, 32 and 33 and bottom wall 34. Each of the vertical walls and bottom wall has incorporated therein a plurality of the serpentine channels or conduits indicated at 35.

The serpentine channels constitute one continuous conduit, as indicated for example in the walls 30 and 31 and are connected as indicated at 36. The channels in the bottom are also continuous and in a similar manner are connected to the channels in the vertical walls. The inlet valve for the serpentine channel is shown at 40 and the outlet valve is indicated at 42. These valves are similar to the valve indicated at 26. The cover at 44 for the container indicated in Fig. 3 is shown in Fig. 4 and has incorporated therein the serpentine channel or conduit 45 with the longitudinal member 46. The inlet valve for the channel 45 is indicated at 47 and the outlet valve at 48, which are both similar to 26.

The inlet valves and the outlet valves 40 and 42 may be omitted, and the ends of the conduit in the container may have connecting members to the serpentine conduit 45, and by means of this construction the valves 40 and 42 may be omitted and the valves 47 and 48 function for both the container and its cover.

Referring to Figs. 5 and 6, a cylindrical container is indicated, having a vertical wall comprising the sections 50 and a bottom 54 connected thereto. The serpentine conduit or channel is indicated at 55, having the inlet valve 56 and the outlet valve 57, similar to 26. The cylindrical wall may be made in one unit without the sections 50 referred to. The cover for the cylindrical container is indicated at 60 with a serpentine conduit 61 having the inlet valve 62 and the outlet valve 63, similar to 26.

Referring to Figs. 7 and 8, a plurality of sheets of the insulating material are connected to each other to constitute a block 65. The sheets of the insulating material are indicated at 70, 71, 72, 73 and 74. A serpentine channel or conduit 75 as already described is provided for the sheet 70, a serpentine channel 76 is provided for the sheet 71, a serpentine channel 77 is provided for the sheet 72, and a serpentine channel 78 is provided for the sheet 73. The serpentine channels are connected by the cross members 81 and 82 at their lower ends, and are connected by the cross member 83 at their upper ends to constitute a continuous channel through the block. The inlet valve shown at 86 and the outlet valve at 87 are similar to 26.

Referring to Figs. 9 and 10, a pair of sheets of the insulating material are indicated at 90 and 91. In the sheet 91, is incorporated the serpentine conduit 92 having the inlet valve 93 and the outlet valve 94. This modification is used when a plurality of the blocks are located horizontally in line with their vertical sides abutting against each other.

Referring to Fig. 11 there is shown a plurality of pads, sheets or pads of material each of which is indicated in its entirety by the numeral 98. Each pad has a channel 99 formed therein and the said channels are interconnected by connecting members 100. The assembling of the various pads constitutes insulation for a container with a top wall, bottom wall, side walls and end walls. The continuous conduit is provided with the inlet valve 101 and the outlet valve is shown at 102, similar to 26.

Referring to Fig. 12 a block is shown with the sheets of the material 105, 106, 107, 108, 109 which are provided with the usual serpentine channels as already described, having the inlet valve 110, and the outlet valve 111, similar to 26. An additional sheet of the insulating material is indicated at 115 with a serpentine conduit having the inlet valve 116 and the outlet valve 117. The serpentine channels with the valves 110 and 111 are connected to each other to make one continuous conduit, by means of cross members as already described, and shown in Fig. 8. The serpentine channel having the inlet valve 116 and outlet valve 117 is not connected to the other channels of the block. In making up a container with this form of block the outside surface thereof would comprise the

sheets 105 and the inside surface of the container would comprise the sheets 115. The serpentine channel with the valves 116 and 117 is used for holding cold gas for the purpose of creating a blanket of cold gas around the product being preserved. The conduit having the valves 110 and 111 contain a partial vacuum and are for the purpose of maintaining the temperature of the cold gas in the other conduit.

Referring to Fig. 13 a sheet of the heat, cold and sound cellular insulating material similar to 20, is indicated at 120, and has connected thereto the inlet opening 121, at one end, and the outlet opening 122, which are directly inserted in said material and to which valves may be connected. The said valves are directly inserted in said material without the use of any serpentine conduit as indicated at 23 and 24 in Fig. 2.

It is to be noted that the sheets and blocks described may constitute the walls of a container without any outside receptacle therefor, but they may also constitute the inside lining of a container. The container just described of insulating material may be located within an outside container of various different materials. Also a container of various materials may be located within the container of insulating material. By this construction there is produced a container with an outside shell, an inside shell, and a lining between them of insulating material.

In Fig. 14 is indicated a sheet of the material 125 similar to 20 having channels 126 on its outer face. In Fig. 15 is shown a cover 127 made of the cellular material with the channels 128 on its outer face. In Fig. 16 is indicated a sheet of material 130 similar to 20 having the metallic mesh 131 incorporated therein.

Various modifications may be made in the invention, and the present exemplification is to be taken as illustrative and not limitative thereof.

Having described my invention, what I desire to secure by Letters Patent and claim is:

1. The combination of a block comprising a plurality of heat, cold and sound cellular insulating sheets of material, each with a partial vacuum therein, a coating for each sheet of material and means to connect the sheets together.

2. In combination, a heat, cold and sound insulating cellular material, a coating for said material, an inlet valve and an outlet valve inserted in said material.

3. In combination a heat, cold and sound insulating cellular material, a coating for said material and a conduit formed in said material having an inlet at one end and an outlet at its other end.

4. In combination, a heat, cold and sound insulating cellular material, a water and air-proof coating for said material, a conduit formed in the material, an inlet valve at one end of said conduit and an outlet valve at its other end.

5. The combination of a plurality of heat, cold and sound insulating sheets of material, a water and air proof coating for each sheet of material, functioning also as binder between the adjacent sheets to form a block, a conduit formed in the adjacent faces of the sheets, connecting members for the conduits to form one continuous channel in the block, an inlet valve for one end of the channel and an outlet valve for the outer end of the channel.

6. The combination of a plurality of blocks of heat, cold and sound insulating material, a water and air proof coating for each block, a channel formed in each block, conduits connecting the adjacent ends of the channels in the blocks to form one continuous channel through all the blocks, the blocks adapted, located and secured in a container and the like to form a container wall of insulating material with a continuous conduit throughout, an inlet valve at one end of the continuous conduit and an outlet valve at its outlet end.

7. The combination of a plurality of sheets of heat, cold and sound insulating material forming a block, a water and air proof coating for each sheet functioning also as a binder between the adjacent faces of the sheets, a channel between each pair of sheets and formed therein, connecting members for the channels to form a continuous conduit, an inlet valve for one end of the conduit and an outlet valve for its outer end, an additional sheet of said material connected to said block, a channel formed with the latter sheet, independent of said conduit, an inlet valve for one end of the latter channel and an outlet valve for the other end of the latter channel.

8. The combination of a heat, cold and sound insulating cellular sheet of material, a water and air proof coating for said sheet, a conduit formed in said sheet having an inlet end and an outlet end and channels formed on the outer face of the sheet.

9. The combination of a heat, cold and sound insulating cellular sheet of material, a water and air proof coating for said sheet, a conduit formed in said sheet and extending therethrough and having an inlet end and an outlet end and a stiffening element imbedded in the sheet.

10. The combination of a heat, cold and sound insulating cellular sheet of material, a water and air proof coating for said sheet, a conduit formed in said sheet and extending therethrough having an inlet end and an outlet end and a metallic mesh imbedded in said sheet.

In testimony whereof I affix my signature.

WILLIAM R. RESPESS.