Feb. 14, 1961 E. D. BAYLEY, JR 2,971,616

BUILDING PANEL

Filed Dec. 6, 1956 2 Sheets-Sheet 1

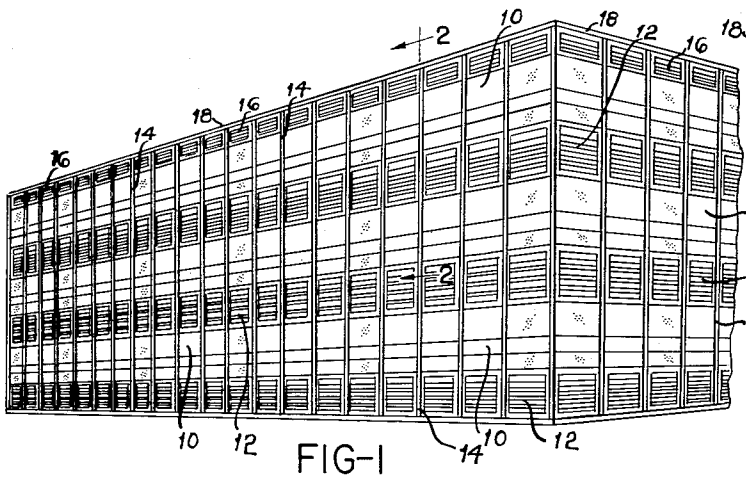


FIG-1

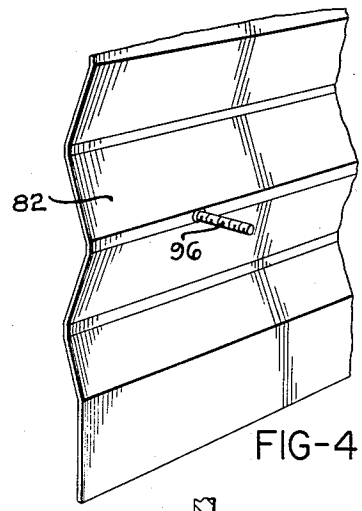


FIG-4

FIG-3

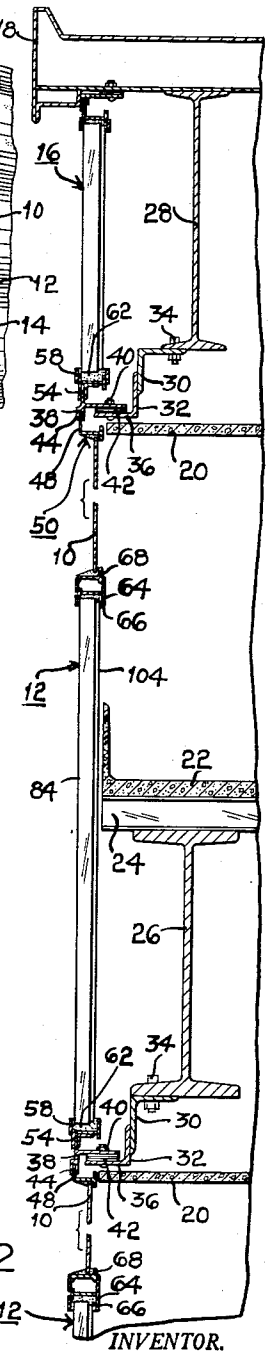


FIG-2

INVENTOR.
ELDEN D. BAYLEY, JR.
BY Dyburg & Jacox
ATTORNEYS

Feb. 14, 1961 E. D. BAYLEY, JR 2,971,616

BUILDING PANEL

Filed Dec. 6, 1956 2 Sheets-Sheet 2

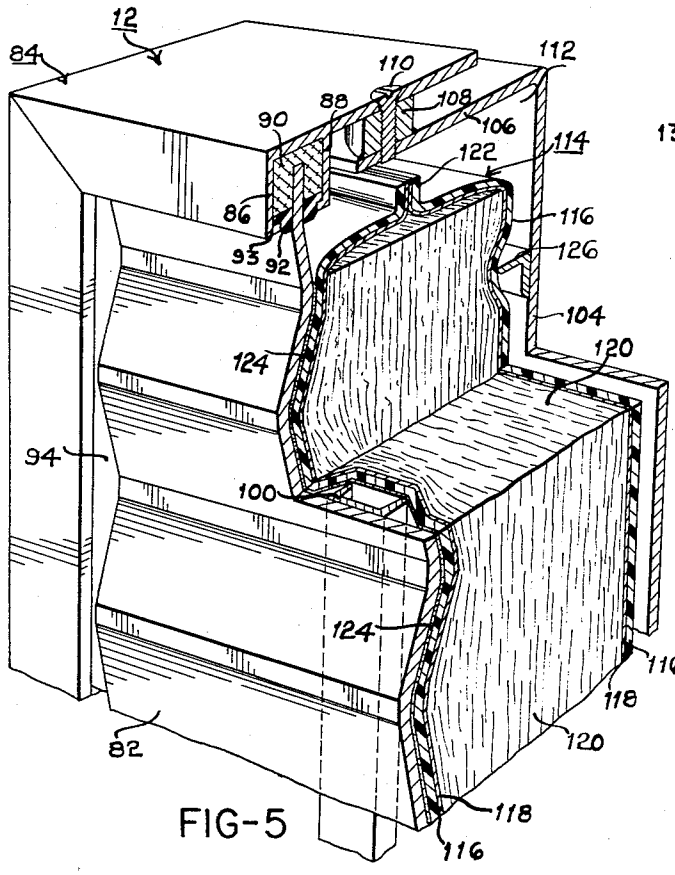


FIG-5

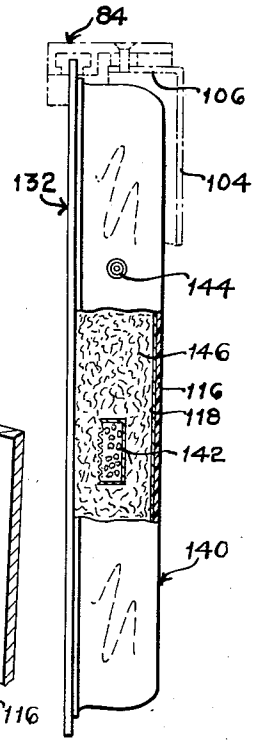


FIG-6

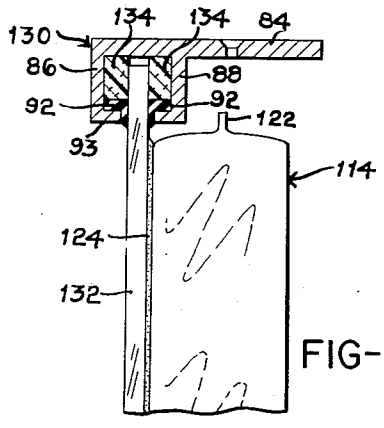


FIG-7

INVENTOR.
ELDEN D. BAYLEY, JR.
BY Dybvig & Jacox
ATTORNEYS

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BUILDING PANEL

Elden D. Bayley, Jr., Springfield, Ohio, assignor to The William Bayley Co., a corporation of Ohio

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10 Claims. (Cl. 189—34)

This invention relates to a building panel and more particularly to a building panel having separate thermally insulated interior and exterior panel members secured within a suitable frame, although not necessarily so limited.

An object of this invention is to provide a building panel having separate spaced interior and exterior panel members, wherein an insulating pouch is provided between said members, the construction being such as to exclude moist air from the pouch and from the inner surface of the exterior panel member as a means of preventing condensation of moisture in the pouch and on the inner surface of the exterior panel member when the panel is exposed to low temperatures.

Another object of this invention is to provide a building panel having separate interior and exterior panel members secured within a frame, wherein the exterior panel member is thermally insulated from the frame and the interior panel member as a means of reducing heat transfer through the panel.

Still another object of this invention is to provide a building panel having separate interior and exterior panel members secured within a frame, whereby considerable flexbility in the surface contour of the panel members is permitted.

Another object of this invention is to provide a building panel having separate interior and exterior panel members, wherein concealed reenforcing means are provided for structurally reeinforcing at least one of the panel members permitting sacrifices in the structural strength of the reenforced panel member for the sake of decorative appearance.

Still another object of this invention is to provide a novel insulating pouch for use in the interior of the aforesaid building panel.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawings,

Figure 1 is a fragmentary perspective view of a building constructed with the panels of this invention.

Figure 2 is an enlarged sectional view, taken substantially along the line 2—2 of Figure 1.

Figure 3 is an enlarged sectional view of a supporting assembly for the panel of this invention.

Figure 4 is an enlarged fragmentary perspective view of an exterior panel member used in fabricating the panel of this invention.

Figure 5 is a fragmentary perspective view, with portions shown in section, of the panel of this invention.

Figure 6 is an enlarged side elevation view, with portions broken away and other portions shown in phantom, illustrating a modification of the panel of this invention.

Figure 7 is an enlarged fragmentary elevation view, with parts shown in section, illustrating another modification.

As will become more apparent in the following, the figures illustrate a skin wall construction typically referred to as a "horizontal system" for the reason that the panels are supported principally by horizontally ordered supports. It is to be understood, however, that the panels of this invention may be utilized with equal effectiveness in "vertical systems" wherein the individual panels are supported by vertically ordered supports, such as vertical mullions.

Referring to the drawings in detail, Figure 1 illustrates a typical skin wall building construction, wherein alternate tiers of ventilator windows, indicated at 10, and building panels, indicated at 12, are assembled between spaced upright mullions 14. The building is crowned by suitable head panels 16 adjacent a cornice structure 18.

As shown in Figure 2, the skeletonal structure of the building includes alternate spaced ceilings 20 and floors 22, the latter being supported by joists 24 which rest upon I-beams 26. The I-beams 26 are associated with the main supporting framework of the building, not illustrated. The building is so constructed and arranged that an I-beam 26, or the equivalent, is provided under each floor of the building extending parallel and adjacent the outer wall thereof. The outer wall structure is anchored to and supported in part by these I-beams.

Similarly, an I-beam 28 is provided under the cornice structure 18 to provide an anchor for the upper portion of the outer wall structure.

A typical assembly for anchoring the outer wall structure to the I-beams 26 and 28 is illustrated in Figure 3. The assembly comprises first and second angle clips 30 and 32, respectively, welded together and bolted to the lower flange of the I-beam 26, or 28 as the case may be, with suitable bolts 34. The angle clips 30 and 32 cooperate to provide a horizontal lug 36 disposed in spaced parallel relation to the I-beam 26, or 28, and projecting into the plane of the outer wall. Lugs 36 are thus provided between each pair of adjacent mullions 14 in close proximity to each ceiling 20 of the building. Separate means, not shown, are employed for securing the spaced mullions 14 to the supporting framework of the building.

Horizontal supporting rails 38 are secured to the lugs 36 by bolts 40 disposed at spaced intervals. The rails 38 are adjusted to a predetermined vertical elevation with suitable metallic spacers illustrated at 42. Horizontal adjustment is enabled by placing slotted holes in the lugs 36.

Each rail 38 is provided with a downwardly projecting channel portion 44 having a channel 46 therein for receiving a flange 48 integral with the frame 50 of a window 10. Each rail 38 is further provided with an upwardly projecting flange 52 to which a member 54 and an angle bar 56 are welded. A vertical channel element 58 is bolted to the outer side of the member 54 and a welded inner channel assembly 60 is bolted to the angle bar 56. The channel element 58 and the assembly 60 cooperate to provide a substantially rectangular channel 62 for receiving the lower margin of a panel 12, or 16, as the case may be.

The channels 46 and 62 are packed with a suitable calking compound, which aids in retaining the window frames and panels in proper position and which also compensates for differential thermal expansion and contraction of the various elements comprising the wall structure.

Similar channels packed with a calking compound are provided in the mullions 14, whereby the panels and windows may be assembled in tiers between adjacent vertical mullions and between adjacent horizontal supporting rails 38.

As shown in Figure 2, the window frames 58 include a meeting rail 64 disposed at the lower end thereof having a channel 66 therein adapted to seat upon the panel 12 thereunder. The channel 66, like the channels 46 and

62, is packed with a suitable calking compound. The meeting rail or sill 64 provides a seat for the frame member 68 for the window 10, which may be outwardly projected for ventilation purposes.

It is desirable that the panels 12 and 16 be thermally insulating panels. To satisfy the thermal insulating requirements, the panels are conventionally made hollow and packed with a suitable insulating material, there generally being separate interior and exterior panel members with insulating means sandwiched therebetween comprising a single building panel.

The building construction as described above is recognized as being comparatively old and well established in the building art, and is discussed herein merely as a background for the present invention, which comprises the novel panel construction described hereinbelow. As emphasized hereinbefore the supporting structure for the panels of this invention may comprise essentially a horizontal system as shown, or a vertical system. The exact nature of the panel supporting structure is immaterial to the present invention.

In the present invention, improved insulating means for the interior of the panel have been devised along with an improved panel construction affording greater flexibility of exterior design.

The preferred embodiment of the panel of this invention is illustrated in detail in Figure 5. The panel 12 includes a rectangular exterior panel member 82 mounted in a rectangular frame 84. The panel member 82, as illustrated is crimped or plaited to emphasize the flexibility in the design of the exterior panel member.

The frame 84 is provided with spaced parallel inwardly projecting flanges 86 and 88 adjacent the outer margin thereof which cooperate to provide a channel 90 for receiving the margins of the exterior panel member 82. The channel 90 is packed with a suitable inexpensive viscous or pasty insulating and packing material for retaining the exterior panel member 82 in substantially fixed position within the frame 84. The packing material is retained within the channel 90 by elastomeric sealing strips 92 which are anchored by inwardly turned lips 93 integral with the flanges 86 and 88. The strips 92 may be applied as a viscous material that sets and forms a watertight seal for the margins of the exterior panel member 82.

The elastomeric strips 92 permit the use of inexpensive mixtures for packing the channel 90. For example, a mixture of clay dispersed in oil, or a mastic, not capable of itself of forming a bond with the metal of the frame 84 or the panel 82 may be packed within the channel 90, the mixture being protected and retained by the comparatively more expensive elastomeric strips 92.

Preferably, the frame 84 is assembled from extruded aluminum stock, the frame being assembled about the panel member 82 to permanently lock the panel member within the frame. The frame 84 is preferably bent into rectangular shape, providing suitable notches in the extruded aluminum stock for the corners, then the opposite ends are spot welded together. The panel 82, inasmuch as it is virtually suspended within the frame 84, may be of any desired composition, as for example, sheet metal, plastic, ceramic, or the like, the selection of the material of the panel 82 being dictated by decorative rather than structural requirements.

As shown in Figures 3 and 4, threaded screw elements 96 may be welded to the interior surface of the panel member 82, when this member is of crimped sheet metal composition, for the purpose of securing reenforcing bars such as the U-shaped bar 100 to the panel member 82. Nuts 102 are employed to secure the reenforcing bars in place. These reenforcing bars 100 function to prevent warping of the sheet metal panel member 82. Several such bars 100 may be employed at spaced intervals along the sheet metal panel member, the bars extending preferably in a direction normal to the direction of the plaits formed in the panel member. The panel member may have the plaited portions extending either vertically or horizontally.

The frame 84 also supports an interior panel member 104 provided with flange portions 106 at the margins thereof adapted to telescope into the frame 84. Spacers 108 disposed between the frame 84 and the flange portions 106 retain the interior panel member 104 in spaced relation to the frame 84, so as to provide an air gap communicating with the interior of the panel 12. The interior panel 104 is secured to the frame 84 in parallel opposing relation to the panel member 82 by screws 110 penetrating the frame 84 and the spacers 108 to engage the flange portions 106.

The interior panel member 104 as illustrated is of sheet metal construction as for example, aluminum. However, it is to be understood that the panel member 104 is not a load bearing panel and therefore any suitable metal or plastic construction may be employed. Inasmuch as the interior panel member 104 may form a portion of the interior wall of the building, the panel member may be given an appropriate attractive finish.

The substantially rectangular cavity 112 formed between the panel members 82 and 104 is partially filled with an insulating pouch 114. The pouch 114 comprises sheets of laminated plastic and aluminum foils 116 and 118, respectively, wrapped around a pad 120 of insulating fibers. The pouch is sealed so as to be air tight along seams 122 by any suitable means, as for example, by heat sealing the margins of the plastic foil 116. As illustrated in Figure 5, the aluminum foil 118 is innermost in the pouch 114 and is provided with a reflective surface for minimizing heat transfer through the walls of the pouch. Other non-metallic materials such as paper may be substituted for the plastic foil. When the substituted non-metallic foil is a paper foil or other foil capable of absorbing relatively large quantities of moisture, it is deemed preferable to place the metallic foil to the exterior of the pouch so as to protect the non-metallic foil from moisture.

The pouch 114 is joined at one side thereof to the inner surface of the exterior panel member 82 by an adhesive bonding agent indicated by the reference numeral 124. As clearly shown in Figure 5, the pouch wraps partially around the reenforcing bars 100 leaving small air pockets adjacent and within the bars 100. The pouch is spaced outwardly from the interior panel member 104 by spaced angle bars 126 welded or otherwise secured to that panel member.

By bonding the pouch 114 to the panel member 82, air is excluded from the inner surface of the panel member 82, thereby keeping moisture condensation, resulting from exposure of the panel member 82 to cold air, to a minimum on that surface. The only source of moisture is found in the small air pockets in and adjacent the reenforcing bars 100. The requirement for weep holes conventionally required in such panels is eliminated by this construction.

In panels wherein the exterior panel member 82 has a substantially planar inner surface, the pressure exerted upon the pouch by the angle bars 126 may be sufficient to establish intimate contact between the pouch and the inner surface of the exterior panel member, such that the adhesive bonding agent may be omitted.

The air space adjacent the interior panel member 104 communicates with the interior atmosphere of the building through the air gaps provided by the spacers 108. Thus, the interior of the panel 12 is maintained in substantial equilibrium with the ambient atmosphere of the building and moisture condensation on either side of the panel member 104 is precluded.

Figures 6 and 7 illustrate modifications of the preferred embodiment of Figure 5. The panel 130 of Figure 7 illustrates the use of a smooth planar panel member 132 as compared to the crimped panel member 82.

There is no need for the reenforcing bars **100** in this panel.

As a further modification, the viscous insulating material in the channel **90** has been replaced by fibrous plastic strips **134** which center the panel member **132** within the frame **84**. The plastic strips have the advantage of affording greater support for the panel **132** when the panel is subjected to high wind stresses. The use of plastic strips in place of the viscous insulating substance in the channel **90**, however, is an alternative which will in large part be dictated by manufacturing costs, rather than structural requirements.

Figure 6 illustrates the use of a modified pouch **140** of laminated aluminum and plastic construction, wherein the pouch is sealed directly to the exterior panel member **132**, the panel member **132** forming one side of the pouch.

In constructing the combined panel and pouch **140**, the pouch material provided with a valved inlet port **144** is first secured to the panel **132**. The air trapped within the pouch **140** is then partially evacuated and subsequently insulation fibers **146** are introduced into the pouch through the port **144** by means of a pressurized gas stream. Finally, the port **144** is opened momentarily to permit the gas pressure in the pouch to reduce to that of the ambient atmosphere to minimize strain in the pouch material. Preferably, the gas thus introduced into the pouch **140** is free of moisture to preclude moisture condensation within the pouch **140**.

As illustrated in Figure 6, moisture condensation in the pouch **140** may also be minimized by placing a packet **142** of a suitable desiccating compound in the pouch **140** during manufacture.

While not so illustrated, it is apparent that the pouch **114** of the preferred embodiment may be constructed in a similar manner, that is by blowing fibers into the preformed pouch. It is further apparent that other means not requiring the valved inlet port **144** may be employed to obtain a moisture free atmosphere in the pouch.

The insulating material sealed within the pouch may comprise glass, plastic, cotton, or wool fibers, or any other suitable insulating means.

Although the preferred embodiment and various modifications of the device and method have been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. A building panel for use in skin wall construction and the like, said panel comprising an exterior panel member, a frame surrounding said exterior panel member, said frame having an inwardly directed channel in the perimeter thereof receiving the margins of the exterior panel member, first insulation means disposed in said channel for supporting the margins of said exterior panel member in spaced relation to said frame whereby said exterior panel member is thermally insulated from said frame, an interior panel member provided with normally disposed flange portions at the margins thereof positioned telescopically within said frame, means for securing said interior panel member to said frame in spaced parallel relation to said exterior panel member, there being a cavity between said panel members, and second insulation means partially filling said cavity.

2. A building panel according to claim 1 wherein said second insulation means comprises an airtight pouch of laminated metallic and non-metallic foils, and insulating fibers packed loosely in said pouch so as to provide an insulating medium therein, said construction panel including adhesive means retaining one side of said pouch in intimate contact with the inner surface of said exterior panel member, and means for supporting the opposite side of said pouch in spaced relation to the inner surface of said interior panel member.

3. A building panel according to claim 1 wherein the means for securing said interior panel member to said frame includes spacing elements disposed between said frame and the flange portions of said interior panel member providing an air gap therebetween for admitting air to the cavity within the building panel.

4. A building panel according to claim 1 wherein one of said panel members is plaited and wherein a reenforcing bar extending normal to the plaits of said panel member is secured to the inner surface thereof at spaced intervals to prevent warping of the plaited panel member, said reenforcing bar being disposed intermediate said second insulation means and said plaited panel member.

5. A building panel for use in skin wall construction and the like, said panel comprising a plaited rectangular exterior panel member, a rectangular frame surrounding said exterior panel member, first insulation means engaging the margins of said exterior panel member and retained by said frame for supporting said exterior panel member within said frame, a rectangular inner panel provided with normally projecting flange portions at the margins thereof positioned telescopically within said frame, spacing elements disposed between said frame and said flange portions providing an air gap therebetween, means for securing said interior panel member to said frame in spaced parallel relation to said exterior panel member whereby a rectangular cavity bounded by said flange portions is provided between said panel members, and second insulation means partially filling said cavity.

6. A building panel according to claim 5 wherein said first insulating means includes a viscous insulating substance and wherein said frame is provided with channel means for receiving and retaining the insulating substance.

7. A building panel according to claim 5 wherein said first insulating means includes plastic strips engaging the margins of said exterior panel member and wherein said frame is provided with channel means for receiving and retaining said plastic strips.

8. A building panel for use in skin wall construction and the like, said panel comprising a plaited rectangular exterior panel member, a rectangular frame surrounding said exterior panel member, first insulation means engaging the margins of said exterior panel member and retained by said frame for supporting said exterior panel member within said frame, a rectangular inner panel provided with normally projecting flange portions at the margins thereof positioned telescopically within said frame, spacing elements disposed between said frame and said flange portions providing an air gap therebetween, means for securing said interior panel member to said frame in spaced parallel relation to said exterior panel member whereby a rectangular cavity bounded by said flange portions is provided between said panel members, second insulation means partially filling said cavity, said second insulation means including an airtight pouch, and insulating fibers packed loosely in said pouch, adhesive means securing one side of said pouch in intimate contact with the inner surface of said exterior panel member and means for supporting the opposite side of said pouch in spaced relation to the inner surface of said interior panel member.

9. A building panel for use in skin wall construction and the like, said panel comprising a rectangular exterior panel member, a rectangular frame surrounding said exterior panel member, first insulation means engaging the margins of said exterior panel member and retained by said frame for supporting said exterior panel member within said frame, a rectangular inner panel provided with normally projecting flange portions at the margins

thereof positioned telescopically within said frame, spacing elements disposed between said frame and said flange portions providing an air gap therebetween, means for securing said interior panel member to said frame in spaced parallel relation to said exterior panel member whereby a rectangular cavity bounded by said flange portions is provided between said panel members, and second insulation means partially filling said cavity.

10. A building panel for use in skin wall construction and the like, said panel comprising a rectangular exterior panel member, a rectangular frame surrounding said exterior panel member, first insulation means engaging the margins of said exterior panel member and retained by said frame for supporting said exterior panel member within said frame, a rectangular inner panel provided with normally projecting flange portions at the margins thereof positioned telescopically within said frame, spacing elements disposed between said frame and said flange portions providing an air gap therebetween, means for securing said interior panel member to said frame in spaced parallel relation to said exterior panel member whereby a rectangular cavity bounded by said flange portions is provided between said panel members, second insulation means partially filling said cavity, said second insulation means including an airtight pouch, and insulating fibers packed loosely in said pouch, adhesive means securing one side of said pouch in intimate contact with the inner surface of said exterior panel member and means for supporting the opposite side of said pouch in spaced relation to the inner surface of said interior panel member.

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