March 2, 1943. C. TURNER ET AL 2,312,301

HEAT INSULATING MATERIAL

Filed April 19, 1940

Fig. 1

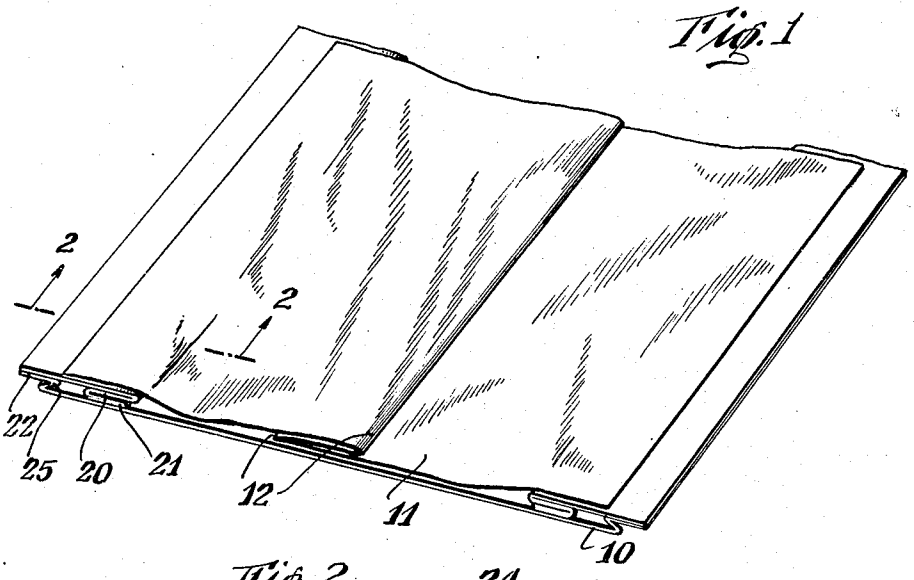


Fig. 2

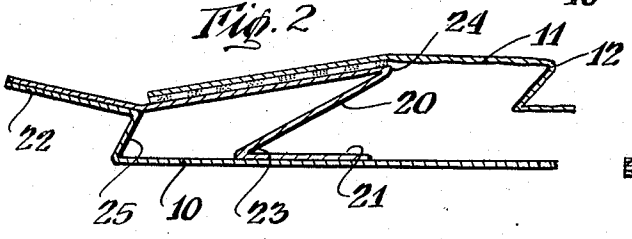


Fig. 4

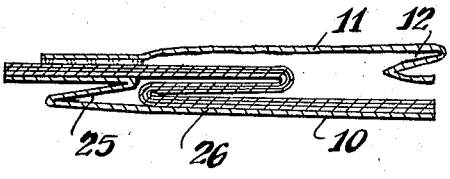


Fig. 3

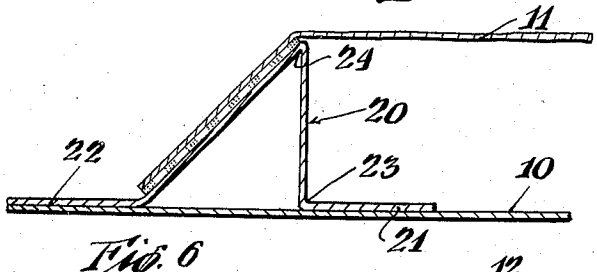


Fig. 5

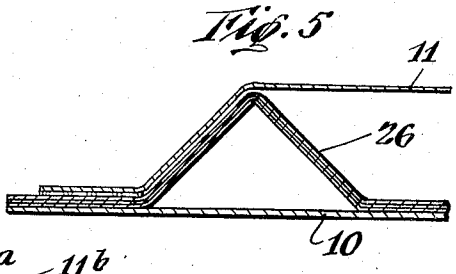


Fig. 6

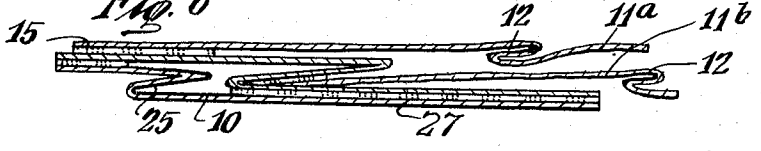
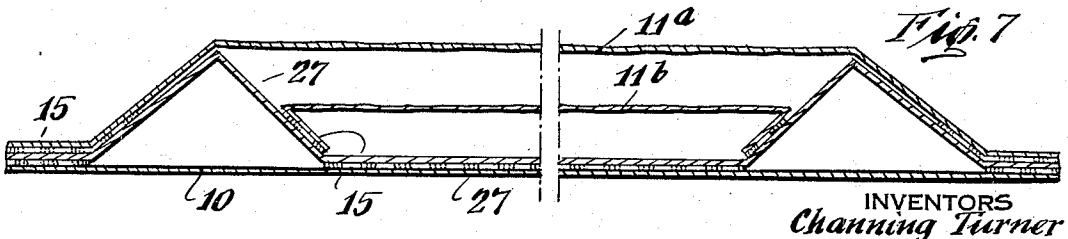


Fig. 7



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UNITED STATES PATENT OFFICE

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HEAT INSULATING MATERIAL

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Application April 19, 1940, Serial No. 330,462

3 Claims. (Cl. 154—45)

This invention relates to heat insulating material and more particularly to a substantially flat but expansible form of material containing two or more sheets having folds of excess material and adapted to be rolled up upon itself into a tight roll of any desired length or to be assembled in any other type of relatively compact mass so that it can be readily shipped.

Attempts have been made heretofore to produce a commercially satisfactory rolled form of heat insulating sheet material, but these have not proven entirely satisfactory due primarily to the difficulty of rolling the material into a tight roll without damaging it and the difficulty of installing the material in expanded form to effect the desired heat insulating air spaces between the several sheets of the material. This form of heat insulating material usually comprises one or more sheets of metallic foil or metallized surface sheet which has heat reflective properties and a foundation or base sheet to which the heat reflective sheet material is attached at spaced intervals so as to form air spaces between the foil and base sheets upon expanding the material.

In accordance with the present invention these commercial problems have been overcome and there has been produced an entirely satisfactory form of heat insulating sheeted material which will roll up into a tight roll without damaging the foil or base sheet and which can be installed very easily, requiring only a small transverse expansion of the material at the time of installation to effect heat insulating air spaces. One of the features of this new form of material is that it does not require fastening to the inside faces of the framing members of a building to effect expansion of the material and separation of the several layers to produce the heat insulating air spaces. On the other hand, the material of this invention may be fastened to the edge or narrow faces of the framing members such as studs or beams without any difficulty; and with slight lateral expansion will produce a permanent separation between the several sheets when the material has been fastened to the edge faces of the framing members. Obviously if desired the material may be cut to sheets of desired length and assembled for shipment in the form of a relatively flat compact mass or pack. However, rolling will ordinarily be preferred.

One of the fundamental principles of the heat insulating material of this invention is that the heat reflective sheet has one or more longitudinal folds away from the margins so as to cause the heat reflective sheet to lie flat when it is rolled but permitting it to be expanded to the desired position at the time of installation; and the base or foundation sheet has longitudinal folds of excess material near the margin which will unfold when the sheet is pulled slightly in a transverse direction and upon unfolding will effect the erection of spacing or bridging members between the foundation sheet and the heat reflective sheet at or near the side edges.

The folds in the foundation sheet and the heat reflective sheet are preferably so arranged that they do not conflict with each other when unfolded and ordinarily these folds should be so proportioned that when the foundation sheet is stretched to a maximum the heat reflective sheet will still be slightly creased or folded. The natural resistance to bending of the heat reflective sheet will put it under adequate tension to keep it spaced from the foundation sheet but no positive strain will be imposed upon the heat reflective sheet. In some cases the heat reflective sheet may be connected to the foundation sheet by a member, such as paper, and in such case the folds may be formed in such connecting member rather than in the heat reflective sheet itself, but ordinarily we prefer the form described.

The marginal bridging members used in the heat insulating assembly of this invention may be made in various forms and from various types of materials so long as they will lie flat approximately in the plane of the foundation sheet when the foundation sheet is in flat form for shipment and open up to form a structure which will elevate the heat-reflective sheet from the foundation sheet and maintain an air space between the heat reflective sheet and the foundation sheet.

The base or foundation sheet used in the heat insulating assembly of this invention may be made of any suitable flexible material including various types of paper and fabric or combinations thereof. The heat reflective sheet may be any suitable form of foil such as aluminum foil or any suitable form of flexible sheet material which has been provided with a heat reflective surface such as coated paper. The sheet material which is to form the bridging element between the base or foundation sheet and the heat reflective sheet will usually be of a similar type of material to the foundation sheet, but need not be and may be made of any suitable material including various forms of paper and fabric. This bridging sheet material should be folded easily so as to permit rolling up, but should nevertheless possess sufficient rigidity so that it will maintain a separa-

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tion between the base sheet and the heat reflective sheet when the assembly is expanded. Either or both the bridging sheet and the foundation sheet may be waterproofed or include water resistant material which would be conducive to forming a vapor barrier for the heat insulating assembly. Likewise the paper may be made flame-proof by treatment with any suitable chemicals conventionally used for that purpose.

Other details of the invention will be more clearly understood from the following description taken in conjunction with the accompanying drawing which illustrates certain nonlimiting embodiments of the invention and in which.

Fig. 1 is an elevational perspective view of a short length of the pre-assembled heat insulating material in substantially flat, collapsed form;

Fig. 2 is a fragmentary sectional view taken along lines 2—2 of Fig. 1 to illustrate the assembly in partially expanded form;

Fig. 3 is a sectional view showing the assembly of Fig. 2 in fully expanded form;

Fig. 4 is a fragmentary sectional view illustrating in collapsed position a modified form assembly using a reinforced sheet for the bridging member;

Fig. 5 is a sectional view showing the assembly of Fig. 4 in expanded position;

Fig. 6 is a sectional view in collapsed position of a similar form of assembly except that it has two heat reflective sheets; and

Fig. 7 is a sectional view showing the assembly of Fig. 6 in fully expanded form.

In the drawing, the numeral 10 represents a base or foundation sheet of fibrous material which will ordinarily be some form of paper. The numeral 11 designates a sheet of heat-reflective material, particularly metallic foil. As shown in Fig. 1 the sheet 11 lies closely adjacent to the sheet 10 when the device is folded flat for rolling, but (as shown for example in Fig. 3) is held spaced from the sheet 10 when the structure is expanded for installation.

Running longitudinally of the sheet 10 and approximately parallel with its sides are double folds forming openable plaits as indicated at 25. Attached to the backing sheet along each edge is a bridging member 20. The bridging members 20 are here shown as being each formed of a sheet of fibrous material such as paper folded along an approximate center line, as indicated at 24, to form two legs or side portions. One of these legs or side portions is attached to the base sheet 10 outside of a plait 25, as indicated at 22, and the other leg is attached to the sheet 10 inside of the plait 25 as indicated at 21. A fold or crease 23 in the leg nearer to the center permits the bridging member to lie flat approximately in the plane of the foundation member 10 when the device is collapsed for rolling.

By having the legs of each bridging member attached on opposite sides of a plait 25, it is apparent that when the base or foundation sheet 10 is stretched laterally, the legs of the bridging member are drawn apart to form raised ridges of generally triangular cross-section which extend along the edges of the base sheet and rise up from the base sheet. Fig. 2 shows a plait 25 partly open, with the bridging member starting to rise, and Fig. 3 shows the foundation sheet 10 fully expanded so plait 25 has disappeared.

Connected with the foundation sheet 10 outside of the plaits 25 is a heat-reflective sheet 11 which passes over the folds 24 in the bridging members. This heat-reflective sheet 11 also is provided with a plait 12 which preferably is formed near the center of the assembly so that it will not increase the thickness beyond that caused by the bridging members and the plaits 25. We have described the bridging members 20 as being two separate strips. This is our preferred form of construction, but if desired, they may be joined together and made integral with a reinforcing sheet running across the foundation sheet as indicated at 27 in Fig. 7.

The plait 25 in the base sheet 10 provides excess material that straightens out when the assembly is expanded laterally. Unfolding of this plait 25 permits the necessary movement of the bridging member 20 to effect separation between the sheets 10 and 11. The proportions and relations of the base sheet 10 to the bridging member 20 and foil sheet 11 are such that on complete and full expansion of sheet 10 no undue strain is imposed on the foil sheet 11 which would cause it to tear or cause the bridging member 20 to bend or collapse. It will be noted that only one leg of the bridging member 20 overlies the fold 25 in the foundation member and also it will be noted that the fold 12 in the foil has been removed from these folds. By arranging these folds so that there is a minimum of overlap between them, the sheet is maintained as thin as possible to permit ready rolling.

In Figs. 4 and 5 the bridging member is formed from a reinforced sheet 26. This sheet is reinforced to give it the necessary rigidity to serve as a bridging member and also to waterproof the sheet. A commercial form of such paper is so-called sandwich paper having two kraft liners with asphalt inbetween. When the assembly is expanded laterally to its full form as indicated in Fig. 10 the bridging sheet 26 assumes a substantially triangular form with equal sides which provides an efficient type of separating means for the foil and base sheets.

In the form shown in Figs. 6 and 7 there are two foil sheets 11*a* and 11*b*. Both of these sheets have plaits 12, which plaits are preferably formed at different locations so as to avoid any mating of the folds and sticking or tearing of the foil when the sheet is expanded.

As illustrated more clearly in Fig. 7 the foil sheets 11*a* and 11*b* are joined by adhesive or any other suitable means as indicated at 15, to the intermediate portions of the inner legs of the bridging sheet 27. This bridging sheet in the expanded form assumes a triangular shape and the two foil sheets 11*a* and 11*b* are joined to the two sides of the triangle as indicated. As indicated, the bridging sheet 27 may expand the full length of the base sheet 10, although this is not essential. These two sheets may be joined together continuously or only at intervals. In this embodiment the bridging sheet is made of only one ply of paper but which is sufficiently thick to function as a bridging member when the assembly is expanded.

It is to be noted that in the form of structure shown, the bridging member supports the foil away from the backing sheet. As previously stated, the structure should be such that no substantial tension is exerted on the foil. However, if the parts are so put together that expanding the backing sheet tends to put tension on the foil, the inner leg of each of the bridging members can readily collapse to prevent the foil from being torn. However, the stiffness of these legs is sufficient to keep the foil approximately flat. By this construction the foil is maintained under the

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necessary tension and yet a sufficient strain can be exerted on the foundation sheet to hold it flat without any danger of tearing the foil.

It will be understood that various substitutions and modifications may be made in the above described materials and construction without departing from the scope of our invention, some of the novel features of which are defined in the appended claims.

We claim:

1. An assembly of heat insulation material and support material adapted to be shipped in rolled form and to be opened by tension on the sides of the support material, comprising a flexible foundation sheet of fibrous material having parallel folds approximately paralleling and adjacent its sides to form openable plaits running the length of the foundation sheet, bridging members consisting of strips of fibrous material folded longitudinally to form two legs, one on each side of such fold, each such bridging member having one leg attached to the foundation sheet between its edge and the adjacent plait and having the other leg attached to the foundation sheet between the plait and the center of the sheet and each of the bridging members being folded to lie flat approximately in the plane of the foundation sheet so that the foundation sheet and the bridging member form an approximately flat assembly that can be rolled up, but said bridging members being adapted, when the plaits are opened by stretching the foundation sheet laterally, to open to form ridges of triangular section running adjacent the edges of the foundation sheet, and further comprising a flexible heat-reflective sheet connected to said foundation sheet nearer its edges than said plaits and passing over the folds in the bridging members so that when the foundation sheet is expanded laterally and said bridging members are opened, they will spread the body of the heat-reflective sheet away from the foundation sheet and hold the two sheets in spaced relation.

2. A structure as specified in claim 1 which comprises a second sheet of heat-reflective material attached to intermediate portions of those legs on the bridging members which are nearest the center of the foundation sheet so that when the foundation sheet is expanded, such second sheet of heat-reflective material will be held intermediate the foundation sheet and the first specified sheet of heat-reflective material.

3. A structure as specified in claim 1 in which only one leg of each bridging member overlies a plait of the foundation sheet and in which the heat-reflective material has a longitudinal plait spaced away from the plaits in the foundation sheet and from the bridging members whereby the thickness of the assembly is maintained at a minimum.

CHANNING TURNER.
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