

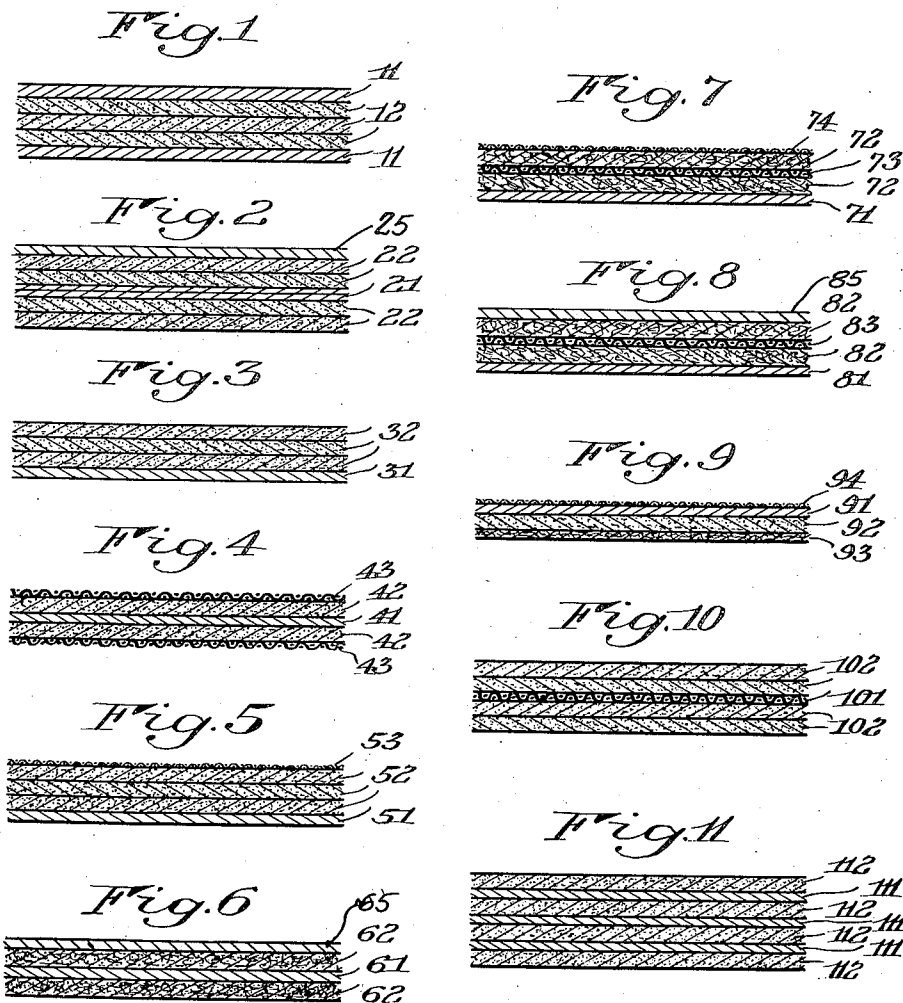
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COMPOSITE CONSTRUCTION MATERIAL

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COMPOSITE CONSTRUCTION MATERIAL

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This invention relates to a composite construction or building material and has for one of its objects the provision of a generally improved and more satisfactory construction material having a substantial amount of stiffness or rigidity and at the same time including a portion which is relatively soft or flexible.

Another object is the provision of a product especially suitable for use in constructing automobile bodies, for example, and which when so used will have a sound deadening and heat insulating effect.

Still another object is the provision of a composite building material which will have a sound deadening effect or a heat insulating effect or both when used for general construction purposes, such as being embodied in walls or floors of buildings.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawing:

Figs. 1 to 11 inclusive are diagrammatic cross-sections each taken through a different embodiment of material constructed in accordance with the present invention.

Similar reference numerals throughout the several views indicate the same parts.

The composite material of the present invention may be constructed in a considerable variety of ways, some embodiments being more useful under certain circumstances, and other embodiments being more useful under other circumstances. A number of possible embodiments are herein illustrated and described as examples. Other variations, or combinations of certain features of one embodiment with certain features of another embodiment, will be obvious to those skilled in the art.

An underlying idea of most of the various embodiments is the use of a relatively strong or rigid member to give the desired degree of stiffness to the composite material, associated with a relatively soft member providing the sound deadening or heat insulating effect, or both. The strong rigid member may be called for convenience a structural member. Preferably both the structural member and the soft flexible member are of fibrous material. For example, the strong rigid member may be of heavy cardboard, chip board, paper board, or other suitable form of fibre board preferably of a rigid, dense, and compact kind, as distinguished from porous or

cellular boards and from soft, weak, and flexible material such as felt paper, or hair felt, for example.

It is generally advantageous to have the structural member of the composite material of a fibrous nature rather than of a metallic or other mineral nature, not only from the standpoint of economy, but also because of the lighter weight of fibrous material such as paper board, and because of the fact that paper board or other fibrous materials in general have a greater sound deadening effect than metal or other mineral materials, such as plaster. Thus a structural member of paper board or the like is not so likely to give rise to sounds or squeaks, which might be produced by metallic structural members when the composite material is used in articles subject to repeated jars and vibrations, such as automobile bodies.

Referring now to Fig. 1 of the drawing, there is shown as one embodiment of the invention a composite structure including a pair of outside or liner sheets 11 of relatively stiff fibrous material, such as heavy fibre board, and a plurality of intermediate layers or plies 12 of relatively soft material placed between the liner sheets 11. The plies of this soft material 12 may each consist, for example, of a relatively thick layer of felt paper. The various plies 11 and 12 are cemented together by any suitable adhesive such as sodium silicate, which tends also to render the product fire-resistant to some degree.

In Fig. 2 of the drawing there is shown a construction somewhat the reverse of that illustrated in Fig. 1. Here the stiff structural members 21 are placed at the center of the product and in the present instance two layers or plies of heavy paper board are employed. This same idea of using two or more plies of material for the structural member may be utilized in any of the other embodiments of the invention, if preferred. On each side of this stiff structural core one or more layers of relatively soft material 22 are employed. For example, two plies of felt paper may be placed on each side of the structural core, all of the various plies being secured to each other as by means of cement or other suitable means.

In Fig. 3 there is shown an embodiment comprising only a single structural member 31 of a single ply of heavy paper board, and three plies of relatively soft material, such as felt paper, secured to one side of the structural member 31.

Fig. 4 illustrates still another embodiment employing the central structural layer 41 of stiff paper board or the like, a thick layer 42 of felt

paper or the like on each side of the member 41, and a layer 43 of textile fabric secured by cement or other suitable means to the outer face of each layer 42. The textile fabric 43 is preferably strong and coarse, such as burlap, although it may be of a fine and close weave and may be coated with a waterproofing material and/or embossed and/or decorated if desired. The layers 43 form the exposed faces of the composite structure. The word "exposed" is here used purely with reference to the composite building material itself, without regard to whether or not the face of the material is ultimately exposed to view after it has been incorporated in a finished wall or other structure.

In Fig. 5 of the drawing there is shown a construction comprising a structural member 51 of heavy paper board or the like, a layer 52 of relatively soft material formed, for example, by three plies of felt paper, and an outer layer 53 of textile fabric of a relatively fine or close weave which has been waterproofed by the use of sizing or by any suitable known method. This fabric 53 may be decorated if desired. The form of construction herein illustrated is especially suitable where the material is to be used in damp surroundings, as the waterproof nature of the layer 53 will, to a large extent, prevent moisture from entering the layers 52 and 51 and from disintegrating them or causing any breaking down of the adhesive employed between the various layers.

In Fig. 6 there is shown a central structural layer 61 of paper board or the like, having on each side a soft layer 62 of flocculent material such as wool, hair felt, or the like. In cases where it is not necessary that the product have the stiffness provided by a layer 61 of paper board, the layer 61 may be of a stiff fabric, such as coarse burlap, which will give relatively greater stiffness than the flocculent layers 62, and will fulfil the functions of a structural member, but which will still permit the composite material to be flexible to a substantial degree.

Referring now to Fig. 7, there is shown an embodiment of the invention comprising a structural member 71 of paper board or the like, to one side of which is attached adhesively or otherwise a layer 72 of soft flexible material preferably of a substantially flocculent nature, such as hair felt. When this layer 72 is of substantial thickness, it may be advisable to incorporate at an intermediate point therein a reinforcing layer 73 of reticulated fabric, for example. This may be, for instance, a layer of burlap of a relatively loose or open weave, so that the fibres of the layer 72 are felted through the burlap. If desired, another reinforcing layer 74 may overlie the exposed surface of the layer 72 and be secured thereto adhesively or in any other suitable manner. This outer reinforcing layer 74 is preferably also of a reticulated textile fabric, and may consist, for example, of a more or less open network of the same general character as ordinary cotton mosquito netting or fly screening. Such a net work helps to hold the flocculent felted layer 72 in place, but because of the reticulated character of the layer 74 the material 72 is exposed in the interstices of the net work to such an extent that it may still be considered to form a substantially exposed face of the composite material.

In Fig. 8 of the drawing there is illustrated an embodiment substantially similar to that shown in Fig. 7 except that the outer reinforcing layer 74 is omitted. In this embodiment the struc-

tural or stiffening member of paper board or other suitable material is indicated at 81, and the layer of flocculent material, such as hair felt, is shown at 82. A reinforcing layer 83 is embedded in the layer 82, this reinforcing layer being of reticulated or open weave textile fabric through which the fibres of the layer 82 are felted.

In the embodiment shown in Fig. 9, the structural or stiffening member of paper board or the like is indicated at 91. To one side of this there is attached a layer 92 of felt paper or other relatively soft material, and if an exposed surface of still softer material is desired, there may be added a layer 93 of cotton wadding, or the like. When waterproofness is desired, a layer 94 of waterproofed cloth may be cemented to the member 91 on the opposite side from the member 92, and if this side of the composite material is to be exposed to view in the final finished structure, a layer 94 may be employed even when waterproofness is not desired, such member being of cloth, good quality paper, or any other suitable or desirable material. Obviously a similar finishing layer, either waterproofed or not, may be utilized in connection with any of the other embodiments of the invention.

Fig. 10 of the drawing shows an embodiment somewhat similar to that illustrated in Fig. 2, but differing therefrom in that the structural stiffening layer 101 is of heavy textile fabric, such as burlap, instead of paper board or the like. On each side of this layer 101 of burlap there is placed a thick layer 102 of felt paper, each such layer being built up preferably of two or more plies. When a total of four or more plies of felt paper are employed in this way with a stiffening layer of textile fabric embedded therein at an intermediate point, it is found that for most purposes the resulting composite product is sufficiently strong and rigid without the use of a layer of paper board or the like, and in some cases this use of a textile fabric as an intermediate stiffening member seems to result in a product which is even stronger than when a layer of paper board is used in place of the fabric.

Another variation is illustrated in Fig. 11, in which a plurality of layers 112 of felt paper are employed, four being shown in the present instance, and between each two layers of felt paper there is interposed a layer 111 of kraft paper, paper board, or other suitable stiffening material. Because of the use of several stiffening layers 111 spaced in this way, each individual layer need not be of great thickness and it is found to be satisfactory to use simply kraft paper for each layer in place of the thicker paper board which is preferably used in some of the other embodiments.

The terms "paper board" and "fibre board" as used in this specification and in the claims are intended in a broad sense, as being practically interchangeable and synonymous with each other and include the products variously known as card board, chip board, paste board, box board and the like, as well as all boards or sheet materials which includes substantial quantities of fibre or fibrous materials, whether in the form of paper pulp or otherwise.

As briefly mentioned above, some of the embodiments previously described are more suitable for some uses and others are better adapted for other uses. For example, where a substantial degree of sound absorption is desired, the embodiments shown in Figs. 6, 7, and 8 would be especially useful because of the relatively thick layers

of flocculent material which act as excellent absorbers of sound. These layers also provide heat insulation to a substantial extent when this is desired.

5 Other embodiments of the invention, such for example, as those shown in Figs. 1 to 3 inclusive, will be especially suitable in the construction of automobile bodies where some degree of sound deadening and heat insulation is desired. The
10 use of the embodiments having one of the exposed faces of soft material, such as those shown, for example, in Figs. 2, 3, 4, 9, and 10, is particularly suitable in the construction of automobile bodies and the like because here the exposed face of the
15 soft material can be placed in contact with the metal sheathing, frame work, or other metallic parts of the automobile body (the metal sheet to be damped being shown by way of example at 25, 65, and 85, in Figs. 2, 6, and 8, respectively), and because of its soft nature it will tend to damp
20 or diminish to a considerable extent the noises created in or transmitted through the metallic parts. Also the soft faces of the composite building material in contact with the metallic parts
25 of the body will not themselves give rise to noises and squeaks to such an extent as would be the case if a building material having a hardened exposed face were placed in contact with the metallic parts.
30 Any or all of the various layers of the various embodiments disclosed may be fireproofed or waterproofed, or both, by any suitable and well known treatments. If desired, the structural member or members of fibre board or paper board
35 may be treated with an asphaltic emulsion added to the beater or applied at any point during the making of the board. Felt made of asbestos fibres may be substituted for ordinary felt paper where a high degree of fire resistance is desired. The
40 felt paper, hair felt, fabric, or other soft material may be lightly impregnated if desired with asphaltum or any waterproofing or fireproofing

material, preferably being impregnated only to an extent which will not materially stiffen the soft material or destroy the sound absorbing properties thereof. The various layers of various materials may be made up of one or several plies as preferred. The adhesive or cement used to hold the various layers or plies together may be of any desired character, either waterproof or not waterproof, as preferred.

While certain embodiments of the invention 10 have been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details described, but is intended to cover all variations and modifications 15 thereof falling within the spirit of the invention or the scope of the appended claims.

I claim:

1. A composite construction material comprising a layer of relatively strong and rigid fiber 20 board to give stiffness to the composite material, a layer of felt paper attached to said fiber board, and a layer of cotton batting attached to said felt paper.

2. A composite construction material comprising a plurality of plies of felt paper secured to 25 each other, and a layer of relatively strong and rigid fiber board secured to each side of said plurality of plies of felt paper to give stiffness to the composite material. 30

3. A construction for damping vibrations of metal sheets and absorbing sound in the vicinity thereof, comprising a body of relatively soft felt-like material lying substantially against one side 35 of the metal sheet to be damped, a layer of relatively strong and rigid fiber board secured to a substantial area of said felt-like body, and a second body of relatively soft and porous felt-like material on the opposite side of said fiber board layer from said metal sheet and secured to said 40 fiber board layer throughout a substantial area.

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