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(54) An insulating board

(57) A composite insulating board 1 comprises a first insulation body 2 of a expanded polystyrene which has an external surface 3 and an internal surface 4. The external surface 4 is profiled with elongate longitudinally extending projections 5 with elongate longitudinally extending recesses 6 therebetween. The internal surface 4 is generally flat. The composite insulating board 1 also comprises a second insulating body 10 of a foam such as polyisocyanurate foam which extends from the internal surface 4 of the first insulating body. An open mesh armature 20 between the first insulating body 2 and the foam 10 to provide enhanced bonding between the polystyrene body 2 and the foam 10 at the interface therebetween. The introduction of an armature veil 20 on top of the polystyrene prior to laying down of the liquid foam reactants, prevents the reactants from coming into direct contact with the polystyrene surface prior to initial foaming. When the reacting liquid expands a small amount of the foam thus formed is forced through the armature 20 and adheres to the surface of the polystyrene. This results in enhanced fusion between the polystyrene and the foam without damage to the polystyrene.

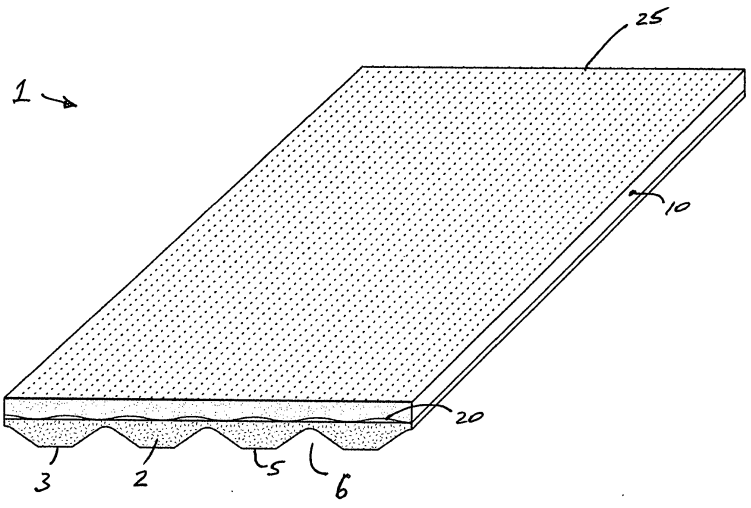

Fig. 1

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Description

Introduction

[0001] The invention relates to composite insulating boards.

[0002] There are many roofs which have been clad with asbestos sheets. Whilst such roofs are generally safe if untouched, if it is required to renew the roof the asbestos sheets must be removed. Because of the dust generated during removal and break-up of the asbestos sheet such roof renewals must be carried out by specialist contractors and the removed asbestos sheeting presents major problems of disposal. Consequently, removal of old asbestos roofing sheets is very expensive and, therefore, impractical in the majority of situations.

[0003] This invention is directed towards providing a solution to at least some of these problems.

Statements of Invention

[0004] According to the invention there is provided a composite insulating board comprising:-

a first insulating body of a first insulating material having an external surface and an internal surface, the external surface being profiled;

a second insulating body of a second insulating material which is different from the first insulating material and extends from the internal surface of the first insulating body, the second insulating material comprising an insulating foam; and

an open mesh armature between the first insulating body and the insulating foam to enhance bonding between the first insulating body and the insulating foam at the interface therebetween.

[0005] In one case the first insulating material is a polystyrene.

[0006] The polystyrene is preferably profiled to conform to a corrugated roof panel.

[0007] In one embodiment he insulating foam comprises a polyisocyanurate foam.

[0008] The armature may comprise a glass fibre veil.

[0009] In one embodiment the external face of the insulating foam has a facing material. The facing material may comprise a non-woven glass fibre mat.

[0010] The invention also provides a method for manufacturing a composite insulating board comprising the steps of:-

providing a first insulating body of a first insulating material, the first insulating body having a profiled external surface and a generally flat internal surface;

applying an armature to the flat internal surface of the first insulating body;

laying down liquid foam reactants onto the armature;

applying a facer over the liquid foam reactants;

heating the composite body thus formed in an oven, the foam, on expansion, passing through the armature and contacting the internal surface of the first insulating body; and

curing the composite insulating board thus formed.

[0011] In one embodiment the first insulating body is provided on a conveyor and the method comprises advancing the first insulating body to an armature applying station prior to lay-down of the liquid foam reactants.

[0012] The armature may comprise a glass fibre veil.

[0013] The first insulating body may be of polystyrene.

[0014] The foam may be a polyisocyanurate foam.

[0015] The facing may comprise a glass fibre mat.

Brief Description of the Drawings

[0016] The invention will be more clearly understood from the following description thereof given by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is an isometric view of a composite insulating board according to the invention;

Fig. 2 is a cross sectional view of the board of Fig. 1;

Fig. 3 is an enlarged cross sectional view of part of the board;

Fig. 4 is an isometric view illustrating the composite board of the invention, in use, on a roof; and

Fig. 5 is a diagram illustrating steps in the manufacture of the composite insulating board of the invention.

Detailed Description

[0017] Referring to the drawings and initially to Figs. 1 to 3 thereof there is illustrated a composite insulating board 1 according to the invention. The board 1 comprises a first insulation body 2 of a first insulation material which has an external surface 3 and an internal surface 4. It will be noted that the external surface 4 is profiled with elongate longitudinally extending projections 5 with elongate longitudinally extending recesses 6 therebetween. The internal surface 4 is generally flat. The composite insulating board 1 also comprises a second insulating body 10 of a second insulating material which extends from the internal surface 4 of the first insulating

body. In this case, the first insulating body 2 is of an expanded polystyrene material which is shaped to provide the desired profiled external surface. The second insulating body 10 is of an insulating foam material which in this case is a polyisocyanurate foam.

[0018] The composite insulating board also comprises an open mesh armature 20 between the first insulating body 2 and the foam 10 to provide enhanced bonding between the polystyrene body 2 and the foam 10 at the interface therebetween.

[0019] In the invention, there are two dissimilar insulating materials (the polystyrene and the foam) and there are major technical problems in providing such a composite insulating board in which the two dissimilar materials are fixed together.

[0020] We found that when liquid polyisocyanurate foam reactants are laid onto pre-formed expanded polystyrene, the polystyrene dissolves in the contact region, leading to major loss of adhesion and a composite product which is unsuitable for purpose. In addition, on production, polyisocyanurate foam boards are at a temperature in excess of 70°C. Final curing of the foam takes place over several days, depending on product thickness. During this curing time, the product cools to ambient temperature and its linear dimensions reduce significantly (generally by about 0.5%). As a result, when the composite is manufactured, the foam shrinks whilst the polystyrene part remains dimensionally stable. The stresses involved in the behaviour of the dissimilar materials result in bowing of the product which again makes it unsuitable for purpose.

[0021] We have surprisingly found that the introduction of an armature veil 20 on top of the polystyrene prior to laying down of the liquid foam reactants, prevents the reactants from coming into direct contact with the polystyrene surface prior to initial foaming. When the reacting liquid expands a small amount of the foam thus formed is forced through the armature 20 and adheres to the surface of the polystyrene. This results in enhanced fusion between the polystyrene and the foam without damage to the polystyrene. The armature also acts as a balancing/reinforcing mechanism at the interface of the polystyrene and foam. When the finished product is stacked alternately with polystyrene from one board in contact with polystyrene from another board, bowing is eliminated.

[0022] An example of a suitable armature material is a glass fibre veil consisting of glass fibres of variable length (usually between 6 and 10 mm) and variable diameter (usually between 10 and 11 mm) bound by a modified polyvinyl alcohol. Such a veil is available from Owens Corring Veil, Netherlands B.V., product code M50-GA31.

[0023] The composite insulating foam board also has an outer facing material 25 applied to the external face of the insulating foam 2. The facing material may comprise a non-woven glass fibre mat such as Webtech (TM) PIF 1000.11 available from Atlas Roofing Corporation.

[0024] In use, and referring to Fig. 4, the composite insulation board 1 is applied over an existing roofing sheet such as a corrugated asbestos sheet 30. The exposed surface of the roof sheet 30 may be pretreated/cleaned and a bonding agent such as an adhesive may be applied for bonding to the external face of the polystyrene. When the roof has been covered with the composite insulation boards of the invention an outer roofing membrane 40 may be applied over the composite boards to provide a weather tight finish which covers the joints between adjacent composite boards. The roofing membrane 40 may for example, be of plastics and/or bituminous material.

[0025] Referring to Fig.5, to manufacture the composite insulating foam board of the invention, pre-cut lengths of pre-profiled polystyrene bodies 2 are introduced onto a continuously running conveyor with the profiled side lowermost. The armature veil 20 which is in a sheet form, is unwound from a reel and applied over the flat face of the polystyrene 2. Liquid foam reactants are then applied from a mixing head 50 over the armature veil 20. A foam begins to form and the external facing 25 is applied from a reel to the upper face of the rising foam. The foam is heated in an oven 60 and the composite insulating body is cured as described above.

[0026] It will be appreciated that the drawings are for illustrative purposes. For example, the armature is shown in a wave-like form in the finished product. The actual form may vary significantly depending on processing conditions and other factors. Similarly, in Fig. 5 adjacent polystyrene profiled bodies are shown for illustrative purposes as slightly spaced-apart. In practice, there would not generally be such a gap.

[0027] The invention is not limited to the embodiments hereinbefore described which may be varied in construction and detail.

Claims

1. A composite insulating board comprising:-

   a first insulating body of a first insulating material having an external surface and an internal surface, the external surface being profiled;
   a second insulating body of a second insulating material which is different from the first insulating material and extends from the internal surface of the first insulating body, the second insulating material comprising an insulating foam; and
   an open mesh armature between the first insulating body and the insulating foam to enhance bonding between the first insulating body and the insulating foam at the interface therebetween.

2. A composite insulating board as claimed in claim 1 wherein the first insulating material is a polystyrene.

3. A composite insulating board a claimed in claim 2 wherein the polystyrene is profiled to conform to a corrugated roof panel.

4. A composite insulating board as claimed in any of claims 1 to 3 wherein the insulating foam comprises a polyisocyanurate or polyurethane foam.

5. A composite insulating board as claimed in any of the claims 1 to 3 wherein the insulating foam comprises a phenolic foam

6. A composite insulating board as claimed in any of claims 1 to 5 wherein the armature comprises a glass fibre veil.

7. A composite insulating board as claimed in any of claims 1 to 6 wherein the external face of the insulating foam has a facing material.

8. A composite insulating board as claimed in claim 7 wherein the facing material comprises a non-woven glass fibre mat.

9. A method for manufacturing a composite insulating board comprising the steps of:-

providing a first insulating body of a first insulating material, the first insulating body having a profiled external surface and a generally flat internal surface;
applying an armature to the flat internal surface of the first insulating body;
laying down liquid foam reactants onto the armature;
applying a facer over the liquid foam reactants;
heating the composite body thus formed in an oven, the foam, on expansion, passing through the armature and contacting the internal surface of the first insulating body; and
curing the composite insulating board thus formed.

10. A method as claimed in claim 9 wherein the first insulating body is provided on a conveyor and the method comprises advancing the first insulating body to an armature applying station prior to laydown of the liquid foam reactants.

11. A method as claimed in claim 9 or 10 wherein the armature comprises a glass fibre veil. I.

12. A method as claimed in any of claims 9 to 11 wherein the first insulating body is of polystyrene.

13. A method as claimed in any of claims 9 to 12 wherein the foam is a polyisocyanurate or polyurethane foam.

14. A method as claimed in any of claims 9 to 12 wherein the foam is a phenolic foam.

15. A method as claimed in any of claims 9 to 14 wherein the facing comprises a glass fibre mat.

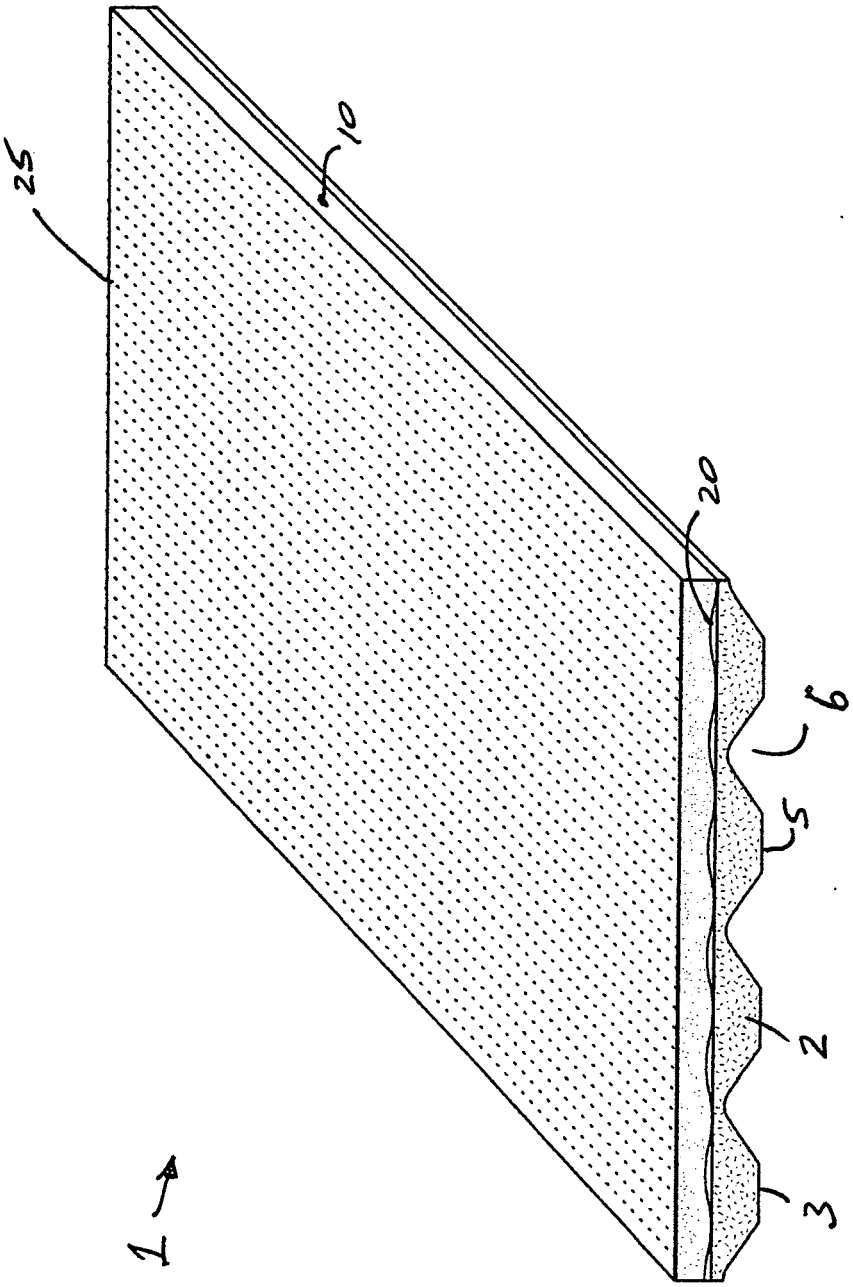

Fig. 1

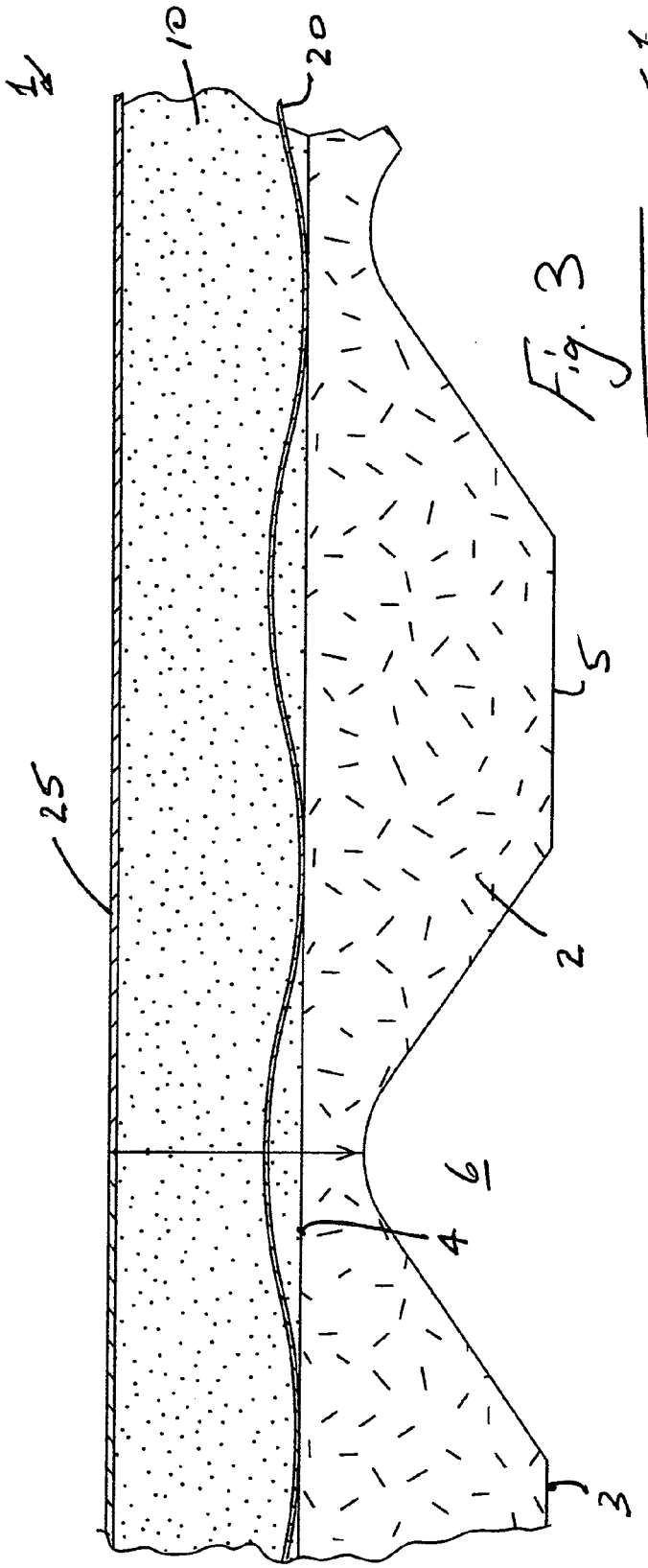

Fig. 3

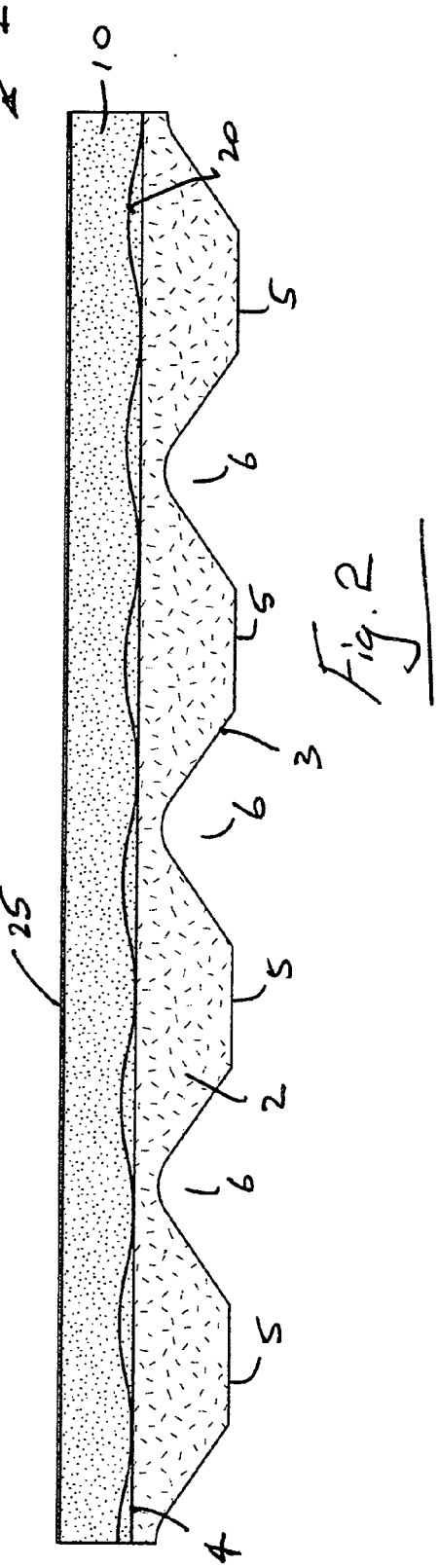

Fig. 2

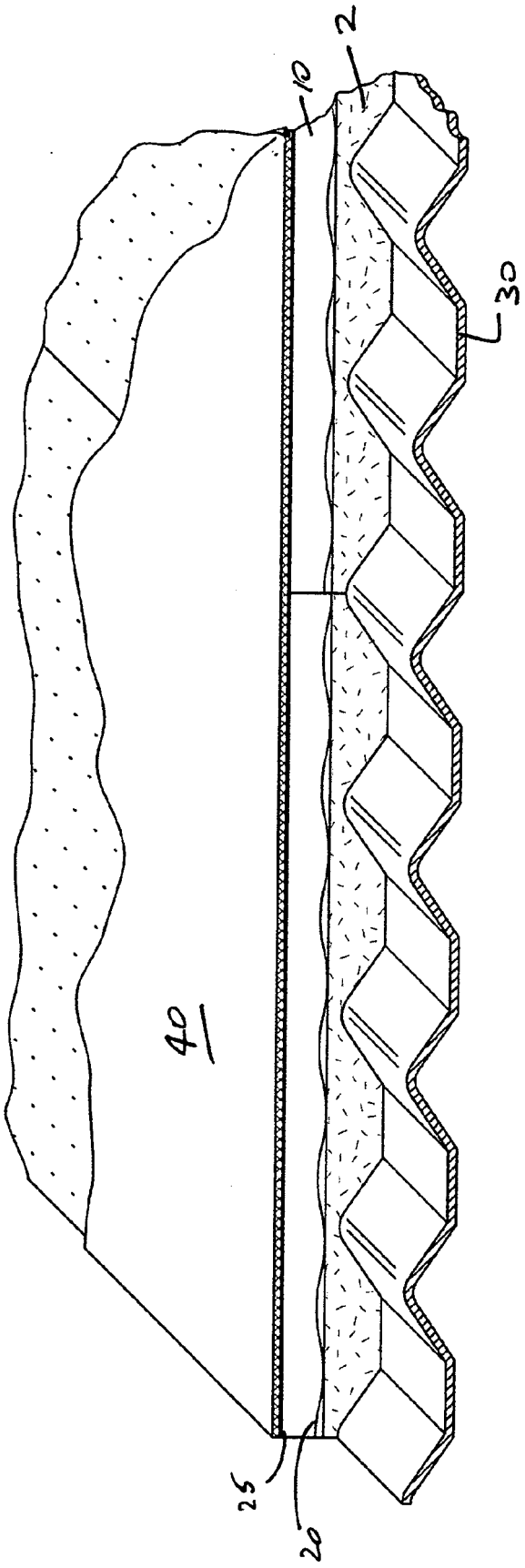

Fig. 4

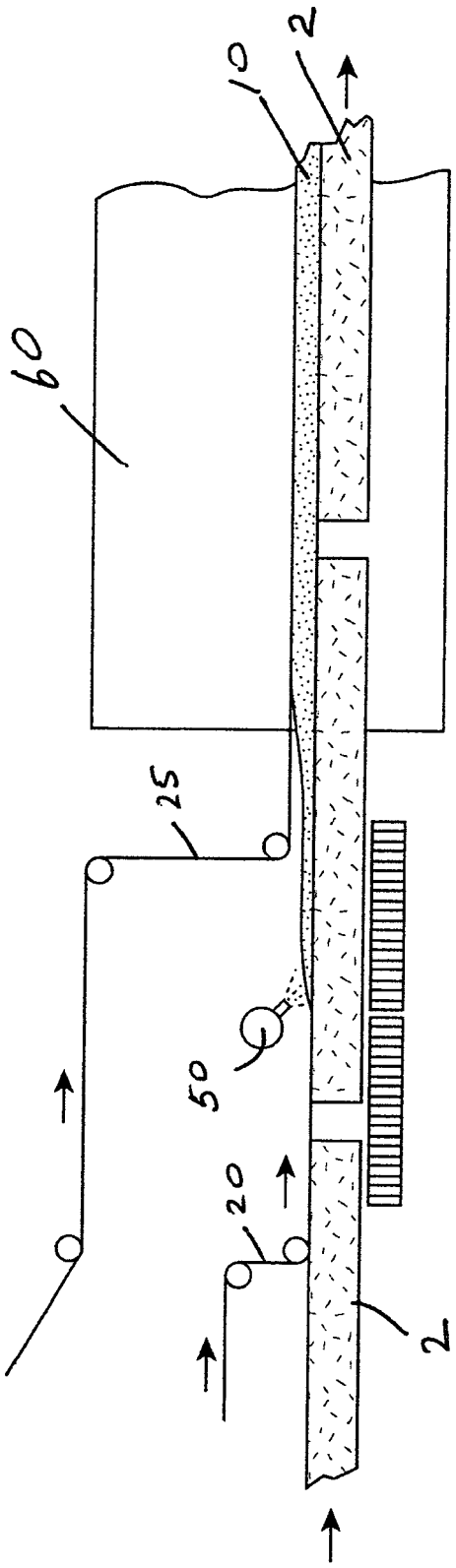

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 12 39 4002

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	GB 2 155 851 A (COOLAG PURLBOARD LTD) 2 October 1985 (1985-10-02) * figures 1, 2 * * page 1, line 38 - line 44 * * page 1, line 56 - line 60 * * page 1, line 77 - line 79 * * page 1, line 101 - line 122 * -----	1-15	INV. E04D3/35 E04D13/16
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A	WO 81/01816 A1 (PARKER L) 9 July 1981 (1981-07-09) * figure 2 * * page 13, line 22 - page 14, line 34 * -----	9-15	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	31 August 2012	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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