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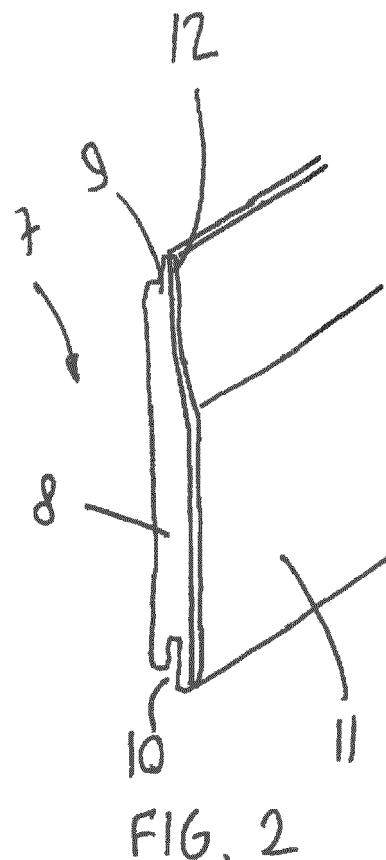
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(54) **Composite cladding boards**

(57) A cladding board (7, 13, 16, 17) comprises a side with a tongue (9, 23) and a side with a groove (10) or cut-out portion (21) to facilitate the attachment of the cladding board to another such cladding board; wherein said board incorporates a backing layer (2, 8, 19) of primarily rigid foamed plastics material; and a further layer (3, 11, 14, 15, 18) located over said backing layer being primarily of an elastomer; said groove or cut-out portion being of exposed rigid foamed plastics material without any elastomer covering being provided in said groove or cut-out portion; wherein said further layer (3, 11, 14, 15, 18) has greater inherent flexibility than said backing layer (2, 8, 19).



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Description

Field of the Invention

[0001] The to boards.

Background to the Invention

[0002] Cladding boards are typically designed for covering vertical surfaces. These can be used inside and outside. Wooden cladding has been used for many years with well-known drawbacks of expanding and contracting dependent upon the weather conditions; requiring frequent treatments to prevent boards from rotting; and being prone to igniting.

[0003] Plastic cladding is also available in various forms. These are generally provided as extruded boards which are by definition formed with a layer of relatively thin plastics material which may or may not be coated for extra weather resistance. The following prior art documents are acknowledged: WO01/26899, US2010/064611, US2010/242398, EP0550873, and EP0192627.

Summary of the Invention

[0004] In a first broad independent aspect, the invention provides a cladding board comprising a side with a tongue and a side with a groove or cut-out portion to the attachment of the cladding board to another such cladding board; wherein said board incorporates a backing layer of primarily rigid foamed plastics material; and a further layer located over said backing layer being primarily of an elastomer or polyurea; said groove being of exposed rigid foamed plastics material without any elastomer or polyurea covering being provided in said groove or cut-out portion.

[0005] In a subsidiary aspect, the further layer covers at least the front of said tongue. Consequently, when the tongue is in contact with the of an adjacent board a watertight seal is achieved between the boards.

[0006] The provision of the rigid foamed plastics material layer provides enhanced insulation for buildings or other structures which are clad by this board. This would assist in retaining the heat in a building the colder months whilst retaining the coolth during the warmer months. The provision of the foamed rigid layer may also increase the rigidity of a building. The provision of the elastomer located over the backing layer improves the weather resistance. If the rigid foamed plastics material layer were simply left exposed, the weather would erode the surface. It also allows the layer which is most exposed to the weather conditions to withstand cycles of expansion and contraction which might arise even though they would arise at a much lower level than a prior art wood-based cladding board. This configuration is also particularly advantageous in terms of the interconnection between adjacent cladding boards.

[0007] In a subsidiary aspect, said layer of primarily rigid foamed plastics material has a shore D hardness of 35 to 75. In this range, the cladding board rigidity achieves optimal constructional strength. It can for example be used as a conventional wood-based cladding board i.e. it can be cut or trimmed using carpenter's tools.

[0008] In a further subsidiary aspect, said further layer is an inherently flexible layer. In a further subsidiary aspect, said further layer has a cushioning effect. In a further subsidiary aspect, the inherent flexibility of said further layer is higher than at of the rigid backing layer. This aspect particularly improves its weather resistance properties due to for example the impact of hail stones.

[0009] In a further subsidiary aspect, said further layer has a shore A hardness of 35 to 90. This allows the layer to absorb impacts and to weather in an improved manner. The likelihood of the outer layer peeling back due to several cycles of differing weather conditions is substantially reduced.

[0010] In a further subsidiary aspect, said layer of primarily rigid foamed plastics material is primarily polyurethane. This material is particularly suited for retaining its configuration and has improved thermal properties. Furthermore, it allows the use of a variety of fillers.

[0011] The cladding board may be further improved if the layer of primarily rigid foamed plastics material incorporates 20% to 50% fillers by weight. This reduces the percentage of plastics material used whilst by selecting the appropriate filler improvements with regards to the board's fire retarding properties, structural strength and weather resistance are improved.

[0012] In a further subsidiary aspect, said fillers comprise one or more from the group consisting of: ground glass, ground limestone, mineral filler, flour, pulverised fuel ash (PFA), and fibres. The provision of fibres is particularly advantageous in terms of providing improved structural strength and since the further layer may be provided without the use of any fibres, the risk of an operator accidentally interacting with a fibre is almost entirely done away with.

[0013] In a further subsidiary aspect, said layer of primarily rigid foamed plastics material incorporates glass fibres. These substantially improve the rigidity of the cladding board whilst an operator can still cut or trim the board using carpenter's tools.

[0014] In a further subsidiary aspect, the layer of primarily rigid foamed plastics material incorporates a rice-based fibre. The use of a natural product of this kind provides a product which is not only of improved strength but with reduced negative environmental impact.

[0015] In a further subsidiary aspect, said layer of primarily rigid foamed plastics material incorporates 30% to 60% air by volume. This allows the cladding board to appear relatively bulky whilst being of sufficient strength. It also substantially improves the thermal insulation properties of the board.

[0016] In a further subsidiary aspect, said further layer is primarily of a polyurethane elastomer. This is particu-

larly advantageous in order to create a chemical bond between the backing layer and the further layer. This does away with any requirement for employing adhesives between the several layers.

[0017] In a further subsidiary aspect, said polyurethane elastomer incorporates no air bubbles. This allows the elastomeric layer to cope with weather fluctuations whilst a relatively smooth finish can be obtained. Alternatively, the polyurethane elastomer layer can incorporate in certain embodiments a relief in order for the cladding board to take the shape and configuration of a wood-based board, plastics, and/or stone.

[0018] In a further subsidiary aspect, said polyurethane elastomer incorporates one or more fillers selected from the group comprising ground glass, water scavengers, liquid fire retardants, recycled rubber, minerals and pulverised fuel ash (PFA).

[0019] The provision of liquid and powder fire retardants is particularly beneficial in terms of preventing the spread of a fire within a structure which has been clad by the cladding board. It also prevents an external fire from spreading into an enclosure which has been protected.

[0020] In a further subsidiary aspect, the cladding board further comprises a coating provided over said further layer, said coating being at least in part an aliphatic isocyanate. This is particularly beneficial for improving the aesthetic appeal of the board but as well providing an extra protective layer.

[0021] In a further subsidiary aspect, said backing layer and said further layer are chemically cross-linked; thereby no separate adhesive links one layer to the other. This allows the cladding board to appear as a single unitary composition despite the various layers fulfilling different functions.

[0022] In a second broad independent aspect, the invention provides a moulding process of producing a cladding board, comprising the steps of selecting a mould for forming a cladding board with a side with a tongue and a side with a groove to facilitate the attachment of the cladding board to another such cladding board; forming a layer which is primarily of an elastomer; forming a backing layer which is primarily of rigid foamed plastics and preventing said groove from being covered by said elastomer. The advantages achieved in the context of the cladding board which have already been detailed above are in part due to the manufacturing process adopted. Furthermore, it allows the configuration of the board to not only achieve the improvements mentioned above but it allows the board to be made to more closely resemble wood-based cladding products.

[0023] In a further subsidiary aspect, the method comprises the step of starting the moulding process with an in-mould coating of aliphatic isocyanate based medium.

Brief Description of the Figures

[0024]

Figure 1 shows a cross-sectional view of a cladding board.

Figure 2 shows a perspective view of the end of a cladding board.

Figure 3 shows a perspective view of the end of a cladding board in accordance with a further embodiment of the invention.

Figure 4 shows a perspective view of the end of a cladding board in accordance with a further embodiment.

Figure 5 shows a cladding board according to a further embodiment of the invention.

Detailed Description of the Figures

[0025] Figure 1 shows a section 1 of a typical cladding board according to the invention. It incorporates a backing layer 2, a further layer 3 and a coating 4. The backing layer 2 is of filled polyurethane rigid foam. This layer may itself have a thickness of between 10mm and 30mm. It has a relatively large proportion of air bubbles such as air bubble 5 distributed randomly throughout the layer. The air bubbles or closed cells of gas are of greater size in the centre of the backing layer whilst they are compressed in the outer portions of the backing layer. This allows the material to be denser in the outer portions compared to the core of the backing layer where the cells occupy a greater volume. The content of air in this layer may be between 30% and 70% in volume. In addition to the air bubbles a number of fibres such as fibres 6 are provided throughout the layer in order to increase its rigidity. The fibres may be of chopped glass fibre strands or other appropriate man-made fibrous material. Alternatively, a natural fibre such as that obtained from rice husks might be employed to provide the necessary increased rigidity. In addition to the fibres, other fillers are envisaged. In this layer of the cladding board 20% to 50% fillers by weight is envisaged. The fillers may be mineral fillers coupled with ground glass or pulverised fuel ash (PFA). In addition, the backing layer which could also be referred to as a core layer may employ fire retardants.

[0026] Layer 3 is provided to cover the backing layer with regards to at least its top face. Layer 3 may be either an unfilled or a filled polyurethane elastomer. This elastomer may be pigmented. It may also contain fire retardants in either liquid or powder form along with other fillers such as water scavengers, recycled rubber, further elastomers, or even minerals. The shore A of the layer 3 may be selected between 35 and 90.

[0027] The further layer may alternatively have a much higher inherent flexibility. The shore level may be selected to offer a cushioning effect. The inherent flexibility of the further layer may be higher than that of the rigid backing layer. This aspect particularly improves its weather

resistance properties due to for example the impact of hail stones.

[0028] Due to the selection of materials for both layer 2 and layer 3 chemical cross-linking arises which creates excellent adhesion between the core and its topping without any requirement for a separate adhesive.

[0029] Optionally, a further top layer is provided such as top layer 4 which provides an improved finish. This top layer may be based on aliphatic isocyanate. Other materials of a similar category may be employed in this context. This selection of material however is particularly suited for cross-linking with layer 3 in order to provide a layer-wise construction which holds together as an integral unit without the use of adhesives. The thickness of layer 4 may be much less than a millimetre and typically of the order of the thickness of a typical paint. Layer 3 however is preferably of 1mm to 5mm in thickness.

[0030] The process which is preferred in the production of the cladding board is a moulding process. The first step in the process is to place an in-mould coating consisting of an aliphatic isocyanate based medium applied in one or more full or partial layers (each layer having a thickness similar to that of paint). Layer 3 which might be a hybrid polyurethane is applied to cross-link with the coating 4 to form a hard or alternatively a resilient backing to the coating. Once this is applied, another form of polyurethane is applied. This polyurethane is that of layer 2 and would contain a wide spectrum of fillers. This layer would also readily cross-link with the previous layer 3 during the curing process. In order to control the expansion of the foam polyurethane an encapsulating mould box is employed which constrains the expansion within the mould itself. The cladding board lends itself to being cut or trimmed using carpenter's tools.

[0031] Figure 2 shows a cladding board 7 with a filled polyurethane rigid foam layer 8 in which are formed a tongue 9 and a groove 10 in its respective upper and lower side. The groove 10 may either be formed during the moulding process or cut out as a separate step in the manufacturing process. Directly over the outer face of layer 8, there is provided a polyurethane elastomer 11 which protects and seals the closed or open cell portions of layer 8. In this configuration layer 11 covers the outside portion 12 of tongue 9. This configuration may facilitate an improved attachment of the tongue into the groove of a corresponding cladding board.

[0032] Figure 3 shows a further cladding board generally referenced 13 with a polyurethane elastomer provided on both the outer and inner surfaces of tongue 14.

[0033] In a further embodiment, as shown in figure 4, both the tongue and the groove can be entirely free of any polyurethane elastomer. Elastomer 15 of cladding board 16 is limited to the outer most surface of the board.

[0034] Figure 5 shows a cladding board with a front face 18 of polyurethane elastomer 18 and a backing layer 19 of closed-cell foamed polyurethane. Closed-cell foamed polyurethane is potentially an inventive option for any of the preceding embodiments. The rear face 20 of

the backing layer is sloped. In a lower portion of the board, a cut-out portion 21 is provided. A projection 22 is provided on one side of the lower portion whilst said cut-out portion 21 fulfils the function of a groove. The board progressively narrows towards the upper portion which forms in effect a tongue for engagement with cut-out 21. The elastomeric layer extends over said tongue in order to facilitate the seal between adjacent boards when assembled together.

Claims

1. A cladding board comprising a side with a tongue and a side with a groove or cut-out portion to facilitate the attachment of the cladding board to another such cladding board; wherein said board incorporates a backing layer of primarily rigid foamed plastics material; and a further layer located over said backing layer being primarily of an elastomer or polyurea; said groove being of exposed rigid foamed plastics material without any elastomer or polyurea covering being provided in said groove or cut-out portion; wherein said further layer has greater inherent flexibility than said backing layer.
2. A cladding board according to claim 1, wherein said further layer covers at least the front portion of said tongue.
3. A cladding board according to either claim 1 or claim 2, wherein said layer of primarily rigid foamed plastics material has a shore D hardness of 35 to 75.
4. A cladding board according to any of claims 1 to 3, wherein said further layer has a shore A hardness of 35 to 90.
5. A cladding board according to any of the preceding claims, wherein said layer of primarily rigid foamed plastics material is primarily polyurethane.
6. A cladding board according to claim 5, wherein said layer of primarily rigid foamed plastics material incorporates 20 to 50% fillers by weight.
7. A cladding board according to claim 6, wherein said fillers comprise one or more from the group consisting of: ground glass, pulverised fuel ash (PFA), and fibres.
8. A cladding board according to any of the preceding claims, wherein said layer of primarily rigid foamed plastics material incorporates one or both of the following: glass fibres and rice based fibres.
9. A cladding board according to any of the preceding claims, wherein said layer of primarily rigid foamed

plastics material incorporates 30 to to 60% air by volume.

10. A cladding board according to any of the preceding claims, wherein said further layer is primarily of polyurethane elastomer and optionally said polyurethane elastomer incorporates no air bubbles. 5
11. A cladding board according to claim 10, wherein said polyurethane elastomer incorporates one or more fillers selected from the group comprising ground glass, water scavengers, liquid fire retardants, powder fire retardants, recycled rubber, minerals and pulverised fuel ash (PFA). 10
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12. A cladding board according to any of the preceding claims, further comprising a coating provided over said further layer; said coating being at least in part an aliphatic isocyanate. 20
13. A cladding board according to any of the preceding claims, wherein adjacent layers are chemically cross-linked; thereby no separate adhesive links one layer to another. 25
14. A moulding process of producing a cladding board, comprising the steps of selecting a mould for forming a cladding board with a side with a tongue and a side with a groove or cut-out portion to facilitate the attachment of the cladding board to another such cladding board; forming a layer which is primarily of an elastomer or polyurea; forming a backing layer which is primarily of rigid foamed plastics material; and preventing said groove or cut-out portion from being covered by said elastomer or polyurea; said layer having greater inherent flexibility than said backing layer. 30
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15. A process according to claim 14, comprising the step of covering at least the front portion of said tongue with said layer. 40
16. A process according to either claim 14 or claim 15, comprising the step of starting the moulding process with an in-mould coating of aliphatic isocyanate based medium. 45

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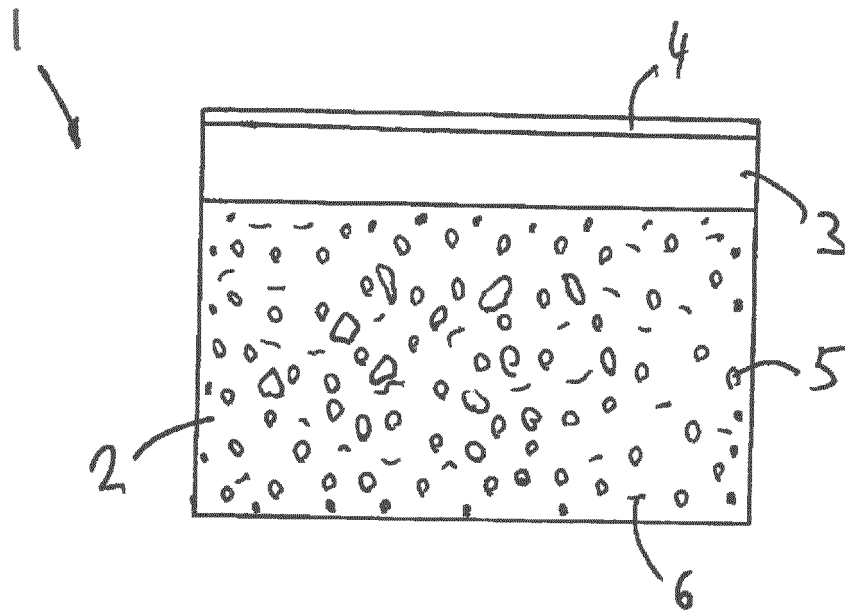


FIG. 1

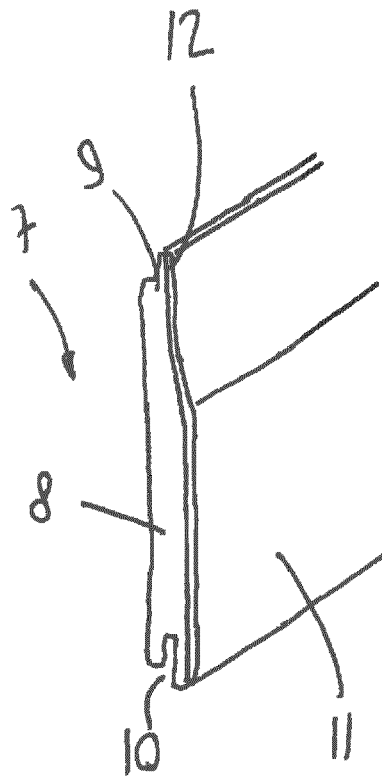


FIG. 2

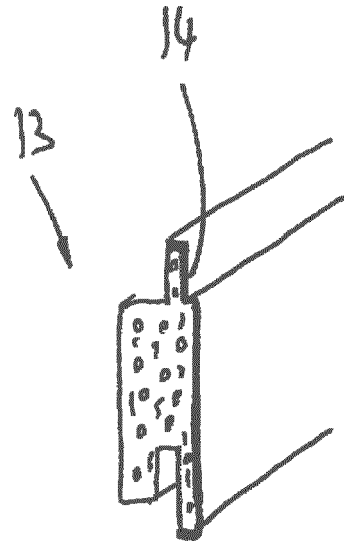


FIG. 3

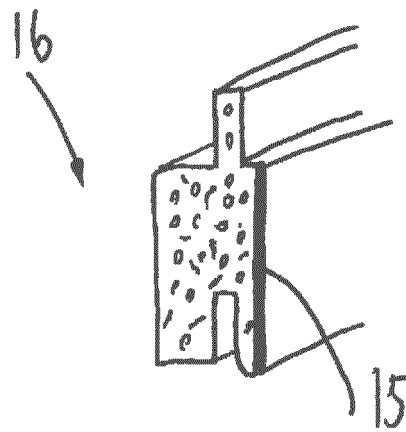
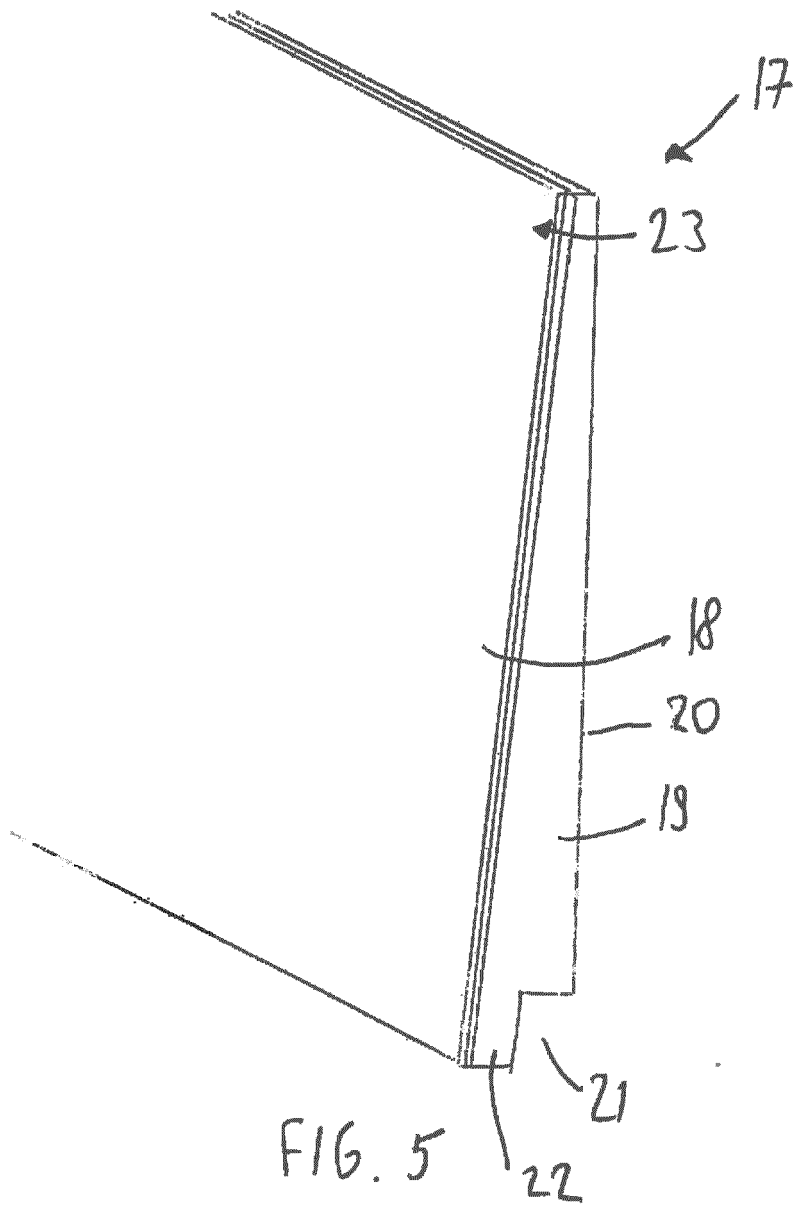


FIG. 4



REFERENCES CITED IN THE DESCRIPTION

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