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(54) **Insulating covering for a surface**

(57) To provide an insulating covering on a surface, insulating boards of expanded plastic preferably expanded polystyrene beads each encapsulated in bitumen, and preferably provided with a cementitious covering layer, are adhered to the surface using an adhesive bituminous composition which is solvent free and not water based.

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## SPECIFICATION

**Insulating covering for a surface**

- 5 This invention relates to the provision of insulating covering for a surface.
- It is known for insulating boards of expanded plastics materials, typically of polystyrene, and particularly of the extruded type, to be capable of
- 10 withstanding the effects of rainwater and so to be used on the outer surfaces of roof structures. However, they cannot very easily be attached directly to the roof surfaces, or indeed to any other surfaces such as vertical, inclined or floor surfaces.
- 15 In particular, solvent based adhesives are inappropriate, especially with polystyrene, because they tend to degrade the plastic while water based adhesives which might otherwise solve the problem are clearly of little use in situations where damp may occur.
- 20 Thus, these boards, which are very light in weight, create the difficulty that they need to be heavily loaded with paving slabs or gravel when they are in an exposed position in order to prevent their removal by negative wind pressure and also to stop them
- 25 floating on water which may be trapped beneath them on a surface.
- It has now been realised that an excellent insulating surface can be formed, and the above difficulties can be largely overcome, by using a self-adhesive
- 30 bituminous composition which is solvent-free and not water-based to adhere a body of expanded plastics to a surface to be covered in an insulating manner. It is also realised that particular advantages result in the situation where the bodies are formed of
- 35 expanded plastics beads each of which is encapsulated in a bitumen or a bituminous compound which is free from solvents, light oils, emulsifiers or other liquifying agents, such beads subsequently having been pressed together to distort them and remove
- 40 the voids between them.
- According to the present invention, therefore, there is provided an insulating covering for a surface, such covering comprising a plurality of boards of expanded plastics material each of which
- 45 is retained on the surface by an adhesive bituminous composition which is solvent-free and not water-based.
- There is also provided a method of covering a surface by adhering thereto boards of expanded
- 50 plastics material using an adhesive bituminous composition which is solvent-free and not water-based.
- The adhesive can be provided in two ways, firstly by being in the form of a self-adhesive pre-formed
- 55 surface layer on the expanded plastics board or secondly by being supplied on site to the surface to be protected and to have the boards applied thereonto.
- The invention, therefore, also provides the combination of expanded plastics material boards,
- 60 together with the means to form a bituminous adhesive composition which is solvent-free and not water-based and with which the boards can be adhered to a surface.
- 65 The invention also provides a body of expanded

plastics material having on one surface a layer of a self-adhesive bituminous composition which is solvent-free and not water-based.

- 70 Preferably the plastic is expanded polystyrene in which case the fact that the adhesive is solvent-free and not water-based is particularly advantageous. Preferably also, the plastics beads in the boards are each encapsulated in bitumen or a bituminous compound which is free from solvents, liquids, oils,
- 75 emulsifiers or other liquifying agents prior to being distorted and pressed together to remove voids therefrom. The bituminous covering on the beads allows a particularly effective adhesive with the adhesive bituminous compositions employed in the
- 80 invention.
- Preferably, on the surface of the insulation boards remote from the surface being covered there is provided a surface layer consisting of a cementitious polymer composition bonded to the plastics boards
- 85 which provides improved resistance to ultra-violet light and is also capable of withstanding damage by light foot traffic. Again this feature is best employed when encapsulated beads are employed in the boards, particularly encapsulated polystyrene
- 90 beads. A primer of a similar cementitious/polymeric composition may be employed to assist attachment of such a surface layer to the board.
- In the embodiment of the invention where a self-adhesive bituminous composition is applied at
- 95 the factory on one surface of the insulation boards, a suitable release film or paper will be attached to permit handling during transportation and prior to installation which will, upon removal, permit the board to be bonded directly to a surface, such as a
- 100 concrete surface which may be primed or unprimed, without the addition of any other bonding agent.
- In embodiments where a separate bituminous adhesive composition is used a cold applied two part bitumen/rubber proprietary compound such as that
- 105 sold by the applicants under the name Servi-Dek is particularly appropriate.
- The invention is particularly useful in applying insulating surfaces to concrete surfaces but it is also applicable to the sealing and insulation of other
- 110 surfaces such as are found in buildings and civil engineering structures, and being for instance of wood, metal decking or plaster. By adhesive bituminous composition is meant a composition containing asphalt, bitumen, tar or pitch modified with the
- 115 addition of a polymer preferably rubber. Preferably, however, bitumens are used, these being understood to be by-products from the refining of crude oil. Such refining often takes place naturally, of course, so that the bitumen can be extracted from
- 120 naturally occurring rock asphalt or separated from lake asphalt. Normally, bitumen as herein defined is preferable to coal tars and other coal extracts such as pitches in the bituminous composition because bitumens, when mixed with polymers, can provide
- 125 much the best adhesive effect, being least sensitive to temperature with regard to ease of application, adhesive and subsequent ability to remain in place without running. Bitumens also stretch and recover in a way not offered by coal based compositions.
- 130 A self-adhesive bituminous composition such as

can be applied at the factory to the boards to allow direct installation is one which will enable the boards when pressed by normal hand pressure against an appropriate surface such as a concrete surface  
5 without any prior treatment of the adhesive or of the surface to remain stuck thereto. On the other hand, a two part adhesive composition as also contemplated in the invention is one where the two parts are mixed together and applied to the surface with the boards  
10 then applied thereto. The composition cures and thereby bonds the boards to the surface.

The interaction of the bituminous coating of the beads in the preferred embodiments with the bituminous adhesive composition provides a very effective  
15 attachment in both types of embodiments.

The bituminous self-adhesive composition is preferably formed of natural or synthetic rubber, virgin or reclaimed, blended into bitumen to provide a smooth mix. The ratio by weight of bitumen to  
20 rubber is preferably 80:20 to 95:5, especially about 90:10. Generally, suitable compositions have a softening temperature (measured by the Ring and Ball method) of 60 to 130°C and penetration values of 50 to 120, preferably 60 to 80 at 25°C (Institute of  
25 Petroleum Cone Method). Paper having a release coating thereon e.g. siliconised paper or paper having a coating thereon of a vinyl chloride polymer is satisfactory as a removable protective coating for boards with the adhesive pre-formed in place.

Where the surface layer on the top of the boards is provided for the purpose of ultraviolet resistance and to provide a protective surface it is preferably of a cementitious composition including an elastomeric polymer to provide flexibility and cohesive  
35 strength. The elastomeric polymer proportion may be 2 to 10%, preferably 3 to 5%, by weight of the cementitious content which itself may be a combination of cement and aggregate, desirably 10 parts aggregate to 5 to 9 parts preferably 6 to 8.5 parts,  
40 cement by weight. The aggregate may, for instance, be silica sand.

The addition of the elastomer assists in making a bond between the cementitious protective surface and the spheres of expanded plastics, particularly if  
45 a slurry or primer of cement and elastomeric polymer is first employed as a bonding layer onto the expanded plastics body. A white or light coloured cement and/or a light coloured aggregate can usefully be employed, particularly where hot climates are  
50 involved in order to impart solar reflectivity. It will be an advantage if the cementitious composition is applied by a spray using a large aperture nozzle or is deposited in some other way so as to retain a textured surface which will improve its resistance to  
55 freezing and subsequent thawing without leading to spalling from the top of the insulating board.

As mentioned, the bituminous adhesive composition has no solvent and is not water based so it will itself be completely water resistant and water-proof.  
60 Where the insulation boards comprise encapsulated beads the overall insulation will be still more effectively water-resistant and water-proof.

In embodiments where the adhesive is applied on site the ingredients will be in general in two parts  
65 namely a rubber in liquid form to be mixed with a

bitumen. This will give a mixture spreadable on the surface to be protected which will then cure and form an adhesive water-proof compound with which the boards are to be stuck. Typically, 0.2 to 1 m<sup>2</sup>, and  
70 preferably 0.3 to 0.7 m<sup>2</sup> can be covered per litre of mixed composition, with greater amounts being required in the case of rough concrete surfaces, particularly if they are dusty. A thickness of 2 to 6 millimetres, preferably 3 to 4 millimetres is appropriate spread on the surface prior to the application of  
75 the insulating boards thereto.

In the event that the self-adhesive bituminous layer is provided on the insulating boards a thickness of from 0.025 cm upwards is desirable, otherwise proper adhesion is unlikely to arise. In general, preferred thicknesses are 0.063 to 0.5 cm, the thicker the layer of adhesive the better the water-proofing and adhesion effect but generally 0.063 to 0.4 cm is satisfactory with thicknesses at the upper end of this  
85 range being preferred.

Where the body comprises expanded plastics beads which are each encapsulated in bitumen or bituminous compound it is desirable that the bitumen or bituminous compound be solid at ambient  
90 temperature. Preferably the body has a smooth outer surface and in general the extent of compression is such that the beads are so distorted from the original spherical form that they interlock with and have substantially straight edges between one  
95 another. The diameter of the smallest beads is preferably not less than one fifth and preferably not less than one half of the diameter of the largest ones and most preferably the beads are generally of a uniform size. The softening point of the bitumen or  
100 bituminous compound should be higher than the melting point of the beads in preferred embodiments and desirably the bitumen or bituminous compound is an asphalt with a softening point of 115°C or more. Preferably the asphalt has a penetration value of 1 to 6, preferably 1 to 4 at a conditioned  
105 temperature of 25°C (Institute of Petroleum Needle Method) and the weight ratio is approximately one part by weight of beads to one and a half parts by weight of bitumen or bituminous material. Such an insulating material body can be made by heating the bitumen or bituminous compound to a temperature appreciably above its softening point in order to make it liquid and free-running and then by processing the expanded plastics beads therewith so as to  
115 completely encapsulate each of the beads and, while the encapsulating bituminous material is in a semi-liquid state, pressing the beads together and distorting them so as substantially to eliminate voids between the beads. The beads may be cooled after  
120 coating, separated from each other and then reheated when pressed together and they may be further expanded or re-expanded while being pressed together so as to urge against one another and interlock with one another. Superheated steam can  
125 be injected amongst the beads to bring about this further expansion.

#### CLAIMS

130 1. An insulating covering for a surface, such

- covering comprising a plurality of boards of expanded plastic material such of which is retained on the surface by an adhesive bituminous composition which is solvent-free and is not water-based.
- 5 2. A covering according to claim 1 wherein the adhesive composition is a two part composition which is mixed and applied to the surface and is subsequently covered with the boards.
- 10 3. A covering according to claim 1 wherein the adhesive composition is a self-adhesive composition preformed as a surface layer on the boards.
4. A covering according to claim 1, 2 or 3 wherein the boards are of expanded polystyrene.
- 15 5. A covering according to any preceding claim wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents and which are pressed together to remove voids
- 20 therebetween.
6. A covering according to any preceding claim including a surface layer consisting of a cementitious polymer composition on the surface of the boards remote from the surface being covered.
- 25 7. A covering according to claim 6 including a primer of a cementitious/polymeric composition to assist attachment of such surface layer.
8. A covering according to any preceding claim wherein the adhesive composition is a bitumen-
- 30 rubber mix.
9. A method of providing an insulating covering on a surface by adhering to the surface a plurality of boards of expanded plastics material using an adhesive bituminous composition which is solvent-
- 35 free and not water-based.
10. A method according to claim 9 wherein the adhesive composition is a two part composition which is mixed and applied to the surface and is subsequently covered with the boards.
- 40 11. A method according to claim 9 wherein the composition is a self-adhesive composition preformed as a surface layer on the boards.
12. A method according to claim 9, 10 or 11 wherein the boards are of expanded polystyrene.
- 45 13. A method according to any one of claims 9 to 12 wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other
- 50 liquifying agents and which are pressed together to remove voids therebetween.
14. A method according to any one of claims 9 to 13 wherein a surface layer consisting of a cementitious polymer composition is applied on the surface
- 55 of the boards remote from the surface being covered.
15. A method according to claim 14 where a primer of a cementitious/polymeric composition is used to assist attachment of such surface layer.
- 60 16. A method according to any one of claims 9 to 15 wherein the adhesive composition is a bitumen-rubber mix.
17. The combination for the purpose of providing an insulating covering on a surface of expanded
- 65 plastics material boards together with the ingredients for an adhesive bituminous composition which is solvent-free and not water-based.
18. The combination according to claim 13 wherein the boards are of expanded polystyrene.
- 70 19. The combination according to claim 17 or 18 wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents
- 75 and which are pressed together to remove voids therebetween.
20. The combination according to claim 17, 18 or 19, including a surface layer consisting of a cementitious polymer composition on the surface of the
- 80 boards remote from the surface being covered.
21. The combination of claim 20 including a primer of a cementitious/polymer composition to assist attachment of such surface layer.
22. The combination according to claim 17, 18,
- 85 19, 20 or 21 wherein the adhesive composition is a bitumen-rubber mix.
23. A body of expanded plastics material having on one surface a layer of a self-adhesive bituminous composition which is solvent-free and not water-
- 90 based.
24. The body according to claim 23 wherein the boards are of expanded polystyrene.
25. The body according to claim 23 or 24 wherein the boards are formed of expanded plastics beads,
- 95 each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents and which are pressed together to remove voids therebetween.
- 100 26. The body according to claim 23, 24 or 25 including a surface layer consisting of a cementitious polymer composition on the surface of the boards remote from the surface being covered.
27. A body according to claim 26 including a
- 105 primer of a cementitious/polymeric composition to assist attachment of such surface layer.
28. The body according to claim 23, 24, 25, 26 or 27 wherein the self-adhesive composition is a bitumen-rubber mix.
- 110 29. An insulating covering for a surface substantially as hereinbefore described.
30. A method of providing an insulating covering on a surface substantially as hereinbefore described.
31. A combination according to claim 17 and
- 115 substantially as hereinbefore described.
32. A body according to claim 23 and substantially as hereinbefore described.
- Amendments to the claims have been filed, and have
- 120 the following effect:
- \*(a) Claims 1 - 32 above have been deleted or textually amended.
- \*(b) New or textually amended claims have been
- 125 filed as follows:
1. An insulating covering for a surface, such covering comprising a plurality of boards of expanded plastic material each of which is retained on the surface by a waterproofing adhesive bituminous
- 130 composition which is solvent-free and is not water-

- based, wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other
- 5 liquifying agents and which are pressed together to remove voids therebetween.
2. A covering according to claim 1 wherein the adhesive composition is a two part composition which is mixed and applied to the surface and is
- 10 subsequently covered with the boards.
3. A covering according to claim 1 wherein the adhesive composition is a self-adhesive composition performed as a surface layer on the boards.
4. A covering according to claim 1, 2 or 3 wherein
- 15 the boards are of expanded polystyrene.
5. A covering according to any preceding claim including a surface layer consisting of a cementitious polymer composition on the surface of the boards remote from the surface being covered.
- 20 6. A covering according to claim 5 including a primer of a cementitious/polymeric composition to assist attachment of such surface layer.
7. A covering according to any preceding claim wherein the adhesive composition is a bitumen-
- 25 rubber mix.
8. A method of providing an insulating covering on a surface by adhering to the surface a plurality of boards of expanded plastics material using a water-
- 30 proof adhesive bituminous composition which is solvent-free and not water-based wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents and which are
- 35 pressed together to remove voids therebetween.
9. A method according to claim 8 wherein the adhesive composition is a two part composition which is mixed and applied to the surface and is subsequently covered with the boards.
- 40 10. A method according to claim 8 wherein the composition is a self-adhesive composition performed as a surface layer on the boards.
11. A method according to claim 8, 9 or 10 wherein the boards are of expanded polystyrene.
- 45 12. A method according to any one of claims 8 to 11 wherein a surface layer consisting of a cementitious polymer composition is applied on the surface of the boards remote from the surface being covered.
- 50 13. A method according to claim 12 where a primer of a cementitious/polymeric composition is used to assist attachment of such surface layer.
14. A method according to any one of claims 8 to 13 wherein the adhesive composition is a bitumen-
- 55 rubber mix.
15. The combination for the purpose of providing an insulating covering on a surface of expanded plastics material boards together with the ingredients for a waterproof adhesive bituminous com-
- 60 position which is solvent-free and not water-based wherein the boards are formed of expanded plastics beads, each of which is encapsulated in bitumen or a bituminous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents
- 65 and which are pressed together to remove voids therebetween.
16. The combination according to claim 15 wherein the boards are of expanded polystyrene.
17. The combination according to claim 15 or 16
- 70 including a surface layer consisting of a cementitious polymer composition on the surface of the boards remote from the surface being covered.
18. The combination of claim 17 including a primer of a cementitious/polymer composition to
- 75 assist attachment of such surface layer.
19. The combination according to claim 15, 16, 17 or 18 wherein the adhesive composition is a bitumen-rubber mix.
20. A body of expanded plastics material in the
- 80 form of a board having on one surface a layer of a waterproof self-adhesive bituminous composition which is solvent-free and not water-based, wherein the board is formed of expanded plastics beads, each of which is encapsulated in bitumen or bitumi-
- 85 nous compound which is free from solvent, liquids, oils, emulsifiers or other liquifying agents and which are pressed together to remove voids therebetween.
21. The body according to claim 20 wherein the board is of expanded polystyrene.
- 90 22. The body according to claim 20 or 21 including a surface layer consisting of a cementitious polymer composition on the surface of the board remote from the surface being covered.
23. A body according to claim 22 including
- 95 primer of a cementitious/polymeric composition to assist attachment of such surface layer.
24. The body according to claim 20, 21, 22 or 23 wherein the self-adhesive composition is a bitumen-rubber mix.
- 100 25. An insulating covering for a surface substantially as hereinbefore described.
26. A method of providing an insulating covering on a surface substantially as hereinbefore described.
27. A combination according to claim 15 and
- 105 substantially as hereinbefore described.
28. A body according to claim 20 and substantially as hereinbefore described.