

PATENT SPECIFICATION

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(54) ADHESIVE ROLLS

- (71) We, W. R. GRACE & Co., a Corporation organised and existing under the Laws of the State of Connecticut, United States of America, of 3, Hanover Square, New York 10004, New York, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

- This invention relates to a novel roll of sheet-like material and is an improvement in or modification of the invention described in Patent Application No. 1,230,754; the rolls are related to the structures and methods of Patent Applications Nos. 1,230,753, 1,230,755 and 1,230,756. The materials are particularly useful for application to concrete surfaces and will be described herein chiefly by reference to such use. It is to be understood, however, that the same description applies, *mutatis mutandis*, to the sealing of other surfaces, particularly such as are found in buildings and civil engineering structures.

- It is known to seal surfaces, particularly of concrete, by forming thereon a membrane of a bituminous composition or the like which is substantially impermeable to moisture and water vapour. [The term "bituminous composition" is used in this specification to include compositions containing asphalt, tar or pitch.] It is also known that such a composition may form an adhesive for a layer of cladding material, e.g. tiles and panels of linoleum, polyvinyl chloride, thermoplastic material, natural or reconstituted stone or cork, and wood block and wood strip flooring. In the past such membranes have been formed

by the application *in situ* of hot liquid bitumen, tar or pitch or a cold solution or emulsion of bitumen, tar or pitch. If desired, the membrane may be reinforced with latex, asbestos fibres or other types of filler. It is also known to provide a waterproofing membrane by the use of films of polyethylene or synthetic or natural rubber, or of bituminous roofing felt.

These known methods suffer from serious disadvantages. Thus in general the known procedures require formation of the layer of sealant *in situ* with the consequent difficulties in ensuring a uniform layer and the expense of labour at the site. Furthermore where the surface is a concrete floor which is subject to rising moisture, the adhesive must form a water-impermeable and alkali-resistant membrane; in practice this means that a bituminous composition must be applied hot to the floor, which is highly inconvenient, or a solvent-based bituminous composition must be used, which is expensive and involves fire risk. Generally the adhesive compositions currently in use require, in order to permit evaporation of solvent or aqueous content, to be placed in position some time before the cladding material is applied if a satisfactory bond is to be obtained, and this again is inconvenient.

It is also known to provide the rear surface of cladding materials, particularly floor tiles, with a layer of a contact adhesive covered by a protective sheet which is removed before placing the cladding material in position. However, it is not possible to provide a satisfactory water- and alkali-resistant continuous coating under the cladding material by this

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means, particularly on a typical rough dusty concrete surface.

Our Patent Application No. 1,230,754 relates to the use of preformed membranes of waterproofing pressure-sensitive adhesives, which provide substantial advantages over the known procedures. Thus in its broadest aspect our Patent Application No. 1,230,754 discloses and claims a novel structure comprising a sheet-like support of polyethylene or polypropylene, the support having adhered thereto a membrane of a waterproofing pressure-sensitive adhesive, which is a bituminous-rubber composition, the structure being at least 15 cm. in width and the membrane being at least 0.025 cm. thick.

As disclosed in Patent Application No. 1,230,754, the membrane can be a layer of the adhesive alone or the adhesive can contain reinforcing material, particularly to give the membrane mechanical strength; if desired the membrane can contain a plurality of layers of waterproofing pressure-sensitive adhesive (the adhesive being the same or different in the different layers), and the layers can be separated by reinforcing material in the form of a sheet.

The structures are designed to provide a continuous waterproof membrane adherent to a surface, the outer surface of the membrane having a non-adhesive surface.

Our Patent Application No. 1,230,754 then goes on to disclose that for storage purposes the surface of the membrane remote from the support must have a protective coating thereon, and that the structures as produced in the factory, stored and brought to the site are in the form of laminates of the protective coating, the membrane and the sheet-like support. The structures are conveniently available in the form of rolls.

It has now been realised, in accordance with the present invention, that in rolls of the structures as produced in the factory, stored and brought to the site, it is possible for the protective coating on the face of the membrane, which face is to be applied to the surface to be sealed and/or provided with a layer of contact adhesive, to be provided by the support itself, if the support is such that when the roll of the structure is unrolled, the substrate is physically separated from the said face of the membrane without substantial damage to the membrane. Thus the invention provides a structure in the form of a roll and comprising (a) a waterproof membrane comprising a waterproofing pressure-sensitive adhesive which is a bituminous-rubber composition, and, adhered to the membrane, (b) a sheet-like support of polyethylene or polypropylene, one face of the support being substantially more readily physically separable from the membrane than the other face, the membrane being at least

0.025 cm. thick and the support being at least 15 cm. wide.

Such rolls can be prepared by forming a support one face of which is substantially more readily separable from the pressure-sensitive adhesive than the other face, preparing a laminate of the support and a membrane of the pressure-sensitive adhesive with the said other face contiguous thereto, and rolling up the laminate. The said more readily separable face can be rendered more readily separable before, during or after the lamination with the membrane.

The differential separability of the two faces of the support can readily be obtained by forming a release coating on one face only of the support; preferably the release coating is on the outer face of the rolled-up support. The release coating can be formed in known manner, for example by deposition of a silicone, such as by the application to the membrane of a dispersion of a silicone compound which is cured with the aid of a catalyst and/or heat and forced ventilation. The outer face of the support is that facing away from the centre of the roll.

When the rolls of the invention are used, they are simply unrolled, thus exposing one surface of the membrane, which surface is applied to the surface to be sealed. If necessary the formation of a continuous waterproof seal over the whole surface is achieved by further applications so that each membrane overlaps its neighbour.

The widths of the novel rolls can be up to 120 cm. and even more, depending on the use to which they are to be put; generally they will be up to 91 cm. wide, with widths in the upper part of this range, e.g. 60 to 91 cm., being preferred where the whole of a surface is to be rendered waterproof. The thickness of the membrane and support can also vary widely depending on the intended end use, but will generally each be 0.025 to 0.6 or 0.9 cm.

A variety of bituminous-rubber adhesives can be used successfully for the membrane, but the adhesive must be such that the membrane will stick to the required surface without the use of heat or additional bonding agents; thus for application to surfaces of concrete, which are comparatively rough and dusty, the layer of adhesive must be at least 0.063 to 0.5 cm. thick; the thicker the layer of adhesive, the better the waterproofing effect, but in general a layer 0.063 to 0.4 cm. thick is satisfactory, with thicknesses at the upper end of this range being preferred. A support having on it a single layer of adhesive 0.23 to 0.35 cm. thick is preferred.

The rubber in the adhesive can be a natural or synthetic rubber, virgin or reclaimed, and is blended into bitumen to provide a smooth mix. The ratio by weight of bitumen to rubber is suitably greater than 80:20, prefer-

ably up to 95:5, especially 90:10. Generally, suitable compositions have softening temperatures (measured by the Ring and Ball method) of 60° to 140°C, preferably 60° to 110°C. and penetration values of 50 to 400, preferably 150—300 at 25°C. (100 g. 5 secs.—Institute of Petroleum method).

It is generally desirable that the support should be substantially impermeable to water. For many purposes it is desirable that the support should be such that after application to the surface it is capable of stretching with movement of the concrete or other material, e.g. as a result of shrinkage, with maintenance of a moisture and moisture-vapour proof seal. To this end it is desirable that when the support is of polyethylene the combined structure of the support and the membrane should have, at 20°C., an elongation at break of at least 300%, a tensile strength of at least 1.5 kg. per cm. width and an Elmendorf tear strength of at least 750 gm. The term "Elmendorf tear strength" as used herein refers to the test described in Elmendorf, Paper 1920, 26, April 21st, page 302. However, where stretchability and flexibility are less important than other properties, supports not fulfilling these requirements can be utilized.

Particularly for use in road-building it is desirable that the support should be such that hot asphalt (base course) can be poured directly onto it without deleterious effect on the waterproof seal. For this purpose the support when of polypropylene should be able to resist a temperature of at least 150° C. A particularly suitable material for this purpose is one consisting of a woven fabric of polypropylene fibres having on one face a waterproof layer of a pressure-sensitive bitumen-rubber adhesive as described above and on the other face a waterproof layer of a bitumen adhesive which is not a pressure-sensitive adhesive when cold but becomes tacky at elevated temperature, as when a hot asphalt mix is poured thereon.

Although cellular films can be used as supports, the supports are preferably substantially incompressible and have a thickness of at most 0.6 cm.

Related rolls and a method of using them are disclosed and claimed in our Patent Application No. 9039/68 (Serial No. 1,265,952).

55 WHAT WE CLAIM IS:—

1. A structure in the form of a roll and comprising (a) a waterproof membrane comprising a waterproofing pressure-sensitive adhesive which is a bituminous-rubber composition, and, adhered to the membrane, (b) a sheet-like support of polyethylene or polypropylene, one face of the support being substantially more readily physically separable from the membrane than the other face,

the membrane being at least 0.025 cm. thick and the support being at least 15 cm. wide. 65

2. A structure according to claim 1 wherein the sheet-like support has on one face a release coating.

3. A structure according to claim 2 wherein the outer face (as hereinbefore defined) of the support has the release coating. 70

4. A structure according to claim 2 or 3 wherein the release coating is provided by silicone deposition. 75

5. A structure according to any one of the preceding claims wherein the support is a water-impermeable film of polyethylene.

6. A structure according to any one of claims 1 to 4 wherein the support is a woven or non-woven fabric. 80

7. A structure according to any one of claims 1 to 4 wherein the support is a polypropylene film having a softening temperature of at least 150°C. 85

8. A structure according to any one of claims 1 to 5 wherein the support is of polyethylene, and the combined support and membrane have, at 20°C., an elongation at break of at least 300%, a tensile strength of at least 1.5 kg. per cm. width and an Elmendorf tear strength of at least 750 g. 90

9. A structure according to any one of the preceding claims wherein the membrane is 0.063 to 0.4 cm. thick. 95

10. A structure according to claim 9 wherein the membrane is 0.23 to 0.33 cm. thick.

11. A structure according to any one of the preceding claims wherein the bituminous-rubber composition is a blend of natural or synthetic rubber and bitumen, the ratio by weight of bitumen to rubber being greater than 80:20. 100

12. A structure according to claim 11 wherein the ratio is up to 95:5. 105

13. A structure according to any one of the preceding claims which is 15 to 120 cm. wide.

14. A structure according to claim 13 which is 15 to 91 cm. wide. 110

15. A structure according to claim 14 which is greater than 60 cm. wide.

16. A structure according to any one of claims 6 and 9 to 15 wherein the support is a woven fabric of polypropylene fibres. 115

17. A structure according to claim 16 wherein the fabric has on one face a membrane as defined in claim 1, and on the other face a waterproof layer of a bitumen adhesive which is not a pressure-sensitive adhesive when cold but which becomes tacky at an elevated temperature. 120

18. A structure according to claim 1 substantially as hereinbefore described. 125

19. A method of forming a waterproof seal on a surface, the method comprising unrolling a structure according to any one

ably up to 95: 5, especially 90: 10. Generally, suitable compositions have softening temperatures (measured by the Ring and Ball method) of 60° to 140°C, preferably 60° to 110°C. and penetration values of 50 to 400, preferably 150—300 at 25°C. (100 g. 5 secs.—Institute of Petroleum method).

It is generally desirable that the support should be substantially impermeable to water. For many purposes it is desirable that the support should be such that after application to the surface it is capable of stretching with movement of the concrete or other material, e.g. as a result of shrinkage, with maintenance of a moisture and moisture-vapour proof seal. To this end it is desirable that when the support is of polyethylene the combined structure of the support and the membrane should have, at 20°C., an elongation at break of at least 300%, a tensile strength of at least 1.5 kg. per cm. width and an Elmendorf tear strength of at least 750 gm. The term "Elmendorf tear strength" as used herein refers to the test described in Elmendorf, Paper 1920, 26, April 21st, page 302. However, where stretchability and flexibility are less important than other properties, supports not fulfilling these requirements can be utilized.

Particularly for use in road-building it is desirable that the support should be such that hot asphalt (base course) can be poured directly onto it without deleterious effect on the waterproof seal. For this purpose the support when of polypropylene should be able to resist a temperature of at least 150° C. A particularly suitable material for this purpose is one consisting of a woven fabric of polypropylene fibres having on one face a waterproof layer of a pressure-sensitive bitumen-rubber adhesive as described above and on the other face a waterproof layer of a bitumen adhesive which is not a pressure-sensitive adhesive when cold but becomes tacky at elevated temperature, as when a hot asphalt mix is poured thereon.

Although cellular films can be used as supports, the supports are preferably substantially incompressible and have a thickness of at most 0.6 cm.

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WHAT WE CLAIM IS:—

1. A structure in the form of a roll and comprising (a) a waterproof membrane comprising a waterproofing pressure-sensitive adhesive which is a bituminous-rubber composition, and, adhered to the membrane, (b) a sheet-like support of polyethylene or polypropylene, one face of the support being substantially more readily physically separable from the membrane than the other face,

the membrane being at least 0.025 cm. thick and the support being at least 15 cm. wide.

2. A structure according to claim 1 wherein the sheet-like support has on one face a release coating.

3. A structure according to claim 2 wherein the outer face (as hereinbefore defined) of the support has the release coating.

4. A structure according to claim 2 or 3 wherein the release coating is provided by silicone deposition.

5. A structure according to any one of the preceding claims wherein the support is a water-impermeable film of polyethylene.

6. A structure according to any one of claims 1 to 4 wherein the support is a woven or non-woven fabric.

7. A structure according to any one of claims 1 to 4 wherein the support is a polypropylene film having a softening temperature of at least 150°C.

8. A structure according to any one of claims 1 to 5 wherein the support is of polyethylene, and the combined support and membrane have, at 20°C., an elongation at break of at least 300%, a tensile strength of at least 1.5 kg. per cm. width and an Elmendorf tear strength of at least 750 g.

9. A structure according to any one of the preceding claims wherein the membrane is 0.063 to 0.4 cm. thick.

10. A structure according to claim 9 wherein the membrane is 0.23 to 0.33 cm. thick.

11. A structure according to any one of the preceding claims wherein the bituminous-rubber composition is a blend of natural or synthetic rubber and bitumen, the ratio by weight of bitumen to rubber being greater than 80:20.

12. A structure according to claim 11 wherein the ratio is up to 95:5.

13. A structure according to any one of the preceding claims which is 15 to 120 cm. wide.

14. A structure according to claim 13 which is 15 to 91 cm. wide.

15. A structure according to claim 14 which is greater than 60 cm. wide.

16. A structure according to any one of claims 6 and 9 to 15 wherein the support is a woven fabric of polypropylene fibres.

17. A structure according to claim 16 wherein the fabric has on one face a membrane as defined in claim 1, and on the other face a waterproof layer of a bitumen adhesive which is not a pressure-sensitive adhesive when cold but which becomes tacky at an elevated temperature.

18. A structure according to claim 1 substantially as hereinbefore described.

19. A method of forming a waterproof seal on a surface, the method comprising unrolling a structure according to any one



of claims 1 to 15 and applying the membrane so exposed to the surface.

20. A method according to claim 19 wherein the surface is concrete.

5 21. A method according to claim 19 or 20 wherein a continuous waterproof seal is formed over the whole surface by the use of overlapping structures, and another surface is formed or placed in contact therewith.

10 22. A method of forming a waterproof seal on a surface, the method comprising unrolling a structure according to any one of claims 16 to 18 and applying the membrane so exposed to the surface.

23. A method according to claim 19 substantially as hereinbefore described. 15

24. A surface whenever treated by the method according to any one of claims 19 to 21.

25. A surface whenever treated by the method according to claim 22 or 23. 20

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