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(54) **Sheet-like structure**

(57) A sheet like structure comprises a flexible metal substrate e.g. of aluminium which is impressed so as to have projections on one side and depressions on the other with an adhesive membrane contiguous to it on one side. The impressions in the metal allow it to be readily bent and after bending to lie flat rather than become arched. The invention allows the application therefore of a thin metal sheet, for instance on an outside surface where it will absorb ultraviolet radiation and thus protect the adhesive membrane by which it is secured to the surface to be protected. The adhesive membrane is preferably bituminous, preferably a bitumen-rubber mix and may also comprise a scrim of glass or polymeric fibres.

SPECIFICATION

Sheet like structure

5 This invention relates to sheet like structures.

Already known are preformed sheet like structures comprising a substrate for instance in the form of a film of a water impermeable plastics material, and a waterproofing pressure sensitive adhesive membrane, such as of a bituminous composition, in particular a rubber-bitumen mixture. Such substrates are supplied in rolls with a width of 1 m. or so and can be laid side by side, for instance on concrete, to provide a waterproof layer thereon.

15 While it is also known to use such structures with aluminium as a substrate, it has hitherto been necessary to limit the thickness of the aluminium to very thin foils in order that the structure should not have excessive rigidity. Such excessive rigidity would give rise to arching and creasing of the aluminium based structure upon laying, and result in the formation of channels which would permit the entry of water.

To avoid this problem, the structures employing an aluminium substrate and a bituminous adhesive that are known to date have been limited to widths of about 25 cm at most and employ only a thin aluminium foil, of a thickness between 0.99 mm and 0.050 mm, mostly in the region of 0.009 mm to 0.075 mm. However, structures of this nature suffer from the disadvantage that the thin aluminium substrates have low tensile strength, tear easily and also possess only limited resistance to atmospheric corrosion, so limited, in fact, that it is known for such structures to be supplied with a protective coat of paint over the aluminium in order to improve the resistance to weathering.

We have found that a metal backed adhesive preformed sheet like structure, particularly one employing aluminium, which displays hitherto unachieved flexibility for a useful metal thickness can be obtained by impressing the metal so that it is formed with an array of projections on one side with corresponding depressions on the other before laminating with the adhesive compound.

We have found that this arrangement allows the structure using relatively thick metal to be laid flat while still possessing easy bending or moulding properties so as to achieve a particular shape if required. For instance, to take one simple example, the structure can be turned through a right angle, such as must be formed between the upper surface of a flat roof and the internal vertical surface of a parapet wall, and also when tucking the structure at right angles into rebates.

Thus the invention provides a sheet like structure comprising an impressed metal substrate with an adhesive membrane contiguous thereto on one side. The metal is a flexible metal, preferably aluminium, and the adhesive preferably waterproofing, preferably bituminous and preferably a bitumen-rubber mix.

To provide a useful thickness of metal, while still allowing the additional flexibility offered as a result of the invention, a metal thickness of 0.125 to 0.25

mm, preferably 0.15 mm is employed. The depths of the depressions introduced by impressing can be from 0.1 to 0.8 mm, preferably 0.50 mm. The adhesive should be thick enough to fill the depressions (or the gaps between the projections) and offer a smooth surface for overall adhesion to a surface to be covered. Its minimum overall thickness should therefore be 1.5 mm, that is when the maximum projection height is employed, so that over the structure its smallest thickness will be approaching 1.0 mm. However, a minimum thickness of 1.8 mm, preferably 2.5 mm is better as it increases the assurance of adhesion.

70 More particularly, therefore, the invention provides a sheet like structure comprising an impressed aluminium substrate of a thickness of 0.1 to 0.8 mm with an array of projections on one side and corresponding depressions on the other side, with an adhesive waterproofing membrane with a minimum thickness of 1 mm laminated thereto.

75 The structure of the invention may find many applications, and can be provided in a variety of widths. The structures are particularly useful for application to concrete surfaces, and for this application the membranes are preferably pressure sensitive, that is to say they enable the structures when pressed with normal hand pressure against a concrete surface, without any prior treatment of the surface or membrane, to adhere to the concrete. Thus, while priming and/or initial heating may with advantage be performed, they are not essential in order to adhere the membrane to concrete.

The membrane can be a layer of the adhesive alone or the adhesive can contain reinforcing material, for example a scrim of glass fibres or an organic 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.

100 The structures as produced in a factory, stored, and brought to the site for use are in the form of laminates comprising the metal, the adhesive and, usually a removable protective coating such as a siliconised paper, and are conveniently in the form of rolls.

On the one hand, the structures may be up to 120 cm, typically 1 m wide when for use in covering large surfaces. On the other hand, structures of as little as 65 cms in width may be provided.

110 Particularly when a waterproofing facility is desired, bituminous adhesives are generally suitable except where their colour is a disadvantage. If a bituminous adhesive is used, it 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 rubber is preferably from 80:20 to 95:5, especially about 90:10. Other types of contact adhesive composition may include polychloroprene, butyl rubber, oil-based mastics or compositions containing rosins or rosin derivatives. Generally, suitable compositions having softening points (measured by the Ring and Ball method) of 60 to 110°C and penetration values of 150-300 at 25°C

(100 g. 5 secs. - Institute of Petroleum method).

A wide variety of materials can be used to provide protective coatings in the structures of the invention. Paper having a release coating thereon, e.g. silico-

5 nised paper or paper having a coating thereon of a vinyl chloride polymer, is satisfactory. Other materials include films of organic polymers, particularly vinyl chloride polymers.

The structures of the invention can be prepared

10 without difficulty by techniques known per se. It is preferred to use adhesives which are not solvent-based and which are heated. Thus the adhesive may be bonded to the substrate to form a uniform layer contiguous to the substrate. If it is desired to

15 incorporate a sheet-like reinforcing layer in the membrane, this can be achieved, for example by pressing a scrim into the layer of adhesive.

The impression of the metal, which can be performed using a solid metal roller cut with suitable

20 profiles and a resilient backing roller is preferably such that the projections and depressions, which may be generally rectangular, are regularly arranged in rows and columns. This is found to allow notable flexibility and the facility to bend the structure so

25 that it keeps its shape. The projections may be from 1 cm to 3 cm long and from 0.25 to 1 cm wide, preferably being 2.2 by 0.5 cms. The margins between the depressions may be from 0.5 to 1 cm, preferably 0.7 cm wide.

30 One application for structures of the invention is as a roofing material. The structures can be unrolled and adhered to such roofing undersurfaces as wood, concrete or previously applied roofing felts and can give absolute water tightness. Moreover, they are

35 particularly resistant to the action of sunlight, in particular the ultraviolet component thereof, thus offering much improved weathering to conventional roofing materials. Moreover, the metallic surface acts as a reflectant, assisting therefore in keeping the

40 building below cool when used in hot climates.

The "bendability" imparted by the impressing of the metal means that the structure can be used as a vehicle for installing a metallic layer of significant

45 thickness in those positions, which has not readily been possible hitherto except when lead has been used.

Further, structures according to the invention can be employed in such structures where the initially mentioned waterproofing membranes are used at

50 present, that is in providing waterproofing membranes in concrete structures, in particular underground structures or roof or bridge decks where the structures are then covered, either by more concrete or by a roofing or surfacing material. There is, in fact,

55 a particular advantage offered in the case of road and bridge building, namely that hot asphalt can be poured directly out the structure without deleterious effect on the waterproof seal and the asphalt will be most satisfactory keyed to the impressed surface of

60 the structure thus reducing slipping between the road surface and the underlying structure.

Where a waterproofing property is desired, as in many of the applications envisaged, a waterproofing, preferably rubber-bitumen membrane should

65 be employed. The thicker the membrane, the better

the waterproofing properties, and a thickness of up to 0.4 cm can usefully be employed.

CLAIMS

- 70
1. A sheet like structure comprising an impressed metal substrate with an array of projections on one side and corresponding depressions on the other, the substrate being flexible and having an
- 75 adhesive membrane contiguous thereto on one side.
2. A structure according to claim 1, wherein the metal is aluminium.
 3. A structure according to claim 1 or 2, wherein the membrane is a waterproofing membrane.
- 80
4. A structure according to claim 3, wherein the membrane is bituminous.
 5. A structure according to claim 4, wherein the membrane is a bitumen - rubber mix.
 6. A structure according to any preceding claim,
- 85 wherein the metal is of a thickness of from 0.125 to 0.25 mm.
7. A structure according to claim 6, wherein the metal thickness is 0.15 mm.
 8. A structure according to any preceding claim,
- 90 wherein the depths of the depressions introduced by impression are from 0.1 to 0.8 mm.
9. A structure according to claim 8m, wherein the depths of the depressions are 0.5 mm.
 10. A structure according to any preceding claim,
- 95 wherein the membrane is of a thickness of at least 1.5 mm.
11. A structure according to any preceding claims, wherein the membrane is of a thickness of at least 1.8 mm.
- 100
12. A structure according to any preceding claim, wherein the membrane is of a thickness of at least 2.5 mm.
 13. A structure according to any preceding claim,
- 105 wherein the membrane is of a thickness of no more than 4 mm.
14. A sheet like structure according to any preceding claim, wherein the adhesive membrane is a pressure sensitive adhesive.
 15. A structure according to any preceding claim,
- 110 wherein the adhesive membrane is reinforced.
16. A structure according to any preceding claim, having a release sheet on the side of the membrane remote from the substrate.
 17. A structure according to any preceding claim
- 115 of a width of at least 1 metre.
18. A structure according to any preceding claim in the form of roll.
 19. A structure according to any preceding claim,
- 120 wherein the depressions are rectangular and arranged in rows and columns.
20. A structure according to claim 19, wherein the depressions are 1 to 3 cm long and from 0.5 to 1 cm wide.
 21. A structure according to claim 20, wherein
- 125 the depressions are 2.2 by 0.5 cms.
22. A structure according to claim 20 or 21, wherein the margins between the depressions are from 0.5 to 1 cm in width.
 23. A structure according to claim 22, wherein
- 130 the margins between the depressions are 0.7 cm

wide.

24. A sheet like structure according to claim 1
and substantially as hereinbefore described.

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