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(54) Method for the production of a waterproof coating on a surface and sheet materials suitable for use in connection with said method.

(57) A sheet material for the production of a coating comprising interconnected pressure relieving passages, one side of said material comprising a large number of separate rectangular zones of a bituminous binder modified with 5–40% by weight of a thermoplastic elastomer, and method of preparing a roof coating.

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Method for the production of a waterproof coating on a surface and sheet materials suitable for use in connection with said method.

The invention relates to a method for the production of a waterproof coating on a surface, and particularly to the production of a roof coating wherein a sheet material is rolled out and bonded to the surface in separate zones so as to form interconnected pressure relieving passages between the sheet material and the surface.

The purpose of providing such pressure relieving zones in a roof coating of e.g. roofing felt is to avoid the accumulation of moisture and air under superatmospheric pressure in restricted zones of the roof coating causing serious steam bulges in the roof coating. A number of methods for the formation of pressure relieving passages in roof coatings are known. Thus, instead of applying bitumen all over the surface to be coated it may be applied in restricted zones by means of a broom, and subsequently the roofing felt may be pressed against the surface.

Another known method of the above mentioned type is described in Danish patent specification No. 133.481. In this method a roof coating material is used, the under side of which is coated with both a bitumen layer and a layer of balls of a cellular plastics material. The application is effected by decomposing said balls and heating of the bitumen layer so as to form a melt within separate zones by means of a strong gas burner and subsequently the roof coating material is pressed against the roof so as to bind the roof coating material to the roof within the melt zones.

DE-OS No. 28 45 700 describes a roof coating material consisting of a layer of roofing felt, the under side of which is coated with a thick mat of coarse, elastic fibres, and preferably synthetic fibres, and comprising on the opposite side, which is intended to be contacted with the surface, separate zones of a binder such as a self-adhesive bitumen layer or a layer of a binder which can be activated by addition of a further component.

As stresses will inevitable arise in the coating and/or the surface it is important that the coating is bonded to the surface in such a way that not only pressure but also stress can be relieved because otherwise cracks in the coating will be formed.

The known coating methods do not result in an optimum pressure relief because the adhesion is effected within relatively large adhesive zones separated by non-adhering zones. This is mainly due to the fact that the binders previously used spread during heating. Thus, there is a risk of the formation of steam/air bulges within the adhesive zones.

The resulting discontinuity in adhesion is also unfavourable as far as the stress relief is concerned. Furthermore the known bitumen binders become brittle at low temperatures, and thus cannot absorb the stresses which may arise in cold weather.

The object of the invention is to provide a uniformly adhered coating which not only is pressure relieving but also stress relieving over a wide temperature range.

This object is obtained by the method of the invention by using a sheet material comprising separate zones of a bituminous binder modified with 5–40% by weight of a thermoplastic elastomer.

The modified bitumen binder has various properties which makes it particularly suitable for use in connection with the method of the invention. Thus, it can be applied mechanically in the form of small well-defined protrusions e.g. by means of a pattern roller. This results in the above mentioned interconnected pressure relieving zones being of a fine-meshed network of passages of well-defined dimensions. Thus, steam/air bulges which may be formed within large zones coated with a binder between the surface and the coating may be avoided and the stress relief is dispersed over the entire surface. In addition to that the binder has the property of not spreading even at high temperatures, e.g. at temperatures of 70°C which may occur when the roof surface is subjected to sunlight. Also the binder maintains its elasticity at low temperatures. For instance with proper use of thermoplastic elastomers within the range specified above the binder may be used for the production of coatings which are to be stress relieving at temperatures down to ÷35°C. Finally, if properly composed the binder presents the advantage of being self-adhesive in the sense that it will bind to a dustless surface at temperatures down to 5°C when pressed against such surface.

However, it is pointed out that the adhesion of the sheet material for certain compositions of the binder presupposes that the

binder zones are heated prior to the application onto the surface.

The binding compositions have such a good interior cohesion and excellent adhesion to the surface that it is sufficient to coat 25-40% of the surface area of the sheet material even in the case of the coating being exposed to strong wind forces.

The thermoplastic elastomer is preferably a blokcopolymer based on polystyrene and polybutadiene or polyisoprene, and it is used, as mentioned, in an amount from 5 to 40% by weight based on the weight of the bitumen component. The use of less than 5% by weight of elastomer results in a binder with a too poor flexibility, and the use of more than 40% by weight of elastomer makes the binder too viscous for mechanical application. In addition to bitumen and thermoplastic elastomer the binder may contain one or more resins such as petroleum resin and tall oil resin and one or more oils such as process oil and soya bean oil. Such resins and oils may be used to modify e.g. viscosity and tackiness of the mixture of bitumen and elastomer within a given temperature range. Examples of other components of the binder are alkylated amines and antioxidants. The bitumen component may be distilled bitumen or oxidized bitumen.

The application of the sheet material described above to the surface is effected in conventional manner. The sheet material is covered with a plastic film, release paper or the like which is removed before application. In the case of thin films the removal may be effected by burning off the film, and following this step the zones coated with the binder may be superficially heated. During application the sheet material is preferably pressed against the surface. This can be effected by means of squeezing rollers or by stepping on it to press it against the surface.

The invention also relates to a coating sheet material in the form of a roll, said coating material being characterized in that it comprises a large number of small separate zones coated with a bituminous binder modified with 5-40% by weight of thermoplastic elastomer.

The binder zones preferably are of a height of 1-3 mm, preferably 1.5 mm above the sheet material, thus making each zone function as a spacing element when the material has been applied to the surface.

Such relatively thick binder zones are suitable because as

mentioned above the binder exhibits a relatively large stability with respect to shape within the relevant temperature range and thus does not spread.

The individual binder zones are preferably formed in such a way that they have an extension of less than 50 mm in at least one direction. Thus, experience has shown that it is preferable to apply the binder in the form of rows of elongated zones with intervening spaces which are of a width twice that of the binder zones. If the width of the latter zones is e.g. 15 mm the distance between the rows is thus about 30 mm.

As mentioned above the sheet material coated with a binder for use in connection with the method of the invention may be manufactured by applying the binder in a molten state to the one side of the sheet material with a pattern roller.

The application of the binder in the desired pattern may be effected on sand coated or similarly treated roof sheets.

Before the sheet material is wound up the binder zones must be covered which preferably is effected by applying thereto a thin plastic film e.g. a polyolefine film with a thickness ranging from 0.008 to 0.05 mm.

This film is removed before applying the sheet material to the surface. When the films are of a thickness of 0.008 to 0.01 mm the removal is preferably effected by burning off the film.

The coating sheet material of the invention is particularly suitable for use in the method of the invention. However, it may also be used in a coating comprising at least two sheet materials, the sheet material of the invention having the binder zones facing a superimposed sheet material.

The invention will now be further described with reference to the drawings wherein

Fig. 1 shows one side of a preferred embodiment of a coating sheet material of the invention.

Fig. 2 shows one side of another embodiment of a coating material of the invention, and

Fig. 3 shows a schematic cross sectional view of a surface comprising a coating produced by the method of the invention.

Fig. 1 shows a sheet 1 having applied thereto a binder within row of rectangular zones 2 extending in the longitudinal direction of the sheet material. The sheet material comprises at its right edge a continous stripe 3 of a binder which serves to bind the sheet with an adjacent one by partial overlapping.

Fig. 2 also illustrates a sheet 5 comprising a large number of zones 6 coated with a binder. Most of these zones are rectangular and extend in the transverse direction of the sheet. However, at the right edge the sheet 5 comprises a number of square zones coated with a binder. Furthermore the sheet 5 comprises at its left edge a continous stripe 7 of a binder for the use of binding the sheet to an adjacent one

Fig. 3 shows a roof surface 10 of wood which by a wall 11 is supported by a beam 12. The roof surface 10 is coated with a coating of sheets of a material 13 which on its under side comprises a number of separated well-defined binder zones 14 between which a network of interconnected pressure relieving zones is formed. The sheets 13 partially overlap one another at their longitudinal edges and are interconnected by means of a continous binder layer 15. At the junction between the roof surface 10 and the wall 11 a strip 16 of a material of the same composition as the sheets 13 is attached. The upper edge of the strip 16 is protected by a cover profile 17 which is attached to the wall 11.

The invention will be further described with reference to the following examples.

Example 1

A welding binder of the following composition was produced:

Oxidized bitumen	70	parts by weight
Tall oil resin	10	-
Soya bean oil	10	-
Polystyrene- polybutadiene-polystyrene-blokcopolymer	7	-
Alkylated amine	2	-
Antioxidant	1	-

This welding binder was applied to a fibre reinforced coating sheet impregnated with bitumen and covered with a sand layer in rows of narrow stripes which extend parallel and in the longitudinal direction of the sheet.

The stripes were of a width of 15 mm, a length of 300 mm, and a thickness of 1.5 mm, and the spacing between the stripes was 30 mm. The sheet was covered with a 10 µm thick protective film of polyethylene.

The coating material thus obtained had the following composition:

Glass fleece reinforced by a polyester net		150 g/m²
Impregnation of oxidized bitumen		400 g/m²
Double sided coating of oxidized bitumen with an addition of 40% by weight of finely divided mineral filler		890 g/m²
Sand coating on the under side		600 g/m²
Binder of the above mentioned composition		750 g/m²
Protective film		10 g/m²
	Total	2800 g/m²

The sheet material thus produced was applied directly to a board surface primed with bitumen after removal of the protective film by burning and by superficially heating the binder zones. The result was a stable, non-cracking coating which was suitable as surface for additional layers of roofing sheets.

Example 2

A self adhesive binder of the following composition was produced:

Distilled bitumen	55 parts by weight	
Polystyrene- polyisoprene-polystyrene- blokcopolymer	20	-
Petroleum resin	15	-
Process oil	10	-

The self adhesive binder was applied to a fibre reinforced coating sheet which had been impregnated with bitumen and coated with sand in the same manner as described in example 1 so as to form a

roofing sheet material of the following composition:

Polyester felt	250 g/m²
Impregnation, oxidized bitumen	800 g/m²
Double -sided coating of polymer modified bitumen	1450 g/m²
Slating coating (rolled into the bitumen layer)	1200 g/m²
Surface coating of sand	300 g/m²
Self adhesive binder of the above mentioned composition	750 g/m²
Silicone coated polyethylene film of a thickness of 50 µm	50 g/m²
Total	4800 g/m²

The coating sheet thus produced was directly applied to a bitumen-primed supporting concrete surface with the protective film being removed immediately before the application of each sheets.

The coating sheet was also used in the coating of an existing roofing felt coating. Prior to the application to this surface steam bulges in the existing coating were perforated and loose parts of the coating were nailed on or adhered to the surface.The upper side of the existing coating was cleaned and primed prior to the application of the coating sheet. In both cases the result was a stable coating showing no tendency of forming steam bulges or cracks.

Example 3

A self adhesive binder of the composition stated in example 2 was applied to a glass fibre reinforced film of a ethylene copolymer and of a thickness of 2 mm. The glass fibre reinforcement consisted of a glass fleece which was rolled into the film. The self adhesive binder was applied to the side comprising the glass fleece and in the manner described in example 1. As a result of the application of the binder the glass fibre layer became completely saturated thus bringing the binder into contact with the film itself.

The resulting coating sheet material had the following composition:

Bituminous film of ethylene copolymer of thickness of 2 mm	1800 g/m²
Glass fleece	40 g/m²
Self-adhesive binder of as described in example 2	750 g/m²
Covering, silicon treated crepe paper	110 g/m²
Total	2700 g/m²

The coating sheet was applied to the upper surface of a roof comprising an insulation layer placed on the supporting construction of the roof the upper surface of the insulation layer being primed prior to the application of the coating sheet.

Also in this case the coating was stable and non-cracking.

Claims

1. A method for the production of a waterproof coating on a surface wherein a sheet material is rolled out and bonded to the surface in separate zones so as to form interconnected pressure relieving passages between the sheet material and the surface characterized in using a sheet material comprising separate zones of a bituminous binder modified with 5-40% by weight of a thermoplastic elastomer.

2. A method as in claim 1 characterized in that the thermoplastic elastomer is a styrene-butadiene or styrene-isoprene blokcopolymer.

3. A method as in claim 1 characterized in that the binder also contains a resin and an oil.

4. A method as in claim 1 characterized in using a sheet material coated with a binder in rows of rectangular zones having a width of less than 50 mm.

5. A method as in claim 1 characterized in that the binder zones have a height of 1-3 mm.

6. A method as in claim 1 characterized in that the binder coated zones cover 25-40% of the surface area of the sheet material.

7. A sheet material for use in the form of a roll characterized in that it comprises a large number of small separate zones coated with a bituminous binder modified with 5-40% by weight of thermoplastic elastomer.

8. A sheet material as in claim 7 characterized in that the thermoplastic elastomer is a styrene-butadiene or styrene-isoprene blokcopolymer.

9. A sheet material as in claim 7 characterized in that the binder also contains a resin and an oil.

10. A sheet material as in claim 7 characterized in that the binder is applied in rows of rectangular zones.

11. A sheet material as in claim 10 characterized in that the binder zones are of a height of 1-3 mm.

12. A sheet material as in claim 7 characterized in that the binder zones cover 25-40% of the total surface area of the sheet material.

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FIG.1

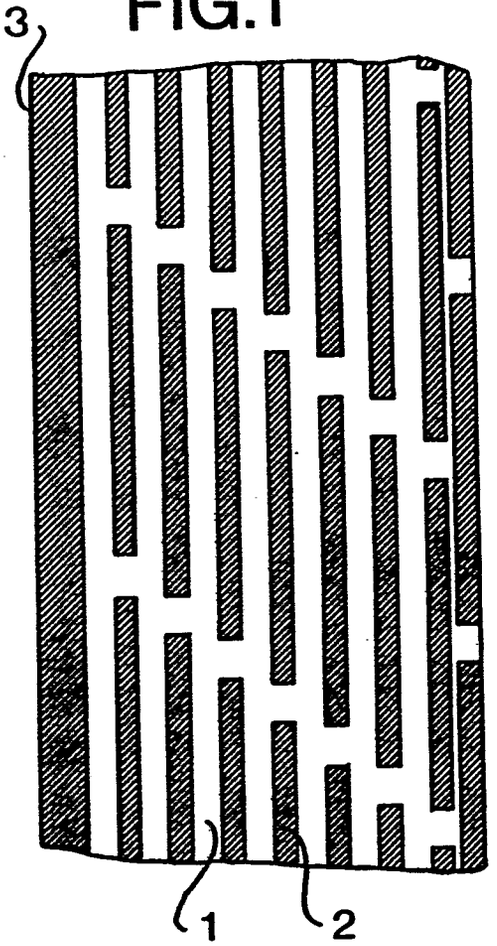
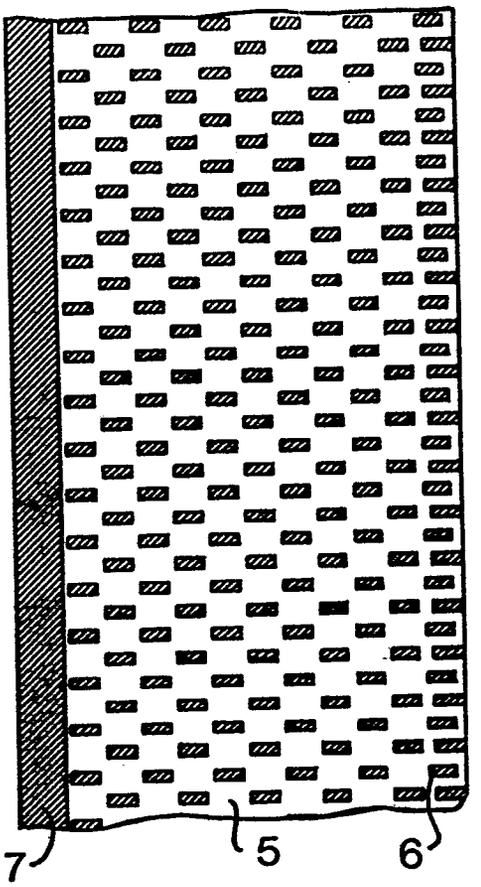


FIG.2



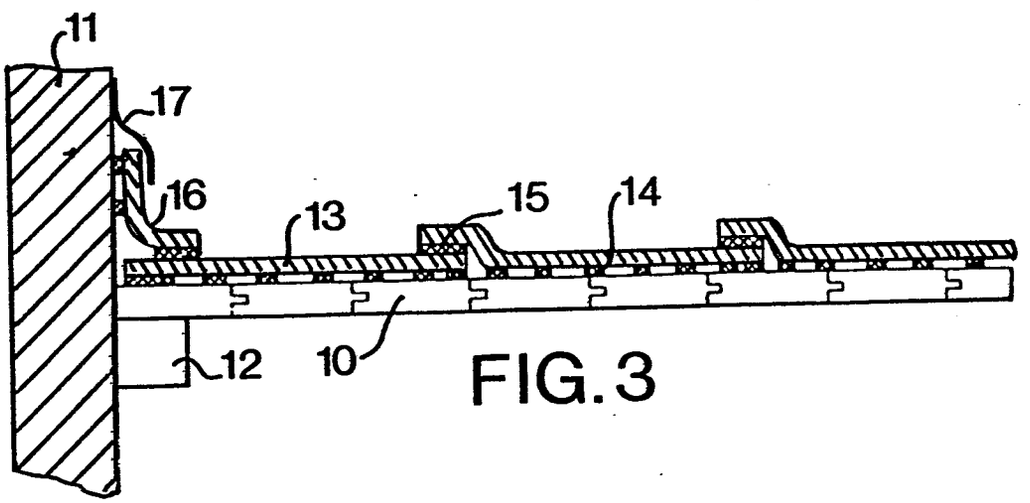


FIG.3