

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 501 838 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
11.09.1996 / Bulletin 1996/37

(51) Int Cl.⁶: **C09J 7/02, E04D 5/10**

(21) Application number: **92301764.4**

(22) Date of filing: **02.03.1992** /

(54) **Waterproofing membrane** /

Wasserdichte Membran

Membrane d'étanchéité

(84) Designated Contracting States:
**AT BE CH DE DK ES FR GB GR IT LI LU MC NL
PT SE**

(30) Priority: **01.03.1991 US 662853**

(43) Date of publication of application:
02.09.1992 Bulletin 1992/36

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- **DATABASE WPI Week 7933, Derwent**
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- **PATENT ABSTRACTS OF JAPAN vol. 10, no. 55**
(M-458)(2112) 5 March 1986 & JP-A-60 203 740
- **PATENT ABSTRACTS OF JAPAN vol. 6, no. 153**
(M-149)13 August 1982 & JP-A-57 071938

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Description

The present invention relates to compositions and methods useful for waterproofing or dampproofing various water-penetrable materials used in building construction and other civil engineering projects. Specifically, the present invention relates to novel waterproofing membranes comprised of a carrier, a synthetic adhesive, and a protective layer.

Various materials used in building construction and other civil engineering projects such as roads and bridges are susceptible to water penetration resulting either from their inherent properties or imperfections such as cracks or pores. Reducing or eliminating water penetration through structures formed of these materials often is desirable such as for below grade building walls, and may be critical in certain structures such as those housing expensive electrical equipment or tunnels moving vehicular or pedestrian traffic under bodies of water.

In conventional waterproofing applications, the waterproofing material is post applied to an existing concrete structure. Available conventional waterproofing agents include ethylene propylene diene monomer (EPDM) sheets, polyvinyl chloride sheets, neoprene sheets, bentonite panels, built-up asphalt systems, coal tar-based, and other asphalt-based compositions. Asphalt-based compositions are currently preferred; most preferred are preformed, flexible sheet-like waterproofing laminates of a support film(s) and a bituminous layer(s) such as described in U.S. Patent Nos. 3,741,856; 3,853,682; and 3,900,102. Bituthene® brand of waterproofing is an example of a popular commercial membrane.

In many inner-city construction projects, the concrete foundation of one structure is poured very close to the foundation and/or property line of its neighbors. In these situations, a permanent concrete form is assembled along the exterior of the foundation. This is referred to as "vertical lagging" or simply "lagging". During a lagging operation, it is virtually impossible to apply a conventional post applied waterproofing membrane to the cured exterior of the foundation because the exterior surface of the concrete cannot be exposed. Accordingly, attempts have been made to affix a pre-applied waterproofing membrane to the lagging form before the wet concrete is poured. Pre-applied waterproofing systems have been limited to Bentonite based products including Volclay Panels, Paraseal, and Claymax. These products rely on the ability of the bentonite clay to expand on contact with water and create an impermeable layer to water migration. However, the rigidity of the lagging material/structure actually prevents the formation of an expanded wet clay layer of a desirable density high enough to qualify the material as impermeable.

Conventionally preferred asphaltic based waterproofing membrane systems have several significant deficiencies when applied with the adhesive facing out in a lagging situation. First, they tend to oxidize during

short periods of outdoor exposure and "mud cracks" develop on the adhesive surface. The oxidized surface does not bond to the post cast concrete. Second, the exposed adhesive surface of the waterproofing membrane tends to become fouled by the elements and by dust. Accordingly, it would be desirable to have an essentially non-tacky waterproofing membrane which can be pre-applied to a concrete form, resist chemical and physical changes from real time outdoor exposure, and develop a strong, fully adhered bond to the post cast concrete structure.

EP-A-0,414,423 discloses waterproof membranes capable of adhering to freshly poured concrete compositions upon curing. The membranes comprise a bituminous sheet having at least one surface coated with a non-tacky polymeric composition comprising water insoluble polymer. Further waterproofing membranes are disclosed in DE-A-2,239,665 and JP-A-54/085510.

An objective of the present invention is to provide a waterproofing membrane which can be pre-applied to a concrete form and adhere strongly to the post cast concrete.

It is also an objective to provide a waterproofing membrane to resist chemical and physical changes during outside exposure and still have the capability for forming a strong and intimate bond to post-cast concrete.

It is further an objective to provide a highly weatherable waterproofing membrane which is essentially not tacky to the touch.

Another objective is to provide a non-asphaltic waterproofing membrane.

It is still further an objective to provide a waterproofing membrane which is particularly suited for vertical lagging construction.

Also, it is an objective to provide a method for pre-applying waterproofing membranes which become fully adhered to the resulting post cast concrete structure.

It is yet another objective to provide a novel waterproofing post cast concrete structure.

These and other objectives will become evident from the following:

The present invention relates to a waterproofing membrane comprising:

- a carrier layer suitable for disposition against a concrete form;
- a layer of pressure sensitive synthetic adhesive disposed upon one face of the carrier layer, the adhesive having a penetration greater than 3 mm (30 dmm) (150 g, 5 sec, 21.1°C (70°F)) according to ASTM D 5-73, and being selected from butyl rubber based adhesives, polyisobutylene based adhesives, acrylic based adhesives, vinyl ether based adhesives, styrene isoprene styrene (SIS) based adhesives, styrene butadiene styrene (SBS) based adhesives, styrene ethylene butylene styrene (SEBS) based adhesives, styrene butadiene rubber

(SBR) based adhesives, and combinations thereof; and a protective coating layer disposed upon the synthetic adhesive layer; which membrane bonds without tackification to concrete cast against the protective coating.

The present invention also relates to a method of waterproofing which comprises affixing to a concrete form a membrane comprising a carrier layer for disposition against the form, a synthetic adhesive layer disposed against one face of the carrier layer and a protective coating layer such that the membrane bonds with concrete cast against the membrane wherein, the synthetic adhesive is a pressure sensitive adhesive having a penetration greater than about 3 mm (30 dmm) (150 g, 5 sec, 21.1°C (70°F)) according to ASTM D 5-73, and being selected from butyl rubber based adhesives, polyisobutylene based adhesives, acrylic based adhesives, vinyl ether based adhesives, styrene isoprene styrene (SIS) based adhesives, styrene butadiene styrene (SBS) based adhesives, styrene ethylene butylene styrene (SEBS) based adhesives, styrene butadiene rubber (SBR) based adhesives, and combinations thereof.

Furthermore, the present invention relates to post cast concrete structures comprising a waterproofing membrane of the present invention adhered to all or part of the exposed surface of said structure and further comprising concrete cast against the membrane after the membrane is affixed to the form.

Figure 1 is a lateral cross sectional view of an entire waterproofing system.

As was mentioned above, conventional waterproofing membranes, particularly asphaltic-based membranes, suffer from many problems when applied with the adhesive facing out in a lagging situation. First, although the subterranean portion of asphaltic-based membranes perform well when properly applied to post cast concrete with no outdoor exposure of the asphaltic based adhesive, the exposed adhesive portions do not weather well. Second, the adhesives currently used in the waterproofing industry tend to foul by the elements and by dust. Their tenacious stickiness may also be a nuisance to construction workers. The present invention solves these problems through the discovery that a waterproofing membrane comprised of a carrier, a synthetic adhesive coated on one face of the carrier, and a protective layer coated on the synthetic adhesive can still become fully adhered with post cast concrete after real time outdoor weathering exposure without the need for tackification.

The carrier layer of the present invention can be fabricated from a thermoplastic, rubber, or metal in the form of a continuous film, a woven material, or a non-woven material. Thermoplastics particularly suited for use in the present invention include high density polyethylene (HDPE), polyethylene terephthalate (PET), polystyrene

(PS), polyvinyl chloride (PVC), polyamides (PA), or combinations thereof. Preferred carriers are thermoplastic films of HDPE, PET, or PVC. The most preferred carrier is a HDPE film. The thickness of the carrier film is from 0.051 mm (0.002 inches) to 0.76 mm (0.030 inches), preferably 0.51 mm (0.020 inches).

As used herein, the term "synthetic adhesive" refers to non-bituminous and non-asphaltic adhesives. The adhesive layer of the membrane is selected from butyl rubber based adhesives, polyisobutylene based adhesives, polyisobutyl based adhesives, acrylic based adhesives, vinyl ether based adhesives, styrene-isoprene-styrene based (SIS) adhesives, styrene-ethylene-butylene-styrene based (SEBS) adhesives, styrene-butadiene-styrene based (SBS) adhesives, and combinations thereof. Pressure sensitive adhesives are preferred. Preferably, the synthetic adhesive is a pressure sensitive hot melt adhesive block copolymer of SIS, SBS or SEBS. Most preferably, the synthetic pressure sensitive hot melt adhesive is based on an SIS block copolymer. For a more detailed description of pressure sensitive adhesives, see Satas, Handbook of Pressure Sensitive Adhesive Technology, by Van Nostrand Reinhold Company, Inc. (1982), incorporated herein by reference.

The synthetic adhesive layer can optionally contain typical additives which retard degradation by light, heat or oxygen, such as, light absorbers (i.e. carbon black, benzotriazoles, etc.), light stabilizers (i.e. hindered amines, benzophenones), antioxidants (i.e. hindered phenols), fillers (i.e. calcium carbonate, silica, titanium dioxide, etc.), plasticizers, rheological additives, and mixtures thereof. Preferred synthetic adhesive layers contain light absorbers, light stabilizers, and antioxidants.

It has further been discovered that the adhesion to post cast concrete is improved when the synthetic adhesive layer has a penetration greater than 3 mm [30 decimillimeters (dmm)] (150 g, 5 sec., 21.1°C (70°F)) as measured according to ASTM D 5-73.

The "adhesive" nature of the synthetic pressure sensitive adhesive has the added benefit in that side laps and end laps of the membrane are easily formed. The thickness of the synthetic adhesive layer is from 0.13 mm (0.005 inches) to 2.03 mm (0.080 inches), preferably greater than 0.51 mm (0.020 inches).

The protective coating of the present invention is intended to have minimal tack and protects the synthetic adhesive from dust, dirt and the elements (particularly sunlight). At the same time, the protective coating does not hinder the ability of the membrane to form a fully adhered strong bond to the post cast concrete and the resulting structure.

The protective coating is preferably selected from the group consisting of styrene butadiene rubber based (SBR) coatings, carboxylated SBR based coatings, acrylic based coatings, polyvinylidene chloride based (PVDC) coatings, polyvinyl chloride based (PVC) coatings, ethylene vinyl acetate copolymer based (EVA)

coatings, ethylene ethyl acetate copolymer based (EEA) coatings, polychloroprene based coatings, polyester based coatings, polyurethane based coatings, styrene-isoprene-styrene based (SIS) coatings, styrene-butadiene-styrene based (SBS) coatings, and combinations thereof. Preferred protective coatings are acrylic based coatings. Most preferred are styrene butylacrylate based coatings.

Elastomeric protective coatings are preferred. As used herein, the term elastomer means an elastic polymer having properties, similar to those of vulcanized natural rubber; namely the ability to be stretched to at least twice its original length and to retract very rapidly to approximately its original length when released. Elastomeric acrylic based coatings are preferred and elastomeric styrene butylacrylate based coatings are most preferred.

The protective coating may optionally contain typical additives including materials which retard degradation by light, heat or oxygen, such as, light absorbers (i.e. carbon black, benzotriazoles, etc.), light stabilizers (i.e. hindered amines, benzophenones), antioxidants (i.e. hindered phenols), fillers (i.e. calcium carbonate, silica, titanium dioxide, etc.) plasticizers, rheological additives and mixtures thereof. Preferred synthetic adhesive layers contain light absorbers, light stabilizers, and antioxidants.

It has further been discovered that the adhesion to post cast concrete is greatly improved when the protective coating has a penetration greater than 3 mm (30 dmm)(150 g. 5 sec., 21.1°C (70°F)) as measured according to ASTM D 5-73.

The thickness of the protective coating is from 0.025 mm (0.001 inches) to 0.51 mm (0.020 inches), preferably 0.13 mm (0.005 inches).

The geometric configuration of the present invention comprises a carrier, the synthetic adhesive layer affixed to one face of the carrier, and the protective layer affixed to the exposed face of the synthetic adhesive layer. The layers can be affixed together by any means.

The preferred embodiment of the present invention comprises: a 0.51 mm (0.020 inch) high modulus thermoplastic HDPE carrier film; a 0.76 mm (0.030 inch) SIS block copolymer synthetic pressure sensitive adhesive layer containing at least one light absorber and at least one light stabiliser, preferably from 0 to 10% carbon black (most preferably about 2%), 0 to 5 % benzophenone and 0 to 5% benzotriazole; and about a 0.13 mm (0.005 inch) elastomeric styrene butylacrylate protective coating containing at least one light reflector, at least one light absorber and at least one light-stabiliser. The preferred light reflectors, absorbers and stabilisers are titanium dioxide, carbon black, benzophenone and a hindered amine light stabiliser, preferably from 0 to 10% carbon black, (most preferably about 5%), 0 to 5% benzophenone (most preferably about 5%, and 0 to 5% benzotriazole (most preferably about 2.5%).

Unlike conventional waterproofing laminates, which

are post-applied to existing concrete structures, the present waterproofing membranes are pre-applied to a substrate, and concrete is post cast against them.

In a typical application, the carrier face of the above waterproofing membranes is affixed to a form prior to post casting the concrete. As used herein, a "form" can be any container or any portion of a container which contacts cast concrete. This includes horizontal and vertical surfaces. In most applications, the carrier is affixed to the form by mechanically fastening the sheet membrane along the side and end edges. Neighboring sheets are placed such that the mechanical fasteners are completely overlapped, creating a surface which is continuous and free of punctures. In horizontal waterproofing applications, the waterproofing membrane can merely be rolled out without any means of fastening, although it is preferred to adhere or fasten the membrane to the substrate. In applications where the form is permanent, such as in vertical lagging operations, the carrier can also be adhered to the form through the use of adhesives.

As depicted in Figure 1, in a lagging operation, the vertical lagging 1 is constructed against the exposed earth 2. The waterproofing membrane 3 is affixed to the form 1. The membrane comprises a carrier 4, which is in contact with the form, a synthetic adhesive 5 and a protective layer 6. Concrete 7 is poured against the waterproofing membrane. Of course, an inner form 8 is used to contain the lateral flow of concrete.

Generally, the present method involves applying a carrier/synthetic adhesive composition to a form (synthetic adhesive side exposed). Thereafter, the protective layer is painted or sprayed on. This insures fully adhered side and end laps, creating a continuous waterproofing barrier. It should also be pointed out that the present invention contemplates applying a carrier/synthetic adhesive/protective layer composition in a single step. Other obvious variations on this theme are also contemplated.

After the cast concrete has set sufficiently, the interior forms(s) are removed and the exterior "lagging" form may be optionally removed. This determination of cure is with the general skill of the art.

As used herein, making a structure "waterproof" means eliminating the ability of water to penetrate the structure. The present invention is used to make waterproof structures constructed of materials which are water-penetrable either inherently or as a result of imperfections such as cracks or pores. The present invention relates to a post cast concrete structure comprising the above waterproofing membrane adhered to all or part of the surface of the structure. Various civil engineering structures including, for example, building, bridges, roads, and tunnels, are made waterproof using the present invention. Building foundations are the preferred structures.

Once the concrete has set, the membrane forms a fully adhered, strong bond to the post cast concrete. Af-

ter seven days, adhesion is believed to be about 95% of its final value (assuming no backfill pressure). The bond strength is at least 35.8 kg/m (2 lb/in) (50.8 mm/min, (2"/min). 21.1°C (70°F)) as measured by the method described in ASTM D903-49. It has been discovered that this fully adhered bond (adhesion greater than 35.8 kg/m (2 lb/in) is formed even after the protective coating face is exposed to over 40 megajoules of ultra violet light/square meter (MJUV/m²) of real time outdoor exposure prior to casting (ASTM G7).

Contemplated equivalents of the present invention include other carriers, synthetic adhesives and protective coatings with characteristics similar to the specific materials described above. Additionally, waterproofing layers or components which do not interfere with the present invention are also contemplated. Alternative methods which result in a waterproofed structure utilizing analogous waterproofing membranes are also contemplated.

The following examples provide specific illustrations of the present invention, but are not intended to limit the scope of the invention as described above and claimed below:

EXAMPLE 1

Preparation of Waterproofing Membrane and Testing Procedure

A waterproofing sheet membrane is manufactured using a 0.51 mm (20 mil) HDPE carrier sheet coated on one face with 0.76 mm (30 mil) of an SIS based pressure sensitive hot melt adhesive, HM-1597 (H.B. Fuller, Vadnais Heights, MN), having a penetration of about 120 dmm. A styrene butylacrylate latex, Ucar-123 (Union Carbide, Cary, NC), having a penetration of about 50 dmm, is coated onto the adhesive side of the sheet membrane at a thickness of about 0.13 mm (5 mil). Concrete is post cast against the protective coating surface of the waterproofing membrane composite after the protective coating surface has been exposed by up to 40 megajoules of ultraviolet light/square meter (MJUV/m²) of real time weathering on a 34° south facing wall in Phoenix, AZ (ASTM G7). Adhesion is measured at a constant rate of extension (CRE) of 50.8 mm/min (2 in/min) at 21.1°C (70°F) with an Instron (Model 100) CRE testing machine following ASTM D903-49. The concrete is allowed to cure a minimum of seven days at room temperature before testing.

EXAMPLE 2

Adhesion of Waterproofing Membrane to Post-Cast Concrete

Samples of the waterproofing membrane described in Example 1 which experience no outdoor weathering develop excellent adhesion to the post cast concrete of

greater than 161.1 kg/m (9 lb/in). Adhesion of samples which have received real time exposure decreases sharply with increasing real time exposure and is about 0 kg/m (0 lb/in) after exposures of about 10 MJUV/m². Adhesion remains at about 0 kg/m (0 lb/in) for all exposure periods greater than 10 MJUV/m².

EXAMPLE 3

Effect of the Addition of Light Absorbers to the Adhesive

A polybutylene oil dispersion, 20 wt% carbon black, is added to the adhesive of the membrane composite described in Example 1. The resulting adhesive, HL2232-X (H.B. Fuller) having a penetration of about 205 dmm, is about 2 wt% carbon black. A styrene butylacrylate latex, Ucar-123 (Union Carbide) having a penetration of about 50 dmm, is coated onto the adhesive side of the sheet membrane composite (HL2232-X adhesive) at a thickness of about 0.13 mm (5 mil). Adhesion is measured after real time weathering as described in Example 1. Samples which experience no weathering develop excellent adhesion to the post cast concrete of greater than 161.1 kg/m (9 lb/in). Adhesion to the concrete decreases as the samples experience increased exposure time and is about 17.9 kg/min (1 lb/in) after 40 MJUV/m².

EXAMPLE 4

Effect of the Addition of Light Stabilizers and Absorbers to the Protective Coating

A protective coating formulation was prepared by mixing a 32 wt% carbon black aqueous dispersion WD-2345 (Daniel Products, Jersey City, NJ), a hindered amine light stabilizer Tinuvin 292 (Ciba Geigy, Hawthorne, NY), a benzotriazole light absorber Tinuvin 1130 (Ciba Geigy), and a styrene butylacrylate based latex Ucar-123 (Union Carbide), under high shear. The resulting formulation has a penetration of about 55 dmm and is 5% carbon black, 2.5% Tinuvin 1130, 5% Tinuvin 292, and 87.5% Ucar-123 based on solids. A 0.13 mm (5 mil) layer of the formulated protective coating is applied to the sheet waterproofing membrane composite (HM-1597 adhesive) described in Example 1. Samples which experience no outdoor weathering develop excellent adhesion to the post cast concrete of greater than (125.3 kg/min) (7lb/in). Adhesion to the cured concrete decreases as the samples experience increased exposure time and is about 17.9 kg/min. (1 lb/in) after 40 MJUV/m².

EXAMPLE 5**Effect of the Addition of Light Stabilizers and Absorbers to the Adhesive and Protective Coating**

The adhesive formulation (HL2232-X) described in Example 3 and the coating formulation described in Example 4 are used in the sheet waterproofing membrane composite described in Example 1. Samples which experience no outdoor weathering develop excellent adhesion to the post cast concrete of greater than 161.1 kg/m (9 lb/in). Adhesion to the cured concrete remains relatively consistent at about 125.3 kg/m (7 lb/in) up to 20 MJUV/m². Adhesion does not fall below 53.7 kg/m (3 lb/in) for samples which have experienced up to 40 MJUV/m² of real time outdoor exposure. The membrane is fully adhered over the entire area between the sheet membrane system and the cured concrete, resulting in an effective waterproofing barrier.

Claims**1. A waterproofing membrane comprising:**

a carrier layer suitable for disposition against a concrete form;
a layer of pressure sensitive synthetic adhesive disposed upon one face of the carrier layer, the adhesive having a penetration greater than 3 mm (30 dmm) (150 g, 5 sec, 21.1°C (70°F)) according to ASTM D 5-73, and being selected from butyl rubber based adhesives, polyisobutylene based adhesives, acrylic based adhesives, vinyl ether based adhesives, styrene isoprene styrene (SIS) based adhesives, styrene butadiene styrene (SBS) based adhesives, styrene ethylene butylene styrene (SEBS) based adhesives, styrene butadiene rubber (SBR) based adhesives, and combinations thereof; and
a protective coating layer disposed upon the synthetic adhesive layer;
which membrane bonds without tackification to concrete cast against the protective coating.

2. A waterproofing membrane according to claim 1, wherein the protective layer is selected from carboxylated SBR based coatings, acrylic based coatings, polyvinylidene chloride (PVDC) based coatings, PVC based coatings, ethylene vinyl acetate (EVA) copolymer based coatings, ethylene ethyl acetate (EEA) copolymer based coatings, polychloroprene based coatings, polyester based coatings, polyurethane based coatings, SIS based coatings, SBR based coatings, SBS based coatings, SEBS based coatings, and combinations thereof.

3. A waterproofing membrane according to claim 1 or 2 wherein the protective layer is elastomeric.

4. A waterproofing membrane according to claim 3 wherein the protective layer is an acrylic-based elastomeric layer.

5. A waterproofing membrane according to claim 4 wherein the protective layer comprises styrene butylacrylate.

6. A waterproofing membrane according to any one of the preceding claims wherein the synthetic adhesive is a styrene-isoprene-styrene, styrene-butadiene-styrene or styrene-ethylene-butylene-styrene block copolymer adhesive.

7. A waterproofing membrane according to claim 6 wherein the synthetic adhesive is a styrene-isoprene-styrene block copolymer adhesive.

8. A waterproofing membrane according to any one of the preceding claims wherein the carrier layer comprises a thermoplastic material in the form of a woven or non-woven continuous film, selected from high density polyethylene (HDPE), polyethylene terephthalate (PET), polystyrene (PS), polypropylene (PP), polyvinylchloride (PVC), polyamide (PA) and combinations thereof.

9. A waterproofing membrane according to any one of the preceding claims wherein the protective layer and/or the synthetic adhesive layer comprise an additive which is a light absorber, light stabilizer, antioxidant, filler, plasticizer or rheological additive.

10. A waterproofing membrane according to claim 9 wherein the protective layer and/or the synthetic adhesive layer comprises at least one additive which retards degradation by light, heat or oxygen.

11. A waterproofing membrane according to any one of the preceding claims wherein the carrier layer is from 0.051 to 0.76 mm (0.002 to 0.030 inches thick, the synthetic adhesive layer is from 0.13 to 2.03 mm (0.005 to 0.080 inches) thick and the protective layer is from 0.025 to 0.51 mm (0.001 to 0.020 inches) thick.

12. A waterproofing membrane according to any one of the preceding claims wherein the protective layer has a penetration greater than 3 mm (30 dmm) (150 g, 5 sec, 21.1°C (70°F)) according to ASTM D 5-73.

13. A waterproofing membrane according to any one of the preceding claims wherein the membrane forms a fully adhered bond to concrete cast against the membrane.

14. A waterproofing membrane according to any one of the preceding claims wherein the membrane is weatherable and forms a fully adhered bond to concrete cast against the membrane after the protective layer has been exposed by up to 40 MJUV/m² of outdoor exposure. 5
15. A waterproofing membrane according to claim 14 wherein the membrane bonds to concrete cast against the membrane with a bond strength of at least 35.8 kg/m (2 lb/in): 21.1°C, 50.8 mm/min (70°F, 2"/min) according to ASTM D903-49. 10
16. A waterproofing membrane according to any one of the preceding claims wherein the carrier layer is disposed against a lagging form whereby concrete can be cast against the protective layer of the membrane. 15
17. A waterproofing membrane according to claim 16 wherein the carrier layer is affixed to the lagging form by mechanical fastening. 20
18. A waterproofing membrane according to claim 16 or 17 wherein the carrier layer is disposed against a vertical surface of the lagging form. 25
19. A waterproofing membrane according to claim 16 or 17 wherein the carrier layer is disposed against a horizontal surface of the lagging form. 30
20. A waterproofing membrane according to any one of the preceding claims wherein the carrier layer comprises from 0.051 mm to 0.76 mm (0.002 inches to 0.030 inches) of high modulus HDPE or PVC, the synthetic adhesive layer comprises from 0.13 mm to 2.03 mm (0.005 inches to 0.080 inches) of a pressure sensitive hot melt adhesive block copolymer of SIS, SBS, or SEBS, and the protective layer comprises from 0.025 mm to 0.51 mm (0.001 inches to 0.020 inches) of an elastomeric acrylic coating. 35 40
21. A waterproofing membrane according to claim 20 wherein the carrier layer comprises 0.51 mm (0.020 inches) of a high modulus thermoplastic HDPE film, the synthetic pressure sensitive hot melt adhesive layer comprises 0.76 mm (0.030 inches) of a SIS pressure sensitive block copolymer, and the protective layer comprises 0.13 mm (0.005 inches) of an elastomeric styrene butylacrylate coating. 45 50
22. A waterproofing membrane according to claim 21 wherein the SIS pressure sensitive block copolymer comprises at least one light absorber and at least one light stabiliser and the protective layer comprises at least one light reflector, at least one light absorber and at least one light stabiliser. 55
23. A waterproofing membrane according to claim 22 wherein the SIS block copolymer comprises 2% carbon black, and the styrene butylacrylate coating comprises titanium dioxide, carbon black, 5% benzophenone, and a hindered amine light stabiliser.
24. A method of waterproofing which comprises affixing to a concrete form a membrane comprising a carrier layer for disposition against the form, a synthetic adhesive layer disposed against one face of the carrier layer and a protective coating layer such that the membrane bonds with concrete cast against the membrane wherein, the synthetic adhesive is a pressure sensitive adhesive having a penetration greater than 3 mm (30 dmm) (150 g, 5 sec, 21.1°C (70°F)) according to ASTM D 5-73, and being selected from butyl rubber based adhesives, polyisobutylene based adhesives, acrylic based adhesives, vinyl ether based adhesives, styrene isoprene styrene (SIS) based adhesives, styrene butadiene styrene (SBS) based adhesives, styrene ethylene butylene styrene (SEBS) based adhesives, styrene butadiene rubber (SBR) based adhesives, and combinations thereof.
25. A method according to claim 24 wherein the protective layer is applied to the synthetic adhesive layer after the carrier and adhesive layers have been affixed to the form.
26. A method according to claim 25 wherein the form is a lagging form.
27. A post cast concrete structure comprising a waterproofing membrane as claimed in any one of claims 1 to 23 adhered to all or part of the exposed surface of said structure, and further comprising concrete cast against the membrane after the membrane is affixed to the form.
28. A structure according to claim 27 where said structure is a foundation and wherein the membrane is affixed to an exterior form by the steps comprised of affixing the carrier layer and synthetic adhesive layer to the form, post casting the concrete against the protective layer and allowing the concrete to set.
29. A structure according to claim 28 wherein the exterior form is a lagging form.

Patentansprüche

1. Wasserdichte Membran, umfassend:
 - eine zur Anbringung an eine Betonform geeignete Trägerschicht,
 - eine an einer Seite der Trägerschicht angeord-

- nete synthetische Haftklebemittelschicht, wobei das Klebemittel eine Penetration von mehr als 3 mm (30 dmm) (150 g, 5 Sekunden, 21,1 °C (70 °F)) gemäß ASTM D 5-73 aufweist und ausgewählt ist aus Klebemitteln auf Butylkautschuk-, Polyisobutyl-, Acryl-, Vinylether-, Styrol-Isopren-Styrol-(SIS)-, Styrol-Butadien-Styrol-(SBS)-, Styrol-Ethylen-Butylen-Styrol-(SEBS)- und Styrol-Butadienkautschuk-(SBR)-Basis sowie Kombinationen davon, und eine auf der synthetischen Klebemittelschicht angeordnete Schutzbeschichtung, wobei die Membran ohne Klebrigmachung an gegen die Schutzbeschichtung gegossenem Beton haftet.
2. Wasserdichte Membran nach Anspruch 1, bei der die Schutzbeschichtung ausgewählt ist aus Beschichtungen auf Basis von carboxyliertem SBR, Acryl, Polyvinylidenchlorid (PVDC), PVC, Ethylenvinylacetat-(EVA)-Copolymer, Ethylenethylacetat-(EEA)-Copolymer, Polychloropren, Polyester, Polyurethan, SIS, SBR, SBS und SEBS sowie Kombinationen davon.
 3. Wasserdichte Membran nach Anspruch 1 oder 2, bei der die Schutzbeschichtung elastomer ist.
 4. Wasserdichte Membran nach Anspruch 3, bei der die Schutzbeschichtung eine Elastomerschicht auf Acrylbasis ist.
 5. Wasserdichte Membran nach Anspruch 4, bei der die Schutzbeschichtung Styrol-Butylacrylat umfaßt.
 6. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der das synthetische Klebemittel ein Styrol-Isopren-Styrol-, Styrol-Butadien-Styrol- oder Styrol-Ethylen-Butylen-Styrol-Blockcopolymer-Klebmittel ist.
 7. Wasserdichte Membran nach Anspruch 6, bei der das synthetische Klebemittel ein Styrol-Isopren-Styrol-Blockcopolymer-Klebmittel ist.
 8. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Trägerschicht ein thermoplastisches Material in Form einer gewebten oder nicht-gewebten kontinuierlichen Folie umfaßt, ausgewählt aus Polyethylen mit hoher Dichte (HD-PE), Polyethylenterephthalat (PET), Polystyrol (PS), Polypropylen (PP), Polyvinylchlorid (PVC), Polyamid (PA) und Kombinationen davon.
 9. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Schutzbeschichtung und/oder die synthetische Klebemittelschicht ein Additiv umfassen, das ein Lichtabsorptionsmittel, Lichtstabilisierungsmittel, Oxidationsschutzmittel, Füllstoff, Weichmacher oder rheologisches Additiv ist.
 10. Wasserdichte Membran nach Anspruch 9, bei der die Schutzbeschichtung und/oder die synthetische Klebemittelschicht mindestens ein Additiv umfaßt, das die Zersetzung durch Licht, Wärme oder Sauerstoff verzögert.
 11. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Trägerschicht 0,051 bis 0,76 mm (0,002 bis 0,030 inch), die synthetische Klebemittelschicht 0,13 bis 2,03 mm (0,005 bis 0,080 inch) und die Schutzbeschichtung 0,025 bis 0,51 mm (0,001 bis 0,020 inch) dick ist.
 12. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Schutzbeschichtung eine Penetration von mehr als 3 mm (30 dmm) (150 g, 5 Sekunden, 21,1 °C (70 °F)) gemäß ASTM D 5-73 aufweist.
 13. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Membran eine vollständig haftende Bindung an gegen die Membran gegossenen Beton bildet.
 14. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Membran wetterfest ist und eine vollständig haftende Bindung an Beton bildet, der gegen die Membran gegossen wird, nachdem die Schutzbeschichtung bis zu 40 MJUV/m² Außenbewitterung ausgesetzt worden ist.
 15. Wasserdichte Membran nach Anspruch 14, bei der die Membran mit einer Haftfestigkeit von mindestens 35,8 kg/m (2 lb/in): 21,1 °C, 50,8 mm/Minute (70 °F, 2"/Minute) gemäß ASTM D903-49 an gegen die Membran gegossenen Beton haftet.
 16. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Trägerschicht an einer Verschalung angeordnet ist, wobei Beton gegen die Schutzschicht der Membran gegossen werden kann.
 17. Wasserdichte Membran nach Anspruch 16, bei der die Trägerschicht durch mechanische Befestigung an der Verschalung angebracht ist.
 18. Wasserdichte Membran nach Anspruch 16 oder 17, bei der die Trägerschicht an einer vertikalen Oberfläche der Verschalung angeordnet ist.
 19. Wasserdichte Membran nach Anspruch 16 oder 17, bei der die Trägerschicht an einer horizontalen Oberfläche der Verschalung angeordnet ist.

20. Wasserdichte Membran nach einem der vorhergehenden Ansprüche, bei der die Trägerschicht etwa 0,051 mm bis 0,76 mm (0,002 inch bis 0,030 inch) HDPE oder PVC mit hohem Modul aufweist, wobei die synthetische Klebemittelschicht 0,13 mm bis 2,03 mm (0,005 inch bis 0,080 inch) eines SIS-, SBS- oder SEBS-Heißschmelz-Haftklebstoffblockcopolymers und die Schutzschicht 0,025 mm bis 0,51 mm (0,001 inch bis 0,020 inch) einer elastomeren Acrylbeschichtung umfaßt.
21. Wasserdichte Membran nach Anspruch 20, bei der die Trägerschicht 0,51 mm (0,020 inch) einer thermoplastischen HDPE-Folie mit hohem Modul umfaßt, wobei die synthetische Heißschmelz-Haftklebstoffschicht 0,76 mm (0,030 inch) eines SIS-Haftklebstoff-Blockcopolymers und die Schutzbeschichtung 0,13 mm (0,005 inch) einer elastomeren Styrol-Butylacrylat-Beschichtung umfaßt.
22. Wasserdichte Membran nach Anspruch 21, bei der das SIS-Haftklebstoffblockcopolymer mindestens ein Lichtabsorptionsmittel sowie mindestens ein Lichtstabilisierungsmittel und die Schutzbeschichtung mindestens einen Lichtreflektor, mindestens ein Lichtabsorptionsmittel und mindestens ein Lichtstabilisierungsmittel umfaßt.
23. Wasserdichte Membran nach Anspruch 22, bei der das SIS-Blockcopolymer 2 % Ruß und die Styrol-Butylacrylat-Beschichtung Titandioxid, Ruß, 5 % Benzophenon und ein gehindertes Amin-Lichtstabilisierungsmittel umfaßt.
24. Abdichtungsverfahren, bei dem eine Membran an eine Betonform angebracht wird, die eine Trägerschicht zur Anordnung an der Form, eine synthetische Klebemittelschicht, die an einer Fläche der Trägerschicht angeordnet ist, und eine Schutzbeschichtung umfaßt, so daß die Membran an gegen die Membran gegossenem Beton haftet, wobei das synthetische Klebemittel ein Haftklebemittel mit einer Penetration von mehr als 3 mm (30 dmm (150 g, 5 Sekunden, 21,1 °C (70 °F)) gemäß ASTM D 5-73 ist und ausgewählt ist aus Klebemitteln auf Butylkautschuk-, Polyisobutyl-, Acryl-, Vinylether-, Styrol-Isopren-Styrol-(SIS)-, Styrol-Butadien-Styrol-(SBS)-, Styrol-Ethylen-Butylen-Styrol-(SEBS)- und Styrol-Butadienkautschuk-(SBR)-Basis sowie Kombinationen davon.
25. Verfahren nach Anspruch 24, bei dem die Schutzbeschichtung auf die synthetische Klebemittelschicht aufgebracht wird, nachdem die Träger- und Klebemittelschichten an der Form befestigt worden sind.
26. Verfahren nach Anspruch 25, bei dem die Form eine

Verschalung ist.

27. Gegossene Betonstruktur, die eine wasserdichtende Membran gemäß einem der Ansprüche 1 bis 23 umfaßt, die an der gesamten oder einem Teil der exponierten Oberfläche der Struktur haftet und weiterhin Beton umfaßt, der gegen die Membran gegossen wurde, nachdem die Membran an der Form befestigt worden war.
28. Struktur nach Anspruch 27, wobei die Struktur ein Fundament ist und die Membran an einer Außenform befestigt worden ist, indem die Träger- und synthetische Klebemittelschicht an der Form befestigt und anschließend der Beton gegen die Schutzbeschichtung gegossen und abbinden gelassen wurde.
29. Struktur nach Anspruch 28, bei der die Außenform eine Verschalung ist.

Revendications

1. Membrane d'étanchéité comprenant :

une couche support apte à être disposée contre une forme en béton;
une couche d'adhésif synthétique sensible à la pression disposée sur une face de la couche de support, l'adhésif ayant une pénétration supérieure à 3 mm (30 dmm) (150 g, 5 sec, 21,1°C (70°F)) selon la norme ASTM D 5-73, et étant choisi parmi des adhésifs à base de caoutchouc butylique, des adhésifs à base de polyisobutylène, des adhésifs à base d'acrylique, des adhésifs à base d'éther vinylique, des adhésifs à base de styrène isoprène styrène (SIS), des adhésifs à base de styrène butadiène styrène (SBS), des adhésifs à base de styrène éthylène butylène styrène (SEBS), des adhésifs à base de caoutchouc styrène butadiène (SBR), et leurs combinaisons; et
une couche de revêtement protecteur disposée sur la couche adhésive synthétique; laquelle membrane se lie sans collage au béton coulé contre le revêtement protecteur.

2. Membrane d'étanchéité selon la revendication 1, caractérisée en ce que la couche protectrice est choisie parmi des revêtements carboxylés à base de SBR, des revêtements à base d'acrylique, des revêtements à base de chlorure de polyvinylidène (PVDC), des revêtements à base de PVC, des revêtements à base de copolymère éthylène vinyl acétate (EVA), des revêtements à base de copolymère éthylène éthyl acétate (EEA), des revêtements à base de polychloroprène, des revêtements

à base de polyester, des revêtements à base de polyuréthane, des revêtements à base de SIS, des revêtements à base de SBR, des revêtements à base de SBS, des revêtements à base de SEBS, et leurs combinaisons.

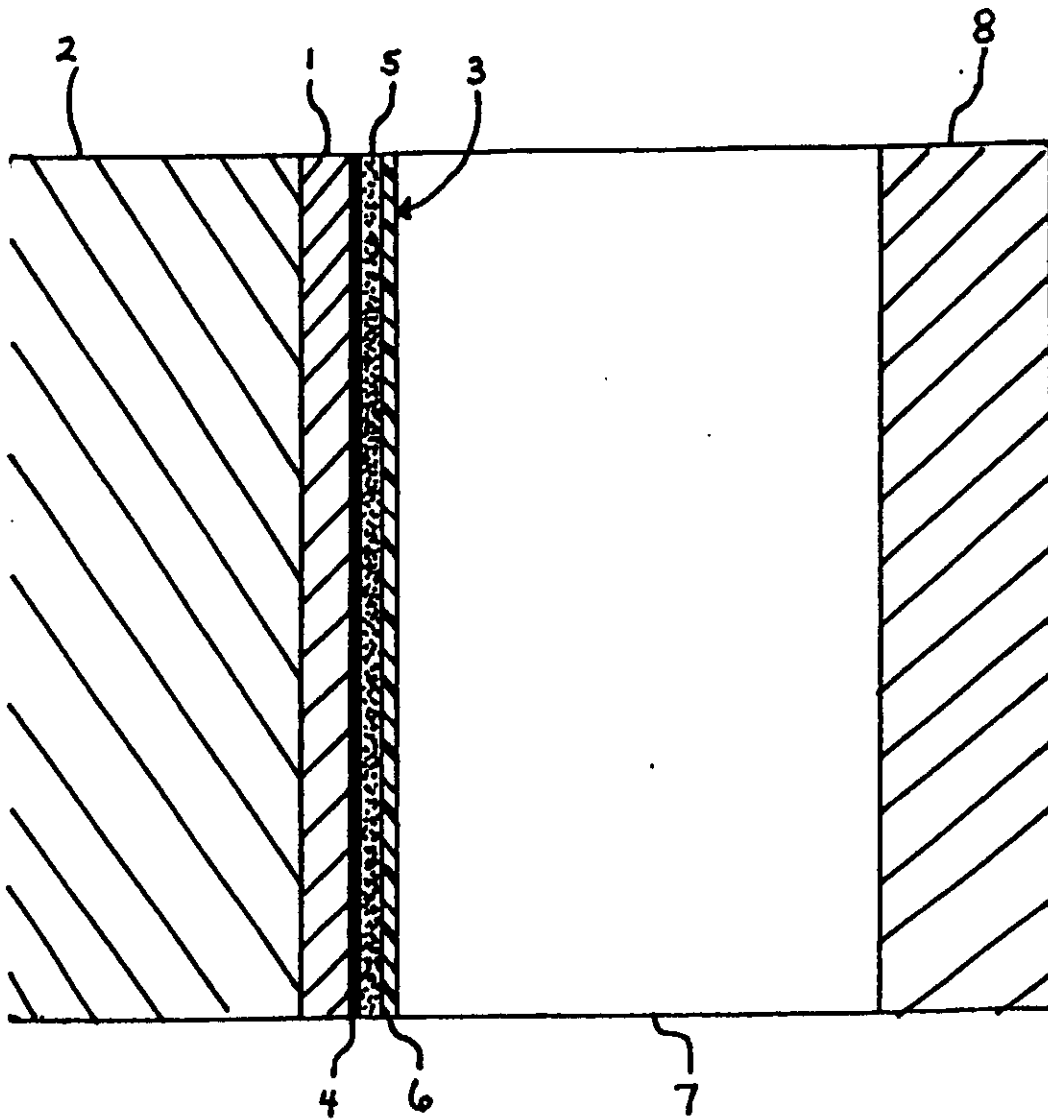
3. Membrane d'étanchéité selon la revendication 1 ou 2, dans laquelle la couche protectrice est élastomère.
4. Membrane d'étanchéité selon la revendication 3 dans laquelle la couche protectrice est une couche élastomère à base d'acrylique.
5. Membrane d'étanchéité selon la revendication 4 dans laquelle la couche protectrice comprend du styrène butylacrylate.
6. Membrane d'étanchéité selon l'une quelconque des revendications précédentes, dans laquelle l'adhésif synthétique est un adhésif copolymère bloc de styrène-isoprène-styrène, styrène-butadiène-styrène ou styrène-éthylène-butylène-styrène.
7. Membrane d'étanchéité selon la revendication 6 dans laquelle l'adhésif synthétique est un adhésif copolymère bloc de styrène-isoprène-styrène.
8. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la couche support comprend un matériau thermoplastique sous la forme d'un film continu tissé ou non tissé, choisi parmi un polyéthylène haute densité (HDPE), un téréphtalate de polyéthylène (PET), un polystyrène (PS), un polypropylène (PP), le polyvinylchlorure (PVC), un polyamide (PA) et leurs combinaisons.
9. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la couche protectrice et/ou la couche adhésive synthétique comprend un additif qui est un absorbant de lumière, un stabilisant à la lumière, un antioxydant, une charge, un plastifiant ou un additif rhéologique.
10. Membrane d'étanchéité selon la revendication 9 dans laquelle la couche protectrice et/ou la couche adhésive synthétique comprend au moins un additif qui retarde la dégradation par la lumière, la chaleur ou l'oxygène.
11. Membrane d'étanchéité selon l'une quelconque des revendications précédentes, dans laquelle la couche support a une épaisseur comprise entre 0,051 et 0,76 mm (0,002 et 0,030 pouce), la couche adhésive synthétique a une épaisseur comprise entre 0,13 et 2,03 mm (0,005 à 0,080 pouce) et la couche protectrice a une épaisseur comprise entre 0,025

et 0,51 mm (0,001 à 0,020 pouce).

12. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la couche protectrice a une pénétration supérieure à 3 mm (30 dmm) (150 g, 5 sec, 21,1°C (70°F)) selon la norme ASTM D 5-73.
13. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la membrane forme une liaison totalement adhésive au béton coulé contre la membrane.
14. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la membrane est susceptible d'altération et forme une liaison totalement adhésive au béton coulé contre la membrane après que la couche protectrice a été soumise à une exposition à l'atmosphère extérieure jusqu'à 40 MJUV/m².
15. Membrane d'étanchéité selon la revendication 14 dans laquelle la membrane se lie au béton coulé contre la membrane avec une résistance de liaison d'au moins 35,8 kg/m (2 lb/in) ; 21,1°C, 50,8 mm/min (70°F, 2"/min) selon ASTM D903-49.
16. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la couche de support est disposée contre une forme de garnissage grâce à quoi du béton peut être coulé contre la couche protectrice de la membrane.
17. Membrane d'étanchéité selon la revendication 16 dans laquelle la couche support est fixée à la forme de garnissage par une fixation mécanique.
18. Membrane d'étanchéité selon la revendication 16 ou 17 dans laquelle la couche support est disposée contre une surface verticale de la forme de garnissage.
19. Membrane d'étanchéité selon la revendication 16 ou 17 dans laquelle la couche support est disposée contre une surface horizontale de la forme de garnissage.
20. Membrane d'étanchéité selon l'une quelconque des revendications précédentes dans laquelle la couche support comprend de 0,051 mm à 0,76 mm (0,002 pouce à 0,030 pouce) de PVC ou HDPE à module élevé, la couche adhésive synthétique comprend de 0,13 mm à 2,03 mm (0,005 pouce à 0,080 pouce) d'un copolymère bloc adhésif fondu sensible à la pression de SIS, SBS, ou SEBS, et la couche protectrice comprend de 0,025 mm à 0,51 mm (0,001 pouce à 0,020 pouce) d'un revêtement acrylique élastomère.

21. Membrane d'étanchéité selon la revendication 20 dans laquelle la couche support comprend 0,51 mm (0,020 pouce) d'un film thermoplastique à module élevé de HDPE, la couche synthétique adhésive fondue sensible à la pression comprend de 0,76 mm (0,030 pouce) d'un copolymère bloc de SIS sensible à la pression, et la couche protectrice comprend 0,13 mm (0,005 pouce) d'un revêtement élastomère de styrène butylacrylate. 5
22. Membrane d'étanchéité selon la revendication 21 dans laquelle le copolymère bloc de SIS sensible à la pression comprend au moins un absorbant de lumière et au moins un stabilisant à la lumière et la couche protectrice comprend au moins un réflecteur de lumière, au moins un absorbant de lumière et au moins un stabilisant à la lumière, 10
23. Membrane d'étanchéité selon la revendication 22 dans laquelle le copolymère bloc SIS comprend 2% de noir de carbone, et le revêtement de styrène butylacrylate comprend du dioxyde de titane, du noir de carbone, 5% de benzophénone, et un stabilisant à la lumière à base d'amine encombrée. 20
24. Procédé d'étanchéité qui consiste à fixer sur une forme en béton une membrane comprenant une couche support destinée à être disposée contre la forme, une couche adhésive synthétique disposée contre une face de la couche support et une couche de revêtement protecteur de telle sorte que la membrane se lie avec du béton coulé contre la membrane, caractérisé en ce que l'adhésif synthétique est un adhésif sensible à la pression ayant une pénétration supérieure à 3 mm (30 dmm) (150 g, 5 sec, 21,1°C (70°F)) selon la norme ASTM D 5-73, et étant choisi parmi des adhésifs à base de caoutchouc butylique, des adhésifs à base de polyisobutylène, des adhésifs à base d'acrylique, des adhésifs à base d'éther vinylique, des adhésifs à base de styrène isoprène styrène (SIS), des adhésifs à base de styrène butadiène styrène (SBS), des adhésifs à base de styrène éthylène butylène styrène (SEBS), des adhésifs à base de caoutchouc de styrène butadiène (SBR), et leurs combinaisons. 25
25. Procédé selon la revendication 24 caractérisé en ce que la couche protectrice est appliquée sur la couche adhésive synthétique après que les couches adhésive et support aient été fixées sur la forme. 30
26. Procédé selon la revendication 25 caractérisé en ce que la forme est une forme de garnissage. 35
27. Structure de béton post-coulé comprenant une membrane d'étanchéité telle que revendiquée dans l'une quelconque des revendications 1 à 23, adhésive à toute ou une partie de la surface exposée de ladite structure, et comprenant en outre du béton coulé contre la membrane après que la membrane ait été fixée sur la forme. 40
28. Structure selon la revendication 27, qui est une fondation et dans laquelle la membrane est fixée sur une forme extérieure grâce aux étapes consistant à fixer la couche support et la couche adhésive synthétique sur la forme, à couler ensuite le béton contre la couche protectrice et à laisser le béton se durcir. 45
29. Structure selon la revendication 28, caractérisée en ce que la forme extérieure est une forme de garnissage. 50
- 55

Fig. 1



REGISTER ENTRY FOR EP0501838/

European Application No EP92301764.4 filing date 02.03.1992

Priority claimed:

01.03.1991 in United States of America - doc: 662853

Designated States BE CH DE DK ES FR GB GR IT LI LU MC NL PT SE AT

Title WATERPROOFING MEMBRANE.

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C09J E04D

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Publication No EP0501838 dated 02.09.1992

Publication in English

Examination requested 17.06.1993

Patent Granted with effect from 11.09.1996 (Section 25(1)) with title
WATERPROOFING MEMBRANE/

22.02.1993 EPO: Search report published on 24.03.1993

Entry Type 25.11 Staff ID. RD06 Auth ID. EPT

29.03.1993 Notification from EPO of change of Applicant/Proprietor details from

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Entry Type 25.14 Staff ID. RD06 Auth ID. EPT

09.08.1996 Notification from EPO of change of Applicant/Proprietor details
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Entry Type 25.14 Staff ID. RD06 Auth ID. EPT

**** END OF REGISTER ENTRY ****

OA80-01
EP

OPTICS - PATENTS

12/05/97

14:09:43
PAGE: 1

RENEWAL DETAILS

PUBLICATION NUMBER EP0501838/

PROPRIETOR(S)

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New York, New York 10036, United States of America/

DATE FILED 02.03.1992 /

DATE GRANTED 11.09.1996 /

DATE NEXT RENEWAL DUE 02.03.1998

DATE NOT IN FORCE

DATE OF LAST RENEWAL 21.02.1997

YEAR OF LAST RENEWAL 06

STATUS PATENT IN FORCE

**** END OF REPORT ****