



(51) International Patent Classification:

B32B 7/00 (2006.01) **B32B 27/06** (2006.01)
B32B 7/04 (2006.01) **B32B 27/26** (2006.01)
B32B 7/06 (2006.01) **B32B 27/30** (2006.01)
B32B 7/10 (2006.01) **B32B 27/32** (2006.01)
B32B 7/12 (2006.01) **B32B 3/00** (2006.01)
B32B 13/00 (2006.01) **B32B 3/12** (2006.01)
B32B 13/04 (2006.01) **B32B 3/26** (2006.01)
B32B 27/00 (2006.01)

(21) International Application Number:

PCT/US2013/054723

(22) International Filing Date:

13 August 2013 (13.08.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2012-179531 13 August 2012 (13.08.2012) JP

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: SHEET FOR CONCRETE CURING AND METHOD FOR SEPARATING AND RECOVERING SAID SHEET

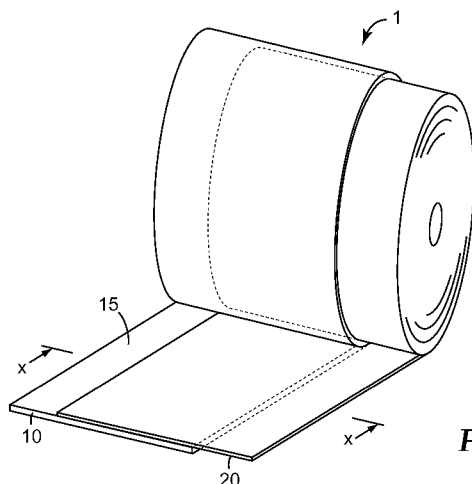


FIG. 1

(57) Abstract: Problem: An object is to provide a sheet that can be easily separated into the cell-containing layer and the adhesive layer (constituents of the sheet) after the sheet is used, and by which both constituents (layers) can be recovered. Resolution Means: A sheet for concrete curing (1) according to the present disclosure includes a cell-containing layer (10) and an adhesive layer (20) laminated on the cell-containing layer (10). An adhesive force generated between the adhesive layer (20) and the concrete-cast surface (100) is not more than 80% of an adhesive force generated between the adhesive layer (20) and a concrete-cast surface (100), and the adhesive force generated between the adhesive layer (20) and the concrete-cast surface (100) is at least 0.15 N/cm².

SHEET FOR CONCRETE CURING AND METHOD FOR SEPARATING AND RECOVERING SAID SHEET

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FIELD OF INVENTION DISCLOSURE

The present disclosure relates to a sheet for concrete curing used to cure concrete immediately following pouring of the concrete; and more particularly relates to a sheet for concrete curing which can be easily separated into each laminate member and recovered when recovering after use of the sheet.

BACKGROUND ART

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Conventional sheets for concrete curing are known that are formed by laminating a cell-containing layer and an adhesive layer as laminate members. However, it has been regular practice to recover and dispose of these curing sheets for concrete in an integrated manner after using these sheets once or multiple times (depending on the usage conditions of the sheet).

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For example, Patent Document 1 describes a sheet for concrete curing comprising a cell-containing layer and an adhesive agent-impregnated layer. Additionally, Patent Document 2 describes a curing method in which a sheet for curing having a thickness of about 1 mm to 2 mm is adhered to a concrete tunnel lining.

Prior ART DOCUMENTS

Patent Documents

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Patent Document 1: Japanese Unexamined Patent Application Publication No. 2012-52334

Patent Document 2: Japanese Unexamined Patent Application Publication No. 2008-156927

SUMMARY OF THE INVENTION DISCLOSURE

Problem to be Solved by the INVENTION DISCLOSURE

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Conventional sheets for concrete curing have been viewed as problematic in terms of hazardous waste because, normally, it has not been possible to easily separate the sheets into cell-containing layers and adhesive layers (members of the sheet) and recover thereof, respectively. Therefore, an object of the

present disclosure is to provide a sheet for curing by which the cell-containing layer and the adhesive layer can be separately recovered easily after use. Furthermore, another object of the present disclosure is to enable reusability by providing a sheet for concrete curing including a new adhesive layer provided on the recovered cell-containing layer.

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Means for solving problems

One aspect of the present disclosure is a sheet for concrete curing including a cell-containing layer and an adhesive layer laminated on said cell-containing layer, wherein: the adhesive force generated between the adhesive layer and the cell-containing layer is not more than 80% of an adhesive force
10 generated between the adhesive layer and a concrete-cast surface, and the adhesive force generated between the adhesive layer and the concrete-cast surface is at least 0.15 N/cm^2 .

In this aspect of the present disclosure, the sheet for concrete curing has an elongated form, and the adhesive layer is not provided on at least a portion of a surface of the cell-containing layer, said portion being a surface of an edge side of the curing sheet for concrete.

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Another aspect of the present disclosure is a method for separating and recovering a used sheet for concrete curing, the method including the steps of: recovering a cell-containing layer by peeling a portion of a surface of a cell-containing layer where an adhesive layer is not provided from a concrete-cast surface, said portion being a surface of an edge side of the curing sheet for concrete; and recovering the adhesive layer by peeling a portion of the remainder of the adhesive layer of the sheet for concrete
20 curing from the concrete-cast surface.

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Herein, "sheet for concrete curing" refers to a sheet used to cover the cast surface of concrete, from which the concrete casting mold has been removed, after casting ready-mixed concrete into the concrete casting mold. The concrete maintains humidity necessary for curing by being covered by the sheet and temperature is controlled by the thermal insulating functionality of the sheet itself. As a result,
25 generation of destructive cracks and the like in the surface of the concrete is reduced.

25

Additionally, the state of "the portion of the surface of the cell-containing layer where the adhesive layer is not provided" refers to a state where the adhesive layer is not provided on a portion (e.g. portion indicated by reference numeral 15 in FIGS. 1 and 2) of the surface of the cell-containing layer on a side of the cell-containing layer on which the adhesive layer is laminated.

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EFFECTS OF THE INVENTION DISCLOSURE

The sheet for concrete curing according to the present disclosure is a sheet by which the cell-containing layer and the adhesive layer of the sheet can be separated and individually recovered easily when peeling the sheet from a concrete-cast surface after use. Therefore, each sheet member can be disposed of appropriately and air pollution accompanying disposal can be reduced. Additionally, with the sheet for concrete curing of the present disclosure, reusability is easily enabled by providing a new adhesive layer on the surface of the recovered cell-containing layer.

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BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a perspective view illustrating the appearance of a curing sheet for concrete according to an embodiment of the present disclosure.

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FIG. 2 is a cross-sectional view of the curing sheet for concrete according to the embodiment of the present invention disclosure, taken along line X-X depicted in FIG. 1.

FIGS. 3a and 3b are process diagrams illustrating an example of a procedure for adhering the sheet for concrete curing according to the present disclosure to a concrete-cast surface.

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FIGS. 4a to 4d are process diagrams illustrating separating and recovering of each layer from the concrete-cast surface after using the sheet for concrete curing according to the embodiment of the present disclosure.

FIGS. 5a-1 to 5d-1 are perspective views illustrating various forms of the sheet for concrete curing according to the present disclosure.

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FIGS. 5a-2 to 5d-2 are front views illustrating various forms of the sheet for concrete curing according to the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION DISCLOSURE

An embodiment of the present disclosure is described below in detail while referring to the attached drawings. In all of the drawings, corresponding constituents are assigned common reference numerals.

FIG. 1 is a perspective view illustrating the appearance of a curing sheet for concrete 1 according to an embodiment of the present disclosure. FIG. 2 is a cross-sectional view of the curing sheet for concrete 1 depicted in FIG. 1, taken along line X-X.

As illustrated in these drawings, the sheet for concrete curing 1 according to the present disclosure is configured as a laminate that includes a cell-containing layer 10 and an adhesive layer 20.

Furthermore, the cell-containing layer 10 is configured so that a top face and/or a bottom face of a film 16 having multiple recesses and protrusions is covered by a cover film 12 (a first cover film 12' and/or a second cover film 12"). The adhesive layer 20 is laminated so as to cover substantially the entire surface of the cover film 12 on the cell-containing layer 10. Preferably, the adhesive layer 20 is provided so as not to cover a portion 15 of the surface of the edge side of the cover film 12. That is, the adhesive layer 20 is preferably configured so as not to be provided on a portion 15 of the surface of the edge portion of the cell-containing layer 10. Reasons for this are in order to secure a starting point for separation of the cell-containing layer from the adhesive layer and to enable easy separation of these two constituents.

Examples of specific forms of the curing sheet for concrete 1 according to the present disclosure include the various forms illustrated in FIG. 5.

A description of the members constituting the sheet for concrete curing according to the present disclosure is given below.

An example of a preferred form of the adhesive layer 20 is a laminate including a backing 22 and an adhesive agent layer 24.

The adhesive agent layer 24 included in the adhesive layer 20 preferably can maintain an adhesive force with a concrete-cast surface 100 of at least **0.15** N/cm² throughout the curing period of the concrete. Such a configuration is preferable because, if an adhesive force of at least **0.15** N/cm² is maintained, it can be fully anticipated that a sheet for concrete curing, which has been applied under regular use conditions, can be fixed and will not become displaced on the concrete-cast surface 100 during the curing period of the concrete. However, in cases where the sheet is used under severe conditions such as in high winds or the like, the adhesive force is preferably configured so as to be at least 0.3 N/cm², or at least 0.5 N/cm².

Here, "concrete casting" refers to the task of casting ready-mixed concrete into an assembled concrete casting mold, and the task of setting the ready-mixed concrete thereafter. Additionally, "concrete-cast surface 100" refers to an outermost surface of the ready-mixed concrete from which the casting mold has been removed, at a point where the ready-mixed concrete can maintain its own form.

"Ready-mixed concrete" refers to concrete produced in accordance with the specifications of JISA 5308 and, specifically, preferably refers to concrete that is optimal from the perspectives of the casting conditions of the ready-mixed concrete, the strength of the cured concrete structure, and the like. For example, normal ready-mixed concrete preferably includes from 10 parts by mass to 100 parts by mass of water and from 30 parts by mass to 200 parts by mass of aggregate, both per 100 parts by mass of cement. In this case, a combination of fine aggregate and coarse aggregate is preferably used because the aggregate increases density when curing. A grain diameter of the aggregate can be appropriately selected from a range of a few mm to tens of mm. The cement preferably complies with the specifications set forth in JISR 5210, 5211, 5212, 5213, and 5214.

"Curing period" refers to the period lasting until the ready-mixed concrete expresses sufficient strength as a result of hydration reaction. Average daily temperatures vary and, with the cement described above, when the average daily temperature is 15°C or greater, the curing period is at least seven

days, when the average daily temperature is 10°C or greater, the curing period is at least 10 days, and when the average daily temperature is 5°C or greater, the curing period is at least 12 days.

On the other hand, a maximum value of the adhesive force between the adhesive layer 20 and the concrete-cast surface 100 is determined by the tensile strength of the adhesive layer 20. That is, the maximum value of the adhesive force is selected from within a range where breakage does not occur when peeling and recovering the adhesive layer 20 from the concrete-cast surface 100 due to the adhesive strength between the adhesive layer 20 and the concrete-cast surface 100 being excessively strong.

An adhesive force generated between the adhesive layer 20 and the cell-containing layer 10 is preferably not more than 80% of the adhesive force generated between the adhesive layer 20 and the concrete-cast surface 100. A reason for this is because such a configuration enables the separation and recovery of only the cell-containing layer 10 while leaving the adhesive layer 20 adhered to the concrete-cast surface 100.

Specifically, with the sheet for concrete curing illustrated in FIG. 2, the adhesive force generated between the backing 22 of the adhesive layer 20 and the first cover film 12' of the cell-containing layer 10 is preferably not more than 80% of the adhesive force generated between the adhesive agent layer 24 of the adhesive layer 20 and the concrete-cast surface 100

Note that the bonding strength between the members constituting the adhesive layer 20 (e.g. the adhesive agent layer 24, the backing 22, etc.) and the bonding strength between the members constituting the cell-containing layer 10 (e.g. the first cover film 12', the second cover film 12'', the film 16 having recesses and protrusions, etc.) are formed so as to be sufficiently great, and so that intra-layer debonding does not occur when recovering the sheet for concrete curing 1 from the concrete-cast surface 100.

The type of adhesive agent, formulation, thickness of the adhesive agent, and method of bonding the adhesive layer 20 to the cover film are appropriately selected in order to achieve adhesive force that satisfies the condition described above.

For example, the type of the adhesive agent constituting the adhesive agent layer can be selected from acrylic resins, silicone resins, and fluorine resins. Additionally, when using an acrylic resin, the

formulation of the adhesive agent is preferably an emulsion system. The thickness of the adhesive layer is selected taking the extent of the recesses and protrusions (unevennesses) that exist on the concrete-cast surface into consideration, but is generally in a range from 20 μm to 100 μm .

The type and material of the backing 22 included in the adhesive layer 20 can be selected from polyolefin resins such as polypropylene resins, polyethylene resins, and the like, of which a single type or combination of two or more types may be used.

Examples of polypropylene resins that are suitable for use as the backing 22 include propylene homopolymers, copolymers of propylene and another olefin, and the like. Examples of the other olefin to be copolymerized with the propylene include α -olefins such as ethylene, butene-1, isobutylene, pentene-1, and the like; and the copolymer of the propylene with these other olefins may be either a random copolymer or a block copolymer.

Additionally, examples of polyethylene resins that are suitable for use as the backing 22 include high density polyethylene (HDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), linear very low density polyethylene (LVLDPE), ethylene-vinyl acetate copolymers, and the like. In cases where the backing 22 is heat-bonded to the first cover film 12', the backing 22 is preferably formed from the same material as the first cover film 12' (see FIG. 2). The thickness of the backing 22 is selected taking adhesion properties during the heat-bonding process into consideration, but is generally in a range from 20 μm to 200 μm .

The adhesive layer 20 and the backing 22 are fabricated as a laminate in which the adhesive agent is applied to the backing 22.

As described above, the cell-containing layer 10 has a configuration in which the top face and/or the bottom face of the film 16 having multiple recesses and protrusions is covered by the cover film 12. That is, a laminate can be fabricated by encapsulating air in the recesses of the film 16 having recesses and protrusions and laminating the cover film 12 thereon via heat-bonding or the like (with the sheet illustrated in FIG. 2, the first cover film 12' and the second cover film 12"), without collapsing the recesses and protrusions of the film 16 having recesses and protrusions.

In this case, a depth of the recesses of the film 16 is from 2.0 mm to 20.0 mm and an area of a top surface of each of the protrusions of the film 16 is from 10 mm² to 250 mm². A total area of the top surfaces of the protrusions of the film having recesses and protrusions is selected from a range of 20% to 80% of the total area of the cover film 12.

5 The form of the cells formed from the film 16 having recesses and protrusions and the cover film 12 may be either columnar (including prism and cylinder) or frustal (including circular frustal and pyramidal frustal). Additionally, the cell-containing layer 10 may be multi-layered, being formed by providing a plurality of cover films on the film having a plurality of recesses and protrusions.

10 A resin material can be used for the film 16 having recesses and protrusions and the cover film 12 and examples thereof include polyolefin resins such as polypropylene resins, polyethylene resins, and the like, of which a single type or combination of two or more types may be used.

15 Examples of the polypropylene resins include propylene homopolymers, copolymers of propylene and another olefin, and the like. Examples of the other olefin to be copolymerized with the propylene include α -olefins such as ethylene, butene-1, isobutylene, pentene-1, and the like; and the copolymer of the propylene with these other olefins may be either a random copolymer or a block copolymer.

 Additionally, examples of the polyethylene resins include high density polyethylene (HDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), linear very low density polyethylene (LVLDPE), ethylene-vinyl acetate copolymers, and the like.

20 The same resin may be selected from among the resin materials described above for the film 16 having recesses and protrusions and the cover film 12 or, as necessary, different resins may be selected.

 When using the resin material described above for both the film 16 having recesses and protrusions and the cover film 12, thicknesses of each of the films is configured to be in a range from 10 μ m to 80 μ m.

25 Bonding of the cell-containing layer 10 and the adhesive layer 20 can be performed via heat-bonding while contact bonding the adhesive layer 20 to the cell-containing layer 10. Specifically, in the

example of the sheet for concrete curing 1 illustrated in FIG. 2, the cover film 12 of the cell-containing layer 10 is heat-bonded to the backing 22 of the adhesive layer 20. Additionally, bonding of the cell-containing layer 10 and the adhesive agent layer can be performed by applying a coating liquid including an adhesive agent composition to the cell-containing layer 10.

5 For example, when using heat-bonding, the constituents may be laminated by extruding the adhesive layer onto the cell-containing layer 10 at a temperature of about **200°C**.

Next, a description of a method for adhering the sheet for concrete curing to a concrete-cast surface will be given using the example illustrated in FIGS. 3a and 3b.

10 First, as illustrated in FIG. 3a, the adhesive layer 20 of a sheet A for concrete curing is aligned with a predetermined position on the concrete-cast surface and adhered to the concrete-cast surface 100. Then, as illustrated in FIG. 3b, a portion of an edge surface of sheet B for concrete curing is abutted against the sheet A such that a gap is not formed therebetween, thus adhering the sheets to the concrete-cast surface.

15 Thereafter, this process of adhering is repeated and the sheet is adhered to all necessary parts of an entirety of the cast surface.

Next, a description of a method for separating and recovering the curing sheet for concrete from the concrete-cast surface will be given.

The sheet for concrete curing according to the present disclosure can, for example, be separately recovered via the procedure illustrated in FIGS. 4a to 4d.

20 (1) The cell-containing layer 10 is recovered from the concrete-cast surface 100 by peeling at a location ("X" in FIGS. 4a to 4c), where an adhesive layer 24 is not provided, on the edge face of a short side of the sheet for concrete curing (FIGS. 4b and 4c)..

(2) The adhesive layer of each sheet is recovered from the concrete-cast surface 100 by peeling a portion of the adhesive layer of each remaining sheet for concrete curing (FIG. 4d).

25 According to this embodiment, the following functions and effects can be provided.

(1) The sheet for concrete curing is constituted by a cell-containing layer and an adhesive layer laminated on said cell-containing layer, wherein an adhesive force generated between the adhesive layer and the cell-containing layer is not more than 80% of the adhesive force generated between the adhesive layer and a concrete-cast surface, and the adhesive force generated between the adhesive layer and the concrete-cast surface is at least 0.15 N/cm^2 . As a result, it is possible to separately recover each of the adhesive layer and the cell-containing layer of the sheet for concrete curing.

(2) Furthermore, the form of the sheet for concrete curing (1) described above is elongated, and is free of adhesive on at least a portion of its surface, said portion being an edge side of the sheet for concrete curing. As a result, peeling can be started from the portion of the surface of the sheet where the adhesive layer is absent, which makes easy separation and recovery possible.

(3) In one aspect of the sheet for concrete curing described above in (1) and (2), the material of the cover film of the cell-containing layer contacting the adhesive layer is an olefin resin, and the material of the adhesive agent of the adhesive layer is an acrylic resin. As a result, in addition to the effects described above, it is possible to wind the sheet for concrete curing into a roll (such as that illustrated in FIG. 1) without using release paper.

(4) When recovering the sheet for concrete curing constituted by the adhesive layer and the cell-containing layer, first, a cell-containing layer is recovered from the concrete-cast surface by peeling a portion of a surface of a cell-containing layer where an adhesive layer is not provided from a concrete-cast surface, said portion being a surface of an edge side of the curing sheet for concrete. Thereafter, the adhesive layer is recovered from the concrete-cast surface. As a result, each sheet member can be disposed of appropriately and air pollution accompanying disposal can be reduced. Additionally, it is possible to reuse the sheet by providing a new adhesive layer on the surface of the separately recovered cell-containing layer.

(5) In the method for separately recovering a sheet for concrete curing described above in (4), the sheet as described in any one of (1) to (3). As a result, it is possible to more readily dispose of each sheet member individually.

EXAMPLES

The sheet for concrete curing of the present disclosure is described hereinafter using examples, but the scope of the present disclosure is not limited to these examples.

5 (1) Preparation of the sheet for concrete curing

Various types of sheets for concrete curing configured to have the structures, characteristics, and forms described below were prepared.

1) Configuration of cell-containing layer: a) Cover film-material (polyethylene), thickness (40 μ m), width (300 mm), length (1,000 mm); b) Film having recesses and protrusions-material (polyethylene),
10 thickness (30 μ m), width (300 mm), length (1,000 mm), recess depth / protrusion height (8 mm).

2) Adhesive layer: a) Backing-material (polyethylene), thickness (50 μ m), width (300 mm), length (1,000 mm); b) Adhesive agent layer-material (acrylic), thickness (50 μ m), width (300 mm), length (1,000 mm).

3) Method of bonding the cell-containing layer with the adhesive layer: Using a thermal fusion bonding method, a fusion bonding temperature was set to about 200°C, and the adhesive force between the two
15 constituents was adjusted by changing the pressurization conditions. Additionally, when bonding the two constituents, the constituents were offset 20 mm in the width direction so as to provide a portion on the surface of the longitudinal edge of the sheet for concrete curing where the adhesive layer was not provided. Thus, a sheet for concrete curing having the form illustrated in FIG. 1 and FIG 5a was fabricated.

20 (2) Test Method

1) A concrete block having a cast surface with a width of 50 cm, a length of 50 cm and a height of 100 cm was prepared, and the sheet for concrete curing prepared according to the method described above (1) was adhered by hand to said concrete-cast surface.

The adhesive strength between the cell-containing layer and the adhesive layer and the adhesive strength between the adhesive layer and the concrete cast surface was measured by following steps based on JISK6849 published in 1994..

(a)At first, the sheet for concrete curing was cut into bits having a size with a length of 25 mm, a width of 5 25 mm for measuring the adhesive strength above.

(b)Next, the cell-containing layer was pulled from the adhesive layer in a vertical direction from the surface of concrete cast block (that is, this pulling direction is a direction of sheet for thickness of concrete curing) in a parallel with measuring a load (adhesive force). In this time ,the load (adhesive force) was measured by using “push-pull gauge (Digital Forth gauge FGP-10 manufactured by NIDEC- 10 SHIMPO CORPORATION, Nagaokakyo city Kyoto prefecture, Japan.)

(c)Next, the adhesive layer was peeled from the concrete cast surface in a vertical direction from the surface of concrete cast block (that is, this pulling direction is a direction of sheet for thickness of concrete curing) in a parallel with measuring a load (adhesive force). In this time, the load (adhesive force) was measured by using “push-pull gauge (Digital Forth gauge FGP-10 manufactured by NIDEC- 15 SHIMPO CORPORATION, Nagaokakyo city Kyoto prefecture, Japan.)

2) The sheet for concrete curing was applied to the cast surface and allowed to sit at rest for 10 days.

Testing conditions are shown in Table 1.

Table 1

		Ratio of the adhesive force between the adhesive agent layer and the cell-containing layer of the sheet for concrete curing to the adhesive force between the adhesive agent layer and the concrete-cast surface of the sheet for concrete curing (%)			
		60%	80%	100%	200%
Adhesive force between the adhesive agent layer of the sheet for concrete curing and the concrete-cast surface (N/cm ²)	0.03	Working Example 1	Working Example 4	Comparative Example 1	Comparative Example 4
	0.5	Working Example 2	Working Example 5	Comparative Example 2	Comparative Example 5
	1	Working Example 3	Working Example 6	Comparative Example 3	Comparative Example 6

(3) Test evaluation method and test results

5 Test results are shown in Table 2.

The evaluations shown in Table 2 are based on the following standards. 1) Evaluation of formation of destructive cracks in the concrete-cast surface: Examples in which there were no destructive cracks formed in the concrete-cast surface after testing were given an evaluation of "A"; and examples in which one or more cracks formed were given an evaluation of "B". 2) Evaluation of peeling: Examples in which the sheet for concrete curing did not peel from the concrete-cast surface during the rest period (curing period) were given an evaluation of "A"; and examples in which the sheet did peel from the surface were given an evaluation of "B". 3) Evaluation of separate recovery of the sheet for concrete curing: The sheet was peeled from the concrete-cast surface according to the method illustrated in FIGS. 4A to 4D. Examples in which the peeling could be carried out as illustrated were given an evaluation of "A"; and examples in which the peeling could not be carried out as illustrated were given an evaluation of "B".

Note that for sheet for concrete curing where the adhesive force with the concrete-cast surface was less than 0.15 N/cm^2 , the sheets peeled from the concrete-cast surface within the 10 day testing period and, therefore, were not considered for evaluation.

Table 2

	W.E. 1	W.E. 2	W.E. 3	W.E. 4	W.E. 5	W.E. 6	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3	Comp. Ex. 4	Comp. Ex. 5	Comp. Ex. 6
Evaluation of formation of cracks	A	A	A	A	A	A	A	A	A	A	A	A
Evaluation of peeling	A	A	A	A	A	A	A	A	A	A	A	A
Evaluation of separate recovery	A	A	A	A	A	A	B	B	B	B	B	B

In Table 2, “W.E.” is an abbreviation for “Working Example”; and “Comp. Ex.” is an abbreviation for “Comparative Example.”

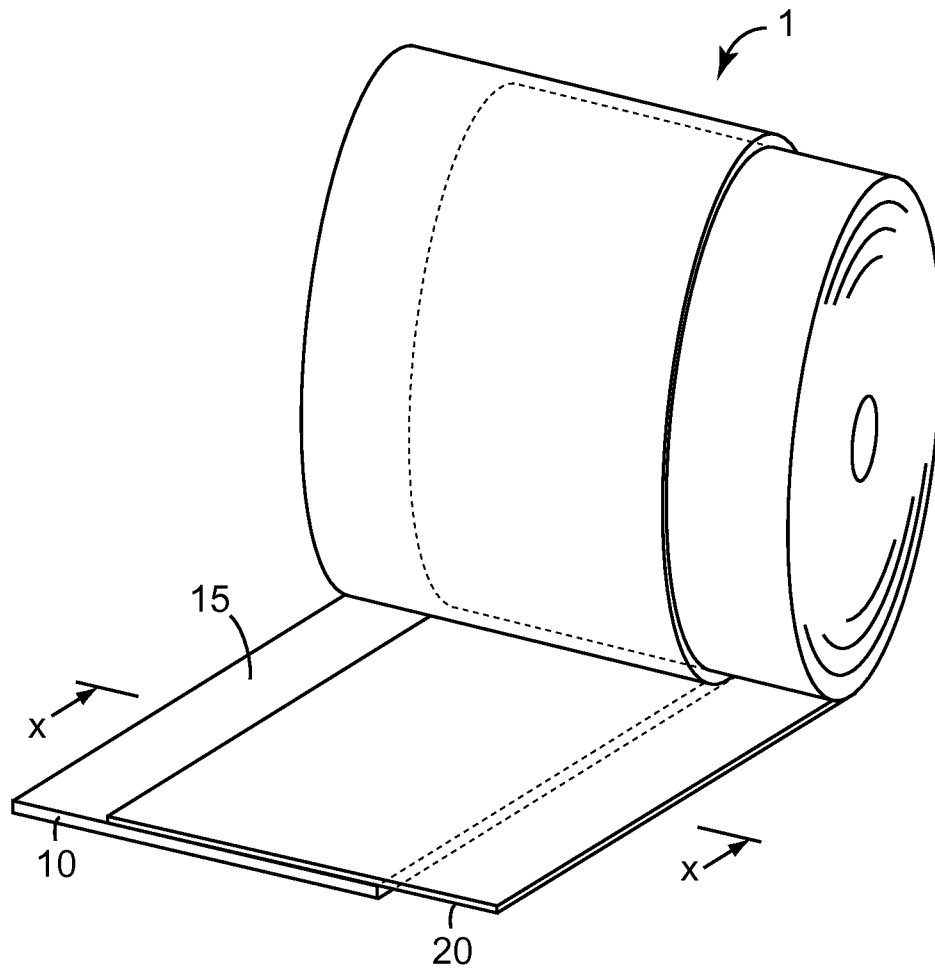
[Reference Numerals]

- 1 sheet for concrete curing
- 10 Cell-containing layer
- 12 Cover film
- 12' First cover film
- 12'' Second cover film
- 15 Portion of the surface of 10 not covered by adhesive layer
- 16 Film having recesses and protrusions
- 20 Adhesive layer
- 22 Backing
- 24 Adhesive agent layer
- 100 Concrete-cast surface

What is Claimed Is:

1. A sheet for concrete curing comprising a cell-containing layer and an adhesive layer laminated on said cell-containing layer, wherein: the adhesive force generated between the adhesive layer and the cell-containing layer is not more than 80% of the adhesive force generated between the adhesive layer and a concrete-cast surface, and the adhesive force generated between the adhesive layer and the concrete-cast surface is at least 0.15N/cm^2 .
2. The sheet for concrete curing according to claim 1, wherein: the sheet for concrete curing has an elongated form, and the adhesive layer is not provided on **at least** a portion of a surface of the cell-containing layer, said portion being a surface of an edge side of the curing sheet for concrete.
3. The sheet for concrete curing according to claim 1 or 2, wherein: a material of a surface of the cell-containing layer contacting the adhesive layer is an olefin resin, and a material of an adhesive agent of the adhesive layer is an acrylic resin.
4. A method for separating and recovering a sheet for concrete curing, the method comprising the steps of:
 - (1) recovering a cell-containing layer by peeling a portion of a surface of a cell-containing layer where an adhesive layer is not provided from a concrete-cast surface, said portion being a surface of an edge side of the sheet for concrete curing; and
 - (2) recovering the adhesive layer by peeling a portion of the remainder of the adhesive layer of the sheet for concrete curing from the concrete-cast surface.
5. The method for separating and recovering a sheet for concrete curing according to claim 4, wherein the sheet for concrete curing is the sheet for concrete curing described in any one of claims 1 to 3.

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**FIG. 1**

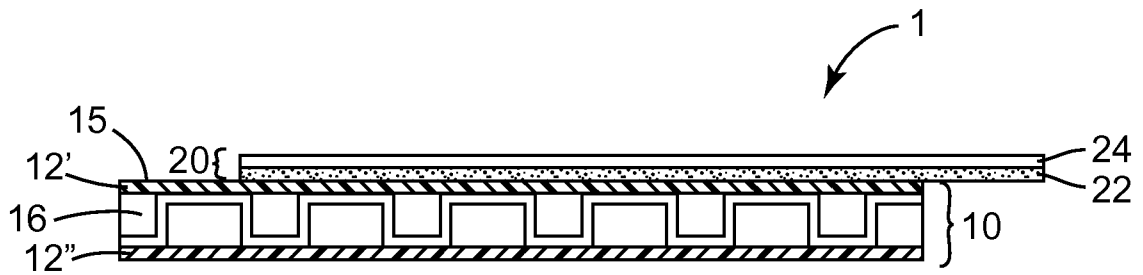


FIG. 2

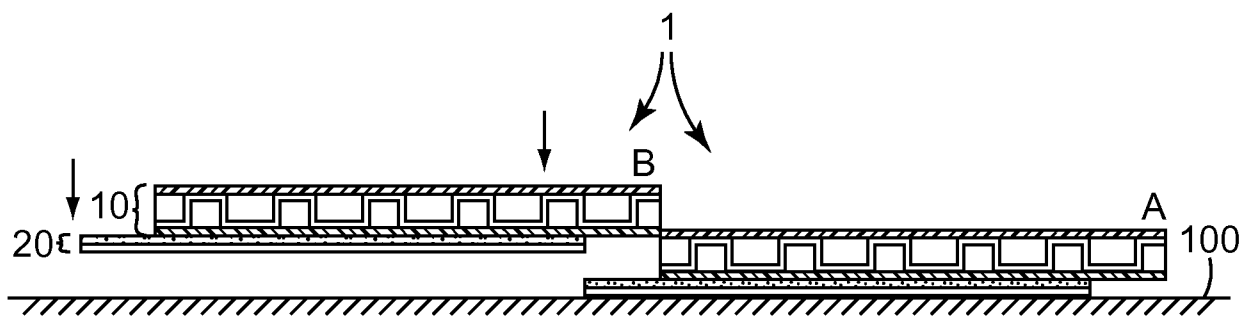


FIG. 3a

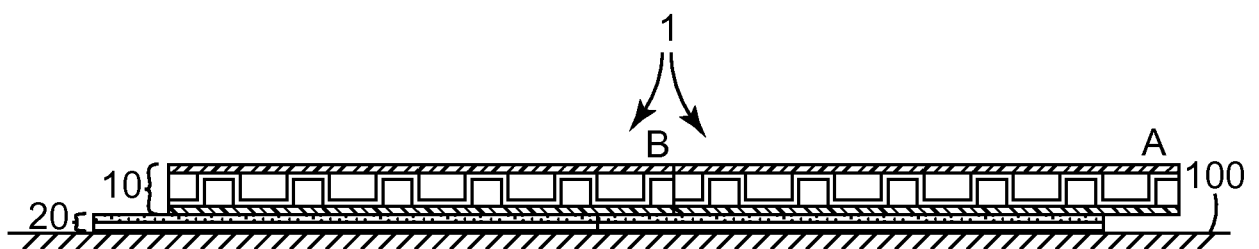


FIG. 3b

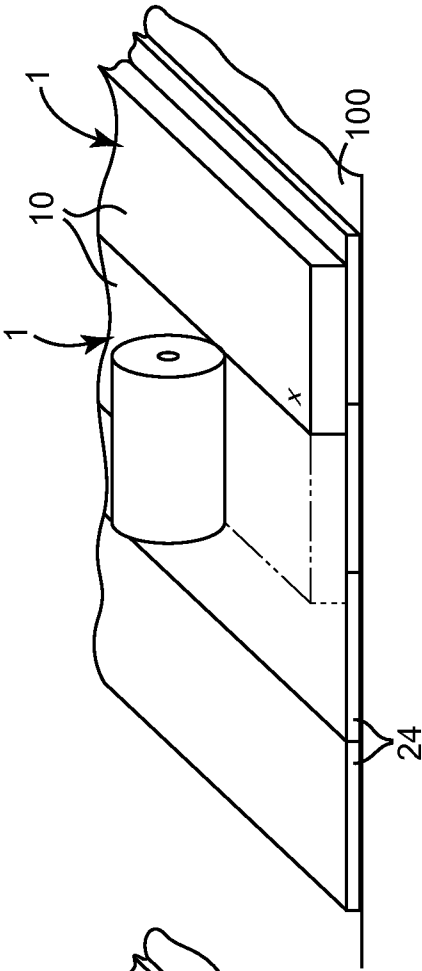


FIG. 4c

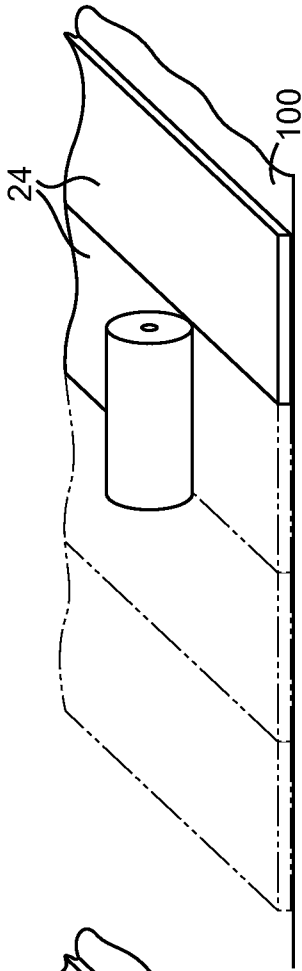


FIG. 4d

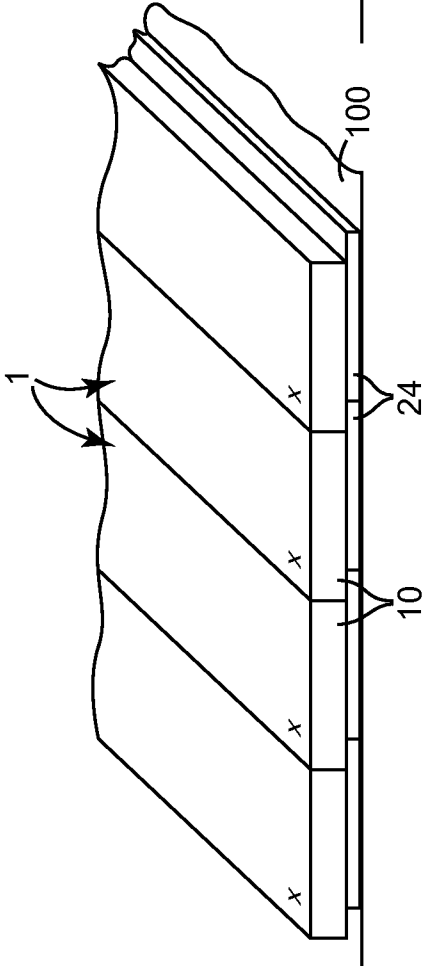


FIG. 4a

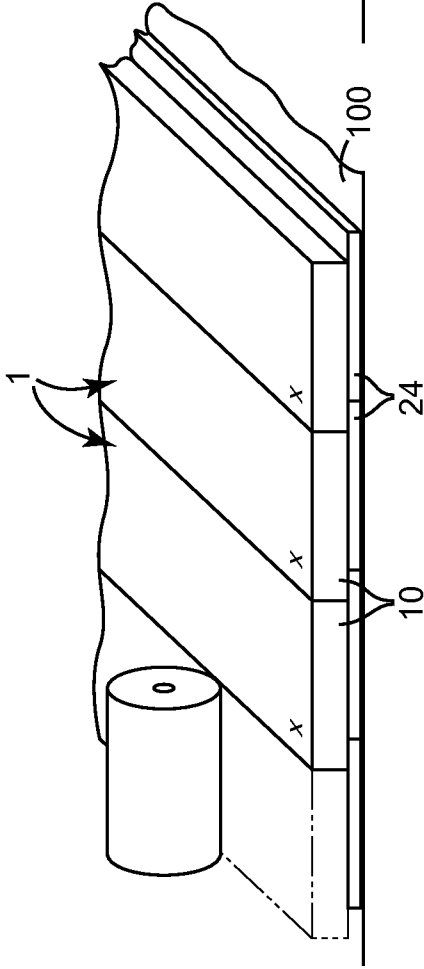


FIG. 4b

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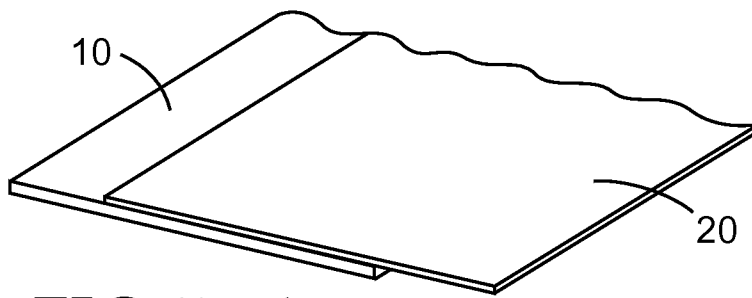


FIG. 5a-1

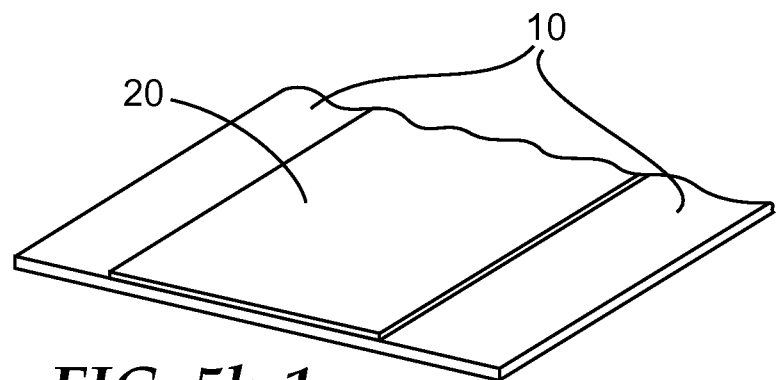


FIG. 5b-1

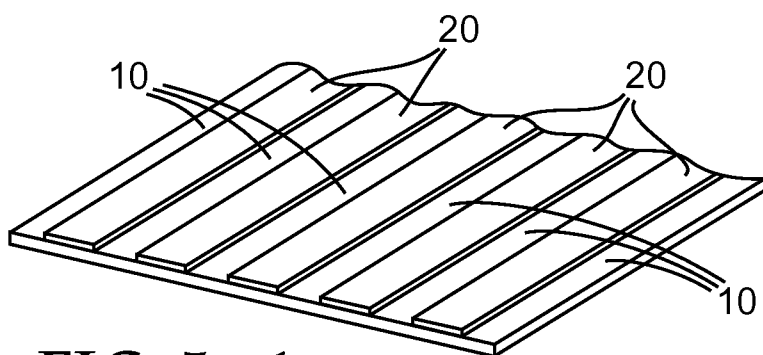


FIG. 5c-1

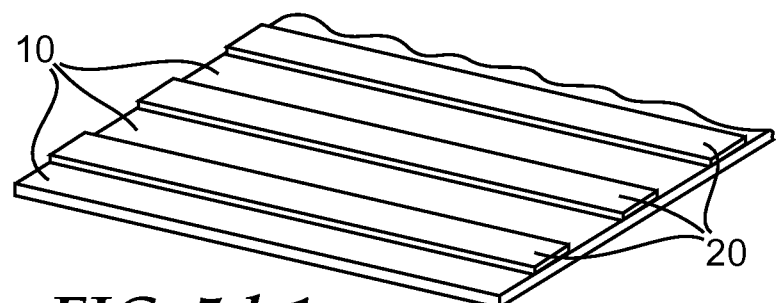


FIG. 5d-1

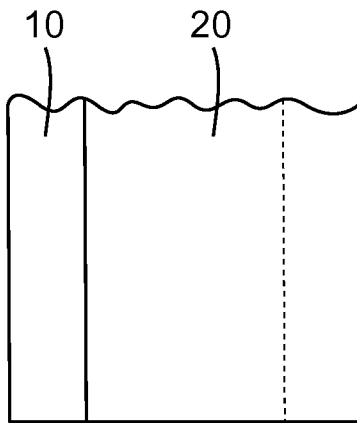


FIG. 5a-2

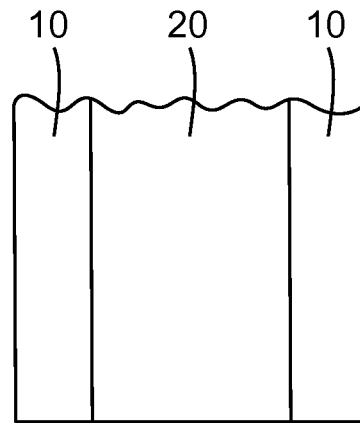


FIG. 5b-2

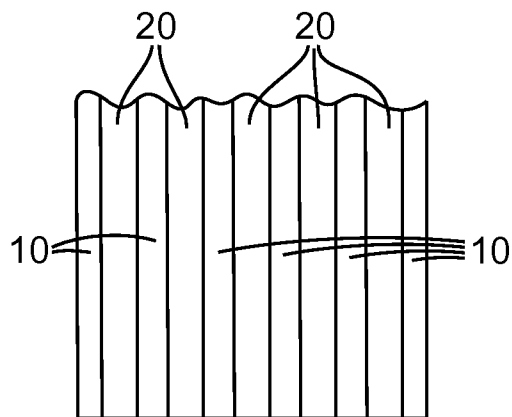


FIG. 5c-2

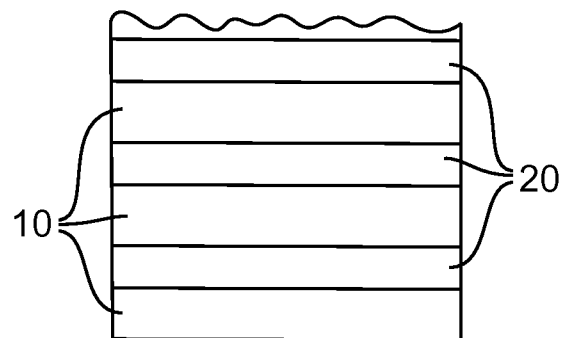


FIG. 5d-2

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/054723

A. CLASSIFICATION OF SUBJECT MATTER

INV. B32B7/00 B32B7/04 B32B7/06 B32B7/10 B32B7/12
B32B13/00 B32B13/04 B32B27/00 B32B27/06 B32B27/26
B32B27/30 B32B27/32 B32B3/00 B32B3/12 B32B3/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B32B E04G B28B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 4 785981 B1 (KAWAKAMI SANGYO CO LTD; JAPAN DEV & CONSTRUCTION) 5 October 2011 (2011-10-05) EPDOC abstract Figure 2 WPI abstract Figures	1,2
X	JP 2008 156927 A (KAJIMA CORP) 10 July 2008 (2008-07-10) EPDOC abstract - "expanded polyethylene" WPI abstract ----- -/--	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

10 October 2013

Date of mailing of the international search report

30/10/2013

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Authorized officer

Hammond, Andrew

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/054723

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2012 066595 A (THREE M INNOVATIVE PROPERTIES) 5 April 2012 (2012-04-05) EPODOC abstract WPI abstract Figures paragraph [0039] - paragraph [0042] paragraph [0033] - paragraph [0037] -----	1-5
X	JP H11 131778 A (TOYO QUALITY ONE CORP) 18 May 1999 (1999-05-18) EPODOC abstract - "adhering", "concrete curing", "foam sheets", "thermoplastic film layers", "laminated sheets" Figures WPI abstract -----	1
A	JP H11 148228 A (HAGIWARA KOGYO KK) 2 June 1999 (1999-06-02) EPODOC abstract Figures (a) and (b) WPI abstract -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/054723

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		JP 2012052334 A	15-03-2012
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		JP 2008156927 A	10-07-2008
JP 2012066595 A	05-04-2012	NONE	
JP H11131778 A	18-05-1999	NONE	
JP H11148228 A	02-06-1999	NONE	