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(71) Applicant: **LG HAUSYS, LTD.** [KR/KR]; One IFC, 10 Gukjegeumyung-ro, Youngdungpo-gu, Seoul 07326 (KR).

(72) Inventors: **SHIN, Ji Hee**; 2nd Fl., 5-7, Seongdae-ro 21da-gil, Dongjak-gu, Seoul 31173 (KR). **SON, Jong Seok**; 1650-ho, 304-dong, 43, Sinyul-ro, Seowon-gu, Cheongju-si, Gyeongsangbuk-do 28608 (KR).

(74) Agent: **CHO, Inje**; NewKorea International Patent & Law Office, 5th Fl., Singwan, 433, Seolleung-ro, Gangnam-gu, Seoul 06212 (KR).

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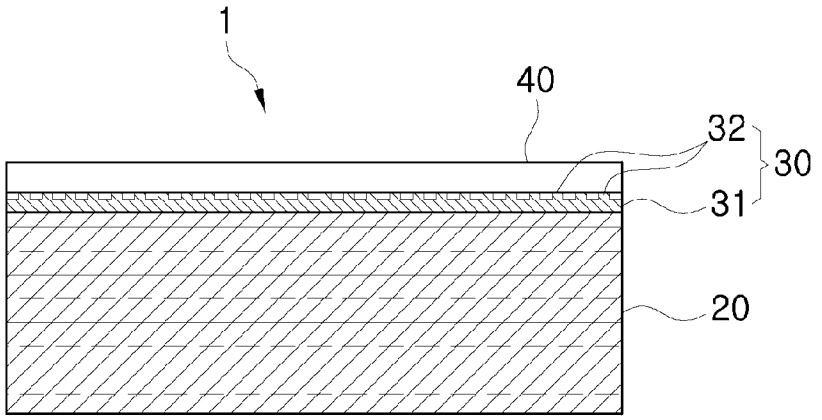
(54) Title: PVC TILE INCLUDING POLYESTER FIBER



(57) Abstract: The present invention relates to a PVC tile, and more particularly to a PVC tile that may be applied to floor materials for home use due to increased dimensional stability, may be produced by a simple manufacturing process through improvement of dimensional stability without preparation of a separate layer due to easy processability, and allows environmental protection and cost reduction by reusing conventional discarded or nonreusable woven polyester.

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Description

Title of Invention: PVC TILE INCLUDING POLYESTER FIBER

Technical Field

[1] The present invention relates to a PVC tile, and more particularly to a PVC tile that may be applied to floor heating materials for home use due to increased dimensional stability, may be produced by a simple manufacturing process through improvement of dimensional stability without preparation of a separate layer due to easy processability, and allows environmental protection and cost reduction by reusing conventional discarded or nonreusable woven polyester.

Background Art

[2] As illustrated in FIG. 1, a general PVC tile 100 is constituted of a transparent layer 140, a printed layer 130, a base layer 120, and an easy layer 110 and each of these layers is formed of a composition including a PVC resin. However, when such a conventional PVC tile is applied to materials for home use, problems, such as shrinking, expansion, and curling, due to temperature change according to floor heating occur. Accordingly, the conventional PVC tile can only be applied to commercial spaces beneath which floor heating is not done.

[3]

[4] As an example which can also be applied into home spaces by improving such a dimensional stability problem, Korean Patent Application Publication No. 10-2011-0103808 discloses a flooring material having improved dimensional stability by preparing an impregnated glass fiber layer having a thickness of 0.3 mm by impregnating glass fiber in acrylic sol and then drying the same, followed by laminating the impregnated glass fiber layer between a base layer and a printed layer of a tile.

[5] However, since the flooring material includes a separate layer, i.e., an impregnated glass fiber layer, a process of manufacturing the same is complex and an adhesive for adhering the impregnated glass fiber layer to another layer is disadvantageously required.

[6] In addition, if the glass fiber itself is directly mixed with a layer constituting the PVC tile, all the glass fiber is broken, due to the properties of the glass fiber, in a process in which the glass fiber is mixed with a resin by means of a Banbury mixer. Accordingly, the glass fiber could not be directly mixed.

[7]

[8] Meanwhile, Korean Patent No. 10-1455956 discloses a flooring material manufactured using a resin composition that includes a fiber material including aramid fiber, so as to improve dimensional stability. However, upon mixing with the aramid fiber,

processability is poor. In addition, since an aramid fiber for extrusion, which is suitable for manufacture, has to be prepared, a manufacturing process is complex and production costs are high.

[9]

[10] In addition, although a scrap remainder from a weave production process contains PVC and additives which have been used upon coating of a weave, the coat includes polyester fiber, and thus, it is difficult to reuse all of the PVC resin and the polyester fiber.

[11]

[12] Therefore, there is an urgent need for development of a PVC tile that has improved dimensional stability, without influence on processing of the PVC tile and requirement of preparation of a separate layer, and thus is also applicable to materials for home use.

[13]

[14] [Related Art Document]

[15] [Patent Document]

[16] (Patent Document 1) KR 10-2011-0103808 A(September 21, 2011)

[17] (Patent Document 2) KR 10-1455956 B (October 28, 2014)

Disclosure of Invention

Technical Problem

[18] Therefore, the present invention has been made in view of the above problems, and it is one object of the present invention to provide a PVC tile that may be applied to floor materials for home use due to increased dimensional stability, may be produced by a simple manufacturing process through improvement of dimensional stability without preparation of a separate layer due to easy processability, and allows environmental protection and cost reduction by reusing conventional discarded or nonreusable woven polyester.

Solution to Problem

[19] In accordance with one aspect of the present invention, provided is a PVC tile including a base layer; a printed layer formed on the base layer; and a transparent layer formed on the printed layer, wherein the base layer includes polyester fiber.

Advantageous Effects of Invention

[20] Since a base layer occupying the largest part of a whole structure of a PVC tile according to the present invention includes polyester fiber, overall dimensional stability of the PVC tile is increased. Accordingly, the PVC tile can be applied to floor materials for home use.

[21] Since the PVC tile according to the present invention uses polyester fiber that does not affect processing of a PVC resin, mixing and molding may be carried out after

directly adding polyester fiber to a composition forming the base layer of the PVC tile. Accordingly, a process of forming a separate dimensional-stabilizing layer and laminating the same is not required, thereby simplifying a manufacturing process.

[22] In addition, since, in the present invention, the base layer including a PVC resin and an additive includes polyester fiber, a weave remainder from other woven polyester or weave discarded after being used may be reused, thereby providing environmental protection and cost reduction effects.

Brief Description of Drawings

[23] FIG. 1 illustrates a schematic sectional view of a conventional PVC tile.

[24] FIG. 2 illustrates a schematic sectional view of a PVC tile according to the present invention.

[25] FIG. 3 illustrates a schematic sectional view of a PVC tile according to an example of the present invention.

[26] FIG. 4 is a graph illustrating dimensional stability test results of base layers prepared according to an example of the present invention and a comparative example.

[27] FIG. 5 is a graph illustrating dimensional stability test results of tiles (complete products) manufactured according to an example of the present invention and a comparative example.

[28] FIGS. 6a to 6c are graphs illustrating measurement results of the size of a gap between tiles manufactured according to each of a comparative example and an example.

Best Mode for Carrying out the Invention

[29] Hereinafter, the present invention is described in detail with reference to the accompanying drawings.

[30] FIG. 2 illustrates a schematic sectional view of a PVC tile including polyester fiber according to the present invention. As illustrated in FIG. 2, the present invention relates to a PVC tile 1 including a base layer 20; a printed layer 30 formed on the base layer 20; and transparent layer 40 formed on the printed layer 30, wherein the base layer 20 includes polyester fiber.

[31]

[32] In the present invention, the base layer 20 is characterized by being formed of a composition including a PVC resin, a plasticizer, a filler, a processing aid, a stabilizer, and polyester fiber.

[33] As the PVC resin, a PVC resin having a polymerization degree of 800 to 1500 is preferred.

[34] As the plasticizer, a phthalate-based, benzoate-based, citrate-based, or phosphate-based plasticizer may be used. Preferably, a phthalate-based plasticizer having superior

compatibility with the PVC resin and being cheap, is used. As the phthalate-based plasticizer, dioctylterephthalate (DOTP) or dioctylphthalate (DOP) is preferred. The content of the plasticizer is preferably 20 to 60 phr based on 100 phr of the PVC resin so as to provide processability.

[35] As the filler, one or more selected from the group consisting of calcium carbonate, talc, fly ash, blast furnace slag, and a combination thereof may be used. Preferably, calcium carbonate is used as the filler because there are advantages in terms of cost and versatility and heat resistance and durability may be increased. The content of the filler is preferably 100 to 700 phr based on 100 phr of the PVC resin. When the content of the filler is less than 100 phr, the cost of a tile may increase and heat resistance and durability may be deteriorated. On the other hand, when the content of the filler is greater than 700 phr, processability and flexibility may be decreased. Accordingly, the filler is perferably included within the above range.

[36] As the processing aid, an acrylic copolymer for supplementing processability and melt strength may be used. The content of the processing aid is preferably 1 to 20 phr based on 100 phr of the PVC resin.

[37] As the stabilizer, a barium-zinc based thermal stabilizer or a calcium-zinc based thermal stabilizer may be used. The content of the stabilizer is preferably 1 to 5 phr based on 100 phr of the PVC resin.

[38] As the polyester fiber which is added to supplement dimensional stability in a length direction, a polyethylene terephtalate (PET) fiber is preferred. The content of the polyester fiber is preferably 1 to 10 phr based on 100 phr of the PVC resin polyester fiber. When the content of the polyester fiber is less than 1 phr, dimensional stability improvement effect is slight. On the other hand, when the content of the polyester fiber is greater than 10 phr, processability may be decreased. Accordingly, the polyester fiber is preferably included within the above range.

[39] Since the base layer 20 occupying the largest part of a whole structure of the PVC tile 1 according to the present invention includes polyester fiber, overall dimensional stability of the PVC tile is increased. Accordingly, the PVC tile can be applied to floor materials for home which floor heating is done. In addition, since the PVC tile according to the present invention uses polyester fiber that does not affect processing of a PVC resin, mixing and molding may be carried out after directly adding polyester fiber to a composition forming the base layer of the PVC tile. Accordingly, a process of forming a separate dimensional-stabilizing layer and laminating the same is not required, thereby simplifying a manufacturing process. Further, a weave remainder from other woven polyester or weave discarded after being used may be reused, thereby providing environmental protection and cost reduction effects.

[40] The thickness of the base layer 20 may be 1 to 5 mm.

[41]

[42] The printed layer 30 formed on the base layer 20 according to the present invention provides various printing patterns to the PVC tile 1. Here, the printed layer 30 may be formed by, after forming a white sheet 31, providing the printed pattern 32 to a surface of the white sheet 31 by a method such as reproduction proof printing, gravure printing, screen printing, offset printing, rotary printing, or flexo printing (see FIGS. 2 and 3).

[43] The white sheet 31, makes the printed pattern 32 or a pattern formed thereon clear and may allow superior durability realization by increasing adhesion of the base layer 20 laminated thereunder.

[44] In addition, the printed layer 30 may be formed using another transparent sheet or colored sheet other than the white sheet 31.

[45] The white sheet 31 may be formed of a composition including a PVC resin, a plasticizer, a filler, titanium dioxide, and a stabilizer. The composition forming the white sheet 31 may include 10 to 30 phr of the plasticizer, 1 to 300 phr of the filler, 1 to 50 phr of the titanium dioxide, and 1 to 5 phr of the stabilizer, based on 100 phr of the PVC resin. Description of an additive including PVC and a plasticizer is the same as that of the base layer, thus being omitted.

[46] The thickness of the white sheet 31 may be 0.01 to 0.3 mm, but the present invention is not limited thereto.

[47] Selectively, the printed layer 30 may be directly formed on the base layer 20 by reproduction proof printing, gravure printing, or screen printing. In this case, since the printed layer 30, which is an ink layer formed by printing, is too thin to measure the thickness thereof and not to affect a total thickness of the PVC tile according to the present invention, the thickness of the printed layer 30 may be disregarded.

[48] Such a printed layer 30 provides a pattern by printing and thus allows of provision of a PVC tile exhibiting an appearance and design having a superior aesthetics.

[49]

[50] In the present invention, the transparent layer 40 formed on the printed layer 30 protects a printed pattern or a pattern of the printed layer 30. The transparent layer 40 may be formed of a composition including a PVC resin, a plasticizer, and a stabilizer. The composition forming the transparent layer 40 may include 10 to 40 phr of the plasticizer and 1 to 5 phr of the stabilizer based on 100 phr of the PVC resin. Description of an additive including PVC and a plasticizer is the same as that of the base layer, thus being omitted.

[51] The thickness of the transparent layer 40 may be 0.1 to 3 mm.

[52]

[53] Meanwhile, Meanwhile, an easy layer 10 may be selectively, further formed under

the base layer 20 of the PVC tile according to the present invention (FIG. 3). The easy layer 10, which is a part that adheres to a floor surface upon construction, protects the lowest part of the tile, obstructs moisture at the bottom, and of upper, and keeps overall curling balance of the tile. The easy layer 10 may be formed of a composition including a PVC resin, a plasticizer, a filler, and a stabilizer. The composition forming the easy layer 10 may include 10 to 30 phr of the plasticizer, 1 to 300 phr of the filler, and 1 to 5 phr of the stabilizer, based on 100 phr of the PVC resin. Description of an additive including PVC and a plasticizer is the same as that of the base layer, thus being omitted.

[54] The thickness of the easy layer 10 may be 0.1 to 3 mm.

[55]

[56] In addition, a surface treatment layer (not shown) may be selectively, further formed on the highest layer of the PVC tile of the present invention.

[57] That is, the surface treatment layer may be formed on the transparent layer 40 and protects the tile from initial contamination, i.e., adherence of contaminants, while improving scratch resistance and wear resistance. The surface treatment layer may be generally formed by coating a coating solution wherein a thermosetting or UV curable compound is dissolved in a solvent. However, since, in the case of the thermosetting compound, the properties of other layers locating at a lower part, particularly the transparent layer 40 and the base layer 20, may be changed when heat is applied to form the surface treatment layer, an UV curable compound is more preferred. Here, as the UV curable compound, a monomer or an oligomer having one or more functional groups, such as a crosslinkable unsaturated linking group, may be used. For example, urethane acrylate, epoxy acrylate, polyether acrylate, polyester acrylate, dipentaacrythritol hexaacrylate, dipentacrythritol pentaacrylate, pentaacrythritol tetraacrylate, dipentaerythritol hexaacrylate, dipentaerythritol pentaacrylate, or the like may be used. However, these substances are only provided as examples and the present invention is not limited thereto. As the UV curable compound of the present invention, these substances may be used alone or as a mixture of two or more thereof. The coating solution including the UV curable compound generally includes a photopolymerization initiator other than the UV curable compound and a solvent. As needed, various additives, such as a photostabilizer and a leveling agent, may be included within a range within which the properties of the surface treatment layer are not changed. The surface treatment layer has a surface hardness of 7 H or more measured by a pencil hardness test. At this surface hardness, a plastic film exhibits a superior surface hardness. More preferably, the surface hardness is controlled within a range of 7H to 8H. The UV curable compound constituting the surface treatment layer may be preferably a general photocurable urethane acrylate.

[58] The thickness of the surface treatment layer may be 5 to 40 ㎛.

[59]

[60] The transparent layer 40, the white sheet 31, the base layer 20, and the easy layer 10 of the PVC tile including polyester fiber according to the present invention may be manufactured by calender molding, casting molding, blow molding, extrusion molding, or the like.

[61] Calender molding is a method of continuously producing a sheet or a film by rolling a raw material between two or more rolls rotating in opposite directions, casting molding is a method of multilayer-coating a release paper, which is easily delaminated and has superior heat resistance, with synthetic resin sol and then laminating, blow molding is a method of manufacturing a hollow container by inserting parison, which has been prepared by heating and melting a thermoplastic resin and continuously extruding the same in a tubular shape by means of an extruder, into one or more molds, closing lids, and sealing upper and lower parts of the molds and then blowing air into the parison in a mandrel such that the parison is expanded and thus adheres to inner walls of the molds, and extrusion molding is a method of heating and melting a thermoplastic plastic material on a surface of a base by means of an extruder such that the thermoplastic plastic material becomes a flow state, and then extruding the thermoplastic plastic material into a film shape on a T-die while continuously pressing the same.

[62] Preferably, the calender molding is used because the contents of components, such as additives, may be freely controlled compared to other manufacturing methods and thus a tile having superior flexibility, impact resistance, mechanical strength, processability, fitness, and melting efficiency may be provided. In addition, the raw material costs may be reduced. Accordingly, the calender molding method is preferred.

[63]

[64] In addition, each of the layers of the PVC tile including polyester fiber according to the present invention may be formed by being laminated through application of heat and pressure using a lamination process known in the art.

[65]

[66] Now, the present invention will be described in more detail with reference to the following preferred examples. It is obvious to those skilled in the art that these examples are provided for illustrative purposes only and various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention. In addition, it is obvious that such modifications, additions and substitutions are within the scope of the appended claims.

[67]

[68] [Example]

[69] (Preparation of transparent layer)

[70] Based on 100 phr of the PVC resin, 30 phr of a plasticizer and 3 phr of a stabilizer were kneaded by means of a Banbury mixer and then subjected to first and second mixing by means of a 2 roll machine, thereby preparing a composition for forming a transparent layer. Subsequently, the composition for preparing a transparent layer was subjected to calender molding at 160°C, thereby preparing a transparent layer (film) having a thickness of 0.15 mm.

[71]

[72] (Preparation of printed layer)

[73] Based on 100 phr of the PVC resin, 25 phr of a plasticizer, 50 phr of calcium carbonate, 10 phr of titanium dioxide, and 3 phr of a stabilizer were mixed by means of a Banbury mixer and then subjected to first and second mixing by means of a 2 roll machine. Subsequently, a prepared material was subjected to calender molding at 160°C, thereby preparing a white sheet having a thickness of 0.10 mm. In addition, a printed pattern was formed on a white sheet surface by gravure printing or reproduction proof printing, thereby preparing a printed layer.

[74]

[75] (Preparation of base layer)

[76] Based on 100 phr of the PVC resin, 50 phr of a plasticizer, 500 phr of calcium carbonate, 10 phr of an acrylic copolymer, 3 phr of a stabilizer, and 10 phr of polyester fiber were kneaded by means of a Banbury mixer and then subjected to first and second mixing by means of a 2 roll machine, thereby preparing a composition for preparing a base layer.

[77] Subsequently, the composition for preparing a base layer was subjected to calender molding at 160°C, thereby preparing a base layer having a thickness of 2.60 mm.

[78]

[79] (Preparation of easy layer)

[80] Based on 100 phr of the PVC resin, 20 phr of a plasticizer, 200 phr of calcium carbonate, and 3 phr of a stabilizer were kneaded by means of a Banbury mixer and then subjected to first and second mixing by means of a 2 roll machine. Subsequently, a prepared raw material was subjected to calender molding at 160°C, thereby preparing an easy layer having a thickness of 0.15 mm.

[81]

[82] The prepared transparent layer, printed layer, base layer, and easy layer were sequentially stacked and then laminated through application of heat and pressure using a lamination process, thereby preparing a PVC tile including polyester fiber. A sectional view of the tile according to the example is schematically illustrated in FIG. 3.

[83]

[84] [Comparative Example]

[85] A transparent layer, a printed layer, a base layer, and an easy layer were respectively prepared in the same composition and method as the above example, except that the base layer was not mixed with a polyester fiber. Subsequently, the layers were thermally laminated, thereby manufacturing a tile as a comparative example.

[86]

[87] [Experimental Example 1]

[88] The base layers used in the example and the comparative example and the tiles (complete products) manufactured according to the example and the comparative example were respectively subjected to a long-term residence test (Lab) at 80°C.

[89] Dimensional stability of each of the base layers used in the example and the comparative example was measured. Measurement results are shown in Table 1 and FIG. 4. A dimensional stability measurement result of the tile manufactured according to each of the example and the comparative example is shown in Table 2 and FIG. 5.

[90] To investigate dimensional stability, a dimensional change rate in a length direction (L) was measured. In particular, the dimensional change rate was measured as follows: {(vertical length upon measurement - vertical length at day 0)/vertical length at day 0}X100.

[91]

[92] [Table 1]

Results of dimensional stability measurement in length direction of base layers

Base layer					
		Comparative example		Example	
Length in length direction (L, mm)	Early (room temperature, Day 0)	260.68	260.53	258.63	260.05
	80°C, Day 3	260.33	260.01	258.34	259.81
	%	0.13	0.20	0.11	0.09
	Average	0.17		0.10	
	80°C, Day 10	260.18	259.92	258.26	259.75
	%	0.19	0.23	0.14	0.12
	Average	0.21		0.13	
	80°C, Day 17	260.01	259.78	258.08	259.57
	%	0.26	0.29	0.21	0.18
	Average	0.27		0.20	
	80°C Day 27	259.90	259.76	258.08	259.54
	%	0.30	0.30	0.21	0.20
	Average	0.30		0.20	

[93]

[94] [Table 2]

Results of dimensional stability measurement in length direction of tiles

Tile(complete products)					
		Comparative example		Example	
Length in length direction (L, mm)	Early (room temperature, 0day)	260.71	260.40	259.65	259.50
	80°C, Day 3	260.24	259.61	259.27	259.01
	%	0.18	0.30	0.15	0.19
	Average	0.24		0.17	
	80°C, Day 10	259.99	259.33	259.08	258.88
	%	0.28	0.41	0.22	0.24
	Average	0.35		0.23	
	80°C, Day 17	259.80	259.04	258.89	258.70
	%	0.35	0.52	0.29	0.31
	Average	0.44		0.30	
	80°C, Day 27	259.59	259.01	258.85	258.65
	%	0.43	0.53	0.31	0.33
	Average	0.48		0.32	

[95]

[96] As shown in Table 1 and FIG. 4, it can be confirmed that, after a predetermined time (80°C, Day 17), the dimension of the base layer of the example including the polyester fiber is constantly maintained without an additional dimensional change, whereas the dimension of the base layer of the comparative example excluding the polyester fiber is continuously changed. In addition, it can be confirmed that, over the whole measurement period, the base layer of the comparative example shows a greater dimensional change rate, compared to the base layer of the example.

[97]

[98] In addition, it can be confirmed from Table 2 and FIG. 5 that, during the whole measurement period, the tile, as a complete product, of the example shows a smaller dimensional change rate compared to the tile of the comparative example, and, over time, a dimensional change of the tile of the example is smaller than that of the tile of the comparative example as time goes on.

[99]

[100] [Experimental Example 2]

[101] The tile of the example and the tile of the comparative example were constructed in an indoor floor that may be heated. Subsequently, over time after floor heating, the sizes of gaps between tiles were observed. Upon floor heating, surface temperatures of the constructed tiles of the example and the comparative example were 47 to 55°C.

[102]

[103] In three parts of areas constructed with the tiles, the sizes (unit: mm) of gaps between the tiles were measured. Results are illustrated in FIGS. 6a, 6b, and 6c.

[104] As illustrate in FIGS. 6a to 6c, it can be confirmed that, although gaps are observed in all of the tiles of the comparative example and the example over time, the tiles of the comparative example exhibit greater gaps therebetween, compared to the tiles of the example.

[105]

[106] As confirmed from Experimental Examples 1 and 2, the base layer occupying the largest part of a whole structure of a PVC tile according to the present invention includes polyester fiber, and thus, overall dimensional stability of the PVC tile is increased.

[107] Accordingly, the PVC tile can be applied to floor materials for home use.

[108] In addition, since the PVC tile according to the present invention uses polyester fiber that does not affect processing of a PVC resin, mixing and molding may be carried out after directly adding polyester fiber to a composition forming the base layer of the PVC tile. Accordingly, a process of forming a separate dimensional-stabilizing layer and laminating the same is not required, thereby simplifying a manufacturing process.

[109] Further, since, in the present invention, the base layer including a PVC resin and an additive includes polyester fiber, a weave remainder from other woven polyester or weave discarded after being used may be reused, thereby providing environmental protection and cost reduction effects.

[110]

[111] [Description of Symbols]

[112] 1: Tile of the present invention

[113] 10: easy layer

[114] 20: base layer

[115] 30: printed layer

[116] 31: white sheet

[117] 32: printed pattern

[118] 40: transparent layer

[119] 100: conventional PVC tile

[120] 110: easy layer

[121] 120: base layer

[122] 130: printed layer

[123] 140: transparent layer

Claims

[Claim 1] A PVC tile, comprising:
a base layer;
a printed layer formed on the base layer; and
a transparent layer formed on the printed layer,
wherein the base layer comprises polyester fiber.

[Claim 2] The PVC tile according to claim 1, wherein the base layer is formed of a composition comprising a PVC resin, a plasticizer, a filler, a processing aid, a stabilizer, and polyester fiber.

[Claim 3] The PVC tile according to claim 2, wherein the composition forming the base layer comprises 100 phr of the PVC resin, 20 to 60 phr of the plasticizer, 100 to 700 phr of the filler, 1 to 20 phr of the processing aid, 1 to 5 phr of the stabilizer, and 1 to 10 phr of the polyester fiber.

[Claim 4] The PVC tile according to claim 1, wherein the polyester fiber is a polyethylene terephtalate (PET) fiber.

[Claim 5] The PVC tile according to claim 1, wherein a thickness of the base layer is 1 to 5 mm.

[Claim 6] The PVC tile according to claim 1, wherein the printed layer is formed by adding a printing pattern to a white sheet surface by reproduction proof printing, gravure printing, screen printing, offset printing, rotary printing, or flexo printing.

[Claim 7] The PVC tile according to claim 6, wherein the white sheet is formed of a composition comprising a PVC resin, a plasticizer, a filler, titanium dioxide, and a stabilizer.

[Claim 8] The PVC tile according to claim 7, wherein the composition forming the white sheet comprises 100 phr of the PVC resin, 10 to 30 phr of the plasticizer, 1 to 300 phr of the filler, 1 to 50 phr of the titanium dioxide, and 1 to 5 phr of the stabilizer.

[Claim 9] The PVC tile according to claim 1, wherein a thickness of the printed layer is 0.01 mm to 0.3 mm.

[Claim 10] The PVC tile according to claim 1, wherein the transparent layer is formed of a composition comprising a PVC resin, a plasticizer, and a stabilizer.

[Claim 11] The PVC tile according to claim 10, wherein the composition forming the transparent layer comprises 100 phr of the PVC resin, 10 to 40 phr of the plasticizer, and 1 to 5 phr of the stabilizer.

[Claim 12] The PVC tile according to claim 1, wherein a thickness of the

transparent layer is 0.1 mm to 3 mm.

[Claim 13] The PVC tile according to claim 1, wherein an easy layer is further formed under the base layer.

[Claim 14] The PVC tile according to claim 13, wherein the easy layer is formed of a composition comprising a PVC resin, a plasticizer, a filler, and a stabilizer.

[Claim 15] The PVC tile according to claim 14, wherein the composition forming the easy layer comprises 100 phr of the PVC resin, 10 to 30 phr of the plasticizer, 1 to 300 phr of the filler, and 1 to 5 phr of the stabilizer.

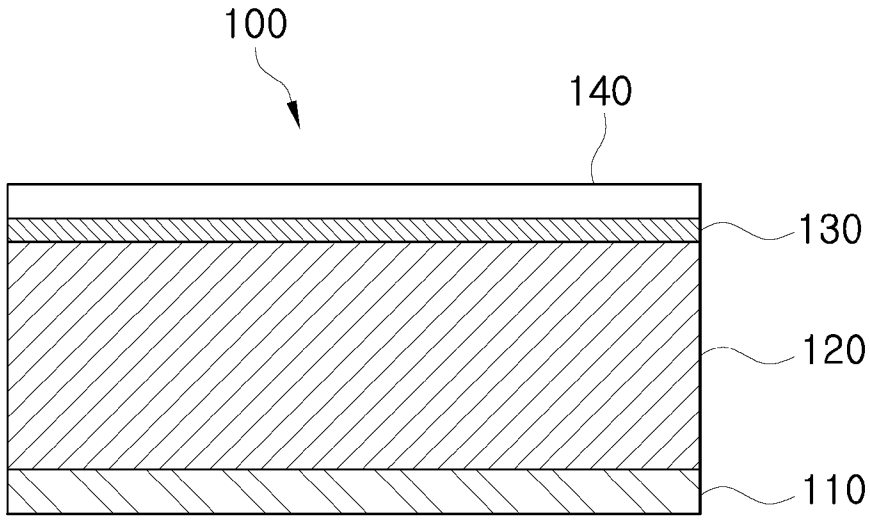
[Claim 16] The PVC tile according to claim 13, wherein a thickness of the easy layer is 0.1 mm to 3 mm.

[Claim 17] The PVC tile according to claim 1, wherein a surface treatment layer is further formed on the transparent layer.

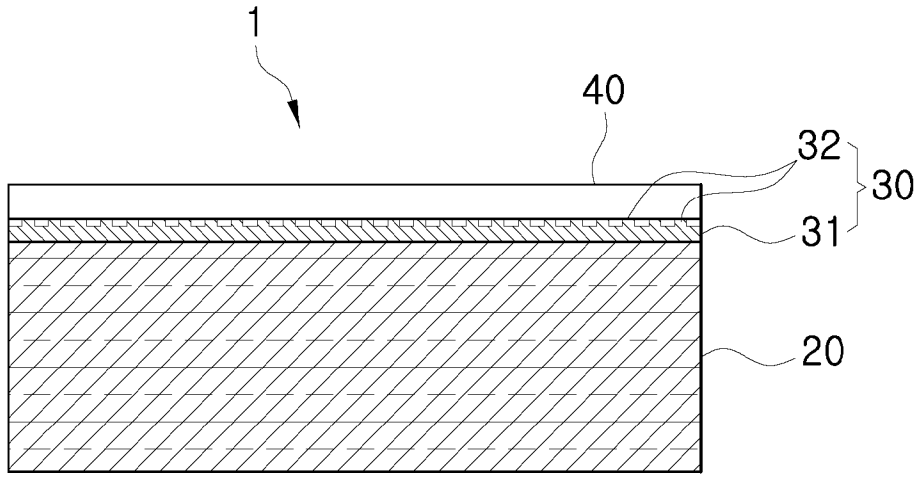
[Claim 18] The PVC tile according to claim 17, wherein the surface treatment layer is formed of a composition comprising a UV curable compound.

[Claim 19] The PVC tile according to claim 17, wherein a thickness of the surface treatment layer is 5 to 40 ㎛.

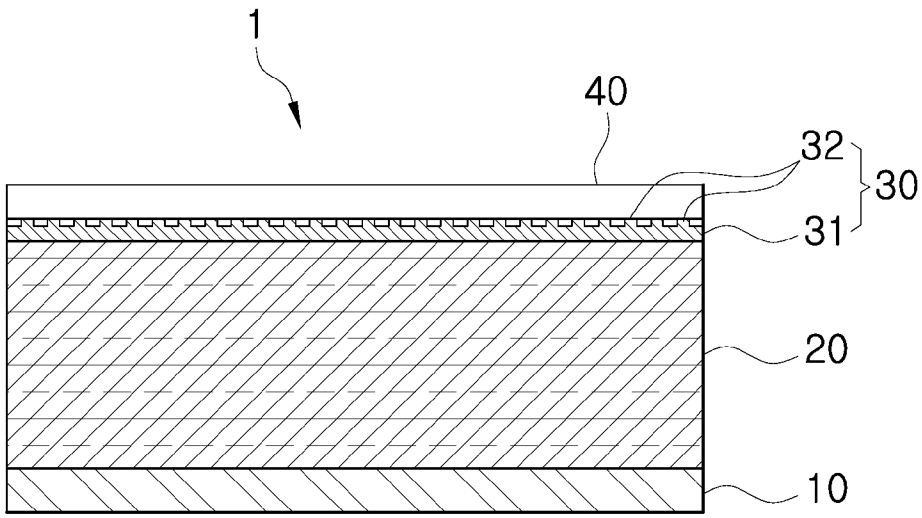
[Fig. 1]



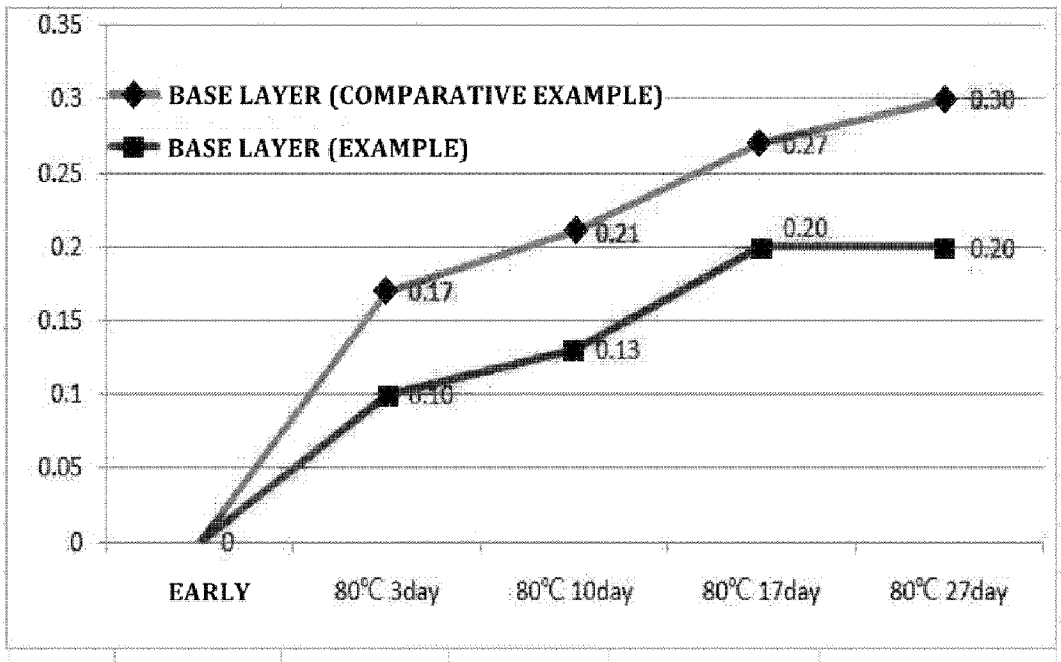
[Fig. 2]



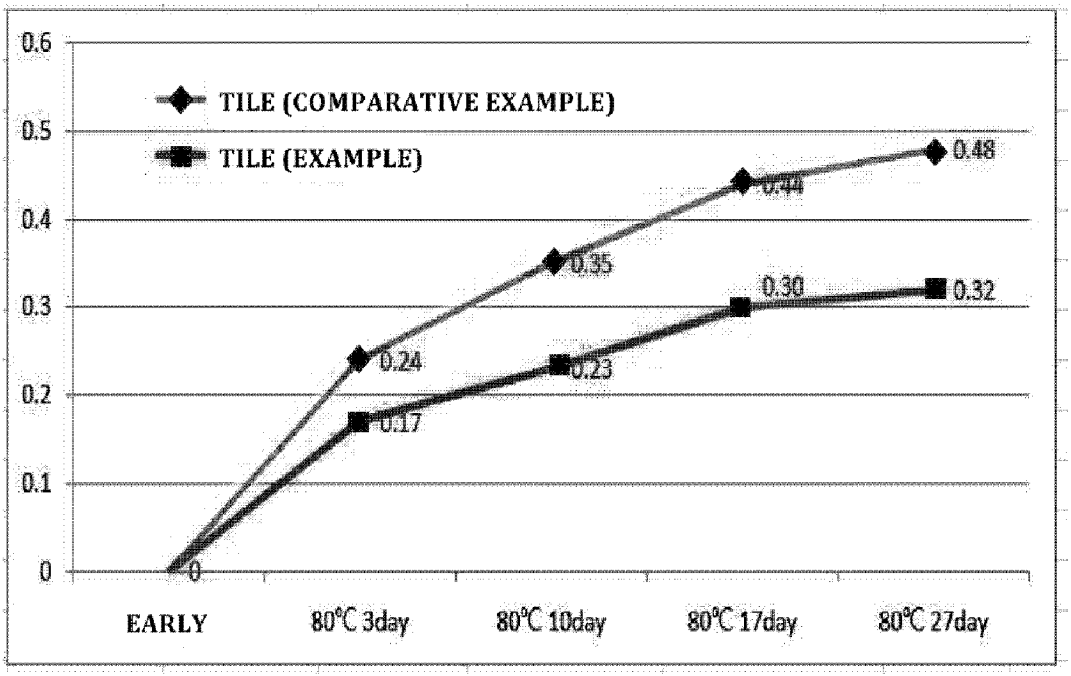
[Fig. 3]



[Fig. 4]


0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
BASE LAYER (COMPARATIVE EXAMPLE)
BASE LAYER (EXAMPLE)
0.30
0.27
0.21
0.20
0.20
0.17
0.13
0.10
0
EARLY
80℃ 3day
80℃ 10day
80℃ 17day
80℃ 27day

[Fig. 5]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0.4
0.3
0.2
0.1
0
TILE (COMPARATIVE EXAMPLE)
TILE (EXAMPLE)
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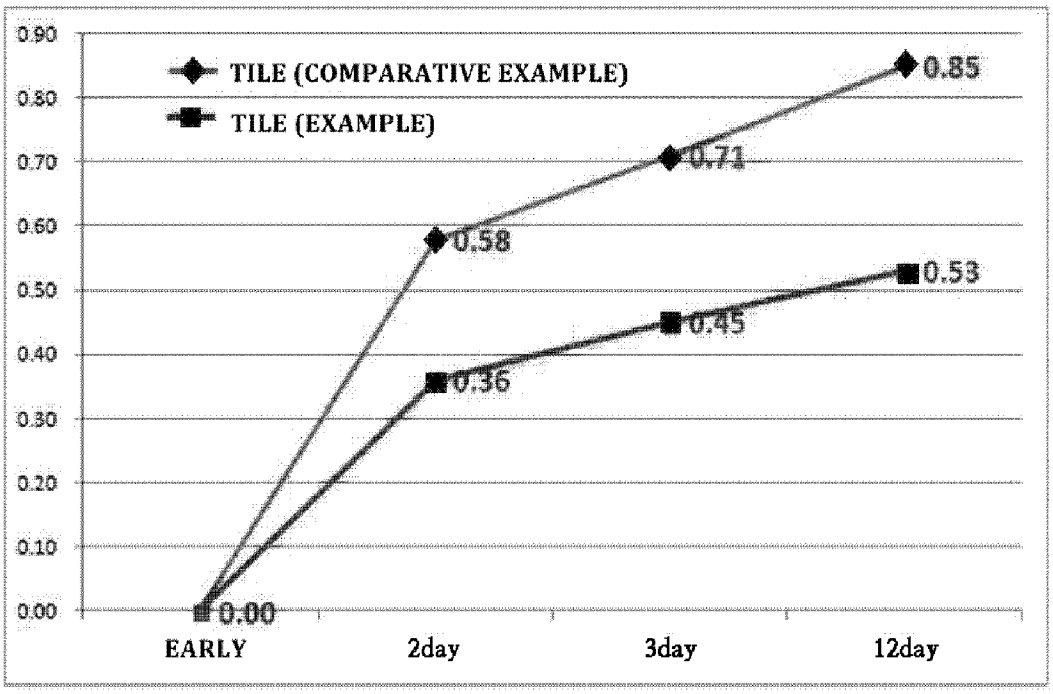
0.44
0.35
0.30
0.32
0.24
0.23
0.17
0
EARLY
80℃ 3day
80℃ 10day
80℃ 17day
80℃ 27day

[Fig. 6a]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0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
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TILE (EXAMPLE)
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0.71
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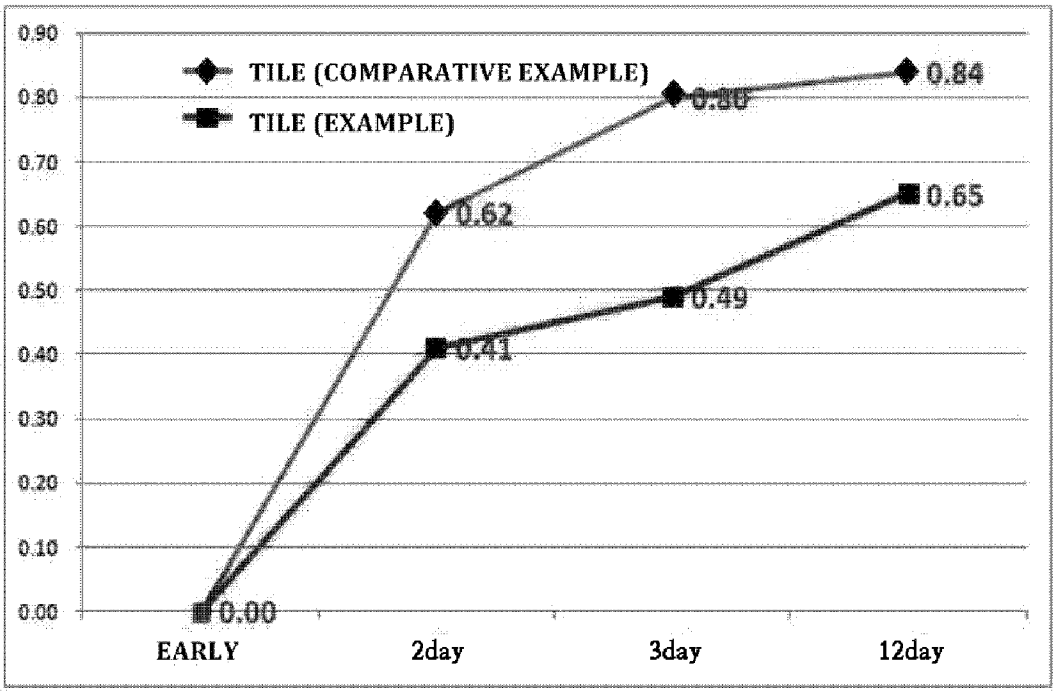
0.45
0.36
0.00
EARLY
2day
3day
12day

[Fig. 6b]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0.80
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0.50
0.40
0.30
0.20
0.10
0.00
TILE (COMPARATIVE EXAMPLE)
TILE (EXAMPLE)
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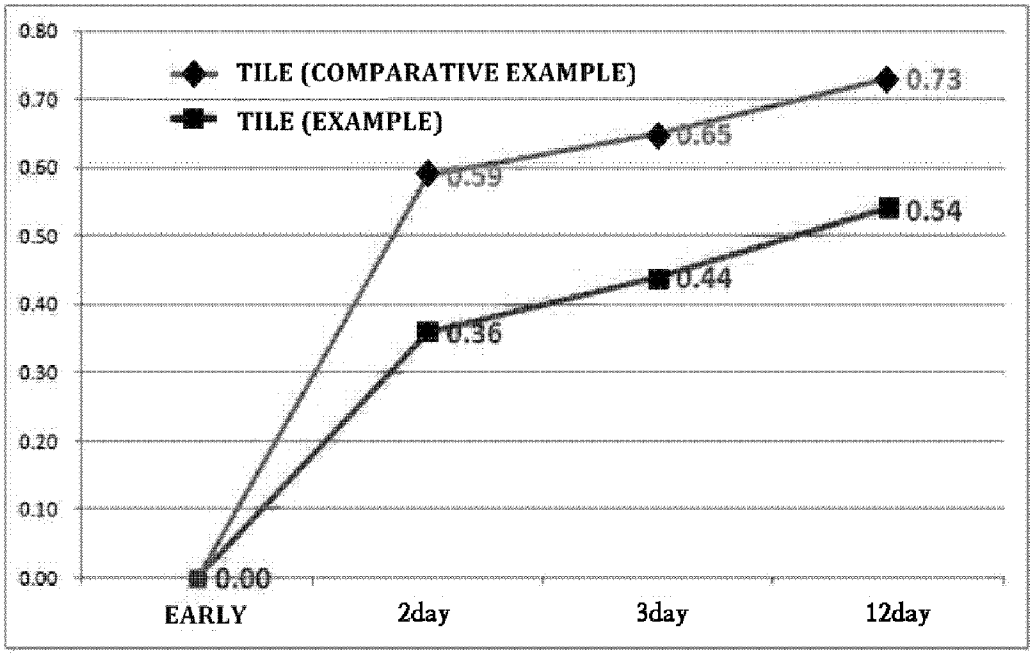
0.80
0.62
0.65
0.49
0.41
0.00
EARLY
2day
3day
12day

[Fig. 6c]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0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
TILE (COMPARATIVE EXAMPLE)
TILE (EXAMPLE)
0.00
0.59
0.65
0.73
0.36
0.44
0.54
EARLY
2day
3day
12day

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2016/012547

A. CLASSIFICATION OF SUBJECT MATTER

E04F 15/10(2006.01)i, E04C 2/26(2006.01)i, E04C 2/32(2006.01)i, E04B 5/02(2006.01)i, B32B 27/12(2006.01)i, B32B 27/30(2006.01)i

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)
E04F 15/10; E04F 15/08; B32B 5/10; B32B 13/12; B32B 27/06; B32B 27/12; B32B 15/08; B32B 7/12; E04F 15/022; E04C 2/26; E04C 2/32; E04B 5/02; B32B 27/30

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: PVC, tile, polyester fiber, base layer, printed layer, and transparent layer

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2005-0098480 A (KCC CO., LTD.) 12 October 2005 See paragraphs [0028], [0033]-[0039] and figure 1.	1-19
Y	JP 06-058037 U (TOLI CORP.) 12 August 1994 See paragraphs [0007]-[0008], [0017] and figure 1.	1-19
Y	KR 10-2012-0018456 A (LG HAUSYS, LTD.) 05 March 2012 See paragraphs [0036]-[0037] and figure 5.	13-16
A	KR 10-1455956 B1 (LG HAUSYS, LTD.) 28 October 2014 See claims 1-15 and figure 1.	1-19
A	KR 10-1302335 B1 (LG HAUSYS, LTD.) 30 August 2013 See claims 1-3 and figure 1.	1-19

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 January 2017 (26.01.2017)	**02 February 2017 (02.02.2017)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea
Facsimile No. +82-42-481-8578

Authorized officer
BAE, Geun Tae
Telephone No. +82-42-481-3547

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2016/012547

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-2005-0098480 A	12/10/2005	KR 10-1105497 B1	13/01/2012
JP 06-058037 U	12/08/1994	None	
KR 10-2012-0018456 A	05/03/2012	CN 103079815 A	01/05/2013
		CN 103079815 B	04/03/2015
		EP 2608959 A2	03/07/2013
		EP 2608959 A4	05/10/2016
		JP 2013-534285 A	02/09/2013
		JP 5601657 B2	08/10/2014
		KR 10-1274852 B1	13/06/2013
		US 2013-0142980 A1	06/06/2013
		US 9017785 B2	28/04/2015
		WO 2012-026722 A2	01/03/2012
		WO 2012-026722 A3	28/06/2012
KR 10-1455956 B1	28/10/2014	CN 104995361 A	21/10/2015
		EP 3101198 A1	07/12/2016
		US 2016-258168 A1	08/09/2016
		WO 2015-111784 A1	30/07/2015
KR 10-1302335 B1	30/08/2013	CN 102470650 A	23/05/2012
		CN 102470650 B	15/04/2015
		JP 2013-504702 A	07/02/2013
		JP 5733730 B2	10/06/2015
		KR 10-2011-0032536 A	30/03/2011
		US 2012-0128946 A1	24/05/2012
		WO 2011-037325 A2	31/03/2011
		WO 2011-037325 A3	16/06/2011