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(54) **Title**: COMPOSITE MATERIAL ROOFING STRUCTURE

(57) **Abstract**: The present invention is a composition for making high quality, mold resistant, water proof building products. The composition from which these products are formed is a mixture of various polyethylene or polypropylene materials, in conjunction with fillers which may comprise recycled rubber products such as ethylene propylene-diene monomers, and styrene butadiene rubber, or mineral fillers to achieve a different feel and texture to the formulation without compromising the integrity of the product. This is achieved by altering the melt and amount of the high and/or low density polyethylene or polypropylene in the mix to end up with the correct material integrity. Colorants may be additionally be added to the mixture prior to final molding. This composition allows for products to be made that resemble traditional building products, but with a higher performance level that are also recyclable in their entirety.

COMPOSITE MATERIAL ROOFING STRUCTURE

FIELD OF THE INVENTION

The present invention relates to building components, such as roofing elements, and more particularly to building components that are formed of specified combinations of synthetic materials to simulate building components formed from natural materials and to enhance the desirable properties of the building components.

BACKGROUND OF THE INVENTION

In the art of building components such as roofing with tiles constructed of natural materials, it has been known for many years to roof tiles with natural slates. Such slates, derived from quarries, are cut to size, drilled or punched with nail holes, and applied to roofs in a conventional manner. However, such natural slates, while providing for roofs for many years, often 50-100 years, generally require a basic supporting roof structure capable of withstanding great amounts of weight, such as on the order of 2,000 lbs. per square, with a square being a 10 feet by 10 feet area of a roof.

Synthetic products have been developed which simulate natural-appearing building components for use in decks, roofs, such as slate roofs, and other building structures. However, these synthetic building components are either very heavy, or if weight is a consideration, rather thin, when constructed thinner than natural slate or other natural roofing tiles, in order to reduce the weight required.

Other synthetic building components have been developed, such as from molded concrete with appropriate lightweight fillers, sometimes with partial recesses for weight reduction purposes to address these concerns.

However, such prior art synthetic products either have not adequately simulated the natural materials in either appearance or desirable impact, wear and fire resistance properties, or have not been constructed in a manner that enables the building

components to be made with recycled materials, which are becoming more and more prevalent with the continued usage of these types of materials. Most of the synthetic materials used to form the building components have a large carbon footprint, e.g., due to the extra energy used to form the material and in its processing into the building components. Further, because prior art building components are formed exclusively from virgin materials, as the reuse of the materials results in significant degradation of the properties of the materials, the inability to use any forms of recycled materials does not make the formation of prior art synthetic building components environmentally friendly.

In addition, the properties of certain materials used to form these materials necessitate that the processing of the material be carefully controlled in order to form useful products. For example, due to the properties of polypropylene that affect how the material flows and cools, the molding process must be closely controlled to prevent the item molded from the polypropylene from having undesirable properties, such as limited impact resistance, such as in compression molding processes.

As a result, it is desirable to develop a lightweight, synthetic building component composition that enables composition to be modified as desired to ensure that the building component formed therewith in the specified process has sufficient durability and a desired appearance for use in various building structures, such as in forming a roof covering, and optionally without the need for additional components when utilized to form a roof. Additionally, the building component composition should allow for increased ease of manufacture such that the building component can be formed with the desired appearance in any suitable molding process. Further, when the building components are to be removed and replaced, it would be desirable to be able to recycle the building components to form additional building components, as opposed to simply disposing of them.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, a one-piece building component, such as a roofing element, is provided that is formed of a molded synthetic material so as to simulate a natural appearing element, with the building component

composition including various materials selected to provide various benefits to the building component. The composition for the building component is formed of a polymeric resin combined with a binder. The presence of the binder allows for the manipulation of the properties of the polymeric resin, especially in the case of recycled polymeric resins, and the resulting building component, in manner that improves the ability to process the resin to form a building component using various molding techniques. These property benefits include increased mold resistance, fire retardency, increased wind resistance, increased impact resistance, and appearance.

According to another aspect of the present invention, the binder utilized in the composition of the roofing element enables the composition for the building component to be formed with synthetic components that can be obtained from scrap or other recycled materials. Also, the use of these materials and the binder renders the roofing component itself entirely recyclable for forming additional building components The primary materials used in forming the roofing tiles include polymeric resins or plastics of various types, such as polypropylene, giving the composition a large amount of flexibility when processing the composition into the desired roofing element. The additional components of the composition are then added to this initial starting material and subsequently formed into the building component with the desired shape, color and size.

Numerous other aspects, features and advantages of the present invention will be made readily apparent from the following detailed description of the preferred embodiments, and the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

According to the present invention, the synthetic roofing element comprises a body composed of a material which is molded so as to very closely resemble the appearance of natural building materials, such as slate, ceramic, wood, and stone, among others. Moreover, the synthetic building component of the present invention may be manufactured, such as in any suitable molding, extrusion or similar process for composite plastic materials, to realistically resemble other natural materials for use in building structure applications and for use, generally, in other cladding capacities not limited to

roofing applications, including but not limited to siding, foundation, decking and decorative trim applications, among others. By way of example only, such natural materials to be emulated according to the present invention may include stone, clay, cedar and other finishes intended to emulate the look and texture of stone and wood materials. Thus, the synthetic building component of the invention when emulating a stone or ceramic finish may be formed to replicate the shape, size, structure and texture of clay, terra cotta, Spanish/mission tile, barrel tile and ceramic tile. When emulating a wood finish, the synthetic building component may be formed to replicate the shape, size, structure, texture and grain of any of a variety of hardwoods and soft woods, such as cedar, oak, mahogany, and the like.

The building component of the present invention is formed of a composition including as a primary component or ingredient a plastic or polymeric resin material that comprises one or more plastics selected from polyesters, polyolefins, polyethylenes, including high-, medium- and low-density polyethylene, polystyrenes, polyamides, polypropylenes, and equivalents and combinations thereof. The plastic or resin component of the composition of the roofing element is present within a range of about 10% to 90% by weight of the composition for the roofing element.

The plastic ingredient of the building component of the present invention gives the building component the mechanical properties of hardness, rigidness, being infusible and insoluble (i.e., waterproof), and, optionally has extensive cross-linking. By way of example, the plastic or polymeric resin material may be obtained as virgin thermoplastic polymer materials, or can be obtained from recycled material streams formed essentially of the above polymers.

In preferred embodiments of the building component, the plastic ingredient is formed from at least partially from polypropylene materials. Polypropylene has previously been used for constructing building components, but has been limited in its use to only virgin polypropylene. The use of exclusively virgin polypropylene has resulted in building components having limited desirable qualities, such as fire and impact resistance, due to the issues with processing the virgin polypropylene in an injection molding process.

The other essential component of the building component composition is one or more binders that are present preferably in an amount of up to about 90% by weight of the overall composition, and more preferably between about 1% and about 75% by weight. The binder effectively alters the properties of the polymeric resin used to form the building component to provide a building component having the desired fire, impact and wear resistance, while also allowing the building component to be formed utilizing multiple molding processes. In particular, the presence of the binder alters the melt index of the polymeric resin thereby allowing the resin and binder to be used in different molding processes to form the building component, such as injection molding, compression molding, and extrusion, among others. Additionally, the binder changes the physical properties of the resulting building component, including the impact resistance without degrading the natural properties of the primary ingredient, such as it fire resistance.

The binder itself takes the form of another polymeric resin distinct from that used as the primary ingredient of the building component, but can be similar to those resins used as the primary ingredient. For example, the polyethylene resins discussed previously can also be utilized, or function in the composition as the binder for the other resins present in the composition. In addition to polyethylene, other suitable plastics or polymeric resins that can be used as the binder include ethylene/vinyl acetate polymers, which can be used alone or in combination with an ultra low density polyethylene to form the binder, such as EVAC- Ethylene-Vinyl Acetate Copolymer, as well as LLDPE-Linear Low Density Polyethylene, LDPE- Low Density Polyethylene, Metalocine , EAA-Ethylene/Acrylic Acid Copolymer, ultra low density polypropylene, EEA Poly(Ethylene-Ethyl Acrylate) , EAA-Ethylene/Acrylic Acid Copolymer, PVB-Poly(Vinyl Butyral), EMAC-Poly(Ethylene Methyl Acrylate), TPO-Thermoplastic Polyolefin (often applied to elastomers), TPU- Thermoplastic Polyurethene (often applied to elastomers), or materials of comparable physical properties.

Because there is a wide range of ingredients that can be utilized in combination with one another as either the primary polymeric resin component or the binder for the building component composition, this makes the formation of the building components from recycled materials possible. As opposed to the prior art synthetic material building

components that required the use of virgin materials in part based on the specific conditions in which the component is formed, the use of the binder in combination with the different polymeric resins as the primary ingredient essentially allows the composition to be modified as necessary to provide a building component with the desired properties based on the type and amount of the binder that is used. In particular, if the characteristics of a selected primary ingredient do not allow the ingredient to b formed or function properly for the desired building component, the binder is selected based on its properties to create a composition that can be formed into the desired building component using the specified process, and that has the desired impact, wear and heat or fire resistance properties. Therefore, in the case of use of a recycled polymeric resin material as the primary component which may not have the desired initial characteristics, a binder can be selected and added to the recycled resin to provide a composition that has the desired properties and can effectively be used to form a building component. Further, because each of the resin components used in the composition can come from recycled materials, the entire building component formed from the composition can itself be fully recycled.

In addition to the primary resin ingredient and the binder, the building components of the present invention may preferably include other ingredients in the composition. One of these ingredients is a filler compound. The compounds that can be utilized as the filler for the building component composition of the present invention include chemical constituents that are inactive chemical compounds which act as reinforcing agents that impart to a composition matrix considerable stiffness and rigidity, as compared with those of a pure thermoplastic or polymeric resin component. The filler compounds for the composition of the building component of the present invention are used to increase the modulus of elasticity and strength of the composition forming the building component. Additionally, this combination of the thermoplastic or polymeric resin component with the filler compound is used to produce a composite building component that is less brittle and more resistant to impact stresses, and at the same time maintaining adequate compressive, tensile, flexural and shear strengths, respectively, to the formed building component. The filler compounds that can be used in the composition for the roofing elements include filler compounds selected from the group

consisting of calcium oxide; calcium carbonate; cement; fly ash; fiberglass fibers; metal shavings; metal oxides, such as zinc oxide; polyester fibers; aluminum oxides; mica; perlite; zeolites; vermiculite; silica; silicates; quartz sands, #12 sand; #30 sand, #60 sand; aggregate particles/granules of stone, rock, marble, gravel, glass, clay and talc and equivalents and combinations thereof.

One additional filler compound that is most preferably utilized in the composition for the building component of the present invention is composed of polymeric compounds and recycled tire bits. Both ethylene propylene-diamine monomer copolymers and styrene butadiene rubber, which is obtained from shredded vehicle tires, are excellent filler materials in the molded products of the invention, and are typically obtained by recycling waste materials which would otherwise go to already full land fills. Such filler materials have already been "vulcanized", so they are fire retardant as well, which provides additional benefit to he roofing elements of the present invention. They are relatively inexpensive, water repellant and high temperature resistant, so they are especially suitable for use in building components such as roofing materials (shingles), floor coverings (tiles and sheet material), and other construction materials among other items. Other filler compounds, such as those described previously, could also be used to replace all or a part of the preferred copolymer and rubber materials, so long as the replacement filler compounds have the needed properties to the building component, especially water and heat resistance.

In addition to the primary resin ingredient, binder and the filler compound, the composition used to form the building component of the present invention also preferably contains various additional additives. The additives can include compounds such as thermal stabilizers, ultraviolet (UV) light stabilizers, pigments or colorants, compatibilizers, processing aids, flame retardant additives, and other functional chemicals capable of improving processing of the materials and performance of the building components formed from the composition.

With regard to the colorants, the colorants are preferably present in an amount of up to 15% by weight of the overall composition, and more preferably up to about 10% by

weight between preferred coloring in the formulation is natural iron oxide. However, any other suitable natural or synthetic coloring materials may also be used to provide the building components with the desired appearance.

Concerning the fire retardants that can be utilized in the composition for the building components, the components are preferably present in an amount of up to 60% by weight of the overall composition, and more preferably between about 1% and about 50% by weight, with a couple of preferred components are aluminum trihydrate and magnesium hydroxide. Other fire retardants may be used instead of either the aluminum trihydrate or the magnesium hydroxide. These include Plastisan B made by 3V Corp., Georgetown, S.C., Phos-check, available from Solutia Corp., St, Louis, Mo. and Dover-phos-9228 made by Dover Chemical, Dover, Ohio. In addition, other components of the composition for the roofing elements can contribute to the fire retardency of the building components other than the actual fire retardant, such as the preferred filler material including the recycled tire rubber which as a result of being vulcanized, already has a fire retardant aspect to it.

The UV components can be present in the composition in an amount of up to about 20% by weight of the overall composition, and more preferably from between about 0.1% to about 16% by weight, and can include UV inhibitors and UV stabilizers. The UV stabilizers can include Tinuvin®783 FDL or Univol 5050H, from Ciba® of Basel, Switzerland, which each show significant contribution to long-term thermal stability for the composite material element, and helps to keep the material from chalking on the surface over time. The UV inhibitors may include Chimassorb® 81 or Univol 3008, from Ciba® of Basel, Switzerland, which are each a solid-form UV absorber of the 2-hydroxy-benzophenone class. The absorbance spectrum (in the UVB range only) for the inhibitor and relatively low photo-permanence makes it useful in this application, as it helps to absorb the UV rays that could otherwise cause premature degradation of the material performance for the composition forming the building components.

The composition can also include antioxidants as an ingredient preferably present in an amount of up to 10% by weight of the overall composition, and more preferably between about 1% and about 8% by weight, such as Irganox ® B225 or Annox B8011, from Ciba® of Basel, Switzerland, which are phenolic based anti-oxidants that hinder thermally induced oxidation of polymers in high temperature applications. The antioxidants function to stabilize the color and appearance of the surface of the composite material used to form the building components. The stabilization function of the antioxidants effectively controls the look of the building components throughout the varying temperatures of the processing of the material, instead of allowing the high processing temperatures to negatively affect the look of the color and surface of the building components.

The following are a few examples of building components formed utilizing the polymer resin and binder compositions of the present invention:

EXAMPLE 1

A Spanish replica tile roofing element can be formed with the following components in a preferred embodiment of the composition of the present invention:

1. ethylene propylene-diene monomers and scrap from styrene butadiene rubber products as filler in an amount of up to about 50% by weight (of the overall composition);
2. ethylene vinyl acetate and ultra low density polyethylene as a binder in an amount of between about 10-40% by weight, and more preferably about 15% by weight;
3. a fire retardant (i.e., aluminum tri-hydrate or magnesium hydroxide) in an amount of 10-35% by weight,
4. iron oxide in an amount of between about 1-10% by weight;
5. high density polyethylene as a primary resin ingredient in an amount of between about 5-50% by weight;
6. U.V. stabilizer in an amount of between about 1-8% by weight;
7. U.V. inhibitor in an amount of between about 1-8% by weight;

8. antioxidant in an amount of between about 1-8% by weight.

The above materials are added together in the form of dry powders into a suitable mixing apparatus and agitated therein for a sufficient time period to achieve a uniform and homogeneous building component composition. The desired coloring for the particular building component desired is added to the composition in the mixing apparatus during the agitation of the composition within the apparatus to achieve a uniform and homogeneous distribution of the coloring throughout the composition. This uniformly mixed composition can then be utilized in various forms to form the desired roofing element by introducing the composition into a suitably-shaped mold to form the building component therein under sufficient temperature and pressure. By way of example only, certain methods that can be utilized to process the composition into the building element having the desired shape include extrusion, compression molding, injection molding, and thermoforming.

Additionally, the uniform composition can be further processed, such as to enable the composition to be stored for later use, or to place the composition in a form, e.g., forming the composition into multiple pellets, to increase the ease of use of the composition in other processes to form building components, to maximize quality of the composition and the roofing elements formed therefrom, and to aid in creating a less hazardous production environment by reducing the dust generated from the use of the composition.

One additional advantage of the building component compositions of the present inventions is the lack of the need for any pre-heating step in the processing of the composition. In some other similar processes using similar materials it is necessary to preheat or to chemically cure the virgin polymer composition while processing the composition prior to forming the building component. Unfortunately, this required step has the drawback of degrading the properties of the virgin material being processed, which results in a building component with degraded properties. In the process for forming the roofing component of the composition of the present invention, there is no preheat or chemical curing step. The materials or ingredients for the composition are simply mixed together in dry powdered form and then either immediately heated for

molding the building components, or cooled and pelletized, such that the pellets can be stored or transported for later use when they can be heated and molded into the finished product. This reduces the energy consumption and stress on the material by reducing the number of heat cycles. And also saves on the amount of fossil fuel used in the processing of the building components as no additional heat needs to be applied to the composition.

EXAMPLE 2

A roof sheathing material is manufactured with a formulation similar to that employed in Example 1, but without styrene butadiene rubber and a mineral filler.

1. TPO Thermoplastic Polyolefin as a binder up to about 50% by weight (of the overall composition);
2. ethylene vinyl acetate and ultra low density polyethylene as a binder in an amount of between about 10-40% by weight, and more preferably about 15% by weight;
3. a fire retardant (i.e., aluminum tri-hydrate or magnesium hydroxide) in an amount of 10-35% by weight,
4. polypropylene as a primary ingredient in an amount of between about 5-50% by weight;

The polypropylene is used to make the product slightly flexible but is still rigid enough to be used as the desired component, such as for decking, due to the presence of the binder which alters the natural properties of the polypropylene, even when in recycled form, to achieve these properties. Additionally, since this component is designed for use under other building materials, no colorants are added to the composition. The material composition provides a strong non-rotting material that tightly seals and/or engages with fasteners to prevent water intrusion. The product formed from this composition is impact-resistant, and is has a much greater useful life than the natural product it replaces, such that this particular application of the building component composition can eliminate the need for underlayments that degrade over time. The sheathing can also be made in a standard size without any loss of the composition in the manufacturing process. This material composition is also fully recyclable.

EXAMPLE 3

To achieve the highest fire and hail ratings, the following formula may be utilized to form a roofing element:

1. a fire retardant in an amount of 45% by weight (of the overall composition);
2. ultra low density polyethylene and/or ethylene vinyl acetate as a binder in an amount of 25% by weight;
3. high density polyethylene as a portion of the primary ingredient in an amount of about 20% by weight;
4. low density polyethylene as a portion of the primary ingredient in an amount of about 10% by weight; and
5. a small amount of color, i.e., less than 10% by weight.

EXAMPLE 4

A Spanish replica tile that is very lightweight and which is class A fire and Class 4 hail rated can be molded from the following composition of the present invention formed in a manner similar to Example 1:

1. polypropylene a primary ingredient in an amount of up to about 75% by weight (of the overall composition);
2. calcium carbonate in an amount of between about 10-50% by weight, and more preferably about 35% by weight;
3. a fire retardant present in an amount of between about 20-50% by weight;
4. Linear Low Density Polyethylene as a binder system present in an amount of between about 1-20% by weight;
5. a U.V. stabilizer present in an amount of between about 0.1- 8% by weight; and
6. a U.V. inhibitor present in an amount of between about 0.1- 8% by weight.

EXAMPLE 5

A shake or cedar replica shingle can be formed with the following components in another preferred embodiment of the composition of the present invention:

1. polypropylene a primary ingredient present in an amount of up to about 75% by weight of the overall composition;
2. calcium carbonate present in an amount of between about 10-50% by weight, and more preferably present in an amount of about 35% by weight;
3. a fire retardant present in an amount of between about 20-50% by weight;
4. ultra low density polypropylene as a binder system present in an amount of between about 1-20% by weight;
5. a U.V. stabilizer present in an amount of between about 0.1%- 8% by weight; and
6. a U.V. inhibitor present in an amount of between about 0.1%- 8% by weight.

While particular percentages of materials have been disclosed herein, it is intended in this specification to include all equivalent materials which would occur to those of skill in the art via reasonable experimentation with the compounds and processes disclosed herein.

CLAIMS

What is claimed is:

1. A building product comprising a composition of:

a) between about 10-60% by weight of a filler;

b) about 10-40% by weight a binder;

c) about 0-40% by weight fire retardant; and

d) about 5-80% by weight of a polymeric resin.

2. The building product of claim 1 wherein the polymeric resin comprises low density polyethylene and high density polyethylene in an amount of between about 5-50% by weight.

3 The building component of claim 1 wherein the polymeric resin comprises high density polyethylene in an amount of about 20% by weight, and low density polyethylene in an amount of about 10% by weight

4. The building product of claim 1 wherein the polymeric resin comprises polypropylene present in an amount of up to about 75% by weight

5. The building product of claim 1 wherein the filler comprises recycled vulcanized rubber.

6. The building product of claim 5 wherein the filler comprises a combination of ethylene propylene-diene monomers and scrap from styrene butadiene rubber products in an amount of up to about 50% by weight.

7. The building product of claim 1 wherein the filler comprises a mineral filler.

8. The building product of claim 1 wherein the binder comprises ethylene vinyl acetate in an amount of between about 10-40% by weight.

9. The building product of claim 1 wherein the binder comprises ultra low density polyethylene in an amount of between about 10-40% by weight.

10. The building product of claim 1 further comprising about 0.1-8% by weight of an antioxidant.

11. The building product of claim 1 further comprising about 0.1-8% by weight of an U.V. inhibitor

12. The building product of claim 1 further comprising about 0.1- 8% by weight of an U.V. stabilizer.

13. The building product of claim 1 wherein the product is selected from the group consisting of: roofing tiles, roofing sheathing, siding materials, hand rails, deck panels, pallets, pavers, and decorative construction accessories.

14. The building component of claim 1 further comprising a colorant.

15. The building component of claim 1 wherein the entire building component is recyclable.

16. The building component of claim 1 wherein the entire composition is formed of recycled components.

17. A building product comprising a composition of:

a) polypropylene in an amount of up to about 75% by weight of the composition;

b) calcium carbonate in an amount of between about 10-50% by weight;

c) a fire retardant present in an amount of between about 20-50% by weight;

d) a binder system present in an amount of between about 1-20% by weight;

e) a U.V. stabilizer present in an amount of between about 0.1- 8% by weight; and

f) a U.V. inhibitor present in an amount of between about 0.1- 8% by weight.

18. A building component comprising a composition of:

a) a fire retardant in an amount of 45% by weight of the overall composition;

b) a binder in an amount of 25% by weight;

c) a high density polyethylene in an amount of about 20% by weight; and

d) a low density polyethylene in an amount of about 10% by weight.

19. The building component of claim 18 wherein the binder comprises a combination of ethylene vinyl acetate and ultra low density polyethylene.

20. The building component of claim 18 further comprising a colorant.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/046853

A. CLASSIFICATION OF SUBJECT MATTER
INV. C08K3/00 C08L23/00

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)
C08K C08L

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 133 378 A (DAVIS JAMES A [US] ET AL) 17 October 2000 (2000-10-17) claim 1	1
X	US 2007/132144 A1 (RAFAILOVICH MIRIAM [US] ET AL) 14 June 2007 (2007-06-14) the whole document	1
X	WO 2005/067470 A2 (BUILDING MATERIALS INVEST CORP [US]) 28 July 2005 (2005-07-28) the whole document	1
X	US 5 366 779 A (THOMPSON ANDREW [GB]) 22 November 1994 (1994-11-22) the whole document	1-3

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/	Authorized officer
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/030448 A2 (POLYGLASS USA INC [US]; ZANCHETTA NATALINO [US]; DRIGO MICHELE [IT]; M) 15 March 2007 (2007-03-15) the whole document	1-3
X	WO 97/11114 A1 (NEXT GENERATION TECHNOLOGIES I [US]) 27 March 1997 (1997-03-27) page 5, line 11 - page 5, line 13; claims 1-12	1-3
A	WO 99/07792 A1 (EXXON FRANCE [FR]; BOUSSAD NADJIB [FR]) 18 February 1999 (1999-02-18) the whole document	1-3

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International application No.
PCT/US2009/046853

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

2-3, 1 (partially)

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 2-3(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the polymeric resin comprises a particular amount of LDPE and a particular amount of HDPE.

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2. claim: 4(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the polymeric resin comprises a particular amount of polypropylene.

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3. claims: 5-6(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the filler comprises recycled vulcanized rubber.

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4. claim: 7(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the filler comprises a mineral filler.

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5. claim: 8(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the binder comprises a particular amount of EVA.

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6. claim: 9(completely); 1(partially)

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the binder comprises a particular amount ultra low density polyethylene.

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7. claim: 10

   Building product comprising a particular amount of a filler, a binder and a polymeric resin where the building product further comprises a particular amount of antioxidant.

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8. claim: 11(completely); 1(partially)

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the building product further comprises a particular amount of U.V. inhibitor.

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9. claim: 12(completely); 1(partially)

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the building product further comprises a particular amount of U.V. stabilizer.

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10. claim: 13(completely); 1(partially)

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the building product is limited to a selection of products.

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11. claim: 14(completely); 1(partially)

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the building product further comprises a colorant

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12. claim: 15(completely); 1(partially)

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the entire building product is recyclable.

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13. claim: 16(completely); 1(partially)

Building product comprising a particular amount of a filler, a binder and a polymeric resin where the entire composition is formed of recycled components.

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14. claim: 17(completely); 1(partially)

Building product comprising a particular amount of polypropylene, calcium carbonate, a fire retardant, a binder system, a UV. stabilizer and a U.V. inhibitor.

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15. claims: 18-20(completely); 1(partially)

Building product comprising a particular amount of a fire retardant, a binder, HDPE and LDPE.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2009/046853

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