



(51) International Patent Classification:

A45D 33/00 (2006.01) *A45D 40/00* (2006.01)
A45D 34/00 (2006.01) *B29C 43/02* (2006.01)

(21) International Application Number:

PCT/US2013/051227

(22) International Filing Date:

19 July 2013 (19.07.2013)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

13/554,195 20 July 2012 (20.07.2012) US

(71) Applicant: ELC MANAGEMENT LLC [US/US]; Suite 345 South, 155 Pinelawn Road, Melville, New York 11747 (US).

(72) Inventors: MARTINS, Agostinho; 131 North 6th Street, New Hyde Park, New York 11040 (US). MCGUIRE, Eliot Drangeid; P.O. Box 397, Penns Park, Pennsylvania 18943 (US).

(74) Agents: HAERTER, Martin W. et al.; 155 Pinelawn Road, Suite 345 South, Melville, New York 11747 (US).

(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, JP, 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, 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: METHOD FOR MAKING A BIODEGRADABLE AND COMPOSTABLE COMPONENT FOR COSMETIC PACKAGING

(57) Abstract: A cosmetic product insert for a package for storing and dispensing a cosmetic product or a beauty care product including a biodegradable support component made from compressed fibrous biomass bound by a cosmetically compatible and compostable binder.



WO 2014/015224 A1

METHOD FOR MAKING A BIODEGRADABLE AND COMPOSTABLE COMPONENT FOR COSMETIC PACKAGING

BACKGROUND OF THE INVENTION

5

FIELD OF THE INVENTION

[0001] The present invention relates to cosmetic and personal care packaging. In particular, the present invention is directed to a cosmetic product insert with a biodegradable support component made from fibrous biomass and a cosmetically compatible and compostable binder, and methods for making and filling such packaging.

DESCRIPTION OF THE PRIOR ART

15

[0002] Most cosmetic and personal care packaging is currently made from non-biodegradable plastics, or from metal. Packaging made from non-biodegradable plastics has the problem of increasing waste stream. Packaging made from metal components often requires additional processing steps (e.g., grinding edges, removing burrs, cleaning, anti-corrosion treatment, surface polishing or roughening). In addition, metal parts may have sharp edges, or splinters or shavings associated with their production and use that could pose a hazard to consumers. To avoid the additional processing and safety concerns associated with metal parts, and to reduce waste flow and reduce negative impact on the environment associated with non-biodegradable plastic parts, there is a need for biodegradable cosmetic and personal care packaging, and in particular, a need for compostable packaging.

BRIEF SUMMARY OF THE INVENTION

[0003] It is an object of the present invention to provide cosmetic and personal care packaging that includes biodegradable, compostable components, and methods

for making and filling those components. The components are made from fibrous biomass held together with a compostable binder.

[0004] It is an object of the invention to provide a biodegradable component for a package for storing and dispensing a cosmetic product or a beauty care product, the

5 component made from a compressed fibrous biomass bound by a cosmetically compatible and compostable binder, the component adapted to store, dispense or apply the product. The component has at least one surface adapted to contact the cosmetic or beauty care product. The at least one surface preferably has increased adhesion to the product. The increased adhesion is provided by at least one of free
10 portions of biomass fibers extending from the surface, or rough topography of the surface, as described in greater detail herein. The surface can be further adapted for contact with a cosmetic or beauty care product by structure including at least one of lugs, recesses, patterning, dimpling, grooving, embossing and knurling.

[0005] It is an object of the invention to provide a method of making a

15 biodegradable component for a package for storing and dispensing a cosmetic or beauty care product, the method comprising the steps of providing a mold cavity defined by a bottom wall and a side wall, and a corresponding die, the cavity and die when fully closed being dimensioned to form the component in a preselected and desired shape. A quantity of fibrous biomass sufficient to form the component is
20 placed in the mold cavity. The quantity of fibrous biomass includes a cosmetically compatible and compostable biomass binder. The die is closed on the mold cavity under pressure to compress and bind the quantity of fibrous biomass such that the resin is cured and the component is formed. The die is opened from the mold cavity and the formed component is released. The biomass binder may be in whole or part a
25 resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate, or
30 any other suitable binder that is compostable and cosmetically compatible. Alternatively, the compostable binder may be in whole or part a naturally occurring constituent of the fibrous biomass.

[0006] It is a further object of the invention to provide a method of filling a biodegradable component for a package for storing and dispensing cosmetic and beauty care products, the biodegradable component made from a fibrous biomass and a cosmetically compatible and compostable binder. The method includes the steps of forming the component to include a product reservoir such that at least one portion of a surface of the product reservoir has at least one of a rough surface topography or extending free portions of individual ones of the fibrous biomass. Once the component is formed, a quantity of product in a filling state is prepared, the quantity of product including a product binder. The quantity of product is filled into the reservoir such that it adheres mechanically to the surface when the product binder is cured or the product is pressed into the component.

[0007] It is a further object of the invention to provide a biodegradable component for a package for storing and dispensing cosmetic and beauty care products that is formed in a mold having a sidewall draft angle that is about 0 degrees to about 30 degrees.

[0008] It is a further object of the invention to provide a biodegradable component for a package for storing and dispensing cosmetic and beauty care products with a solid body made of compressed fibrous biomass and a cosmetically compatible and compostable binder, the body having a cavity for storing and dispensing a cosmetic product, wherein at least one surface in the cavity is adapted to contact and have increased adhesion to the product. The cavity is made by mechanical working of the solid body. The mechanical working is at least one of boring, milling, cutting, laser cutting, stamping, die cutting or grinding.

[0009] It is a further object of the invention to provide a method of making a biodegradable component for a package for storing and dispensing cosmetic products, wherein a solid body is made of compressed fibrous biomass including a cosmetically compatible and compostable binder and the body is mechanically worked to achieve a desired component shape and dimension. At least one surface in the component is adapted to contact and have increased adhesion to the product.

The solid body is mechanically worked by at least one of boring, milling, cutting, laser cutting, stamping, die cutting or grinding.

[0010] It is a further object of the invention to provide a method for forming a cosmetic product insert for a cosmetic compact, the insert having product in the form of a dispensable supply portion secured to a support portion. The method comprises the steps of: providing a mold cavity defined by a bottom wall and a side wall, and a
5 corresponding die, the cavity and die when fully closed being dimensioned to form the insert in a preselected and desired shape; providing a quantity of cosmetic product in a form suitable for placing in the cavity, the quantity of cosmetic product sufficient to form the dispensable supply portion; providing a quantity of fibrous biomass sufficient to form the support portion for the dispensable supply portion of cosmetic product;
10 placing in the cavity a first layer selected from one of the quantity of cosmetic product and the quantity of fibrous biomass; placing in the cavity a second layer selected from the other of the quantity of cosmetic product and the quantity of fibrous biomass; and closing the die onto the mold cavity under pressure to compress the second layer and the first layer, and to adhere the second layer to the first layer such that the insert is
15 formed. The cosmetic product includes a suitable cosmetically compatible cosmetic product binder. The quantity of fibrous biomass further comprises a cosmetically compatible and compostable biomass binder. The biomass binder and the cosmetic product binder are the same binder, or the biomass binder and the cosmetic product binder are different binders. The biomass binder may be in whole or part a resin
20 selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate, polybutylene adipate, or any
25 other suitable binder that is compostable and cosmetically compatible. Alternatively, the biomass binder may be in whole or part a naturally occurring constituent of the fibrous biomass.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a cross-sectional side elevation of a compact wherein one or more components of the compact are biodegradable, compostable components made according to the invention;

[0012] FIG. 2 is a cross-sectional side elevation view of a mold and die that may be used in making the component of the invention, in an open position;

[0013] FIG. 3 is a cross-sectional side elevation view of the mold and die of FIG. 2 in a closed position;

5 [0014] FIG. 4 is cross-sectional side elevation view of a component of the invention;

[0015] FIG. 5 is a cross-sectional side elevation view of a second embodiment of a mold and die that may be used in making the component of the invention, in an open position;

10 [0016] FIG. 6 is a cosmetic compact insert including a dispensable product supply portion and a biodegradable and compostable support portion for the supply portion;

[0017] FIG. 7 is a perspective view of pre-form solid board or block of fibrous biomass prior to mechanical working to shape the component;

15 [0018] FIG. 8 is a perspective view of the board or block shown in FIG. 7 after mechanical working to shape the component;

[0019] FIG. 9 is a cross-sectional side elevation view of the second embodiment of the biodegradable component according to the invention;

[0020] FIG. 10 is a cross-sectional side elevation view of the second embodiment of the biodegradable component according to the invention with a cover and product

20 P;

[0021] FIG. 11 is a plan view close-up photograph of the surface of the present invention taken at 15X (15 times) magnification illustrating the rough surface topography and free portions of individual fibers of the fibrous biomass;

25 [0022] FIG. 12 is a plan view close-up photograph of the surface of the present invention taken at 35X (35 times) magnification illustrating the rough surface topography and free portions of individual fibers of the fibrous biomass;

[0023] FIG. 13 is a plan view close-up photograph of the surface of the present invention taken at 30X (30 times) magnification illustrating the rough surface topography and free portions of individual fibers of the fibrous biomass; and

30 [0024] FIG. 14 is a side elevation view close-up photograph of a sectional cut through the component of the present invention taken at 15X (15 times) magnification

illustrating the rough surface topography and free portions of individual fibers of the fibrous biomass.

DETAILED DESCRIPTION OF THE INVENTION

5

[0025] Referring now to FIG. 1, a package for storing and dispensing a cosmetic product or a beauty care product is shown generally at reference number 2. The package is in the form of a compact 4. The compact has a base 8, and a cover 10 (shown in the closed position) secured to the base 8 by a hinge 12. A biodegradable component 6 is provided in the form of a pan 16 with a side wall 22 and a bottom wall 24 defining a reservoir 18 for storing and dispensing the product P. The pan 16 is secured to the base 8 with an adhesive 14. The component 6 comprises a compressed fibrous biomass, also referred to as "biofiber". The fibrous biomass is bound together by a cosmetically compatible and compostable binder. The component 6 is adapted to store, dispense or apply the product P.

10

[0026] At least one surface 20 of the component 6 is adapted to contact the product P and may be adapted to have increased adhesion to the product P. In the embodiment illustrated in FIG. 1, the surface 20 is an upper side of the bottom wall 24, but could alternatively be an inner side of sidewall 22, or both the upper side of bottom wall 24 and the inner side of sidewall 22.

20

[0027] The surface 20 is adapted to have increased adhesion to the product P by way of a relatively rough surface topography caused by matted biomass fibers secured in a coarse binder surface with bumps, craters, recesses and pits (see FIGS. 11-13), and by random free portions of individual ones of the biomass fibers extending from the surface (see FIGS. 11-14). The matted biomass fibers may be secured at random angles as shown, or in an oriented fashion (not shown). For clarity, "free portions" are defined herein as any portion or part of an individual one of the biomass fibers that extends from or above the surface or binder. The free portions include free ends of biomass fibers extending from the surface, as well as mid-portions of biomass fibers that arch from and return to the surface, or mid-portions of biomass fibers that bridge or span clearances in the surface caused by the bumps, craters, recesses, pits and stacked fibers in the surface. The surface 20 is

25

30

also adapted to have increased adhesion due to the rough topography of surface 20 caused by shapes of the fibers and stacking of the fibers of the biomass embedded in binder in the surface 20. While to human touch, the surface 20 of a biodegradable component 6 of the present invention feels smooth, when viewed under a

5 magnification of 15X to 35X (15 times to 35 times magnification) the biodegradable component has a relatively rough surface topography. Under magnification, the surface 20 of the fibrous biomass in binder appears much like matted grass or straw crushed down and trapped in dry mud (see FIGS. 11-13), with random free portions extending from the surface (FIGS. 11-14), including free ends of individual ones of the
10 fibrous biomass. The stacked, crushed and matted biomass fibers secured in binder form a rough surface topography that include curved free portions of the biomass fibers bulging from the surface, voids, pits, craters and clearances in the surface between and under fibers, crossed fibers, parallel fibers and even random free portions of fibers protruding from the surface. It is believed that this relatively rough
15 topography of the surface and the free portions of biomass fibers extending from the surface contribute significantly to the increased capacity of the cosmetic product P to adhere to the biodegradable component 6, such as pan 16. The rough surface topography and extending free portions of biomass fibers clearly increase the surface area that cosmetic product can adhere to. The increased adhesion of the
20 components to the cosmetic product allows, for example, a cosmetic or personal care powder product to be pressed with significantly less pressure into the component 6, e.g., pan 16, yet still have excellent adhesion to the component. This increased adhesion provides a significant advantage over, for example, metal or plastic components that often require, prior to filling, a scrubbing, sanding, scraping, etching
25 or erosion operation to increase adhesion to a level that is adequate. However, the adequate level of adhesion achieved after processing metal or plastic components is still magnitudes below the significantly elevated levels of adhesion provided by the biodegradable components of the present invention. To compensate for lower adhesion levels, for example, with pressed powder filling, the metal or plastic
30 components require significantly higher pressing pressures to ensure adhesion of the product to the component. However, the higher adhesion levels of the present invention permit lower pressure pressing. Lower pressure pressing is preferred due

to advantages such as a lower cost of processing machinery and manufacture, less waste due to reduced damage to product or components at lower pressure and a 'softer' product for the consumer. Products pressed at lower pressures are more desirable to consumers because they dispense more readily with a more desirable
5 feel and payout – applicator brushes, pads and sponges load more easily and more fully and the 'feel' to the consumer is softer.

[0028] It should be noted that unless steps are taken during manufacture of the biodegradable component 6, generally all surfaces of component 6 will have some degree of increased adhesion for the reasons given above – rough surface

10 topography and free portions of fibers protruding from the surface. Steps can be taken to reduce or eliminate the rough surface topography and/or protruding free portions of biomass fibers for applications where increased adhesion of product is less desirable, such as certain liquid or lotion containers, lip gloss packages, etc. The steps that can be taken to reduce adhesion include treating or coating a surface with
15 a cosmetically compatible, and preferably compostable, varnish, paint, lacquer, resin, film or other suitable surface coating. Alternatively, for surfaces of component 6 that do not require increased adhesion to the product P, e.g., outer surfaces of pan 16, the component may be veneered or clad with, for example, a foil or film. The foil or film is preferably made from a biodegradable and compostable material. As another
20 alternative, the surfaces of the pan 16, or any biodegradable component 6, may be treated with a waterproofing liquid or solution applied to either the interior or exterior of the pan or component.

[0029] Similarly, the surface 20 may be treated to resist penetration or absorption of the product P or of ingredients of the product P. The surface may be treated with a
25 cosmetically compatible, and preferably compostable, varnish, paint, laquer, resin, film or other suitable surface coating.

[0030] The surface 20 of the component 6 can be further adapted for adhesion by including structure on surface 20 such as lugs, recesses, patterning, dimpling, grooving, embossing, pillowing and knurling (see, for example, the pillowing in FIG.
30 11, or the grooves in FIG. 12). Providing such additional surface structure increases significantly (estimated to be by several magnitudes) the roughness of the biomass that protrudes slightly from the surface as well as the protruding free portions of

biomass as the fibers are forced to bulge from the surface when the structures are formed by molding, stamping, cutting, grinding, etc.

[0031] In addition, the increased capacity for adhesion of the component 6 can be used to facilitate securing the component 6 to other parts of the package. For example, in the embodiment illustrated in FIG. 1, the bottom of the pan 16 is secured to the base 8 with adhesive 14. With the significantly increased adhesion capacity of the surfaces of biodegradable component 6, a manufacturer can use significantly less glue to secure the component 6 to the rest of the package 2.

[0032] Product P may be in the form of a pressed powder, a loose powder, a liquid, a stick, a rod, a bar, a puck, a gel, a cake, a paste, a lotion or pomade.

[0033] The fibrous biomass is preferably selected from one of wood pulp (e.g., hardwood such as, for example, maple, or softwood, such as, for example, pine or spruce, etc.), cellulose, bamboo, willow, bagasse (sugar cane pulp), corn, rice straw, reed, bulrush, coconut, agave, flax or palm. However, any biodegradable biological fiber will do. The fibrous biomass may constitute randomly or directionally non-woven mats, or woven mats of fibers. The mats may include chips of biomass material as well as strands of biomass material, either randomly positioned or oriented.

[0034] The cosmetically compatible and compostable binder may be in whole or part selected from a cosmetically compatible and biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate (which can be obtained by polycondensation of polyhydric alcohols and polybasic acids), or any other suitable binder that is compostable and cosmetically compatible.

[0035] The cosmetically compatible and compostable binder may be in whole or part a naturally occurring constituent of the fibrous biomass that can be drawn out of the biomass and cured by processing, such as, for example, with heat or steam treatment and/or sufficient pressures. Alternatively, the fibrous biomass may be secured and solidified without binder simply by compression sufficient to cause friction-type adhesion between the fibers.

[0036] Although illustrated as a pan 16 in a compact 4, the biodegradable component 6 can be any part of a package, such as, for example, a cup (as in a lipstick or deodorant stick case), a cap, a lid, an applicator, a spatula, a dipper, a spoon, a rod, a bottle, a jar, a hinge, a pencil body or a frame. In the compact 4
5 illustrated in FIG. 1, the component 6 can also take the form of the base 8, lid 10 or hinge 12. For example, the hinge 12 could be made as a biodegradable component as a living hinge (not shown). A living hinge made of fibrous biomass and compostable resin could take advantage of the fibrous mat or woven nature of the material. In fact, biodegradable fibrous biomass components can be substituted for
10 many of the components of cosmetic packaging currently made with plastic, glass or metal.

[0037] With respect to product P, solvents, cosmetic product binders (e.g., for pressed powder) or other ingredients included in product P should be selected to be minimally absorbed by component 6. If product P includes ingredients that are
15 susceptible to absorption by the fibrous biomass or compostable binder of component 6, those ingredients should be provided in product P in sufficient quantity (a "threshold" quantity) to allow for such absorption without compromising the quality, purpose or effectiveness of product P. Ingredients of product P should also be selected to avoid or minimize expanding, discoloring or deforming the component 6.
20 Alternatively, prior to bringing product P into contact with component 6, the contacting surface(s) can be treated as described in more detail above to minimize or eliminate undesired absorption, discoloration or deformation.

[0038] With pressed powder in particular, particle size of the powder can range from 100 nanometers to 200 microns.

[0039] Referring now to FIGS. 2-4, the invention further comprises a method of making a biodegradable component 6 for a package 2 for storing and dispensing a cosmetic or beauty care product. The component 6 is a pan 38 (see FIG 4) similar to pan 16 in the embodiment illustrated in FIG. 1. The method comprises a first step of providing a mold cavity 26 in a mold base 28. The mold cavity 26 has an upwardly
25 directed opening and is defined by a bottom wall 30 and a side wall 32. A die 34 corresponding to the mold cavity depends from a top plate 36. The cavity 26 and die 34 when fully closed are dimensioned to form a clearance that defines the
30

preselected and desired shape of the component 6, pan 38. A quantity 40 of fibrous biomass sufficient to form the component 6 is provided. The quantity 40 of fibrous biomass includes a cosmetically compatible and compostable biomass binder. The quantity 40 of fibrous biomass is placed in the cavity 26. The die 34 is lowered in the direction of arrows 42 to close the die onto the mold cavity to compress and bind the quantity of fibrous biomass under pressure such that the resin is cured and the component 6, pan 38, is formed. It will be understood that closing the die onto the mold cavity is done such that a pressure is applied to the quantity of fibrous biomass sufficient to compress and shape the quantity of fibrous biomass and cure the binder to form the component. The pressure applied to the molds and in turn to the biomass fiber may be in the range of 0.1 p.s.i. to 2,500 p.s.i. ("p.s.i." is pounds per square inch) or higher. After compression and sufficient curing, the die is opened from the mold cavity to release the formed component 6, pan 38.

[0040] The cosmetically compatible and compostable biomass binder may be in whole or part a resin selected from a cosmetically compatible and biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate or polybutylene adipate, or any other suitable binder that is compostable and cosmetically compatible.

[0041] The cosmetically compatible and compostable biomass binder may alternatively or additionally be in whole or part a naturally occurring constituent of the fibrous biomass.

[0042] Steam or other forms of heat may be applied to the mold parts and/or the quantity of fibrous biomass prior to or during the step of closing the die onto the mold cavity under pressure. For example, the step of compressing the die onto the mold cavity may include heat or steam applied to one or more of the mold components, or through one or more of the mold components directly to the quantity of fibrous biomass in the mold cavity. The heat or steam is provided to help form and cure the component 6 by, for example, softening the fibers of the biomass or the cosmetically compatible and compostable binder, and/or to accelerate curing of the cosmetically

compatible and compostable binder. The steam or other heat is applied, for example, in a quantity sufficient to soften the fibrous biomass and/or effect curing rate of the cosmetically compatible and compostable binder. For example, the steam may be provided to the mold cavity through channels, ports, vents or screens incorporated in the mold parts. Cooling fluids or gasses may also be provided to the mold parts or mold cavity to facilitate forming or curing activity in the mold.

[0043] The mold cavity and/or the die is configured to provide to the finished component at least one surface adapted to contact the cosmetic product P as described in greater detail above, and preferably adapted to have increased adhesion to the cosmetic product.

[0044] The mold 46 may also be provided in three parts as illustrated in FIG. 5. A die 34 depends from a top plate 36. A mold cavity 26 is defined by a circumferential sidewall 22. The mold cavity 26 is open at the top and bottom. A mold base 28 forms the bottom of the cavity when the mold components are closed. A quantity 40 of fibrous biomass is provided in a continuous sheet form. Product P is in a loosely packed cake 44, or may alternatively be provided as loose powder, liquid, paste or extrusion. A patterned sheet or screen 52 is provided above the base 28, but below the Product P. The patterned sheet or screen 52 is provided to emboss a pattern corresponding to that on the sheet or screen onto the product P when it is compressed in the mold. In the arrangement as illustrated in FIG. 5, the mold parts are closed to form in a single mold cycle the component 6 as a pan 48 (see Fig. 6) in an upside-down orientation and containing the packed product P. The pan 48 is illustrated in FIG. 6 in the upside down orientation as it would come out of the mold 46 upon release, with a pattern 50 in the surface of the product P. After release from the mold, the pan 48 containing product P can be righted and secured in a compact base 8 such as that shown in FIG. 1. It will be apparent to one of skill in the art that numerous other well known methods, mold types, mold arrangements, component orientations and sequences are possible to yield the desired results. For example, the component 6 may be made by pour molding or casting.

[0045] One method of filling a biodegradable component 6 for a package 2 for storing and dispensing cosmetic and beauty care products is to first fully or partially form the component 6. The component 6 is made from a fibrous biomass and a

compostable binder as described above. The component 6 is formed to include a product reservoir 18 (see FIGS. 1, 4) such that at least one portion of a surface of the product reservoir has a rough surface topography and/or extending free portions of the fibrous biomass. A quantity 40 of product P is prepared in a fillable or filling state.

- 5 Depending on the nature of the component, the product filling state may be a liquid, a paste, a fluid, a powder, a cake pre-form, a cake (final-form), an extrusion, a puck, etc. The quantity of product contains a product binder. The quantity of product in filling form is filled into the reservoir by, for example, inserting a cake, an extrusion or a puck, or pouring in a liquid, paste or slurry, etc. Alternatively, as described above and illustrated in FIGS. 5-6, the product P is formed *in situ* in the reservoir. Once the product P is in the reservoir 18, the product P is adhered to a surface 20 of the component 6 by curing the product binder and/or by pressing the product P into the rough topography of the surface 20 or causing the free fiber portions of the surface 20 to be trapped in the product P. Heating (e.g., steam) or cooling can be used to facilitate the curing process. Preferably, the pressing of product P into the reservoir, and/or the pressing of the fibrous biomass and product combination is conducted at pressures in the range of 0.1 p.s.i to 2,500 p.s.i.

- [0046] The biodegradable component 6 for a package 2 for storing and dispensing cosmetic and beauty care products can be formed in a mold cavity having a sidewall draft angle A that is about 0 degrees to about 30 degrees (see FIG. 2). Preferably the mold cavity sidewall draft angle A is about 0.1 degree to about 17 degrees to facilitate release of the component 6 from the cavity. Most preferably, the mold cavity sidewall draft angle A is about 1 degree to about 7 degrees. The preferred mold cavity sidewall draft angles work particularly well where the component is a pressed powder pan, and where the pan is adapted to be used in a filling operation at powder pressing pressures in the range of 0.1 p.s.i to 2,500 p.s.i.

- [0047] FIGS. 7-10 illustrate another embodiment of a biodegradable component 106 for a package 102 for storing and dispensing cosmetic and beauty care products. The component 106 has a solid body 103 made of compressed fibrous biomass and a cosmetically compatible and compostable binder. The body 103 has a reservoir 118 for storing and dispensing a cosmetic product P (see FIGS. 8 and 10). At least one surface 120 of the body, preferably in the reservoir 118 is adapted to contact the

product and preferably have increased adhesion to the product P (see FIG. 10). A cover 110 is secured to the body 103 by, for example, a hinge 112. The cover 110 may be made from a conventional plastic, metal or resin, or alternatively, the cover 110 may be made from molded or machined biodegradable fibrous biomass in

5 compostable binder similar to that of the body 103 or other components described herein. The component 106 can be made by molding a solid body 103 with a reservoir 118 by the methods of molding with a cavity and die described above, either in separate molding cycles for the component and product or in a single cycle as described herein. Alternatively, the component 106 is made from a solid piece of pre-

10 manufactured fibrous biomass material in the form of a block or board 122 (see FIG. 7). The block or board is mechanically worked or machined to, for example round the corners (see ref numbers 124, 126 in FIG. 8), and to provide the reservoir 118, i.e., to achieve the desired shape and configuration of the component 106. The mechanical working or machining is in the form of boring, milling, cutting, laser cutting, stamping,

15 die cutting or grinding the block or board 122 to round the corners (124, 126) and/or create the reservoir 118 in the body 103. The fibrous biomass of component 106 includes a cosmetically compatible and compostable binder. The cosmetically compatible and compostable binder may be in whole or part a resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic

20 polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate, or any other suitable binder that is compostable and cosmetically compatible. Alternatively, the cosmetically compatible

25 and compostable binder in the fibrous biomass in the component 106 may be in whole or part a naturally occurring constituent of the fibrous biomass. The board or block 122 can be made by molding, extrusion, casting or any other method suitable for manufacturing such block or board.

[0048] Advantages of component 106 are that the body 103 forms a near complete

30 package 102 in a single, easily manufactured piece that avoids complex assembly or gluing. Where the first embodiment (FIG. 1) has a separate base 8 and pan 16 that must be secured together with adhesive 14, the embodiment in FIGS. 8 and 9 is a

complete, 1 piece solid base for a compact with a cavity reservoir. It is therefore highly cost effective to produce. Furthermore, the solid body 103 provides a significant weight and heft to the package that gives it a substantial, quality feel and avoids the hollow sounds of a typical plastic compact. In addition, the significant

5 weight and heft of the solid body 103 of the present embodiment allows manufacturers to avoid steps typically taken with hollow plastic compacts to increase the weight, heft and quality feel. For example, hollow plastic compacts often have steel plates added to increase the weight to provide the substantial, quality feel, or have hollow voids backfilled with foam to give the compact a more solid feel. The
10 addition of steel or foam adds to the cost of manufacture in both materials and additional processing costs. The solid body 103 of the present embodiment avoids the added cost of steel or foam while still providing a quiet compact with a quality weight, heft and feel. All that is needed on the single piece body 103 to complete the cosmetic package is product P in the reservoir 118 (see FIG. 10) and a cover 110
15 secured, for example, by a hinge 112 that is glued, staked, pinned or otherwise fastened to the body 103 and cover 110. Exposed surfaces of the compact can be lacquered, painted, coated, sheathed, veneered, foiled, laminated or otherwise decorated by known and conventional techniques.

[0049] Another embodiment of the invention is a method for forming a cosmetic
20 product insert 206 for a cosmetic compact 4. This is best illustrated in FIGS. 5 and 6. The insert 206 (FIG. 6) has a quantity of product P in the form of a dispensable product supply portion 208. The dispensable product supply portion 208 is secured to a support portion 210. The support portion 210 is comprised of fibrous biomass and a cosmetically compatible and compostable binder. The method comprises the steps of
25 providing a mold cavity 26 defined by a bottom wall 24 and a side wall 22. A corresponding die 34 is provided. The cavity 26 and die 34 when fully closed are dimensioned to form the insert 206 in a preselected and desired shape. A quantity of cosmetic product 44 is provided in a form suitable for placing in the cavity 26. The quantity of cosmetic product is sufficient to form the dispensable supply portion 208
30 and contains a cosmetically compatible cosmetic product binder. A quantity of fibrous biomass sufficient to form the support portion 210 is provided. The fibrous biomass contains a cosmetically compatible and compostable binder in an uncured state. A

first layer selected from one of the quantity of cosmetic product and the quantity of fibrous biomass is placed in the cavity. A second layer selected from the other of the quantity of cosmetic product and the quantity of fibrous biomass is placed in the cavity above the first layer. The die is closed onto the mold cavity under pressure to

5 compress the second layer and the first layer, and to adhere the second layer to the first layer such that the insert 206 is formed. As noted above, the cosmetic product P includes a suitable cosmetically compatible cosmetic product binder and the quantity of fibrous biomass includes a cosmetically compatible and compostable biomass binder. The biomass binder and the cosmetic product binder may be the same

10 binder, or the biomass binder and the cosmetic product binder may be different binders. The biomass binder may be in whole or part a resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid,

15 polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate, or any other suitable binder that is compostable and cosmetically compatible. Alternatively, the biomass binder may be in whole or part a naturally occurring component of the fibrous biomass. The first layer and second layer are compressed at a pressure in the range of 0.1 p.s.i to 2,500

20 p.s.i. The biomass fiber is selected from the at least one of wood pulp, cellulose, bamboo, willow, bagasse, corn, rice straw, reed, bulrush, coconut, agave, flax or palm. The form suitable for placing the quantity of cosmetic product in the cavity is selected from at least one of a liquid, a powder, a foam, a paste, a gel, a sheet, a plug, a mat, a block, a cake and a puck. The quantity of fibrous biomass may be

25 provided to the method in a loose form. Alternatively, the quantity of fibrous biomass is provided wholly or partly pre-formed in the form of a sheet, a plug, a mat, a block, a cake, a fabric, a web or a puck.

[0050] The advantages of the present invention are numerous. The invention reduces the amount of non-biodegradable or non-compostable waste entering the waste stream. The invention allows manufacture in a variety of ways to create a

30 package that has the weight and feel of a luxury goods package.

[0051] It is understood that various modifications and changes in the specific form and construction of the various parts can be made without departing from the scope of the following claims.

What is claimed is:

1. A method for forming a cosmetic product insert for a cosmetic compact, the insert having a quantity of cosmetic product in the form of a dispensable product supply portion, the dispensable product supply portion secured to a compostable support portion, the method comprising the steps of:
 - 5 providing a mold cavity defined by a bottom wall and a side wall, and a corresponding die, the cavity and die when fully closed being dimensioned to form the insert in a preselected and desired shape;
 - providing the quantity of cosmetic product in a form suitable for placing in the cavity, the quantity of cosmetic product sufficient to form the dispensable product supply portion;
 - 10 providing a quantity of fibrous biomass sufficient to form the support portion for the dispensable product supply portion;
 - placing in the cavity a first layer selected from one of the quantity of cosmetic product and the quantity of fibrous biomass;
 - 15 placing in the cavity a second layer selected from the other of the quantity of cosmetic product and the quantity of fibrous biomass; and
 - closing the die onto the mold cavity and applying sufficient pressure to compress the second layer and the first layer, and to adhere the second layer to the first layer such that the insert is formed.
 - 20
2. The method of claim 1 wherein the cosmetic product includes a suitable cosmetically compatible cosmetic product binder.
- 25 3. The method of claim 1 wherein the quantity of fibrous biomass further comprises a cosmetically compatible and compostable biomass binder.
4. The method of claim 3 wherein the cosmetic product includes a suitable cosmetically compatible cosmetic product binder.

5. The method of claim 4 wherein the biomass binder and the product binder are the same binder.
- 5 6. The method of claim 4 wherein the biomass binder and the product binder are different binders.
- 10 7. The method of claim 3 wherein the biomass binder is a resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate.
- 15 8. The method of claim 4 wherein the biomass binder is a resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, 20 polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate.
- 25 9. The method of claim 5 wherein the biomass binder is a resin selected from the group consisting of a biodegradable one of polyurethane resin, polyester, aliphatic polyester, polyvinyl alcohol, polycaprolactone, polyhydroxyalkanoate, denatured starch, a natural polymer, a polyisocyanate, polyglycolic acid, polylactic acid, polyhydroxybutyric acid, polyhydroxyvaleric acid, a 30 polyhydroxycarboxylic acids, polybutylene succinate and polybutylene adipate.

10. The method of claim 1 wherein the first layer and second layer are compressed at a pressure in the range of 0.1 p.s.i to 2,500 p.s.i.
- 5 11. The method of claim 1 wherein the biomass fiber is selected from the at least one of wood pulp, cellulose, bamboo, willow, bagasse, corn, rice straw, reed, bulrush, coconut, agave, flax and palm.
- 10 12. The method of claim 1 wherein the form suitable for placing the quantity of cosmetic product in the cavity is selected from at least one of a powder, a particulate, a paste, a cake, a pomade, a pre-form, a liquid, a gel and a foam.
13. The method of claim 3 wherein the biomass binder is a naturally occurring component of the fibrous biomass.
- 15 14. The method of claim 4 wherein the biomass binder is a naturally occurring component of the fibrous biomass.
15. The method of claim 5 wherein the biomass binder is a naturally occurring component of the fibrous biomass.
- 20 16. The method of claim 1 wherein the quantity of fibrous biomass is provided in a loose form.
- 25 17. The method of claim 1 wherein the quantity of fibrous biomass is provided pre-formed in a form selected from at least one of a sheet, a plug, a mat, a block, a cake and a puck.
18. The method of claim 6 wherein the biomass binder is a naturally occurring component of the fibrous biomass.
- 30 19. The method of claim 1 wherein the form suitable for placing the quantity of cosmetic product in the cavity is selected from at least one of a liquid, a

powder, a foam, a paste, a gel, a sheet, a plug, a mat, a block, a cake and a puck.

20. A cosmetic product insert for a cosmetic compact, the insert comprising:

5

a compostable support portion made from a compressed fibrous biomass bound by a cosmetically compatible and compostable binder, and a quantity of cosmetic product in the form of a dispensable product supply portion, the dispensable product supply portion secured to the compostable

10

support portion.

FIG. 1

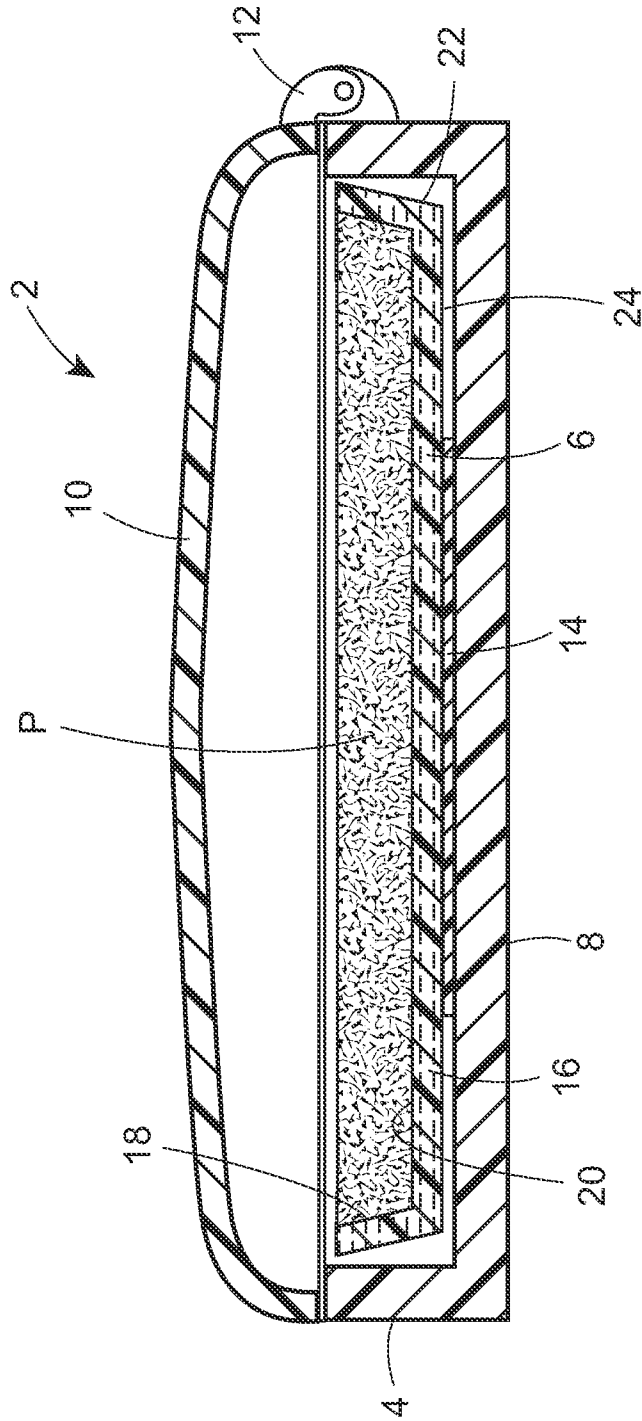


FIG. 2

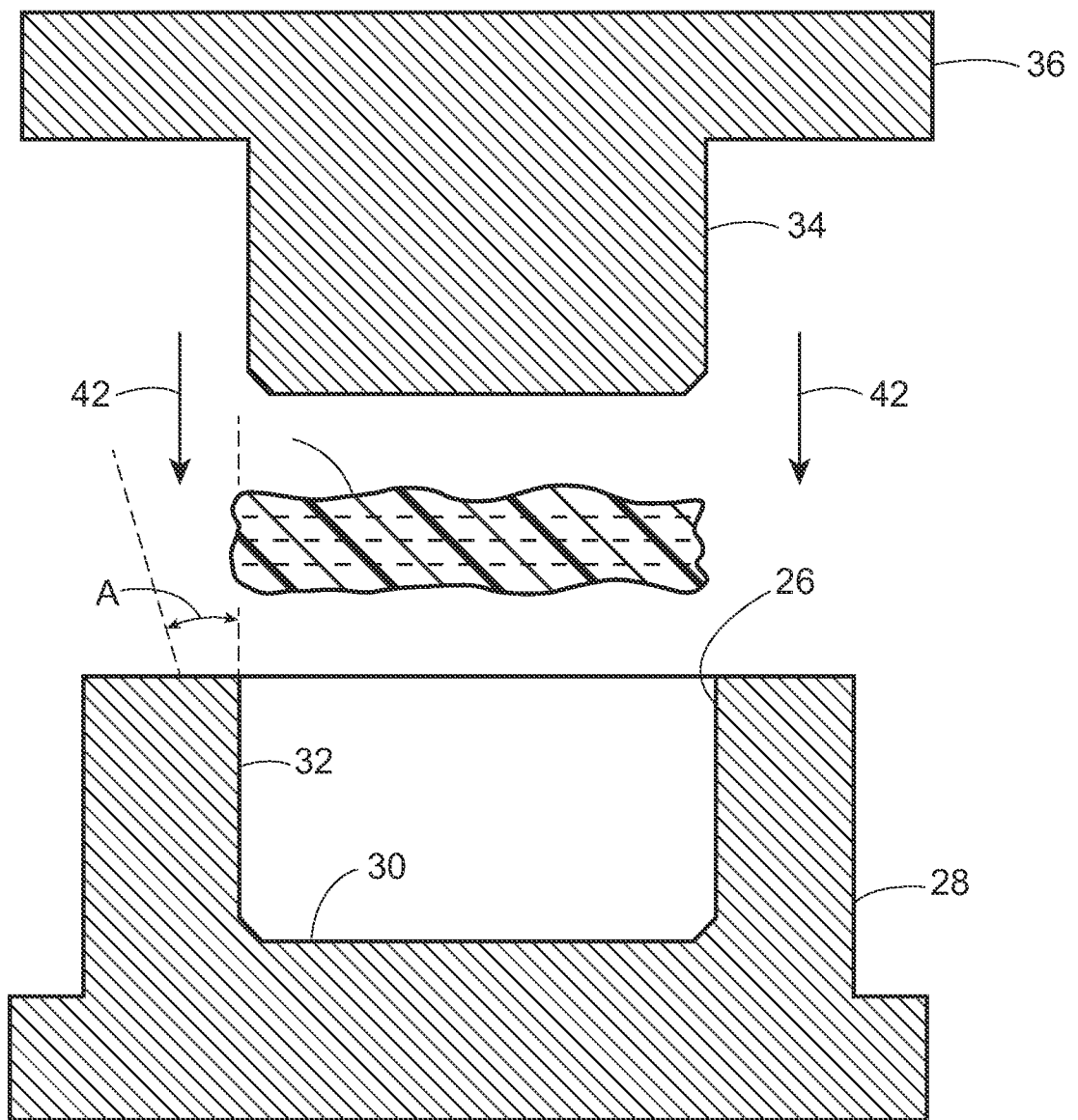


FIG. 3

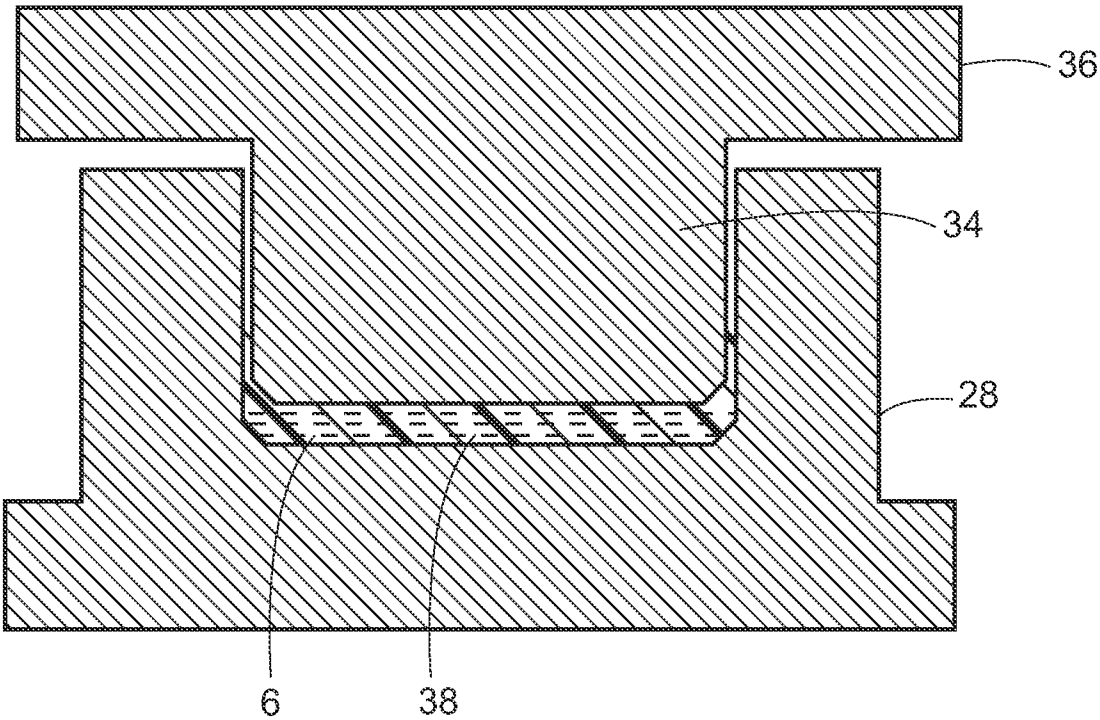


FIG. 4

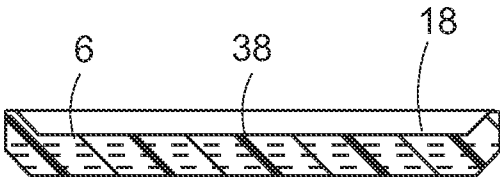


FIG. 5

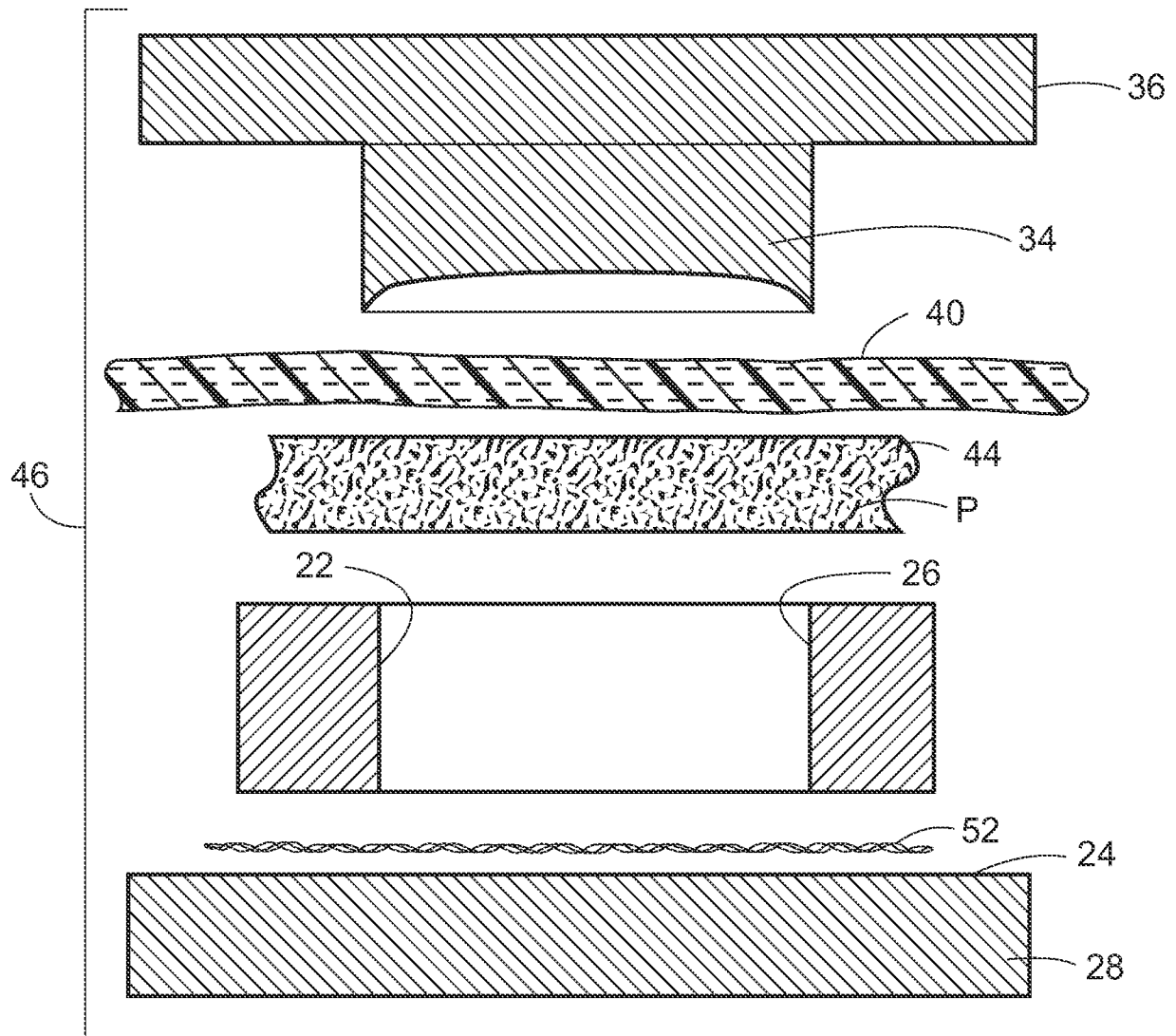


FIG. 6

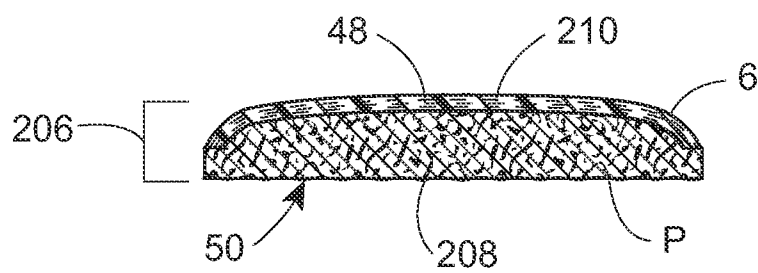


FIG. 7

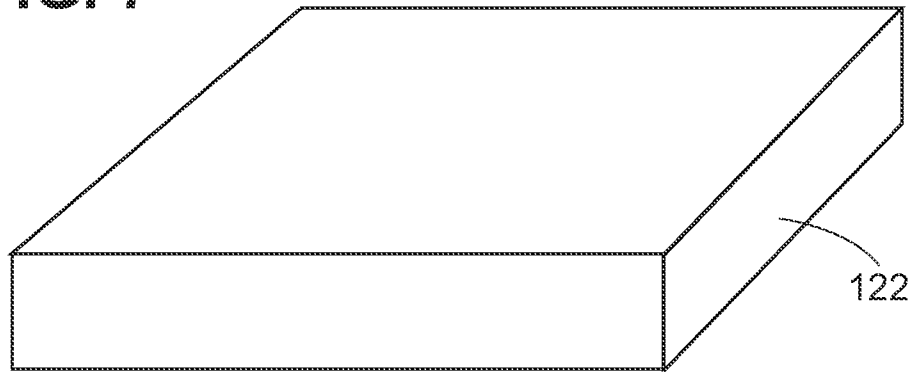


FIG. 8

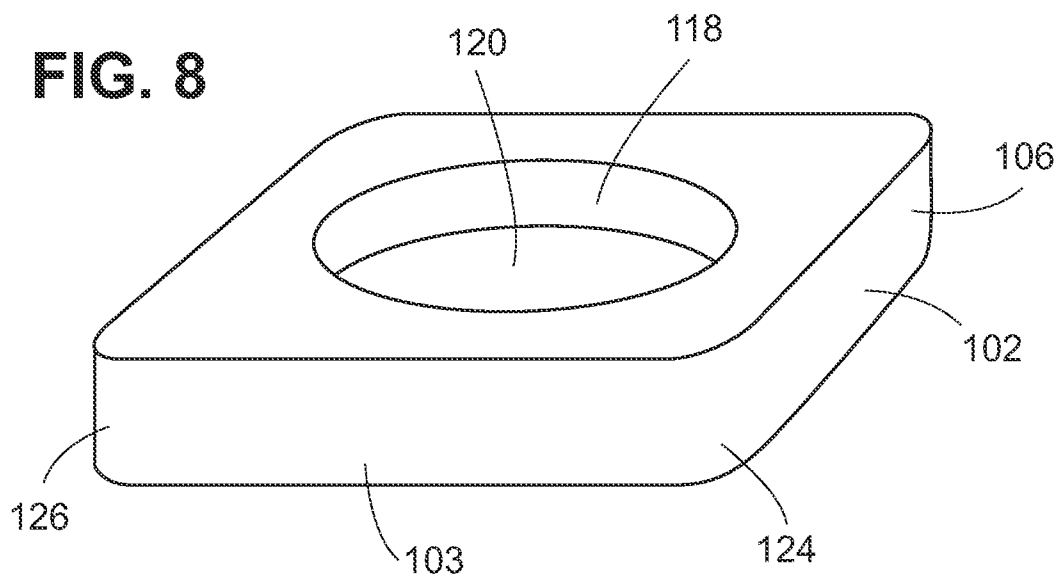


FIG. 9

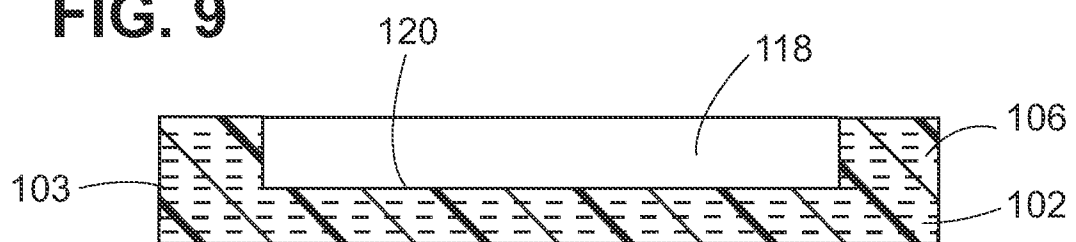


FIG. 10

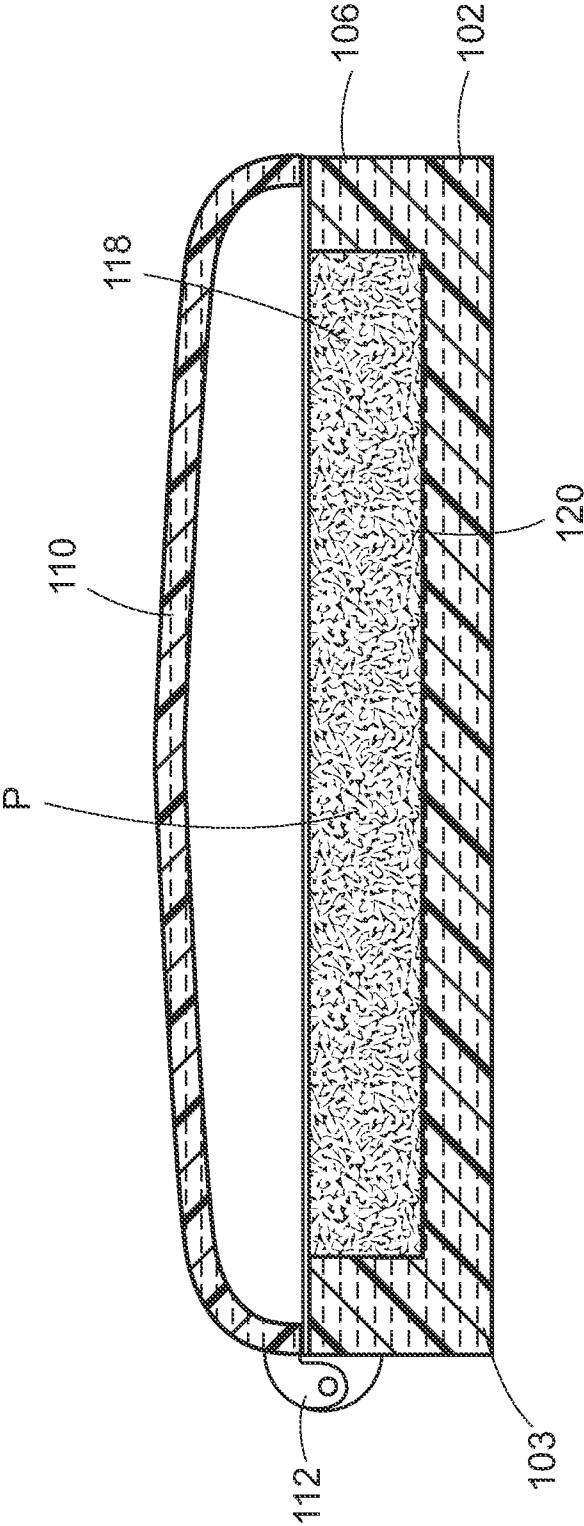


FIG. 11



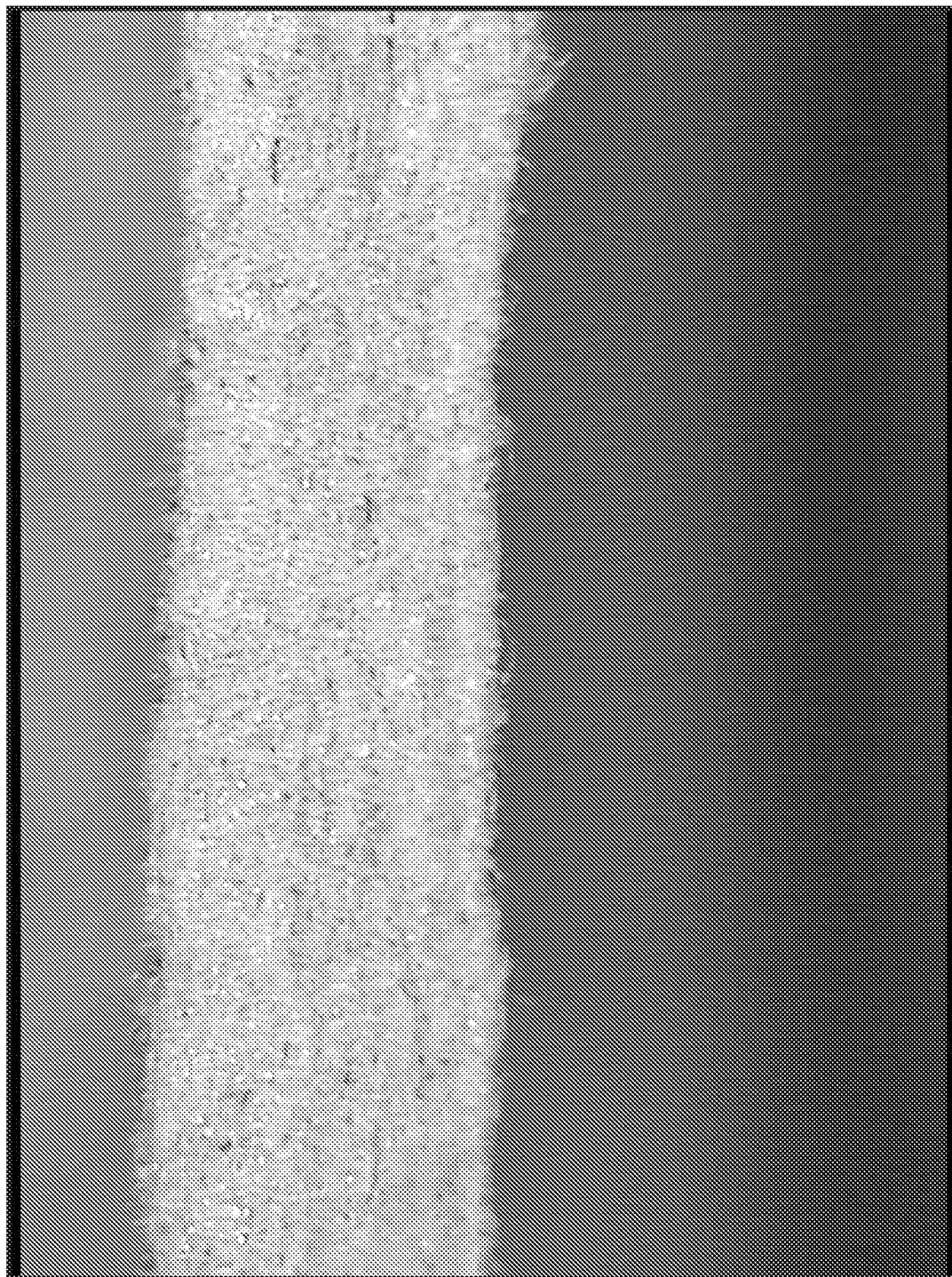
FIG. 12



FIG. 13



FIG. 14



A. CLASSIFICATION OF SUBJECT MATTER**A45D 33/00(2006.01)i, A45D 34/00(2006.01)i, A45D 40/00(2006.01)i, B29C 43/02(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)

A45D 33/00; C08L 1/00; B65D 13/00; B65D 75/00; B29C 44/06; B32B 3/26; C08J 9/00; A01G 9/10; A45D 34/00; A45D 40/00; B29C 43/02

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: package, cosmetic, biodegradable, fibrous, compressed, mold, die, first layer, second layer, compact

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2002-0090679 A (ECONEER CO LTD) 5 December 2002 See abstract and claims 1-2, 4, 6, 9.	1-20
Y	US 2003-0107145 A1 (OZASA, A. et al.) 12 June 2003 See claims 1, 9 and paragraphs [0183]-[0184].	1-20
A	US 5598929 A (JENSEN, M. et al.) 4 February 1997 See abstract and claims 1, 10-12.	1-20
A	US 5545450 A (ANDERSEN, P. J. et al.) 13 August 1996 See abstract and claims 1, 22, 23, 26, 62-76.	1-20
A	US 2007-0000171 A1 (STEARNS, D. N.) 4 January 2007 See abstract and claims 1, 4-5, 14.	1-20



Further documents are listed in the continuation of Box C.



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

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"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

17 October 2013 (17.10.2013)

Date of mailing of the international search report

18 October 2013 (18.10.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City,
302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

YANG In Su

Telephone No. +82-42-481-8131



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/051227

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 10-2002-0090679 A	05/12/2002	None	
US 2003-0107145 A1	12/06/2003	AT 332802 T	15/08/2006
		AU 2001-286196 B2	23/12/2004
		AU 2001-86196 A1	26/03/2002
		AU 8619601 A	26/03/2002
		CA 2421280 A1	03/03/2003
		CA 2421280 C	26/02/2008
		CN 100506523 C	01/07/2009
		CN 101157291 A	09/04/2008
		CN 1455733 A	12/11/2003
		DE 60121454 D1	24/08/2006
		DE 60121454 T2	05/07/2007
		EP 1321289 A1	25/06/2003
		EP 1321289 A4	01/10/2003
		EP 1321289 B1	12/07/2006
		JP 3961421 B2	22/08/2007
		KR 10-0566714 B1	03/04/2006
		NZ 524969 A	28/10/2005
		US 7332214 B2	19/02/2008
		WO 02-22353 A1	21/03/2002
US 05598929 A	04/02/1997	EP 0790942 A1	06/12/2000
		EP 0790942 B1	07/03/2001
		JP 10-508271 A	18/08/1998
		JP 3046845 B2	29/05/2000
		WO 96-15961 A1	30/05/1996
US 05545450 A	13/08/1996	AU 1995-29710 B2	20/05/1999
		AU 1995-29710 C	07/03/1996
		AU 1995-35118 B2	25/03/1999
		AU 1995-35118 C	15/05/1996
		AU 1995-35524 B2	06/05/1999
		AU 1997-24355 B2	19/08/1999
		AU 1997-26108 B2	19/08/1999
		AU 1997-28005 B2	18/11/1999
		AU 1997-33890 B2	30/03/2000
		AU 1998-52803 B2	17/06/1999
		AU 705277 C	29/03/2007
		CA 2143004 A1	09/06/1994
		CA 2143004 C	01/05/2007
		CA 2156050 A1	01/09/1994
		CA 2156050 C	11/05/2004
		CA 2202869 A1	02/05/1996
		CA 2202869 C	23/11/2004
		CA 2248771 A1	16/10/1997
		CA 2248771 C	06/06/2006
		CA 2248982 A1	16/10/1997
		CA 2248982 C	30/07/2002

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/051227

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		CN 1047139 C	08/12/1999
		CN 1062004 C	14/02/2001
		CN 1083792 A	16/03/1994
		CN 1083792 C	16/03/1994
		CN 1099711 A	08/03/1995
		CN 1100395 A	22/03/1995
		CN 1103043 A	31/05/1995
		CN 1126233 A	10/07/1996
		CN 1126233 C	10/07/1996
		CN 1250736 A	19/04/2000
		CN 1250736 C	03/11/2004
		CN 1403349 A	19/03/2003
		EP 0662029 A1	08/11/2000
		EP 0678068 A1	03/09/2003
		EP 0686082 A1	02/05/2002
		EP 0686082 B1	04/09/2002
		EP 0688261 A1	27/01/1999
		EP 0713481 A1	14/10/1998
		EP 0714383 A1	17/04/2002
		EP 0743899 A1	27/01/1999
		EP 0775173 A1	21/11/2001
		EP 0775173 B1	23/10/2002
		EP 0788422 A1	02/01/2002
		EP 0804331 A1	21/08/2002
		EP 0804331 B1	21/08/2002
		EP 0892716 A1	12/11/2003
		EP 0892717 A1	04/12/2002
		EP 0920371 A1	20/11/2002
		EP 0920371 B1	07/05/2003
		EP 0960711 A2	01/12/1999
		EP 0960711 A3	11/07/2001
		EP 0960711 B1	04/12/2002
		EP 1007320 A1	14/06/2000
		EP 1007320 B1	20/07/2005
		EP 1155794 A2	21/11/2001
		EP 1155794 A3	05/03/2003
		EP 1300228 A2	09/04/2003
		EP 1308263 A2	07/05/2003
		EP 1308263 A3	21/05/2003
		JP 08-500075 A	09/01/1996
		JP 08-507035 A	30/07/1996
		JP 08-509949 A	22/10/1996
		JP 08-511486 A	03/12/1996
		JP 09-502154 A	04/03/1997
		JP 09-505121 A	20/05/1997
		JP 09-507463 A	29/07/1997
		JP 10-505369 A	26/05/1998
		JP 10-506854 A	07/07/1998
		JP 11-504950 A	11/05/1999
		JP 2000-504058 A	04/04/2000

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/051227

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2000-508258 A	04/07/2000
		JP 2000-511126 A	29/08/2000
		JP 2001-523196 A	20/11/2001
		JP 3296565 B2	02/07/2002
		JP 3361813 B2	07/01/2003
		JP 3425959 B2	14/07/2003
		KR 10-0309418 B1	17/12/2001
		KR 10-0316469 B1	28/02/2002
		KR 10-0317178 B1	04/09/2002
		KR 10-0355468 B1	17/05/2003
		KR 10-1995-0702899 A	23/08/1995
		KR 10-1996-0700869 A	24/02/1996
		KR 10-1996-0703821 A	31/08/1996
		KR 10-1996-0703823 A	31/08/1996
		KR 10-1997-0700581 A	12/02/1997
		KR 10-1997-0704832 A	06/09/1997
		KR 10-1997-0706116 A	03/11/1997
		KR 10-1999-0087469 A	27/12/1999
		KR 10-2000-0004908 A	25/01/2000
		KR 10-2000-0015774 A	15/03/2000
		US 5385764 A	31/01/1995
		US 5453310 A	26/09/1995
		US 5506046 A	09/04/1996
		US 5508072 A	16/04/1996
		US 5514430 A	07/05/1996
		US 5527387 A	18/06/1996
		US 5543186 A	06/08/1996
		US 5545297 A	13/08/1996
		US 5549859 A	27/08/1996
		US 5580409 A	03/12/1996
		US 5580624 A	03/12/1996
		US 5582670 A	10/12/1996
		US 5614307 A	25/03/1997
		US 5618341 A	08/04/1997
		US 5626954 A	06/05/1997
		US 5631052 A	20/05/1997
		US 5631053 A	20/05/1997
		US 5631097 A	20/05/1997
		US 5641584 A	24/06/1997
		US 5654048 A	05/08/1997
		US 5658603 A	19/08/1997
		US 5658624 A	19/08/1997
		US 5660900 A	26/08/1997
		US 5660904 A	26/08/1997
		US 5662731 A	02/09/1997
		US 5665439 A	09/09/1997
		US 5665442 A	09/09/1997
		US 5676905 A	14/10/1997
		US 5679145 A	21/10/1997
		US 5679381 A	21/10/1997

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/051227

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 5683772 A	04/11/1997
		US 5691014 A	25/11/1997
		US 5702787 A	30/12/1997
		US 5705203 A	06/01/1998
		US 5705237 A	06/01/1998
		US 5705238 A	06/01/1998
		US 5705239 A	06/01/1998
		US 5705242 A	06/01/1998
		US 5709827 A	20/01/1998
		US 5709913 A	20/01/1998
		US 5714217 A	03/02/1998
		US 5716675 A	10/02/1998
		US 5720913 A	24/02/1998
		US 5736209 A	07/04/1998
		US 5738921 A	14/04/1998
		US 5753308 A	19/05/1998
		US 5766525 A	16/06/1998
		US 5776388 A	07/07/1998
		US 5783126 A	21/07/1998
		US 5798151 A	25/08/1998
		US 5800647 A	01/09/1998
		US 5800756 A	01/09/1998
		US 5810961 A	22/09/1998
		US 5830305 A	03/11/1998
		US 5830548 A	03/11/1998
		US 5843544 A	01/12/1998
		US 5851634 A	22/12/1998
		US 5868824 A	09/02/1999
		US 5879722 A	09/03/1999
		US 5928741 A	27/07/1999
		US 5976235 A	02/11/1999
		US 6030673 A	29/02/2000
		US 6083586 A	04/07/2000
		US 6090195 A	18/07/2000
		US 6168857 B1	02/01/2001
		US 6180037 B1	30/01/2001
		US 6200404 B1	13/03/2001
		US E039339 E1	17/10/2006
		US RE39339 E1	17/10/2006
		WO 94-04330 A1	03/03/1994
		WO 94-12328 A1	09/06/1994
		WO 94-19172 A1	01/09/1994
		WO 94-20274 A1	15/09/1994
		WO 95-04709 A1	16/02/1995
		WO 95-05350 A1	23/02/1995
		WO 95-15849 A1	15/06/1995
		WO 95-21056 A1	10/08/1995
		WO 95-33606 A1	14/12/1995
		WO 96-05254 A1	22/02/1996
		WO 96-10477 A1	11/04/1996

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2013/051227

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007-0000171 A1	04/01/2007	WO 96-12606 A1	02/05/1996
		WO 97-23333 A1	03/07/1997
		WO 97-37827 A1	16/10/1997
		WO 97-37841 A1	16/10/1997
		WO 97-37842 A1	16/10/1997
		WO 97-47452 A1	18/12/1997
		US 2008-0276529 A1	13/11/2008
		US 2009-0236035 A1	24/09/2009
		US 2010-0077662 A9	01/04/2010
		WO 2008-140715 A1	20/11/2008