copolymer of hydroxybutyric acid together with hydroxyvaleric acid.

9 A laminate as claimed in Claim 8 in which the polyhydroxyalkanoic acid has a molecular weight of 100,000 to 800,000.

10 A laminate as claimed in any preceding claim in which the polylactic acid cellulose ester or polycaprolactone has a molecular weight of at least 40,000.

11 A process of making a laminate as claimed in any preceding claim in which the other layers are applied to the cellulosic sheet simultaneously.

12 A process as claimed in Claim 11 in which temperatures of 150 to 300°C are used for coextrusion and in which the melting points of the polymers used are below the said extrusion temperature.

13 A process as claimed in Claim 11 or 12 in which the laminate is cooled to a temperature of 40 to 70°C by contacting the laminate with a chill roll.

14 A process as claimed in any of Claims 11 to 13 in which the sacrificial layer is stripped from the laminate and re-used in the manufacturing process.

INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 96/00819

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B32B29/00 B32B27/10 D21H19/34 D21H19/30 B65D65/46

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)
IPC 6 B32B D21H B65D

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DATABASE WPI Section Ch, Week 9502 Derwent Publications Ltd., London, GB; Class A23, AN 95-009350 XP002007485 & JP,A,06 293 113 (TOPPAN PRINTING CO LTD) , 21 October 1994 see abstract ---	1-3
X	DATABASE WPI Section Ch, Week 9444 Derwent Publications Ltd., London, GB; Class A92, AN 94-354371 XP002007486 & JP,A,06 278 741 (TOPPAN PRINTING CO LTD) , 4 October 1994 see abstract --- -/--	1-3

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

[X] Patent family members are listed in 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 document 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 another 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

1

Date of the actual completion of the international search	Date of mailing of the international search report
4 July 1996	12.07.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl, Fax (+ 31-70) 340-3016	McConnell, C

Form PCT/ISA/210 (second sheet) (July 1992)

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 96/00819

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 534 471 (TOPPAN PRINTING CO LTD) 31 March 1993 see page 3, line 7 - line 24 see page 6, line 13 - line 42; claims	1,2
A		3-5,7,8, 11-14
A	WO,A,94 09210 (PEARLSTEIN LEONARD) 28 April 1994 see claims 1-4 see page 9, line 27 - line 33	1-3
A	DATABASE WPI Section Ch, Week 9414 Derwent Publications Ltd., London, GB; Class A14, AN 94-114861 XP002007487 & JP,A,06 064 111 (TOPPAN PRINTING CO LTD) , 8 March 1994 see abstract	1-3

1

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INTERNATIONAL SEARCH REPORT

..Information on patent family members

Inter nal Application No
PCT/GB 96/00819

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-0534471	31-03-93	US-A-	5498385	12-03-96
		US-A-	5409772	25-04-95
		JP-A-	5245996	24-09-93
WO-A-9409210	28-04-94	AU-B-	5327594	09-05-94
		CA-A-	2150377	28-04-94
		CN-A-	1089564	20-07-94
		EP-A-	0664844	02-08-95
		US-A-	5458933	17-10-95
		US-A-	5512333	30-04-96

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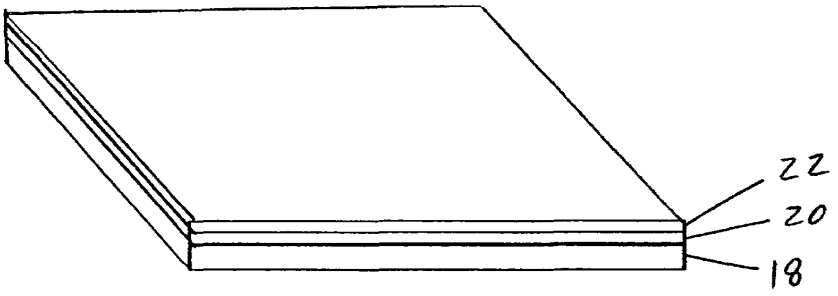
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BIODEGRADABLE PAPER-BASED AGRICULTURAL SUBSTRATE



(57) Abstract: A substrate comprising a paper layer (18) and at least one biodegradable polymer layer extruded thereon is provided (20 or 22). The paper layer may have multiple polymer layers extruded on one side, or both (20 or 22). Additives appropriate for the particular use of the substrate may be added to one or more of the polymer layers.

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BIODEGRADABLE PAPER-BASED AGRICULTURAL SUBSTRATE

PRIORITY CLAIM

This application claims the priority date of, and incorporates by reference, pending U.S. Provisional Patent Application Nos. 60/182,614, which was filed on February 15, 2000 and 60/228,715, which was filed on August 29, 2000.

FIELD OF THE INVENTION

This invention generally relates to agricultural mulches. Specifically, this invention relates to biodegradable agricultural mulches which may remain in the soil after their use.

BACKGROUND OF THE INVENTION

Plastic mulches are widely used in numerous agricultural applications to control weeds, retain

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moisture in the soil and increase soil temperature to facilitate plant growth and to increase crop quality and yield.

Desirable characteristic for a mulch include having sufficient mechanical strength so that they may be used in commercial farming operations with heavy duty equipment, resistance to stresses caused by weather (rain, sun, wind, etc.), puncture resistance to growing weeds, sufficient wet strength, moisture retention and ultraviolet light absorption. It is also important that standard agricultural equipment be able to till the mulch into the soil at the end of the growing season so that the mulch need not be removed in a separate and expensive operation.

A wide variety of mulch products have been developed in an attempt to meet the above requirements. Traditionally, agricultural mulch films have been predominantly comprised of either low or high density polyethylene because they are relatively inexpensive and more resistant to severe weather conditions than other materials. However, these materials are not considered

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biodegradable and must be removed and land filled at the end of the growing season.

To address the biodegradability problem some conventional mulches are made from paper. However, paper generally degrades too quickly, does not retain sufficient ground moisture or lacks sufficient strength to be used in commercial agricultural operations. Coating paper with various compounds such as polyethylene, polypropylene, or polyvinyl chloride, polyvinyldene chloride, styrene butadiene, carboxylated styrene butadiene, carboxylated acrylonitrile butadiene, and natural rubber latex may increase its strength and slow its degradation rate. However, the coating must be completely biodegradable and incorporate all of the features discussed above for the paper/coating substrate to function as a useful agricultural mulch.

U.S. Patents 3,810,328, 3,938,280 and 3,939,606 disclose paper-based mulches with coatings that include organic resin or plastic coatings such as polyethylene, polypropylene, polyvinyl chloride, wax-based coatings, polyvinyl acetate, Saran or similar coatings.

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U.S. Patents 4,782,626, 5,163,247, 5,672,434 and 5,866,269, disclose paper or cellulose fiber mulches with latex coatings or related methods.

U.S. patents 5,532,298 and 5,853,541 disclose agricultural mulches made by combining mixtures of linters, pulps and water holdout materials or pulps, polyethylene fibers and, optionally, water holdout materials.

U.S. patent 5,191,734 discloses a mulch comprised of biodegradable cellulose or synthetic fiber web treated with latex.

U.S. patent 5,096,941 discloses a degradable composition comprised of polyethylene and cerium stearate which can be made into a film and used as an agricultural mulch.

All of these references concern mulches which may contain non-biodegradable material.

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U.S. patent 5,934,011 discloses a seed mat comprised of a water soluble paper layer, a water absorbing polymer film layer and seeds.

U.S. Patent 6,033,747 discloses the use of various biodegradable polyesters comprised of poly (3-hydroxybuturate-co-3-hydroxyhexanoate) to laminate base materials to form agricultural mulches.

U.S. Patent 6,040,063 discloses biodegradable hydroxy functionalized polyester compounds and mulches made therefrom.

U.S. patents 5,863,991, 5,880,220, 5,889,135, 5,936,045, 6,018,004, 6,046,248, 6,111,058, 6,114,042 and 6,103,858 disclose biodegradable polyester compounds with various applications.

U.S. patents 5,292,783, 5,466,079, 5,580,911, 5,599,858 and 5,900,322 are related cases which disclose various chemical compounds, including polyesters, with various applications.

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While a variety of products exist, none possess all of the qualities that are desirable for an agricultural mulch. Thus, there is a need for a truly biodegradable agricultural mulch which will not build up and remain in the soil after tilling and which incorporates the desirable features and characteristics described above.

SUMMARY OF THE INVENTION

The present invention is a paper-based agricultural substrate/mulch, which is biodegradable, has sufficient mechanical strength for commercial operations and retains sufficient ground moisture. Other advantages include adjustable biodegradation rates and wet strength, resistance to natural stresses, such as weather, and the ability to be tilled or disked into the soil with standard agricultural equipment.

The preferred embodiments, when used in an agricultural application, will eventually degrade to water, CO_2 and biomass. This complete biodegradation distinguishes the mulches of the invention from many existing mulches which may break down to small pieces

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when tilled but biodegrade slowly so that they remain in the soil for several planting seasons.

In accordance with one preferred embodiment of the invention a substrate comprising a paper layer and an extruded biodegradable polymer layer is provided.

In accordance with another preferred embodiment of the invention a substrate comprising a paper layer and a co-extrusion of two or more biodegradable polymer layers on the same side of the paper layer is provided.

In accordance with another preferred embodiment of the invention a substrate comprising a paper layer and at least one extruded biodegradable polymer layer on each side of the paper layer is provided.

In accordance with another preferred embodiment of the invention a substrate comprising a paper layer, at least one polymer layer and various additives in the polymer layer suited to the particular use of the substrate is provided.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic showing the process by which a preferred substrate is produced;

Fig. 2 is a perspective view of a preferred substrate which shows the layers thereof;

Fig. 3 is a perspective view of another preferred substrate which shows the layers thereof;

Fig. 4 is a perspective view of the mulch application process.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a biodegradable mulch which has properties which make it particularly suitable for its intended uses.

In a preferred embodiment of the invention, a paper layer is bonded with at least one polymer layer to form a multilayer substrate. The paper layer helps the mulch

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maintain a tight fit with the ground, helps the mulch resist penetration by weeds, makes the mulch more opaque (i.e. it blocks the sun from the ground) and it holds moisture. The polymer can be applied as a single layer or as a multi-layer co-extrusion to one or both sides of the paper. In the co-extruded structure the polymer layer, which is bonded to the paper, does not have additives. The outer polymer layer contains slip and/or antiblock additives so that it does not stick to a chill roll on the manufacturing equipment or to itself. The final polymer layer may also contain additives to affect the rate of biodegradation, coloring agents, chemicals to improve soil conditions (e.g. fertilizers), ultraviolet light stabilizers, and printing.

The level of adhesion between the paper layer and polymer layer can be increased from that of single extruded polymer layer by using a two-layer co-extruded polymer layer structure. When one polymer layer is used it will, generally, incorporate additives such as slip agents or antiblock concentrate which will reduce the amount of adhesion between the polymer layer and the paper layer. With two or more polymer layers on the same side of the paper layer the polymer layer making contact

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with the paper need not have these additives and, therefore, will adhere more strongly to the paper surface.

With decreased bond strength between the paper and polymer, the overall substrate behaves more like a polymer film in its toughness and elasticity. Decreased bond strength also helps to prevent the propagation of cracks and tears in the substrate.

The paper layer increases the opacity to sunlight and impenetrability of the mulch to weeds. Prior art low density polyethylene films, for example, are easily pierced by weeds such as nutsedge. These weeds may have stiff stalks which can grow upward and form a weak area in the film, eventually causing penetration. The paper layer adds stiffness to the structure of the substrate so that weeds cannot penetrate it.

A variety of paper grades including multiwall, super calendered kraft (SCK), extensible kraft, unbleached kraft, bleached grade paper or any paper material providing the appropriate attributes may be used. The paper layer may also contain wet strength agents and/or

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additional synthetic or natural fibers. It is preferred that the basis weight of the paper be in the range of 15-60 lb./3000 ft.^{2} (Note: 3000 ft.^{2} is equivalent to 3MSF), preferably 18-50 lb./3000 ft.^{2}. Generally, the paper should be stiff enough to resist weed penetration while not being so heavy that the substrate is too stiff to be applied with conventional agricultural equipment.

Several different polymer compounds can be used to make the polymer film layer. Two statistical aliphatic and aromatic copolyesters suitable for use in the invention are manufactured by Eastman Chemical Corporation, Kingsport, TN and BASF Aktiengesellschaft, Ludwigshafen, Germany, respectively. Eastman EASTAR® BIO GP is a copolyester resulting from the copolymerization of the monomers 1,4-benzenedicarboxylic acid (terephthalic acid), 1,4-butanediol, and adipic acid. The resulting copolyester is poly(tetramethylene adipate-co-terephthalate). BASF ECOFLEX® is also a copolyester resulting from the copolymerization of 1,4-benzenedicarboxylic acid (terephthalic acid), 1,4-butanediol, and adipic acid with the resulting copolyester being poly(tetramethylene adipate-co-

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terephthalate) plus a branching agent or a chain extender.

Various other biodegradable resins, such as Cargill-Dow ECOPLA® polylactic acid (Cargill-Dow LLC, Midland, MI), Union Carbide TONE® polycaprolactones (Union Carbide Corporation, Houston, TX), Dupont BIOMAX® polyester (Dupont Chemical Corporation, Wilmington, DE), PAC Polymers QPAC25® polyethylene carbonate (PAC Polymers, Inc., Greenville, DE), extrudable soy proteins, cellulose acetate based polymers and extrudable starches may be used in the invention.

The chemicals listed herein may be used alone or in combination to form a composition which can be extruded as a polymer layer. It is also possible to use two or more polymer layers, each having different chemical compositions, in the same substrate.

Various organic or inorganic fillers, such as lime, clay, cellulose fibers, or others may be added to the polymer composition.

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Slip agents may be added to the polymer so that the extruded polymer layer does not stick to the chill roll on the extrusion equipment. If more than one polymer layer is extruded onto the same side of a paper layer only the outer polymer layer will have the slip agent. The slip agent may be premixed with a preferred polymer and may include wax and other agents.

Antiblock concentrate may also be used with or instead of the slip agent. The antiblock concentrate may be premixed with a preferred polymer and may include talc.

Carbon black may also be premixed with the preferred polymers. The carbon black makes the polymer layer darker so that it absorbs more sunlight and heats the ground more efficiently. The carbon black also helps to prevent the sunlight from reaching weeds under the mulch. A preferred amount of carbon black in the polymer layer is about 1-10 wt.%.

Referring to Fig. 1, the pelletized polymer and, depending on the mix, pelletized polymer/slip agent mixture, pelletized polymer/antiblock concentrate and

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pelletized polymer/carbon black mixtures are physically blended 2 and dried in a forced air oven 4 at 60°C for at least three hours. In order to avoid polymer degradation the moisture level should be at or below 2 wt%. After drying the polymer composition is sent to a standard extruder 6, melted and extruded onto paper. The Eastman and BASF polymers have a melting point of 110-115°C (230-302°F) and a degradation temperature of approximately 270°C (520°F). To achieve an adequate melt flow and avoid degradation the temperature settings for the extruder barrel zones and die should be set a 160-250°C (320-480°F).

The paper layer is also directed to the extruder after it is treated with flame, corona discharge or a primer 8 so that the paper and polymer layers adhere to each other more strongly. The flame/corona treatments oxidize the surface of the paper so that it is more chemically compatible with the extruded polymer. The heating of the paper from the flame or corona treatment also allows the polymer to more thoroughly penetrate the surface of the paper. If a primer is used it is placed on the paper surface before the polymer is extruded onto it to help "tie" the paper and polymer surfaces together.

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Better control of the adhesion level is generally achieved with flame or corona treatment. If multiple polymer layers are extruded they will easily adhere to and penetrate each other because of their chemical similarity. As the paper and polymer layers exit the extruder 6 they are strongly adhered to each other.

The preferred level of adhesion between the paper and polymer layers is approximately 50-250 g_f. If the adhesion is lower than 50 g_f the polymer and paper layers separate easily during exposure to harsh weather in the field. When the adhesion level is above 250 g_f the substrate generally begins to have a lower tear strength, i.e. similar to that of the paper layer alone. However, if a heavy polymer layer is used the substrate will maintain a high tear strength even with high adhesion levels.

After exiting the extruder the substrate is trimmed 10 to remove unevenly coated edges and so that the final product is either 3 or 5 feet wide to fit standard agricultural mulch laying equipment. The substrate is then wound 12 into large production rolls and rewound onto 25-100 lb. rolls for use in the field.

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Maximum line speeds of 1000 ft/min were achieved for the co-extruded (2 or more polymer layers) substrates, and 900 ft/min speeds were achieved with the monolayer (one polymer layer) paper/polymer substrates.

A preferred mulch will comprise: 75-100 wt% Eastman EASTAR® BIO GP, 0-15 wt% slip additive (1-12 wt% preferred) and 0-10 wt% carbon black (1-7 wt% preferred). Another preferred mulch comprises: 87-100 wt% BASF ECOFLEX®, 0-15 wt% slip agent, 0-12 wt% antiblock concentrate and 0-10% carbon black.

Substrate biodegradation rates may be varied by adjusting the weights of either, or both, the polymer layers and paper layer, i.e. lighter layers generally degrade faster. Further, though generally applied paper side down (in mulches where polymer is extruded onto only one side of the paper layer), these substrates may be applied paper side up, which generally increases the biodegredation rate.

Those familiar with the art can easily adjust variables such as adhesion level, flame and corona

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treatment levels, process temperatures, line speeds and other variables in order to produce a product with the preferred properties.

One example of a final product mulch is shown in Figs. 2, which shows the paper layer 14 and the polymer layer 16. In this embodiment layer 16 may include slip agents or antiblock concentrate, carbon black or other additives. Fig. 3 shows an alternative embodiment of the mulch which comprises a paper layer 18, a first polymer layer 20 and a second polymer layer 22. In this embodiment layer 22 may include slip agents or antiblock concentrate, carbon black or other additives, though, generally, layer 20 will not.

The paper layer may also have identifying writing or marks to indicate suggested locations for planting seeds etc. Other alternatives include adding fertilizers, grass seeds, flower seeds, weed controllers, insecticides, fungicides, water retainer chemicals, wave absorbent pigments or color pigments to the outer polymer layer. The mulch may also be prepunched to facilitate planting.

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Fig. 4 shows the mulch being applied in a typical manner. The mulch roll 24 is placed on the mulch laying apparatus 26 and unrolled as the apparatus moves down the field. As the mulch 28 is laid down its edges 30 are covered with soil 32 by the apparatus 26 so that wind cannot get underneath the mulch. The mulch may remain in place during the entire growing season and can be tilled or disked into the soil with standard farming equipment after harvesting. After tilling the mulch will essentially completely biodegrade within several months, generally no longer than 6 months.

EXAMPLES

Sample products were made by the process described above and compared to a 30 lb./3000 ft.^{2} extensible natural kraft paper and a low density polyethylene (LDPE) plastic film. The results are shown in Table 1:

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TABLE 1

	Sample A	Sample B	Sample C	Sample D	Sample E	Sample F
Basis Wt. ($lb./3000 ft.^2$)	29.7	19.7	40.0	38.8	40.0	40.0
Caliper (mils)	3.1	1.4	3.5	3.5	3.5	3.5
Tensile Strength MD (machine direction) (lb_f/in) (pounds force/inch)	19.1	2.7	19.4	17.1	22.6	22.1
Tensile Strength CD (cross direction) (lb_f/in)	6.9	3.9	7.7	7.6	9.0	9.8
Tear Strength, MD (g_f) (grams force)	39.3	107.2	64.7	117.0	87.2	83.5
Tear Strength, CD (g_f)	57.4	66.7	98.4	164.0	82.0	87.8

Sample A: extensible natural kraft (30lb./3MSF)
Sample B: black LDPE film (1.4 mil)
Sample C: 5lb./3MSF ECOFLEX® with carbon black, slip additive, and antiblock additive: 5lb./3MSF pure ECOFLEX®: 30lb./3MSF natural extensible kraft
Sample D: 10lb./3MSF ECOFLEX® with carbon black, slip additive, antiblock additive: 30lb./3MSF natural extensible kraft
Sample E: 5lb./3MSF EASTAR® with carbon black, slip additive: 5lb. pure EASTAR®: 30lb./3MSF natural kraft
Sample F: 10lb./3MSF EASTAR® with carbon black, slip additive: 30lb./3MSF natural kraft

As seen in Table 1, the polymer coated samples (samples C-F) had a higher tensile strength in the machine direction and cross direction as compared to the paper sample (sample A). The tensile strength of the paper (sample A) and sample paper/polymer products (samples C-F) were significantly higher than the polyethylene film (sample B). This illustrates the importance of the paper substrate in increasing the stiffness of the mulch.

Addition of polymer layers to the paper layer also increases the tear strength of the paper in both the

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machine direction and cross direction, as compared to the paper or the LDPE film. This is significant because mulches often tear in the cross direction during while being applied in the field.

FIELD TESTS

From field studies at several major universities, it is evident that the stiffness provided by the paper substrate inhibits piercing by certain weeds, such as nutsedge. The paper layer has also been found to provide enough dimensional stability to prevent the polymer film from expanding in warmer temperatures. This will help the mulch to maintain a tight fit to the soil surface, thus, providing better soil heating than polyethylene films.

Test samples were applied in the field with use of standard agricultural equipment such as that illustrated in Fig. 4. Field tests were performed in several locations so that the substrates were exposed to various environments. For example, samples in Florida were exposed to hot and humid weather, samples in California

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were exposed to very dry conditions and samples in New Hampshire, New York and Pennsylvania were used to test the early season heating efficiency of the mulch. During the tests, sample substrates with paper layers of 30 lbs./3000 ft.^{2} Or lighter worked best because the edges of the mulch did not curl. Curling may keep the mulch from laying tightly against the ground and may reduce heating efficiency.

Table 2 represents the results of several tests of the mulch versus a typical black low density polyethylene film. The average change in temperature at 2 in. and 4 in. depth with each mulch is compared to results for the bare ground.

TABLE 2

Average Temperature Change (^{0}F) vs. Bare Ground at 2" and 4" Soil Depth

Sample	Temp. Change (2")	Temp. Change (4")
Black Film (average)	10.5	5.5
ECOFLEX® coated structure	8.0	4.0

The results show that the heating efficiency of the paper/polymer substrate is very similar to that of the black LDPE film.

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Table 3 shows the results of tests wherein the yield of bell peppers was measured. The data represents the averages of each variable. Three plots were planted for each variable. Each plot had dimensions of approximately 12 ft. by 2 ft. The plants were placed at 1.5 ft. intervals.

TABLE 3

	Yield (Green Fruit)	Yield (Red Fruit)	Total Yield
Sample	lbs. per plot	lbs. per plot	lbs. per plot
Sample G	30.8	5.0	35.8
Sample H	34.9	4.4	39.3

Sample G: 10lb./3MSF ECOFLEX® with carbon black, slip additive, antiblock additive: 30lb./3MSF natural extensible kraft

Sample H: 10lb./3MSF ECOFLEX® with carbon black, slip additive, antiblock additive: 40lb./3MSF natural multiwall kraft

The complete growing season was 4-5 months. The testing period, from mulch application to tilling, was 5 months. The paper/polymer substrate partially degraded during the growing season, e.g. the polymer layer began to embrittle and chip. Under similar conditions, i.e. alternating exposure to rain and sunshine, paper alone probably would have degraded significantly in only two weeks.

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At the end of the season the samples were disked/tilled into the soil with standard rotatillers and plowing equipment. Most of the substrate was chopped into very small pieces. After a few days there was no visible evidence of the substrate in the field.

The invention has numerous applications in both large commercial and small agricultural operations. While the invention has been described with reference to preferred embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. For example, various polymer blends or composites could be used in the invention.

Further, it should be understood that, in general, the extrusion process for polymer films is known and many variables can be adjusted by those familiar with the art.

In addition, many modifications may be made to adapt a particular situation to the teachings of the invention

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without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

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What is claimed is:

1. An agricultural mulch comprised of: a first polymer layer extruded onto a first side of a paper layer, the first polymer layer comprising the product of the copolymerization of 1,4-benzenedicarboxylic acid, 1,4-butanediol, and adipic acid.

2. The agricultural mulch of claim 1, further comprising a second polymer layer extruded onto a second side of the paper layer.

3. The agricultural mulch of claim 1, wherein the first polymer layer further comprises a slip agent and/or antiblock composition.

4. The agricultural mulch of claim 1, wherein the paper layer is a paper selected from the group consisting of multiwall paper, super calendered kraft paper, extensible kraft paper, unbleached kraft paper and bleached grade paper.

5. The agricultural mulch of claim 1, wherein the weight of the paper layer is 15 to 60 lb./3000 ft^2.

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6. The agricultural mulch of claim 1, wherein the weight of the first polymer layer is 2-30 lb./3000 ft.^{2}.

7. The agricultural mulch of claim 1, wherein the first polymer layer further comprises an organic or inorganic material selected from the group consisting of carbon black, fertilizer, flower seeds, grass seeds, lime, clay and cellulose fibers.

8. An agricultural mulch comprised of: a first polymer layer extruded onto a first side of a paper layer, the first polymer layer comprising the product of the copolymerization of 1,4-benzenedicarboxylic acid, 1,4-butanediol, and adipic acid and a second polymer layer extruded onto the first polymer layer.

9. The agricultural mulch of claim 8, further comprising a third polymer layer extruded onto a second side of the paper layer.

10. The agricultural mulch of claim 9, further comprising a fourth polymer layer extruded onto the third polymer layer.

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11. The agricultural mulch of claim 8, wherein the second polymer layer further comprises a slip agent and/or antiblock composition.

12. The agricultural mulch of claim 8, wherein the paper layer is a paper selected from the group consisting of multiwall paper, super calendered kraft paper, extensible kraft paper, unbleached kraft paper and bleached grade paper.

13. The agricultural mulch of claim 8, wherein the weight of the paper layer is 15 to 60 lb./3000 ft^2.

14. The agricultural mulch of claim 8, wherein the combined weight of the first and second polymer layers is 2-30 lb./3000 $ft.^2$.

15. The agricultural mulch of claim 8, wherein the second polymer layer further comprises an organic or inorganic material selected from the group consisting of carbon black, fertilizer, flower seeds, grass seeds, lime, clay and cellulose fibers.

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16. A method for manufacturing an agricultural mulch comprising:

(a) preparing a paper layer;

(b) preparing a first polymer layer, the polymer layer being a product of a copolymerization of 1,4-benzenedicarboxylic acid, 1,4-butanediol and adipic acid; and

(c) extruding the first polymer layer onto a first side of the paper layer.

17. The method of claim 16, further comprising: extruding a second polymer layer onto the first polymer layer.

18. The method of claim 17, further comprising: extruding a third polymer layer onto a second side of the paper layer.

19. The method of claim 18, further comprising: extruding a fourth polymer layer onto the third polymer layer.

20. The method of claim 17, further comprising: adding an organic or inorganic material to the second

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polymer layer, the material being selected from the group consisting of carbon black, fertilizer, grass seeds, flower seeds, lime, clay and cellulose fibers.

21. The method of claim 17, further comprising: adding a slip agent and/or antiblock composition to the second polymer layer.

22. The method of claim 16, further comprising: extruding a second polymer layer onto a second side of the paper layer.

23. The method of claim 16, further comprising: adding an organic or inorganic material to the first polymer layer, the material being selected from the group consisting of carbon black, fertilizer, grass seeds, flower seeds, lime, clay and cellulose fibers.

24. The method of claim 16, further comprising: adding a slip agent and/or antiblock composition to the first polymer layer.

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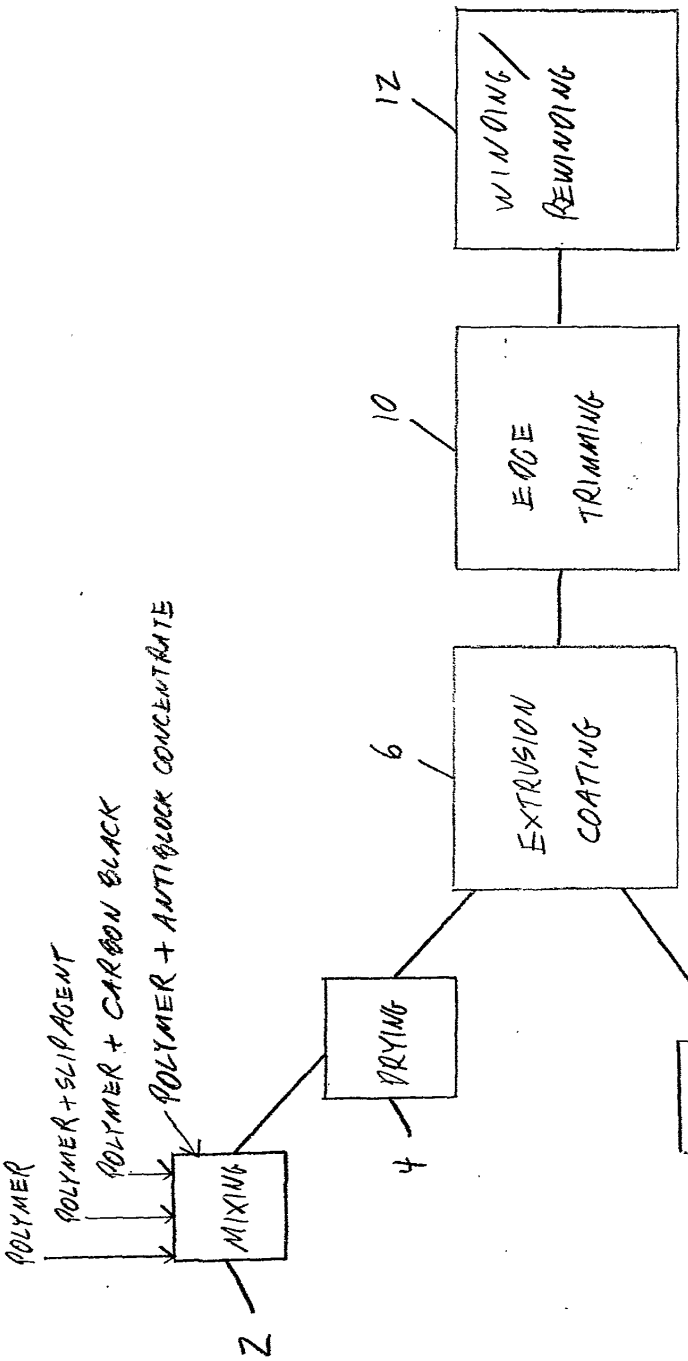


FIG. 1

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FIG. 2

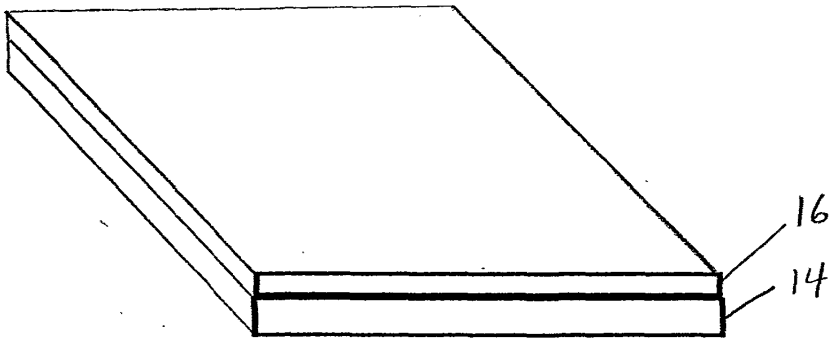
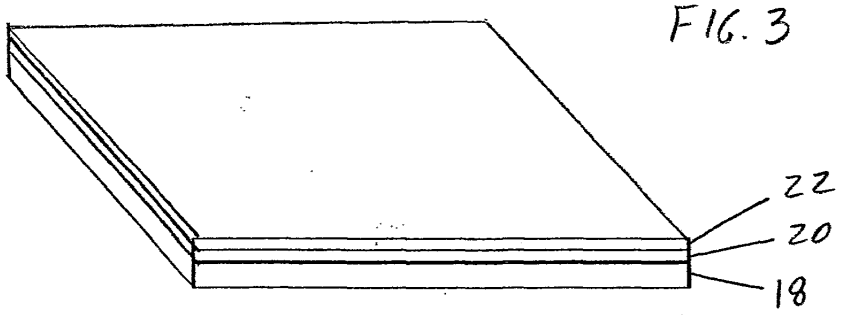
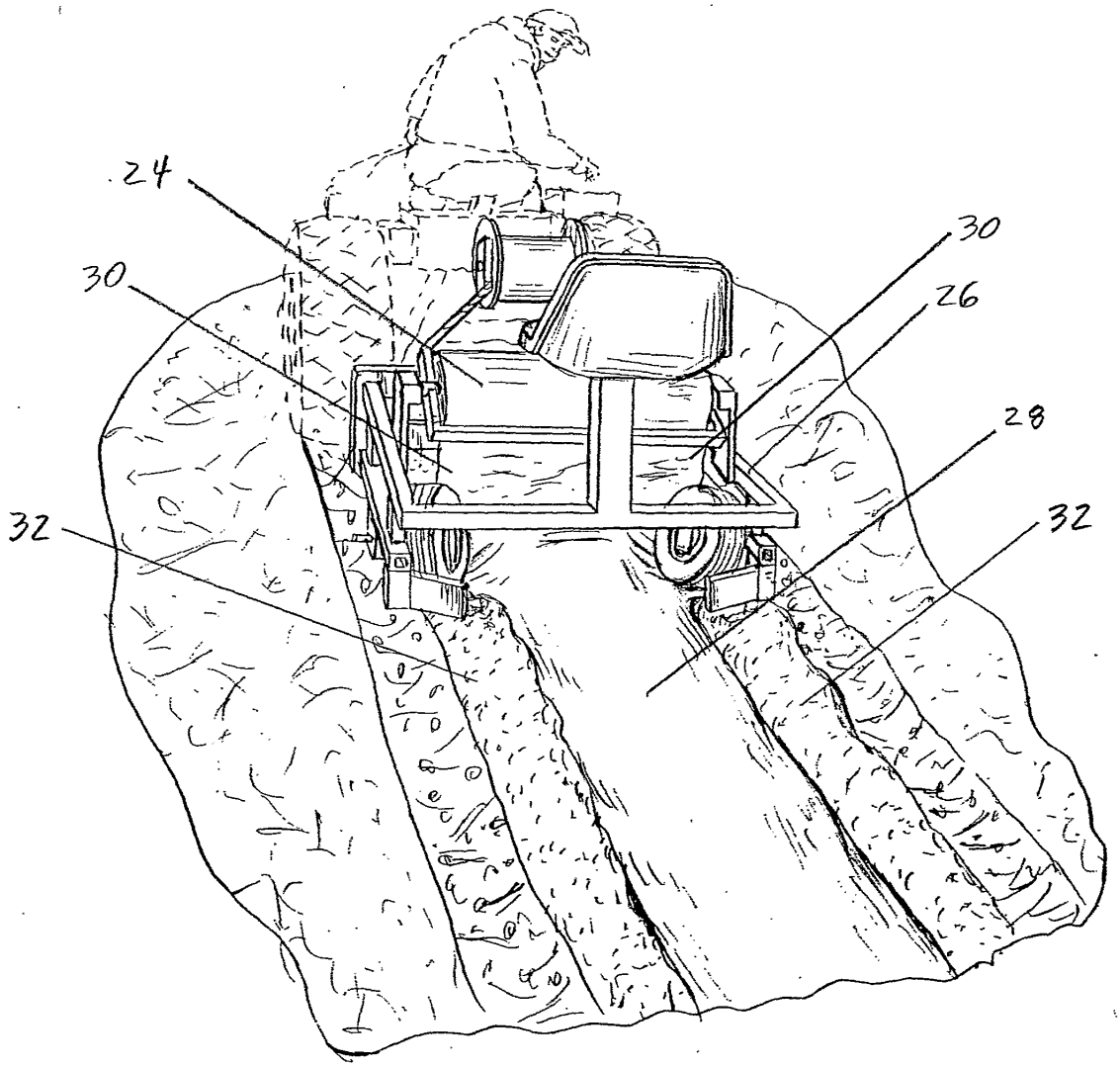


FIG. 3



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FIG. 4



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/05034

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :Please See Extra Sheet.
US CL :Please See Extra Sheet.
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)

U.S. : Please See Extra Sheet.

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

PALM

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

EAST

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,901,838 A (CHENDINNING et al.) 26 August 1975, see entire document.	1-24
A	US 4,782,626 A (SHANLEY et al.) 08 November 1988, see entire document.	1-24
A	US 5,585,150 A (SHEEHAN) 17 December 1996, see entire document.	1-24
Y	US 5,672,434 A (DALEBROUX et al.) 30 September 1997, see entire document.	1-24
A,P	US 6,029,395 A (MORGAN) 29 February 2000, see enitre document.	1-24
A,P	US 6,164,001 A (GAUDREAULT et al.) 26 December 2000, see enitre document.	1-24

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search

21 MARCH 2001

Date of mailing of the international search report

23 APR 2001

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/05034

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F 22 B 7/04;
A 01 C 11/00;
B 05 D 1/36;
B 32 B 3/14, 29/02.

A. CLASSIFICATION OF SUBJECT MATTER:
US CL :

47/9;
111/102;
119/172;
427/411;
428/50, 292.7.

B. FIELDS SEARCHED
Minimum documentation searched
Classification System: U.S.

47/9;
111/102;
119/172;
427/411;
428/50, 292.7.

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PATENT ABSTRACTS OF JAPAN

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C08G 63/42

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(22)Date of filing : 23.10.2001

(71)Applicant : NIPPON SHOKUBAI CO LTD
(72)Inventor : IWAI KUNIHIRO
ITO HIROSHI
JIYOUJIMA MICHIHIRO

(54) POLYESTER RESIN COMPOSITION

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a polyester resin composition, which is prepared from a biodegradable aliphatic polyester and has an adequate weight average molecular weight as well as adequate flowability and subsequently giving excellent mechanical strength and molding property, and also to provide an aliphatic polyester, which can be suitably used for the composition.
SOLUTION: The polyester resin composition contains a resin component having a biodegradable aliphatic polyester as a mandatory component. The composition is characterized by having the specific relationship (1): $-1.3 \times 10^{-5} < \{\log(Y/660)\}/X < 0$ (1), where X is the weight average molecular weight of the above resin component at the viscosity index (MI) measurement and Y (g/10 min) is the above viscosity index.

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特開2003－128898
（P2003－128898A）
(43)公開日　平成15年５月８日(2003.5.8)

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63/42		63/42		

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最終頁に続く

(54)【発明の名称】　ポリエステル樹脂組成物

(57)【要約】
【課題】　生分解性の脂肪族ポリエステルを用いた組成物における、重量平均分子量の確保と流動性の確保の両立を可能とし、その結果、機械的強度に優れるとともに成形性も良好であるという利点を合わせ持つポリエステル樹脂組成物、および、該樹脂組成物に好適に用いることのできる脂肪族ポリエステルを提供する。
【解決手段】　本発明にかかるポリエステル樹脂組成物は、生分解性の脂肪族ポリエステルを必須とする樹脂分を含む樹脂組成物であって、前記樹脂組成物について粘度指数（ＭＩ）を測定したときの、前記樹脂分の重量平均分子量をＸ、前記粘度指数（ＭＩ）をＹ（ｇ／１０ｍｉｎ）とすると、これらが特定式（１）に示す関係を満たす、ことを特徴とする。

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【特許請求の範囲】

【請求項１】生分解性の脂肪族ポリエステルを必須とする樹脂分を含む樹脂組成物であって、

前記樹脂組成物について粘度指数（ＭＩ）を測定したとき

$$-1.3\times10^{-5}<\{\log(Y/660)\}/X<0 \quad (1)$$

ことを特徴とする、ポリエステル樹脂組成物。

【請求項２】前記脂肪族ポリエステルの重量平均分子量が１００００以上である、請求項１に記載のポリエステル樹脂組成物。

【請求項３】前記脂肪族ポリエステルが炭素数２以上の脂肪族ジカルボン酸と炭素数２以上の脂肪族グリコールとから得られる樹脂である、請求項１または２に記載のポリエステル樹脂組成物。

【請求項４】前記脂肪族ポリエステルがポリエチレンサクシネートである、請求項３に記載のポリエステル樹脂組成物。

【請求項５】環状酸無水物と環状エーテルとを開環重合して得られる重合体と多価酸無水物とを反応させてなる、脂肪族ポリエステル。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、成形材料用などとして好ましく使用でき、しかも、生分解性をも有するポリエステル樹脂組成物、および、該樹脂組成物に好適に用いることのできる脂肪族ポリエステルに関する。詳しくは、機械的強度に繋がる重量平均分子量を備えながら高い流動性を持ち、しかも、使用後の廃棄処分を考慮した生分解性をも兼ね備えた、成型加工性等に優れた、ポリエステル樹脂組成物、および、該樹脂組成物に好適に用いることのできる脂肪族ポリエステルに関する。

【０００２】

【従来の技術】脂肪族ポリエステルは、一般に、生分解性を有するため、これを樹脂分として含むポリエステル樹脂組成物は、その特徴を生かし、繊維、シート、フィルム、その他の成形品に加工することで、成形品使用後の廃棄処分における環境負荷の軽減に寄与することが期待されている。しかし、従来のポリエステル樹脂組成物は、工業上の生産性という観点から見ると、問題があった。すなわち、機械的強度を高めるために樹脂分の重量平均分子量を高くなるようにすると、溶融粘度が高くなり、流動性が低下して、成形性を低下させるという問題※

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※きの、前記樹脂分の重量平均分子量をＸ、前記粘度指数（ＭＩ）をＹ（ｇ／１０ｍｉｎ）とすると、これらが下式（１）を満たす、

$$-1.3\times10^{-5}<\{\log(Y/660)\}/X<0 \quad (1)$$

※である。

【０００３】それでは、流動性が高ければ良いかというと、そうではなく、機械的強度やその他の製品特性に繋がる樹脂分の重量平均分子量の確保も重要である。このような事情は、成形用途以外に使用されるポリエステル樹脂組成物でも同様である。

【０００４】

【発明が解決しようとする課題】そこで、本発明が解決しようとする課題は、生分解性の脂肪族ポリエステルを用いた組成物における、重量平均分子量の確保と流動性の確保の両立を可能とし、その結果、機械的強度に優れるとともに成形性も良好であるという利点を合わせ持つポリエステル樹脂組成物、および、該樹脂組成物に好適に用いることのできる脂肪族ポリエステルを提供することである。

【０００５】

【課題を解決するための手段】本発明者は、上記課題を解決するために鋭意検討し、その過程で、樹脂分の重量平均分子量と組成物全体の流動性との適度のバランスが重要であり、この適度のバランスを確実に得るための指標を見出すことが必要であると確信して、思考錯誤と実験を重ねた。そして見出したのが、以下に述べる式である。本発明は、このようにして完成された。また、本発明者は、環状酸無水物と環状エーテルとの開環重合により得られる重合体を、鎖延長剤である多価酸無水物と反応させることにより得られる脂肪族ポリエステルであれば、上記課題を一挙に解決できることを見出し、本発明を完成した。

【０００６】すなわち、本発明にかかるポリエステル樹脂組成物は、生分解性の脂肪族ポリエステルを必須とする樹脂分を含む樹脂組成物であって、前記樹脂組成物について粘度指数（ＭＩ）を測定したときの、前記樹脂分の重量平均分子量をＸ、前記粘度指数（ＭＩ）をＹ（ｇ／１０ｍｉｎ）とすると、これらが下式（１）を満たす、

$$-1.3\times10^{-5}<\{\log(Y/660)\}/X<0 \quad (1)$$

ことを特徴とする。

【０００７】また、本発明にかかる脂肪族ポリエステルは、環状酸無水物と環状エーテルとを開環重合して得られる重合体と多価酸無水物とを反応させてなる、ことを特徴とする。

【０００８】

【発明の実施の形態】以下、本発明にかかるポリエステル樹脂組成物および脂肪族ポリエステルの好ましい実施の形態について詳しく説明する。

〔ポリエステル樹脂組成物〕本発明にかかるポリエステル樹脂組成物（以下、本発明の樹脂組成物と称することがある。）は、脂肪族ポリエステルを必須とする樹脂分を含む樹脂組成物であり、該樹脂分は脂肪族ポリエステルのみであっても他の樹脂を含む場合であってもよい。また、本発明の樹脂組成物には、樹脂分以外に他の成分を含むものとする。

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【０００９】上記脂肪族ポリエステルは、上述のように、本発明にかかるポリエステル樹脂組成物中の樹脂分における必須成分である。上記脂肪族ポリエステルは、その重量平均分子量は、１００，０００～５００，０００が好ましく、より好ましくは１２０，０００～４００，０００、さらにより好ましくは１４０，０００～３００，０００である。上記重量平均分子量が、１００，０００未満の場合は、本発明の樹脂組成物から得られる成形体が脆くなったり強度不十分になったりするおそれがあり、５００，０００を超える場合は、本発明の樹脂組成物の流動性が低くなり過ぎて成形が困難となるおそれがある。

【００１０】上記脂肪族ポリエステルとしては、特に限定はされないが、具体的には、①多塩基酸（あるいはそのエステル）とグリコールとを縮重合して得られる重合体、②ヒドロキシカルボン酸（あるいはそのエステル）を縮重合して得られる重合体、③環状酸無水物と環状エーテルとを開環重合して得られる重合体、④環状エステルを開環重合して得られる重合体、などを好ましく挙げることができる。①において、多塩基酸（あるいはそのエステル）としては、特に限定はされないが、例えば、炭素数２以上の脂肪族ジカルボン酸（あるいはそのエステル）、好ましくは炭素数２～６の脂肪族ジカルボン酸（あるいはそのエステル）であることが好ましく、コハク酸、アジピン酸、スベリン酸、セバシン酸、アゼライン酸、デカンジカルボン酸、オクタデカンジカルボン酸、ダイマー酸、あるいはそれらのエステル等が挙げられるが、なかでも、炭素数２～６の脂肪族ジカルボン酸（あるいはそのエステル）がより好ましく、コハク酸、アジピン酸などが挙げられる。同様に、①において、グリコールとしては、特に限定はされないが、例えば、炭素数２以上の脂肪族グリコール、好ましくは炭素数２～６の脂肪族グリコールであることが好ましく、エチレングリコール、プロピレングリコール、１，３－プロパンジオール、１，４－ブタンジオール、ネオペンチルグリコール、１，５－ペンタンジオール、１，６－ヘキサンジオール、デカメチレングリコールなどが挙げられるが、なかでも、炭素数２～４の脂肪族グリコールがより好ましく、エチレングリコール、プロピレングリコール、１，３－プロパンジオール、１，４－ブタンジオールなどが挙げられる。また、グリコール成分の一部として、ポリオキシアルキレングリコールを用いることもでき、具体的には、特に限定されるわけではないが、例えば、ポリオキシエチレングリコール、ポリオキシプロピレングリコール、ポリオキシテトラメチレングリコールおよびこれらの共重合体を挙げることができる。上記多塩基酸およびグリコールについては、得られる脂肪族ポリエステルの融点、生分解性、経済性を考慮すると、コハク酸とエチレングリコールとの組み合わせ、および／または、コハク酸と１，４－ブタンジオールとの組み合わせが好ましく、なかでも、前者のコハク酸とエチレングリコールとの組み合わせがより好ましい。すなわち、本発明でいう脂肪族ポリエステルとしては、コハク酸とエチレングリコールとを重合してなる樹脂、および／または、コハク酸と１，４－ブタンジオールとを重合してなる樹脂が好ましく、なかでも、前者の樹脂、つまり、ポリエチレンサクシネートであることがより好ましい。

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【００１１】上記①の脂肪族ポリエステルを得る場合、反応温度は、１６０～２５０℃とすることが好ましく、１７０～２４０℃がより好ましい。１６０℃未満の場合、反応が進まず目的の脂肪族ポリエステルが得られないおそれがあり、２５０℃を超える場合は、熱変性物などのゲル状分が多くなり、本発明の効果が得られないおそれがある。また、反応時間については、特に限定されるわけではなく、上記反応温度に応じ、適宜設定すればよい。②においては、ヒドロキシカルボン酸としては、限定はされないが、例えば、グリコール酸、乳酸、３－ヒドロキシプロピオン酸、３－ヒドロキシ－２，２－ジメチルプロピオン酸、３－ヒドロキシ－３－メチル－酪酸、３－ヒドロキシ酪酸、４－ヒドロキシ酪酸、３－ヒドロキシ吉草酸、４－ヒドロキシ吉草酸、５－ヒドロキシ吉草酸、６－ヒドロキシカプロン酸、クエン酸、リンゴ酸およびこれらのエステル等が挙げられる。重縮合反応としては、通常のエステル交換法またはエステル化法さらには両方の併用によっても何らさしつかえない。

【００１２】上記②の脂肪族ポリエステルを得る場合、反応温度は、１６０～２５０℃とすることが好ましく、１７０～２４０℃がより好ましい。１６０℃未満の場合、反応が進まず目的の脂肪族ポリエステルが得られないおそれがあり、２５０℃を超える場合は、熱変性物などのゲル状分が多くなり、本発明の効果が得られないおそれがある。また、反応時間については、特に限定されるわけではなく、上記反応温度に応じ、適宜設定すればよい。③においては、環状酸無水物としては、特に限定はされないが、例えば、無水コハク酸、無水マレイン酸、無水イタコン酸、無水グルタル酸、無水アジピン酸、無水シトラコン酸等が挙げられる。同様に、環状エーテルとしては、特に限定はされないが、例えば、エチレンオキシド、プロピレンオキシド、シクロヘキセンオキシド、スチレンオキシド、エピクロロヒドリン、アリルグリシジルエーテル、フェニルグリシジルエーテル、テトラヒドロフラン、オキセパン、１，３－ジオキソラン等が挙げられる。これらのうち、得られるポリエステルの融点、生分解性、経済性を考慮すると、無水コハク酸とエチレンオキシドとの組み合わせが好ましい。すなわち、本発明でいう脂肪族ポリエステルとしては、無水コハク酸とエチレンオキシドとを重合してなる樹脂、つまり、ポリエチレンサクシネートが好ましい。開環重合は、オクチル酸ジルコニール、テトラアルコキシジルコニウム、トリアルコキシアルミニウム化合物等の金属

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アルコキシド化合物等の通常公知の開環重合触媒を用い、ベンゼン、トルエン、キシレン、シクロヘキサン、ｎ－ヘキサン、ジオキサン、クロロホルム、ジクロロエタン等の不活性溶媒中での重合や塊状重合等の方法により行うことができる。

【００１３】上記③の脂肪族ポリエステルを得る場合、反応温度は、１２０～１８０℃とすることが好ましく、１２５～１５０℃がより好ましい。１２０℃未満の場合、反応が進まず目的の脂肪族ポリエステルが得られないおそれがあり、１８０℃を超える場合は、熱変性物などのゲル状成分が多くなり、本発明の効果が得られないおそれがある。また、反応時間については、１～２０時間とすることが好ましく、より好ましくは３～１５時間である。１時間未満の場合、共重合性がくずれ、目的の脂肪族ポリエステル成分が得られないおそれがあり、２０時間を超える場合、熱変性物などのゲル状分が多くなり、本発明の効果が得られないおそれがある。

【００１４】④においては、環状エステルとしては、特に限定はされないが、例えば、β－プロピオラクトン、β－メチル－β－プロピオラクトン、δ－バレロラクトン、ε－カプロラクトン、グリコリド、ラクチド等が挙げられる。開環重合は、③の場合と同様に、通常公知の開環重合触媒を用い、上記不活性溶媒中での重合や塊状重合等の方法により行うことができる。上記④の脂肪族ポリエステルを得る場合、反応温度は、１２０～１８０℃とすることが好ましく、１２５～１５０℃がより好ましい。１２０℃未満の場合、反応が進まず目的の脂肪族ポリエステルが得られないおそれがあり、１８０℃を超える場合は、熱変性物などのゲル成分が多くなり、本発明の効果が得られないおそれがある。

【００１５】また、反応時間については、１～２０時間とすることが好ましく、より好ましくは３～１５時間である。１時間未満の場合、発熱により反応が困難となるおそれがあり、２０時間を超える場合、熱変性物などのゲル状分が多くなり、本発明の効果が得られないおそれがある。上記脂肪族ポリエステルとしては、上述した①から④の脂肪族ポリエステルのなかでも、比較的短時間で且つ工業的に効率良く製造できるため、前記③の環状酸無水物と環状エーテルとを開環重合して得られる脂肪族ポリエステルが好ましく、また、多塩基酸部位とグリコール部位が完全に共重合できるため、前記④の多塩基酸（あるいはそのエステル）とグリコールを重縮合して得られる脂肪族ポリエステルが好ましい。

【００１６】上記①から④までのいずれの脂肪族ポリエステルにおいても、その重量平均分子量が１００，０００より低い場合は、さらにエステル交換反応で高分子量化したものであってもよいし、種々の鎖延長剤と反応させて高分子量化したものであってもよい。上記エステル交換は、温度を１８０～２８０℃の範囲で反応させることが好ましい。１８０℃未満であると反応が進行せず、

２８０℃を超える場合は分解反応が促進される。また、その際、減圧度は０．５～３．０ｍｍＨｇの範囲にして反応させることが好ましい。０．５ｍｍＨｇ未満であると反応するのが困難であり、３．０ｍｍＨｇを超える場合は反応が進行しない。

【００１７】上記鎖延長剤としては、特に限定はされないが、例えば、イソシアナート化合物、エポキシ化合物、アジリジン化合物、オキサゾリン化合物、多価金属化合物、リン酸エステル、亜リン酸エステル等、多価カルボン酸、多価酸無水物が挙げられ、これらは１種のみで用いても、２種以上を併用してもよい。上記多価カルボン酸としては、特に限定されるわけではないが、具体的には、例えば、ブタン－１，２，３，４－テトラカルボン酸、ピロメリット酸、ビフェニルテトラカルボン酸、ｐ－ターフェニル３，４，３′，４′－テトラカルボン酸、３，３′，４，４′－ベンゾフェノンテトラカルボン酸、１，２，３，４－シクロペンタンテトラカルボン酸、ナフタレン－１，４，５，８－テトラカルボン酸、３，４，９，１０－ペリレンテトラカルボン酸、２，３，４，５－テトラヒドロフランテトラカルボン酸、３，３′，４，４′－ジフェニルスルホンテトラカルボン酸、ビシクロ［２．２．２］オクト－７－エン－２，３，５，６－テトラカルボン酸等や、マレイン酸－スチレン共重合体、マレイン酸－酢酸ビニル共重合体、マレイン酸－塩化ビニル共重合体、マレイン酸－ブタジエン共重合体、マレイン酸－メチルビニルエーテル共重合体、マレイン酸－エチレン共重合体等が挙げられる。これらは１種のみ用いても２種以上を併用してもよい。なかでも、ピロメリット酸は、芳香環を有しており機械的強度に優れたものとなるためより好ましい。

【００１８】上記多価酸無水物としては、分子内に２つ以上の酸無水物基を有するものであれば特に限定はないが、具体的には、例えば、ブタン－１，２，３，４－テトラカルボン酸二酸無水物、二無水ピロメリット酸、ビフェニルテトラカルボン酸二酸無水物、ｐ－ターフェニル３，４，３′，４′－テトラカルボン酸二酸無水物、３，３′，４，４′－ベンゾフェノンテトラカルボン酸二酸無水物、１，２，３，４－シクロペンタンテトラカルボン酸二酸無水物、ナフタレン－１，４，５，８－テトラカルボン酸二酸無水物、３，４，９，１０－ペリレンテトラカルボン酸二酸無水物、２，３，４，５－テトラヒドロフランテトラカルボン酸二酸無水物、３，３′，４，４′－ジフェニルスルホンテトラカルボン酸二無水物、ビシクロ［２．２．２］オクト－７－エン－２，３，５，６－テトラカルボン酸二酸無水物等の２価酸無水物；無水マレイン酸－スチレン共重合体、無水マレイン酸－酢酸ビニル共重合体、無水マレイン酸－塩化ビニル共重合体、無水マレイン酸－ブタジエン共重合体、無水マレイン酸－メチルビニルエーテル共重合体、無水マレイン酸－エチレン共重合体等が挙げられる。これらは

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１種のみ用いても２種以上を併用してもよい。なかでも、二無水ピロメリット酸、ブタン－１，２，３，４－テトラカルボン酸二酸無水物、３，３′，４，４′－ベンゾフェノンテトラカルボン酸二酸無水物から選ばれる少なくとも１種であると、反応性および製造効率が高いためさらに好ましい。

【００１９】上記鎖延長剤と脂肪族ポリエステルとの反応においては、脂肪族ポリエステルを合成した後に鎖延長剤を添加して脂肪族ポリエステルと鎖延長剤とを反応させてもよいし、鎖延長剤の存在下で脂肪族ポリエステルを合成しながら脂肪族ポリエステルと鎖延長剤とを反応させてもよいし、脂肪族ポリエステルの合成途中で鎖延長剤を添加（一括添加および／または逐次添加（連続的添加および／または間歇的添加））して脂肪族ポリエステルと鎖延長剤と反応させてもよく、両者の反応のさせ方については、特にこれらに限定はされない。この反応方法としては、具体的には、例えば、脂肪族ポリエステルを適当な溶媒に溶かして鎖延長剤と反応させる方法、脂肪族ポリエステルを加熱溶融させて鎖延長剤と反応させる方法等が挙げられるが、特にこれらに限定はされない。

【００２０】上記鎖延長剤の使用量は、脂肪族ポリエステルに対して０．００１～１０重量％であれば特に限定はされず、好ましくは０．０１～５重量％である。０．００１重量％未満であると所望の効果は得られにくく、１０重量％を超えるとゲル状分を含むため成形性が悪くなる。上記脂肪族ポリエステルは、本発明でいう樹脂分中のすべて（すなわち含有割合１００重量％）であっても、他の樹脂などの存在を前提とした一部であってもよく、特に限定はされないが、例えば、後者である場合は、樹脂分中に脂肪族ポリエステルは５～９５重量％含まれていることが好ましく、より好ましくは１０～９０重量％、さらにより好ましくは２０～８０重量％である。上記脂肪族ポリエステルの含有割合が５重量％未満であると、脂肪族ポリエステルの含有効果が十分発揮されないおそれがあり、９５重量％を超えると、上記他の樹脂の効果が発揮されないおそれがあり、また、脂肪族ポリエステルの含有効果は含有率１００重量％の場合と同様である。

【００２１】本発明でいう樹脂分が、上記脂肪族ポリエステル以外に他の樹脂を含む場合、該他の樹脂としては、特に限定されるわけではないが、具体的には、例えば、ポリスチレン、ポリエチレン、ポリプロピレン、ポリウレタン、ポリエステル、ポリビニルアルコール系樹脂、アクリロニトリル－ブタジエン－スチレン樹脂、フッ素樹脂、エポキシ樹脂、アルキッド樹脂、シリコン樹脂、酢酸ビニル樹脂、ポリエステル変性アクリル樹脂、オルガノシリケートの縮合物、ポリエーテルなどが好ましく挙げられ、これらは、１種のみ含んでいても、２種以上含んでいてもよい。なかでも、相溶性に優れるという理由で、ポリエステル、ポリエーテルがより好ましい。

【００２２】上記他の樹脂が本発明でいう樹脂分中に含まれる場合は、該樹脂分中に、５～９５重量％含まれていることが好ましく、より好ましくは１０～９０重量％、さらにより好ましくは２０～８０重量％である。上記他の樹脂の含有割合が５重量％未満であると、上記他の樹脂の含有効果が発揮されないおそれがあり、９５重量％を超えると、上記樹脂分の必須成分である脂肪族ポリエステル樹脂の含有効果が十分発揮されないおそれがあり、また、上記他の樹脂の含有効果は含有率１００重量％の場合と同様である。上記他の樹脂が本発明でいう樹脂分中に含まれる場合は、該樹脂分中での脂肪族ポリエステルを含む各種樹脂の存在形態は、特に限定されるわけではなく、複数の樹脂の単なる混合であってもよいし、新たに架橋剤を加えられ複数の樹脂がブロック状にされていてもよいし、また、各種ポリエステル樹脂が存在する場合はエステル交換などを行ってもよいが、なかでも、簡便という理由から、単なる混合された形態が好ましい。

【００２３】本発明でいう脂肪族ポリエステルを必須に含む樹脂分は、本発明にかかるポリエステル樹脂組成物中に、８０重量％以上含まれていることが好ましく、より好ましくは９０重量％以上、さらにより好ましくは９５重量％以上である。上記樹脂分の含有割合が８０重量％未満である場合、ポリエステル樹脂組成物の機械的強度を損なうおそれがある。本発明にかかる樹脂組成物は、上記樹脂分以外にも他の成分を含むものである。上記他の成分としては、特に限定はされないが、例えば、酸化防止剤、結晶核剤、顔料、骨材、充填剤、染料、耐熱剤、レベリング剤、添加系の紫外線吸収剤、添加系の紫外線安定剤、耐候剤、滑剤、帯電防止剤、安定剤、強化材、難燃剤等が挙げられる。これらをは１種のみ含んでいても、２種以上含んでいてもよい。

【００２４】上記酸化防止剤としては、特に限定されないが、具体的には、例えば、フェノール系酸化防止剤、イオウ系酸化防止剤、リン系酸化防止剤等が挙げられ、公知の化合物の中から次のようなものが挙げられる。フェノール系酸化防止剤としては、特に限定はされないが、具体的には、例えば、２，４－ビス－（ｎ－オクチルチオ）－６－（４－ヒドロキシ－３，５－ｔ－ブチルアニリノ）－１，３，５－トリアジン、ペンタエリスリチル－テトラキス〔３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕（商品名　ＩＲＧＡＮＯＸ　１０１０）、２，２－チオージエチレンビス〔３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕、３，９－ビス－〔２－（３－（３－ｔ－ブチル－４－ヒドロキシ－５－メチルフェニル）－プロピオニルオキシ）－１，１－ジメチルエチル〕２，４，８，１０－テトラオキサスピロ〔５，５〕

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ウンデカン(商品名 Ｓｕｍｉｌｉｚｅｒ ＧＡ－８０)、トリエチレングリコール－ビス〔３－（３－ｔ－ブチル－５－メチル－４－ヒドロキシフェニル)プロピオネート〕(商品名 ＩＲＧＡＮＯＸ ２４５)、１，６－ヘキサンジオール－ビス〔３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル）プロピオネート〕（商品名 ＩＲＧＡＮＯＸ ２５９）、テトラキス〔メチレン（３，５－ジ－ｔ－ブチル－４－ヒドロキシハイドロシンナメート）〕メタン、オクタデシル－３－（３，５－ジ－ｔ－ブチル－４－ヒドロキシフェニル)プロピオネート(商品名 ＩＲＧＡＮＯＸ １０７６)、３，５－ジ－ｔ－ブチル－４－ヒドロキシ－ベンジルフォスフォネート－ジエチルエステル（商品名 ＩＲＧＡＮＯＸ １２２２)、Ｎ，Ｎ'－ヘキサメチレン－ビス（３，５－ジ－ｔ－ブチル－４－ヒドロキシ－ヒドロシンナムアミド）、３，５－ジ－ｔ－ブチル－４－ヒドロキシ－ベンジルフォスフォネート－ジエチルエステル、１，３，５－トリメチル－２，４，６，－トリス－（３，５－ジ－ｔ－ブチル－４－ヒドロキシベンジル)ベンゼン、ビス（３，５－ｔ－ブチル－４－ヒドロキシベンジルホスホン酸エチル)カルシウム（商品名 ＩＲＧＡＮＯＸ １４２５ＷＬ）、トリス－（３，５－ジ－ｔ－ブチル－４－ヒドロキシベンジル）－イソシアヌレート（商品名 ＩＲＧＡＮＯＸ ３１１４）、１，１，３－トリス（２－メチル－４－ヒドロキシ－５－ｔ－ブチルフェニル）ブタン、２，２－ビス〔４－（２－（３，５－ジ－ｔ－ブチル－４－ヒドロキシハイドロシンナモイルオキシ））エトキシフェニル〕プロパン、２，６－ジ－ｔ－ブチル－４－メチルフェノールなどが挙げられる。

【００２５】イオウ系酸化防止剤としては、特に限定はされないが、具体的には、例えば、ジラウリル－３，３－チオジプロピオネート（商品名 ＳＵＭＩＬＩＺＥＲ ＴＰＬ－Ｒ）、ジミリスチル－３，３－チオジプロピオネート（商品名 ＳＵＭＩＬＩＺＥＲ ＴＰＭ）、ジステアリル－３，３－チオジプロピオネート（商品名ＳＵＭＩＬＩＺＥＲ ＴＰＳ）、ペンタエリスリチルテトラキス（３－ラウリルチオジプロピオネート（商品名 ＳＵＭＩＬＩＺＥＲ ＴＰ－Ｄ）、ジトリデシル－３，３－チオジプロピオネート（商品名 ＳＵＭＩＬＩＺＥＲ ＴＬ）、２－メルカプトベンゾイミダゾール（商品名 ＳＵＭＩＬＩＺＥＲ ＭＢ）などが挙げられる。

【００２６】リン系酸化防止剤としては、特に限定はされないが、具体的には、例えば、トリフェニルフォスファイト、トリラウリルフォスファイト、トリス（ノニルフェニル）ホスファイト、トリイソオクチルホスファイト、トリイソデシルホスファイト、トリフェニルホスファイト，ジフェニルイソデシルホスファイト、ジフェニルイソオクチルホスファイト、フェニルイソデシルホスファイト、ジイソオクチルフェニルホスファイト、テトラキス（２，４－ジ－ｔ－ブチルフェニル）－４，４－

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ビフェニレンフォスフォナイト（商品名 ＩＲＧＡＦＯＳ Ｐ－ＥＰＱＦＦ)、トリス（２，４－ジ－ｔ－ブチルフェニル）ホスファイト(商品名 ＩＲＧＡＦＯＳ １６８)、ジステアリルペンタエリスリトール－ジ－ホスファイト、ジオクチルペンタエリスリトール－ジ－ホスファイト、ジイソデシルペンタエリスリトール－ジ－ホスファイト、ビス（２，４－ジ－ｔ－ブチルフェニル)ペンタエリスリトール－ジ－ホスファイト、ビス（２，６－ジ－ｔ－ブチル－４－メチルフェニル）ペンタエリスリトール－ジ－ホスファイト(商品名 アデカスタブ ＰＥＰ－３６)、テトラキス（２，４－ジ－ｔ－ブチルフェニル）－４，４'－ビフェニレンフォスフォナイト(商品名 ＳＡＮＤＯＳＴＡＢ Ｐ－ＥＰＱ)などの次亜リン酸、亜リン酸およびそのエステル類；リン酸ジフェニル、リン酸２－エチルヘキシルジフェニル、リン酸ジベンジル、リン酸トリエチル、リン酸トリメチル、リン酸トリオクチル、リン酸トリクレジル、リン酸トリス（４－ｔｅｒ－ブチルフェニル）、リン酸トリス（ブトキシエチル）、リン酸トリ－ｎ－ブチルなどのリン酸およびそのエステル類；次亜リン酸、ポリリン酸などが挙げられる。

【００２７】上記酸化防止剤は、単独で用いても、２種以上を併用してもよい。上記酸化防止剤を用いる場合は、本発明のポリエステル樹脂組成物中の樹脂分１００重量部に対して、０．０１～２．００重量部含むようにすることが好ましく、より好ましくは０．０５～１．００重量部である。上記含有量が、０．０１重量部未満の場合は、脂肪族ポリエステルを含む樹脂分を熱安定化させる効果が十分発揮されないおそれがあり、２．００重量部を超える場合は、上記安定化の効果は得られるが、含有量に比例した効果は得られず且つ機械的強度などの物性が低下するおそれがある。

【００２８】上記結晶核剤としては、特に限定されないが、以下のような公知の化合物を挙げることができ、具体的には、例えば、カーボンブラック、炭酸カルシウム、合成ケイ酸及びケイ酸塩、亜鉛華、ハイサイトクレー、カオリン、塩基性炭酸マグネシウム、マイカ、タルク、石英粉、ケイ藻土、ドロマイト粉、酸化チタン、酸化亜鉛、酸化アンチモン、硫酸バリウム、硫酸カルシウム、アルミナ、ケイ酸カルシウム、窒化ホウ素等の、無機化合物；オクチル酸、トルイル酸、ヘプタン酸、ペラルゴン酸、ラウリン酸、ミリスチン酸、パルチミン酸、ステアリン酸、ベヘニン酸、セロチン酸、モンタン酸、メリシン酸、安息香酸、ｐ－ｔｅｒｔ－ブチル安息香酸、テレフタル酸、テレフタル酸モノメチルエステル，イソフタル酸、イソフタル酸モノメチルエステル等の金属塩等の、カルボキシル基の金属塩を有する低分子有機化合物；ポリエチレンの酸化によって得られるカルボキシル基含有ポリエチレン、ポリプロピレンの酸化によって得られるカルボキシル基含有ポリプロピレン、エチレン、プロピレン、ブテン－１等のオレフィン類とアクリ

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ル酸又はメタクリル酸との共重合体、スチレンとアクリル酸又はメタクリル酸との共重合体、オレフィン類と無水マレイン酸との共重合体、スチレンと無水マレイン酸との共重合体等の、カルボキシル基を有する高分子有機化合物またはその金属塩；３，３－ジメチルブテン－１、３－メチルブテン－１、３－メチルペンテン－１、３－メチルヘキセン－１、３，５，５－トリメチルヘキセン－１などの炭素数５以上の３位分岐α－オレフィン、ならびにビニルシクロペンタン、ビニルシクロヘキサン、ビニルノルボルナンなどのビニルシクロアルカンの重合体、ポリエチレングリコール、ポリプロピレングリコールなどのポリアルキレングリコール、ポリグリコール酸、ポリエチレンテレフタレート、ポリブチレンテレフタレート、ポリトランスシクロヘキサンジメタノールテレフタレート、セルロース、セルロースエステル、セルロースエーテル等の、高分子有機化合物；リン酸ジフェニル、亜リン酸ジフェニル、リン酸ビス（４－ｔｅｒｔ－ブチルフェニル）ナトリウム、リン酸メチレン（２，４－ｔｅｒｔ－ブチルフェニル）ナトリウム等の、リン酸又は亜リン酸及びその金属塩；ビス（ｐ－メチルベンジリデン）ソルビトール、ビス（ｐ－エチルベンジリデン）ソルビトール等の、ソルビトール誘導体；無水チオグリコール酸、パラトルエンスルホン酸およびその金属塩；等を挙げることができる。これらの中でも、結晶化速度、生分解性の点から、主鎖に芳香環をもつ高分子化合物以外の化合物が好ましい。また、成形のためにはよりいっそう速い結晶化速度が求められるため、これら結晶核剤の中でも、無機化合物、カルボキシル基を有する低分子有機化合及びその金属塩物、無機化合物とカルボキシル基を有する低分子有機化合物及びその金属塩との組み合わせ、カルボキシル基を有する高分子有機化合物またはその金属塩、カルボキシル基を有する高分子有機化合物またはその金属塩とカルボキシル基を有する低分子有機化合物及びその金属塩との組み合わせ、が好ましい。また、さらに、無機化合物の中では、タルク、マイカ、窒化ホウ素が好ましく、カルボキシル基を有する低分子有機化合及びその金属塩物の中では、ステアリン酸が好ましい。

【００２９】上記結晶核剤は、単独で用いても、２種以上を併用してもよい。上記結晶核剤を用いる場合は、本発明のポリエステル樹脂組成物中の樹脂分１００重量部に対して、０．０００１～１０重量部含むようにすることが好ましく、より好ましくは０．０００１～５重量部、さらにより好ましくは０．５～５重量部である。上記含有量が、０．０００１重量部未満の場合は、結晶核剤としての所定の効果が得られにくく、１０重量部を超える場合は、配合に見合うだけの効果が得られにくく、不経済であって現実的ではない。上記顔料としては、その種類は特に限定されるわけではないが、具体的には、無機顔料としては酸化チタン、三酸化アンチモン、亜鉛華、リトポン、鉛白等の白色顔料、カーボンブラック、黄鉛、モリブデン赤、べんがら等の着色顔料など、また、有機顔料としてはベンジジン、ハンザイエローなどのアゾ化合物やフタロシアニンブルーなどのフタロシアニン類などを好ましく挙げることができ、これらは単独で用いても、２種以上を併用してもよい。

【００３０】本発明のポリエステル樹脂組成物を耐候性の必要な環境で用いる場合は、上記顔料としては耐候性の良好なものを選択することが望ましく、例えば、白色顔料である酸化チタンに関してはアナターゼ型の酸化チタンを用いるよりもルチル型の酸化チタンを用いる方が塗膜の耐候性の面で好ましい。また、ルチル型としては、硫酸法酸化チタンよりは塩素法酸化チタンのほうが長期に耐候性を維持発現させることができるので好ましい。上記骨材としては、その種類は透明骨材でも着色骨材であってもよく、具体的には、特に限定されるわけではないが、透明骨材としては長石、硅砂、硅石、寒水砂、ガラスビーズ、合成樹脂ビーズなど、また、着色骨材としては大理石粉、御影石粉、蛇紋岩、蛍石、着色硅砂粉、有色陶磁器粉などを好ましく挙げることができ、これらは単独で用いても、２種以上を併用してもよい。

【００３１】本発明でいう重量平均分子量Ｘとは、本発明にかかるポリエステル樹脂組成物中の樹脂分についての重量平均分子量であり、かつ、該樹脂組成物の粘度指数（ＭＩ）の測定時における樹脂分の重量平均分子量である。なお、本発明においては、上記粘度指数（ＭＩ）の測定時とは、粘度指数（ＭＩ）の測定後であるとしてよい。よって、ＭＩ測定直後（ＭＩ測定装置から押し出された直後）の流動性のあるポリエステル樹脂組成物について、その樹脂組成物に含まれる樹脂分の重量平均分子量を以下の方法により測定する。また、上記樹脂分の重量平均分子量Ｘの測定方法は、特に限定されるわけではないが、一般的には、例えば、ＧＰＣ（ゲルパーミエーションクロマトグラフィー）を用いて測定する方法が好ましく挙げられ、具体的には、クロロホルム等の溶媒により、本発明のポリエステル樹脂組成物中の樹脂分のみを溶出して溶離液とし測定する。上記ＧＰＣとしては、特に限定はされないが、具体的には、例えば、カラムとしてＳｈｏｄｅｘ Ｋ－８０５、８０４、８０３および８０２（昭和電工（株）製）を備えたＨＬＣ－８０２０（東ソー（株）製）などを挙げることができる。また、測定条件としては、上記溶離液を、４０℃、１ｍｌ／分でカラムに通して測定する条件が挙げられる。

【００３２】一方、上記樹脂分が脂肪族ポリエステル以外の他の樹脂を含む場合についても、上述の測定方法と同様の方法により樹脂分の重量平均分子量Ｘを求めることができるが、この際求める重量平均分子量Ｘは、上記樹脂分に対し測定し算出した重量平均分子量であり、つまり、上記樹脂分に含まれる各樹脂それぞれの重量平均分子量が平均された値であるとする。本発明でいう粘度

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指数Ｙとは、通常一般的に樹脂等の流動性の指標として考えられているメルトインデックス（ＭＩ）を、本発明にかかるポリエステル樹脂組成物について測定した値のことである。このＭＩの測定方法としては、具体的には、ＪＩＳ　Ｋ７２１０に基づく測定方法が挙げられる。

【００３３】本発明でいうポリエステル樹脂組成物は、前記式（１）を満たす樹脂組成物であるため、樹脂分が高い重量平均分子量であるとともに樹脂組成物全体で高い流動性を有するといった、両方の特性を兼ね備え、成形性に優れている。よって、押出し成形、射出成形、中空成形および真空成形等のための成形材料として用いる場合には、エネルギーコストの低減や生産性の向上を達成した状態で、各種部品、容器、器具、フィルム、シートおよび繊維等の成形品を得ることができる。

〔脂肪族ポリエステル〕本発明にかかる脂肪族ポリエステル（以下、本発明の脂肪族ポリエステルと称することがある。）は、環状酸無水物と環状エーテルとを開環重合して得られる重合体と、多価酸無水物と、を反応させて得られる。

【００３４】上記環状酸無水物としては、特に限定はされないが、具体的には、例えば、上記本発明のポリエステル樹脂組成物の説明において記載した環状酸無水物の具体例と同様のものを好ましく挙げることができる。上記環状エーテルとしては、特に限定はされないが、具体的には、例えば、上記本発明のポリエステル樹脂組成物の説明において記載した環状エーテルの具体例と同様のものを好ましく挙げることができる。上記重合体を得る場合には、環状酸無水物および環状エーテル以外にも、他の単量体を使用してよく、その種類は特に限定はされないが、具体的には、例えば、上記本発明のポリエステル樹脂組成物の説明において記載した多塩基酸（あるいは、そのエステル）、グリコール、ヒドロキシカルボン酸（あるいは、そのエステル）、環状エステルなどを好ましく挙げることができる。

【００３５】上記多価酸無水物としては、特に限定はされないが、具体的には、例えば、上記本発明のポリエステル樹脂組成物の説明において記載した多価酸無水物の具体例と同様のものを好ましく挙げることができる。本発明においては、多価酸無水物は、鎖延長剤として、複数の上記重合体（環状酸無水物と環状エーテルとを開環重合して得られる重合体）と反応し結合することによって、上記重合体どうし間に介在する構造となり、上記重合体を高分子量化させ得る。具体的には、上記重合体の分子量が１００，０００未満であっても、容易に高分子量化させることができる。

【００３６】本発明の脂肪族ポリエステルを得る方法としては、上述のように、上記環状酸無水物と環状エーテルとを開環重合して得られる重合体を、多価酸無水物と反応させる方法が好ましい。上記開環重合は、オクチル酸ジルコニール、テトラアルコキシジルコニウム、トリアルコキシアルミニウム化合物等の金属アルコキシド化合物等の通常公知の開環重合触媒を用い、ベンゼン、トルエン、キシレン、シクロヘキサン、ｎ－ヘキサン、ジオキサン、クロロホルム、ジクロロエタン等の不活性溶媒中での重合や塊状重合等の方法により行うことができる。

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【００３７】上記開環重合においては、反応温度は１２０～１８０℃とすることが好ましく、１２５～１５０℃がより好ましい。１２０℃未満の場合、反応が進まず所望の脂肪族ポリエステルが得られないおそれがあり、１８０℃を超える場合は、熱変性物などのゲル状成分が多くなり、所望の脂肪族ポリエステルが得られないおそれがある。また、反応時間は１～２０時間とすることが好ましく、より好ましくは３～１５時間である。１時間未満の場合、共重合性がくずれ、所望の脂肪族ポリエステルが得られないおそれがあり、２０時間を超える場合、熱変性物などのゲル状分が多くなり、同様に所望の脂肪族ポリエステルが得られないおそれがある。

【００３８】このようにして得られる上記重合体と上記多価酸無水物との反応においては、上記重合体を合成した後に上記多価酸無水物を添加して両者を反応させてもよいし、多価酸無水物の存在下で上記重合体を合成しながら両者を反応させてもよいし、上記重合体の合成途中で多価酸無水物を添加（一括添加および／または逐次添加（連続的添加および／または間歇的添加））して両者を反応させてもよく、両者の反応のさせ方については、特にこれらに限定はされない。具体的な反応方法・反応手順としては、例えば、上記重合体を合成した後に上記重合体を適当な溶媒に溶かして多価酸無水物と反応させる方法、上記重合体を加熱溶融させて多価酸無水物と反応させる方法などが挙げられるが、特にこれらに限定はされない。

【００３９】上記多価酸無水物の使用量は、上記重合体に対して０．００１～１０重量％であれば特に限定はされず、好ましくは０．０１～５重量％である。０．００１重量％未満であると所望の効果は得られにくく、１０重量％を超えるとゲル状分を含むため成形性が悪くなる。また、多価酸無水物の存在下で上記重合体の合成する場合や、上記重合体の合成途中に多価酸無水物を添加して使用する場合は、重合体の合成に用いる単量体の全重量に対して、０．００１～１０重量％であれば特に限定はされず、好ましくは０．０１～５重量％である。０．００１重量％未満であると所望の効果が得られないおそれがあり、１０重量％を超えるとゲル状分を含むため成形性が悪くなるおそれがある。

【００４０】上記重合体と上記多価酸無水物との反応においては、反応温度は、１２０～１８０℃であることが好ましく、より好ましくは１２５～１５０℃である。反応温度が１２０℃未満の場合は、反応が進まず所望の脂

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肪族ポリエステルが得られないおそれがあり、１８０℃を超える場合は、熱変性物などのゲル状分が多くなり所望の脂肪族ポリエステルが得られないおそれがある。上記重合体と上記多価酸無水物との反応においては、反応時間は、１～２０時間であることが好ましく、より好ましくは３～１５時間である。反応時間が１時間未満の場合は、共重合性がくずれ所望の脂肪族ポリエステルが得られないおそれがあり、２０時間を超える場合は、熱変性物などのゲル状分が多くなり所望の脂肪族ポリエステルが得られないおそれがある。

【００４１】上記重合体と上記多価酸無水物との反応においては、反応圧力は、特に限定されるわけではなく、適宜所望の脂肪族ポリエステルが得られるよう設定すればよい。上記重合体と上記多価酸無水物との反応においては、上記各反応条件下での反応後、得られた重合体を熟成させることが好ましいが、その場合、熟成温度、熟成時間は、特に限定されるわけではなく、適宜所望の脂肪族ポリエステルが得られるよう設定すればよい。本発明の脂肪族ポリエステルについては、その重量平均分子量は、１，０００～５００，０００であることが好ましく、より好ましくは１００，０００～４００，０００である。重量平均分子量が、１，０００未満であると本発明の脂肪族ポリエステルの効果が得られないおそれがあり、５００，０００を超える場合は、本発明の脂肪族ポリエステルの流動性が低くなりすぎて成形が困難となるおそれがある。

【００４２】本発明の脂肪族ポリエステルについては、その分子量分布は、１．５～１０であることが好ましく、より好ましくは２～５である。分子量分布が、１．５未満であると、多価酸無水物の効果が小さいと考えられ、１０を超える場合は、多価酸無水物の影響が大きくゲル状分を含んでいると考えられる。本発明の脂肪族ポリエステルについては、メルトインデックス（ＭＩ）の値は、０．１～１００であることが好ましく、より好ましくは１～５０である。ＭＩ値が０．１未満であると、いかなる成形においても粘度が高すぎて困難となるおそれがあり、１００を超える場合は、粘度が低すぎて成形には適さないおそれがある。

【００４３】本発明の脂肪族ポリエステルは、特性として重量平均分子量の高さとともに優れた流動性を兼ね備え、特に成型加工性などに優れている。よって、本発明の脂肪族ポリエステルの用途については、特に限定されるわけではないが、具体的には、例えば、上述した本発明のポリエステル樹脂組成物に含まれる脂肪族ポリエステルとしても好適に用いることができるが、その他にも、可塑剤、潤滑剤、粘着剤などにも好ましく用いることができ、本発明の脂肪族ポリエステルの優れた効果十分に発揮することができる。

【００４４】

【実施例】以下に実施例によりさらに詳細に本発明を説明するが、本発明はこれに限定されるものではない。なお、以下においては、便宜上、「重量部」を単に「部」と記すことがある。また、便宜上、「重量％」を単に「％」と記すことがある。本発明の実施例、比較例における測定、評価法を説明する。

〔重量平均分子量〕ＧＰＣ（ゲルパーミエーションクロマトグラフィー）により測定する。ＧＰＣ測定は、カラムとしてＳｈｏｄｅｘ Ｋ－８０５、８０４、８０３および８０２（昭和電工（株）製）を直列に備えたＨＬＣ－８０２０（東ソー（株）製）を用い、測定条件としては、クロロホルムによる溶離液を、４０℃、１ｍｌ／分でカラムに通して測定した。

【００４５】なお、本発明の実施例、比較例においては、「ＭＩ測定後の重量平均分子量」とは、ＭＩ測定直後（ＭＩ測定装置から押出された直後）に樹脂（または、樹脂組成物）をクロロホルムに溶かして１％溶液とした状態で測定した重量平均分子量であり、すなわち、これをＭＩ測定時の樹脂（または、樹脂組成物）の重量平均分子量であるとする。

〔メルトインデックス（ＭＩ）〕ＪＩＳ Ｋ７２１０に準拠する。ＪＩＳ Ｋ７２１０に基づくメルトインデックス（ＭＩ）の測定方法は、２１６０ｇの荷重をピストン上に加えたときに、１９０℃の樹脂組成物の溶融体が、特定のオリフィスを通して１０分間に押し出される重量（ｇ）を測定する方法である。よって、ＭＩの単位は「ｇ／１０ｍｉｎ」となり、ＭＩの値が小さいほど、流動性が低いことを意味する。

【００４６】－実施例１－

１リットルのＳＵＳ製反応器に、無水コハク酸１１０部、オクチル酸ジルコニール１．６７部、ピロメリット酸無水物０．２３部および脱水トルエン２２０部を加え、窒素置換を行った。次いで、攪拌下でＳＵＳ反応器を徐々に１３０℃まで昇温して無水コハク酸を溶解し、同温度でＳＵＳ製反応器の圧力を０．２９～０．６９ＭＰａ（ゲージ圧）に維持しながら、酸化エチレン７０．９部を１時間あたり１４．０部の添加速度で５時間にわたって連続的に投入した。

【００４７】酸化エチレン投入後、１３０℃で１．０時間熟成反応を行い，実施例１の脂肪族ポリエステルを得た。この脂肪族ポリエステルの、ＧＰＣ測定による重量平均分子量は２８５，０００、分子量分布は４．０、メルトインデックス（ＭＩ）は８５であった。また、ＧＰＣ測定によるＭＩ測定後の重量平均分子量は１１５，０００であった。

－実施例２－

ピロメリット酸無水物を０．３４部とする以外は、実施例１と同様の操作を行い、実施例２の脂肪族ポリエステルを得た。この脂肪族ポリエステルのＧＰＣ測定による重量平均分子量は３５６，０００、分子量分布は５．０、メルトインデックス（ＭＩ）は９０であった。ま

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た、ＧＰＣ測定によるＭＩ測定後の重量平均分子量は、１７０，０００であった。

【００４８】－実施例３－

１リットルのＳＵＳ製反応器に、無水コハク酸１１０部、オクチル酸ジルコニール１．６７部、ピロメリット酸無水物０．２３部および脱水トルエン２２０部を加え、窒素置換を行った。次いで、撹拌下でＳＵＳ反応器を徐々に１３０℃まで昇温して無水コハク酸を溶解し、同温度でＳＵＳ製反応器の圧力を０．２９～０．６９ＭＰａ（ゲージ圧）に維持しながら、酸化エチレン７０．９部を１時間あたり１４．０部の添加速度で５時間にわたって連続的に投入した。

【００４９】酸化エチレン投入後、１３０℃で１．０時間熟成反応を行い、脂肪族ポリエステル（１）を得た。脂肪族ポリエステル（１）のＧＰＣ測定による重量平均分子量は、２８５，０００であった。得られた脂肪族ポリエステル（１）３０部、イルガノックス１０１０（チバガイギー社製酸化防止剤の商品名）０．１５部およびステアリン酸リチウム０．１５部を、ラボプラストミル（東洋精機社製小型二軸混練装置の製品名）を用いて、３０ｒｐｍ、ヒーター温度１３０℃の条件下で混合し、成形材料用ポリエステル樹脂組成物（１）を得た。

【００５０】次に、得られた成形材料用ポリエステル樹脂組成物（１）について、８０℃で１０時間減圧下で乾燥後、ＪＩＳ　Ｋ７２１０に基づくＭＩ（メルトインデックス）測定を行った。その結果、ＭＩは４５で、ＧＰＣ測定によるＭＩ測定後の樹脂分の重量平均分子量は１５０，０００であった。ここで、Ｘ＝１５０，０００、Ｙ＝４５としたところ、成形材料用ポリエステル樹脂組成物（１）は、前記式（１）を満たすものであった。

－実施例４－

ピロメリット酸無水物を０．３４部とする以外は、実施例３と同様にして、脂肪族ポリエステル（２）を得た。脂肪族ポリエステル（２）のＧＰＣ測定による重量平均分子量は、３５６，０００であった。

【００５１】得られた脂肪族ポリエステル（２）３０部、実施例１でも用いたイルガノックス０．１５部およびステアリン酸リチウム０．１５部を、ラボプラストミルを用いて、３０ｒｐｍ、ヒーター温度１３０℃の条件下で混合し、成形材料用ポリエステル樹脂組成物（２）を得た。次に、得られた成形材料用ポリエステル樹脂組成物（２）について、８０℃で１０時間減圧下で乾燥後、ＪＩＳ　Ｋ７２１０に基づくＭＩ（メルトインデックス）測定を行った。その結果、ＭＩは３９で、ＧＰＣ測定によるＭＩ測定後の樹脂分の重量平均分子量は２１０，０００であった。

【００５２】ここで、Ｘ＝２１０，０００、Ｙ＝３９としたところ、成形材料用ポリエステル樹脂組成物（２）は、前記式（１）を満たすものであった。

－比較例１－

１リットルのガラス製反応器に、コハク酸５１９部および１，４－ブタンジオール４１７部を加え、窒素置換を行った。次いで、窒素ブローのもと撹拌下にガラス製反応器を徐々にヒーター温度１７０℃まで昇温し、３時間後に水が留分として１３５部得られた。引き続いて１時間かけて減圧を行い、０．８～６ｍｍＨｇの減圧下、ヒーター温度１７０℃で２．５時間反応を行った。さらにヒーター温度２１０℃で５時間反応を行った結果、脂肪族ポリエステル（１１）を得た。脂肪族ポリエステル（１１）のＧＰＣ測定による重量平均分子量は、１２，６００であった。

【００５３】得られた脂肪族ポリエステル（１１）１００部に、チタンテトライソプロポキシド０．０１６部を加え、０．３～１．０ｍｍＨｇの減圧下、ヒーター温度２２０℃で５．２５時間、引き続いて２４０℃で２．５時間反応を行った。反応後、さらに、１００ｍＬのガラス製反応容器中に移し、ヘキサメチレンジイソシアネート０．１２部を加え、窒素ブローのもと撹拌下、１８０℃で２時間反応させて、脂肪族ポリエステル（１１'）を得た。得られた脂肪族ポリエステル（１１'）３０部、実施例１でも用いたイルガノックス０．１５部およびステアリン酸リチウム０．１５部を、ラボプラストミルを用いて、３０ｒｐｍ、ヒーター温度１３０℃の条件下で混合し、成形材料用ポリエステル樹脂組成物（１１）を得た。

【００５４】得られた成形材料用ポリエステル樹脂組成物（１１）について、８０℃で１０時間減圧下で乾燥後、ＪＩＳ　Ｋ７２１０に基づくＭＩ（メルトインデックス）測定を行った。ＭＩは２で、ＧＰＣ測定によるＭＩ測定後の樹脂分の重量平均分子量は１８０，０００であった。ここで、Ｘ＝１８０，０００、Ｙ＝２としたところ、成形材料用ポリエステル樹脂組成物（１１）は、前記式（１）を満たさないものであった。

－実施例５－

成形材料用ポリエステル樹脂組成物（２）９部と、成形材料用ポリエステル樹脂組成物（１１）２１部とを、ラボプラストミルを用いて、３０ｒｐｍ、ヒーター温度１３０℃の条件下で混合し、成形材料用ポリエステル樹脂組成物（３）を得た。この成形材料用ポリエステル樹脂組成物（３）では、その樹脂分が、脂肪族ポリエステル（１）と脂肪族ポリエステル（１１）とをブレンドしたものとなる。

【００５５】次に、得られた成形材料用ポリエステル樹脂組成物（３）について、８０℃で１０時間減圧下で乾燥後、ＪＩＳ　Ｋ７２１０に基づくＭＩ（メルトインデックス）測定を行った。その結果、ＭＩは８で、ＧＰＣ測定によるＭＩ測定後の樹脂分の重量平均分子量は１８６，０００であった。ここで、Ｘ＝１８６，０００、Ｙ＝８としたところ、成形材料用ポリエステル樹脂組成物（３）は、前記式（１）を満たすものであった。

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【００５６】

【表１】

	実施例 3	実施例 4	実施例 5	比較例 1
ＭＩ測定時の重量平均分子量	150,000	210,000	186,000	180,000
ＭＩ (g／10min)	45	39	8	2
引っ張り強度 (MPa)	32	38	42	48
成形性	○	○	○	×

【００５７】

【発明の効果】本発明によれば、生分解性の脂肪族ポリエステルを用いた組成物における、重量平均分子量の確保と流動性の確保の両立を可能とし、その結果、機械的強度に優れるとともに成形性も良好であるという利点を合わせ持つポリエステル樹脂組成物、および、該樹脂組成物に好適に用いることのできる脂肪族ポリエステルを提供することができる。

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フロントページの続き

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(71)Applicant : OJI PAPER CO LTD
(72)Inventor : SAKO TAKASHI

(54) MOISTUREPROOF LAMINATE AND MOISTUREPROOF COATING MATERIAL

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a moistureproof laminate which shows water disaggregation properties and can be recycled and reused as wastepaper and further, in detail, exhibits improved moistureproofness and imparted biodegradability.
SOLUTION: This moistureproof laminate has a moistureproof layer containing a biodegradable resin and a flat sheet-like pigment, formed on at least one side of a paper support. The moistureproof layer preferably contains a moistureproofness improver. In addition, the biodegradable resin is preferably one kind selected from among a microbiologically produced polyester resin, an aliphatic polyester resin, a polylactic acid resin and an acetic acid cellulose resin.

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最終頁に続く

(54)【発明の名称】　防湿積層体及び防湿性塗料

(57)【要約】
【課題】　水離解性を有して、古紙として再生、再利用可能な防湿積層体に関するものであって、さらに詳述すれば、防湿性を向上させると同時に、生分解性を付与した防湿積層体を提供する。
【解決手段】　紙支持体の少なくとも片面に生分解性樹脂と平板状顔料を含む防湿層を有する防湿積層体。該防湿層は防湿性向上剤を含むことが好ましい。また該生分解性樹脂が、微生物産性ポリエステル系樹脂、脂肪族ポリエステル系樹脂、ポリ乳酸系樹脂、酢酸セルロース系樹脂から選ばれる少なくとも一種であることが好ましい。

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【特許請求の範囲】

【請求項１】紙支持体の少なくとも片面に生分解性樹脂と平板状顔料を含む防湿層を有することを特徴とする防湿積層体。

【請求項２】防湿層が防湿性向上剤を含むことを特徴とする請求項１記載の防湿積層体。

【請求項３】生分解性樹脂が、微生物産性ポリエステル系樹脂、脂肪族ポリエステル系樹脂、ポリ乳酸系樹脂、酢酸セルロース系樹脂から選ばれる少なくとも一種であることを特徴とする請求項１～２のいずれかに記載の防湿積層体。

【請求項４】平板状顔料が、アスペクト比５以上かつ粒子径が２０ｎｍ～１００μｍであることを特徴とする請求項１～３のいずれかに記載の防湿積層体。

【請求項５】防湿性向上剤が、尿素－ホルムアルデヒド縮合反応生成物、メラミン－ホルムアルデヒド縮合反応生成物、炭素原子数が１～８個のアルデヒド化合物、１個以上のエポキシ基を有するエポキシ化合物、架橋反応性多価金属化合物、オルガノアルコキシシラン化合物、オルガノアルコキシ金属化合物、有機アミン化合物、アンモニア、ポリアミド化合物、ポリアミドポリ尿素化合物、ポリアミンポリ尿素化合物、ポリアミドアミンポリ尿素化合物、ポリアミドアミン化合物、ポリアミドアミン－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミン－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミドポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、及びポリアミドアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物から選ばれた少なくとも１種を含むことを特徴とする請求項２～４のいずれかに記載の防湿性積層体。

【請求項６】生分解性樹脂と平板状顔料を含むことを特徴とする防湿性塗料。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、水離解性を有し、古紙として再利用可能な防湿積層体に関するものであり、更に詳述すれば、生分解性を有する防湿積層体、及び防湿性塗料に関するものである。

【０００２】

【従来の技術】従来より上質紙、晒クラフト紙、未晒クラフト紙、各種の塗工紙等の巻取りや平判の包装には、紙製品の吸湿を防ぐために、ポリエチレン、ポリプロピレン等のポリオレフィン樹脂等を紙にラミネートした、耐湿、耐水性を有するポリオレフィンラミネート紙（以下ポリラミ紙）が包装紙として広く使用されている。また、セメント袋、塩袋、飼料袋、肥料袋等の重袋用原紙は、中身の吸湿、吸水を防止しながら重量物を搬送する用途のため防湿性と強度が要求されるため、ポリオレフィン樹脂をクラフト紙にラミネートしたポリラミ紙とクラフト紙を積層したもの等が広く使用されている。しかし、これらポリラミ紙は、使用後回収しても、ポリラミ層の存在のため、水に十分に再離解しないため、古紙として再使用できないことが問題となっている。従って、使用済みのポリラミ紙を廃棄する場合は、焼却や埋立てによる手段をとらざるを得ないため環境汚染となる懸念がある。特に埋立て処分の場合、支持体である紙には生分解性があるものの、ポリエチレン等のポリオレフィン樹脂は生分解性が極めて低いため、分解せずに長期間に渡って残留するという問題がある。

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【０００３】上記のように、従来のポリラミによって得られた防湿紙には問題があり、これに代わる防湿紙の開発がなされている。このための技術の一つとして、紙基材にブタジエン系ラテックスにワックスをブレンドした配合物を塗工して防湿紙を得る技術が提案されている（特公昭５５－２２５９７号公報）。しかし、この技術はワックスを用いるため、防湿紙同士を重ねて置いた際に生ずる「すべり」の問題や、防湿紙に印刷する際の印刷適性の点で問題であった。また、上記配合物の紙への塗工によって、ポリラミ紙に匹敵する防湿性を有する防湿紙を得ることは不可能であった。また、パラフィンワックス、マレイン化もしくはフマール化ロジンと多価アルコールとのエステル化物、液状ポリブテン及びロジンなどを主成分とするワックスエマルジョン、あるいは前記ワックスエマルジョンと合成ゴム系ラテックスとの混合物を紙基材表面に塗布し、加温下で乾燥させた防湿紙の製造方法が提案されている（特開昭６１－４７８９６号公報）。しかし、この方法で得られる防湿紙をロール状とした場合、支持体の裏面にも表面防湿層の含有するワックス成分が僅かに浸出するため、前記防湿紙により包装された高重量のロール状巻取紙を搬送する際、包装紙とその内容物が滑りによるずれを生じたり、それによって包装紙の破れ、内容物の落下などという問題が発生する。

【０００４】更に、防湿層表面にワックスを含む場合、防湿紙表面にはラベル等を貼り付けることができず、また貼付してもすぐ剥がれてしまうという問題がある。また、包装紙による包装時に通常用いられる接着剤によって紙同士を接着した場合、接着不良となるおそれがある。例えば一般的に使用される酢ビエマルジョン系接着剤では、表面のはじき性のため塗工が不可能、もしくは塗工できても接着性が発揮されない。従って、接着にはホットメルト接着剤、中でも特に常温で流動性があって粘着力を有する合成ゴム系のホットメルト接着剤等、限定された接着剤を用いる必要がある。しかし、このような合成ゴム系のホットメルト接着剤は、常温でべたつきが著しく取り扱いが難しく、更に通常のホットメルトのような扱いやすい数ｃｍ各程度のペレットではなく、数十ｃｍ角のブロック状のものしかないため作業性が悪

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く、コスト高になるという問題がある。粘着テープを使用して包装材を接着する方法もあるが、接着剤による接着に比べ、粘着テープを使用する場合は、包装時の作業性が大幅に劣る欠点があり、特定の用途にしか用いることができないのが現状である。

【０００５】そこで、これら問題を解決するために、支持体裏面に両性化合物よりなる防滑層を設けた防湿紙が提案されている(特公昭５６－１８７１２号)。しかし、支持体表面に防湿層、裏面に防滑層を設けた防湿性積層体のシートを巻取りとして仕上げた場合、その巻き圧が高くなると、防滑層顔料が防湿層表面に損傷を与え防湿性能の劣化が発生する。このため巻き圧を低くする必要があるが、巻き圧の低下は巻き取り時の巻き滑り発生による長尺巻取りの製造を不可能としたり、巻き取り側面の不揃いによる後工程での大幅な作業性の低下などが付随するという問題を有している。以上のように、離解性を有し、プラスチックフイルムに勝る防湿性を有するワックスを含んだ防湿紙で、滑りによる問題が発生しない防湿紙は存在していないのが現状である。

【０００６】ワックスを用いない防湿紙としては、本発明者等が紙支持体上に平板状顔料と合成樹脂ラテックスとからなる防湿層を設けた防湿積層体（特開平９－２１０９６号）を提案した。この発明においては、それ自体は水蒸気を通さないと思われる顔料、例えばフィロケイ酸塩化合物のような平板状顔料を合成樹脂ラテックスなどの重合体と混合したものを塗工、防湿層を形成させたものである。その防湿メカニズムは、平面的には水蒸気の透過面積が小さくなること、また厚み方向では、平板状顔料が防湿層表面に対して平行に配列して積層するため、防湿層中の水蒸気はこの平板状顔料を迂回しながら透過することから（曲路効果）、水蒸気の透過距離が長くなり、結果として大幅に防湿性能が向上するものである。

【０００７】しかしながら、このような平板状顔料を使用した防湿紙は古紙として再利用できるものの、使用後ゴミとして埋立て処分された場合、防湿層が生分解性に乏しいため自然分解されず埋立地の土壌中に長期渡って残留するといった問題がある。

【０００８】

【発明が解決しようとする課題】本発明の目的は、水離解性を有し、古紙として再利用可能な防湿積層体において、防湿性を高め、更に生分解性を有する防湿積層体、及び防湿性塗料を提供するものである。

【０００９】

【課題を解決するための手段】本発明は上記課題を解決するために以下の方法をとる。即ち、本発明の第１は、紙支持体の少なくとも片面に生分解性樹脂と平板状顔料を含む防湿層を有する防湿積層体である。

【００１０】本発明の第２は、防湿層が防湿性向上剤を含む本発明の第1記載の防湿積層体である。

【００１１】本発明の第３は、生分解性樹脂が、微生物産性ポリエステル系樹脂、脂肪族ポリエステル系樹脂、ポリ乳酸系樹脂、酢酸セルロース系樹脂から選ばれる少なくとも一種である本発明の第１～２のいずれかに記載の防湿積層体である。

【００１２】本発明の第４は、平板状顔料が、アスペクト比５以上かつ粒子径が２０ｎｍ～１００μｍである本発明第１～３のいずれかに記載の防湿積層体である。

【００１３】本発明の第５は、防湿性向上剤が、尿素－ホルムアルデヒド縮合反応生成物、メラミン－ホルムアルデヒド縮合反応生成物、炭素原子数が１～８個のアルデヒド化合物、１個以上のエポキシ基を有するエポキシ化合物、架橋反応性多価金属化合物、オルガノアルコキシシラン化合物、オルガノアルコキシ金属化合物、有機アミン化合物、アンモニア、ポリアミド化合物、ポリアミドポリ尿素化合物、ポリアミンポリ尿素化合物、ポリアミドアミンポリ尿素化合物、ポリアミドアミン化合物、ポリアミドアミン－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミン－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミドポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、及びポリアミドアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物から選ばれた少なくとも１種を含む本発明の第２～４のいずれかに記載の防湿性積層体である。

【００１４】本発明の第６は、生分解性樹脂と平板状顔料を含むことを特徴とする防湿性塗料である。

【００１５】

【発明の実施の形態】以下に本発明について詳細に説明する。本発明で使用する分解性樹脂としては、生分解性、即ち土壌、水中の微生物、あるいは水、光により分解され、最終的に水、二酸化炭素等の自然物に分解される性質を有する樹脂であれば特に制限はない。また、完全に分解されなくとも原形をとどめない形で崩壊する樹脂も本発明の範疇とする。このような生分解性樹脂としては、微生物産性ポリエステル系樹脂、脂肪族ポリエステル系樹脂、ポリ乳酸系樹脂、酢酸セルロース系樹脂等が挙げられる。微生物産性ポリエステル系樹脂としては、グルコースから微生物により作られるポリヒドロキシバリレート・ブチレート共重合体（３－ヒドロキシ吉草酸と３－ヒドロキシ酪酸の共重合体、日本モンサント「バイオポール」、三菱ガス化学「ビオグリーン」）が挙げられる。脂肪族ポリエステル系樹脂としては、二塩基酸を含む多価カルボン酸とジオールを含む多価アルコールとの重縮合物、ラクトンの開環重合物、ヒドロキシ脂肪族酸の重縮合物、コハク酸、エチレングリコール、１，４－ブタンジオールの重縮合物により得られるポリエチレンサクシネート・ポリブチレンサクシネート（昭和高分子「ビオノーレ」、Ｉｒｅ　Ｃｈｅｍｉｃａｌｓ

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「Ｅｎｐｏｌ」、三菱ガス化学「ユーペック」、ＢＡＳＦ「Ｅｃｏｆｌｅｘ」、Ｄｕｐｏｎｔ「Ｂｉｏｍａｘ」、Ｅａｓｔｍａｎ Ｃｈｅｍｉｃａｌｓ「ＥａｓｔａｒＢｉｏ」、日本触媒「ルナーレＳＥ」）、ポリプロピオラクトン、ポリカプロラクトン（ダイセル化学「セルグリーン」、Ｄｏｗ「ＴＯＮＥ」）等が挙げられる。ポリ乳酸系樹脂としては、乳酸の縮合重合により得られるポリ乳酸単独、あるいは脂肪族ジカルボン酸、グリコール等との共重合体が挙げられる（島津製作所「ラクティ」、三井化学「レイシア」、Ｃａｒｇｉｌ－Ｄｏｗ「ＮａｔｕｒｅＷｏｒｋｓ」）。

【００１６】天然物系の生分解性樹脂としては、デンプンを化学的に変性したもの（日本コーンスターチ「コーンポール」）、酢酸セルロース系樹脂（ダイセル化学工業「セルグリーンPCA」、日本触媒「ルナーレZT」、帝人「セルロースアセテート」）、キトサン系樹脂（アイセロ化学「ドロンVA」）等が挙げられる。上記生分解性樹脂中に、生分解速度調整等のために、生分解性のある天然物、例えば澱粉等を添加してもよい（日本合成化学「マターピー」、日本食品化工「プラコーン」）。更に、物性調整等のためにタルク、アルミナ、ワラスナイトセルロース等の充填剤や、可塑剤、熱安定剤、加工助剤、酸化防止剤、植物油脂、顔料、紫外線吸収剤等の各種薬品を添加してもよい。

【００１７】また、生分解性樹脂には、光分解促進剤や生分解促進剤が含まれることが好ましい。光分解促進剤としては光励起剤と増感剤が挙げられる。光励起剤には、ベンゾフェノンとその誘導体（ベンゾイン類、ベンゾインアルキルエーテル類、ベンゾフェノン、４，４－ビス（ジメチルアミノ）ベンゾフェノンなど）、アセトフェノンとその誘導体（アセトフェノン、α，α－ジエトキシアセトフェノンなど）、キノン類、チオキサントン類、フタロシアニンなどが挙げられる。増感剤にはアナターゼ型酸化チタン、エチレン－一酸化炭素共重合体、芳香族ケトンと金属塩との複合体などが挙げられる。また、これら光分解促進剤は２種以上併用してもよい。また、生分解促進剤には、オキソ酸（例えば、グリコール酸、乳酸、クエン酸、酒石酸、リンゴ酸、などの炭素数２～６程度のオキソ酸）、飽和ジカルボン酸（例えば、修酸、マロン酸、コハク酸、無水コハク酸、グルタル酸、などの炭素数２～６程度の低級飽和ジカルボン酸など）などの有機酸；これらの有機酸と炭素数１～４程度のアルコールとの低級アルキルエステル等が例示される。好ましい生分解促進剤としては、クエン酸、酒石酸、リンゴ酸などの炭素数２～６程度の有機酸、及び椰子殻活性炭等が含まれる。また、これら生分解促進剤は２種以上併用してもよい。

【００１８】本発明に用いられる生分解性樹脂層を得るための樹脂又は樹脂組成物の好ましいメルトフローインデックス（ＭＦＲ）は、１９０℃、荷重２，１６０ｇで

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測定した場合、０．５～１００ｇ/１０minであり、更に好ましくは１～２０ｇ/１０min、最も好ましくは１～５ｇ/１０minである。

【００１９】これら生分解性樹脂の中で、本発明においては、防湿性の面から、微生物産性ポリエステル系樹脂、脂肪族ポリエステル系樹脂、ポリ乳酸系樹脂、酢酸セルロース系樹脂が特に好ましい。

【００２０】なお、ポリビニルアルコールやデンプンなども生分解性樹脂として扱う場合もあるが、本発明においては、防湿性が極めて劣るため、使用することができない。本発明に使用可能な生分解性樹脂の防湿性の目安としては、厚さ２０μｍのフィルム状とした場合、透湿度が１０００ｇ/ｍ²・２４hr以下、より好ましくは５００ｇ/ｍ²・２４hr以下、更に好ましくは３００ｇ/ｍ²・２４hr以下である。透湿度が１０００ｇ/ｍ²・２４hr以下より大きい樹脂、例えばポリビニルアルコール系樹脂などは、平板状顔料や防湿性向上剤を添加しても防湿性に限界があるため好ましくない。

【００２１】本発明で使用できる平板状顔料としては、第１にはフィロケイ酸塩鉱物が挙げられる。フィロケイ酸塩鉱物に属するものは板状又は薄片状で明瞭な劈開性を有し、雲母族、パイロフィライト、タルク（滑石）、緑泥石、セプテ緑石、蛇紋石、スチルプノメレーン、粘土鉱物などがある。これらの中でも産出される時の粒子が大きく産出量が多い鉱物、例えば雲母族やタルクが好ましい。雲母族には、白雲母（マスコバイト）、絹雲母（セリサイト）、金雲母（フロコパイト）、黒雲母（バイオタイト）、フッ素金雲母（人造雲母、合成マイカ）、紅マイカ、ソーダマイカ、パナジンマイカ、イライト、チンマイカ、パラゴナイト、ブリトル雲母、カリ四ケイ素雲母、ナトリウム四ケイ素雲母、ナトリウムテニオライト、リチウムテニオライトなどが挙げられる。また、合成雲母などの合成品も本発明の範疇に含むものとする。

【００２２】カオリンなどの粘土鉱物も一般的には平板結晶といわれている。しかし、結晶一個をとれば平板の部分はあるが全体としては粒状である。しかし、カオリンのうち、意識的に結晶層を剥離し平板になるように切りだしたデラミカオリンなどは本発明ににおける平板状顔料として用いることができる。また、平板状顔料の粒子径は、防湿層の膜厚に対応したものを使用したほうが好ましい。その場合は、平板状顔料をボールミル、サンドグラインダー、コボルミル、ジェットミルなどの粉砕機で粉砕分級して所望の粒子径を得た後本発明に使用するものとする。

【００２３】本発明に用いる平板状顔料の第２は、積み重なった構造やイオンで結合した平板性の高い、いわゆる無機層状化合物である。無機層状化合物の具体例としては、グラファイト、リン酸塩系誘導体型化合物（リン酸ジルコニウム系化合物）、カルコゲン化合物［式ＭＸ

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zで表わされるジカルコゲン化合物が例示される。ここで、MはＩＶ族（Ｔｉ、Ｚｒ、Ｈｆ）、Ｖ族（Ｖ、Ｎｂ、Ｔａ）又はＶＩ族（Ｍｏ、Ｗ）の元素を、Ｘはカルコゲン（Ｓ、Ｓｅ、Ｔｅ）を示す。］が挙げられる。

【００２４】本発明に用いる平板状顔料の第３として、スメクタイト族、バーミキュライト族などの粘土鉱物を挙げることができる。より具体的には、ディッカイト、ナクライト、スメクタイト、ハロイサイト、アンチゴライト、クリソタイル、パイロフィライト、テトラシリリックマイカ、リチウムテニオライト、ナトリウムテニオライト、マーガライト、バーミキュライト、ザンソフィライト、緑泥石、等を挙げることができる。特にスメクタイトが好ましく、スメクタイトにはモンモリロナイト、ハイデライト、ノントロナイト、サポナイト、鉄サポナイト、ヘクトライト、ソーコナイト、スチブンサイトなどを挙げることができる。

【００２５】また、本発明で使用する平板状顔料は、水あるいは溶剤中で分散された状態での平均粒子径が２０ｎｍ～１００μｍの間にあるものが好適であり、好ましくは１μｍ～５０μｍ程度である。平均粒子径が２０ｎｍ未満であると、アスペクト比が小さくなり防湿性向上効果が小さい。一方１００μｍを越えると塗工層表面から顔料が突き出し、外観不良や防湿性低下を招き好ましくない。本発明で用いる平板状顔料の水あるいは溶剤に分散された平均粒子径は、平均粒子径が０．１μｍ以上のものは光散乱理論を応用したレーザー回折による粒度分布測定装置において測定した値である。また、水あるいは溶剤に分散された平均粒子径が０．１μｍのものについは動的光散乱法を用いて測定した値である。

【００２６】また、用いる平板状顔料の好ましいアスペクト比は５以上であり、特に好ましくはアスペクト比が１０以上である。アスペクト比が５未満のものは曲路効果が小さいために防湿性が低下する。アスペクト比は大きいほど平板状顔料の塗工層中における層数が大きくなるため高い防湿性能を発揮する。平板状顔料の厚みは、防湿膜の断面写真より測定する。厚みが０．１μｍ以上のものは電子顕微鏡写真より画像か解析して求める。厚みが０．１μｍ未満のものは透過型電子顕微鏡写真より画像解析して求める。本発明でいうアスペクト比は上記水又は溶剤に分散された平均粒子径を防湿膜の断面写真より求めた厚さで除したものである。

【００２７】生分解性樹脂と平板状顔料の配合量は質量換算で９５／５～３０／７０が好ましく、より好ましくは９０／１０～３５／６５、特に好ましくは８５／１５～４０／６０である。平板状顔料の配合量が５％未満になると防湿性向上効果及び離解性向上効果が小さくなる。平板状顔料が７０％を越えて大きくなると、平板状顔料の間を埋める樹脂が不足して空隙やピンホールの増大を招き防湿性が悪化する。

【００２８】生分解性樹脂と平板状顔料の混合方法に特

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に制限はない。混合方法の一例を挙げると、生分解性樹脂と平板状顔料をバンバリーミキサー、ロール型混練機、連続型インテンシブミキサー、二軸押出機、一軸押出機、コニーダーなどの樹脂を溶融して機械的シェアーで混練する方法がある。また、生分解性樹脂を溶剤で溶解させた溶液に平板状顔料を分散させる方法がある。また、生分解性樹脂の水性エマルジョンや分散液に平板状顔料を分散させる方法がある。混練、分散の時に必要に応じて乳化剤や分散剤、流動性改良剤などを適宜添加することもできる。

【００２９】防湿性向上剤は、生分解性樹脂と反応して、それを疎水性に変性し、又は架橋反応してこれを疎水化し、あるいは平板状顔料を被覆して、又は平板状顔料を疎水性化し、又は、その互に平行な積層配向を促進し、あるいは、生分解性樹脂及び／又は平板状顔料との接着性を高め、又はこれらの間隙を充填するなどして、防湿層の防湿性を向上させるものである。

【００３０】本発明に用いられる防湿性向上剤は、例えば下記：尿素－ホルムアルデヒド縮合反応生成物、メラミン－ホルムアルデヒド縮合反応生成物、炭素原子数が１～８個のアルデヒド化合物、１個以上のエポキシ基を有するエポキシ化合物、架橋反応性多価金属化合物、オルガノアルコキシシラン化合物、オルガノアルコキシ金属化合物、有機アミン化合物、ポリアミド化合物、ポリアミドポリ尿素化合物、ポリアミンポリ尿素化合物、ポリアミドアミンポリ尿素化合物、ポリアミドアミン化合物、ポリアミドアミン－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミドポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、ポリアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物、及びポリアミドアミンポリ尿素－エピハロヒドリン又はホルムアルデヒド縮合反応生成物から選ばれた少なくとも１種を含むことが好ましい。

【００３１】上記防湿性向上剤に用いられる化合物のうち、尿素－ホルムアルデヒド縮合反応生成物、メラミン－ホルムアルデヒド縮合反応生成物は、ホルムアルデヒドに由来するメチロール基を有し、これが、生分解性樹脂の親水性官能基（水酸基、カルボン酸基、エステル基）と水素結合あるいは脱水反応して、当該重合体又は共重合体分子を架橋し、これを疎水性化、水不溶化（三次元網目構造化）することができる。また、上記縮合生成物は、生分解性樹脂と化学的に反応しなくても、生分解性樹脂と平板状顔料とを安定に結着して、防湿層の防湿性能を高めることができる。

【００３２】上記防湿性向上剤に用いられる炭素原子数が１～８個のアルデヒド化合物は、ホルムアルデヒド、アセトアルデヒド、グリオキザール、プロピルアルデヒド、プロパンジアール及びヘキサンジアールなどを包含し、これは、そのアルデヒド基において、合成樹脂成分に含まれる重合体又は共重合体の前記親水性官能基と付

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加反応してこれを疎水性化、及び水不溶性化することができる。

【００３３】上記防湿性向上剤に用いられる１個以上のエポキシ基を有するエポキシ化合物は、例えば、ポリグリシジルエーテル化合物、及びポリアミドーエポキシ樹脂などを包含し、これは、生分解性樹脂に含まれる水酸基やカルボン酸基などの活性水素を有する官能基とと開環付加反応して、これを疎水性化及び水不溶性化することができる。また上記エポキシ化合物は、生分解性樹脂と、平板状顔料とを強固に結着し、これらの間隙を充填して、防湿層の防湿効果を向上させることができる。

【００３４】本発明において、防湿性向上剤として使用される架橋反応性多価金属化合物は、例えば、炭酸ジルコニウムアンモニウム、ジルコニウムアルコキシド、チタンアルコキシド及びアルミニウムアルコキシドなどを包含し、これらの化合物中の多価金属は、生分解性樹脂の官能基と配位結合し、あるいは共有結合して、生分解性樹脂を疎水性化し、水不溶性化することができる。

【００３５】本発明において、防湿性向上剤として用いられるオルガノアルコキシシラン化合物及びオルガノアルコキシ金属化合物は、一般にカップリング剤として称されているものであって、無機ー有機複合材料系にあっては無機成分と有機成分とを化学的に架橋結合し、あるいは両者の少なくとも一方に化学的、又は物理的に結合して、両者の親和性を高め、それによって、前記無機ー有機複合材料の耐熱性、耐水性、機械的強度などを向上させるものである。本発明においては、オルガノアルコキシシラン化合物及びオルガノアルコキシ金属化合物は、生分解性樹脂と平板状顔料との親和性、接着性を向上させて両者を密着させ、間隙の形成を防止し、それによって、防湿層の防湿性能を向上させることができる。

【００３６】本発明に用いられるオルガノアルコキシシラン化合物は、その親水性部にＳｉ原子を含むものであって、例えばビニルトリメトキシシラン、γーグリシドキシプロピルメチルジエトキシシラン、γーグリシドキシプロピルトリメトキシシラン、γーグリシドキシプロピルトリエトキシシラン、γーメタクリロキシプロピルトリメトキシシラン、及びＮーβー（アミノエチル）ーγーアミノプロピルトリメトキシシランなどを包含する。

【００３７】また本発明に用いられるオルガノアルコキシ金属化合物は、その親水性部分に多価金属原子（例えば、Ｔｉ，Ａｌなど）を含むものであって、例えばイソプロピルトリイソステアロイルチタネート、イソプロピルトリオクタノイルチタノール、イソプロピルイソステアロイルジアクリルチタネート、イソプロピルトリクミルフェニルチタネート、及びイソプロピルトリ（Ｎーアミドエチル・アミノエチル）チタネートなどのチタネート化合物、並びに、アセトアルコキシアルミニウムジイソプロピレートなどのアルミニウム化合物を包含する。

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【００３８】オルガノアルコキシシラン化合物及びオルガノアルコキシ金属化合物（以下カップリング剤と記す）は、その分子構造において、Ｓｉ、Ｔｉ、又はＡｌ原子を含み、無機物質に対して高い反応性又は親和性を有する親水性部分と、有機化合物に対して高い反応性又は親和性を有する疎水性部分とを有する。この親水性部分は、Ｔｉ、Ａｌ、又はＳｉ原子に結合したアルコキシ基を加水分解することにより形成される。

【００３９】カップリング剤の親水基と無機化合物との反応は次の順で進行するといわれている。即ち（１）カップリング剤の、アルコキシ基の加水分解により形成された親水基の形成、（２）カップリング剤の親水基の脱水縮合によるオリゴマー化、（３）無機質表面の親水基又は吸着水とカップリング剤の親水基との間に水素結合の形成、（４）加熱脱水反応により、カップリング剤の親水基と無機質表面の親水基との間に共有結合の形成、である。加水分解するアルコキシ基としてはメトキシ基、エトキシ基、イソプロポキシ基、オクチルオキシ基等が用いられる。また、カップリング剤の親水基と無機化合物の反応性は、無機化合物がガラス、シリカ、アルミナ、タルク、クレー、マイカなどのように表面に水酸基を有する場合に high いが、チタネートカップリング剤の場合、無機化合物が炭酸カルシウム、硫酸バリウム、硫酸カルシウムであっても、高い反応性を示す。

【００４０】一方、カップリング剤の疎水基部分については、疎水基部分が有機オリゴマーである場合、平板状顔料表面に有機質の被膜を形成し、表面を疎水化して、生分解性樹脂との接着性を高める。また、疎水基部分がエポキシ基、ビニル基、アミノ基等の反応性有機官能基を有する場合、この官能基と生分解性樹脂とが架橋し、生分解性樹脂に対する接着性が高まる。従って、カップリング剤の疎水基部分の組成は、生分解性樹脂の組成に応じて選択することができる。

【００４１】なお、上記カップリング剤の使用方法としては、インテグラルブレンド法と、前処理法がある。インテグラルブレンド法は、生分解性樹脂と平板状顔料とを含む塗工液にカップリング剤を直接添加する方法である。また前処理法は、あらかじめ平板状顔料をカップリング剤で処理する方法で、乾式法と湿式法とがある。乾式法はミキサーに粉体状の平板状顔料を入れ、これを予備加熱後カップリング剤を添加して加温下で高速撹拌する方法であり、湿式法は水、溶剤又はこれらの混合液中にカップリング剤と平板状顔料を添加し高速撹拌した後乾燥して粉末を得る方法である。インテグラルブレンド法は前処理法に比べて、カップリング剤の使用効果がやや劣るが、平板状顔料の前処理という工程がないため作業性に優れている。

【００４２】インテグラルブレンド法や湿式前処理法において、平板状顔料を水性処理系において処理する場合、カップリング剤の水溶性を高めるため、アルコキシ

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基として比較的疎水性の弱いメトキシ基、エトキシ基、イソプロポキシ基を用いることが好ましく、カップリング剤の疎水基部分には、親水性のあるエポキシ基、アミノ基、ヒドロキシル基が含有されていることが好ましい。また、カップリング剤が水に溶けにくい場合は界面活性剤を極少量併用することもある。

【００４３】カップリング剤の添加量は、平板状顔料１００重量部に対して０．１～５重量部であることが好ましく、より好ましくは０．５～２重量部である。カップリング剤の使用量が０．１重量部未満の場合、カップリング剤による平板状顔料表面の被覆が不十分となるためその効果が不十分になることがあり、またそれが５重量部を越える場合、カップリング剤の効果が飽和し、不経済になることがある。

【００４４】カップリング剤で処理された平板状顔料の表面の疎水性が過度に高くなり、このため水性分散液とした時増粘して牽工できなかったり、分散不良となって凝集体が発生することがある。この場合には、界面活性剤やポリアクリル酸系の分散剤やイソプロピルアルコール、ジアルキルスルホコハク酸ナトリウム等の湿潤剤を用いて分散させることができる。

【００４５】本発明において、防湿性向上剤として用いられる有機アミン化合物、及びポリアミド化合物は、カチオン性を有し、これがアニオン性を示す平板状顔料と接触すると、その軟凝集及び互いに平行な積層配向を促進し、防湿層の防湿性能を向上させることができる。

【００４６】また本発明において、生分解性樹脂に含まれる官能基が有機モノアミン、有機ポリアミン、又は有機第４級アンモニウム塩と反応して、生分解性樹脂の疎水性、又は水不溶性を高めることができる。

【００４７】本発明において、防湿性向上剤として用いられる有機アミン化合物は第１級アミン化合物、第２級アミン化合物、第３級アミン化合物、及び第４級アンモニウム塩化合物のいずれであってもよく、また、有機モノアミン及び有機ポリアミンのいずれであってもよい。更に有機アミン化合物は、アミノ基以外の異種官能基、例えばエポキシ基、ヒドロキシル基、カルボン酸基、ニトリル基などを有するものを包含する。このような変性有機アミン化合物としては、モノエポキシ化合物やジエポキシ化合物などのエポキシ基を有する化合物とアミン化合物の付加物、エチレンオキサイドやプロピレンオキサイドなどのヒドロキシル基を有する化合物とアミン化合物の付加物、アクリルニトリルとアミン化合物のマイケル付加物、フェノール化合物とアルデヒド化合物とアミン化合物のマンニッヒ反応で得られる付加物などが挙げられる。

【００４８】上記のような変性には、１）アミン化合物の有する刺激臭や皮膚刺激性などの毒性を低下させること、２）アミン化合物の粘度を低下させること、及び３）分子量を大きくし秤量誤差を小さくすることなどの

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効果がある。アミン化合物の変性の程度には、特に制限はない。

【００４９】本発明に用いられる有機アミン化合物を例示すれば下記の通りである。

１）脂肪族ポリアミン（ポリアルキレンポリアミン）又はモノアミンエチレンジアミン、プロピレンジアミン、ジエチレントリアミン、トリエチレンテトラミン、テトラエチレンペンタミン、ペンタエチレンヘキサミン、イミノビス－プロピルアミン、ビス（ヘキサメチレン）トリアミン、ジメチルアミノプロピルアミン、ジエチルアミノプロピルアミン、アミノエチルエタノールアミン、メチルイミノビスプロピルアミン、メンタンジアミン－３、Ｎ－アミノエチルピペラジン、１，３－ジアミノシクロヘキサン、イソホロンジアミン、トリエチレンジアミン、ポリビニルアミン、ステアリルアミン、ラウリルアミンなど。

２）芳香族ポリアミン又はモノアミンｍ－フェニレンジアミン、４，４′－メチレンジアニリン、ベンジジン、ジアミノジフェニルエーテル、４，４′－チオジアニリン、ジアニシジン、２，４－トルエンジアミン、ジアミノジフェニルスルホン、４，４′－（ｏ－トルイジン）、ｏ－フェニレンジアミン、メチレンビス（ｏ－クロロアニリン）、ｍ－アミノベンジルアミン、アニリンなど。

３）芳香族環基を有する脂肪族ポリアミン又はモノアミンメタキシリレンジアミン、テトラクロロキシレンジアミン、トリメチルアミノメチルフェノール、ベンジルジメチルアミン、α－メチルベンジルジメチルアミンなど。

４）第２級アミンＮ－メチルピペラジン、ピペリジン、ヒドロキシエチルピペラジン、ピロリジン、モルホリンなど。

５）第３級アミンテトラメチルグアニジン、トリエタノールアミン、Ｎ，Ｎ′－ジメチルピペラジン、Ｎ－メチルモルホリン、ヘキサメチレンテトラミン、トリエチレンジアミン、１－ヒドロキシエチル－２－ヘプタデシルグリオキサリジン、ピリジン、ピラジン、キノリンなど。

６）第４級アンモニウム塩ジアリルジメチルアンモニウムクロライド、ヘキシルトリメチルアンモニウムクロライド、シクロヘキシルトリメチルアンモニウムクロライド、オクチルトリメチルアンモニウムブロマイド、２－エチルヘキシルトリメチルアンモニウムブロマイド、１，３－ビス（トリメチルアンモニオメチル）シクロヘキサンジクロライド、ラウリルジメチルベンジルアンモニウムクロライド、ステアリルジメチルベンジルアンモニウムクロライド、テトラデシルジメチルベンジルアンモニウムクロライドなど。

７）ベタイン化合物、グリシン化合物、アミノ酸化合物ヤシ油アルキルベタイン、ラウリルジメチルアミノ酢酸

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ベタイン、ラウリル酸アミドプロピルベタイン、ポリオクチルポリアミノエチルグリシン、ラウリルアミノプロピオン酸ナトリウムなど。上記有機アミン化合物の中でも、脂肪族ポリアミン、芳香族環基を有する脂肪族ポリアミン、変性ポリアミンを用いることが好適である。

【００５０】本発明で使用されるポリアミド化合物（ポリアミドアミン化合物とも称せられる）は、上記アミン化合物とカルボン酸基を有する化合物の脱水縮合反応により得られるものである。例えばトール油とジエチルトリアミンの反応生成物、リノレン酸の２量体とテトラエチルペンタミンの反応生成物、トリエチレンテトラミンと飽和２塩基酸（アジピン酸、セバシン酸、イソフタル酸、テレフタル酸）の反応生成物、重合脂肪酸とジエチルトリアミンの反応生成物などが挙げられる。これらポリアミド化合物の分子量は１０００～５０００程度であることが好ましい。

【００５１】本発明で用いられる有機アミン化合物又はポリアミド化合物は水溶性であることが好ましいが、水不溶性であっても乳化や分散処理して使用することもできる。上記アミン化合物又はポリアミド化合物を２種以上混合して用いてもかまわない。有機アミン化合物又はポリアミド化合物のアミン価は一般に１００～１０００であることが好ましいが、特に制限はない。

【００５２】本発明において、防湿性向上剤として用いられるエポキシ化合物は、モノエポキシ化合物であってもよい。このモノエポキシ化合物は、脂肪族モノエポキシ化合物及び芳香族モノエポキシ化合物を包含し、例えばブチレンオキサイド、オクチレンオキサイド、ブチルグリシジルエーテル、スチレンオキサイド、フェニルグリシジルエーテル、グリシジルメタクリレート、アリルグリシジルエーテル、フェノールポリエチレングリコールグリシジルエーテル、ラウリルアルコールポリエチレングリコールグリシジルエーテルなどから選ぶことができる。

【００５３】本発明に用いられるモノエポキシ化合物は水溶性のものが好ましいが、不溶性のものでも界面活性剤などを単官能エポキシ化合物に対して０．１～３重量％用いて水中に分散して使用することができる。

【００５４】上記モノエポキシ化合物は生分解性樹脂１００部に対して０．０５～１０重量部、好ましくは０．５～５重量部で用いられることが望ましい。モノエポキシ化合物の配合量が０．０５重量部未満である場合は防湿性向上の効果が不十分になることがあり、またそれが１０重量部を越えると防湿性の効果が飽和し、経済的に不利になることがある。

【００５５】上記モノエポキシ化合物を含む防湿性向上剤が用いられる場合、それとともに用いられる生分解性樹脂は、アクリル酸、アクリルアミド、などのようにエポキシ環と反応可能な親水性官能基（カルボキシル基、アミド基、及びヒドロキシル基、など）を有するモノマーを含む共重合体を含むことが好ましい。

【００５６】本発明において、防湿性向上剤として用いられるポリアミドポリ尿素化合物、ポリアミンポリ尿素化合物、ポリアミドアミンポリ尿素化合物及びポリアミドアミン化合物は、（ｉ）ポリアルキレンポリアミン又はアルキレンポリアミン、（ii）尿素類、（iii）二塩基性カルボン酸、及び必要により（iv）アルデヒド類、エピハロヒドリン類及びα，γ－ジハロ－β－ヒドリン類から選ばれた化合物を反応させて得られる（特公昭５９－３２５９７号公報、特開平４－１００９７号公報など）。

【００５７】上記合成において、二塩基性カルボン酸（iii）を用いるとポリアミドポリ尿素化合物又はポリアミドアミンポリ尿素化合物が得られ、用いない場合はポリアミンポリ尿素系化合物が得られる。アルデヒド類やエピハロヒドリン類は用いる場合、その使用量は非常に少ないか、あるいは合成過程で自己架橋を起こして、フリーのメチロール基やエポキシ基がほとんど残存しないことが好ましい。また、上記反応において、尿素数（ii）を用いず、ポリアルキレンポリアミン又はアルキレンポリアミン（ｉ）と、二塩基性カルボン酸とを反応させるとポリアミドアミン化合物が得られる。成分（iv）アルデヒド類、エピハロヒドリン類、及びα，γ－ジハロ－β－ヒドリン類の反応量は、成分（ｉ）の１００モル量に対し、５～３００モルの範囲内にあることが好ましい。

【００５８】上記成分（ｉ）として用いられるポリアルキレンポリアミン又はアルキレンポリアミンとしては、例えばジエチレントリアミン、トリエチレンテトラミン、テトラエチレンペンタミン、イミノビスプロピルアミン、３－アザヘキサン－１，６－ジアミン、４，７－ジアザデカン－１，１０－ジアミン、エチレンジアミン、プロピルジアミン、１，３－プロパンジアミン、ヘキサメチレンジアミンなどが挙げられる。これらの中でジエチレントリアミン及び／又はトリエチレンテトラミンを用いることが好ましい。これらの化合物（ｉ）は単独、あるいは２種類以上の混合物として用いられる。また、化合物（ｉ）にシクロヘキシルアミンなどの脂環式アミン及び脂環式エポキシ化合物の１種以上を併用してもよい。

【００５９】成分（ii）として用いられる尿素類としては尿素、チオ尿素、グアニル尿素、メチル尿素、ジメチル尿素などが挙げられる。これらの中でも尿素を用いることが好ましい。これらの尿素化合物は、単独で用いてもよく、あるいは２種類以上を混合して用いてもよい。また、成分（iii）として用いられる二塩基性カルボン酸類は、分子内にカルボキシル基又はそれから誘導される基を２個有するものであって、遊離酸であってもよく、あるいはエステル類又は酸無水物などであってもよい。二塩基性カルボン酸は脂肪族、芳香族、脂環式二塩

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基性カルボン酸のいずれでもよい。その具体例としては、コハク酸、グルタル酸、アジピン酸、セバシン酸、マレイン酸、フマール酸、フタル酸、イソフタル酸、テレフタル酸、テトラハイドロフタル酸、及びヘキサハイドロフタル酸などが挙げられる。また、二塩基性カルボン酸とグリコール類との反応生成物であって、末端に遊離カルボン酸基を有するポリエステル類を使用してもよい。これら二塩基性カルボン酸類は単独で用いてもよく、あるいは２種類以上を混合して用いてもよい。成分（iv）として用いられるアルデヒド類としてはホルムアルデヒド、プロピルアルデヒドなどのアルキルアルデヒド類やグリオキザール、プロパンジアール、ブタンジアール、エピハロヒドリン類としてはエピクロロヒドリン、エピブロモヒドリンなどが挙げられる。更に、成分（iv）として用いられるα，γージハロ－β－ヒドリン類としては１，３－ジクロロ－２－プロパノールなどが挙げられる。これらアルデヒド類、エピハロヒドリン類、α，γージハロ－β－ヒドリン類は単独で用いてもよく、あるいは２種類以上を混合して用いてもよい。

【００６０】更に単量体成分として脂環式エポキシ化合物、アルキル化剤（一般式Ｒ－Ｘ；Ｒ＝低級アルキル基、アルケニル基、ベンジル基、フェノキシエチル基など、Ｘ＝ハロゲン原子）、一般式Ｒ′－Ｃ（＝Ｙ）－ＮＨ２〔Ｒ′はアルキル基もしくは－ＮＲ′２基、Ｙは酸素原子又は硫黄原子〕で表される化合物などを反応させてもよい。

【００６１】上記各成分は、任意の順序で反応させることができるが、合成法の一例として次の方法を用いることができる。即ち、アルキレンジアミン又はポリアルキレンポリアミンと、尿素類とを脱アンモニア反応させ、次に、この反応生成物を二塩基性カルボン酸類と脱水縮合させ、更に尿素類と脱アンモニア反応させることによりポリアミドポリ尿素化合物が得られる。このポリアミドポリ尿素化合物をアルデヒド類、エピハロヒドリン類、α，γージハロ－β－ヒドリン類から選ばれた化合物と反応させるとポリアミドポリ尿素－アルデヒド（エピハロヒドリン）樹脂が得られる。

【００６２】アルデヒド類、エピハロヒドリン類、α，γージハロ－β－ヒドリン類は分子量の調整、水溶性の調整を目的として使用されるが、メチロール基やエポキシ環は自己架橋させほとんど残留していないことが好ましい。

【００６３】本発明において、防湿性向上剤として用いられる上記ポリアミドポリ尿素化合物、ポリアミンポリ尿素化合物、ポリアミドアミンポリ尿素化合物及びポリアミドアミン化合物は、水性塗工液中で微カチオン性を示すため、アニオン性を有する平板状顔料を、皮膜形成過程において軟凝集させ、この時、これらの平板状粒子を、互いに平行に積層配向させるものと思われる。このような平板状粒子の積層配向性の向上は防湿層の防湿性能を向上させる。また、上記化合物のうちには、その分子内にエポキシ環及び／又はメチロール基を有するものが包含されるが、これらの官能基の含有率は微少であり、またその合成過程において、エポキシ環及び／又はメチロール基形成化合物の大部分が自己架橋するため、これらの官能基の影響は無視できる程度である。このため上記化合物を防湿性向上剤として含む防湿層は、防湿性紙の回収再生の際に、紙支持体から容易に離解し、再生パルプの離解性を阻害することはほとんど認められない。

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【００６４】本発明において、防湿性向上剤は、質量換算で、生分解性樹脂と平板状顔料との合計を１００部としそれに対して０．０５～３０部の割合で用いられることが好ましく、０．５～２０重量部であることがより好ましく１～１０部が特に好ましい。この配合量が、０．１部未満の時は、防湿性向上効果が不十分になることがあり、またそれが３０部を越えると、その防湿性向上効果が飽和し、経済的に不利になることがある。なお、２種類以上の化合物からなる防湿性向上剤を用いることもできる。

【００６５】本発明の防湿積層体に用いられる防湿性向上剤において、架橋反応剤と、カップリング剤が併用されていてもよい。この場合架橋反応剤は、尿素－ホルムアルデヒド縮合反応生成物、メラミン－ホルムアルデヒド縮合反応生成物、炭素原子数が１～８個のアルデヒド化合物、１個以上のエポキシ基を有するエポキシ化合物、架橋反応性多価金属化合物及び有機アミン化合物、ポリアミド化合物などから選ばれた１種以上を含むことができ、また、カップリング剤は、前述のオルガノアルコキシシラン化合物及びオルガノアルコキシ金属化合物から選ばれた１種以上を含むことができる。

【００６６】本発明においては、基材表面の凹凸による防湿性の低下を防ぐために防湿層と基材の間にアンカー層を設けることができる。アンカー層は、顔料と接着性の水性樹脂からなるものが好ましく、使用される顔料としては炭酸カルシウム、カオリン、クレー、タルク、酸化チタン、酸化亜鉛、水酸化アルミニウム、無定型シリカ、プラスチックピグメントなどがあり、接着性の水性樹脂としては、でんぷん、カゼイン、ポリビニルアルコール及びそれらの変性体などの水溶性樹脂や、スチレン・ブタジエン系ラテックス、（メタ）アクリルエステル系ラテックス、（メタ）アクリルスチレン系ラテックスなどの合成樹脂ラテックスからなるものがある。またこれら顔料と接着性の樹脂との好ましい配合（質量）比率（固形比）は５：９５～５０：５０である。その塗工量は固形分で３～３０ｇ/ｍ²が好ましい。３ｇ/ｍ²未満では紙支持体の凹凸をカバーして平坦な平面を得ることが難しく、３０ｇ/ｍ²を越えて塗工しても下塗りする効果が飽和してしまう。また必要に応じて、ポリカルボン酸などの分散剤、消泡剤、界面活性剤、保水剤、色合い調

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整剤などを添加したりすることができる。

【００６７】本発明においては、必要に応じて防湿層上にオーバーコート層を設けることができる。オーバーコート層は防湿層のピンホールや、微小な空隙を埋めることにより防湿性を向上させるものである。オーバーコート層に使用される樹脂は、成膜性及び耐水性がよい樹脂であることが望ましいが用途に応じて選択可能であり特に限定されない。使用される樹脂を例示すると、αオレフィン・不飽和カルボン酸共重合体、スチレン－ブタジエン系ラテックス、アクリルエステル系樹脂、ポリエステル系樹脂、また、本明細書中で前述の生分解性樹脂などが挙げられる。なお、上記オーバーコート層には、必要に応じて、分散剤、消泡剤、界面活性剤、保水剤、色合い調整剤などを添加することができる。

【００６８】本発明における防湿層の形成方法には特に制限はない。例えば、生分解性樹脂と平板状顔料の混合物を紙支持体に溶融押出ラミネートして積層する方法、生分解性樹脂と平板状顔料のフィルムを押出成形で作成した後、紙支持体と張合わせる方法、生分解性樹脂の溶液あるいは分散液に平板状顔料を混合した防湿塗料を紙支持体に塗工する方法などが挙げられる。

【００６９】本発明に用いられる紙支持体は、機械的離解作用により水中で分散しやすいパルプあるいは古紙を主成分とするものであれば特に制限はないが、一般的に用いられている晒または未晒クラフト紙（酸性紙又は中性紙）、又はダンボール用、建材用、白ボール用、チップボール用等に用いられる板紙等が好適であり、更に好ましくはヤンキードライヤー等で強制乾燥がなされた片ツヤ紙、又はカレンダー処理が施された晒／未晒クラフト紙等であり、このような紙基材を用いた場合は、基材表面が高平滑なので、防湿層の厚さ方向における平板状顔料の配向が、塗工面に対して均一、かつ平行に配列しやすくなるため、防湿性能も格段に向上する。

【００７０】本発明の防湿積層体の用途は、新聞用紙、印刷用紙、感熱紙、インクジェット用紙などの紙製品の巻取包装や、印刷用紙などの平判紙包装や、ＰＰＣ用紙、感熱紙、インクジェット用紙などの小判断裁紙包装など、紙製品の包装に好適に使用できる。また、食品包装用の紙器、紙コップなどは古紙回収が困難なため、本発明の防湿積層体はコンポスト化が可能となり、好適に使用できる。また、本発明の積層体を段ボールシートのライナーや中芯用にも好適で、段ボール箱の用途にも使用できる。

【００７１】本発明における生分解性樹脂と平板状顔料を含んだ塗料は、生分解性樹脂をトルエン、メチルエチルケトン、イソプロピルアルコールなどの有機溶剤に溶解あるいは分散したものに、平板状顔料を分散させた組成物、あるいは、生分解性樹脂を水中に分散、エマルジョン化したものに、平板状顔料を分散した組成物である。生分解性樹脂の溶解、及び分散は既知の方法で行える。水分散液の場合、あらかじめ生分解性樹脂を微細に粉砕（粒子径１０μ以下）にしたものを、界面活性剤やポリアクリル酸、ポリビニルアルコールなどを用いて、ホモミキサーなどで分散する方法、また、生分解性樹脂を溶解させ、高圧容器の中で水と高温高圧で混合し水中油滴型のエマルジョンを作成する方法などがある。このような組成物は、本発明における防湿積層体を形成するための塗料として使用可能である。その他、生分解性樹脂フィルムのコーティング、鉄製品などの錆防止のためのコーティング、ポスターなどの耐水性を付与するためオーバーラミ用のコーティングなどに使用することができる。また、生分解性樹脂の溶液あるいは水分散液と平板状顔料を含んだ組成物に、本発明における防湿性向上剤を加えることが好ましい。

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【００７２】

【実施例】以下に実施例を挙げて本発明を具体的に説明するが、下記の実施例は本発明を限定するものではない。また、特に断らない限り実施例中の部は質量部を示す。

＜実施例１＞生分解性樹脂（セルグリーンＨＢ－０５：ポリカプロラクトン系、比重１．２２g/cm^3、１９０℃でのＭＦＲ６．１g/10min、ビカット軟化点１０５℃、ダイセル化学製）７０部と、合成マイカ（ＰＤＭ－９Ｌ－２０：合成フッ素金雲母、$KMg_3AlSi_3O_{10}F_2$、平均粒子径２０μm、アスペクト比６０、トピー工業製）３０部をタンブラーで３０分間攪拌した後、得られたドライブレンド品（生分解性樹脂ペレットと合成マイカの混合品）を二軸押出機で溶融混練しペレット化した。得られたペレットを、更に溶融押出ラミネーターで未晒クラフト紙（７０g/m^2、１００μm厚）に２０μm厚で積層し、防湿積層体を得た。

【００７３】＜実施例２＞生分解性樹脂としてルナーレＳＥ（脂肪族ポリエステル系樹脂、密度１．３５g/m１、融点１００℃、１１０℃での溶融粘度１５０００poise、日本触媒製）を使用したこと以外は、実施例１と同様にして防湿積層体を得た。

【００７４】＜実施例３＞天然白雲母１００部（ＦＡ－５００：$K_2O \cdot 3Al_2O_3 \cdot 6SiO_2 \cdot 2H_2O$、平均粒子径１８μm、アスペクト比２０、山口雲母製）を８０℃でヘンシェルミキサーにより攪拌しているところに、シランカップリング剤（ＫＢＭ６０３：アミノシランカップリング剤、信越化学工業製）の５％水溶液２０部を添加し、１０分間攪拌した。この時の温度変化は、水溶液を添加して１分後６０℃になり、１０分後には７８℃迄達した。更に、ポリアミドポリ尿素樹脂の５％水溶液を２０部添加、攪拌した。この時の温度変化は、水溶液を添加して１分後に５８℃となり、１０分後に７９℃迄達したところで、ヘンシェルミキサーから天然白雲母を取り出した。カップリング剤で処理された天然白雲母と、生分解性樹脂（ルナーレＳＥ：脂肪族ポリ

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エステル系樹脂、密度１．３５ｇ/ｍｌ、融点１００℃、１１０℃での溶融粘度１５０００poise、日本触媒製）を使用し、実施例１と同様にして防湿積層体を得た。

【００７５】＜実施例４＞生分解性樹脂（ＬＡＣＴＹ９０３０：乳酸系樹脂、平均分子量１４万、ガラス転移温度６０．５℃、融点１４９．５℃、１９０℃でのＭＦＲ５．５ｇ/１０min、島津製作所製）２０部、アクリルアミド系共重合物（ＤＲ５７００：固形分３０％、ハイモ製）０．０５部、ポリビニルアルコール（ＰＶＡ２１７：部分ケン化、ケン化度８７－８９％、重合度１７００、クラレ製）０．２部、酢酸エチル１２０部、イオン交換水８０部を、ホモミキサーを装着したオートクレーブ中に仕込んだ。更に酢酸を用いてｐＨを６に調製してから、１２０℃に加熱して１０，０００ｒｐｍで３分間攪拌した後、４０℃まで急冷した。その後、減圧下で酢酸エチルを除去して生分解性樹脂の分散液を得た。この分散液中の樹脂粒子径は３μｍであった（堀場製作所製ＬＡ９１０型レーザー回折粒度分布計により測定）。この分散液３５０部に、合成マイカ（ＰＤＭ－９Ｌ－２０：合成フッ素金雲母、$KMg_3AlSi_3O_{10}F_2$、平均粒子径２０μｍ、アスペクト比６０、トピー工業製）３０部を加えて撹拌し、防湿塗料とした。得られた防湿塗料を未晒クラフト紙（７０ｇ/ｍ^2、１００μｍ厚）上にメイヤーバーにより塗工量２０ｇ/ｍ^2（固形分換算）塗工し、防湿積層体を得た。

【００７６】＜比較例１＞生分解性樹脂（セルグリーンＨＢ－０５：ポリカプロラクトン系、比重１．２２ｇ/ｃｍ^3、１９０℃でのＭＦＲ６．１ｇ/１０min、ビカット軟化点１０５℃、ダイセル化学製）を使用して、溶融押出ラミネーターで未晒クラフト紙（７０ｇ/ｍ^2、１００μｍ厚）に２０μｍ厚さで積層して防湿積層体を得た。

【００７７】＜比較例２＞生分解性樹脂（ルナーレＳＥ：脂肪族ポリエステル系樹脂、密度１．３５ｇ/ｍｌ、融点１００℃、１１０℃での溶融粘度１５０００poise、日本触媒製）を使用した以外は、比較例１と同様にして防湿積層体を製造した。

【００７８】＜比較例３＞実施例４で得られた生分解性樹脂の分散液のみを、未晒クラフト紙（７０ｇ／ｍ^2、１００μｍ厚）の上にメイヤーバーにより塗工量２０ｇ/ｍ^2（固形分換算）塗工し、防湿積層体を得た。

【００７９】＜比較例４＞ポリエチレン樹脂（ＬＣ５２２：日本ポリケム製）を使用して、溶融押出ラミネーターで未晒クラフト紙（７０ｇ/ｍ^2、１００μｍ厚）に２０μｍの厚さで積層して防湿積層体を得た。

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【００８０】以上、実施例、比較例で得られた防湿積層体を以下の方法で評価した。評価結果は表１に示す。

【００８１】＜試験方法＞

１）透湿度

ＪＩＳ－Ｚ－０２０８（カップ法）Ｂ法（４０℃９０％ＲＨ）で、防湿層面を外側にして測定した。透湿度の基準としては５０ｇ/ｍ^2・２４時間以下であれば実用性がある。

２）離解性

防湿積層体４５ｇ相当分を、約５ｃｍ四方にカッティングしたものをＴＡＰＰＩ離解標準機（ディスインテグレーター、２リットル容器）を用いて水１５００ｇ中で２０分間離解した。得られたスラリーを実験室手抄きマシーンを使用し、６０ｇ/ｍ^{2}の手抄きシートを作製した。この手抄きシート未離解物(フィルム片、紙片)の大きさを目視で評価し、存在する未離解片の大きさ（長径）が１ｍｍ未満のものを○、１～５ｍｍのものを△、５ｍｍより越えて大きいものを×とした。未離解片の大きさは５ｍｍ以下であれば古紙として使用可能であり、１ｍｍ以下であれば適用用途が広がるため更に好ましい。

３）生分解性

防湿積層体を畑土壌に埋設し、６ヶ月後に取り出して分解状態を観察する。紙繊維がわずかに残るが、原形をとどめないものを◎、紙繊維と防湿層がわずかに残るが、原形をとどめないものを○、防湿層が完全に残り、紙も一部が分解しているだけのものを×と評価した。

【００８２】

【表１】

	透湿度 g/m^2・24hr	離解性	生分解性
実施例１	３８	○	○
実施例２	３６	○	○
実施例３	２８	○	○
実施例４	４２	○	○
比較例１	１５０	×	○
比較例２	１７５	×	○
比較例３	２００	×	○
比較例４	３２	×	×

【００８３】

【発明の効果】本発明により、水離解性を有し、古紙として再利用可能な防湿紙であって、防湿性を高め、更に生分解性を有する防湿積層体を提供することが可能となった。

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1. A moisture-proof laminate comprising a moisture-proof layer that contains a biodegradable resin and a plate-like pigment on at least one side of a paper supporter.

2. The moisture-proof laminate of Claim 1, wherein the moisture-proof layer contains a moisture-proof improver.

3. The moisture-proof laminate of any one of Claims 1 and 2, wherein the biodegradable resin is at least one member selected from a microbially produced polyester resin, an aliphatic polyester resin, a polylactic resin, and a cellulose acetate resin.

[0015]

[Description of Embodiments]

The present invention is described below in detail. The degradable resin used in the present invention is not particularly limited, as long as the resin has properties showing biodegradability, namely, properties for degrading by microorganisms in soil or water, or by water or light finally to natural substances such as water, carbon dioxide, or the like. The present invention includes resins which collapse so that their original forms do not remain even if not completely degraded. These biodegradable resins include a microbially produced polyester resin, an aliphatic polyester resin, a polylactic resin, a cellulose acetate resin, and the like. The microbially produced polyester resin includes a polyhydroxy valerate/butyrate copolymer which is produced from glucose by microorganisms (a copolymer of 3-hydroxy valerate and 3-hydroxybutyric acid; "Biopol" (Monsanto Japan), "Biogreen" (Mitsubishi Gas Chemical)). The aliphatic polyester resin includes a polycondensate of a polyvalent carboxylic acid containing a dibasic acid and a polyhydric alcohol containing a diol, a ring-opened polymer of lactones, a polycondensate of hydroxyl aliphatic acids, and a polyethylene succinate/polybutylene succinate ("Bionolle" (Showa Highpolymer), "Enpol" (Ire Chemicals), "Upec" (Mitsubishi Gas Chemical), "Ecoflex" (BASF), "Biomax" (Dupont), "EastarBio" (Eastman Chemicals), and "Lunale SE"

(Nippon Shokubai)) obtained from a polycondensate of succinic acid, ethylene glycol, and 1,4-butanediol, polypropiolactone, polycaprolactone ("Celgreen" (Daicel Chemical Industries), "Tone" (Dow)), and the like. The polylactic resin includes polylactic acids alone, which can be obtained by condensation polymerization of lactic acids, or a copolymer of aliphatic dicarboxylic acid, glycol, and the like ("Lacty" (Shimadzu), "Lacea" (Mitsui Chemicals), "NatureWorks" (Cargil-Dow)).

[0016]

The biodegradable resin derived from natural products includes chemically modified starch ("Cornpol" (Japan Corn Starch)), a cellulose acetate resin ("Celgreen PCA" (Daicel Chemical Industries), "Lunale ZT" (Nippon Shokubai), "Cellulose Acetate" (Teijin)), a chitosan resin ("Dolon VA" (Aicello Chemical)), and the like. Biodegradable natural products such as starch may be added to the above biodegradable resins for adjustment of biodegradation rate and the like ("Mater-Bi" (Nippon Synthetic Chemical Industry), "Placorn" (Nihon Shokuhin Kako)). Further, in order to adjust physical properties, the following may be added: fillers such as talc, alumina, wollastonite, and cellulose; and various chemicals such as plasticizers, heat stabilizers, processing aids, antioxidants, vegetable fat and oil, pigments, and ultraviolet absorbing agents.

[0017]

Additionally, the biodegradable resin preferably contains photodegradation enhancers and biodegradation enhancers. The photodegradation enhancer includes an agent for photoexcitation and a sensitizer. The agent for photoexcitation includes benzophenone and derivatives thereof (benzoins, benzoin alkyl ethers, benzophenone, 4,4-bis(dimethyl amino) benzophenone, etc.), acetophenone and derivatives thereof (acetophenone, a lfa,alfa-diethoxy acetophenone, etc.), quinines, thioxanthones, phthalocyanine, and the like. The sensitizer includes anatase-type titanium dioxide, a copolymer of ethylene/carbon monoxide, a complex of aromatic ketone and a metal salt, and the like. Also, two or more of these photodegradation enhancers may be used in combination. In addition, the exemplary biodegradation enhancer includes organic acids such as oxo acids (for example, oxo acids having about 2 to 6 carbon atoms such as

glycolic acid, lactic acid, citric acid, tartaric acid, and malic acid), and saturated dicarboxylic acids (for example, lower saturated dicarboxylic acids having about 2 to 6 carbon atoms such as oxalic acid, malonic acid, succinic acid, succinic anhydride, and glutaric acid; and the like); lower alkyl esters of these organic acids and alcohol having about 1 to 4 carbon atoms; and the like. A preferred biodegradation enhancer includes organic acids having about 2 to 6 carbon atoms such as citric acid, tartaric acid, and malic acid; coconut shell activated carbon; and the like. Also, two or more of these biodegradation enhancers may be used in combination.

[0021]

The first example of the plate-like pigments that can be used in the present invention includes phyllosilicate minerals. Minerals that belongs to phyllosilicate minerals are in the form of plates or flakes and have clear cleavage properties; the minerals include mica group minerals, pyrophyllite, talc, chlorite, serpentine, stilpnomelane, clay minerals, and the like. Among these, minerals that have large particle at the time of their production, for example, mica group minerals and talc are preferred. The mica group mineral includes muscovite, sericite, phlogopite, biotite, fluorphlogopite (artificial mica, synthetic mica), red mica, soda mica, roscoelite, illite, paragonite, brittle mica, tetrasilicic potassium mica, tetrasilicic sodium mica, sodium taeniolite, lithium taeniolite, and the like. Also, synthetic minerals such as synthetic mica are to fall within the present invention.

[0027]

The blending amounts of the biodegradable resin and the plate-like pigment are preferably 95/5-30/70 in terms of mass, more preferably, 90/10-35/65, and particularly preferably, 85/15-40/60. The blending amount of the plate-like pigment less than 5% results in reduction in moisture-proof property-enhancing effect and disintegration property-enhancing effect. The blending amount of the plate-like pigment greater than 70% results in the lack of resin for filling in the gap caused by [illegible] the plate-like pigment, which increases voids and pinholes, and consequently, moisture-proof property deteriorates.

[0066]

In the present invention, an anchor layer can be provided between a moisture-proof layer and a substrate in order to prevent the reduction in the moisture-proof property due to the asperity on the surface of the substrate. The anchor layer preferably includes a pigment and an adhesive aqueous resin. The pigment used includes calcium carbonate, kaolin, clay, talc, titanium oxide, zinc oxide, aluminum hydroxide, amorphous silica, plastic pigment, and the like. The adhesive aqueous resin includes aqueous resins such as starch, casein, polyvinyl alcohol, and variants thereof, and synthetic resin latexes such as styrene-butadiene latex, (meth)acrylic ester latex, and (meth)acrylic-styrene latex. The preferred blend (mass) ratio (solid ratio) of these pigments to the adhesive resins is 5:95 to 50:50. The coating weight is preferably 3 to 30g/m^2 in terms of its solid content. The coating weight less than 3g/m^2 makes it difficult to cover the asperity on the paper supporter to obtain an even flat surface, and the coating weight greater than 30g/m^2 saturates the effect of basecoat. Also, as needed, dispersing agents such as polycarboxylic acid, antifoaming agents, surfactants, water retention agents, tint controlling agents, and the like can be added.

[0070]

The moisture-proof laminate according to the present invention can be preferably used in the following packing of paper products: roll packing of paper products such as newsprint paper, printing paper, heat sensitive paper, and ink-jet paper; packing of flat paper such as printing paper; packing of paper such as PPC paper, heat sensitive paper, and ink-jet paper. Also, the laminate can be preferably used because it can be changed into compost while paper containers for food packaging, paper cups, and the like are difficult to recycle. The laminate is also preferably used for the liners and corrugating medium of a cardboard sheet, and can be used for cardboard boxes.

Example 1

Seventy parts of a biodegradable resin (Celgreen HB-05: polycaprolactone-base, specific gravity 1.22g/cm^3, MFR 6.1g/10 min at 190°C, Vicat softening temperature 105°C, Daicel Chemical Industries) and 30 parts of a synthetic mica (PDM-9L-20: synthetic fluorphlogopite, $KMg_3AlSi_3O_{10}F_2$,

average particle diameter 20 μm, aspect ratio 60, Topy Industries) were agitated with a tumbler for 30 minutes. Subsequently, the thus obtained dry blend (a mixture of the biodegradable resin pellet and the synthetic mica) was subjected to melting and kneading with a twin screw extruder for pelletizing the mixture. Further, an unbleached kraft paper (70g/m^2, 100 μm thick) was provided with a lamination 20 μm thick of the resulting pellet by using a melt extrusion laminator to obtain a moisture-proof laminate.

Electronic Patent Application Fee Transmittal	
Application Number:	11348150
Filing Date:	06-Feb-2006
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Filer:	Matthew M. Eslami/Michele McRoy
Attorney Docket Number:	FDS-029388-US
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	930	930
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**1110**

Electronic Acknowledgement Receipt	
EFS ID:	11150841
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	10-OCT-2011
Filing Date:	06-FEB-2006
Time Stamp:	14:24:03
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1110
RAM confirmation Number	9465
Deposit Account	090525
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		111005_rsptoadvisoryaction_fds029388us.pdf	177662 364379f03685170683ca5ffe467c24bbe55d655e	yes	12

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment After Final	1	1
Claims	2	3
Applicant Arguments/Remarks Made in an Amendment	4	12

Warnings:

Information:

2	Request for Continued Examination (RCE)	111005_rce_fds029388us.pdf	697452 33f8db3348acef16858abb102acf9b458e10ee83	no	3

Warnings:

Information:

3	Information Disclosure Statement (IDS) Form (SB08)	110913_suppids_fds029388us.pdf	612013 a8713297d746b874b18cc5edcdd29f0147e829fa	no	4

Warnings:

Information:

A U.S. Patent Number Citation or a U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form for autoloading of data into USPTO systems. You may remove the form to add the required data in order to correct the Informational Message if you are citing U.S. References. If you chose not to include U.S. References, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.

4	Foreign Reference	CA2150377C.pdf	1635693 da4fd06e2bfcdba449d144ee5a0853b70162946f	no	42

Warnings:

Information:

5	Foreign Reference	CA2179522C.pdf	706330 64c485ba984ac03124996108bd012151578f265d	no	18

Warnings:

Information:

6	Foreign Reference	JP11128284eng.PDF	112112 ff520d20abb37c55ee9d08ba1879e75e60757935	no	5
Warnings:					
Information:					
7	Foreign Reference	WO1996031347A1.pdf	418804 0bad48ac1c9bb678f437e2f7bdf5be33ca40bcb5	no	15
Warnings:					
Information:					
8	Foreign Reference	WO2001060143A1.pdf	904962 fe769bdc5609bea7da48b8588eff08e26a6c625a	no	35
Warnings:					
Information:					
9	Foreign Reference	2003128898eng.PDF	497082 a74ec844b64898edc2eb02cb359eb29cc3ac4bfe	no	12
Warnings:					
Information:					
10	Foreign Reference	jp2003220668eng.PDF	662785 e1adee69715b1fb428d73c783b53bd7fbabe0d2e	no	18
Warnings:					
Information:					
11	Non Patent Literature	EwaRudnik_CompostablePolymerMaterials_1st_Ed_Page_43_2008.pdf	1965396 a0d22016fed2f8773add889cd6ad5e7c8a5a379e	no	32
Warnings:					
Information:					
12	Non Patent Literature	110930_npl_fds029388us.pdf	437477 204e449e76e265ba1542d0c7ea7d5c7bac110501	no	4
Warnings:					
Information:					
13	Fee Worksheet (SB06)	fee-info.pdf	31750 3a7507bca71bfb777235c14c5d96dd4d298c73a4	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	8859518	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

AMENDMENT AFTER FINAL AND REQUEST FOR RECONSIDERATION

United States Patent and Trademark Office
Customer Service Window, Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (made FINAL) mailed July 20, 2011 (as well as the Advisory Action mailed September 26, 2011), the period for response which is currently set to expire October 20, 2011, please amend the above-captioned application as follows, as well as consider the following remarks, in conjunction with the concurrently filed Request for Continued Examination (RCE) under 37 CFR § 1.114. Applicants submit there are good and sufficient reasons, in accordance with 37 CFR § 1.116(b), for entering these amendments. In particular, it is believed these amendments will put the above-captioned application in condition for allowance.

Applicants' representative, Matt M. Eslami, respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicants' representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this paper.

Remarks/Arguments begin on page **4** of this paper.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Currently Amended) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a substrate having a separate interior product facing ~~contacting~~ surface and a separate exterior surface;

a first moisture barrier layer disposed only on said interior surface of said substrate; and

a second moisture protectant layer disposed only on said exterior surface of said substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture barrier layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture barrier layer disposed on said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler

selected from the group consisting of calcium carbonate and starch.

81. (Currently Amended) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Currently Amended) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Currently Amended) The product according to Claim 76 ~~74~~, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one member selected from the group consisting of calcium carbonate and starch.

84. (Currently Amended) The product according to Claim 76 ~~74~~, wherein the substrate comprises paperboard; and the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and comprises polylactic acid and from 5 to 20 percent by weight of at least one member selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Currently Amended) The product according to claim 76 ~~74~~, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer is selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of this application, as amended, is respectfully requested. Claims 1-73 and 85-86 have previously been cancelled. Claims 74-75 and 79 are currently cancelled. Claims 76-78, 80-84, and 87-88 are currently pending.

B. Procedural Matters

Applicants gratefully acknowledge the courtesy of the telephone interview of September 28, 2011 (hereafter referred to as "September 28, 2011 Interview") extended by Primary Examiner Patterson to Applicants' representatives, Matthew M. Eslami, Thomas W. Ryan, and Eric W. Guttag, to discuss on what basis the instant Claims could be amended to be placed in condition for allowance. Applicants' representatives have also reviewed the "Examiner Initiated Interview Summary" of September 30, 2011 (hereafter referred to as "September 30, 2011 Interview Summary), and are frankly surprised at how **inaccurate** and **incomplete** this September 30, 2011 Interview Summary is, including failing to note at least the following:

1. That this September 28, 2011 Interview was initiated by Applicants' representatives and not Examiner Patterson as might be suggested by the title of the September 30, 2011 Interview Summary.

2. That the focus of this September 28, 2011 Interview was specifically on Claims 76 and 79 and not on "all [claims] of record" as might be suggested by the September 30, 2011 Interview Summary.

3. That, at Applicants' representatives' request, Examiner Patterson proposed certain language for inclusion in Claim 76 which was also suggested by Examiner Patterson would move the above-captioned applications towards allowance: (a) the first moisture barrier layer be disposed **only** on the interior surface of the substrate; (b) the second moisture barrier layer be disposed **only** on the exterior surface of the substrate; (c) changing interior product

contacting surface" to "interior product **facing** surface"; and (d) incorporating the language of Claim 79 regarding "coat weight" (i.e., a coat weight of from 5 to 30 lbs/3000 ft^2).

The actual substance of this September 28, 2011 Interview is discussed further below, as appropriate.

C. Amendments to Claims

As was discussed and as was agreed to at the September 28, 2011 Interview, Claim 76 has been amended to recite that: (a) the first moisture barrier layer is disposed **only** on the interior surface of the substrate; (b) the second moisture barrier layer is disposed **only** on the exterior surface of the substrate; (c) an "interior product **facing** surface"; and (d) that the second moisture barrier layer has a "coat weight" **of from 5 to 30 lbs/3000 ft^2**. Support for these amendments to Claim 76 may be found, for example (as was pointed out at the September 28, 2011 Interview), in FIG. 7 of the above-captioned application, as well as Claim 79 (now cancelled).

In addition to Claim 79, Claims 74-75 have now been cancelled. In view of the amendments to Claim 76 and the cancellation of Claims 74-75 and 79, Claims 81-82 have been amended to conform to the language of amended Claim 76. Claims 83-84 and 87 have also been amended to depend from amended Claim 76 and to conform to the language of amended Claim 76.

D. Response to Rejection of Claim 76 under 35 U.S.C. § 102(b) as Being Anticipated by Doane

At page 2 of the Final Office Action ("Final Action"), Claim 76 has again been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 6,040,063 to Doane et al. (hereafter referred to as (hereafter referred to as "**Doane**"). **This rejection is respectfully traversed with respect to Claim 76**, as amended, for at least the following reasons.

In support of the rejection of Claim 76 as being anticipated by **Doane**, the Final Action makes the following allegation:

> ***Allegation 1***: [**Doane**] discloses a laminate comprising [a] substrate (column 4, lines 32-39) and **an interior and exterior moisture protective layer** (coating '16' in Figure 2; column 4, lines 29-31) comprising [a] biodegradable polyester (column 4, line 52).[1]

In response to the Examiner's proposed amendments at the September 28, 2011 Interview, Claim 76 has been amended to recite that: (a) the first moisture barrier layer is disposed **only** on the interior surface of the substrate; (b) the second moisture barrier layer is disposed **only** on the exterior surface of the substrate; (c) an "interior product **facing** surface"; and (d) that the second moisture barrier layer has a "coat weight" **of from 5 to 30 lbs/3000 ft^2**.

In view of these amendments to Claim 76 proposed by the Examiner, what Allegation 1 asserts[2] does not support the rejection of amended Claim 76 as anticipated by **Doane**. Claim 76 is distinguishable over **Doane** in reciting that the second moisture barrier layer of the laminate of the cup, which is disposed **only** on the exterior substrate surface, **is separate from** the first moisture barrier layer disposed **only on the interior substrate surface**. In other words, Claim 76 recites **two separate** and **distinct moisture barrier layers**, **each one disposed, respectively, only on either the interior or exterior surface of the substrate**. By contrast, and contrary to what Allegation 1 asserts, coating layer 16 of **Doane** forms only **one continuous and surrounding exterior layer** with respect structure 12. In fact, and contrary to the requirements of 37 CFR § 1.104(c)(2)[3] and MPEP § 707.05,[4] Allegation 1 provides a **completely inadequate explanation** as to how **Doane** teaches **two separate** and **distinct moisture barrier layers**, **each one disposed, respectively, only on either the interior or exterior surface of the substrate** according to amended Claim 76.

In response to Applicants' argument at pages 6-7 of their prior June 10, 2011 Response that **Doane** does not disclose two separate and distinct moisture barrier layers, one each disposed on the interior and exterior surface of the substrate, the Final Action makes the

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[1] See page 2 of the Final Action (emphasis added).
[2] The Advisory Action mailed September 26, 2011 (hereafter "September 26, 2011 Advisory Action") asserts that the following: "However, because the first moisture barrier layer '14' is disposed on the surface of the substrate, the second moisture barrier layer is also disposed on the surface of the substrate, although not in direct contact with the substrate." But like what Allegation 1 asserts, this assertion from the September 26, 2011 Advisory Action also does not support **Doane** anticipating amended Claim 76 for the same reasons presented in response to Allegation 1.
[3] 37 CFR § 1.104(c)(2) states, in relevant part, that: "The pertinence of each reference, **if not apparent**, must be clearly explained and each rejected claim specified." (Emphasis added.)
[4] MPEP § 707.05 (Citation of References) states, in relevant part, that: "When such prior art is cited, its **pertinence should be explained**." (Emphasis added.)

following additional allegation:

> ***Allegation 2***: However, **both layers [i.e., layers 14 and 16] are clearly disposed on the interior and exterior surfaces of the substrate '12'** as shown in Figure 1 [of **Doane**].[5]

What Allegation 2 asserts also does not support the rejection of Claim 76, as amended, as anticipated by **Doane**. Applicants agree that layers 14 and 16 shown in FIG. 2 of **Doane** are separate and distinct layers. But, again, and contrary to the requirements of 37 CFR § 1.104(c)(2)[6] and MPEP § 707.05,[7] what Allegation 2 neglects to address, and what is not shown by layers 14 and 16 in FIG. 2 of **Doane**, are one of each of these separate and distinct moisture barrier layers **being disposed, respectively, only on either the interior or exterior surface of the substrate** as recited in Claim 76. Instead, layer 14 is disposed on interior layer 12 (which Allegation 2 also **mischaracterizes** as the "substrate"), while layer 16 is disposed on layer 14 (not interior layer 12). Like Allegation 1, Allegation 2 again **mischaracterizes** what is fairly taught by FIG. 2 of **Doane** with respect to the positioning of moisture barrier layers with respect to the interior and exterior surfaces of the substrate according to amended Claim 76.

If the Examiner still maintains that **Doane** teaches a **cup**[8] comprising a laminate having **two separate** and **distinct moisture barrier layers**, **each one disposed on either the interior and exterior surface of the substrate** according to amended Claim 76 based on what is asserted in Allegations 1-2, then Applicants also assert that this rejection under 35 U.S.C. § 102(b) appears to be based, at least partially, on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the

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[5] See page 5 of the present Office Action (emphasis added).
[6] 37 CFR § 1.104(c)(2) states, in relevant part, that: "The pertinence of each reference, **if not apparent**, must be clearly explained and each rejected claim specified." (Emphasis added.)
[7] MPEP § 707.05 (Citation of References) states, in relevant part, that: "When such prior art is cited, its **pertinence should be explained**." (Emphasis added.)
[8] Page 5 of the Final Action also asserts that page 7 of Applicants' prior June 10, 2011 Response argues that "[**Doane**] is not in the form of a cup." But that assertion **mischaracterizes** what was said at page 7 of Applicants' prior June 10, 2011 Response. Applicants' primary emphasis in their argument at page 7 of their prior June 10, 2011 Response was on **Doane** not teaching a laminate having **two separate** and **distinct moisture barrier layers**, **each one disposed only on either the interior and exterior surface of the substrate** according to Claim 76. In addition, the further assertion at page 5 of the Final Action that the "tray disclosed by" **Doane** "is in the form of a cup as shown in Figure 1" further **mischaracterizes** what even **Doane** identifies element 10 to be (a "foam tray"). See, for example, column 3, lines 56-57. In fact, nowhere does **Doane** even mention that its structure can be a cup according to Claim 76.

Examiner wishes to persist in this rejection of Claim 76 under 35 U.S.C. § 102(b) as being anticipated by **Doane** for the same reasons presented in Allegations 1-2, Applicants again **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[9] because this rejection appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Doane**, or any other verifiable evidence provided by the Examiner.

For at least the foregoing reasons, Claim 76, as amended, is patentable over **Doane**. Accordingly, the rejection of this Claim under 35 U.S.C. § 102(b) based on this reference should be withdrawn.

E. Response to Rejection of Claims 74-75, 81-83, and 87-88 under 35 U.S.C. § 103(a) as Being Unpatentable over Asrar, in view of Lind

At pages 2-3 of the Final Action, Claims 74, 81-83, and 87-88[10] have again been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 6,025,028 to Asrar et al (hereafter referred to as "**Asrar**"), in view of U.S. Pat. No. 4,267,960 to Lind et al. (hereafter referred to as "**Lind**"). **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

First, Claim 74 has been cancelled. Accordingly, this rejection is now **moot** with respect to cancelled Claim 74. Second, Claims 81-83, and 87-88, as amended or as currently presented, now depend, directly or indirectly, from amended Claim 76 which has not been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Asrar**, even in view of **Lind**, and is therefore admitted by the Final Action to be patentable over this combination of

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[9] See 37 CFR § 1.104(d)(2) which states: "When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons." Applicants note that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued "the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] ***expressly entitle*** an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner's asserted level of skill in the art]" (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that "this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process." See 31 USPQ2d at 1455. See also *In re Vaidyanathan* (Fed. Cir. 2010)(non-precedential)(slip opinion at 18): "If it is not possible for the examiner to provide this type of information, **the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge** (as a person approximating one of ordinary skill in the art) of the technology in question (citing 37 CFR § 1.104(d)(2)) (emphasis added)."

[10] As Applicants have even noted in their prior June 10, 2011 Response, Claims 85 and 86 have previously been cancelled, so the reference of this rejection to those Claims is moot.

references. Accordingly, Claims 81-83 and 87-88 must similarly be patentable over this combination of references.

For at least the foregoing reasons, the rejection of pending Claims 81-84, and 87-88, as amended or as currently presented, under 35 U.S.C. § 103(a) over **Asrar**, even in view of **Lind**, should now be withdrawn.

D. Response to Rejection of Claims 77-80 under 35 U.S.C. § 103(a) as Being Unpatentable over Doane

At page 3 of the Final Action, Claims 77-80 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Doane**. **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78 under 35 U.S.C. § 103(a) as being unpatentable over **Doane**, the Final Action makes the following allegation:

> ***Allegation 3***: [**Doane**] fails to disclose a calcium carbonate in the amount of 5-20% by weight. However, the calcium carbonate disclosed by [] is for nucleation (column 9, lines 38-41). It there would have been obvious for one of ordinary skill in the art to select an amount of calcium carbonate depending on the desired amount.[11]

What Allegation 3 asserts does not support the rejection of Claims 77-78 as being unpatentable over **Doane** for at least the following reasons. First, for at least the same reasons presented above in Section D in response to Allegations 1-2, amended Claim 76 is patentable over **Doane**. Allegation 3 does not assert that those features recited in Claim 77 (i.e., second moisture barrier layer comprising from 5 to 20 percent by weight of at least one filler) or recited in Claim 78 (i.e., second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth) which were asserted **to be missing from the teachings** of **Doane** are now taught by that reference.[12]

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[11] See page 4 of the Final Action (emphasis added).

[12] Similar to the assertion made at page 6 of the Final Action with respect to what **Asrar** teaches with respect to the calcium carbonate filler of Claims 81-83, page 5 of the Final Action also asserts "it is unclear why the calcium carbonate disclosed by [**Doane**] would fail to provide the properties provided by the claimed carbonate

In support of the rejection of Claim 79 under 35 U.S.C. § 103(a) as being unpatentable over **Doane**, the Final Action makes the following allegation:

> ***Allegation 4***: [**Doane**] **fails to disclose** a polymeric protectant layer, moisture protective layer and product contact layer having a **thickness** of from five to thirty pounds per three thousand feet. However, [**Doane**] discloses layers comprised in a tray (column 4, lines 10-13), as discussed above. **It therefore would have been obvious** for one of ordinary skill in the art **to have provided for a desired coat weight of polymeric protectant layer, moisture protective layer and product contact layer depending on the desired weight of the package**.[13]

In response to the Examiner's proposed amendments at the September 28, 2011 Interview, Claim 76 has been amended to recite the language of Claim 79 (now cancelled), i.e., the second moisture barrier layer has a coat weight **of from 5 to 30 lbs/3000 ft^2**: What Allegation 4 asserts again does not support the rejection of amended Claim 76 as being unpatentable over **Doane** for at least the following reasons. First, for at least the same reasons presented above in Section D in response to Allegations 1-2, amended Claim 76 is patentable over **Doane**. Allegation 4 does not assert that those features in amended Claim 76 (i.e., the second moisture barrier layer disposed **only** on the exterior substrate surface is **separate from** the first moisture barrier layer **disposed only on either the interior substrate surface**) which were asserted **to be missing from the teachings** of **Doane** are now taught by that reference.

Second, Allegation 4 concedes that the coat weights (not **thickness** as asserted by Allegation 4) recited in amended Claim 76 are not taught by **Doane**. Instead, Allegation 4 asserts that it "would be obvious . . . to have provided for a desired coat weight of polymeric protectant layer, moisture protective layer and product contact layer depending on the desired weight of the package." That assertion again amounts to an **impermissible** "conclusory statement" without any "rational underpinning" which is **factually unsupported** by **Doane**,[14]

[of Claims 77-78 and 80]." But, again, the purpose that **Doane** teaches for including calcium carbonate is clearly relevant, particularly with respect to whether this reference teaches the amounts recited in Claims 77-78 and 80 for the calcium carbonate used as filler.

[13] See page 4 of the Final Action (emphasis added).

[14] Page 6 of the Final Action further asserts that "because the coating would be a component of the cup, the weight of the cup would clearly be impacted by variance in the thickness of the coating." But that assertion, again, provides **no factually supported basis** in **Doane** for why this reference would teach the **specific coat weights** recited in Claim 79. See also response to Allegation 10 in Section C above.

the reference relied upon in rejecting this language now incorporated into amended Claim 76.[15]

Allegation 4 points to **absolutely nothing** in **Doane** (or any other verifiable evidence) to **factually support** why one of ordinary skill in the art would select the particular coat weights recited in amended Claim 76. In fact, and in response to the Examiner's question at the September 28, 2011 Interview, there is commercial, as well as practical, significance in the claimed coat weight range now recited in amended Claim 76 (i.e., a coat weight **of from 5 to 30 lbs/3000 ft^2**.), which is also not taught by **Doane**. If the coat weight is below 5 lbs/3000 ft^2, it may be difficult to apply the moisture barrier layer to the substrate surface, e.g., using, for example, a laminating extruder to apply this layer. Conversely, there may be compostability restrictions coat weights above 30 lbs/3000 ft^2.

With respect to Claim 80 (which depends directly from amended Claim 76), and contrary to the requirements of 37 CFR § 1.104(b),[16] provides **absolutely no explanation** as to what the rejection of Claim 80 as being unpatentable over **Doane** is based on. Nonetheless, for at least the same reasons presented above in response to Allegations 1-4, Claim 80 is patentable over **Doane**.

For at least the foregoing reasons, Claims 77-78 and 80, as amended or as currently presented, are patentable over **Doane**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) over this reference should be withdrawn.

F. Conclusion

Claims 76-78, 80-84, and 87-88, as amended or as currently presented, are patentable over the art relied upon in the Final Action. Accordingly, Claims 76-78, 80-84, and 87-88 are in condition for allowance, and favorable action is earnestly solicited thereon.

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[15] *See e.g., In re Kahn,* 78 U.S.P.Q.2d at 1336 (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* See also *In re Vaidyanathan* (Fed. Cir. 2010)(non-precedential)(slip opinion at 17): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should** elaborate, **discuss**ing **the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added).

[16] 37 CFR § 1.104(b) states, in relevant part, that: "The examiner's action **will be complete as to all matter**." (Emphasis added.)

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Mr. Matthew M. Eslami at 513-248-6193 to expedite prosecution of the above application.

No extension of time is believed to be required. However, the Commissioner is hereby authorized by this paper to charge any fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment, to Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully Submitted,

Date: October 10, 2011

By: /Matthew M. Eslami/

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PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/348,150	02/06/2006	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/10/2011	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 10	Minus	** 73	= 0	X $ =		OR	X $60=	0
Independent (37 CFR 1.16(h))	* 1	Minus	***13	= 0	X $ =		OR	X $250=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/PHYLLIS CANTY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 11/23/2011

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
11/23/2011	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/348,150	CLEVELAND ET AL.	
	Examiner	Art Unit	
	MARC PATTERSON	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/10/11*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *76-78,80-84,87 and 88* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *76-78,80-84,87 and 88* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/10/11*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

WITHDRAWN REJECTIONS

1. The 35 U.S.C. 102(b) rejection of Claim 76 as being anticipated by Doane et al. (U.S. Patent No. 6,040,063), of record on page 2 of the previous Action, is withdrawn

NEW REJECTIONS

Claim Rejections – 35 USC § 103(a)

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 76 and 87 – 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koeblitz et al. (German Patent No. 10020461).

With regard to Claim 76, Koeblitz et al disclose a product in the form of a cup (container having an opening; English Abstract; Novelty) substrate having first moisture barrier layer disposed only on the interior surface and second moisture protectant layer disposed only on the exterior surface and comprising a biodegradable polyester polymer (inner and outer sides have liquid a resistant coating comprising polycaprolactone; English Abstract; Description). Koeblitz et al fail to disclose a coat weight from 5 to 30 lbs/3000 ft^2. However, it would have been obvious for one of ordinary skill in the art to select a thickness depending on the desired weight of the end product.

With regard to Claims 87 – 88. Koeblitz et al disclose polylactic acid (English Abstract; Description).

4. Claims 77 – 78 and 80 – 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koeblitz et al (German Patent No. 10020461) in view of Doane et al (U.S. Patent No. 6,040,063).

Koeblitz et al disclose a product as discussed above. With regard to Claims 77 – 78 and 80 - 84, Koeblitz et al fail to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate.

Doane et al disclose a degradable polyester comprising calcium carbonate for the purpose of nucleation (column 9, lines 38 - 41).

It therefore would have been obvious for one of ordinary skill in the art to provide for calcium carbonate in order to provide nucleation as taught by Doane et al.

Doane et al fail to disclose a calcium carbonate in the amount of 5 - 20% by weight. However, as stated above, the calcium carbonate disclosed by Doane et al is for nucleation (column 9, lines 38 - 41).

It therefore would have been obvious for one of ordinary skill in the art to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by Doane et al.

ANSWERS TO APPLICANT'S ARGUMENTS

5. Applicant's arguments regarding the 35 U.S.C. 102(b) rejection of Claim 76 as being anticipated by Doane et al. (U.S. Patent No. 6,040,063), of record in the previous Action, have been considered and have been found to be persuasive. The rejection is therefore withdrawn. The new rejections above are directed to Claims 76 – 78, 80 – 84 and 87 – 88.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 11/348,150	Applicant(s)/Patent Under Reexamination CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,048,975	05-2006	Tojo et al.	428/34.3
*	B	US-2001/0038893	11-2001	Mohan et al.	428/34.2
*	C	US-2004/0026834	02-2004	Ibaraki et al.	266/177
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	10020461	10-2001	Germany	Koeblitz et al.	
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 894 of 1179

DERWENT-ACC-NO: 2002-115317

DERWENT-WEEK: 200219

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TITLE: Biologically degradable containers useful in packaging is coated with biologically degradable film and having increased liquid resistance

INVENTOR: KAISER N; KESSELRING A ; KOEBLITZ T

PATENT-ASSIGNEE: APACK BIOLOGISCHE VERPACKUNGEN AG[APACN]

PRIORITY-DATA: 2000DE-1020461 (April 26, 2000)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
DE 10020461 A1	October 31, 2001	DE
WO 0181193 A1	November 1, 2001	DE
AU 200061505 A	November 7, 2001	EN

DESIGNATED-STATES: AE AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES
FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD
MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA UG US UZ VN
YU ZA ZW AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL
OA PT SD SE SL SZ TZ UG ZW

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
DE 10020461A1	N/A	2000DE-1020461	April 26, 2000
AU 200061505A	N/A	2000AU-061505	June 16, 2000
WO2001081193A1	Based on	2000WO-EP05573	June 16, 2000

INT-CL-CURRENT:

TYPE	IPC	DATE
CIPS	B65D65/46	20060101

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 895 of 1179

ABSTRACTED-PUB-NO: DE 10020461 A1

BASIC-ABSTRACT:

NOVELTY - A biologically degradable molded body, especially a container, with inner and outer sides, at least one opening based on a composite obtained from starch and a biologically degradable fiber material, the inner and outer sides having a liquid resistant coating formed from a biologically degradable film on the molded body is new.

DESCRIPTION - An INDEPENDENT CLAIM is included for preparation of the molded body in which the body is coated on the inside and outside with a first biologically degradable film, optionally the projection of the first film at the edge of the hole in the body is removed, the outside of the body is coated with a second biologically degradable film, and the projection of this film at the edge of the body is also removed, and the first and second films are joined, e.g. by welding, in the edge region between the inner and outer sides of the body.

USE - The molded body or container is useful in packaging.

ADVANTAGE - The molded body avoids the drawbacks of previous molded bodies and has increased liquid resistance.

DESCRIPTION OF DRAWING(S) - Figure 1 shows an example of the apparatus.

low pressure chamber, (1)

Heating element, (2)

Protective element, (3)

Holes, (4)

Molded body, (5)

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
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Biodegradable film (6)

EQUIVALENT-ABSTRACTS:

POLYMERS

Preferred Components: The thickness of the film deposited on the molded body is about 100 micron, and the film is made from: cellulose ester, cellulose glass, polyester, polyester derivative, polyester amide, starch, and mixtures of these. The cellulose ester is selected from: cellulose acetate-, diacetate-, acetobutyrate-, butyrate, propionate, or acetopropionate or their mixtures. The polyester is selected from: polylactic acid, poly-beta-hydroxybutyrate, poly-beta-hydroxyvaleriate, polycaprolactone, and their mixtures. The polyester is a copolymer from poly-beta-hydroxybutyrate and poly-beta-hydroxyvaleriate, or a polyester from 1,4-benzenedicarboxylic acid, 1,4-butandiol, and hexanedicarboxylic acid. The polyesteramide is a copolymer of PA6 or PA66 and an aliphatic ester.

No specific examples give.

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: BIOLOGICAL DEGRADE CONTAINER USEFUL PACKAGE COATING FILM INCREASE LIQUID RESISTANCE

DERWENT-CLASS: A11 A23 A92 Q34

CPI-CODES: A03-A00A; A11-B09A2; A12-B07; A12-P01B;

ENHANCED-POLYMER-INDEXING:
Polymer Index [1.1]
018 ; D01 D11 D10 D23 D22 D31 D42 D50 D76 D86 F24 F29 F26 F34 H0293 P0599
G3623 R01863 107779; S9999 S1434;
Polymer Index [1.2]
018 ; ND01; K9416; K9574 K9483; K9676*R; K9687 K9676; B9999 B3021
B3010; Q9999 Q8399*R Q8366; Q9999 Q7818*R; N9999 N7192 N7023; N9999

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Clearwater Paper Corp. v. Graphic Packaging International LLC
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PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

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/M.P./	1	2150377	CA		1994-04-28	Suskind		☐
/M.P./	2	2179522	CA		1995-06-29	Waddington		☐
/M.P./	3	11128284	JP		1999-05-18	Nakamura et al.		☒

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

/M.P./	4	199631347	WO		1996-10-10	Waddington		☐
/M.P./	5	200160143	WO		2001-08-23	Lee et al.		☐
/M.P./	6	2003128898	JP		2003-05-08	Kunihiro et al.		☒
/M.P./	7	2003220668	JP		2003-08-05	Takashi		☒

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
/M.P./	1	Ewa Rudnik, "Compostable Polymer Materials", 1st Ed., Page 43, 2008	☐
/M.P./	2	Michael and Irene Ash, "Handbook of Green Chemicals", 2nd Ed., Page 564, 2004	☐

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EXAMINER SIGNATURE

Examiner Signature	/Marc Patterson/	Date Considered	11/17/2011

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2011-10-10
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 901 of 1179

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	Art Unit
	MARC PATTERSON	1782

SEARCHED			
Class	Subclass	Date	Examiner
428	34.1	11/21/11	M.A.P.
428	34.2	11/21/11	M.A.P.
428	35.7	11/21/11	M.A.P.
428	35.9	11/21/11	M.A.P.
428	36.9	11/21/11	M.A.P.

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

AMENDMENT

United States Patent and Trademark Office
Customer Service Window, Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (non-FINAL) mailed November 23, 2011, the period for response which is currently set to expire February 23, 2012, please amend the above-captioned application as follows, as well as consider the following remarks.

Applicants' representative, Matt M. Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this paper.

Remarks/Arguments begin on page **4** of this paper.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Currently Amended) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a paperboard substrate having a separate interior product facing surface and a separate exterior surface;

a first moisture barrier layer disposed only on said interior surface of said paperboard substrate, wherein the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2; and

a second moisture protectant layer disposed only on said exterior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture barrier layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture barrier layer disposed on said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture

protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

81. (Previously Presented) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Previously Presented) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Currently Amended) The product according to Claim 76, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one ~~member~~ filler selected from the group consisting of calcium carbonate and starch.

84. (Previously Presented) The product according to Claim 76, wherein the substrate comprises paperboard; and the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and comprises polylactic acid and from 5 to 20 percent by weight of at least one member selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Currently Amended) The product according to claim 76, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer ~~is~~ selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of this application, as amended, is respectfully requested. Claims 1-75, 79, and 85-86 have previously been cancelled. Claims 76-78, 80-84, and 87-88 are currently pending.

B. Procedural Matters

Applicants gratefully acknowledge the Examiner's statements at pages 2 and 4 of the present Office Action that the prior rejection of Claim 76 under 35 U.S.C. § 102(b) as being anticipated by U.S. Pat. No. 6,040,063 to Doane et al (hereafter referred to as "**Doane**") has been withdrawn in view of the persuasiveness of Applicants' arguments in their prior amendment after final of October 10, 2011 (hereafter referred to as "October 10, 2011 AAF").

Applicants are also enclosing a complete English translation of German Patent No. 10020461 to Koeblitz et al. (hereafter referred to as "**Koeblitz**") which is cited by the present Office Action. While Applicants believe this enclosed English translation of **Koeblitz** is complete and accurate, Applicants make no warranty as to the complete truth and accuracy of this enclosed English translation.

C. Amendments to Claims

Claim 76 has been amended to recite a **paperboard** substrate. Support for this amendment to Claim 76 may be found, for example, in paragraphs [0032] and [0051] of the published version (i.e., U.S. Appln. No. 20070184220)[1] of the above-captioned application.

Claim 76 has also been amended to recite that the **first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2**. Support for this amendment to Claim 76 may be found, for example, in paragraphs [0050]-[0051] of the published version (i.e., U.S. Appln. No. 20070184220) of the above-captioned application.

Claim 83 has been amended to recite that the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one **filler** selected from the group

[1] All references to the above application herein will be with respect to the published version U.S. Pat. Appln. No. 20070184220, published August 9, 2007.

consisting of calcium carbonate and starch. Support for this amendment to Claim 83 may be found, for example, in paragraphs [0018] and [0053] of the published version (i.e., U.S. Appln. No. 20070184220) of the above-captioned application.

A typographical error in Claim 87 has also been corrected.

D. Response to Rejection of Claims 76 and 87-88 under 35 U.S.C. § 103(a) as Being Unpatentable over Koeblitz

At pages 2-3 of the present Office Action, Claims 76 and 87-88 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Koeblitz**. **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claim 76 as being unpatentable over **Koeblitz**, the present Office Action makes the following allegation:

> ***Allegation 1***: [**Koeblitz**] disclose[s] product in the form of a cup (container having an opening; English Abstract; Novelty) **substrate** having first moisture barrier layer disposed only on the interior surface and second moisture protectant layer disposed only on the exterior surface and comprising a biodegradable polyester polymer (inner and outer sides have liquid a resistant coating comprising polycaprolactone; English Abstract; Description). [**Koeblitz**] **fail[s] to disclose a coat weight from 5 to 30 lbs/3000 ft^2**. However, **it would have been obvious** for one of ordinary skill in the art **to select a thickness depending on the desired weight of the end product**.[2]

In response to what Allegation 1 asserts, Claim 76 has been amended to recite a **paperboard** substrate. By contrast, **Koeblitz** teaches (see enclosed English translation) a "biodegradable molded body" having a biodegradable film applied to the inner and outer sides of this "biodegradable molded body."[3] This "biodegradable molded body" is manufactured from a mass of material which can be baked (such as in a wafer mold), and which contains starch, biodegradable fiber material (plant or animal fibers such as fibers containing cellulose),[4] and water, as well as other optional additives such as protein, filler, anti-caking agents, dyes, etc.[5]

---

[2] See page 2 of the present Office Action (emphasis added).
[3] See paragraph [0041] of the enclosed English translation of **Koeblitz**.
[4] See paragraph [0014] of the enclosed English translation of **Koeblitz**.
[5] See paragraph [0011] of the enclosed English translation of **Koeblitz**.

In other words, the "substrate" of **Koeblitz** **is a baked molded mass of material** which is completely unlike the **paperboard** substrate of amended Claim 76. In fact, the enclosed English translation of **Koeblitz** makes no mention of paperboard as being a "biodegradable molded body." Accordingly, amended Claim 76 is distinguishable from, as well as patentable over, **Koeblitz** in reciting a **paperboard** substrate.

Claim 76 has also been amended to recite that the **first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2**. Accordingly, amended Claim 76 is further distinguishable from, as well as patentable over, **Koeblitz** in reciting that the first and second moisture protectant layers each have **a coat weight of from 5 to 30 lbs/3000 ft^2**. In fact, Allegation 1 admits that **Koeblitz** does not teach these coat weights recited in amended Claim 76.[6] Instead, Allegation 1 asserts that "it would have been obvious" "to select a thickness depending on the desired weight of the end product." But this assertion amounts to a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything which Allegation 1 asserts is allegedly taught by **Koeblitz**, or any other verifiable evidence provided by the Examiner. "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion of obviousness."[7]

Allegation 1 points to **absolutely nothing** in **Koeblitz** (or any other verifiable evidence) to **factually support** why one of ordinary skill in the art would select the particular coat weights for the first and second moisture protectant layers recited in amended Claim 76. In fact, Applicants must conclude that what is asserted in Allegation 1 with respect to the coat weights recited in amended Claim 76 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**.

---

[6] Contrary to what Allegation 1 asserts, amended Claim 76 recites "coat weights," not **thickness**.

[7] *See e.g., In re Kahn,* 78 U.S.P.Q.2d at 1336 (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc*., 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id*. See also *In re Vaidyanathan* (Fed. Cir. 2010)(non-precedential)(slip opinion at 17): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should elaborate, discussing the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added).

Accordingly, if the Examiner wishes to persist in this assertion in Allegation 1 regarding the coat weights recited in amended Claim 76, Applicants **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[8] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Koeblitz**, or any other verifiable evidence provided by the Examiner.

In support of the rejection of Claims 87-88 as being unpatentable over **Koeblitz**, the present Office Action makes the following allegation:

> ***Allegation 2***: [**Koeblitz**] disclose[s] polylactic acid (English Abstract; Description.[9]

Claims 87 and 88 each depend directly from amended Claim 76. Accordingly, Claims 87-88 are patentable over **Koeblitz** for at least the same reasons amended Claim 76 is patentable over this reference.

For at least the foregoing reasons, Claims 76 and 87-87, as amended or as currently presented, are patentable over **Koeblitz**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) based on this reference should be withdrawn.

E. Response to Rejection of Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as Being Unpatentable over Koeblitz, in view of Doane

At page 3 of the present Office Action, Claims 77-78 and 80-84 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Koeblitz**, in view of **Doane**. **This**

---

[8] See 37 CFR § 1.104(d)(2) which states: "When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons." Applicants note that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued "the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] ***expressly entitle*** an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner's asserted level of skill in the art]" (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that "this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process." See 31 USPQ2d at 1455. See also *In re Vaidyanathan* (Fed. Cir. 2010)(non-precedential)(slip opinion at 18): "If it is not possible for the examiner to provide this type of information, **the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge** (as a person approximating one of ordinary skill in the art) of the technology in question (citing 37 CFR § 1.104(d)(2)) (emphasis added)."

[9] See page 3 of the present Office Action.

rejection is respectfully traversed with respect to these Claims, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78 and 80-84 as being unpatentable over **Koeblitz**, in view of **Doane**, the present Office Action makes the following allegations:

> ***Allegation 3***: [**Koeblitz**] disclose[s] product as discussed above. With regard to Claims 77-78 and 80-84, [**Koeblitz**] **fail[s] to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate**.[10]
>
> ***Allegation 4***: [**Doane**] disclose[s] degradable polyester **comprising calcium carbonate for the purpose of nucleation** (column 9, lines 38 - 41).[11]
>
> ***Allegation 5***: It therefore would have been obvious for one of ordinary skill in the art **to provide for calcium carbonate in order to provide nucleation as taught by** [**Doane**].[12]
>
> ***Allegation 6***: [**Doane**] **fail[s] to disclose a calcium carbonate in the amount of 5 - 20% by weight**. However, as stated above, the calcium carbonate disclosed by Doane et al is for nucleation (column 9, lines 38 - 41).[13]
>
> ***Allegation 7***: It therefore would have been obvious for one of ordinary skill in the art **to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by** [**Doane**].

What Allegations 3-7 assert do not support the rejection of Claims 77-78 and 80-84 as being unpatentable over **Koeblitz**, even in view of **Doane**, for at least the following reasons. First, for at least the same reasons presented above in Section D in response to Allegation 1, amended Claim 76 is patentable over **Koeblitz**. Second, Allegations 3-7 do not assert that those features recited in amended Claim 76 (i.e., **paperboard** substrate, and **coat weights of from 5 to 30 lbs/3000 ft^2** for the first and second moisture protectant layers) which were asserted **to be missing from the teachings** of **Koeblitz**, are now taught by **Doane**.

Third, Claims 77-78 and 80-84 are further distinguishable over **Doane** in reciting that the moisture protectant layer comprises **at least one filler** which may be calcium carbonate

[10] See page 3 of the present Office Action (emphasis added).
[11] See page 3 of the present Office Action (emphasis added).
[12] See page 3 of the present Office Action (emphasis added).
[13] See page 3 of the present Office Action (emphasis added).

(see Claims 78, 80, and 82-84). As admitted by Allegation 3, **Koeblitz** does not teach 5 to 20 percent by weight of at least one filler comprising calcium carbonate. Instead, Allegation 4 relies upon **Doane** to teach that calcium carbonate can be used "for the purpose of nucleation." But nowhere does **Doane** teach calcium carbonate as a filler for a moisture protectant layer according to Claims 78, 80, or 82-84.

Fourth, these "nucleating agents" are taught by **Doane** for use **in preparing natural polymer foams for structure 12**[14] (structure 12 would correspond to the paperboard substrate of Claims 77-78 and 80-84), and not the hydroxyfunctional polyester layer 14 which is self-adhered to the surface of structure 12 (layer 14 would correspond to one of the first or second moisture protectant layers of Claims 77-78 and 80-84). In other words, and contrary to what Allegations 4-5 suggest, **Doane** does not teach inclusion of calcium carbonate (or any other disclosed "nucleating agent") in its hydroxyfunctional polyester layer 14 as a filler, much less as a filler in the first and second moisture protectant layers (which correspond to layer 14 of **Doane**) of Claims 77-78 and 80-84.

Fifth, Allegation 6 admits that Doane fails to disclose including calcium carbonate in the amount of 5 to 20% by weight. Instead, Allegation 7 asserts that it would be obvious "to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by [**Doane**]. But this assertion by Allegation 7 is, again, a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything which Allegation 7 asserts is allegedly taught by **Doane**, or any other verifiable evidence provided by the Examiner.[15] Given that **Doane** is teaching the use of calcium carbonate for an entirely different purpose (nucleating agent versus filler), and not in the moisture protectant layers according to Claims 77-78 and 80-84, Allegation 7 provides absolutely no **factually supported** "rational basis" for this assertion that one of ordinary skill the art would, by chance, select the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84.

In fact, Applicants must again conclude that what is asserted in Allegation 7 with respect to the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this

[14] See, for example, column 7, lines 53-56, and column 9, lines 4-6, of **Doane**.
[15] See cases and text cited in footnote 7.

assertion in Allegation 7 regarding the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84, Applicants **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[16] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Doane**, or any other verifiable evidence provided by the Examiner.

For at least the foregoing reasons, Claims 77-78 and 80-84, as currently presented, are patentable over **Koeblitz**, even in view of **Doane**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) over this combination of references should be withdrawn.

F. Conclusion

Claims 76-78, 80-84, and 87-88, as amended or as currently presented, are patentable over the art relied upon in the Final Action. Accordingly, Claims 76-78, 80-84, and 87-88 are in condition for allowance, and favorable action is earnestly solicited thereon.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Mr. Matthew M. Eslami at 513-248-6193 to expedite prosecution of the above application.

[16] See cases and text cited in footnote 8 with respect to 37 CFR § 1.104(d)(2).

No extension of time is believed to be required. However, the Commissioner is hereby authorized by this paper to charge any fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment, to Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully Submitted,

Date: February 21, 2012

By: /Matthew M. Eslami/

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PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	11348150
Filing Date	2006-02-06
First Named Inventor	CLEVELAND, CS
Art Unit	1782
Examiner Name	Patterson, Marc A.
Attorney Docket Number	FDS-029388-US

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	1	20030143256		2003-07-31	Gen	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-02-21
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 917 of 1179

Electronic Patent Application Fee Transmittal	
Application Number:	11348150
Filing Date:	06-Feb-2006
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Filer:	Matthew M. Eslami/Michele McRoy
Attorney Docket Number:	FDS-029388-US
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt	
EFS ID:	12118875
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	21-FEB-2012
Filing Date:	06-FEB-2006
Time Stamp:	13:32:59
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	17020
Deposit Account	090525
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	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	11

Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	120221_suppids_fds029388us.pdf	612307 4fa9fa1402ead30de3e999b84eb0df43b277b30f	no	4
Warnings:					
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3	Fee Worksheet (SB06)	fee-info.pdf	30327 d2cf310c34274469655b7658c8438961401dc918	no	2
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PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/348,150	02/06/2006	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 02/21/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 10	Minus	** 73	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	* 1	Minus	***13	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/ELMIRA HALL/

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(Not for submission under 37 CFR 1.99)

Application Number	11348150
Filing Date	2006-02-06
First Named Inventor	CLEVELAND, CS
Art Unit	1782
Examiner Name	Patterson, Marc A.
Attorney Docket Number	FDS-029388-US

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5736204		1998-04-07	Suskind	

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	1	1089564	CN		1994-07-20	Suskind		☐
	2	199409210	WO		1994-04-28	Suskind		☐

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	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-03-06
Name/Print	Matthew M. Eslami	Registration Number	45488

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(54) Title: COMPOSTABLE PACKAGING FOR CONTAINMENT OF LIQUIDS

(57) Abstract

A compostable paperboard container and package for liquids which is coated with a material capable of degrading to carbon dioxide, water and biomass under composting conditions.

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Description

COMPOSTABLE PACKAGING FOR CONTAINMENT OF LIQUIDS

Technical Field

The present invention relates to a compostable container for containing liquids or liquid containing materials. The present invention furthers relates to a paperboard container having a degradable coating on at least one of the internal or external surfaces thereof. More particularly, the present invention relates to a paperboard container which will biodegrade to carbon dioxide, water and biomass under composting conditions. The present invention further relates to a method of making and a method of using the degradable container.

Background Art

In the management of Municipal Solid Waste (MSW), the expectation that paper and paper products would biodegrade in landfills has proven to be unreliable. In fact, newspapers buried for over fifty year have been recovered from landfills in readable condition. Since paper comprises about 50% of landfill space, it has become an important priority to find alternate ways to manage paper waste.

Recycling paper, often with the removal of printing inks and coatings, has proven to be economically feasible when the recovered pulp fibers find new markets and applications. Fiber recovery, and, in particular, repeated fiber recoveries tend to damage, break, and otherwise reduce the quality of paper fiber. This degradation in paper quality often results in a product with limited or nonexistent new markets or applications.

Since paper has the inherent property of biodegradability under appropriate conditions, more attractive alternates to simple landfilling have received increased attention. Among these, is the process of composting, in which waste is degraded to humus or biomass under accelerated and controlled conditions of moisture, air and microorganisms. More specifically, paper, under

composting conditions is converted into carbon dioxide, water, and biomass. The biomass is essentially comprised of microorganisms. Thus, the mass of waste is significantly reduced and the humus by-product has commercial value as low grade fertilizer, soil conditioner, and as a mulch for land and agricultural applications.

Paper products are often coated with resins or plastic materials to provide barrier properties when they will be used in the containment of liquids. The most important requirements for these structures when intended for use as folded cartons to contain liquid products include:

a. barrier properties to reduce and prevent absorption and/or transmission of liquid components;

b. heat sealability for carton construction and integrity.

c. printability to provide attractive, non-functional graphics;

d. vapor barriers to contain fragrances, flavors, moisture, etc.;

e. barriers to oxygen and other ambient gases;

f. rigidity, shape retention, and crush resistance.

Typical constructions of important commercial value include milk cartons in which the paperboard coating composition is low density polyethylene; fruit juice containers as described in U.S. Reissue Patent No. 33,376; and wet wipe container as described in copending U.S. Patent Applications Serial Nos. 07/740,141 and 07/923,556, all of which are incorporated herein by reference.

Such constructions meet the requirements stated above in (a)-(f), however, such constructions are compostable only to the degree to which cellulose pulp is present, typically around 85%. Under composting conditions, the pulp fibers would be expected to decompose leaving a residue of biologically inert plastic.

Disclosure of the Invention

It is therefore an object of the invention to overcome these and other difficulties encountered in the prior art.

Given the current waste disposal problems, another object of the present invention is to provide a container for liquids which meets requirements (a)-(f) and which will also degrade to carbon dioxide, water and biomass under composting conditions.

Another object of the present invention is to provide liquid barrier properties to pulp based substrates which are degradable under composting conditions by coating with polymers selected from the group of aliphatic polyesters.

A further object of the invention is to provide, as an environmentally improved alternate to plastic, a completely degradable packaging material for the containment of liquids and wet products.

Still another object of the invention is to provide crush-resistant, durable packaging material suitable for liquids and wet products.

A further object of the invention is to provide coated packaging material for use in folded cartons in which the coating has a composting rate approximately equal to the pulp based substrate.

Another object of the invention is to provide special properties to coatings of biodegradable aliphatic polyesters, by blending to about 30% by weight with polymers or fillers that are either miscible or mechanically compatible.

To achieve the objects and in accordance with the purpose of the invention, as embodied and broadly described herein, the invention comprises a compostable package for containing liquids or wet products including a base of paperboard having coated thereon a polymeric material capable of preventing leaks wherein said base and said polymeric material degrades to form carbon dioxide, water and biomass.

In another aspect of the invention there is provided a method of making a compostable package for containing a liquid or a liquid containing material comprising, providing a base of paperboard, coating said paperboard with a material capable of preventing leaks, wherein said base and said material are compostable to carbon dioxide, water and

biomass, forming said paperboard into a container and sealing the edges and bottom of said container.

In still another aspect of the invention there is provided a method of using a compostable package for containing a liquid or a liquid containing material comprising, providing a base of paperboard, coating said paperboard with a material capable of preventing leaks, wherein said base and said material are compostable to carbon dioxide, water and biomass, forming said paperboard into a container, sealing the edges and bottom of said container, and placing into said container a liquid or a material containing a liquid.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims.

Brief Description of the Drawings

Figure 1, illustrates the aerobic biodegradation of polycaprolactone using ASTM D5209.

Figure 2, illustrates the loss of mechanical properties observed for a film of polycaprolactone under outdoor composting conditions.

Figure 3, illustrates the loss of mechanical properties observed for a film of polycaprolactone under indoor composting conditions.

Figure 4, illustrates the biodegradability mechanism for polycaprolactone.

Figure 5, illustrates the biodegradations of polyesters of 3-hydroxybutyric acid and 3-hydroxyvaleric acid (PHBV).

Figure 6, illustrates the aerobic biodegradation of blends of polycaprolactone and polyethylene.

Figure 7, illustrates the loss of mechanical properties observed for a film of polycaprolactone - polyethylene blends under outdoor composting conditions.

Figure 8, illustrates the loss of mechanical properties observed for a film of polycaprolactone - polyethylene blends under indoor composting conditions.

Figures 9-12, illustrate cross-sectional views of the structure of the container materials according to the present invention.

Figure 13, illustrates the apparatus for use in the test methodology employed in the examples.

Best Mode for Carrying Out the Invention

According to the present invention, a paperboard container is produced for containing liquids or liquid containing materials. The container is formed from paperboard or related paper substrates. For the purposes of this invention, the term paperboard refers to those grades and types of paper made on either cylinder board machines or multiwire, fourdrinier type machines as well as multiformers. Fiber stock may be either recycled, or virgin or mixtures thereof, bleached or unbleached. Additional information on paper and paperboard used in packaging applications may be found in James E. Kline, Chapter 10, Paper and Paperboard, Miller Freeman Publications, San Francisco, CA, 1982, which is herein incorporated by reference.

The paperboard or paper substrate for use in the present invention has a basis weight of from about 35 lbs/ream to about 220 lbs/ream and preferably from about 175 lbs/ream to about 220 lbs/ream. According to one embodiment of the present invention, the paper substrate has a thickness from about 4 to 25 mils and more preferably about 10 to 20 mils. The coated paperboard should be selected to produce a container having a cross directional (CD) stiffness as determined by the Taber method of from 50 to 150 and more preferably of from 60 to 135. The Taber method is described in TAPPI Test Procedure T-489.

The ratio of cross direction Taber stiffness of the coated paperboard to its basis weight (lb/ream) is at least 0.20 and more preferably at least 0.5.

Paperboard is generally stronger and stiffer in the machine direction (MD) than in the cross direction. According to one embodiment of the present invention the machine direction preferably runs along the container from side to side, i.e. in a direction perpendicular with the top and bottom of the container. The machine direction runs from side to side of the container; the fiber direction of the paperboard from top to bottom of the container is said to be the cross direction (CD). The coated paperboard used in the container according to the present invention preferably has a ratio of Taber stiffness of MD/CD of less than or equal to about 2.65 and more preferably less than or equal to about 1.92.

The paperboard or paper substrate material is coated on at least one side thereof with a degradable resin in a thickness of from about 0.5 to 2.0 mils. In one preferred embodiment, both sides of the paperboard substrate are coated with the degradable resin to a thickness of from about 0.5 to about 2.0 mils. In the present invention degradation includes biodegradation as well as degradation by moisture, light, oxygen and other well known means of breaking down waste materials.

Coating techniques, for example, extrusion coating, impregnation and the like, are well known in the art, and in accordance with the present invention, inner coatings and outer coatings may be applied by processes well known in the art. Furthermore, the design, quality control and fabrication of folded cartons for the containment of liquids are well known in the art, and these processes and techniques may be used in making the containers of the present invention.

Characteristics of the biodegradable coating materials for use in the present invention include good moisture barrier properties, good thermal sealing properties, sufficient stiffness to give the container good crush resistance and biodegradability under composting conditions.

Examples of biodegradable resins include thermoplastic oxyalkanoyl polymers, e.g., ε - caprolactone polymers and those that contain the recurring unit:

$$-O(CH_2)_x-C=O$$

Wherein x is an integer having a value of 2,3 and 5-7, including polymers of beta propriolactone and Δ - valerolactone; polyesters of 3-hydroxybutyric acid, 3-hydroxyvaleric acid and mixtures thereof as well as copolymers of any of the above.

Suitable also are graft polymers prepared by reacting a lactone such as ε - caprolactone with hydroxyl or amino functional resins such as hydrolyzed ethylene - vinyl acetate copolymers; segmented polyurethane prepared by reacting polycaprolactone bearing terminal hydroxyl groups with diisocyanates and, optionally, chain-extending glycols such as 1,4 butanediol.

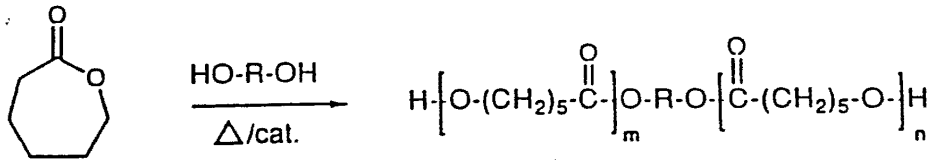
Included also are aliphatic polyesters such as polyglycolic acid, polylactic acid, polydioxanone, poly(trimethylene carbonate) and their co- and terpolymers as well as blends of any of the above with polyesters prepared from alkanediols and alkanedicarboxylic acids including oxalates.

Preferred biodegradable resins for use in the present inven
tion are polyhydroxyaliphatic acids (PHAA).

Naturally occurring biodegradable substances are useful as fillers offering the advantage of reduced cost. Such fillers include starch, tree bark, ground paper, peat moss and soy bean powder.

Polyhydroxyaliphatic acids in film form are biodegradable under composting conditions. One preferred polyhydroxyaliphatic acid, polycaprolactone (PCL) is

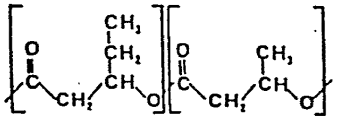
available as a biodegradable thermoplastic resin from Union Carbide. It is synthesized from ε-caprolactone:



Polycaprolactone in film form, has been demonstrated to be biodegradable under soil burial and composting conditions, as shown in Figures 1-3. Composting of PCL is thought to occur by the mechanism proposed in Figure 4.

Other preferred polymers for use in the present invention are the commercially available PHBV polymers of ICI which are polyesters of 3-hydroxybutyric (HB) and 3 hydroxyvaleric (HV) acids. Their general structure is:

PHBV COPOLYMERS



These polymers are produced by the fermentation of sugar by the bacterium ALCALIGENES EUTROPHUS and will degrade to carbon dioxide and water when placed in the presence of microorganisms found in soil, sewage, and river bottoms as shown in Figure 5.

While PCL is claimed to undergo aerobic degradation, PHBV will degrade under either aerobic or anaerobic conditions.

To enhance or optimize functional properties and cost it may be desirable to blend these resins with other material. The successful blending of the aliphatic polyester with additives to provide improved properties and reduced cost without impairing degradability was a most useful and surprising aspect of this invention.

Additives and blending resins include those which are either miscible or mechanically compatible with aliphatic polyester. Examples listed below are suitable for use with polycaprolactone:

Miscible	Mechanically Compatible
PVC	Polyethylene
SAN	Polypropylene
ABS	Natural Rubber
Phenoxy	Styrene/Butadiene
Polycarbonate	Elastomer & Block Copolymers
Nitrocellulose	Polyvinylacetate
Poly (Vinylidene Chloride)	Polybutadiene
Styrene/Allyl Alcohol Copolymers	Ethylene/Propylene Rubber

In addition, PCL may be blended with thermoplastic elastomers for improved toughness, adhesive, and flexibility. Especially suitable are the elastomeric segmented polyurethanes prepared from aliphatic polyester diols, aromatic or alicyclic diisocyanates; and, optionally, short chain diol or diamine chain - extender.

Accordingly, the skilled artisan can incorporate the many useful and unique properties of these additives into the coating composites to meet specific requirements of the various end uses contemplated. These materials may be added in from about 0% to about 30%, preferably from about 10 to about 20%. Although these materials alone are either slowly compostable or noncompostable, their use in limited amounts as described above does not impair the ultimate biodegradation of the coating materials.

In addition to blended compositions, these compositions may be coated onto the paperboard substrate in successive layers. Noncompostable or slowly compostable layers are so positioned so as not to interfere with composting of the remainder of the container. As an alternative, individual layers of the same or different blended materials may be used to form the substrate coatings. Noncompostable and slowly compostable materials may be used in blends or as intermediate layers in limited amounts. When used in blends,

these materials are preferably contained in less than 30% and when found in film form are preferably less than o.6 mils in thickness. These materials do not interfere with the compostability and degradation of the container and are found in the humus. After composting, these materials are from a practical standpoint indistinguishable from the rest of the humus.

In one preferred embodiment, the coating is comprised of either 100% aliphatic polyester or mixtures thereof with polyethylene in which the polyethylene is present at levels up to about 30%. The addition of polyethylene reduces the rate of water vapor transmission which is advantageous for certain long shelf-life products. With the addition of as much as 30% polyethylene to aliphatic polyester, composting is slower, but nevertheless effective under typical composting conditions, as shown in Figures 6-8.

As an alternative or in addition to the materials described above, starch may be added to the coating materials according to the present invention. Starch may be added in from about 0% to about 70% and more preferably from about 40 to about 60%. One commercially available starch based biodegradable material for use in the present invention is Mater-Bi® produced by Novamont. This product contains up to 60% starch and 40% of a biodegradable resin material.

Since both coatings and pulp-based substrate are degradable, disposable packages from these composites will decompose completely thus contributing to alternate waste treatment of paper based products. In addition to being completely degradable, the containers according to the present invention may be incinerated.

Figures 9, 10, 11, and 12 show several embodiments of the coated paperboard used in the production of the container according to the present invention.

In Figure 9, layer 1 is a flexible, strong paper substrate. Layer 2 is an interior or exterior coating of 80-100% of a biodegradable resin having a thickness of from about 0.5 to about 2.0 mil.

In Figure 10, layer 1 is a paperboard substrate. An interior coating 2 and an exterior coating 3 are each present at a thickness of from about 0.5 to about 2.0 mil.

When it is desirable to minimize the rate of water vapor transmission, the coated paperboard illustrated in Figure 11 or 12 can be employed. In Figure 11, a layer 4 comprising a barrier layer, for example a high polyethylene content (30-100%) layer is coated directly onto one side of the paperboard. This coating is less than 0.5 mil. in thickness and preferably about 0.2-0.3 mil.

In one preferred embodiment, coatings 2 and 3 are comprised of at least 70% and preferably 90-100% of aliphatic polyester at a thickness of from about 0.5 to about 2 mils each. In addition to meeting all of the requirements described in (a)-(f) above, this embodiment provides an excellent barrier to moisture vapor. The polyethylene component which represents only about 1-3% by weight of the total composition does not interfere with the rate of composting as it is confined to the innermost layer and therefore does not hinder the degradation of the outermost layers, i.e.: the aliphatic polyester or the cellulose pulp fibers. Thus, in this embodiment of the invention, the outer surfaces 2 and 3, which provide the initial sites for microbial attack, are composed of the biodegradable aliphatic polyester coatings. The pulp substrate 1 is accessible to microbial attack either through the degraded layer 3 or through the edges.

In another alternative, the exterior coating layer 3 may be eliminated in which case exposure of the pulp layer is immediate and direct.

Figure 12 represents an alternate configuration to the performance properties and compostability of Figure 10. In this particular case, the high barrier layer 4 is positioned between two layers of pulp substrate 1 and 1'.

The container according to the present invention can be used to contain a variety of liquids and liquid containing materials. For Example, the container may be used for

beverages such as milk, juice, fruit punch, soda, frozen juice, and iced tea; fabric softener; butter; margarine; cosmetics such as shampoo, conditioner, suntan lotion and body lotion; pancake syrup; cooking oil; processed grains, fruits and vegetables such as applesauce and pasta sauces; frozen vegetables; fruits; breads and bread products and single-use wet wipes.

In one embodiment, the container which is preferable for use with the present invention has cut ends which are sealed to avoid seepage of the liquid into or out of the body of the paperboard. The sealing of the edges may be done in a variety of manners. It may be accomplished by coating the edges, or by thinning the material down near the cut edges, i.e., skivving. Skivving of the edges is followed by folding the skivved areas over the cut edges.

In another preferred embodiment, there is a moisture-impervious membrane provided over the contents. Such membranes are sometimes referred to as lidding stock or material. Membranes for this application are typically comprised of a strong barrier top layer with a heat sealable lower layer. Non-limiting examples of top layers which may be used in the present invention, include paper, polyester, polyethylene, metallized polyester and polypropylene. Non-limiting examples of heat seal layers include polyethylene, ethylene-vinylacetate copolymers, and aliphatic polyester. The edges of the membrane are adhered to the upper edges of the container and provide an effective storage and shipping seal. The membrane should peel away from the edges of the container at the seal without exposure of pulp fibers. Additionally a moisture-impervious membrane can be heat sealed at the bottom of the container as well. The bottom of the container is preferably heat sealed by applying heat and pressure, as well known in the art.

In one embodiment when the material to be contained is wet towellettes, the consumer obtains the product, rips open a perforation providing a slot or opening in the paperboard, permitting the hinged cap-like lid to be raised. This

exposes the membrane, which is easily peeled off with the fingers and either stored in the box or thrown away. Thereafter, sealing is done entirely by the raising and lowering of the hinged lid. The moist towels or napkins are preferably stacked and lie horizontally in the container and may be individually removed as needed.

It is also possible to provide a separate or separable pouch, bag or liner within the container to provide further waterproofing protection. Alternatively, this separable liner may be supplied during refilling of the container using a prepackaged bag of replacement wipes.

The container according to the present invention provides sufficient stiffness to provide the consumer with a container having handleability and to provide crush resistance of the box during storage, shipment and under conditions of household use.

Containers according to the present invention preferably have a compression strength of at least 60 lbs. and more preferably at least 70 lbs. as tested in accordance with TAPPI test procedure T-804. The container should also preferably have a cross directional Ring Crush of at least 115 lbs. and more preferably at least 140 lbs. Ring crush can be defined according to TAPPI Test Procedure T818 om-87. The compression strength of the containers is indicative of stacking and handling ability of the containers. Higher stiffness and crush resistance in the cross direction of the paperboard provides improved stacking and handling of the containers.

The following examples are illustrative of the invention embodied herein.

EXAMPLES

I. Paper used as base:

a. Bleached paperboard grade DLC (Schoeller Technical Papers, Pulaski, N.Y.); basis weight 175 lb/ream, 11.5 mils in thickness. Taber Stiffness MD (machine direction) x CD (cross direction) = 65 x 35.

b. Bleached paperboard grade 4554 (Westvaco); basis weight 205 lb/ream; 20 mil in thickness.

c. Bleached paperboard grade GAA-11 (Schoeller) 3.5 mil., 38 lb/ream.

d. Bleached paperboard 215 lb/ream, International Paper.

II. The coatings were extruded from the following polymers:

a. polycaprolactone (PCL) Tone Polymers P-767E and P-787 (representing different molecular weights with 767E being the lowest), Union Carbide Chemicals and Plastics Company, Inc., Solvents and Coatings Materials Division, Bound Book, N.J.

b. PHBV tm (ICI Americas, Wilmington, DE) - 8% and 12% polyhydroxyvalerate;

c. Linear low density polyethylene (LLDPE); hexene based grade DFDA-7047 (Union Carbide)

d. Low density polyethylene (LDPE) (Quantum)

III. Testing and Evaluations

a. Liquid containment was evaluated by the Mason Jar Test as follows:

The Mason Jar Test to Determine Liquid Containment of Packaging Materials

This test procedure provides a convenient way to observe the liquid barrier properties of film, paper, coated paper and related packaging materials. Failure in the test materials such as attack or penetration by the contained liquid or leaks through pin-holes and other coating imperfections are usually observed within the first 24 hours of the test.

As can be seen from Figure 13, a standard wide mouth Ball type Mason Jar, 7 inch high and 3½ inch wide is drilled with a 1/8" hole for pressure equalization.

The hole is plugged and the jar is filled with 600 ml of liquid. Optionally, dye may be added to aid in observing the nature and location of failures.

Test specimen circles 3 and 5/16" in diameter are placed between two rubber gaskets and then tightened on the jar with the outer screw type lid supplied with the jar.

The jar is inverted and the plug removed.

The assembly is examined daily for signs of leakage and penetration.

In those cases where fluid consistently leaked around specimen edges, it was useful to heat seal the material to the rubber gaskets.

Test results are reported based upon sample composition, thickness, liquid, elapsed time and nature of failure.

b. Water vapor transmission (WVT) was measured according to TAPPI T523 on -87 and ASTM F 1249-90

c. Oxygen transmission was measured according to ASTM D-3985

Extrusion coatings were conducted using an Egan single flight screw through a 15 inch T-type die with a 30 mil gap setting.

Polycaprolactone P-767E was extruded with a temperature profile of 200°F in the feed zone; 225-250°F in the barrel and 245°F in the die.

Films were collected on a matte finished steel chill roll at 55-60°F and combined through a nip roll with the substrate after surface treatment of the latter with corona discharge or flame to enhance adhesion.

EXAMPLE 1

PCL-767E was coated on one side of the Westvaco paperboard at a thickness of 1.25 mils. The coated material was challenged with baby wet wipe lotion in the Mason Jar Test with no signs of penetration or leakage after one month. Its water vapor transmission rate was 15.65 gm/100 sq.in./24 hr.

EXAMPLE 2

The coated paperboard from Example 1 was coated on the other side with a second layer of PCL-767E at 1.25 mil.

The coated board basis weight was 311.5 g/sq.m. with a thickness of 23 mils.

In the Mason Jar Test, using Downy® Fabric Softener, manufactured by Proctor & Gamble, as the fluid, no leaks, swelling or penetration was observed after 1.3 months. Similar results were observed with iced tea over a period of 26 days. Water vapor transmission was 8.55 gm/100 sq.in./24 hr.

EXAMPLE 3

PHBV 8% and 12% were mixed in a 1:1 ratio and extruded on the DLC substrate at a thickness of 1.5 mil. The basis weight of the coated paper was 215.8 g/sq.m.

In the Mason Jar Test, this material resisted leakage penetration by baby wet wipe lotion for two months.

EXAMPLE 4

The coating mix of Example 3 was applied to one side of the DLC substrate at a thickness of 2.0 mil. Total basis weight was 241.8 g/sq.m. The water vapor transmission value was 4.5 gm/100 sq.in./24 hr.

EXAMPLE 5

Polycaprolactone P-767E and LLDPE resin were mixed in a ratio of 90% PCL and 10% LLDPE and extruded onto the Westvaco paperboard at a coating thickness of from about 1.0 to about 1.3 mil.

Extrusion temperatures were 275°F at the feed zone 325-345°F in the barrel; and 345°F in the die.

Basis weight was 291.5 g/sq.m. Water vapor transmission was 11.0 gm/sq.in./24 hr. In comparison to Experiment 1, water vapor transmission was reduced by 30% due to the presence of the polyethylene.

EXAMPLE 6

In this experiment a second coating layer was applied to the product of Example 5. Coating thickness was 1.25 mil. and the basis weight measured at 303.9 g/sq.m. Water vapor transmission was 5.33 gm/100 sq.in./24 hrs. In comparison to Experiment 2, water vapor transmission was reduced by 38% due to the presence of polyethylene.

In the Mason Jar Test with baby wet wipe lotion, no leaks or penetration was observed for five weeks.

EXAMPLE 7

PCL-767E and LLDPE were mixed in a ratio of 85/15 and extruded onto the Westvaco paper at a thickness of 1.25 mil. Water vapor transmission was 8.45 gm/100 sq.in./24 hr. In comparison to Experiment 1, water vapor transmission was reduced by 46% due to the polyethylene.

Downey fabric softener was used in the Mason Jar Test with no leaks or penetration after one month.

EXAMPLE 8

A second layer of 85/15 PCL-767E and LLDPE at 1.25 mil. was applied to the other side of the substrate used in Experiment 7 giving a total basis weight of 300.7 g/sq.m.

Water vapor transmission was 4.81 gm/100 sq.m./24 hr. In the Mason Jar Test with baby wet wipe lotion, no leaks or penetration was observed for three weeks. In comparison with Experiment 2, water vapor transmission was reduced by 44% due to the presence of polyethylene.

Examples 1-8 above illustrate the configurations as set forth in Figures 9 and 10.

EXAMPLE 9

With DLC as the substrate an 0.5 mil. coating of low density polyethylene (Quantum NA-206) was extruded on one side only.

Two layers of PCL 767E at 1.2 mil. each were then extruded onto first, the polyethylene side and second, the uncoated side. This composite is representative of the embodiment described in Figure 10. The water vapor transmission rate was 1.22 gm/100 in^2/24 hr.

EXAMPLE 10

Example 9 was repeated with a polyethylene coating of 0.3 mil. The water vapor transmission rate was 1.79 gm/100 in^2/24 hr. Taber Stiffness according to TAPPI-489 was 98.5 in the machine-direction and 60.0 in the cross direction.

EXAMPLE 11

This is an example of the configuration shown in Figure 8. The substrate, GAA-11, was a high tear strength, starch sized paper at 3.5 mil. thickness. It was extrusion coated with 2.0 mil. of PCL-767E giving a material useful as a heat sealable lidding stock.

The following examples illustrate test samples which were deemed to provide acceptable barrier properties and degradation properties for use in the present invention.

Example 12

2.0 mils of 85% PCL and 15% LLDPE was coated on both sides of a base of 215 lb/ream paperboard obtained from International Paper.

Example 13

1.25 mils of 85% PCL and 15% LLDPE was coated on both sides of a base of 215 lb/ream paperboard obtained from International Paper.

Example 14

2.0 mils of 90% PCL and 10% LLDPE was coated on both sides of a base of 215 lb/ream paperboard obtained from International Paper.

Example 15

1.25 mils of 90% PCL and 10% LLDPE was coated on both sides of a base of 215 lb/ream paperboard obtained from International Paper.

Example 16

First 0.5 mils of LDPE and then 1.25 mils of PCL were coated on one side of a base of 215 lb/ream paperboard obtained from International Paper. The other side of the based was coated with 2.0 mils of PCL.

Example 17

0.5 mils of LDPE, 85% PCL and 15% Texin 480A polyurethane was coated on both sides of a base of 215 lb/ream paperboard obtained from International Paper.

The oxygen permeability of these and other coatings on paperboard are compared in the chart below (23°C):

COATING SAMPLE	CC O_2/100 IN_2/24 HOUR	
	760 mm O_2	Omm O_2
Low density polyethylene; reference Example 3	21.8 (80% RH)	17.2 (80% RH)
Serial No. 07/923,556	22.2 (30% RH)	17.3 (30% RH)
Example 2	13.8 (80% RH)	12.6 (80% RH)
Present Invention	13.8 (30% RH)	12.4 (30% RH)
Example 6	29.0 (80% RH)	16.5 (80% RH)
	33.0 (30% RH)	43.0 (30% RH)
Example 8	26.0 (80% RH)	15.4 (80%)
	30.4 (30% RH)	28.5 (30% RH)

The coated paper board materials described in the examples above are excellent candidates in the construction of containers for the packaging of liquids and wet products.

Ease of sealing and seal integrity were excellent, and surprisingly better than polyethylene which is the current industry standard. When exposed to hot air for 5-10 seconds, these coatings became tacky and readily formed strong coating to coating or coating to paper bonds. The present invention also provides for means by which the adhesive properties of the coated surface may be modified. For examples, in the opening and dispensing of a heat sealed container, the adhesion may be desirably reduced to allow a clean, fiber-free peel and separation of layers.

These and related modifications may be achieved by blending or by topical treatment of the coatings described herein with low molecular weight, (i.e., 500-3000) aliphatic polyesters. The later have a tendency to be waxy and low in strength; and, as such, weaken the adhesive interface and lower the cohesive strength of the coating.

Materials of this invention are well suited to the steps involved in converting coated paperboard into a folded carton including sheeting, printing, scoring, perforating, skivving, folding, and sealing.

The result of the Mason Jar Tests with typical fluids indicate that aliphatic polyesters in film form when coated on paper substrates are entirely satisfactory in containing a wide range of liquids.

Other embodiments of the invention will be invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

Claims

1. A compostable container for packaging a liquid or liquid containing material comprising

a base of paperboard having coated thereon a material capable of preventing leaks wherein said base and said material are capable of degrading to form carbon dioxide, water and biomass.

2. The container according to claim 1, wherein the coating material is selected from aliphatic polyesters.

3. The container according to claim 1, wherein the coating material is heat sealable, flexible, adhesive, resistant to stress cracks and abrasion resistant.

4. The container according to claim 2, wherein the coating material is selected from polycaprolactone, poly-3-hydroxybutyric acid, poly-3-hydroxyvaleric acid, polyglycolic acid and copolymers of glycolic acid, lactic acid and polyactide.

5. The container according to claim 4, wherein the coating material is polycaprolactone.

6. The container according to claim 2, wherein said material further contains an additive selected from the group consisting of PVC, SAN, ABS, phenoxy, polycarbonate, nitrocellulose, poly vinylidene chloride, styrene/allyl alcohol copolymers, polyethylene, polypropylene, natural rubber, styrene/butadiene elastomer and block copolymers, polyvinylacetate, polybutadiene, ethylene/propylene rubber, starch and thermoplastic segmented polyurethane.

7. The container according to claim 6, wherein the additive is polyethylene.

8. The container according to claim 1, wherein said base further comprises, two layers of paperboard having a barrier layer placed therebetween.

9. The container according to claim 8, wherein the barrier layer is polyethylene.

10. The container according to claim 1, wherein said base of paperboard has a barrier layer applied prior to application of said coating material.

11. The container according to claim 10, wherein the barrier layer is polyethylene.

12. A method of making a compostable package for containing a liquid or a liquid containing material comprising,

providing a base of paperboard;

coating said paperboard with a material capable of preventing leaks, wherein said base and said material are compostable to carbon dioxide, water and biomass;

forming said paperboard into a container; and

filling the container with a liquid or liquid containing material therein and sealing said container.

13. The method according to claim 12, wherein the coating material is selected from aliphatic polyesters.

14. The method according to claim 12, wherein the coating material is heat sealable, flexible, adhesive, resistant to stress cracks and abrasion resistant.

15. The method according to claim 13, wherein the coating material is selected from polycaprolactone, poly-3-hydroxybutyric acid, poly-3-hydroxyvaleric acid, polyglycolic acid and copolymers of glycolic acid and lactic acid.

16. The method according to claim 15, wherein the coating material is polycaprolactone.

17. The method according to claim 13, wherein said material further contains an additive selected from the group consisting of PVC, SAN, ABS, phenoxy, polycarbonate, nitrocellulose, poly vinylidene chloride, styrene/allyl alcohol copolymers, polyethylene, polypropylene, natural rubber, styrene/butadiene, elastomer and block copolymers, polyvinylacetate, polybutadiene, ethylene/propylene rubber and starch.

18. The method according to claim 17, wherein the additive is polyethylene.

19. The method according to claim 12, wherein the liquid or liquid containing material is selected from the group consisting of milk, juice, fruit punch, soda, frozen

juice, iced tea, fabric softener, butter, margarine, cosmetics, shampoo, conditioner, suntan lotion, body lotion, pancake syrup, cooking oil, processed grains, fruits, vegetables, applesauce pasta sauces, frozen vegetables, frozen fruits, breads, bread products and single-use wet wipes.

20. The method according to claim 19, wherein the liquid or liquid containing material is single-use wet wipes.

21. A method of using a compostable package for containing a liquid or a liquid containing material comprising,

providing a base of paperboard;

coating said paperboard with a material capable of preventing leaks, wherein said base and said material are compostable to carbon dioxide, water and biomass;

forming said paperboard into a container;

sealing the edges and bottom of said container; and

placing into said container a liquid or a material containing a liquid.

22. The method according to claim 21, wherein the coating material is selected from polyhydroxyaliphatic acids.

23. The method according to claim 21, wherein the coating material is sealable, flexible, adhesive, resistant to stress cracks and abrasion resistant.

24. The method according to claim 22, wherein the coating material is selected from polycaprolactone, poly-3-hydroxybutyric acid, poly-3-hydroxyvaleric acid, polyglycolic acid and copolymers of glycolic acid, lactic acid and polyactide.

25. The method according to claim 24, wherein the coating material is polycaprolactone.

26. The method according to claim 22, wherein said material further contains an additive selected from the group consisting of PVC, SAN, ABS, phenoxy, polycarbonate, nitrocellulose, poly vinylidene chloride, styrene/allyl alcohol copolymers, polyethylene, polypropylene, natural rubber, styrene/butadiene, elastomer and block copolymers,

polyvinylacetate, polybutadiene, ethylene/propylene rubber and starch.

27. The method according to claim 26, wherein the additive is polyethylene.

28. The method according to claim 21, wherein the liquid or liquid containing material is selected from the group consisting of milk, juice, fruit punch, soda, frozen juice, iced tea, fabric softener, butter, margarine, cosmetics, shampoo, conditioner, suntan lotion, body lotion, pancake syrup, cooking oil, processed grains, fruits, vegetables, applesauce pasta sauces, frozen vegetables, frozen fruits, breads, bread products and single-use wet wipes.

29. The method according to claim 28, wherein the liquid or liquid containing material is single-use wet wipes.

30. A compostable package for liquid or liquid containing material comprising

a base of paperboard forming a container, having coated thereon a material capable of preventing leaks wherein said base and said material are capable of degrading to form carbon dioxide, water and biomass,

wherein said container has therein, a liquid or liquid containing material.

31. The container according to claim 30, wherein the coating material is selected from polyhydroxyaliphatic acids.

32. The container according to claim 30, wherein the coating material is sealable, flexible, adhesive, resistant to stress cracks and abrasion resistant.

33. The container according to claim 31, wherein the coating material is selected from polycaprolactone, poly-3-hydroxybutyric acid, poly-3-hydroxyvaleric acid, polyglycolic acid and copolymers of glycolic acid and lactic acid.

34. The container according to claim 33, wherein the coating material is polycaprolactone.

35. The container according to claim 31, wherein said material further contains an additive selected from the group

consisting of PVC, SAN, ABS, phenoxy, polycarbonate, nitrocellulose, poly vinylidene chloride, styrene/allyl alcohol copolymers, polyethylene, polypropylene, natural rubber, styrene/butadiene, elastomer and block copolymers, polyvinylacetate, polybutadiene, ethylene/propylene rubber and starch.

36. The container according to claim 35, wherein the additive is polyethylene.

37. The container according to claim 30, wherein the liquid or liquid containing material is selected from the group consisting of milk, juice, fruit punch, soda, frozen juice, iced tea, fabric softener, butter, margarine, cosmetics, shampoo, conditioner, suntan lotion, body lotion, pancake syrup, cooking oil, processed grains, fruits, vegetables, applesauce pasta sauces, frozen vegetables, frozen fruits, breads, bread products and single-use wet wipes.

38. The container according to claim 37, wherein the liquid or liquid containing material is single-use wet wipes.

39. The container according to claim 30, wherein said base further comprises, two layers of paperboard having a barrier layer placed therebetween.

40. The container according to claim 39, wherein the barrier layer is polyethylene.

41. The container according to claim 30, wherein said base of paperboard has a barrier layer applied prior to application of said coating material.

42. The container according to claim 41, wherein the barrier layer is polyethylene.

FIG. 1

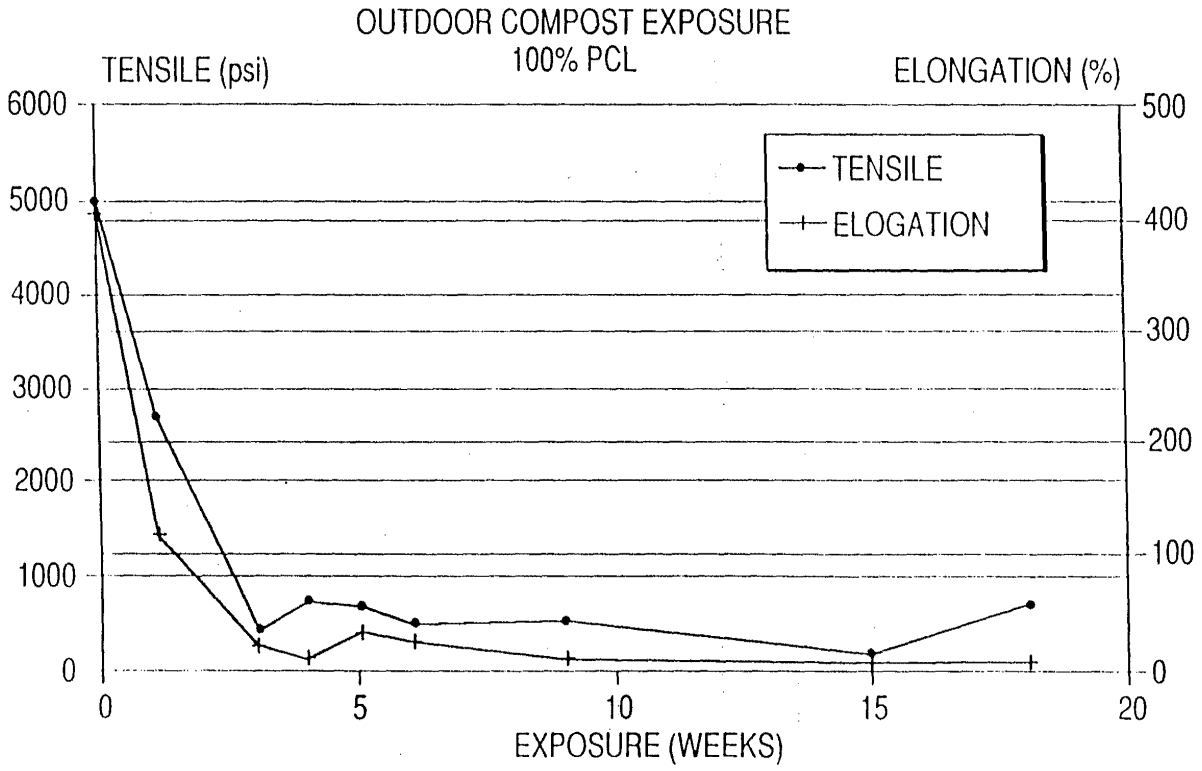
AEROBIC BIODEGRADATION OF POLYCAPROLACTONE (ASTM D5209)

INOCULUM EXPOSURE (DAYS)	CUMULATIVE CARBON DIOXIDE (mg)
0	0
5	22.2
19	145.1
32	299.8
42	406.8
50	484.2
60	532.1

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FIG. 2



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FIG. 3

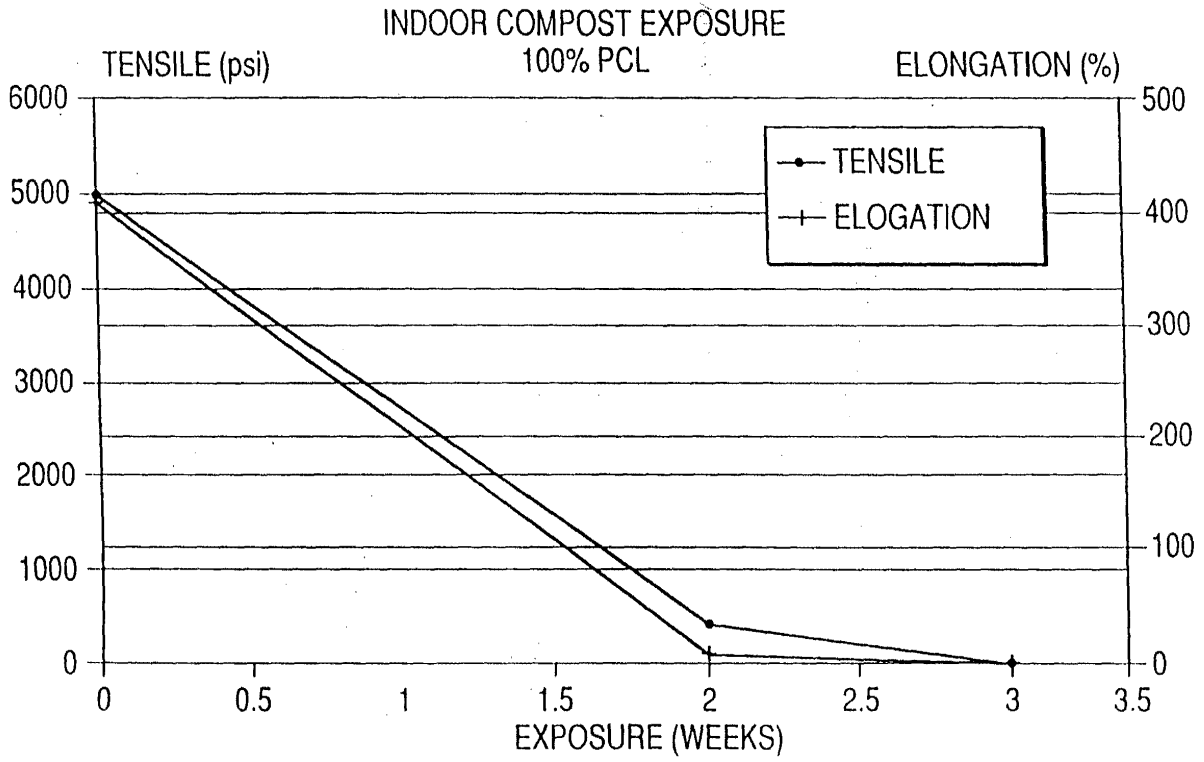
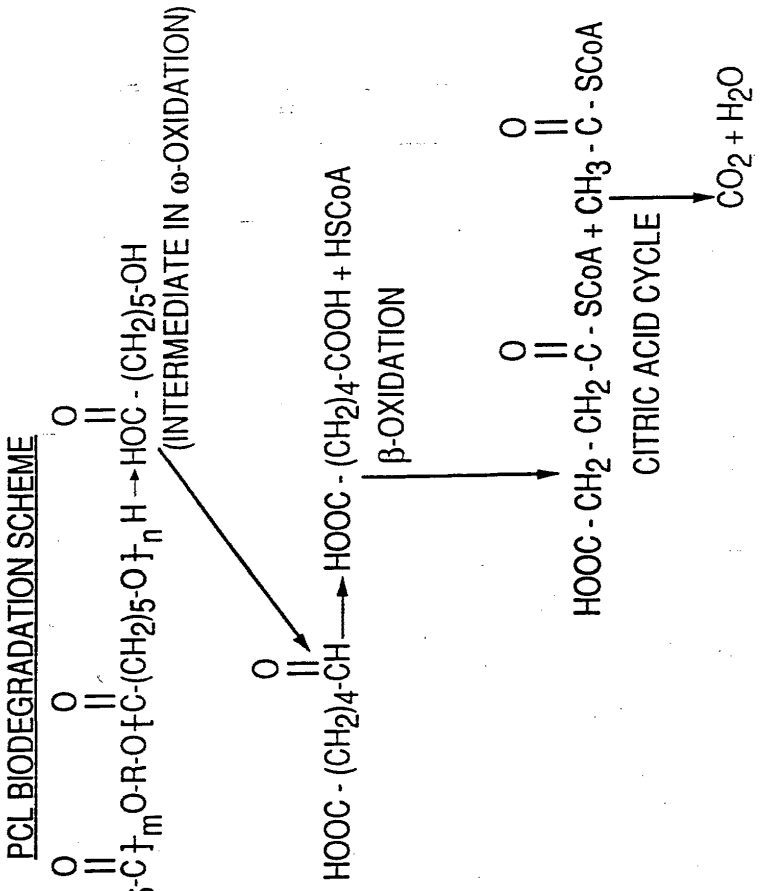


FIG. 4

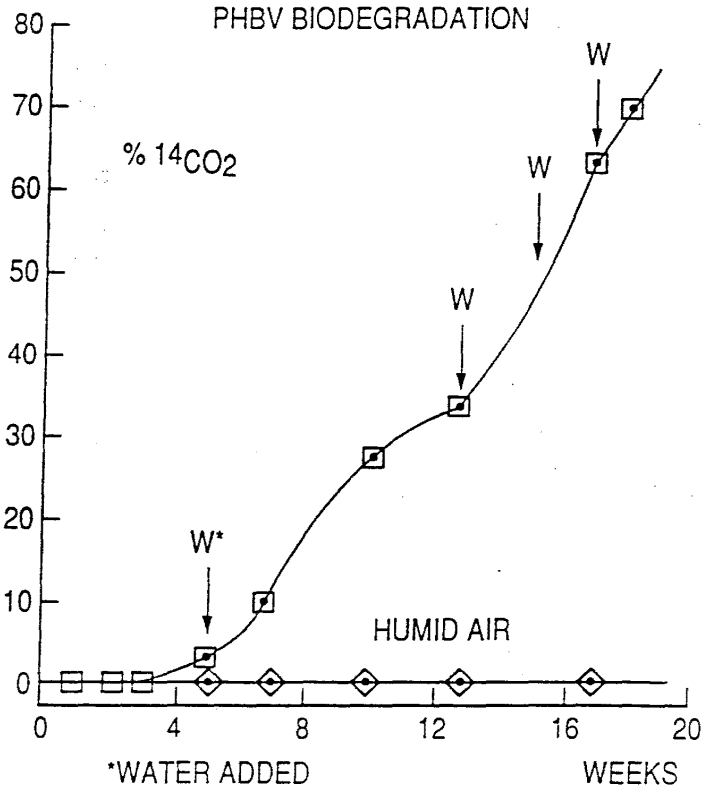


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FIG. 5

PHBV IS INDEFINITELY STABLE WHEN STORED IN AIR; DEGRADATION TO CO_2 AND WATER WILL OCCUR ONLY WHEN THE POLYMERS ARE EXPOSED TO MICROORGANISMS FOUND NATURALLY IN SOIL, SEWAGE, RIVER BOTTOMS, ETC.

IN A CONTROLLED EXPERIMENT USING C14 TAGGED, PHBV FILM LOST APPROXIMATELY 50% OF ITS CARBON CONTENT IN 16 WEEKS AS CO_2 WHEN BURIED IN MOIST SOIL.



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FIG. 6

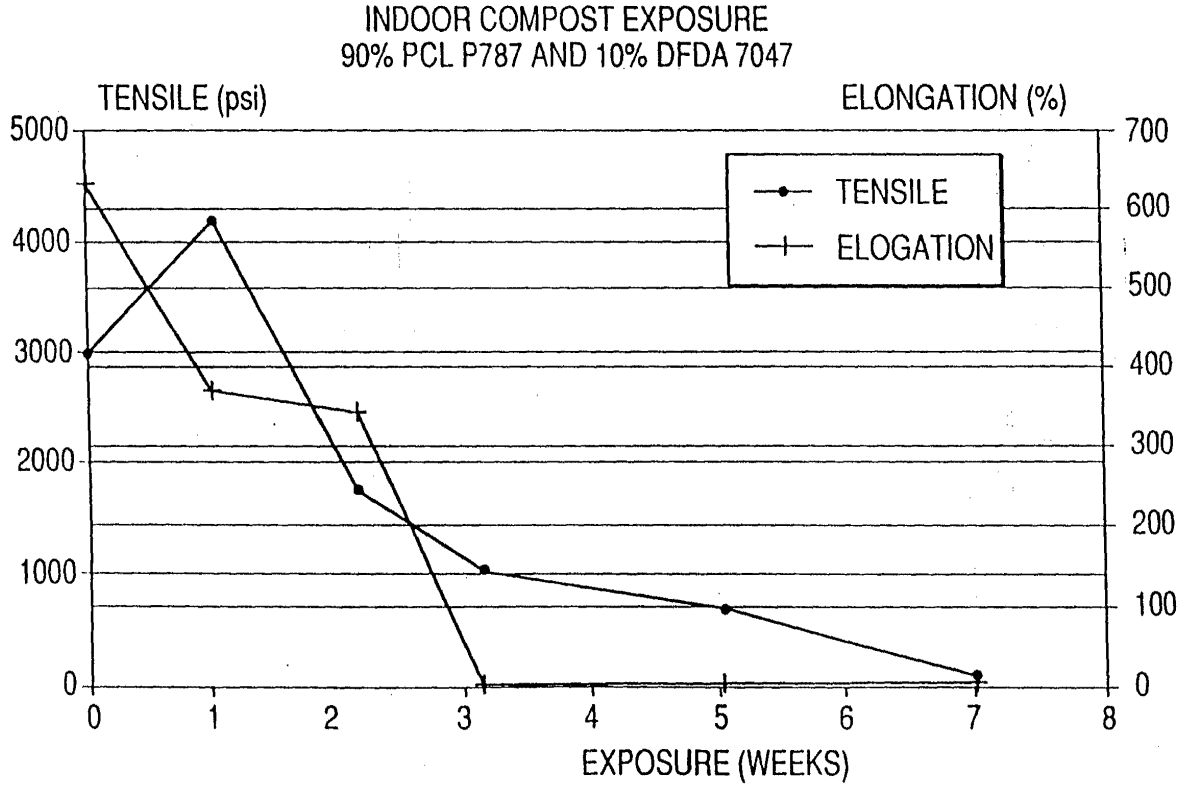
AEROBIC BIODEGRADATION OF
POLYCAPROLACTONE POLYETHYLENE BLENDS

	CUMULATIVE CARBON DIOXIDE (mg)	
INOCULUM EXPOSURE (DAYS)	90% PCL 10% LLDPE	80% PCL 20% LLDPE
0	0	0
5	24.6	19.8
19	228.9	125.8
32	361.0	198.4
42	391.8	220.4
50	406.3	256.3
60	440.5	287.8

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FIG. 7



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FIG. 8

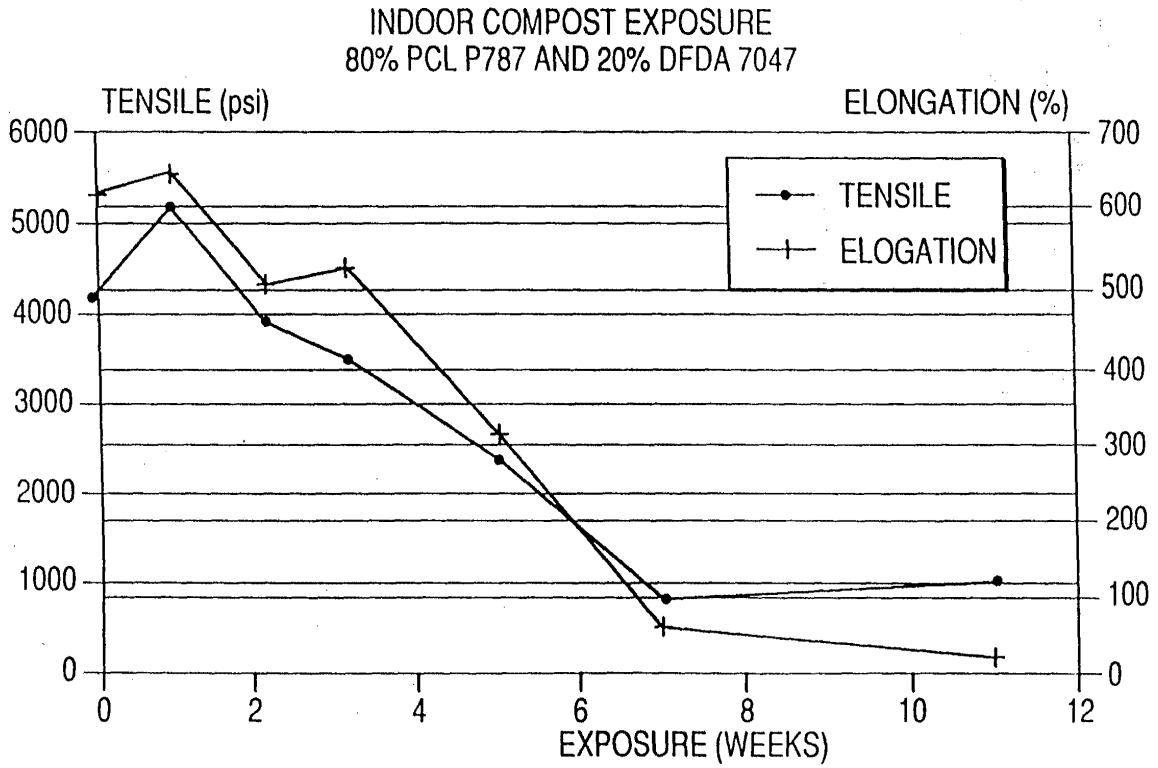


FIG. 9

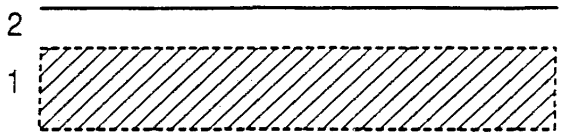


FIG. 10

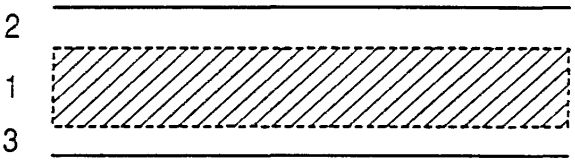


FIG. 11

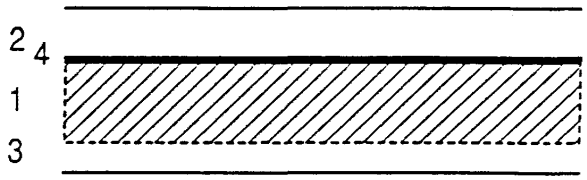
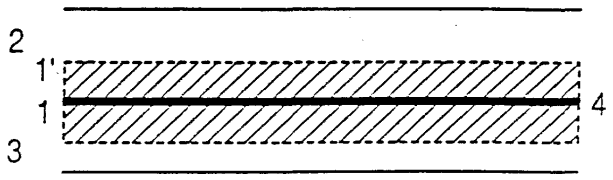
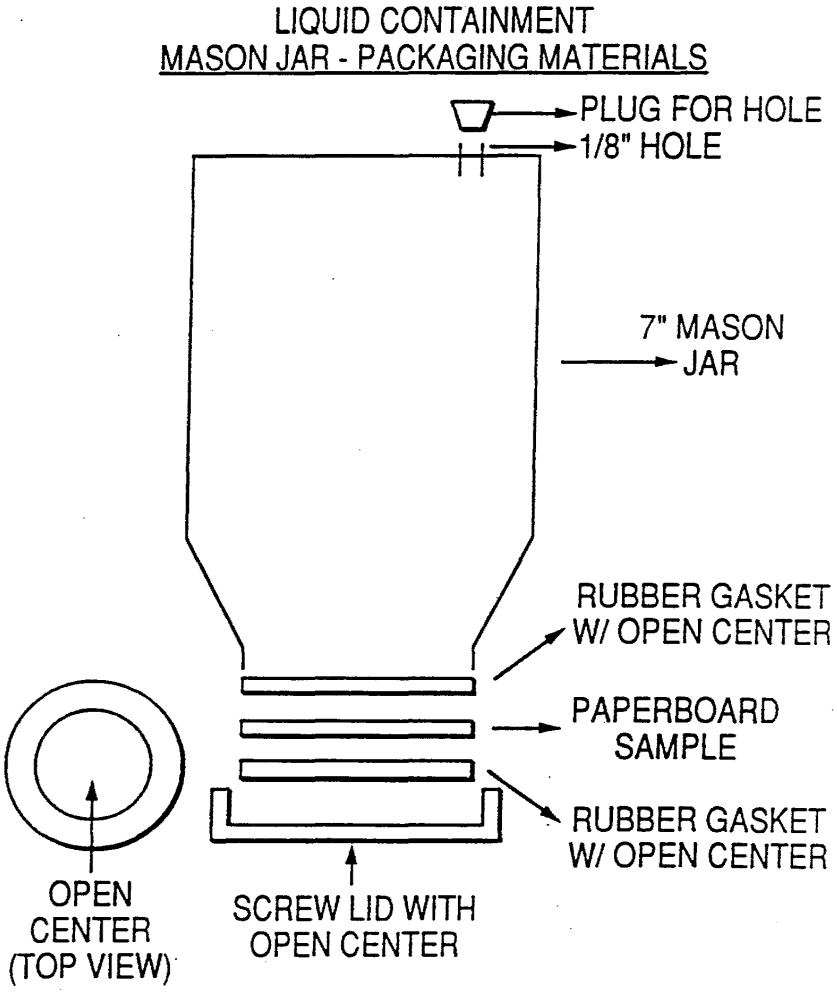


FIG. 12



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FIG. 13



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INTERNATIONAL SEARCH REPORT

Inte. .onal Application No
PCT/US 93/09686

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 D21H27/10 D21H19/28 B65D81/22 B65D65/46 B32B27/10
D21H27/36

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)
IPC 5 D21H

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO,A,93 02947 (I.C.D. INDUSTRIES) 18 February 1993 see the whole document ---	1-3,6,7, 12-14, 17-23, 26-32, 35-38
P,X	EP,A,0 534 471 (TOPPAN PRINTING CO., LTD) 31 March 1993 see the whole document --- -/--	1-7, 10-18, 20-27, 30-36, 41,42

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

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"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

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"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
10 January 1994	18. 01. 94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Songy, O

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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.
P,X	DATABASE WPI Section Ch, Week 9249, Derwent Publications Ltd., London, GB; Class A18, AN 92-402207 & JP,A,4 298 345 (DAINIPPON PRINTING CO LTD) 22 October 1992 see abstract	1-7, 10-18, 21-27, 30-36, 41,42
X	DATABASE WPI Section Ch, Week 9215, Derwent Publications Ltd., London, GB; Class A32, AN 92-119374 & JP,A,4 062 054 (DAINIPPON PRINTING KK) 27 February 1992 see abstract	1-7, 10-38, 41,42
A	US,A,3 958 056 (BRUGH ET AL.) 18 May 1976 see the whole document	8,9
A	FR,A,976 091 (I.G. FARBENINDUSTRIE AG) 13 March 1951	

1

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INTERNATIONAL SEARCH REPORT

information on patent family members

Inte ional Application No
PCT/US 93/09686

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-9302947	18-02-93	NONE	
EP-A-0534471	31-03-93	NONE	
US-A-3958056	18-05-76	NONE	
FR-A-976091		DE-C- 866596	

Form PCT/ISA/210 (patent family annex) (July 1992)

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[12] 发明专利申请公开说明书

[21]申请号 93119139.4

[51]Int.Cl[5]

[43]公开日 1994 年 7 月 20 日

B65D 85 / 00

[22]申请日 93.10.16

[30]优先权

[32]92.10.16[33]US[31]962,100

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代理人 吴惠中

说明书页数: 附图页数:

[54]发明名称 用于盛装液体的可堆肥处理的包装

[57]摘要

一种用于盛装液体的可堆肥处理的纸板容器和包装，它被用一种在堆肥条件下可降解成二氧化碳、水和生物物质的材料涂覆。

(BJ)第 1456 号

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权 利 要 求 书

1. 一种用于包装液体或含液体的材料的可堆肥处理的容器，包括一种在其上具有涂覆的可防止渗漏的材料的纸板基础，其特征在于所述的基础和所述的材料为可降解形成二氧化碳、水和生物物质。

2. 如权利要求 1 所述的容器，其特征在于涂料材料选自脂肪族聚酯。

3. 如权利要求 1 所述的容器，其特征在于涂料材料为可热封接的、有柔韧性的、粘性的、可对抗压碎和抗磨损的。

4. 如权利要求 2 所述的容器，其特征在于涂料材料选自聚己内酯、聚-3-羟基丁酸，聚-3-羟基戊酸、聚乙醇酸和乙醇酸、乳酸和聚缩多酸(polyactide)的共聚物。

5. 如权利要求 4 所述的容器，其特征在于涂料材料为聚己内酯。

6. 如权利要求 2 所述的容器，其特征在于所述的材料进一步含有添加剂选自 PVC、SAN、ABS、苯氧基、聚碳酸酯、硝基纤维素、聚二氯乙烯、苯乙烯/烯丙基醇共聚物、聚乙烯、聚丙烯、天然橡胶、苯乙烯/丁二烯弹性体和链段共聚物、聚乙酸乙烯基酯、聚丁二烯、乙烯/丙烯橡胶、淀粉和热塑性链段聚尿烷的组合。

7. 如权利要求 6 所述的容器，其特征在于添加剂为聚乙烯。

8. 如权利要求 1 所述的容器，其特征在于所述的基础进一步包括具有放置于其二层纸板之间的屏障层。

9. 如权利要求 8 所述的容器，其特征在于屏障层为聚乙烯。

10. 如权利要求 1 所述的容器，其特征在于所述的纸板的基础具有一层先于所述涂料材料应用的屏障。

11. 如权利要求 10 所述的容器，其特征在于所述的屏障层为聚

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乙烯。

12. 一种制备用于盛装液体或含液体的材料的方法，包括；

提供一个纸板的基础；用一可防止渗漏的材料涂覆所述的纸板，其特征在于所述的基础和所述的材料可堆肥处理成二氧化碳、水和生物物质；将所述的纸板成形为一容器；和用液体或含液体的材料填充该容器并且封接该容器。

13. 如权利要求12所述的方法，其特征在于涂料材料选自脂肪族聚酯。

14. 如权利要求12所述的方法，其特征在于涂料材料为可热封接的、有柔韧性的、粘性的、可对抗压碎和抗磨损的。

15. 如权利要求13所述的方法，其特征在于涂料材料选自聚己内酯、聚-3-羟基丁酸，聚-3-羟基戊酸、聚乙醇酸和乙醇酸和乳酸的共聚物。

16，如权利要求15所述的方法，其特征在于涂料材料为聚己内酯。

17. 如权利要求13所述的方法，其特征在于所述的材料进一步含有添加剂选自PVC、SAN、ABS、苯氧基、聚碳酸酯、硝基纤维素、聚二氯乙烯、苯乙烯/烯丙基醇共聚物、聚乙烯、聚丙烯、天然橡胶、苯乙烯/丁二烯弹性体和链段共聚物、聚乙酸乙烯基酯、聚丁二烯、乙烯/丙烯橡胶和淀粉的组合。

18. 如权利要求17所述的方法，其特征在于添加剂为聚乙烯。

19. 如权利要求12所述的方法，其特征在于液体或含液体的材料选自牛奶、果汁液、水果混合甜饮料、苏打水、果冻和冰茶；纤维柔软剂；白脱油；人造黄油；化妆品如香波、调理剂、防晒液和润肤液；薄馅饼糖浆；烹饪油；加工的谷物、水果、蔬菜、苹果沙司和pasta沙司，冷冻蔬菜、冷冻水果；面包和面包产品及一次性使用的湿毛巾的组合。

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20. 如权利要求19所述的方法，其特征在于液体或含液体的材料为一次性使用的湿毛巾。

21. 一种使用用于盛装液体或含液体的材料的可堆肥处理包装方法，包括：

提供一个纸板的基础；用一可防止渗漏的材料涂覆所述的纸板，其特征在于所述的基础和所述的材料可堆肥处理成二氧化碳、水和生物物质；将所述的纸板成形为一容器；封接所述容器的边缘和底部；和用液体或含液体的材料填充所述的容器。

22. 如权利要求21所述的方法，其特征在于涂料材料选自聚羟基脂肪酸。

23. 如权利要求21所述的方法，其特征在于涂料材料为可热封接的、有柔韧性的、粘性的、可对抗压碎和抗磨损的。

24. 如权利要求22所述的方法，其特征在于涂料材料选自聚己内酯聚-3-羟基丁酸，聚-3-羟基戊酸、聚乙醇酸和乙醇酸、乳酸和聚缩多酸的共聚物。

25. 如权利要求24所述的方法，其特征在于涂料材料为聚己内酯。

26. 如权利要求22所述的方法，其特征在于所述的材料进一步含有添加剂选自PVC、SAN、ABS、苯氧基、聚碳酸酯、硝基纤维素、聚二氯乙烯、苯乙烯/烯丙基醇共聚物、聚乙烯、聚丙烯、天然橡胶、苯乙烯/丁二烯弹性体和链段共聚物、聚乙酸乙烯基酯、聚丁二烯、乙烯/丙烯橡胶和淀粉的组合。

27. 如权利要求26所述的方法，其特征在于添加剂为聚乙烯。

28. 如权利要求21所述的方法，其特征在于液体或含液体的材料选自牛奶、果汁液、水果混合甜饮料、苏打水、果冻和冰茶；纤维柔软剂；白脱油；人造黄油；化妆品如香波、调理剂、防晒液和润肤液；薄馅饼糖浆；烹饪油；加工的谷物、水果、蔬菜、苹果沙司和pasta沙

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司，冷冻蔬菜、冷冻水果；面包和面包产品及一次性使用的湿毛巾的组。

29. 如权利要求 28 所述的方法，其特征在于液体或含液体的材料为一次性使用的湿毛巾。

30. 一种用于包装液体或含液体的材料的可堆肥处理的包装包括一种在其上具有涂覆的可防止渗漏的材料的纸板基础，其特征在于所述的基础和所述的材料为可降解形成二氧化碳、水和生物物质的，其中所述的容器中盛装有液体或含液体的材料。

31. 如权利要求 30 所述的方法，其特征在于涂料材料选自聚羟基脂肪酸。

32. 如权利要求 30 所述的方法，其特征在于涂料材料为可热封接的、有柔韧性的、粘性的、可对抗压碎和抗磨损的。

33. 如权利要求 31 所述的方法，其特征在于涂料材料选自聚己内酯、聚-3-羟基丁酸，聚-3-羟基戊酸、聚乙醇酸和乙醇酸、乳酸和聚缩多酸的共聚物。

34. 如权利要求 33 所述的方法，其特征在于涂料材料为聚己内酯。

35. 如权利要求 31 所述的方法，其特征在于所述的材料进一步含有一种添加剂选自 PVC、SAN、ABS、苯氧基，聚碳酸酯、硝基纤维素、聚二氯乙烯、苯乙烯/烯丙基醇共聚物、聚乙烯、聚丙烯天然橡胶、苯乙烯/丁二烯弹性体和链段共聚物、聚乙酸乙烯基酯、聚丁二烯、乙烯/丙烯橡胶和淀粉的组合。

36. 如权利要求 35 所述的方法，其特征在于添加剂为聚乙烯。

37. 如权利要求 30 所述的方法，其特征在于液体或含液体的材料选自牛奶、果汁液、水果混合甜饮料、苏打水、果冻和冰茶；纤维柔软剂；白脱油；人造黄油；化妆品如香波、调理剂、防晒液和润肤液；薄馅饼糖浆；烹饪油；加工的谷物、水果、蔬菜、苹果沙司和 pasta 沙

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司，冷冻蔬菜、冷冻水果；面包和面包产品及一次性使用的湿毛巾的组合。

38. 如权利要求 37 所述的方法，其特征在于液体或含液体的材料为一次性使用的湿毛巾。

39. 如权利要求 30 所述的容器，其特征在于所述的基础进一步含有具有放置于其二层纸板之间的屏障层。

40. 如权利要求 39 所述的容器，其特征在于屏障层为聚乙烯。

41. 如权利要求 30 所述的容器，其特征在于所述的纸板的基础具有一层先于所述涂料材料应用的屏障层。

42. 如权利要求 41 所述的容器，其特征在于所述的屏障层为聚乙烯。

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说　明　书

用于盛装液体的可堆肥处理的包装

本发明涉及一种用于盛装液体或含液体的材料的可用来堆肥处理的容器。本发明还涉及在其至少一个内或外表面上具有一种可降解涂料的纸板容器。更具体地，本发明涉及一种在堆肥条件下降解成二氧化碳、水和生物物质的纸板容器。本发明还涉及一种制备和使用可降解容器的方法。

对城市固体废物(MSW)的管理中，对于纸张和纸质产品可在挖坑掩埋中生物降解的期望已被证实是不可靠的。事实上，从挖坑掩埋中发现的已掩埋超过五十年的报纸仍是可阅读的。因为纸张含有约 50% 的填坑掩埋空间，所以这就为寻找替代方法以管理纸张废物成为重要的优选考虑事情。

当回收的纸浆纤维有新的市场和应用时，通常伴随有除去油墨和涂料以回收纸张重用被证明是经济可行的。纤维回收，及尤其是重复的纤维回收易于损害、破裂及其它从而降低纸张纤维的质量。在纸张质量的这种降解结果通常导致仅有有限的或不存在新的市场或应用的产品。

因为纸张在适当条件下具有生物降解的固有性质，所以对于简单掩埋的更佳替代方法已被引起了日益增长的注意。其中之一便是堆肥的方法，其中废物在湿度、空气和微生物的加速和控制的条件下被降解成腐植土或生物物质。更具体地，纸张在堆肥条件下被转变成二氧化碳、水和生物物质。该生物物质主要系由微生物组成。因此，废物量显著减少并且付产物腐植土具有商业价值，可作为低级堆肥、土壤调节剂以及土地和农业应用上的覆盖料。

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当用于液体盛装时，纸质产品通常用树脂或塑料材料涂覆以提供屏障的性质。当被用作折叠纸板以盛装液体产品时，对于这些结构的最重要要求包括：

a. 减少和防止液体成份的吸收和/或透过的屏障作用；

b. 纸板结构和完整的可用热封口性；

c. 以提供具有吸引力、无作用的图形的可印刷性；

d. 含有香味、气味、湿度等的蒸发屏障；

e. 阻挡氧气和其它外界气体的屏障；

f. 有刚度、形状保持能力及抗压碎性。

重要的有商业价值的典型结构包括纸板涂料组合物为低密度聚乙烯涂层的牛奶纸板箱；如 U. S. Reissue Patent No. 33,376 所述的水果汁液容器；如 Copending U. S. Patent Applications Serial Nos. 07/740,141 和 07/923,556 所述的湿毛巾的容器，此处以上所述的均用作参考。

这些结构满足了上述(a)—(f)的要求，然而，这些结构仅在纤维素纸浆存在、典型的为约 85% 时才是可用以堆肥的。在堆肥条件下，纸浆纤维被期望分解并留下生物惰性塑料的残余物。

因此本发明的目的是克服在现有技术中遇到的这些和其它困难。

对于目前废物处理的问题，本发明的另一个目的是提供一个盛装液体的容器，它能满足(a)—(f)的要求并在堆肥的条件下还会降解成二氧化碳、水和生物物质。

本发明的另一个目的是通过用选自脂肪族聚酯组合的聚合物涂覆以便它在堆肥条件下可降解的以纸浆为基础的基材提供液体屏障的性质。

本发明的更进一步目的是提供一种用于液体和湿产品的盛装的完全可降解的包装材料，作为塑料的替代物，以改进环境条件。

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本发明还有一个目的是提供适用于液体和湿产品的抗压碎的、可持久经用的包装材料。

本发明的另一个目的是提供用于折叠纸板的涂覆的包装材料，其中涂料具有约与以纸浆为基础的基材相等重量的堆肥率。

本发明的另一个目的是向可生物降解的脂肪族聚酯的涂料提供特殊的性质，即将其约30%(重量)与可混溶或可相容的聚合物或填料混合。

为了实现这些目的并与在这里具体体现和广泛描述的本发明的目的相一致，本发明包括一个可盛装液体或湿产品的可堆肥处理的包装，它包括一个在其上用一防止渗漏的聚合材料涂覆的纸板的底板，其中所述的底板和所述的聚合材料能降解以形成二氧化碳、水和生物物质。

本发明的另一方面是提供一种制备盛装液体或含液体的材料的可用以堆肥包装的方法，包括提供纸板的底板、用一可防止渗漏的材料涂覆所述的纸板(其中所述的底板和所述的材料可堆肥使成二氧化碳、水和生物物质)、将所述纸板形成容器并且封接所述容器的边缘和底部。

在本发明的另一方面中提供了一种用于盛装液体或含液体的材料的可用以堆肥的包装的使用方法，包括提供纸板的底板、用一可防止渗漏的材料涂覆所述的纸板(其中所述的底板和所述的材料可堆肥便成二氧化碳、水和生物物质)、将所述的纸板形成容器，封接所述容器的边缘和底部和将液体或含有液体的材料放入所述容器。

此外，本发明的目的和优点将部分地置于下列说明书中，而且其另一个部分将是从说明书看来是显而易见的，或可通过本发明的实践得知。通过特别在附属的权利要求中指出的因素或组合的方法将实现和得到本发明的目的和优点。

图1说明了使用ASTM D5209方法的聚己内酯的需氧生物降

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解。

图 2 说明了在室外堆肥条件下对于聚己内酯膜机械性能损失的观察。

图 3 说明了在室内堆肥条件下对于聚己内酯膜机械性能损失的观察。

图 4 说明了聚己内酯的生物可降解的机理。

图 5 说明了 3-羟基丁酸和 3-羟基戊酸(PHBV)的聚酯的生物降解。

图 6 说明了聚己内酯和聚乙烯组合的需氧生物降解。

图 7 说明了在室外堆肥条件下对于聚己内酯—聚乙烯混合物膜机械性能损失的观察。

图 8 说明了在室内堆肥条件下对于聚己内酯—聚乙烯混合物膜机械性能损失的观察。

图 9 -12 说明了根据本发明的容器材料结构的截面图。

图 13 说明了用于在实施例中使用的测试方法中所用的设备。

根据本发明，制备一种用于盛装液体或含液体材料的纸板容器。容器由纸板或相关的纸质基材制成。对于本发明的目的，术语“纸板”指的是在圆柱型板机器或多线的改良型长网造纸机或多重成型机上制得的纸张类型和级别。纤维原料可以是可重用的、或未使用过的或其混合物、漂白的或未漂白的。在包装应用中使用的纸张和纸板的其它资料可在 James E. Kline, Chapter 10, Paper and Paperboard, Miller Freemen Publications, San Francisco, CA, 1982 中找到，此处用作参考。

本发明中使用的纸板或纸质基材具有基础重量约 35lbs/令-约 220lbs/ 令，较佳的为约 175lbs/ 令— 约 220lbs/ 令。根据本发明的一个具体方案，纸质基材具有厚度约 4--25 密耳，更佳的为约 10—20 密耳。应该选择被涂覆的纸板制备横向刚度(CD)为 50—150，更

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佳的为 60—135(由 Taber 方法测定)的容器。Taber 方法在 TAPPI 试验操作 F—489 中有描述。

被涂覆的纸板的横向刚度与其基础重量(lb/令)之比为至少 0.20、更佳的为至少 0.5。

通常，纸板在机械方向(MD)比在横向方向更强和更硬。根据本发明的一个具体体现，机器方向较佳的沿着容器一侧至另一侧的方向运行，即在容器的顶部和底部的垂直方向。机械方向从容器的一侧运行至另一侧；纸板从容器的顶部至底部的纤维方向被称作横向(CD)。在根据本发明的容器中使用的被涂覆纸板较佳的具有 Taber 硬度与 MD/CD 之比为小于或等于约 2.65，更佳的为少于或等于约 1.92。

纸板或纸质基材材料在其至少一测用一可降解的树脂涂覆，其厚度为约 0.5—2.0 密耳。在另一个较佳的具体体现中，纸板基材的二侧均用可降解的树脂涂覆，厚度为约 0.5—2.0 密耳。在本发明中，降解包括生物降解以及由湿度、光线、氧气和其它公知的破坏废物物质的方法所引起的降解。

涂覆技术，例如挤压涂覆、浸渍等在现有技术中是公知的，而且根据本发明，内层涂料和外层染料也可通过现有技术中公知的方法被应用。而且，盛装液体的折叠纸板的设计、质量控制及加工在现有技术中均是公知的，这些方法和技术也可被用于制备本发明的容器。

在本发明中使用的可降解涂料材料的特征包括良好的湿度屏障性质、良好的热封口性质、这样可向容器提供良好的抗压碎性的足够的硬度以及在堆肥条件下的生物降解性质。

可生物降解的树脂举例包括热塑性氧代链烷酰基聚合物，如∈-己内酯聚合物和那些含有重复单元：

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$$-O(CH_2)_x-\overset{|}{C}=O$$

其中 X 为 2、3 和 5-7 的整数，包括 β-丙内酯和△-戊内酯的聚合物；3-羟基丁酸、3-羟基戊酸的聚酯及其混合物和上述任何一种化合物的共聚物。

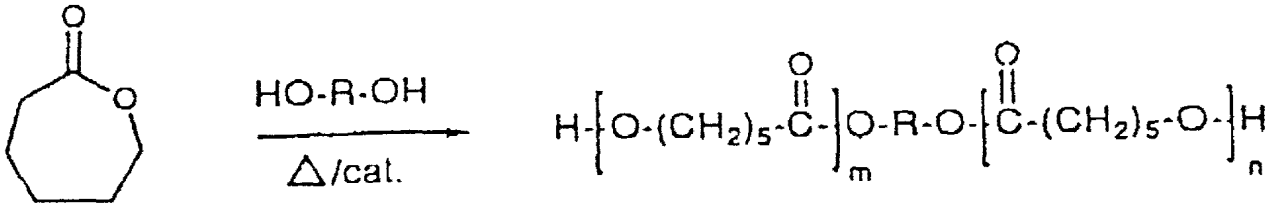
合适的化合物还有由内酯如∈-己内酯和带有羟基或氨基基团的树脂如水解的己烯—乙酸乙烯酯共聚物反应制备的接枝聚合物；由末端带有羟基的聚己内酯羟和二异氰酸酯以及任意的链延伸乙二醇类(chain—extending glycols)如 1,4-丁二醇反应制备的链段聚氨基甲酸乙酯。

举例的化合物还有脂肪族聚酯如聚乙醇酸、聚乳酸、聚二噁烷酮、聚(碳酸三亚甲酯)及其共聚物和三元聚合物以及上述任何一种化合物与由链烷二醇类和包括草酸的链烷二羧酸类制备的聚酯的混合物。

在本发明中使用的较佳的可生物降解的树脂为聚羟基脂肪酸(PHAA)。

自然界所遇到的生物可降解的物质可以填料形式使用，它可提供降解费用的优点。这些填料包括淀粉、树皮、磨碎的纸张、泥碳沼和大豆豆粉。

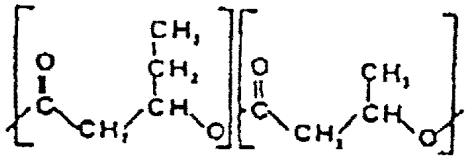
以薄膜形式的聚羟基脂肪酸在堆肥条件下是可生物降解的一种较佳的聚羟基脂肪酸，聚己内酯(PCL)为可从 Union Carbide 得到的可生物降解的热塑性树脂。它由∈-己内酯合成：



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薄膜形式的聚己内酯已经证实在土壤掩埋和堆肥条件下是可生物降解的，如图1—3所示。PCL的堆肥通过图4中所示的机理发生。

在本发明中使用的其它较佳的聚合物为商业上可得到的ICI的PHBV聚合物，它是3-羟基丁酸(HB)和3-羟基戊酸(HV)的聚脂。其通常结构为：



羟基戊酸　　羟基丁酸

(HV)　　(HB)

HV含量0—50克分子%

这些聚合物由蔗糖的ALCALIGENS EUTROPHOS细菌发酵制备，并当如图5所示在土壤、污水和河底可以找到的微生物，该微生物能将糖类分解成二氧化碳及水。

当PHBV贮存于空气中时，它是长期稳定的，只有当聚合物暴露于存在于土壤、污水、河底等中的微生物时才会降解成Co_2和水。在使用C14的对照试验中。当被掩埋于潮湿土壤中时，PHBV膜在16周内以Co_2形式失去约50%的碳。

当PCL进行的是需氧降解，但是PHBV将在需氧或厌氧条件下进行降解。

为了改进或优选作用性质和成本，将这些树脂与其它材料混合是人们所期望的。脂肪酸和添加剂的成功混合可提供改进的性质和减少成本费用，同时不会损害本发明的极有用且令人惊讶的方面一可降解性。

添加剂和掺合的树脂包括那些与脂肪族聚酯可混合或可相配伍的化合物。下列举例可合适的与聚己内酯一起使用。

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可混性	机械地可配伍的
PVC	聚乙烯
SAN	聚丙烯
ABS	天然橡胶
苯氧基	苯乙烯/ 丁二烯
聚碳酸酯	弹性体及链段共聚物
硝基纤维素	聚乙烯基乙酸酯
聚(亚乙烯基氯)	聚丁二烯
苯乙烯/ 烯丙基醇	乙烯/ 丙烯
共聚物	橡胶

此外，也可将 PCL 与热塑性弹性体混合以改进韧性、粘度和柔软性。特别合适的化合物为由脂肪族聚脂二醇、芳香或脂环二异氰酸酯制备的弹性体的链段聚氨基甲酸酯；和任意的，短链二醇或二胺链延伸剂。

因此，熟练的技术人员可结合这些添加剂的许多有用的或独特的性质掺入涂料组合物中，以满足所设计的各种最终用途的特殊需要。这些物质可以加入约 0%－30%，较佳的约 10－20%。虽然单个这些物质是有缓慢堆肥效果的或无堆肥效果的，但是如上所述少量的应用不会损害涂料材料的最终生物降解。

除了被混合的组合物以外，这些组合物可以连续层状被涂覆至纸板基材上。如此定位无堆肥效果或缓慢堆肥效果的层状就不会干扰容器剩余部分的堆肥效果。作为一种替代法，还可使用相同或不同混合的材料的单个层状以形成基材涂料。无堆肥效果和缓慢堆肥效果的材料可以以有限量应于于混合物中或作为中间层状。当用于混合物中时，较佳的含有少于 30% 的这些材料，并且当它以薄膜形式存在时，较佳的厚度为少于 0.6 密耳。这些材料不影响容器的堆

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肥效果和降解，并且存在于腐殖土中。在堆肥之后，从实践观点来看，这些材料与腐殖土的剩余材料是不可辨别的。

在另一个较佳具体方案中，涂料由100%脂肪族聚酯或其聚乙烯的混合物(聚乙烯的存在量高至约30%)组成。聚乙烯的加入减少了水蒸气透过，后者对于某些长搁置寿命产品是有利的。当加入高达30% 聚乙烯至脂肪族聚酯中时，堆肥效果缓慢，但在典型堆肥条件下仍是有效的，如图6—8所示。

作为一种替代物或除了上述材料外，根据本发明还可加入淀粉。淀粉可以加入约0%—70%，更佳的为40%—60%。一种在本发明中使用的商业上可得到的以淀粉为基础的可生物降解材料为由Novamont制造的Mater-Bi®。该产品含有高达60% 淀粉和40% 可生物降解的树脂材料。

因为涂料和以纸浆为基础的基材均是可降解的，所以由这些组合物形成的可处理包装也将完全分解，从而对以纸张为基础的产品的替代废物处理作出贡献。除了可完全降解，根据本发明的容器还可被焚烧。

图9、10、11和12显示了根据本发明在容器的制造中使用的涂覆的纸板的几个具体方案。

在图9中，层1为有弹性的，硬纸基材。层2为具有厚度为约0.5—2.0密耳的80—100%可生物降解的树脂的内层或外层涂料。

在图10中，层1为纸板基材。内层涂料2和外层涂料3分别具有厚度约0.5—约2.0密耳。

当希望减小水蒸气透过时，可以使用如图11或12所示的涂覆的纸板。在图11中，层4含有一层屏障层，例如直接将高聚乙烯含量(30—100%)的层状涂覆至纸板的一侧。该涂料的厚度小于0.5密耳，较佳的约0.2—0.3密耳。

在一个较佳一具体方案中涂料2和3由至少包括70% 和较佳

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的为 90—100% 的脂肪族聚酯组成，其厚度分别为约 0.5—约 2 密耳。除了满足上述(a)—(f)全部要求外，该具体体现提供了一个对于潮湿蒸气的极好屏障。当聚乙烯成份被确定为最内层时，重量仅为全部组合物重量的1—3%的聚乙烯不会影响堆肥的速率，因此也不会防碍最外层，即脂肪族聚酯或纤维素纸浆纤维的降解。这样，在本发明的这个具体体现中，提供微生物侵蚀的起始位点的外层表面 2 和 3 由可生物降解的脂肪族聚酯的涂料组成。纸浆基材 1 通过降解层 3 或通过边缘易于受微生物侵蚀。

在另一个替代例中，在纸浆层的暴露是立即的而且直接的情况下，外层涂料层 3 可被取消。

图 12 代表了一种实现图 10 的性质和堆肥性能的交替的图形。在该具体表现中，高阻挡层 4 被置于二层纸浆基材 1 和 1' 之间。

根据本发明的容器可被用于盛装各种液体和含液体的材料。例如，可用于盛装饮料如牛奶、果汁液、水果混合甜饮料、苏打水、果冻和冰茶；纤维柔软剂；白脱油；人造黄油；化妆品如香波、调理剂、防晒液和润肤液；薄馅饼糖浆；烹饪油；加工的谷物、水果和蔬菜如苹果沙司和 Pasta 沙司，冷冻蔬菜；水果；面包和面包产品及一次性使用的湿毛巾。

在一个具体体现中，在本发明中使用较佳的容器具有被切割的末端，后者经封接后以避免液体渗漏进入或渗出纸板体。可用各种方法封接边缘。这可通过涂覆边缘，或通过在切割边缘处削薄材料即切成薄片来实现。在将被切片的区域折叠至切割边缘上之后进行封口。

在另一个较佳的具体体现中，向组份提供了一层湿气不可渗透性膜。这样的膜有时指的是盖料或有盖物质。这样应用的膜典型的由一硬阴挡顶层和可用热封接底层所组成。本发明中可使用的顶层无限定举例包括纸张、聚酯、聚乙烯、金属化聚酯和聚丙烯。热封接层

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的无限定举例包括聚乙烯、乙烯-乙烯基乙酸酯共聚物，和脂肪族聚酯。薄膜的边缘与容器的上部边缘粘连，并且提供一个有效的贮存和运输封接。该膜可在封接处从容器边缘剥离，而不暴露纸浆纤维。另外，一层湿气不可渗透膜同样可在容器底部被热封接。容器底部较佳的用加热和压力以及现有技术中公知的方法热封接。

当所盛装的材料为湿毛巾时，在这个具体体现中，消费者得到产品，打开一个在纸板中提供了狭缝或开口、允许铰接的帽状盖可以升高的穿孔。这样就暴露了薄膜，后者可用手指轻易地剥离，并且被贮存在盒子中或被扔掉。之后，通过铰接的盖子的升高和降低彻底地完成封接。湿的手帕或餐巾较佳的被塞入并被水平置于容器中，并可根据需要单独地移去。

还可行的是在容器中提供一分离或可分开的小袋，包或衬里从而进一步提供防水性能的保护。或者，可在重新填装使用替代毛巾的预包装包期间可供给的衬里。

根据本发明的容器提供了足够的硬度，从而向消费者提供了一种具有处理稳定性的容器以及在贮存、运输期间和在家庭使用条件下提供了盒子的抗压碎性。

根据本发明的容器较佳的具有压缩强度为至少 60lbs 和更佳的为 70lbs，根据TAPPI 试验方法 T—804 测定。容器还应较佳的具有横向的环压(Ring Crush)为至少 115lbs.，和更佳的为至少 140lbs.，环压可根据TAPPI 试验方法 T819om—87 定义。容器的压缩力象征着容器的可捆扎和可处理能力。在纸板的横向中较高的硬度和抗压性提供了容器的改进捆扎和处理。

此处下列实施例是对本发明的具体体现。

实施例

I 用作基础的纸张：

a. 漂白的纸板级别 DLC(Schoeller Technical Papers，Pulaski，N.

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Y.)；基础重量 175lb/令，厚度 11.5 密耳。Taber 硬度 MD(机械方向)XCD(横向)＝65×35。

b. 漂白的纸板级别 4554(Westvaco)；基础重量 205lb/令；厚度为 20 密耳。

c. 漂白的纸板级别 GAA-11(Schoeller)，3.5 密耳，38lb/令。

d. 漂白的纸板 215lb/令，International Paper。

Ⅱ 由下列聚合物挤压涂层：

a. 聚己内酯(PCL)Tone Polymers P-767E 和 P-787(代表不同分子量，767E 为最低分子量)，Union Carbide Chemicals and Plastics Company，Inc.，Solvents and Coatings Materials Division，Bound Book，N. J.

b. PHBV tm(ICI Americas，Wilmington，DE)-8% 和 12% 聚羟基戊酸酯；

c. 线性纸密度聚乙烯(LLDPE)；以己烯为基础的级别 DFDA-7047 (Union Carbide)

d. 低密度聚乙烯(LDPE)(Quantum)

Ⅲ 试验和评价

a. 通过下列 Mason Jar Test 评价液体盛装：

测定包装材料的液体盛装的 Mason Jar Test

该测定方法提供了一种观察薄膜、纸张、涂覆的纸张和有关的包装材料的液体阻挡性能的简便方法。在试验的最初 24 小时内通常就可观察到试验材料的是否失败如被盛装液体的侵蚀或渗透或者通过针孔和其它涂覆缺陷的渗漏。

从图 13 可以看出，一标准阔嘴球型 Mason 大口瓶，以 1/8″孔钻孔的 7 英吋高和 3.5 英吋宽使得压力均衡。

堵塞孔洞并且将该罐用 600ml 液体填满。任意的也可加入染料以帮助观察失败的本质和位置。

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试验样品环 3 和直径 5/16″ 被置于二个橡皮垫圈之间，然后在罐上用一由罐供给的外部螺旋型盖子紧固。

将罐颠倒过来并且移去堵塞物。

每天检查该组合件的渗漏和渗透迹象。

在那些液体连续在样品边缘渗漏的情况中，加热封接材料至橡皮垫圈上是有用的。

以样品组合物、厚度、液体、消逝时间和失败的本质为基础记录试验结果。

b. 根据 TAPPI TS23 on-87 和 ASTM F1249-90 测定水蒸气的透过(WVT)；

C. 根据 ASTM D-3985 测定氧气的透过。

利用一 Egan 单个螺旋片螺旋通过 15 英吋 T-类型模具、固定 30 密耳空隙。

在喂料地区中、在温度分布为 200F 下挤压聚己内酯 P-767E；桶内为 225-250F，模具内为 245F。

在 55-60F 在一垫子终止的钢质冷却轧辊上收集薄膜，并且在用电晕放电式火焰增加粘连而对后者的表面处理之后通过一压轧轧辊与基材结合。

实施例 1

在 Westvaco 纸板的一侧涂覆 PCL-767E，厚度为 1.25 密耳。被涂覆的材料在 Mason 罐中用婴儿湿搽液处理。1 个月后未发现渗透或渗漏的迹象。其水蒸气透过率为 15.65gm/100 sq. in. /24 小时。

实施例 2

实施例 1 的被涂覆的纸板在其另一侧用第二层 PCL-767E 涂覆，厚度为 1.25 密耳。

被涂覆的板基础重量为 311.5g/sq. m.，厚度为 23 密耳。

在 Mason Jar 试验中，使用 Proctor & Gamble 生产的 Downy^{R}

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纤维软化剂(Fabric Softner.)作为液体，在1,3个月后未观察到渗漏、膨胀或渗透。对冰茶观察26天得到相同的结果。水蒸气透过率为8.55gm/100s.q. in./24小时。

实施例3

以1:1的比率混合8%和12%PHBV，并在DL(基材上挤压，厚度为1.5密耳。被涂覆的纸张的基础重量为215.8g/平方米。

在Mason Jar试验中，该材料可抗拒由婴儿湿搽液引起的渗漏性渗透二个月。

实施例4

实施例3的涂料混合物被应用于DLC基材的一侧，厚度为2.0密耳。总重量为241.8g/sq.mo水蒸气透过率为4.5gm/100sq.in./24小时。

实施例5

以90%聚己内酯PCL和10%LLDPE的比率混合聚己内酯P-767E和LLDPE树脂，并挤压至Westvaco纸板上，厚度为约1.0-约1.3密耳。

在喂料地区的挤压温度为2.75°F，桶内为325—345°F；在模具内为345°F。

基础重量为291.5g/sq.m。水蒸气透过率为11.0gm/sq.in./24小时。与实施例1相比较，由于聚乙烯的存在，水蒸气透过率减小了30%。

实施例6

在这个实施例中，将第二层涂料层应用于实施例5的产品。涂料厚度为1.25密耳，测得的基础重量为303.9g/sq.m。水蒸气透过率为5:33gm/100sq.in./24小时。与实施例2相比较，由于聚乙烯的存在，水蒸气透过率减少了38%。

在Mason Jar试验中，使用婴儿湿搽液五周内未观察到渗漏或

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渗透。

实施例 7

以 85/15 的比率混合 PCL－767E 和 LLDPE，并挤压至 Westvaeo 纸张上，厚度为 1.25 密耳。水蒸气透过为 8.45gm/100 sq.in./24 小时。与实施例 1 相比较，由于聚乙烯的存在水蒸气透过减少了 40%。

在 Mason Jar 试验中，使用 Downey 纤维软化剂（fabric softener），一个月后没有渗漏或渗透。

实施例 8

将厚度为 1.25 密耳的 85/15 的 PCL－767E 和 LLDPE 的第二层应用于实施例 7 中使用的基材的另一侧，使总重量为 300.7g/sq.m。

水蒸气透过为 4.81gm/100sq.m./24 小时。在 Mason Jar 试验中使用婴儿湿搽液，三周后未观察到渗漏或渗透。与试验 2 相比较，由于聚乙烯的存在水蒸气透过减小了 44%。

上述实施例 1－8 说明的构型置于图 9 和 10 中。

实施例 9

以 DLC 为基材，仅在其一侧上挤压涂层厚为 0.5 密耳的低密度聚乙烯涂料(Quantum NA－206)。

然后将二层厚度为 1.2 密耳的 PCL767E 首先挤压至聚乙烯侧，再挤压至未涂覆侧。该堆肥以图 10 所示的具体体现表示。水蒸气透过率为 1.22gm/100in^2/24 小时。

实施例 10

用厚为 0.3 密耳的聚乙烯涂料重复实施例 9。水蒸气透过率为 1.79gm/100in^2/24 小时。根据 TAPPI－489 的 Taber 硬度在机用方向中为 98.5，在横向为 60.0。

实施例 11

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这是在图 8 中显示的构型的举例。基材 GAA－11 为一有高撕裂强度的淀粉上浆的纸张，厚度为 3.5 密耳。用 PCL－767E 挤压涂覆，厚度为 2.0 密耳，得到可用作热封接盖料的材料。

下列实施例说明了试验样品，后者被认为可提供在本发明中使用的可接受的屏障性质和降解性质。

实施例 12

在由 International Paper 得到的，基础重量为 215lb/令的纸板的二侧涂覆厚为 2.0 密耳的 85% PCL 和 15%LLDPE。

实施例 13

在由 International Paper 得到的、基础重量的 215lb/令的纸板的二侧涂覆厚为 1.25 密耳的 85% PCL 和 15%LLDPE。

实施例 14

在由 International Paper 得到的。基础重量为 215lb/令的纸板的二侧涂覆厚为 2.0 密耳的 90%PCL 和 10%LLDPE。

实施例 15

在由 International Paper 得到的、基础重量为 215lb/令的纸板的二侧涂覆厚为 1.25 密耳的 90%PCL 和 10%LLDPE。

实施例 16

在由 International Paper 得到的、基础重量为 215lb/令的纸板的一侧先涂覆厚为 0,5 密耳的 LDPE，再涂覆厚为 1.25 密耳的 PCL 。该基础的另一侧用厚为 2.0 密耳的 PCL 涂覆。

实施例 17

在由 International Paper 得到的，基础重量为 215lb/令的纸板的二侧用厚为 0.5 密耳的 LDPE、85%PCL 和 15% Texin 480A 聚氨基甲酸乙酯涂覆。

在下表中比较这些氧气渗透率和在纸板上的其它涂料(23 ℃)：

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涂料样品	CCO_2 /100 IN_2 /24 小时	
	760mmO_2	Omm O_2
低密度聚乙烯	21.8(80%RH)	17.2(80%RH)
参考实施例 3		
系列号 07/923，556	22.2(30% RH)	17.3(30% RH)
实施例 2	13.8(80% RH)	12.6(80% RH)
本发明	13.8(30% RH)	12.4(30% RH)
实施例 6	29.0(80% RH)	16.5(80% RH)
	33.0(30% RH)	43.0(30% RH)
实施例 8	26.0(80% RH)	28.5(30% RH)
	30.4(30% RH)	28.5(30% RH)

在以上实施例中所述的涂覆的纸板在用于液体和湿产品包装的容器的构型中是极好的选择物。

封接的容易性和封接的完整性都是良好的，并且比目前作为工业标准的聚乙烯好得多。当暴露于热空气 5—10 秒钟，这些涂料开始发粘并且已形成强有力的涂料以涂覆或涂覆至纸带上。本发明还提供了可以调节被涂覆表面的粘连性质的方法。例如，在打开和分配热封接容器时，可根据需要降低粘连性，从而引起干净的无纤维的剥离及层状物的分离。

这些及相关的改进可以通过混合或通过局部所述的涂料与低分子量(即 500—3000)脂肪族聚酯的有关处理而实现。后者具有蜡化的倾向和较低的强度；并且还可削弱粘连界面和降低涂料的粘连强度。

本发明的材料非常适用于有关将被涂覆纸板转变成折叠纸板的步骤，包括扩展、印刷、刻痕、钻孔、切片、扩叠和封接。

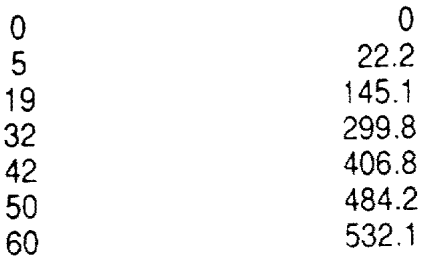
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使用典型液体的Mason Jar试验的结果显示，被涂覆至纸张基材上的以薄膜形式的脂肪族聚酯是完全适用于盛装广大范围的液体。

对于本技术领域内的技术人员，根据其对说明书的理解和此处本发明公开的实践，本发明的其它具体体现是显而易见的。需要理解的是，说明书和实施例仅作为举例，本发明的真正范围和精神将由下列权利要求表示。

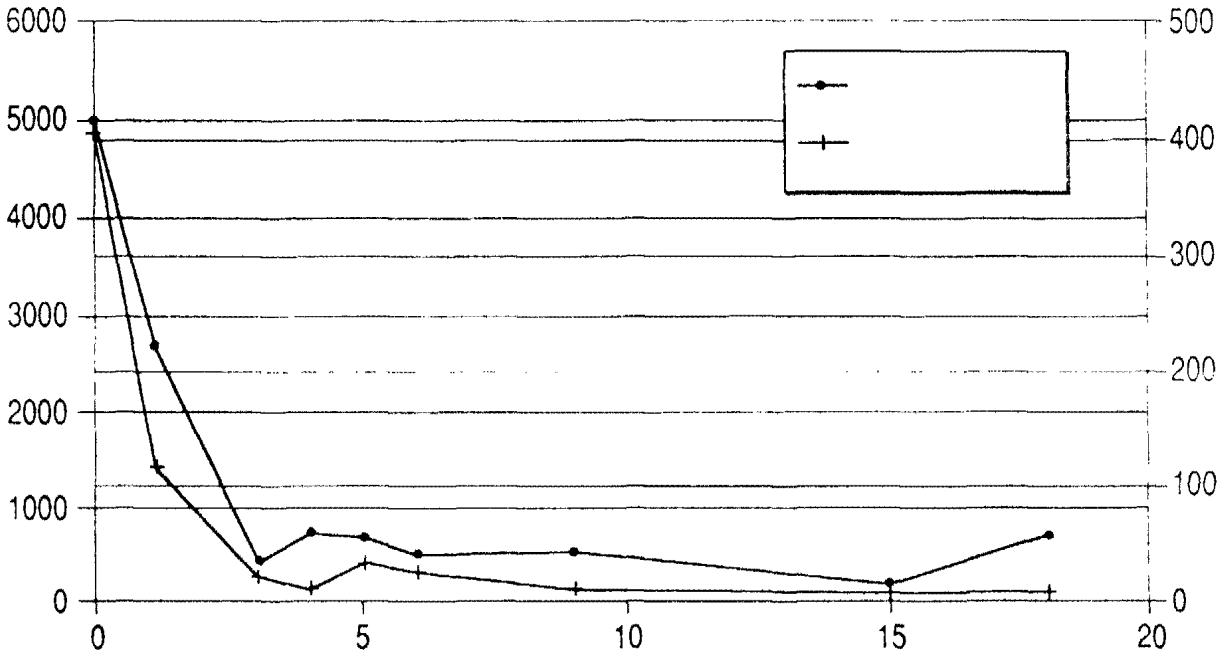
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图　1



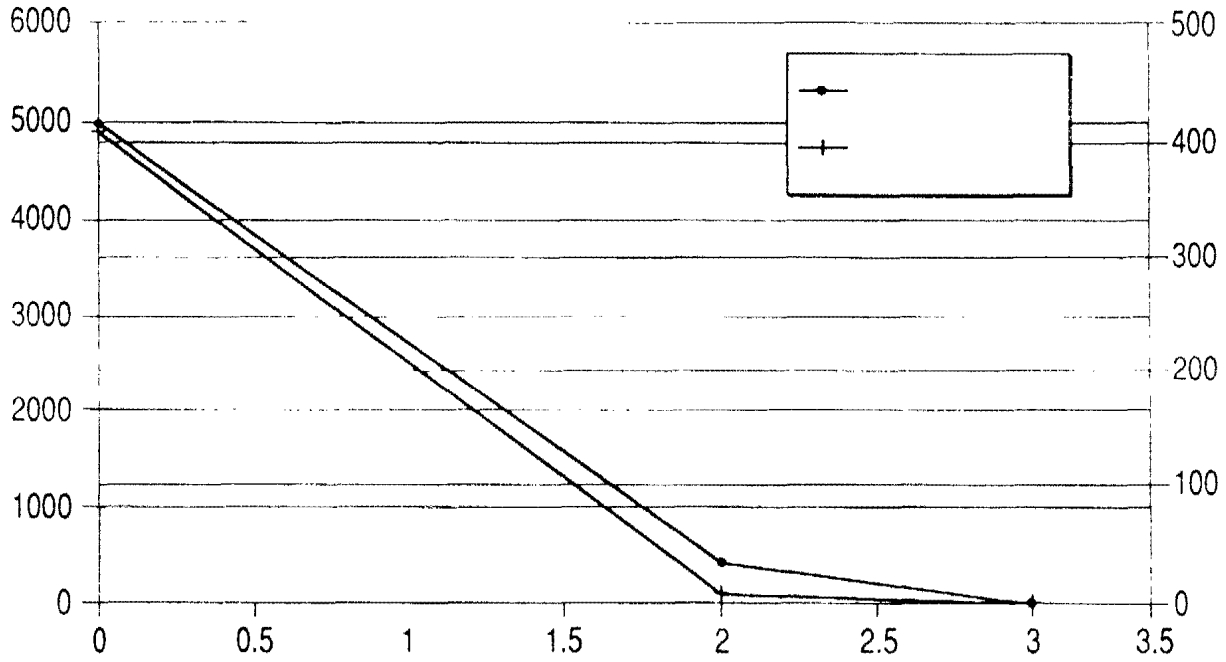
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图 2



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图 3



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图 4

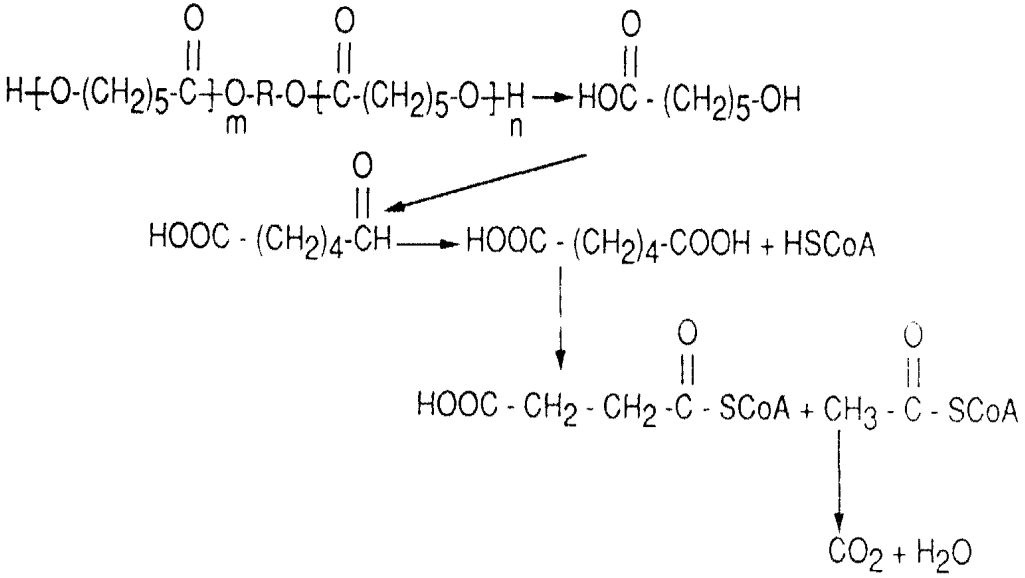
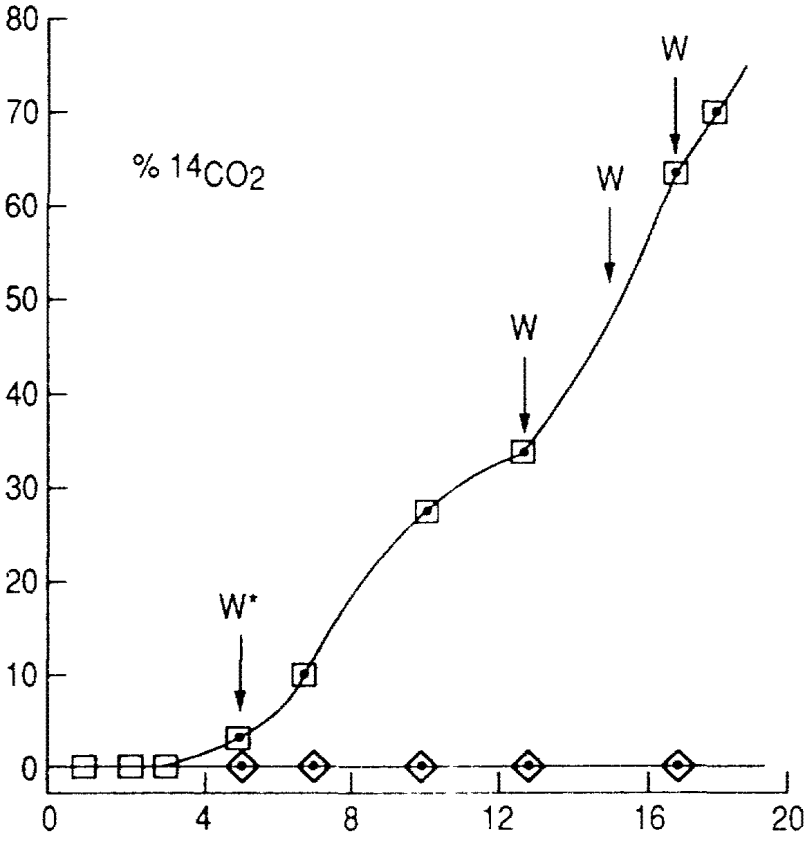

HOOC - (CH2)5-OH
HOOC - (CH2)4-CH
HOOC - (CH2)4-COOH + HSCoA
HOOC - CH2 - CH2 -C - SCoA + CH3 - C - SCoA
CO2 + H2O

图 5



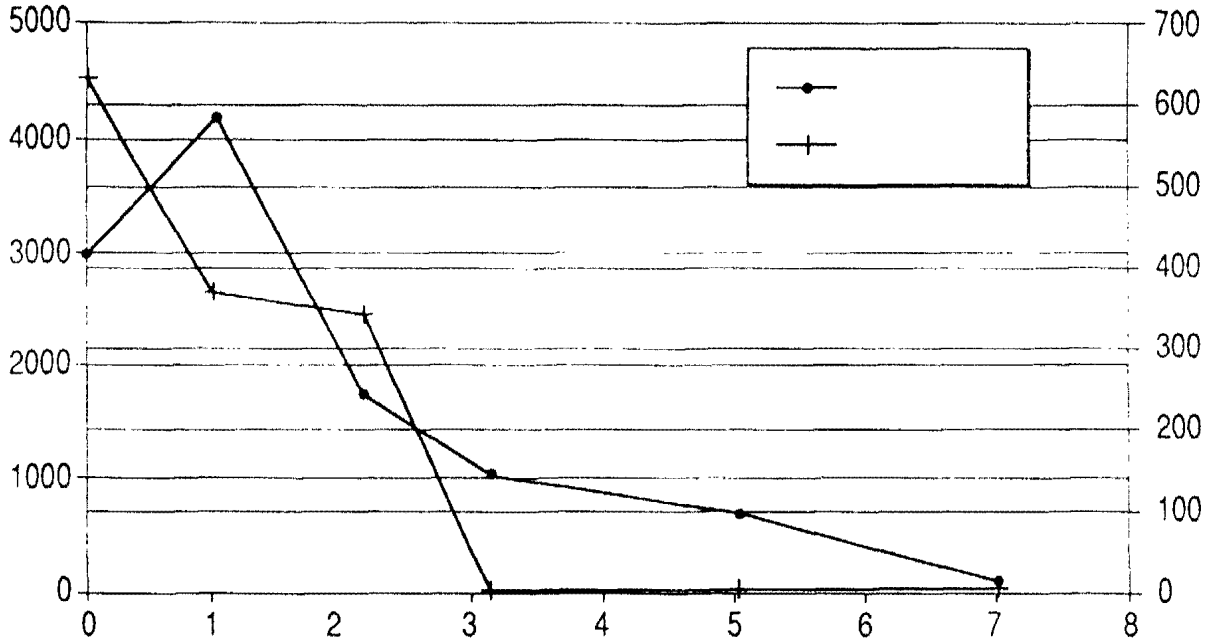
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图 6

0	0	0
5	24.6	19.8
19	228.9	125.8
32	361.0	198.4
42	391.8	220.4
50	406.3	256.3
60	440.5	287.8

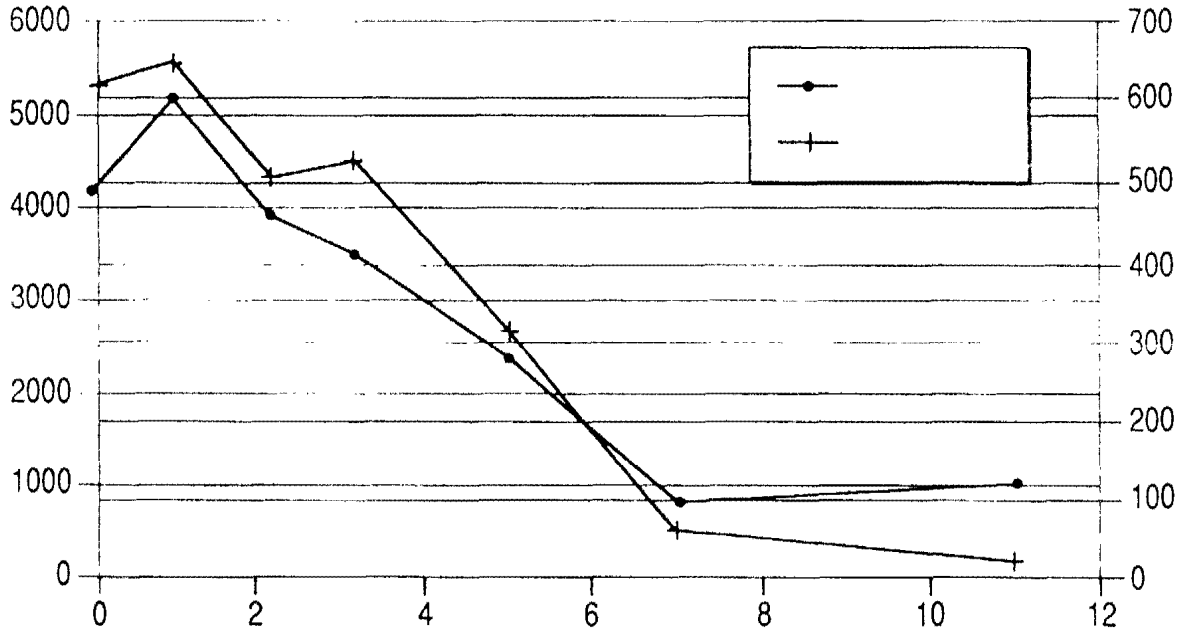
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图 7



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图 8



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图 9

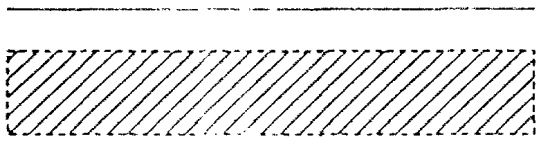


图 10

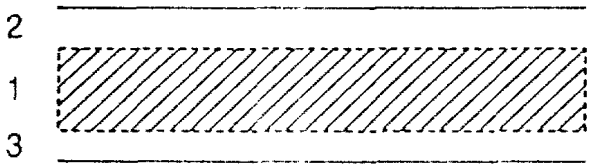


图 11

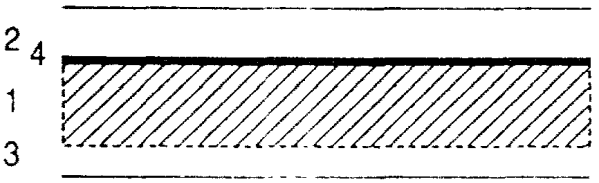
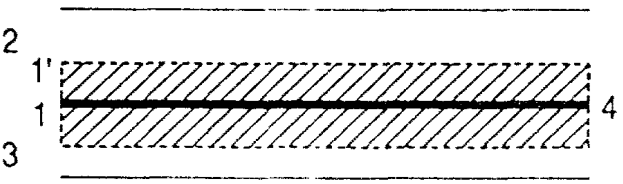
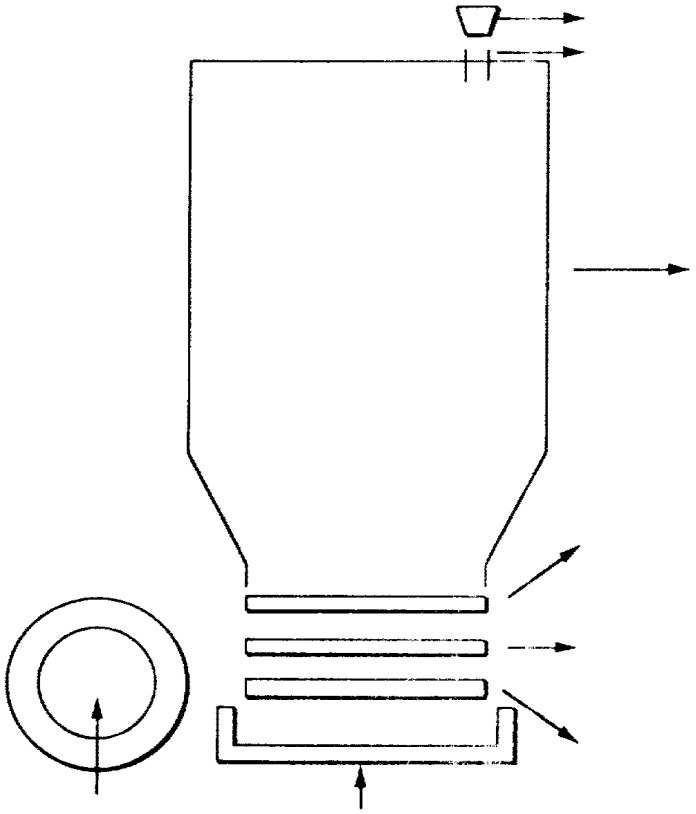


图 12



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图 13



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Electronic Acknowledgement Receipt	
EFS ID:	12230149
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	06-MAR-2012
Filing Date:	06-FEB-2006
Time Stamp:	09:28:45
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	120305_suppids_fds029388us.pdf	612365 c6003cb36cf5dd69106a39721d220fb42b4275cb	no	4

Warnings:
Information:

2	Foreign Reference	WO1994009210A1.pdf	1420307 b522ec6d55bb23d800d35fffc8a74f466153feef	no	40
Warnings:					
Information:					
3	Foreign Reference	CN1089564A.pdf	1134169 e1a9284f7148430ced9c804757d3ae9a72d9a2bc	no	34
Warnings:					
Information:					
			Total Files Size (in bytes):	3166841	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 04/24/2012

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
04/24/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/348,150	CLEVELAND ET AL.	
	Examiner	Art Unit	
	MARC PATTERSON	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 April 2012*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *76-78,80-84,87 and 88* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *76-78,80-84,87 and 88* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

WITHDRAWN REJECTIONS

1. The 35 U.S.C. 103(a) rejection of Claims 76 and 87 - 88 as being unpatentable over Koeblitz et al. (German Patent No. 10020461), of record on page 2 of the previous Action, is withdrawn.

2. The 35 U.S.C. 103(a) rejection of Claims 76 and 87 – 88 as being unpatentable over Koeblitz et al. (German Patent No. 10020461), of record on page 2 of the previous Action, is withdrawn.

NEW REJECTIONS

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 76 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 76 recites the phrase 'the first moisture protectant layer' in line 6. There is insufficient basis for this limitation in the claim.

5. Claim 76 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 76 recites the phrase 'the second moisture barrier layer' in line 10. There is insufficient basis for this limitation in the claim.

Claim Rejections – 35 USC § 103(a)

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 76 and 87 – 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suskind (U.S. Patent No. 5,736,204).

With regard to Claim 76, Suskind discloses a product in the form of a cup (container having an opening; column 3, lines 37 – 40) comprising a substrate comprising paperboard (column 3, line 38) having first moisture barrier layer disposed only on the interior surface and second moisture protectant layer disposed only on the exterior surface (column 6, lines 65 – 67) and comprising a biodegradable polyester polymer (a liquid resistant coating comprising polycaprolactone; (column 4, lines 46 - 51). Suskind fails to disclose a coat weight from 5 to 30 lbs/3000 ft^2. However, it would have been obvious for one of ordinary skill in the art to select a thickness depending on the desired weight of the end product.

With regard to Claims 87 - 88. Suskind discloses polylactic acid (column 4, lines 54 - 55).

8. Claims 77 - 78 and 80 - 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suskind (U.S. Patent No. 5,736,204) in view of Doane et al (U.S. Patent No. 6,040,063).

Suskind discloses a product as discussed above. With regard to Claims 77 - 78 and 80 - 84, Suskind fails to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate.

Doane et al disclose a degradable polyester comprising calcium carbonate for the purpose of nucleation (column 9, lines 38 - 41). It therefore would have been obvious for one of ordinary skill in the art to provide for calcium carbonate in order to provide nucleation as taught by Doane et al. Doane et al fail to disclose a calcium carbonate in the amount of 5 - 20% by weight. However, as stated above, the calcium carbonate disclosed by Doane et al is for nucleation (column 9, lines 38 - 41).

It therefore would have been obvious for one of ordinary skill in the art to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by Doane et al.

ANSWERS TO APPLICANT'S ARGUMENTS

9. Applicant's arguments regarding the 35 U.S.C. 103(a) rejection of Claims 76 and 87 - 88 as being unpatentable over Koeblitz et al. (German Patent No. 10020461) and 35 U.S.C. 103(a) rejection of Claims 76 and 87 – 88 as being unpatentable over Koeblitz et al. (German Patent No. 10020461), of record in the previous Action, have been considered and have been found to be persuasive. The rejections are therefore withdrawn. The new rejections above are directed to amended Claims 76 - 78, 80 - 84 and 87 - 88.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

AMENDMENT AFTER FINAL REJECTION PURSUANT TO 37 CFR § 1.116(b)

United States Patent and Trademark Office
Customer Service Window, Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (made FINAL) mailed April 24, 2012, the period for response which is currently set to expire February 23, 2012, please amend the above-captioned application as follows, as well as consider the following remarks. Applicants submit there are good and sufficient reasons, in accordance with 37 CFR § 1.116(b), for entering these amendments. In particular, it is believed these amendments will put the above-captioned application in condition for allowance or appeal.

Applicants respectfully request prompt issuance of a Notice of Allowance or an Advisory Action by the Examiner, as the present amendment is being timely filed on or before two months of the mailing date of the Final Office Action (*i.e.*, on or before June 24, 2012). See MPEP § 706.07(f). Applicants' representative, Matthew M Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this amendment.

Remarks/Arguments begin on page **4** of this amendment.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Currently Amended) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a paperboard substrate having a separate interior product facing surface and a separate exterior surface;

a first moisture protectant ~~barrier~~ layer disposed only on said interior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2; and

a second moisture protectant layer disposed only on said exterior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture protectant ~~barrier~~ layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture protectant ~~barrier~~ layer disposed on said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

81. (Previously Presented) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Previously Presented) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

84. (Currently Amended) The product according to Claim 76, wherein the ~~substrate comprises paperboard; and the~~ first moisture protectant layer ~~has a coat weight of from 5 to 30 lbs/3000 ft^2 and~~ comprises polylactic acid and from 5 to 20 percent by weight of at least one filler ~~member~~ selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Previously Presented) The product according to claim 76, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of this application, as amended, is respectfully requested. Claims 1-75, 79, and 85-86 have previously been cancelled. Claims 76-78, 80-84, and 87-88 are currently pending.

B. Procedural Matters

Applicants gratefully acknowledge the Examiner's statements at pages 2 and 4 of the Final Office Action (hereafter referred to as the "Final Action") that the prior rejection of Claims 76 and 87-88 under 35 U.S.C. § 103(a) as being unpatentable over German Patent No. 10020461 to Koeblitz et al. (hereafter referred to as "**Koeblitz**") has been withdrawn.

C. Amendments to Claims and Response to Rejections of Claim 76 under 35 U.S.C. § 112, Second Paragraph, for Alleged "Indefiniteness"

At page 2 of the Final Action, Claim 76 has been rejection under 35 U.S.C. 112, second paragraph, for alleged "indefiniteness" in two respects: (1) the phrase "the first moisture protectant layer" in line 6 is alleged to have "insufficient basis"; and (2) the phrase "the second moisture barrier layer" in line 10 is also "insufficient basis."

In response to this rejection, Claim 76 has been amended in line 5 to recite a first moisture **protectant** layer disposed only on said interior surface of said paperboard substrate. In former line 10 (now line 11), Claim 76 has also been amended to change the "second moisture barrier layer" to the "second moisture **protectant** layer." Support for these amendments to Claim 76 may be found, for example, in paragraphs [0032] and [0051] of the published version (i.e., U.S. Appln. No. 20070184220)[1] of the above-captioned application. These amendments to Claim 76 overcome this rejection under 35 U.S.C. 112, second paragraph, which should now be withdrawn.

Line 6 of Claim 76 has also been amended to recite that the first moisture protectant layer comprises **at least one biodegradable polyester polymer**. Support for this amendment to Claim 76 may be found, for example, in paragraphs [0051] of the published version (i.e.,

[1] All references to the above application herein will be with respect to the published version U.S. Pat. Appln. No. 20070184220, published August 9, 2007.

U.S. Appln. No. 20070184220) of the above-captioned application.

Claim 84 has been amended to recite that the first moisture protectant layer comprises polylactic acid and from 5 to 20 percent by weight of at least one **filler** selected from the group consisting of calcium carbonate and starch. Support for this amendment to Claim 84 may be found, for example, in paragraphs [0018] and [0053] of the published version (i.e., U.S. Appln. No. 20070184220) of the above-captioned application. Claim 84 has also been amended to conform to the language of amended Claim 76.

D. Response to Rejection of Claims 76 and 87-88 under 35 U.S.C. § 103(a) as Being Unpatentable over Suskind

At pages of the Final Action, Claims 76 and 87-88 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over newly cited U.S. Pat. No. 5,736,204 to Suskind (hereafter referred to as "**Suskind**"). **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claim 76 as being unpatentable over **Suskind**, the Final Action makes the following allegation:

> ***Allegation 1***: [**Suskind**] **discloses a product in the form of a cup (container)** having an opening; column 3, lines 37-40) comprising a substrate comprising paperboard (column 3, line 38) having [a] first moisture barrier layer disposed only on the interior surface and [a] second moisture protectant layer disposed only on the exterior surface (column 6, lines 65-67) and comprising a biodegradable polyester polymer (a liquid resistant coating comprising polycaprolactone; (column 4, lines 46 - 51). [**Suskind**] **fails to disclose a coat weight from 5 to 30 lbs/3000 ft^2**. However, **it would have been obvious** for one of ordinary skill in the art **to select a thickness depending on the desired weight of the end product**.[2]

What Allegation 1 asserts does not support rejecting Claim 76, as amended, as being unpatentable over **Suskind** for at least the following reasons. First, and contrary to what Allegation 1 asserts, **Suskind** does not teach "a product in the form of a cup" according to amended Claim 1. Instead, **Suskind** teaches a "container" used to contain a variety of liquids and liquid containing materials, including "beverages such as milk, juice, fruit punch, soda, frozen juice, and iced tea; fabric softener; butter; margarine; cosmetics such as shampoo,

[2] See page 3 of the Final Action (emphasis added).

conditioner, suntan lotion and body lotion; pancake syrup; cooking oil; processed grains, fruits and vegetables such as applesauce and pasta sauces; frozen vegetables; fruits; breads and bread products and single-use wet wipes."[3] Contrary to what Allegation 1 suggests, one of ordinary skill in the art would understand the difference between the "container" taught by **Suskind** and the "cup" recited in amended Claim 76. In fact, **nowhere** does **Suskind** mention the word "cup."

Second, Allegation 1 admits that **Suskind** does not teach the coat weights recited in amended Claim 76. Instead, Allegation 1 asserts that "it would have been obvious" "to select a thickness depending on the desired weight of the end product."[4] But this assertion amounts to a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything which Allegation 1 asserts is allegedly taught by **Suskind**, or any other verifiable evidence provided by the Examiner. "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion of obviousness."[5]

Allegation 1 points to **absolutely nothing** in **Suskind** (or any other verifiable evidence) to **factually support** why one of ordinary skill in the art would select the particular coat weights for the first and second moisture protectant layers recited in amended Claim 76. In fact, Applicants must conclude that what is asserted in Allegation 1 with respect to the coat weights recited in amended Claim 76 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this assertion in Allegation 1 regarding the coat weights recited in amended Claim 76, Applicants **respectfully request** that he provide

---

[3] See column 7, lines 30-39, of **Suskind**.

[4] Contrary to what Allegation 1 suggests, the relevant feature recited by Claim 76 is "coat weight," not **thickness**.

[5] *In re Kahn,* 441 F.2d 977, 988 (Fed. Cir. 2006) (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc*., 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id*. See also *In re Vaidyanathan*, 96 U.S.P.Q.2d 1507, 1514 (Fed. Cir. 2010) (non-precedential): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should** elaborate, **discussing the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added)."

an affidavit/declaration under 37 CFR § 1.104(d)(2)[6] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Suskind**, or any other verifiable evidence provided by the Examiner.

In support of the rejection of Claims 87-88 as being unpatentable over **Suskind**, the Final Action makes the following allegation:

> ***Allegation 2***: [**Suskind**] discloses polylactic acid (column 4, lines 54-55).[7]

In response to Allegation 2, Claims 87 and 88 each depend directly from amended Claim 76. Accordingly, Claims 87-88 are patentable over **Suskind** for at least the same reasons presented above in response to Allegation 1 for why amended Claim 76 is patentable over this reference.

For at least the foregoing reasons, Claims 76 and 87-87, as amended or as currently presented, are patentable over **Suskind**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) based on this reference should be withdrawn.

E. Response to Rejection of Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as Being Unpatentable over Suskind, in view of Doane

At pages 3-4 of the Final Action, Claims 77-78 and 80-84 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Suskind**, in view of U.S. Pat. No. 6,040,068 to Doane (hereafter referred to as "**Doane**"). **This rejection is respectfully traversed with**

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[6] See 37 CFR § 1.104(d)(2) which states: "When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons." Applicants note that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued "the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] ***expressly entitle*** an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner's asserted level of skill in the art]" (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that "this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process." See 31 USPQ2d at 1455. See also *In re Vaidyanathan*, 96 U.S.P.Q.2d at 1515: "If it is not possible for the examiner to provide this type of information, **the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge** (as a person approximating one of ordinary skill in the art) of the technology in question (citing 37 CFR § 1.104(d)(2)) (emphasis added)."

[7] See page 3 of the Final Action.

respect to these Claims, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78 and 80-84 as being unpatentable over **Suskind**, in view of **Doane**, the Final Action makes the following allegations:

> ***Allegation 3***: [**Suskind**] discloses a product as discussed above. With regard to Claims 77-78 and 80-84, [**Suskind**] **fail[s] to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate**.[8]
>
> ***Allegation 4***: [**Doane**] disclose[s] degradable polyester **comprising calcium carbonate for the purpose of nucleation** (column 9, lines 38-41).[9]
>
> ***Allegation 5***: It therefore would have been obvious for one of ordinary skill in the art **to provide for calcium carbonate in order to provide nucleation as taught by** [**Doane**].[10]
>
> ***Allegation 6***: [**Doane**] **fail[s] to disclose a calcium carbonate in the amount of 5 - 20% by weight**. However, as stated above, the calcium carbonate disclosed by Doane et al is for nucleation (column 9, lines 38 - 41).[11]
>
> ***Allegation 7***: It therefore would have been obvious for one of ordinary skill in the art **to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by** [**Doane**].

What Allegations 3-7 assert do not support rejecting of Claims 77-78 and 80-84 as being unpatentable over **Suskind**, even in view of **Doane**, for at least the following reasons. First, for at least the same reasons presented in Section D above in response to Allegation 1, amended Claim 76 is patentable over **Suskind**. Second, Allegations 3-7 do not assert that those features recited in amended Claim 76 (i.e., product in the form of a **cup** and **coat weights of from 5 to 30 lbs/3000 ft^2** for the first and second moisture protectant layers) which were asserted **to be missing from the teachings** of **Suskind**, are now taught by **Doane**.

Third, Claims 77-78 and 80-84 are further distinguishable over **Doane** in reciting that the moisture protectant layer comprises **at least one filler** which may be calcium carbonate

[8] See page 4 of the Final Action (emphasis added).
[9] See page 4 of the Final Action (emphasis added).
[10] See page 4 of the Final Office Action (emphasis added).
[11] See page 4 of the Final Office Action (emphasis added).

(see Claims 78, 80, and 82-84). As admitted by Allegation 3, **Suskind** does not teach 5 to 20 percent by weight of at least one filler comprising calcium carbonate. Instead, Allegation 4 relies upon **Doane** to teach that calcium carbonate can be used "for the purpose of nucleation." But nowhere does **Doane** teach calcium carbonate as a filler for a moisture protectant layer according to Claims 78, 80, or 82-84.

Fourth, these "nucleating agents" are taught by **Doane** for use **in preparing natural polymer foams for structure 12**[12] (structure 12 would correspond to the paperboard substrate of Claims 77-78 and 80-84), and not the hydroxyfunctional polyester layer 14 which is self-adhered to the surface of structure 12 (layer 14 would correspond to one of the first or second moisture protectant layers of Claims 77-78 and 80-84). In other words, and contrary to what Allegations 4-5 suggest, **Doane** does not teach inclusion of calcium carbonate (or any other disclosed "nucleating agent") in its hydroxyfunctional polyester layer 14 as a filler, much less as a filler in the first and second moisture protectant layers (which correspond to layer 14 of **Doane**) of Claims 77-78 and 80-84.

Fifth, Allegation 6 admits that **Doane** fails to disclose including calcium carbonate in the amount of 5 to 20% by weight. Instead, Allegation 7 asserts that it would be obvious "to select an amount of calcium carbonate depending on the desired amount of nucleation as taught by [**Doane**]. But this assertion by Allegation 7 is, again, a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything which Allegation 7 asserts is allegedly taught by **Doane**, or any other verifiable evidence provided by the Examiner.[13] Given that **Doane** is teaching the use of calcium carbonate for an entirely different purpose (nucleating agent versus filler), and not in the moisture protectant layers according to Claims 77-78 and 80-84, Allegation 7 provides absolutely no **factually supported** "rational basis" for this assertion that one of ordinary skill the art would, by chance, select the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84.

In fact, Applicants must again conclude that what is asserted in Allegation 7 with respect to the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this

[12] See, for example, column 7, lines 53-56, and column 9, lines 4-6, of **Doane**.
[13] See cases and text cited in footnote 5.

assertion in Allegation 7 regarding the amounts of filler (e.g., calcium carbonate) recited in Claims 77-78 and 80-84, Applicants **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[14] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Doane**, or any other verifiable evidence provided by the Examiner.

For at least the foregoing reasons, Claims 77-78 and 80-84, as currently presented, are patentable over **Suskind**, even in view of **Doane**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) over this combination of references should be withdrawn.

F. Conclusion

The rejection of Claim 76 under 35 U.S.C. 112, second paragraph, for alleged "indefiniteness" has been overcome by appropriate amendments and should therefore be withdrawn.

Claims 76-78, 80-84, and 87-88, as amended or as currently presented, are patentable over the art relied upon in the Final Action. Accordingly, Claims 76-78, 80-84, and 87-88 are in condition for allowance, and favorable action is earnestly solicited thereon.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Mr. Matthew M. Eslami at 513-248-6193 to expedite prosecution of the above application.

[14] See cases and text cited in footnote 6 with respect to 37 CFR § 1.104(d)(2).

No extension of time is believed to be required. However, the Commissioner is hereby authorized by this paper to charge any fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment, to Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully Submitted,

Date: June 8, 2012

By: /Matthew M. Eslami/

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	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

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	2	6033747		2000-03-07	Shiotani	

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	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-06-08
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1025 of 1179

Electronic Patent Application Fee Transmittal	
Application Number:	11348150
Filing Date:	06-Feb-2006
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Filer:	Matthew M. Eslami/Michele McRoy
Attorney Docket Number:	FDS-029388-US
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt	
EFS ID:	12972704
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	08-JUN-2012
Filing Date:	06-FEB-2006
Time Stamp:	16:44:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	3582
Deposit Account	090525
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		120608_rsptofnloa_fds029388us.pdf	168314 87448f79026c337af229fda0a2f39fa7c29de101	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment After Final	1	1
	Claims	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	11

Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	120608_suppids_fds029388us.pdf	612361 5558a03608545f8ee2820d90e2a12204315cf90a	no	4
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30328 b630defcd8763bedc9dfa99d326099d5f462b557	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	811003		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/348,150	02/06/2006	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	06/08/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 10	Minus	** 73	= 0	X $ =		OR	X $60=	0
	Independent (37 CFR 1.16(h))	* 1	Minus	***13	= 0	X $ =		OR	X $250=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/CRYSTAL QUEEN/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 06/28/2012

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
06/28/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/348,150	CLEVELAND ET AL.	
	Examiner	Art Unit	
	MARC PATTERSON	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 June 2012*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *76-78,80-84,87 and 88* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *76-78,80-84,87 and 88* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/8/12*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

WITHDRAWN REJECTIONS

1. The 35 U.S.C. 103(a) rejections of Claim 76, of record on page 2 of the previous Action, are withdrawn.

2. The 35 U.S.C. 103(a) rejection of Claims 77 – 78 and 80 – 84 as being unpatentable over Suskind (U.S. Patent No. 5,736,204) in view of Doane et al (U.S. Patent No. 6,040,063).

NEW REJECTIONS

Claim Rejections – 35 USC § 103(a)

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 76 and 87 - 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suskind (U.S. Patent No. 5,736,204).

With regard to Claim 76, Suskind discloses a product in the form of a cup (container having an opening; column 3, lines 37 - 40) comprising a substrate comprising paperboard (column 3, line 38) having a first moisture protectant layer disposed only on the interior surface and second moisture protectant layer disposed only on the exterior surface (column 6, lines 65 - 67) and comprising a biodegradable polyester polymer (a liquid resistant coating comprising polycaprolactone; (column 4, lines 46 - 51). Suskind fails to disclose a coat weight from 5 to 30

lbs/3000 ft2. However, it would have been obvious for one of ordinary skill in the art to select a weight depending on the desired weight of the end product.

With regard to Claims 87 - 88. Suskind discloses polylactic acid (column 4, lines 54 - 55).

5. Claims 77 - 78 and 80 - 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suskind (U.S. Patent No. 5,736,204) in view of Yamamoto et al (U.S. Patent No. 2004/0014883).

Suskind discloses a product as discussed above. With regard to Claims 77 - 78 and 80 - 84, Suskind fails to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate.

Yamamoto et al disclose a degradable polyester (paragraphs 0136 – 0137) comprising 5 to 20 percent by weight of at least one filler comprising calcium carbonate (paragraph 0145) for the purpose of obtaining packaging that preserves freshness (paragraph 0160).

It therefore would have been obvious for one of ordinary skill in the art to provide for calcium carbonate in order to provide packaging that preserves freshness as taught by Yamamoto et al.

ANSWERS TO APPLICANT'S ARGUMENTS

6. Applicant's arguments regarding the 35 U.S.C. 103(a) rejections of Claim 76 and 35 U.S.C. 103(a) rejection of Claims 77 – 78 and 80 – 84 as being unpatentable over Suskind (U.S. Patent No. 5,736,204) in view of Doane et al (U.S. Patent No. 6,040,063), of record in the

previous Action, have been considered and have been found to be persuasive. The rejections are therefore withdrawn.

Applicant's arguments regarding the 35 U.S.C. 103(a) rejection of Claims 76 and 87 – 88 as being unpatentable over Suskind (U.S. Patent No. 5,736,204) have been carefully considered but have not been found to be persuasive for the reasons set forth below.

Applicant argues, on page 5 of the remarks dated June 8, 2012, that although Suskind discloses a container for juice, one of ordinary skill in the art would understand the difference between the disclosed container and a cup.

However, the claimed invention is directed to any product that is 'in the form of' a cup. Furthermore, the disclosure by Suskind of a paperboard juice container, therefore a carton having some opening, is, broadly speaking, 'in the form of' a cup.

Applicant also argues, on page 7, that the statement that it would have been obvious for one of ordinary skill in the art to select a thickness depending on the desired weight of the end product is merely conclusory, and that an affidavit should be provided as evidence of personal knowledge.

However, the weight of the coating clearly determines, in part the weight of the container, as the coating is a component of the container; furthermore, the claimed weight is not stated by the specification, or by Applicant's remarks, to be particularly critical.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 11/348,150	Applicant(s)/Patent Under Reexamination CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-2004/0014883	01-2004	Yamamoto et al.	524/599
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1038 of 1179

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	Art Unit
	MARC PATTERSON	1782

SEARCHED			
Class	Subclass	Date	Examiner
428	34.1	11/21/11	M.A.P.
428	34.2	11/21/11	M.A.P.
428	35.7	11/21/11	M.A.P.
428	35.9	11/21/11	M.A.P.
428	36.9	11/21/11	M.A.P.
428	34.1	6/26/12	M.A.P.
428	34.2	6/26/12	M.A.P.
428	35.7	6/26/12	M.A.P.
428	35.9	6/26/12	M.A.P.
428	36.9	6/26/12	M.A.P.

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.P./	1	5565503		1996-10-15	Garcia et al.	
/M.P./	2	6033747		2000-03-07	Shiotani	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Marc Patterson/	Date Considered	06/26/2012

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-06-08
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1043 of 1179

UNITED STATES PATENT AND TRADEMARK OFFICE

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P.O. Box 1450
Alexandria, Virginia 22313-1450
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BIB DATA SHEET

CONFIRMATION NO. 5681

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/348,150	02/06/2006	428	1782	FDS-029388-US

APPLICANTS

Christopher S. Cleveland, Newport, KY;
Tricia S. Reighard, Loveland, OH;
James I. Marchman, Loveland, OH;

**** CONTINUING DATA ***************************

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
03/06/2006

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /MARC A PATTERSON/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		KY	5	73	13

ADDRESS

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140
UNITED STATES

TITLE

Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
5780	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

O.K. to enter

/M.P./

06/26/2012

AMENDMENT AFTER FINAL REJECTION PURSUANT TO 37 CFR § 1.116(b)

United States Patent and Trademark Office
Customer Service Window, Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (made FINAL) mailed April 24, 2012, the period for response which is currently set to expire February 23, 2012, please amend the above-captioned application as follows, as well as consider the following remarks. Applicants submit there are good and sufficient reasons, in accordance with 37 CFR § 1.116(b), for entering these amendments. In particular, it is believed these amendments will put the above-captioned application in condition for allowance or appeal.

Applicants respectfully request prompt issuance of a Notice of Allowance or an Advisory Action by the Examiner, as the present amendment is being timely filed on or before two months of the mailing date of the Final Office Action (*i.e.*, on or before June 24, 2012). See MPEP § 706.07(f). Applicants' representative, Matthew M Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this amendment.

Remarks/Arguments begin on page **4** of this amendment.

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	1139	((biodegradable biodegradable) with polyester) and ((starch starches kaolin talc diatomaceous (calcium adj carbonate)) same filler) and layer	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/06/26 18:25
L3	36	((biodegradable biodegradable) with polyester) and ((starch starches kaolin talc diatomaceous (calcium adj carbonate)) same filler) and layer and (428/34.1.ccls. 428/34.2.ccls. 428/35.7.ccls. 428/35.9.ccls. 428/36.9.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/06/26 18:34

6/26/2012 6:42:22 PM

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1046 of 1179

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

RESPONSE

United States Patent and Trademark Office
Customer Service Window, Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (non-Final) mailed June 28, 2012, the period for response which is currently set to expire September 28, 2012, please consider the following remarks.

Applicants' representative, Matthew M Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this response.

Remarks/Arguments begin on page **4** of this response.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Previously Presented) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a paperboard substrate having a separate interior product facing surface and a separate exterior surface;

a first moisture protectant layer disposed only on said interior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2; and

a second moisture protectant layer disposed only on said exterior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture protectant layer disposed on said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

81. (Previously Presented) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Previously Presented) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

84. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer comprises polylactic acid and from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Previously Presented) The product according to claim 76, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of this application, as amended, is respectfully requested. Claims 1-75, 79, and 85-86 have previously been cancelled. Claims 76-78, 80-84, and 87-88 are currently pending.

B. Procedural Matters

Applicants gratefully acknowledge the Examiner's statement at page 2 of the present Office Action that the following rejections have been withdrawn: (1) Claim 76 under 35 U.S.C. § 112, second paragraph, for alleged "indefiniteness"[1]; and (2) Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,736,204 to Suskind (hereafter referred to as "**Suskind**"), in view of U.S. Pat. No. 6,040,063 to Doane (hereafter referred to as "**Doane**").

Applicants also gratefully acknowledge the Examiner's review of the Information Disclosure Statement (IDS) filed on June 8, 2012, and the notations by the Examiner that all references listed in the accompanying SB08 forms have been considered, and made of record.

C. Amendments to Claims

No further amendments have been made to pending Claims 76-78, 80-84, and 87-88.

D. Response to Rejection of Claims 76 and 87-88 under 35 U.S.C. § 103(a) as Being Unpatentable over Suskind

At pages 2-3 of the present Office Action, Claims 76 and 87-88 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over newly cited U.S. Pat. No. 5,736,204 to Suskind (hereafter referred to as "**Suskind**"). **This rejection is respectfully traversed with respect to these Claims**, as currently presented, for at least the following reasons.

In support of the rejection of Claim 76 as being unpatentable over **Suskind**, the present Action makes the following allegation:

[1] Applicants believe the reference to this withdrawn rejection as being under 35 U.S.C. § 103(a) to be a typographical error.

> ***Allegation 1***: [**Suskind**] **discloses a product in the form of a cup (container)** having an opening; column 3, lines 37-40) comprising a substrate comprising paperboard (column 3, line 38) having [a] first moisture barrier layer disposed only on the interior surface and [a] second moisture protectant layer disposed only on the exterior surface (column 6, lines 65-67) and comprising a biodegradable polyester polymer (a liquid resistant coating comprising polycaprolactone; (column 4, lines 46 - 51). [**Suskind**] **fails to disclose a coat weight from 5 to 30 lbs/3000 ft^2**. However, **it would have been obvious** for one of ordinary skill in the art **to select a thickness depending on the desired weight of the end product**.[2]

What Allegation 1 asserts does not support rejecting Claim 76, as currently presented, as being unpatentable over **Suskind** for at least the following reasons. First, and contrary to what Allegation 1 asserts, **Suskind** does not teach "a product in the form of a cup" according to Claim 1. Instead, **Suskind** teaches a "container" used to contain a variety of liquids and liquid containing materials, including "beverages such as milk, juice, fruit punch, soda, frozen juice, and iced tea; fabric softener; butter; margarine; cosmetics such as shampoo, conditioner, suntan lotion and body lotion; pancake syrup; cooking oil; processed grains, fruits and vegetables such as applesauce and pasta sauces; frozen vegetables; fruits; breads and bread products and single-use wet wipes."[3] Contrary to what Allegation 1 suggests, one of ordinary skill in the art would understand the difference between the "container" taught by **Suskind** and the "cup" recited in Claim 76. In fact, **nowhere** does **Suskind** mention the word "cup."

Second, Allegation 1 admits that **Suskind** does not teach the coat weights recited in Claim 76. Instead, Allegation 1 asserts that "it would have been obvious" "to select a thickness depending on the desired weight of the end product."[4] But this assertion amounts to a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything which Allegation 1 asserts is allegedly taught by **Suskind**, or any other verifiable evidence provided by the Examiner. "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated**

[2] See pages 2-3 of the present Office Action (emphasis added).
[3] See column 7, lines 30-39, of **Suskind**.
[4] Contrary to what Allegation 1 suggests, the relevant feature recited by Claim 76 is "coat weight," not **thickness**.

reasoning with some **rational underpinning** to support the legal conclusion of obviousness."[5]

Allegation 1 points to **absolutely nothing** in **Suskind** (or any other verifiable evidence) to **factually support** why one of ordinary skill in the art would select the particular coat weights for the first and second moisture protectant layers recited in Claim 76. In fact, Applicants must conclude that what is asserted in Allegation 1 with respect to the coat weights recited in Claim 76 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this assertion in Allegation 1 regarding the coat weights recited in Claim 76, Applicants **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[6] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Suskind**, or any other verifiable evidence provided by the Examiner.

In support of the rejection of Claims 87-88 as being unpatentable over **Suskind**, the Final Action makes the following allegation:

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[5] *In re Kahn,* 441 F.2d 977, 988 (Fed. Cir. 2006) (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* See also *In re Vaidyanathan*, 96 U.S.P.Q.2d 1507, 1514 (Fed. Cir. 2010) (non-precedential): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should** elaborate, **discuss**ing **the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added)."

[6] See 37 CFR § 1.104(d)(2) which states: "When a rejection in an application is based on facts within the personal knowledge of an employee of the Office, the data shall be as specific as possible, and the reference must be supported, when called for by the applicant, by the affidavit of such employee, and such affidavit shall be subject to contradiction or explanation by the affidavits of the applicant and other persons." Applicants note that in the unpublished case of *In re Sun*, 31 USPQ2d 1451, 1455 (Fed. Cir. 1993), the USPTO argued "the procedures established by 37 C.F.R. Section 1.107(b) (1993) [now 37 CFR § 1.104(d)(2)] ***expressly entitle*** an Applicant, on mere request, to an examiner affidavit that provides [citations that support the Examiner's asserted level of skill in the art]" (emphasis added). Furthermore, in *In re Sun*, the Federal Circuit, held that "this procedure, so readily available, helps save the lack of citation in an office action from possible constitutional infirmity in denying reasonable notice and hence due process." See 31 USPQ2d at 1455. See also *In re Vaidyanathan*, 96 U.S.P.Q.2d at 1515: "If it is not possible for the examiner to provide this type of information, **the examiner might choose instead to provide an affidavit detailing the examiner's own personal knowledge** (as a person approximating one of ordinary skill in the art) of the technology in question (citing 37 CFR § 1.104(d)(2)) (emphasis added)."

> ***Allegation 2***: [**Suskind**] discloses polylactic acid (column 4, lines 54-55).[7]

In response to Allegation 2, Claims 87 and 88 each depend directly from Claim 76. Accordingly, Claims 87-88 are patentable over **Suskind** for at least the same reasons presented above in response to Allegation 1 for why Claim 76 is patentable over this reference.

In response to the arguments presented at page 5 of Applicants' prior June 8, 2012 Amendment After Final (hereafter referred to as "June 8, 2012 AAF") that "one of ordinary skill in the art would understand the difference between the disclosed container and a cup," the present Office Action makes the following additional allegation:

> ***Allegation 3***: However, the claimed invention is directed to any product that is 'in the form of' a cup. Furthermore, the disclosure by [**Suskind**] [is] of a paperboard juice container, therefore **a carton having some opening, is, broadly speaking, 'in the form of' a cup**.[8]

What Allegation 3 asserts also does not support rejecting Claim 76, as currently presented, as being unpatentable over **Suskind** for at least the reasons presented above in response to Allegation 1, as well as the following reasons. A "carton having some opening" is not necessarily a "cup." Also, if **Suskind** had considered its "containers" to include a "cup," this reference would have said so. Again, what Allegation 3 asserts is simply a "conclusory statement" without any "rational underpinning" which is **factually supported** by anything allegedly taught by **Suskind**, or any other verifiable evidence provided by the Examiner.[9] Instead, Applicants must again conclude that what is asserted in Allegation 3 with respect to the meaning of "cup" recited in Claim 76 is, at least partially, based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this assertion in Allegation 3 regarding the meaning of "cup" recited in Claim 76, Applicants again **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[10] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not

[7] See page 3 of the present Office Action.
[8] See page 4 (Answers to Applicant's Arguments) of the present Office Action (emphasis added).
[9] See cases cited in footnote 5.
[10] See 37 CFR § 1.104(d)(2) and cases cited in footnote 6.

been provided to Applicants, and which are not fairly taught or suggested by **Suskind**, or any other verifiable evidence provided by the Examiner.

In response to the arguments presented at page 7 of Applicants' prior June 8, 2012 AAF that the assertions in Allegation 1 that "it would have been obvious" "to select a thickness depending on the desired weight of the end product" are "conclusory" and without any "rational underpinning" that is factually supported (thus requiring the Examiner to provide a an affidavit/declaration under 37 CFR § 1.104(d)(2) as to facts which are apparently within the Examiner's personal knowledge), the present Office Action makes the following additional allegation:

> ***Allegation 4***: However, **the weight of the coating clearly determines**, in part **the weight of the container**, as the coating is a component of the container; furthermore, **the claimed weight is not stated by the specification**, or by Applicant's remarks, **to be particularly critical**.[11]

What Allegation 4 asserts also does not support rejecting Claim 76, as currently presented, as being unpatentable over **Suskind** for at least the reasons presented above in response to Allegation 1, as well as the following reasons. First, Applicants do not understand what the basis is for the assertion in Allegation 4 that "the claimed weight is not stated by the specification." In fact, the recited coated weight of 5 to 30 lbs/3000 ft^2 is disclosed in paragraphs [0048] and [0049] of the above-captioned application.[12]

Second, that the coat weight "determines, in part the weight of the container" as asserted by Allegation 4 **begs the question being asked**, namely, does **Suskind** teach or suggest to one of ordinary skill in the art the coat weights recited in Claim 76. As Allegation 1 admits, **Suskind** does not teach the coat weights (whether "critical" or not) recited in Claim 76. Accordingly, one of ordinary skill in the art is **left completely without any factual basis** for choosing these particular coat weights based on what the reference (i.e., **Suskind**) relied upon by Allegation 4 actually teaches. Again, Applicants must conclude that what is asserted in Allegation 4 with respect to the "coat weights" recited in Claim 76 is, at least partially,

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[11] See page 4 (Answers to Applicant's Arguments) of the present Office Action.
[12] While paragraphs [0048] and [0049] of the above-captioned application refer to Layers K, L, and M as having certain "thicknesses," it also clear from other portions of the above-captioned application that the unit "lbs/3000 ft^2" more correctly refers to the coat weight. See, for example, paragraph [0030] of the above-captioned application.

based on facts within the Examiner's personal knowledge **which have not been provided to Applicants**. Accordingly, if the Examiner wishes to persist in this assertion in Allegation 4 regarding the "coat weights" recited in Claim 76, Applicants again **respectfully request** that he provide an affidavit/declaration under 37 CFR § 1.104(d)(2)[13] because this assertion appears to be based, at least partially, on facts within the Examiner's personal knowledge which have not been provided to Applicants, and which are not fairly taught or suggested by **Suskind**, or any other verifiable evidence provided by the Examiner.

For at least the foregoing reasons, Claims 76 and 87-88, as amended or as currently presented, are patentable over **Suskind**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) based on this reference should be withdrawn.

E. Response to Rejection of Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as Being Unpatentable over Suskind, in view of Yamamoto

At pages 3-4 of the present Office Action, Claims 77-78 and 80-84 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Suskind**, in view of U.S. Appln. No. 20040014883 to Yamamoto et al. (hereafter referred to as "**Yamamoto**"). **This rejection is respectfully traversed with respect to these Claims**, as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78 and 80-84 as being unpatentable over **Suskind**, in view of **Yamamoto**, the present Office Action makes the following allegations:

> ***Allegation 5***: [**Suskind**] discloses a product as discussed above. With regard to Claims 77-78 and 80-84, [**Suskind**] **fail[s] to disclose 5 to 20 percent by weight of at least one filler comprising calcium carbonate**.[14]
>
> ***Allegation 6***: [**Yamamoto**] disclose[s] a degradable polyester (paragraphs 0136-0137) comprising 5 to 20 percent by weight of at least one filler comprising calcium carbonate (paragraph 0145) **for the purpose of obtaining packaging that preserves freshness** (paragraph 0160).[15]

[13] See 37 CFR § 1.104(d)(2) and cases cited in footnote 6.
[14] See page 3 of the present Office Action (emphasis added).
[15] See page 3 of the present Office Action (emphasis added).

> ***Allegation 7***: It therefore would have been obvious for one of ordinary skill in the art **to provide for calcium carbonate in order to provide packaging that preserves freshness as taught by** [**Yamamoto**].[16]

What Allegations 5-7 assert do not support rejecting Claims 77-78 and 80-84 as being unpatentable over **Suskind**, even in view of **Yamamoto**, for at least the following reasons. First, for at least the same reasons presented in Section D above in response to Allegations 1 and 3-4, Claim 76 is patentable over **Suskind**. Second, Allegations 5-7 do not assert that those features recited in Claim 76 (i.e., product in the form of a **cup** and **coat weights of from 5 to 30 lbs/3000 ft^2** for the first and second moisture protectant layers) which were asserted **to be missing from the teachings** of **Suskind**, are now taught by **Yamamoto**.

Third, as admitted by Allegation 5, **Suskind** does not teach including 5 to 20% by weight of at least one filler (such as calcium carbonate) in the first or second moisture protectant layers recited in Claims 77-78 and 80-84. Instead, Allegation 6 relies upon **Yamamoto** to allegedly teach "a degradable polyester" comprising "at least one filler comprising calcium carbonate."

Fourth, Allegations 6 and 7 suggest that **Yamamoto** includes the "at least one filler" such as calcium carbonate, in the polyester film "for the purpose of obtaining packaging that preserves freshness." But paragraph [0160] of **Yamamoto** nowhere says or suggests that fillers are incorporated in its polyester films "for the purpose of obtaining packaging that preserves freshness." In fact, the reason for incorporating these fillers as other "additives" in the polyester films of **Yamamoto** **is completely unstated**.

Fifth, **Yamamoto** simply teaches use of its polyester films as **packaging** films.[17] Nothing in **Yamamoto** suggests that these polyester films may be used as moisture protectant layers for a cup according to Claims 77-78 and 80-84. In fact, **nowhere** does **Yamamoto** mention the word "cup." Accordingly, Allegations 6 and 7 are simply "conclusory statements" without any "rational underpinning" which is **factually supported** by anything allegedly taught by **Yamamoto** for combining this reference with **Suskind** with respect to Claims 77-78 and 80-84.[18]

---

[16] See page 3 of the present Office Action (emphasis added).
[17] See abstract and paragraph [0008] of **Yamamoto**.
[18] See cases cited in footnote 5.

For at least the foregoing reasons, Claims 77-78 and 80-84, as currently presented, are patentable over **Suskind**, even in view of **Yamamoto**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) over this combination of references should be withdrawn.

F. Conclusion

Claims 76-78, 80-84, and 87-88, as currently presented, are patentable over the art relied upon in the Final Action. Accordingly, Claims 76-78, 80-84, and 87-88 are in condition for allowance, and favorable action is earnestly solicited thereon.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite prosecution of the above application.

No extension of time is believed to be required. However, the Commissioner is hereby authorized by this paper to charge any fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment, to Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully Submitted,

Date: August 16, 2012

By: /Matthew M. Eslami/

Matthew M. Eslami
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Electronic Acknowledgement Receipt	
EFS ID:	13516260
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	16-AUG-2012
Filing Date:	06-FEB-2006
Time Stamp:	16:46:46
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		120816_rsptooa_fds029388us.pdf	168731 8cba976026ab0b4ec63990f5b9cc5f1943f0dae0	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	3
	Applicant Arguments/Remarks Made in an Amendment	4	11
Warnings:			
Information:			
	Total Files Size (in bytes):	168731	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number	Filing Date	☐ To be Mailed
11/348,150	02/06/2006	

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY ☐ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 08/16/2012	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 10	Minus	** 73	= 0	X $ =		OR	X $60=	0
Independent (37 CFR 1.16(h))	* 1	Minus	***13	= 0	X $ =		OR	X $250=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/CORALIA BETANCOURT/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 10/19/2012

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
10/19/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/348,150	CLEVELAND ET AL.	
	Examiner	Art Unit	
	MARC PATTERSON	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2012*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *70-76,80-84,87 and 88* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *70-76,80-84,87 and 88* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

WITHDRAWN REJECTIONS

1. The 35 U.S.C. 103(a) rejection of Claims 76 and 87 – 88 as being unpatentable over Suskind (U.S. Patent No. 5,736,204), of record on page 2 of the previous Action, is withdrawn.

2. The 35 U.S.C. 103(a) rejection of Claims 77 - 78 and 80 – 84 as being unpatentable over Suskind (U.S. Patent No. 5,736,204) in view of Yamamoto et al (U.S. Patent No. 2004/0014883), of record on page 2 of the previous Action, is withdrawn.

NEW REJECTIONS

Claim Rejections – 35 USC § 103(a)

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 76 – 78, 80 – 84 and 87 - 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nangeroni et al (U.S. Patent No. 6,183,814 B1).

With regard to Claims 76 and 87 – 88, Nangeroni et al discloses a product in the form of a cup (column 18, line 10) comprising a substrate comprising paperboard (column 4, lines 48 – 65) having a first moisture protectant layer comprising polylactic acid disposed only on the interior surface and second moisture protectant layer comprising polylactic acid disposed only on the exterior surface (column 4, lines 48 – 65), therefore comprising a biodegradable polyester

polymer. Nangeroni et al fails to disclose a coat weight from 5 to 30 lbs/3000 ft^2. However, it would have been obvious for one of ordinary skill in the art to select a weight depending on the desired weight of the end product.

With regard to Claims 77 – 78 and 80 – 84, the layer comprises calcium carbonate (column 28, lines 40 – 44). Nangeroni et al fail to disclose 5 to 20 percent by weight. However, Nangeroni et al teach the selection of the amount of calcium carbonate depending on the desired coloration of the end product (column 28, lines 40 – 44). It therefore would have been obvious for one of ordinary skill in the art to select an amount depending on the desired coloration.

ANSWERS TO APPLICANT'S ARGUMENTS

5. Applicant's arguments regarding the rejections of the previous Action have been carefully considered and have been found to be persuasive. The rejections have therefore been withdrawn. The new rejections above are directed to amended Claims 76 – 78, 80 – 84 and 87 – 88.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 11/348,150	Applicant(s)/Patent Under Reexamination CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,183,814	02-2001	Nangeroni et al.	427/361
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	Art Unit
	MARC PATTERSON	1782

SEARCHED			
Class	Subclass	Date	Examiner
428	34.1	11/21/11	M.A.P.
428	34.2	11/21/11	M.A.P.
428	35.7	11/21/11	M.A.P.
428	35.9	11/21/11	M.A.P.
428	36.9	11/21/11	M.A.P.
428	34.1	6/26/12	M.A.P.
428	34.2	6/26/12	M.A.P.
428	35.7	6/26/12	M.A.P.
428	35.9	6/26/12	M.A.P.
428	36.9	6/26/12	M.A.P.
428	34.1	10/18/12	M.A.P.
428	34.2	10/18/12	M.A.P.
428	35.7	10/18/12	M.A.P.
428	35.9	10/18/12	M.A.P.
428	36.9	10/18/12	M.A.P.

SEARCH NOTES		
Search Notes	Date	Examiner

INTERFERENCE SEARCH			
Class	Subclass	Date	Examiner

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Alexandria, Virginia 22313-1450
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 12/27/2012

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
12/27/2012	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	11/348,150	CLEVELAND ET AL.	
	Examiner	Art Unit	
	MARC PATTERSON	1782	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *76,80-84,87 and 88* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *76,80-84,87 and 88* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

DETAILED ACTION

WITHDRAWN REJECTIONS

1. The previous Office Action dated October 19, 2012 is withdrawn.

Response to Arguments

2. Applicant's arguments with respect to claims 76-78 and 80-88, as set forth in the response dated August 16, 2012, have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

NEW REJECTIONS

Claim Rejections – 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 76 and 87 – 88 are rejected under 35 U.S.C. 102(b) as being anticipated by Kuusipalo et al (U.S. Patent No. 6,645,584 B1).

With regard to Claims 76 and 87 - 88, Kuusipalo et al discloses a product in the form of a cup (column 4, line 34) comprising a substrate comprising paperboard (column 4, lines 15 – 17) having a coating provided either on one side or on both sides (column 4, lines 15 - 17), the coating comprising a first moisture protectant layer comprising polylactic acid and a second moisture protectant layer comprising polylactic acid (column 4, lines 10 - 14), therefore a

biodegradable polyester polymer; the layers are therefore disposed, only on the interior surface and exterior surface, with polylactic acid. Figure 2 shows two polylactic acid coating layers, an interior coating and an exterior coating, each coating weighing 5 g/m^2 and coextruded with a polyester adhesive that weighs 5 g/m^2; Kuusipalo et al therefore disclose an interior coating and exterior coating having a coat weight from 5 to 30 lbs/3000 ft^2 (column 5, lines 30 - 59).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 77 – 78 and 80 – 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuusipalo et al (U.S. Patent No. 6,645,584 B1) as applied to claims 76 and 88 above further in view of Nangeroni et al (U.S. Patent No. 6,183,814) .

Kuusipalo et al discloses a cup having an interior and exterior coating as discussed above for claims 76 and 88. The coatings comprise a filler (mineral component; column 4, lines 3 - 5).

With regard to Claims 77 – 78 and 80 – 84, Kuusipalo et al fail to disclose a coating comprising 5 - 20% by weight of a filler such as calcium carbonate.

Nangeroni et al teach a cup (column 18, line 10) having a paper substrate (column 4, lines 48 - 65) and interior and exterior coatings of polylactic acid (column 4, lines 48 - 65) having a filler. The filler can be present in an amount of less than 10 wt% (column 27, lines 26-30). Calcium carbonate could also be present as a pigment, which could also be considered a filler.

It therefore would have been obvious for one of ordinary skill in the art to provide for a filler within the presently claimed range in the coating of Kuusipalo et al in order to prevent blocking or sticking of the coated paper during storage and transport, (Nangeroni, column 27, lines 13-15).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gwendolyn Blackwell, can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 11/348,150	Applicant(s)/Patent Under Reexamination CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,645,584	11-2003	Kuusipalo et al.	428/34.2
*	B	US-5,849,374	12-1998	Gruber et al.	428/34.3
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

AMENDMENT

United States Patent and Trademark Office
Customer Service Window, Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (non-Final) mailed December 27, 2012, please amend the above-captioned application as follows, as well as consider the following remarks.

Applicants also concurrently petition for a one (1) month extension of time for filing this response to this December 27, 2012 Office Action, to thereby extend the period for response (originally set to expire on March 27, 2013) through April 27, 2013. Applicants are also concurrently submitting payment of the extension fee required by 37 CFR § 1.17(a)(1).

Applicants' representative, Matthew M Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this response.

Remarks/Arguments begin on page **4** of this response.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Currently Amended) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a paperboard substrate having a separate interior product facing surface and a separate exterior surface;

a first moisture protectant layer ~~disposed~~ is coated directly only on said interior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2; and

a second moisture protectant layer ~~disposed~~ is coated directly only on said exterior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture protectant layer disposed on and directly adhered to said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

81. (Previously Presented) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Previously Presented) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

84. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer comprises polylactic acid and from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Previously Presented) The product according to claim 76, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

89. (New) The product according to Claim 83, wherein the first moisture protectant layer

comprises from 5 to 20 percent by weight of calcium carbonate as the filler.

90. (New) The product according to Claim 84, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of calcium carbonate as the filler.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of the above-captioned application, as amended, is respectfully requested. Claims 1-75, 79, and 85-86 have previously been cancelled. New Claims 89 and 90 have been added. Claims 76-78, 80-84, and 87-90 are currently pending.

B. Procedural Matters

Applicants acknowledge the Examiner's statement at page 2 of the present Office Action that the following rejections are now moot in view of Applicants' prior response of August 16, 2012 (hereafter referred to as "August 16, 2012 Response"): (1) Claims 76 and 87-88 under 35 U.S.C. § 103(a) as being unpatentable over newly cited U.S. Pat. No. 5,736,204 to Suskind (hereafter referred to as "**Suskind**"); and (2) Claims 77-78 and 80-84 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Suskind**, in view of U.S. Appln. No. 20040014883 to Yamamoto et al. (hereafter referred to as "**Yamamoto**").

C. Amendments to Claims

Claim 76 has been amended to recite that first moisture protectant layer **is coated directly** only on said interior surface of said paperboard substrate. Claim 76 has also been amended to recite that the second moisture protectant layer **is coated directly** only on said exterior surface of said paperboard substrate. Support for these amendments to Claim 76 may be found, for example, in paragraphs [0050] and [0051], as well as FIGS. 6 and 7, of the published version (i.e., U.S. Appln. No. 20070184220)[1] of the above-captioned application.

New Claims 89 and 90 have been added. New Claim 89, which depends from Claim 83, recites that the first moisture protectant layer comprises from 5 to 20 percent by weight of **calcium carbonate as the filler**. Similarly, new Claim 90, which depends from Claim 84, recites that the second moisture protectant layer comprises from 5 to 20 percent by weight of **calcium carbonate as the filler**. Support for new Claims 89 and 90 may be found, for example, in paragraph [0018] of the published version (i.e., U.S. Appln. No. 20070184220) of the above-captioned application.

[1] All references to the above application herein will be with respect to the published version U.S. Pat. Appln. No. 20070184220, published August 9, 2007.

D. Response to Rejection of Claims 76 and 87-88 under 35 U.S.C. § 102(b) as Being Anticipated by Kuusipalo et al.

At pages 2-3 of the present Office Action, Claims 76 and 87-88 have been rejected under 35 U.S.C. § 102(b) as being anticipated over newly cited U.S. Pat. No. 6,645,584 to Kuusipalo et al. (hereafter referred to as "**Kuusipalo et al.**"). **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claim 76 and 87-88 as being anticipated by **Kuusipalo et al.**, the present Action makes the following allegation:

> ***Allegation 1***: [**Kuusipalo et al.**] discloses a product in the form of a cup (column 4, line 34) comprising a substrate comprising paperboard (column 4, lines 15-17) having a coating comprising a first moisture protectant layer comprising polylactic acid and a second moisture protectant layer comprising polylactic acid (column 4, lines 10-14), therefore a biodegradable polyester polymer; the layers are therefore disposed, only on the interior surface and exterior surface, with polylactic acid. Figure 2 shows two polylactic acid coating layers, an interior coating and an exterior coating, each coating weighing 5 g/m^2 **and coextruded with a polyester adhesive** that weighs 5 g/m^2; [**Kuusipalo et al.**] therefore disclose[s] an interior coating and exterior coating having a coat weight [of] from 5 to 30 lbs/3000 ft^2 (column 5, lines 30-59).[2]

In response to what Allegation 1 asserts, Claim 76 has been amended to recite that: (1) first moisture protectant layer **is coated directly** only on said interior surface of said paperboard substrate; and (2) the second moisture protectant layer **is coated directly** only on said exterior surface of said paperboard substrate. In other words, as now recited in amended Claim 76, the first moisture protectant layer, as well as the second moisture protectant layer, are coated **directly** onto the respective interior and exterior surface of the paperboard substrate **without an additional adhesive**. By contrast, and as stated in Allegation 1, **Kuusipalo et al.** teaches co-extruding the polylactic acid **with an additional polyester adhesive** onto the surfaces of its coated paperboard. Accordingly, the laminate of amended Claim 76 is patentably distinguishable from the coated paperboard of **Kuusipalo et al**.

[2] See pages 2-3 of the present Office Action (emphasis added).

Claims 87 and 88, as currently presented, each depend directly from amended Claim 76. Accordingly, Claims 87 and 88 are patentable over **Kuusipalo et al.** for at least the same reasons presented in response to Allegation for why amended Claim 76 is patentable over this reference.

For at least the foregoing reasons, Claims 76 and 87-88, as amended or as currently presented, are patentable over **Kuusipalo et al**. Accordingly, the rejection of these Claims under 35 U.S.C. § 102(b) based on this reference should be withdrawn.

E. Response to Rejection of Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as Being Unpatentable over Kuusipalo et al., in view of Nangeroni et al.

At pages 3-4 of the present Office Action, Claims 77-78 and 80-84 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Kuusipalo et al.**, in view of U.S. Pat. No. 6,183,814 to Nangeroni et al. (hereafter referred to as "**Nangeroni et al.**"). **This rejection is respectfully traversed with respect to these Claims**, as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78 and 80-84 as being unpatentable over **Kuusipalo et al.**, in view of **Nangeroni et al.**, the present Office Action makes the following allegations:

> ***Allegation 2***: [**Kuusipalo et al.**] discloses a cup having an interior and exterior coating as discussed above for claims 76 and 88. The coatings comprise a filler (mineral component; column 4, lines 3-5). With regard to Claims 77-78 and 80-84, [**Kuusipalo et al.**] **fail[s] to disclose a coating 5 to 20 percent by weight of a filler such as calcium carbonate**.[3]
>
> ***Allegation 3***: [**Nangeroni et al.**] teach[es] a cup (column 18, line 10) having a paper substrate (column 4, lines 48-65) and interior and exterior coatings of polylactic acid (column 4, lines 48-65) having a filler. The filler can be present in an amount of less than 10 wt% (column 27, lines 26-30). Calcium carbonate could also be present as a pigment, which could also be considered a filler.[4]

[3] See pages 3-4 of the present Office Action (emphasis added).
[4] See page 4 of the present Office Action (emphasis added).

> ***Allegation 4***: **It therefore would have been obvious** for one of ordinary skill in the art **to provide for filler with the presently claimed range in the coating of Kuusipalo et al. to prevent blocking or sticking of the coated paper during storage and transport** ([**Nangeroni et al.**], column 27, lines 13-15).[5]

What Allegations 2-4 assert do not support rejecting Claims 77-78 and 80-84 as being unpatentable over **Kuusipalo et al.**, even in view of **Nangeroni et al.**, for at least the following reasons. First, for at least the same reasons presented in Section D above in response to Allegation 1, amended Claim 76 is patentable over **Kuusipalo et al**. Accordingly, Claims 77-78 and 80-84 are patentable over **Kuusipalo et al**. for at least the same reasons presented in Section D above in response to Allegation 1 for why amended Claim 76 is patentable over this reference

Second, Allegations 2-4 do not assert that those features recited in amended Claim 76 (i.e., the first moisture protectant layer, as well as the second moisture protectant layer, are coated **directly** onto the respective interior and exterior surface of the paperboard substrate **without an additional adhesive**) which were asserted **to be missing from the teachings** of **Kuusipalo et al**, are now taught by **Nangeroni et al**.

Third, as admitted by Allegation 2, **Kuusipalo et al.** does not teach including 5 to 20% by weight of at least one filler (such as calcium carbonate) in the first or second moisture protectant layers recited in Claims 77-78 and 80-84. Instead, Allegation 3 relies upon **Nangeroni et al.** to allegedly teach "the filler can be present in an amount of less than 10 wt%" and that "[c]alcium carbonate could also be present as a pigment, which could also be considered a filler."

Fourth, in further in response to what Allegation 3 asserts, new Claim 89 (which depends directly from Claim 83) and new Claim 90 (which depends directly from Claim 84) have been added which recite, respectively, that first and second moisture protectant layer comprises from 5 to 20 percent by weight of **calcium carbonate as the filler**. Contrary to what Allegation 3 asserts, **Nangeroni et al.**, in listing several inorganic fillers, does not teach calcium carbonate can be one of those inorganic fillers. In addition, while column 28, lines 40-43, of **Nangeroni et al.** teaches that calcium carbonate may be a pigment, **nowhere does this reference teach that the pigment, be it calcium carbonate or otherwise, may be**

[5] See page 4 of the present Office Action (emphasis added).

present in the coating in an amount from 5 to 20 percent by weight according to new Claims 89 and 90.

Fifth, the "motivation" asserted by Allegation 4 for combining **Nangeroni et al.** with **Kuusipalo et al.** (i.e., "to prevent blocking or sticking of the coated paper during storage and transport") based upon column 27, lines 13-15 of **Nangeroni et al.** is **simply made-up** and **provides no legally appropriate "rational basis" for combining these references with respect to Claims 77-78 and 80-84**. "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion of obviousness."[6] Instead, **the complete failure of these assertions** by Allegation 4 **to provide any rational and factually supported basis** for combining **Nangeroni et al.** with **Kuusipalo et al.** with respect to Claims 77-78 and 80-84 1 is **clear evidence** that Applicants' application disclosure is being used **impermissibly** as the "road map to find its prior art components."[7]

For at least the foregoing reasons, Claims 77-78 and 80-84, as currently presented, as well as new Claims 89 and 90, are patentable over **Kuusipalo et al.**, even in view of **Nangeroni et al**. Accordingly, the rejection of Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) over this combination of references should be withdrawn.

F. Conclusion

Claims 76-78, 80-84, and 87-88, as amended or as currently presented, as well as new Claims 89 and 90, are patentable over the art relied upon in the present Office Action. Accordingly, Claims 76-78, 80-84, and 87-90 are in condition for allowance, and favorable action is earnestly solicited thereon.

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[6] *In re Kahn,* 441 F.2d 977, 988 (Fed. Cir. 2006) (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* See also *In re Vaidyanathan*, 96 U.S.P.Q.2d 1507, 1514 (Fed. Cir. 2010) (non-precedential): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should** elaborate, **discuss**ing **the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added)."

7 In determining obviousness under 35 U.S.C. § 103, the Federal Circuit has held that it is **improper hindsight reasoning** to use an **Applicant's own invention** as a "**roadmap to find its prior art components**." *Princeton Biochemicals Inc. v. Beckman Coulter Inc.*, 411 F.3d 1332, ___, 75 USPQ2d 1051, 1054 (Fed. Cir. 2005) (emphasis added).

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Mr. Matthew M. Eslami at 513-248-6193 to expedite prosecution of the above application.

Please charge the amount of **$150.00** required for the request for a one-month extension of time to our Deposit Account No. 09-0525. In the event any variance exists between the amount enclosed and the Patent Office charges for filing the above-noted documents, including any other fees required under 37 C.F.R 1.136 for any necessary Extension of Time to make the filing of the attached documents timely, please charge or credit the difference to our Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3).**

Respectfully Submitted,

Date: April 23, 2013

By: /Matthew M. Eslami/

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Electronic Patent Application Fee Transmittal	
Application Number:	11348150
Filing Date:	06-Feb-2006
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Filer:	Matthew M. Eslami/Michele McRoy
Attorney Docket Number:	FDS-029388-US
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 1 month with $0 paid	1251	1	200	200

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
		Total in USD ($)		**200**

Electronic Acknowledgement Receipt	
EFS ID:	15591418
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	23-APR-2013
Filing Date:	06-FEB-2006
Time Stamp:	15:35:47
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$200
RAM confirmation Number	2242
Deposit Account	090525
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: Charge any Additional Fees required under 37 C.F.R. Section 1.16 (National application filing, search, and examination fees) Charge any Additional Fees required under 37 C.F.R. Section 1.17 (Patent application and reexamination processing fees)	

Charge any Additional Fees required under 37 C.F.R. Section 1.19 (Document supply fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.20 (Post Issuance fees)

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	130423_rsptooa_fds029388us.pdf	158570 8e71dfdfe1e43bb112858a9ad53d6f67facae811	no	10
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30346 35c09c1f70b00f8b80f4dc1492541578ab51b884	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	188916		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/348,150	Filing Date 02/06/2006	☒ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **04/23/2013**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 73	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***13	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/Katrina Harling/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 07/15/2013

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
07/15/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 11/348,150	Applicant(s) CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2013*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *76-78,80-84 and 87-90* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *76-78,80-84 and 87-90* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some * c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

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DETAILED ACTION

WITHDRAWN REJECTIONS

1. The 35 U.S.C. 102(b) rejection of Claims 76 and 87 – 88 as being anticipated by Kuusipalo et al (U.S. Patent No. 6,645,584 B1), of record on page 2 of the previous Action, is withdrawn.

2. The 35 U.S.C. 103(a) rejection of Claims 77 - 78 and 80 – 84 as being unpatentable over Kuusipalo et al (U.S. Patent No. 6,645,584 B1), of record on page 2 of the previous Action, is withdrawn.

NEW REJECTIONS

Claim Rejections – 35 USC § 103(a)

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 76 and 87 - 88 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamawaki et al (Japanese Patent No. 2003013391) in view of Kuusipalo et al (U.S. Patent No. 6,645,584 B1).

With regard to Claims 76 and 87 - 88, Yamawaki et al disclose a product in the form of a container (paragraph 0001, English translation) comprising a paper substrate having a coating provided either on one side or on both sides (paragraph 0007), the coating comprising a first

layer comprising polylactic acid, therefore moisture protectant, and a second layer comprising polylactic acid (paragraph 0022); the layers are therefore disposed, only on the interior surface and exterior surface, with a biodegradable polyester; each layer weighs from 5 to 30 lbs/3000 ft^2 (paragraph 0028). Yamawaki et al fail to disclose a cup – shaped container and paperboard.

Kuusipalo et al teach the interchangeability of paper and paperboard in the making of a container (column 1, lines 6 - 8) and a container that is cup - shaped (Figure 4) for the purpose of obtaining a drinking cup (column 5, lines 60 - 63).

It therefore would have been obvious for one of ordinary skill in the art to provide for a cup – shaped container and paperboard in order to obtain a drinking cup as taught by Kuusipalo et al.

5. Claims 77 – 78, 80 – 84 and 89 – 90 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamawaki et al (Japanese Patent No. 2003013391) in view of Kuusipalo et al (U.S. Patent No. 6,645,584 B1) and further in view of Nangeroni et al (U.S. Patent No. 6,183,814).

Yamawaki et al and Kuusipalo et al disclose a cup having an interior and exterior coating as discussed above for claims 76 and 88. With regard to Claims 77 – 78, 80 – 84 and 89 – 90, Yamawaki et al and Kuusipalo et al fail to disclose a coating comprising 5 - 20% by weight of a filler such as calcium carbonate.

Nangeroni et al teach a cup (column 18, line 10) having a paper substrate (column 4, lines 48 - 65) and interior and exterior coatings of polylactic acid (column 4, lines 48 - 65) having a

filler. The filler can be present in an amount of less than 10 wt% (column 27, lines 26-30). Calcium carbonate could also be present as a pigment, which could also be considered a filler.

It therefore would have been obvious for one of ordinary skill in the art to provide for a filler within the presently claimed range in the coating of Yamawaki et al and Kuusipalo et al in order to prevent blocking or sticking of the coated paper during storage and transport (Nangeroni, column 27, lines 13-15).

ANSWERS TO APPLICANT'S ARGUMENTS

6. Applicant's arguments regarding the 35 U.S.C. 102(b) rejection of Claims 76 and 87 – 88 as being anticipated by Kuusipalo et al (U.S. Patent No. 6,645,584 B1), and 35 U.S.C. 103(a) rejection of Claims 77 - 78 and 80 – 84 as being unpatentable over Kuusipalo et al (U.S. Patent No. 6,645,584 B1), of record in the previous Action, have been considered and have been found to be persuasive. The rejections are therefore withdrawn. The new rejections above are directed to amended Claims 76 – 78, 80 – 84 and 87 – 90.

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gwendolyn Blackwell, can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Notice of References Cited	Application/Control No. 11/348,150	Applicant(s)/Patent Under Reexamination CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
	A	US-			
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N	JP-2003013391-A	01-2003	Japan	Yamawaki et al (English)	
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

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PTO 13-4833

CC=JP
DATE=20030115
KIND=A
PN=2003013391

BIODEGRADABLE PAPER SHEET AND PAPER CONTAINER
[生分解性を有する紙シート及び紙容器]

KENTARO YAMAWAKI, ET AL.

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. JULY 2013
TRANSLATED BY: SCHREIBER TRANSLATIONS, INC.

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INTERNATIONAL CLASSIFICATION (51): D21H 19/28; B32B 1/02, 9/00, 9/02, 27/10, 27/20, 27/30, 27/36; B65D 30/02, 65/42, 65/46; D21H 19/08, 19/10, 19/20, 19/26, 19/36, 19/40, 25/06

PRIOR ART DOCUMENTS (56): N/A

PRIORITY COUNTRY (33): N/A

PRIORITY NUMBER (31): N/A

PRIORITY DATE (32): N/A

INVENTOR(S) (72): KENTARO YAMAWAKI; RYUKICHI MATSUO; JUNICHI KAMINAGA; YUMIKO KATO; AND TOSHIAKI KAKEMURA

APPLICANT(S) (71): TOPPAN PRINTING CO., LTD.

DESIGNATED CONTRACTING STATES (81): N/A

TITLE (54): BIODEGRADABLE PAPER SHEET AND PAPER CONTAINER

FOREIGN TITLE [54A]: 生分解性を有する紙シート及び紙容器

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/1[1]

[Scope of Patent Claims]

[Claim 1] A paper sheet, characterized in that at least one side of its paper substrate is coated or impregnated with a biodegradable resin to form a biodegradable resin layer.

[Claim 2] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of polyester-based biodegradable resins such as a polyoxycarboxylic acid group, a polylactic acid group, a polylactone group, a fatty acid polyester group, a fatty acid-aromatic polyester copolymer group, a polyesteramide copolymer group, a polyesterurethane copolymer group, a polyesterurea copolymer group, a polyhydroxyalkanoate copolymer group, a polyestercarbonate copolymer group and a polyesterether copolymer group and a derivative thereof, or said polyester-based biodegradable resin with a cross-linking agent.

[Claim 3] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of natural polysaccharides such as cellulose, starch, dextran, pullulan, nigeran, curdlan, gellan gum, xanthan gum, carrageenan, guar gum, tamarind gum, gum arabic, agar, levan, alginic acid, alginate, chitin, chitosan, heparin, locust bean gum, mannan,

[1] Numbers in the margin indicate pagination in the foreign text.

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glucan, galactan, araban, xylan, pectin, glycogen and hyaluronic acid and a metal salt thereof and a derivative thereof.

[Claim 4] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of plant resins such as rosin, copal, dammar, elemi, ester gum, lignin, lacquer, tannin and gluten and a derivative thereof or one or a plurality of animal resins such as shellac, gelatin, casein, collagen and animal glue and a derivative thereof.

[Claim 5] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of polyamino acids such as a polyglutamic acid group, a polylisine group and a polyaspartic acid group and a derivative thereof.

[Claim 6] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from polyalcohol and a derivative thereof.

[Claim 7] The paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from a mixture of two or more types of the biodegradable resins as set forth in one of Claims 2 to 6 or said biodegradable resins with a layered silicate compound.

[Claim 8] The paper sheet as set forth in one of Claims 1 to 7, characterized in that the paper substrate is coated or

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impregnated with an aqueous solution or aqueous dispersion of said biodegradable resin to form a biodegradable resin layer.

[Claim 9] A paper container, characterized in that the paper sheet as set forth in Claim 1 is molded to form a container.

[Claim 10]

A paper sheet or paper container, characterized in that an inorganic oxide thin film is formed on said biodegradable resin layer of the paper sheet or paper container as set forth in Claim 1 or 9.

[Claim 11] The paper sheet or paper container as set forth in Claim 10, characterized in that said inorganic oxide thin film is a vapor deposited thin film such as chemical vapor deposition (CVD) and plasma CVD.

[Claim 12] The paper sheet or paper container as set forth in Claim 10 or 11, characterized in that said biodegradable resin is heat treated and then an inorganic oxide thin film is formed on said resin layer.

[Claim 13] The paper sheet or paper container as set forth in one of Claims 1 to 12, characterized in that at least one side of said paper substrate is coated with inorganic pigment.

[Claim 14] The paper sheet as set forth in one of Claims 1 to 13, characterized in that said paper substrate or paper sheet is calendered.

[Detailed Description of the Invention]

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[0001]

[Field of the Invention] The present invention relates to a biodegradable gas barrier paper sheet or paper container, which is used as the paper-based packaging material for food products, drugs, electronic and electric parts and various types of industrial products.

[0002]

[Conventional Technology] In many cases, the packaging material for food products, drugs, electronic and electric parts and various types of industrial products must have the gas barrier function (oxygen resistance and water vapor permeation resistance). Conventionally, to provide the gas barrier function to the material, in the case of the oxygen barrier function, a saponified ethylene-vinylacetate copolymer (EVOH), or the like, is added and, in the case of the oxygen or water vapor barrier function, polychloride vinylidene (PVDC) is coated on a resin film or aluminum is vapor deposited as the dry process. However, in the case of PVDC, hazardous substances are likely to generate upon incineration and aluminum is incombustible, does not have transparency and is hard to separate upon recycling. On the other hand, a film, wherein an inorganic oxide such as silicon, aluminum, magnesium and zinc is deposited to solve these problems, is used in various types of packaging materials since it is excellent in the oxygen and water vapor barrier function,

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transparency and incombustible. Furthermore, an inorganic oxide-deposited film made from a biodegradable resin substrate is proposed and appears promising as the packaging material with a low environmental burden since it is biodegradable and compostable after its disposal.

[0003] In the meantime, the increase in environmental protection awareness of recent years spreads to a transition from the petroleum-based material, which is the underground resource, to the natural resource-based material, which has low environmental burden. Among natural resources, paper made from plant fibers as the raw material can be naturally regenerated, is recyclable and compostable, has low heat of combustion upon garbage incineration and is biodegradable. Therefore, there is an increasing demand for the paper container instead of the synthetic resin-based container.

[0004] As a result, many proposals have been made on the composite material, which are made from a paper substrate and a biodegradable film. As for the gas barrier function, there is a proposal on the material wherein a biodegradable resin is preliminarily laminated on a paper substrate and then an inorganic oxide is vapor deposited.

/2

[0005] When a biodegradable resin is laminated on a paper substrate, it is possible to use methods such as lamination of

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paper with a biodegradable resin film, melt extrusion coating of a biodegradable plastic on paper, or the like. However, in the case of paper lamination or melt extrusion coating, the adhesive agent or anchor agent is not biodegradable and, as the drug, which is called filler and preliminarily put on paper to fill the voids on the paper surface or make the surface flat and smooth, a synthetic polymer-based petroleum drug is used. In addition, the above described lamination method cannot be used in the three-dimensional surface of the substrate such as a molded pulp container. To solve this problem, the applicant of the present invention proposed a molded pulp container with a good gas barrier property, wherein a biodegradable resin is added to the filler and said filler is formed by dipping coating or spray coating.

[0006]

[Problem to Be Solved by the Invention] The present invention attempts to provide an environmentally-friendly paper sheet or paper container having excellent biodegradability, recyclability, resource saving property, safety, and good gas barrier property without using a petroleum-based solvent.

[0007]

[Means to Solve the Problem] To achieve the above described objective, the invention, according to Claim 1, is a paper sheet, characterized in that at least one side of its paper substrate

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is coated or impregnated with a biodegradable resin to form a biodegradable resin layer.

[0008] The invention, according to Claim 2, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of polyester-based biodegradable resins such as a polyoxycarboxylic acid group, a polylactic acid group, a polylactone group, a fatty acid polyester group, a fatty acid-aromatic polyester copolymer group, a polyesteramide copolymer group, a polyesterurethane copolymer group, a polyesterurea copolymer group, a polyhydroxyalkanoate copolymer group, a polyestercarbonate copolymer group and a polyesterether copolymer group and a derivative thereof, or said polyester-based biodegradable resin with a cross-linking agent.

[0009] The invention, according to Claim 3, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of natural polysaccharides such as cellulose, starch, dextran, pullulan, nigeran, curdlan, gellan gum, xanthan gum, carrageenan, guar gum, tamarind gum, gum arabic, agar, levan, alginic acid, alginate, chitin, chitosan, heparin, locust bean gum, mannan, glucan, galactan, araban, xylan, pectin, glycogen and hyaluronic acid and a metal salt thereof and a derivative thereof.

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[0010] The invention, according to Claim 4, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of plant resins such as rosin, copal, dammar, elemi, ester gum, lignin, lacquer, tannin and gluten and a derivative thereof or one or a plurality of animal resins such as shellac, gelatin, casein, collagen and animal glue and a derivative thereof.

[0011] The invention, according to Claim 5, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from one or a plurality of polyamino acids such as a polyglutamic acid group, a polylisine group and a polyaspartic acid group and a derivative thereof.

[0012] The invention, according to Claim 6, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from polyalcohol and a derivative thereof.

[0013] The invention, according to Claim 7, is the paper sheet as set forth in Claim 1, characterized in that said biodegradable resin is made from a mixture of two or more types of the biodegradable resins as set forth in one of Claims 2 to 6 or said biodegradable resins with a layered silicate compound.

[0014] The invention, according to Claim 8, is the paper sheet as set forth in one of Claims 1 to 7, characterized in that the paper substrate is coated or impregnated with an aqueous

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solution or aqueous dispersion of said biodegradable resin to form a biodegradable resin layer.

[0015] The invention, according to Claim 9, is a paper container, characterized in that the paper sheet as set forth in Claim 1 is molded to form a container.

[0016] The invention, according to Claim 10, is a paper sheet or paper container, characterized in that an inorganic oxide thin film is formed on said biodegradable resin layer of the paper sheet or paper container as set forth in Claim 1 or 9.

[0017] The invention, according to Claim 11, is the paper sheet or paper container as set forth in Claim 10, characterized in that said inorganic oxide thin film is a vapor deposited thin film such as chemical vapor deposition (CVD) and plasma CVD.

[0018] The invention, according to Claim 12, is the paper sheet or paper container as set forth in Claim 10 or 11, characterized in that said biodegradable resin is heat treated and then an inorganic oxide thin film is formed on said resin layer.

[0019] The invention, according to Claim 13, is the paper sheet or paper container as set forth in one of Claims 1 to 12, characterized in that at least one side of said paper substrate is coated with inorganic pigment.

[0020] The invention, according to Claim 14, is the paper sheet as set forth in one of Claims 1 to 13, characterized in that said paper substrate or paper sheet is calendered.

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[0021]

[Preferred Embodiment of the Invention] The preferred embodiment of the present invention will be described below in detail. The paper material used in the present invention is paper, which can be reclaimed with alkaline, and made from one type or a mixture of two or more types of commonly-available pulp materials such as wood.

/3

More practically, examples of the pulp material include bleached or unbleached softwood or hardwood sulfite pulp, kraft pulp, groundwood pulp, explosion pulp, thermomechanical pulp (TMP) and chemical thermomechanical pulp (CTMP). The pulp material of the present invention is not limited to a specific one. Due to the development of the waste paper recycling technology and increased tendency to recycle waste paper of recent years, waste paper recycled pulp such as deinked pulp (DIP) may be used depending on the case. If necessary, non-wood fibers such as hemp, cotton (linter), straw, bamboo, kenaf, bagasse, cladophorales, espalto, camellia, oriental paper bush, diplomorpha sikokiana and ramie may be added. The non-wood fibers include recycled cellulose such as rayon, tencel and polynosic fibers. In addition, microbiological cellulose, valonia cellulose, sea squirt cellulose, or the like, may be used. Furthermore, a sizing agent, a dry paper strength-

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reinforcing agent, a wet paper strength-reinforcing agent, dye and pigment, a filler, a fixing agent, or the like, may be added accordingly.

[0022] As the biodegradable resin of the present invention, it is possible to use a polyoxycarboxylic acid group such as a polyglycolide group and a polylactic acid group. Especially, any polylactic acid group may be used as long as it is made from a lactic acid group via direct ring-opening polymerization or ring-opening polymerization of the dimer (lactide) at an appropriate ratio of the D-lactic acids to the L-lactic acids. As the polylactone group, it is possible to use one type of lactone such as ε-caprolactone, β-propiolactone, γ-butylolactone and δ-valerolactone or a mixture of two or more types thereof. As the fatty acid polyester group, it is possible to use polybutylenesuccinate, a polybutylenesuccinateadipate copolymer or a polyethylenesuccinate copolymer. As the fatty acid-aromatic polyester group, it is possible to use a copolymer of polybutyleneadipate with terephthalic acid or isophthalic acid. As the polyhydroxyalkanoate group, it is possible to use polyhydroxybutylate or a polyhydroxybutylatevalerate copolymer and examples of the polyhydroxyalkanoate also include a biological product. As the polyesteramide group, it is possible to use a copolymer of ε-caprolactone with ε-caprolactam or a copolymer of various types of fatty acid polyester groups with

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hexamethylenediamine. As the polyesterurethane group, it is possible to use the one wherein said fatty acid polyester groups are copolymerized or cross-linked with bifunctional or trifunctional isocyanate groups. As the polyestercarbonate copolymer, it is possible to use the one, which is obtained by copolymerizing said fatty acid polyester groups with diphenylcarbonate and has carbonate bonds. In addition, one type or a mixture of two or more types of the above described polyester groups may be used. As the cross-linking agent, any polyfunctional reagent may be used as long as it can be reacted without departing from the scope of the present invention. Examples of the cross-linking agent include a polyol group such as glycerol, sorbitol, trimethylolpropane and pentaerythritol, a multivalent carboxylic acid group such as citric acid and the above described multifunctional isocyanate group.

[0023] In addition, as the biodegradable resin of the present invention, it is possible to use cellulose. Examples of the cellulose include various type of microfibrillar cellulose and micropulverized cellulose. As the cellulose derivative, it is possible to use hydroxymethylethyl cellulose, carboxymethyl cellulose, methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, hydroxyethylpropyl cellulose, dialdehyde cellulose or diesterified cellulose. Examples of starch and a derivative thereof include amylopectin, amylose, sea-gel, carboxymethylated

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starch, epichlorohydrin starch, allyl starch, acetylated starch, various types of hydroxyalkylated starch, various types of cationized starch, various types of anionized starch, long-chain alkylesterified starch, dextrin, phosphate starch and dialdehyde starch. In addition, it is possible to use natural saccharides as set forth in the Claim and a metal salt thereof and a derivative thereof. One type or a mixture of two or more types of said natural saccharides may be used in a manner similar to the above.

[0024] Furthermore, as the biodegradable resin of the present invention, it is possible to use a rosin derivative. Examples of the rosin derivative include maleic rosin, fumaric rosin, rosin-modified glycerinester, rosin-modified pentaerythritolester, half-ester of rosin, hydrogenated rosin ester, rosinethoxylate and rosin-modified metal salt. In addition, one type or a mixture of two or more types of the plant resins or animal resins as set forth in the Claim and a derivative thereof may be used.

[0025] Moreover, the polyamino acid group such as a polyglutamic acid group, a polylisine group and a polyaspartic acid group may be a natural product or a synthetic product.

[0026] A mixture of two or more types of said biodegradable resins may be used. Examples of the mixed type of biodegradable

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resin include a mixture of chitosan/cellulose/starch and a mixture of starch/fatty acid polyester.

[0027] If at least one or a plurality of said biodegradable resins are in the form of aqueous solution, aqueous emulsion or aqueous dispersion, it is possible to produce a non-petroleum solvent, which is more environmentally friendly. Naturally, said biodegradable resins may be dissolved with a petroleum-based solvent. However, except a polylactone group and a polylactic acid group, the polyester-based biodegradable resin can only be dissolved with a halocarbon group such as highly toxic chloroform. Therefore, it is preferable to use the form of aqueous emulsion or aqueous dispersion. In addition, if the biodegradable resin is made from a water-soluble material such as methyl cellulose, carboxymethyl cellulose, starch, casein, animal glue and polyvinyl alcohol, it can be coated or impregnated in a paper substrate. If not, the biodegradable resin may be mechanically pulverized by a dry or wet method such as a pulverizer, a ball mill, and a roll mill, thereby obtaining the aqueous dispersion.

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Alternately, it may be turned into the aqueous emulsion by using an emulsifying agent or a surfactant. In addition, the biodegradable resin may be emulsion polymerized to form the latex or microencapsulated to form the aqueous emulsion.

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[0028] Furthermore, said biodegradable resins or a solution thereof may be coated or partially impregnated on a paper substrate in the form of, preferably, an aqueous solution, or an aqueous emulsion or an aqueous dispersion by the coating or impregnation method such as air-knife coating, bar coating, roll coating, gravure coating, cast coating, blade coating, gate roll coating, kiss roll coating, dipping and spray coating. If the size press impregnation method is used, it is possible to impregnate the material into the inside of the paper substrate. Since the biodegradable resin is coated or impregnated by the above described method and then thermally pressurized by a hot plate, the voids on the surface of the paper substrate are filled and the biodegradable resin is plasticized, thereby obtaining a uniform film with high surface smoothness. The coating amount is preferably 5 to 30 g/m^2. If the coating amount is less than 5 g/m^2, it is difficult to obtain a uniform film and pin holes are likely to generate. If the coating amount is more than 30 g/m^2, the physical properties are saturated and, in extreme cases, cracks (cohesive failure) are generated. When the material is impregnated by size press, the impregnating amount is increased as the basis weight of paper is increased to that extent. As a result, the void filling effect is improved and the gas barrier property is improved even if an inorganic oxide thin film is placed. The basis weight of paper is not limited to a

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specific one. Since it is possible to use paper with a basis weight of 30 to 400 g/m^2 up to thick paper with a basis weight of 600 g/m^2, the impregnating amount is preferably 5 to 60 g/m^2. If the impregnating amount is less than or more than this range, the same phenomenon as above may occur, which is not desirable.

[0029] According to the present invention, by adding a layered silicate compound to the biodegradable resin, a non-aqueous solution thereof, an aqueous solution thereof, an aqueous emulsion thereof or an aqueous dispersion thereof, said layered silicate compound is orientated in a flat plate-like manner on the paper substrate after coating or impregnation, thereby improving the surface smoothness and air permeation resistance. As the layered silicate compound, it is possible to use kaolin, a mica group, a brittle mica group, pyrophyllite, talc, smectite, vermiculite, chlorite, septet-chlorite, serpentine, stilpnomelane or montmorillonite in the plate-like form or thin piece-like form. Said layered silicate compound has a particle diameter of preferably several ten to several hundred μm, which can be oriented on the paper substrate.

[0030] In addition, inorganic pigment may be preliminarily coated on one side or both sides of the paper substrate. Said inorganic pigment is a filler such as clay, kaolin, calcium carbonate, titanium dioxide and talc (talc). It is preferable to use clay, which is inexpensive and has good physical properties.

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Furthermore, said inorganic pigment may be added to the inside of the paper substrate during the paper-making process. However, since the strength of paper is decreased, it is preferable to coat the inorganic pigment on the surface of the paper substrate and form a dense coating layer.

[0031] As the substrate to add the barrier property, it is convenient to use paper with excellent smoothness, which is obtained by calendering the above described paper coated with inorganic pigment (filler), e.g., clay-coated paper with good surface smoothness. In addition, a biodegradable resin is coated or impregnated on the clay-coated surface of said paper as a filler layer and pressurized and heated by a heat plate to improve the filling effect, thereby providing an excellent barrier property. In addition, a filler paper sheet wherein various types of biodegradable resins is coated or impregnated may be processed by a super calendar.

[0032] The inorganic oxide thin film of the present invention is formed with the purpose of improving the gas barrier property of the substrate and is made from a vapor deposited film of an inorganic metal compound including a monomer such as oxide or nitride of aluminum, silicon, zinc or magnesium or a mixture thereof. Among them, the silicon oxide and aluminum oxide are inexpensive and have a good barrier property. As the vapor deposition method, it is possible to use the PVD (physical vapor

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deposition method) such as the vacuum deposition method, sputtering method and ion plating method or the plasma activation CVD (chemical vapor deposition) method. Among them, the CVD method is economically preferable and unlikely to generate heat during the process and, further, can be used in a three-dimensional object such as a container.

[0033] The film thickness of the inorganic oxide layer is 50 to 3,000 Á, or preferably, 100 to 2,000 Á. When the film thickness falls in this range, it is advantageous from the standpoint of transparency and barrier property. If the film thickness is less than 50 Á, it is not possible to form a uniform thin film. If the film thickness is more than 3,000 Á, the physical properties are saturated and, further, cracks are likely to generate, thereby decreasing the gas barrier property.

[0034] The paper sheet, which is the substrate of the gas barrier paper sheet of the present invention, can be manufactured by the conventional paper manufacturing process including the paper making process, sheet making process, pressing process, heating and drying process. In addition, the paper container, which is made from the substrate of the gas barrier paper container of the present invention, can be manufactured by the conventional method. For example, the substrate is punched through by a plunger type can making machine and four corners of the sheet are attached, thereby

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assembling and molding the container. In addition, it is possible to use the press type molding method wherein the substrate is extrusion molded by thermal pressure by using a specialized tray molding machine or the vacuum molding method. Alternately, it is possible to use the wet type or dry type pulp molding method. In this way, it is possible to manufacture the paper container without using the after process. Furthermore, the gas barrier paper sheet of the present invention may be assembled and molded in the above described manner to obtain the gas barrier paper container of the present invention.

[0035]

[Working Example] This section will describe the working examples of the biodegradable filler paper sheet or paper container of the present invention. However, the present invention is not limited to them.

[0036] The pulp slurry used in the working examples below was manufactured by the method below.

(Manufacturing Method of the Pulp Slurry) The raw material for the pulp slurry was manufactured as follows: the raw material for the softwood kraft pulp (NBKP) was disintegrated in accordance with JIS-P8209 “Method for Formulating the Hand-made Paper for the Pulp Test” and, by using the Canadian standard freeness test method, which is based on JIS-P8121 “Method for Testing the Freeness of Pulp”, the material with the freeness of

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300 mlCSF (beating degree) was made by a beater, thereby obtaining the pulp slurry with a solid concentration of 1.0%.

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[0037] (Working Example 1) The pulp slurry was absorbed by a commercially-available large-size vacuum and paper with a basis weight of about 250 g/m^2 was made by a standard square-type hand-made paper making machine. The resultant paper was dehydrated by a dehydration press (3.43×10^5 Pa) for 3 minutes and heat dried by a yankee drier (surface temperature: about 120°C), thereby forming thick paper. The thick paper was coated with a dioxane solution with 10 wt. % of commercially-available solid type polycaprolactone (made by Union Carbide Co., Ltd., TONE P-767) once by using a wire bar #30. The resultant paper was dried for 2 minutes in an oven at 100°C, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 7 g/m^2.

[0038] (Working Example 2) The clay-coated layer of commercially-available coated board paper (made by Oji Paper Co., Ltd., UF Coat) with the basis weight of 250 g/m^2 was coated with commercially-available polycaprolactone (made by Union Carbide Co., Ltd., TONE P-767) in a manner similar to Working Example 1, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 7 g/m^2.

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[0039] (Working Example 3) The thick paper obtained in a manner similar to Working Example 1 was coated with a dioxane solution with 10 wt. % of commercially-available solid type polylactic acid (made by Shimadzu Co., Ltd., LACTY) once by using a wire bar #30. The resultant paper was dried for 2 minutes in an oven at 100°C, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 7 g/m^2.

[0040] (Working Example 4) The pulp slurry was absorbed by a commercially-available large-size vacuum and paper with a basis weight of about 250 g/m^2 was made by a standard square-type hand-made paper making machine. The resultant paper was directly placed on wet paper and sprayed/impregnated with a dioxane solution with 10 wt. % of commercially-available solid type polylactic acid (made by Shimadzu Co., Ltd., LACTY). The resultant paper was once again filtered and thermally pressurized (surface temperature: about 120°C, about 4×10^5 Pa) for 2 minutes, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 20 g/m^2.

[0041] (Working Example 5) A commercially-available aqueous dispersion of esterified starch (made by Miyoshi Oil Co., Ltd., LANDY 200S) was diluted with water to have the solid portion of 10 wt. %. Then, the wet paper obtained in a manner similar to

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Working Example 4 was sprayed/impregnated with said aqueous dispersion. The extra moisture was once again absorbed and filtered and the paper was thermally pressurized (surface temperature: about 120°C, about 4 × 10^5 Pa) for 2 minutes, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 20 g/m^2.

[0042] (Working Example 6) The pulp slurry was diluted to have the solid portion of 0.4 wt. %. 4 L of the resultant pulp slurry was absorbed and dehydrated on a female paper mold, thereby obtaining the intermediate body. Said intermediate body was placed in a press mold wherein each of the wire clothes was engaged, thereby obtaining a molded pulp container. An aqueous dispersion of esterified starch (made by Miyoshi Oil Co., Ltd., LANDY 200S) was diluted with water to have the solid portion of 10 wt. %. Then, the inner surface of the container was sprayed/impregnated with said aqueous dispersion. The extra moisture was once again absorbed and filtered and the paper was placed in a female metal mold and thermally pressurized (surface temperature: about 120°C, about 4 × 10^5 Pa) for 1 minute, thereby making the biodegradable filler paper sheet of the present invention. The coating amount of the sheet was about 17 g/m^2.

[0043] (Comparative Example 1) NBKP aqueous dispersed slurry with a freeness of 300 CSF was absorbed by a commercially-

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available large-size vacuum and paper with a basis weight of about 250 g/m^2 was made by a standard square-type hand-made paper making machine. The resultant paper was dehydrated by a dehydration press (3.43 × 10^5 Pa) for 3 minutes and heat dried by a yankee drier (surface temperature: about 120°C), thereby forming NBKP base paper.

[0044] (Comparative Example 2) The clay-coated layer of commercially-available coated board paper (made by Oji Paper Co., Ltd., UF Coat) with the basis weight of 250 g/m^2 was coated with commercially-available styrene-butadiene copolymer latex (solid portion: 50 wt. %) once by using a wire bar #30. The resultant paper was dried for 2 minutes in an oven at 100°C, thereby making a filler paper sheet. The coating amount of the sheet was about 8 g/m^2.

[0045] Each of the biodegradable filler paper sheets obtained in Working Examples 1 to 6 or their paper containers and the samples obtained in Comparative Examples 1 to 2 was cut into a paper piece with a size of 1 cm x 4 cm. The center line average surface roughness (Ra) of the filler layer was measured by using a surface roughness measurement instrument, SURFCOM (made by Tokyo Seimitsu Co., Ltd.). The measurement conditions were: traverse length: 4 mm; cutoff: 0.88 mm; V-mag: x 2K; and speed: 0.3 mm/s. Table 1 shows the results.

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[Table 1]

Working Example	Center Line Average Surface Roughness (Ra) (μm)
Working Example 1	0.65
Working Example 2	0.49
Working Example 3	0.53
Working Example 4	0.48
Working Example 5	0.43
Working Example 6	0.45
Comparative Example 1	1.15
Comparative Example 2	0.62

[0047] Based on the results of Table 1, it was found that each of the biodegradable filler paper sheets and paper containers of the present invention (Working Examples 1 to 6) had extremely small surface roughness and good surface smoothness. In addition, it was found that, by thermally pressurizing and pressing the sheet by a hot plate, the surface smoothness was further improved. Furthermore, the sheet coated with the commercially-available styrene-butadiene copolymer latex had good surface smoothness.

[0048] This section will describe the working examples of the gas barrier paper sheet and paper container of the present invention. However, the present invention is not limited to them.

[0049] (Working Example 7) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Á on the filler layer of the biodegradable filler paper sheet of Working Example

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1, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0050] (Working Example 8) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic /6 oxide thin film with a film thickness of 400 Á on the filler layer of the biodegradable filler paper sheet of Working Example 2, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0051] (Working Example 9) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Á on the filler layer of the biodegradable filler paper sheet of Working Example 3, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0052] (Working Example 10) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Á on the filler layer of the biodegradable filler paper sheet of Working Example 4, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0053] (Working Example 11) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Á on the filler

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layer of the biodegradable filler paper sheet of Working Example 5, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0054] (Working Example 12) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Å on the filler layer of the biodegradable filler paper sheet of Working Example 6, thereby obtaining the biodegradable gas barrier paper sheet of the present invention.

[0055] (Comparative Example 3) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Å on the NBKP base paper of Comparative Example 1.

[0056] (Comparative Example 4) Hexamethyldisiloxane was used as monomer gas in the plasma activation CVD to deposit an inorganic oxide thin film with a film thickness of 400 Å on the coated layer of the commercially-available coated board paper of Comparative Example 2, which was coated with commercially-available styrene-butadiene copolymer latex.

[0057] The gas barrier paper sheets or paper containers obtained in Working Examples 7 to 12 were evaluated as follows: in accordance with JIS-Z0208 “Method for Testing the Water Vapor Transmission of the Moisture-proof Packaging Material (cup method)”, the filler layer + the inorganic oxide thin film layer

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of each of the gas barrier paper sheets or paper containers of the present invention were placed in the calcium chloride-filled side and stored under the conditions of 40°C and 90%RH and the water vapor transmission was measured. Here, in the case of the container of Working Example 6, calcium chloride was filled in the container and the opening of the container was sealed with an aluminum foil-contained laminate film and the water vapor transmission was measured. Table 2 shows the results.

[0058]

[Table 2]

Working Example	Water Vapor Transmission ($g/m^2 \cdot 24$ hr)
Working Example 7	1.8
Working Example 8	1.5
Working Example 9	1.7
Working Example 10	1.0
Working Example 11	0.5
Working Example 12	1.2
Comparative Example 1	3,000
Comparative Example 2	2,700
Comparative Example 3	2,500
Comparative Example 4	1.8

[0059] Based on the results of Table 2, it was found that each of the biodegradable gas barrier paper sheets and paper containers of the present invention had excellent water vapor transmission. In addition, those paper sheets and paper containers wherein the commercially-available styrene-butadiene

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copolymer latex was coated as the filler layer had good water vapor transmission.

[0060] Each of the biodegradable gas barrier paper sheets or paper containers of Working Examples 7 to 12 and the samples of Comparative Examples 1 to 4 was cut into a piece with a size of 1 cm × 1 cm. 5 g of each of the pieces was placed in 1.5 L of aqueous solution of 0.5 wt. % caustic soda and disintegrated for about 20 minutes by using a standard disintegrator. As a result, all of the samples of the working examples of the present invention and those of Comparative Examples 1 and 3, which did not have the filler layer of the present invention, were completely disintegrated. On the other hand, the samples of Comparative Examples 2 and 4, wherein the styrene-butadiene copolymer latex was used as the filler agent, contained small solid substances.

[0061] Each of the biodegradable gas barrier paper sheets or paper containers (Working Examples 7 to 12) and the samples of Comparative Examples 1 to 4 was cut into a piece with a size of 10 cm × 10 cm. The resultant pieces were buried in a soil and their biodegradability was evaluated. As a result, 5 months later, all of the samples of the working examples of the present invention and the samples of Comparative Examples 1 and 3, which did not have the filler layer of the present invention, were completely broken and did not retain their original shapes. On

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the other hand, the samples of Comparative Examples 2 and 4, wherein the styrene-butadiene copolymer latex was used as the filler agent, contained film-like thin paper pieces.

[0062] Swine manure and sawdust were mixed to adjust the moisture at about 65% and left for 1 month, thereby obtaining a compost. Then, each of the biodegradable gas barrier paper sheets or paper containers (Working Examples 7 to 12) and the samples of Comparative Examples 1 to 4 was cut into a piece with a size of 10 cm × 10 cm and the resultant pieces were buried in the above described compost and their biodegradability was evaluated. As a result, 4 months later, all of the samples of the working examples of the present invention and the samples of Comparative Examples 1 and 3, which did not have the filler layer of the present invention, were completely broken and did not retain their original shapes. On the other hand, the samples of Comparative Examples 2 and 4, wherein the styrene-butadiene copolymer latex was used as the filler agent, contained film-like thin paper pieces.

[0063]

[Effect of the Invention] According to the present invention, in the paper sheet with a biodegradable resin layer formed by coating or impregnating a biodegradable resin on a paper substrate, the biodegradable resin layer works as the filler.

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Furthermore, voids on the paper are filled by heat treating the layer such as thermally pressurizing and pressing the layer by a hot plate, the biodegradable resin is plasticized, thereby forming a film made from the uniform biodegradable resin layer with excellent surface smoothness. In addition, by forming an inorganic oxide thin film layer on the biodegradable resin layer of the paper sheet or paper container obtained by molding said paper sheet, it is possible to provide the paper sheet or paper container with an excellent gas barrier property.

[0064] The paper sheet or paper container of the present invention is made from the paper substrate with a low environmental burden, a biodegradable resin layer and an inorganic oxide thin film layer, which is formed on said biodegradable resin layer, and has biodegradability and can be degraded with alkali. Therefore, it can be recycled and incinerated and is compostable without problems. In addition, when the biodegradable resin layer is formed by coating or impregnating the resin on the paper substrate, the aqueous solution or aqueous dispersion can be used as the coating or impregnating solution and the solvent, or the like, is not used. Therefore, there are no problems such as evaporation of the solvent during the coating or impregnating process and, thus, the safety of the working environment is considered. In this way, according to the present invention, it is possible to provide an

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environmentally-friendly paper sheet or paper container having excellent biodegradability, recyclability, resource saving property, safety, and good gas barrier property.

[0065] The biodegradable gas barrier paper sheet or paper container of the present invention is favorably used as various types of environmentally-friendly packaging materials for food products, drugs, electronic and electric parts and various types of industrial products, which are increasingly in demand.

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Docket No.: FDS-029388-US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF:

CLEVELAND, et al.	:	GROUP ART UNIT: 1782
SERIAL NO: 11/348,150	:	EXAMINER: PATTERSON, MARC A.
FILED: February 06, 2006	:	CONFIRMATION #: 5681

FOR: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

AMENDMENT AFTER FINAL REJECTION PURSUANT TO 37 CFR § 1.116(b)

United States Patent and Trademark Office
Customer Service Window, Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action (made FINAL) mailed July 15, 2013, the period for response which is currently set to expire October 15, 2013, please amend the above-captioned application as follows, as well as consider the following remarks. Applicants submit there are good and sufficient reasons, in accordance with 37 CFR § 1.116(b), for entering these amendments. In particular, it is believed these amendments will put the above-captioned application in condition for allowance or appeal.

Applicants respectfully request prompt issuance of a Notice of Allowance or an Advisory Action by the Examiner, as the present amendment is being timely filed on or before two months of the mailing date of the Final Office Action (*i.e.*, on or before September 15, 2013). See MPEP § 706.07(f). Applicants' representative, Matthew M Eslami, also respectfully requests a telephone conference in the event the Examiner has any questions, comments or suggestions that would place any pending claim not in allowable form in better condition for allowance. Applicant's representative may be reached directly at 513-248-6193.

The Amendments to/Listing of the Claims begins on page **2** of this amendment.

Remarks/Arguments begin on page **5** of this amendment.

IN THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the above-captioned application:

Listing of Claims:

Claims 1-75. (Canceled).

76. (Currently Amended) A product in the form of a cup comprising a laminate forming moisture barriers, said laminate comprising:

a paperboard substrate having a separate interior product facing surface and a separate exterior surface;

a first moisture protectant layer is coated directly only on said interior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the first moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2; and

a second moisture protectant layer is coated directly only on said exterior surface of said paperboard substrate and comprising at least one biodegradable polyester polymer, wherein the second moisture protectant layer has a coat weight of from 5 to 30 lbs/3000 ft^2 and is separate from the first moisture protectant layer coated ~~disposed~~ on and directly adhered to said interior surface of said substrate.

77. (Previously Presented) The product according to Claim 88, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

78. (Previously Presented) The product according to Claim 77, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

79. (Cancelled).

80. (Previously Presented) The product according to Claim 76, wherein the second moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

81. (Previously Presented) The product according to Claim 87, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler.

82. (Previously Presented) The product according to 81, wherein the first moisture protectant layer comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate, starch, clay kaolin, talc, cellulose fibers, and diatomaceous earth.

83. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer further comprises from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

84. (Previously Presented) The product according to Claim 76, wherein the first moisture protectant layer comprises polylactic acid and from 5 to 20 percent by weight of at least one filler selected from the group consisting of calcium carbonate and starch.

85-86 (Cancelled).

87. (Previously Presented) The product according to claim 76, wherein the first moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

88. (Previously Presented) The product according to claim 76, wherein the second moisture protectant layer comprises at least one biodegradable polyester polymer selected from the group consisting of compostable polylactic acid and a compostable polyhydroxyalkanoate.

89. (Previously Presented) The product according to Claim 83, wherein the first moisture

protectant layer comprises from 5 to 20 percent by weight of calcium carbonate as the filler.

90. (Previously Presented) The product according to Claim 84, wherein the second moisture protectant layer comprises from 5 to 20 percent by weight of calcium carbonate as the filler.

REMARKS/ARGUMENTS

A. Status of Claims

Favorable reconsideration of the above-captioned application, as amended, is respectfully requested. Claims 1-75, 79, and 85-86 have previously been cancelled. Claims 76-78, 80-84, and 87-90 are currently pending.

B. Procedural Matters

Applicants acknowledge the Examiner's statements at page 2 and 4 of the Final Office Action (hereafter referred to as the "Final Action") that the following rejections have been withdrawn in view of Applicants' prior response/amendment of April 23, 2013 (hereafter referred to as "April 23, 2013 Amendment"): (1) Claims 76 and 87-88 under 35 U.S.C. § 102(b) as being anticipated over newly cited U.S. Pat. No. 6,645,584 to Kuusipalo et al. (hereafter referred to as "**Kuusipalo et al.**"); and (2) Claims 77-78 and 80-84 under 35 U.S.C. § 103(a) as being unpatentable over **Kuusipalo et al.**, in view of U.S. Pat. No. 6,183,814 to Nangeroni et al. (hereafter referred to as "**Nangeroni et al.**").

C. Amendments to Claims

Claim 76 has been amended to change "disposed" in the next to last line to "coated" to be consistent with the remaining language in Claim 76.

D. Response to Rejection of Claims 76 and 87-88 under 35 U.S.C. § 103(a) as Being Unpatentable by Kuusipalo et al.

At pages 2-3 of the Final Action, Claims 76 and 87-88 have been rejected under 35 U.S.C. § 103(b) as being unpatentable over newly cited Japanese Pat. No. 2003013391 to Yamawaki et al. (hereafter referred to as "**Yamawaki et al.**"), in view of **Kuusipalo et al**. **This rejection is respectfully traversed with respect to these Claims**, as amended or as currently presented, for at least the following reasons.

In support of the rejection of Claim 76 and 87-88 as being unpatentable over **Yamawaki et al.**, in view of **Kuusipalo et al.**, the Final Action makes the following allegations:

> ***Allegation 1***: [**Yamawaki et al.**] disclose[s] a product in the form of a container (paragraph 0001, English translation) comprising a **paper substrate** having a coating provided either on one side or on both sides (paragraph 0007), the coating comprising a first layer comprising polylactic acid, therefore moisture protectant, and a second layer comprising polylactic acid (paragraph 0022); the layers are therefore disposed, only on the interior surface and exterior surface, with a biodegradable polyester; **each layer weighs from 5 to 30 lbs/3000 ft^2** (paragraph 0028). **[Yamawaki et al.] fail[s] to disclose a cup-shaped container and paperboard**.[1]
>
> ***Allegation 2***: [**Kuusipalo et al.**] **teaches the interchangeability of paper and paperboard in the making of a container** (column 1, lines 6-8) and a container that is cup-shaped (Figure 4) for the purpose of obtaining a drinking cup (column 5, lines 60-63).[2]
>
> ***Allegation 3***: **It therefore would have been obvious** for one of ordinary skill in the art **to provide for a cup-shaped container and paperboard in order to obtain a drinking cup as taught by** [**Kuusipalo et al.**].[3]

What Allegations 1-3 assert do not support rejecting Claim 76, as amended, as being unpatentable over **Yamawaki et al.**, even in view of **Kuusipalo et al**. First, as admitted by Allegation 1, **Yamawaki et al.** does not teach a cup-shaped product or the use of a paperboard substrate according amended Claim 76.

Second, Allegation 1 **mischaracterizes** what **Yamawaki et al.** fairly teaches in paragraph 0022 regarding the coating amount of its biodegradable resin. What **Yamawaki et al.** teaches in paragraph 0022 is that coating amount is "preferably 5 to 30 **g/m^2**."[4] By contrast, amended Claim 76 recites that the coat weight for each of the first and second moisture protectant layers is from 5 to 30 **lbs/3000 ft^2**. Nowhere does Allegation 1 show how the coating amount disclosed in paragraph 0022 of **Yamawaki et al.** is equivalent to or even comparable to the coating weight recited for each of the first and second moisture protectant layers of amended Claim 76.

Third, the reliance by Allegation 2 upon column 1, lines 6-8, of **Kuusipalo et al.** to allegedly teach "the interchangeability of paper and paperboard in the making of a container" **is completely misplaced**. The description (see column 5, lines 60-65) in conjunction with

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[1] See pages 2-3 of the Final Action (emphasis added). As acknowledged by the Final Action, all references to the disclosure in **Yamawaki et al.** are based on the English translation as kindly provided with the Final Action.
[2] See page 3 of the Final Action (emphasis added).
[3] See page 3 of the Final Action (emphasis added).
[4] Emphasis added.

drinking cup **10** shown FIG. 4 of **Kuusipalo et al.** says that cup 10 is "made of the **paperboard 1** according to FIG. 1."[5] Therefore, even **Kuusipalo et al.** recognizes that paperboard used as the substrate for the cup of amended Claim 76 **is not equivalent to** the "paper sheet" taught by **Yamawaki et al.**

Fourth, amended Claim 76 recites that the laminate forming the cup comprises: (1) a first moisture protectant layer **coated directly** only on said interior surface of said paperboard substrate; and (2) a second moisture protectant layer **coated directly** only on said exterior surface of said paperboard substrate. In other words, as now recited in amended Claim 76, the first moisture protectant layer, as well as the second moisture protectant layer, are both coated **directly** onto the respective interior and exterior surface of the paperboard substrate comprising the laminate **without an additional adhesive**. By contrast, and as acknowledged in the prior December 27, 2012 Office Action (hereafter referred to as the "December 27, 2012 Office Action"),[6] **Kuusipalo et al.** teaches co-extruding the polylactic acid **with an additional polyester adhesive** onto the surfaces of its coated paperboard. Accordingly, the laminate of the cup of amended Claim 76 **is patentably distinct** from the coated paperboard of **Kuusipalo et al**, including that used with the drinking cup **10** shown in FIG. 4 of this reference.

Fifth, the assertion by Allegation 3 that it "would have been obvious" to "provide for a cup-shaped container and paperboard in order to obtain a drinking cup as taught by [**Kuusipalo et al.**]" is merely a "conclusory statement" which has **no factually supported** "rational underpinning" in the references relied upon. "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion of obviousness."[7] As pointed out above in response to Allegation 2, the alleged

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[5] Emphasis added.
[6] See pages 2-3 of the December 27, 2012 Office Action, citing column 5, lines 30-59 of **Kuusipalo et al**.
[7] *In re Kahn,* 441 F.2d 977, 988 (Fed. Cir. 2006) (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* See also *In re Vaidyanathan*, 96 U.S.P.Q.2d 1507, 1514 (Fed. Cir. 2010) (non-precedential): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have**

"interchangeability" of the paperboard taught by **Kuusipalo et al.** for the "paper sheet" taught by **Yamawaki et al.** is nonexistent. Instead, **the complete failure of these assertions** by Allegation 2 **to provide any rational and factually supported basis** for combining **Kuusipalo et al.** with **Yamawaki et al.** is **clear evidence** that Applicants' application disclosure is being used **impermissibly** as the "road map to find its prior art components."[8]

Claims 87 and 88, as currently presented, each depend directly from amended Claim 76. Accordingly, Claims 87 and 88 are patentable over **Yamawaki et al.**, even in view of **Kuusipalo et al.**, for at least the same reasons presented in response to Allegations 1-3 for why amended Claim 76 is patentable over this combination of references.

For at least the foregoing reasons, Claims 76 and 87-88, as amended or as currently presented, are patentable over **Yamawaki et al.**, even in view of **Kuusipalo et al**. Accordingly, the rejection of these Claims under 35 U.S.C. § 103(a) based on this combination of references should therefore be withdrawn.

E. Response to Rejection of Claims 77-78, 80-84, and 89-90 under 35 U.S.C. § 103(a) as Being Unpatentable over Yamawaki et al., in view of Kuusipalo et al., and further in view of Nangeroni et al.

At pages 3-4 of the present Office Action, Claims 77-78, 80-84, and 89-90 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over **Yamawaki et al.**, in view of **Kuusipalo et al.**, and further in view of **Nangeroni et al**. **This rejection is respectfully traversed with respect to these Claims**, as currently presented, for at least the following reasons.

In support of the rejection of Claims 77-78, 80-84, and 89-90 as being unpatentable over **Yamawaki et al.**, in view of **Kuusipalo et al.**, and further in view of **Nangeroni et al**, the Final Action makes the following allegations:

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been obvious or was well known. Instead, **the examiner should** elaborate, **discuss**ing **the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added)."

8 In determining obviousness under 35 U.S.C. § 103, the Federal Circuit has held that it is **improper hindsight reasoning** to use an **Applicant's own invention** as a "**roadmap to find its prior art components**." *Princeton Biochemicals Inc. v. Beckman Coulter Inc.*, 411 F.3d 1332, ___, 75 USPQ2d 1051, 1054 (Fed. Cir. 2005) (emphasis added).

> ***Allegation 4***: [**Yamawaki et al.**] and [**Kuusipalo et al.**] disclose a cup having an interior and exterior coating as discussed above for [C]laims 76 and 88. With regard to Claims 77-78, 80-84 and 89-90, [**Yamawaki et al.**] and [**Kuusipalo et al.**] **fail to disclose a coating 5 to 20 percent by weight of a filler such as calcium carbonate**.[9]
>
> ***Allegation 5***: [**Nangeroni et al.**] teach[es] a cup (column 18, line 10) having a paper substrate (column 4, lines 48-65) and interior and exterior coatings of polylactic acid (column 4, lines 48-65) having a filler. The filler can be present in an amount of less than 10 wt% (column 27, lines 26-30). Calcium carbonate could also be present as a pigment, which could also be considered a filler.[10]
>
> ***Allegation 5***: **It therefore would have been obvious** for one of ordinary skill in the art **to provide for a filler with the presently claimed range in the coating of [Yamawaki et al.] and [Kuusipalo et al.] to prevent blocking or sticking of the coated paper during storage and transport** ([**Nangeroni et al.**], column 27, lines 13-15).[11]

What Allegations 4-6 assert do not support rejecting Claims 77-78, 80-84, and 89-90 as being unpatentable over **Yamawaki et al.**, even in view of **Kuusipalo et al.**, and even further in view of **Nangeroni et al.**, for at least the following reasons. First, for at least the same reasons presented in Section D above in response to Allegations 1-3, amended Claim 76 is patentable over **Yamawaki et al.**, even in view of **Kuusipalo et al**. Accordingly, Claims 77-78, 80-84, and 89-90 are patentable over this combination of references for at least the same reasons presented in Section D above in response to Allegations 1-3 for why amended Claim 76 is patentable over this combination of references.

Second, Allegations 4-6 do not assert that those features recited in amended Claim 76 (i.e., the first moisture protectant layer, as well as the second moisture protectant layer, are coated **directly** onto the respective interior and exterior surface of the **paperboard** substrate **without an additional adhesive**) which were asserted **to be missing from the teachings** of **Yamawaki et al.**, as well as **Kuusipalo et al**, are now taught by **Nangeroni et al**.

Third, as admitted by Allegation 4, **Yamawaki et al.**, as well as **Kuusipalo et al**, do not teach including 5 to 20% by weight of at least one filler (such as calcium carbonate) in the first or second moisture protectant layers recited in Claims 77-78, 80-84, and 89-90.

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[9] See pages 3-4 of the present Office Action (emphasis added).
[10] See pages 3-4 of the Final Action (emphasis added).
[11] See page 4 of the Final Action (emphasis added).

Instead, Allegation 5 relies upon **Nangeroni et al.** to allegedly teach "the filler can be present in an amount of less than 10 wt%" and that "[c]alcium carbonate could also be present as a pigment, which could also be considered a filler."

Fourth, in further in response to what Allegation 5 asserts, Claim 89 (which depends directly from Claim 83) and Claim 90 (which depends directly from Claim 84) recite, respectively, that first and second moisture protectant layer comprises from 5 to 20 percent by weight of **calcium carbonate as the filler**. Contrary to what Allegation 5 asserts, **Nangeroni et al.**, in listing several inorganic fillers, does not teach calcium carbonate can be one of those inorganic fillers. In addition, while column 28, lines 40-43, of **Nangeroni et al.** teaches that calcium carbonate may be a pigment, **nowhere does this reference teach that the pigment, be it calcium carbonate or otherwise, may be present in the coating in an amount from 5 to 20 percent by weight** according to Claims 89 and 90.

Fifth, the "motivation" asserted by Allegation 6 for combining **Nangeroni et al.** with **Yamawaki et al.** and **Kuusipalo et al.** (i.e., "to prevent blocking or sticking of the coated paper during storage and transport") based upon column 27, lines 13-15 of **Nangeroni et al.** is **simply made-up** and **provides no legally appropriate "rational basis" for combining these references with respect to Claims 77-78, 80-84, and 89-90**.[12] Instead, **the complete failure of these assertions** by Allegation 6 **to provide any rational and factually supported basis** for combining **Nangeroni et al.** with **Yamawaki et al.** and **Kuusipalo et al.** with respect to Claims 77-78, 80-84, and 89-90 is, again, **clear evidence** that Applicants' application disclosure is being used **impermissibly** as the "road map" [13] for this rejection.

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[12] "Rejections on obviousness grounds cannot be sustained by mere **conclusory statements**; instead there must be some **articulated reasoning** with some **rational underpinning** to support the legal conclusion of obviousness." *In re Kahn,* 441 F.2d 977, 988 (Fed. Cir. 2006) (emphasis added), cited with approval in the Supreme Court's decision in *KSR International Co. v. Teleflex, Inc.*, 550 U.S. 398, 418 (2007). In *KSR International*, the Supreme Court also observed "in formulating a rejection under 35 U.S.C. § 103(a) based upon a combination of prior art elements, it remains necessary to identify the reason why a person of ordinary skill in the art would have combined the prior art elements in the manner claimed." *Id.* See also *In re Vaidyanathan*, 96 U.S.P.Q.2d 1507, 1514 (Fed. Cir. 2010) (non-precedential): "Obviousness is determined as a matter of foresight, not hindsight. [Citations to *KSR International* and *Graham v. John Deere Co.* omitted]. *KSR* [*International*] did not free the PTO's examination process from explaining its reasoning. In making an obviousness rejection, **the examiner should not rely on conclusory statements that a particular feature of the invention would have been obvious or was well known**. Instead, **the examiner should** elaborate, **discuss**ing **the evidence or reasoning that leads the examiner to such a conclusion** (emphasis added)."

13 In determining obviousness under 35 U.S.C. § 103, the Federal Circuit has held that it is **improper hindsight reasoning** to use an **Applicant's own invention** as a "**roadmap to find its prior art components**." *Princeton Biochemicals Inc. v. Beckman Coulter Inc.*, 411 F.3d 1332, ___, 75 USPQ2d 1051, 1054 (Fed. Cir. 2005) (emphasis added).

For at least the foregoing reasons, Claims 77-78, 80-84, and 89-90, as currently presented, are patentable over **Yamawaki et al.**, even in view of **Kuusipalo et al.**, and even further in view of **Nangeroni et al**. Accordingly, the rejection of Claims 77-78, 80-84, and 89-90 under 35 U.S.C. § 103(a) over this combination of references should therefore be withdrawn.

F. Conclusion

Claims 76-78, 80-84, and 87-90, as amended or as currently presented, are patentable over the art relied upon in the Final Action. Accordingly, Claims 76-78, 80-84, and 87-90 are in condition for allowance, and favorable action is earnestly solicited thereon.

Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Mr. Matthew M. Eslami at 513-248-6193 to expedite prosecution of the above application.

No extension of time is believed to be required. However, the Commissioner is hereby authorized by this paper to charge any fees due under 37 C.F.R. §§ 1.16 and 1.17 which may be required, including any required extension of time fees, or credit any overpayment, to Deposit Account No. 09-0525. **This paragraph is intended to be a CONSTRUCTIVE PETITION FOR EXTENSION OF TIME in accordance with 37 C.F.R. § 1.136(a)(3) if needed.**

Respectfully Submitted,

Date: September 13, 2013

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Electronic Acknowledgement Receipt	
EFS ID:	16851765
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Michele McRoy
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	13-SEP-2013
Filing Date:	06-FEB-2006
Time Stamp:	16:25:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	130913_fnloa_fds029388us.pdf	231781 ae7866e3194bf3ffd97dbee88c7f115d82aa0e3a	no	11

Warnings:
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PTO/SB/06 (09-11)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 11/348,150	Filing Date 02/06/2006	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT **09/13/2013**

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 12	Minus	** 73	= 0	X $80 =	0
Independent (37 CFR 1.16(h))	* 1	Minus	***13	= 0	X $420 =	0
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	0

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))						
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
					TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
/BRENDA MURPHY/

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
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NOTICE OF ALLOWANCE AND FEE(S) DUE

1726 7590 10/10/2013
INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER
PATTERSON, MARC A

ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 10/10/2013

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

TITLE OF INVENTION: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	01/10/2014

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

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If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1144 of 1179

PART B - FEE(S) TRANSMITTAL

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P.O. Box 1450
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

TITLE OF INVENTION: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	01/10/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATTERSON, MARC A	1782	428-034200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

PTOL-85 (Rev. 02/11)

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1145 of 1179

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29	NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
❑ Applicant asserting small entity status. See 37 CFR 1.27	NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
❑ Applicant changing to regular undiscounted fee status.	NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PTOL-85 (Rev. 02/11) Approved for use through 08/31/2013. OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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1726 7590 10/10/2013

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

DATE MAILED: 10/10/2013

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 435 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 435 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notices of Allowance and Fee(s) Due mailed between October 1, 2013 and December 31, 2013

(Addendum to PTOL-85)

If the "Notice of Allowance and Fee(s) Due" has a mailing date on or after October 1, 2013 and before January 1, 2014, the following information is applicable to this application.

If the issue fee is being timely paid on or after January 1, 2014, the amount due is the issue fee and publication fee in effect January 1, 2014. On January 1, 2014, the issue fees set forth in 37 CFR 1.18 decrease significantly and the publication fee set forth in 37 CFR 1.18(d)(1) decreases to $0.

If an issue fee or publication fee has been previously paid in this application, applicant is not entitled to a refund of the difference between the amount paid and the amount in effect on January 1, 2014.

Notice of Allowability	Application No. 11/348,150	Applicant(s) CLEVELAND ET AL.	
	Examiner MARC PATTERSON	Art Unit 1782	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *9/13/13*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *76-78,80-84 and 87-90*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov .
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   Certified copies:
   a) ☐ All b) ☐ Some *c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

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Clearwater Paper Corp. v. Graphic Packaging International LLC
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DETAILED ACTION

Allowable Subject Matter

1. The following is an examiner's statement of reasons for allowance: The prior art of record discloses a laminate but fails to disclose a product in the form of a cup comprising a laminate comprising a paperboard substrate having an interior facing surface and an exterior surface, a first moisture protectant layer coated directly only on the interior surface and comprising at least one biodegradable polyester polymer having a coat weight of from 5 to 30 lbs/3000 ft^2 and a second moisture protectant layer coated directly only on the exterior surface comprising at least one biodegradable polyester polymer having a coat weight of from 5 to 30 lbs/3000 ft^2.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Marc A Patterson whose telephone number is 571-272-1497. The examiner can normally be reached on Mon - Fri 8:30 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gwendolyn Blackwell, can be reached on 571-272-5772. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Marc A Patterson/
Primary Examiner, Art Unit 1782

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	Art Unit
	MARC PATTERSON	1782

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner
428	34.1	11/21/11	M.A.P.
428	34.2	11/21/11	M.A.P.
428	35.7	11/21/11	M.A.P.
428	35.9	11/21/11	M.A.P.
428	36.9	11/21/11	M.A.P.
428	34.1	6/26/12	M.A.P.
428	34.2	6/26/12	M.A.P.
428	35.7	6/26/12	M.A.P.
428	35.9	6/26/12	M.A.P.
428	36.9	6/26/12	M.A.P.
428	34.1	10/18/12	M.A.P.
428	34.2	10/18/12	M.A.P.
428	35.7	10/18/12	M.A.P.
428	35.9	10/18/12	M.A.P.
428	36.9	10/18/12	M.A.P.
428	34.1	10/8/13	M.A.P.
428	34.2	10/8/13	M.A.P.
428	35.7	10/8/13	M.A.P.
428	35.9	10/8/13	M.A.P.
428	36.9	10/8/13	M.A.P.

SEARCH NOTES		
Search Notes	Date	Examiner

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Clearwater Paper Corp. v. Graphic Packaging International LLC
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INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
428	34.1	10/8/13	M.A.P.
428	34.2	10/8/13	M.A.P.
428	35.7	10/8/13	M.A.P.
428	35.9	10/8/13	M.A.P.
428	36.9	10/8/13	M.A.P.

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✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	07/20/2011	09/26/2011	11/23/2011	04/24/2012	06/28/2012	10/19/2012	12/27/2012	07/15/2013	10/08/2013
	1	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-
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	37	-	-	-	-	-	-	-	-	-
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	71	-	-	-	-	-	-	-	-	-
	72	-	-	-	-	-	-	-	-	-

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	74	✓	✓	-	-	-	-	-	-	-
	75	✓	✓	-	-	-	-	-	-	-
	76	✓	✓	✓	✓	✓	✓	✓	✓	=
	77	✓	✓	✓	✓	✓	✓	✓	✓	=
	78	✓	✓	✓	✓	✓	✓	✓	✓	=
	79	✓	✓	-	-	-	-	-	-	-
	80	✓	✓	✓	✓	✓	✓	✓	✓	=
	81	✓	✓	✓	✓	✓	✓	✓	✓	=
	82	✓	✓	✓	✓	✓	✓	✓	✓	=
	83	✓	✓	✓	✓	✓	✓	✓	✓	=
	84	✓	✓	✓	✓	✓	✓	✓	✓	=
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	86	-	-	-	-	-	-	-	-	-
	87	✓	✓	✓	✓	✓	✓	✓	✓	=
	88	✓	✓	✓	✓	✓	✓	✓	✓	=
	89								✓	=
	90								✓	=

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Clearwater Paper Corp. v. Graphic Packaging International LLC
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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	54	((biodegradable biodegradability) with polyester) and ((starch starches kaolin talc diatomaceous (calcium adj carbonate)) same filler) and layer and (428/34.1.ccls. 428/34.2.ccls. 428/35.7.ccls. 428/35.9.ccls. 428/36.9.ccls.)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2013/10/08 17:42

10/8/2013 6:29:10 PM

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UNITED STATES PATENT AND TRADEMARK OFFICE

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United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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Alexandria, Virginia 22313-1450
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BIB DATA SHEET

CONFIRMATION NO. 5681

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/348,150	02/06/2006	428	1782	FDS-029388-US

APPLICANTS

Christopher S. Cleveland, Newport, KY;
Tricia S. Reighard, Loveland, OH;
James I. Marchman, Loveland, OH;

**** CONTINUING DATA ***************************

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****
03/06/2006

Foreign Priority claimed ☐ Yes ☑ No 35 USC 119(a-d) conditions met ☐ Yes ☑ No Verified and Acknowledged /MARC A PATTERSON/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		KY	5	73	13

ADDRESS

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140
UNITED STATES

TITLE

Biodegradable paper-based laminate with oxygen and moisture barrier properties and method for making biodegradable paper-based laminate

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
5780	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	**Art Unit**
	MARC PATTERSON	1782

CPC		
Symbol	**Type**	**Version**

CPC Combination Sets				
Symbol	**Type**	**Set**	**Ranking**	**Version**

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/MARC PATTERSON/ Primary Examiner.Art Unit 1782	10/08/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	76	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	**Art Unit**
	MARC PATTERSON	1782

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
428	34.2	B	3	2	B	1 / 02 (2006.01.01)	B	3	2	B	1 / 08 (2006.01.01)

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
428	34.1	35.7	35.9	36.9	

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	12	
/MARC PATTERSON/ Primary Examiner.Art Unit 1782	10/08/2013	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	76	1

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1161 of 1179

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11348150	CLEVELAND ET AL.
	Examiner	**Art Unit**
	MARC PATTERSON	1782

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		17		33		49		65	9	81				
	2		18		34		50		66	10	82				
	3		19		35		51		67	3	83				
	4		20		36		52		68	4	84				
	5		21		37		53		69		85				
	6		22		38		54		70		86				
	7		23		39		55		71	5	87				
	8		24		40		56		72	6	88				
	9		25		41		57		73	11	89				
	10		26		42		58		74	12	90				
	11		27		43		59		75						
	12		28		44		60	1	76						
	13		29		45		61	7	77						
	14		30		46		62	8	78						
	15		31		47		63		79						
	16		32		48		64	2	80						

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 12	
/MARC PATTERSON/ Primary Examiner.Art Unit 1782 (Primary Examiner)	10/08/2013 (Date)	O.G. Print Claim(s) 76	O.G. Print Figure 1

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1162 of 1179

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
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Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

1726 7590 10/10/2013
INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

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I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Jane A. Tompkins (Depositor's name)
Jane A. Tompkins (Signature)
11-25-2013 (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

TITLE OF INVENTION: BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1780	$300	$0	$2080	01/10/2014

EXAMINER	ART UNIT	CLASS-SUBCLASS
PATTERSON, MARC A	1782	428-034200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 MATTHEW M. ESLAMI
2 ERIC GUTTAG
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: INTERNATIONAL PAPER CO.
(B) RESIDENCE: (CITY and STATE OR COUNTRY): MEMPHIS, TN

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☑ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies _____

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☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 22-0185 (enclose an extra copy of this form).

PTOL-85 (Rev. 02/11)

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1163 of 1179

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

☐ Applicant asserting small entity status. See 37 CFR 1.27

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

☐ Applicant changing to regular undiscounted fee status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature [signature] Date 11/19/2013

Typed or printed name MATTHEW M. ESLAMI Registration No. 45,488

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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Electronic Patent Application Fee Transmittal	
Application Number:	11348150
Filing Date:	06-Feb-2006
Title of Invention:	BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Filer:	Matthew M. Eslami/Jane Tomlinson
Attorney Docket Number:	FDS-029388-US
Filed as Large Entity	

Utility under 35 USC 111(a) Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Utility Appl Issue Fee	1501	1	1780	1780
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**2080**

Electronic Acknowledgement Receipt	
EFS ID:	17496065
Application Number:	11348150
International Application Number:	
Confirmation Number:	5681
Title of Invention:	BIODEGRADABLE PAPER-BASED LAMINATE WITH OXYGEN AND MOISTURE BARRIER PROPERTIES AND METHOD FOR MAKING BIODEGRADABLE PAPER-BASED LAMINATE
First Named Inventor/Applicant Name:	Christopher S. Cleveland
Customer Number:	1726
Filer:	Matthew M. Eslami/Jane Tomlinson
Filer Authorized By:	Matthew M. Eslami
Attorney Docket Number:	FDS-029388-US
Receipt Date:	25-NOV-2013
Filing Date:	06-FEB-2006
Time Stamp:	15:51:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$2080
RAM confirmation Number	5521
Deposit Account	090525
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)

1	Issue Fee Payment (PTO-85B)	131125_IssueFee_fds029388us.pdf	117925 01d306fd7870f189b2c4fc1ac58b76d2e0782ee6	no	2
Warnings:					
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Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32564 84813383794e586de43cdc02b3a3e8037d77b7ed	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	150489		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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PTO/SB/08a (01-10)
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	11348150
Filing Date	2006-02-06
First Named Inventor	CLEVELAND, CS
Art Unit	1782
Examiner Name	Patterson, Marc A.
Attorney Docket Number	FDS-029388-US

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.P./	1	5736204		1998-04-07	Suskind	

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/M.P./	1	1089564	CN		1994-07-20	Suskind		☐
/M.P./	2	199409210	WO		1994-04-28	Suskind		☐

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NON-PATENT LITERATURE DOCUMENTS Remove

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Marc Patterson/	Date Considered	12/23/2013

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-03-06
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Clearwater Paper Corp. - EX1002
Clearwater Paper Corp. v. Graphic Packaging International LLC
Page 1172 of 1179

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Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

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	1					
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/M.P./	1	20030143256		2003-07-31	Gen	
If you wish to add additional U.S. Published Application citation information please click the Add button.						Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							☐
If you wish to add additional Foreign Patent Document citation information please click the Add button								Add

NON-PATENT LITERATURE DOCUMENTS			Remove
Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11348150
	Filing Date	2006-02-06
	First Named Inventor	CLEVELAND, CS
	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

	1		☐

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EXAMINER SIGNATURE

Examiner Signature	/Marc Patterson/	Date Considered	12/23/2013

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	Art Unit	1782
	Examiner Name	Patterson, Marc A.
	Attorney Docket Number	FDS-029388-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Matthew M. Eslami/	Date (YYYY-MM-DD)	2012-02-21
Name/Print	Matthew M. Eslami	Registration Number	45488

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	02/06/2006	Christopher S. Cleveland	FDS-029388-US	5681

1726 7590 12/27/2013

INTERNATIONAL PAPER COMPANY
6285 TRI-RIDGE BOULEVARD
LOVELAND, OH 45140

EXAMINER	
PATTERSON, MARC A	
ART UNIT	PAPER NUMBER
1782	

MAIL DATE	DELIVERY MODE
12/27/2013	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
11/348,150	06 February, 2006	CLEVELAND ET AL.	FDS-029388-US

INTERNATIONAL PAPER COMPANY
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LOVELAND, OH 45140

EXAMINER	
MARC PATTERSON	
ART UNIT	PAPER
1782	20131223

DATE MAILED:

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Commissioner for Patents

The Information Disclosure Statements of February 21, 2012 and March 6, 2012 have been initialed and are attached.

/MARC PATTERSON/
Primary Examiner, Art Unit 1782

PTO-90C (Rev.04-03)

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/348,150	01/28/2014	8637126	FDS-029388-US	5681

1726 7590 01/08/2014

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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 950 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Christopher S. Cleveland, Newport, KY;
Tricia S. Reighard, Loveland, OH;
James I. Marchman, Loveland, OH;

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