Patent Law Fundamentals For Scientists, Engineers and Managers

Robert A. Migliorini
Senior Counsel

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- This Primer on Patent Law Fundamentals is not legal guidance and should not be relied upon for any of your intellectual property decisions or actions – I recommend that you seek the advice of competent legal counsel for any specific intellectual property legal issues you may have.

Agenda

PART I

- Patents – Introduction
- Trade secrets
- Inventorship
- Invention documentation
- Types of Patents

Part II

- Patent procurement process overview
- Patent searching
- Patentability requirements
- U.S. Patent Application Filing Formalities

Part III

- How to read a U.S. patent publication
- Patent application preparation
- Patent prosecution

Part IV

- Foreign filing and prosecution
- Post grant options
- Patent litigation and infringement
- Patent opinions

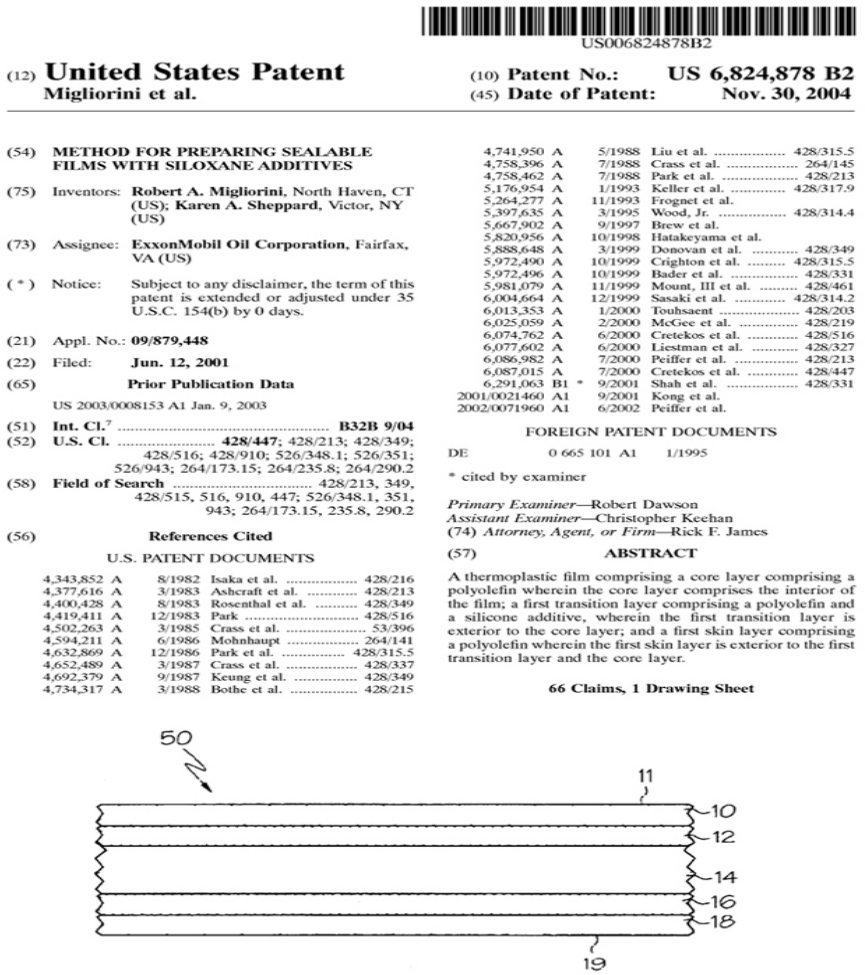
PART III

How to Read a U.S. Patent Publication

- Information page
  - Title, Abstract, Representative drawing
- Drawings
- Specification
  - Cross-reference to related applications, Field, Background, Summary, Brief description of drawings, Detailed description
- Claims

How to Read a U.S. Patent Publication Information Page

- Patent or application and number
- INID codes
  - Internationally agreed numbers for ID of bibliographic data
- Date of issue or grant
- Title of invention
- Inventors
- Assignee
  - Patent owner
- Notices: E.g. disclaimers
- Appln. serial number
- Filing date
  - Enforcement period



US006824878B2

(12) **United States Patent**
Migliorini et al.

(10) **Patent No.: US 6,824,878 B2**
(45) **Date of Patent: Nov. 30, 2004**

(54) **METHOD FOR PREPARING SEALABLE FILMS WITH SILOXANE ADDITIVES**

(75) Inventors: **Robert A. Migliorini**, North Haven, CT (US); **Karen A. Sheppard**, Victor, NY (US)

(73) Assignee: **ExxonMobil Oil Corporation**, Fairfax, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/879,448**

(22) Filed: **Jun. 12, 2001**

(65) **Prior Publication Data**

US 2003/0008153 A1 Jan. 9, 2003

(51) **Int. Cl.**[7] **B32B 9/04**

(52) **U.S. Cl.** **428/447**; 428/213; 428/349; 428/516; 428/910; 526/348.1; 526/351; 526/943; 264/173.15; 264/235.8; 264/290.2

(58) **Field of Search** 428/213, 349, 428/515, 516, 910, 447; 526/348.1, 351, 943; 264/173.15, 235.8, 290.2

(56) **References Cited**

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4,419,411	A	12/1983	Park	428/516
4,502,263	A	3/1985	Crass et al.	53/396
4,594,211	A	6/1986	Mohnhaupt	264/141
4,632,869	A	12/1986	Park et al.	428/315.5
4,652,489	A	3/1987	Crass et al.	428/337
4,692,379	A	9/1987	Keung et al.	428/349
4,734,317	A	3/1988	Bothe et al.	428/215
4,741,950	A	5/1988	Liu et al.	428/315.5
4,758,396	A	7/1988	Crass et al.	264/145
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5,176,954	A	1/1993	Keller et al.	428/317.9
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5,397,635	A	3/1995	Wood, Jr.	428/314.4
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5,888,648	A	3/1999	Donovan et al.	428/349
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5,972,496	A	10/1999	Bader et al.	428/331
5,981,079	A	11/1999	Mount, III et al.	428/461
6,004,664	A	12/1999	Sasaki et al.	428/314.2
6,013,353	A	1/2000	Touhsaent	428/203
6,025,059	A	2/2000	McGee et al.	428/219
6,074,762	A	6/2000	Cretekos et al.	428/516
6,077,602	A	6/2000	Liestman et al.	428/327
6,086,982	A	7/2000	Peiffer et al.	428/213
6,087,015	A	7/2000	Cretekos et al.	428/447
6,291,063	B1 *	9/2001	Shah et al.	428/331
2001/0021460	A1	9/2001	Kong et al.	
2002/0071960	A1	6/2002	Peiffer et al.	

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* cited by examiner

Primary Examiner—Robert Dawson
Assistant Examiner—Christopher Keehan
(74) *Attorney, Agent, or Firm*—Rick F. James

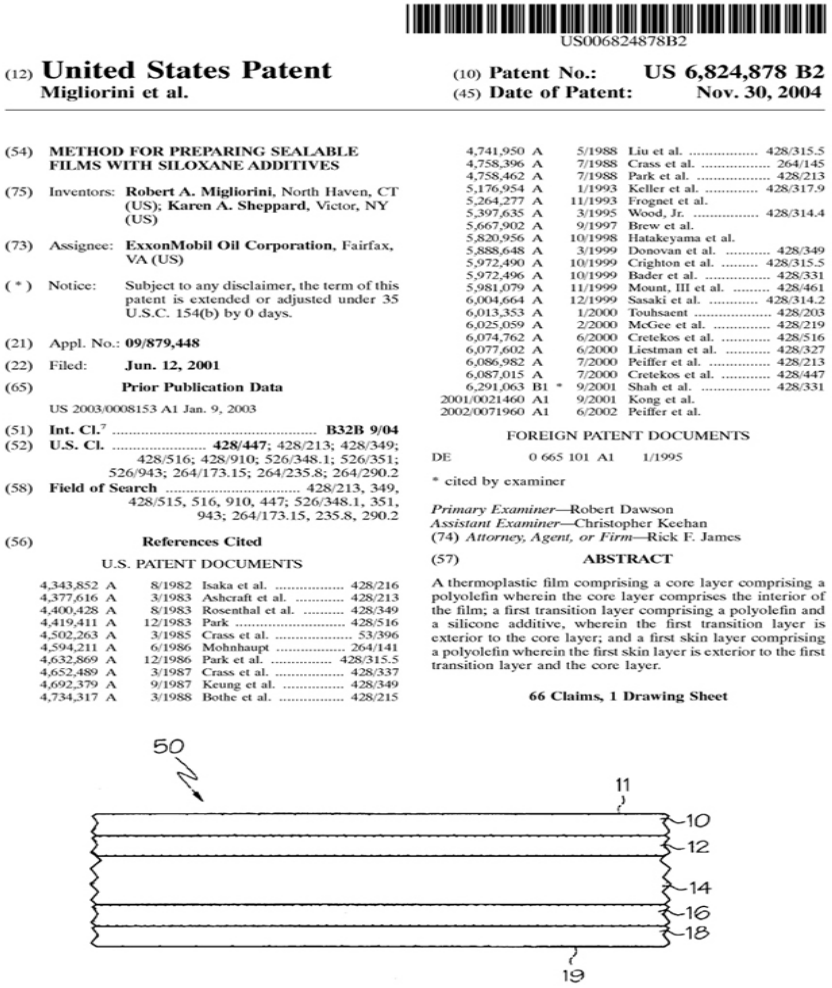
(57) **ABSTRACT**

A thermoplastic film comprising a core layer comprising a polyolefin wherein the core layer comprises the interior of the film; a first transition layer comprising a polyolefin and a silicone additive, wherein the first transition layer is exterior to the core layer; and a first skin layer comprising a polyolefin wherein the first skin layer is exterior to the first transition layer and the core layer.

66 Claims, 1 Drawing Sheet

How to Read a U.S. Patent Publication Information Page

- Related applications
  - Priority purposes
- U.S. and international search classifications
  - Class/subclass
  - Technical subject matter area
- Field of search during exam
- References cited during exam
  - U.S. and foreign patent documents
  - Other publications
- Examiner(s), attorney(s)
- Abstract
  - Summary of 150 words or less
  - Nature and gist of invention
- No. of claims and drawings
- One figure of drawings



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4,734,317	A	3/1988	Bothe et al.	428/215
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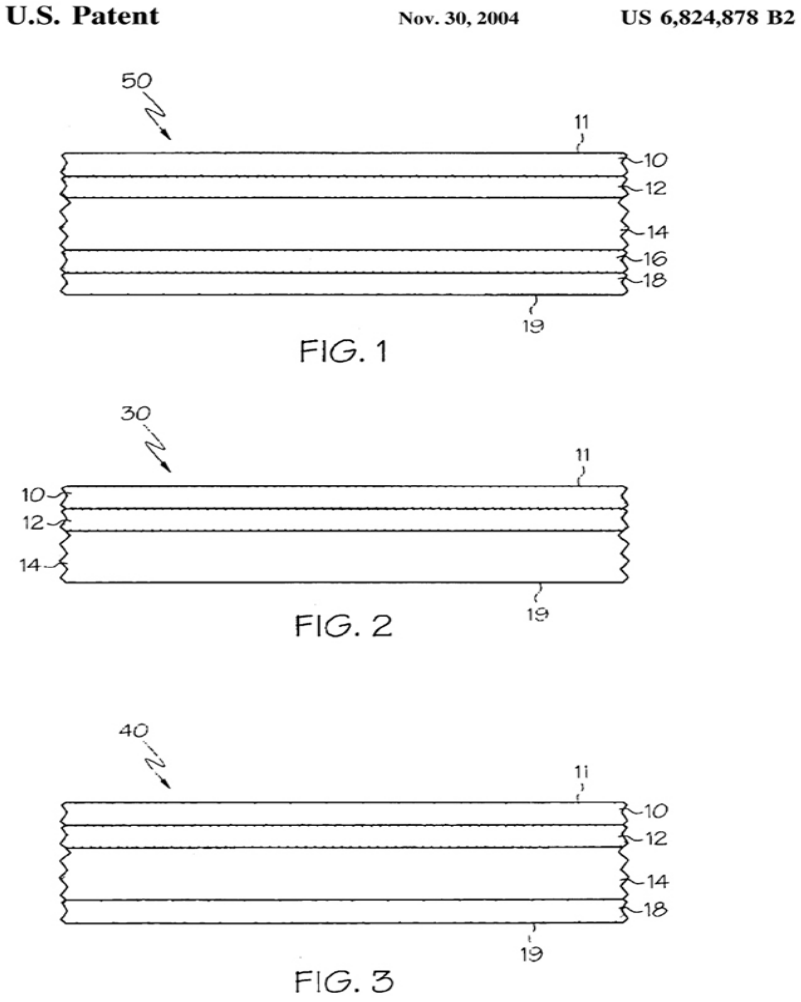
A thermoplastic film comprising a core layer comprising a polyolefin wherein the core layer comprises the interior of the film; a first transition layer comprising a polyolefin and a silicone additive, wherein the first transition layer is exterior to the core layer; and a first skin layer comprising a polyolefin wherein the first skin layer is exterior to the first transition layer and the core layer.

66 Claims, 1 Drawing Sheet

How to Read a U.S. Patent Publication Drawings

- 35 U.S.C. 113 – requires that drawings of the invention be submitted “where necessary for the understanding of the subject matter sought to be patented.”
- Almost always necessary in the mechanical and electrical arts.
- May not be necessary in the chemical arts.
  - Composition of matter.
  - Typically required for process patents
- Graphs included as drawings.
  - Support data as tables in detailed description
- Prior art must be labeled as such.
- Formal versus informal.
- Numbering as opposed to text.
- More is better.



How to Read a U.S. Patent Publication Specification

- 35 U.S.C. 112 – 1st paragraph : “The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.”
- 3 requirements:
  - written description
  - enablement
  - best mode

How to Read a U.S. Patent Publication Specification

- Written description requirement
  - The invention must be described so that those skilled in the art will know that the inventor was in possession of the invention at the time the application was filed.
    - The disclosure must support all the claims.
  - To ensure that the scope of any new or amended claims was sufficiently described in the original spec. so that the filing date is truly the date of the invention covered by the claims.
    - Whether one skilled in the art could reasonably have found the later claimed invention in as-filed specification.
    - Prohibition against adding new subject matter to the spec. to support later added/amended claims.
  - Judged as of application filing date.

How to Read a U.S. Patent Publication Specification

- Enablement requirement
  - Specification must be in such full, clear and concise terms as to enable any person skilled in the art to make and use the invention.
  - Must apprise one of ordinary skill in the art how to make and how to use the invention without undue experimentation.
  - Not fatal if some experimentation is needed.
  - Judged as of application filing date.

How to Read a U.S. Patent Publication Specification

- Best mode requirement
  - A description of the best embodiment of the invention known to the inventors.
    - Need not be indicated as “best” embodiment in the application.
  - Inventor’s preferred way to make and use the invention.
  - Cannot conceal from public preferred embodiments of the invention.
    - Prior to America Invents Act, grounds to invalidate a patent.
  - Duty to update when filing related applications with new subject matter.
  - Judged as of application filing date.

How to Read a U.S. Patent Publication Specification

- Title
  - Should be general.
  - Not like a technical paper title.
- Cross-reference to related applications
  - To claim priority to earlier filed applications
  - Provisional, non-provisional, foreign application
- Field
  - Technical field to which invention pertains.
  - 1-2 sentences only
  - PTO uses to route application to right examining group.

US 2006/0264543 A1 Nov. 23, 2006
1

FIBER REINFORCED POLYPROPYLENE COMPOSITIONS

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application 60/681,609 filed May 17, 2005.

FIELD OF THE INVENTION

[0002] The present invention is directed generally to articles made from fiber reinforced polypropylene compositions having a flexural modulus of at least 300,000 psi and exhibiting ductility during instrumented impact testing. The present invention is also directed to processes for making such articles: It more particularly relates to advantageous fiber reinforced polypropylene compositions of matter. Still more particularly, the present invention relates to polypropylene based fiber composites including a propylene based polymer, an organic fiber, and an inorganic filler.

BACKGROUND OF THE INVENTION

[0003] Polyolefins have limited use in engineering applications due to the tradeoff between toughness and stiffness. For example, polyethylene is widely regarded as being relatively tough, but low in stiffness. Polypropylene generally displays the opposite trend, i.e., is relatively stiff, but low in toughness.

[0004] Several well known polypropylene compositions have been introduced which address toughness. For example, it is known to increase the toughness of polypropylene by adding rubber particles, either in-reactor resulting in impact copolymers, or through post-reactor blending. However, while toughness is improved, the stiffness is considerably reduced using this approach.

[0005] Glass reinforced polypropylene compositions have been introduced to improve stiffness. However, the glass fibers have a tendency to break in typical injection molding equipment, resulting in reduced toughness and stiffness. In addition, glass reinforced products have a tendency to warp after injection molding

[0006] Another known method of improving physical properties of polyolefins is organic fiber reinforcement. For example, EP Patent Application 0397881, the entire disclosure of which is hereby incorporated herein by reference, discloses a composition produced by melt-mixing 100 parts by weight of a polypropylene resin and 10 to 100 parts by weight of polyester fibers having a fiber diameter of 1 to 10 deniers, a fiber length of 0.5 to 50 mm and a fiber strength of 5 to 13 g/d, and then molding the resulting mixture. Also, U.S. Pat. No. 3,639,424 to Gray, Jr. et al., the entire disclosure of which is hereby incorporated herein by reference, discloses a composition including a polymer, such as polypropylene, and uniformly dispersed therein at least about 10% by weight of the composition staple length fiber, the fiber being of man-made polymers, such as poly(ethylene terephthalate) or poly(1,4-cyclohexylenedimethylene terephthalate).

[0007] Fiber reinforced polypropylene compositions are also disclosed in PCT Publication WO02/053629, the entire disclosure of which is hereby incorporated herein by reference. More specifically, WO02/053629 discloses a polymeric compound, comprising a thermoplastic matrix having a high flow during melt processing and polymeric fibers having lengths of from 0.1 mm to 50 mm. The polymeric compound comprises between 0.5 wt % and 10 wt % of a lubricant.

[0008] Various modifications to organic fiber reinforced polypropylene compositions are also known. For example, polyolefins modified with maleic anhydride or acrylic acid have been used as the matrix component to improve the interface strength between the synthetic organic fiber and the polyolefin, which was thought to enhance the mechanical properties of the molded product made therefrom.

[0009] Other background references include PCT Publication WO90/05164; EP Patent Application 0669372; U.S. Pat. No. 6,395,342 to Kadowaki et al.; EP Patent Application 1075918; U.S. Pat. No. 5,145,891 to Yasukawa et al., U.S. Pat. No. 5,145,892 to Yasukawa et al.; and EP Patent 0232522, the entire disclosures of which are hereby incorporated herein by reference.

[0010] A need exists of an improved polypropylene based fiber composite that yields a combination of improved impact resistance/toughness, and stiffness for use in molded articles at favorable raw material and manufacturing costs. In addition, the polypropylene-fiber compositions when formed into molded articles will ideally not splinter after subjected to break through drop weight impact testing.

SUMMARY OF THE INVENTION

[0011] It has surprisingly been found that substantially lubricant-free fiber reinforced polypropylene compositions can be made which simultaneously have a flexural modulus of at least 300,000 psi and exhibit ductility during instrumented impact testing. Particularly surprising is the ability to make such compositions using a wide range of polypropylenes as the matrix material, including some polypropylenes that without fiber are very brittle. The compositions of the present invention are particularly suitable for making articles including, but not limited to household appliances, automotive parts, and boat hulls.

[0012] In one embodiment, the present invention provides an article of manufacture made from a composition comprising, based on the total weight of the composition, at least 30 wt % polypropylene, from 10 to 60 wt % organic fiber, from 0 to 40 wt % inorganic filler, and from 0 to 0.1 wt % lubricant. The composition has a flexural modulus of at least 300,000 psi and exhibits ductility during instrumented impact testing (15 mph, −29° C., 25 lbs). In another embodiment, the fiber reinforced polypropylene composite with an inorganic filler further includes from 0.01 to 0.1 wt % lubricant. Suitable lubricants include, but are not limited to, silicon oil, silicon gum, fatty amide, paraffin oil, paraffin wax, and ester oil. In another embodiment, the present invention provides an automotive part made from such composition.

[0013] In another embodiment, the present invention provides an article of manufacture made from a composition consisting essentially of at least 30 wt % homopolypropylene, from 10 to 60 wt % organic fiber, and from 0.1 to 40 wt % inorganic filler, based on the total weight of the composition. The composition has a flexural modulus of at least 300,000 psi and exhibits ductility during instrumented impact testing (15 mph, −25° C., 25 lbs).

How to Read a U.S. Patent Publication Specification

- Background
  - Discussion of state of closest art
  - May include references to patents
  - Set forth problems involved with prior art which are solved by invention. Problem-solution approach for Europe.
  - Characterizations in background are binding admissions (even if wrong)
  - Shorter is better
- Summary
  - Brief summary of invention indicating its nature and substance
  - Directed to claimed invention
  - Recite independent claim(s)

US 2006/0264543 A1 Nov. 23, 2006
1

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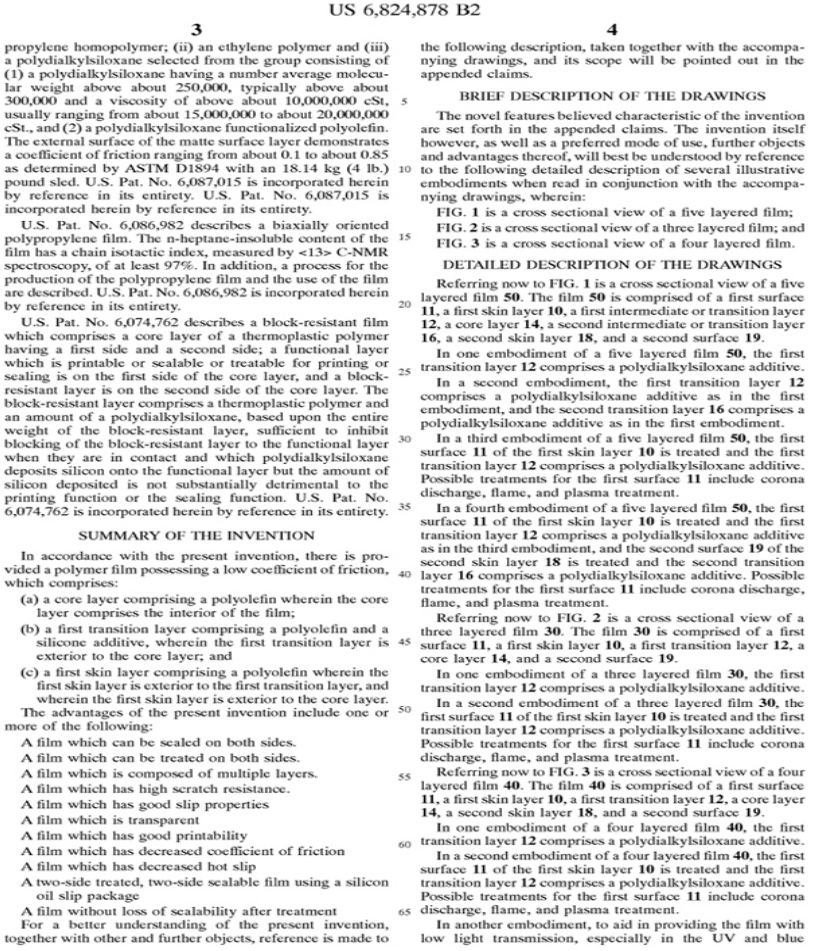
[0012] In one embodiment, the present invention provides an article of manufacture made from a composition comprising, based on the total weight of the composition, at least 30 wt % polypropylene, from 10 to 60 wt % organic fiber, from 0 to 40 wt % inorganic filler, and from 0 to 0.1 wt % lubricant. The composition has a flexural modulus of at least 300,000 psi and exhibits ductility during instrumented impact testing (15 mph, −29° C., 25 lbs). In another embodiment, the fiber reinforced polypropylene composite with an inorganic filler further includes from 0.01 to 0.1 wt % lubricant. Suitable lubricants include, but are not limited to, silicon oil, silicon gum, fatty amide, paraffin oil, paraffin wax, and ester oil. In another embodiment, the present invention provides an automotive part made from such composition.

[0013] In another embodiment, the present invention provides an article of manufacture made from a composition consisting essentially of at least 30 wt % homopolypropylene, from 10 to 60 wt % organic fiber, and from 0.1 to 40 wt % inorganic filler, based on the total weight of the composition. The composition has a flexural modulus of at least 300,000 psi and exhibits ductility during instrumented impact testing (15 mph, −25° C., 25 lbs).

How to Read a U.S. Patent Publication Specification

- Brief description of the drawings
  - Brief description of each figure.
- Detailed description
  - Solution to problem in prior art
  - Satisfy written description, enablement and best mode requirements
  - Description of the forms or embodiments of the invention.
  - When drawings, a description of each with reference to parts of drawing by numbering.
  - Disclose ranges of variables
  - Data tables
  - Units in SI units.
  - More is better.



US 6,824,878 B2

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propylene homopolymer; (ii) an ethylene polymer and (iii) a polydialkylsiloxane selected from the group consisting of (1) a polydialkylsiloxane having a number average molecular weight above about 250,000, typically above about 300,000 and a viscosity of above about 10,000,000 cSt, usually ranging from about 15,000,000 to about 20,000,000 cSt., and (2) a polydialkylsiloxane functionalized polyolefin. The external surface of the matte surface layer demonstrates a coefficient of friction ranging from about 0.1 to about 0.85 as determined by ASTM D1894 with an 18.14 kg (4 lb.) pound sled. U.S. Pat. No. 6,087,015 is incorporated herein by reference in its entirety. U.S. Pat. No. 6,087,015 is incorporated herein by reference in its entirety.

U.S. Pat. No. 6,086,982 describes a biaxially oriented polypropylene film. The n-heptane-insoluble content of the film has a chain isotactic index, measured by <13> C-NMR spectroscopy, of at least 97%. In addition, a process for the production of the polypropylene film and the use of the film are described. U.S. Pat. No. 6,086,982 is incorporated herein by reference in its entirety.

U.S. Pat. No. 6,074,762 describes a block-resistant film which comprises a core layer of a thermoplastic polymer having a first side and a second side; a functional layer which is printable or sealable or treatable for printing or sealing is on the first side of the core layer, and a block-resistant layer is on the second side of the core layer. The block-resistant layer comprises a thermoplastic polymer and an amount of a polydialkylsiloxane, based upon the entire weight of the block-resistant layer, sufficient to inhibit blocking of the block-resistant layer to the functional layer when they are in contact and which polydialkylsiloxane deposits silicon onto the functional layer but the amount of silicon deposited is not substantially detrimental to the printing function or the sealing function. U.S. Pat. No. 6,074,762 is incorporated herein by reference in its entirety.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a polymer film possessing a low coefficient of friction, which comprises:

(a) a core layer comprising a polyolefin wherein the core layer comprises the interior of the film;

(b) a first transition layer comprising a polyolefin and a silicone additive, wherein the first transition layer is exterior to the core layer; and

(c) a first skin layer comprising a polyolefin wherein the first skin layer is exterior to the first transition layer, and wherein the first skin layer is exterior to the core layer.

The advantages of the present invention include one or more of the following:

A film which can be sealed on both sides.
A film which can be treated on both sides.
A film which is composed of multiple layers.
A film which has high scratch resistance.
A film which has good slip properties
A film which is transparent
A film which has good printability
A film which has decreased coefficient of friction
A film which has decreased hot slip
A two-side treated, two-side sealable film using a silicon oil slip package
A film without loss of sealability after treatment

For a better understanding of the present invention, together with other and further objects, reference is made to

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the following description, taken together with the accompanying drawings, and its scope will be pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of several illustrative embodiments when read in conjunction with the accompanying drawings, wherein:

FIG. **1** is a cross sectional view of a five layered film;

FIG. **2** is a cross sectional view of a three layered film; and

FIG. **3** is a cross sectional view of a four layered film.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring now to FIG. **1** is a cross sectional view of a five layered film **50**. The film **50** is comprised of a first surface **11**, a first skin layer **10**, a first intermediate or transition layer **12**, a core layer **14**, a second intermediate or transition layer **16**, a second skin layer **18**, and a second surface **19**.

In one embodiment of a five layered film **50**, the first transition layer **12** comprises a polydialkylsiloxane additive.

In a second embodiment, the first transition layer **12** comprises a polydialkylsiloxane additive as in the first embodiment, and the second transition layer **16** comprises a polydialkylsiloxane additive as in the first embodiment.

In a third embodiment of a five layered film **50**, the first surface **11** of the first skin layer **10** is treated and the first transition layer **12** comprises a polydialkylsiloxane additive. Possible treatments for the first surface **11** include corona discharge, flame, and plasma treatment.

In a fourth embodiment of a five layered film **50**, the first surface **11** of the first skin layer **10** is treated and the first transition layer **12** comprises a polydialkylsiloxane additive as in the third embodiment, and the second surface **19** of the second skin layer **18** is treated and the second transition layer **16** comprises a polydialkylsiloxane additive. Possible treatments for the first surface **11** include corona discharge, flame, and plasma treatment.

Referring now to FIG. **2** is a cross sectional view of a three layered film **30**. The film **30** is comprised of a first surface **11**, a first skin layer **10**, a first transition layer **12**, a core layer **14**, and a second surface **19**.

In one embodiment of a three layered film **30**, the first transition layer **12** comprises a polydialkylsiloxane additive.

In a second embodiment of a three layered film **30**, the first surface **11** of the first skin layer **10** is treated and the first transition layer **12** comprises a polydialkylsiloxane additive. Possible treatments for the first surface **11** include corona discharge, flame, and plasma treatment.

Referring now to FIG. **3** is a cross sectional view of a four layered film **40**. The film **40** is comprised of a first surface **11**, a first skin layer **10**, a first transition layer **12**, a core layer **14**, a second skin layer **18**, and a second surface **19**.

In one embodiment of a four layered film **40**, the first transition layer **12** comprises a polydialkylsiloxane additive.

In a second embodiment of a four layered film **40**, the first surface **11** of the first skin layer **10** is treated and the first transition layer **12** comprises a polydialkylsiloxane additive. Possible treatments for the first surface **11** include corona discharge, flame, and plasma treatment.

In another embodiment, to aid in providing the film with low light transmission, especially in the UV and blue

How to Read a U.S. Patent Publication Specification

- Examples
  - Experimental data
  - Actual (past tense) or prophetic (present tense).
  - Comparative examples useful.
  - Test methods used (ASTM).
  - In many countries, claims will be limited to examples.
  - More is better.

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U.S. Pat. Nos. 6,077,602; 6,013,353; 5,981,079; 5,972,496; 6,074,762; 6,025,059; and 5,888,648 disclose the use of coatings and/or metal layers on a film, and are disclosed herein by reference. In one embodiment, suitable coatings may include PVdC's, PVOH's, or acrylics which serve to boost gloss, enhance machineability, and/or enhance ink adhesion; suitable metals may include aluminum. In another embodiment, the first skin layer **10** and/or the second skin layer **18** may have an aluminum layer applied by a vacuum deposit process.

Although certain preferred embodiments have been disclosed for the five layer film **50**, three layer film **30**, and four layer film **40**, additional embodiments of films with three or more layers are possible by interchanging elements already disclosed that would be clear to one with ordinary skill in the art.

The following examples illustrate the present invention:

EXAMPLE 1

An example of a typical 4 or 5-layer heat sealable coextruded structure exhibiting this concept with some representative polyolefins for the tie layers and skin or cap layers is shown below.

Treated or Untreated
EP random copolymer, PB copolymer, EPB terpolymer, MDPE, LLDPE, LDPE, EVA, EMA, Surlyn ionomer (0.1–2.0 micron thickness) PP homopolymer, EP block copolymer, EP random copolymer, PB copolymer, EPB terpolymer, MDPE, LLDPE, LDPE, EVA, EMA, Surlyn ionomer containing 0.2–4% polydialkylsiloxane additive (0.2–6.0 micron thickness)
Isotactic PP homopolymer, HDPE or LLDPE (5–50 micron thickness)
Optional Second Tie Layer - PP homopolymer, EP block copolymer, EP random copolymer, PB copolymer, EPB terpolymer, MDPE, LLDPE, LDPE, EVA, EMA, Surlyn ionomer, maleic andhydride grafted polyolefin containing 0.2–4% polydialkylsiloxane additive (0.2–6.0 micron thickness)
EP random copolymer, PB copolymer, EPB terpolymer, MDPE, LLDPE, LDPE, EVA, EMA, Surlyn ionomer, EVOH copolymer (0.1–2.0 micron thickness)
Treated or Untreated

EXAMPLE 2

Two Side Sealable Coextruded Type Structures

5-layer two side sealable film structures (21 microns) were produced with siloxane type additives in both tie layers. The layer structure was as follows:

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Outside - Untreated
Chisso XPM7510 EPB terpolymer (0.15–0.60 micron thickness)
Chisso XPM7500 Series EPB terpolymer w/polydimethylsiloxane additive (0.5 microns)
Isotactic PP homopolymer (18.5–19.5 micron thickness)
Chisso XPM7500 Series EPB terpolymer w/polydimethylsiloxane additive (0.5 microns)
Chisso XPM7510 EPB terpolymer (0.15–0.60 micron thickness)
Inside - Corona Treated

Three types of siloxane additives were trialed: 1. Dow Corning 10,000 cs silicone oil, 2. Dow Corning 60,000 cs silicone oil, 3. Dow Corning MB50-001 silicone gum masterbatch (50% ultra high molecular weight siloxane in PP homopolymer). Two control films were produced for comparison purposes. One control film (BW-01270-01) was a 3-layer film with 30,000 cs silicone oil in each skin layer. One side was treated to exhibit the loss of sealability when a surface with silicone oil is treated. A second control (BW-01270-03) film was produced with no siloxane additive in neither the skin layer nor the tie layer to exhibit the high cof numbers obtained when siloxane is not used as an additive in the film.

Films were tested for crimp seal strength (230–280F), TMI static and kinetic cof, and optical properties (haze and gloss). Lab test data is shown in the table below. With all three types of siloxane additive in the tie layer, it was possible to produce a surface treated two side sealable film that exhibited improved cof relative to the control film without siloxane additive. The ultrahigh molecular weight silicone gum was found to be the most effective of the 3 siloxane additives for maintaining sealability and improving slip properties. The use of silicone gum also allows for thinner skin layers to be used without sealability loss after surface treatment. For all films, the treated surface has a higher cof than the untreated surface probably due to static charges induced with corona treatment.

SILOXANE IN TIE LAYER LAB TEST RESULTS

Semiworks Roll #	BW-01270-01	BW-10270-03	BW-10270-09	CW-01310-07	CW-01310-12
Skin Resin	XPM7504	XPM7510	XPM7510	XPM7510	XPM7510
Skin Siloxane Additive	30K cs Si oil	None	None	none	None
Skin Additive level	0.8%	Not applicable	not applicable	not applicable	Not applicable
Skin thickness (microns)	0.58	0.15	0.15	0.61	0.46
Tie Layer base resin	PP homo.	XPM7510	XPM7510	XPM7510	XPM7510
Tie Layer Siloxane Additive	None	None	Si Gum	10K cs Si oil	60K cs Si Oil
Tie Layer Additive Level	not applicable	Not applicable	1.50%	1%	1%
Tie Layer Thickness (micron)	Same as core	0.5	0.5	0.5	0.5
Corona treatment (Outside - o)	No	No	no	no	No
Corona treatment (Inside - I)	Yes	Yes	yes	yes	Yes
Crimp Seal Strength (g/in) (o/o)	385	390	410	340	340
Crimp Seal Strength (g/in) (I/I)	45	395	515	240	245
Static cof (o/o)	0.3	0.69	0.24	0.28	0.27
Kinetic cof (o/o)	0.29	0.68	0.23	0.27	0.27
Static cof (I/I)	0.55	0.9	0.39	0.59	0.62
Kinetic cof (I/I)	0.52	0.9	0.38	0.61	0.63
Haze %	1.3	1.1	1.9	1.7	1.5
Gloss	88.7	91.9	88.5	88.4	88.7

How to Read a U.S. Patent Publication Claims

- 35 USC 112, 2nd para.
  - The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject which the applicant regards as his invention.
- Define the scope of protection afforded by the patent grant.
  - Accurate and unambiguous
  - Allows others to avoid infringement
- Consecutively numbered.
- Independent and dependent format
- “The name of the game is the claim.”

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What is claimed is:

1. A thermoplastic film comprising:
(a) a core layer comprising a Ziegler-Natta catalyst-polymerized polypropylene, polyethylene, polybutene, copolymers thereof or blends thereof wherein the core layer comprises the interior of the film;
(b) a first transition layer comprising a polyolefin and a silicone additive, wherein the first transition layer is exterior to the core layer; and
(c) a first skin layer comprising a polyolefin wherein the first skin layer is exterior to the first transition layer and the core layer;
wherein the first transition layer is between the core layer and the first skin layer.

2. The film of claim 1 wherein the first skin layer has an exposed surface and wherein the exposed surface of the first skin layer is subjected to a treatment selected from the group consisting of corona discharge, plasma, and flame.

3. The film of claim 1 in which the silicone additive of the first transition layer is a polydialkylsiloxane.

4. The film of claim 1 in which the silicone additive of the first transition layer is a polydimethylsiloxane.

5. The film of claim 1 in which a sufficient amount of silicone additive is incorporated in the first transition layer as to migrate through the first skin layer to an exposed surfaces of the first skin layer to confer a coefficient of friction of less than about 0.7.

6. The film of claim 1 in which a sufficient amount of silicone additive is incorporated in the first transition layer as to migrate through the first skin layer to an exposed surfaces of the first skin layer to confer a coefficient of friction from about 0.2 to about 0.5.

7. The film of claim 1 wherein the first skin layer further comprises an anti-blocking agent and wherein at least a major proportion of the anti-blocking agent is in the form of particles of approximately spherical shape.

8. The film of claim 7 wherein the anti-blocking agent is selected from the group consisting of silica, cross-linked methacrylate, and polymethylsilosiloxane.

9. The film of claim 7 wherein the anti-blocking agent is silica particles wherein at least a major proportion of which are approximately spherical in shape.

10. The film of claim 1 wherein the first skin layer comprises a polymer selected from the group consisting of ethylene-propylene-butene-1 terpolymer, ethylene-propylene random copolymer, propylene-butene-1 copolymer, MDPE, LLDPE, LDPE, EVA, EMA, surlyn ionomer, and mixtures thereof.

11. The film of claim 10 wherein the ethylene-propylene-butene-1 terpolymer component comprises from about 10 to about 90 weight percent of the blend and the ethylene-propylene random copolymer comprises from about 10 to about 90 weight percent of the blend.

12. The film of claim 10 in which the ethylene-propylene-butene-1 terpolymer is obtained from the random interpolymerization of from about 1 to about 8 weight percent ethylene with from about 65 to 95 propylene with butene-1 making up the balance of the terpolymer.

13. The film of claim 10 in which the ethylene-propylene-butene-1 terpolymer is obtained from the random interpolymerization of from about 3 to about 6 weight percent ethylene with from about 86 to about 93 weight percent propylene with butene-1 making up the balance of the terpolymer.

14. The film of claim 10 in which the ethylene-propylene random copolymer is obtained from the random co-polymerization of from about 2 to about 8 weight percent ethylene with propylene making up the balance of the copolymer.

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15. The film of claim 10 in which the propylene-butene-1 copolymer is obtained from the random co-polymerization of from about 1 to about 16 weight percent butene-1 with propylene making up the balance of the copolymer.

16. The film of claim 1 wherein the core layer comprises a polymer selected from the group consisting of a polypropylene homopolymer, a high-density polyethylene, a linear low-density polyethylene, a ethylene-propylene copolymer, and mixtures thereof.

17. The film of claim 1 wherein the transition layer comprises a polymer selected from the group consisting of polypropylene homopolymer, medium-density polyethylene, linear low-density polyethylene, low-density polyethylene, ethylene-propylene copolymer, propylene-butene copolymer, ethylene-propylene-butene terpolymer, EVA, EMA, surlyn ionomer, and mixtures thereof.

18. The film of claim 1 in which the core layer comprises at least about 70 percent of the total thickness of the film.

19. The film of claim 18 in which the total thickness of the film is from about 0.35 to about 2.0 mils.

20. The film of claim 1 wherein the first transition layer has a thickness of about 0.2 to about 6 microns and wherein the first skin layer has a thickness of about 0.1 to about 3 microns.

21. The film of claim 1 wherein the silicone additive has a viscosity greater than about 1,000,000 centistokes.

22. The film of claim 1 wherein the silicone additive has a viscosity from about 10,000,000 centistokes to about 50,000,000 centistokes.

23. The film of claim 1 wherein the silicone additive has a viscosity greater than about 1,000 centistokes.

24. The film of claim 1 wherein the first transition layer comprises from about 0.2% to about 4% by weight of the silicone additive.

25. The film of claim 1 wherein the first transition layer comprises from about 0.6% to about 2% by weight of the silicone additive.

26. The film of claim 1 wherein the first transition layer comprises from about 0.6% to about 2% by weight of the silicone additive, and wherein the silicone additive has a viscosity from about 10,000,000 centistokes to about 50,000,000 centistokes.

27. The film of claim 1 wherein the exterior side of the first skin layer is coated with a coating selected from the group consisting of acrylics, PVDC, PVOH, and mixtures thereof.

28. The film of claim 1 wherein the exterior side of the first skin layer is vacuum metallized.

29. The film of claim 1 having a seal strength of at least about 200 grams per inch and having a coefficient of friction of at most about 0.65.

30. The film of claim 1 having a seal strength of at least about 240 grams per inch and having a coefficient of friction of at most about 0.4.

31. A method of making a film comprising the steps of:
(1) coextruding a film through a die wherein the film comprises a core layer comprising a polyolefin wherein the core layer comprises the interior of the film; a first transition layer comprising a polyolefin and a silicone additive, wherein the first transition layer is exterior to the core layer; and a first skin layer comprising a polyolefin, and being substantially free of a silicone additive, wherein the first skin layer is exterior to the first transition layer, and wherein said the first skin layer is exterior to the core layer, and wherein the first transition layer is between the core layer and the first skin layer;

Patent Claims

- Claims start on a separate page of the patent application beginning with:
  - "I (or we) claim." or "What is claimed is:"
- One sentence rule per claim.
- Claim: What is the Best Unique Description of the Invention?
  - "Unique or novel": no single prior reference (including our own) includes (anywhere in the reference) every characteristic in the new application claim
  - Best: recites only enough characteristics to be novel.
- Independent claim – 35 USC 112 (c) (previously 3rd para.)
  - Does not refer to another claim (long form)
  - Stands alone
    - 1. The polymer composition comprising A, B, C and D.
- Dependent claim – 35 USC 112 (c)(d)(e) (previously 3rd-5th para.)
  - Refers to previous claims (short form)
  - Incorporates by reference all the limitations of the claim to which it refers
  - Specifies further limitations
    - 2. The polymer composition of claim 1, further including E.
    - 2. The polymer composition comprising A, B, C, D and E.

Patent Claims

- Type of claims based on subject matter:
  - Machine or apparatus claims
    - An automated extrusion machine . . .
  - Manufacture or article claims
    - A writing device . . .
    - A reactor . . .
  - Process or method claims
    - Method of making
      - A method of making pizza . . .
    - Method of using
      - A method of using a polyethylene plastic film to stop basement water infiltration . . .
  - Composition of matter claims
    - A pharmaceutical compound . . .
    - Catalysts, resins . . .

Patent Claims

- 3 Parts of Claims:
  1. Preamble
  2. Transition phrase
  3. Body
- Example
  1. A regenerable sulfur oxides trap catalyst composition for trapping SOx from a combustion source comprising a metal (M) oxide, wherein M is selected from Cu, Fe, Mn, Ag, Co, Ce, Zr and combinations thereof.
     - Preamble – “A regenerable sulfur oxides trap catalyst composition for trapping SOx from a combustion source”
     - Transition phrase – “comprising”
     - Body – “a metal (M) oxide, wherein M is selected from Cu, Fe, Mn, Ag, Co, Ce, Zr and combinations thereof.”

Patent Claims - Preamble

- Introduces and identifies the invention
  - “A cheeseburger …”
  - “An edible food product …”
- May also state a purpose or use, but not advantageous.
  - “A cheeseburger for low fat consumption …”
  - “An edible food product for consumption …”
- Not limiting where a patentee defines a structurally complete invention in the body of the claim and uses the preamble only to state a purpose or intended use.
- May limit the invention if it recites essential structure or steps or if it is “necessary to give life, meaning and vitality to the claim.”
- Try to avoid unnecessary language in preamble as it may not assist in achieving patentability and may limit claim scope in litigation.

Patent Claims – Transition Phrase

- Introduces elements and limitations that make up the invention
  - "An edible food product comprising …"
- "Comprising" – open ended - leaves claim open for unspecified elements, steps or ingredients in any amount.
  - Other open ended phrases: "comprising the steps of", "including", "containing", "characterized by"
- "Consisting of" – closed ended - closes the claim to the inclusion of elements, steps, or ingredients other than those recited. Excludes any element not specified (except for impurities).
- "Consisting essentially of" – closed ended - claim is open for the inclusion of unspecified elements, steps or ingredients which do not materially affect the basic and novel characteristics of the invention.
- "Comprising" preferred to "consisting essentially of" which is preferred to "consisting of" because more difficult to design around the claim scope.

Patent Claims – Body

- Recites the elements and limitations of the invention
- But must provide an interrelationship between elements
- Must also provide antecedent basis for elements
- Must be clear and unambiguous
  - Example: "... crystallizing the [PET] granulate ... at a temperature of 220° to 260°C under an inert gas atmosphere."
  - Question: Does the temperature limitation refer to temperature of heating medium or to temperature of granulate?
  - *Eastman Kodak v. Goodyear*

Patent Claims – Scope

Broad vs. Narrow Claims

- Example: Which Claim is Broadest? Narrowest?

  1. A composition comprising oil, water, and a surfactant.
  2. A composition consisting essentially of oil, water, and a surfactant.
  3. A composition consisting of oil, water, and a surfactant.

- Competitor who produces a composition with oil, water, a surfactant and a dispersant (in any amount) may likely infringe claim 1.
- Same competitor may not infringe claim 2 if the dispersant functions as something that materially affects the composition.
- Same competitor would likely not infringe claim 3 if the dispersant is something more than an impurity present in the composition even if it does not materially affect the composition.

Patent Claims – Scope

Broad vs. Narrow Claims

- No Unnecessary Limitations
  - Example: Which Claim is Broader?

  1. A composition comprising oil, water, and a surfactant.

  2. A composition comprising oil and water.
- Claims Need Not Read Like Recipes or Instructions
- Use Only those Limitations Necessary to Distinguish from the Prior Art.

Patent Claims – Scope

- Consider the Reason for Limitations
  - Example: Which Claim is Broader?

  1. A composition comprising oil, water, and 5-10 wt. % of a surfactant.
  2. A composition comprising oil, water, and an amount of surfactant sufficient to disperse the oil in the water.

- Functional limitations – describing what something does as opposed to what it is.
- Functional limitations are often desirable, especially when both functional and numerical limitations are claimed (in parallel). In the Example above, a good strategy would be to include both claims.
- Be sure to suggest functional limitations; the attorney may not know a functional alternative is available.

Patent Claims – Scope

- Avoid the Need to Amend Claims, If Possible
  - Q: Which Claim is Broader?

  1. A composition comprising oil, water, and 5-10 wt. % of a surfactant. (as-filed in application)
  2. A composition comprising oil, water, and 5-10 wt. % of a surfactant. (amended to such during prosecution)

- Whichever claim has not been amended.
  - Amendments are very often necessary to avoid prior art, but a quirk of patent law is that unamended claims are effectively broader than identical claims that have been amended. (This is one reason why the attorney may write 50 or 100 claims.)
  - The best way to avoid amendments is to know the prior art (patentability search) and draft claims around it when preparing the application.

Patent Application Preparation Steps In Process

1. Invention rated for filing by business
2. Patentability search of invention disclosure
3. Review search results
4. Prepare first draft application
5. Review of draft application
6. Continue drafts and review to finalize
7. File application

Patent Application Preparation
Inventor Assistance

- Volunteer helpful information
  - Collaborative process between inventor(s) and attorney
- Understand the prior art
  - Review patentability search results
  - Help attorney understand the prior art and distinctions relative to the invention
  - Disclose other relevant references to attorney
- Provide Data
  - Electronic format, SI units
  - Source data for any figures
  - Don’t suppress “negative” or “bad” data
- Critically Read the Application
  - As a competitor: How could you argue that the disclosure is too vague or incomplete to practice the invention?
  - As a professor grading a paper: Is it accurate? Are there logical gaps? Are the terms properly defined? Anything missing? Is it clear what is inventive vs. comparative?
  - Are there one or more pending related applications that you can claim priority to?

Patent Application Preparation Inventor Assistance

- Critically Read the Claims
  - Read and question the claim language
  - As a competitor: How could you work around the claims?
  - As a patent Examiner: Is it novel and non-obvious?
  - As a skilled third party: Is it ambiguous? Does it make sense? Is it consistent with the rest of the application?
- Full Disclosure to the Attorneys
  - Relevant references
  - “Bad” data
- Err on the side of giving too much info, not too little
- Remember that the duty to disclose (to be reviewed) continues during the entire prosecution process
- Discuss inventorship questions with the attorney

Patent Prosecution
Steps in Process

- Initial Filing by applicant
  - Provisional or regular application along with filing fee and other formalities documentation.
  - Oath/Declaration, Information disclosure statement, assignment.
- Formalities reviewed by USPTO
  - Filing date accorded if specification, drawings (as required) and at least one claim (regular application)
  - Notice of missing parts
  - Assigned to art unit for examination
- Search And Examination by USPTO
  - Two or more independent and distinct inventions in a single application→Restriction requirement
  - Rejection/Objection to specification, drawings and claims
  - 1st Office action issued by Examiner

Patent Prosecution
Steps in Process

- Response to 1st Office action by Applicant
  - Respond to restriction requirement → Elect claims to prosecute and withdraw from prosecution non-elected claims
  - Argue against objections/rejections
  - Amend with regard to objection/rejections
- Response to 2nd Office action by Applicant
  - If Final Office action, options are more limited.
  - Amend with regard to objection/rejections.
  - Argue against objections/rejections.
  - File a Notice of Appeal
  - Refile as a continuation application (Request for Continued Exam)
- Notice of Allowance by USPTO
- Review of allowance by Applicant.
  - Decision to file divisional application to the non-elected claims
  - Supplemental Duty of Disclosure Form completed by inventors
  - Payment of Issue Fee
- Patent Issues

Patent Prosecution
Inventor Assistance

- Read over the Office action, and prior art references cited.
- Focus on the specification and drawings of prior art relative to 102 and 103 rejections.
- Look for distinctions between prior art cited and application claims
  - Are all elements of independent claims satisfied by references?
  - Can an argument be made to distinguish claims over prior art?
  - Can the independent claims be amended to include a feature not taught or suggested by prior art?
- Are any secondary considerations to patentability applicable.
  - Unexpected results, commercial success, long felt need, failure of others, etc.
- Read over the draft response to the Office action for technical correctness
- Respond promptly to attorney questions as responses to Office actions are deadline driven.
  - 3-mos. w/o paying extension fees and 6-mos. w/extension fees.

Patent Prosecution
Inventor Assistance

Arguments Examiners Like:

- The problem and solution were not recognized.
- It would not be obvious to combine the references because:
  - the combination of references would not work
  - one skilled in the art would not see a reason to combine the references
  - One reference “teaches away” from the technical merits of the other reference.
- The combination still does not make the invention
- Our results were surprising because...
- The Examiner misinterpreted the reference

Patent Prosecution
Inventor Assistance

Arguments Examiners Ignore:

- The prior art reference is invalid (irrelevant)
- The prior art claims... (irrelevant)
- The prior art does not claim our invention…(irrelevant)
- Their commercial process never worked right (irrelevant)
- I don’t believe their disclosure (irrelevant)
- Our product/process is cheaper (irrelevant)
- None of their examples show... (irrelevant)

Patent Prosecution
How to get a strong patent

- Broad Disclosure for Defensive Publication
  - Best mode is disclosed
- Claims Consistent with Business Objectives
- Inventorship is accurate
- All known material prior art references disclosed
- Invention not publicly disclosed, offered for sale, or secretly used for more than 1-year prior to filing date.
  - No 1-year “grace” period outside the U. S.

Patent Prosecution
How to get an invalid patent

- Use The Invention (Even Secretly) For More Than 1 Year Before Filing Patent Application
  - Trade Secrets Can Not Become Patents (after 1 year)
- Disclose the Invention to Your Customers Without an Adequate Secrecy Agreement
- Fail to Disclose Relevant References
  - Any time before patent issues
  - Disclose to the handling attorney
- Fail to Disclose the Best Mode
  - No “secret ingredients” or “secret steps”