



(12) **DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION**

(13) **A1**

(22) Date de dépôt/Filing Date: 2016/08/25

(41) Mise à la disp. pub./Open to Public Insp.: 2018/02/25

(51) Cl.Int./Int.Cl. *D21H 19/80* (2006.01),
B65D 65/38 (2006.01), *D21H 21/16* (2006.01),
D21H 21/20 (2006.01), *D21H 27/10* (2006.01)

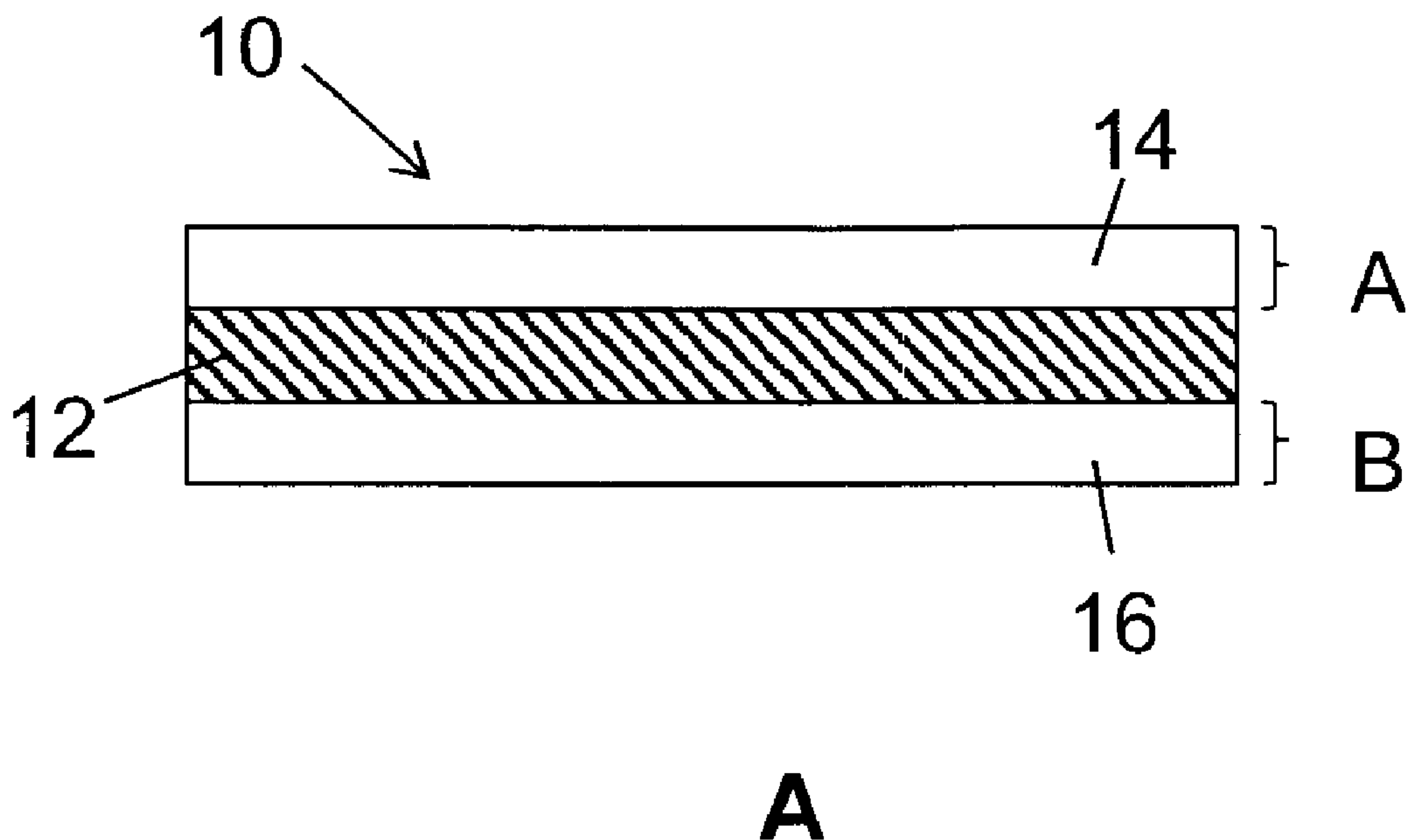
(71) Demandeur/Applicant:
CASCADES SONOCO, INC., CA

(72) Inventeurs/Inventors:
MONGRAIN, YVON, CA;
ALLEN, EMILIE, CA...

(74) Agent: ROBIC

(54) Titre : SUBSTRAT A BASE DE PAPIER COUCHE DESTINE A DES CONTENANTS ET PROCEDE DE
FABRICATION ASSOCIE

(54) Title: COATED PAPER-BASED SUBSTRATE FOR CONTAINERS AND PROCESS FOR MAKING THE SAME



(57) Abrégé/Abstract:

A coated paper-based substrate for manufacturing a container and a method for preparing the same. The coated paper-based substrate comprises a cellulosic fiber-based substrate coated on a first surface with a coating A and coated on a second surface

(57) **Abrégé(suite)/Abstract(continued):**

with a coating B. The coating A comprises at least one layer of an extruded or laminated polymeric film or of a laminated foil. The coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer capable of providing a water and/or moisture barrier to the second surface of the paper-based substrate once coated. The extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different. The coating A and the coating B are heat sealable to each other.

ABSTRACT

A coated paper-based substrate for manufacturing a container and a method for preparing the same. The coated paper-based substrate comprises a cellulosic fiber-based substrate coated on a first surface with a coating A and coated on a second surface with a coating B. The coating A comprises at least one layer of an extruded or laminated polymeric film or of a laminated foil. The coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer capable of providing a water and/or moisture barrier to the second surface of the paper-based substrate once coated. The extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different. The coating A and the coating B are heat sealable to each other.

COATED PAPER-BASED SUBSTRATE FOR CONTAINERS AND PROCESS FOR MAKING THE SAME

TECHNICAL FIELD

[001] The technical field relates to coated paper-based substrates for manufacturing containers and to a process for making such coated paper-based substrates. The paper-based substrate is coated on both sides with coatings providing specific properties to the paper-based substrate.

TECHNICAL BACKGROUND

[002] In the paper industry, and more particularly in the field of paper-based containers for foodstuff, such as milk carton, ice cream carton, soft drink or coffee cups to name a few, the containers are usually made from paper-based substrates coated on both surfaces with polyethylene coatings. Such polyethylene coatings allow protecting the interior of the container, which is in contact with the foodstuff, and also the exterior of the container. For instance, polyethylene coatings on the exterior surface of the container provide protection against water condensation thereby limiting or avoiding deterioration of the carton when the foodstuff in the container is colder than ambient temperature. Polyethylene coatings on the interior surface of the container may provide protection against water and/or moisture and/or oil and/or grease. Foamed polyethylene coatings may also provide other features to the container such as avoiding heat transfer when the foodstuff in the container is a hot foodstuff such as coffee for instance.

[003] Polyethylene coatings are generally applied by extrusion onto the paper-based substrate. In some cases, a primer coating can be applied to the substrate before extrusion of the polyethylene to enhance adhesion thereof.

[004] When erecting the container, a portion of the paper surface, which will face the interior of the container and be in contact with the goods therein (e.g. foodstuff), covers a portion of the other surface, which will form the exterior of the container, and the superimposed portions are “glued” together using heat and/or pressure. Good adhesion between the two coatings, through sealing, is required to maintain integrity of the container in use. Good sealing (through heat-sealing) is usually observed when the coatings are of the same nature on both surfaces of the paper-based substrate, such as for polyethylene coatings.

[005] However, extruded polyethylene coatings commonly used in the field, are difficult to recyclable and/or repulpable and/or non-compostable and/or non-biodegradable which makes them less environmental friendly.

[006] Moreover, polyethylene coatings need to be corona treated to increase their surface tension to ease the printing on the surface of the coated substrate (e.g. on the exterior surface), requiring a further step in the coating process, the coated process being an in-line or an off-line process.

[007] In view of the above, there is a need for coated paper-based substrates for manufacturing containers to hold goods such as foodstuff or any other type of goods, which would be able to overcome or at least minimize the above-discussed prior art concerns.

BRIEF SUMMARY

[008] It is therefore an aim of the present invention to address the above mentioned issues.

[009] According to one aspect, there is provided a coated paper-based substrate for manufacturing a container. The coated paper-based substrate comprises a cellulosic fiber-based substrate coated on a first surface with a coating A and coated on a second surface with a coating B. The coating A comprises at least one layer of

an extruded or laminated polymeric film or of a laminated foil. The coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer capable of providing a water and/or moisture barrier to the second surface of the paper-based substrate once coated. The extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different. The coating A and the coating B are heat sealable to each other.

[010] In an embodiment, the polymer or copolymer of the coating B provides a water and/or moisture barrier to the second surface of the paper-based substrate once coated. In another embodiment, the polymer or copolymer of the coating B further provides an oil and/or grease barrier to the paper-based substrate.

[011] In an embodiment, the aqueous dispersion comprises a polymer or copolymer selected from an acrylic- or acrylate-based polymer or copolymer such as styrene-acrylic copolymer and styrene-acrylic-acrylonitrile copolymer, polyester such as polyethylene terephthalate (PET), plant oil-based polyester resin, polyurethane, polyvinylidene chloride (PVDC), ethylene copolymer resin dispersion, paraffinic wax, styrene-butadiene copolymer, starch, dextrin, LDPE, HDPE, PLA, nylon, polypropylene and mixtures thereof.

[012] In another embodiment, the aqueous dispersion further comprises mineral charges. The mineral charges may comprise calcium carbonate (CaCO₃), clay, mica, talc, titanium dioxide and/or carbon black.

[013] In an embodiment, the aqueous dispersion is selected from the products EvCote® Barrier 3000 or 3050 (Akzo Nobel), Epotal® 100 (BASF), Aqualene® 5050 (Aquabased), Serfene™ 546 (DOW), Actega® X22 (Altana), Michem®Coat 81 (Michelman), Vaporcoat 2200R Michelman, Barrier-Grip R5701A (IGI Enviro-Coatings), Spectra-Guard™ 3003, 3005 or 3007BK (Spectra-Kote), Ulterion® 535 OPV, Ulterion® 537 OPV, Ulterion® 323 BC, HydraBan® products (Michelman),

Aquaban® products (IGI), BYK Aquacer® products (BYK), MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF) and Acronal® S504 (BASF).

[014] In an embodiment, the surface tension of the coating B is from about 15 to about 60 dynes/cm. The surface tension of the coating B may be above about 38 dynes/cm.

[015] In another embodiment, the layer of the extruded or laminated polymeric film or laminated foil provides an oil and/or grease and/or moisture and/or water barrier to the paper-based substrate once coated.

[016] In an embodiment, the extruded or laminated polymeric film comprises a PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PLA, PBS, PP, PET, Nylon, PVDC, EvOH or a metallized film. In another embodiment, the coating A comprises at least one layer of a film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA.

[017] In an embodiment, the extruded or laminated polymeric film comprises a food grade polymer. In another embodiment, the extruded or laminated polymeric film further comprises mineral charges. The mineral charges may comprise calcium carbonate (CaCO₃), clay, mica, talc, titanium dioxide and/or carbon black.

[018] In an embodiment, the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF), PLA Ingeo™ biopolymer (Ingeo), BioPBS™ FZ91, FZ71 or FD92 (PTT MCC Biochem), MarFlex® 1017 (Chevron Phillips) or DOW™ Polyethylene 722 (Dow Plastics). The coating A may preferably comprise at least one layer of an extruded polymeric film of Ecovio® (BASF).

[019] In an embodiment, the laminated foil comprises aluminium foil.

[020] In an embodiment, the coating A further comprises a primer layer between the first surface of the cellulosic fiber-based substrate and the layer of the extruded

or laminated polymeric film or the laminated foil. The primer layer may comprise a water based emulsion or dispersion of polymers or copolymers selected from acrylic-based polymers, acrylate-based polymers, styrene-butadiene copolymers, styrene-acrylic copolymers, styrene-acrylic-acrylonitrile copolymers, polyethylene imines, functionalized polypropylenes, polyurethanes, polyesters, ethylene-acrylic acid copolymers, modified ethylene copolymers and any mixture thereof.

[021] In an embodiment, the coating A comprises a primer layer of a water based dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane elastomer and a layer of an extruded film of PLA. In another embodiment, the coating A comprises a primer layer of the product MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606, Epotal® S440 or Epotal® P100 ECO and a layer of an extruded film of PLA. The coating A may preferably comprise a primer layer of the product MICA R-1509-B and a layer of an extruded film of Ecovio® (BASF).

[022] In an embodiment, the coating B further comprises an adhesion promotor to enhance heat sealing between the coatings A and B. The adhesion promotor may be present in the aqueous dispersion. In an embodiment, the adhesion promotor is applied as an additional layer onto the polymer or copolymer layer of the coating B. The adhesion promotor may comprise a PEI or a derivative thereof.

[023] In an embodiment, the coating A comprises at least one layer of an extruded polymeric film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures) and the adhesion promotor of the coating B comprises a PEI or LDPE or wax emulsions.

[024] In an embodiment, the cellulosic fiber-based substrate is a recycled or virgin liner, medium, fine paper, newspaper, chipboard, kraftpak® paper, paperboard, molded pulp, bleached paperboard (i.e. SBS) or any other cellulosic fiber-based substrate, wherein the cellulosic fiber-based substrate is optionally coated (e.g. clay coated).

[025] In an embodiment, the cellulosic fiber-based substrate has a basis weight from about 40 g/m² to about 1000 g/m². The cellulosic fiber-based substrate may preferably have a basis weight from about 200 g/m² to about 400 g/m².

[026] According to another aspect, there is provided a process for preparing a coated paper-based substrate for manufacturing a container, wherein the coated paper-based substrate comprises a cellulosic fiber-based substrate coated on a first surface with a coating A and coated on a second surface with a coating B. The coating A comprises at least one layer of an extruded or laminated polymeric film or of a laminated foil. The coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer. The extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different, and the coating A and the coating B are heat sealable to each other. In an embodiment, the process comprises: applying the aqueous dispersion of the at least one polymer or copolymer; drying the aqueous dispersion to form the at least one layer of the polymer or copolymer; and applying by extrusion or lamination the layer of the polymeric film or laminating the foil on the first surface of the paper-based substrate.

[027] In an embodiment, the aqueous dispersion comprises at least one polymer or copolymer capable of providing a water and/or moisture barrier on the second surface.

[028] In an embodiment, the aqueous dispersion comprises a polymer or copolymer selected from an acrylic- or acrylate-based polymer or copolymer such as styrene-acrylic copolymer and styrene-acrylic-acrylonitrile copolymer, polyester such as polyethylene terephthalate (PET), plant oil-based polyester resin, polyurethane, polyvinylidene chloride (PVDC), ethylene copolymer resin dispersion paraffinic wax, styrene-butadiene copolymer, starch, dextrin, LDPE, HDPE, PLA, nylon, polypropylene and mixtures thereof. The aqueous dispersion may further comprise

mineral charges comprising calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.

[029] In an embodiment, the aqueous dispersion is selected from the products EvCote® Barrier 3000 or 3050 (Akzo Nobel), Epotal® 100 (BASF), Aqualene® 5050 (Aquabased), Serfene™ 546 (DOW), Actega® X22 (Altana), Michem®Coat 81 (Michelman), Vaporcoat 2200R Michelman, Barrier-Grip R5701A (IGI Enviro-Coatings), Spectra-Guard™ 3003, 3005 or 3007BK (Spectra-Kote), Ulterion® 535 OPV, Ulterion® 537 OPV, Ulterion® 323 BC, HydraBan® products (Michelman), Aquaban® products (IGI), BYK Aquacer® products, (BYK), MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF), Epotal® S440 and Acronal® S504 (BASF).

[030] In an embodiment, the surface tension of the coating B is from about 15 to about 60 dynes/cm. The surface tension of the coating B may be above about 38 dynes/cm.

[031] In an embodiment, the layer of the extruded or laminated polymeric film or laminated foil provides an oil and/or grease and/or moisture and/or water barrier to the paper-based substrate once coated.

[032] In another embodiment, the extruded or laminated polymeric film comprises a PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PLA, PBS, PP, PET, Nylon, PVDC or a metallized film. The extruded or laminated polymeric film may comprise a food grade polymer.

[033] In an embodiment, the coating A comprises at least one layer of a film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA.

[034] In an embodiment, the extruded or laminated polymeric film further comprises mineral charges. The mineral charges may comprise calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.

[035] In an embodiment, the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF), PLA Ingeo™ biopolymer (Ingeo), BioPBS™ FZ91, FZ71 or FD92 (PTT MCC Biochem), MarFlex® 1017 (Chevron Phillips) or DOW™ Polyethylene 722 (Dow Plastics). The coating A may comprise at least one layer of an extruded polymeric film of Ecovio® (BASF).

[036] In an embodiment, the laminated foil comprises aluminium foil.

[037] In an embodiment, the process further comprises applying a primer layer on the first surface of the paper-based substrate before applying the layer of the polymeric film or laminating the foil.

[038] In an embodiment, the primer layer comprises a water based emulsion or dispersion of polymers or copolymers selected from acrylic-based polymers, acrylate-based polymers, styrene-butadiene copolymers, styrene-acrylic copolymers, styrene-acrylic-acrylonitrile copolymers, polyethylene imines, functionalized polypropylenes, polyurethanes, polyesters, ethylene-acrylic acid copolymers, modified ethylene copolymers and any mixture thereof.

[039] In an embodiment, the coating A comprises a primer layer of a water based dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane elastomer and a layer of an extruded film of PLA. The coating A may comprise a primer layer of the product MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606, Epotal® S440 or Epotal® P100 ECO and a layer of an extruded film of PLA. The coating A may preferably comprise a primer layer of the product MICA R-1509-B and a layer of an extruded film of Ecovio® (BASF).

[040] In an embodiment, the aqueous dispersion of the primer layer of the coating A and the aqueous dispersion of the coating B are the same and are applied

simultaneously on the first surface and second surface of the cellulosic fiber-based substrate, respectively.

[041] In an embodiment, the coating B further comprises an adhesion promotor to enhance heat sealing between the coating A and the coating B. The adhesion promotor may be present in the aqueous dispersion.

[042] In an embodiment, the process further comprise applying a layer of an adhesion promotor onto the polymer or copolymer layer on the second surface of the paper-based substrate. The process may further comprise drying the adhesion promotor layer.

[043] In an embodiment, the adhesion promotor comprises a PEI or a derivative thereof.

[044] In an embodiment, the coating A comprises at least one layer of an extruded polymeric film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures) and the adhesion promotor of the coating B comprises a PEI.

[045] In an embodiment, the cellulosic fiber-based substrate is a recycled or virgin liner, medium, fine paper, newspaper, chipboard, kraftpak® paper, paperboard, molded pulp, bleached paper board or any other cellulosic fiber-based substrate, wherein the cellulosic fiber-based substrate is optionally coated (e.g. clay coated). In an embodiment, the cellulosic fiber-based substrate has a basis weight from about 40 g/m² to about 1000 g/m². The cellulosic fiber-based substrate may preferably have a basis weight from about 200 g/m² to about 400 g/m².

[046] In an embodiment, the polymeric film is applied in a quantity from about 2.5 g/m² to about 250 g/m². The polymeric film may be applied in a quantity from about 5 g/m² to about 30 g/m².

[047] In an embodiment, the aqueous dispersion of the coating B is applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 20 g/m². The aqueous dispersion of the coating B may be applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 10 g/m².

[048] According to a further aspect, there is provided a container made from the coated paper-based substrate as defined herein.

[049] According to another aspect, there is provided the use of the container of as described herein, for holding cold and/or frozen goods or goods that need to be refrigerated and/or frozen. The goods may include foodstuff.

[050] Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of embodiments thereof, with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[051] FIG. 1 comprises FIG. 1A to FIG. 1D which are cross-sectional views of a coated paper-based substrate according to various embodiments.

[052] FIGS. 2 to 5 are block diagrams representing various embodiments of the process for obtaining a coated paper-based substrate.

DETAILED DESCRIPTION

[053] A paper-based substrate coated for manufacturing a container to hold goods will be described.

[054] Broadly described, the coated paper-based substrate comprises a cellulosic fiber-based substrate coated on a first surface with a coating **A** and coated on a second surface with a coating **B**. The coating **A** comprises at least one layer of an

extruded or laminated polymeric film or of a laminated foil. The coating **B** comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer. The extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different. The coatings **A** and **B** are heat sealable to each other.

[055] As will be described in more detail below, in one embodiment, the coating **A** may further comprise a primer layer between the first surface of the cellulosic fiber-based substrate and the layer of the extruded or laminated polymeric film or the laminated foil.

[056] In another embodiment, the coating **B** may also comprise an adhesion promotor to enhance heat sealing between the coatings **A** and **B**.

[057] In another embodiment, the coating **A** faces goods in the container, in use, and thereby forms an interior coating, the coating **B** forming an exterior coating.

[058] A process for manufacturing a coated paper-based substrate as described herein may comprise the following steps:

- applying the aqueous dispersion of at least one polymer or copolymer to the second surface of the paper-based substrate;
- drying the aqueous dispersion to form a layer of the polymer or copolymer on the second surface of the paper-based substrate; and
- applying by extrusion or lamination the layer of the polymeric film or laminating the foil on the first surface of the paper-based substrate.

[059] In an embodiment, the process may further comprise applying a primer layer on the first surface of the paper-based substrate before applying the layer of the polymeric film or laminating the foil.

Abbreviations and definitions

[060] Various terms and abbreviations used in the present description will be defined in the following paragraphs.

[061] PE: polyethylene, polymer resulting from the polymerization of ethylene and having the chemical formula $(C_2H_4)_n$. PE includes any type of polyethylene such as LDPE, MDPE, HDPE, LLDPE and any other type of polyethylene known in the field. In the present description, PE also refers to any mixture of the different types of polyethylene previously mentioned.

[062] LDPE: low density polyethylene. LDPE may be defined by a density range from 0.910-0.925 g/cm³.

[063] MDPE: medium density polyethylene. MDPE may be defined by a density range from 0.926 to 0.940 g/cm³.

[064] HDPE: high density polyethylene. HDPE may be defined by a density range from 0.941 to 0.97 g/cm³.

[065] LLDPE: linear low density polyethylene. LLDPE may show a density ranging from 0.91 to 0.94 g/cm³. An example of LLDPE is mLLDPE which is manufactured by using metallocene catalysts.

[066] PP: polypropylene, polymer resulting from the polymerization of ethylene and having the chemical formula $(C_3H_6)_n$.

[067] PET: polyethylene terephthalate, a polymer consisting of polymerized units of the monomer ethylene terephthalate having the chemical formula $[OC(O)C_6H_4C(O)OC_2H_4]_n$.

[068] PLA: polylactic acid, a polyester having the chemical formula $[CH(CH_3)C(O)O]_n$.

[069] PBS: Polybutylene succinate, an aliphatic polyester consisting of polymerized units of butylene succinate having the chemical formula $[C(O)C_2H_4C(O)OC_4H_8O]_n$.

[070] PVDC: polyvinylidene chloride, a homopolymer of vinylidene chloride having the chemical formula $(C_2H_2Cl_2)_n$.

[071] PEI: polyethyleneimine, a linear or branched polymer consisting of polymerized unit of ethyleneimine. The linear form has the chemical formula $(C_2H_5N)_n$.

[072] EvOH: ethylene vinyl alcohol, a copolymer of ethylene and vinyl alcohol having the chemical formula $(C_2H_4O)_x(C_2H_4)_y$.

[073] PBAT : polybutyrate adipate terephthalate, copolyester of adipic acid, 1,4-butanediol and dimethyl terephthalate, having the formula $(C(O)C_6H_4C(O)OC_4H_8)_m(C(O)C_4H_8C(O)OC_4H_8O)_n$.

[074] In the present description, a "container" means a receptacle for holding goods. A container can be a box, a cup, a bowl, a can, a jar, a carton, a tray, a plate, a bottle or any other suitable receptacle capable of holding goods.

[075] In the present description, the "goods" to be packaged in the container can be any type of goods, including foodstuff, such as any solid, semi-solid or liquid foodstuff. For instance, the foodstuff can be water, juice, coffee, tea, soft drink, milk, soup, ice cream, ice, meals, meat, fish, vegetables, fruits, pastry, etc. However, the goods are not limited to foodstuff, and could include ice packs or gel bags for pain relief to name a few other possible non-foodstuff goods. In an embodiment, the goods may be refrigerated and/or frozen, or may be any goods having a temperature which is colder than the ambient temperature at which they are packaged/poured in the container.

[076] When the goods to be packaged in the container are foodstuff, the container can include, without being limited to, a cup for any type of drinks (e.g. coffee; soft drinks), a milk box, a container for ice cream, a bowl for soup, a dinner box etc.

[077] In the present description, the “cellulosic fiber-based substrate” is used as the basis substrate onto which different coatings are applied, as will be described in detail below, to make the coated paper-based substrate. For example, the cellulosic fiber-based substrate can be a recycled or virgin liner, medium, fine paper, newspaper, chipboard, Kraftpak® paper, paperboard, molded pulp, bleached paper board (e.g. solid bleached sulphate (SBS)) or any other cellulosic fiber-based substrate. The cellulosic fiber-based substrate used to make the paper-based substrate described herein, can be uncoated or coated, i.e. with a clay coating.

[078] The term “about”, as used herein before any numerical value, means within an acceptable error range for the particular value as determined by one of ordinary skill in the art. This error range may depend in part on how the value is measured or determined, *i.e.* the limitations of the measurement system. It is commonly accepted that a 10% precision measure is acceptable and encompasses the term “about”.

Coated paper-based substrate

[079] Referring to Fig. 1, the coated paper-based substrate (10) comprises a cellulosic fiber-based substrate (12) having a first and a second surface. The first surface is coated with coating **A** and the second surface is coated with coating **B**.

[080] In particular embodiment, the coating **A** may face goods in the container in use and may be referred to as the “interior” coating. The coating **B** may then be directed toward the exterior of container in use and may be referred to as the “exterior” coating. However, the coating **A** may also face the exterior of the container in use, the coating **B** then facing the interior.

[081] According to an embodiment, as shown in Fig. 1A, the coating **A** may comprise at least one layer of a polymeric film which is extruded or laminated or of a laminated foil (14) and the coating **B** may comprise at least one layer of an aqueous dispersion of at least one polymer or copolymer (16). In an embodiment, the layer (16) may provide a water and/or moisture barrier to the second surface of the paper-based substrate once coated.

[082] According to another embodiment, as shown in Fig. 1B, the coating **A** may further comprise a primer layer (18) applied between the first surface of the cellulosic fiber-based substrate (12) and the layer of the extruded or laminated polymeric film or the laminated foil (14). In this configuration, the coating **A** may comprise at least two coated layers.

[083] According to another embodiment, the coating **B** may also comprise an adhesion promotor to enhance heat sealing between the coating **B** and the coating **A**. The adhesion promotor may be present in the aqueous dispersion of the polymer or copolymer forming layer (16) or may be applied as an additional layer onto the extruded or laminated polymeric film or the laminated foil. In the latest case, the coated paper-based substrate (10) would have a configuration as shown in Fig. 1C, wherein the adhesion promotor is represented by layer (20) covering layer (16) of the aqueous dispersion of the polymer or copolymer.

[084] According to a further embodiment, the coated paper-based substrate (10) may present a coating layout corresponding to the one shown in Fig. 1D, wherein the basis substrate (12) comprise a coating **A** composed of a primer layer (18) and a layer of an extruded or laminated polymeric film or laminated foil (14), and an a coating **B** composed of at least a layer of an aqueous dispersion of a polymer or copolymer (16) and an adhesion promotor layer (20).

[085] The cellulosic fiber-based substrate (12) may be any type of substrate usually used in the field and can be a recycled or virgin liner, medium, fine paper,

newspaper, chipboard, kraftpak® paper, paperboard, molded pulp, bleached paper board (e.g. SBS) or any other cellulosic fiber-based substrate. The cellulosic fiber-based substrate (12) used to make the coated paper-based substrate (10) can be a basis substrate which has previously been coated, i.e. with a clay coating, as commonly used in the field.

[086] Examples of cellulosic fiber-based substrate (12) can have a basis weight from about 40 g/m² to about 1000 g/m². In an optional embodiment, the cellulosic fiber-based substrate (12) can have a basis weight from about 200 g/m² to about 400 g/m².

[087] The coating **A** and the coating **B** will now be described in more detail.

Coating A

[088] As previously described, the coating **A** of the coated paper-based substrate comprises at least one layer of a polymeric film or of a laminated foil (14). The polymeric film depending on its nature is applied by extrusion or laminated onto the substrate. In an embodiment, the polymeric film or the laminated foil may provide an oil and/or grease and/or moisture and/or water barrier to the paper-based substrate once coated.

[089] In one embodiment, the coating **A** may comprise a polymeric film which is a PE, PLA, PBS, PP, PET, EvOH, Nylon, PVDC or a metallized film, or may comprise a foil. The PE may be a mLLDPE, LDPE, HDPE or any mixture thereof. The metallized film is understood to comprise any polymer film coated with a thin layer of metal (e.g. aluminium). Examples of films used in metallized film include PE, PET, PP and nylons. In some embodiment, bio-based polymers which are manufactured from renewable resources may be used in the polymeric film of coating **A**. Hence, the polymeric film may be obtained from Bio-PE, Bio-PBS, Bio-PP or Bio-PET.

[090] When the polymeric film of coating **A** comprises PE, PLA, PBS, PP, EvOH or PVDC, it is applied by extrusion onto the substrate's surface. When the polymeric film is PET, Nylon or a metallized film, lamination is employed for applying such films to the substrate's surface. Foil is also applied by lamination. In a particular embodiment, where the coating **A** comprises a laminated polymeric film or foil, a PE film may be laminated on the substrate's surface before lamination of the polymeric film or foil.

[091] In a particular embodiment, the coating **A** may comprise an extruded polymeric film made from PE (mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA. It is worth mentioning that the polymeric film may result from extrusion of one, two or three layers of PE, PBS or PLA. For each layer, the nature of the PE, PBS or PLA may be the same or different. Considering for example that the polymeric film of coating **A** comprises PLA (the same would apply for PE or PBS): the film may consist of one extruded layer of PLA, two extruded layers of PLA or three extruded layers of PLA, each layer being of the same PLA or of different PLAs. In one embodiment, the polymeric film of coating **A** may comprise three extruded layers of PLA (or PE or PBS) wherein either the same PLA (or PE or PBS) is used for the three layers, or wherein two different types of PLA (or PE or PBS) are used. In the case where two different types of PLA are used, let's say PLA1 and PLA2, the following combinations of extrusion layers would be possible: (PLA1)(PLA1)(PLA2) or (PLA1)(PLA2)(PLA1) or (PLA2)(PLA1)(PLA1) or (PLA1)(PLA2)(PLA2) or (PLA2)(PLA1)(PLA2) or (PLA2)(PLA2)(PLA1). These possible combinations would also apply for two different PE or two different PBS.

[092] Optionally, the polymeric film may further comprise mineral charges (e.g. calcium carbonate, clay, mica, talc, titanium dioxide and/or carbon black) and other additives such as Ethyl Methacrylate (EMA) or Ethylene Acrylic Acid (EEA) for instance. When the polymeric film comprises PLA, it may also further comprise polybutyrate adipate terephthalate (PBAT).

[093] Examples of commercial products which may be used to form the polymeric film of the coating **A** may be the products Ecovio® (BASF), BioPBS™ FZ91, FZ71 or FD92 (PTT MCC Biochem), MarFlex® 1017 (Chevron Phillips) or DOW™ Polyethylene 722 (Dow Plastics), to name a few. PLA's resin products manufactured by DaniMer Scientific LLC or NatureWorks LLC may also be used to form the polymeric film layer of the coating **A**. The products Ecovio®, which comprise PLA, are compostable polymers. This makes them attractive on an environmental perspective. This is also the case for the PBS products BioPBS™ FZ91, FZ71 or FD92, which are bio-based material made from renewable resources.

[094] As previously mentioned, the coating **A** may comprise a layer of a laminated foil instead of the polymeric film described above. The laminated foil may be any type of metallic foil, for example an aluminium foil.

[095] According to a further embodiment, the coating **A** of the coated paper-based substrate may comprise a primer layer (18) between the first surface of the cellulosic fiber-based substrate (12) and the layer of the extruded or laminated polymeric film or the laminated foil (14). It may be advantageous in some embodiments to have a primer in between the substrate surface and the polymeric film or laminated foil, to enhance adhesion and/or reduce coating weight and costs.

[096] The primer layer is usually obtained by application of a water based emulsion or dispersion of polymers or copolymers onto the first surface of the cellulosic fiber-based substrate. In an embodiment, the water based emulsion or dispersion may comprise polymers or copolymers which are selected from acrylic-based polymers, acrylate-based polymers, styrene-butadiene copolymers, styrene-acrylic copolymers, styrene-acrylic-acrylonitrile copolymers, polyethylene imines, functionalized polypropylenes, polyurethanes, polyesters, ethylene-acrylic acid copolymers, modified ethylene copolymers and any mixture thereof.

[097] Table 1 below provides examples of primer layers that may be used underneath the polymeric film or laminated foil in the coating A.

Table 1:

Coating (A)		
Polymeric film / laminated foil	Primer layer (water based emulsion, dispersion or solution)	
PE (e.g. LDPE, HDPE, mLLDPE and their mixtures)	PEI	<i>Examples:</i> Adcote® 313 Michem® Flex P1852 MICA A-131-X
PLA	Styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer, polyester-polyurethane elastomer	<i>Examples:</i> MICA R-1509-B Michem® Flex P1822 Acronal® S 504 NA Styronal® BN 4606 Epotal® P100 ECO Epotal S440
PBS	Styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer, styrene-butadiene copolymer	<i>Examples:</i> MICA R-1509-B Acronal® S 504 NA Styronal® BN 4606
PP	Functionalized polypropylene resin emulsion	<i>Examples:</i> MICA R-3332-A MICA R-1207
PET	Polyurethane, EAA	<i>Examples:</i> MICA I-372-C MICA G-1092
Nylon	EEA	MICA G-1092
PVDC	Polyester-polyurethane elastomer	<i>Example:</i> Luphen® 700 BASF
Metallized film	Water based modified ethylene copolymer resin dispersion, EEA	<i>Examples:</i> MICA M-1164 MICA G-1092
Laminated foil	EEA	<i>Example:</i> MICA G-1092

[098] In a particular embodiment, the primer layer may comprise a water based emulsion or dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane

elastomer. For instance, and more particularly when the polymeric film comprises PLA or PBS, the water based emulsion or dispersion of the primer layer may be selected from the product MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606 or Epotal® P100 ECO.

[0099] In another embodiment, the coating **A** may comprise a primer layer of a water based emulsion or dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane elastomer (e.g. MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606 or Epotal® P100 ECO) underneath a layer of an extruded film of PLA.

[0100] In a further embodiment, the coating **A** may comprise a primer layer of the product MICA R-1509-B and a layer of an extruded film of an Ecovio® product.

[0101] In another particular embodiment, the coating **A** may face the goods in the container erected from the coated substrate, thereby forming the interior coating. In addition, if the container to be erected from the coated paper-based substrate is intended to be used for foodstuff packaging, the polymeric film of coating **A** may advantageously comprise a food grade polymer. The polymeric film may comprise pigments, dyes, anti-foaming agents, dispersing agents, thickening agents, pH control agents, antioxidant agents, antimicrobial agents (SANAFOR® for example), or ethylene absorbers, such as carbon, alumina, clay and the like.

Coating B

[0102] The coating **B** of the coated paper-based substrate generally comprise at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer. The coating layer **B** may comprise two layers obtained by applying two aqueous dispersions of at least one polymer or copolymer. The composition of the aqueous dispersions of the two layers may be the same or may be different.

According to one embodiment, the polymer(s) or copolymer(s) may provide a water and/or moisture barrier to the second surface of the paper-based substrate once coated. According to a further embodiment, the polymer(s) or copolymer(s) of the coating **B** may provide oil and/or grease barrier to the paper-based substrate. The term "barrier" as used herein should not be solely limited as strictly preventing passage of water and/or moisture and/or oil and/or grease throughout the paper-based substrate. The polymers or copolymers in the coating **B** may be chosen to impart some water and/or moisture resistance and eventually oil and/or grease resistance to the paper-based substrate's surface. As such, the polymers or copolymers may be selected to limit or even avoid progression of water and/or moisture and eventually of oil and/or grease throughout the paper-based substrate.

[0103] In one embodiment, the aqueous dispersion of coating **B** may comprise a polymer or copolymer selected from an acrylic- or acrylate-based polymer or copolymer, polyester, plant oil-based polyester resin, polyurethane, polyvinylidene chloride (PVDC), paraffinic wax, styrene-butadiene copolymer, starch, dextrin, LDPE, HDPE, PLA, nylon, polypropylene and mixtures thereof. Examples of acrylic- or acrylate-based polymers or copolymers include styrene-acrylic copolymers and styrene-acrylic-acrylonitrile copolymers. An example of polyester is a polyethylene terephthalate (PET).

[0104] In some embodiments, the aqueous dispersion may further comprise mineral charges, such as for example calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black. The aqueous dispersion of the coating **B** may also comprise other additives such as pigments, dyes, anti-foaming agents, dispersing agents, thickening agents, pH control agents, antioxidant agents, antimicrobial agents, ethylene absorbers, etc.

[0105] Examples of commercial compounds which could be used for the aqueous dispersion for the coating **B** include the products EvCote® Barrier 3000 or 3050

(Akzo Nobel), Epotal® 100 (BASF), Aqualene® 5050 (Aquabased), Serfene™ 546 (DOW), Actega® X22 (Altana), Michem®Coat 81 (Michelman), Vaporcoat 2200R Michelman, Barrier-Grip R5701A (IGI Enviro-Coatings), Spectra-Guard™ 3003, 3005 or 3007BK (Spectra-Kote), Ulterion® 535 OPV, Ulterion® OPV 537, Ulterion® 323 BC, HydraBan® products (Michelman), Aquaban® products (IGI), BYK Aquacer® products (BYK), MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF) and Acronal® S504 (BASF), EPOTAL S440, etc.

[0106] In a particular embodiment, the aqueous dispersion used for the coating **B** may include MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF), Acronal® S504 (BASF), Epotal® 100 (BASF), Actega® X22 (Altana), Aquaban® products (IGI), and Barrier-Grip R5701A (IGI Enviro-Coatings).

[0107] In another embodiment, the aqueous dispersion of the coating **B** is identical to the aqueous dispersion of the primer layer of the coating **A**.

[0108] As previously mentioned, the coating **B** may, in some embodiments, further comprise an adhesion promotor, which will enhance heat sealing between the coatings **A** and **B** of the coated paper-based substrate. When an adhesion promotor is used, it may be added to the aqueous dispersion before application thereof to the basis substrate, or the adhesion promotor may be applied separately, as an additional layer, onto the polymer or copolymer layer resulting from application of the aqueous dispersion.

[0109] Examples of adhesion promoters include, without limitation, PEI, EMA, EEA or derivatives thereof, or any other known adhesion promoting agents. The adhesion promotor may also be LDPE or wax emulsion. The adhesion promoters may be provided as water-based dispersions or waterborne solutions.

[0110] In some embodiments, the coating **B** may present a surface tension which varies from about 15 to about 60 dynes/cm. The surface tension of the coating **B**

may be above about 38 dynes/cm in some applications, for instance if the surface is to be printed by flexography.

[0111] As mentioned above, the coating **B** is heat sealable to the coating **A**. In addition, the coating **B** may present the following optional features, which may be combined or not. It may be water and/or moisture resistant, oil and/or grease resistant, printable (e.g. flexo printable, offset printable), coldset gluable, hotmelt gluable, anti-slip, anti-abrasive, tinted with different colors or pearlescent. The coating **B** may also present heat and/or cold insulation capabilities; it may be corrosion inhibitor, antistatic conductive/dissipative/resistive, cohesive, pressure sensitive, thermal indicator (color change upon ambient temperature).

Coating combinations

[0112] As mentioned above, one important feature of the coating **A** and coating **B** applied onto the paper-substrate, is that they are heat sealable to each other. Indeed, when erecting the container using the coated paper-substrate, a portion of the coating **B** will be superimposed to a portion of the coating **A**, and the superimposed portions will be “glued” together using heat. A good adhesion between the two coatings, through heat-sealing, will maintain integrity of the container in use.

[0113] The features of each one of the coatings **A** and **B** have been described above. However, Table 2 below provides some examples of combinations of coatings **A** and **B** in the coated paper-based substrate. Table 2 also mentions whether an adhesion promotor may be used for the coating **B** in these example combinations.

Table 2:

Coating A	Coating B
Polymeric film or laminated	Polymer or copolymer in the aqueous dispersion

foil	
PE (LDPE, HDPE, mLLDPE, or their mixtures)	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • polyurethanes • PVDC • styrene-butadiene copolymer
PLA	• Acrylic or acrylate-based polymers • styrene-butadiene copolymer
PBS	• Acrylic or acrylate-based polymers • styrene-butadiene copolymer
PP	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • PVDC • styrene-butadiene copolymer • Polypropylene emulsion
PET	• Acrylic or acrylate-based polymers • polyurethanes • PVDC • styrene-butadiene copolymer
Nylon	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • polyurethanes • PVDC • styrene-butadiene copolymer
PVDC	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • polyurethanes • styrene-butadiene copolymer
metallized film	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • polyurethanes • PVDC • styrene-butadiene copolymer • Ethylene emulsion
Aluminium foil	• Acrylic or acrylate-based polymers • polyesters (e.g. PET) • polyurethanes • PVDC • styrene-butadiene copolymer • Ethylene emulsion

[0114] In some embodiments, the coating **B** may comprise an adhesion promoter for promoting heat sealing between the coatings **A** and **B** of the coated paper-

based substrate. Examples of adhesion promoters include, without limitation, PEI, EMA, EEA or derivatives thereof, or any other known adhesion promoting agents. The adhesion promoter may also comprise LDPE or wax emulsion. The adhesion promoter may be added to the aqueous dispersion or applied separately. The adhesion promoter may be selected according to its compatibility with the polymer(s) or copolymer(s) of the aqueous dispersion, as the person skilled in the art would be able to determine.

[0115] In some particular embodiments, the coated paper-based substrate may comprise the combinations of coatings **A** and **B** as mentioned in Table 3.

Table 3:

Coating A		Coating B	
Extruded or laminated polymeric film	Primer	Polymer or copolymer in the aqueous dispersion	Adhesion promotor
PE (LDPE, HDPE, mLLDPE, or their mixtures) <i>Examples:</i> MarFlex® 1017 DOW™ Polyethylene 722	PEI <i>Examples:</i> Adcote® 313, Michem® Flex P1852, MICA A-131-X	LDPE, mLLDPE, HDPE emulsion. Wax emulsion, Polyethylene oxide emulsion, paraffin wax emulsion, cationic latex <i>Examples :</i> Vaporcoat 2200R Spectra-kote 3007BK Progressive V1129 Envirocoating EC403 Michelman X300 Ulterion 537OPV	BYK Aquacer series Aquaban series Hydraban 708 PEI <i>Examples:</i> Adcote® 313, Michem® Flex P1852, MICA A-131-X
PLA <i>Examples:</i> Ecovio® products	Styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer, polyester-polyurethane elastomer with or without blends with inorganic compounds	Styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer, styrene-butadiene copolymer, with or without blends with inorganic compounds	Styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer, styrene-butadiene copolymer, with or without blends with inorganic

	<i>Examples:</i> MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606 or Epotal® P100 ECO	<i>Examples:</i> Spectra-Guard 3000 Spectra-Guard 3003 IGI Barrier Grip R5701A Michemcoat 81 Michemcoat 50,51,55 Progressive V1120 Aqualene 5050 Actega X22 Epotal S440 MICA R-1509-B Acronal® S 504 NA	compounds <i>Examples:</i> MICA R-1509-B Acronal® S 504 NA
PBS <i>Examples:</i> BioPBS™ FZ91, FZ71 or FD92	Styrene-acrylic copolymer, styrene- acrylic-acrylonitrile copolymer, styrene- butadiene copolymer, polyester-polyurethane elastomer with or without blends with inorganic compounds <i>Examples:</i> MICA R-1509-B Acronal® S 504 NA Styronal® BN 4606	Styrene-acrylic copolymer, styrene- acrylic-acrylonitrile copolymer, styrene- butadiene copolymer with or without blends with inorganic compounds <i>Examples:</i> Spectra-Guard 3000 Spectra-Guard 3003 IGI Barrier Grip 5701A Michemcoat 81 Michemcoat 50,51,55 Progressive V1120 Actega X22 Aqualene 5050 Epotal S440 MICA R-1509-B Acronal® S 504 NA	Styrene-acrylic copolymer, styrene-acrylic- acrylonitrile copolymer, styrene-butadiene copolymer with or without blends with inorganic compounds MICA R-1509-B Acronal® S 504 NA
PET <i>Examples:</i> EvCote® Barrier 3000 or 3050	Polyurethane, polyethylene acrylic acid (EAA), ethylene copolymer resin dispersion <i>Examples:</i> MICA I-372-C MICA G-1092	PET emulsions, Polyurethane emulsions <i>Examples:</i> EvCote® Barrier 3000 or 3050	Polyurethane, polyethylene acrylic acid (EAA), ethylene copolymer resin dispersion <i>Examples:</i> MICA I-372-C MICA G-1092

[0116] The coating combinations reported in Tables 2 and 3 are provided as examples only, and a person skilled in the art would be able to prepare a coated substrate with any other possible coatings, having the features as described herein.

Process

[0117] Various embodiments of a process for obtaining the coated paper-based substrate described herein will now be described.

[0118] Fig. 2 illustrates a first embodiment of the process for coating the cellulosic fiber-based substrate with the coating **A** and the coating **B**. More particularly, the embodiment shown in Fig. 2 would allow preparing the coated substrate illustrated in Fig. 1A. Hence, in this first embodiment, the process may comprise a first step (100) of applying the aqueous dispersion of the polymer(s) or copolymer(s) to the second surface of the paper-substrate, followed by step (110) of drying the aqueous dispersion, thereby forming layer (16) of the coating **B**. In step (120), the layer of the polymeric film or laminated foil is applied on the first surface of the paper-based substrate, thereby forming layer (14) of the coating **A**. The polymeric film, depending on its nature, may be applied by extrusion or by lamination. While most of the polymeric films used for the coating **A** will usually be applied by extrusion in an extruder, there are polymeric films such as nylon, PET or metallized films, which may however be applied by lamination.

[0119] When the polymeric film of coating **A** comprises PE, PLA, PBS, PP, EvOH or PVDC, it is applied by extrusion onto the substrate's surface. When the polymeric film is PET, Nylon or a metallized film, lamination is employed for applying such films to the substrate's surface. Foil is also applied by lamination. In a particular embodiment, where the coating **A** comprises a laminated polymeric

film or foil, a PE film may be laminated on the substrate's surface before lamination of the polymeric film or foil.

[0120] In a particular embodiment, the coating **A** comprises PE (mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA and is applied by extrusion on the substrate's surface. It is worth mentioning that the polymeric film may be applied by extrusion in one, two or three layers of PE, PBS or PLA. For each layer, the nature of the PE, PBS or PLA may be the same or different. For example, when PLA is used for the coating **A** (the same would apply for PE or PBS), one extruded layer of PLA, two extruded layers of PLA or three extruded layers of PLA, each layer being of the same PLA or of different PLAs, may be applied to the substrate's surface. In one embodiment, three extruded layers of PLA (or PE or PBS) are applied for the polymeric film of coating **A**. The three extruded layers may comprise either the same PLA (or PE or PBS), or two different types of PLA (or PE or PBS). In the case where two different types of PLA are applied, let's say PLA1 and PLA2, the PLA layers may be extruded according to one of the the following combinations: (PLA1)(PLA1)(PLA2) or (PLA1)(PLA2)(PLA1) or (PLA2)(PLA1)(PLA1) or (PLA1)(PLA2)(PLA2) or (PLA2)(PLA1)(PLA2) or (PLA2)(PLA2)(PLA1). These possible combinations would also apply for two different PE or two different PBS.

[0121] Figs. 3 to 5 illustrate further embodiments of the process for coating the cellulosic fiber-based substrate with the coating **A** and the coating **B**. More particularly, the embodiments shown in Figs. 3 to 5 would allow preparing the coated substrate illustrated in Fig. 1B.

[0122] In Fig. 3, the first step (200) comprises forming layer (16) of the coating **B** by application of the aqueous dispersion of the polymer(s) or copolymer(s) to the second surface of the paper-substrate, followed by step (210) of drying the aqueous dispersion. Steps (220) to (240) illustrate application of coating **A**. In step (220) the primer layer (18) of a water based emulsion, dispersion or solution of polymer(s) or copolymer(s) is applied on the first surface of the paper-based substrate. Then, the

primer layer (18) is dried in step (230). The next step (240) comprises applying layer (14) of the polymeric film or laminated foil onto the primer layer (18). It is worth reminding that the aqueous dispersion applied to the second surface for forming coating **B** can be the same aqueous dispersion as the one used to form the primer layer of the coating **A**.

[0123] In Fig. 4, the primer layer (18) of the coating **A** is applied on the first surface of the substrate in step (300), and then dried in step (310). The layer (16) of the coating **B** is then formed by application of the aqueous dispersion of the polymer(s) or copolymer(s) to the second surface of the paper-substrate in step (320), followed by step (330) of drying the aqueous dispersion. The next step (340) comprises applying layer (14) of the polymeric film or laminated foil onto the primer layer (18).

[0124] In the embodiments represented in Figs. 3 and 4, the aqueous dispersion of the coating **B** and the primer layer of the coating **A** are applied and dried in series, before application of the polymeric extrusion layer (or laminated layer) onto the primer layer. The embodiments of the process represented in Figs. 3 and 4 can be more particularly used when the aqueous dispersions of the coating **B** and of the primer layer are different, but they could be also used if the aqueous dispersions are the same. However, when the aqueous dispersions of the coating **B** and of the primer layer are the same, it may be advantageous to apply these dispersions simultaneously on both surfaces of the paper-substrate, as shown in Fig. 5. In Fig. 5, step (400) thus comprises applying the aqueous dispersion of polymer(s) or copolymer(s) on both the first and second surface simultaneously. Then, in step (410) the aqueous dispersion is dried on both surfaces. Hence, the primer layer (18) of the coating **A** and the layer (16) of the coating **B** can be formed simultaneously. In the last step (420), the polymeric extrusion layer (or laminated layer) is applied onto one of the surfaces of the paper-substrate coated with the aqueous dispersion.

[0125] Even though Figs. 2 to 5 do not expressly show a step of applying an adhesion promotor layer (20) onto the layer (16) obtained by application of the

aqueous dispersion of polymer(s) or copolymer(s) onto the second surface, it is apparent to a person skilled in the art that such step, if required, could be carried out between steps 110 and 120 of Fig. 2, between steps 210 and 220 of Fig. 3, between steps 330 and 340 of Fig. 4 or between steps 410 and 420 of Fig. 5. Generally, if an adhesion promotor is present as a separate layer onto the layer (16) of the coating **B**, it is applied as a water-based dispersion or waterborne solution and then is dried before application of the polymeric extrusion layer or laminated layer on the opposite surface.

[0126] Application of the aqueous dispersions/emulsions/solutions, used for the coating **B**, the primer layer of the coating **A**, and the adhesion promotor layer if present, may be carried out using any known apparatus known in the art. For example, the aqueous dispersions/emulsions/solutions can be applied using a rod coater, Invo-coater, a blade coater, an air knife coater, a spray coater, a curtain coater, a slot die coater, an iso-bar rod coater, a gravure coater, a reverse gravure coater, roll coater or by flexography.

[0127] In an embodiment, the coating **B** comprises two layers obtained by applying two aqueous dispersions, comprising polymer(s) or copolymer(s) capable of providing a water and/or moisture barrier to the second surface of the paper-based substrate once coated. The composition of the aqueous dispersions of the two layers may be the same or may be different. In an embodiment, two successive applications are carried out to form the two layers of aqueous dispersion.

[0128] In a specific embodiment, a rod coater or a blade coater are used for applying the aqueous dispersions/emulsions/solutions. When the substrate is coated on both surfaces with an aqueous dispersion, which may be the same or different, to form the primer layer (18) and layer (16), two rod/blade coaters in series may be used, with a dryer placed between the first and second coaters to dry the first applied aqueous dispersion before application of the second one. Of

course, a drier is also present after the second coater to dry the second applied aqueous dispersion.

[0129] Where the same aqueous dispersion is applied on both surfaces of the substrate, one could use coaters in series as explained above, or one could use a single coater capable of applying the aqueous dispersion at the same time on both surfaces of the substrate (see Fig. 5). For instance, the aqueous dispersion could be applied using a twin sizer, twin rod coater or twin blade coater.

[0130] The aqueous dispersion of the coating **B**, and the primer of the coating **A** when applied to the first surface, can be applied to the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 20 g/m². In an embodiment, the aqueous dispersion and/or the primer layer are applied to the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 10 g/m².

[0131] When the aqueous dispersion of the coating **B** comprises a PE, it may be applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating from about 0.05 g/m² or about 7 g/m². When the aqueous dispersion of the coating **B** comprises a PLA, it may be applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating from about 0.05 g/m² or about 7 g/m², or from 2 g/m² or about 7 g/m².

[0132] When the primer layer applied to the first surface comprise a PEI, a dried quantity of less than about 1 g/m² and even from about 0.05 to about 0.20 g/m² may be sufficient. If the primer layer comprises PLA, a dried quantity of about 1 to about 5 g/m² or from about 2 to about 4 g/m² may be sufficient to provide a good adhesion of the polymeric film or laminated foil applied thereon.

[0133] The aqueous dispersion of the coating **B**, and the primer of the coating **A** when applied to the first surface, can be dried to reach a temperature on the surface of the coated substrate, at the exit of the drier, of from about 50°C to about

85°C. For instance, the temperature on the surface of the coated substrate at the exit of the drier can be from about 70°C to about 85°C. The drying conditions are set up to remove as much moisture as possible from the coated substrate while avoiding the formation of bubbles in the coating. A person skilled in the art will be able to adjust the temperature to optimize the drying.

[0134] The polymeric film applied to the first surface to form the coating **A** can be applied, depending on its nature as explained above, by extrusion or lamination. If a foil is to be applied, lamination is used.

[0135] In an embodiment, the polymeric film may be applied in a quantity from about 2.5 g/m² to about 250 g/m². In another embodiment, the polymeric film may be applied in a quantity from about 5 g/m² to about 30 g/m².

[0136] In one embodiment, the polymeric film is formed by providing the polymer(s) in the form of granules to the extruder. If the polymeric film comprises additives (e.g. mineral charges), a masterbatch polymer(s)/additives can be provided to the extruder. Alternatively, the granules of each of the constituents of the polymeric film can be provided separately to the extruder. In the extruder screw, the granules are then heated to allow melting thereof thereby forming a "liquid", somewhat viscous, coating which can then be extruded as a film through a die or extrusion head, directly to the surface of the cellulosic fiber based substrate or onto the primer layer if present. Another possible extrusion process utilizes two or more extruders to melt and deliver two or more constituents of the coating to a single extrusion head (die) which will extrude the coating as a film to the substrate surface. The heating temperature in the extruder is determined by the nature of the coating constituents and their melting temperature. A person skilled in the art will be able to determine the conditions to obtain a good quality film at the exit of the extrusion head.

[0137] As previously mentioned, in some embodiments, the polymeric film may be applied by lamination, such as when the film comprises PET, Nylon or is a metallized film. In some embodiments, the coating **A** comprises a foil, which may also be applied by lamination. In a particular embodiment, where the coating **A** comprises a laminated polymeric film or a laminated foil, a PE film may be laminated on the substrate's surface before lamination of the polymeric film or foil. The PE film may comprise EMA or EEA. In an embodiment, the PE film comprises 75wt% LDPE and 25wt% EMA or EEA. In an embodiment, the PE is melted and applied on the substrate's surface using a laminator. The polymeric film is then applied against the PE film, while the PE is still in melted state. The polymeric film is applied against the PE film at the nip pressure point of the laminator, i.e. the contact point between a nip roll and a chill roll of the laminator. The pressure created at the nip pressure point brings the PE film and the polymeric film into intimate contact, while cooling the PE film. The pressure also promotes good adhesion of the PE to the substrate's surface.

EXAMPLES

Example 1: impact of the primer on the adhesion of PLA

[0138] A trial was performed to determine the impact of the use of a primer coating made of a waterborne extrusion primer for polyester on the adhesion of a PolyLactic Acid (PLA). In this trial, about 4 g/m² dry of MICA R-1509-B (from Mica Corporation) was applied as a pre-coat on the board side (not on the clay coated side) of two boards (MetsäBoard™ 17 mil and Atlas™ 21 mil). Some areas were coated with MICA R-1509-B and some not. Scrapers were used between the application roll and the sheet to create uncoated and coated stripes. Then, PLA (Ecovio® PS 1606 from BASF) was applied on areas with and without MICA R-1509-B.

[0139] For the sample of PLA coated MetsäBoard™ 17 mil, the PLA film is hard to delaminate from the portions of the substrate which have not been pre-coated with MICA, but when it does, only a weak quantity of substrate's fibers are teared apart (qualitative delamination tests). On the portions of the sample pre-coated with MICA, the PLA film adhesion is very strong.

[0140] For the sample of PLA coated Atlas™ 21 mil, the PLA adhesion to the portions of the substrate which have not been pre-coated with MICA is lower than adhesion to the portions of the substrate pre-coated with MICA, in the tested condition. On portions of the substrate pre-coated with MICA, the PLA has a strong adhesion.

Example 2: impact of coating B on the adhesion of PLA

[0141] Trials were performed to determine the impact of coatings on both surfaces of the substrate on the adhesion of a PolyLactic Acid (PLA). In those trials, MICA R-1509-B (from Mica Corporation) was applied as a pre-coat on the board side of boards (MetsäBoard™ 12pt, 215g/m², and 18pt, 310g/m², hereafter referred to as Metsäboards). Then, PLA (Ecovio® PS 1606 from BASF) was applied on the pre-coated MICA R-1509-B.

[0142] To determine the impact a coating applied to the other side of the substrate (coating B) on the adhesion of PLA, Metsäboards with or without coating were applied against the Metsäboards coated with pre-coating MICA R-1509-B and PLA (coating A). Metsäboards with coating A and Metsäboards with or without coating B were heat sealed, with coating A and B facing each other when present, under various temperature and pressure conditions, and during different periods of time. Two operational conditions were tested: “cup stock” condition (high pressure and temperature during a short time) or “Roll header” conditions (lower pressure and temperature during a longer time). Two quantities of coating and two basis weight of substrate were tested. The coating of the second board (coating B) was also

MICA R-1509-B. Therefore in those trials, the primer and the coating B are the same (i.e. MICA R-1509-B). The conditions and results are described in Table 4.

Table 4:

Coating A	Coating B	Conditions Basis weight Pressure Temperature Time Coating quantity	Adhesion
PLA-MICA	MICA	Cup stock 215g/m ² 24 psi 375°C 1s 4g/m ²	Strong
PLA-MICA	MICA		Medium-Strong
PLA-MICA	None		Medium
PLA-MICA	None		Medium
PLA-MICA	MICA	Roll header 215g/m ² 5 psi 191°C 7s 4g/m ²	Strong
PLA-MICA	None		Very weak
PLA-MICA	MICA	Cup stock 310g/m ² 24 psi 375°C 1s 2g/m ²	Strong
PLA-MICA	None		Very weak
PLA-MICA	MICA	Roll header 310g/m ² 5 psi 191°C 7s 2g/m ²	Strong
PLA-MICA	MICA		Strong
PLA-MICA	None		None

[0143] The adhesion of PLA was higher when using the substrates that have been coated with MICA R-1509-B (i.e. with a coating B) than the substrates that have not been coated. Those trials show that the use of coatings on both surfaces of the

substrate (or board) improves the adhesion of the PLA for both “Cup Stock” and “Roll header” conditions. It appears that the differences are smaller for “Cup Stock” conditions. That may be explained by the fact that higher temperature and pressure conditions would increase the adhesion of the PLA in any case.

[0144] In addition, the quantity of coating applied on the substrate does not seem to have a very critical impact of the adhesion of the PLA in the range of quantities tested. However, for 2g/m^2 , the impact of the use of a coating on both surfaces (i.e. the presence of coating B) is higher than for 4g/m^2 .

Example 3: Roll blocking tests.

[0145] Rolls of coated paper, because they are generally tightly wound may block when unrolled. “Roll blocking” is a defect where the superposed film layers adhere together. Trials were performed to determine the impact of the quantity of coating and pre-coating applied on the substrate, as well as of the use of a coating on both sides of the substrate, on “Roll blocking”. As for example 2, MICA R-1509-B (from Mica Corporation) was applied as a pre-coat on the board side of boards (MetsäBoard™ 12pt, 215g/m^2 , and 18pt, 310g/m^2 , hereafter referred to as Metsäboards). Then, PLA (Ecovio® PS 1606 from BASF) was applied on the pre-coated MICA R-1509-B.

[0146] Second Metsäboards with or without coating B were applied against Metsäboards coated with pre-coating MICA R-1509-B and PLA (coating A), and the combined Metsäboards were submitted to “blocking condition” (with lower temperature and pressure and during a larger time than for “cup stock” or “Roll header” conditions). Two quantities of PLA and two basis weights of substrate were tested. The coating of the second Metsäboard (coating B) was also MICA R-1509-B. The conditions and results are described in Table 5.

Table 5:

Coating A	Coating B	Conditions Basis weight Pressure Temperature Time Coating quantity	Blocking
PLA-MICA	MICA	215g/m ² 5 psi 70°C 5 min 4g/m ²	Strong
PLA-MICA	MICA		Medium-Strong
PLA-MICA	None		Weak
PLA-MICA	MICA	310g/m ² 5 psi 70°C 5 min 2g/m ²	None-Weak
PLA-MICA	MICA		Weak
PLA-MICA	None		None-Weak

[0147] According to the results of Table 5, “Roll blocking” is lower, and may even be absent, for substrates coated with 2g/m² of coating than for substrates coated with 4g/m² of coating.

[0148] The above-described embodiments and examples are considered in all respect only as illustrative and not restrictive, and the present application is intended to cover any adaptations or variations thereof, as apparent to a person skilled in the art. Of course, numerous other modifications could be made to the above-described embodiments without departing from the scope of the invention, as apparent to a person skilled in the art.

[0149] The scope of the invention is therefore intended to be limited solely by the scope of the appended claims.

CLAIMS

- 1- A coated paper-based substrate for manufacturing a container, comprising a cellulosic fiber-based substrate coated on a first surface with a coating A and coated on a second surface with a coating B, wherein
 - the coating A comprises at least one layer of an extruded or laminated polymeric film or of a laminated foil;
 - the coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer capable of providing a water and/or moisture barrier to the second surface of the paper-based substrate once coated;
 - the extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different; and
 - the coating A and the coating B are heat sealable to each other.

- 2- The coated paper-based substrate of claim 1, wherein the polymer or copolymer of the coating B provides a water and/or moisture barrier to the second surface of the paper-based substrate once coated.

- 3- The coated paper-based substrate of claim 2, wherein the polymer or copolymer of the coating B further provides an oil and/or grease barrier to the paper-based substrate.

- 4- The coated paper-based substrate of any one of claims 1 to 3, wherein the aqueous dispersion comprises a polymer or copolymer selected from an acrylic- or acrylate-based polymer or copolymer such as styrene-acrylic copolymer and styrene-acrylic-acrylonitrile copolymer, polyester such as polyethylene terephthalate (PET), plant oil-based polyester resin, polyurethane, polyvinylidene chloride (PVDC), ethylene copolymer resin dispersion, paraffinic wax, styrene-butadiene

copolymer, starch, dextrin, LDPE, HDPE, PLA, nylon, polypropylene and mixtures thereof.

5- The coated paper-based substrate of any one of claims 1 to 4, wherein the aqueous dispersion further comprises mineral charges.

6- The coated paper-based substrate of claim 5, wherein the mineral charges comprise calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.

7- The coated paper-based substrate of any one of claims 1 to 4, wherein the aqueous dispersion is selected from the products EvCote® Barrier 3000 or 3050 (Akzo Nobel), Epotal® 100 (BASF), Aqualene® 5050 (Aquabased), Serfene™ 546 (DOW), Actega® X22 (Altana), Michem®Coat 81 (Michelman), Vaporcoat 2200R Michelman, Barrier-Grip R5701A (IGI Enviro-Coatings), Spectra-Guard™ 3003, 3005 or 3007BK (Spectra-Kote), Ulterion® 535 OPV, Ulterion® 537 OPV, Ulterion® 323 BC, HydraBan® products (Michelman), Aquaban® products (IGI), BYK Aquacer® products (BYK), MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF) and Acronal® S504 (BASF).

8- The coated paper-based substrate of any one of claims 1 to 7, wherein the surface tension of the coating B is from about 15 to about 60 dynes/cm.

9- The coated paper-based substrate of any one of claims 1 to 8, wherein the surface tension of the coating B is above about 38 dynes/cm.

10- The coated paper-based substrate of any one of claims 1 to 9, wherein the layer of the extruded or laminated polymeric film or laminated foil provides an oil and/or grease and/or moisture and/or water barrier to the paper-based substrate once coated.

- 11- The coated paper-based substrate of any one of claims 1 to 10, wherein the extruded or laminated polymeric film comprises a PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PLA, PBS, PP, PET, Nylon, PVDC, EvOH or a metallized film.
- 12- The coated paper-based substrate of any one of claims 1 to 11, wherein the coating A comprises at least one layer of a film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA.
- 13- The coated paper-based substrate of any one of claims 1 to 12, wherein the extruded or laminated polymeric film comprises a food grade polymer.
- 14- The coated paper-based substrate of any one of claims 1 to 13, wherein the extruded or laminated polymeric film further comprises mineral charges.
- 15- The coated paper-based substrate of claim 14, wherein the mineral charges comprise calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.
- 16- The coated paper-based substrate of any one of claims 1 to 15, wherein the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF), PLA Ingeo™ biopolymer (Ingeo), BioPBS™ FZ91, FZ71 or FD92 (PTT MCC Biochem), MarFlex® 1017 (Chevron Phillips) or DOW™ Polyethylene 722 (Dow Plastics).
- 17- The coated paper-based substrate of any one of claims 1 to 16, wherein the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF).
- 18- The coated paper-based substrate of any one of claims 1 to 10, wherein the laminated foil comprises aluminium foil.

19- The coated paper-based substrate of any one of claims 1 to 18, wherein the coating A further comprises a primer layer between the first surface of the cellulosic fiber-based substrate and the layer of the extruded or laminated polymeric film or the laminated foil.

20- The coated paper-based substrate of claim 19, wherein the primer layer comprises a water based emulsion or dispersion of polymers or copolymers selected from acrylic-based polymers, acrylate-based polymers, styrene-butadiene copolymers, styrene-acrylic copolymers, styrene-acrylic-acrylonitrile copolymers, polyethylene imines, functionalized polypropylenes, polyurethanes, polyesters, ethylene-acrylic acid copolymers, modified ethylene copolymers and any mixture thereof.

21- The coated paper-based substrate of claim 19 or 20, wherein the coating A comprises a primer layer of a water based dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane elastomer and a layer of an extruded film of PLA.

22- The coated paper-based substrate of any one of claims 19 to 21, wherein the coating A comprises a primer layer of the product MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606, Epotal® S440 or Epotal® P100 ECO and a layer of an extruded film of PLA.

23- The coated paper-based substrate of any one of claims 19 to 22, wherein the coating A comprises a primer layer of the product MICA R-1509-B and a layer of an extruded film of Ecovio® (BASF).

24- The coated paper-based substrate of any one of claims 1 to 23, wherein the coating B further comprises an adhesion promotor to enhance heat sealing between the coatings A and B.

- 25- The coated paper-based substrate of claim 24, wherein the adhesion promotor is present in the aqueous dispersion.
- 26- The coated paper-based substrate of claim 24, wherein the adhesion promotor is applied as an additional layer onto the polymer or copolymer layer of the coating B.
- 27- The coated paper-based substrate of any one of claims 24 to 26, wherein the adhesion promotor comprises a PEI or a derivative thereof.
- 28- The coated paper-based substrate of any one of claims 24 to 27, wherein the coating A comprises at least one layer of an extruded polymeric film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures) and the adhesion promotor of the coating B comprises a PEI or LDPE or wax emulsions.
- 29- The coated paper-based substrate of any one of claims 1 to 28, wherein the cellulosic fiber-based substrate is a recycled or virgin liner, medium, fine paper, newspaper, chipboard, kraftpak® paper, paperboard, molded pulp, bleached paper board or any other cellulosic fiber-based substrate, wherein the cellulosic fiber-based substrate is optionally coated (e.g. clay coated).
- 30- The coated paper-based substrate of any one of claims 1 to 29, wherein the cellulosic fiber-based substrate has a basis weight from about 40 g/m² to about 1000 g/m².
- 31- The coated paper-based substrate of any one of claims 1 to 30, wherein the cellulosic fiber-based substrate has a basis weight from about 200 g/m² to about 400 g/m².
- 32- A process for preparing a coated paper-based substrate for manufacturing a container, wherein the coated paper-based substrate comprises a cellulosic fiber-

based substrate coated on a first surface with a coating A and coated on a second surface with a coating B, and wherein

- the coating A comprises at least one layer of an extruded or laminated polymeric film or of a laminated foil;
- the coating B comprises at least one layer obtained by applying an aqueous dispersion of at least one polymer or copolymer;
- the extruded or laminated polymeric film and the polymer or copolymer of the aqueous dispersion are different; and
- the coating A and the coating B are heat sealable to each other;

the process comprising:

- applying the aqueous dispersion of the at least one polymer or copolymer;
- drying the aqueous dispersion to form the at least one layer of the polymer or copolymer; and
- applying by extrusion or lamination the layer of the polymeric film or laminating the foil on the first surface of the paper-based substrate.

33- The process of claim 32, wherein the aqueous dispersion comprises at least one polymer or copolymer capable of providing a water and/or moisture barrier on the second surface.

34- The process of claim 32 or 33, wherein the aqueous dispersion comprises a polymer or copolymer selected from an acrylic- or acrylate-based polymer or copolymer such as styrene-acrylic copolymer and styrene-acrylic-acrylonitrile copolymer, polyester such as polyethylene terephthalate (PET), plant oil-based polyester resin, polyurethane, polyvinylidene chloride (PVDC), ethylene copolymer resin dispersion, paraffinic wax, styrene-butadiene copolymer, starch, dextrin, LDPE, HDPE, PLA, nylon, polypropylene and mixtures thereof.

- 35- The process of any one of claims 32 to 34, wherein the aqueous dispersion further comprises mineral charges comprising calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.
- 36- The process of any one of claims 32 to 35, wherein the aqueous dispersion is selected from the products EvCote® Barrier 3000 or 3050 (Akzo Nobel), Epotal® 100 (BASF), Aqualene® 5050 (Aquabased), Serfene™ 546 (DOW), Actega® X22 (Altana), Michem®Coat 81 (Michelman), Vaporcoat 2200R Michelman, Barrier-Grip R5701A (IGI Enviro-Coatings), Spectra-Guard™ 3003, 3005 or 3007BK (Spectra-Kote), Ulterion® 535 OPV, Ulterion® 537 OPV, Ulterion® 323 BC, HydraBan® products (Michelman), Aquaban® products (IGI), BYK Aquacer® products, (BYK), MICA R-1509-B (Mica Corporation), Styronal® 4606 (BASF), Epotal® S440 and Acronal® S504 (BASF).
- 37- The process of any one of claims 32 to 36, wherein the surface tension of the coating B is from about 15 to about 60 dynes/cm.
- 38- The process of any one of claims 32 to 37, wherein the surface tension of the coating B is above about 38 dynes/cm.
- 39- The process of any one of claims 32 to 38, wherein the layer of the extruded or laminated polymeric film or laminated foil provides an oil and/or grease and/or moisture and/or water barrier to the paper-based substrate once coated.
- 40- The process of any one of claims 32 to 39, wherein the extruded or laminated polymeric film comprises a PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PLA, PBS, PP, PET, Nylon, PVDC or a metallized film.
- 41- The process of any one of claims 32 to 40, wherein the coating A comprises at least one layer of a film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures), PBS or PLA.

- 42- The process of any one of claims 32 to 41, wherein the extruded or laminated polymeric film comprises a food grade polymer.
- 43- The process of any one of claims 32 to 42, wherein the extruded or laminated polymeric film further comprises mineral charges.
- 44- The process of claim 43, wherein the mineral charges comprise calcium carbonate (CaCO_3), clay, mica, talc, titanium dioxide and/or carbon black.
- 45- The process of any one of claims 32 to 41, wherein the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF), PLA Ingeo™ biopolymer (Ingeo), BioPBS™ FZ91, FZ71 or FD92 (PTT MCC Biochem), MarFlex® 1017 (Chevron Phillips) or DOW™ Polyethylene 722 (Dow Plastics).
- 46- The process of any one of claims 32 to 41, wherein the coating A comprises at least one layer of an extruded polymeric film of Ecovio® (BASF).
- 47- The process of any one of claims 32 to 39, wherein the laminated foil comprises aluminium foil.
- 48- The process of any one of claims 32 to 47, further comprising applying a primer layer on the first surface of the paper-based substrate before applying the layer of the polymeric film or laminating the foil.
- 49- The process of claim 48, wherein the primer layer comprises a water based emulsion or dispersion of polymers or copolymers selected from acrylic-based polymers, acrylate-based polymers, styrene-butadiene copolymers, styrene-acrylic copolymers, styrene-acrylic-acrylonitrile copolymers, polyethylene imines, functionalized polypropylenes, polyurethanes, polyesters, ethylene-acrylic acid copolymers, modified ethylene copolymers and any mixture thereof.

- 50- The process of claim 48 or 49, wherein the coating A comprises a primer layer of a water based dispersion of a styrene-butadiene copolymer, styrene-acrylic copolymer, styrene-acrylic-acrylonitrile copolymer or polyester-polyurethane elastomer and a layer of an extruded film of PLA.
- 51- The process of any one of claims 48 to 50, wherein the coating A comprises a primer layer of the product MICA R-1509-B, Michem® Flex P1822, Acronal® S 504 NA, Styronal® BN 4606, Epotal® S440 or Epotal® P100 ECO and a layer of an extruded film of PLA.
- 52- The process of any one of claims 48 to 51, wherein the coating A comprises a primer layer of the product MICA R-1509-B and a layer of an extruded film of Ecovio® (BASF).
- 53- The process of any one of claims 48 to 52, wherein the aqueous dispersion of the primer layer of the coating A and the aqueous dispersion of the coating B are the same and are applied simultaneously on the first surface and second surface of the cellulosic fiber-based substrate, respectively.
- 54- The process of any one of claims 32 to 52, wherein the coating B further comprises an adhesion promotor to enhance heat sealing between the coating A and the coating B.
- 55- The process of claim 54, wherein the adhesion promotor is present in the aqueous dispersion.
- 56- The process of any one of claims 32 to 54, further comprising applying a layer of an adhesion promotor onto the polymer or copolymer layer on the second surface of the paper-based substrate.

- 57- The process of claim 56, further comprising drying the adhesion promotor layer.
- 58- The process of any one of claims 54 to 57, wherein the adhesion promotor comprises a PEI or a derivative thereof.
- 59- The process of any one of claims 54 to 58, wherein the coating A comprises at least one layer of an extruded polymeric film of PE (e.g. mLLDPE, LDPE, HDPE or their mixtures) and the adhesion promotor of the coating B comprises a PEI.
- 60- The process of any one of claims 32 to 59, wherein the cellulosic fiber-based substrate is a recycled or virgin liner, medium, fine paper, newspaper, chipboard, kraftpak® paper, paperboard, molded pulp, bleached paper board or any other cellulosic fiber-based substrate, wherein the cellulosic fiber-based substrate is optionally coated (e.g. clay coated).
- 61- The process of any one of claims 32 to 60, wherein the cellulosic fiber-based substrate has a basis weight from about 40 g/m² to about 1000 g/m².
- 62- The process of any one of claims 36 to 61, wherein the cellulosic fiber-based substrate has a basis weight from about 200 g/m² to about 400 g/m².
- 63- The process of any one of claims 32 to 62, wherein the polymeric film is applied in a quantity from about 2.5 g/m² to about 250 g/m².
- 64- The process of any one of claims 32 to 63, wherein the polymeric film is applied in a quantity from about 5 g/m² to about 30 g/m².
- 65- The process of any one of claims 32 to 64, wherein the aqueous dispersion of the coating B is applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 20 g/m².

- 66- The process of any one of claims 32 to 65, wherein the aqueous dispersion of the coating B is applied to the second surface of the cellulosic fiber-based substrate to reach a quantity of dried coating of at most about 10 g/m².
- 67- A container made from the coated paper-based substrate of any one of claims 1 to 31 or obtained from the process of any one of claims 32 to 66.
- 68- Use of the container of claim 67 for holding cold and/or frozen goods or goods that need to be refrigerated and/or frozen.
- 69- The use of claim 68, wherein the goods include foodstuff.

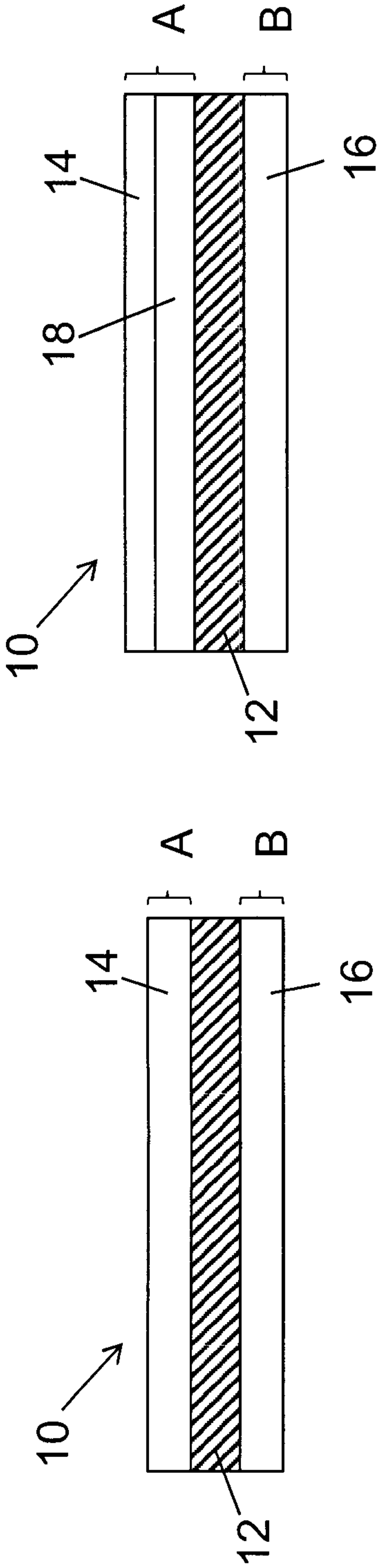


Fig. 1A

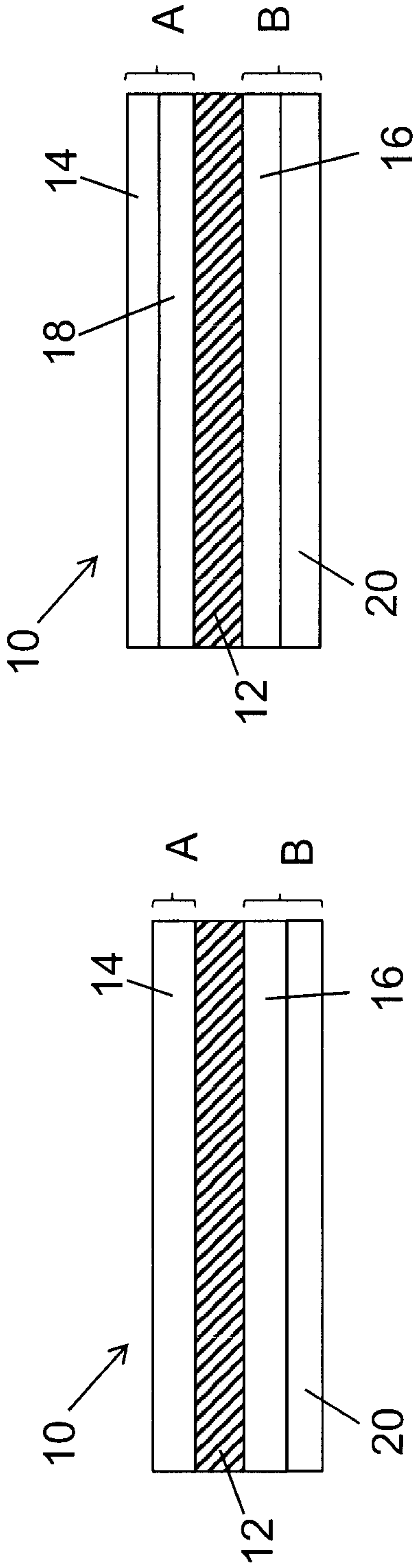


Fig. 1B

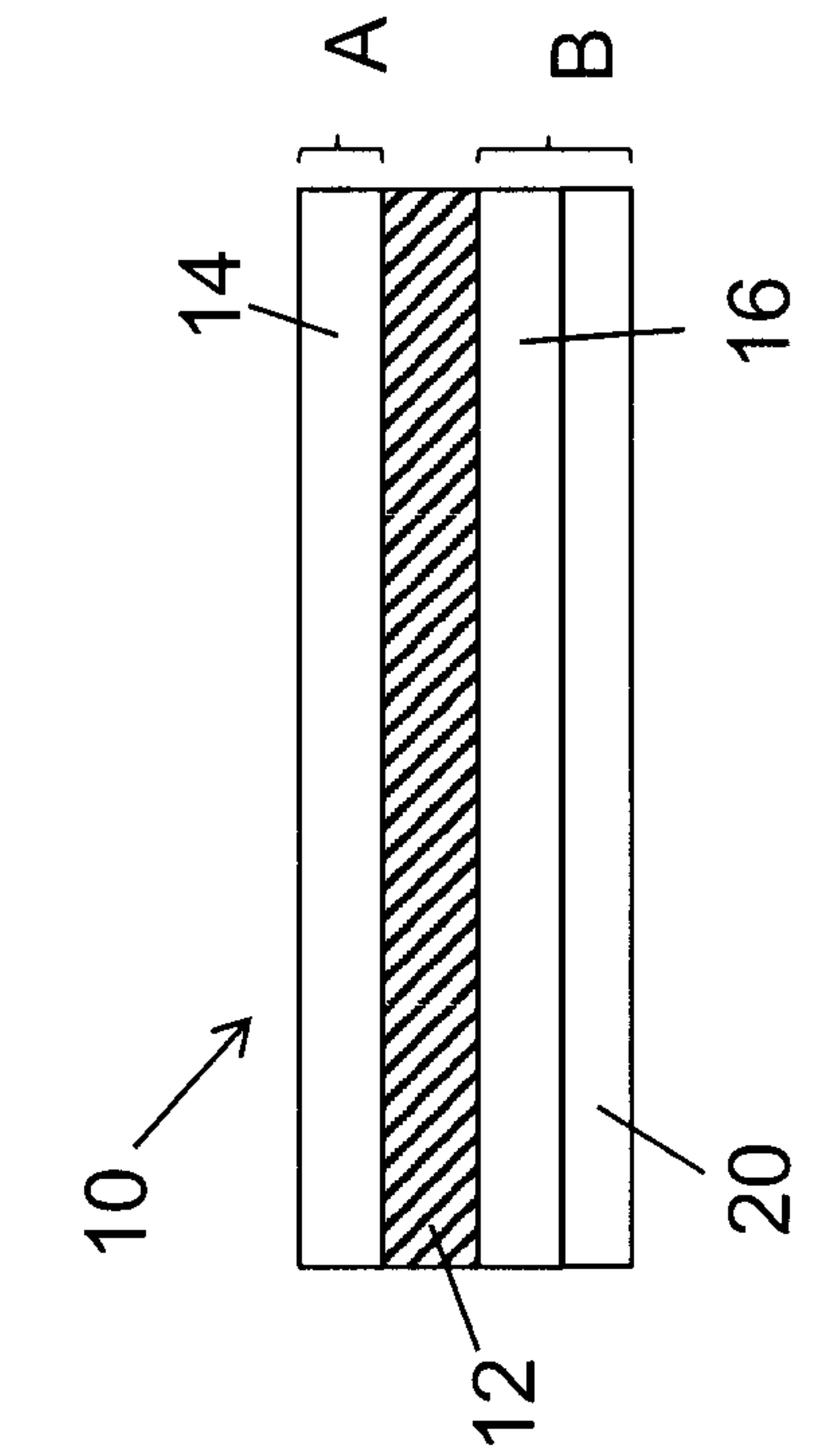


Fig. 1C

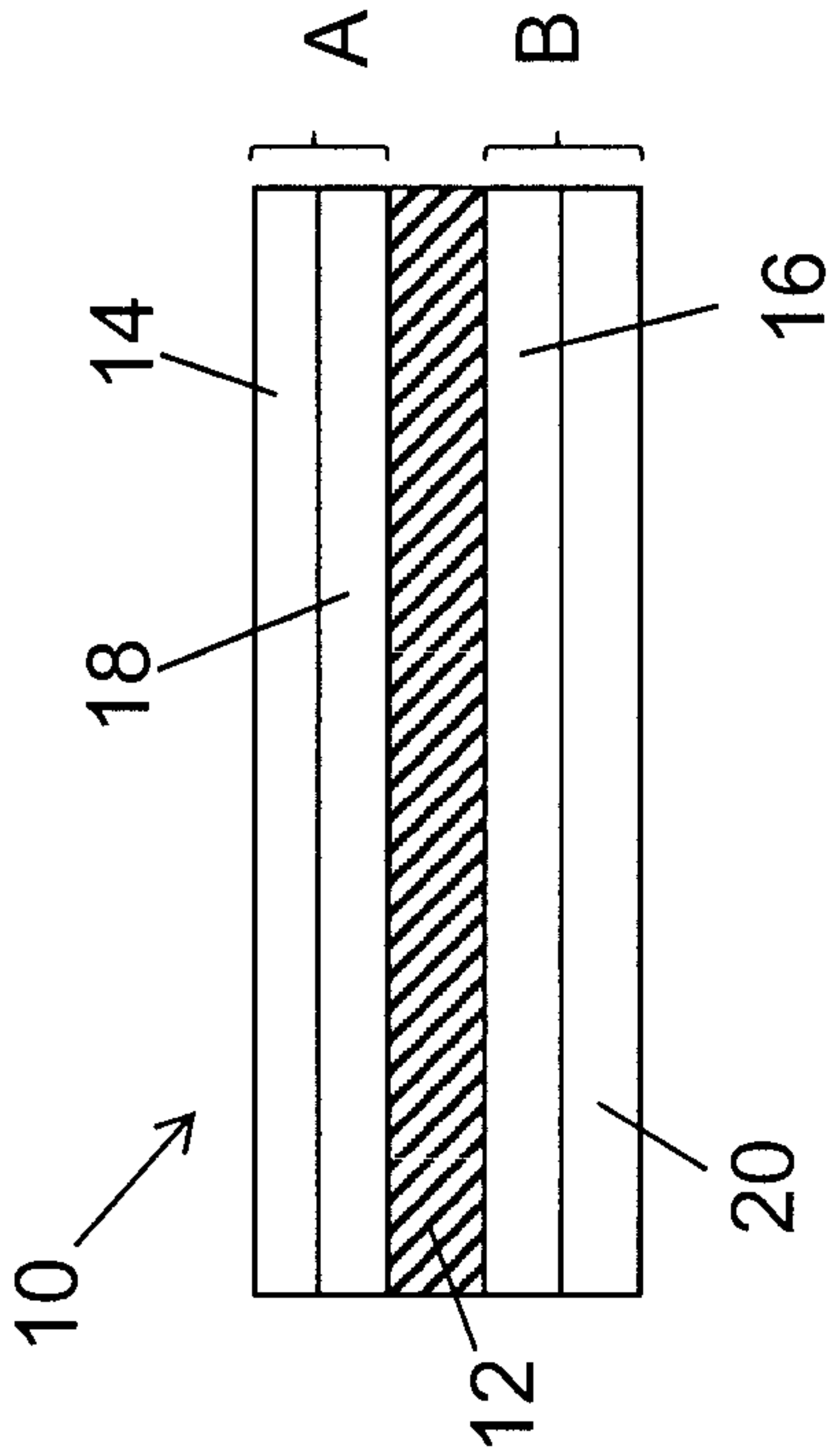
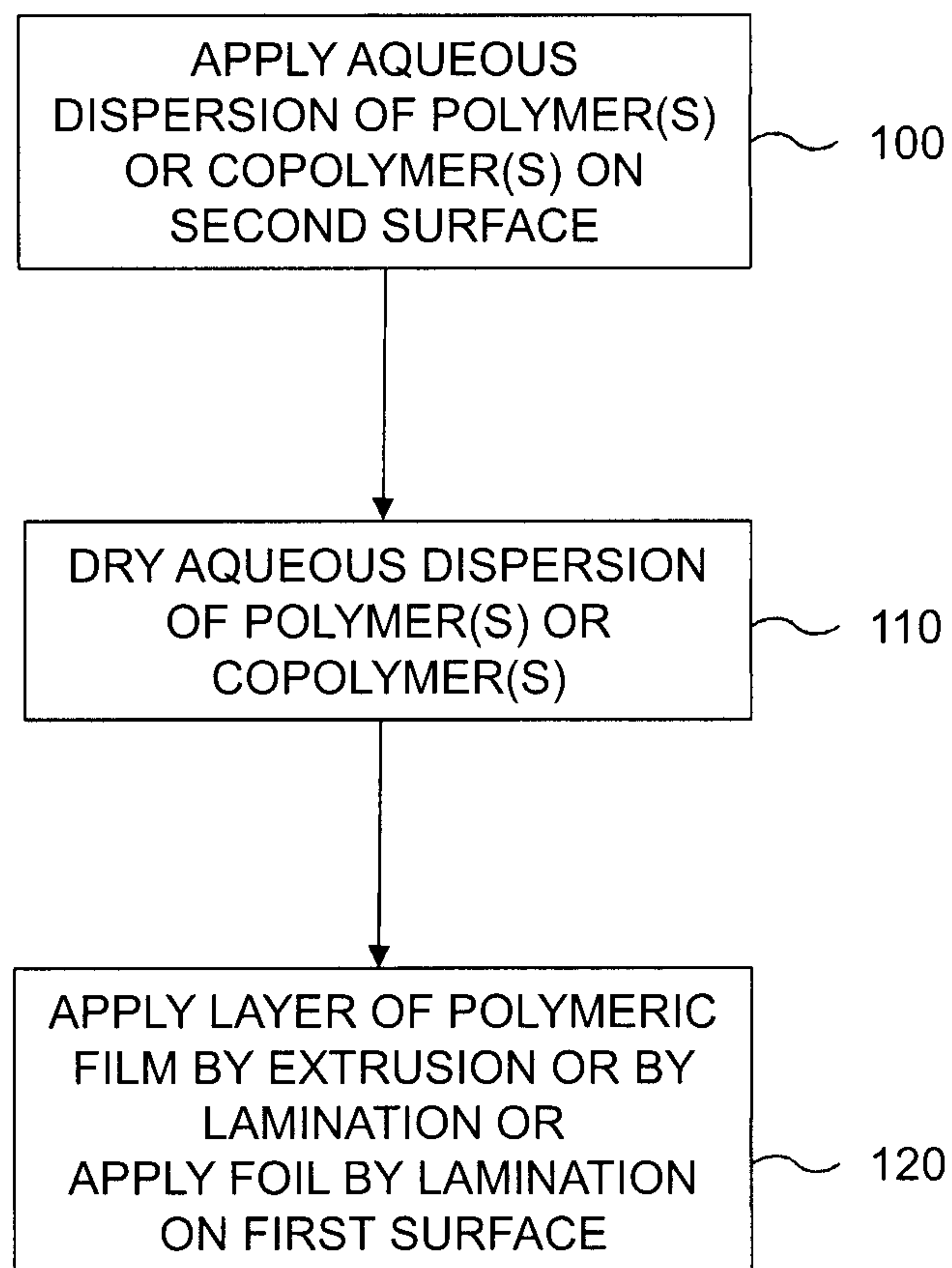
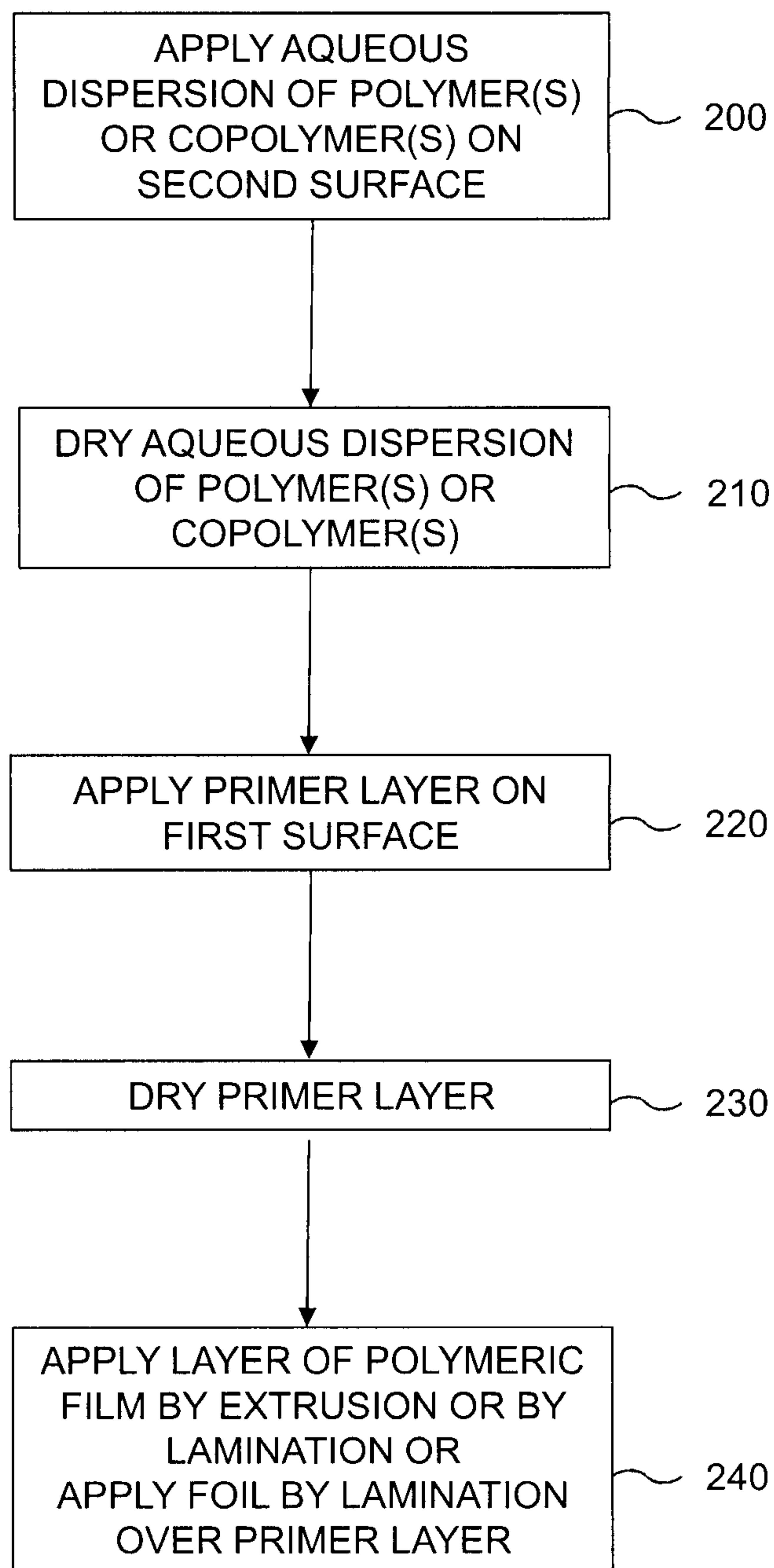
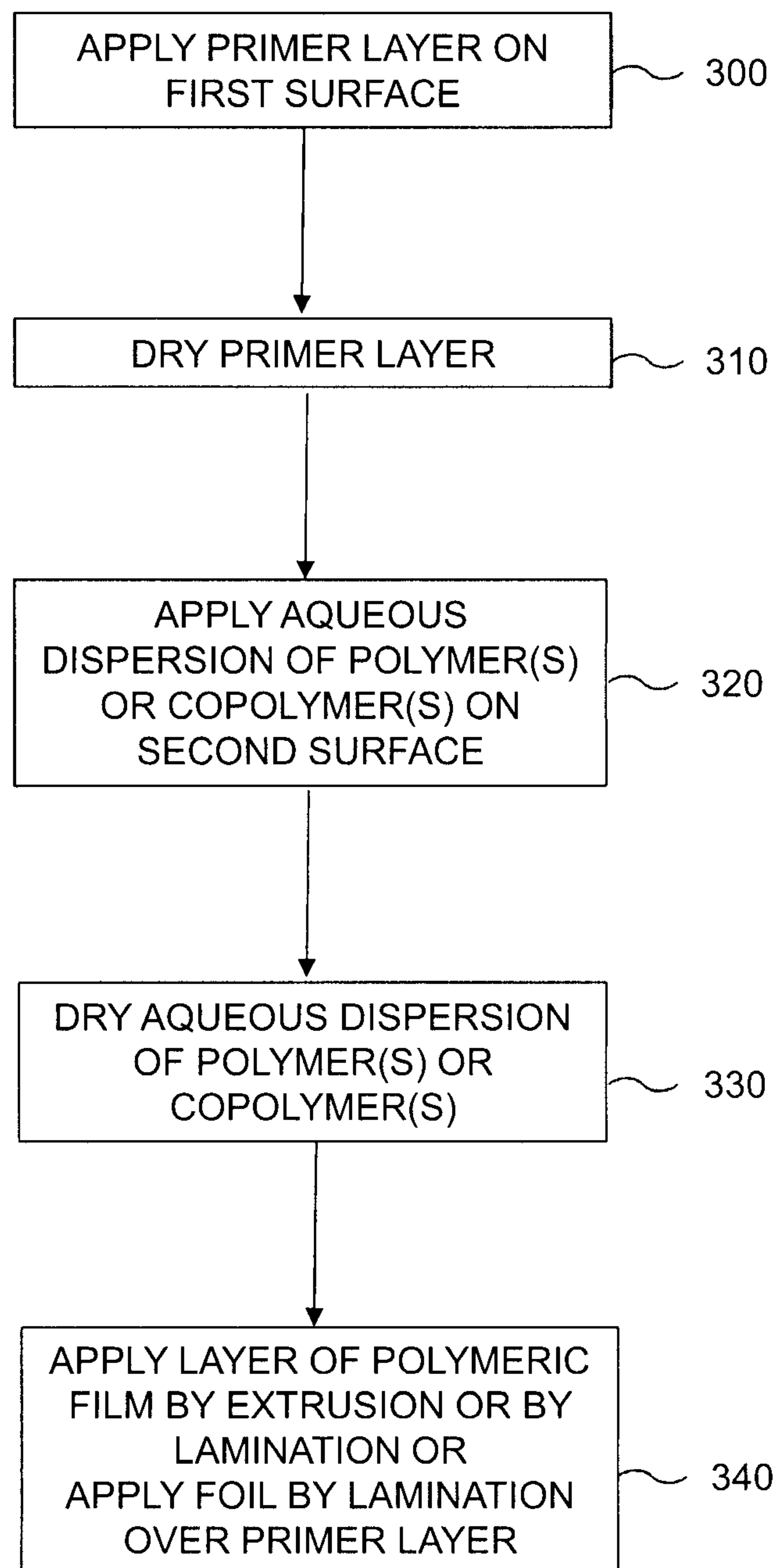
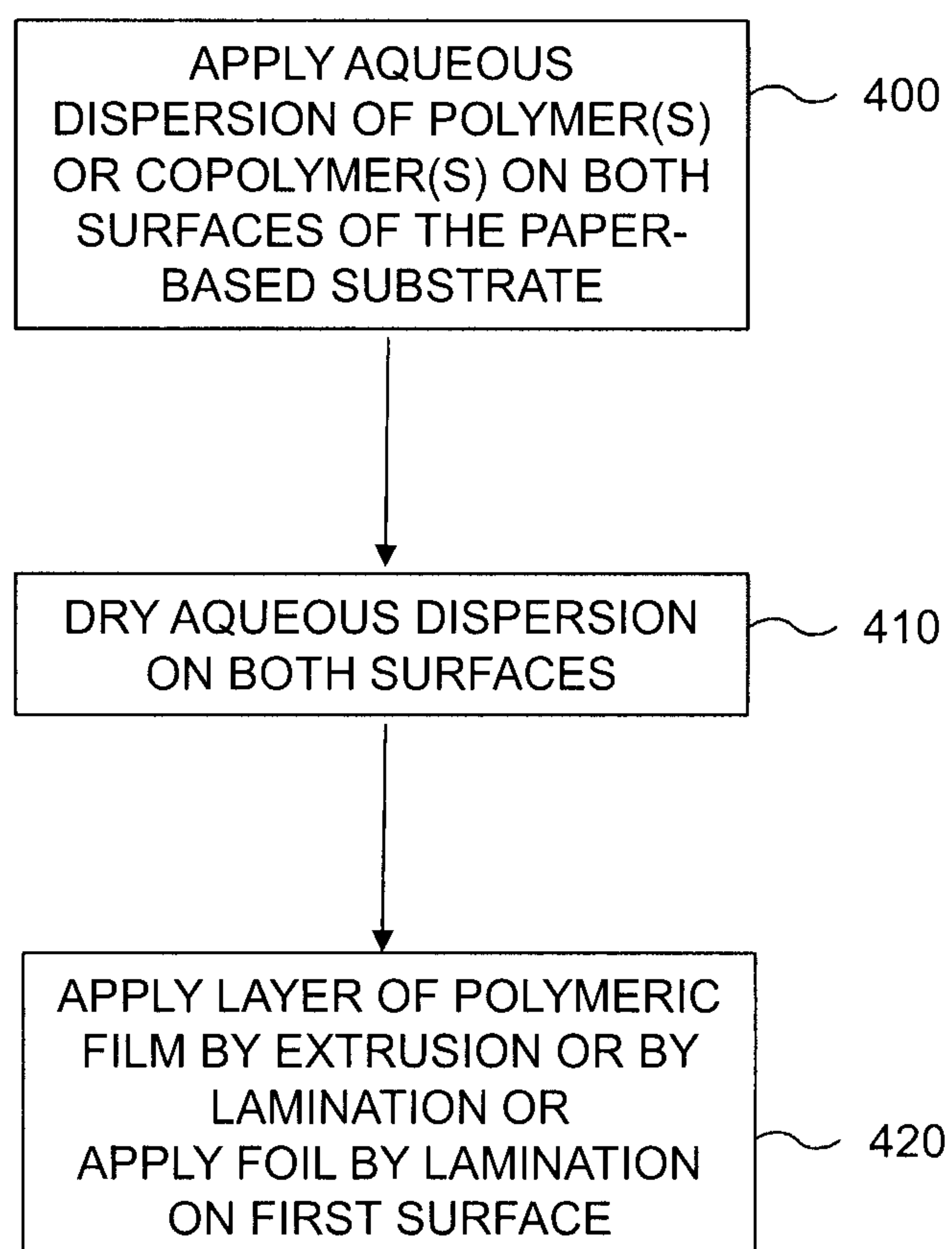


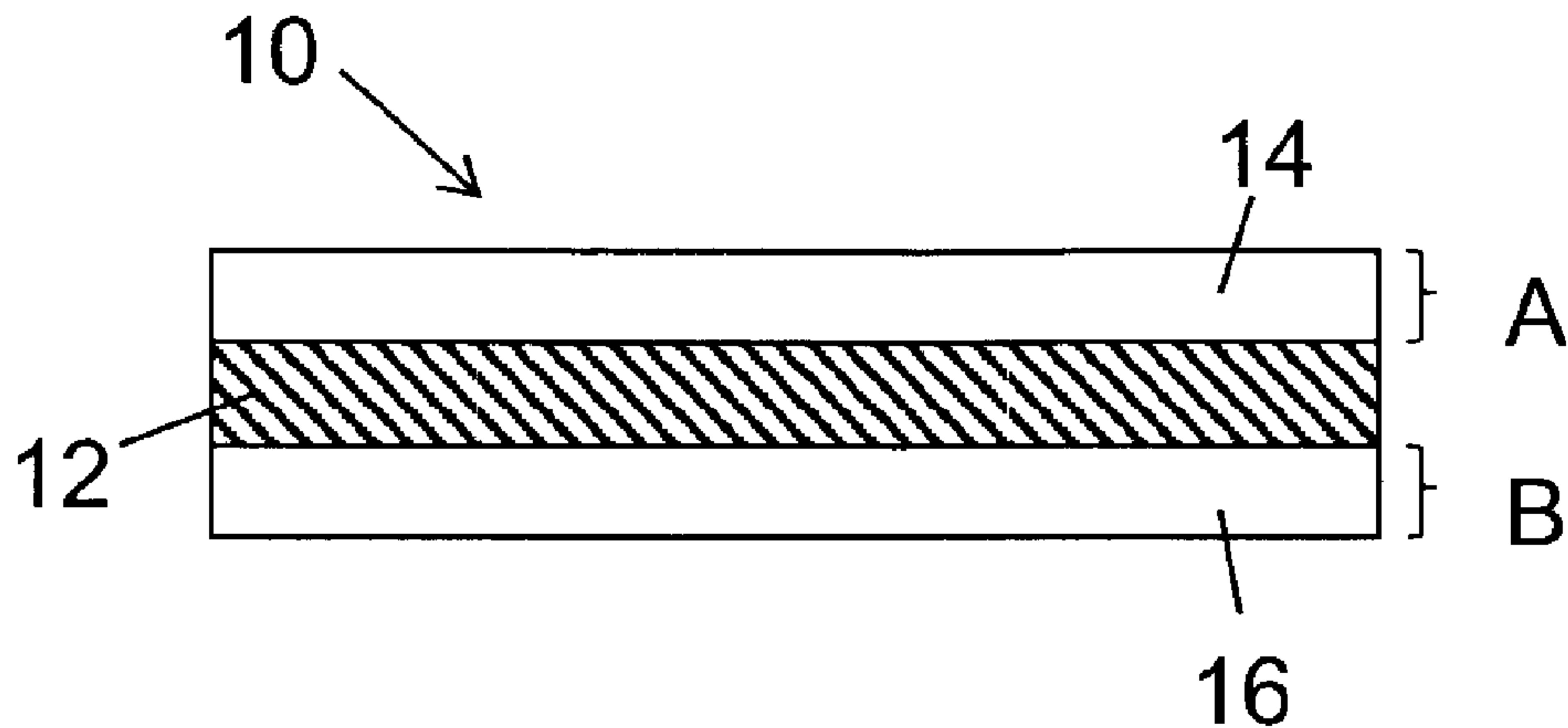
Fig. 1D

**Fig. 2**

**Fig. 3**

**Fig. 4**

**Fig. 5**



A