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(71) Applicant: **HUNTER DOUGLAS, INC.** [US/US]; One Blue Hill Plaza, Pearl River, New York 10965 (US).

(72) Inventors: **LYNCH, David**; 19075 E. Progress Avenue, Centennial, Colorado 80015 (US). **PHILLIPS, Erick A.**; 3140 W. 23rd Avenue, Denver, Colorado 80211 (US). **SWISZCZ, Paul G.**; 7542 Estate Circle, Niwot, Colorado 80503 (US). **WISECUP, Stephen T.**; 7768 Crestview Drive, Niwot, Colorado 80504 (US).

(74) Agent: **CASSIDY, Timothy A.**; P.O. Box 1449, Greenville, South Carolina 29602 (US).

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(54) Title: FABRIC HAVING A BACKING MATERIAL FOR A COVERING FOR AN ARCHITECTURAL OPENING

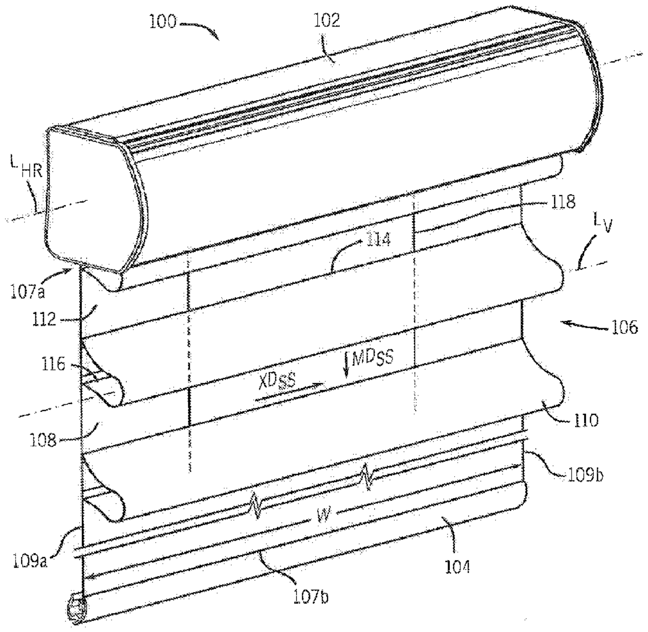

FIG. 1

(57) Abstract: An architectural covering with an operable vane having a fabric backing is provided. The vane may include a vane fabric and a backing material connected to the vane fabric by a layer of adhesive. The backing material may increase a machine-direction stiffness of the vane while slightly affecting a cross-direction stiffness of the vane. As such, the vane may have increased stiffness in its machine direction while simultaneously remaining flexible in its cross direction.

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FABRIC HAVING A BACKING MATERIAL FOR A COVERING FOR AN ARCHITECTURAL OPENING

RELATED APPLICATIONS

[0001] The present application is based upon and claims priority to United States Provisional Patent Application Serial No. 62/185,326, filed on June 26, 2015, which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This invention relates generally to coverings for architectural openings, and more specifically to a fabric having a backing material for a covering for an architectural opening.

BACKGROUND

[0003] Coverings for architectural openings, such as windows, doors, archways, and the like, have taken numerous forms for many years. The fabrics used for the coverings have presented various challenges associated with a given operation of the covering. Generally, it is desirable for the fabric of the covering to present an aesthetically pleasing appearance. For instance, it may be desirable for the covering to have a generally uniform contour, without undulations, puckering, or other contour irregularities caused by the manner in which the fabric is falling, lays, or otherwise hangs in position (in contrast with surface texture or other features of the fabric itself). Different coverings operate in different manners which move the fabric forming the covering element into extended or retracted positions (respectively covering or uncovering the architectural opening) in different manners. For instance, different coverings fold the fabric of the covering element along a given direction to retract the covering. More particularly, some coverings include operable vanes that are movable between open and closed positions. Current trends demand the use of fabrics not previously used in vane construction (e.g., lightly woven fabrics and fabric constructions that have an inherent high level of drape or other physical characteristics not amenable to the operable vane or a desired end use). Current manufacturing methods for making operable vanes of these desired fabrics have not proven sufficient to provide a consistent, preferably smooth appearance of the vane. For example, some vanes have inherent physical properties that offer poor support for uniformity and flatness in appearance. This creates a vane appearance, with creases, puckering or other undesirable non-uniform undulations and can increase the risk of significant capital investment in an unsuccessful product, and may lead to reduced quality and/or market share of the covering.

BRIEF SUMMARY

[0004] The present disclosure generally provides a fabric that has a backing so that the backed fabric offers improvements or an alternative to existing arrangements of the fabric of the shade portion of a covering for an architectural opening (herein “architectural opening covering” for the sake of convenience without intent to limit). More particularly, the present disclosure generally provides a fabric with a backing coupled thereto to modify the stiffness of the fabric along at least a first direction of the fabric to facilitate use of the fabric in a selected shade configuration. In one embodiment, the backing modifies the stiffness of the fabric to permit bending of the fabric about a first axis more readily than about a second axis perpendicular to the first axis. The backing may or may not modify the stiffness about the second axis.

[0005] In one embodiment, the fabric may be used to form an architectural opening covering having a shade employing movable vanes. The vanes formed in accordance with principles of the present invention include an outer fabric and an inner backing material connected together. The backing material is designed such that the backing material satisfies the stiffness requirements for use in a vane by, for example, increasing the stiffness of the vane along the length of the vane (extending across the width of the architectural opening covering) while negligibly affecting the stiffness of the vane perpendicular to the axis about which the vane is to bend to open and close the vane to allow viewing through the shade. Thus, according to the present disclosure, the vane is stiffer along its length but remains flexible about its height, thereby providing a flexible vane that has a consistent, preferably smoothly contoured appearance.

[0006] This summary of the disclosure is given to aid understanding, and one of skill in the art will understand that each of the various aspects and features of the disclosure may advantageously be used separately in some instances, or in combination with other aspects and features of the disclosure in other instances. Accordingly, while the disclosure is presented in terms of embodiments, it should be appreciated that individual aspects of any

embodiment can be claimed separately or in combination with aspects and features of that embodiment or any other embodiment.

[0007] The present disclosure is set forth in various levels of detail in this application and no limitation as to the scope of the claimed subject matter is intended by either the inclusion or non-inclusion of elements, components, or the like in this summary. In certain instances, details that are not necessary for an understanding of the disclosure or that render other details difficult to perceive may have been omitted. It should be understood that the claimed subject matter is not necessarily limited to the particular embodiments or arrangements illustrated herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings, which are incorporated into and constitute a part of the specification, illustrate embodiments of the disclosure and, together with the general description above and the detailed description below, serve to explain the principles of these embodiments.

[0009] **Fig. 1** is a front perspective view of a covering in accordance with an embodiment of the present disclosure.

[0010] **Fig. 2** is a front perspective view of a vane of the covering of **Fig. 1** and in an open configuration in accordance with an embodiment of the present disclosure.

[0011] **Fig. 3** is a front perspective view of a vane without a fabric backing and in an open configuration.

[0012] **Fig. 4** is an enlarged detail view of the vane of **Fig. 2** in accordance with an embodiment of the present disclosure.

[0013] **Fig. 5** is an enlarged, exploded detail view of the vane of **Fig. 2** in accordance with an embodiment of the present disclosure.

[0014] **Fig. 6** is a comparative view of a vane having a backing material and a vane without a backing material in accordance with an embodiment of the present disclosure. The two vanes are shown in a flat, or closed, configuration.

[0015] **Fig.** 7 is a schematic view of a method of manufacturing a vane in accordance with an embodiment of the present disclosure.

DETAILED DESCRIPTION

[0016] It is to be understood by one of ordinary skill in the art that the present discussion is a description of exemplary embodiments only, and is not intended as limiting the broader aspects of the present disclosure.

[0017] In the figures that follow, one embodiment of the present disclosure is described that comprises a shade including a support sheet and a plurality of horizontally-extending vanes that can move relative to the support sheet. It should be understood, however, that the figures are provided for purposes of explanation and in no way limit the different embodiments of the present disclosure. The present disclosure, for instance, is applicable to any suitable window covering product. For instance, roman-type shades, honeycomb shades, vertical shades, blinds, and the like, can also be made in accordance with the present disclosure. For example, in one embodiment, the present disclosure is directed to a shade comprised of a cover fabric in conjunction with a backing material in accordance with the present disclosure as described above.

[0018] **Fig. 1** is a front perspective view of an illustrative embodiment of a covering **100** utilizing a backed fabric formed in accordance with principles of the present disclosure. As illustrated, the covering **100** is shown in a fully-extended, open configuration in accordance with some embodiments of the present disclosure. The illustrative covering **100** includes a head rail **102**, a bottom rail **104**, and a shade **106** extending between the head rail **102** and the bottom rail **104**. The illustrative shade **106** includes a vertically-extending support sheet **108** and a plurality of horizontally-extending vanes **110** connected to the support sheet **108**. The support sheet **108** in the illustrative embodiment of **Fig. 1** is in the form of a flexible sheet of fabric, which may be of a substantially rectangular configuration having top and bottom edges **107a**, **107b**, and left and right side edges **109a**, **109b**. As shown, the support sheet **108**, which may be constructed of knit, woven, or nonwoven materials of various levels of transparencies, is vertically-suspended from the head rail **102** along its top edge **107a**. In some embodiments, the support sheet **108** may be suspended from a generally cylindrical roller rotatably mounted within the head rail **102** for selective reversible rotary movement about a horizontal central axis. The structure of the roller may allow the shade **106** to be retracted around and unwound from the roller as the roller is reversibly rotated. The structure from which the shade **106** is suspended, retracted, and extended may take on forms other than the roller in the head rail **102** as described above. Attached to the bottom edge **107b** of the support sheet **108** is the bottom rail **104**, which is an elongate member that may be weighted and generally maintains the shade **106** in a taut condition at its desired level of extension.

[0019] With continued reference to **Fig. 1**, each of the plurality of vanes **110** is suspended generally horizontally across a front face **112** of the support sheet **108** at vertically-spaced locations such that the length of the vane **110** extends along the width **W** of the shade **106**. As shown, each vane **110** is made from resiliently flexible material or fabric, which may be light-transmissive or light blocking. In the illustrative embodiment of **Fig. 1**, each vane **110** includes a first edge **114** (e.g., an upper edge) and a second edge **116** (e.g., a lower edge) opposite the first edge **114**. The first edge **114** of each vane **110** is attached to the front face **112** of the support sheet **108** across the width **W** of the support sheet **108** and at vertically-spaced locations such that the plurality of vanes **110** hang substantially parallel to the longitudinal axis $\mathbf{L_{HR}}$ of head rail **102**. The second edge **116** of each vane **110** hangs freely such that the second edge **116** of vane **110** is movable relative to the first edge **114** of vane **110** along the front face **112** of the support sheet **108**. The position of the second edge **116** relative to the first edge **114** is variable based on the desired actuation and aesthetics of each vane **110** as it moves from its closed to open positions.

[0020] In the closed position, each vane **110** is substantially flat and generally parallel with the support sheet **108**. In the open position, each vane **110** has a substantial teardrop shape cross-section and extends forwardly of the support sheet **108**. In the embodiment of **Fig. 1**, the vanes **110** may be positioned in any configuration between the fully open and the fully closed configurations to achieve substantially any desired light blocking or occluding characteristics of the shade **106**. To achieve the desired aesthetic effect when in the closed and/or open positions, each vane **110** includes bending properties in at least two directions, as described below.

[0021] In the embodiment shown in **Fig. 1**, the covering **100** includes operating elements **118** for moving the vanes **110** between open and closed positions. Each operating element **118** extends along the front face **112** of the support sheet **108** and is secured at spaced locations along its length to the second edge **116** of each vane **110** such that if the operating element **118** is lifted, the second edge **116** of each vane **110** is lifted synchronously toward the first edge **114** of each respective vane **110** so as to define a gap between the vanes **110** through which vision and/or light may pass. Because each vane **110** is made of flexible material or fabric, movement of the second edge **116** towards the first edge **114** causes the vane **110** to bend or fold about a vane longitudinal axis $\mathbf{L_v}$ and/or expand away from the support sheet **108** as shown in **Fig. 1**, for instance. Accordingly, transitioning the vanes **110** from a closed position to an open position causes the cross-section of each vane **110** to change from a generally planar configuration in the closed position to a generally arcuate configuration in the open position. In the illustrative embodiment of **Fig. 1**, the operating elements **118** slidably pass between the support sheet **108** and the first edge **114** of each vane **110**, and in such locations, the first edge **114** is not attached to the support sheet **108** to allow the operating elements **118** to move relatively between the first edge **114** and the support sheet **108**. The operating elements **118** are shown as monofilament cords but can assume other various forms, including but not limited to strips of fabric or other materials, cords of synthetic or natural fibers, or other similar forms. The operating elements **118** may have a variety of cross-sections, including circular, oval, rectangular, square, or other geometric shapes. The operating elements **118** need not be attached to every vane **110**, but instead may be attached to specific vanes **110** that are desired to be movable between open and closed positions. It will be appreciated that instead of passing between the first edge **114** and the support sheet **108**, the operating elements **118** may pass through the support sheet **108**, or through the vane **110**.

[0022] **Fig. 2** is a front perspective view of an illustrative embodiment of the vane **110** in accordance with principles of the present disclosure. As shown in **Fig. 2**, the machine direction **MD** of the fabric used to form the vane **110** is the direction in which the fabric is processed during assembly. In the illustrative example of **Fig. 2**, the machine direction **MD** thus extends along the length of the vane **110** such that when the vane **110** is connected to the support sheet **108** as part of the complete covering **100**, the machine direction **MD** extends along the length of the vane **110** and across the width **W** of the support sheet **108** between the left and right side edges **109a**, **109b** of the support sheet **108**. In the illustrative embodiment, the cross direction **XD** of the fabric used to form the vane **110** extends transversely to the machine direction **MD**, and in the illustrative example of **Fig. 2**, is thus along the height of the vane **110**. When the vane **110** is connected to the support sheet **108** as part of the complete covering **100**, the cross direction **XD** of each vane **110** extends vertically between the top and bottom edges **107a**, **107b** of the support sheet **108** (and between the first and second edges **114**, **116** of each vane **110**). Although described above as extending along the length of the vane **110** and across the width **W** of the support sheet **108**, it is contemplated that the machine direction **MD** of the fabric used to form the vane **110** need not correspond to the length of the vane **110**, and could instead correspond to, for example, the height of the vane **110**, depending on the design of the product in which the fabric is used. In other words, the machine direction **MD** and the cross direction **XD** of the fabric used to form the vane **110** may, in other configurations, be oriented substantially perpendicular to respective machine and cross directions $\mathbf{MD}_{SS}$, $\mathbf{XD}_{SS}$ of the support sheet **108** (see **Fig. 1**).

[0023] In the illustrative embodiment of **Fig. 2**, the stiffness of each vane **110** in its machine direction **MD** and in its cross direction **XD** is tailored to achieve a desired stiffness characteristic, and thus the desired aesthetic effect, when the vane **110** is in the closed and/or open positions. For example, the vane **110** of **Fig. 2** has sufficient stiffness in its machine direction **MD** (i.e., machine-direction stiffness) to provide fabric with a contour that has a consistent, preferably smooth appearance throughout the vane **110** to reduce ripples **120** or undulations within the vane **110**, as explained below (see **Fig. 3**). Additionally, the stiffness of the vane **110** of **Fig. 2** in its cross direction **XD** (i.e., cross-direction stiffness) permits the vane **110** to remain flexible for resilient bending of the vane **110** during opening and closing, as described above. In this manner, a greater variety of fabrics may be used to construct the vane **110**, including soft hand fabrics not previously feasible for use in vane construction. Soft hand fabrics refer to fabrics that are very flexible and soft to the touch. A soft hand fabric may not possess good drape characteristics when incorporated into a window covering. In the exemplary embodiment of **Fig. 2**, the vane **110** includes an upper tab **122** and a lower tab **124**, each optionally defined by respective upper and lower creases **126**, **128** or fold lines. Each tab **122** and **124** preferably folds rearwardly from the front surface of the vane. The creases **126**, **128** define the first and second edges **114**, **116** of the vane **110** (see **Fig. 2**). The upper tab **122** may be used for attaching the first edge **114** of the vane **110** to the support sheet **108**. Similarly, the lower tab **124** may be used for attaching the second edge **116** of the vane **110** to the operating elements **118** to allow for selective movement of the vane **110** between the open and closed configurations. It will be appreciated that the tabs **122** and **124** are not a required feature of the vane **110**, which may have only one tab or no tabs.

[0024] **Fig. 3** is a front perspective view of an alternative embodiment of the vane **110'** in accordance with principles of the present disclosure. In substantially all respects, the vane **110'** of **Fig. 3** is identical to the vane **110** of **Fig. 2**. However, as illustrated in **Fig. 3**, the vane **110'** does not have sufficient stiffness in its machine direction **MD** to provide a fabric that has a contour with a consistent, smooth, appearance throughout as compared to the vane **110** illustrated in **Fig. 2**. Because of insufficient stiffness in its machine direction **MD**, the vane **110'** of **Fig. 3** includes regions of "puckering" or gathering of the fabric to cause ripples **120**, undulations, or waviness within the vane **110'** (e.g., on a surface of the vane **110'**). This "puckering" causes inconsistencies in appearance and performance of the vane **110** and may be undesirable for at least certain applications.

[0025] **Fig. 4** is an enlarged detail view of an illustrative embodiment of the vane **110** of **Fig. 2** in accordance with principles of the present disclosure. **Fig. 5** is an enlarged exploded view of the vane **110** of **Fig. 4** in accordance with principles of the present disclosure. As shown in **Figs. 4** and **5**, the vane **110** includes a fabric **130** and a backing material **132** connected to the fabric **130** (e.g., to a rear of the fabric **130**) to enhance the desired properties of the fabric **130** in a first direction (e.g., to enhance stiffness along the length of the vane **110** extending about the width **W** of the shade **106** which is not intended to bow or bend or otherwise fold or bend), to reduce or eliminate any unintended or incidental "puckering" or ripples **120** in the vane **110**, and to maintain the desired property of the fabric **130** in a second direction (e.g., to maintain flexibility of the vane about the bending axis of the vane so that the vane readily bends into an open or closed configuration as desired).

[0026] The vane **110** may be formed as a laminate structure of the fabric **130** and the backing material **132** (and adhesive), and may alternatively be referenced as a "vane laminate." The fabric **130**, which may be referred to as a vane fabric, an outer fabric, a fabric material portion, or a first material, and the backing material **132** may be connected together by a layer of adhesive **134** (e.g., a thermoplastic adhesive) positioned between the fabric **130** and the backing material **132**. Many different types and structures of adhesive **134** can be used, which can be applied by spray, gravure, roll coating, die cast extrusion, or by any other suitable manner. Selection of adhesive type and/or structure depends upon the desired characteristics and/or properties of the formed vane **110**. For example without limitation, a crosslinking adhesive may be used for high temperature end use applications, and a thermoplastic adhesive may be selected for moderate temperature end use applications. In each of the embodiments described herein, the adhesive **134** may or may not be relatively inert to the physical characteristics (e.g., stiffness) of the vane laminate. In the illustrative embodiment of **Figs. 4** and **5**, the layer of adhesive **134** is a melt blown adhesive sprayed onto the web structure of at least one of the fabric **130** and the backing material **132** and solidifies with little to no shrinkage. Although **Figs. 4** and **5** depict the layer of adhesive **134** as a continuous layer (in both cross-section and along its length), the layer of adhesive **134** may be a discontinuous web or dot structure. In such embodiments, a section view of the layer of adhesive **134** may appear discontinuous or continuous depending on the section line. In certain embodiments, the type of adhesive used, the manner in which the adhesive is applied, and the amount of adhesive applied in between the backing material in the fabric can further influence the stiffness properties, particularly the stiffness ratio, of the resulting laminate. For example, in one embodiment, the adhesive can also be applied in a unidirectional manner that cooperates with the backing material in increasing the stiffness ratio. In one embodiment, the adhesive may be applied as fibers or filaments. For instance, unidirectionally oriented meltblown fibers may be used as the adhesive.

[0027] Applying the adhesive in a discontinuous manner may, in some embodiments, better preserve the flexibility of the resulting laminate. For example, as described above, the adhesive may be applied in a discontinuous pattern, such as a dot pattern. In this embodiment, the adhesive may cover less than 80%, such as less than about 70%, such as less than about 60%, such as less than about 50%, such as less than about 40%, such as less than about 30% of the surface area of the fabric. The adhesive generally covers greater than about 10% of the surface area, such as greater than about 20% of the surface area, such as greater than about 30% of the surface area.

[0028] According to the present disclosure, almost any type of fabric **130**, particularly fabrics with a soft hand, regardless of its inherent properties, may be used for a desired purpose (e.g., any of a variety of shades **106** or vanes **110** with different bending and/or draping requirements) by application of the backing material **132** thereto to modify the stiffness (and stabilize elongation to improve manufacturing versatility) of the fabric **130** in the desired manner without otherwise significantly affecting the other properties of the fabric **130**, such as thickness, weight, and/or light transmissivity of the fabric **130**. Thus, the backing material **132** may be applied to a variety of fabrics **130** to modify the stiffness ratio of the fabric **130** to achieve a desired flexibility and stiffness characteristics of the laminate for the ultimate application and use of the fabric, such as, without limitation, as a vane in a shade. It is contemplated that the backing material **132** may modify or enhance, based on its inherent physical properties and application, the properties of the fabric **130** in substantially any direction based on a desired end use of the vane laminate. However, for ease of reference and as an illustrative example, the present disclosure describes the stiffness and flexibility of the fabric **130** in terms of machine direction and cross direction. As noted above, the machine direction **MD** and cross direction **XD** typically correspond, in the illustrative embodiment of **Fig. 4**, to length and height, respectively, of the fabric **130** used to form the vane **110**. It is contemplated, however, that the machine direction and the cross direction of the fabric **130** do not necessarily correspond to the length and height of the vane **110**, respectively, when the vane **110** is implemented in the shade **106**. Thus, it should be appreciated that the specific orientations described herein (e.g., machine direction and cross direction) are for illustration purposes and for ease of reference and do not define the scope of the present disclosure.

[0029] The fabric **130** and the backing material **132** may be made of any suitable material, including but not limited to woven or nonwoven fabrics of natural or man-made materials, including vinyl, plastic, or other such materials. In the illustrative embodiments of **Figs. 4** and **5**, however, the backing material **132** is a directional nonwoven material, although non-directional woven and nonwoven fabrics or materials are also contemplated. The backing material **132**, which may be referred to as an inner fabric, a backing material portion, or a second material and may be sheer, may be formed from a plurality of fiber segments oriented primarily along the longitudinal axis $\mathbf{L_V}$ of the vane **110** (i.e., along the machine direction **MD** of the vane **110**). In some embodiments, the backing material **132** may be formed from aligned continuous fibers, yarns, and/or carded, aligned staple fibers that have some fiber overlapping. Additionally or alternatively, the backing material **132** may be formed from a plurality of generally parallel rows, each row including a plurality of longitudinal fibers substantially oriented and overlapping along the row, the rows extending along the longitudinal axis $\mathbf{L_V}$ of the vane **110** with little or no cross-linking between the rows. Thus, in the illustrative embodiments of **Figs. 4** and **5**, the backing material **132** may have a “grain” or striated appearance in one direction (e.g., in the machine direction **MD** of the vane **110**) such that the fibers appear to be in a “combed” web structure.

[0030] Accordingly, the fiber orientation of the backing material **132** enhances or increases, sometimes significantly, for instance by multiples, the machine-direction stiffness of the vane **110** about an axis, such as in its machine direction **MD**. Additionally, because the fibers of the backing material **132** extend mainly along the machine direction **MD** of the vane **110**, with little cross-linking between rows, the backing material **132** maintains as constant and/or slightly affects the cross-direction stiffness of vane **110**, thus maintaining the bending properties of the vane **110** in its cross direction **XD**. In some embodiments, the backing material **132** may be configured with increased cross-linking between rows to achieve a more equal machine direction to cross direction fiber distribution such that the vane **110** achieves a desired stiffness to operate properly for a particular application.

[0031] In one embodiment, the backing material **132** comprises a meltspun web or a laminate containing a meltspun web. In accordance with the present disclosure, the meltspun web includes fibers that are oriented in one direction for increasing the stiffness of the material in the direction of orientation. The meltspun web, for instance, may comprise a spunbond web, a meltblown web, a hydroentangled web, a coform web, and the like. The meltspun web can be made exclusively from continuous filaments, can be made exclusively from staple fibers, or can be comprised of a combination of continuous filaments combined with staple fibers.

[0032] In addition to meltspun webs, the backing material **132** may comprise any other suitable nonwoven web or laminate. The nonwoven web, for instance, may comprise a wetlaid web, an airlaid web, a bonded carded web, and/or a crosslapped web in which the web contains fibers that have been unidirectionally oriented.

[0033] The backing material **132** can have various different characteristics and properties depending upon the particular application, as long as the material is capable of being adhered to another fabric and includes unidirectionally oriented fibers and/or greater stiffness properties in one direction. For example, in certain embodiments, the backing material **132** can have a relatively light basis weight. Using a backing material with a relatively light basis weight can provide various advantages and benefits. For instance, a relatively light basis weight material can provide the necessary stiffness adjustment to a fabric without significantly interfering with the opacity characteristics of the fabric. In addition, it was discovered that lightweight basis materials can dramatically and unexpectedly improve the elongation properties of a fabric. When using a relatively light basis weight material, the backing material can have a basis weight of generally less than about 20 gsm, such as less than about 17 gsm, such as less than about 15 gsm, such as less than about 13 gsm, such as less than about 10 gsm, such as less than about 8 gsm, such as less than about 5 gsm, such as even less than about 3 gsm. The backing material generally has a basis weight greater than 1 gsm.

[0034] In an alternative embodiment, the backing material can also have a relatively heavy basis weight. For instance, the basis weight of the backing material can be greater than about 20 gsm, such as greater than about 30 gsm, such as greater than about 40 gsm, such as greater than about 50 gsm, such as greater than about 60 gsm. The basis weight of the backing material is generally less than about 150 gsm, such as less than about 120 gsm. Heavier basis weight materials may be desired in certain applications, especially when producing laminates that are designed to block light.

[0035] The backing material **132** can also be produced from various different fibers and filaments. In one embodiment, for instance, the backing material is made exclusively from synthetic fibers, filaments, or a combination of fiber and filaments. For example, the backing material can be made from polyester, a polyolefin such as polyethylene or polypropylene, an acrylic, or mixtures thereof. The backing material can also contain other fibers, including cellulose fibers, regenerated cellulose fibers such as rayon, cotton fibers, and the like.

[0036] One example of a suitable backing material **132** includes MILIFE® T-Grade MD-only nonwoven, a 100% polyester nonwoven material manufactured by JX Nippon. MILIFE® T-Grade MD-only nonwoven comes in a variety of grades, including T10, which has a basis weight of 10 g/m^2 and a tensile strength of 50 N/50mm. Other fabrics or materials may be utilized for the backing material **132** depending on the particular application, including fabrics having a variety of ratios between machine direction and cross direction fiber distributions operable to affect the physical properties of the vane **110** in a low profile manner.

[0037] In an alternative embodiment, the backing material **132** comprises a unidirectionally oriented hydroentangled web. In one embodiment, the hydroentangled web can have a relatively low basis weight such as less than about 20 gsm, such as less than about 17 gsm, such as less than about 15 gsm, such as less than about 13 gsm, such as less than about 10 gsm, such as less than about 8 gsm. The basis weight is generally greater than about 2 gsm, such as greater than about 5 gsm, such as greater than about 7 gsm.

[0038] In one embodiment, the hydroentangled web is made from a precursor web comprising a spunbond web made from continuous polymeric filaments. The precursor or spunbond web is placed on a foraminous surface and subjected to the hydroentangling process. Hydroentanglement is affected by application of high pressure liquid streams to the web. Filaments of the web are rearranged on the fabric forming surface of the device. In one embodiment, the forming surface and the liquid streams act in conjunction to rearrange the filaments of the web and to create a unidirectionally oriented web that has sufficient integrity and strength for handling. In order to form the web, filaments can be used having a really low denier. For instance, the filaments can have a denier of less than about 3.0, such as less than about 2.5, such as less than about 2.0, such as less than about 1.5, such as less than about 1.0, such as less than about 0.8, such as less than about 0.5. The denier of the filaments is generally greater than about 0.2, such as greater than about 0.5, such as greater than about 1.0.

[0039] In one embodiment, the spunbond precursor web comprises a web that has been lightly bonded which allows the high pressure fluid streams to break or disrupt the bonds without breaking the continuous filaments. As a consequence, a relatively low basis weight web can be formed made from substantially continuous filaments that have been unidirectionally oriented. If desired, after hydroentangling, the spunbond and hydroentangled web can be subjected to further bonding processes, such as thermal bonding.

[0040] In an alternative embodiment, a unidirectionally oriented hydroentangled web may be used as the backing material which comprises two or more webs that have been hydroentangled together. For example, in this embodiment, a unidirectionally oriented nonwoven web can be hydroentangled with one or more other nonwoven webs to result in a unidirectionally oriented structure that has sufficient strength and integrity for handling and incorporation into fabric laminates.

[0041] The unidirectionally oriented web that is subjected to hydroentangling can be made using different processes and techniques. In one embodiment, for instance, the web may comprise a meltspun web, such as a spunbond or meltblown web, that has been stretched in one direction for unidirectionally orienting the fibers. The nonwoven web can be stretched, for instance, using rollers that operate at different speeds. Alternatively, stretching can occur on a tenter frame. The draw ratio of the unidirectionally oriented nonwoven fabric, for instance, can be from about 5 to about 20, such as from about 8 to about 12. The nonwoven web can be made from staple fibers, continuous filaments, or mixtures thereof. The fibers and filaments can have a denier of from about 0.01 to about 10, such as from about 0.03 to about 5.

[0042] The unidirectionally oriented web is then hydroentangled with at least one other nonwoven web. The nonwoven web can comprise any suitable fiber web or nonwoven fabric. For instance, in one embodiment, the unidirectionally oriented web is hydroentangled with a carded web. The carded web can be made from staple fibers having any of the denier ranges described above. The two webs are then hydroentangled together in order to produce a nonwoven material not only having unidirectionally oriented fibers but also having sufficient integrity and strength to be later processed. The resulting nonwoven material can have a basis weight of from about 8 gsm to about 150 gsm. In one embodiment, for instance, the material has a relatively light basis weight of less than about 25 gsm, such as less than about 20 gsm, such as less than about 15 gsm, such as less than about 12 gsm, such as less than about 10 gsm. The basis weight is generally greater than about 3 gsm, such as greater than about 5 gsm.

[0043] In yet another embodiment of the present disclosure, the backing material **132** may be formed directly on one side of the fabric **130**. For example, any suitable nonwoven web having unidirectionally oriented fibers or filaments may be applied directly to the fabric **130** in accordance with the present disclosure. The nonwoven web, for instance, may comprise a spunbond web, a meltblown web, a coform web, or the like. By applying the backing material **132** directly to the fabric **130**, the backing material can have a very low basis weight. For instance, the backing material **132** can have a basis weight of less than about 15 gsm, such as less than about 12 gsm, such as less than about 10 gsm, such as less than about 8 gsm, such as less than about 5 gsm, such as even less than about 3 gsm. In one embodiment, for instance, unidirectionally oriented fibers, filaments, or mixtures thereof can be applied directly to the fabric **130** in a manner that produces little to no crossover points that are typically present in nonwoven webs.

[0044] The above described backing materials when attached to a fabric are all capable of adjusting the stiffness of the fabric in one direction. In particular, the stiffness is increased in a first direction without significantly affecting the stiffness in a second and perpendicular direction. In the figures, the first direction is the machine direction, while the second direction is the cross-direction. It should be understood, however, that the stiffness of a fabric can be increased in any suitable direction depending upon the particular application. In the illustrative embodiments of **Figs. 4** and **5**, the ratio between the machine-direction stiffness and the cross-direction stiffness (i.e., stiffness ratio) of the vane **110** having the backing material **132** attached thereto is between about 1.5:1 and about 18:1. In various embodiments, the stiffness ratio of laminates made according to the present disclosure (first direction to second direction) can generally be greater than about 2:1, such as greater than about 3:1, such as greater than about 4:1, such as greater than about 6:1, such as greater than about 8:1, such as greater than about 10:1, such as greater than about 12:1, such as greater than about 14:1. The stiffness ratio is generally less than about 50:1, such as less than about 40:1, such as less than about 30:1, such as less than about 20:1. Certain fabrics or materials have stiffness ratios within the range mentioned above without the use of the backing material **132**. However, the backing material **132** can be used on substantially any type of fabric or material, including but not limited to densely or lightly wovens or nonwovens, lightweight woven sheers, lightweight nonwovens, and lightweight knits, to enhance its respective stiffness ratio. For example, the backing material **132** is not only able to enhance materials having a poor stiffness ratio, the backing material **132** may also be used to selectively enhance and support materials that have a desired stiffness ratio but do not have a desired stiffness in general. For example without limitation, for fabrics **130** having a stiffness ratio equal to or greater than 1:1, the backing material **132** may include less machine direction orientation compared to a backing material **132** used for a fabric **130** having a stiffness ratio less than 1:1. Additionally or alternatively, for fabrics **130** having a desired stiffness ratio but lacking stiffness in general, the backing material **132** may be unbiased such that the backing material **132** has an equal machine direction to cross direction fiber distribution (see **Fig. 5**), resulting in a more balanced enhancement of the stiffness of the vane **110** in both its machine direction **MD** and its cross direction **XD**. For fabrics having a desired stiffness ratio, the backing material **132** may have a relatively light basis weight that may desirably influence the elongation properties of the fabric without significantly impacting the opacity of the fabric. For instance, the backing material, in this embodiment, can have a basis weight of less than about 12 gsm, such as less than about 10 gsm, such as less than about 8 gsm, such as less than about 6 gsm, such as less than about 4 gsm. The basis weight of the backing material is generally greater than about 1 gsm.

[0045] Illustrative examples of increases in stiffness ratio with respect to various fabrics or materials are shown below in **Tables 1-3**. The various fabrics or materials shown in **Tables 1-3** below were tested using a Handle-O-Meter testing machine, developed by Johnson & Johnson and now manufactured by Thwing-Albert, that measures the combination of surface friction and flexibility of sheeted materials (i.e., the handle of the fabric). All of the materials were tested face side down on the testing machine. Although the various fabrics and materials in **Tables 1-3** were tested using a Handle-O-Meter testing machine, any suitable stiffness measurement technique for fabrics would suffice in comparing the relative machine-direction stiffness and cross direction-stiffness of the vane **110** so long as the measurement technique is capable of distinguishing measurements at least between machine direction and cross direction.

[0046] **Table 1** below shows Handle-O-Meter test results using "Polyester Woven A" as the fabric **130**. Polyester Woven A is a mid-weight (100 gsm-150 gsm), plain weave, 100% polyester, woven construction. In row 1, Polyester Woven A was tested without the backing material **132**. In row 2, Polyester Woven A was tested with the backing material **132** applied thereto. Rows 3-4 illustrate test data of Polyester Woven A with various conventional backing materials applied thereto for comparison with the backing material **132**. Although **Table 1** illustrates test results using Polyester Woven A, similar results can be achieved for substantially any woven material whose stiffness ratio is heavily biased towards one direction (e.g., its cross-direction stiffness).

Table 1: "Polyester Woven A" Handle-O-Meter Test Results

	Material Description	**Machine-Direction Stiffness (Ave.)**	**Cross-Direction Stiffness (Ave.)**	**Stiffness Ratio**
1	Polyester Woven A – without backing material **132**	15.5	46.8	0.33:1
2	Polyester Woven A – with backing material **132**	75.2	44.5	1.69:1
3	Polyester Woven A – with 20 gsm Unitika spun bound nonwoven	80.6	78.2	1.03:1
4	Polyester Woven A – with H&V 17 gsm smooth calendered nonwoven	69.0	82.0	0.84:1

[0047] **Table 2** below shows Handle-O-Meter test results using "Polyester Woven B" as the fabric **130**, and shows stiffness testing with and without the backing material **132** of the present disclosure applied thereto. Polyester Woven B is a heavy-weight (greater than 150 gsm), plain weave, 100% polyester, woven construction. In row 1, Polyester Woven B was tested without the backing material **132**. In row 2, Polyester Woven B was tested with the backing material **132** applied thereto in accordance with the present disclosure.

Table 2: "Polyester Woven B" Handle-O-Meter Test Results

	Material Description	**Machine-Direction Stiffness (Ave.)**	**Cross-Direction Stiffness (Ave.)**	**Stiffness Ratio**
1	Polyester Woven B – without backing material **132**	17.6	45.6	0.39:1
2	Polyester Woven B – with backing material **132**	84.7	55.1	1.54:1

[0048] **Table 3** below shows Handle-O-Meter test results using "Polyester Woven C" as the fabric **130**, and shows stiffness testing with and without the backing material **132** of the present disclosure applied thereto. Polyester Woven C is a lightweight (less than 100 gsm), plain weave woven composed of 100% polyester woven material. In row 1, Polyester Woven C was tested without the backing material **132**. In row 2, Polyester

Woven C was tested with the backing material **132** applied thereto in accordance with the present disclosure.

Table 3: "Polyester Woven C" Handle-O-Meter Test Results

	Material Description	Machine-Direction Stiffness (Ave.)	Cross-Direction Stiffness (Ave.)	Stiffness Ratio
1	Polyester Woven C – without backing material **132**	13.7	2.2	6.23:1
2	Polyester Woven C – with backing material **132**	57.8	3.7	15.62:1

[0049] As shown in **Tables 1-3** above, the stiffness ratio of each of the tested fabrics or materials was substantially increased through the application of the backing material **132** to the fabric **130**. In fact, for the tested fabrics or materials, the backing material **132** selectively increases the machine-direction stiffness at least about 1.5 times greater, and more preferably at least about 2 times greater, and more preferably approximately 5 times greater, than the effect of the backing material **132** on the cross-direction stiffness. For example, with reference to **Table 1**, application of the backing material **132** to the Polyester Woven A fabric **130** resulted in an approximate 5% decrease in cross-direction stiffness but also an approximate 385% increase in machine-direction stiffness, or an approximate 77 times greater effect on the machine-direction stiffness than the effect on the cross-direction stiffness of the vane **110**. Similar results are shown in **Table 2**, which provides an approximate 18 times greater effect on the machine-direction stiffness than the effect on the cross-direction stiffness of the Polyester Woven B fabric **130**. Similarly, **Table 3** shows an approximate 5 times greater effect on the machine-direction stiffness than the effect on the cross-direction stiffness of the Polyester Woven C fabric **130**. In contrast as shown in **Table 1** above, use of conventional backing materials, such as 20 gsm 100% polyester Unitika spun bound nonwoven, Hollingsworth & Vose 17 gsm 100% polyester smooth calendered nonwoven (5-pressure), and Hollingsworth & Vose 17 gsm 100% polyester smooth calendered nonwoven (10-pressure), increases both the machine-direction stiffness and the cross-direction stiffness of the vane **110** without the selective bias towards significantly increasing only the machine-direction stiffness while only slightly affecting (increasing or decreasing) the cross-direction stiffness of the vane **110** as with the backing material **132** of the present disclosure. As can be seen in **Tables 1-3**, use of the backing material **132** increases the stiffness of the vane **110** in its machine direction **MD** while maintaining the flexibility of the vane **110** in its cross direction **XD**, unlike use of conventional backing materials as shown in **Table 1**. As illustrated in **Tables 1** and **2**, for fabrics **130** having a stiffness ratio less than 1:1, the backing material **132** may be operable to "flip" the stiffness ratio by significantly increasing machine-direction stiffness while marginally affecting cross-direction stiffness, or vice-versa. Thus, according to an embodiment of the present disclosure, strength and/or stiffness deficiencies of the fabric **130** can be overcome through application of the backing material **132** to the fabric **130**.

[0050] As indicated by the tables above, a backing material **132** can be selected so as to influence the stiffness properties of the fabric in a manner desired for a particular application. In general, the backing material, when applied to a fabric, can increase the stiffness of the fabric in a first direction by greater than about 2 times, such as greater than about 3 times, such as greater than about 4 times, such as even greater than about 5 times the original stiffness of the fabric. In contrast, the stiffness in the second direction can remain substantially unaffected. For instance, applying the backing material to the fabric can increase the stiffness in the second direction by less than about 2 times, such as less than about 1.5 times, such as less than about 1 times, such as less than about 0.5 times the original stiffness of the fabric. In addition, as described above, the stiffness ratio of the fabric after the backing material is applied can increase at least about 1.5 times greater, such as at least about 2 times greater, such as at least about 2.5 times greater, such as at least about 3 times greater, such as at least about 3.5 times greater, such as at least about 4 times greater, such as at least about 4.5 times greater, such as at least about 5 times greater, such as at least about 5.5 times greater, such as at least about 6 times greater than the original stiffness ratio of the fabric. The stiffness ratio is generally increased less than 50 times greater, such as less than about 40 times greater, such as less than about 30 times greater, such as less than about 20 times greater than the original stiffness ratio of the fabric.

[0051] With continued reference to **Figs. 4** and **5**, depending on the physical characteristics of the fabric **130**, the backing material **132** may be selected and/or the properties of the backing material **132** may be tailored to produce a variety of vanes **110** that behave similarly in the covering **100**. For example, through targeted selection of respective backing materials **132**, a variety of fabrics **130** each having different physical characteristics may be used to produce respective vanes **110** that have similar properties (e.g., weight, machine-direction stiffness, cross-direction stiffness). Thus, fabrics **130** not having desired stiffness characteristics alone may be used for a particular purpose (e.g., any of a variety of shades **106** or vanes **110** with different bending and/or draping requirements) by application of the backing material **132** thereto to achieve the desired stiffness of the resulting vane laminate to suit the needs of a particular end use. In the embodiments described herein, the backing material **132** may modify the bending and draping characteristics of the fabric **130** without otherwise significantly affecting other properties of the fabric **130**, such as but not limited to thickness, basis weight, and/or the opacity of the fabric **130**.

[0052] With reference to **Fig. 5**, the fabric **130** includes a machine direction $\mathbf{MD_{VF}}$ and a cross direction $\mathbf{XD_{VF}}$. Similarly, the backing material **132** includes a machine direction $\mathbf{MD_{BF}}$ and a cross direction $\mathbf{XD_{BF}}$. As shown, the respective machine directions $\mathbf{MD_{VF}}$, $\mathbf{MD_{BF}}$ of the fabric **130** and the backing material **132** extend parallel to each other and parallel to the machine direction **MD** of the vane **110**. Similarly, the respective cross directions $\mathbf{XD_{VF}}$, $\mathbf{XD_{BF}}$ of the fabric **130** and the backing material **132** extend parallel to each other and parallel to the cross direction **XD** of the vane **110**. In an alternative embodiment, however, the machine direction of the fabric **130** and the machine direction of the backing material **132** may be arranged perpendicular to each other depending upon the construction of the different fabric materials. Similarly, the cross direction of the fabric may be perpendicular to the cross direction of the backing material. In the illustrative embodiment of **Fig. 5**, the backing material **132** may be sized identically to the fabric **130**. In some embodiments, the fabric **130** may have relatively greater dimensions such that an upper portion and/or a bottom portion of the fabric **130** may be folded over the backing material **132** toward the support sheet **108** to respectively form the upper and lower tabs **122**, **124** and the upper and lower creases **126**, **128** of the vane **110** (see **Fig. 2**). In such embodiments, the adhesive **134** may facilitate in setting and/or holding at least one of the upper and lower creases **126**, **128**. Additionally or alternatively, the backing material **132** may help achieve better fold or crease retention in the vane **110**. Also, when the backing material **132** is applied to the fabric **130**, the vane **110** may be more easily scored and bent.

[0053] The relative dimensions of the fabric **130**, the layer of adhesive **134**, and the backing material **132** are exaggerated in **Fig. 5** for illustrative purposes. In practice, the layer of adhesive **134** and the backing material **132** add limited thickness and weight to the fabric **130**, although the thickness and weight of the adhesive **134** and the backing material **132** may be tailored to achieve a desired aesthetic and/or strength characteristic. For example, in an illustrative embodiment, the layer of adhesive **134** and the backing material **132** contribute about 10 to about 30 grams per square meter in weight and/or add between about 0.02 and about 0.06 mm in thickness to the vane **110**. Also, although the adhesive **134** is shown as a substantial layer in **Fig. 5**, the adhesive **134** may be less substantial in practice and appear thin like a web of interconnected adhesive fibers or a dot coated hot melt adhesive.

[0054] **Fig. 6** is a comparative view of illustrative embodiments of a vane **110A** having a backing material **132** and a vane **110B** without a backing material **132**. Without the backing material **132**, the vane **110B** may "pucker" to create irregularities in surface contour and topography (e.g., creating ripples **120**). This "puckering" transmits to the finished vane **110** and is visible in use. As can be seen in **Fig. 6**, the backing material **132** reduces the amount of "puckering" within the vane **110** by stabilizing the fabric **130** in at least one direction (e.g., its machine direction $\mathbf{MD_{VF}}$). For example, the backing material **132** is operable to prevent stretching of the fabric **130** in the least one direction (e.g., its machine direction $\mathbf{MD_{VF}}$). As illustrated in **Fig. 6**, the backing material **132** causes the fabric **130** to lie flat against, for example, a work surface **136** as shown in **Fig. 6** or against the support sheet **108** in operation. As a result, a consistent, preferably smooth, appearance is achieved without adversely affecting the "feel" and the look of the fabric **130** or its function during operation, at least from a front side view of the vane **110**. In some embodiments, the backing material **132**, and in particular the fibers of the backing material **132**, is not visible to a user when the vane **110** is implemented in the shade **106** even under backlighting conditions.

[0055] In one embodiment, for instance, a backing material is selected that does not significantly impact the opacity of the fabric **130**. Consequently, in one embodiment, the backing material can advantageously influence the stiffness of the fabric **130** without significantly impacting the light transmission properties of the fabric. For example, in certain embodiments, a backing material can be selected that increases the opacity of the fabric **130** by no more than about 35%, such as no more than about 30%, such as no more than about 25%, such as no more than about 20%, such as no more than about 15%, such as no more than about 13%, such as no more than about 10%, such as no more than about 8%. The opacity of materials can be measured using an XRITE Densitometer Opacity Tester manufactured by X-Rite, Inc. of Grandville, MI. The above instrument measures density which can be converted to opacity (%). The above instrument measures a density from 0 to 5 with 0 representing 0% opacity and 5 representing approximately 100% opacity. In the above embodiments, the density (opacity) of the fabric **130** prior to being combined with the backing material **132** can be from about 0.2 to about 2, such as from about 0.3 to about 1.8, such as from about 0.5 to about 1.5.

[0056] In an alternative embodiment, a backing material can be selected that substantially blocks all light from transmitting through the laminate after the backing material is attached to the fabric **130**. For example, the backing material **132** and the fabric **130** can form a laminate having a density (opacity) of greater than about 4, such as greater than about 4.5, such as greater than about 4.8. When selecting a backing material for blocking out light, the backing material may have a relatively high basis weight. For instance, the basis weight of the backing material may be greater than about 20 gsm, such as greater than about 30 gsm, such as greater than about 40 gsm, such as greater than about 50 gsm, such as greater than about 60 gsm. The basis weight of the backing material is generally less than about 150 gsm.

[0057] In addition to influencing stiffness, it was also discovered that the backing material of the present disclosure can also have a significant and unexpected impact on the elongation properties of the fabric **130**. Of particular advantage, the backing material of the present disclosure can have a significant impact on the stiffness ratio of the fabric and the elongation properties of the fabric while only marginally impacting opacity. As described above, the opacity of the fabric may increase by no more than about 35%, such as no more than about 15%, such as even no more than about 10%. For example, in the direction that stiffness increases, the backing material when applied to the fabric can decrease the elongation of the fabric by greater than about 20%, such as greater than about 25%, such as greater than about 30%, such as even greater than about 35%. The elongation is generally decreased in an amount up to about 100%, such as up to about 80%. Decreasing the elongation of the fabric in the direction that stiffness increases as described above can dramatically and unexpectedly improve the handling and drape characteristics of the resulting material and significantly improve the manufacturing versatility and durability of the composite material. The above changes can be made to elongation using the backing material while again only marginally affecting opacity.

[0058] **Fig.** 7 is a schematic view of an illustrative embodiment of a method of manufacturing the vane **110** in accordance with principles of the present disclosure. As shown in **Fig.** 7, the fabric **130** and the backing material **132** are bonded together in a flatbed laminator **138** to create a laminated fabric assembly **140**, which is alternatively referred to as a “fabric laminate” and is subsequently formed into the vane **110**. Although **Fig.** 7 illustrates a flatbed laminator **138**, other machines can be used to create the laminated fabric assembly **140** to similar effect, such as calenders and drum machines. In the illustrative embodiment of **Fig.** 7, the fabric **130** is wound on a first spool **142** and the backing material **132** is wound on a second spool **144**. The first spool **142** and the second spool **144** reside and rotate within a common plane in a spaced relationship such that the fabric **130** and the backing material **132** extend from the respective spools **142**, **144** in substantial or coextensive alignment. An alignment mechanism **146** for verifying the alignment of the fabric **130** and the backing material **132** is also shown in **Fig.** 7. In some embodiments, the alignment mechanism **146** fine-tunes the alignment of the fabric **130** and the backing material **132** before the two fabrics **130**, **132** are permanently bonded together. Before entering the flatbed laminator **138**, the adhesive **134** is applied to one side of at least one of the backing material **132** and the fabric **130**. For example, the adhesive **134** may be melt blown or otherwise applied onto the backing material **132** as the backing material **132** is unrolled from the second spool **144**. In some embodiments, the backing material **132** is wound onto the second spool **144** with the adhesive **134** pre-applied to the backing material **132** for later activation. Additionally or alternatively, the adhesive **134** may take the form of a web adhesive wound on a third spool, which may reside and rotate within the common plane of, and in a spaced relationship with, the first spool **142** and the second spool **144**. In such embodiments, the fabric **130**, the backing material **132**, and the web adhesive may extend from the respective spools **142**, **144** in substantial or coextensive alignment, with the web adhesive positioned between the fabric **130** and the backing material **132**.

[0059] With continued reference to **Fig.** 7, the backing material **132** is laminated to one side of the fabric **130** using heat and/or pressure applied by the flatbed laminator **138**. For instance, the flatbed laminator **138** may include a heating platen assembly **148** to heat set the adhesive **134** applied between the fabric **130** and the backing material **132**. As shown in **Fig.** 7, the heating platen assembly **148** includes an upper platen **150** and a lower platen **152** maintained at a high temperature between about 300°F and about 350°F (e.g., about 325°F) such that as the fabric **130** and the backing material **132** are passed therebetween, the adhesive **134** is activated to bond the two fabrics **130**, **132** together. Each of the upper platen **150** and the lower platen **152** includes a pressure surface **154** that is generally rectangular in shape and is longer than it is wide. In some embodiments, the upper platen **150** and the lower platen **152** press the fabrics **130**, **132** together to consistently bond the backing material **132** to the fabric **130**. For instance, each of the upper platen **150** and the lower platen **152** may apply a pressure of between about 2.5 psi and about 25 psi (e.g., approximately 5 psi) to the fabric assembly **140**. The heat and pressure settings described above are for illustration purposes. In the illustrative embodiment of **Fig.** 7, the stiffness of the fabric assembly **140** may be tailored by adjusting the heat and/or pressure settings of the heating platen assembly **148**.

[0060] After passing through the heating platen assembly **148**, the fabric assembly **140** may pass through a cooling platen assembly **156** to reduce the temperature of the fabric assembly **140** for later processing (e.g., to room temperature). Similar to the heating platen assembly **148**, the cooling platen assembly **156** includes an upper chilling platen **158** and a lower chilling platen **160**, each of which applying a pressure to the fabric assembly **140** passing therebetween (e.g., approximately 5 psi) and including a pressure surface **162** that is generally rectangular in shape and is longer than it is wide. Each of the upper chilling platen **158** and the lower chilling platen **160** are water cooled to maintain the reduced temperature of the cooling platen assembly **156**. For example, cooling water passes through the upper chilling platen **158** and the lower chilling platen **160** at a temperature between about 52°F and about 58°F (e.g., about 54°F). In the exemplary embodiment of **Fig.** 7, the fabric **130** and the backing material **132** are continuously passed through the heating platen assembly **148** and/or the cooling platen assembly **156** by one or more conveyors **164** running between about 15 and about 20 feet per minute (e.g., about 18.5 fpm). After passing through the flatbed laminator **138**, the fabric assembly **140** may undergo further processing, such as but not limited to, cutting the fabric assembly **140** to desired length for particular applications or products.

[0061] Although **Figs. 1-7** illustrate the backing material **132** associated with an operable vane **110** selectively attached to a support sheet **108**, the backing material **132** of the present disclosure can be utilized on different vane structures where bending along one axis while having stiffness along the axis is desired. For example, the backing material **132** may be applied to vertical vane structures, roller shades, and/or vane structures attached to and extending between two vertically or horizontally extending sheets of material to create either a vane or shade structure that has a consistent, preferably smooth, appearance throughout due at least in part to increased stiffness in a desired direction (e.g., in a machine direction and/or in a cross direction of the vane or shade structure).

[0062] The foregoing description has broad application. It should be appreciated that the concepts disclosed herein may apply to many types of shades, in addition to the shades described and depicted herein. For example, the concepts may apply equally to Roman-type shades, honeycomb shades, vertical shades, or any other shade having an elongated vane that needs to bend along its width or height. The discussion of any embodiment is meant only to be explanatory and is not intended to suggest that the scope of the disclosure, including the claims, is limited to these embodiments. In other words, while illustrative embodiments of the disclosure have been described in detail herein, it is to be understood that the inventive concepts may be otherwise variously embodied and employed, and that the appended claims are intended to be construed to include such variations, except as limited by the prior art.

[0063] The present disclosure may be better understood with respect to the following further examples.

EXAMPLES

Example 1

[0064] Physical properties of backed and unbacked fabric samples were tested. Face fabrics from three different rolls were tested. Each roll was made from a 175gsm, 100% polyester jacquard weave fabric. Backing fabrics used were a MILIFE oriented nonwoven having a basis weight of 10 gsm and a MILIFE oriented nonwoven having a basis weight of 15 gsm.

[0065] Machine-direction and cross-direction stiffness were tested using a Handle-O-Meter, available from Thwing-Albert Instrument Co. of Philadelphia, Pa. Five machine-machine direction and five cross-direction tests were performed using samples from each roll. The average stiffness of the five machine-direction samples and five cross-direction samples tested for each roll is reported in Table 4. The tests were run according to ASTM D2923.

[0066] Machine-direction and cross-direction elongation were measured using an Instron 5969 Tensile Tester. Five machine-machine direction and five cross-direction tests were performed using samples from each roll. The sample test size was 2.0" x 5.0", the crosshead speed was 1.5 in/min, the force exerted on the specimen was 5 lbf, and the grip distance was 3.0". The average elongations of the five machine-direction samples and five cross-direction samples tested for each roll are reported in Table 4.

Table 4

	Roll 1		% Change	Roll 2		% Change	Roll 3		% Change
	Face Fabric Alone	Face Fabric + Backing Fabric 10 gsm	-	Face Fabric Alone	Face Fabric + Backing Fabric 10 gsm	-	Face Fabric Alone	Face Fabric + Backing Fabric 15 gsm	-
MD/Warp Direction Stiffness (gram-force)	10	74.7	647	9.1	75.2	726	10.5	87.9	737
CD/Weft Direction Stiffness (gram-force)	32.8	35.2	7	35.1	39.1	11	40.9	50.2	23
MD Elongation (% stretch)	76	47.4	-38	80.4	48.8	-39	68.6	34.9	-49
CD Elongation (% stretch)	49.3	41.7	-15	-	-	-	31.4	37.5	19
Thickness (in)	0.0123	0.0141	15	0.0129	0.0146	13	0.0123	0.0141	15

Example 2

[0067] The effect of the backing fabric on opacity was tested. Face fabrics from Example 1 were tested for opacity alone and with a MILIFE 10 gsm oriented nonwoven backing fabric. Face fabric from roll 1 had a beige color and face fabric from roll 2 had a dark brown color. Five tests were run for each sample. The average optical density of the five samples is shown in Table 5. The tests were run using an Xrite Densitometer Opacity Tester having a 3 mm aperture. The X-Rite Densitometer, made by X-Rite, Inc. of Grandville, Mich., was used to measure visible light transmittance/opacity. This machine measured over a range of about 400–750 nm, and may be considered to provide a more accurate measurement of human visible light transmittance than measurements taken at a single visible light wavelength.

Table 5

	Roll 1 (beige)		% Change	Roll 2 (dark brown)		% Change
	Face Fabric Alone	Face Fabric + Backing Fabric	-	Face Fabric Alone	Face Fabric + Backing Fabric	-
Opacity (optical density)	0.59	0.63	7	1.18	1.33	13

[0068] The foregoing discussion has been presented for purposes of illustration and description and is not intended to limit the disclosure to the form or forms disclosed herein. For example, various features of the disclosure are grouped together in one or more aspects, embodiments, or configurations for the purpose of streamlining the disclosure. However, it should be understood that various features of the certain aspects, embodiments, or configurations of the disclosure may be combined in alternate aspects, embodiments, or configurations. Moreover, the following claims are hereby incorporated into this Detailed Description by this reference, with each claim standing on its own as a separate embodiment of the present disclosure.

[0069] The phrases "at least one", "one or more", and "and/or", as used herein, are open-ended expressions that are both conjunctive and disjunctive in operation. The term "a" or "an" entity, as used herein, refers to one or more of that entity. As such, the terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein. All directional references (e.g., proximal, distal, upper, lower, upward, downward, left, right, lateral, longitudinal, front, back, top, bottom, above, below, vertical, horizontal, radial, axial, clockwise, and counterclockwise) are only used for identification purposes to aid the reader's understanding of the present disclosure, and do not create limitations, particularly as to the position, orientation, or use of this disclosure. Connection references (e.g., attached, coupled, connected, and joined) are to be construed broadly and may include intermediate members between a collection of elements and relative movement between elements unless otherwise indicated. As such, connection references do not necessarily infer that two elements are directly connected and in fixed relation to each other. Identification references (e.g., primary, secondary, first, second, third, fourth, etc.) are not intended to connote importance or priority, but are used to distinguish one feature from another. The drawings are for purposes of illustration only and the dimensions, positions, order and relative sizes reflected in the drawings attached hereto may vary.

<u>What is claimed is</u>:

1. A fabric laminate for an architectural covering, the fabric laminate comprising:
a fabric material portion having a first stiffness in a first direction, and a second stiffness in a second direction transverse to said first direction; and
a backing material portion bonded to said fabric material portion, wherein said backing material portion increases said first stiffness, said backing material portion increasing said second stiffness less than said first stiffness so as to increase a stiffness ratio between said first stiffness and said second stiffness.

2. A fabric laminate according to claim 1, wherein:
said first direction extends along a machine direction of said fabric material portion; and
said second direction extends along a cross direction of said vane fabric.

3. A fabric laminate according to claim 1, wherein:
said fabric material portion has a first stiffness ratio biased in one of said first direction and said second direction; and
said backing material portion causes said fabric laminate to have a second stiffness ratio biased in the other of said first direction and said second direction.

4. A fabric laminate according to claim 1 or 2, wherein said stiffness ratio is greater than approximately 1.5:1.

5. A fabric laminate according to claim 1, 2 or 3, wherein said backing material portion increases the first stiffness in the first direction at least about 1.5 times greater, and such as at least about 2 times greater, such as approximately 5 times greater, than an effect on said second stiffness in said second direction.

6. A fabric laminate according to any of the preceding claims, wherein said backing material comprises a plurality of fibers or filaments oriented substantially along said first direction.

7. A fabric laminate according to any of the preceding claims, wherein said backing material portion comprises a nonwoven.

8. A fabric laminate according to any of the preceding claims, wherein said backing material portion has a basis weight of less than 17 gsm, such as a basis weight of 10 gsm or less.

9. A fabric laminate according to any of the preceding claims, wherein said backing material portion comprises a spunbond web, a meltblown web, a carded web, a hydroentangled web, an airlaid web, a wetlaid web, or a coform web.

10. A fabric laminate as defined in any of the preceding claims, wherein said backing material portion increases said first stiffness at least 3 times, such as at least 4 times, while increasing the second stiffness less than 2 times, such as less than 1.5 times.

11. A fabric laminate as defined in any of the preceding claims, wherein said fabric material portion has an elongation in said first direction and wherein said backing material portion bonded to said fabric material portion decreases said elongation in said first direction at least about 20%, such as at least about 30%.

12. A fabric laminate according to any of the preceding claims, wherein the backing material portion bonded to said fabric material portion increases an opacity of said fabric material portion by less than about 30%, such as less than about 20%, such as less than about 10%.

13. A fabric laminate according to claim 12, wherein said fabric material portion has an optical density (opacity) of from about 0.2 to about 2, such as from about 0.3 to about 1.8, such as from about 0.5 to about 1.5.

14. A vane laminate for an architectural covering, the vane laminate having a machine direction stiffness along a length of said vane laminate and a cross direction stiffness along a height of said vane laminate, the vane laminate comprising:

a vane fabric; and

a backing material connected to said vane fabric;

wherein said backing material increases said machine direction stiffness of said vane laminate while slightly affecting said cross direction stiffness of said vane laminate such that the machine direction stiffness increases at least about 1.5 times greater than the effect on said cross-direction stiffness.

15. A vane laminate according to claim 14, wherein:

said vane fabric has a first stiffness ratio;

said vane laminate has a second stiffness ratio; and

said first stiffness ratio of said vane fabric is less than approximately 1:1; and

said second stiffness ratio of said vane laminate is greater than approximately 1.5:1.

16. A vane laminate according to claim 15, wherein said machine direction stiffness increases by at least about 3 times or more while said cross direction stiffness increases by less than about 1 times.

17. A vane laminate according to claim 14, 15 or 16, further comprising a thermoplastic adhesive positioned between said vane fabric and said backing material.

18. A vane laminate according to claim 15, 16 or 17, wherein a stiffness ratio between said machine direction stiffness and said cross direction stiffness of said vane laminate is greater than about 1.5:1.

19. A vane laminate according to claim 18, wherein said stiffness ratio is less than or equal to about 18:1.

20. A vane laminate according to any of claims 14 through 19, wherein said backing material increases the weight of said vane laminate between about 10 and about 30 grams per square meter.

21. A vane laminate according to any of claims 14 through 20, wherein said backing material is formed from a plurality of fiber segments oriented substantially along a longitudinal length of said vane laminate.

22. A vane laminate according to any of claims 14 through 21, wherein:

said vane fabric has a machine direction stiffness ratio biased in one of said first direction and said second direction; and said backing material causes said fabric laminate to have a cross-direction stiffness ratio biased in the other of said first direction and said second direction.

23. A vane laminate according to any of claims 14 through 20, wherein said backing material is formed from a plurality of filaments oriented substantially along a longitudinal length of said vane laminate.

24. A vane laminate according to any of claims 14 through 23, wherein said backing material comprises a nonwoven web.

25. A vane laminate according to any of claims 14 through 24, wherein said backing material comprises a spunbond web.

26. A vane laminate according to any of claims 14 through 24, wherein said backing material comprises a meltblown web, carded web, hydroentangled web, airlaid web, wetlaid web, or coform web.

27. A vane laminate according to any of claims 14 through 26, wherein said vane fabric has an elongation in said machine direction and wherein said backing material bonded to said vane fabric decreases the elongation in said machine direction at least about 20%, such as at least about 30%.

28. A vane laminate according to any of claims 14 through 27, wherein said backing material bonded to said vane fabric increases an opacity of said vane fabric by less than about 30%, such as less than about 20%, such as less than about 10%.

29. A vane laminate according to claim 28, wherein said vane fabric has an optical density (opacity) of from about 0.2 to about 2, such as from about 0.3 to about 1.8, such as from about 0.5 to about 1.5.

30. A vane laminate according to any of claims 14 through 29, wherein said backing material has a basis weight of less than 17 gsm, such as less than 15 gsm, such as less than 12 gsm, such as less than 10 gsm, such as less than 8 gsm, and greater than about 1 gsm.

31. A covering for an architectural opening, the covering comprising:

a support sheet;

at least one vane having a first edge and a second edge opposite said first edge, said first edge connected to said support sheet, and said second edge movable relative to said support sheet, wherein said at least one vane comprises:

an outer fabric; and

a backing material bound to said outer fabric, said backing material increasing a machine direction stiffness of said outer fabric while slightly affecting a cross direction stiffness of said outer fabric;

wherein:

said machine direction stiffness is along a length of said vane; and

said cross direction stiffness is along a height of said vane.

32. The covering according to claim 31, further comprising an adhesive bonding said backing material to said outer fabric, wherein said adhesive sets a crease defining at least one of said first edge and said second edge of said at least one vane.

33. The covering according to claim 31 or 32, further comprising:

a head rail; and

a bottom rail;

wherein:

said support sheet extends between said head rail and said bottom rail; and

said at least one vane extends substantially parallel to said head rail and said bottom rail.

34. The covering according to any of claims 31 through 33, wherein said backing material increases said machine direction stiffness at least about 1.5 times greater than the effect of said backing material on said cross direction stiffness.

35. The covering according to claim any of claims 31 through 34, wherein said backing material increases said machine direction stiffness at least by about 2 or more greater than the effect of said backing material on said cross direction stiffness.

36. The covering according to claim 35, wherein said backing material increases said machine direction stiffness at least by about 5 times greater than the effect of said backing material on said cross direction stiffness.

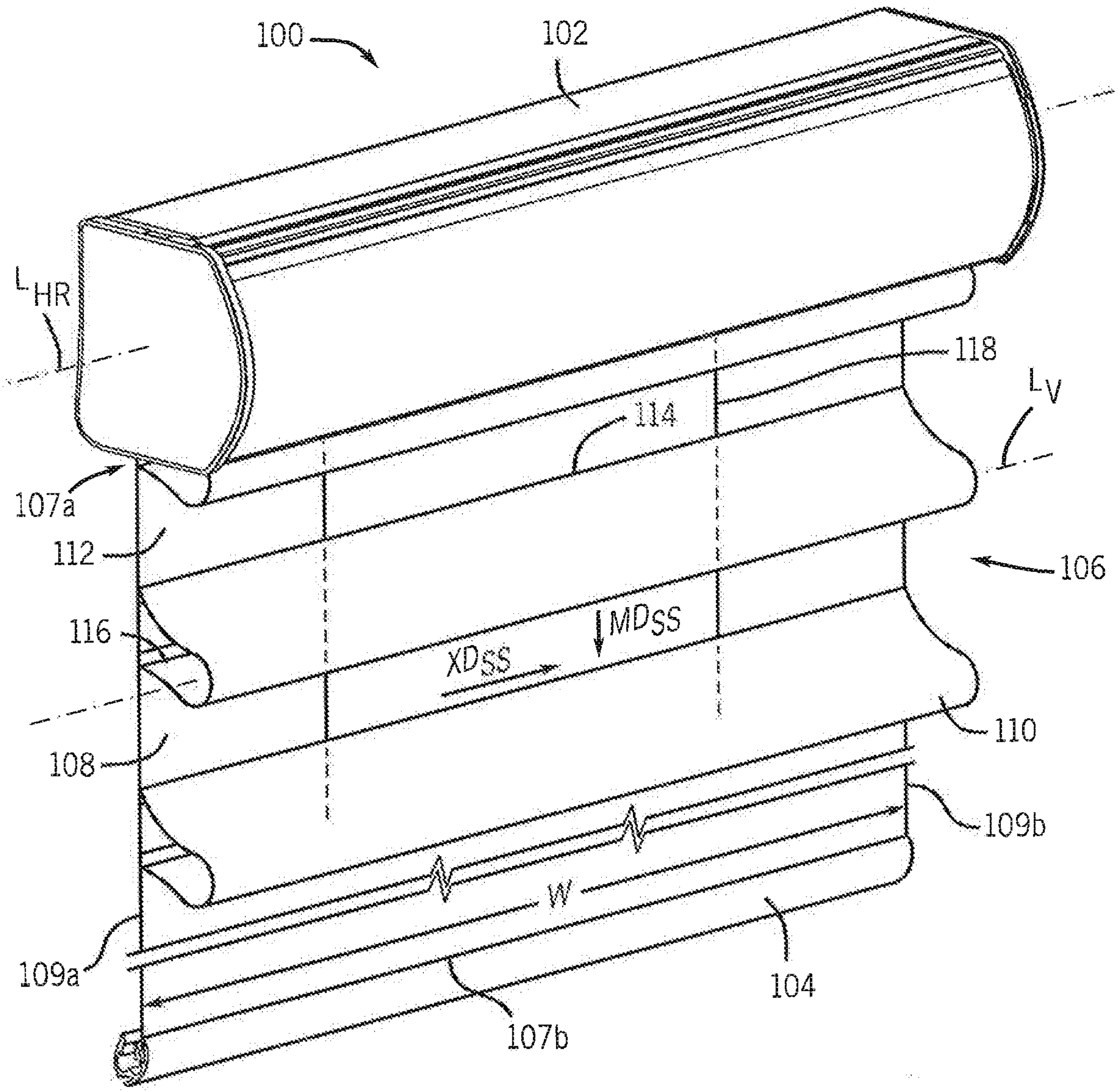
37. A method of manufacturing a fabric for use as an operable vane for an architectural covering, said method comprising:
providing a first material for an outer portion of the fabric;
providing a second material for an inner portion of the fabric; and
attaching the second material to a rear of the first material to enhance the stiffness properties of the first material in a first direction while maintaining the bending properties of the first material in a second direction.

38. The method according to claim 37, further comprising applying an adhesive to at least one of the first material and the second material.

39. The method according to claim 38, wherein applying the adhesive includes melt blowing the adhesive to at least one of the first material and the second material.

40. The method according to claim 37, wherein attaching the second material to the first material includes passing the first and second materials through a flatbed laminator.

41. The method according to claim 37, 38, 39 or 40, further comprising:
passing the first and second materials through a heating platen assembly to activate an adhesive positioned between the first and second materials; and
passing the first and second materials through a cooling platen assembly to reduce the temperature of the fabric to room temperature.



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L_{HR}
118
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L_V
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MD_{SS}
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FIG. 1

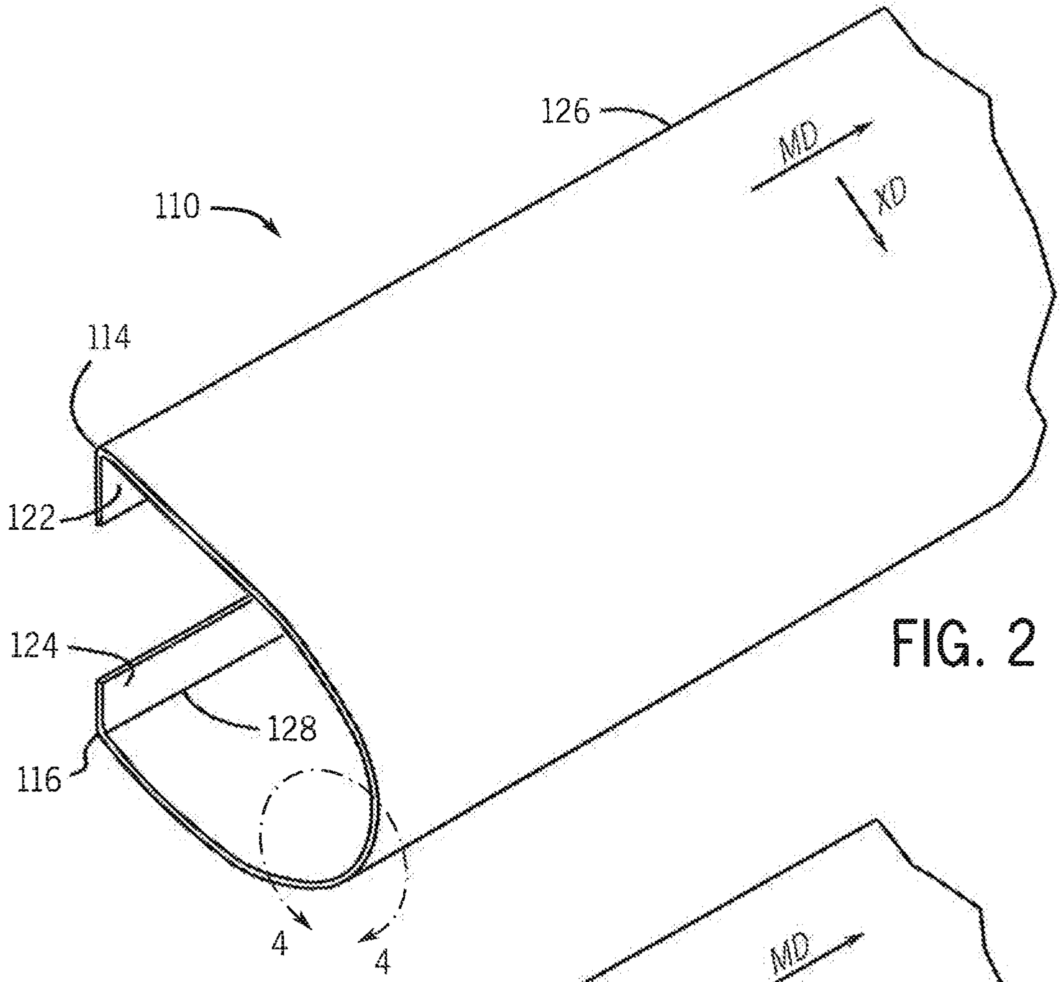


FIG. 2

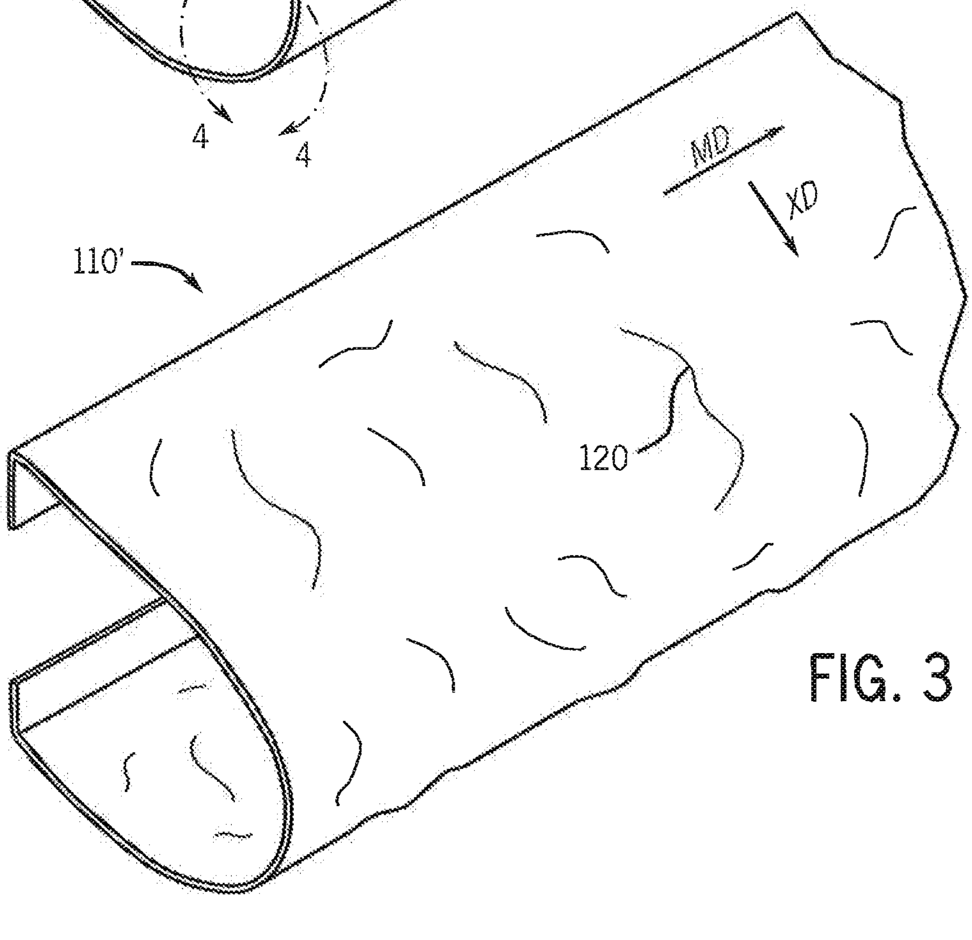
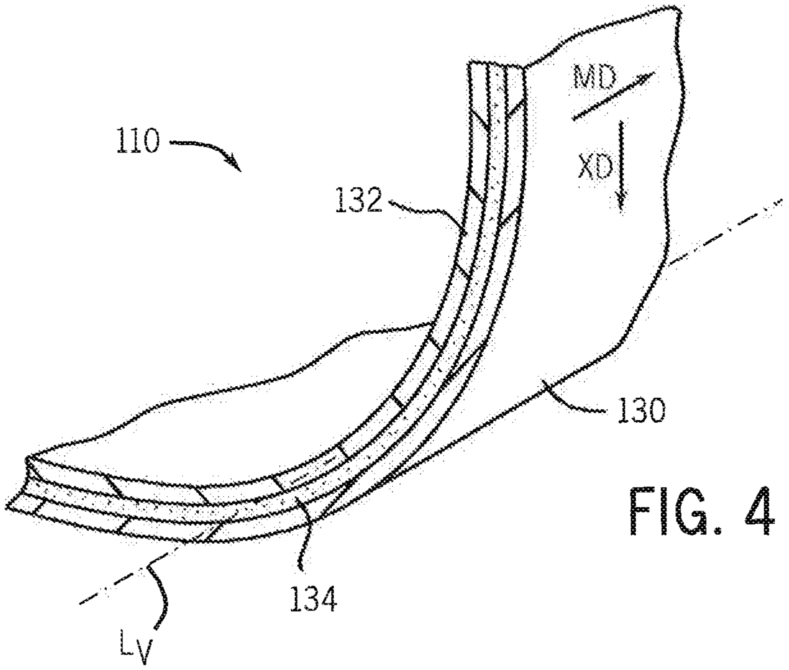


FIG. 3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MD
XD
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FIG. 4

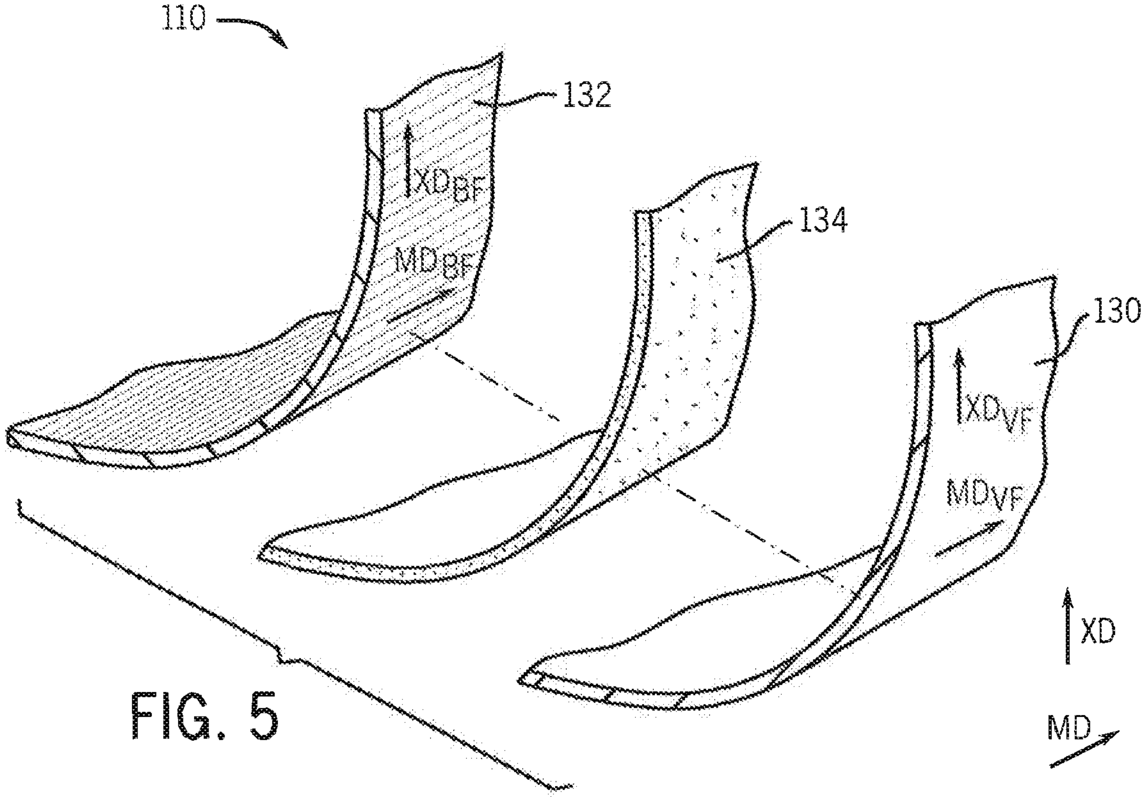
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FIG. 5

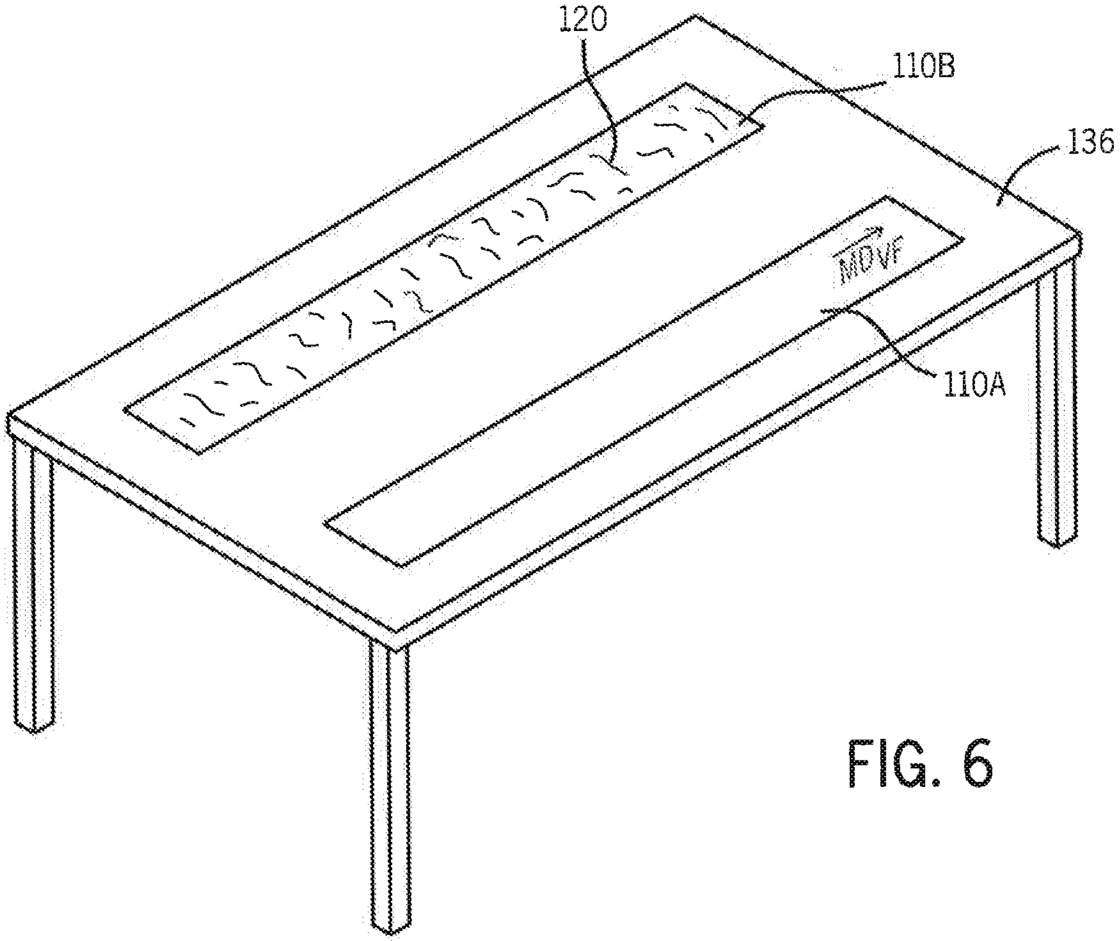

FIG. 6

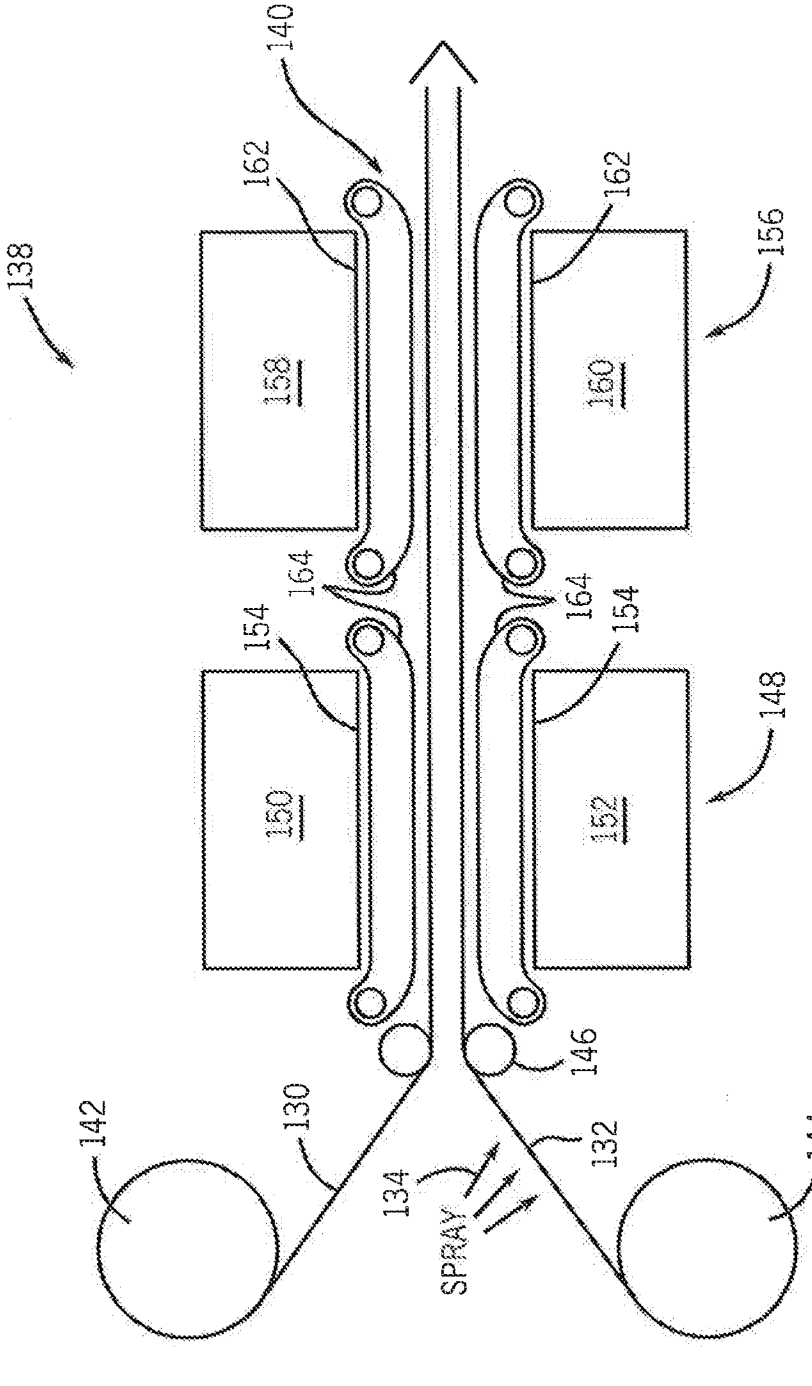

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FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/39335

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

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

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

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

3. ☒ Claims Nos.: 6-13, 18-30, 34-36
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

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

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

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

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

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

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

Remark on Protest

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

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

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US16/39335

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - B32B 5/24, 5/26, 7/12; E06B 9/26, 9/264, 9/386 (2016.01)
CPC - B32B 5/24, 5/26, 7/12; E06B 9/26, 9/264, 9/386
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC(8): B32B 5/24, 5/26, 7/12; D03D 7/00, 25/00; E06B 9/00, 9/24, 9/26, 9/264, 9/28, 9/34, 9/386 (2016.01)
CPC: B32B 5/24, 5/26, 7/12; D03D 7/00, 25/00; E06B 9/00, 9/24, 9/26, 9/264, 9/28, 9/34, 9/386

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatSeer (US, EP, WO, JP, DE, GB, CN, FR, KR, ES, AU, IN, CA, Other Countries (INPADOC), RU, AT, CH, TH, BR, PH), EBSCO, Google/Google Scholar, Fabric, vane, lamellae, laminat*, composit*, fuse*, fusing, Ratio, range, Stiffness, rigid*, composite, Machine, Longitudinal*, Cross, direction, backing, material

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,642,561 A (GROBNER WW) 15 February 1972; figure 1; column 1, lines 1-10; column 2, lines 1-75; column 3, lines 25-75; column 4, lines 30-60; column 5, lines 20-30; column 6, lines 25-75; column 7, lines 5-20; column 9, lines 5-10	1-3, 5/1-5/3, 37, 38, 40 --- 4/1, 4/2, 31, 32, 33/31, 33/32, 39, 41/37-41/40
Y	US 5,339,883 A (COLSON WB et al.) 23 August 1994 column 7, lines 15-20	4/1, 4/2
Y	US 2011/0126959 A1 (HOLT R et al.) 02 June 2011 figures 1B, 1C, 3; paragraphs [0072]-[0074]	31, 32, 33/31, 33/32
Y	US 2008/0286520 A1 (COLSON WB et al.) 20 November 2008 paragraph [0017]	39, 41/39
Y	US 6,342,115 B1 (POURMAND N et al.) 29 January 2002 figure 1; column 3, lines 20-65; column 4, lines 40-67; column 5, lines 1-10	41/37-41/40
A	US 4,519,435 A (STIER K) 28 May 1985 entire document	1-3, 4/1, 4/2, 5/1-5/3, 14-16, 17/14-17/16, 31, 32, 33/31, 33/32, 39 and 41/37-41/40

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

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 August 2016 (31.08.2016)	16 SEP 2016

Name and mailing address of the ISA/	Authorized officer
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Shane Thomas PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774