US 20060194494A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2006/0194494 A1**

Lubker, II (43) **Pub. Date: Aug. 31, 2006**

(54) **PROTECTIVE DRAINAGE WRAPS**

(76) Inventor: **John W. Lubker II**, Roswell, GA (US)

Correspondence Address:
PACTIV CORPORATION
c/o JENKENS & GILCHRIST
225 WEST WASHINGTON STREET
SUITE 2600
CHICAGO, IL 60606 (US)

(21) Appl. No.: **11/415,583**

(22) Filed: **May 2, 2006**

Related U.S. Application Data

(60) Continuation-in-part of application No. 10/869,333, filed on Jun. 16, 2004, which is a division of application No. 10/255,273, filed on Sep. 26, 2002, now Pat. No. 6,869,901, which is a continuation-in-part of application No. 09/788,776, filed on Feb. 20, 2001, now Pat. No. 6,550,212.

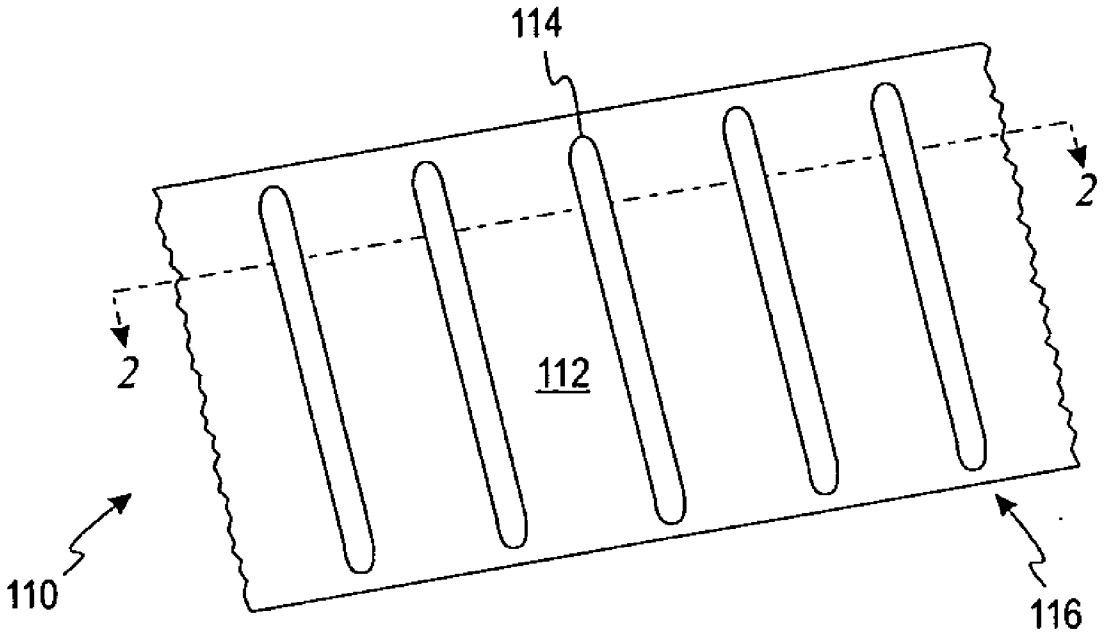
Publication Classification

(51) **Int. Cl.**
E04B 1/70 (2006.01)
D03D 15/00 (2006.01)
E04C 1/00 (2006.01)

(52) **U.S. Cl.** **442/208**; 52/302.1; 52/309.7; 52/481.1; 52/741.13; 52/741.1; 52/742.12; 52/309.16; 52/404.1

(57) **ABSTRACT**

A protective drainage wrap comprises a porous layer, a breathable solid layer portion and a plurality of fibers, filaments, tapes or yarn. The porous layer is adapted to allow water to pass therethrough. The breathable solid layer portion is adapted to allow water vapor to pass therethrough while preventing or inhibiting water from passing therethrough. The plurality of fibers, filaments, tapes or yarn is located between and attached to the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn forms a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap.



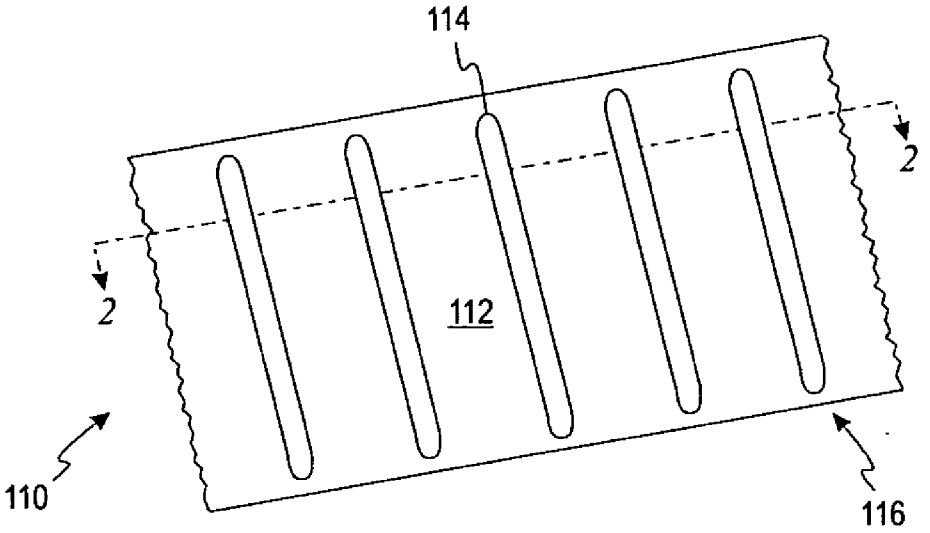


Fig. 1

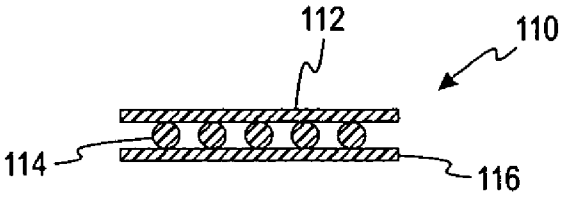


Fig. 2

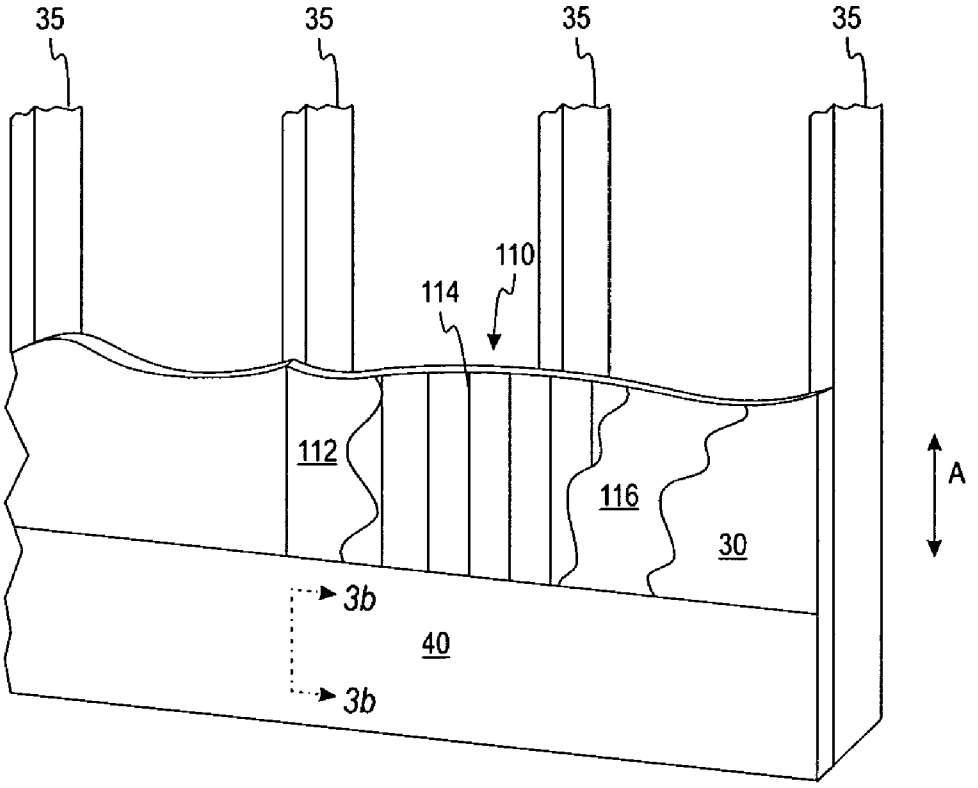


Fig. 3a

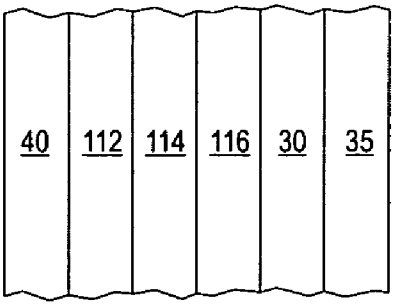


Fig. 3b

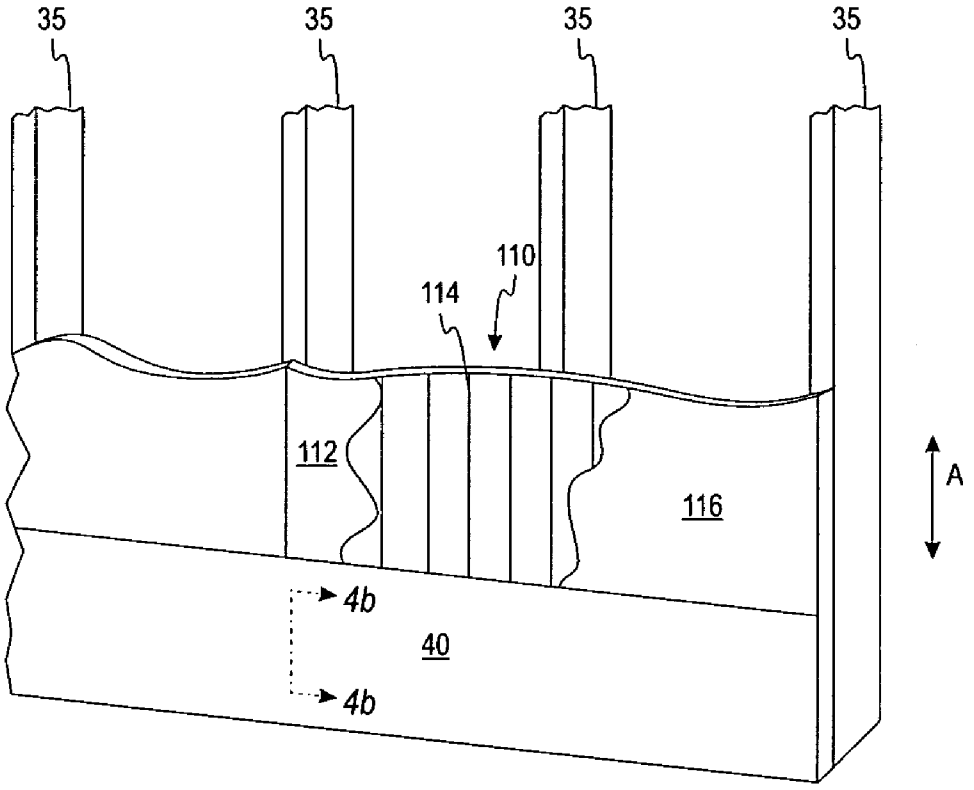


Fig. 4a

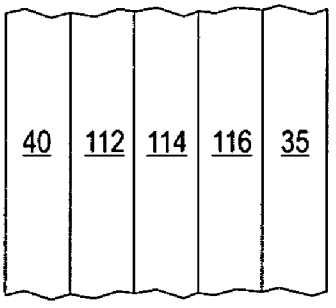


Fig. 4b

PROTECTIVE DRAINAGE WRAPS

CROSS-REFERENCE To RELATED APPLICATIONS

[0001] This application is a continuation-in-part of application Ser. No. 10/869,333 filed on Jun. 16, 2004, which is entitled "Method for Producing Protective Drainage Wraps"; application Ser. No. 10/869,333 is a division of application Ser. No. 10/255,273 filed on Sep. 26, 2002 and issued as U.S. Pat. No. 6,869,901; application Ser. No. 10/255,273 is a continuation-in-part of U.S. application Ser. No. 09/788,776 filed on Feb. 20, 2001, and issued as U.S. Pat. No. 6,550,212. application Ser. Nos. 10/869,333; 10/255,273; and 09/788,776 are all incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to protective wraps that are used to protect against air infiltration and moisture build-up in buildings. Specifically, the protective wraps of the present invention include a porous layer and a breathable solid layer portion.

BACKGROUND OF THE INVENTION

[0003] There have been many different protective wraps used in the construction of buildings, such as residential and commercial construction. Protective wraps are used to protect against air infiltration and damaging moisture build-up. Air infiltration may occur in typical construction through, among other places, sheathing seams and cracks around windows and doors. Moisture build-up can occur externally in the wall cavity from, for example, leaking exterior finishes or coverings, and cracks around windows and doors.

[0004] Protective wraps are typically used as secondary weather barriers in buildings behind exterior coverings such as stucco. Stucco may be synthetic based (e.g., a polymer-based stucco) or cementitious (a mixture of Portland cement, lime and sand). One type of stucco system, exterior insulation finish system (drainage EIFS), that is used in buildings typically involves using a drainage plane, an insulation board, and a wire or synthetic mesh that accepts a cementitious coating. In existing stucco applications, at least one protective wrap is not typically installed directly in contact with the cementitious coatings. In some instances, multiple layers of protective wrap are installed with one of the layers contacting the cementitious coatings. These multiple layers may be house wrap, building paper or both and are installed in two separate applications.

[0005] The protective wraps to be used in stucco applications desirably (a) prevents or inhibits liquid water from passing through the protective wrap into the sheathing or interior wall cavity when a large water head builds up on its surface; (b) attaches to the stucco; and (c) allows water to partially enter into the protective wrap so as to potentially assist the hydration process of the stucco curing.

[0006] Accordingly, a need exists for a protective wrap that is adapted to be used in stucco applications that addresses at least some, if not all, of these desirable attributes.

SUMMARY OF THE INVENTION

[0007] According to one embodiment, a protective drainage wrap comprises a porous layer, a breathable solid layer portion, and a plurality of fibers, filaments, tapes or yarn. The porous layer is adapted to allow liquid water to pass therethrough. The breathable solid layer portion is adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough. The plurality of fibers, filaments, tapes or yarn is located between the porous layer and the breathable solid layer portion and is attached to the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn forms a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap.

[0008] According to one method, a protective drainage wrap is used in a building. A protective drainage wrap is provided that comprises a porous layer, a breathable solid layer portion and a plurality of fibers, filaments, tapes or yarn. The porous layer is adapted to allow liquid water to pass therethrough. The breathable solid layer portion is adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough. The plurality of fibers, filaments, tapes or yarn is located between and attached to the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn forms a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap. At least one framing member is provided. The protective drainage wrap is installed over at least one of the framing members.

[0009] According to another method, a protective drainage wrap is used in a building. A protective drainage wrap is provided that comprises a porous layer, a breathable solid layer portion and a plurality of fibers, filaments, tapes or yarn. The porous layer is adapted to allow liquid water to pass therethrough. The breathable solid layer portion is adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough. The plurality of fibers, filaments, tapes or yarn is located between and attached to the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn forms a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap. A sheathing is provided. The protective drainage wrap is installed over the sheathing.

[0010] According to one method of forming a protective drainage wrap, a porous layer is provided that is adapted to allow liquid water to pass therethrough. A breathable solid layer portion being adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough is provided. A plurality of fibers, filaments, tapes or yarn is attached to the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn is located between the porous layer and the breathable solid layer portion. The plurality of fibers, filaments, tapes or yarn forms a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] **FIG. 1** is a top perspective view of a protective drainage wrap according to one embodiment of the present invention.

[0012] **FIG. 2** is a cross-sectional view taken generally along line II-II of **FIG. 1**.

[0013] **FIG. 3***a* is a cut-away perspective view of the protective drainage wrap of **FIG. 1** fastened to sheathing and a framing member according to one embodiment of the present invention.

[0014] **FIG. 3***b* is a side view taken generally along line **3***b*-**3***b* of **FIG. 3***a*.

[0015] **FIG. 4***a* is a cut-away perspective view of the protective drainage wrap of **FIG. 1** fastened to a framing member according to one embodiment of the present invention.

[0016] **FIG. 4***b* is a side view taken generally along line **4***b*-**4***b* of **FIG. 4***a*.

[0017] While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof have been shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed but, on the contrary, the intention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0018] Turning now to the drawings and referring initially to **FIGS. 1 and 2**, a protective drainage wrap **110** according to one embodiment is shown. The protective wraps of the present invention, including protective wrap **110**, are adapted to be attached over sheathing or framing members. The protective wraps of the present invention are adapted to be used in stucco (e.g., synthetic or cementitious) applications. It is contemplated that the protective wraps may be used in other applications.

[0019] The protective drainage wrap **110** of **FIGS. 1 and 2** comprises a porous layer **112**, a plurality of fibers, filaments, tapes or yarn **114** and a breathable solid layer portion **116**. The plurality of fibers, filaments, tapes or yarn **114** is located between the porous layer **112** and the breathable solid layer portion **116**. The plurality of fibers, filaments, tapes or yarn **114** is attached to the porous layer **112** and the breathable solid layer portion **116**. Thus, the protective wrap **110** is an integral structure.

[0020] The porous layer **112** of the protective drainage wrap **110** is adapted to allow liquid water to pass therethrough. In a stucco application, a large water head may tend to build up on the surface closest to the stucco (i.e., the porous layer **112**). By having the porous layer being adapted to allow liquid water to pass therethrough, a large water head tends not to form. The porous layer **112** may be made of several different types of materials. Non-limiting examples of materials that may be used to form the porous layer **112** include building paper, housewrap, non-woven porous material and felt. Non-limiting commercial examples of building paper and housewrap may be available from several sources including Fortifiber Building Systems Group of Reno, Nev. The strength of the non-woven porous material should hold the stucco in place. Non-limiting examples of non-woven porous material that may be used include polymeric materials such as, for example, polyester, polyethylene, polypropylene, nylon and combinations thereof. It is contemplated that other materials may be used in forming the porous layer of the protective drainage wrap that is adapted to allow water to pass therethrough.

[0021] The plurality of fibers, filaments, tapes or yarn **114** forms a plurality of channels to assist in forming a drainage path for draining liquid moisture from the protective drainage wrap. The plurality of fibers, filaments, tapes or yarn of the protective wrap assists in providing an improved traverse direction (TD) strength. A desirable TD strength and machine direction (MD) strength assists in inhibiting or preventing tears and/or fraying that may be caused during installation. These tears and/or fraying may be caused by, for example, nails or staples during the installation of the protective wraps. These tears and/or fraying may also be caused after installation by environmental conditions such as wind, UV degradation or by vandalism before the protective wrap is covered with an exterior covering. Depending on the material selected for the porous material and the breathable solid layer portion, they may provide MD and TD strength to the protective wrap.

[0022] The plurality of fibers, filaments, tapes or yarn **114** may be made of materials such as polyolefins, polyesters, nylons or combinations thereof. Polyolefins that may be used in forming the plurality of fibers, filaments, tapes or yarn **114** include polypropylenes or polyethylenes. The term "polypropylene" as used herein includes polymers of propylene or polymerizing propylene with other aliphatic polyolefins, such as ethylene, 1-butene, 1-pentene, 3-methyl-1-butene, 4-methyl-1-pentene, 4-methyl-1-hexene, 5-methyl-1-hexene and mixtures thereof. Polypropylene not only includes homopolymers of propylene, but also propylene copolymers comprised of at least 50 mole percent of a propylene unit and a minor proportion of a monomer copolymerizable with propylene and blends of at least 50 percent by weight of the propylene homopolymer with another polymer.

[0023] The term "polyethylene" as used herein includes low density polyethylene (LDPE), medium density polyethylene (MDPE), high density polyethylene (HDPE), very low density polyethylene (VLDPE), linear low density polyethylene (LLDPE), metallocene-catalyzed linear low density polyethylene (mLLDPE) and combinations thereof.

[0024] An example of a "polyester" includes a polyester resin, which is a polycondensation product of a dicarboxylic acid with a dihydroxy alcohol. An example of a "polyethylene terephthalate" includes a polyester resin made from ethylene glycol and terephthalic acid. An example of a "nylon" is a polyamide polymer that is characterized by the presence of the amide group (—CONH).

[0025] Each of the plurality of fibers, filaments, tapes or yarn **114** may be made of a single fiber or filament, or a plurality of fibers, filaments, tapes or yarn aligned with each other. It is contemplated that the plurality of fibers, filaments, tapes or yarn **114** may be made of a mixture of single fibers or filaments, and a plurality of fibers, filaments, tapes or yarn aligned with each other. For example, the single fibers or filaments may be alternated with the plurality of filaments aligned with each other such that the thicknesses of the plurality of fibers, filaments, tapes or yarn **114** vary.

[0026] As best shown in **FIG. 2**, each of the plurality of fibers, filaments, tapes or yarn **114** is shaped in a generally oval manner. The plurality of fibers, filaments, tapes or yarn **114** is desirably substantially circular or circular in shape. The plurality of fibers, filaments, tapes or yarn **114** is shaped in a manner that will allow water to flow down the channels

formed between the plurality of fibers, filaments, tapes or yarn **114** via gravity. It is contemplated that the plurality of fibers, filaments, tapes or yarn **114** may be shaped in a different manner.

[**0027**] The thicknesses of the plurality of fibers, filaments, tapes or yarn **114** of the present invention provide unique vertical channels, when installed, that enhance liquid water drainage within the protective wrap. The installed plurality of fibers, filaments, tapes or yarn **114** allows liquid water to readily exit a wall system.

[**0028**] The plurality of fibers, filaments, tapes or yarn **114** is shown in **FIGS. 3***a*,**3***b* after being installed. The plurality of fibers, filaments, tapes or yarn **114** is installed in a general vertical manner (in direction of arrow A) so as to enhance moisture drainage. The plurality of fibers, filaments, tapes or yarn **114** of **FIG. 3***a* may also be referred to as extending across the width of the protective wrap.

[**0029**] It is contemplated that the plurality of fibers, filaments, tapes or yarn **114** may be located in a generally diagonal manner when installed such that the water is allowed to drain and readily exit a wall system.

[**0030**] The plurality of fibers, filaments, tapes or yarn **114** may be made by a variety of processes. In one process, the plurality of fibers, filaments, tapes or yarn **114** is made from an extrusion process.

[**0031**] According to one embodiment, the plurality of fibers, filaments, tapes or yarn **114** is yarn. The yarn portion is capable of absorbing moisture such as liquid water. Additionally, the yarn portion may be capable of wicking the liquid water that may provide further enhancement to the hydration properties. To assist in moving the liquid water downwardly via gravity, the yarn portion is desirably installed in a generally vertical position. In addition, the yarn portion provides a channeling effect between the plurality of yarn strands to assist in moving the liquid water downwardly. If the channel formed between adjacent yarn strands is blocked within the protective drainage wrap, then the liquid water may be absorbed by the yarn. This absorbed water may flow downwardly via the yarn strand or may be transported to another channel for moving the water downwardly.

[**0032**] Types of yarn that may be used in the present invention include spun yarn, bulk continuous process (bcp) yarn and natural yarn (e.g., jute). Spun yarn may be formed by a two step process in which very small filaments are extruded and chopped to a selected length. These filaments are then spun into a continuous yarn using, for example, a spinning frame. Bulk continuous process yarns may be formed by extruding 70 or 80 very small fibers into continuous filaments that are spaced in close proximity to each other. The close proximity of the continuous filaments allows for the filaments to be intertwined by air entanglement or twisting to create a single yarn. It is contemplated that the yarn may be made in a larger diameter monofilament to assist in providing strength to the protective drainage wrap. The larger diameter monofilaments may be used on a portion of the protective drainage wrap such as in an alternating technique with bulk continuous process yarns.

[**0033**] It is contemplated that a bulk continuous filament may be used. The process for forming a bulk continuous filament includes providing a number of monofilaments that are wound or twisted together to form a larger diameter filament. One commercial example of a bulk continuous filament is manufactured by Hercules Incorporation of Wilmington, Del.

[**0034**] The yarn portion may be made of polymeric materials such as polyolefins, polyesters, nylons or combinations thereof. Some contemplated polyolefins to be used in forming the yarn portion include polypropylenes or polyethylenes. Each of the plurality of strands of the yarn portion may be made of a plurality of fibers or filaments twisted with each other. It is contemplated that the strands of yarn portion may have varying numbers of fibers or filaments twisted with each other such that the thicknesses of the strands differ. For example, the strands of yarn portion may alternate the number of fibers or filaments twisted with each other to provide strands of varying thicknesses. One type of yarn that is contemplated is a spun polypropylene yarn that is manufactured by Propex Fabrics of Austell, Ga.

[**0035**] To assist in natural vapor transmission, the protective wraps of the present invention includes the breathable solid layer portion **116**. The breathable solid layer portion **116** allows water vapor to exit while preventing or inhibiting liquid water from passing therethrough. The liquid water desirably runs down the plurality of fibers, filaments, tapes or yarn **114** as discussed above. By preventing or inhibiting liquid water from passing therethrough, such liquid water does not contact the sheathing or interior building wall cavity.

[**0036**] Natural vapor transmission is desirable because of moisture build-up occurring from internal moist air present in the wall cavity. Moisture build-up may occur from materials, such as green lumber, used in framing or structural sheathing. Moisture build-up may also occur from environmental elements, such as rain, during construction before an exterior coating has been installed or water that enters the installed wall system. In addition to moisture, some air will pass through the breathable solid layer portion **116**. It is desirable that the breathable solid layer portion **116** has a permeability of from about 5 to about 50 perms. The most desired permeability is dependent on the application and environmental conditions where the protective wrap is used.

[**0037**] In one embodiment, the breathable solid layer portion is a spunbonded polymeric film. The spunbonded polymeric film may be a polyolefin film such as, for example, polyethylene, polypropylene or the combination thereof. It is contemplated that other spunbonded polymeric films may be used including polyester, nylon and the combination thereof. Spunbonded polymeric film that may be used include film marketed as DuPont's TYVEX® spunbonded olefin, which is a continuous fiber form of high density polyethylene that includes carbon and hydrogen. It is contemplated that other spunbonded polymeric films may be used.

[**0038**] In another embodiment, the breathable solid layer portion is a woven material with a breathable coating. The woven material may be a polymeric material such as polyester, polyethylene, polypropylene, nylon and combinations thereof. The breathable coating may be may from different materials including polymeric materials. One type of breathable coating is a polyurethane coating. One non-limiting example of a commercial type of polyurethane coating is

marketed by Noveon Inc. It is contemplated that other breathable coatings may be used.

[0039] The breathable coating may be applied by various processes to the woven material. According to one process of the present invention, pellets of a resin(s) for forming the breathable coating are added in their solid form into an extrusion hopper. These pellets are heated to a sufficient temperature in an extruder to form a molten material. The molten material that will form the breathable coating exits the extruder through a die. The extruder typically has a horizontal die in which the molten material exits and falls vertically by gravity onto a surface of the woven material. At the same time the molten material is exited from the extruder, the woven material proceeds in a direction transverse to the extruder.

[0040] The woven material may proceed on a transport mechanism involving rollers that pull the woven material along a threaded path. The transport mechanism is located below the extruder die that extrudates the coating. The amount of breathable coating applied to the woven material depends on factors such as the speed of the transport mechanism, size of the extruder die opening, and speed of the coating exiting the die. The amount of breathable coating used should be sufficient to cover the woven material without leaving pin holes or interstices.

[0041] In a further embodiment, the breathable solid layer portion is a breathable film. The breathable film may be made of materials that are inherently breathable or materials that are processed in such a manner that the material becomes breathable. The breathable film may be made of materials that are inherently breathable such as polyurethane or nylon. Some materials such as nylon become more breathable as the humidity increases. It is contemplated that other materials may be used in forming an inherently breathable film.

[0042] In one process of further processing material to become a breathable film, material is extruded or blown to form a film. The resulting extruded or blown film is then further processed (e.g., stretched) to form a breathable film that provides air and moisture breathability. It is contemplated that other processing may be used to form the breathable film. Materials that may be further processed to form the breathable film include polyolefins, polyurethanes, polyesters and nylons. Polyolefins that may be used in forming the breathable film include polyethylene, polypropylene or the combination thereof It is contemplated that other materials may be used and further processed to form the breathable film.

[0043] It is contemplated that the material to be used in forming the breathable film may include additional components such as a mineral or inorganic filler. Non-limiting examples of fillers that may be used include calcium carbonate, talc, clay, titanium dioxide, barium sulfate, fungible fillers, polystyrenes, and zeolites. It is contemplated that other materials may be used including other finely powdered inorganic materials. The average size of the mineral or inorganic filler may vary, but is generally from about 0.1 to about 5 microns. The average particle size and size distribution is typically optimized for the desired properties and end uses.

[0044] For example, the breathable film may include at least one polyolefin and a mineral or inorganic filler in one embodiment. In this embodiment, the breathable film typically includes at least about 40 wt. % of the filler with the balance being the polyolefin. The breathable film generally comprises from about 40 to about 60 wt. % filler.

[0045] In one embodiment, the breathable film comprises polyethylene or polypropylene in combination with calcium carbonate. The polyethylene or polypropylene is mixed with the calcium carbonate and melted. The composition is extruded into a film by, for example, a blown or cast process. In one embodiment, the film including a polyolefin (e.g., polyethylene or polypropylene) and a filler (e.g., calcium carbonate) is stretched, resulting in the bonds of the film breaking slightly around the location of the mineral filler. By slightly breaking the bonds of the film, the film becomes a breathable film. The stretching of the breathable film is typically performed prior to attachment with the plurality of fibers, filaments, tapes or yarn **114**.

[0046] The stretching may be performed by a machine direction orientation, cross machine direction tentering, intermeshing stretching or a combination thereof. Machine direction orientation typically involves running the film between two pairs of rollers in which the second pair of rollers is running faster than the first pair. Because of the difference in speeds between the pair of rollers, the film is stretched. Cross machine direction tentering typically includes grasping the sides of the film and stretching it sideways. Intermeshing stretching, which may also be referred to as incremental or interdigitating stretching typically involves the film traveling between two grooved or toothed rollers. One example of an intermeshing process technology is disclosed in U.S. Pat. No. 5,865,926 to Clopay Plastic Products Company of Cincinnati, Ohio. It is contemplated that other stretching techniques may be used to form the breathable film. This type of breathable film may be referred to as a voided polymeric coating.

[0047] Breathable films that may be used include those made by 3M Company (SCOTCH® microporous films), Exxon (Exxaire porous films) and AssiDoman Bellcoat in Belgium. It is contemplated that other breathable films may be used in the present invention.

[0048] The breathable solid layer portion **116** generally has a thickness of from about 0.5 mil to about 2 mils, and desirably from about 0.8 to about 1.2 mil.

[0049] The plurality of fibers, filaments, tapes or yarn **114** may be attached to the porous layer **112** and the breathable solid layer portion **116** via a suitable adhesive, heat bonding, laminating, UV-cured material or attaching method. If an adhesive is used, the adhesive is selected based on the materials used to form the porous layer **112**, the plurality of fibers, filaments, tapes or yarn **114**, and breathable solid layer portion **116**. The adhesive may be located initially on the plurality of fibers, filaments, tapes or yarn **114** before being attached to the porous layer **112**, breathable solid layer portion **116**. It is contemplated that the adhesive may be selectively located on the porous layer **112** and the breathable solid layer portion **116**. The adhesive in these embodiments is not typically placed in such a manner that the water vapor would be hindered in traveling through the breathable solid layer portion **116**. In another embodiment, the adhesive may be a breathable adhesive such that water vapor is adapted to pass therethrough. A breathable adhesive is desirable in that it will not inhibit or prevent water vapor from passing through the breathable solid layer portion **116**.

[0050] In another method, the porous layer and the breathable solid layer portion are applied to the plurality of fibers, filaments, tapes or yarn by laminating, thermobonding, or ultrasonically bonding or welding. The thermobonding should not be performed at temperatures where the breathable solid layer portion loses the ability to allow the water vapor to travel therethrough.

[0051] Additives to the protective wraps are contemplated in the present invention. For example, the protective wraps may include colorant additives to resist the glare of the sun or identification of manufacturer. The addition of colorant assists workers in installing the protective wrap. The protective wraps may also include chemical additives such as ultraviolet inhibitors and antioxidants to withstand deterioration from prolonged exposure to sunlight. In addition, the protective wraps of the present invention may be translucent. Translucent protective wraps assist in locating studs, as well as window and door openings. The protective wraps of the present invention may also include printing thereon.

[0052] The tensile strength of the protective drainage wraps as measured by ASTM D 882 is generally greater than about 15 lbs./in, and desirably greater than about 20 or 25 lbs./in. It is beneficial that the protective drainage wraps of the present invention are strong so as to inhibit or prevent tearing and/or fraying during or after installation. Tearing and/or fraying may, and typically will, result in unwanted air infiltration and/or moisture penetration. The TD tear strength of the protective drainage wraps as measured by ASTM D 1117 is generally greater than 10 lbs., and desirably greater than about 15 or 20 lbs.

[0053] The protective drainage wraps of the present invention may be formed into a number of shapes. The protective drainage wraps, however, are generally stored in a roll on a circular cardboard core. The protective drainage wraps of the present invention may be manufactured in a variety of sizes. Popular sizes used in residential and commercial construction include, but are not limited to, 3 foot by 100 foot (3'×100'), 4.5'×100', 4.5'×150', 4.5'×195', 9'×100', 9'×150', 9'×195' and 10'×150'. For example, the 3' length extends in the transverse direction, while the 100' length extends in the machine direction.

[0054] The thickness of the protective drainage wraps may also vary, but is generally from about 8 to about 12 mils as measured by ASTM D 751. The thickness of the protective drainage wraps is typically from about 9 to about 11 mils. Popular thickness of protective drainage wraps includes about 10 mils.

[0055] The protective drainage wraps of the present invention may be used as wraps in residential and commercial buildings. The protective drainage wrap is typically covered by a cementitious exterior covering (stucco or EIFS). The protective drainage wrap may also assist in controlling the drying/curing process of the cementitious exterior covering so that the hydration of the exterior covering will not occur too fast or too slow.

[0056] According to one process of the present invention, a protective drainage wrap is attached directly to sheathing which is attached to framing members. The sheathing may be made from various materials. Some examples of materials used as sheathing include thin composite laminations, fiberboard, oriented-strand board (OSB), plywood, polyisocyanurate foam, extruded polystyrene (XPS) foam, and molded expanded polystyrene (EPS) foam. Some examples of framing members include plywood and OSB. The protective wraps may be attached mechanically to the sheathing by using fasteners such as nails or staples.

[0057] Referring back to **FIG. 3***a*, the protective wrap **110** (porous layer **112**, plurality of fibers, filaments, tapes or yarn **114** and breathable solid layer portion **116**) is installed over the sheathing **30**. The sheathing **30** is attached to a plurality of framing members **35**. Types of framing members that may be used include southern yellow pine (SYP) and spruce pine fur (SPF). Some framing members, however, may be made of metal. In another embodiment, the framing members may be structural insulated panels. The protective wrap **110** of **FIG. 3***a* has been cut-away to depict the porous layer **112**, the plurality of fibers, filaments, tapes or yarn **114** and the breathable solid layer portion **116**. **FIG. 3***a* also shows an exterior covering (stucco **40**) that is located on an exterior surface of the protective wrap **110**. More specifically, the stucco is attached to the porous layer **112**. The breathable solid layer portion **116** of **FIG. 3***a* is located adjacent to the sheathing **30**. The relative locations of the layers after installation are depicted in **FIG. 3***b*.

[0058] According to another process of the present invention (**FIG. 4***a*), the protective wrap **110** is installed directly over a plurality of framing members **35**. The protective wrap is attached to the plurality of framing members in a similar manner as discussed above with respect to attaching the protective wrap to the sheathing. The relative locations of the layers after installation are depicted in **FIG. 4***b*.

[0059] While the present invention has been described with reference to one or more particular embodiments, those skilled in the art will recognize that many changes may be made thereto without departing from the spirit and scope of the present invention. Each of these embodiments and obvious variations thereof is contemplated as falling within the spirit and scope of the claimed invention, which is et forth in the following claims.

What is claimed is:

1. A protective drainage wrap comprising:

a porous layer being adapted to allow liquid water to pass therethrough;

a breathable solid layer portion being adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough; and

a plurality of fibers, filaments, tapes or yarn being located between the porous layer and the breathable solid layer portion and being attached to the porous layer and the breathable solid layer portion, the plurality of fibers, filaments, tapes or yarn forming a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap.

2. The protective wrap of claim 1 wherein the porous layer is a building paper or housewrap.

3. The protective wrap of claim 1 wherein the porous layer is a non-woven porous material.

4. The protective wrap of claim 1 wherein the porous layer is felt.

5. The protective wrap of claim 1 wherein the breathable solid layer portion is a woven material with a breathable coating.

6. The protective wrap of claim 1 wherein the breathable solid layer portion is a spunbonded polymeric material.

7. The protective wrap of claim 6 wherein the polymeric spunbonded material is a polyolefin spunbonded material.

8. The protective wrap of claim 6 wherein the polyolefin spunbonded material includes polyester, nylon or the combination thereof.

9. The protective wrap of claim 1 wherein the breathable solid layer portion is a breathable film.

10. The protective wrap of claim 1 wherein the plurality of fibers, filaments, tapes or yarn comprises polypropylene, polyethylene or combinations thereof.

11. The protective wrap of claim 1 wherein the plurality of fibers, filaments, tapes or yarn is yarn.

12. A method of using a protective drainage wrap in a building, the method comprising the acts of:

providing a protective drainage wrap comprising a porous layer, a breathable solid layer portion and a plurality of fibers, filaments, tapes or yarn, the porous layer being adapted to allow liquid water to pass therethrough, the breathable solid layer portion being adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough, the plurality of fibers, filaments, tapes or yarn being located between the porous layer and the breathable solid layer portion and being attached to the porous layer and the breathable solid layer portion, the plurality of fibers, filaments, tapes or yarn forming a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap;

providing at least one framing member; and

installing the protective drainage wrap over at least one of the framing members.

13. The method of claim 12 further including providing a sheathing, the sheathing being located between the protective wrap and the at least one framing members.

14. The method of claim 12 wherein the porous layer is a building paper or housewrap.

15. The method of claim 12 wherein the porous layer is a non-woven porous material.

16. The method of claim 12 wherein the porous layer is felt.

17. The method of claim 12 wherein the breathable solid layer portion is a woven material with a breathable coating.

18. The method of claim 12 wherein the breathable solid layer portion is a spunbonded polymeric material.

19. The method of claim 12 wherein the breathable solid layer portion is a breathable film.

20. The method of claim 12 further including the act of providing and installing stucco to the porous layer.

21. A method of using a protective drainage wrap in a building, the method comprising the acts of:

providing a protective drainage wrap comprising a porous layer, a breathable solid layer portion and a plurality of fibers, filaments, tapes or yarn, the porous layer being adapted to allow liquid water to pass therethrough, the breathable solid layer portion being adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough, the plurality of fibers, filaments, tapes or yarn being located between the porous layer and the breathable solid layer portion and being attached to the porous layer and the breathable solid layer portion, the plurality of fibers, filaments, tapes or yarn forming a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap;

providing a sheathing; and

installing the protective drainage wrap over the sheathing.

22. The method of claim 21 wherein the porous layer is a building paper or housewrap.

23. The method of claim 21 wherein the porous layer is a non-woven porous material.

24. The method of claim 21 wherein the porous layer is felt.

25. The method of claim 21 wherein the breathable solid layer portion is a woven material with a breathable coating.

26. The method of claim 21 wherein the breathable solid layer portion is a spunbonded polymeric material.

27. The method of claim 21 wherein the breathable solid layer portion is a breathable film.

28. The method of claim 21 further including the act of providing and installing stucco to the porous layer.

29. A method of forming a protective drainage wrap, the method comprising the acts of:

providing a porous layer being adapted to allow liquid water to pass therethrough;

providing a breathable solid layer portion being adapted to allow water vapor to pass therethrough while preventing or inhibiting liquid water from passing therethrough; and

attaching a plurality of fibers, filaments, tapes or yarn to the porous layer and the breathable solid layer portion, the plurality of fibers, filaments, tapes or yarn being located between the porous layer and the breathable solid layer portion, the plurality of fibers, filaments, tapes or yarn forming a plurality of channels to assist in forming a drainage path for draining liquid water from the protective drainage wrap.

30. The method of claim 29 wherein the porous layer is a building paper or housewrap.

31. The method of claim 29 wherein the porous layer is a non-woven porous material.

32. The method of claim 29 wherein the porous layer is felt.

33. The method of claim 29 wherein the breathable solid layer portion is a woven material with a breathable coating.

34. The method of claim 29 wherein the breathable solid layer portion is a spunbonded polymeric material.

35. The method of claim 29 wherein the breathable solid layer portion is a breathable film.

* * * * *