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(54) Title: A DISPOSABLE GARMENT

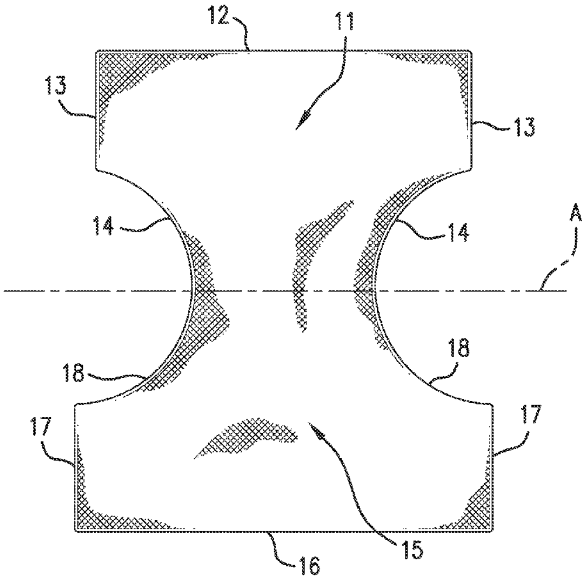

FIG. 1

(57) Abstract: This invention claims disposable garments comprising a stretchy laminate and methods of making the same.

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A DISPOSABLE GARMENT

This application claims priority to and benefit of provisional filed patent application numbers 62/048047 and 62/048066 filed on 9/9/2014 and provisional patent application number 62/171129 filed on 6/4/2015.

BACKGROUND

Adhesives are often used to bond substrates together. In the area of industrial adhesives, hot melt adhesives are commonly used to bond together a wide variety of articles including disposable absorbent articles comprising non-woven substrates e.g. diapers, training paints, surgical garments, swim wear, absorbent underpants, adult incontinence products, sanitary napkins and medical dressings (e.g. wound care products).

There can be multiple hot melt adhesives used in the manufacture of a disposable absorbent article. For example, in the manufacture of a disposable diaper, hot melt adhesive ar e used for construction (e.g. bonding the backsheet to the nonwoven and optionally the absorbent pad), elastic attachment (e.g. bonding the elastic material to the backsheet in for example the leg or waist area), and for the core stabilization (e.g. applying an adhesive to the absorbent core to increase the strength of the core).

Hot melt adhesives can also be used to form elastic composites that are useful in disposable garments. Currently, elastic composites are often formed in a 5-layer configuration including the following layers: nonwoven, hot melt adhesive, elastic material, hot melt adhesive, nonwoven. The hot melt adhesive bonds the non-adhesive elastic to the nonwoven to form a composite. Some elastic composites are bulky with gathers due to the way the elastic composites are formed.

Elastic strand components are also often added to disposable garments to improve fit, but methods of incorporating elastic strand components into the disposable garment are complicated.

There remains a need for a simplified way to impart elastic properties to a disposable garment.

SUMMARY

In one aspect, the invention features a disposable garment including first and second extensible nonwoven substrates and at least one elastic hot melt adhesive composition disposed between and bonding the first and second substrates, creating a stretchy bonded region; the elastic hot melt adhesive composition having a viscosity of less than about 200,000 cps at application temperature of around 177°C and a set after 50% hysteresis of no greater than about 20%; and said disposable garment comprising: a front panel having a front waist edge substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second hip edges which each end where a pair of first and second front leg edges begins; and a back panel having a back waist edge substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second back hip edges which each end where a pair of first and second back leg edges begins; wherein when the first front hip edge is connected to the first back hip edge and the second front hip edge is connected to the second back hip edge, the front waist edge and the back waist edge form a torso opening, and the first front leg edge and first back leg edge form a first leg opening and the second front leg edge and the second back leg edge form a second leg opening; wherein the disposable garment is free of added elastic strand components.

In one embodiment, the first and second extensible nonwoven substrates are oriented such that disposable garment is more extensible around the torso opening than it is from the front waist edge to the back waist edge. In another embodiment, the disposable garment retains a conformable shape upon being stretched when worn and is substantially gather-free. In a different embodiment, the stretchy bonded region comprises at least 90% of the disposable garment.

In one embodiment, the disposable garment is a disposable absorbent garment comprising an absorbent core between the first and second extensible nonwoven.

In another embodiment, the disposable garment additionally comprising a third body facing nonwoven substrate affixed around the waist edges and the longitudinal edges of the stretchy bonded region, and a core disposed between the stretchy bonded region and the third body facing nonwoven substrate. In a different embodiment, the disposable garment has a minor area of unbonded regions with increased breathability over the bonded region.

In one embodiment, the hip edges are connected through a bond that is not repositionable. In another embodiment, the disposable garment additionally includes a fastening component located at zone adjacent to the back hip edges for bonding to the front hip edges. In one embodiment, the disposable garment includes a first and second extensible nonwoven that are same and the extensible nonwoven has an elongation at break in the cross direction of greater than about 75%. In a different embodiment, the first and second extensible nonwovens are different and each extensible nonwoven has an elongation at break in the cross direction of greater than about 75%.

In still another embodiment, the disposable garment comprises a second bonded region, the second bonded region comprising a different second elastic hot melt adhesive and/or a different elastic hot melt adhesive coat weight.

In one embodiment, the extensible nonwoven is airlaid, carded and hydroentangled. In another embodiment, the elastic hot melt adhesive composition in the disposable article includes: from about 30% by weight to about 60% by weight of one or more styrene block copolymers wherein the one or more styrene block copolymers has an average styrene content of at least about 30% by weight and an average MFR (200°C/5 kg) of no less than about 20, greater than about 10% by weight of a plasticizer and, a tackifying agent.

In another aspect, the invention features a method of manufacturing a stretchy laminate comprising the steps of: providing a first and second extensible nonwoven substrates in a state such that it is not substantially extended beyond its original state in any direction during formation of the laminate; providing an elastic hot melt adhesive comprising a viscosity of less than about 200,000 cps at application temperature and a set after 50% hysteresis of no greater than about 20%; advancing each first and second extensible nonwoven substrate in a machine direction; applying the elastic hot melt adhesive in hot molten form to the first extensible nonwoven substrate; contacting the second extensible nonwoven substrate to the hot molten elastic hot melt adhesive coated first extensible nonwoven substrate to form a layered configuration; cooling the layered configuration to create a stretchy laminate bonded with the hot melt adhesive.

In one embodiment, a gather-free disposable undergarment free of added elastic strand components comprising the stretchy laminate made according to the method defining a torso opening and two leg openings. In a different embodiment, the stretchy laminate is made in line with the disposable garment cut from the stretchy laminate. In another embodiment, the method, further includes the steps of: providing a third continuous web and advancing it in the machine direction; and adhering the third continuous web to the laminate via an adhesive. In still another embodiment, the elastic hot melt adhesive is applied to the substrate in a substantially continuous film coating.

In a different aspect, the invention features a method of manufacturing a stretchy laminate comprising the steps of: providing a first and second extensible nonwoven substrates in a state such that it is not substantially extended beyond its original state in any direction during formation of the laminate; providing an elastic hot melt adhesive comprising having a viscosity of less than about 200,000 cps at application temperature and a set after 50% hysteresis of no greater than about 20%; advancing each first and second extensible nonwoven substrate in a machine direction; applying the elastic hot melt adhesive in hot molten form to the first extensible nonwoven substrate; applying the elastic hot melt adhesive in hot molten form to the second extensible nonwoven substrate; contacting the hot molten elastic hot melt adhesive coated sides of the first and second extensible nonwoven substrates to form a layered configuration; cooling the layered configuration to create a stretchy laminate bonded with the hot melt adhesive.

BRIEF DESCRIPTION OF DRAWINGS

Fig 1 is a plain view of a disposable garment in an unfolded state prior to the front hip edges being bonded to the back hip edges.

Fig 2 is a front view of an assembled disposable garment.

Fig 3 is an illustration of how three adjacent bonded regions could be applied to a substrate using three different adhesive applicators.

Fig 4 is a plain view of a disposable garment in an unfolded state prior to the front hip edges being bonded to the back hip edges with zones of stretchy regions in the longitudinal direction alternating with zones having properties different from the stretchy region.

DETAILED DESCRIPTION

Applicants have discovered that certain hot melt adhesive compositions and extensible nonwoven substrates can be used to form elastic bonded regions that are useful in making disposable garments and disposable absorbent garments. In a less preferred embodiment, applicants expect that non-extensible non-woven substrates could be used, if activated after the elastic bonded regions are formed. The "disposable" garments are not designed to withstand washing, but rather are intended for a single use and disposal. As further described below, the disposable garment is made from a "stretchy" laminate and therefore takes on a form that conforms to the wearer's torso and legs, in the absence of added elastic strand components. The laminate and disposable garments made from the laminate are "stretchy", being easily stretched in use, providing the user of the garment with soft, non-binding comfort and body conforming, non-bulky fit. The disposable garments are discrete and preferably are gather-free. Disposable garments that are "gather-free" are substantially smooth and substantially free of gathers, puckers, ripples or other three dimensional undulations which are unavoidable for other types of laminates intended to provide stretch to disposable garments. Whether the disposable garment will be used in a simple design, such as disposable underwear, or as a disposable absorbent garment including an additional absorbent feature for absorbing fluids, the simplicity of the disposable garments enables countless cost effective designs and methods of manufacture.

STRETCHY LAMINATE

A stretchy laminate is formed from an elastic hot melt adhesive disposed between at least two extensible nonwoven substrates. The stretchy laminate is extensible in at least one direction to at least about 1.25, 1.5, or 2 times its unstretched length.

ELASTIC HOT MELT ADHESIVE COMPOSITION

The elastic hot melt adhesive composition can be a pressure sensitive (i.e. has at least some tack at room temperature) hot melt adhesive. The elastic hot melt adhesive composition can be light in color and can have good thermal stability. In a cooled film, the elastic hot melt adhesive composition can be clear i.e. translucent or alternatively the hot melt adhesive can be opaque. The elastic hot melt adhesive compositions can have an Initial Molten Gardner Color after manufacturing of less than about 3, or even less than about 2. Alternately, the elastic hot melt adhesive composition can be pigmented to an opaque color such as e.g. pink, blue, white, gray, etc.

The elastic hot melt adhesive composition has a viscosity at application temperature of no greater than about 200,000 cps, no greater than about 100,000 cps, or even no greater than about 50,000 cps.

In one embodiment, the elastic hot melt adhesive composition can be applied in-line, on a high speed production line. For in-line application, the elastic adhesive has a viscosity of no greater than about 40,000 cps at around 177°C (350°F), no greater than about 15,000 cps at around 177°C (350°F) no greater than about 10,000 cps at around 177°C (350°F), no greater than about 7,500 cps at around 177°C (350°F), or even no greater than about 5,000 cps at 177°C (350°F).

The elastic hot melt adhesive composition gives a set after 50% hysteresis of no greater than about 20%, no greater than about 12%, no greater than about 10%, or even no greater than about 6% when tested according to the 2-Peak Hysteresis Test Method

The elastic hot melt adhesive composition provides good adhesion when tested according to the Peel Force Test Method. In some embodiments, the elastic adhesive can have a peel adhesion of greater than about 100 grams, greater than about 200 grams, or even greater than about 300 grams.

The elastic hot melt adhesive composition can include one or more styrene block copolymers, a tackifying agent, and greater than about 15% by weight of a plasticizer.

The elastic hot melt adhesive composition can have a viscosity curve with a Viscosity Ratio (i.e. Viscosity @ 149°C(300°F) (cps)/Viscosity @ 177°C(350°F) that is less than about 7, less than about 6, less than about 5, or even less than about 4. A low viscosity ratio can indicate improved machining at high line speeds as the adhesive does not gain viscosity quickly as it cools.

The elastic hot melt adhesive composition can include a tackifying agent with at least some aromatic content and a plasticizer such as naphthenic oil.

Thermoplastic Elastomer

The elastic hot melt adhesive composition includes one or more thermoplastic elastomers. The thermoplastic elastomers can be selected from the group consisting of olefinic thermoplastic elastomers (e.g. propylene and ethylene copolymers) and styrene block copolymers. The elastomer can further be functionalized i.e. by the addition of other chemical groups such as e.g. acid, anhydride (e.g. maleic anhydride), and hydroxyl groups. Suitable propylene thermoplastic elastomers include polypropylene homopolymers and higher order polymers (e.g., copolymers and terpolymers) derived from propylene and at least one olefin co-monomer. Examples of suitable olefin co-monomers include C2-C12 α-olefin monomers including, e.g., ethylene, butylene, isobutylene, 1-butene, pentene, 1-hexene, 4-methyl-1-pentene, 1-heptene, 1-octene, nonene, decene, dodecene, cyclopentene, cyclohexene, cyclooctene, 3-methyl pentene-1,3,5,5-trimethyl-hexene-1, 5-ethyl-1-nonene, and combinations thereof. The propylene thermoplastic elastomer preferably includes at least 50 % by weight propylene.

Useful examples of propylene thermoplastic elastomers include polypropylene, propylene/ethylene copolymers, propylene/ethylene/butene terpolymers, propylene/butene copolymers, propylene/hexene, propylene/octene, propylene/norbornene, and combinations thereof.

Useful propylene thermoplastic elastomers include, e.g., single-site (e.g., metallocene) catalyzed propylene thermoplastic elastomers.

Suitable propylene thermoplastic elastomers are commercially available under a variety of trade designations including, e.g., VISTAMAXX from ExxonMobil Chemical Company (Houston, Texas) including, e.g., VISTAMAXX 6102 propylene-ethylene copolymer, VISTAMAXX 6202 propylene-ethylene copolymer, VISTAMAX 6502 propylene-ethylene copolymer, VISTAMAXX 3000 propylene-ethylene copolymer, and VISTAMAXX 3980, and the NOTIO trade designations from Mitsui (Japan) including NOTIO PN-2070.

Suitable ethylene thermoplastic elastomers include ethylene copolymers i.e. copolymers of ethylene and one or more C_3-C_{10} alpha-olefin monomer. Exemplary C_3-C_{10} alpha-olefins include propylene, isobutylene, 1-butene, 1-hexene, 4-methyl-1-pentene, 1-heptene, and 1-octene. Preferred alpha-olefins include 1-butene, 1-hexene, 4-methyl-l-pentene, 1-heptene, and 1-octene, more preferably 1-hexene and 1-octene, particularly 1-octene. Suitable ethylene thermoplastic elastomers include homogeneous interpolymers and block polymers. The ethylene thermoplastic elastomers include, e.g., single-site (e.g., metallocene) catalyzed ethylene thermoplastic elastomers.

Suitable ethylene thermoplastic elastomers are commercially available under a variety of trade designations including, e.g. ENGAGE from Dow Chemical Company (Houston, Texas) including, e.g. ENGAGE 8200 ethylene-octene copolymer, ENGAGE 8150 ethylene-octene copolymer and ENGAGE HM7487.

Suitable styrene block copolymers includes an aromatic vinyl polymer block and a conjugated diene polymer block, a hydrogenated conjugated diene polymer block, or a combination thereof. The blocks can be arranged in a variety of configurations including, e.g., linear, branched, radial, star block, and combinations thereof. The aromatic vinyl polymer block can be derived from a variety of aromatic vinyl compounds including, e.g., styrene, alpha-methylstyrene, beta-methylstyrene, o-, m-, p-methylstyrene, t-butylstyrene, 2,4,6-trimethylstyrene, monofluorostyrene, difluorostyrene, monochlorostyrene, dichlorostyrene, methoxystyrene, 1,3-vinylnaphthalene, vinylanthracene, indene, acenaphthylene, and combinations thereof. The diene polymer block can be derived from a variety of diene-containing compounds including, e.g., isoprene, butadiene, hexadiene, 2,3-dimethyl-1,3-butadiene, 1,3-pentadiene, and hydrogenated versions thereof, and combinations thereof.

Useful styrene block copolymers include, e.g., diblock, triblock and multiblock copolymers including, e.g., styrene-butadiene, styrene-butadiene-styrene, styrene-isoprene, styrene-isoprene-styrene, styrene-ethylene/butene, styrene-ethylene/butene-styrene, styrene-ethylene/propylene, styrene-ethylene/propylene-styrene, styrene-ethylene-ethylene/propylene-styrene, and combinations thereof.

The styrene block copolymers have an average styrene content of at least about 25%, at least about 30%, at least about 35%, at least about 40%, or even from about 35% to about 45% by weight.

As an example, if an elastic hot melt adhesive composition comprises two styrene block copolymers A and B, polymer A is present at 25% by weight with a styrene content of 35% by weight and polymer B is present at 25% by weight with a styrene content of 45% by weight. The average styrene content of the one or more styrene block copolymers is calculated in the following way: 0.5 (35) + 0.5 (45) = 40% by weight.

The one or more styrene block copolymers have an average Melt Flow Rate (MFR) according to ASTM D 1238 (200°C/5 kg) in dg/min of no less than about 20, no less than about 25, no less than about 30, from about 5 to about 75, or even from about 10 to about 50. The average MFR of the styrene block copolymers is calculated in a similar manner as the average styrene content.

The elastic hot melt adhesive composition can include at least one styrene block copolymer with a styrene content of at least about 40% by weight.

The elastic hot melt adhesive composition has a total styrene block copolymer content of at least about 30 % by weight, at least about 40 % by weight, from about 30% to about 80 % by weight, from about 35% to about 65% by weight, or even from about 40% to about 60 % by weight.

The styrene block copolymers can be pure tri-block copolymers containing no di-block. Alternately, the styrene block copolymer can include a portion of di-block. The styrene block copolymer can include diblock content of greater than 30% by weight.

Useful styrene block copolymers include VECTOR 6241 (Linear, styrene-butadiene-styrene, pure triblock copolymer, 43% by weight styrene, MFR (200°C/5kg) = 23 dg/min), VECTOR 8508 (Linear, styrene-butadiene-styrene, pure triblock copolymer, 29% by weight styrene, MFR (200°C/5kg) = 12 dg/min and VECTOR 4411 (Linear, styrene-isoprene-styrene, pure triblock copolymer, 44% by weight styrene, MFR (200°C/5kg) = 40 dg/min) all available from TSRC Dexco (Houston, Texas) and GLOBALPRENE 3545 (Linear, styrene-butadiene-styrene block copolymer, 63% by weight diblock, 45% by weight styrene, MFR (190°C/5kg) = 55) available from LCY CHEMICAL CORP. (Taipei, Taiwan).

The elastic hot melt adhesive composition has a total thermoplastic elastomer content of at least about 30 % by weight, at least about 40 % by weight, from about 30% to about 80 % by weight, from about 35% to about 65% by weight, or even from about 40% to about 60 % by weight.

Tackifying Agent

The elastic hot melt adhesive composition can include a tackifying agent. The tackifying agent can be fluid or solid at room temperature. Suitable classes of tackifying agents include, e.g., aromatic, aliphatic and cycloaliphatic hydrocarbon resins, mixed aromatic and aliphatic modified hydrocarbon resins, aromatic modified aliphatic hydrocarbon resins, and hydrogenated versions thereof; terpenes (e.g. alpha and beta pinene derived terpenes), modified terpenes and hydrogenated versions thereof; natural rosins, modified rosins, rosin esters, and hydrogenated versions thereof; low molecular weight polylactic acid; and combinations thereof. Examples of useful natural and modified rosins include gum rosin, wood rosin, tall oil rosin, distilled rosin, hydrogenated rosin, dimerized rosin and polymerized rosin. Examples of useful rosin esters include e.g., glycerol esters of pale wood rosin, glycerol esters of hydrogenated rosin, glycerol esters of polymerized rosin, pentaerythritol esters of natural and modified rosins including pentaerythritol esters of pale wood rosin, pentaerythritol esters of hydrogenated rosin, pentaerythritol esters of tall oil rosin, and phenolic-modified pentaerythritol esters of rosin.

Useful tackifying agents are commercially available under a variety of trade designations including, e.g., the ESCOREZ series of trade designations from Exxon Mobil Chemical Company (Houston, Texas) including ESCOREZ 5400 (1% aromatic content), ESCOREZ 5600 (9.8% aromatic content), ESCOREZ 5690 (10% aromatic content), ESCOREZ 5615 (9.9% aromatic content), the EASTOTAC series of trade designations from Eastman Chemical (Kingsport, Tennessee) including EASTOTAC H-100R and EASTOTAC H-100L, and the WINGTACK series of trade designations from Cray Valley HSC (Exton, Pennsylvania) including WINGTACK 86, WINGTACK EXTRA, and WINGTACK 95 and the PICCOTAC and KRISTALEX series of trade designations from Eastman Chemical Company (Kingsport, Tennessee) including, e.g., PICCOTAC 8095 and KRISTALEX 3100.

The elastic hot melt adhesive composition can be free from end block resin that has a softening point greater than about 130°C.

Alternately, the composition may include an end block resin with a softening point greater than 130°C. When present, the composition includes at least about 3% by weight, at least about 5% by weight, at least about 10% by weight, from about 1% to about 20% by weight, from about 3% to about 18% by weight, or even from about 5% to 15% by weight.

The elastic hot melt adhesive composition can include at least one tackifying agent with aromatic content. The tackifying agent can have an aromatic content of greater than 5%, greater than 20%, greater than 50%, from about 5% to about 20% by weight, or even from about 8% to about 15% by weight.

The elastic hot melt adhesive composition can include a tackifying agent with a melt point of less than 100°C, or even less than 95°C.

The elastic hot melt adhesive composition can include at least about 5% by weight, at least about 20% by weight, at least about 25% by weight, from about 5% by weight to about 50 % by weight, from about 15 % by weight to about 40 % by weight, or even from about 20 % by weight to about 37 % by weight tackifying agent.

Plasticizer

The elastic hot melt adhesive composition can include a plasticizer. Suitable plasticizers include, e.g., naphthenic oils, paraffinic oils (e.g., cycloparaffin oils), mineral oils, phthalate esters, adipate esters, olefin oligomers (e.g., oligomers of polypropylene, polybutene, and hydrogenated polyisoprene), polybutenes, polyisoprene, hydrogenated polyisoprene, polybutadiene, benzoate esters, animal oil, plant oils (e.g. castor oil, soybean oil (e.g. high oleic soy oil), derivatives of oils, glycerol esters of fatty acids, polyesters, polyethers, lactic acid derivatives and combinations thereof.

Useful commercially available plasticizers include CALSOL 550 naphthenic oil from Calumet Specialty Products Partners, LP (Indianapolis, Indiana), KAYDOL OIL mineral oil from Sonneborn (Tarrytown New York) PARAPOL polybutene from Exxon Mobil Chemical Company (Houston, Texas), OPPANOL polyisobutylene from BASF (Ludwigsjhafen, Germany), KRYSTOL 550 mineral oil from Petrochem Carless Limited (Surrey, England), PURETOL 35 and 15 both mineral oils from Petro Canada Lubricants Inc. (Mississauga, Ontario) and PLENISH from Pioneer DuPont.

The plasticizer can be a naphthenic oil. Alternately, the plasticizer includes aromatic or naphthenic groups.

The plasticizer can be present in the elastic adhesive composition in an amount of at least about 10%, at least about 15% by weight, at least about 18% by weight, from about 10% to about 50% by weight, or even from about 15% to about 45% by weight.

Wax

The elastic hot melt adhesive composition can include a wax. Useful classes of wax include, e.g., paraffin waxes, microcrystalline waxes, high density low molecular weight polyethylene waxes, by-product polyethylene waxes, polypropylene waxes, Fischer-Tropsch waxes, oxidized Fischer-Tropsch waxes, functionalized waxes such as acid, anhydride, and hydroxy modified waxes, animal waxes, vegetable waxes (e.g. soy wax) and combinations thereof. Useful waxes are solid at room temperature and preferably have a Ring and Ball softening point of from 50°C to 170°C. Useful waxes are commercially available from a variety of suppliers including EPOLENE N and C series of trade designations from Westlake Chemical Corporation (Houston, Texas) including e.g. EPOLENE N-21 and the LICOCENE series of trade designations from Clariant International Ltd. (Muttenz, Switzerland) including e.g. TP LICOCENE PP 6102.

The elastic hot melt adhesive composition can include no greater than about 8% by weight, no greater than about 5% by weight, from about 1% by weight to about 7.5% by weight, or even from about 1% to about 5% by weight wax.

Additional Components

The elastic hot melt adhesive composition optionally includes additional components including but not limited to, e.g., foaming agents, stabilizers, antioxidants, additional polymers (e.g. olefin based polymers (e.g. propylene and/or ethylene homo-polymers/co-polymers), functionalized polymers such as acid, anhydride, and hydroxy modified polymers), amorphous poly-alpha olefins, polyethylene copolymers), adhesion promoters, ultraviolet light stabilizers, corrosion inhibitors, odor absorbers/neutralizers, colorants (e.g., pigments (e.g. titanium dioxide, carbon black, and mixtures thereof) and dyes), fragrances, fillers (e.g. nanoparticles, calcium carbonate, clay, talc, fumed silica), surfactants, wetness indicators, superabsorbents, coextrusion coatings, processing aids and combinations thereof.

The elastic hot melt adhesive composition can comprise from about 0.05 to about 2.0% by weight pigment, or even from about 0.05 to about 0.5% pigment. Useful antioxidants include, e.g., pentaerythritol tetrakis[3,(3,5-di-tert-butyl-4-hydroxyphenyl)propionate], 2,2'-methylene bis(4-methyl-6-tert-butylphenol), phosphites including, e.g., tris-(p-nonylphenyl)-phosphite (TNPP) and bis(2,4-di-tert-butylphenyl)4,4'-diphenylene-diphosphonite, di-stearyl-3,3'-thiodipropionate (DSTDP), and combinations thereof. Useful antioxidants are commercially available under a variety of trade designations including, e.g., the IRGANOX series of trade designations including, e.g., IRGANOX 1010, IRGANOX 565, and IRGANOX 1076 hindered phenolic antioxidants and IRGAFOS 168 phosphite antioxidant, all of which are available from BASF Corporation (Florham Park, New Jersey), and ETHYL 702 4,4'-

methylene bis(2,6-di-tert-butylphenol). When present, the elastic adhesive composition preferably includes from about 0.1 % by weight to about 5 % by weight antioxidant.

EXTENSIBLE NONWOVEN

The first and second substrates are extensible nonwovens. The nonwovens are significantly more extensible in one direction (e.g. width) than in the other direction (e.g. length). As related to the methods of manufacture, the nonwovens are significantly more extensible in the cross direction (CD) as compared to the machine direction (MD). Less extensibility in the machine direction enables the nonwoven to be coated with the elastic hot melt adhesive without the coated extensible nonwoven being distorted or significantly stretched.

Extensibility is measured by Elongation at Break (%) according to WSP (Worldwide Strategic Partners) Method 110.4 for Nonwovens. The higher the Elongation at Break, the more extensible the nonwoven.

The extensible nonwovens have Elongation at Break in the cross direction of greater than about 60%, greater than about 75%, or even greater than about 100%.

The extensible nonwovens can have a ratio of Elongation at Break (CD/MD) of greater than about 2, greater than about 3, greater than about 4, from about 2 to about 6, or even from about 3 to about 5.

The extensible nonwoven can have a basis weight (WSP 130.1 for Nonwovens) of less than 40 gsm (grams per square meter), less than 35 gsm, or even less than about 30 gsm.

The extensible nonwoven can contain fibers made from one or more polymers (e.g. PET (polyethylene terephthalate), PBT (polybutylene terphthalate), nylon, polypropylene and polyethylene), one or more natural fibers (e.g. rayon cellulose, cotton cellulose, hemp and viscose) or combinations thereof. The extensible nonwoven can be formed by a number of different methods, including e.g. airlaid, wetlaid, spunbond or meltblown. The fibers can be carded (e.g. run through a comb) so that they are oriented in a particular direction. The webs can be bonded together in any manner including e.g. hydroentangled, chemical bonded, needle punched or thermally bonded.

In one embodiment, the extensible nonwoven is comprised of fibers that are airlaid. Airlaid nonwoven can feel softer. In another embodiment, the nonwoven is comprised of polypropylene fibers which are airlaid, carded and hydroentangled.

In another embodiment, the extensible nonwoven may be a self-elastic. This is accomplished by incorporation of elastic fibers into the nonwoven, or by incorporating absorbed elastic material to improve elasticity. Elastic hotmelt adhesive compositions described herein can be used in conjunction with elastic nonwoven to augment the elastic performance of the composite.

DISPOSABLE GARMENT

The stretchy bonded region can comprise at least 70% of the disposable article, at least 80% of the disposable article, at least 90% of the disposable article, or even the entire disposable article.

The disposable garments are worn by users with their torso in the waist opening and their legs through leg openings. The disposable garment stretches and comfortably conforms to their waist, hips, and legs as they move throughout the day. It has even been found that the waist and leg edges may roll slightly in use, forming soft, comfortable cuffs providing additional comfort and security to the wearer without the need of the added expense of finishing these edges with added elastic strand components. "Added elastic strand components" refer to elastic and stretchy yarn, string, or strands which are not elastic hot melt adhesives as described herein. The disposable garments are "free of added elastic strand components" and instead rely on the stretchy laminate for stretch properties. It is desirable to be free of added elastic strand components due to the complexity inclusion of such added elastic strand components adds to the manufacturing process. A disposable garment is considered "free of added elastic strand components" even where the disposable garment is made with self-elastic extensible nonwoven employing elastic fibers or materials in the extensible nonwoven as such self-elastic extensible nonwovens do not add the disposable garment manufacturing complexity sought to be avoided by avoiding added elastic strand components.

The disposable garment shown in Fig. 1 has a front panel **11** ending at approximately the middle of the disposable garment at mid-line **A** where the back panel **15** begins. The front panel **11** has a front waist edge **12** substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second hip edges **13** which each end where a pair of first and second front leg edges **14** begins. The back panel **15** has a back waist edge **16** substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second back hip edges **17** which each end where a pair of first and second back leg edges **18** begins.

The disposable garment in Fig. 2 shows how the disposable garment may look when the hip edges are connected **23.** The torso opening **21** is formed by the front waist edge **12** and the back waist edge **16.** The front leg edges **14** and back leg edges **18** form leg openings **22.**

The disposable garments are formed from stretchy laminates made from the elastic hot melt adhesive and extensible nonwovens as described herein. These stretchy laminates may have zones of unbonded regions and/or zones of bonded stretchy regions which utilize different elastic hot melt adhesives, a second adhesive that is not elastic, or alternatively different coat weights of elastic hot melt adhesives. These zones could be stripes running the longitudinal direction, parallel to the longitudinal edge, for example having a width of from about 0.5 mm to about 100 mm, from about 0.5- to about 50 mm, from about 0.5 to 10 mm, or even from about 0.5 to 3 mm . Fig 4 is an example of a disposable garment (32) with different zones in a stripe pattern. In this embodiment, the stretchy regions (35) alternate with regions (37) selected from the group consisting of unbonded regions, regions bonded with a different hot melt adhesive and regions bonded with a different coat weight of the elastic hot melt adhesive. The zones could also be applied in any other pattern or combination of patterns. For example, areas near the torso opening and the leg openings may benefit from a different elastic hot melt adhesive than the remaining areas. The unbonded regions could be in areas of the disposable article not requiring the stretchy, conformable characteristics, or could be added in order to impart additional breathability.

The disposable garments can comprise optional components (but not added elastic strand components). For example, the hip edges may be designed to receive a separate fastening component. This fastening component could comprise, for example, a hook and loop structure and/or a pressure sensitive adhesive tape capable of securing the hip edges and of being refastenable.

When designed as a disposable absorbent garment, the disposable garment can comprise an absorbent core feature such as fluff pulp and/or super absorbent polymer focused in the crotch region between the leg edges. When included in the disposable absorbent garment, the core could be positioned in between the first and second extensible nonwoven, optionally adhered into place with a traditional hot melt adhesive or with the elastic hot melt adhesive used in creating the stretchy laminate. The core alternatively could be disposed on a body facing surface of the first extensible nonwoven substrates opposite the exterior facing second extensible nonwoven substrate. In this embodiment, the core can be held in place by a third nonwoven web adhered to the stretchy laminate, for example by sewing, ultrasonic bonding, or bonding through an additional adhesive. The core also could be a separate device that the user places in the disposable absorbent garment, such as a sanitary napkin adhered to the internal facing extensible nonwoven substrate of the stretchy laminate through a pressure sensitive positioning adhesive provided on the sanitary napkin. The core also could be a separate device that the user slides into a pocket created from a third nonwoven substrate adhered to the stretchy laminate.

METHOD OF MAKING DISPOSABLE GARMENTS

The method of manufacturing includes making a stretchy laminate either inline with the manufacture of the ultimate disposable garment or offline where the stretchy laminate is then supplied in web form to be made into disposable garments in a separate process.

METHOD OF MAKING STRETCHY LAMINATE

To make the laminate, first and second extensible nonwovens as described above are provided. These substrates can be the same substrates or different substrates so long as they both are extensible nonwovens. The extensible nonwoven substrates are provided in a state such that they are not substantially extended beyond their original state in any direction during formation of the laminate. "Not substantially extended beyond their original state" allows that they are drawn taut in order to create a smooth front and back panel, but they should not be intentionally stretched substantially beyond their original relaxed dimensions.

Further, the elastic hot melt adhesive is not extended beyond its original state in any direction prior to bonding the first and/or second extensible nonwoven during the formation of the laminate.

The extensible nonwoven substrates are also each oriented such that they are extensible in the same direction relative to each other and should be extensible in the cross direction during manufacture of the disposable garment to prevent undesired stretching of during machining.

The elastic hot melt adhesive described above is also provided, and applied in hot molten form to the first extensible nonwoven substrate. The second extensible nonwoven substrate is contacted with the hot molten elastic hot melt adhesive coated first extensible nonwoven substrate to form a layered configuration. The layered configuration is then cooled to create a stretchy laminate bonded with the elastic hot melt adhesive.

In another embodiment, the elastic hot melt adhesive is applied in a molten form to the first and second extensible nonwoven substrates and then the adhesive sides of the substrates bonded together to form the laminate. In this embodiment, the stretch laminate includes two layers of elastic hot melt adhesive. The two layers of elastic hot melt adhesive can be the same elastic hot melt adhesive or can be different elastic hot melt adhesives.

In still another embodiment, the elastic hot melt adhesive is applied to the first extensible nonwoven and then a second hot melt adhesive is applied in a discontinuous pattern to bond the elastic hot melt adhesive to the second extensible nonwoven.

Perforation of the stretchy laminate can be used to adjust or vary the elastic behavior and breathability of the laminate. The holes imparted by perforation need to be relatively small so the stretchy laminate maintains its stretch properties. The stretchy laminate can also be pre-stretched prior to making the disposable garment. The stretchy laminate can further include nonwoven or elastic fibers that are sprinkled onto the elastic hot melt adhesive after the elastic hot melt is applied and before the second nonwoven is put in place.

The hotmelt adhesive may be applied with a coatweight of greater than 20 g/m^2, greater than 35 g/m^2, from 20 to 150 g/m^2, from 25 to 125 g/m^2, from 30 to 100 g/m^2, or even from 35 to 90 g/m^2.

The coat weight of the elastic hot melt adhesive can be varied in the stretchy laminate to create regions of varying elasticity.

Optionally, the elastic hot melt adhesives can be applied using two or more different adhesive applicators using a slot coating or a non-contact coating application to at least one extensible nonwoven substrate, forming a series of side by side continuous films that then bond the first and second extensible nonwoven substrates together and create a bonded region of stretchy laminate. In one embodiment (Fig 3), three coating heads **42** are used to apply 3 adjacent adhesive regions **44** to a substrate **49.** The 3 adjacent adhesive regions slightly overlap each other.

METHOD OF FORMING THE DISPOSABLE GARMENT

The stretchy laminate is formed into a disposable garment either in-line with the following steps for forming the disposable garment, or the stretchy laminate is provided in a web form for completion of the following steps. In both the in-line method and the method where a preformed laminate is provided, it is important that the stretchy laminate be provided such that it is more extensible in the cross direction to the machine direction of the laminate web to prevent undesired stretching of the laminate during manufacture.

The method further comprises: a. cutting the laminate to create front and back waist edges running in the cross direction, and cutting the first and second longitudinal edges (comprising hip edges and leg edges) in the machine direction. The method also typically includes a step enabling the hip edges to be connected. For example, in one embodiment, a fastening component is attached to the regions adjacent two back hip edges through an additional hot melt adhesive so a user can repositionably fasten the disposable garment at the hip regions themselves. Optionally, companion landing zones on the opposing regions adjacent the two front hip edges are adhered if needed for adequate fastening. Alternatively, the method includes a step of permanently (not repositionably) bonding the two front hip edges to the two back hip edges. This bonding can be done through a variety of mechanisms including but not limited to use of an additional adhesive, ultrasonic bonding or sewing.

METHOD OF MAKING DISPOSABLE ABSORBENT GARMENTS

When the disposable garment is intended for use as a disposable absorbent garment (e.g. an incontinence article or diaper, or a sanitary napkin or pad), the method of making includes additional steps beyond those described above for forming the simpler disposable garment. For example, an absorbent core could be added between the extensible nonwoven substrates used to make the stretchy laminate. In another embodiment, a third nonwoven web is introduced and an absorbent core is sandwiched between the third nonwoven web and the stretchy laminate. In both embodiments, the core is optionally bonded in place through the elastic hot melt adhesive or through a different adhesive. In the embodiment having a third nonwoven web joined to the stretchy laminate to create a fourth layer of the disposable garment, the core can optionally be held in place with aid from the third nonwoven web such as where a pocket is formed for the core. In yet another embodiment, a third nonwoven web is joined to the stretchy laminate such that it creates a pocket and the user supplies their own absorbent core such as a sanitary napkin.

EXAMPLES

Composition amounts in tables are all in weight %.

Test Procedures

Test procedures used in the examples and throughout the specification, unless stated otherwise, include the following.

Viscosity Test Method

Viscosity is determined in accordance with ASTM D-3236 entitled, "Standard Test Method for Apparent viscosity of Adhesives and Coating Materials," (October 31, 1988), using a Brookfield Thermosel viscometer Model RVDV 2 and a number 27 spindle. The results are reported in centipoise (cps).

Molten Gardner Color

The adhesive is tested (in the molten state) to determine Molten Gardner Color by comparing the color of the sample against the Gardner Color Standards as set forth in ASTM D-1544. The comparison is made using a Gardner Delta Comparator equipped with an Illuminator available from Pacific Scientific (Bethesda, Maryland).

Test Lamination Preparation

Test laminations were prepared by continuous slot coating the elastic hot melt adhesive composition between two nonwoven* substrates at an application temperature of 177°C(350°F), a nip pressure of 10.5 Newtons/centimeter (N/cms) (6 pounds per linear inch (PLI)), and a run speed of at least 6.1 meters/min (m/min) (20 feet/min). Laminations were prepared with an adhesive coat weight of 100 grams per square meter (gsm) and the width of the adhesive was at least 7.6 cms (3 inches). A sufficient amount of laminate was prepared such that at least 1.5 m (60 inches) of representative lamination was collected for testing.

*The nonwoven used is carded, hydroentangled and comprises 50/50 (PET/PP). It has a basis weight of 29g/m^2, a cross direction tensile strength of 93 grams/cm^2 (600 grams/in^2), a CD elongation at break = 217% WSP Method 110.4, and an elongation ratio (CD/MD) = 4.3.

Peel Force Test Method

Test laminates were prepared by coating adhesive between two substrates according to the Test Lamination Preparation method above. Peel force is determined using ASTM D1876-01 entitled; "Test Method for Determining Peel Resistance of Adhesive (T-Peel Test Method)," with the exception that the test is run at a rate of 30.5 cms per minute (12 inches per minute), instead of 25.4 cms per minute (10 in per minute), over a period of 10 seconds, and 7 replicates are run instead of the 10 specified in ASTM D1876. The samples are run on an INSTRON type-test instrument. The test samples are 2.54 cms (1 inch) in width and at least 10.16 cms (4 inches) in length. The average peel force over 10 seconds of peeling is recorded, and the results are reported in grams. The initial peel force is measured at least 24 hours after the laminate is prepared.

2-Peak Hysteresis Test Method

Test laminates were prepared by coating adhesive between two substrates according to the Test Lamination Preparation method above. Test samples are prepared by cutting the laminates in cross-web direction, with 1 inch in width and at least 3 inches in length. The test is conducted at least 24 hours after the non-woven laminate is prepared.

The strips prepared are extended to a certain strain (e.g. 50%, 100 %, 150% or 200%) and then retracted to their original dimension. Subsequently the specimen goes through a second extension-retraction cycle with the same deformation. The cross head speed is set to 50.8 cms per minute (20 inches per minute). There is no holding time between extension and retraction. The samples are run on an INSTRON type-test instrument with at least 3 replicates. The permanent set after each cycle is determined by the tensile strain on the retraction curve where the tensile stress reduces to 5 gram force. The peak load/stress at maximum deformation and percent energy loss between each cycles are also recorded.

Rheological Creep and Recovery

Rheological Creep and Recovery was run on a Texas Instruments AR-G2 rheometer using parallel plate geometry with a 8 mm plate. The test was run isothermally at 38°C with a gap of 300 um.

Once equilibrated at 38°C, a pressure of 26,800 Pa was applied. The sample was held at this pressure for 20 minutes (creep portion of test). The pressure was then released to 0 Pa for 20 minutes (recovery portion of test).

The strain was measured. Values at specified intervals are reported in the table.

Table One - Elastic Hot Melt Adhesive Examples

	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Ex. 8	Ex. 9	Ex. 10	Ex. 11
VECTOR 6241						20	20				
VECTOR 4411	46	46	46	42.5	42.5	26	26	50	50	35	35
ESCOREZ 5490				32			29.5	29.5		38.5	
ESCOREZ 5400	33.5										
ESCOREZ 5690		33.5	33.5		32	31.5	31.5		29.5		38.5
PURETOL 35	20	20		25				20		26	
CALSOL 550			20		25	22			20		26
PLENISH							22				
IRG 1010	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Viscosity (cps)											
@149°C (300°F)	204,500	68,000	38,800	77,000	18,250	33,500	28,100	279,600	74,800	18400	6000

@177°C(350°F)	14,050	9,700	8,020	6,950	4,210	8,940	7,750	30,150	12,550	2545	2065
Viscosity Ratio @149°C/ @177°C	14.56	7.01	4.83	11.10	4.34	3.75	3.63	9.27	6.0	7.23	2.91
Rheo. Creep											
Strain @ 0.01 sec				.078	.067				.052	.084	.078
Strain @ 600 sec				.232	.169				.162	.457	.377
Strain @ 1200 sec				.246	.192				.189	.488	.424
Rheo. Recovery											
Strain @ 1200 sec				.246	.192				.189	.488	.424
Strain @ 1800 seconds				.05	.041				.048	.106	.104
Strain @ 2400 sec				.043	.033				.039	.094	.087

Table Two – Elastic Hot Melt Adhesive Examples

	Ex. 12	Ex. 13	Ex. 6	Ex. 14	Ex. 15	Ex. 16	Ex. 17
VECTOR 8508	20	15					
VECTOR 4411	26	31	26	26		46.5	
VECTOR 6241			20	20	30		46.5
GLOBALPRENE 3545					15		
Avg. Styrene Content of SBC	37.5	39.1	43.6	43.6	43.7	44	43
Avg. MFR (200°C/5kg)	27.8	30.9	32.6	32.6	> 33	40	23
ESCOREZ 5690	31.5	31.5	31.5	33.5		29.75	29.75
ESCOREZ 5615					34.5		
CALSOL 550	22	22	22	20	20	23.25	23.25
IRGANOX 1010	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Table Three – Physical Properties

	Ex. 12	Ex. 13	Ex. 6	Ex. 14	Ex. 15	Ex. 16	Ex. 17
Viscosity (cps)							
@149°C(300°F)	47,000	48,590	33,500	33,000	33,800	35,150	37,800
@163°C(325°F)	23,125	21,570	16,290	16,150	17,750	14,250	18,850
@177°C(350°F)	12,700	12,800	8,940	9,250	11,050	7,050	12,050
Viscosity Ratio @149°C/177°C	3.70	3.80	3.75	3.56	3.06	4.99	3.11
Elasticity							
50% hysteresis							
Set 1st cycle (%)	6	6	6	8	9	6	5
Set 2nd cycle (%)	7	6	7	10	10	7	6
Energy loss (%)	31.1	31.1	35.1	37.0	37.9	35.1	34.5
100% hysteresis							
Set 1st cycle (%)	15	14	15	21	23	16	14
Set 2nd cycle (%)	17	17	17	23	26	18	16
Energy loss (%)	43.0	44.2	46.7	48.7	51.2	46.9	45.6
150% hysteresis							
Set 1st cycle (%)	24	24	27	37	41	26	23
Set 2nd cycle (%)	27	27	30	40	45	28	27
Energy loss (%)	54.3	55.1	55.2	59.8	61.6	56.2	54.4
Adhesion							
Average peel (gram force)	278	238	437	256	852	68	272

Table Four - Elastic Hot Melt Adhesive Examples

	Ex. 18	Ex. 19	Ex. 20
VECTOR 4411	10	45	10
KRATON D 1111	20		20
Avg. Styrene Content of SBC	29	44	29
Avg. MFR (200°C/5kg)	14.5	40	14.5
ESCOREZ 5400	24.5		32.5
PLASTOLYN 290	20	9.5	
ENDEX 155			9.5
CALSOL 550		45	
PURETOL 35	25		27.5
EVERNOX 10	0.5	0.5	0.5
Viscosity (cps)			
@149°C(300°F)	93,120	71,500	30,100
@163°C(325°F)	30,500	23,200	12,200
@177°C(350°F)	13,100	8,300	6,325
Viscosity Ratio @149°C/177°C	7.1	8.6	4.8
Adhesion			
Average peel (gram force)	185	62	916

Example 21

Disposable underwear (brief style) was made in the following way. A lamination was prepared by continuous slot coating of Example 6 (Table One above) between two nonwoven substrates at an application temperature of 177°C(350°F), a nip pressure of 10.5 N/cms(6 pli), a run speed of at least 6.1 m/min (20 ft/min) and a coat weight of 80 gsm.

The nonwoven used was Suominen FIBRELLA Lite Nonwoven (Grade F6600-122-25) having a cross direction elongation at break = 220 %(WSP Method 110.4), and an elongation ratio (CD/MD) = 4.3. The lamination was cut into one brief shaped piece (similar in shape to Fig 1) and the piece was folded in half (along line A, Fig 1) and sewn together down each side to form briefs. The briefs were very flat in initial appearance and could be easily folded into a thin square.

The briefs were worn by a human user for around 8 hours. The briefs were found to conform well to the body and stay in place.

It is envisioned that absorbent qualities could be added to the underwear by insertion of an absorbent pad (after manufacture) or an absorbent core (during manufacture).

The disposable garments and methods of the present invention are claimed below. Each of the dependent claims could alternatively be dependent from any of the preceding claims rather than from a single claim.

What is claimed is

1. A disposable garment comprising first and second extensible nonwoven substrates and at least one elastic hot melt adhesive composition disposed between and bonding the first and second substrates, creating a stretchy bonded region;

the elastic hot melt adhesive composition having a viscosity of less than about 200,000 cps at application temperature of around 177°C and a set after 50% hysteresis of no greater than about 20%; and

said disposable garment comprising:

a front panel having a front waist edge substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second hip edges which each end where a pair of first and second front leg edges begins; and

a back panel having a back waist edge substantially perpendicular to a pair of opposing first and second front longitudinal edges comprised of first and second back hip edges which each end where a pair of first and second back leg edges begins;

wherein when the first front hip edge is connected to the first back hip edge and the second front hip edge is connected to the second back hip edge, the front waist edge and the back waist edge form a torso opening, and the first front leg edge and first back leg edge form a first leg opening and the second front leg edge and the second back leg edge form a second leg opening;

wherein the disposable garment is free of added elastic strand components.

2. A disposable garment according to Claim 1 wherein the first and second extensible nonwoven substrates are oriented such that disposable garment is more extensible around the torso opening than it is from the front waist edge to the back waist edge.

3. A disposable garment according to Claim 1 retains a conformable shape upon being stretched when worn and is substantially gather-free.

4. A disposable garment according to Claim 1 wherein the stretchy bonded region comprises at least 90% of the disposable garment.

5. A disposable garment according to Claim 1 in the form of a disposable absorbent garment comprising an absorbent core between the first and second extensible nonwoven.

6. A disposable garment according to Claim 1 additionally comprising a third body facing nonwoven substrate affixed around the waist edges and the longitudinal edges of the stretchy bonded region, and a core disposed between the stretchy bonded region and the third body facing nonwoven substrate.

7. A disposable garment according to Claim 1 having a minor area of unbonded regions with increased breathability over the bonded region.

8. The disposable garment according to Claim 1 wherein hip edges are connected through a bond that is not repositionable.

9. The disposable garment according to Claim 1 additionally comprising a fastening component located at zone adjacent to the back hip edges for bonding to the front hip edges.

10. The disposable garment according to Claim 1 wherein the first and second extensible nonwoven are the same and the extensible nonwoven has an elongation at break in the cross direction of greater than about 75%.

11. The disposable garment according to Claim 1 wherein the first and second extensible nonwovens are different and each extensible nonwoven has an elongation at break in the cross direction of greater than about 75%.

12. The disposable garment according to Claim 1 comprising a second bonded region, the second bonded region comprising a different second elastic hot melt adhesive and/or a different elastic hot melt adhesive coat weight.

13. The disposable garment according to Claim 1 wherein the extensible nonwoven is airlaid, carded and hydroentangled.

14. The disposable garment of Claim 1 wherein the elastic hot melt adhesive composition comprises:

from about 30% by weight to about 60% by weight of one or more styrene block copolymers wherein the one or more styrene block copolymers has an average styrene content of at least about 30% by weight and an average MFR (200°C/5 kg) of no less than about 20,

greater than about 10% by weight of a plasticizer and,

a tackifying agent.

15. A method of manufacturing a stretchy laminate comprising the steps of:

providing a first and second extensible nonwoven substrates in a state such that it is not substantially extended beyond its original state in any direction during formation of the laminate;

providing an elastic hot melt adhesive comprising a viscosity of less than about 200,000 cps at application temperature and a set after 50% hysteresis of no greater than about 20%;

advancing each first and second extensible nonwoven substrate in a machine direction;

applying the elastic hot melt adhesive in hot molten form to the first extensible nonwoven substrate;

contacting the second extensible nonwoven substrate to the hot molten elastic hot melt adhesive coated first extensible nonwoven substrate to form a layered configuration;
cooling the layered configuration to create a stretchy laminate bonded with the hot melt adhesive.

16. A method of manufacturing a stretchy laminate comprising the steps of:
providing a first and second extensible nonwoven substrates in a state such that it is not substantially extended beyond its original state in any direction during formation of the laminate;
providing an elastic hot melt adhesive comprising having a viscosity of less than about 200,000 cps at application temperature and a set after 50% hysteresis of no greater than about 20%;
advancing each first and second extensible nonwoven substrate in a machine direction;
applying the elastic hot melt adhesive in hot molten form to the first extensible nonwoven substrate;
applying the elastic hot melt adhesive in hot molten form to the second extensible nonwoven substrate;
contacting the hot molten elastic hot melt adhesive coated sides of the first and second extensible nonwoven substrates to form a layered configuration;
cooling the layered configuration to create a stretchy laminate bonded with the hot melt adhesive.

17. A gather-free disposable undergarment free of added elastic strand components comprising the stretchy laminate made according to the method of Claim 15 defining a torso opening and two leg openings.

18. A method according to claim 15 where the stretchy laminate is made in line with the disposable garment cut from the stretchy laminate.

19. The method of claim 15, further comprising the steps of:
providing a third continuous web and advancing it in the machine direction; and
adhering the third continuous web to the laminate via an adhesive.

20. The method of claim 15, wherein the elastic hot melt adhesive is applied to the substrate in a substantially continuous film coating.

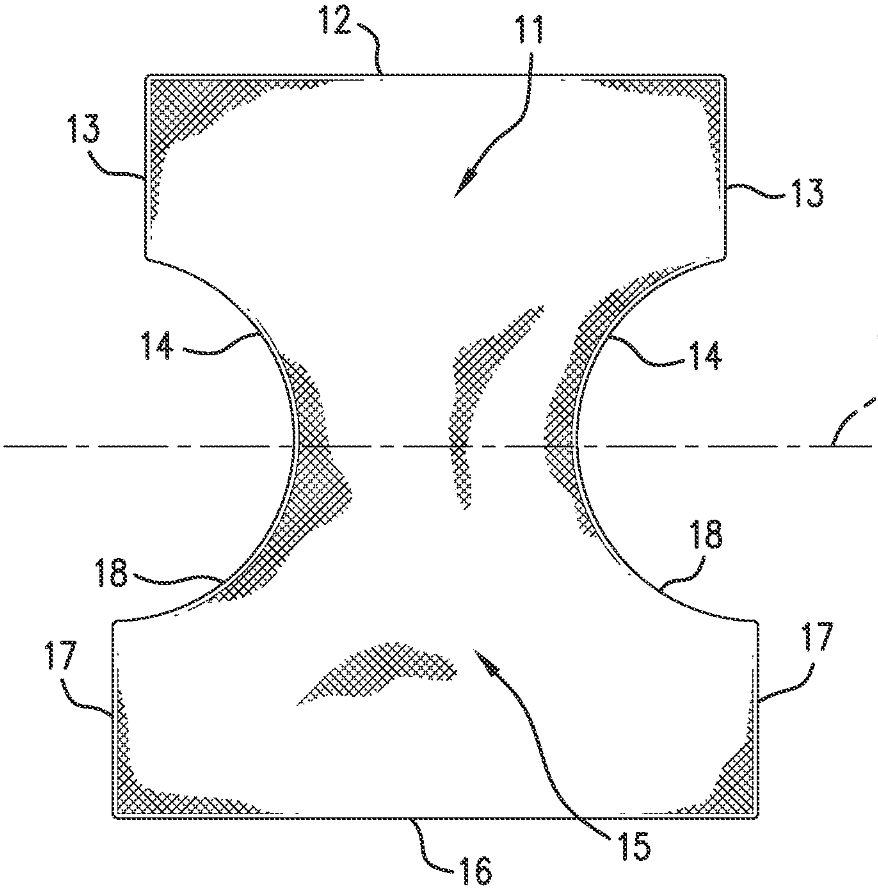

FIG.1

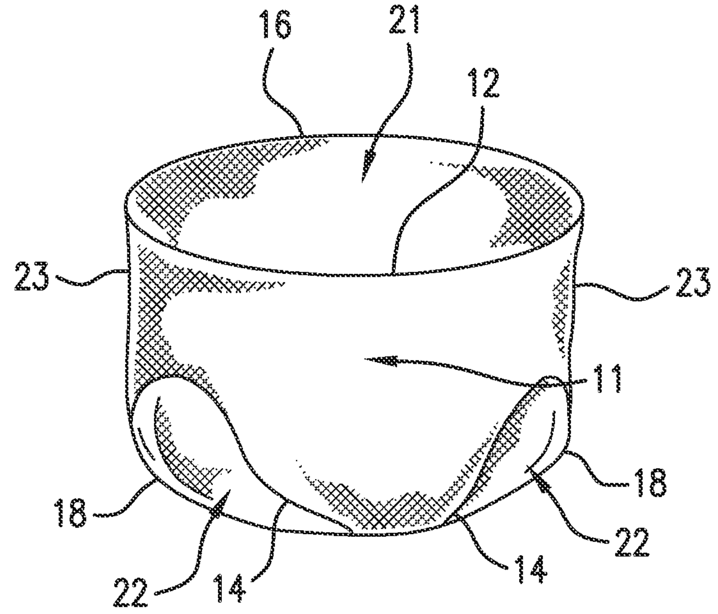

FIG. 2

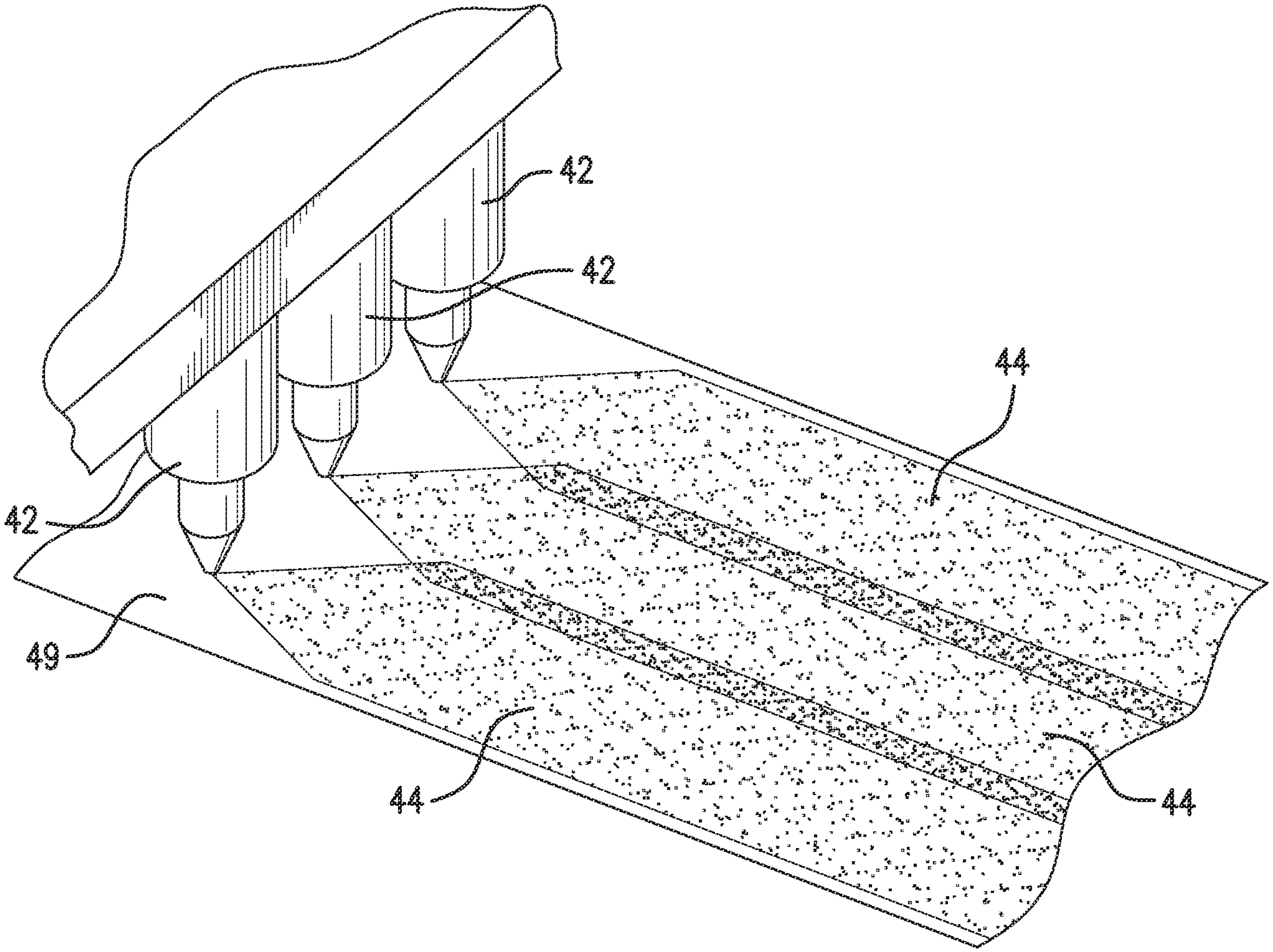

FIG.3

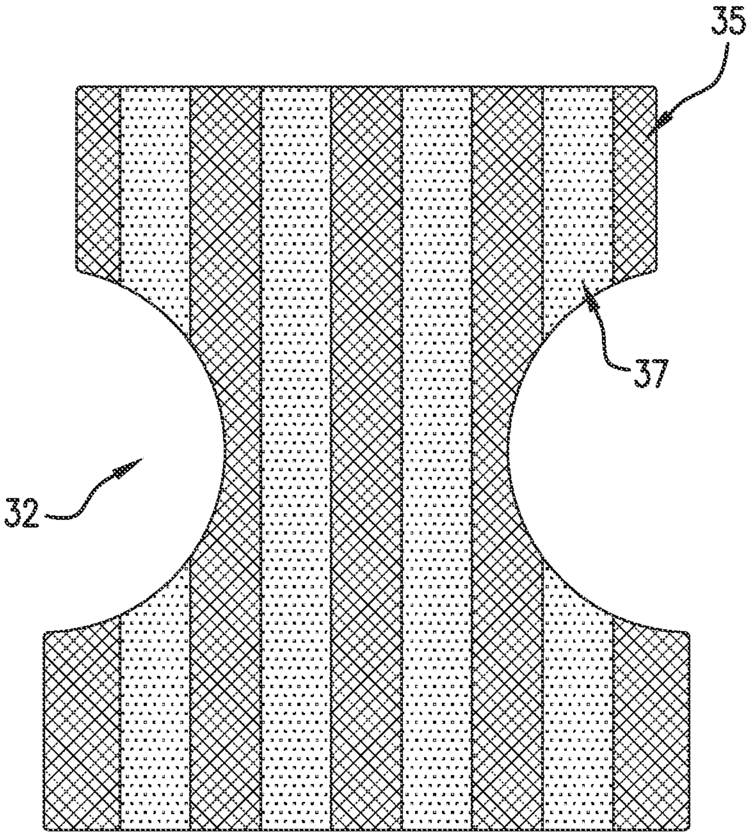

FIG.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/049207

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/49 A61F13/496 A61F13/15 A61L15/58 B32B5/26
B32B7/12 C09J5/06 C09J7/02 C09J153/02 C08L53/02
ADD.

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)
A61F A61L B32B C09J C08L

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2011/022523 A2 (HENKEL CORP [US]; HU YUHONG [US]; XENIDOU MARIA [US]; POLLOCK-DOWNER A) 24 February 2011 (2011-02-24) page 1, paragraphs 1,2,4 page 4, paragraph 18 page 5, paragraph 24 - page 6, paragraph 26 page 7, paragraph 31 - page 8, paragraph 32 page 9, paragraph 34-36 page 11, paragraph 47 page 12, paragraph 53 - page 13, paragraph 56 ----- -/--	1,3,5, 7-11, 13-18,20

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search 25 November 2015	Date of mailing of the international search report 07/12/2015
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Beins, Ulrika

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Information on patent family members

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