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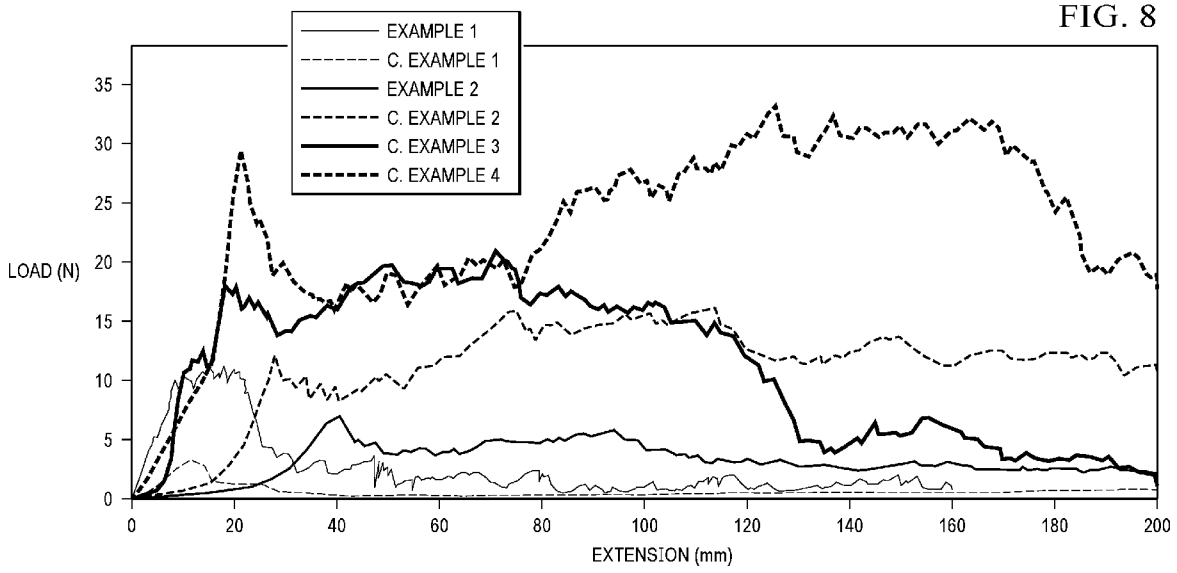
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(54) Title: DIAPER ARTICLE WITH MULTIPLE ABSORBENT BODIES

FIG. 8



(57) **Abstract:** Disclosed is a diaper article comprising an absorbent assembly and an application means, the absorbent assembly comprising: 1) a first absorbent body comprising a first water permeable topsheet; a first water impermeable backsheet; a first absorbent core disposed between the first topsheet and the first backsheet; a first outer cover disposed on the garment facing side of the first backsheet; 2) a second absorbent body disposed on the garment facing side of the first absorbent body, comprising: a second water permeable topsheet; a second absorbent core; and 3) a chassis disposed on the garment facing side of the second absorbent core, the chassis comprising a water impermeable chassis backsheet; wherein the first outer cover and the second topsheet is bonded with a Temporary Bond which enables removing the first absorbent body from the remainder of the diaper article, wherein the Temporary Bond has a Peak Force of about 16N or lower and an Average Force of about 0.3N or higher, according to the measurements herein.

WO 2024/148463 A1

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DIAPER ARTICLE WITH MULTIPLE ABSORBENT BODIES

FIELD OF INVENTION

This invention relates to diaper articles having multiple layers of absorbent bodies enabling a second usage of the absorbent article after removal of one of the absorbent bodies.

BACKGROUND OF THE INVENTION

Diaper articles for personal hygiene, such as disposable taped diapers, disposable pants, and adult incontinence undergarments, are designed to absorb and contain various body exudates, including urine, menses, and fecal matter. Diaper articles having multiple absorbent bodies which enables a second usage after the first soiling are desired. Such diaper article requires having multiple absorbent bodies, wherein the first absorbent body may be removed after the first soiling, and thereby exposing another absorbent body. Such diaper articles having multiple absorbent bodies may provide convenience by enabling removing the soiled absorbent body without complete removal of garments. Such convenience may be particularly desired during outing from the home, or during cold seasons. Diaper articles having multiple absorbent bodies may also provide conservation of material.

Diaper articles having multiple absorbent bodies have been known in the art, such as in US5,613,959 US2017/0216111A, US 2017/0216106A, and US 2017/0239099A. While such diaper articles have been known, they may require improvements for actual usage.

For example, those known in the art may not have considerations for enabling smooth removal of the first absorbent body from the remainder of the article. For example, those known in the art may not have practical measures for keeping the absorbent body for second usage intact during the first usage. For example, those known in the art may not have considerations for delivering sufficient containment, leakage prevention, or wear comfort before and after removal of the first absorbent body.

Based on the foregoing, there is a need for a diaper article having multiple layers of absorbent bodies enabling smooth removal of the first absorbent body after usage, while maintaining the performance of containment and wear comfort for the first usage as well as the second usage. There is also a need for a diaper article which addresses the concerns of consumers who are conscious about sustainable usage of material.

SUMMARY OF THE INVENTION

The present invention is directed to a diaper article comprising an absorbent assembly and an application means, the absorbent assembly comprising:

1) a first absorbent body comprising:

a) a first water permeable topsheet;

b) a first water impermeable backsheet;

c) a first absorbent core disposed between the first topsheet and the first backsheet;

d) a first outer cover disposed on the garment facing side of the first backsheet;

2) a second absorbent body disposed on the garment facing side of the first absorbent body, comprising:

a) a second water permeable topsheet;

b) a second absorbent core; and

3) a chassis disposed on the garment facing side of the second absorbent core, the chassis comprising a water impermeable chassis backsheet;

wherein the first outer cover and the second topsheet is bonded with a Temporary Bond which enables removing the first absorbent body from the remainder of the diaper article, wherein the Temporary Bond has a Peak Force of about 16N or lower and an Average Force of about 0.3N or higher, according to the measurements herein.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as forming the present invention, it is believed that the invention will be better understood from the following description which is taken in conjunction with the accompanying drawings and which like designations are used to designate substantially identical elements, and in which:

Figure 1A – 1B are schematic perspective views of an embodiment of the diaper article of the present invention showing how the first absorbent body is removed from the remainder of the diaper article.

Figure 2A is a schematic plan view of an embodiment of the absorbent assembly of the present invention showing the wearer-facing side wherein below TX the cuff elements are shown, while above TX the cuff elements are removed.

Figure 2B is a schematic plan view of another embodiment of the absorbent assembly of the present invention showing the wearer-facing side wherein below TX the cuff elements are shown, while above TX the cuff elements are removed.

Figure 3 is a transverse schematic cross section view of either Figure 2A or 2B taken along line 3-3.

Figures 4A – 4C are schematic plan views of embodiments of Temporary Bonds of the present invention.

Figure 5A is a schematic perspective view of one embodiment of a pant diaper article of the present invention.

Figure 5B is a schematic plan view of an embodiment of a pant diaper article of the present invention with the seams unjoined and in a flat uncontracted condition showing the garment facing surface.

Figure 6A is an embodiment of a longitudinal schematic cross section view of Figure 5B taken along the longitudinal axis LX having the absorbent assembly of Figure 2A, and with the Temporary Bond and elastic bodies abbreviated.

Figure 6B is another embodiment of a longitudinal schematic cross section view Figure 5B taken along the longitudinal axis LX having the absorbent assembly of Figure 2B and with the Temporary Bond and elastic bodies abbreviated.

Figures 7A – 7F are schematic plan views of embodiments of Signal Zones of the present invention.

Figure 8 shows force profiles of Examples 1-2 and Comparative Examples 1-4 according to the Peel Strength Measurement herein.

DEFINITIONS

As used herein, the following terms shall have the meaning specified thereafter:

"Diaper article" refers to articles of wear including an application means which may be in the form of taped type diapers, pant type diapers, incontinent briefs, feminine hygiene garments, and the like. Diaper articles such as feminine pads which require a separate part for wear, such as a pin, a tape, or an undergarment, is not considered a "diaper article".

"Longitudinal" refers to a direction running substantially perpendicular from a waist edge to an opposing waist edge of the article and generally parallel to the maximum linear dimension of the article.

"Transverse" refers to a direction perpendicular to the longitudinal direction.

"Proximal" and "distal" refer respectively to the position closer or farther relative to the longitudinal center of the article.

"Wearer-facing" and "garment-facing" refer respectively to the relative location of an element or a surface of an element or group of elements. "Wearer-facing" implies the element or surface is nearer to the wearer during wear than some other element or surface. "Garment-facing" implies the element or surface is more remote from the wearer during wear than some other element or surface (i.e., element or surface is proximate to the wearer's garments that may be worn over the disposable diaper article).

"Disposed" refers to an element being located in a particular place or position.

"Joined" refers to configurations whereby an element is directly secured to another element by affixing the element directly to the other element and to configurations whereby an element is indirectly secured to another element by affixing the element to intermediate member(s) which in turn are affixed to the other element.

"Film" refers to a sheet-like material wherein the length and width of the material far exceed the thickness of the material. Typically, films have a thickness of about 0.5 mm or less.

"Nonwoven", nonwoven layer" or "nonwoven web" are used interchangeably to mean an engineered fibrous assembly, primarily planar, which has been given a designed level of structural integrity by physical and/or chemical means, excluding weaving, knitting or papermaking (ISO 9092:2019 definition). The directionally or randomly orientated fibers, are bonded by friction, and/or cohesion and/or adhesion. The fibers may be of natural or synthetic origin and may be staple or continuous filaments or be formed in situ. Commercially available fibers have diameters ranging from less than about 0.001 mm to more than about 0.2 mm and they come in several different forms such as short fibers (known as staple, or chopped), continuous single fibers (filaments or monofilaments), untwisted bundles of continuous filaments (tow), and twisted bundles of continuous filaments (yam). Nonwoven webs can be formed by many processes such as meltblowing, spunbonding, solvent spinning, electrospinning, carding and airlaying. The basis weight of nonwoven webs is usually expressed in grams per square meter (g/m2 or gsm).

"Water-permeable" and "water-impermeable" refer to the penetrability of materials in the context of the intended usage of disposable diaper articles. Specifically, the term "water-permeable" refers to a layer or a layered structure having pores, openings, and/or interconnected void spaces that permit liquid water, urine, or synthetic urine to pass through its thickness in the absence of a forcing pressure. Conversely, the term "water-impermeable" refers to a layer or a layered structure through the thickness of which liquid water, urine, or synthetic urine cannot pass in the absence of a forcing pressure (aside from natural forces such as gravity). A layer or a

layered structure that is water-impermeable according to this definition may be permeable to water vapor, i.e., may be "vapor-permeable".

"Hydrophilic" describes surfaces of substrates which are wettable by aqueous fluids (e.g., aqueous body fluids) deposited on these substrates. Hydrophilicity and wettability are typically defined in terms of contact angle and the strike-through time of the fluids, for example through a nonwoven fabric. This is discussed in detail in the American Chemical Society publication entitled "Contact Angle, Wettability and Adhesion", edited by Robert F. Gould (Copyright 1964). A surface of a substrate is said to be wetted by a fluid (i.e., hydrophilic) when either the contact angle between the fluid and the surface is less than 90°, or when the fluid tends to spread spontaneously across the surface of the substrate, both conditions are normally co-existing. Conversely, a substrate is considered to be "hydrophobic" if the contact angle is greater than 90° and the fluid does not spread spontaneously across the surface of the fiber.

"Extendibility" and "extensible" mean that the width or length of the component in a relaxed state can be extended or increased.

"Elasticated" and "elasticized" mean that a component comprises at least a portion made of elastic material.

"Elongatable material", "extensible material", or "stretchable material" are used interchangeably and refer to a material that, upon application of a biasing force, can stretch to an elongated length of at least about 110% of its relaxed, original length (i.e. can stretch to 10 percent more than its original length), without rupture or breakage, and upon release of the applied force, shows little recovery, less than about 20% of its elongation without complete rupture or breakage as measured by EDANA method 20.2-89. In the event such an elongatable material recovers at least 40% of its elongation upon release of the applied force, the elongatable material will be considered to be "elastic" or "elastomeric." For example, an elastic material that has an initial length of 100mm can extend at least to 150mm, and upon removal of the force retracts to a length of at least 130mm (i.e., exhibiting a 40% recovery). In the event the material recovers less than 40% of its elongation upon release of the applied force, the elongatable material will be considered to be "substantially non-elastic" or "substantially non-elastomeric". For example, an elongatable material that has an initial length of 100mm can extend at least to 150mm, and upon removal of the force retracts to a length of at least 145mm (i.e., exhibiting a 10% recovery).

"Dimension", "Length", "Width", "Pitch", "Diameter", "Aspect Ratio", "Angle", and "Area" of the article are all measured in a state wherein the article is extended to the Full Stretch

Circumference W1 according to the "Whole Article Force Measurement" herein, and utilizing a ruler or a loupe, unless specified otherwise.

"Artwork" refers to a visual presentation to the naked eye, which is provided by printing or otherwise, and having a color. Printing includes various methods and apparatus well known to those skilled in the art such as lithographic, screen printing, flexographic, and gravure ink jet printing techniques.

"Color" or "Colored" as referred to herein includes any primary color except color white, i.e., black, red, blue, violet, orange, yellow, green, and indigo as well as any declination thereof or mixture thereof. The color white is defined as those colors having a L* value of at least 94, an a* value equal to 0 ± 2, and a b* value equal to 0 ± 2 according to the CIE L* a* b* color system.

DETAILED DESCRIPTION OF THE INVENTION

Diaper Article and Absorbent Assembly

Figures 1A-1B are perspective views of an embodiment of the diaper article (10) of the present invention of the pant type comprising an absorbent assembly (20) and an application means (40). The absorbent assembly (20) comprises a first absorbent body (38), a second absorbent body (39) disposed on the garment facing side of the first absorbent body, and a chassis (100) disposed on the garment facing side of the second absorbent core, wherein the first absorbent body (38) and the second absorbent body (39) is bonded with a Temporary Bond (TB) which enables removing the first absorbent body (38) from the remainder of the diaper article (10). The diaper article (10) of the present invention has multiple layers of absorbent bodies (38, 39), enabling usage of the diaper article (10) more than once. Accordingly, the chassis (100) and the application means (40) may be used more than once, thus contributing to sustainable usage of material. Further, the first absorbent body (38) may be removed from the remainder of the diaper article (10) without completely removing the diaper article (10) from the wearer, facilitating easy diaper change.

Figures 2A and 2B are schematic plan views of embodiments of the absorbent assembly of the present invention showing the front side on the top and back side on the bottom. The absorbent assembly (20) has a longitudinal centerline LX which also serves as the longitudinal axis, and a transverse centerline TX which also serves as the transverse axis. The figures below TX show the cuff elements, while the figures above TX have the cuff elements removed. Namely, referring to Figure 3, cuff elements (31, 35, 33, and 34) exist along the left and right

transverse edges of the absorbent assembly. These elements are removed in Figures 2A and 2B above TX, thus the first topsheet (241) and any elements extending beyond the dimension of the first topsheet (241) are shown. Towards the upper left side of Figures 2A and 2B, the elements of the first absorbent body (38) beneath the first topsheet (241) are exposed and shown. Still further, the elements of the second absorbent body (39) beneath the first outer cover (421) are exposed and shown. Figures 2A and 2B below TX are shown in a state wherein any elastic cuff elements (33, 35) are fully stretched. Towards the lower left side of Figures 2A and 2B, the elements of the chassis (100) beneath the nonwoven forming the chassis outer cuff (34) are exposed and shown.

Referring to Figures 2A, 2B, and 3, the first absorbent body (38) and the remainder of the diaper article (39, 100) each carry essential components in order to provide the function as an absorbent diaper article (10). Specifically, the first absorbent body (38) comprises a first water permeable topsheet (241), a first water impermeable backsheet (251), a first absorbent core (621) disposed between the first topsheet and the first backsheet, and a first outer cover (421). The first outer cover (421) serves as the interface between the second absorbent body (39) on which the Temporary Bond (TB) is provided. The second absorbent body (39) comprises a second water permeable topsheet (242) and a second absorbent core (622). The second topsheet (242) serves as the interface between the first absorbent body (38) on which the Temporary Bond (TB) is provided. A chassis (100) is disposed on the garment facing side of the second absorbent core, which chassis (100) comprises a water impermeable chassis backsheet (252) which may serve as the barrier to prevent leakage of exudates absorbed by and contained in any absorbent body within the absorbent assembly (20). When there are only first and second absorbent bodies (38, 39), the second absorbent body (39) may be devoid of a second backsheet. When there are more than 2 absorbent bodies, the second absorbent body (39) may further comprise a second backsheet and a second outer cover, the second outer cover serving as the interface between the third topsheet of the third absorbent body on which another Temporary Bond (TB) is provided. In a similar manner, more layers of absorbent bodies may be comprised in the absorbent assembly (20) wherein the absorbent body closest to the garment facing side may be devoid of a backsheet and an outer cover.

The absorbent assembly (20) of the present invention may be assembled together with an application means (40) to form a diaper article (10), wherein the application means (40) is selected from the group of a fastening means and an elastic belt (40). Referring to Figure 5A, the diaper article (10) may take the form of a pant diaper comprising an elastic belt (40), wherein

the elastic belt (40) may be formed by nonwoven materials and/or woven materials combined with elastic materials such as elastic bodies and films. While not shown, the diaper article (10) may take the form of a taped diaper comprising a fastening means. Fastening means may be, for example, a pair of elongate members and a receiving member, the elongate members transversely protruding from the left and right transverse edges of the back region and fastenable with the receiving member disposed on the front region.

Whether in the pant type or taped type, the diaper article (10) of the present invention, while enabling more than one usage, has an appropriate thickness and thereby are comfortable to wear. The diaper article (10) of the present invention may have a Folded Thickness of no greater than about 12.5mm according to the measurement herein. By providing the diaper article within such Folded Thickness, the article provides the aesthetic and tactile senses similar to that of a diaper article with a single absorbent body.

Topsheet, Backsheet, and Outer Cover

Referring to Figures 2A, 2B, and 3, the absorbent bodies (38, 39) of the present invention each comprise a water permeable topsheet (241, 242) that may be positioned at least in partial contact or close proximity to a wearer. The same or different material may be used for the first and second absorbent bodies (38, 39). Suitable topsheets (241, 242) may be manufactured from a wide range of materials, such as porous foams; reticulated foams; apertured plastic films; or woven or nonwoven webs of natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers), or a combination of natural and synthetic fibers. The topsheet (241, 242) is generally supple, soft feeling, and non-irritating to a wearer's skin. The topsheet (241, 242) is liquid permeable, permitting bodily fluids to readily penetrate through the thickness of the topsheet (241, 242). Exemplary topsheets (241, 242) suitable herein include those available from Xiamen Yanjan New Material Co. Ltd made of carded nonwoven substrate comprising PE/PET bi-component fibers, Fibertex NiLai, Malaysia with tradename H30501221 or FQN Hazlet NJ with tradename SB1206169. Any portion of the topsheet (241, 242) may be coated with a lotion or skin care composition as is known in the art. Examples of suitable lotions include those described in U.S. Patent Nos. 5,607,760; 5,609,587; 5,635,191; and 5,643,588.

The first absorbent body (38) and the chassis (100) of the present invention each comprise a water impermeable backsheet (251, 252) which is designed to prevent the exudates absorbed by and contained within the absorbent core (621, 622) from soiling articles that may contact the diaper article (10), such as bed sheets and undergarments. The same or different material may be used for the first absorbent body (38) and the chassis (100). The backsheets

(251, 252) may be positioned such that it extends beyond the absorbent core (621, 622) disposed on the wearer-facing side of the particular backsheet (251, 252) in both the longitudinal direction and the transverse direction. Suitable backsheet (251, 252) materials include films such as those manufactured by Plaster Argentina with tradename PLBA NBBS 10-12GSM PR V1. Other suitable backsheet (251, 252) materials may include breathable materials that permit vapors to escape from the diaper article (10) while still preventing exudates from passing through the backsheet (251, 252). Exemplary breathable materials may include materials such as woven webs, nonwoven webs, composite materials such as film-coated nonwoven webs, and microporous films such as manufactured by Daika Japan with tradename MPF DKH-180 15G V7 and manufactured by Berry Nashville, TN with trademark BR-137P V13. Such breathable composite materials are described in greater detail in PCT Application No. WO 95/16746 and U.S. Patent No. 5,865,823. Other breathable backsheets including nonwoven webs and apertured formed films are described in U.S. Patent No. 5,571,096. An exemplary, suitable backsheet is disclosed in U.S. Patent No. 6,107,537. Other suitable materials and/or manufacturing techniques may be used to provide a suitable backsheet including, but not limited to, surface treatments, particular film selections and processing, particular filament selections and processing, etc.

The first absorbent body (38) comprises a first outer cover (421) which serves as the interface between the second absorbent body (39). The first outer cover (421) may be made of a soft, non-woven material. The first outer cover (421) and the first backsheet (251) may be joined together by adhesive or any other suitable material or method. An optional chassis outer cover (422) may also be provided on the garment-facing side of the chassis backsheet (252) for providing the diaper article in a finished appearance. Exemplary outer covers (421, 422) suitable herein include those available from Guanhe Hygiene Products Co., Ltd with tradename S31921A made of spunbond nonwoven substrate comprising PP fiber, and Fibertex NiLai Malaysia with tradename A10160EJ – MALAYSIA and available from FQN Hazlet NJ with tradename SM1104174.

Absorbent Core

Referring to Figures 2A, 2B, and 3, the absorbent bodies (38, 39) of the present invention each comprise an absorbent core (621, 622) for absorbing and containing body exudates disposed on the wearer facing side. The absorbent cores (621, 622) may include an absorbent layer and an acquisition system. The absorbent layer is the region wherein absorbent materials having a high retention capacity, such as superabsorbent polymers, are present. The absorbent

layer may be substantially cellulose free. Alternatively, the absorbent layer may contain cellulose. There may be an absorbent layer mainly comprising cellulose, and another absorbent layer mainly comprising superabsorbent polymers.

Superabsorbent polymers of the absorbent layer may be disposed between first and second layers of material immobilized by a fibrous layer of thermoplastic adhesive material. The first and second layers of materials may be nonwoven fibrous webs including synthetic fibers, such as mono-constituent fibers of PE, PET and PP, multiconstituent fibers such as side by side, core/sheath or island in the sea type fibers. Such synthetic fibers may be formed via a spunbonding process or a meltblowing process. Some portions of the absorbent layers may be configured to have substantially no absorbent material to form a channel or a plurality of channels. Channels may be useful for allowing the absorbent core (621, 622) to bend upon swelling with fluids, such that the crotch region conforms to the wearer's body after swelling and prevent sagging of the diaper article (10). The absorbent layers may be disposed in plurality in the absorbent core (621, 622).

Alternatively, the absorbent core (621, 622) may comprise a high loft material encompassing superabsorbent polymers. The term "high loft" refers to low density bulky fabrics, as compared to flat, paper-like fabrics. High loft webs are characterized by a relatively high porosity. This means that there is a relatively high amount of void space in which superabsorbent polymer particles can be distributed. The high loft material (without the superabsorbent particles) may have a density at a pressure of 4.14kPa (0.6 psi) below 0.20 g/cm^3, in particular ranging from 0.05 g/cm^3 to 0.15 g/cm^3. The high loft layer (without the superabsorbent particles) may have a density at a pressure of 2.07 kPa (0.3 psi) below 0.20 g/cm^3, in particular ranging from 0.02 g/cm^3 to 0.15 g/cm^3. The high loft layer (without the superabsorbent particles) may have a density at a pressure of 0.83 kPa (0.12 psi) below 0.15 g/cm^3, in particular ranging from 0.01 g/cm^3 to 0.15 g/cm^3, and a basis weight of from 15 to 500gsm, preferably 30~200gsm, such as those described in US 2021/0361497 Al. The absorbent core (621, 622) comprising high loft material encompassing superabsorbent polymers may also contain channels.

The absorbent cores (621, 622) may also contain an acquisition system for facilitating the acquisition and the distribution of body exudates, and may be placed between the topsheet (241, 242) and the absorbent layer. The function of the acquisition system is to rapidly acquire the fluid from the topsheet (241, 242) away from the wearer-facing side and/or to distribute over a larger area so it is more efficiently absorbed by the absorbent core. The acquisition system may

include cellulosic fibers. Channels may also be formed in the acquisition system, and may be configured to at least partly match the channels of the absorbent layer in the thickness direction. It is also possible that such another liquid management layer may be placed between the backsheet (251, 252) and the absorbent layer. The liquid management layer may be a spunlace nonwoven comprising viscose, PET, CoPET/PET fibers, and combinations thereof.

Temporary Bond

The absorbent assembly (20) of the present invention has the first outer cover (421) and the second topsheet (242) bonded with a Temporary Bond (TB) for enabling removal of the first absorbent body (38) from the remainder of the diaper article (10), after the first use. The Temporary Bond (TB) is provided between two nonwoven layers, the first outer cover (421) and the second topsheet (242) with an appropriate peeling strength. The Temporary Bond (TB) may be provided by any of adhesive, heat energy, ultrasonic energy, or combinations thereof. The Temporary Bond (TB) has a Peak Force of about 16N or lower, or a Peak Force of from about 4N to about 15N, or a Peak Force of from about 4N to about 10N, or a Peak Force of from about 6N to about 15N, or a Peak Force of from about 10N to about 15N, and an Average Force of about 0.3N or higher, or an Average Force of from about 0.4N to about 15N, or an Average Force of from about 1N to about 15N, or an Average Force of from about 0.4N to about 14N, according to the Peel Strength Measurement herein. The Peel Strength Measurement herein intends to mimick the removing activity of the wearer or caregiver (hereinafter collectively "user") when the first absorbent body (38) is removed from the remainder of the diaper article by starting the breaking of the Temporary Bond (TB) from either of the front or back end of the first absorbent body (38) towards the other of the front or back end. The Average Force resembles the force observed during the middle of the removing activity. By having an Average Force of about 0.3N or higher, the Temporary Bond (TB) is strong enough to endure the forces created during the first usage by the wearer. The Peak Force resembles the maximum force experienced during the removing activity. By having a Peak Force of about 16N or lower, the Temporary Bond (TB) is weak enough that the bond may be broken without significant effort and without destroying other components of the diaper article (10). For example, when the Temporary Bond (TB) is too strong, the first outer cover (421) may be destroyed and resulting in some the first outer cover (421) left bonded on the second topsheet (242) and/or exposure of the first backsheet (251). Either is undesired, as providing a destroyed and thus non-functional perception against the remaining diaper article.

So long as the above mentioned Peak Force and Average Force according to the Peel Strength Measurement herein are achieved, the first outer cover (421) and the second topsheet (242) may be any nonwoven material suitable for use as a diaper article (10). Exemplary first outer cover (421) materials may be selected from those having a basis weight of from about 6.5gsm to about 25gsm, preferably from about 8gsm to about 20gsm. Exemplary second topsheet (242) materials may be selected from those having a basis weight of from about 11gsm to about 40gsm, preferably from about 15gsm to about 40gsm. The first outer cover (421) may have a lower basis weight than that of the second topsheet (242).

Figures 4A – 4C are schematic plan views of embodiments of Temporary Bonds (TB) of the present invention. The Temporary Bonds (TB) are provided at least partially along the transverse edges of the second topsheet (242) and extending in the longitudinal direction. As in Figures 4A – 4B, the Temporary Bonds (TB) may be a substantially straight line along the left and right transverse edges of the second topsheet (242). Alternatively, as in Figure 4C, the Temporary Bond (TB) may be a continuous line, such as in oval shape, extending along at least partially the transverse edges of the second topsheet (242). The continuous line may be in the shape of rectangle, or other polygon.

Referring to Figures 2A, 2B and 4A-4C, the first outer cover (421) comprises a front longitudinal edge region within about 5mm from the front end of the first outer cover (421) and within about one third of the transverse dimension of the first outer cover (421) from the longitudinal axis. The first outer cover (421) comprises a back longitudinal edge region within about 5mm from the back end of the first outer cover (421) and within about one third of the transverse dimension of the first outer cover (421) from the longitudinal axis. The Temporary Bond (TB) may be devoid in the front and back longitudinal edge regions. Referring to Figure 4A, the Temporary Bond (TB) may extend in the longitudinal direction up to the front and back ends of the first outer cover (421). Referring to Figure 4B, the Temporary Bond (TB) may extend in the longitudinal direction, however, leaving the front and back ends of the first outer cover (421) unbonded. By providing the Temporary Bond (TB) devoid in the front and back longitudinal edge regions, this facilitates inserting fingers between the first outer cover (421) and the second topsheet (242) for starting the removing activity.

Still referring to Figures 4A – 4B, there may further be provided an Auxiliary Temporary Bond (ATB) between the first outer cover (421) and the first outer cover (421), wherein the Auxiliary Temporary Bond (ATB) provides the same or lower Peak Force as the Temporary Bond (TB) according to the Peel Strength Measurement herein. The Auxiliary Temporary Bond

(ATB) may be disposed between the Temporary Bonds (TB) extending in the transverse direction, wherein the Auxiliary Temporary Bond (ATB) is devoid in the front and back longitudinal edge regions. The Auxiliary Temporary Bond (ATB) may be connected with the left and right Temporary Bonds (TB). As in Figures 4A-4B, the Auxiliary Temporary Bond (ATB) may be disposed adjacent the longitudinal edge regions. Referring to Figure 4A, the Auxiliary Temporary Bond (ATB) may be a straight line extending in the transverse direction. The Auxiliary Temporary Bond (ATB) may be provided in a position of from about 5mm to about 40mm away from the front and back longitudinal edges of the first outer cover (421). By providing the Auxiliary Temporary Bond (ATB) in this position, there is enough space for the user to insert fingers between the first outer cover (421) and the first outer cover (421), for starting the removing activity, while not leaving too much unbonded area. When there is left much unbonded area towards the front and back longitudinal ends of the first absorbent body (38), this may lead to unnecessary folding. Referring to Figure 4B, the Temporary Bond (TB) may be a curvature with the concave portion facing the front or back end and extending in the transverse direction. The Auxiliary Temporary Bond (ATB) may be provided in a position wherein the concave portion closest to the front or back end is from about 5mm to about 40mm away from the front and back longitudinal edges of the first outer cover (421).

Referring to Figure 1B and 7A, the garment facing side of the first absorbent body (38), namely the first outer cover (421), may be provided with a Signal Zone (SZ) which includes an indicia for intuitively guiding the user where the first absorbent body (38) may be pinched for effectively starting the removing action of the first absorbent body (38) from the remainder of the diaper article (10). The Signal Zone (SZ) may be provided adjacent the front and/or back ends of the first outer cover (421), and may overlap the front or back longitudinal edge region of the second topsheet (242). It may be advantageous to provide the Signal Zone (SZ) adjacent the front end of the first outer cover (421) to guide the user to start the removing activity from the front side, as being relatively more hygienic than starting the removing activity from the back side. It may be advantageous to provide the Signal Zone (SZ) adjacent the front end of the first outer cover (421) to guide the wearer oneself to start the removing activity from the front side in a seated posture. It may be advantageous to provide the Signal Zone (SZ) adjacent the back end of the first outer cover (421) to guide the caregiver to start the removing activity from the back side, as being convenient for starting the removing activity when the wearer is in a standing posture. It may be advantageous to provide the Signal Zone (SZ) both adjacent the front end and the back end of the first outer cover (421) to enable the user to start the removing activity

according to various habits as mentioned above or otherwise. It may be advantageous to provide the Signal Zone (SZ) both adjacent the front end and the back end of the first outer cover (421) to enable the caregiver to remove the first absorbent body (38) from both the front and back side upon diaper change when the wearer is in a lying posture. Referring to Figures 7B-7D, the indicia may be a color and/or pattern distinguishable from the remainder of the first outer cover (421), a material and/or topography distinguishable from the remainder of the first outer cover (421), wording such as "open", "start peel" and/or combined with signals such as arrows. Any of the indicia of Figures 7B-7D may be provided in printing, physical treatment such as embossing, quilting, openings or heating, by attaching an additional material, or any combination thereof. Referring to Figure 7E, indicia may be provided by altering the shape of the Signal Zone (SZ), for example, by providing a projection in the transverse center. Such altered shape of the first outer cover (421) may optionally be matched with other material of the first absorbent body (38), such as the first topsheet (241), and/or the first backsheet (251). Referring to Figure 7F, indicia may be provided by attaching an additional material to the Signal Zone (SZ) which additional material projects out from the first outer cover (421). The indicia of any of Figures 7B – 7F may be combined with each other.

Dimensions

Referring to Figures 2A, 2B, and 3, the components for forming the absorbent assembly (20) may have a particular relationship with one another for ensuring that the second absorbent body (39) remains intact during the first usage, while maintaining wear comfort and enabling smooth removal of the first absorbent body (38) after usage. Hereinafter, it is defined that the first backsheet (251) has a transverse dimension T1 and a longitudinal dimension L1, the first outer cover (421) has a transverse dimension T2 and a longitudinal dimension L2, the second topsheet (242) has a transverse dimension T3 and a longitudinal dimension L3, and the chassis backsheet (252) has a transverse dimension T4 and a longitudinal dimension L4.

The Temporary Bond (TB) for bonding the first and second absorbent bodies (38, 39) is provided between the first outer cover (421) and the second topsheet (242) such that the first absorbent body (38) may be removed from the remainder of the diaper article (10) after first usage. In order not to soil the second absorbent body (39) during first usage, T1 may be provided equal to or greater than T3, preferably T1 may be provided greater than T3 by from about 5mm to about 15mm. Further, T2 may be provided equal to or greater than T3 for the same purpose, preferably T2 may be provided greater than T3 by from about 5mm to about 45mm.

Referring to Figure 3, the first absorbent body (38) may further comprise a first outer cover fold over (43) connected to the first outer cover (421), wherein the transverse edges of the first backsheet (251) is sandwiched by the first outer cover (421) and the first outer cover fold over (43). By providing the elements of the first absorbent body (38) in such configuration, there is provided improved protection along the transverse edges of the absorbent assembly (20), and visual exposure of the first backsheet (251) to the user may be avoided. Visual exposure of the backsheet (251, 252) is typically avoided for the purpose of providing the article a finished appearance, and also for avoiding exposure of color of exudates after soiling of the absorbent assembly (20). For purpose of determination of dimension T2, only the first outer cover (421) is concerned, and the dimension of the first outer cover fold over (43) is not counted.

Referring to Figures 2A and 2B, L3 may be provided greater than L1, preferably L3 may be provided greater than L1 by from about 20mm to about 60mm. Namely, the front end and/or the back end of the second topsheet (242) may be extended beyond the first backsheet (251) as well as the first outer cover (421). By providing the first absorbent body (38) and the second absorbent body (39) in such configuration, the user may conveniently remove the first absorbent body (38) from the remainder of the absorbent assembly by inserting fingers between the first outer cover (421) and the second topsheet (242). The chassis backsheet (252) provides barrier function for the entire diaper article (10). In order to provide such function, T4 may be greater than T1, preferably T4 may be provided greater than T1 by from about 40mm to about 60mm. T4 may be provided greater than any of T1, T2, or T3. L4 may be greater than L1 or L2. The first absorbent core is provided smaller in dimension than T1, T2, L1, and L2. The second absorbent core is provided smaller in dimension than T3, T4, L3, and L4. For purpose of clarification, in Figure 3, T2 is shown in greater dimension than T1 due to the exaggeration of the thickness of the first outer cover (421) thus adding dimension at the left and right folding points. In reality, however, the embodiment described in Figure 3 has T1 and T2 in the same transverse dimension.

Still referring to Figures 2A and 2B, the absorbent core existing on the garment facing side, namely the second absorbent core (622), may have the distance between the front end of the core and the front end of the absorbent assembly (20) shorter than the distance between the back end of the core and the back end of the absorbent assembly (20). By somewhat shifting the core towards the front than in the longitudinal center, the absorbent core may effectively receive and absorb fluid waste. When the second absorbent core (622) is disposed at such position relative to the absorbent assembly (20), the back end of the first and second absorbent cores (621, 622) may

be matched, while the front end of the first absorbent core (621) exists proximal from the front end of the second absorbent core (622). By providing the first and second absorbent cores (621, 622) in such position, the vicinity of the longitudinal edge of the first outer cover (421) on the front side may be kept thin by being devoid of the first absorbent core (621), thus facilitating inserting fingers between the first outer cover (421) and the second topsheet (242) for the removing activity of the first absorbent body (38). Such longitudinal dimension difference of the first and second absorbent cores (621, 622) may be provided on the front side, where there is remained less longitudinal dimension between the front end of the absorbent cores (621, 622) and the absorbent assembly (20).

The substrate elements of the absorbent assembly (20) are all depicted in rectangles in Figures 2A and 2B. Alternatively, the 4 edges of the elements of the absorbent assembly (20), and particularly elements of the first absorbent body (38), may be rounded off such as in Figures 1A-1B and 7A-7F. Such rounding off may be beneficial for avoiding the first absorbent body (38) having sharp edges, which sharp edges may otherwise be well observed during the removing action by the user. For purpose of determination of dimensions T1, T2, T3, T4, L1, L2, L3, and L4, the maximum transverse and longitudinal dimensions of each element is measured.

Other Components

The absorbent assembly (20) of the present invention may further comprise components that improve leakage prevention, wearability, fit, or aesthetic aspects of the resulting diaper article (10).

Referring to Figure 3 and Figures 2A and 2B below TX, the chassis (20) may further comprise components that improve the fit of the diaper article around the legs of the wearer. A pair of chassis cuffs may be provided along the transverse edges of the chassis and extending in the longitudinal direction. The chassis cuffs may comprise a pair of chassis inner cuffs (31) and a pair of chassis outer cuffs (34). The chassis inner cuffs (31) may be formed by a piece of material, typically a nonwoven, which is partially bonded to the chassis backsheet (252) and can be partially raised away and thus stand up from the plane defined by the first topsheet (241). The chassis inner cuffs (31) have a free terminal edge intended to contact and form a seal with the wearer's skin. The standing up portion of the inner cuffs (31) typically comprise an elastic element, for example one or a plurality of elastic bodies (35). The chassis inner cuffs (31) provide improved containment of liquids and other body exudates approximately at the junction of the torso and legs of the wearer. In addition to the chassis inner cuffs (31), the article may

comprise chassis outer cuffs (34), which are formed in the same plane as the chassis backsheet (252) which may be at least partially enclosed between the material for forming the chassis inner cuffs (31) and the chassis backsheet (252), and may be placed transversely outwardly relative to the chassis inner cuffs (31). The chassis outer cuffs (34) can provide a better seal around the thighs of the wearer. The chassis outer cuffs (34) may also comprise one or a plurality of elastic bodies (33). Comparing the upper and lower portions divided by TX of each of Figures 2A and 2B, the material for forming the chassis outer cuffs (34) covers the portion of the chassis backsheet (252) which may otherwise be exposed. As explained above, there is benefit in avoiding exposure of the backsheet to the user, as this provides a finished appearance. Referring to Figure 3, the chassis outer cuffs (34) may be formed by the chassis backsheet (252), a chassis cuff material, and a plurality of outer cuff elastic bodies (33) sandwiched between the chassis backsheet (252) and the chassis cuff material, and wherein the chassis inner cuffs (31) may be formed by the same chassis cuff material for forming the chassis outer cuffs (34) extending inwardly and encompassing a plurality of inner cuff elastic bodies (35).

Referring to Figure 2A towards the front and back ends, the second topsheet (242) may extend in the same dimension as the chassis backsheet (252) such that there is no area of the chassis backsheet (252) exposed towards the front and back ends of the absorbent assembly (20). Alternatively, referring to Figure 2B towards the front and back ends, there may be a small area extending in the longitudinal dimension from the front and back ends of the absorbent assembly (20) where the chassis backsheet (252) is exposed. Referring to Figure 6B, when the diaper article is a pant type, such area otherwise exposed may be covered by the outer sheet fold over (93). While not shown, when the diaper article is a taped type, such area otherwise exposed may be covered by a waist band attached along the front and back ends of the absorbent assembly (20) extending in the transverse direction, and having elasticity in the transverse direction.

As is typically provided for diaper articles with a single absorbent body, the chassis backsheet (252) and/or the chassis outer cover (422) may be provided with artwork which may be visible from the garment facing side of the diaper article (10). Such artwork may be coordinated with artwork provided on the fastening means, for example the elastic belts, for forming a pant article.

The first absorbent body (38) and the second absorbent body (39) may be provided with different aesthetics discernible from the topsheet side so that the user may distinguish between the first and second absorbent body (38, 39), and/or for appealing the existence of multiple absorbent bodies. For example, the first and second topsheets (241, 242) may be provided with

different topography such as bondings, embossings, and openings. For example, the adhesive for bonding the first or second topsheet (241, 242) with layers directly underneath may be provided in a color and a pattern, wherein the color and/or pattern provided in the first and second absorbent body (38, 39) may be different.

Pant Diaper Article

Referring to Figures 5A and 5B, the diaper article (10) of the present invention may be in the pant form wherein the application means (40) is an elastic belt (40), the elastic belt (40) comprising a front belt (84), a back belt (86), and a pair of side seams (32) sealing the transverse edges of the front belt (84) and the back belt (86). The pant diaper article (10) may be a belt-type pant as in Figures 5A and 5B wherein the front belt (84) and the back belt (86) are discontinuous in the longitudinal direction, and assembled with the absorbent assembly (20) wherein the front and back belts (84, 86) are positioned on the garment facing side of the absorbent assembly (20), wherein by the side seam (32) sealing the front and back belts (84, 86) form a ring-like belt. For the belt-type pant, the front belt (84) may be referred to as the front region (26), the back belt (86) may be referred to as the back region (28), and the remainder may be referred to as the crotch region (30). The front and back belts (84, 86) may be rectangular. At least one of the front and back belts (84, 86) may be shaped (not shown). For the belt-type pant, the longitudinal dimension (LB) of the back belt (86) may be greater than that (LF) of the front belt (84), wherein the distal edges (88) of the front belt (84) and the back belt (86) are matched for seaming, thereby leaving the proximal edges (90) of the back belt (86) remaining unsealed. The unsealed proximal edges of the back belt (86) may form a buttock cover. While not shown, the pant elastic article (10) may be a one-piece type wherein the front and back belt (86) are continuous.

Referring to Figure 5B, the front belt (84) and the back belt (86) may each be formed by a laminate comprising a plurality of elastic bodies (96) running in the transverse direction. At least some of the elastic bodies (96) extend in the transverse direction substantially parallel to each other. Referring to Figures 5B, 6A and 6B, the front belt (84) and the back belt (86) may each comprise a laminate, the laminate comprising a plurality of elastic bodies (96) running in the transverse direction, an inner sheet (94), an outer sheet (92), and an outer sheet fold over (93) wherein the outer sheet fold over (93) is an extension of the outer sheet material formed by folding the outer sheet material at the distal edge (88) of the front and back belts; wherein the elastic bodies (96) are sandwiched between two of these sheets. The outer sheet fold over (93) from the front and back belts (84, 86) may sandwich the front and back longitudinal edges of

some components of the absorbent assembly (20). The front elastic belt (84) and the back elastic belt (86) may each be made only by elastic bodies (96), the inner sheet (94), the outer sheet (92), and the outer sheet fold over (93). The elastic bodies (96) may be disposed in the same or different denier, interval, and force between the front and back, as well as in different longitudinal positions of the belt.

Referring back to Figure 5B, the pant diaper article (10) is formed by the absorbent assembly (20), the front belt (84) and the back belt (86), wherein the position of the absorbent assembly (20) in view of the front belt (84) and back belt (86) are arranged in order to provide good absorbency as well as good wear comfort. When the pant diaper article (10) has the seams unjoined and in a flat uncontracted condition of the elastic members, the side seam and the diaper article (10) each have a longitudinal dimension. When the longitudinal dimension (LB) of either belt is greater than that (LF) of the other belt, the longitudinal dimension of the side seam equals LF. When the pant diaper article (10) has the seams unjoined and in a flat uncontracted condition of the elastic members, the longitudinal dimension between the proximal edge of the front side seam and the proximal edge of the back side seam, may be from about 40% to about 70%, preferably from about 43% to about 60% of the longitudinal dimension of the diaper article (10). By providing the pant diaper article (10) in such configuration, the absorbent assembly (20) may be appropriately placed against the wearer for wear comfort.

When the diaper article (10) is the belt-type pant as in Figure 5B, the distal edge of the front belt (84) and the front longitudinal end of the absorbent assembly (20) has a distance D1, and the distal edge of the back belt (86) and the back longitudinal end of the absorbent assembly (20) has a distance D2, D1 may be provided smaller than D2. By providing D1 smaller than D2, the absorbent assembly (20) may be shifted toward the front, thereby effectively receiving and absorbing fluid waste.

Referring to Figures 6A and 6B, the pant diaper article (10) of the present invention may have a chassis outer cover (422) provided on the garment facing side of the chassis backsheet (252). The chassis outer cover (422) may be any nonwoven material suitable for the first outer cover (421) mentioned above. When the diaper article (10) is the belt-type pant as in Figure 5B and a chassis outer cover (422) is present, the chassis outer cover (422) may extend through the crotch region (30) but only partly in the longitudinal direction in the front and back regions (26, 28) to leave the distal parts of the front belt (84) and the back belt (86) free of the chassis outer cover (422). Namely, the longitudinal length of the chassis outer cover (422) may be longer than the distance between the front and back belts (84, 86), and shorter than the longitudinal length of

the chassis backsheet (252). By such configuration, the distal parts of the front belt (84) and the back belt (86) are devoid of the chassis outer cover (422), thereby provide the overall article (10) relatively thin, and provide cost saving.

As described above, it may be advantageous to guide the user to start the removing activity of the first absorbent body (38) from the front and/or back end of the first absorbent body (38). Referring to the front side, the longitudinal dimensions of the components of the absorbent assembly (20) may be coordinated with the components of the front belt (84) for accommodating the removing activity. Referring to Figures 2A and 6A, the outer sheet fold over (93) may be provided in a dimension such that the front longitudinal edges of components of the second absorbent body (39) as well as the chassis (100) may be sandwiched between the inner sheet (92) and the outer sheet fold over (93), while the front longitudinal edges of components of the first absorbent body (38) exist proximal from the proximal edge of the outer sheet fold over (93). Alternatively, referring to Figures 2B and 6B, the front longitudinal edges of components of the first absorbent body (38) may exist distal from the proximal edge of the outer sheet fold over (93), and provided on the wearer-facing side of the outer sheet fold over (93). In either configuration of Figure 6A or 6B, the removing activity of the user may be accommodated. While not shown, the longitudinal dimensions of the components of the absorbent assembly (20) may be coordinated with the components of the back belt (86) in similar configuration as described above for the front side.

Peeling Strength Measurement

1. Preparation of finished product specimen

Specimen for the measurements hereinbelow is obtained from 3 finished diaper article samples. When the article is a pant, peel apart the side seam of the pant. The article is then stretched in the longitudinal direction such that any longitudinally extending elastic bodies, such as cuff elastics, are fully stretched, and then the article is attached on an appropriate board having at least an area of the fully stretched article via any attachment means, such as tape, adhesive, hooks, or the like. Identify which of the front or back side ("peeling side") the first absorbent body is intended to be peeled off from the remainder of the article. Cut by scissors along the width direction (transverse direction) at 10cm from the longitudinal edge of the first absorbent body on the peeling side by scissors. The portion exposed by such cutting is the measurement edge.

2. MTS test setting and measuring

As equipment, MTS Criterion Model 42 running TW Elite 4.3.1.375 software with standard tensiometer or equivalent is used. All testing is performed in a room maintained at 23 ± 2 °C and 50 ± 5 % relative humidity.

The initial distance between the upper grip and lower grip is set to be 20 mm. Grips having a transverse dimension greater than the width of the Temporary Bonding on the left and right sides are selected, such that the specimen is peeled at the same horizontal level simultaneously. The measurement edge of the specimen is gripped by the grips such that the upper grip is clamping the first absorbent body, and the lower grip is clamping the remainder of the article. The specimen is set such that the transverse direction of the specimen matches the horizontal direction of the equipment. A constant rate of extension of 500mm/min is applied. The elongation measurement is taken from the point where the program starts. The upper grip starts moving up, while the lower grip remains static, resulting in the first absorbent body's peeling off. The program stops until the upper grip moves 200 mm. The force (N) is continuously measured by the machine at a sampling rate of 50 Hz.

The Peak Force is the maximum force value observed during the measurement process. The Average Force is the average value observed between 80mm and 160mm extension. For both values, measurements from 3 specimens are obtained and averaged up to 0.01N preciseness.

Folded Thickness Measurement

1. Preparation of finished product specimen

Specimen for the measurements hereinbelow is obtained for 3 finished diaper articles. When the article is a pant, the article is used in its original form. When the article is a taped diaper, the article is folded in half along the longitudinal center line of the article. The folded longitudinal center of the article is called the "bottom".

2. Folded thickness measurement

As equipment, Ono Sokki Closed Shaft foot caliper with 24.13 mm diameter foot exerting 0.689 kPa on Ames stand with Caliper Gauge GS-503 or equivalent; Digital Readout DG-3610 Measure all or equivalent are used. All testing is performed in a room maintained at 23 ± 2 °C and 50 ± 5 % relative humidity.

The specimens are obtained immediately after they are removed from a freshly opened package, and subject to the following measurement, such that measurement may be completed in 5 minutes from opening the package:

(1) Lift the caliper foot carefully by hand, lay the specimen flat on the caliper stand and place the caliper foot on the specimen such that the caliper foot is placed 5mm away from the bottom,

and at the transverse center. Wait approx. 5 seconds and take the reading. The reading is the thickness of the bottom of the article.

(2) Lift the caliper foot carefully by hand, lay the specimen flat on the caliper stand and place the caliper foot on the specimen such that the caliper foot is placed 50mm away from the bottom, and at the transverse center. Wait approx. 5 seconds and take the reading. The reading is the thickness of the bottom of the article.

(3) The value obtained by steps (1) and (2) are averaged.

The Folded Thickness is the average of the value obtained in (3) from 3 samples averaged up to 0.1mm preciseness.

EXAMPLE

Examples 1-2 and Comparative Examples 1-4 are Size 4 (L-size) belt-type pant diaper articles having 2 absorbent layers and all with configuration of Figures 2A, 3, 4A, 5B, and 6A, and the dimensions and materials of Table 1 below. Examples 1-2 and Comparative Examples 1-4 have peel strength properties as in Figure 8 and Table 2 below. Examples 1-2 each have a Folded Thickness of 11.2mm.

Table 1

Element	Dimension (mm)	Material identification
First backsheet	T1=150, L1=370	
First Outer cover	T2=150, L2=370	15 gsm spunbond nonwoven substrate comprising PP fiber available from Guanhe Hygiene Products Co., Ltd with tradename S31921A
Second topsheet	T3=140, L3=403	40 gsm carded nonwoven substrate comprising PE/PET bi-component fibers available from Xiamen Yanjan New Material Co. Ltd
Chassis backsheet	T4=198, L4=403	

Table 2

Venue	Comparative Example 1	Example 1	Example 2	Comparative Example 2	Comparative Example 3	Comparative Example 4
Peak Force (N)	3.33	7.17	12.71	16.11	21.00	33.01
Average Force (N)	0.25	3.40	1.49	13.45	10.95	28.55

The Temporary Bonds of pant diaper article of Examples 1-2 endure the forces created during the first usage by the wearer, and are capable of being broken without destroying other components of the pant diaper article. The Temporary Bonds of pant diaper article of

Comparative Example 1 does not endure the forces created during the first usage, and thus the first absorbent body risks unintentional removal from the remainder of the pant diaper article. The Temporary Bonds of pant diaper articles of Comparative Examples 2-4 are so strong that, the first outer cover is unintentionally destroyed before completion of the removing activity.

Consumer Acceptance

12 panelists in Nanjing, China who were users of similar price range products as the target consumers were recruited. They were asked to use the products they used most often (hereinafter "benchmark") for 2 days, and then to use pant diaper article samples of Example 1 (hereinafter "Example 1") for 2 days, and answer a set of questions. Table 3 shows results of the panelists scoring each sample in a scale of 0 to 100 points against the attribute of "easy application". Table 4 shows results of percentage of panelists who "strongly agreed" or "somewhat agreed" to the statement. Table 5 shows results of percentage of panelists who agreed to the statements.

Table 3

	Example 1	Benchmark
Easy application	73points *1)	8points

Table 4

Statement	Example 1	Benchmark
The time and effort I spend on diaper change is what I desire for	83% *1)	8%

*1) Statistically significantly better compared to Benchmark at 90% confidence.

Table 5

Statement	
It's much easier application compared to Benchmark	58%
It's a little easier application compared to Benchmark	33%
I feel less pressure or less struggle during diaper change	92%
It's the most effortless diaper I have ever experienced	83%
It's a product I'm willing to continue to use for my baby	92%
It's a hygienic product for mom to peel (first absorbent body from remainder of article)	83%

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range

surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm." Further, every numerical range given throughout this specification includes every narrower numerical range that falls within such broader numerical range.

Every document cited herein, including any cross referenced or related patent or application, is hereby incorporated herein by reference in its entirety unless expressly excluded or otherwise limited. The citation of any document is not an admission that it is prior art with respect to any invention disclosed or claimed herein or that it alone, or in any combination with any other reference or references, teaches, suggests or discloses any such invention. Further, to the extent that any meaning or definition of a term in this document conflicts with any meaning or definition of the same term in a document incorporated by reference, the meaning or definition assigned to that term in this document shall govern.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

CLAIMS

What is claimed is:

1. A diaper article comprising an absorbent assembly and an application means, the absorbent assembly comprising:

1) a first absorbent body comprising:

a) a first water permeable topsheet;

b) a first water impermeable backsheet;

c) a first absorbent core disposed between the first topsheet and the first backsheet;

d) a first outer cover disposed on the garment facing side of the first backsheet;

2) a second absorbent body disposed on the garment facing side of the first absorbent body, comprising:

a) a second water permeable topsheet;

b) a second absorbent core; and

3) a chassis disposed on the garment facing side of the second absorbent core, the chassis comprising a water impermeable chassis backsheet;

wherein the first outer cover and the second topsheet is bonded with a Temporary Bond which enables removing the first absorbent body from the remainder of the diaper article, wherein the Temporary Bond has a Peak Force of about 16N or lower and an Average Force of about 0.3N or higher, according to the measurements herein.

2. The diaper article of claim 1 wherein the first outer cover has a basis weight of from about 6.5gsm to about 25gsm, and the second topsheet has a basis weight of from about 11gsm to about 40gsm.

3. The diaper article of claim 2 wherein the first outer cover has a lower basis weight than the second topsheet.

4. The diaper article of claim 1 or 2 wherein the Temporary Bond is provided by ultrasonic energy.

5. The diaper article of claim 1 or 2 wherein the Temporary Bond is disposed along the transverse edges of the second topsheet extending in the longitudinal direction.

6. The diaper article of claim 1 or 2 wherein the Temporary Bond is provided in the shape of an oval.

7. The diaper article of claim 5 further comprising an Auxiliary Temporary Bond, wherein the Auxiliary Temporary Bond is disposed between the Temporary Bonds and extending in the transverse direction, wherein the Auxiliary Temporary Bond is disposed adjacent the longitudinal edge of the Temporary Bond.

8. The diaper article of claim 5 wherein an indicia is provided on the garment facing side of the first outer cover for guiding where the first absorbent body may be pinched for removing the first absorbent body from the remainder of the diaper article.

9. The diaper article of claim 8 wherein the indicia is provided on both the front and back ends of the first absorbent body.

10. The diaper article of claim 1 or 2 wherein the front end of the second absorbent core exists distal from that of the first absorbent core, the front end of the first backsheet exists between the front end of the second absorbent core and the front end of the first absorbent core, and the front end of the first outer cover exists between the front end of the second absorbent core and the front end of the first absorbent core.

11. The diaper article of claim 1 or 2 having a Folded Thickness of no greater than about 12.5mm, according to the measurements herein.

12. The diaper article of claim 1 or 2 wherein the first backsheet has a transverse dimension T1 and the second topsheet has a transverse dimension T3; wherein T1 is equal to or greater than T3.

13. The diaper article of claim 1 or 2 wherein the first and second absorbent cores comprise superabsorbent polymers.

14. The diaper article of claim 1 or 2 wherein the chassis further comprises a pair of chassis outer cuffs and a pair of chassis inner cuffs, wherein the chassis outer cuff is formed by the chassis backsheet, a chassis cuff material, and a plurality of outer cuff elastic bodies sandwiched between the chassis backsheet and the chassis cuff material, and wherein the chassis inner cuff is formed by the chassis cuff material extending inwardly and encompassing a plurality of inner cuff elastic bodies.

15. The diaper article of claim 1 or 2 wherein the application means is selected from the group of a fastening means and an elastic belt.

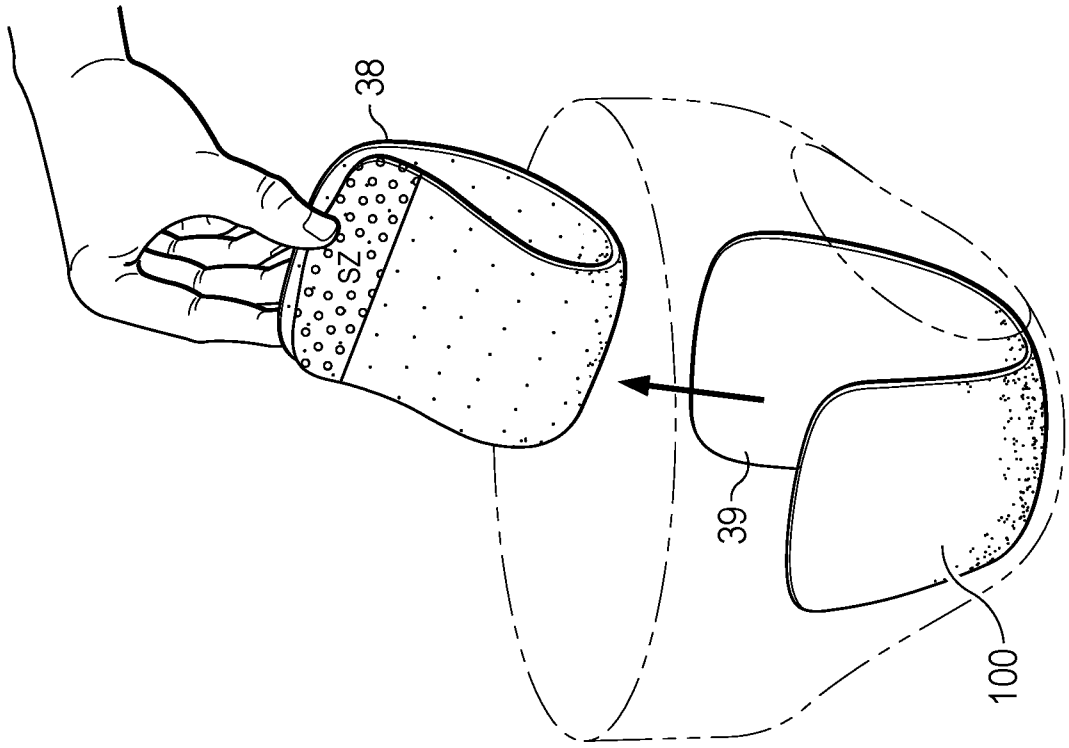


FIG. 1B

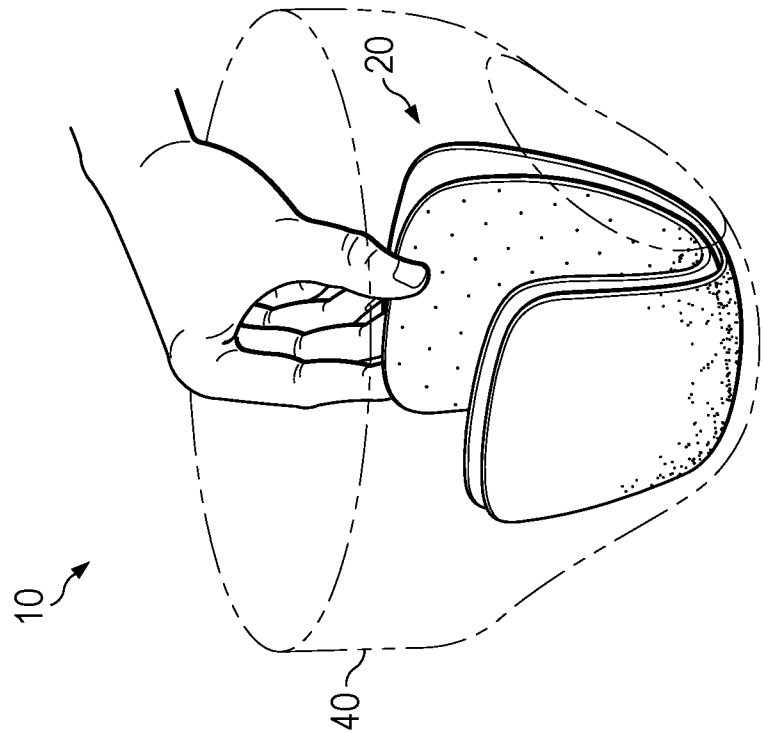


FIG. 1A

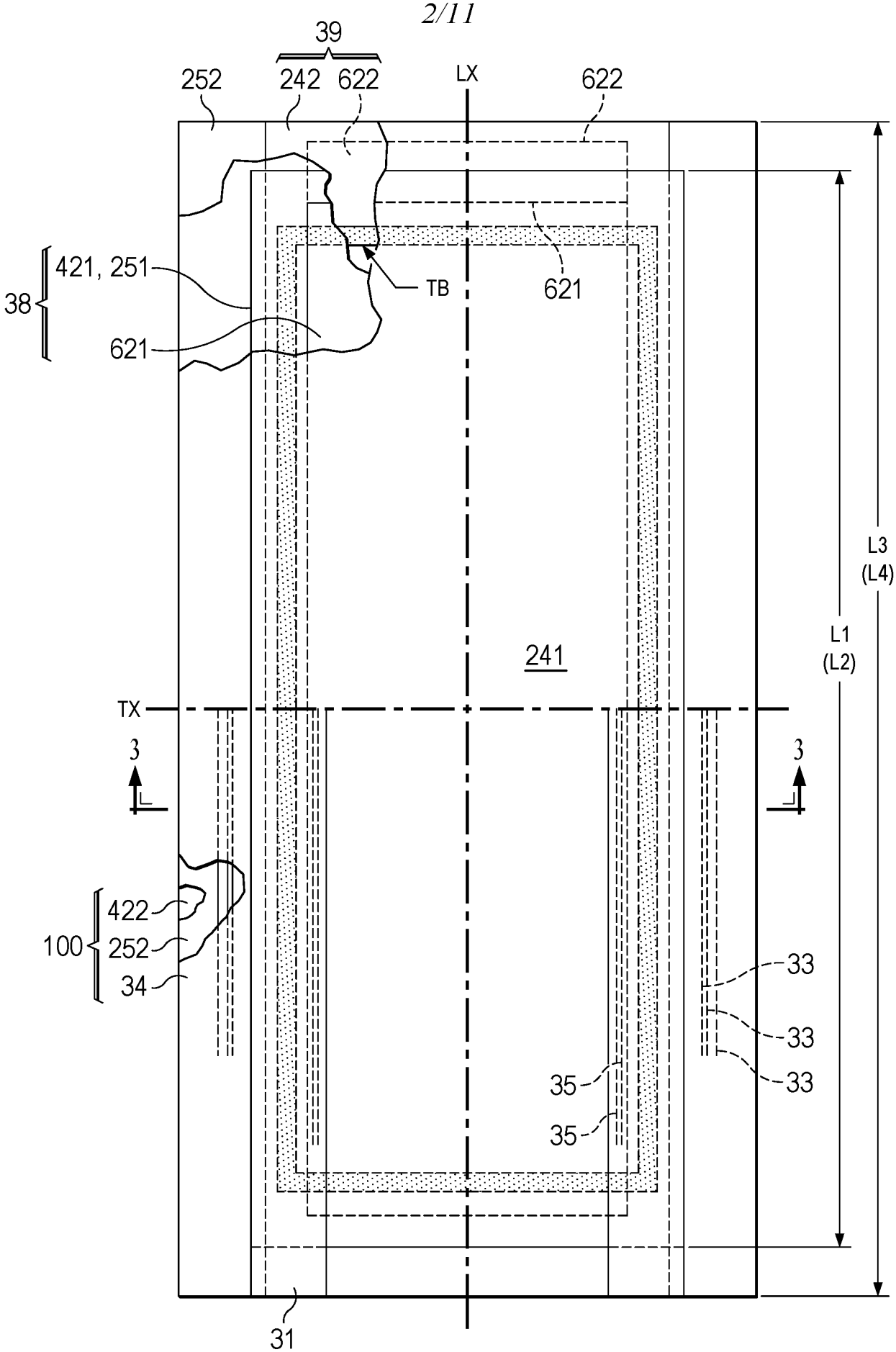

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242
622
LX
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421, 251
38
621
TB
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241
L3
(L4)
L1
(L2)
TX
3
3
422
100
252
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FIG. 2A

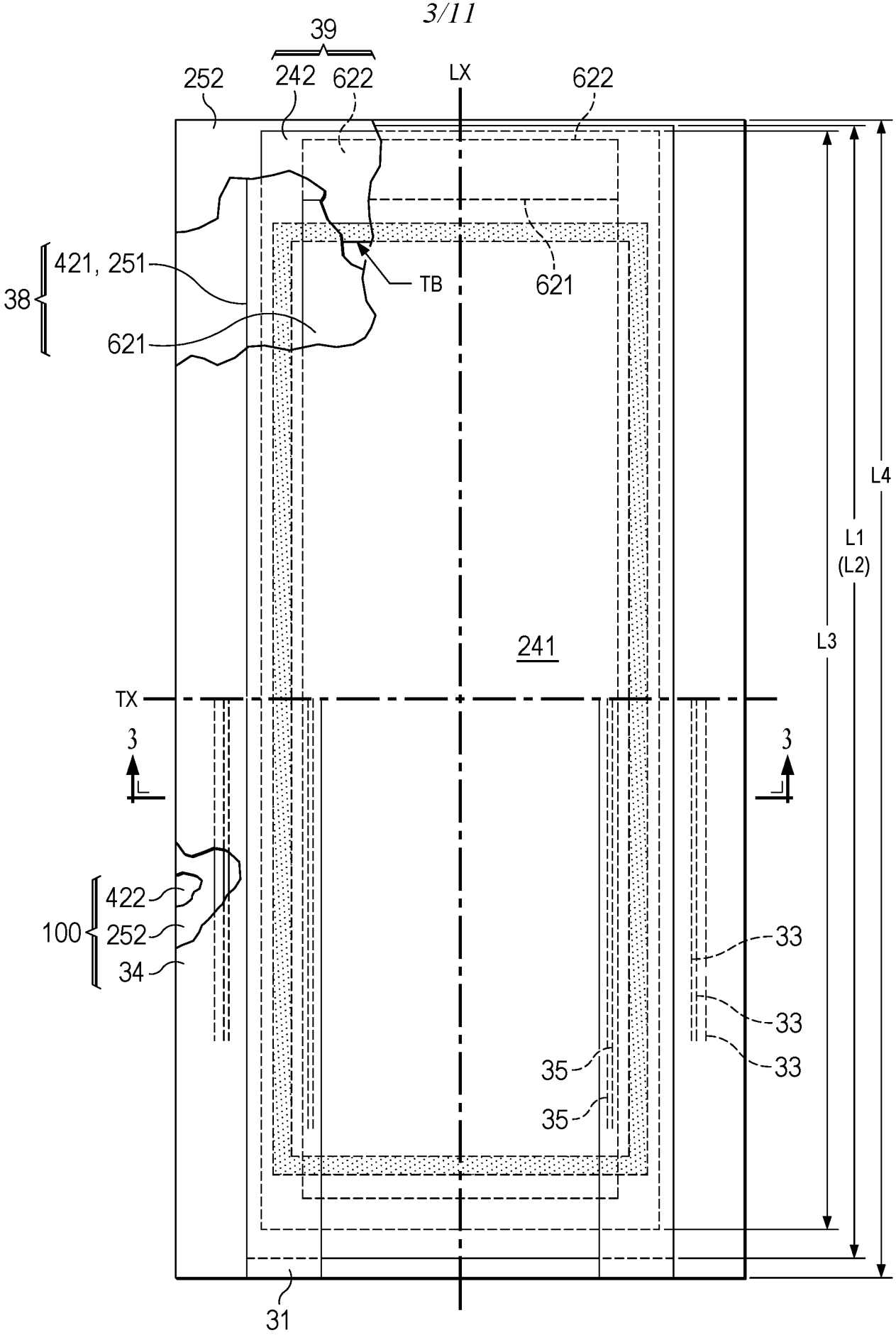

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FIG. 2B

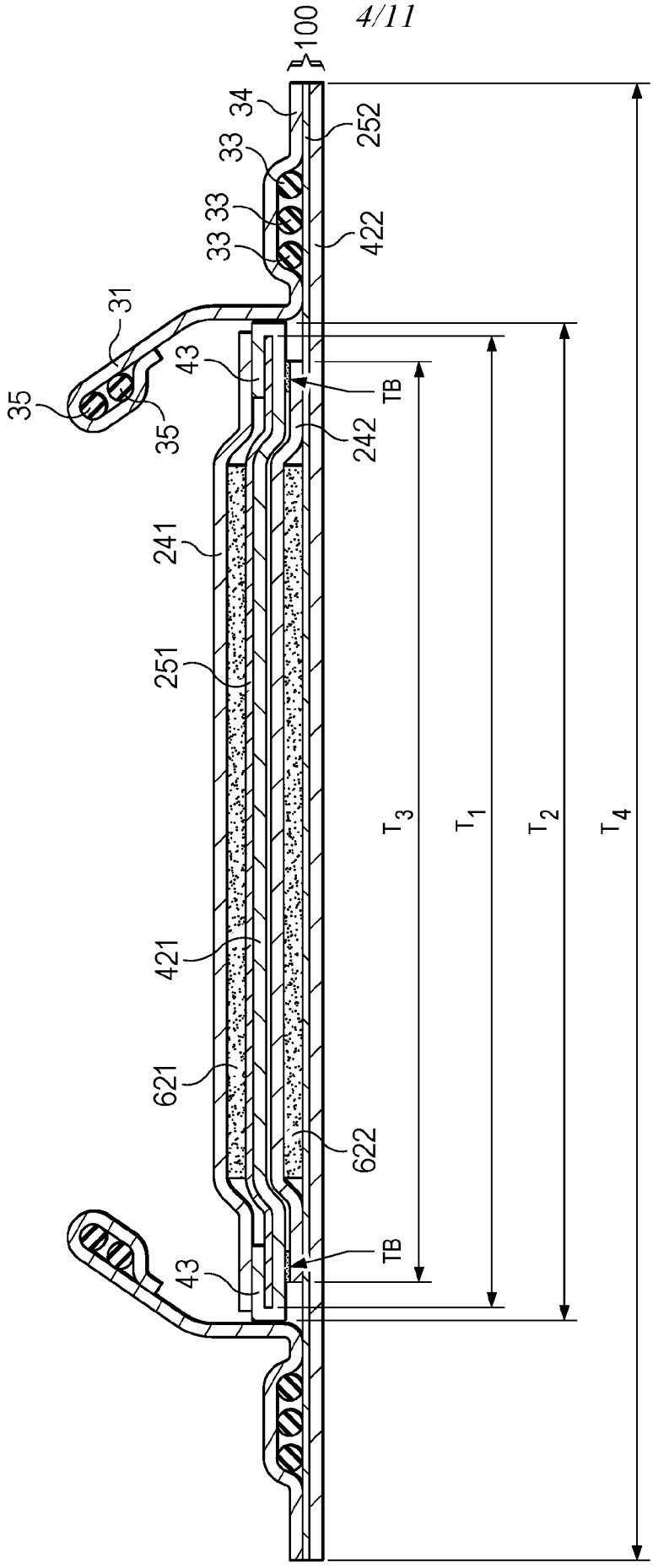

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422
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242
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251
421
621
622
43
TB
T3
T1
T2
T4

FIG. 3

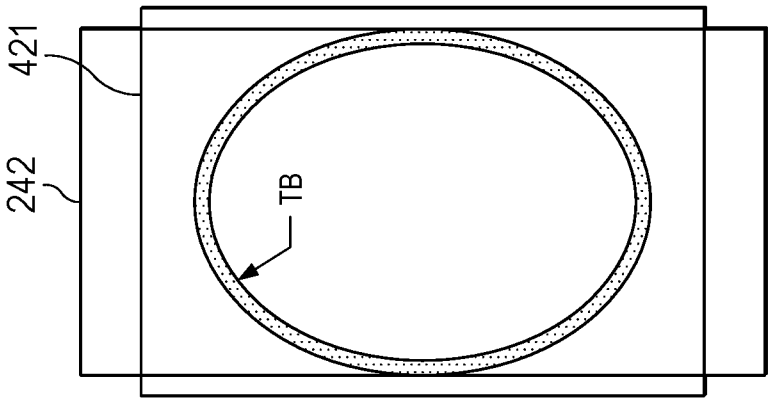


FIG. 4C

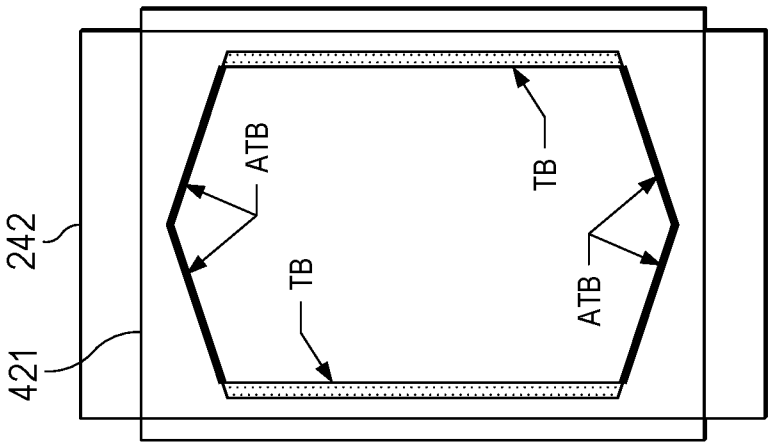


FIG. 4B

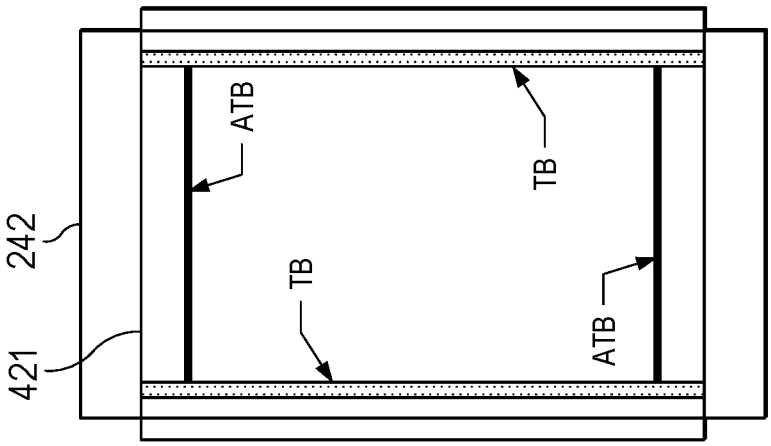


FIG. 4A

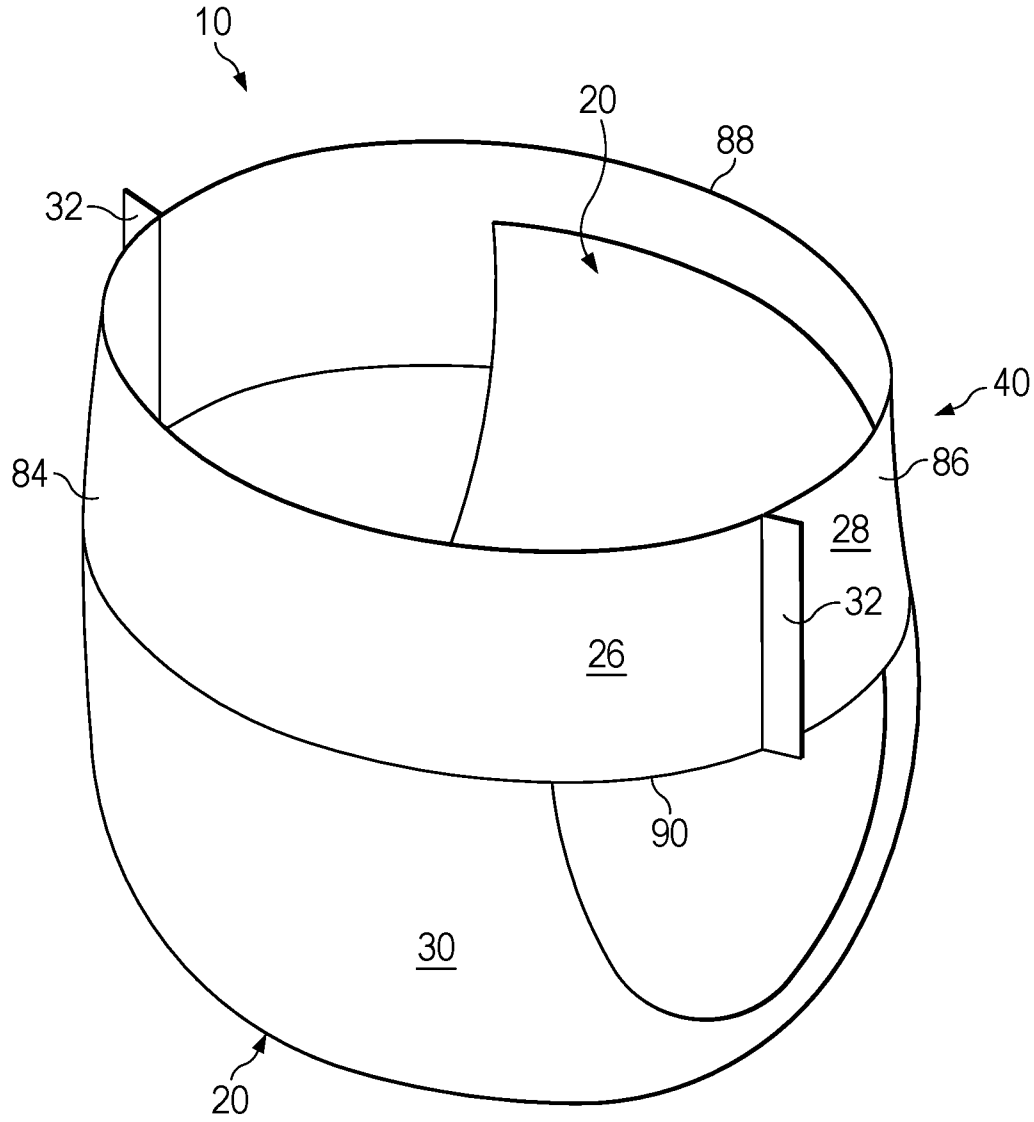


FIG. 5A

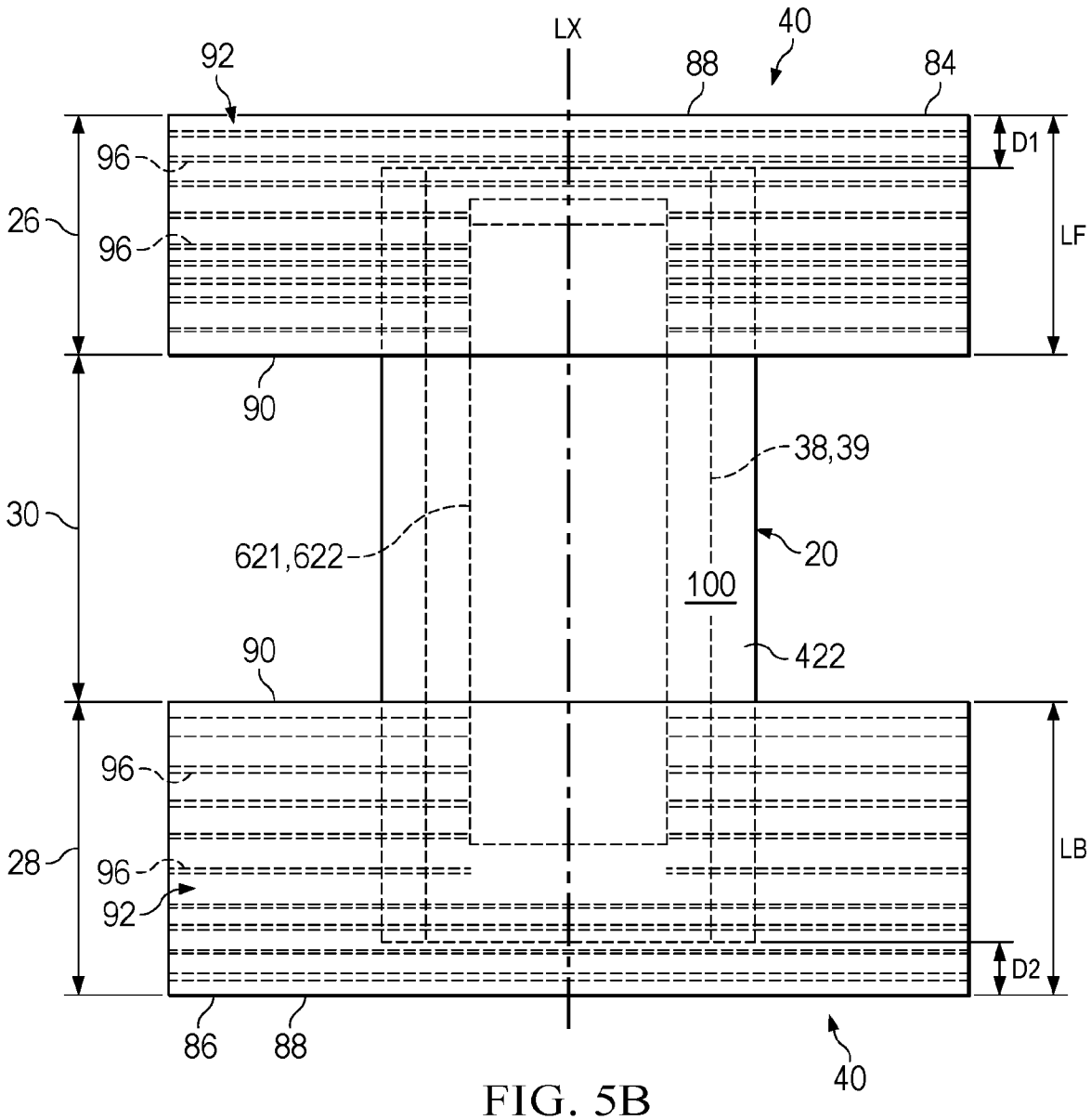

LX
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88
84
D1
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26
96
LF
90
38,39
30
621,622
20
100
90
422
96
LB
28
96
92
D2
86
88
40

FIG. 5B

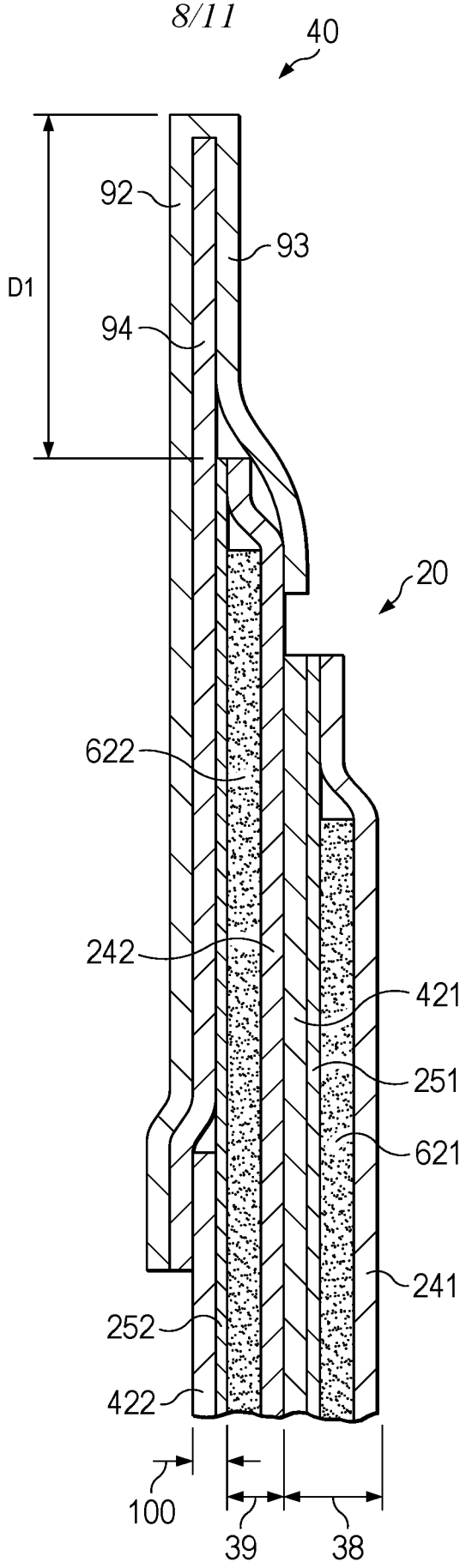


FIG. 6A

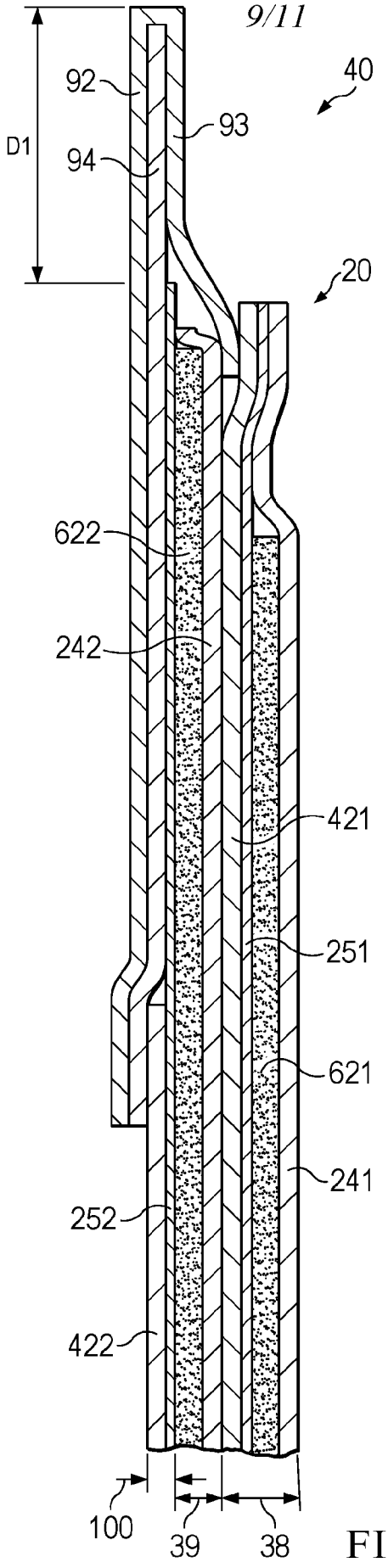


FIG. 6B

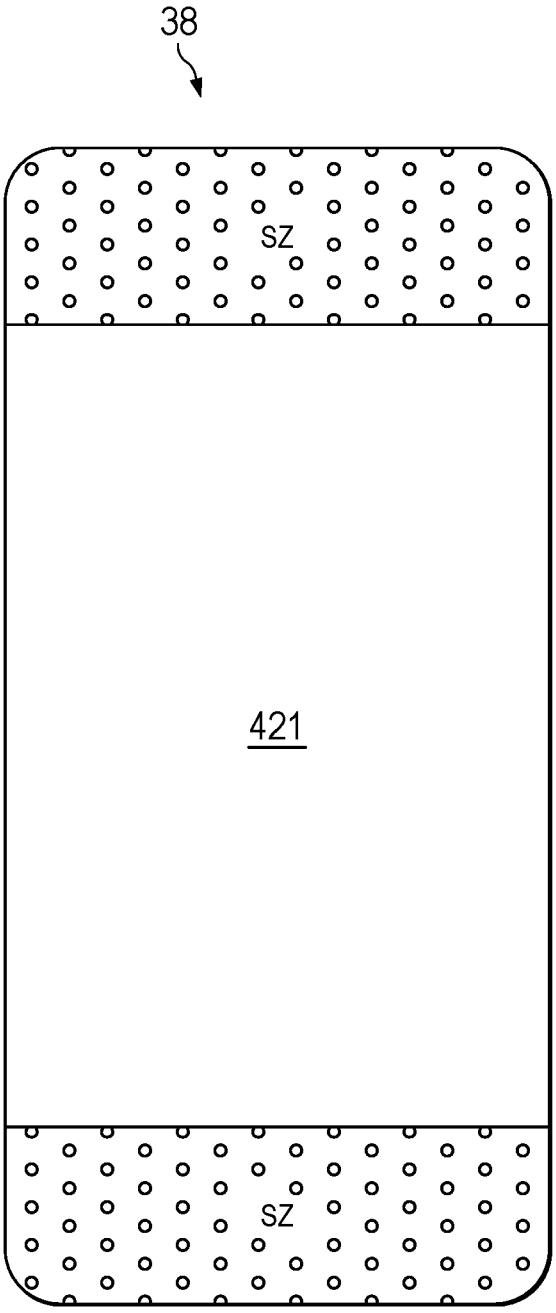


FIG. 7A

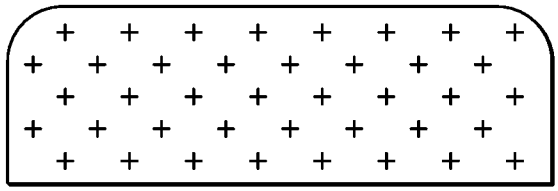


FIG. 7B

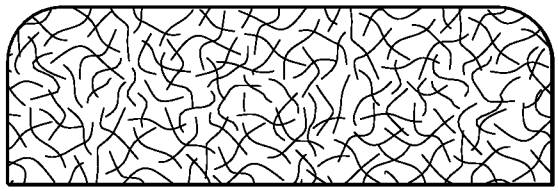


FIG. 7C

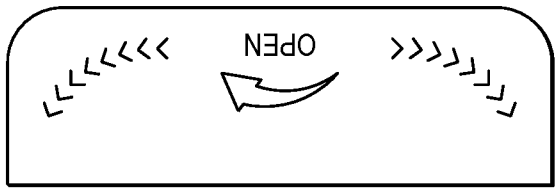


FIG. 7D

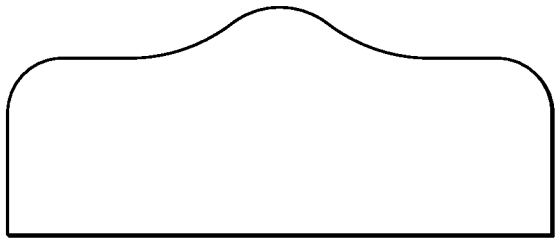


FIG. 7E

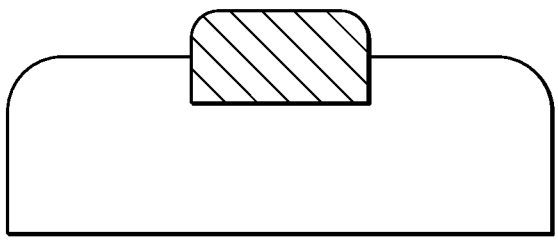
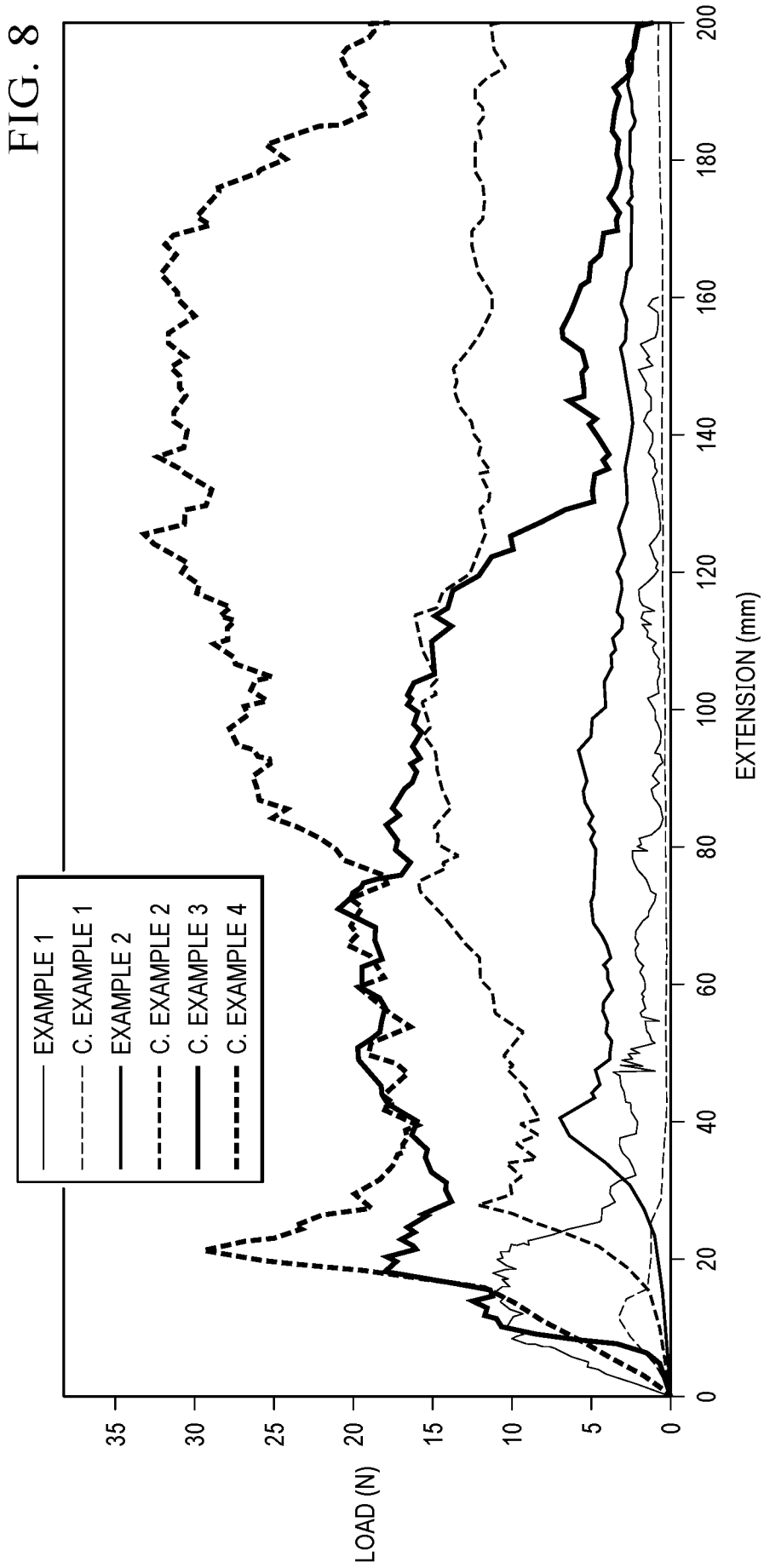


FIG. 7F

FIG. 8


EXAMPLE 1
C. EXAMPLE 1
EXAMPLE 2
C. EXAMPLE 2
C. EXAMPLE 3
C. EXAMPLE 4
LOAD (N)
0
5
10
15
20
25
30
35
EXTENSION (mm)
0
20
40
60
80
100
120
140
160
180
200

INTERNATIONAL SEARCH REPORT

International application No
PCT/CN2023/071286

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/49 A61F13/505 A61F13/74
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

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, BIOSIS, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 1 151 688 A (MCNEIL PPC INC [US]) 11 June 1997 (1997-06-11) claim 1; fig. 1, 2, 18 and corresponding passage of the description; the whole document	1-15
X	US 10 159 611 B2 (KIMBERLY CLARK CO [US]) 25 December 2018 (2018-12-25) fig. 1, 2, 18; claim 1 and corrresponding passages of the description.	1-15
X	US 2017/239099 A1 (KLEUSKENS SARAH AUSTIN [US] ET AL) 24 August 2017 (2017-08-24) fig. 1, 2, 18; claim 1 and corrresponding passages of the description)	1-9,13, 15

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 May 2023	02/06/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Hoff, Céline

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No
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