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(54) Title: DISPOSABLE ABSORBENT PANT WITH EFFICIENT DESIGN AND CONVENIENT SINGLE SECTION SIDE STRETCH PANELS

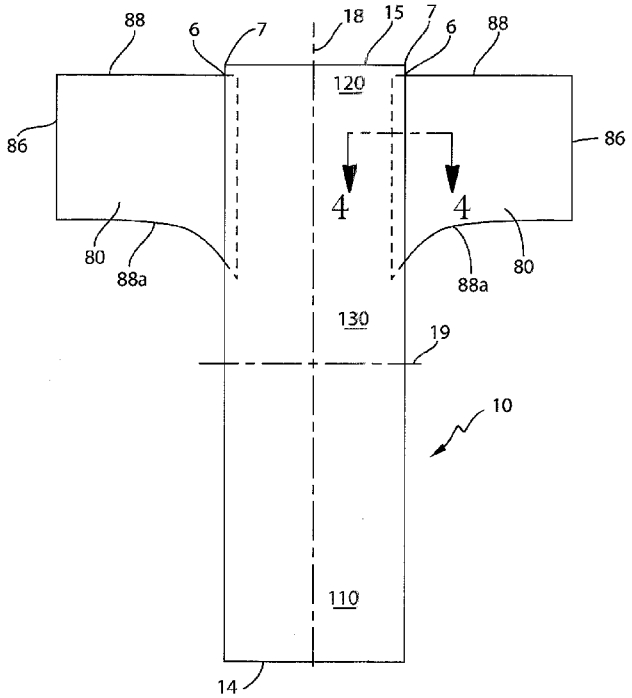

Fig. 1

(57) Abstract: A disposable absorbent pant having single-section side stretch panels is disclosed. The pant may have features including seams of overlapping configuration or sandwiched configuration, or a belt configuration. A seam of overlapping configuration may be formed by bonds with features that provide for tensile strength in a lateral direction, while providing enhanced tearability for convenient removal, and may include additional features including indicia of a tearing location, a tear-inducing notch, and structure to grasp for tearing. A seam of sandwiched configuration may provide a finished outward appearance. A belt configuration provides counterbalancing of lateral tension forces and reduces demand for structural robustness in backsheet materials, seams and bonds. Sandwiched and belt configurations allow for extended lateral width of side panels and increased stretch, without extending overall hoop circumference at risk of unduly loose fit.

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DISPOSABLE ABSORBENT PANT WITH EFFICIENT DESIGN AND CONVENIENT SINGLE SECTION SIDE STRETCH PANELS

BACKGROUND OF THE INVENTION

Disposable absorbent diapers configured to be donned like pants, in that to be donned they are pulled on over the wearer's feet and up the legs rather than wrapped directly about and fastened at the wearer's lower torso like an infant diaper, have been in the market for a number of years. Such products are often marketed as "training pants" intended for children who are walking, beginning to develop independence and dress themselves, and learning to control their bodily functions so that they can transition out of diapers and into underwear. Such training pants provide a toilet-training child with an underwear-like garment that she can learn to don herself in the same manner as underpants, providing a new sense of accomplishment and independence, while still providing protection against accidents.

Similar articles are marketed in larger sizes and intended for older children experiencing childhood enuresis, or adults experiencing incontinence.

Currently marketed designs are constructed from a rectangular or hourglass-shaped precursor chassis having a liquid impermeable, garment-facing backsheet, liquid permeable, wearer-facing topsheet and an absorbent core between the backsheet and the topsheet. The chassis of the typical design will have front and rear waist regions and a crotch region between the waist regions, and respective front and rear pairs of stretch panels formed of a laterally, elastically stretchable and contractible stretch laminate, extending from each of the waist regions, with the respective front and rear panels on each side then joined together at side seams to form a pant-like structure. The stretch laminate panels at the sides provide for elastic hoop-wise expansion of the article to allow it to be pulled over body contours while being donned, and elastic hoop-wise contraction to hold the article comfortably and securely in place while being worn.

While sufficiently popular to sustain their presence in the market, current designs present at least several challenges.

Because such products are "disposable" for the consumer and the industry is highly competitive (factors that exert downward pressure on pricing), the business of manufacturing disposable absorbent pants requires large scale and production volume for success. In addition to product quality, performance, fit, appearance and consumer satisfaction, ease of manufacture,

cost and material conservation are ever-present and ever-important objectives. Elastomeric materials used as components of stretch laminates are among the more expensive components of many current disposable absorbent pant designs. Consequently, inclusion of such materials to any extent that is unnecessary to provide their intended function (elastic stretch and contraction) is undesirable.

The amount of overall lateral hoop-wise expansion available in a disposable absorbent pant is affected by the lateral width of the stretch panels (*i.e.*, the greater the lateral width of the stretch panel, the greater the amount of lateral expansion that it will provide). Thus, the respective front and rear stretch panels must be of a sufficient lateral width to provide for the amount of lateral hoop stretch required for the intended wearer to easily and comfortably don the pant. Generally, increasing stretch capability by increasing the lateral width of the stretch panels provides for easier and more comfortable donning. On the other hand, once the pant is donned and in wearing position on the wearer, contraction is required to provide a secure, neat fit and exudate containment functionality. If the stretch panels are excessively wide, they will not be stretched enough in wearing position to provide sufficient contractive securing tension, and an unacceptably loose/sloppy fit can be the result. Generally, decreasing the lateral width of the stretch panels increases the snugness, neatness and security of the fit and containment functionality. Thus, in designing stretch panels and selecting their width, competing and conflicting objectives are presented.

Further, the precursor front and rear stretch panels must have additional lateral width available to form the seams along which they are to be attached. The seams typically include a section of the stretch laminate that is relatively fixed, such that it cannot serve to provide stretch capability. Thus, in one sense, the stretch capability of the portions of the stretch laminate material (including the relatively expensive elastomeric materials) required for side seams is wasted. Considering the production volumes required for competitiveness in the market, this is not an insignificant factor.

Additionally, the typical chassis, and especially the liquid impermeable backsheet thereof, will be required to be of a certain lateral width at the front and rear waist regions in order to provide desired containment of urine or other liquid exudates, and a desired width of the envelope structure containing the absorbent core. The needed lateral width of the backsheet will take up substantial portions of the lateral waist circumference. This leaves only a smaller fraction of the overall waist band length (at the side-hip areas) available for stretch panels. In

order to provide the stretch capability needed to strike the balance between the need for ease of donning and a secure fit, relatively high-performance elastomeric material is needed for the stretch laminate – which is relatively expensive. Some designs have added elastically stretchable members and suitable accompanying construction to the rear and/or front waist regions to supplement waistband stretch capability. This approach, however, adds its own cost and complexity to the design.

Further, it is often desirable for a training pant to be quickly and easily removable (such as when soiled with exudates), without the necessity of having to pull the article down over the wearer's legs and feet. For this reason, it may be desirable that portions of the pant are easily separable by the caregiver or wearer at one or more defined locations, so that it can be conveniently and neatly removed. One currently available design addresses this need by providing side seams held together only by strips of hook-type fastener components engaged with a compatible receiving material, which will allow relatively easy separation along the side seam when the caregiver or wearer applies requisite separating forces across the seam. However, this approach does not help with materials savings and in some circumstances may add cost and complexity to the design. Other design approaches have employed side seams in which the respective front and rear stretch panels are permanently bonded together. Although such approaches decrease the possibility of unintended separation, they also reduce the ease of removal.

In view of the foregoing, the design needs, and costs of materials typically used to make disposable absorbent pants, a need exists for improvements that will conserve materials and improve lateral hoop-wise stretch performance and wearer/caregiver convenience.

BRIEF DESCRIPTION OF THE DRAWINGS

Like components and/or features are given like numeric references throughout the drawings and views. In the drawings:

Fig. 1 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, and laid out flat, garment-facing side up;

Fig. 2 is a perspective view of an assembled pant;

Fig. 2A is a perspective outside view of an overlapping seam on an assembled pant;

Fig. 2B is a perspective outside view of an overlapping seam on an assembled pant;

Fig. 2C is a perspective outside view of an overlapping seam on an assembled pant;

Fig. 2D is a schematic outside front view of an assembled pant in an upright position;

Fig. 3A is a schematic, exploded, lateral cross-sectional view of a seam having an overlapping configuration, and portions of a chassis and side panel at the seam arranged in one configuration;

Fig. 3B is a schematic, exploded, lateral cross-sectional view of a seam having an overlapping configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 3C is a schematic, exploded, lateral cross-sectional view of a seam having an abutting configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 3D is a schematic, exploded, lateral cross-sectional view of a seam having an overlapping configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 4A is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in one configuration;

Fig. 4B is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 5A is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 5B is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in another alternative configuration;

Fig. 6 is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in another alternative configuration;

Fig. 7A is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in another alternative configuration;

Fig. 7B is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in another alternative configuration;

Fig. 8 is a schematic, exploded, lateral cross-sectional view of a seam having an overlapping configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration;

Fig. 9 is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in another alternative configuration;

Fig. 10 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up, having side panels with curved-cut edges having reverse symmetry about inflection points;

Fig. 11 is a schematic plan view of a portion of stretch laminate material cut to form precursors of two side panels;

Fig. 12 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up;

Fig. 13A is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in one configuration, and also depicting a barrier cuff in one configuration attached at the seam, longitudinally below a location at which such cuff would be have its free edge tacked/bonded down;

Fig. 13B is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in one configuration, and also depicting a barrier cuff in an alternative configuration attached at the

seam, longitudinally below a location at which such cuff would be have its free edge tacked/bonded down;

Fig. 14A is a schematic, exploded, lateral cross-sectional view of a combination seam joining portions of a chassis and side a barrier cuff in one configuration attached at the seam in the crotch region;

Fig. 14B is a schematic, exploded, lateral cross-sectional view of a combination seam joining portions of a chassis and side a barrier cuff in an alternative configuration attached at the seam in the crotch region;

Fig. 15 is a schematic, exploded, lateral cross-sectional view of a seam having an overlapping configuration, and portions of a chassis and side panel at the seam arranged in one configuration, and also depicting a barrier cuff in one configuration attached at the seam, longitudinally below a location at which such cuff would be have its free edge tacked/bonded down;

Fig. 16A is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration, and also depicting a barrier cuff in an alternative configuration attached at the seam, longitudinally below a location at which such cuff would be have its free edge tacked/bonded down;

Fig. 16B is a schematic, exploded, lateral cross-sectional view of a seam having a sandwiched configuration, and portions of a chassis and side panel at the seam arranged in an alternative configuration, and also depicting a barrier cuff in another alternative configuration attached at the seam, longitudinally below a location at which such cuff would be have its free edge tacked/bonded down;

Fig. 17 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up, having an elasticized band in the rear region;

Fig. 18 is a schematic, exploded, longitudinal cross sectional view of a portion of the structure depicted in Fig. 18, as indicated in Fig. 17;

Fig. 19 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest

lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up, having side panels with a belt layer;

Fig. 20 is a schematic, exploded, lateral cross-sectional view of a portion of the structure depicted in Fig. 19 in one alternative, as indicated in Fig. 19;

Fig. 21 is a schematic, exploded, lateral cross-sectional view of a portion of the structure depicted in Fig. 19 in another alternative, as indicated in Fig. 19;

Fig. 22 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up, having side panels with a belt layer with a lateral waist edge disposed longitudinally above the chassis edge;

Fig. 23 is a schematic, exploded, lateral cross-sectional view of a portion of the structure depicted in Fig. 22, as indicated in Fig. 22;

Fig. 24A is a schematic, exploded, lateral cross-sectional view of a portion of the structure depicted in Fig. 22 in one alternative, as indicated in Fig. 22;

Fig. 24B is a schematic, exploded, lateral cross-sectional view of a portion of the structure depicted in Fig. 22 in another alternative, as indicated in Fig. 22;

Fig. 25 is a schematic, exploded, longitudinal cross-sectional view of a portion of the structure depicted in Fig. 22, as indicated in Fig. 22;

Fig. 26 is a schematic plan view of a precursor structure of a pant including a chassis and side panels, depicted schematically as it would appear with the chassis stretched out to its fullest lateral and longitudinal extents against any contraction caused by elastic members in the chassis, laid out flat, garment-facing side up, having side panels with a belt layer with a lateral waist edge disposed longitudinally above the chassis edge, and having elasticized waistband and leg opening edges;

Fig. 27A is a schematic, exploded, longitudinal cross-sectional view of a portion of the structure depicted in Fig. 26 in one alternative, as indicated in Fig. 26; and

Fig. 27B is a schematic, exploded, longitudinal cross-sectional view of a portion of the structure depicted in Fig. 26 in another alternative, as indicated in Fig. 26.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

For purposes of this description, the following terms are given the meanings set forth:

"Activate" refers to a process of incremental stretching of a relatively inelastic layer, or of a zero-strain laminate of an elastic member and one or more relatively inelastic layers, to impart stretchability to the relatively inelastic layer(s), in a manner described in, for example, U.S. Patents Nos. 5,143,679, 5,156,793, and/or 5,167,897 and/or U.S. App. Ser. Nos. 10/288,095; 10/288,126; 10/429,433; 11/410,170; 11/811,130; 11/899,656; 11/899,810; 11/899/811; 11/899,812; 12/204,844; 12/204,849; 12/204,854; 12/204,858; or 12/204,864, the disclosures of which are incorporated herein by reference. An "activated" material or portion thereof, or a material or portion thereof having "activation," is a material or portion thereof that has undergone the process.

"Elastic" or "elastomeric", and related terms, with respect to a member or a material, means the ability of the member or material, as displayed in a section of composite material including the member or material (*e.g.*, a section of side panel laminate), having an initial length prior to loading and a substantially uniform width perpendicular to its initial length, to elongate in length under tensile load applied in the direction of the initial length, without rupture or breakage, by at least 50% of its initial length, as determined by application of the Elongation and Set Test described below. Additionally, following elongation under tensile load by 50% of its initial length, held for a duration of 30 seconds, and subsequent release of the tensile load, an "elastic" member has a set less than or equal to 25% of its initial length, after one loading and unloading cycle and after 1 minute following unloading, performed according to the Elongation and Set Test. For example and by way of illustration, a sample of an "elastic" member that has an initial pre-load length of 50.0 mm can elongate under tensile load at an elongation speed of 250 mm/minute, without rupture or breakage, to at least 75.0 mm (50% elongation). After the sample is held at 50% elongation for 30 seconds and then the tensile load is removed, the sample will contract to a length of 62.5 mm or less within one minute, *i.e.*, have a set of 12.5 mm or less (set of 25% of initial length, or less).

"Film" – means a skin-like or membrane-like layer of material formed of one or more polymers, which does not have a form consisting predominately of a web-like structure of consolidated polymer fibers or other fibers.

"Inner" – with respect to a pant or feature thereof as described herein, generally refers to the inside, or wearer-facing side, of the feature.

"Lateral" – with respect to a pant or feature thereof as described herein, refers to a direction substantially parallel to the waist edges of the pant.

"Length" – with respect to a pant or feature thereof as described herein, unless otherwise specified, refers to a dimension measured along a line substantially perpendicular to the waist edges of the pant.

"Liquid impermeable" – means substantially resistive to through-penetration of liquid water and urine at room temperature and ordinary conditions of use.

"Liquid permeable" – means substantially permitting of through-penetration of liquid water and urine at room temperature and ordinary conditions of use.

"Longitudinal" – with respect to a pant or feature thereof as described herein, refers to a direction substantially perpendicular to the waist edges of the pant.

"Mechanical bond site" – means any location at which a bond of and between separate layers of materials is created by (a) compression exerted on and through the layers between bonding rollers or other compressing devices at a compression site ("compression" bond); (b) localized application of heat, ultrasonic or other heating energy exerted on and through the layers ("thermal" or "ultrasonic" bond); or (c) a combination of compression exerted on and through the layers between bonding rollers or other compressing devices at a compression site together with heat, ultrasonic energy or other heating energy directed to the compression site ("combination" bond), to effect localized deformation, physical entanglement and/or fusing, or a combination thereof, of the separate layers of materials at or about the bond site. As used herein, "mechanical bond" also means and is limited to a bond that cannot be reestablished merely by urging materials together by hand at room temperature following a forcible separation thereof, in that forcible separation of the bonded layers effects destruction of the physical structure at or about the bond site.

"Nonwoven" – means any cloth-like, web-like and/or sheet-like material formed of consolidated polymer fibers that are neither knitted nor woven.

"Outer" – with respect to a pant or feature thereof as described herein, generally refers to the outside, or garment-facing side, of the feature.

"Proximate to" - when one of two features is described as the one "proximate to" a third feature, "proximate to" identifies which feature of the first two is closest to the third.

"Width" – with respect to a pant or feature thereof as described herein, unless otherwise specified, refers to a dimension measured along a line substantially parallel to the waist edges of the pant.

Description

Referring to Fig. 1, a disposable absorbent pant according the present invention may be formed of a precursor structure having a chassis 10, having a first waist region 110, a second waist region 120, and a crotch region 130 between the first and second waist regions. A longitudinal center line 18 and a lateral center line 19 may be identified, that equally divide the width and length, respectively, of the chassis 10. The crotch region 130 may constitute about 33 percent to about 50 percent of the chassis length, and correspondingly, each waist region may constitute about 25 percent to about 33 percent of the chassis length.

Additional chassis details are schematically represented in exploded cross-section in, *e.g.*, Figs. 3-9 and 13A-16. The chassis 10 may include an inner, body-facing, liquid-permeable topsheet 30, an absorbent core 40, and an outer, garment facing, liquid-impermeable backsheet 49 formed of a liquid-impermeable polymer film layer 50 and an outer backsheet nonwoven layer 52. The liquid-impermeable polymer film layer 50 of backsheet 49 may be included to provide liquid containment capability to the chassis. (Generally, the fine dotted lines in the figures schematically represent deposits of adhesive that may be included to bond layers together, whether specifically identified or not in the following description.) Chassis 10 also may include various other features (not specifically shown) such as additional layers of containment, liquid acquisition and/or distribution material, etc.

Referring to Figs. 1 and 3A, the precursor structure also includes a pair of laterally opposing side panels 80 that extend laterally from the chassis 10. Side panels 80 are laterally elastically extensible and contractible. Each of side panels 80 may be a single, continuous section of material (*i.e.*, having no intermediate seams joining separate sections) cut from a web of stretch laminate material, the stretch laminate material formed of outer and inner layers of side panel nonwoven 81, 85, with an elastic member 83 sandwiched therebetween. The stretch laminate may be formed of materials and activated to enable lateral stretch. Side panels 80 may be formed of a stretch laminate material such as described in, for example, U.S. Pats. Nos.

5,167,897; 5,156,793; and 5,143,679; and U.S. App. Ser. Nos. 10/288,095; 10/288,126; 10/429,433; 11/410,170; 11/811,130; 11/899,656; 11/899,810; 11/899/811; 11/899,812; 12/204,844; 12/204,849; 12/204,854; 12/204,858; or 12/204,864, the disclosures of which are incorporated herein by reference. Side panels 80 may be laterally elastically extensible so as to provide lateral, hoop-wise stretch for easy and comfortable donning and wear of the article, and to provide lateral, hoop-wise contraction for a neat, secure and comfortable fit. Activated stretch laminate formed without pre-stretching of the elastic member (also known as "zero-strain" stretch laminate) may be desirable in some circumstances, because it may present a smoother, softer and more cloth-like appearance than live stretch laminate, which may have a rough appearance. As an alternative, however, a stretch laminate may be formed by laminating an elastic member in a pre-stretched condition to one or more layers of nonwoven that are in a substantially unstretched condition. When the resulting laminate (also known as "live-stretch" laminate) is allowed to relax under contraction of the elastic member, the nonwoven layer(s) form gathers or rugosities of gathered material transverse to the direction of stretch of the elastic member, which are then available to permit and accommodate stretching of the laminate along the direction of pre-stretch of the elastic member. Elastic member 83 may be one or more longitudinally-spaced laterally extending strips of an elastomeric material, or a continuous layer of elastomeric film. Alternatively, elastic member 83 may be one or more laterally extending, longitudinally-spaced strands of elastomeric material, or a scrim material having elastomeric strand components. Materials forming side panels 80 may be joined or integrated with materials of the chassis 10 in various ways as will be hereinafter described.

Referring to Figs. 1 and 2, a disposable absorbent pant 5 (Fig. 2) may be formed by folding chassis 10 at or about lateral center line 19 to bring waist regions 110, 120 together, topsheet 30 facing inwardly, and then by joining the materials of side panels 80 near seam edges 86 thereof, to materials of chassis 10, in various ways as will be hereinafter described. The resulting absorbent pant 5 is a pant-like structure having leg openings 8 and waist opening 7, with side panels 80 each formed of a single section of material. The pant may be donned by insertion of the wearer's feet into waist opening 7 then back out through leg openings 8, and then by pulling the pant by one or more of waist/top edges 14, 15, 88 up and over the wearer's legs and buttocks and into place about the lower torso, like a pair of underpants or briefs. The lateral stretch capability of the side panels 80 allows the pant to elastically expand laterally or hoop-wise to ease its passage over body contours while being donned, and then elastically contract to provide a secure fit while in wearing position on the wearer's body.

Seam Location Indicia

Side panels 80 may be formed of a stretch laminate material that is manufactured of one or more layers of material that are distinct from materials forming chassis 10. As such, these materials may be tinted or printed to impart color that provides a visual contrast with materials forming chassis 10. Referring to Fig. 2, side panels 80 may be formed of materials having, or printed to have, one or more colors that contrast with, *e.g.*, color(s) of materials forming waist regions 110, 120 of chassis 10, and particularly backsheet 49 (*see, e.g.*, Fig. 3A). Alternatively, the materials forming side panels 80 may be untinted, while materials forming backsheet 49, such as polymer film layer 50 and/or outer backsheet nonwoven layer 52, may be tinted or printed in colors that contrast with side panels 80. Alternatively, materials forming both side panels 80 and backsheet 49 may be tinted and/or printed, but in contrasting colors.

The resulting visual contrast between chassis 10 and/or backsheet 49, and side panel 80, can be exploited to provide a visible indicium of the locations of seams 87 joining side panels 80 to waist regions 110, 120. This visible indicium may be useful, to a wearer or caregiver, for identifying location(s) at which the seam(s) may be separated by tearing, made more convenient by the overlapping configuration described below.

For purposes herein, a "visual contrast" between a side panel and a chassis is created when a clearly and readily apparent contrast exists, or at a minimum, where the calculated value ΔE^* (a value calculated based on the measured values in the CIE L*a*b* color scale for respective specimens of the backsheet and side panel, according to the color measurement method set forth below) is 3.0 or greater.

Strong But Conveniently Tearable Side Panel Seams

Referring to Fig. 3A, side panels 80 may be joined to chassis 10 by seam 87 having an overlapping configuration as schematically depicted. In this overlapping configuration, all components of side panel 80, including outer side panel nonwoven layer 81, elastic member 83, and inner side panel nonwoven layer 85, overlie all components of chassis 10, to the outside thereof. Where the above-described visible indicium of a tearing location is desired, and contrasting colors for chassis materials and side panel materials are selected, this configuration provides such visible indicium readily identifying a seam location.

The overlapping configuration illustrated, however, has some disadvantages unless mitigating features are included. The illustrated overlapping configuration provides a relatively

small, singularized surface area of respective chassis materials and side panel materials available to be bonded and joined. As may be appreciated from Fig. 3A, only a relatively small strip of contact area between inner side panel nonwoven layer 85 and outer backsheet nonwoven layer 52 is provided at seam 87. Additionally, lateral tension across seam 87 in the direction of the double-headed arrow as illustrated in Fig. 3A will create a moment tending to cause the seam to rotate slightly in the direction indicated by the curved arrow, which results in a combination of both shear stress and normal stress in the seam, increasing the likelihood of a failure of the seam.

Thus, for purposes of providing suitable lateral hoop tensile strength of the pant, and reducing the chances of a loss of elastic contraction or even failure resulting from delamination and/or decoupling of elastic member 83 from other layers 81, 85 of side panel 80 resulting from stretching, it may be desirable in many circumstances that a bond securely bonding and unitizing elastic member 83 with materials forming, at least, backsheet 49, if not the entire chassis envelope structure formed by backsheet 49 and topsheet 30. Accordingly, it may be desirable that with an overlapping construction as illustrated, a plurality of mechanical bond sites 60 are provided, which penetrate through, and bond, all layers of side panel 80 to each other, and also with at least all layers of backsheet 49, and, even more desirable in some circumstances, all layers of the chassis 10 underlying the overlapping side panel 80, including topsheet 30, liquid-impermeable polymer film layer 50, and outer backsheet nonwoven layer 52. This type of bonding marries the strengths of all of the layers at the seam 87 to provide a relatively strong seam 87 for the overlapping configuration illustrated.

Referring to Figs. 2 and 3A, a plurality of mechanical bond sites 60 at seams 87 may be discrete, spaced apart from each other, and lie along a single line or path defined by a bonded area (bond site) followed by an unbonded area followed by a bonded area . . . and so on. Such a line or path of intermittent mechanical bonding may be created by suitably configured mechanical bonding equipment and provides several advantages.

Referring to Fig. 3A, it can be seen that mechanical bonds 60 penetrating and bonding together outer side panel nonwoven layer 81, elastic member 83, inner side panel nonwoven layer 85, outer backsheet nonwoven layer 52, liquid-impermeable polymer film layer, and, optionally, topsheet 30, serve to anchor elastic member 83 to chassis 10. This enables the manufacturer to minimize the amount of material forming elastic member 83 that extends past bonds 60, overhanging the seam (with respect to Fig. 3A, to the right) – *i.e.*, minimize elastomeric material

that is wasted at the seam because its stretch functionality is not utilized to provide stretch capability to the pant.

As noted previously, it may be desirable that seam 87 be conveniently tearable to enable quick and neat removal of the pant when, *e.g.*, it is soiled. If seam 87 were bonded by a continuous, elongated bond site along the length thereof, a neat tear propagating along the seam may be difficult or unlikely. With the plurality of discrete, spaced apart bond sites 60 lying along a single line or path as suggested in Fig. 2, however, lateral, longitudinal and/or normal forces manually exerted by the wearer or caregiver gripping the pant at the top (waist edge) and pulling across a seam 87 (*i.e.*, when the wearer or caregiver pulls the top corner and front edge of side panel 80 downwardly relative waist region 110), initially concentrates such forces to a significant extent about the top-most discrete bond site 60t, making breaking the bond or the materials about the bond at that single site relatively easy. When the bond at, or materials about, the top-most bond site 60t break, sudden acceleration of the wearer/caregiver's gripping hands pulling away from each other, resulting from the materials "letting go," at the bond site 60t, together with continued pulling forces exerted, can cause the next bond site down the path to be attacked with equal or greater concentrated separating force, resulting in a quick material break, and so on, each subsequent bond along the path being attacked by concentrated separating forces individually, in a sequential, zipper-like fashion. This mode of tearing of the seam is enabled by the unbonded areas between the sequential bond sites 60, which allow for the acceleration following each discrete bond break, as described above. It will be appreciated that, to achieve the zipper-tear effect described above, it may be desirable that the seam 87 have no parallel second line or path defined by bond sites 62 (such as illustrated in Fig. 2A) that are longitudinally offset from bond sites 60 in such a manner as to substantially reduce or eliminate the advantage provided by the unbonded areas along the first path. In other words, it may be desirable that the above-described acceleration between bond breaks be enabled, not substantially interrupted by bonds along or adjacent the tear path. Accordingly, a single line, path or row of bond sites 60 along a seam 87 (as illustrated in Fig. 2) may be desired in some circumstances. Alternatively, a plurality of paths or rows of bond sites may be employed, as not to be longitudinally offset, as suggested by Fig. 2B), or otherwise arranged to provide a tear propagation path lying along a path of discrete, spaced apart bonds separated by unbonded areas. This will preserve the zipper-tear effect described above.

The size, shape and spacing of the mechanical bond sites 60 may be adjusted (via corresponding configuration of the mechanical bonding equipment) to strike a desired balance

between seam strength and convenient tearability. Without intending to be bound by theory, it is believed that the strength, or ability of a mechanical bond to hold respective lapped, bonded web materials together against applied shearing forces, resides in a perimeter "grommet" of deformed, entangled and/or fused materials that have been expressed from the interior of the bond site out toward the perimeter, under pressure exerted by the bonding equipment. It is believed preferable that bond sites be circular or rounded, having no sharp angles about their perimeters, to avoid concentrations of stresses that such features would promote, and conversely, to promote the smooth distribution of stresses about the perimeter "grommet". It is believed, further, that a greater number of relatively smaller bond sites can have comparatively greater holding strength than a smaller number of relatively larger, similarly-shaped bond sites occupying the same total bond site area, because the greater number of smaller sites will have total combined perimeters, having surrounding "grommet" formations, exceeding that of the fewer number of larger sites. At the same time, however, bond sites cannot be too small, because, as bond site size/area is decreased, a point is reached where there will be insufficient material available within the bond site area to be expressed out to the perimeter, to form a substantial "grommet" of deformed, entangled and/or fused materials.

Without intending to be bound by theory, it is believed that lateral lines of tension T in the pant during wear often tend to be inclined front-to-rear as suggested in Figs. 2C and 2D (where the pant is configured such that waist region 110 is the front region) as a result of wearer body contours and force distribution when the article is loaded with exudates, as explained in, *e.g.*, PCT App. No. WO 2007/141749 by Lodge. In one alternative mechanical bond pattern, a plurality of individual, spaced-apart mechanical bond sites 60 may be disposed in a path and configured in a manner having characteristics such as suggested in Figs. 2C and 2D, to provide both convenient tearability and satisfactory lateral seam strength. Referring to these figures, it can be seen that individual mechanical bond sites 60 may be of rounded elongate, oblong, oval, ovaloid, elliptical or other rounded elongate shapes that have their longest dimensions measurable along directions that are inclined as they move laterally away from longitudinal center line 18 of chassis 10, as viewed with pant 5 in an upright orientation as suggested in Fig. 2D – a direction illustrated by inclined lines 63. Without intending to be bound by theory, it is believed that a mechanical bond configuration having characteristics suggested in Figs. 2C and 2D may provide satisfactory lateral seam strength because, when the bond sites are appropriately configured, generally, shearing stresses resulting from most or all lateral lines of tension T in the side panel 80 may be distributed along the greater lengths of the mechanical bonds at the seam.

Thus, the depicted mechanical bond site arrangement may be quite resistant to unintentional tearing resulting only from lateral forces in the pant occurring during normal wear, as compared with other possible bond patterns. Without intending to be bound by theory, it is believed further, however, that upon a combination of the differing lateral, longitudinal and normal separating forces exerted across a seam 87 by a wearer or caregiver gripping chassis 10 along waist edge 15 and side panel 80 along top edge 88 with either hand, respectively (*i.e.*, when the wearer or caregiver pulls the top corner and front edge of side panel 80 downwardly relative waist region 110), the depicted incline of the elongate mechanical bond sites 60 promotes tear propagation in the side panel 80 along the outlines of the elongate shapes, directed downward and toward longitudinal center line 18 (*i.e.*, toward the longitudinal edge of the side panel, approximately along the direction of inclined lines 63), providing for relatively easy tearing propagating downward along seam 87 with minimized likelihood of tear propagation away from seam 87 into the remainder of side panel 80. The angle α formed by either of inclined lines 63 with respect to longitudinal center line 18 may be in range of about 15 degrees to about 75 degrees, more preferably about 25 degrees to about 60 degrees, and even more preferably about 30 degrees to about 50 degrees.

In a variation of the seam configuration depicted in Fig. 3A, rather than side panel 80 being disposed such that it overlaps chassis 10 over outer backsheet nonwoven layer 52, *i.e.*, rather than it being disposed such that it overlaps chassis 10 on the outside (garment-facing side) thereof, and overlies layer 52, side panel 80 may be disposed such that backsheet 49 and/or entire chassis 10 overlap/overlie side panel 80 on the outside (garment-facing side) thereof. *See* Fig. 3D. Thus, each of side panel layers 81 and 85, and optionally, elastic member 83, may be disposed to the inside of backsheet 49 and even chassis 10, including topsheet 30. Layers 81 and 85, and optionally, elastic member 83, may also be bonded to the chassis at mechanical bond sites 60, as described above. This alternative may also include a tearability-enhancing bond configuration having similarities to that depicted in Figs. 2C and 2D.

To provide a further indicia of tearability and convenience to the wearer or caregiver, a tearaway grip tab 66 may be included (see Fig. 2C). Tearaway grip tab 66 is preferably disposed on the outside of the pant, and may extend from, or simply be a tab-like extension at the longitudinal edge of, the material forming side panel 80 when it overlies the chassis to the outside at an overlapping seam. In the alternative in which the material forming side panel 80 underlies the chassis at an overlapping seam, a tearaway grip tab may be included at or proximate the longitudinal edge of the chassis where it joins the side panel, rather than the side panel. A

tearaway grip tab 66 may be included to provide the wearer or caregiver an additional means of grasping to facilitate tearing along an overlapping seam.

In another alternative, it may be desired to form a seam in an abutting configuration as depicted in Fig. 3C. It can be seen that, in this configuration, all layers of side panel 80 still overlap all layers of backsheet 49 and topsheet 30, but with edges turned outward (away from wearer), inside-to-inside (*i.e.*, topsheet 30 facing inner side panel nonwoven layer 85) arrangement. Mechanical bond sites 60 bond the components together. This abutting seam may be desired in some circumstances, such as, for example, for ease or convenience of manufacturing with particular equipment. It also may enhance tearability in that it enables a wearer or caregiver to exert effective separation forces across the seam that are substantially laterally oriented, thus more intuitive for some wearers or caregivers. On the other hand, it may be appreciated that the abutting seam configuration depicted in Fig. 3C may require relatively more material to form the seam than the configuration shown in Fig. 3A, may result in lower in-use seam strength and/or may present a less refined, less finished or less garment-like appearance, and thus, may not be desired in all circumstances.

In combination with any of the above-described features, an additional way in which tearability of the seam in a peeling mode may be enhanced is to stop activation of the stretch laminate at a location laterally short of the mechanical bonds, by as much as a finger's width (approximately 1.0 – 2.5 cm, or 1.0 – 2.0 cm, or even 1.0 – 1.5 cm in lateral width – depending upon the finger's width of the most likely caregiver or wearer). Referring again to Fig. 3A, if the stretch laminate is not activated beyond line AL, situated at the above-mentioned distance from mechanical bonds 60, this provides a substantially non-stretchable zone of the side panel for grasping and pulling away from chassis 10 in a peeling motion, providing more effective tearability. At the same time, the unactivated zone of the side panel (to the right of line AL in Fig. 3A) provides a margin for better anchoring of elastic member 83 within the stretch laminate, that is not weakened by activation so as might promote delamination of the stretch laminate under high stretch conditions.

From the foregoing it can be appreciated that the combination of overlapping seam configuration described, together with bonding at the seam via a plurality of discrete, spaced-apart mechanical bond sites defining a path or line along the seam, can provide a suitably strong yet conveniently visible and tearable seam.

As an alternative to creating a tearable seam formed of mechanical bonds of the side panel 80 to the chassis 10, an overlapping separable and refastenable seam may be created. Referring to Fig. 3B, a seam 87 having an overlapping configuration similar to that suggested in Fig. 3A is suggested. However, rather than having side panel 80 joined to chassis 10 by mechanical bonds 60 as suggested in Fig. 3A, side panel 80 may be joined to chassis 10 by one or more fastener components 64, 65. For example, a first fastener component 64 may be a patch or strip of hook material forming a component of a hook-and-loop fastening system, and a second facing fastener component 65 may be a patch or strip of loop material forming another component of the system. Respective fastener components 64, 65 may be respectively affixed directly to side panel 80 and chassis 10 by mechanical bonds (not shown) and/or adhesive (not shown). Fastener components 64, 65 may be forcibly but substantially non-destructively separated by a wearer or caregiver gripping the side panel 80 and chassis 10 and exerting separation forces across the seam 87. Appropriately selected fastener components 64, 65 may be substantially non-destructively separable, and refastenable following separation, a function provided by a hook-and-loop system, for example. Other types of fastener components which provide for substantially non-destructive separability and refastenability are available, such as snap fastener components, etc. Additionally, where a hook-and-loop fastening system is chosen, it is not always necessary for a distinct loops component to be included. Some types of nonwovens available have sufficient fiber configuration and bonding characteristics as to be suitable for forming an appropriate attachment surface for a hooks component, and may be chosen to form outer backsheet nonwoven layer 52 or inner side panel nonwoven layer 85, wherein only one fastener component 64 or 65 in the form of a patch or strip of hooks is included and will separably and refastenably engage the nonwoven layer. Additional features and advantages of a fastening system that may be included are described in co-pending application Serial No. 11/895,169, which is incorporated herein by reference.

An overlapping seam as described above may be used to join a side panel to a chassis at either the front or the rear of the pant, or both. It may be desirable in some circumstances, however, to dispose such a seam at, at least, the front of the pant. For example, where the expected consumer of the product is a caregiver who is accustomed to applying widely-marketed "taped" diapers having fastening "ears" extending from a rear waist portion and wrapping forward around a baby's hips, removably fastening at a front waist area or "landing zone," that consumer may be accustomed to removing such a diaper by lifting the fasteners at the baby's front. Accordingly, that consumer may expect to remove a pant of the type described herein by

separating it at the front seams, by pulling side panel 80 outwardly away from the chassis 10 front waist region.

Another feature which may be included to enhance wearer/caregiver convenience for tearing is a tophat configuration. Referring to Figs. 1 and 2, a tophat configuration may be formed by joining side panels 80 to chassis 10 with their top edges 88 longitudinally offset (in the example depicted, downwardly relative a wearer) from chassis waist edges 14, 15. This forms notches 6 and tophat corners 7 along the top/waist edge of the pant, at the locations where the side panels join the chassis. When a wearer or caregiver desires to tear the pant at a seam 87, a notch 6, and associated tophat corner 7, provide several advantages. First, notch 6 provides an additional visual indicium of a tearing location. Second, notch 6 can serve to enhance concentration of tearing forces exerted by the wearer or caregiver, and resulting stresses at the topmost bond site 60t, to better aid in initiating tearing. Third, tophat corner 7 constitutes material that the wearer or caregiver may readily identify and grip on one side of the seam, to exert tearing force. To provide the advantages of the tophat configuration, but also reduce chances of consumer perception of poor quality resulting from an excessive offset or step in the waist edges, it may be desirable that the offset, *i.e.*, height of the tophat corner 7 measured from side panel top edge 88, be about 2 mm to about 15 mm, or more preferably about 3 mm to about 12 mm, or still more preferably about 4 mm to about 10 mm.

A tophat configuration may be such that one or both waist edges 14, 15 extend in a longitudinal direction beyond (or, when the pant is upright, are higher than) side panel top edges 88, (a "positive" tophat configuration) as suggested in Figs. 1 and 2. However, a pant also may be imparted with a "negative" tophat configuration, such that one or both waist edges 14, 15 are shorter in a longitudinal direction (or, when the pant is upright, are lower than) side panel top edges 88. This "negative" tophat configuration may provide some of the advantages described above, however, the former configuration may be more desirable for aesthetic reasons.

It also may be desirable, where a tophat configuration is provided in combination with an overlapping seam, as described above, that the amount of lateral overlap of the side panel over the backsheet to point at which it is bonded at the bond sites, *i.e.*, the lateral inset of the bond sites 60 toward the longitudinal center line 18 from the longitudinal side edge of the backsheet, be at least 15 mm, *i.e.*, the bond sides at the overlap seam lie laterally inward (relative the chassis 10) of the longitudinal edge of the backsheet 49, and particularly outer backsheet nonwoven layer 52, by at least 15 mm. This overlap may further facilitate tearing of the seam, by giving the

wearer or caregiver approximately a finger's width portion of backsheet material to grip that lies laterally over and/or laterally outside (relative the chassis 10) the bonds.

Strong, Aesthetically Appealing and Leak-Resistant Side Panel Seams

Another seam configuration and alternative materials configurations are illustrated in Figs. 4 – 6. In contrast to the overlapping seam configuration described above, Figs. 4 – 6 illustrate a sandwiched configuration, in which most or all of the layers forming the side panel at its seam edge 86 are sandwiched between two layers forming the backsheet, and the outer and inner layers of side panel nonwoven 81, 85 are each bonded and/or integral with layers of the backsheet. This sandwiched configuration provides its own advantages.

One set of advantages is attributable to increased material contact surface area as compared with an overlapping configuration seam having the same area of superimposition of respective materials of chassis 10 and side panel 80. As may be appreciated from a comparison of Fig. 4A (sandwiched configuration) with Fig. 3A (overlapping configuration), for the same area A of superimposition of the materials of chassis 10 with the materials of side panel 80, a sandwiched configuration may provide twice as much surface contact area between the respective materials (*i.e.*, along edges of both layers 81, 85 (sandwiched) as compared to along edge of layer 85 only (overlapping). Additionally, if the respective materials are bonded at these contact areas, on the inner and outer surfaces of side panel 80, any rotational moment that might be induced by lateral tension across the seam, such as incidental to the overlapping configuration, is either not present or is substantially reduced by the sandwiched configuration. Thus, lateral tension across seam 87 more likely creates only, or mostly, shearing stresses in the seam. An adhesive bond formed of the type of adhesive typically used to assemble articles of this type is more capable of resisting shearing stress than normal stress under ordinary conditions of use. Thus, a sandwiched configuration makes joining of separate elements by only adhesive bonding more capable (as compared with an overlapped configuration) of providing sufficient strength in a seam joining a side panel to a chassis.

In many circumstances it may be preferable to adhesively bond a side panel directly to the polymer film layer 50 of the backsheet 49 as suggested in Fig. 4A, because, in many types of backsheets the polymer film layer is the layer that contributes the greater proportion of overall lateral tensile strength and dimensional stability to the backsheet. Thus, sufficient bond strength in a seam 87 having a sandwiched configuration (*e.g.*, Fig. 4A) may be achieved merely through use of concealed seam adhesive deposits 89 bonding the inner and outer surfaces of side panel 80

within/between layers of backsheet 49, as suggested in Fig. 4A. In another alternative, a sandwiched configuration as depicted in Fig. 4B may be used. It can be seen in Fig. 4B that side panel 80 may be situated between polymer film layer 50 and topsheet 30, and bonded therebetween by deposits of adhesive 89. This configuration may serve to take advantage the greater opacity of the entire backsheet layer 49, providing better outward concealment of the seam 87, while still bonding side panel 80 directly to polymer film layer 50.

Other advantages may be provided by the described sandwiched configuration. Since the seam may be formed with no externally exposed bonds, a clean and neat, finished outward appearance may be provided. Sufficient adhesive bonding strength may be provided such that mechanical bonding is unnecessary. This may be desirable where perforation or damage to the liquid-impermeable polymer film layer 50 forming the backsheet, typically caused by mechanical bonding and possibly compromising its liquid containment capability, is to be avoided. With an absorbent pant of the kind described herein, this may be desirable particularly in the rear region of the chassis, which may be required to contain liquid expressed from the core when it is compressed, *e.g.*, when the wearer sits on a urine-loaded core. For the foregoing reasons it may be desirable that seams 87 joining the side panels 80 to the chassis 10 in the rear region of the pant have a sandwiched configuration.

In some circumstances, it may be desirable to ensure that elastic member 83 is anchored at the seam. This may be deemed desirable in constructions where lateral tension applied to side panel 80 is likely to cause delamination of the stretch laminate forming the side panel, and lateral contraction of elastic member 83 within and relative to nonwoven layers 81, 85 causing loss of the elastic contraction functionality of the side panel. Anchoring elastic member 83 at the seam can serve to avoid such loss. Accordingly, prior to being joined to chassis 10, the material forming side panel 80 may have one or more mechanical bonds 61 formed along edge 86, anchoring elastic member 83 to layers 81 and 85.

Alternative configurations of materials and seams in a sandwiched configuration are depicted in Figs. 5 and 6.

Referring to Figs. 5A and 5B, it can be seen that outer side panel nonwoven layer 81 may wrap over and around inner side panel nonwoven layer 85, along edge 86. Layer 81, elastic member 83 and layer 85, together with the wraparound portion of layer 81, may be bonded by one or more mechanical bonds 61 as suggested in Fig. 5, thereby providing anchoring of elastic member 83 at the seam. In some circumstances one of inner or outer side panel nonwoven layer

81 or 85 and elastic member 83 may be joined in a process by which melted or softened elastomeric material is extruded or otherwise applied onto the nonwoven layer and adheres thereto without the need for adhesive, to form a precursor laminate including an elastomeric film laminated with a layer of nonwoven. Such a precursor laminate may be produced in a process prior to and separate from the pant manufacturing process, and procured as such for use in the pant manufacturing process. During the pant manufacturing process, the other of inner or outer side panel nonwoven layer 81 or 85 may be joined/laminated with elastic member 83 using a deposit of adhesive therebetween to adhere them together. This procurement and manufacturing procedure may reduce the need for adhesive and may be economically efficient in some circumstances. In the resulting laminate there will be an area thereof comprising a substantial portion or all of the laminate in which a separate deposit of adhesive between one of nonwoven layers 81 or 85 and an elastomeric film forming elastic member 83 is not present, while a deposit of adhesive 89 added during the manufacturing process to laminate the other of nonwoven layers 81 or 85 to the elastomeric film is present. When the resulting side panel 80 is cut from the laminate, a substantial portion or all of the side panel may have no substantial deposit of adhesive between one side of the elastic member 83 and one side panel nonwoven layer 85 laminated thereover, as suggested in Fig. 5B, while having a deposit of adhesive 89 on the other side of elastic member 83 to adhere elastic member 83 to the other side panel nonwoven layer 81. In such circumstances using the wrap-around configuration of layer 81 as suggested in Fig. 5B may be desirable to enhance anchoring of the film along edge 86.

Referring to Fig. 6, it can be seen that side panel 80 may be partially integral with backsheet 49, by sharing a common outer backsheet/side panel nonwoven layer 52. Elastic member 83 may be anchored at the seam by one or more mechanical bonds 61. Elastic member 83 and inner side panel nonwoven layer 85 as discrete components may be bonded to chassis 10 by adhesive deposits 89. This arrangement provides a strong, partially integral junction between side panel 80 and chassis 10, secure anchoring of elastic member 83 at the seam, and a clean, neat, smooth outward appearance along seam 87, because the seam may be partially or substantially concealed by the common outer backsheet/side panel nonwoven layer 52.

Extended Stretch Capability with Maintenance of Snug Fit

Another advantage afforded by the sandwiched configuration described herein is that, with a variation thereof to be described, the lateral, hoop-wise stretch capacity of the pant can be increased by increasing the lateral width of the side panels, without compromising the neat

outward appearance of the sandwiched configuration and without decreasing the lateral width of the chassis at the waist region, which could detrimentally compromise the lateral width of the chassis envelope available to accommodate the absorbent core; and detrimentally compromise the lateral width of liquid-impermeable backsheet available to contain liquids within the pant. Also, the lateral, hoop-wise stretch capacity of the pant can be increased without increasing the relaxed hoop-wise circumference of the pant, a potentially undesirable adjustment that could result in an undesirably loose and/or insecure fit.

Referring to Fig. 7A, it can be seen that seam 87 may be located such that seam 87 affixing side panel 80 to chassis 10 is laterally inset (with respect to Fig. 7A, to the right) a distance D from the longitudinal edge 53 of backsheet 49 and/or backsheet nonwoven layer 52. Seam 87 may be formed by bonds of adhesive deposits 89 near side panel edge 86 as suggested. Portions of side panel 80 lying laterally outward (with respect to Fig. 7A, to the left of) seam 87 may be unbonded to any components of chassis 10, leaving such portions free to laterally stretch independently of components of chassis 10. This configuration provides a way to extend lateral width of the side panel 80, thereby providing additional lateral stretch capacity to the pant, commensurate with the lateral stretch capacity per unit width of the stretch laminate forming side panel 80. This has the advantage of adding stretch capacity to the pant without (a) adding relaxed-state waistband circumference at the risk of creating an undesirably loose- and/or insecurely-fitting pant; or (b) removing chassis or backsheet material at the lateral edges to provide additional lateral room for the added side panel material, *i.e.*, without compromising the lateral width of the chassis envelope that contains the absorbent core, or compromising the lateral width of the liquid-impermeable backsheet material. Additionally, it can be appreciated that the adhesive bonding (adhesive deposits 89, Fig. 7A) made more feasible by the sandwiched configuration does not penetrate or perforate the liquid-impermeable backsheet 49 and particularly the film layer 50, thereby preserving its liquid containment functionality.

In another alternative, the sandwiched configuration depicted in Fig. 7B may be employed. In Fig. 7B it can be seen that, rather than being bonded between polymer film layer 50 and outer backsheet nonwoven layer 52 forming backsheet 49, side panel 80 may be bonded by adhesive deposits 89 between an intermediate layer 54 and polymer film layer 50. This configuration may serve to take advantage the greater opacity of the entire backsheet layer 49, providing better outward concealment of the seam 87, while still bonding side panel 80 directly to polymer film layer 50.

Such extended stretch capability may be provided by disposing seam 87 and the adhesive bonds formed by adhesive deposits 89 at seam 87, at a laterally inset distance D from the laterally outermost longitudinal edge of backsheet nonwoven layer 52 such that, when the materials are in the relaxed state, inset distance D is at least 10% to 50% of the Active Width of the side panel, more preferably, at least 15% to 50% of the Active Width of the side panel, and even more preferably, at least 20% to 50% of the Active Width of the side panel.

Alternatively, sandwiched configuration seams in which seams are laterally inset as described above may be disposed at not just one, but both the first and second chassis waist regions, thereby disposing such extensions of the side panel at both the first and second waist regions. In such a configuration, the total lateral inset distance D of both first and second seams joining a side panel to a chassis (*i.e.*, front and rear seams) may be at least 10% to 50% of the Active Width of the side panel, more preferably, at least 15% to 50% of the Active Width of the side panel, and even more preferably, at least 20% to 50% of the Active Width of the side panel.

For purposes of this description, the "Active Width" of a single-section side panel formed of a stretch laminate is that portion of its width that is not restricted from laterally stretching by bonds at seams, or other structures, and is ordinarily available to provide lateral stretch to the pant structure. Among other methods for causing a side panel of interest to lay flat in a relaxed condition such that its relaxed width can be measured, which will be apparent to those of ordinary skill in the art, the Active Width of a side panel of a particular pant specimen may be determined by using a scissors to cut the chassis laterally across the approximate longitudinal middle of the crotch region of the specimen to separate the first waist region from the second waist region, and cut one side panel longitudinally to separate the first and second waist regions at one side. The resulting dissected pant will consist of the chassis first waist region and the chassis second waist region joined only by the remaining uncut side panel. This structure may be laid relatively flat on a horizontal surface in a relaxed condition to make a width measurement of the side panel. The Active Width of the uncut side panel at any longitudinal location is the width of the side panel, to fullest extent of its relaxed condition, between locations at which the side panel stretch laminate material is bonded to chassis components at seams in the front and rear waist regions. If the side panel is formed of a zero-strain stretch laminate and has an activated zone of a lateral width less than the width of the side panel between bonded locations, and one or more unactivated zones near the seams, the "Active Width" is the width of the activated zone.

From the foregoing description, it can be appreciated that if a side panel is formed of a stretch laminate material that has available lateral stretch before failure of 250% (meaning it will stretch to 2.5 times its relaxed dimension before failure), adding 10% to its Active Width in the manner described adds 25% to its available laterally stretched width; adding 20% to its Active Width adds 50% to its available laterally stretched width, and so on. This gain in available lateral stretch is *per side*, such that adding side panel width as described at both sides (*i.e.*, both hip areas) of the pant provides double the gain in lateral stretched width per side (thus, in the examples above, 50%, 100%, etc.). At the same time, however, with the construction described, relaxed lateral circumference of the pant is not increased. Thus, a way is provided to both increase lateral stretch available for comfortable and easy donning of the pant, while substantially reducing the risk of creating a pant that is undesirably loose- or insecurely-fitting when in wearing position on a wearer.

The manner of providing extended stretch capability via extension of the side panels as described above may also reduce or eliminate the need for supplementary lateral elastic stretch and contractibility features to be built into the waist regions of the chassis 10 along or proximate the edges 14, 15 thereof (as are included in some currently marketed designs), thereby potentially reducing complexity and cost. Thus, a pant may have the extended side panel construction described above, such that substantial lateral elastic stretch and contraction features and capabilities (*e.g.*, lateral elastic members disposed across one or both of the waist regions along or proximate the end edges 14, 15) are not deemed necessary and are not included, in the front and/or rear waist regions, providing for cost savings.

Additional Material Saving Options

Laterally Shortened Elastic Member

The side panel configuration and seam and bonding configurations described herein also make savings of elastomeric material possible in certain ways.

Fig. 8 depicts a seam 87 having an overlapping configuration and joining side panel 80 with chassis 10. Side panel 80 may be formed of a stretch laminate having outer side panel nonwoven layer 81, elastic member 83, inner side panel nonwoven layer 85, with the layers bonded together by respective adhesive deposits 89s to hold the laminate together. If the design requirements of the particular pant do not require stretchability of the entire lateral width of the side panel 80 but only a portion thereof, only activated zone AZ might be incrementally stretched or otherwise activated to render the laminate laterally elastically stretchable, while the portion of

side panel 80 beyond activated zone AZ (with respect to Fig. 8, to the right of zone AZ) may remain unactivated. This will help reduce the likelihood that elastic member 83 will delaminate from layers 81, 85 under lateral strain, and remain securely bonded therebetween. Thus, the manufacturer may reduce the lateral width of elastic member 83 such that it is not as great as that of layers 81, 85, as suggested in Fig. 8. This provides savings in the elastomeric material required to form elastic member 83. In another alternative (not depicted), layers 81, 83 and 85 may be bonded together along the edge of elastic member 83 by one or more mechanical bonds to anchor elastic member 83 to layers 81 and 85.

Fig. 9 depicts a seam 87 having a sandwiched configuration and joining side panel 80 with chassis 10. From the description in the preceding paragraph applied in the context of Fig. 9, a similar way of savings of elastomeric material can be appreciated in the context of a seam having a sandwiched configuration.

Cuff Design and Combination Seam

As may be appreciated from the figures, the lateral waist circumference or hoop length of the pant is taken up by the chassis materials forming the envelope containing the absorbent core 40, the side panels 80, and any longitudinal seams joining the side panels 80 to the chassis. Seams (and the portions of materials necessary to form them) are necessary to join dissimilar materials and/or separate components. However, seams usually provide neither stretch capability (as do the side panels 80), nor envelope space for the absorbent core 40. Thus, it may be desirable to minimize the lateral width of seams and/or to structure seams so as to maximize those portions of the lateral waist circumference of the pant available to be taken up by either side panels 80 or the core envelope space.

Referring to Figs. 12-16B, an absorbent core 40 may be disposed between a topsheet 30 and a backsheet 49, which may be formed of one or more of materials such as outer backsheet nonwoven layer 52 and liquid-impermeable polymer film layer 50. These materials may be seamed together to form a longitudinal seam 87, and thereby form an envelope space that contains absorbent core 40. It can be seen that formation of a seam 87 may consume portions of materials 49, 30 at the longitudinal edges of the chassis 10. Thus, a seam such as seam 87 is formed at the expense of adding extra materials 49, 30 to provide material for the seam; taking lateral waist circumference away from that available to be taken up by the stretch panel; and/or taking lateral waist circumference away from that available to be taken up by the core envelope space.

Additionally, most disposable diapers and training pant products currently in the market have a system of cuffs designed to provide a gasketing function about the wearer's legs and crotch areas, for better containment of exudates. In the crotch region and waist regions proximate the crotch region, material forming such cuffs often also must be joined to the chassis by a seam structure, which can consume its own share of materials and lateral circumference.

Rather than providing separate seams for cuffs, to preserve lateral circumference available for the core envelope and/or side panels, it may be desirable to combine the seam structures joining the side panels to the chassis, joining the topsheet to the backsheet, and joining the cuffs to the chassis.

Referring to Fig. 12, a precursor structure to a pant may include a chassis 10 with side panels 80. The seam joining the side panels 80 to the chassis 10 may have a cross section such as schematically depicted in Figs. 13A or 13B, 15, 16A or 16B. Figs. 13A and 13B depict a sandwiched seam construction joining side panel 80 to chassis 10 similar to that depicted in Fig. 6. Fig. 15 depicts an overlapped seam construction joining side panel 80 to chassis 10 similar to that depicted in Fig. 3A. Figs. 16A and 16B depict a sandwiched seam construction joining side panel 80 to chassis 10 similar to that depicted in Fig. 4A. It can be seen in these figures that barrier cuff 70 may be joined to the inside of the chassis along the same seam 87 as joins side panel 80 to chassis 10. Material forming barrier cuff 70 may be joined to topsheet 30 along seam 87 by adhesive as suggested in, *e.g.*, Figs. 13A, 13B, or may be joined along seam 87 by mechanical bonds 60 that bond some or all of the overlying/stacked layers, as suggested in, *e.g.*, Fig. 15. In order to minimize the lateral waist circumference that is consumed by longitudinal seams, the material forming barrier cuff 70 may overlay and/or be stacked with other materials joined at seam 87, such that seam 87 includes all layers 52, 50, 30 and materials forming cuff 70, and commonly joins all such layers along the same seam 87. Referring to Fig. 15, where an overlapping seam joining the side panel 80 to the chassis 10 and bonded by mechanical bonds 60 is used, it may be desirable to ensure that mechanical bonds 60 do not capture the inner free edge 70b, or a substantial portion, of the material forming barrier cuff 70, which could tend to reduce its available/effective height and effectively waste the cuff material. Accordingly, it may be desirable that the laterally innermost extent 60i of mechanical bonds 60 is disposed no more than 33%, more preferably no more than 25%, still more preferably no more than 20%, of the total lateral width of the cuff 70, from its laterally outer edge 70a, such lateral width being measured with the cuff 70 laid down flat and fully laterally extended (*e.g.*, in a flattened, fully extended left-right position relative Fig. 15).

Barrier cuff 70 may be formed of a single layer of material (*e.g.*, a nonwoven) folded over on itself as suggested in the figures. It may include one or more longitudinal strands of pre-tensioned elastomeric material (such as LYCRA spandex) to form leg edge elastic members and inner edge elastic members 72. Pre-tensioned inner edge elastic members 72 create longitudinal tension forces along the inner edge of barrier cuff 70, causing it to tend to stand up and conform to the wearer's anatomy when the pant is worn, providing a gasketing function that helps contain exudates. Pre-tensioned leg edge elastic members 71 cause the leg openings to gather around the wearer's legs when the pant is worn, providing for better appearance and fit of the pant, and providing a secondary guard against leakage of exudates. As may be appreciated by comparing Figs. 13A and 13B, and 14A and 14B, leg edge elastic members 71 may be positioned within the folded layer of material forming barrier cuff 70, or may be positioned between topsheet 30 and backsheet 49. Alternatively, leg edge elastic members 71 may be positioned between topsheet 30 and the material forming barrier cuff 70. Cuff 70 may extend from a fold 73 that is oriented laterally inwardly relative the chassis (as depicted in Figs. 13A-16A), or may extend from a fold 73 that is oriented laterally outwardly relative the chassis (as depicted in Fig. 16B). The cuff 70 configuration and manner of joining at seam 87 described has the advantages of ease of manufacture and minimizing the amount of lateral waist circumference of the pant that is consumed by longitudinal seams. Additionally, as may be appreciated from Figs. 13A, 13B, 16A and 16B, a leg edge elastic member 71 may overlie or underlie a portion of side panel elastic member 83 where side panel elastic member meets the chassis. This may have the advantage of providing for a band or zone of elastic stretch about the leg opening that entirely encircles the wearer's legs, which may provide both greater security against leakage of the wearer's exudates, and a more finished, neat, underwear- or garment-like appearance.

Complementary Cut Side Panels

It may be desirable to configure side panels such that the lower edges thereof (relative a wearer) are lower at the rear than in the front. This provides for more comfortable fit with greater skin coverage about the wearer's lower outside buttock regions. Thus, referring to Fig. 1, if second waist region 120 of chassis 10 is the rear waist region, it may be desirable that side panels 80 have bottom edges 88a cut such that they extend further down along the waist region at the rear, as suggested by Fig. 1.

However, cutting side panels 80 from stretch laminate stock in a manner similar to that suggested in Fig. 1 may result in the wasting of stretch laminate material and resulting

complications during manufacturing, because all of the material removed to create the concave cuts at bottom edges 88a as shown in Fig. 1 may not be recoverable or usable in the manufacturing process. Generally, handling and disposing of cut-off waste in the manufacturing process at ordinary rates of production of such articles presents a set of problems which must be addressed; thus, it is desirable to avoid cut-off waste where possible.

It may be possible to eliminate such potential waste by configuring the bottom edge cuts of side panels 80 differently. Fig. 10 depicts an alternative bottom edge cut design for side panels 80. If second waist region 120 is the rear waist region, the bottom edges 88a of side panels 80 still extend further down along the waist region at the rear, providing the fit and skin coverage benefits noted above. Further however, bottom edge 88a cuts as depicted in Fig. 10 may eliminate wasted stretch laminate material as a result of the shape of the cuts.

It will be appreciated that the each of the bottom edge 88a cuts depicted in Fig. 10 may be characterized by having an inflection point about which curves on either side of the inflection point are negatively symmetrical. Fig. 11 illustrates this characteristic more clearly. Fig. 11 is a schematic plan view of a rectangular portion of stretch laminate material having perpendicular first and second axes 101, 102, and a cut to form precursors of two side panels 80a, 80b. The cut forms the bottom edges 88a of the two respective side panel precursors 80a, 80b. The cut has an inflection point 88i at the intersection of axes 101, 102. The cut is negatively symmetrical about the inflection point 88i. Thus, bottom edges 88a of two side panel precursors can be formed by a single cut, with no material wasted along the cut. It will be appreciated that, following such cut, bottom edges 88i of two side panels 80 have identical profiles.

Elasticized waist

In order to further complement the lateral stretch features described above, and further enhance fit and comfort, the chassis may additionally include an elasticized waist band. Referring to Figs. 17 and 18, for example, an elasticized waist band 74 may be included in rear region 120. Elasticized waist band 74 may be formed by disposing one or more chassis waist elastic members 75 laterally across the waist region, between layers of other materials, such as layers 50 and 52. A chassis waist elastic member may be formed of one or more strands of elastomeric material. In another alternative, a chassis waist elastic member may be formed of one or more laterally-disposed strips of elastomeric film. The chassis waist elastic members may be disposed between layers of the chassis, such as the layers forming the backsheet, or between the topsheet and the backsheet, or in another alternative, may be disposed between the topsheet,

or backsheet, and a layer of nonwoven material or film in addition to those forming the topsheet and the backsheet, to form a separate elastic band structure, which then may be laid over the chassis topsheet or backsheet and adhered or otherwise bonded thereonto.

In order to impart relatively inelastic materials underlying or overlying the elastic member(s) 75 with lateral elongation capacity to accommodate stretch, they may be activated to provide stretchability in the lateral direction. In another approach, the elastic member(s) 75 may be stretched prior to being laminated with surrounding layers, and may be laminated therein in the stretched condition. Upon subsequent relaxation, the surrounding layers form rugosities extending transversely with respect to the stretch direction, consisting of gathered material. The gathered material is then available to accommodate stretching of the elastic member(s) 75, when the waist band is subjected to lateral tension.

The imparted lateral stretch and contraction capacity of such an elasticized waist band 74 may be advantageously additive with the lateral stretch and contraction capacity of the side panels 20.

Side Panels with Belt Structure

The side panels and seams may be imparted with other features that have several additional advantages. Referring to Figs. 19, 20 and 21, it can be seen that side panels 80 may share a common side panel nonwoven layer having a belt configuration, in that it wraps around a substantial portion of the assembled pant (hereinafter, "belt layer" 81a), and thus, around the wearer's waist. Referring to Figs. 20 and 21, side panels 80 may be activated or otherwise made laterally elastically extendable and contractible through activated zones A, while belt layer 81a may be unactivated and relatively inelastic in unactivated zone UA. Belt layer 81a may, but need not, supplant or replace outer backsheet nonwoven layer 52. It may merely be superimposed or laid over backsheet 49 as suggested in Fig. 20 and bonded to the outside of backsheet 49 and/or outer backsheet nonwoven layer 52 by adhesive deposits 89 as suggested, or by any other bonding mechanism. For example, a discrete mechanical bond, or a substantially longitudinal path or line of one or more mechanical bonds, may be included to bond the layers 81a, 83, 85 of side panels 80 to one or more layers 52, 50, 30 of the chassis. Such mechanical bonds may be disposed laterally outside the absorbent core 40. Belt layer 81a may form an innermost (wearer-facing) layer of side panels 80, or an outermost (garment-facing) layer of side panels 80 (as suggested in Fig. 20). Belt layer 81a may be a single section of material that is continuous across

the waist region of the chassis and both side panels, but for purposes of manufacturing also might also be longitudinally seamed proximate the longitudinal axis of the chassis.

There may be several advantages provided by this belt layer configuration. Because belt layer 81a is shared by both side panels 80, the opposing lateral tension forces in stretched side panels 80 as they are elastically stretched, as when the pant is being donned and worn, are borne and somewhat counterbalanced/canceled out in belt layer 81a, thereby relieving backsheet 49, polymer film layer 50 and outer backsheet nonwoven layer 52 of at least some of these forces and relating stresses in seams 87. Thus, outer backsheet nonwoven layer 52 and/or polymer film layer 50 need not be as robust, and may be reduced in basis weight to save cost. Seams joining the side panel/belt structure to the chassis may be simply formed by deposits of adhesive 89; and at the same time, side panels 80 are more securely attached to the chassis during wear, because of the counterbalancing of lateral forces and resulting removal of a portion of these forces from seams joining the side panels 80 to the chassis 10.

The belt structure may also be used to provide extended stretch capability in a manner similar to that described above for discrete side panels. Referring to Fig. 21, it can be seen that elastic members 83 may be laterally extended inwardly toward the longitudinal center of the chassis 10, and activated zones A can be similarly extended laterally inwardly. A longitudinally centered, unactivated zone UA may be adhered to the outside of backsheet 49 by an adhesive deposit 89, while the remaining portions laterally outboard of unactivated zone UA may comprise activated/elastically extendable/contractible zones A that are not bonded to the chassis. Such extended stretch capability may be provided by disposing adhesive deposit 89 (or other mechanism bonding the side panel/belt structure to the chassis 10) at a lateral inset distance D from the laterally outermost longitudinal edge of backsheet nonwoven layer 52 such that, when the materials are in the relaxed state, inset distance D is at least 10% to 50% of the Active Width of the associated side panel, more preferably, at least 15% to 50% of the Active Width of the side panel, and even more preferably, at least 20% to 50% of the Active Width of the side panel. (The "Active Width" of a side panel is determined as set forth above.) When adhesive deposit 89 or other bonding mechanism bonding the side panel/belt structure to the chassis is placed according to the arrangement depicted in Fig. 21, this provides the advantage of decoupling the lateral forces acting in most of the lateral portions of the extended side panels 80 overlapping the chassis, allowing them to stretch and contract independently of the chassis, providing for increased lateral stretch and contraction capacity and improved fit and comfort. In this configuration (Fig. 21) it may also be desirable to include one or more chassis tack bonds 67

(Fig. 19) to hold the uppermost and laterally outermost portions or corners of the chassis underlying the belt structure, to the belt structure. These bonds may be included to prevent the corners of the chassis from curling or bunching inwardly, particularly during donning of the pant; such curling or bunching could compromise the appearance of the pant and could create a source of wearer discomfort or skin irritation. While such chassis tack bonds may compromise some of the enhanced stretchability provided by the construction of Fig. 21 along the waist edge, the enhanced stretchability will be preserved at locations below the bonds 67. Thus, chassis tack bonds could also provide an advantage of reduced stretchability and/or higher lateral tension about the waist for a secure fit, with greater stretchability and/or lower lateral tension about the buttocks for comfort and accommodation of wearer movement and bending at the hips.

The belt structure may provide another advantage relating to appearance. Pants and similar articles of the type contemplated are often imprinted with decorative designs or graphics. When side panel materials stop at seams near the longitudinal edges of a chassis in the rear region, imprinted designs or graphics typically also stop at or before those longitudinal edges because it is not practical to print on these materials following their assembly into a pant, and across the seams. This can undesirably help draw attention to the fact that the article is a disposable absorbent article rather than a garment, *i.e.*, make it look more noticeably like a disposable diaper. The belt layer, however, can provide a broad, nearly waist-encircling surface on which decorative designs or graphics can be imprinted that may be continuous about a large portion of the waist beyond the longitudinal edges of the chassis, providing a way to improve the appearance of the pant. Thus, an imprinted belt layer, bearing decorative designs or graphics that continue uninterrupted by seams or discontinuities across the rear waist region and around to the front waist region, is contemplated. Decorative designs or graphics may include any of the features described in, for example, co-pending U.S. application Serial No. 11/999,229, the description of which is incorporated herein by reference.

As suggested in Figs. 19 and 20, in one example a belt layer 81a may overlie backsheet 49. In the event a decorative design or graphic is imprinted on a layer of the backsheet 49 beneath the belt layer, it may be desired that belt layer 81a is transparent or translucent so as to allow the imprinted design or graphic to be seen therethrough. It also may be desired in this configuration that the design or graphic imprinted on the backsheet layer not be continuous across the lower edge 68 of the belt layer 81a, so as not to create a visible discontinuity in the visibility, brightness or intensity of the design or graphic, about the lower edge 68.

The side panel/belt structure described above may be configured to provide several additional advantages. Referring to Fig. 22, it can be appreciated that belt structure 140 may be disposed longitudinally relative a waist region 120 of the chassis such that the belt structure waist edge 141 lies longitudinally at or above chassis waist edge 15. This may provide two advantages. First, it provides a continuous, uninterrupted waist band edge that wraps around the wearer's waist in the back and hip areas, which may enhance appearance and comfort. Second, it creates the possibility of using the same belt and chassis structures to manufacture pants of differing sizes. For example, the pant size may be increased by positioning belt structure 140 longitudinally farther away from chassis lateral axis 19, and *vice versa*, without the requirement of a change in size or construction of the chassis or belt structure. This changes the overall length of the pant structure, which provides a way of effecting its size suitability for the intended wearer size.

As suggested in Fig. 22 and as may be appreciated further in Figs. 23 – 25, elastic member(s) 83 need not extend through the entire belt structure 140. Rather, it may end along inner edges 142 and 143 that stop short of the chassis edges. This may provide the required lateral stretch and contraction capacity for the side panels 80, but conserve elastomeric material where it may not be functional or needed in the areas where the belt structure overlies the chassis. As may be seen in Figs. 22, 23 and 25, an elastomeric member 83 may be continuous along the waist edge 141 and side panels 80, to provide a continuously elastically stretchable and contractible waist band portion, but may have a lower longitudinally inner edge 143 such that it does not overlie the absorbent core and/or the chassis.

In Figs. 22 and 24A, it can be seen that laterally inner edges 142 of elastic member(s) 83 may stop short of the longitudinal edges of the chassis, by distance D1. This arrangement entirely decouples forces in the elastic member from the chassis, such that all of the elastic member(s) in the side panels is (are) available to provide lateral stretch capability. In another alternative visible in Fig. 24B, it may be desirable to locate laterally inner edges 142 of elastic member(s) 83 such that they laterally overlap the chassis by distance D2. This arrangement may be desired to provide a location along which the elastic member(s) may be anchored to a chassis component such as the backsheet. This may help provide a more secure connection between the belt structure, the elastic member(s) and the chassis, and help avoid a delamination of the stretch laminate material. In either alternative, however, elastic member(s) 83 may stop short of absorbent core (40), so that no elastomeric material is wasted across the unstretchable core

structure, which may be desirable to save elastomeric material cost when delamination of stretch laminates is not a concern.

In another example depicted in Figs. 26 – 27B, the belt structure 140 may have a separate belt waist band 76 and belt leg bands 77, disposed along the belt structure waist edge 141 and side panel bottom edges 88a, respectively. As shown in Figs. 26 – 27B, belt waist band 76 may include one or more elastic members 83 extending laterally along the belt structure waist edge, and disposed between layers, such as inner nonwoven layer 85 and outer waist band layer 81b, or alternatively, outer side panel nonwoven layer 81a. Belt leg bands 77 may each include one or more elastic members 83 extending laterally along the side panel bottom edges 88a, and similarly disposed between layers, such as inner nonwoven layer 85 and outer leg band layer 81c, or alternatively, outer side panel nonwoven layer 81a. Elastic members 83 may each be one or more laterally extending strips of elastomeric film, or may be laterally extending strands of elastomeric material. The constructions depicted in Figs. 27A and 27B are not exclusive. In another alternative (not shown), elastic members 83 may provided in preformed elastic bands in which elastic members 83 are sandwiched between two layers of nonwoven and/or film material. Such preformed elastic bands may then be bonded to the belt structure by adhesive or any other suitable bonding mechanism. The web material between bands 76, 77 may consist only of one or more layers of nonwoven, with no elastomeric member included. Alternatively, it may consist of only one or more layers of nonwoven together with a layer of an elastomeric film that is relatively less expensive than the material used to form elastic members 83. This latter approach provides a way to cause the belt structure and side panels to be urged to conform to the wearer's body contours for purposes of a neat appearance, while not requiring a heavier or more expensive elastomeric material to bear lateral tension loading, since the majority of this function may be served by the elastic bands 76, 77. Thus, the construction depicted in Figs. 26 – 27B may provide even further potential savings of elastomeric material. Additionally, it may help provide an attractive banded, finished appearance, similar to that of brief-type underwear.

In order to impart the materials underlying or overlying the elastic member 83, and/or the materials disposed between the elastic bands 76, 77, with lateral elongation capacity to accommodate stretch, the layers including the elastic members 83 may be activated to provide stretchability in the lateral direction. In another approach, the elastic member 83 may be stretched prior to being laminated with surrounding layers, and may be laminated therein in the stretched condition. Upon subsequent relaxation of the elastic members 93, the surrounding layers form rugosities extending transversely with respect to the stretch direction, consisting of

laterally gathered material. The gathered material is then available to accommodate stretching of the elastic members 83, when the waist band and leg bands are subjected to lateral tension.

Test Methods

Elongation and Set Test

A commercial tensile tester (e.g., from Instron Engineering Corp. (Canton, MA) or SINTECH-MTS Systems Corporation (Eden Prairie, MN)) is used for this test. The instrument is interfaced with a computer for controlling the test speed and other test parameters, and for collecting, calculating and reporting the data. Elongation and set are measured under typical laboratory conditions (i.e., room temperature of 20°C and relative humidity of 50%).

A rectangular sample 4.00 cm long of the subject laminate material is taken, with sample length for this test measured in the lateral direction relative the pant from which the sample is taken. The rectangular sample is cut 4.00 cm long (lateral direction) by 3.00 cm wide (longitudinal direction).

Procedure

1. Select appropriate clamps and a load cell for the test. The jaws of the respective clamps must have straight edges and be wide enough along such edges to grasp the entire width of the sample (*e.g.*, at least 3.00 cm wide), and clamp substantially along a plane through the tester's line of pull. The load cell is selected so that the tensile response from the sample tested will be between 25% and 75% of the capacity of the load cells or the load range used. A 50-100 N load cell is typical.

2. Calibrate the tester according to the manufacturer's instructions.

3. Set the gauge length at 20.0 mm.

4. Place the sample in the respective clamps such that the longer edges of the sample (*i.e.*, along the 4.00 cm length) are substantially parallel to the gauge length direction (perpendicular the clamp jaw edges), with 1.00 cm of the sample at each end in one of the clamps; and clamp the respective jaws about the sample.

5. Perform the elongation and set test with the following steps:

a. First cycle loading: Pull the sample to 50% elongation (*i.e.*, distance between respective jaws extended to 30.0 mm) at a constant cross head speed of 250 mm/min.

b. First cycle unloading: Hold the sample at 50% elongation for 30 seconds and then return the crosshead to its starting position at a constant cross head speed of 250 mm/min. The sample is held in the unloaded state for 1 minute prior to measuring the first cycle % set.

c. Second cycle loading: Pull the sample to 50% elongation (relative its original length – *i.e.*, distance between jaws again extended to 30.0 mm) at a constant cross head speed of 250 mm/min.

d. Second cycle unloading: Hold the sample at 50% elongation for 30 seconds and then return crosshead to its starting position at a constant cross head speed of 250 mm/min.

A computer data system records the force exerted on the sample during the loading and unloading cycles. From the resulting time-series (or, equivalently, distance-series) data generated, the % set can be calculated. The % set is the increase in unloaded length after the first loading/unloading cycle, divided by the initial pre-load length x 100%. The increase in unloaded length after the first loading/unloading cycle is approximated by the length measured in the second loading cycle at a tensile force of 0.10 N. (The nominal 0.10 N force is selected to be sufficiently high to remove the slack in a sample that has experienced some permanent plastic deformation in a loading cycle, but low enough to impart, at most, insubstantial stretch to the sample.)

The Elongation and Set Test can be suitably modified depending on the expected attributes and/or properties of the particular material sample to be measured. For example, the Test can be suitably modified where a sample of the length and width specified above are not available from the subject pant.

Color Measurement; Determination of ΔE*

Color measurements are made using a tristimulus color meter (spectrophotometer/colorimeter) such as a HunterLab Labscan XE operated under Universal Software 4.1 (available from Hunter Associates Laboratory Inc., Reston VA) or equivalent.

Configure the instrument as follows:

Color Scale	CIE L*a*b*
Illumination	C
Standard Observer	2°
Geometry	45/0°
Port Diameter	0.7 inch
Viewing Area Diameter	0.5 inch
UV Filter	Nominal

Calibrate the instrument according to the vendor instructions using the standard black and white tiles provided by the vendor. Calibration should be performed each day before analyses are performed.

Procedure

Obtain each specimen of a backsheet from a pant by separating away a portion of the backsheet along the location where it meets the side panel, including the polymer film layer together with the outer backsheet nonwoven layer. Use a freeze spray as necessary to deactivate or reduce effectiveness of any adhesives, so as to enable separation of the portion. Identify a section that is undamaged by the separating step. From that section, cut a square specimen 2.5 cm x 2.5 cm.

Obtain each specimen of a side panel by cutting a square section 2.5 cm x 2.5 cm from a side panel, including the component layers forming the side panel, but not including any other layers that may be present at or near the seam where the side panel joins the chassis.

To measure each specimen, place the specimen flat on the instrument with the outer (garment-facing) surface facing the colorimeter's measurement port. Place the white standard tile on the other surface of the specimen, centered over the instrument port for use as a uniform backing. Take readings for L* a* b* values and record to 0.01 units.

Calculations and Reporting

Differences between the paired measurements are calculated using the following standard equation:

$$\Delta E^* = [(L^*_1 - L^*_2)^2 + (a^*_1 - a^*_2)^2 + (b^*_1 - b^*_2)^2]^{0.5},$$

where L^*_1, a^*_1 and b^*_1 are averages of values measured for backsheet specimens, and L^*_2, a^*_2 and b^*_2 are averages of values measured for side panel specimens.

The respective L*, a* and b* values are measured for at least 3 pairs of replicate specimens (3 pairs of respective backsheet and side panel specimens), and averaged. ΔE^* is calculated from the respective averaged values, and reported to 0.1 units.

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".

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.

Embodiments of pants having any of various combinations of the features described above may be constructed, for purposes of incorporating the benefits of those features as described. 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.

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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. An absorbent pant, comprising a chassis section having a front waist region with a front lateral waist edge, a rear waist region with a rear lateral waist edge, a crotch region between the front waist region and the rear waist region, a pair of longitudinal edges extending from the front lateral waist edge to the rear lateral waist edge, a longitudinal center line, a lateral center line, a topsheet, a backsheet and an absorbent core disposed between the topsheet and the backsheet, the backsheet comprising an inner layer of liquid-impermeable polymer film and an outer backsheet nonwoven layer; characterized in that the absorbent pant comprises:

a pair of side panels joining the front waist region to the rear waist region, each of the side panels being formed of a stretch laminate material comprising an elastic member laminated between first and second layers of side panel nonwoven, each side panel comprising a single section of the stretch laminate material joining the front waist region at a front seam and joining the rear waist region at a rear seam;

wherein the front seam is of overlapping configuration wherein each of the first and second layers of side panel nonwoven overlies the outer backsheet nonwoven layer on the outside thereof;

wherein the rear seam is of sandwiched configuration wherein the side panel is directly bonded to the inner layer of liquid-impermeable polymer film at a direct bond location;

wherein the chassis section has a chassis waist elastic member disposed laterally across the rear waist region or the front waist region and disposed between layers of nonwoven material to form a chassis waist elasticized band; and

wherein at the rear waist region, at least one of the side panels has an Active Width, and the at least one side panel is bonded to the backsheet by a bond that is laterally inset from a longitudinal edge of the backsheet by a distance that is at least 10% to 50% of the Active Width.

2. The pant of Claim 1 wherein the chassis waist elastic member comprises a plurality of laterally-disposed strands of elastomeric material.

3. The pant of either of Claims 1 or 2 wherein the chassis waist elastic member comprises at least one laterally-disposed strip of elastomeric film.

4. The pant of any of the preceding claims wherein the chassis waist elasticized band is incrementally stretched in a lateral direction.

5. The pant of any of the preceding claims wherein the chassis waist elastic member has been pre-stretched prior to disposition between layers of nonwoven material, whereby the layers of nonwoven material have longitudinal rugosities in the chassis waist elasticized band.

6. An absorbent pant according to any of the preceding claims further comprising a pair of longitudinal barrier cuffs, each barrier cuff having an attached portion attached to said chassis section on a wearer-facing surface thereof in at least in the crotch region, and a free portion ending with a free inner edge; a leg edge elastic member disposed on the barrier cuff or the chassis proximate the attached portion of the barrier cuff; and an inner edge elastic member disposed on the barrier proximate the free inner edge; wherein the leg edge elastic member overlies or underlies the elastic member of a side panel.

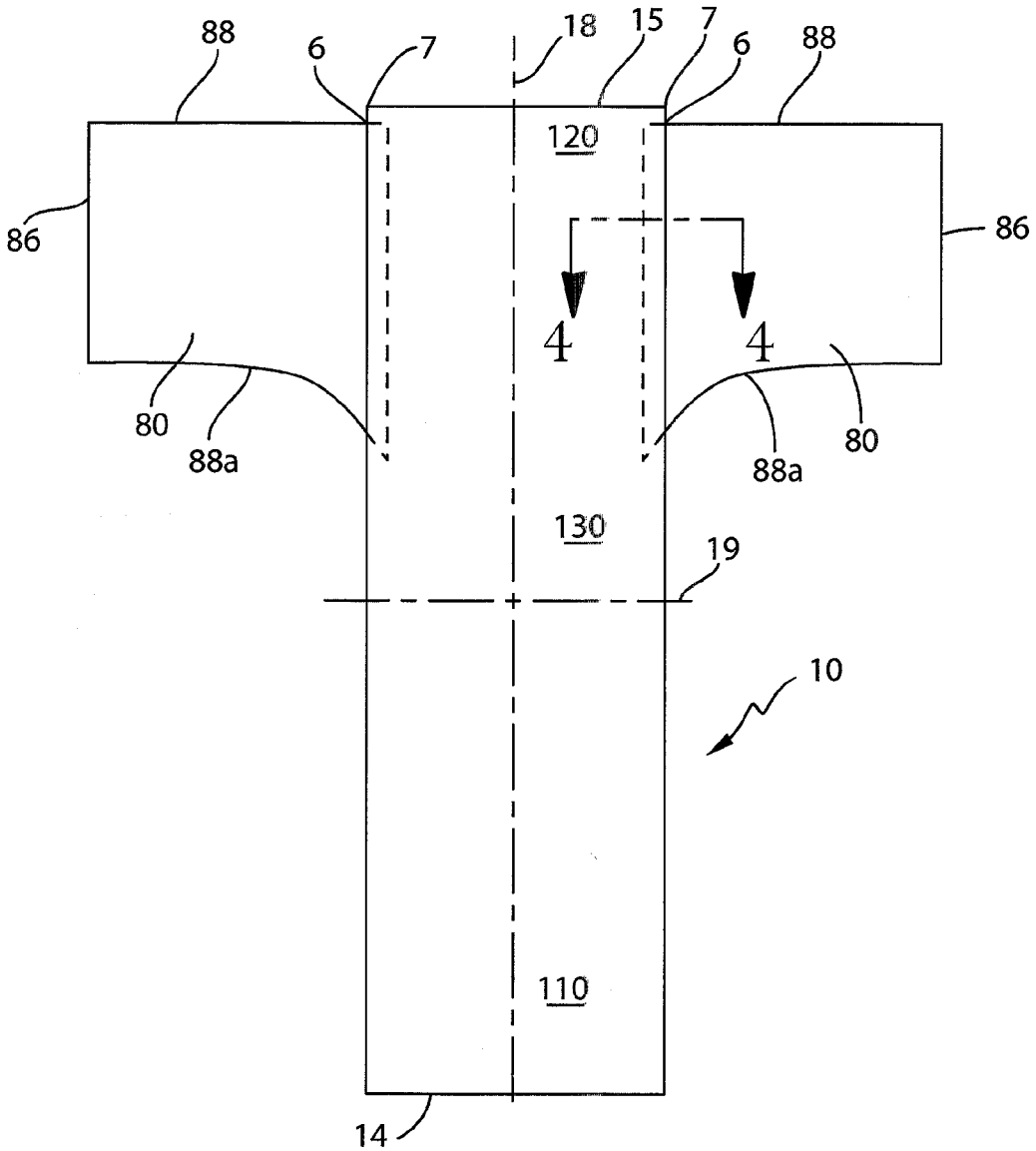

Fig. 1

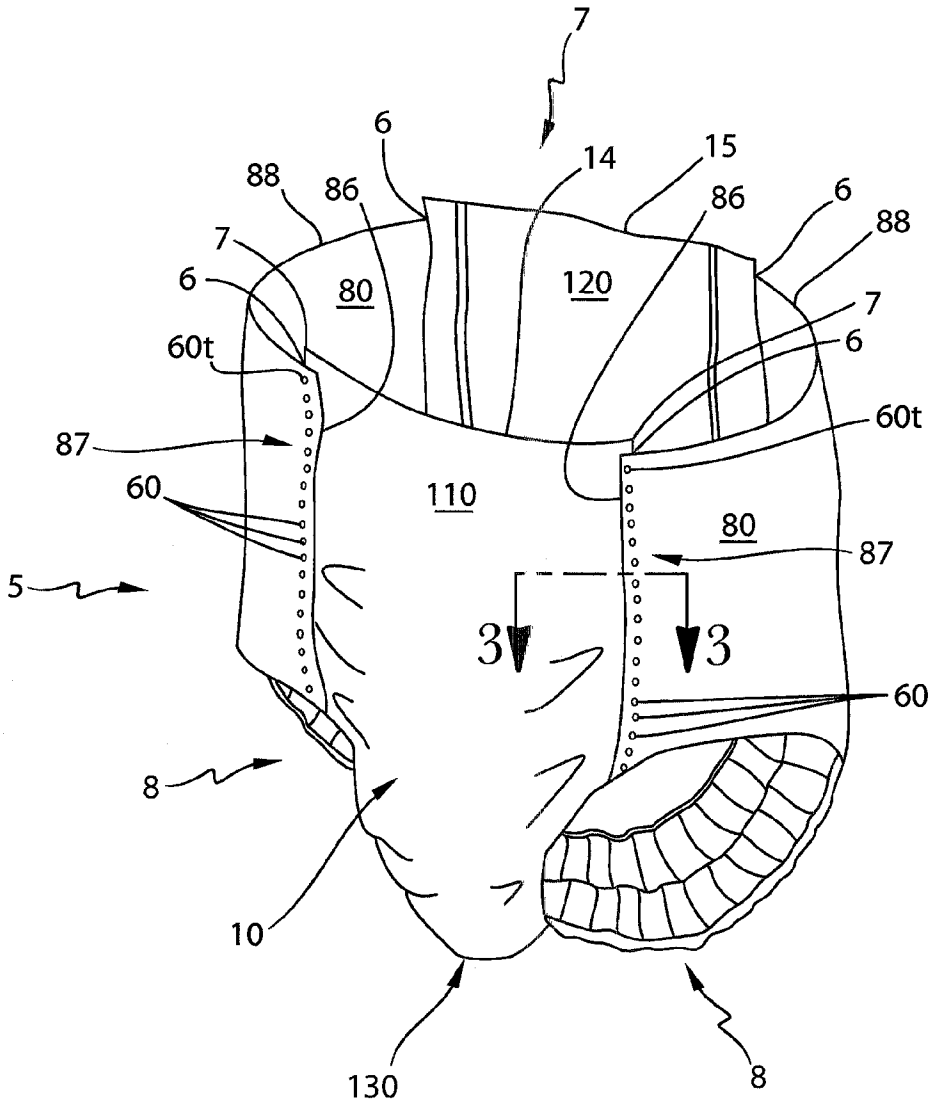
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Fig. 2

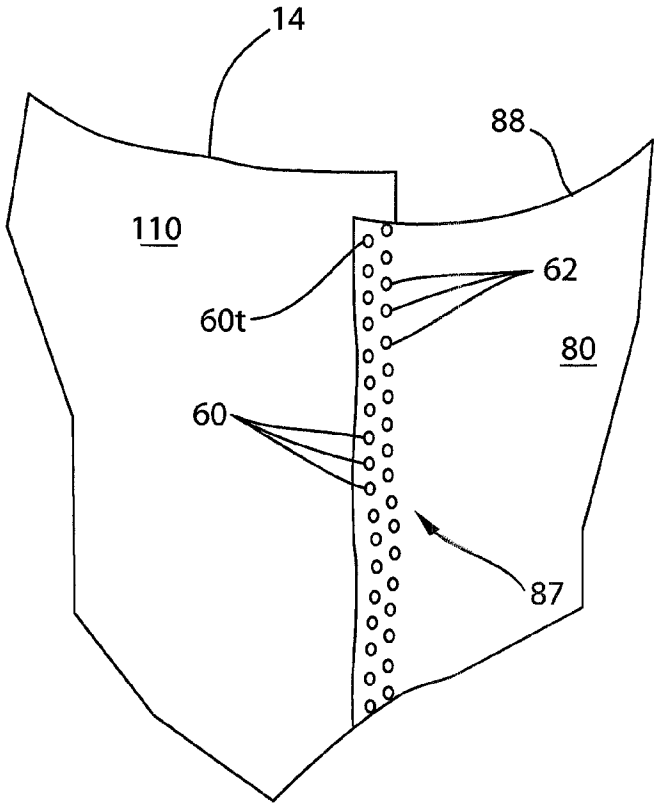
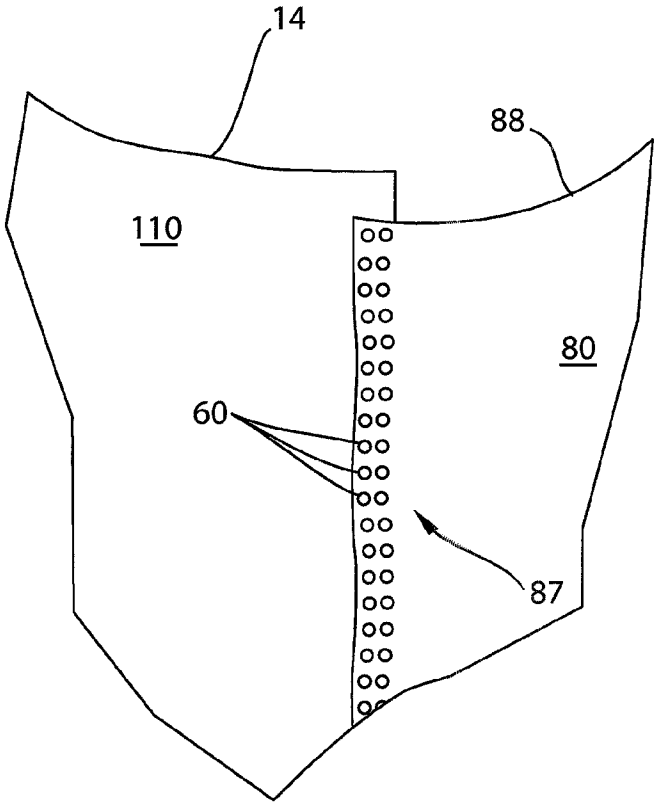


Fig. 2A



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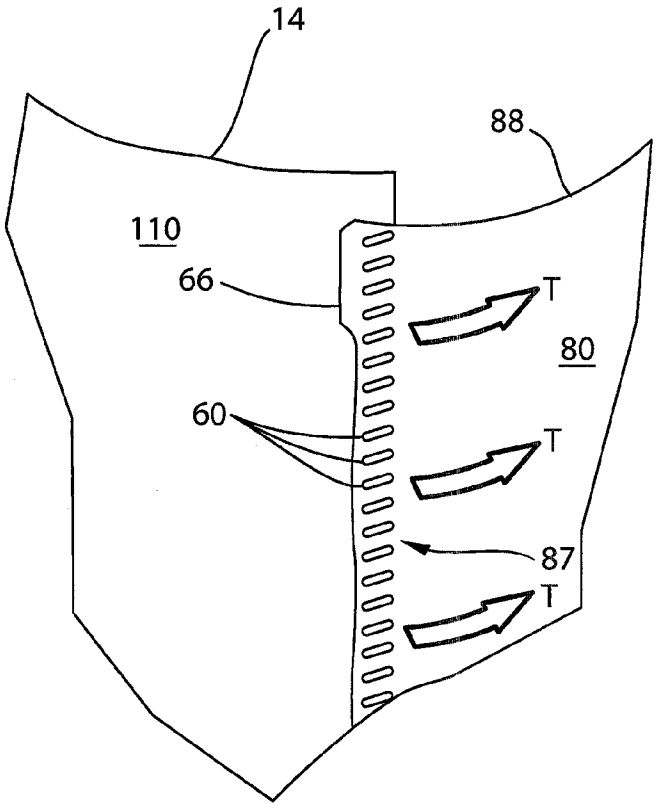


Fig. 2C

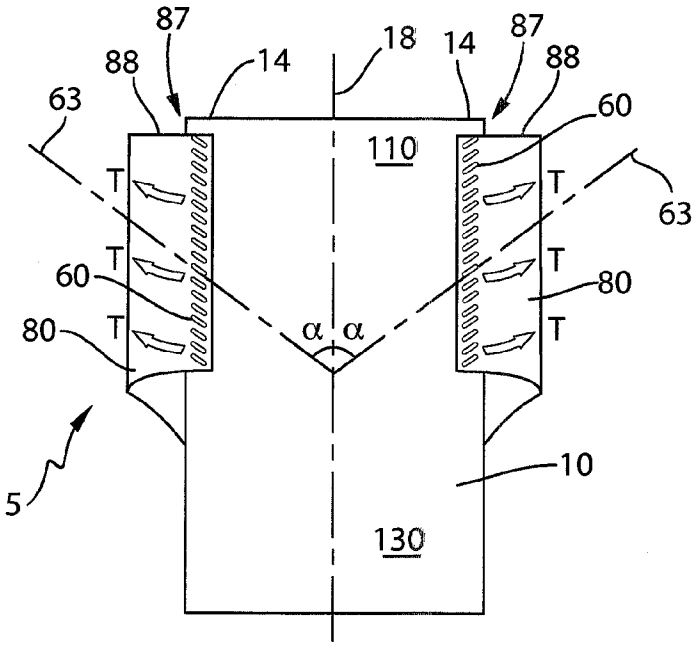


Fig. 2D

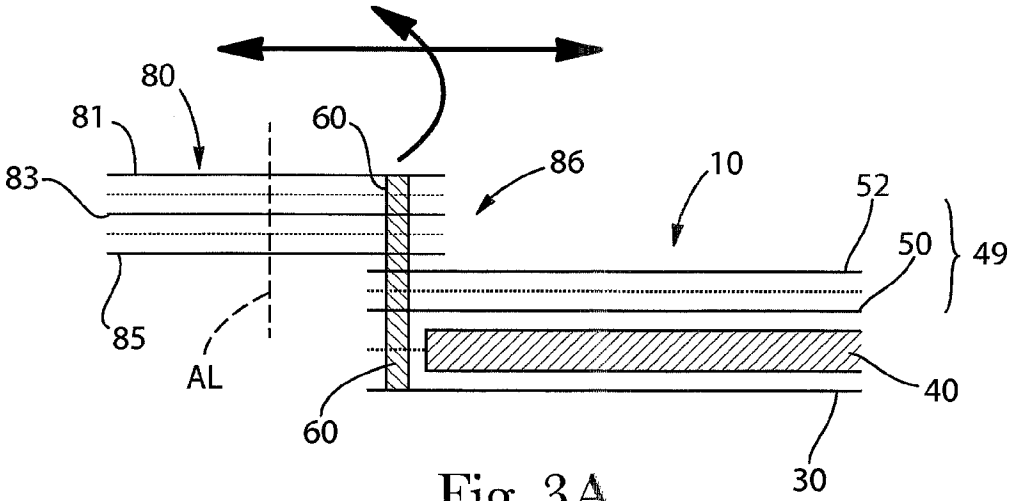
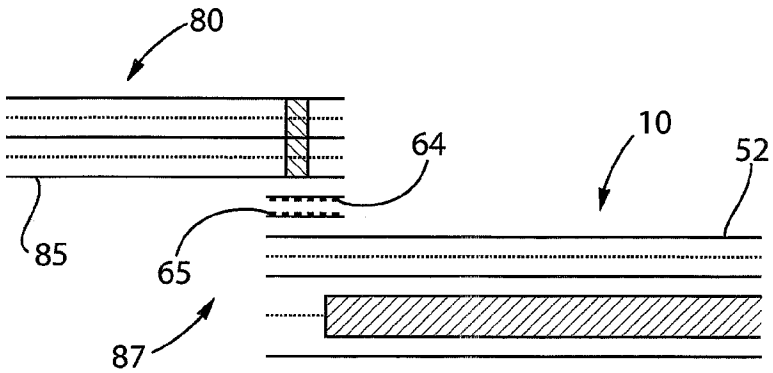


Fig. 3A



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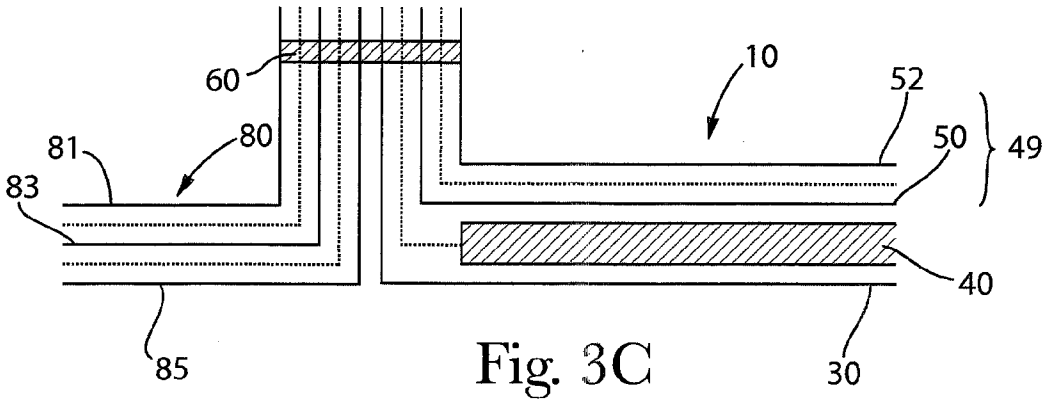

Fig. 3C

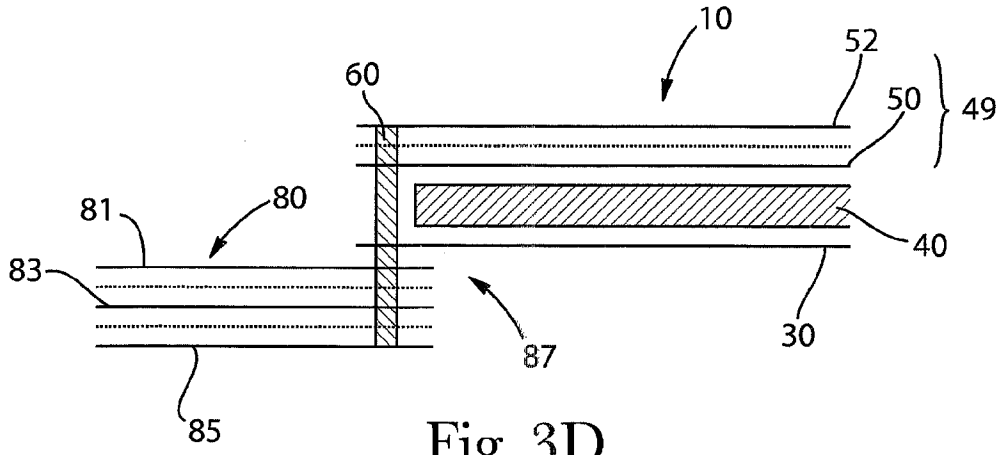

Fig. 3D

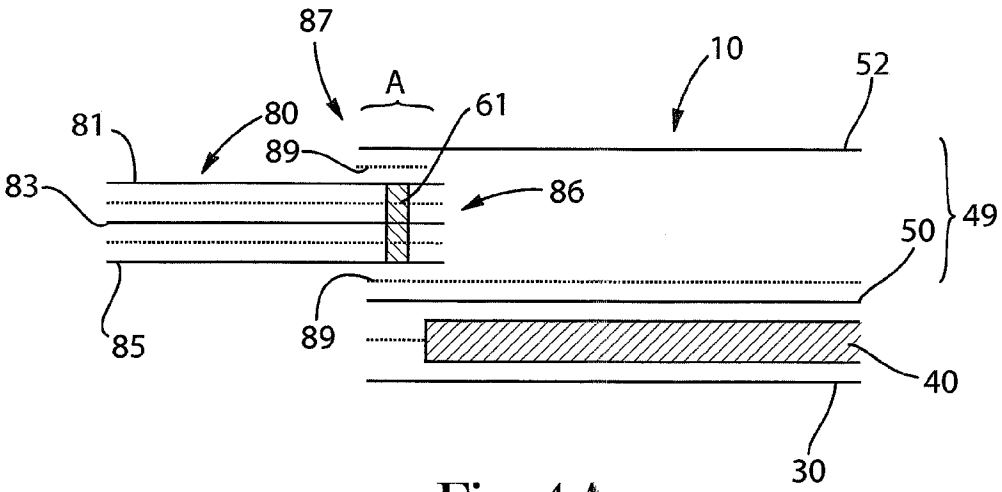
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Fig. 4A

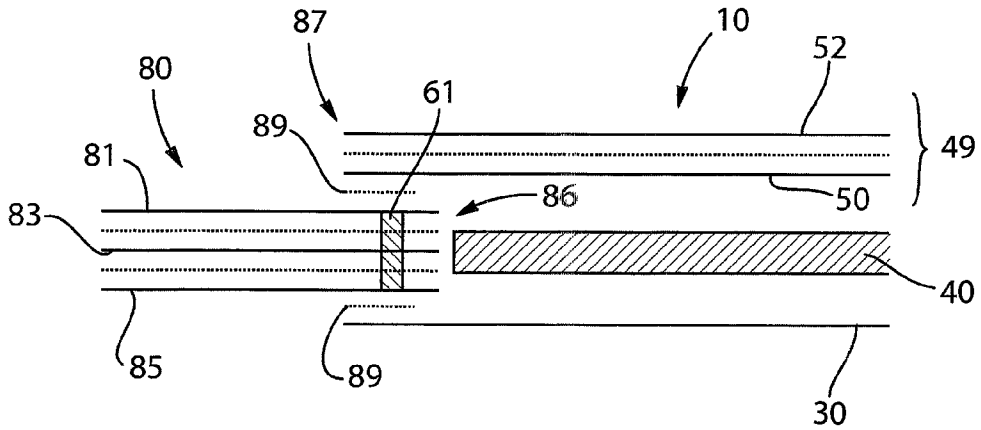
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Fig. 4B

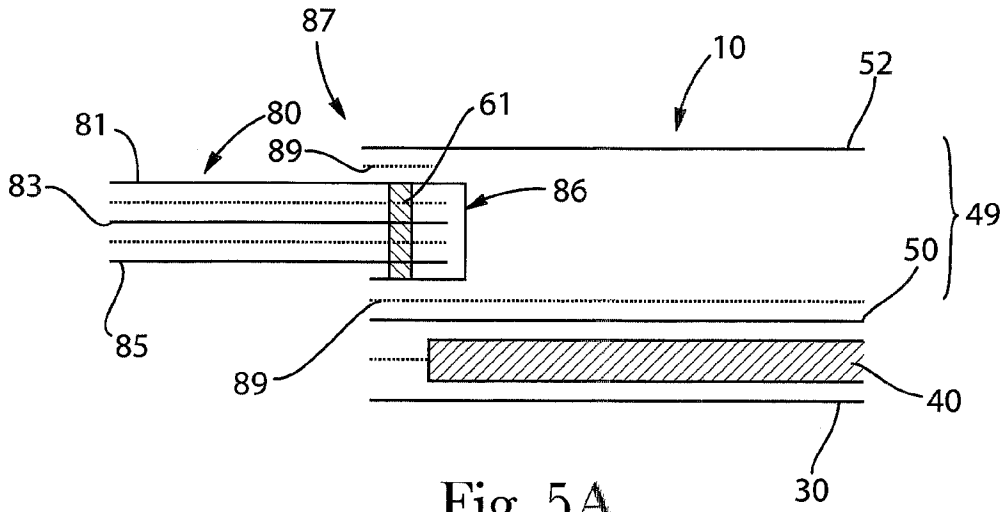
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Fig. 5A

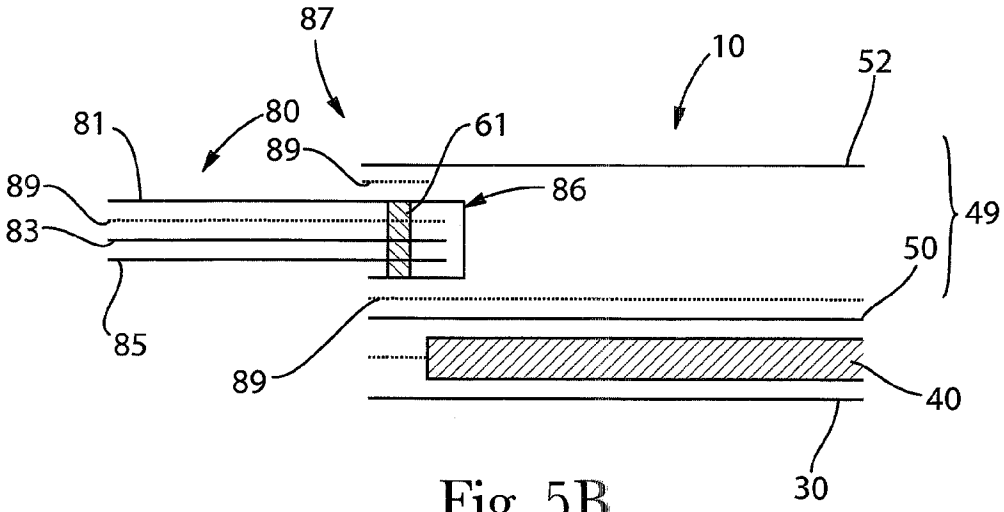
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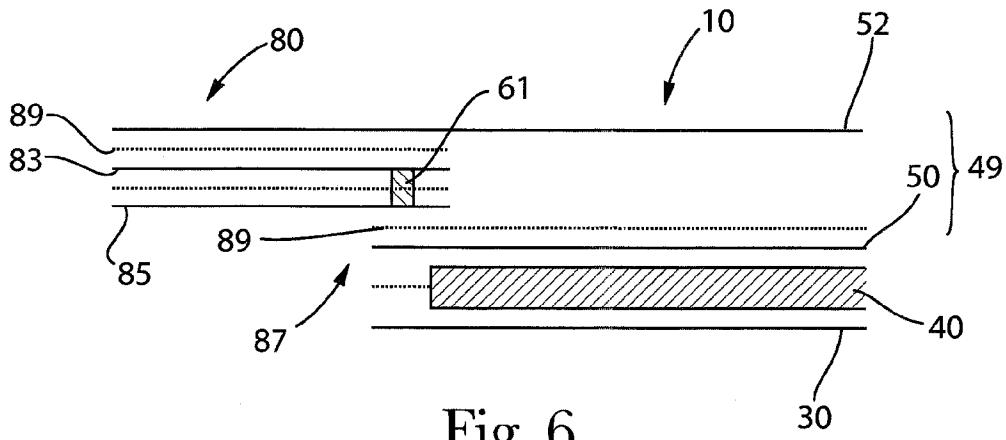
Fig. 5B



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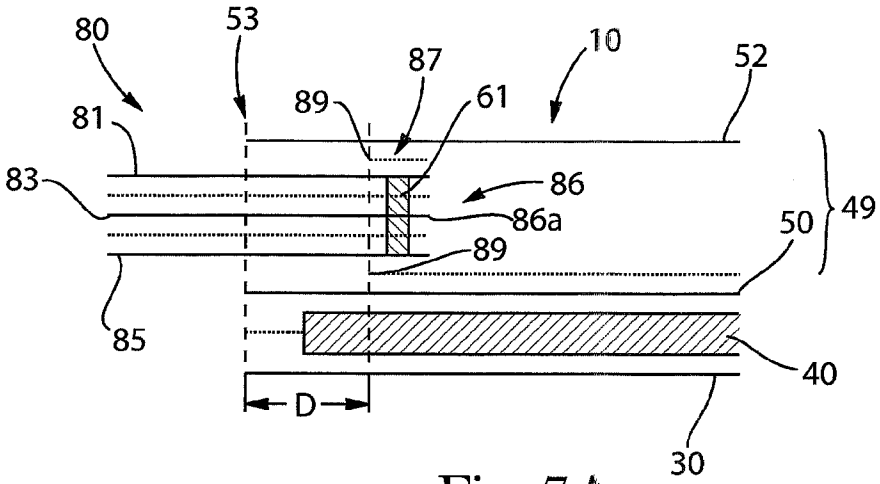
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Fig. 7A

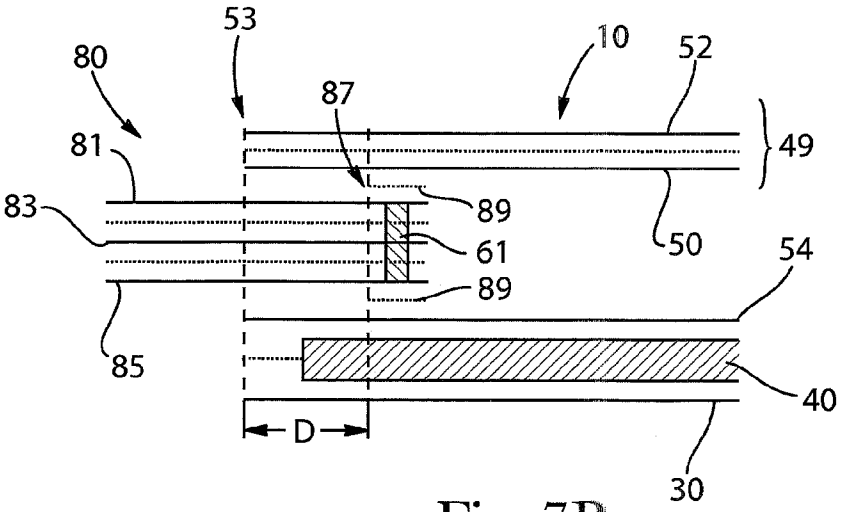
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Fig. 7B

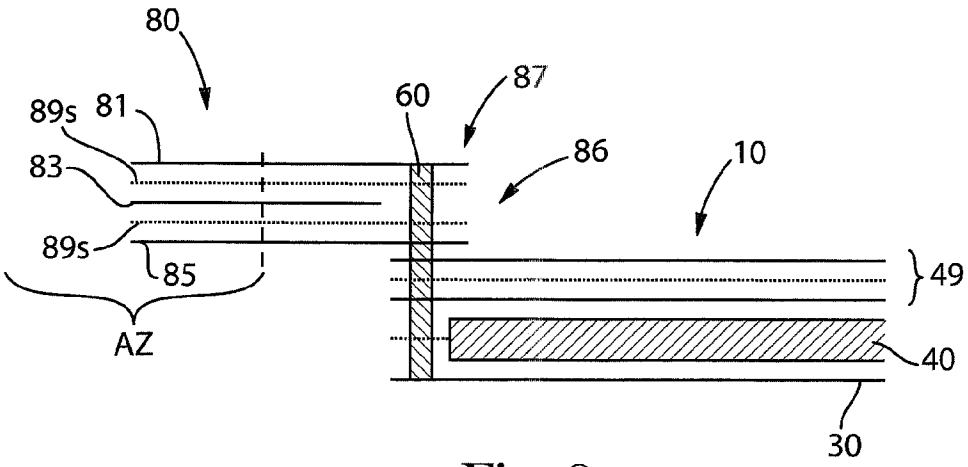
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Fig. 8

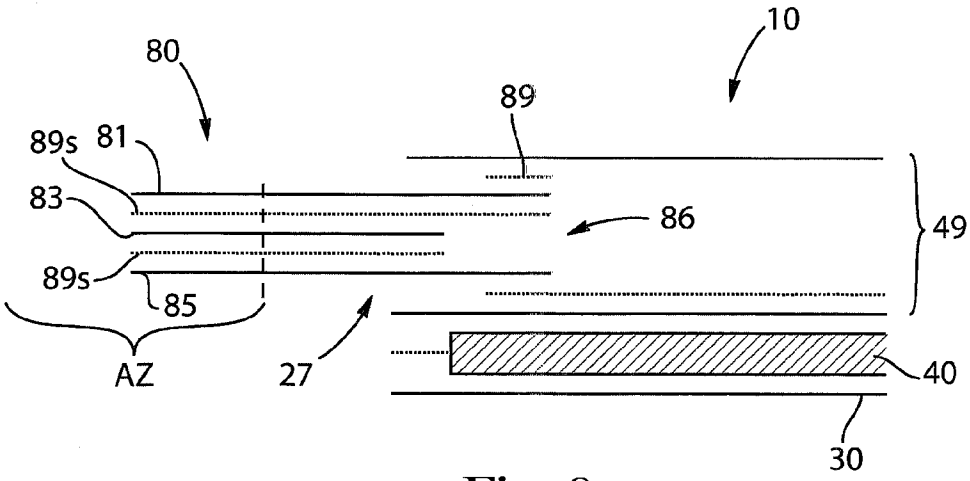
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Fig. 9

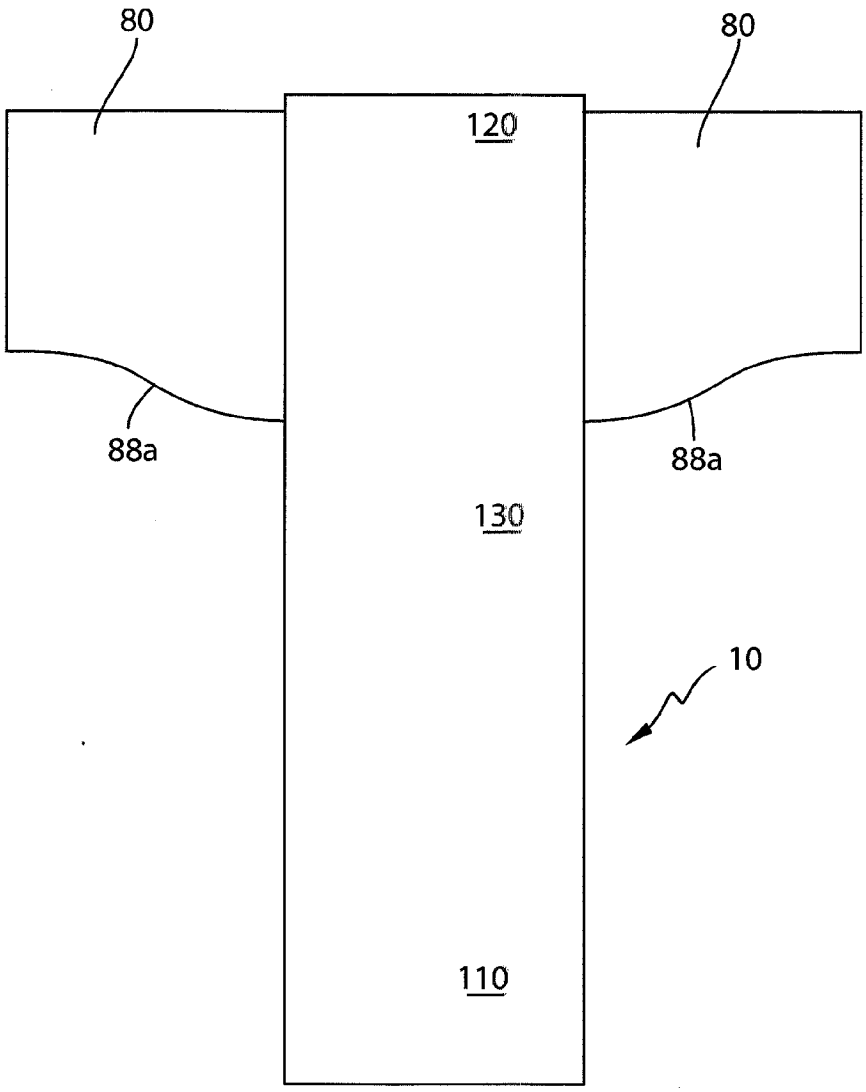
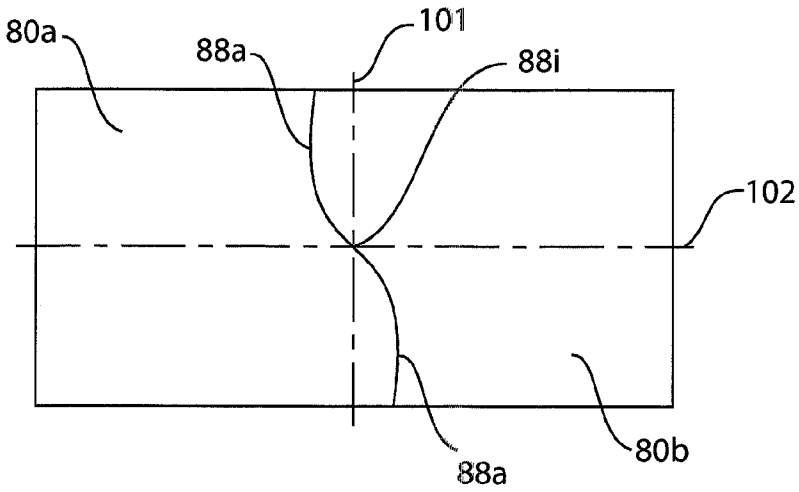


Fig. 10



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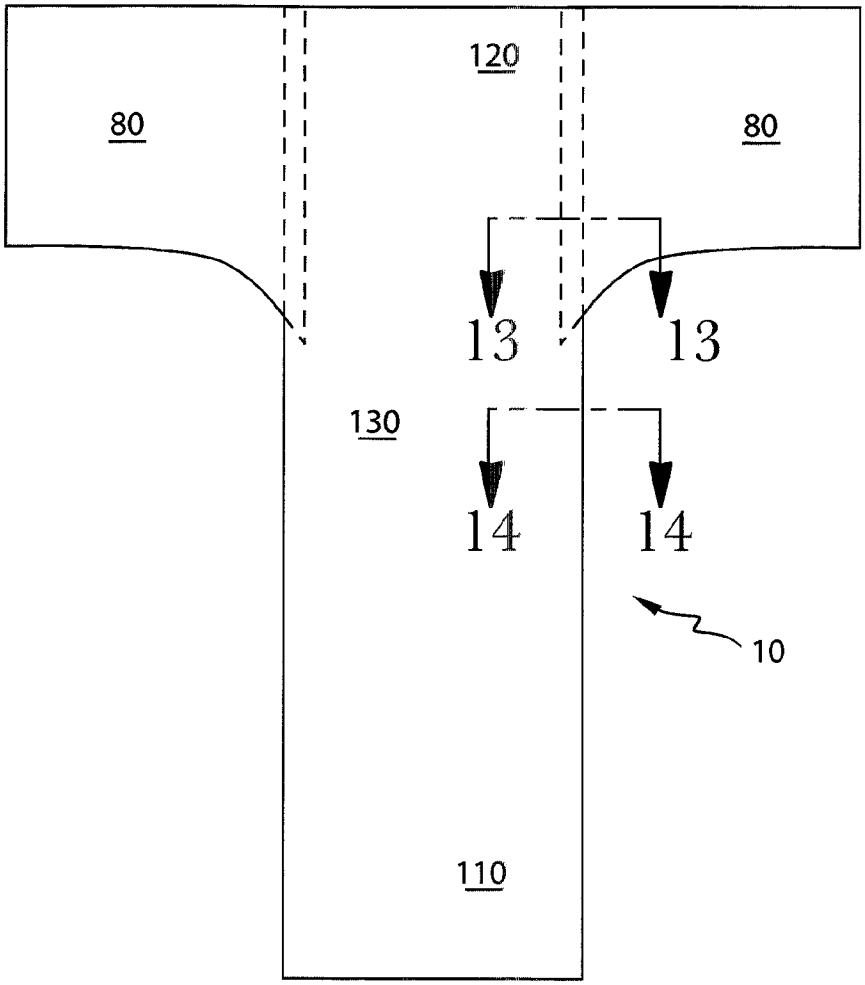

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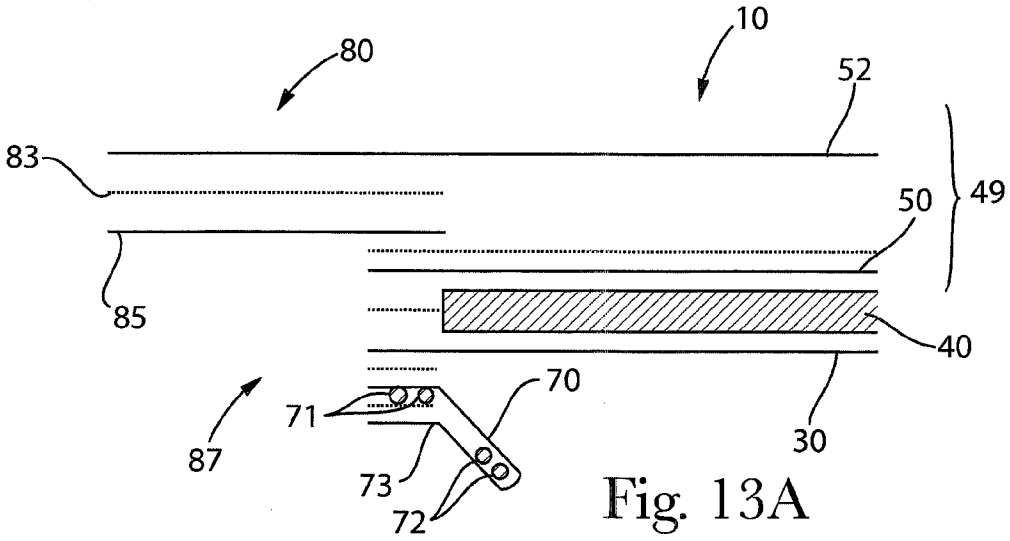


Fig. 13A

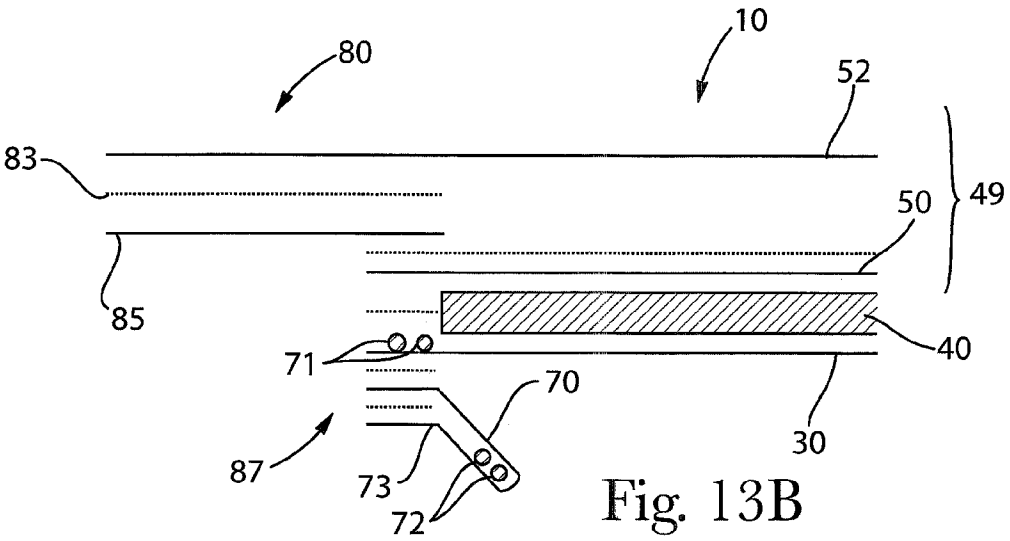


Fig. 13B

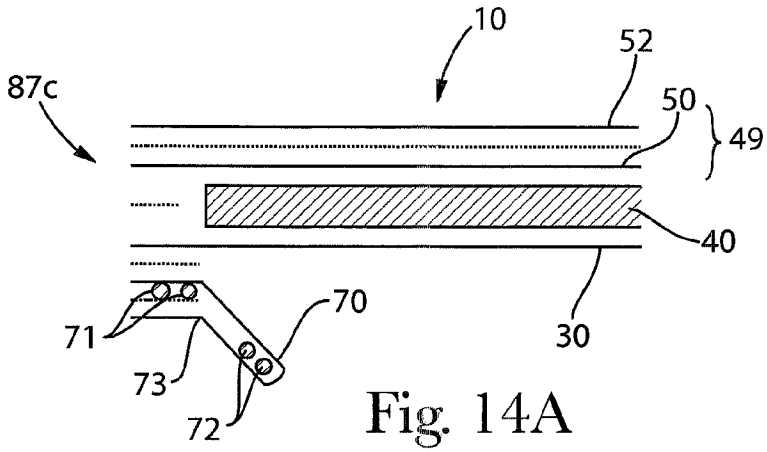


Fig. 14A

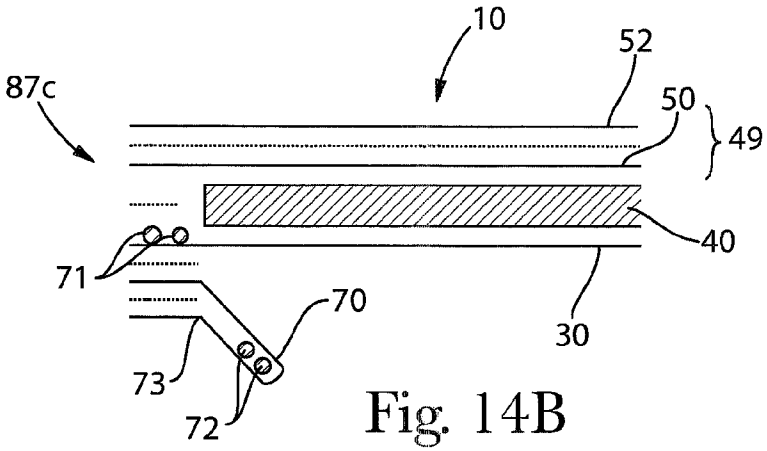
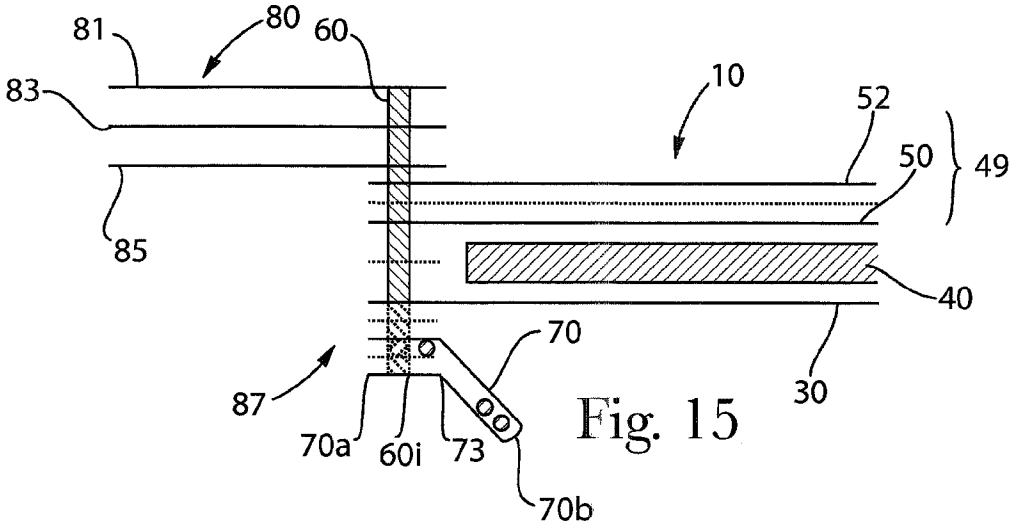


Fig. 14B



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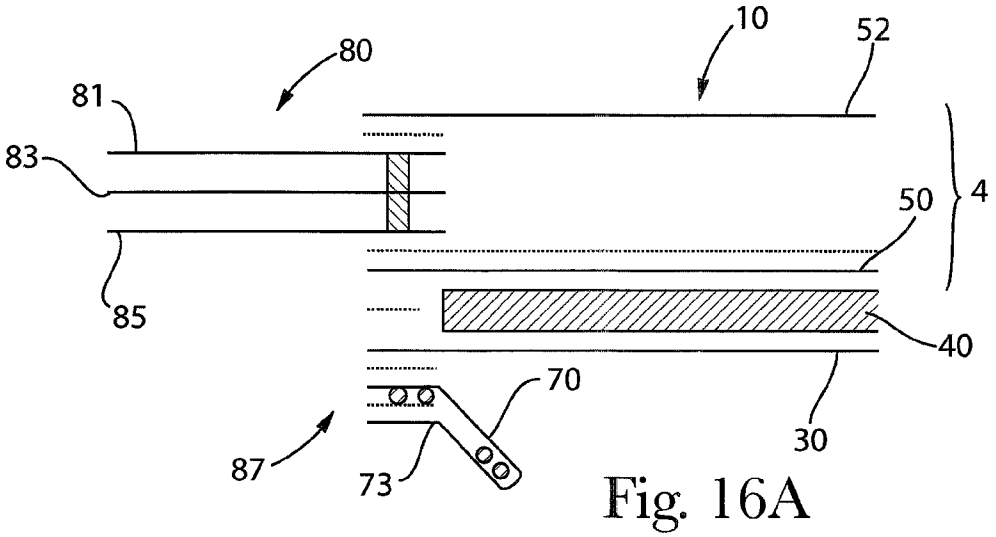

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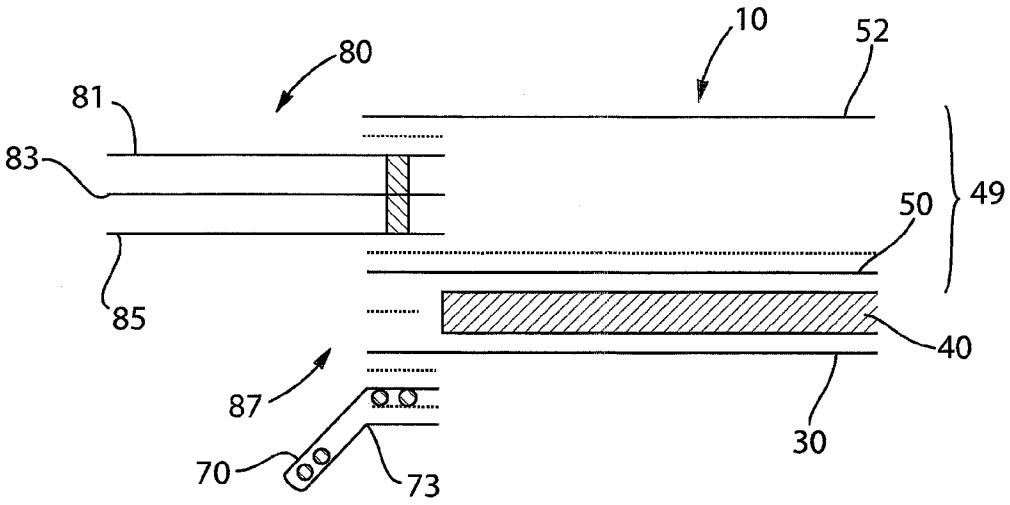

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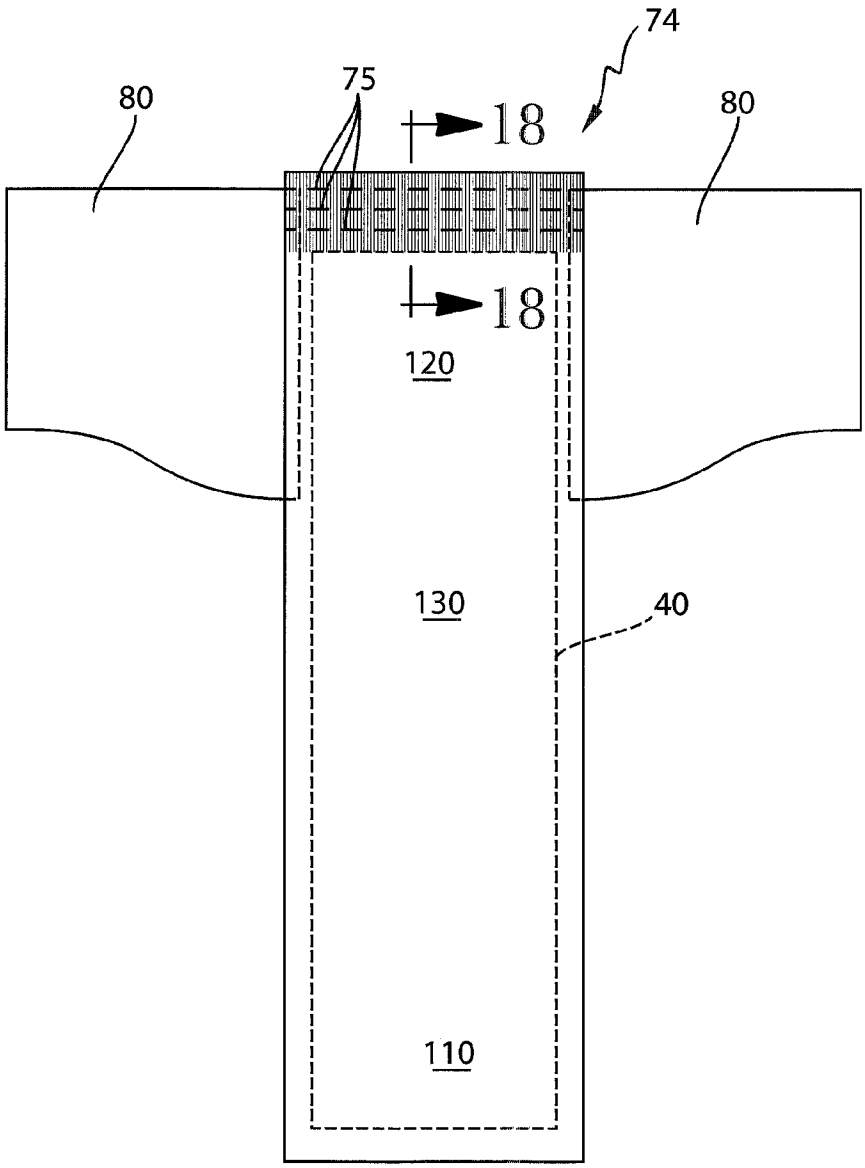
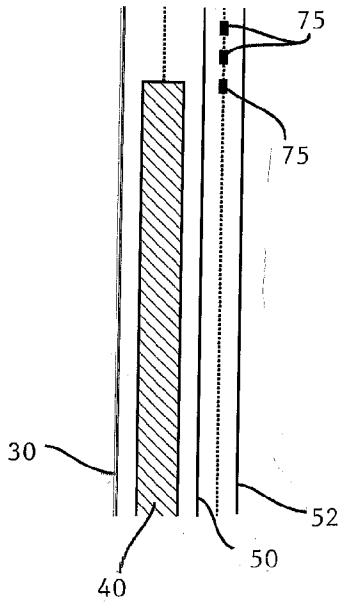
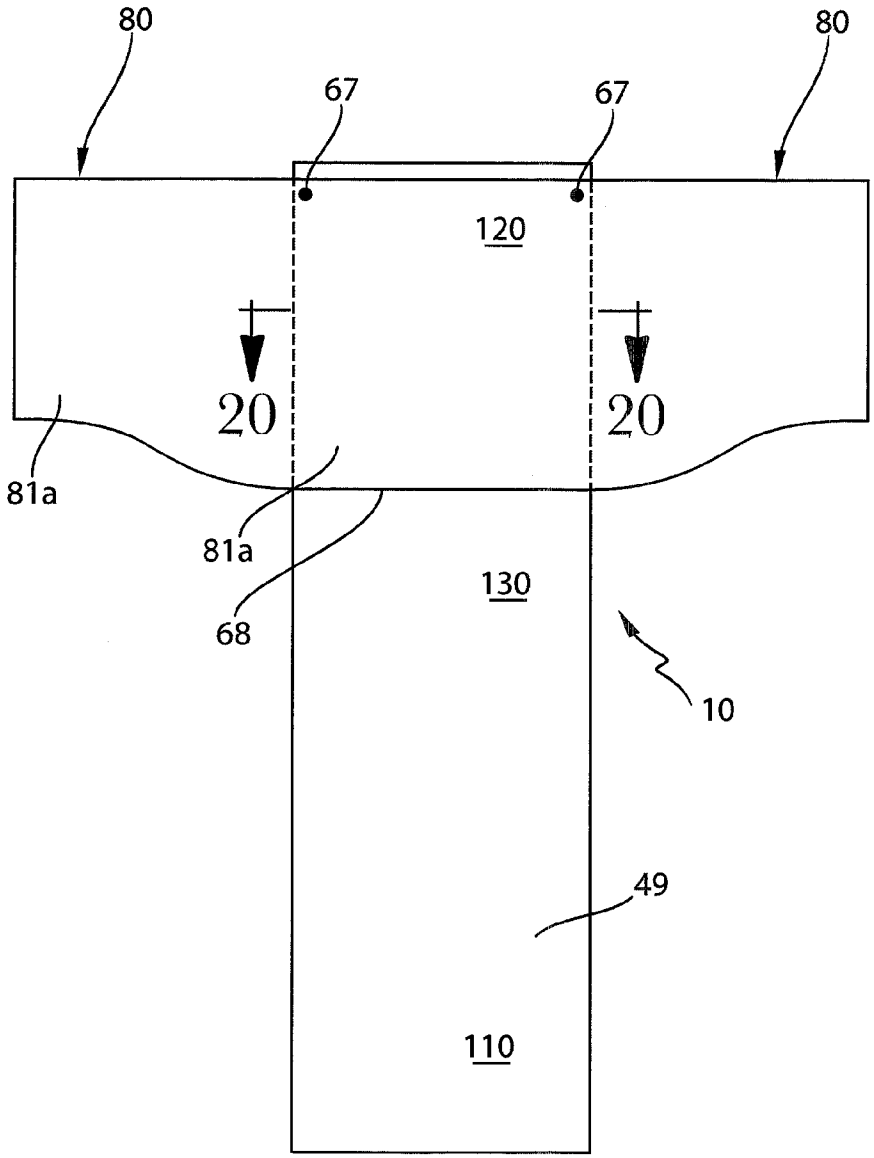


Fig. 17

Fig. 18





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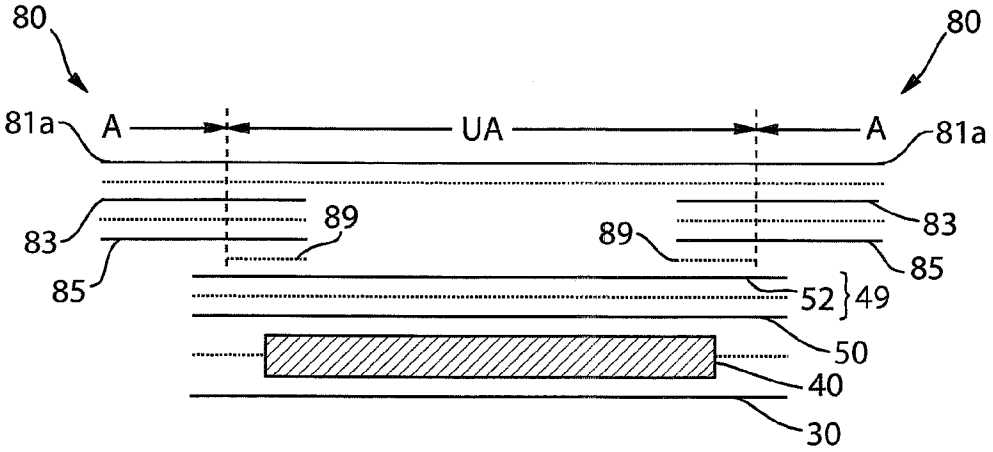
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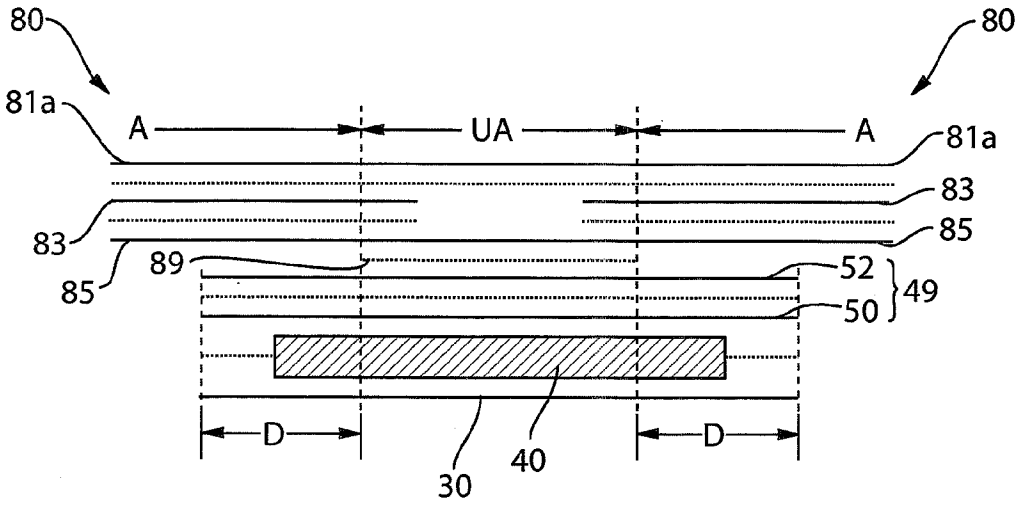
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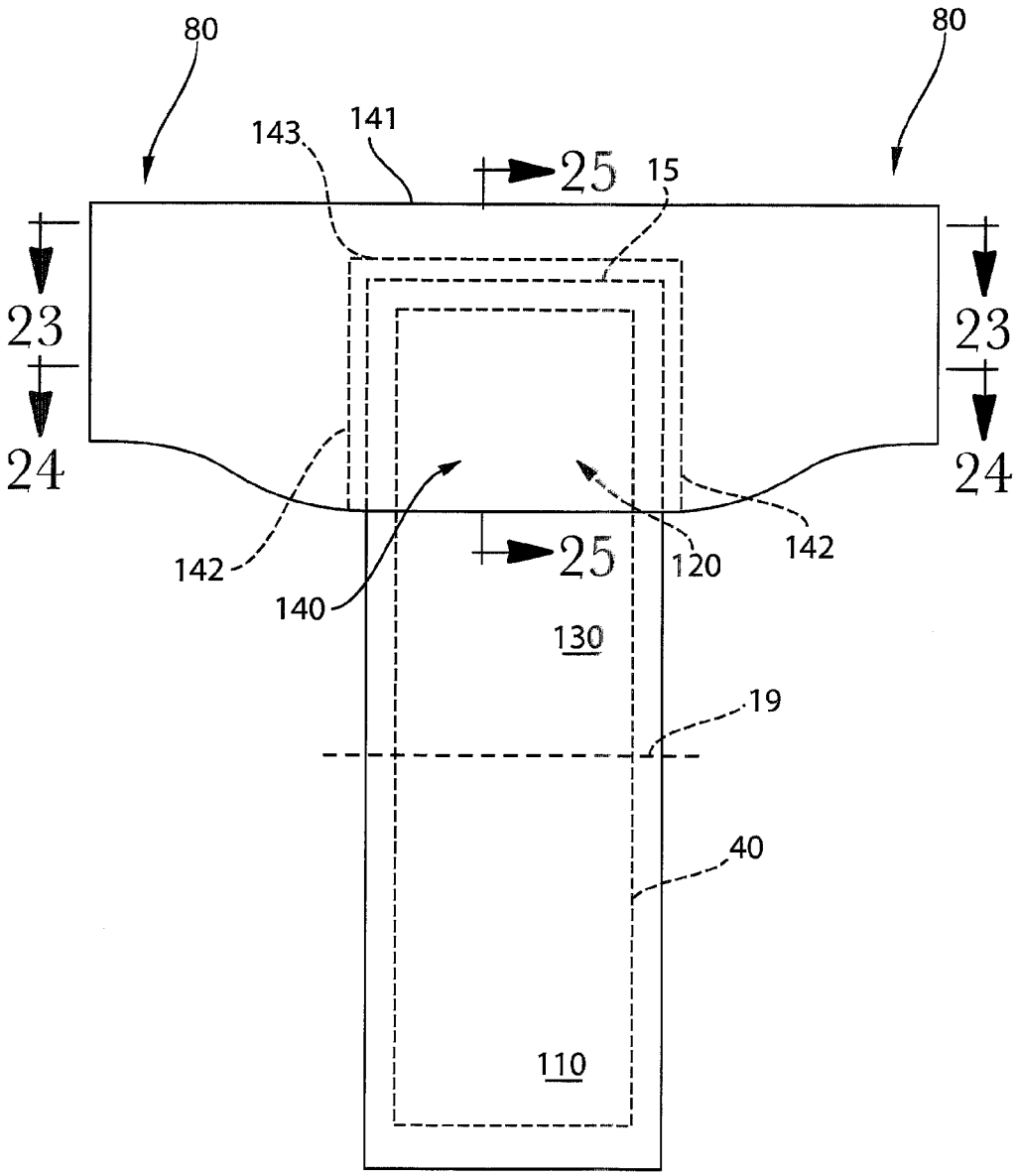
Fig. 21



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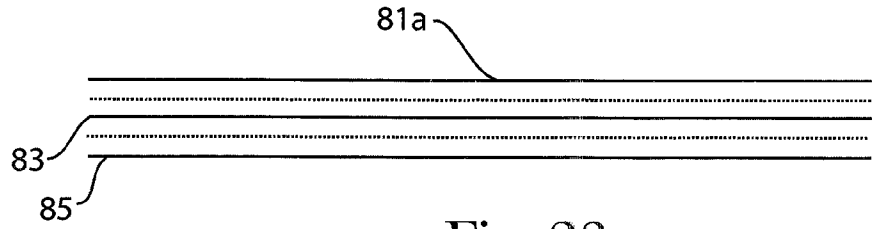

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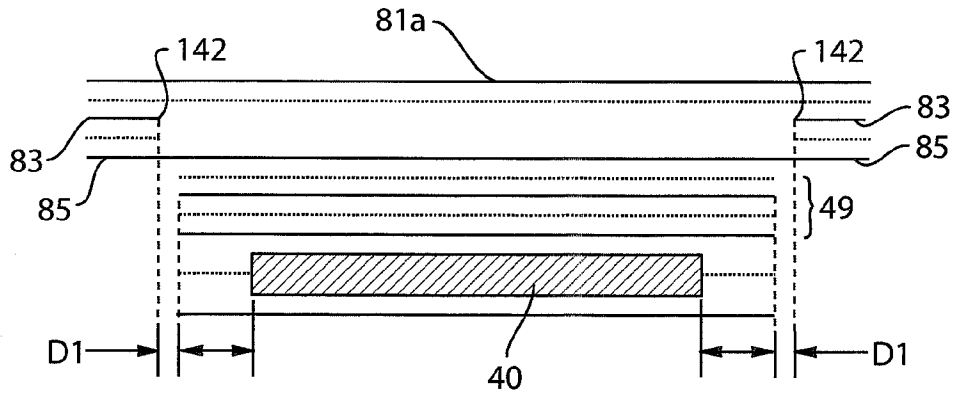


Fig. 24A

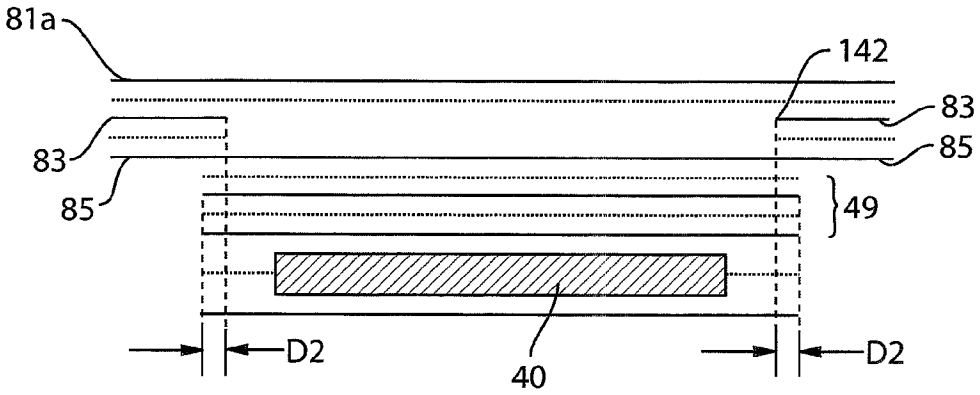
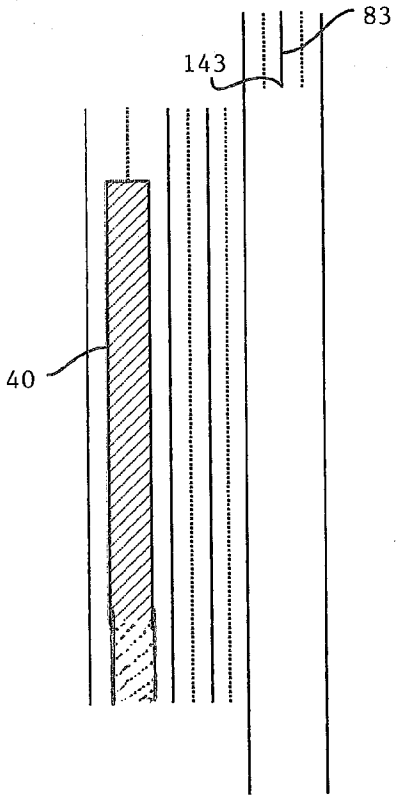


Fig. 24B



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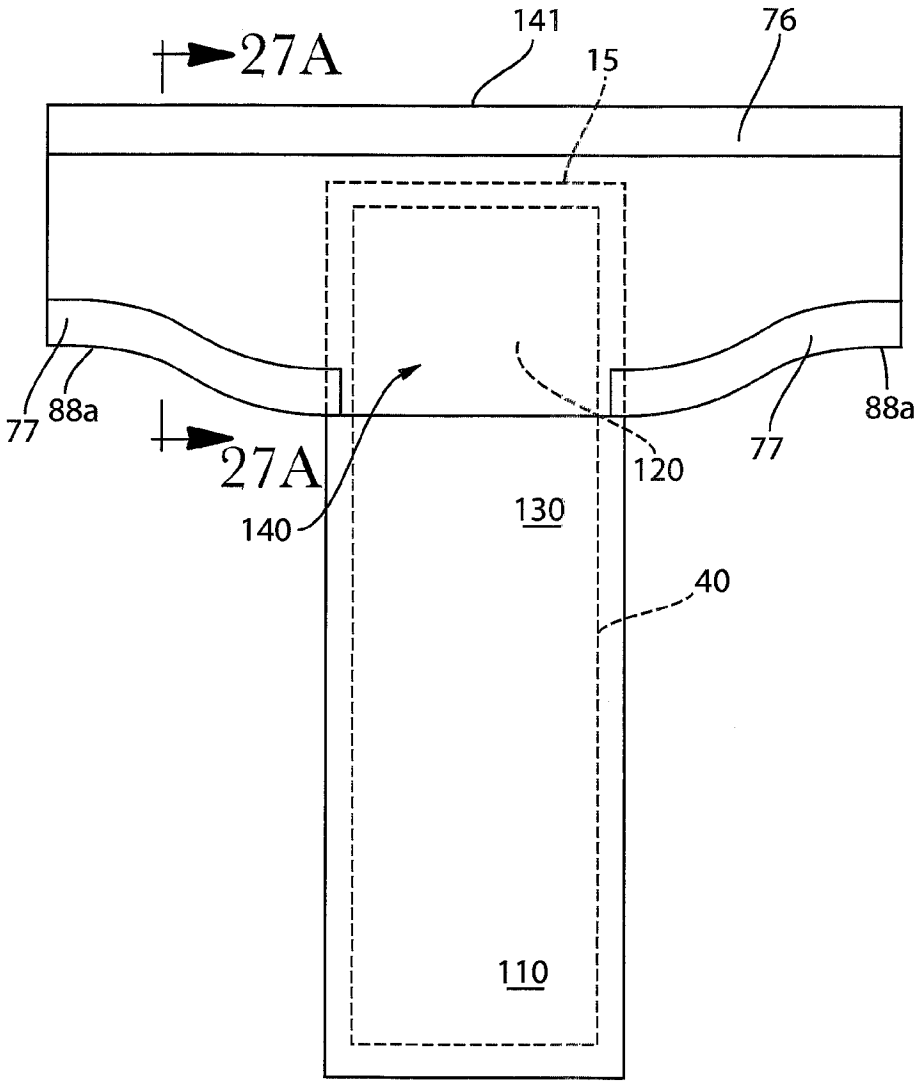

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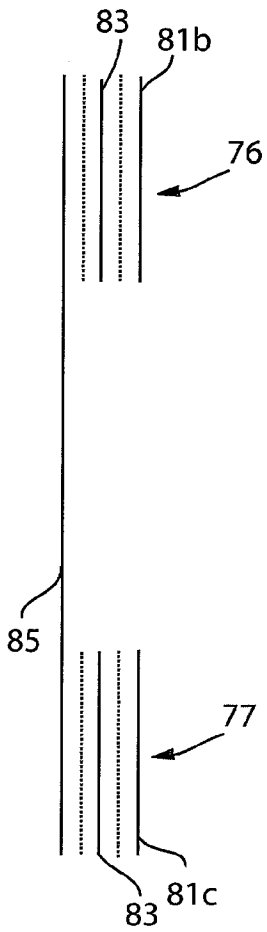

Fig. 27A

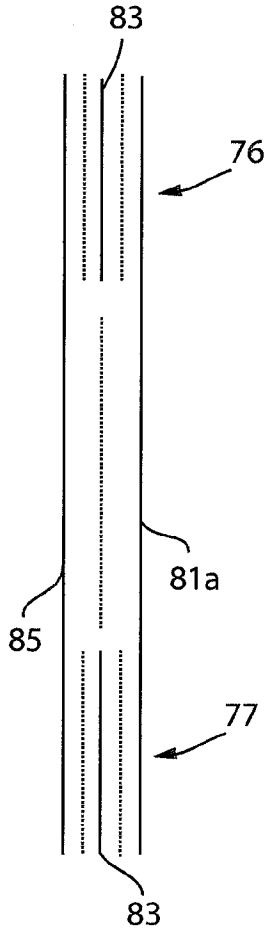

Fig. 27B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/066091

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/496 A61F13/49
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 practical, 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.
A	US 6 443 940 B1 (ASHTON GREGORY [JP] ET AL) 3 September 2002 (2002-09-03) column 1, line 6 - column 2, line 37 column 3, line 36 - column 5, line 57 column 14, line 47 - column 15, line 2; claims 1-10; figures 1,2,4,5 column 16, line 3 - line 26	1-6
A	US 2008/077115 A1 (REYES LOIDA GUZMAN [US]) 27 March 2008 (2008-03-27) paragraph [0022] - paragraph [0030] paragraph [0060] - paragraph [0062]; figures 1A-1C,2,4	1-6

-/--

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

[X] See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
6 March 2012	21/03/2012

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	Demay, Stéphane

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/066091

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/069557 A1 (DRISKELL STACY [US] ET AL) 10 April 2003 (2003-04-10) paragraph [0037] paragraph [0045] - paragraph [0061]; figures 1-5,8	1-6
A	US 2008/071240 A1 (ERDMAN EDWARD P [US] ET AL) 20 March 2008 (2008-03-20) paragraph [0044] - paragraph [0045]; figures 1,7	1-6
A	US 2005/107764 A1 (MATSUDA TOSHIYUKI [JP] ET AL) 19 May 2005 (2005-05-19) claims 1-10; figures 1,2,11-17	1-6
A	WO 02/083050 A1 (KIMBERLY CLARK CO [US]) 24 October 2002 (2002-10-24) claims 1-20; figures 1-5	1-6
A	WO 2008/008004 A1 (SCA HYGIENE PROD AB [SE]; BAECK LUCAS [SE]) 17 January 2008 (2008-01-17) page 13, line 11 - page 16, line 7; figures 6,7	1-6
E	WO 2011/163216 A2 (PROCTER & GAMBLE [US]; ASHTON GREGORY [US]; NISHIKAWA MASAHARU [US]; T) 29 December 2011 (2011-12-29) page 9, line 19 - page 10, line 22 page 11, line 15 - line 21 page 16, line 29 - page 17, line 7 page 18, line 10 - page 24, line 3; claims 1,3,6,13; figures 1,2,7A-B, 8E-F,	1-6

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2011/066091

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6443940 B1	03-09-2002	NONE	
US 2008077115 A1	27-03-2008	CA 2599171 A1	27-03-2008
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US 2003069557 A1	10-04-2003	AU 2002332075 A1	22-04-2003
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