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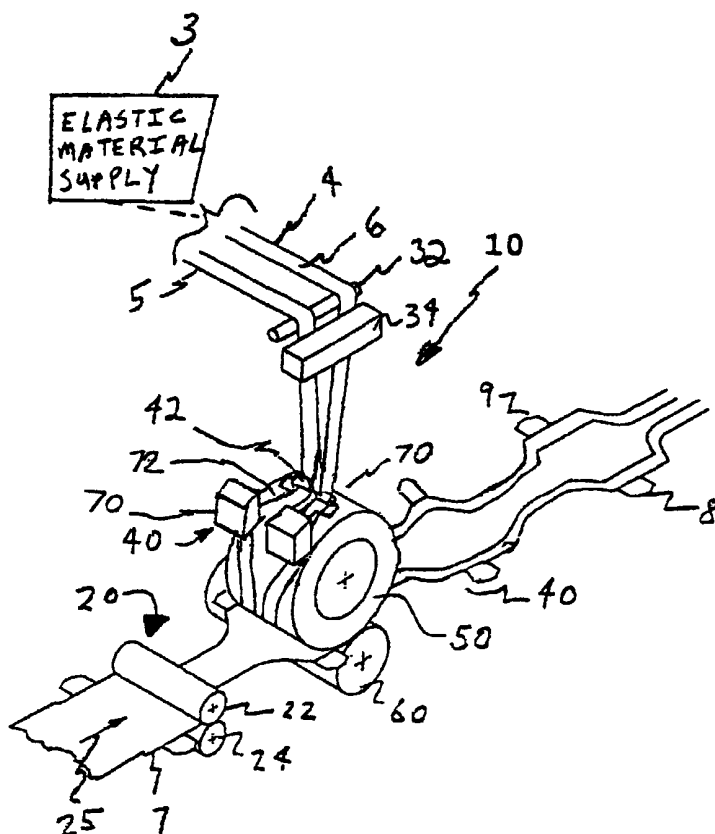
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[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR APPLYING AN ELASTIC MATERIAL IN A CURVILINEAR PATTERN ON A CONTINUOUSLY MOVING SUBSTRATE



(57) Abstract: Methods and apparatus for applying elastic material (4) in a curvilinear pattern on a continuously moving substrate (7). The methods move a substrate along a substrate path (25), supplies the elastic material to an oscillation unit first unit first roll (42) mounted for pivoting and rolling engagement with a transfer roll (50), the pivoting being about a pivot axis parallel to the substrate path, oscillates the oscillation unit first roll such that the first roll pivot axis oscillates in a plane generally transverse to the substrate path, applies the elastic material from the first roll to the transfer roll in the desired curvilinear path configuration, then applies the elastic material from the transfer roll to the substrate and bonds the elastic material to the substrate.



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METHODS AND APPARATUS FOR APPLYING AN ELASTIC MATERIAL IN A CURVILINEAR PATTERN ON A CONTINUOUSLY MOVING SUBSTRATE

FIELD OF THE INVENTION

The present invention relates to a composite web structure and methods and apparatus for applying an elastic material, particularly wide band elastic materials, in a curvilinear pattern on a continuously moving substrate. More particularly, the present invention relates to methods and apparatus for applying wide band elastic materials in curvilinear patterns on continuously moving substrates with severe enough angular displacement to produce a composite web structure, such as a disposable diaper or other absorbent article, with regions having the attached wide band elastic materials, such as leg cuff/containment flap regions, which are more "anatomically correct". Even more particularly the present invention relates to novel methods and apparatus for applying wide band elastic materials in curvilinear patterns on continuously moving substrates having minimal linear transverse direction motion, in relation to the substrate path.

BACKGROUND OF THE INVENTION

Conventional methods of making absorbent articles, such as disposable diapers, are well known in the art. These methods usually rely on attaching various elements to a continuously moving substrate, such as an absorbent article, as attachment materials. The elements may include leg elastics, leg cuffs, containment flaps or an element which is a combination leg cuff/containment flap, such as that shown in U.S. Pat. No. 5,827,387 issued October 27, 1998, to Reynolds et al. The strip of attachment material may be applied to the continuously moving substrate in a discrete or continuous manner. One problem which has been encountered is the attachment of wide band elastic materials with severe enough angular displacement to provide for proper curvilinear placement. Specifically such curvilinear placement is desired to be "anatomically correct", generally in the leg opening region of an absorbent article. Thus an absorbent article having this proper curvilinear placement is perceived as having a better fit on a body of a wearer of the absorbent article.

Curving the wide band elastic attachment material has been very difficult to accomplish and practice at high speed. Manufacturers have to settle for compromises, such as making disposable diapers having straight bands of elastic or reducing line speed.

The application of an elastic in a curvilinear pattern to a moving web generally requires the use of rollers for positioning the strip of elastic. U.S. Pat. No. 2,592,581 to Lorig discloses a method and apparatus for positioning a strip utilizing a roll which may be cylindrical, concave, or convex as desired to suit various installations. In U.S. Pat. No. 4,081,301 to Buell adhesive is intermittently applied to the elastic material while the elastic and web substrate are continuously run at high speed. Bourgeois, U.S. Pat. No. 3,828,367, discloses that a pair of elastic ribbons are fed to curved grooves in a roll under which a continuous web passes. As the roll with the ribbons in its grooves goes over the web, the ribbons are transferred in the contoured pattern of the grooves to the roll. One problem with a grooved roll is that it is unreliable and roping and C-folding occurs with wide band elastic ribbons. U.S. Pat. No. 4,917,746 to Kons et al. discloses a method and apparatus involve a single roll moving or oscillating in a single dimension to apply each elastic ribbon to a web along an undulated path. U.S. Pat. No. 4,915,767 to Rajala et al. uses a rotatable nip roll to press an elastic member against the web so the elastic member is spaced a predetermined maximum distance from a dwell line, a rotatable buffer roll above and in rolling engagement with the rotatable nip roll to cushion the rotatable nip roll against transient perturbations, and an oscillating roll, oscillating in a path transverse to a direction of web travel, above and spaced apart a predetermined length from the rotatable buffer roll. The oscillating roll applies the elastic member in a curved line on the rotatable buffer roll, with the predetermined maximum distance of the elastic member from the dwell line being directly proportional to the predetermined length between the oscillating roll and the rotatable buffer roll.

The method and apparatus of the present invention allows for high speed forming of continuously moving substrates having, as attached elements, elastic materials, such as wide band elastic materials, placed with severe angular displacement in a curvilinear pattern on a continuously moving substrate by allowing a roller to roll and pivot while placing the elastic materials either on a transfer roll or directly on a substrate. The present invention, unlike the prior art, while rolling also oscillates in a plane generally transverse to the substrate path, thus providing a curvilinear pattern with

no required linear movement of the roller across the substrate transverse direction.

SUMMARY

The present invention relates to apparatus and methods for applying at least one elastic material, in a curvilinear path, onto a continuously moving substrate.

The apparatus for applying at least one web of elastic material in a curvilinear path onto a continuously moving substrate has a transporting apparatus for continuously moving the substrate along a substrate path, a rotatable transfer roll, having a transfer roll axis adapted to be in rolling engagement with the substrate and to press the elastic material against the substrate along the curvilinear path, an oscillation unit having at least a first roll having a first roll axis, the first roll being mounted for rolling engagement with a surface of the transfer roll, the first roll also mounted for pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally traverse to the substrate path while rolling thus being effective to apply the elastic material to said transfer roll along the curvilinear path, an elastic material supply for providing the elastic material to the first roll of said oscillation unit, an oscillating drive connected to said oscillation unit for oscillating said oscillation unit in a plane generally transverse to the substrate path and a bonding apparatus to secure the elastic material to the substrate along the curvilinear path when the elastic material is pressed onto the substrate by the transfer roll. Optionally the transfer roll may be deleted and the first roll may directly contact the substrate to apply the elastic material in the curvilinear path.

The method applies at least one web of elastic material in a curvilinear path onto a continuously moving substrate by moving the substrate along the substrate path, supplying the elastic material to at least a first roll having a first roll axis, the first roll being mounted for rolling engagement with a surface of said transfer roll, and for pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally traverse to the substrate path while rolling, thus being effective to apply the elastic material to said transfer roll along the curvilinear path, oscillating the oscillation unit in a path generally transverse to the substrate path applying the elastic material from the first roll to the transfer roll in a curvilinear path configuration, applying the elastic material,

in the curvilinear path configuration, from the transfer roll to the substrate and bonding the elastic material, in the curvilinear path configuration, to the substrate. Optionally the transfer roll may be deleted and the first roll may directly contact the substrate to apply the elastic material in the curvilinear path configuration.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows an elevated angled view of one embodiment of an apparatus of the present invention.

FIG. 2 shows a side view of the first roll and transfer roll with the elastic material path.

FIG. 3 shows a detailed view of the first roll of the oscillation unit with respect to measurements and the pivot axis position in relation to the first roll.

FIG. 4 shows a view of three positions of pivoting of the first roll and the range of oscillation.

Fig. 5 shows a side view of the oscillation unit.

Fig. 6 shows a top view of the oscillation unit.

The invention is not limited in its application to the details of construction or the arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments or of being practiced or carried out in other various ways. Also, it is to be understood that the terminology and phraseology employed herein is for purpose of description and illustration and should not be regarded as limiting. Like reference numerals are used to indicate like components.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

FIG. 1 shows an apparatus for applying a pair of elastic materials 4 and 5 to a substrate 7 along a curvilinear path. While a pair of elastic materials is shown, the apparatus may also be used to apply only one elastic material. For the purposes of discussion, only one of the elastic materials and its related apparatus will be discussed herein since the elastic materials and the apparatus for applying each of the elastic materials to the web are substantially identical.

Referring to FIG. 1, the elastic material 4 is relatively flat, includes wide surface 6, and has a width considerably greater than its thickness. The elastic material 4 comes from an elastic material supply 3 and may be supplied in any known manner that permits a continuous high speed operation. This includes pulling elastic materials, in a tangle free manner, from a box, supplying elastic materials from a reel on which the elastic materials have been wound, receiving the elastic materials directly from another processing unit which forms the elastic material or any other supply manner known in the art. Since, for the purposes of this invention, the exact manner of elastic material supply is not important, the manner of supply has not been shown. The elastic material 4 may be either in the form of a natural rubber, a synthetic elastomer or a combination of materials, such as those shown in U.S. Pat. No. 5,827,387 issued October 27, 1998, to Reynolds et al. Preferably, the elastic material is a combined leg cuff and containment flap such as that detailed in U.S. Pat. No. 5,827,387 issued October 27, 1998, to Reynolds et al.

As shown in FIG. 1, the apparatus 10 for applying elastic materials (4 and 5) to a substrate 7, (the substrate may also be called a web) includes a transporting apparatus 20, which may be any conventionally known type of transporting apparatus, and in FIG.1 includes two rolls (22 and 24) for continuously moving the substrate along a substrate path as shown by the direction of substrate transport arrow 25. Attachment pieces (8 and 9) may be present on the substrate and the substrate may have other additional elements, which are not shown and will not be further discussed, depending on the exact nature of the method for preparing the article.

At least one elastic material is supplied in any known manner by an elastic material supply 3, including, as shown in FIG. 1, supplying the elastic material using a guide 32. The guide may be a roll or a bar or any other mechanism that can guide the

elastic material to a first roll, also called a roller, of an oscillation unit.

The elastic material is any band or ribbon type elastic material, however it is preferably a wide band elastic material having a width of about one half to about four inches, preferably a width of about one to about four inches and most preferably about two to about four inches.

Bonding apparatus 34 supplies adhesive at some point prior to the application of the elastic materials to the substrate. The exact positioning of the adhesive application is not critical, as long as the bonding apparatus applies the adhesive prior to the application of the elastic materials to the substrate. However, preferably the application of the adhesive should be prior to the oscillation of the elastic material to reduce the complexity of the bonding apparatus, since application of the adhesive during or after oscillation of the elastic material would also require oscillation of the bonding apparatus.

Adhesives may be of any known conventional type, so long as the adhesive causes minimal or no interference with the high speed application of the elastic materials to the substrate. One example is a pressure-sensitive adhesive.

Optionally, the bonding apparatus may be an ultrasonic unit properly positioned to be able to properly secure the elastic material to the substrate, such as, for example, at the position of a nip roll 60 in Fig. 1. For example, the ultrasonic unit and a transfer roll or a first roll may provide a nip allowing ultrasonic energy to properly secure the elastic material to the substrate. An ultrasonic unit may be a suitable generator to power an ultrasonic horn and a suitable ultrasonic horn such as a rotary ultrasonic horn taught in U.S. Pat. No. 5,110,403 to Ehlert. Alternatively, the ultrasonic horn may be a stationary ultrasonic horn as are well known to those skilled in the art.

The elastic material continues on to the oscillation unit 40 where it engages a first roll 42, also called a roller or caster, which is a part of the oscillation unit and allows for rolling engagement of the elastic material as the elastic material is fed to the roller. The first roll is also has a pivot axis which allows pivoting while the first roll is in rolling engagement with either a transfer roll 50 or the substrate 7. Thus the roller is able to roll in addition to being pivoted, by oscillation in a plane transverse to the direction of movement of the substrate. This allows an elastic material, preferably a wide band elastic material, to be curved with severe enough angular displacement, up to about sixty degrees, to be perceived as more "anatomically

correct" in a final article incorporating the substrate and elastic material. For example, a wide band elastic material, about one inch in width, may be applied in a sinusoidal stretched manner so that the greatest overall distance from a top edge of the wide band elastic material at the top of a sine wave to a bottom (opposing) edge of the same wide band elastic material at the bottom of the sine wave is about three and one-half inches or an angle of about sixty-four degrees (based on a right triangle).

Fig. 2 shows the direction of travel 46 of the elastic material 4 in relation to the roller 42 and onto a transfer roll 50. The exact direction of travel is not critical as long as the roller is able to apply the elastic material either to the transfer roll in a curvilinear manner for application to the substrate or directly to the substrate in a curvilinear manner.

The roller must be constructed so that the roller can be pivoted in a direction perpendicular to a rolling direction so as to apply the elastic material in a curvilinear pattern. This means that the roller should be constructed so that it is oval, ellipsoid or generally any other such shape, such as trapezoidal, with major parallel faces of the trapezoid forming the rolling or first axis, so that it has a greater diameter in the center of the rolling surface of roller than at the ends of the rolling surface of the roller. These are generally known as rollers with a crown or crowned rollers. It is also required that the roller be able to be oscillated in a plane traverse to the substrate path while the roller is rolling on the transfer roll or the substrate. This is achieved by a roller having a pivot axis and a crowned surface. The pivot axis allows the roller to be oscillated, that is to say pivoted, through part or all of the roller's crown surface while the roller is rolling. The pivot axis may be above, below or tangent to a highest point on the crowned roller surface which furthest away from the point of elastic application to the transfer roll or substrate and the pivot axis must also be parallel to the substrate path when contacting the transfer roll or substrate to allow roller rolling motion while still being able to pivot in a direction perpendicular to the substrate path. Preferably the pivot axis is perpendicular to a centerline of the rolling axis. By being able to pivot in a direction transverse to the substrate path while rolling, the roller is thus able to "travel" through part or all of the crowned roller surface in a direction transverse to the substrate path and thus apply elastic material in a curvilinear pattern to the transfer roll or substrate. Preferably the crown has a radius of curvature which matches a pivot radius. The pivot radius is determined by extending the pivot axis

through the centerline of a rolling axis of the roller and measuring the radius from the thus extended pivot axis/centerline intersection to the point of application of the elastic material to the transfer roll or substrate. Also preferably the crown has a radius which is equal to a maximum diameter of the crowned roller. Preferably the roller is similar to a football or a football having its pointed ends removed to provide parallel and planer opposing sides while still providing the crowned roller surface suitable for rolling.

Figure 3 shows one embodiment of such a roller having a center diameter 80 of 4.0000 inches and an end diameter 82 of 1.3166 inches at both ends. Figure 2 also shows the position of three pivot axes 84a, 84b and 84c in relation to the centerline 87 and the rolling or first axis 86a, 86b and 86c. As is seen in Figure 2, the pivot axis lies on the centerline and has an offset 88 1.0000 inch above the rolling or first axis of the first roll or roller. The overall length 89 of the roller is 5.0000 inches and the curved rolling surfaces have a radius 85 of 3.0000 inches with the two centerpoints for the diameter on the vertical centerline, 1.0000 inch above and below the rolling or first axis. Thus, this embodiment has a common centerpoint for both the pivot axis and the roller surface radius. The overall length of the roller will vary upon the specific application or use of the roller and will be dependent upon at least the width of the elastic material.

Figure 4 shows a range of oscillation 90 of the roller of Figure 2 as it is oscillated in the plane transverse to the substrate path. In this embodiment, the range of oscillation is about 40 degrees to the left or the right with the angle of the oscillation being formed with respect to the vertical centerline 87 of the roller and a line 92 perpendicular to the pivot axis and parallel to the rolling or first axis. This range of oscillation 90 allows the elastic material 4 to be placed on the transfer roll 50 in a curvilinear manner. Thus this roller with the offset pivot axis provides sufficient transverse, or cross-direction, motion, relative to the substrate path while also causing minimal disturbance and twisting to the incoming elastic material path prior to application of the elastic material to the transfer roll or substrate.

Fig. 5 shows a side view of the oscillation unit with the roller in rolling engagement with the transfer roll. As can be seen the oscillating drive arm, which forms the pivot axis, has an offset 88 1.0000 inch above the rolling or first axis of the roller.

Fig. 6 is a top view of the oscillation unit with the roller. The roller may be

held at one end, as is shown in Figure 6, or both ends of the rolling or first axis, but the roller, no matter how it is held for rolling motion, must be able to pivot as described previously. The oscillating drive oscillates as shown by the oscillating drive arrow 73.

The roller may be constructed in any manner so the elastic material remains on the roller and does not bunch up or snag upon application. The specific roller and transport roll surface treatments will vary depending on the specific application or use, the location of the roller pivot axis and substrate characteristics. The roller and transport roll may have any conventionally known treated surface which facilitates the application of the elastic material to the substrate.

The apparatus and method rely on the ability of the elastic material to track the highest surface speed of the roller so that transverse, or cross-machine, displacement is achieved while oscillating the roller.

An oscillating drive 70 oscillates the oscillation unit in a plane generally transverse to the substrate path through an oscillating drive arm 72, as shown in Figs. 5 and 6. The oscillating drive may be of a type well-known in the art and consequently will not be further described herein.

Oscillating drive arm 72 is fixed to oscillating drive 70. Roller 42 must have a roller arm 43 mounted for pivotation to oscillating drive arm 72 so that the roller arm is capable of oscillating in a plane transverse to the direction of movement of the substrate while rolling. Fig. 6 shows a top view of the oscillation unit. Arrow 73 is the direction of oscillation or pivotation. The oscillating drive arm and roller arm may be a single connecting arm or multiple connecting arms cooperating so as to oscillate the roller in the manner described herein while the first roll is in rolling engagement with either the transfer roll or the substrate. The oscillating drive arm may also be directly connected to the roller. The roller may be held at either or both ends of an axis which allows rolling, but the roller, no matter how it is held for rolling motion, must be able to pivot as described previously.

There may be other rolls in the oscillation unit, however this is not a requirement. Optionally the guide may also be part of the oscillation unit. It is a requirement that the roll that is actually in engagement with either the transfer roll or the substrate be in both rolling and pivoting engagement, as previously described with the transfer roll or substrate.

The roller, with the engaged elastic material, is in rolling and pivoting engagement with either the transfer roll 50 in one embodiment or directly with the substrate 7 in a second embodiment. The elastic material is then transferred from the roller to either the transfer roll in a curvilinear configuration and then applied to the substrate (Figure 1) or directly to the substrate in a curvilinear configuration.

The transfer roll, with the engaged curvilinear elastic material, is in rolling engagement with the substrate, and rotates to apply the elastic material to the substrate in the desired curvilinear pattern. A nip roll 60 working in rolling cooperation with the transfer roll or the roller, assists the transfer roll, or the roller, in placing the elastic material onto the substrate with a desired amount of pressure to properly secure the elastic material to the substrate in the desired curvilinear pattern. Optionally, transfer roll/nip roll configuration may include or be replaced by the bonding apparatus in the form of an ultrasonic unit able to properly secure the elastic material at the location where the elastic material is applied to the substrate. Also while it is possible to use multiple transfer rolls in the present invention, it is less complex and therefore preferable to utilize only a single transfer roll, even when utilizing multiple rollers as is shown in FIG. 1.

The transfer roll may also be a variable velocity roll, with or without a hot knife, or other type of cutting roll such that the elastic material is curved, held, cut and applied in discrete units in the desired curvilinear manner. Other conventional measures, such as vacuum and/or roll surface coatings, may be used in conjunction with the transfer roll to keep the elastic material engaged on the transfer roll.

After passing through the defined by the transfer roll and nip roll or the roller and nip roll, the substrate with the attached curvilinear elastic material continues on the substrate path for further processing.

The elastic material may be leg elastic, but preferably the elastic materials define the previously described leg cuff/containment flap elastic materials.

Several advantages are obtained from the present apparatus, method. First, the overall apparatus is not complex. Second, this apparatus and method allows high speed placement of wide band elastic materials onto a substrate, while third, allowing more severe angular displacement of the elastic material, with respect to the substrate path 25, in the composite web structure to achieve a better fit of the final article about the body of the wearer.

An apparatus and method has been described for applying elastic materials having a curvilinear path to a continuously moving substrate. The substrate and elastic material composite may be stored for later use in any known manner or alternatively, the composite may be used immediately in the fabrication of disposable garments such as disposable diapers. When used in a disposable diaper, the curved elastic in each individual diaper fabricated from the substrate and elastic material composite provides elastic materials which are contoured to fit the shape of the body on which the diaper is worn and thereby provide a better fit or seal of the diaper against the body. Moreover, the benefit of the method and apparatus of this invention may be obtained while manufacturing elasticized disposable diapers or other disposable garments at very high production speeds and having severe elastic material angular placement.

Those skilled in the art will now see that certain modifications can be made to the apparatus and methods herein disclosed with respect to the illustrated embodiments, without departing from the spirit of the instant invention. And while the invention has been described above with respect to the preferred embodiments, it will be understood that the invention is adapted to numerous rearrangements, modifications, and alterations, and all such arrangements, modifications, and alterations are intended to be within the scope of the appended claims.

To the extent the following claims use means plus function language, it is not meant to include there, or in the instant specification, anything not structurally equivalent to what is shown in the embodiments disclosed in the specification.

CLAIMS

Having thus described the invention, what is claimed is:

1. Apparatus for applying at least one web of elastic material in a curvilinear path onto a continuously moving substrate, said apparatus comprising:
 - (a) transporting apparatus for continuously moving the substrate along a substrate path;
 - (b) a rotatable transfer roll, having a transfer roll axis, and being adapted to be in rolling engagement with the substrate and to press the elastic material against the substrate along the curvilinear path;
 - (c) an oscillation unit having at least a first roll having a first roll axis generally transverse to the substrate path, said first roll being mounted for rolling engagement with a surface of said transfer roll, and said first roll pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally transverse to the substrate path while rolling and thus being effective to apply the elastic material to said transfer roll along the curvilinear path;
 - (d) an elastic material supply providing the elastic material to said first roll of said oscillation unit;
 - (e) an oscillating drive connected to said oscillation unit and oscillating said oscillation unit first roll such that the first roll pivots in a plane generally transverse to the substrate path; and
 - (f) bonding apparatus securing the elastic material to the substrate along the curvilinear path when the elastic material is pressed onto the substrate by said transfer roll.
2. Apparatus as recited in claim 1 wherein the first roll is generally oval, the first roll axis being the major axis of said oval first roll.
3. Apparatus as recited in claim 1 wherein said bonding apparatus comprises an adhesive applicator which applies adhesive to the elastic material upstream of said

first roll such that the adhesive contacts the substrate and thereby secures the elastic material to the substrate when the elastic material is pressed onto the substrate by said transfer roll.

4. Apparatus as recited in claim 1 further comprising a guide between the elastic material supply and the first roll guiding the elastic material to the first roll of the oscillation unit.

5. Apparatus as recited in claim 4 wherein said oscillation unit includes said guide.

6. Apparatus as recited in claim 1 wherein said elastic material supply is a combined leg cuff and a containment flap material supply.

7. Apparatus as recited in claim 1 wherein said transfer roll is a variable velocity vacuum transfer roll.

8. Apparatus as recited in claim 1 wherein said bonding apparatus further comprises a nip roll to help secure the elastic material to the substrate.

9. Apparatus as recited in claim 1 wherein said bonding apparatus further comprises an ultrasonic apparatus securing the elastic material to the substrate.

10. Apparatus for applying at least one web of elastic material in a curvilinear path onto a continuously moving substrate, said apparatus comprising:

- (a) transporting apparatus for continuously moving the substrate along a substrate path;
- (b) an oscillation unit having at least a first roll having a first roll axis, said first roll being mounted for rolling engagement with a surface of said substrate, and said first roll pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally traverse to the substrate path while rolling and thus being effective to apply the elastic material to

said substrate along the curvilinear path;

- (c) an elastic material supply for providing the elastic material to said first roll of said oscillation unit;
- (d) an oscillating drive connected to said oscillation unit and oscillating said oscillation unit first roll such that the first roll pivots in a plane generally traverse to the substrate path; and
- (e) a bonding apparatus securing the elastic material to the substrate along the curvilinear path when the elastic material is pressed onto the substrate by said transfer roll.

11. Apparatus as recited in claim 10 wherein the first roll is generally oval, the first roll axis being the major axis of said oval first roll.

12. Apparatus as recited in claim 10 wherein said bonding apparatus comprises an adhesive applicator which applies adhesive to the elastic material upstream of said first roll such that the adhesive contacts the substrate and thereby secures the elastic material to the substrate when the elastic material is pressed onto the substrate by said first roll.

13. Apparatus as recited in claim 1 further comprising a guide between the elastic material supply and the first roll guiding the elastic material to the first roll of the oscillation unit.

14. Apparatus as recited in claim 4 wherein said oscillation unit includes said guide.

15. Apparatus as recited in claim 1 wherein said elastic material supply is a combined leg cuff and a containment flap material supply.

16. Apparatus as recited in claim 1 wherein said bonding apparatus further comprises a nip roll to help secure the elastic material to the substrate.

17. Apparatus as recited in claim 1 wherein said bonding apparatus further comprises an ultrasonic apparatus securing the elastic material to the substrate.

18. A method for applying at least one web of elastic material in a curvilinear path onto a continuously moving substrate, said method comprising:

- (a) moving the substrate along the substrate path;
- (b) supplying the elastic material to at least a first roll having a first roll axis, said first roll being mounted for rolling engagement with a surface of said transfer roll, and said first roll pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally traverse to the substrate path while rolling and thus being effective to apply the elastic material to said transfer roll along the curvilinear path;
- (c) oscillating the oscillation unit such that the first roll pivots in a plane generally traverse to the substrate path;
- (d) applying the elastic material from the first roll to the transfer roll in a curvilinear path configuration;
- (e) applying the elastic material, in the curvilinear path configuration, from the transfer roll to the substrate; and
- (f) bonding the elastic material, in the curvilinear path configuration, to the substrate.

19. A method as recited in claim 18 wherein the oscillating of the oscillation unit comprises rotationally oscillating the oscillation unit in a in a plane generally traverse to the substrate path.

20. A method as recited in claim 18 wherein the bonding of the elastic material to the substrate comprises applying adhesive to the elastic material upstream of the first roll such that the adhesive contacts the substrate and thereby secures the elastic material to the substrate when the elastic material is applied onto the substrate by the transfer roll.

21. A method as recited in claim 18 wherein the supplying of the elastic material to the first roll of an oscillation unit comprises guiding the elastic material about to a guide prior to supplying the elastic material to the first roll of the oscillation unit.

22. A method as recited in claim 18 wherein the supplying of the elastic material to the first roll of the oscillation unit comprises guiding the elastic material about an oscillation unit guide prior to supplying the elastic material to the first roll of the oscillation unit.

23. A method as recited in claim 18 wherein the supplying of the elastic material to the first roll of the oscillation unit comprises supplying a combined leg cuff and containment flap material to the first roll of the oscillation unit.

24. A method as recited in claim 18 comprising supplying the elastic material from the first roll to a variable velocity vacuum transfer roll.

25. A method as recited in claim 18 further comprising nipping the elastic material and the substrate between the transfer roll and a nip roll.

26. A method as recited in claim 18 wherein the bonding of the elastic material to the substrate is through use of an ultrasonic bonding apparatus.

27. A method for applying at least one web of elastic material in a curvilinear path onto a continuously moving substrate, said method comprising:

- (a) moving the substrate along the substrate path;
- (b) supplying the elastic material to at least a first roll having a first roll axis, said first roll being mounted for rolling engagement with a surface of said substrate, and said first roll pivoting about a pivot axis parallel to the substrate path with the pivot axis plane further from the point of rolling engagement than the first roll axis such that the first roll is operative to pivot in a plane generally traverse to the substrate path while rolling and thus being effective to apply the elastic material to said substrate along the curvilinear path;
- (c) oscillating the oscillation unit in a path such that the first roll pivots in a plane generally traverse to the substrate path;
- (d) applying the elastic material from the first roll to the substrate in the curvilinear path configuration; and
- (e) bonding the elastic material, in the curvilinear path configuration, to

the substrate.

28. A method as recited in claim 27 wherein the oscillating of the oscillation unit comprises rotationally oscillating the oscillation unit in a plane generally traverse to the substrate path.

29. A method as recited in claim 27 wherein the bonding of the elastic material to the substrate comprises applying adhesive to the elastic material upstream of the first roll such that the adhesive contacts the substrate and thereby secures the elastic material to the substrate when the elastic material is applied onto the substrate by the first roll.

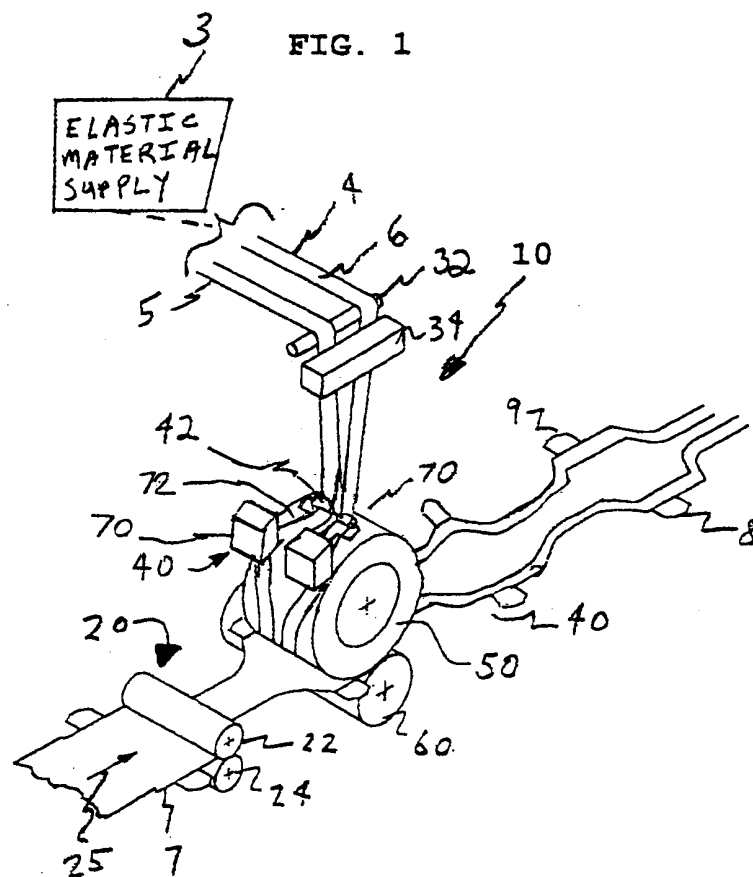
30. A method as recited in claim 27 wherein the supplying of the elastic material to the first roll of the oscillation unit comprises guiding the elastic material to a guide prior to supplying the elastic material to the first roll of the oscillation unit.

31. A method as recited in claim 27 wherein the supplying of the elastic material to the first roll of the oscillation unit comprises guiding the elastic material to an oscillation unit guide prior to supplying the elastic material to the first roll of the oscillation unit.

32. A method as recited in claim 27 wherein the supplying of the elastic material to the first roll of the oscillation unit comprises supplying a combined leg cuff and containment flap material to the first roll of the oscillation unit.

33. A method as recited in claim 27 further comprising nipping the elastic material and the substrate between the first roll and a nip roll.

34. A method as recited in claim 27 wherein the bonding of the elastic material to the substrate is through use of an ultrasonic bonding apparatus.



2/4

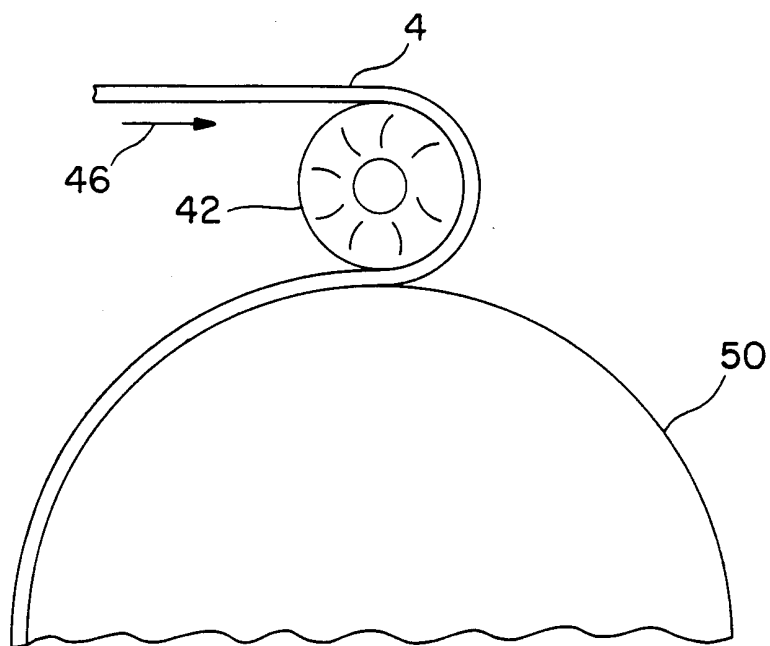


FIG. 2

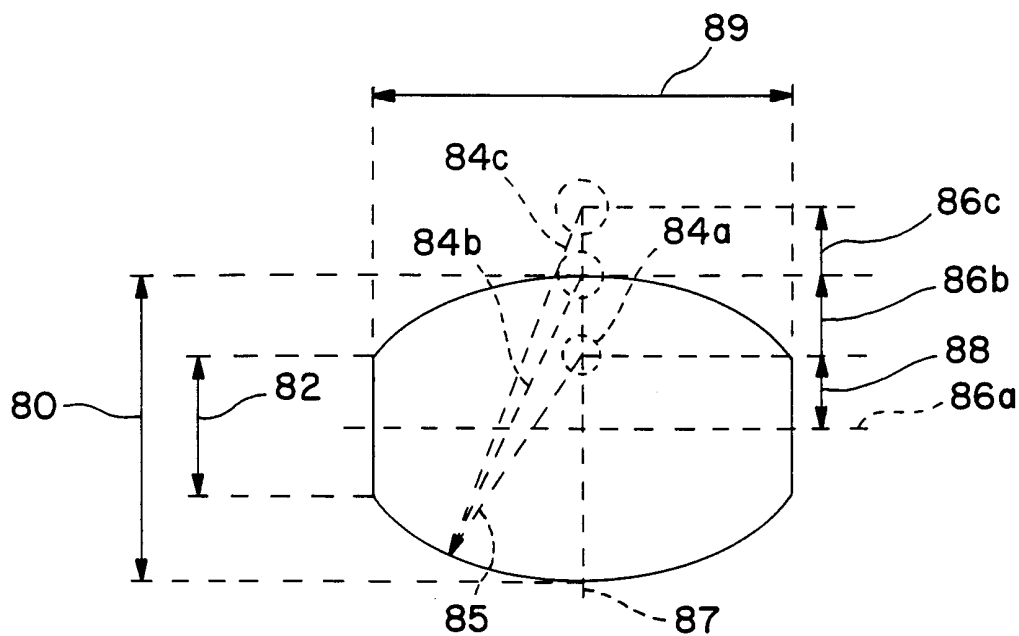


FIG. 3

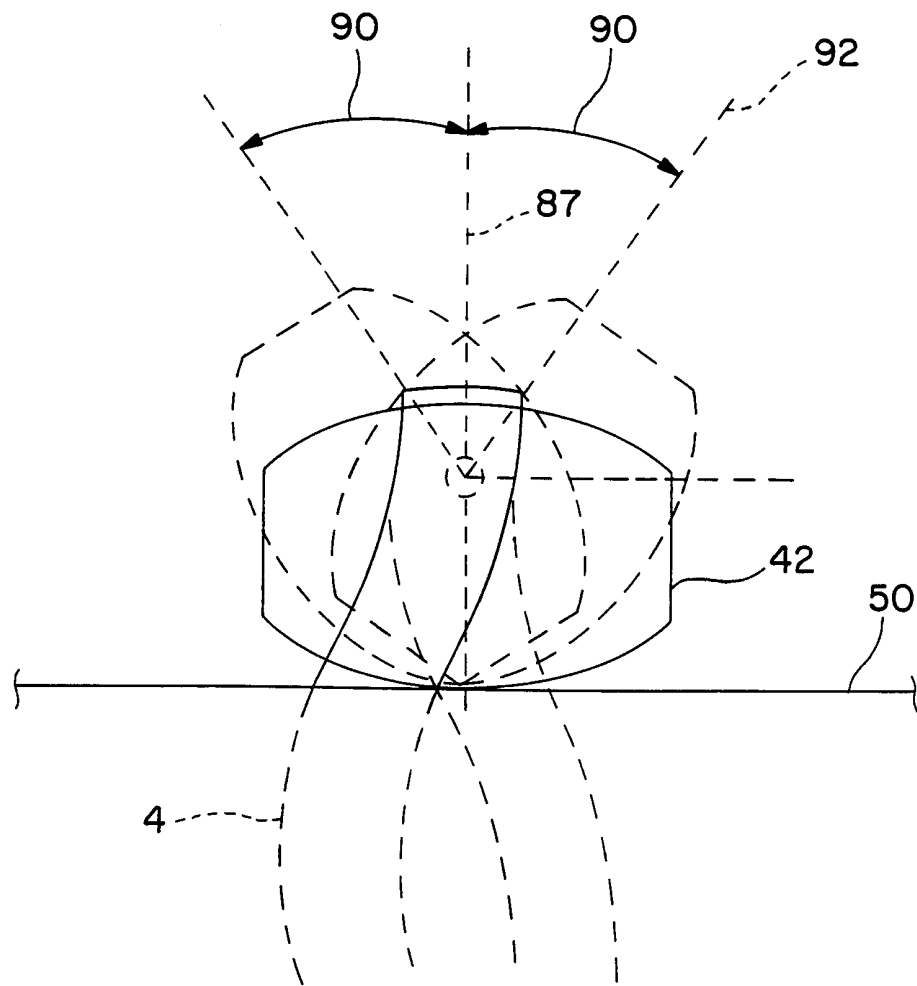


FIG. 4

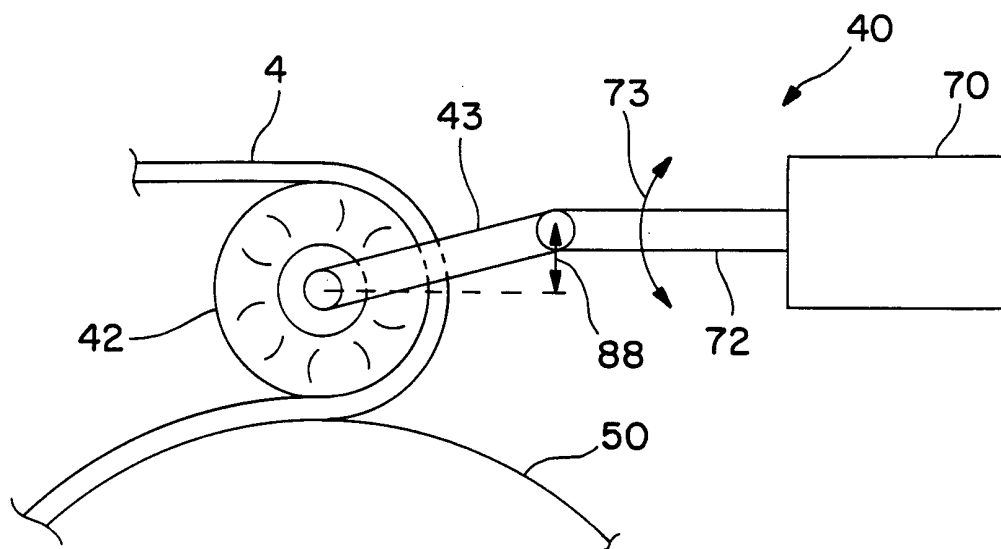


FIG. 5

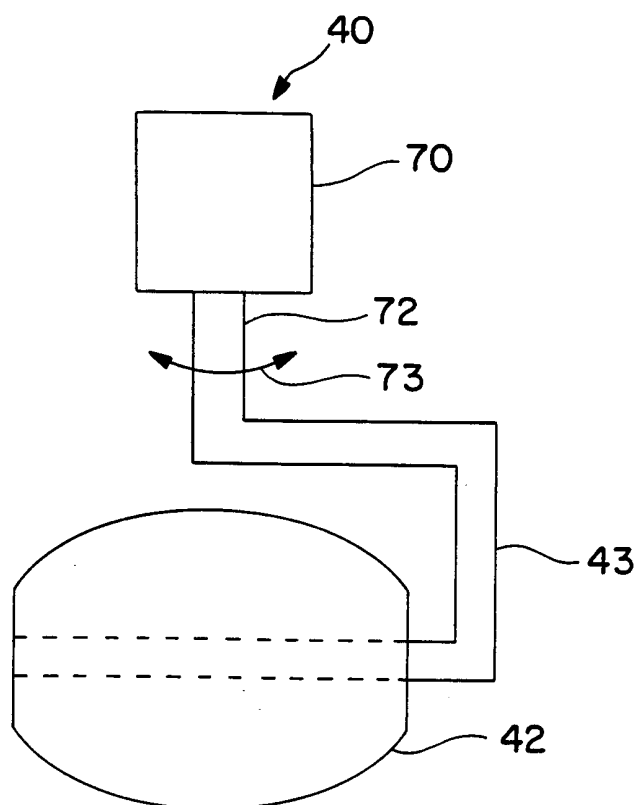


FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 00/34472

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61F13/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 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)

WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 915 767 A (RAJALA GREGORY J ET AL) 10 April 1990 (1990-04-10) cited in the application abstract; claims; figure 1 ---	1-34
A	US 4 917 746 A (KONS HUGO L ET AL) 17 April 1990 (1990-04-17) cited in the application ---	
A	US 3 828 367 A (BOURGEOIS A) 13 August 1974 (1974-08-13) cited in the application ---	
A	US 5 827 387 A (REYNOLDS GARY MACK ET AL) 27 October 1998 (1998-10-27) cited in the application ---	
	-/--	

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

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

8 March 2001

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 110 403 A (EHLERT THOMAS D) 5 May 1992 (1992-05-05) cited in the application -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/34472

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4915767 A	10-04-1990	AU 4526089 A CA 2001912 A WO 9005512 A ZA 8908485 A	12-06-1990 17-05-1990 31-05-1990 25-07-1990
US 4917746 A	17-04-1990	AU 556926 B AU 1507583 A BR 8303213 A CA 1195963 A GB 2123272 A,B IT 1173723 B MX 156384 A ZA 8303841 A	27-11-1986 05-01-1984 31-01-1984 29-10-1985 01-02-1984 24-06-1987 16-08-1988 29-02-1984
US 3828367 A	13-08-1974	FR 2112075 A DE 2146808 A GB 1356603 A	16-06-1972 10-08-1972 12-06-1974
US 5827387 A	27-10-1998	AU 720546 B AU 7870798 A EP 0952801 A WO 9827905 A	01-06-2000 17-07-1998 03-11-1999 02-07-1998
US 5110403 A	05-05-1992	NONE	