

Description

[0001] The present invention relates to an apparatus for holding and spreading a web.

[0002] US-A-5 307 973, issued on 3rd May 1994, discloses a web spreading roller which supports a plurality of profiled rods upon which the web is gripped.

[0003] Disposable, absorbent articles, such as diapers, often incorporate elastic elements in order to ensure a good and comfortable fit against or around the body of the wearer.

[0004] There are many known methods of positioning and attaching elastic elements to continuous webs in the process of manufacture of absorbent articles. EP-A-0 652 175 discloses one such method.

[0005] However, when an elastic element is placed under strain, for example by prestretching before being applied to the web, or by a separate activation step, then any subsequent operations upon that web generally require that the elastic element be maintained in, or returned to, its extended state. This may not require any particular precautions provided the strain in the elastic element is relatively small. One example of a subsequent operation is disclosed in WO96/20076.

[0006] WO96/20076, published on 4th July 1996, discloses a method and apparatus for making an undergarment having overlapping or butt-type side seams. The undergarment is formed from an essentially flat blank which usually has elastic elements attached to it, for example waist elastics. This application discloses that the blanks are held in a defined position on a conveyor belt, and the elastic elements in the blanks are prevented from contracting and from gathering the blanks.

[0007] However, in case the strain in the elastic element is relatively high, then localised contacting or gathering of the web (or blank) becomes an increasing problem. It becomes necessary to provide a means for stretching or spreading the elastic element in order to return it to its extended state.

[0008] The aim of the present invention is to provide a means for stretching or spreading a web, or an elastic element which is attached to a web. In particular it is an aim of the present invention to provide a means for stretching or spreading an elastic element on a high-speed manufacturing machine, when the elastic element is oriented substantially in the cross-machine direction.

Summary of the Invention

[0009] This is achieved by an apparatus comprising at least an first and second web holding means, the first web holding means being attached to a shaft, the shaft being displaced from an axis of rotation; the apparatus further comprising a means for moving the shaft so that the distance between the first and second web holding means is alternately increased and decreased as the

apparatus rotates about the axis of rotation.

Brief Description of the Drawings

[0010]

Figure 1 shows a cross-section through an apparatus of a preferred embodiment of the present invention.

Figure 2 shows a schematic end-view of the apparatus of a preferred embodiment of the present invention.

Detailed Description of the Invention

[0011] The present invention provides an apparatus for holding and spreading a web, or an elastic element of a web; in particular for spreading a web or elastic element in the cross-machine direction of a high speed manufacturing machine. One such elastic element which may be spread is the waist elastic of a diaper or incontinence product.

[0012] The apparatus of the present invention comprises web holding means which hold and spread the web. The spreading action is achieved by means of a shaft which displaces the web holding means during the cycle of the apparatus. By "web holding means" it is meant herein any means for picking up and holding any part of the web, or any component which is attached to the web. Typically it is the elastic component of the web which is picked up and held by the web holding means. Any holding and clamping mechanism may be used. Vacuum blocks are particularly preferred.

[0013] In a preferred embodiment of the present invention, the shaft is oriented substantially parallel to the axis of rotation, and the means for moving the shaft displaces the shaft longitudinally. By "longitudinally" it is meant here that the shaft is displaced, relative to the main cylinder, in a direction along the axis of the shaft.

[0014] In a still further preferred embodiment of the present invention, the apparatus comprises two shafts which are both aligned substantially parallel to the axis of rotation, and which are equidistant from the axis of rotation the axis of rotation being oriented between the two shafts. The apparatus further comprises two pairs of web holding means, a first and second web holding means, and a third and fourth web holding means; wherein the first and third web holding means are attached to the first shaft, and the third and fourth web holding means are attached to the second shaft so that the distance between the first and second web holding means, and the distance between the third and fourth web holding means is alternately increased and decreased as the apparatus rotates about the axis of rotation.

[0015] A particular aspect of the invention can be well understood by means of analogy. The shaft or

shafts can be compared to piston rods, and the web holding means can be compared to the pistons of an internal combustion engine. The web holding means has a top dead centre position analogous to the top dead centre position of a piston in an internal combustion engine. The means for moving the shaft or shafts longitudinally displaces the web holding means from the top dead centre when the apparatus is rotated from 0° to 180° about the axis of rotation, and wherein the means for moving the shaft or shafts longitudinally returns the web holding means to the top dead centre when the apparatus is rotated from 180° to 360°.

[0016] Figure 1 shows a cross-section through an apparatus of the present invention. The apparatus consists of a main cylinder 10 which rotates about an axis of rotation 15. The incoming web travels around an arc of the path which is traced by the outer surface of the main cylinder 10 and, whilst it travels around this arc, an elastic portion of the web is stretched in the cross machine direction (i.e. in a direction parallel to the axis of rotation 15). In Figure 1 a pair of vacuum blocks 1a, 1b pick up and grip opposing ends of an elastic element of the incoming web. At this point in the cycle the outer edges of the vacuum blocks 1a, 1b are preferably spaced apart by a minimum distance, for example, by about 220 mm. The first vacuum block 1a is directly connected to a first shaft 2a and the second vacuum block 1b is connected by means of a cross beam 3 to a second shaft 2b. The first and second shafts 2a, 2b are supported by linear bearings 13 in the side walls of the main cylinder 10, and the shafts are displaced longitudinally within the main cylinder 10 in opposing directions when the main cylinder 10 rotates about the axis of rotation 15. In Figure 1, as the main cylinder 10 rotates, the first shaft 2a is displaced longitudinally from left to right, whilst at the same time the second shaft 2b is displaced longitudinally from right to left. Hence the first vacuum block 1a is moved from left to right, and the second vacuum block 1b is moved from right to left thereby increasing the distance between the vacuum blocks and spreading the elastic portion of the web which is gripped between the vacuum blocks. When the cylinder 10 has been rotated through 180° then the first and second vacuum blocks 1a, 1b are preferably spaced by a maximum distance, for example, by about 300 mm. (The positions of the first and second shafts 2a, 2b are now inverted with respect to each other, and the first and second vacuum blocks now occupy the positions illustrated as 1d and 1c in Figure 1).

[0017] In Figure 1 the first and second shafts 2a, 2b are connected through spherical joints 5 to a wobble plate 4, and the wobble plate 4 is driven by the main shaft 11 through a spherical joint 6. The wobble plate 6 is supported by a rotary bearing 8. The distance through which the vacuum blocks spread the web can be readily adjusted by adjusting the angle of the wobble plate 4 relative to the axis of rotation 15. The adjustment is carried out by means of adjustment mechanism 14

and stationary adjustment plate 9.

[0018] In an alternative embodiment of the present invention the wobble plate can be replaced by a cam mechanism where the first and second shafts are displaced longitudinally by cam followers. Alternatively other linear actuators, such as pneumatic cylinders, may be used and are considered to fall within the scope of the present invention.

[0019] Figure 2 shows a schematic end-view of the apparatus of the present invention. In the illustrated embodiment the main cylinder 10 of the apparatus of the present invention is shown positioned beneath a cylinder 20 upon which a unit operation, such as cutting side notches in the web, is carried out. In Figure 2 the incoming web 100 comprises a continuous web in the machine direction, and elastic components 101 fixed to the web at regular intervals. The elastic components 101 are not held in the cross-machine direction and consequently they are contracted in the cross machine direction which locally constricts the web. The incoming web 100 is picked up at the position indicated as 10a in Figure 2. The vacuum blocks grip the opposing ends of the elastic component 101. When the web has reached the position indicated as 10b in Figure 2 the elastic components 101 have been fully spread and the edges of the web have been returned to a substantially parallel configuration. The web is then transferred to the second cylinder 20 upon which the unit operation is carried out and the web leaves the second cylinder at the position indicated as 20c.

[0020] The benefits of the present invention are particularly evident when the maximum distance between at least one pair of web holding means is increased by at least 20%, preferably at least 35%. In contrast, prior art web spreading devices achieve a spread of less than about 10%. (These values being derived by dividing the width of the spread web by the width of the unsprung web, and then subtracting 1 and multiplying by 100 to express as percentage).

Claims

1. An apparatus for holding and spreading a web, wherein the apparatus comprises at least an first and second web holding means (1a, 1b), the first web holding means (1a) being attached to a shaft (2a), the shaft (2a) being displaced from an axis of rotation (15); the apparatus further comprising a means (4) for moving the shaft (2a) so that the distance between the first and second web holding means (1a, 1b) is alternately increased and decreased as the apparatus rotates about the axis of rotation (15).
2. An apparatus according to claim 1 wherein the shaft (2a) is oriented substantially parallel to the axis of rotation (15), and wherein the means (4) for moving the shaft displaces the shaft (2a) longitudinally

nally.

3. An apparatus according to either of claims 1 or 2, wherein the apparatus comprises two shafts (2a, 2b) which are both aligned substantially parallel to the axis of rotation (15), and which are equidistant from the axis of rotation, the axis of rotation (15) being oriented between the two shafts (2a, 2b), and wherein the apparatus further comprises two pairs of web holding means, a first and second web holding means (1a, 1b), and a third and fourth web holding means (1c, 1d); wherein the first and third web holding means (1a, 1c) are attached to the first shaft (2a), and the third and fourth web holding means (1c, 1d) are attached to the second shaft (2b) so that the distance between the first and second web holding means (1a, 1b), and the distance between the third and fourth web holding means (1c, 1d) is alternately increased and decreased as the apparatus rotates about the axis of rotation (15).
4. An apparatus according to any of the previous claims, wherein at least one of the web holding means (2a, 2b) has a top dead centre position, and wherein the means for moving the shaft or shafts longitudinally displaces the web holding means from the top dead centre when the apparatus is rotated from 0° to 180° about the axis of rotation (15), and wherein the means for moving the shaft or shafts longitudinally returns the web holding means to the top dead centre when the apparatus is rotated from 180° to 360°.
5. An apparatus according to claim 4 wherein the means for moving the shaft or shafts longitudinally is a cam mechanism or a wobble plate (4).
6. An apparatus according to any of the previous claims wherein the maximum distance between at least one pair of web holding means is increased by at least 20%, preferably at least 35%.
7. An apparatus according to any of the previous claims wherein the web holding means are vacuum blocks.

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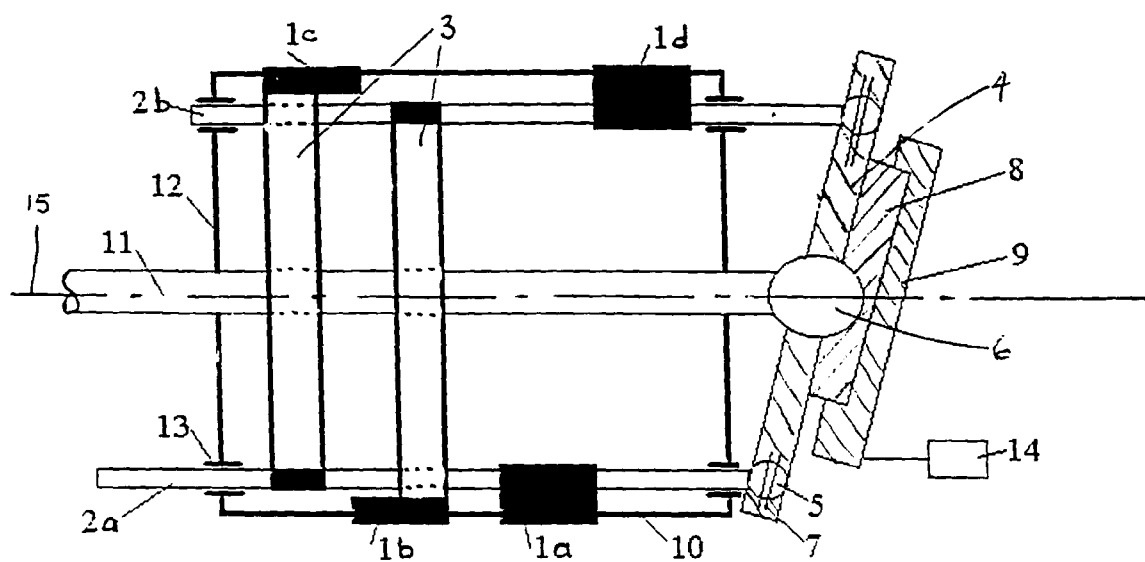


Fig 1

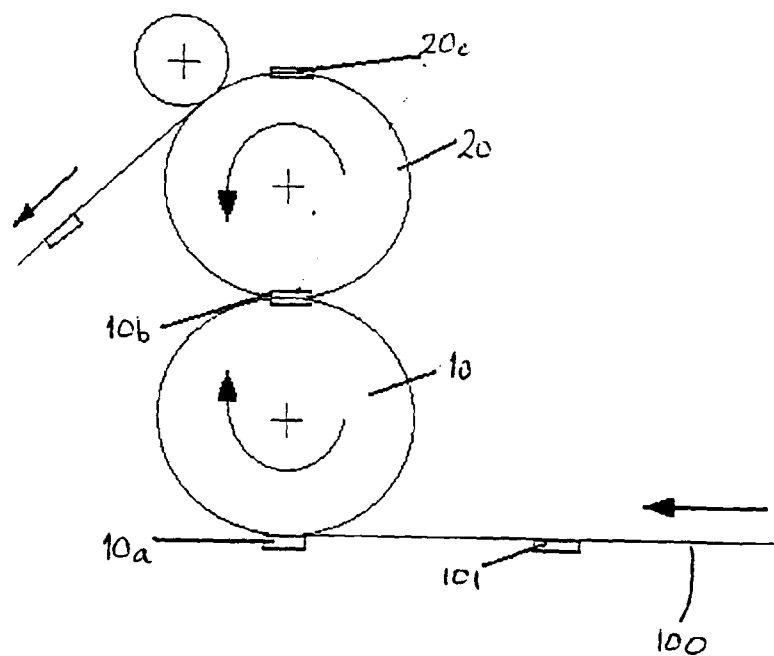


Fig 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 12 3213

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE 31 01 158 A (SANDO IRON WORKS) 26 November 1981 * page 4, line 24 - page 5, line 3 *	1,2,4-6	B65H23/025
Y	* page 5, line 20 - page 7, line 28; claim 1; figures 1,2 *	7	
Y,D	WO 96 20076 A (THE PROCTER & GAMBLE COMPANY) 4 July 1996	7	
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X	DE 706 195 C (C. H. WEISBACH) 20 May 1941 * page 2, line 80 - page 3, line 39; figures *	1,2,4-6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
BERLIN		22 April 1999	Fuchs, H
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 98 12 3213

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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22-04-1999

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