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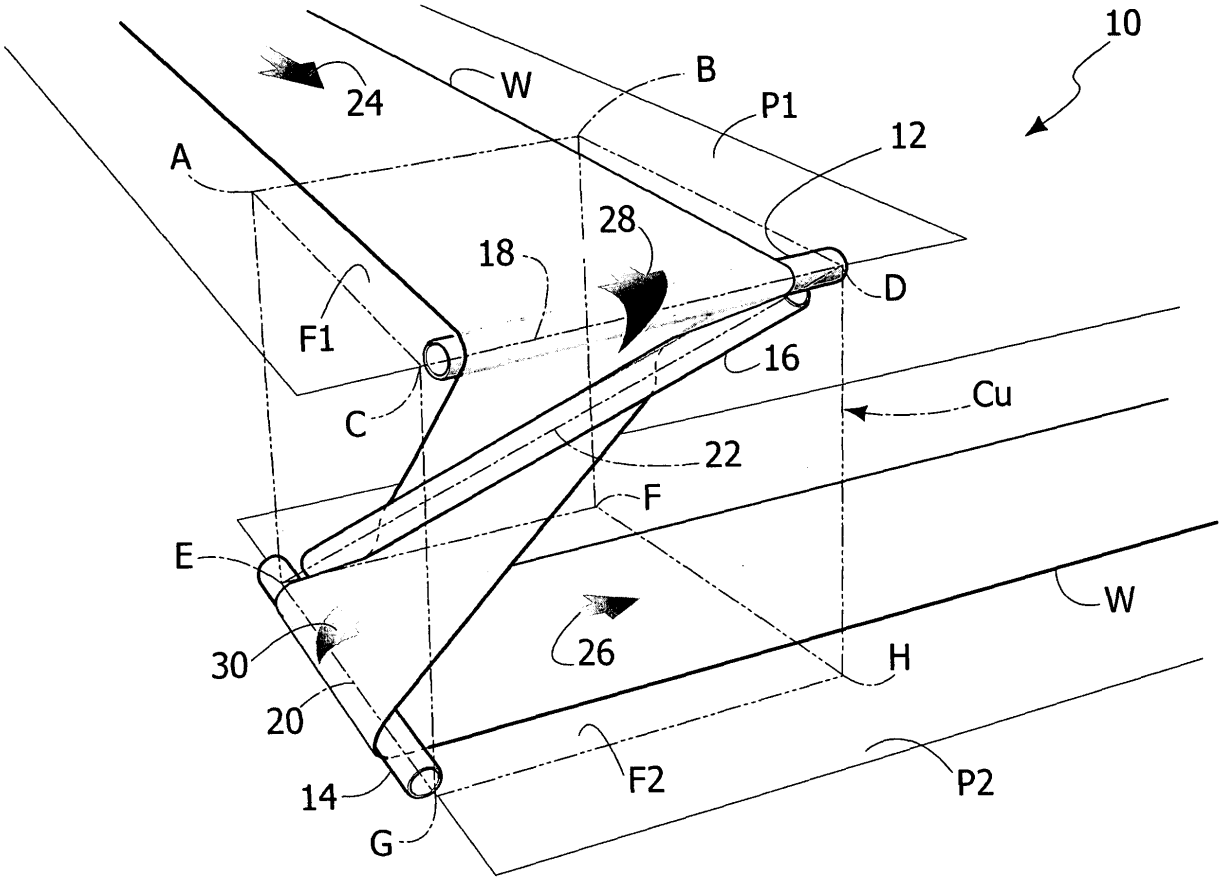
(54) Method and device for deflecting a moving web

(57) A method for deflecting a moving web (W), comprising the steps of deflecting the moving web (W) about three axes (18, 20, 22), two of which (18, 20) are set according to two mutually orthogonal sides (CD, EG) of a cube (Cu), set on two opposite faces (F1, F2) of said cube (Cu), and in which the third axis (22) is set according to a diagonal (E) of said cube (Cu) that joins said sides (CD, EG).



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Description

Field of the invention

[0001] The present invention relates to a method and a device for deflecting a moving web.

[0002] The invention has been developed in particular in view of its application to automatic machines for the production of absorbent sanitary products. In this application, there is frequently the need to deflect by 90° a continuous web that moves in the direction of its own longitudinal axis.

Description of the prior art

[0003] The most common known solution for deflecting a moving web by 90° envisages using a fixed entraining bar set in a plane parallel to the plane of the incoming web and to the plane of the outgoing web and set with its own axis inclined by 45° with respect to the directions of movement of the incoming web and of the outgoing web.

[0004] The main drawback of the known solution is represented by the intense forces that are generated during the process of deviation of the web. In fact, in operation a rather big difference is generated between the tension on the outgoing web and the tension on the incoming web.

[0005] The dynamics of the phenomenon is well explained by the band-brake equation:

$$\frac{F_2}{F_1} = e^{\mu\theta}$$

where:

- μ is the coefficient of friction between the surface of the bar and the band;
- θ is the angle of winding of the web on the entraining bar expressed in radians;
- F1 is the force on the incoming web; and
- F2 is the force on the outgoing web.

[0006] In the known solutions, various arrangements have been proposed for reducing the force necessary to deflect the web by acting on the friction between the web and the deflecting bar, using jets of air within the deflecting bar, cooled bars, surface coatings of the bars with materials with low coefficient of friction, etc. With these arrangements, acceptable but not optimal results are obtained.

Object and summary of the invention

[0007] The object of the solution described herein is to overcome the drawbacks of the known art.

[0008] According to the solution described herein, said object is achieved by a method for deflecting a moving web having the characteristics forming the subject of Claim 1 and by a device for deflecting a moving web having the characteristics forming the subject of Claim 4.

[0009] The claims form an integral part of the technical teaching provided herein.

[0010] As will emerge clearly from the ensuing detailed description, the solution described herein envisages feeding the incoming web along a first plane, feeding the outgoing web along a second plane parallel to the first, and setting a deflecting element between said planes oriented according to the diagonal of a cube with two opposite faces contained in the plane of the incoming web and in the plane of the outgoing web.

[0011] This solution enables a reduction of more than 30% of the variation of tension on the web between entry and exit with respect to a known solution with entraining bar at 45°.

Brief description of the annexed drawing

[0012] The present solution will now be described in detail with reference to the attached drawing, which is provided purely by way of non-limiting example and illustrates a perspective view of an embodiment of a device for deflecting a moving web.

Detailed description of an example of embodiment

[0013] With reference to the annexed drawing, the number 10 designates a device for deflecting by 90° a web W moving in the direction of its own longitudinal axis. The device 10 comprises a first deflecting element 12, a second deflecting element 14, and a third deflecting element 16. In the example illustrated in the figures, the deflecting elements 12 and 14 are constituted by idler rollers, which can turn freely about respective axes 18, 20, whilst the element 16 is constituted by a stationary rod or bar.

[0014] The incoming web W advances in a direction designated by 24, and the outgoing web W advances in a direction 26 set at 90° with respect to the incoming direction 24.

[0015] The axis 18 of the first deflecting element 12 extends in a direction transverse to the direction 24 of the incoming web W. The axis 20 of the second deflecting element 14 extends in a direction transverse to the direction 26 of the outgoing web W.

[0016] The axis 18 of the first deflecting element 12 is contained in a first plane P1 parallel to the plane of the incoming web W. In a corresponding way, the axis 20 of the second deflecting element 14 is contained in a second plane P2 parallel to the plane of the outgoing web W. The first plane P1 and the second plane P2 are parallel to one another.

[0017] The axis 18 of the first deflecting element 12 and the axis 20 of the second deflecting element 14 ex-

tend according to two sides of a cube Cu having two opposite faces F1 and F2, contained, respectively, in the planes P1 and P2. The vertices of the cube Cu are designated by A, B, C, D, E, F, G, H. The face F1 is defined between the vertices A, B, C, D. The face F2 is defined between the vertices E, F, G, H. The axis 18 extends along the side joining the vertices C, D, and the axis 20 extends along the side joining the vertices E, G.

[0018] The axis 22 of the third deflecting element 16 extends along a diagonal of the cube Cu that joins the sides corresponding to the axes 18, 20 to one another. The diagonal along which the axis 22 extends joins the vertices E, D to one another.

[0019] The incoming web W is wound on the first deflecting element 12 in the direction indicated by the arrow 28. The web W is then deflected by the third deflecting element 22 and is wound on the second deflecting element 14 in the direction indicated by the arrow 30. The second deflecting element 14 deflects the web W in the outgoing direction 26. The terminal stretch of the incoming web and the initial stretch of the outgoing web are parallel to the faces F1 and F2.

[0020] All the points of the web W follow paths with the same length during traversal of the device 10. The geometry of the deflecting device 10 ensures the transverse stability of the web W both on the incoming web and on the outgoing web. This geometry reduces the angle of wrap of the web on the third deflecting element 22 and enables a reduction in the variation of tension on the web W between entry and exit as compared to the traditional solutions, as indicated by the band-brake equation.

[0021] A comparative test was conducted on the device according to the present invention with an entraining device according to the known art, and the results set forth in what follows were obtained. The test was conducted with a web of polyethylene with a mass per unit area of 20 g/m^2 and a width of 180 mm. The speed of the web during the test was kept constant at a value of 250 m/min. The tension of the incoming web was measured at entry to and at output from the deflecting device using load cells with a DIGITRAC measuring unit.

[0022] A comparison measurement was made with a deflecting device according to the prior art using a fixed deflecting bar having a diameter of 40 mm and with external surface coated with Teflon for reducing the coefficient of friction to the minimum. The bar was oriented at 45° with respect to the direction of entry and to the direction of exit of the web. The axis of the bar was contained in a plane parallel both to the plane of the incoming web and to the plane of the outgoing web. The data obtained are the following:

- tension of the outgoing web: 1.2 kg;
- tension of the incoming web: 0.4 kg;
- variation of tension: 0.8 kg.

[0023] With a system according to the present invention, given the same characteristics of the material, the following data are obtained:

- tension of the outgoing web: 0.9 kg;
- tension of the incoming web: 0.4 kg;
- variation of tension: 0.5 kg.

[0024] Hence, the device according to the present invention enables a reduction of 46% to be obtained in the variation of tension on the web W during the 90° deflection.

Claims

1. A method for deflecting a moving web (W), **characterized in that** it comprises the steps of deflecting the moving web (W) about three axes (18, 20, 22), two of which (18, 20) are set according to two mutually orthogonal sides (CD, EG) of a cube (Cu), set on two opposite faces (F1, F2) of said cube (Cu), and in which the third axis (22) is set according to a diagonal (ED) of said cube (Cu) that joins said sides (CD, EG).

2. The method according to Claim 1, **characterized in that** the web (W) is deflected about idler rollers (12, 14) that can turn freely about said axes (18, 20).

3. The method according to Claim 1 or Claim 2, **characterized in that** the incoming web and the outgoing web (W) are contained in respective planes parallel to said faces (F1, F2) of said cube (Cu).

4. The method according to Claim 1 or Claim 2, **characterized in that** the web (W) is deflected about a bar (16) fixed on its own axis (22).

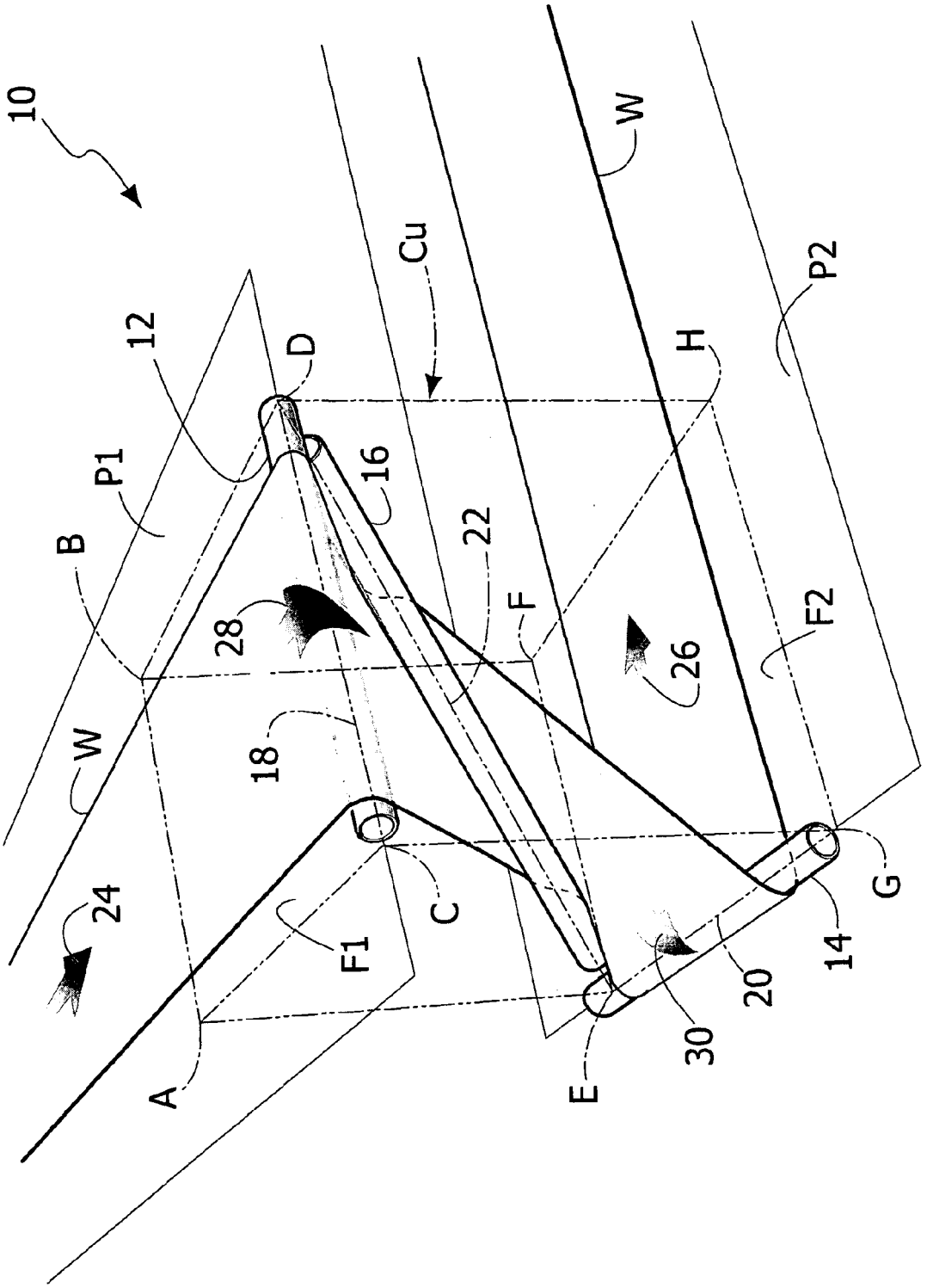
5. A device for deflecting a moving web (W) **characterized in that** it comprises:

   - a first deflecting element (12) extending along a first axis (18) contained in a first plane (P1);
   - a second deflecting element (14) extending along a second axis (20) orthogonal to said first axis (18) and contained in a second plane (P2) parallel to said first plane (P1); and
   - a third deflecting element (22) extending along a third axis (22) set along a diagonal (ED) of a cube (Cu) with two opposite faces (F1, F2) contained, respectively, in said first and second planes (P1, P2), in which said first axis (18) and said second axis (20) are set according to two sides (CD, EG) of said cube (Cu), and said third axis (22) is set according to a diagonal (ED) that joins said two sides (CD, EG).

6. The device according to Claim 6, **characterized in that** the first and second deflecting elements (12,

14,) comprise respective idler rollers that turn about said first and second axes (18, 20).

7. The device according to Claim 5 or Claim 6, **characterized in that** the third deflecting element (16) is a bar fixed on its own axis (22) with the surface coated with anti-adherent material.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EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5772

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 May 2008	Haaken, Willy

CATEGORY OF CITED DOCUMENTS

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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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