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(54) **Title**: PEEL OFF DEVICE FOR UNWINDING A WEB OF MATERIAL FROM A ROLL

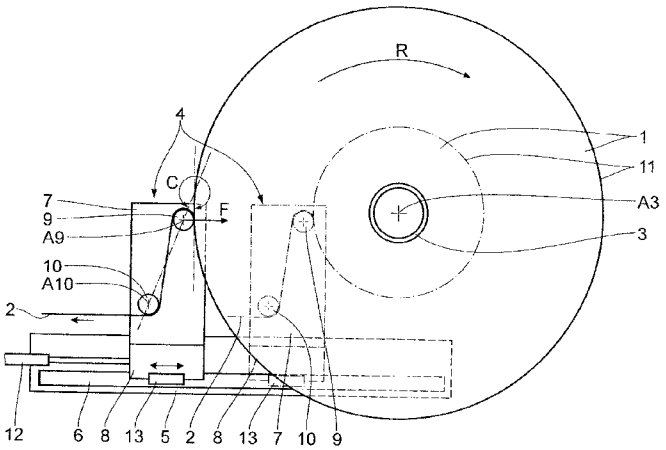

Fig. 1

(57) **Abstract**: Peel off device (4) for unwinding a web of material (2) from a stock roll (1), especially for high speed unwinding a web of a thin polymer film or the like, comprising a base (5) associated to the roll (1), a linear guiding device (6) mounted on the base (5), an idler support (7) linearly guided on the base (5) in a direction towards the roll (1), and a pair of idlers (9, 10) for the web (2) to be unwound. The idlers (9, 10) are mounted offset with respect to each other on the idler support (7) to provide for a meandering path of the web between the idlers (9, 10). The axes of rotation (A9, A10) of the idlers (9, 10) are parallel to the bearing axis (A3) of the roll (1). The the first idler (9) is pushed towards the roll to maintain a contact force (F) between the first idler (9) and the surface of the roll (1) while the web (2) is peeled off the roll (1).

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PEEL OFF DEVICE FOR UNWINDING A WEB OF MATERIAL FROM A ROLL

Field of the Invention

The invention refers to a peel off device for unwinding a web of material from a stock or forming roll, especially for high speed unwinding a web of a thin polymer film or the like.

Background of the Invention

The problem underlying the present invention arises in the field of continuous production of e.g. baby or feminine hygiene care products like diapers or sanitary napkins, where thin polymer films such as a backing sheet or a topsheet have to be peeled off from a stock roll at a high speed. As production practice shows, such as a polymer web may tend to adhere to the stock roll for several reasons, such as interlocking phenomena due to microstructures in the web (e.g. apertures) or adhesion due to the surface properties of the web material.

Due to prior use it is known to provide for an idler at the periphery of the stock roll to support the unwind process of the web from the roll. The web is guided around the circumference of the idler along an angle of contact of about 90° to 120°, then running to the so-called unwind dancers which are a balancing means for the web as concerns instabilities or irregularities in the following in-line production process of any product. The problem is that due to the interlocking phenomena and/or adhesion the web nevertheless tends to stick to the roll leading to a phenomenon, already mentioned above, called “blocking” which occurs whenever a web presents high tendency to stick to itself during unwinding. This can be caused by

surface forces, electrostatic forces or mechanical interlocking of apertures, adhesive coating etc.

Said blocking is a severe problem for downstream processes as it introduces sudden changes of tension, cross-direction tracking issues and wrinkle formation within the web. In most critical cases a web breakage can occur leading to a complete production line stop.

The problems in unwinding a rolled web of material are already addressed in US 3 368 771 A which discloses a method and an apparatus for unwinding a rolled web of material. The apparatus comprises two rollers which are in contact with each other and supported on a rocker arm by means of which a first idler is pivoted onto the stock roll. The web is led around the flexible surface of the first idler, runs through a gap between the first and a second idler and then is led away via the second idler. The latter has a surface with venting passages at the periphery which together with a surface layer of elastic material on the first idler helps to enable the air between the web of material and the surface of the roller to escape completely to the side. The overall object of the prior art apparatus on the one hand is to compensate for the local distortions that are inherent in a particular web of material and which extend in the longitudinal direction and are due, for example, to variations in thickness. On the other hand the air introduced between the web and the rollers is removed owing to a slight contact pressure between the first and second roller which displaces the film of air which is drawn between the web of material and the second roller. Important is the fact that the first idler is in a “out of pressure contact”, this means that the stock roll and the first idler have a space between them or may just touch so long as no appreciable pressure is exerted by the roller on the stock roll.

It was found out that with this "pressureless" concept and the two contacting idlers no significant improvement in avoiding web blocking in modern high speed applications can be reached.

FR 2 573 059 A1 discloses a peel off device for unwinding a web of material from a stock roll especially for high speed unwinding a web of a thin polymer film or the like. This peel off device comprises a base associated to the roll and a linear guiding device mounted on the base. On the linear guiding device several rolls are positioned offset to each other providing for a meandering path of the web between the rolls. Two of the rolls are driven to unwind the web material from the stock roll.

The problem of this known construction is the fact that the heavy stock roll has to be driven indirectly via the traction forces applied by the driven rolls onto the web. High tension forces could lead to a tearing of the web and thus to a disruption of the peeling off process.

It is therefore an object of the invention to provide a peel off device for unwinding a web material from a stock roll in a reliable and undisturbed manner, avoiding web blocking to a high extent.

Summary of the Invention

This object is achieved by a peel off device and method for unwinding a web of material from a roll as indicated in the claims. In particular a device comprising:

- a base associated to the roll,
- a linear guiding device mounted on the base,
- an idler support linearly guided on the base by the linear guiding device in a direction towards the roll, and
- a pair of idlers for the web to be unwound wherein

- the idlers are mounted offset with respect to each other on the idler support to provide for a meandering path of the web between the idlers,
- the axes of rotation of the idlers are parallel to the bearing axis of the roll, and
- a first one of the idlers is pushed towards the roll so that a contact force is maintained between the first idler and the surface of the roll while the web is peeled off the roll

is provided.

This two-idler peeling system significantly differentiates the invention from the known unwinding devices. Firstly, the first idler is maintained in permanent contact with the surface of the roll while the web is peeled off which helps to maximize and maintain constant the peel force even at high speed. Secondly, the separate, offset second idler provides immediate restraining action to prevent the web from passing underneath the first (peeling) idler without being peeling off. Furthermore, the span between the two idlers and the next span of the web path can be maintained at a constant angle.

Finally, the invention only needs a limited layout space due to the compact construction elements involved.

Preferred embodiments are subject matter of the depending claims, the features and advantages of which are explained in detail in the following description of a preferred embodiment referring to the accompanying drawing.

Brief description of the drawings

Fig. 1 shows a schematic elevation of a peel off device according to the invention in a first embodiment.

Fig. 2 shows an enlarged partial schematic elevation of a peel off device according to the invention in a second embodiment.

Detailed description of the drawings

The first embodiment of a peel off device depicted in Fig. 1 is associated to a stock roll 1 of material, e.g. a thin plastic web 2. The stock roll 1 is supported on a driven central reel 3 on which it rotates in the direction R when the web 2 is unwound and supplied to a production line via common unwind dancers (not shown) after leaving the second idler 10. The web may then be used in a converting line for example to be used as topsheet or backsheet in an absorbent article.

To peel off the web 2 from the stock roll 1 in a reliable manner, a peel off device 4 is provided which comprises a base 5 associated to the stock roll 1, i.e. in the case shown the beamlike base 5 extends behind the stock roll 1.

A linear guiding device 6, such as a guiding rail, is mounted on the base 5 in lengthwise direction. This guiding rail 6 holds the idler support 7 via a guide block 8 which is linearly guided along the guiding rail 6.

First and second idlers 9, 10 are mounted offset with respect to each other on the idler support 7 to provide for a meandering path of the web 2 between the two idlers 9, 10. The idlers can freely rotate in relation to the idler support. The idlers 9, 10 respectively comprise axes of rotation A9 and A10 which are parallel to the bearing axis A3 of the stock roll reel 3.

The first idler 9 is kept in surface contact with the circumference 11 of the stock roll 1 by being pushed towards the stock roll 1 by the idler support 7 to generate a contact force F between the first idler 9 and the circumference 11 of the stock roll 1 as the web is peeled off. This force F can be

generated by a pneumatic drive system using a pressurized air cylinder 12 abutting on the base 5 and pushing the idler support 7 along the guiding rail 6. The contact force F may be desired to be maintained in a range between 2 N and 5 N, and may be set up to remain approximately constant during the peeling off process. This may be equivalent to an air pressure of about 1.5 bars when using a pneumatic system. It may be desirable to use lower force for particularly soft material, or higher forces relatively sturdy material, so that the force may also be in the range of between 1 N and 15 N for example .

When peeling off the web 2 from the stock roll 1 the web 2 is led around the first idler 9 by a peel off angle of contact which is about 90° because the first idler is maintained in contact with the surface of the roll (the peel off angle is defined as the angle between the tangent of the roll at the point of peeling off and the line tangent with the surface of the first idler guiding the web and passing through the center of the roll). It is believed that a peel off angle of about 90° maximizes the peeling force and reduces the risk of breakup of the web.

Then the web 2 is led to the second idler 10 which is mounted with a fixed offset with respect the first idler 9. The center to center distance of the two idlers can be a multiple of the (first) idler diameter, e.g. three to six times the diameter. The first and second idlers may advantageously be formed by identical pieces to simplify installation and maintenance but this is not necessary. The angle C between the tangent of the surface 11 of the roll 1 at the point of contact with the idler 9 and the line passing through the centers of the first and second idlers is of more than 270° to provide a meandering path for the web between the idlers. Advantageously, the angle C may be of from 300° to 360°, more advantageously between 320° to 350°,

or more precisely from 330° to 350°. The two idlers can be advantageously mounted in a fixed position relative to each other on the idler support so that their distance and angle are advantageously kept constant during the peel off process.

A magnetic position tracking system 13 may be incorporated into the guiding rail 6 for detecting the position of the guide block 8 along the guiding roll 6. This serves to record the position of the guide block 8 and thus of the first idler 9, i.e. this gives a signal for the current size of the stock roll 1. A magnetic position tracking system may be advantageous to provide a robust system against natural occurring dust formation.

The position tracking system 13 may also be used to detect an anomalous blocking of the movement of the idler support towards the roll 1. In this case a control unit (not shown) may give a signal to push the idler support 7 by means of a short burst of pressurized from the air cylinder 12 in a direction towards the roll 1. In this connection a force impulse is applicable which exceeds the continuous pushing force F. The pressure burst may exemplarily generate a force F of 8 N in a time of 0.5 s.

The dot and dash lines in the drawing show the situation when the stock roll 1 has decreased in diameter considerably versa the initial state depicted in full lines. As can be seen, the idler support 7 has moved linearly along the guiding rail 6 thus moving the idler 9 in a more or less radial direction as concerns the stock roll 1 in synchronism with the diminishing stock on the roll 1. The idler 9 is kept in contact with the stock roll 1 during the complete unwinding process.

The second embodiment of the peel off device as it is shown in Fig. 2 again includes a stock roll 1 of e. g. a thin plastic web 2. The support and drive of

the stock roll 1 may be the same as the embodiment of Fig. 1. Also, the peel off device 4' of the second embodiment comprises a base 5 associated to the stock roll 1, on which a linear guiding device 6, such as a guiding rail, is mounted in lengthwise direction. This guiding rail 6 holds the idler support 7', the guide block 8' of which – contrary to the first embodiment – rotatably supports only the second idler 10.

The first idler 9 is rotatably supported on the pivoting end 15 of a lever arm 16 which is pivotably mounted on the idler support 7' via a pivot axis A17. The latter is provided by a rotary pneumatic cylinder 17 which biases the lever arm 16 and thus the idler 9 towards the surface of the stock roll 1 to generate the contact force F. The pivot axis A17 of the lever arm 16 is parallel to the axis of rotation A9 of the idler 9.

A further difference compared to the embodiment shown in Fig. 1 is the drive of the roller support 7' with guide block 8'. Whereas in the first embodiment the pressurized air cylinder 12 biases the roller support 7 and thus guide block 8 towards the roll, thus creating the contact force F, within the second embodiment the roller support 7' with the guide block 8' are linearly driven along the guiding rail 6 by a stepper motor 18. By means of this stepper motor 18, the roller support 7' and guide block 8' are basically positioned according to the decreasing roll diameter by tracking the roller support 7' and guide block 8' to the right referring to Fig. 2.

Due to the support of the idler 9 on the pivotable lever arm 16, any unroundness of the stock roll 1 can be compensated, as the lever arm 16 with the idler 9, as having a relatively low mass, can easily track any deviations of the surface of the stock roll 1 from the ideal round shape.

The control of the tracking of the roller support 7' and guide block 8' is provided by position sensors, e. g. proximity sensors 19, which monitor the the position of the lever arm 16 within its pivot range P. When the lever arm 16 increasingly pivots in clockwise direction related to Fig. 2, this is an indication that the stock roll 1 decreases in diameter. Accordingly, the roller support 7' and guide block 8' are moved to the right, thus pivoting the lever arm 16 in the counterclockwise direction again until the lever arm 16 on average stands upright and centrally between the pair of proximity sensors 19.

To limit the pivot range P of the lever arm 16, a pair of stoppers 20 is provided on the roller support 7'.

Summing up the advantages of the embodiment of Fig. 2, both the decreasing roll diameter and the unroundness of the roll are compensated. Further on, the idler 9 mounted on the lever arm 16 is well controllable as to the contact force F which is approximately 8 N. The angle of the lever arm stays within a certain operating range which is smaller than the pivot range P never touching the end positions defined by the stoppers 20. When the lever arm tends to move outside of this operation range due to the decreasing roll diameter, the stepper motor 18 will advance the roller support 7' and guide block 8' forward by a certain distance against the stock roll 1.

The controller of the stepper motor 18 "knows" where the roller support 7' and guide block 8' are, as it comprises a counter for the moving steps of the motor. Thus, additional information for the machine control is provided.

Features described in relation to one embodiment may of course be used with the apparatus or method of another embodiment unless they are mutually excluding.

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 functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean "about 40 mm".

CLAIMS

What is claimed is:

1. Peel off device (4) for unwinding a web of material (2) from a stock roll (1), especially for high speed unwinding a web of a thin polymer film or the like, comprising
   - a base (5) associated to the roll (1),
   - a linear guiding device (6) mounted on the base (5),
   - an idler support (7) linearly guided on the base (5) in a direction towards the roll (1), and
   - a pair of idlers (9, 10) for the web (2) to be unwound, wherein
     = the idlers (9, 10) are mounted offset with respect to each other on the idler support (7) to provide for a meandering path of the web between the idlers (9, 10),
     = the axes of rotation (A9, A10) of the idlers (9, 10) are parallel to the bearing axis (A3) of the roll (1), and
     = a first (9) one of the idlers (9, 10) is pushed towards the roll (1) so that a contact force (F) is maintained between the first idler (9) and the surface (11) of the roll while the web is peeled off the roll (1).

2. Peel off device according to claim 1, wherein the idler support (7) pushes the first idler (9) towards the roll (1) to generate the contact force.

3. Peel off device according to claim 1 or 2, wherein the idler support (7) is powered by a pneumatic drive system (12).

4. Peel off device according to claim 1 or 2, wherein the idler support (7) is guided along the guiding device (6) by means of a stepper motor (18).

5. Peel off device according to any of the preceding claims, wherein the contact force (F) between the first idler (9) and the surface of the roll (1) has a value of from between 2 N and 5 N in a direction towards the roll (1).

6. Peel off device according to one of the preceding claims, comprising a position tracking system (13) for the position of the idler support (7).

7. Peel off device according to one of the preceding claims, wherein the linear guiding device is a guiding rail (6).

8. Peel off device according to one of the preceding claims, wherein the angle (C) between the tangent of the surface (11) of the roll (1) at the point of contact with the first idler (9) and the line passing through the centers of the first and second idlers is of from 300° to 360°, preferably from 320° to 350°, more preferably from 330° to 350°.

9. Peel off device according to any one of the preceding claims, wherein the idler support (7) can be pushed by a force impulse exceeding the continuous contact force (F) in a direction towards the roll (1) in case of blocking of the normal movement of the idler support.

10. Peel off device according to one of the preceding claims, wherein the first idler (9) is supported on a lever arm (16), which is pivotably mounted on the idler support (7) and biased towards the roll (1) to generate the contact force (F).

11. Peel off device according to claim 10, wherein the pivot axis (A17) of the lever arm (16) is parallel to the axis of rotation (A9) of the idler (9).

12. Peel off device according to claims 10 or 11, comprising a rotary pneumatic cylinder (17) mounted on the idler support (7) for biasing the lever arm (16) and first idler (9) towards the roll (1).

13. Peel off device according to at least one of the claims 10 to 12, comprising position sensors (19) for the pivot position of the lever arm (16).

14. A method for unwinding a web of material (2) from a stock roll (1), especially for high speed unwinding of a web of a thin polymer film or the like, comprising the steps of

- providing a peel off device comprising a base (5) associated to the roll (1), a linear guiding device (6) mounted on the base (5), an idler support (7) linearly guided on the base (5) in a direction towards the roll (1), and a pair of idlers (9, 10) for the web (2) to be unwound, wherein the idlers (9, 10) are mounted offset with respect to each other on the idler support (7) to provide for a meandering path of the web between the idlers (9, 10), the axes of rotation (A9, A10) of the idlers (9, 10) being parallel to the bearing axis (A3) of the roll (1), and
- pushing the first idler (9) towards the roll (1) so that a contact force (F) is maintained between the first idler (9) and the surface (11) of the roll while the web (2) is peeled off the roll (1).

15. A method for the continuous converting a web of material (2) from a stock roll (1) into an absorbent article, for example wherein the web is converted as a topsheet or backsheet in the absorbent article, wherein the web is unwound according to the method of the preceding claim.

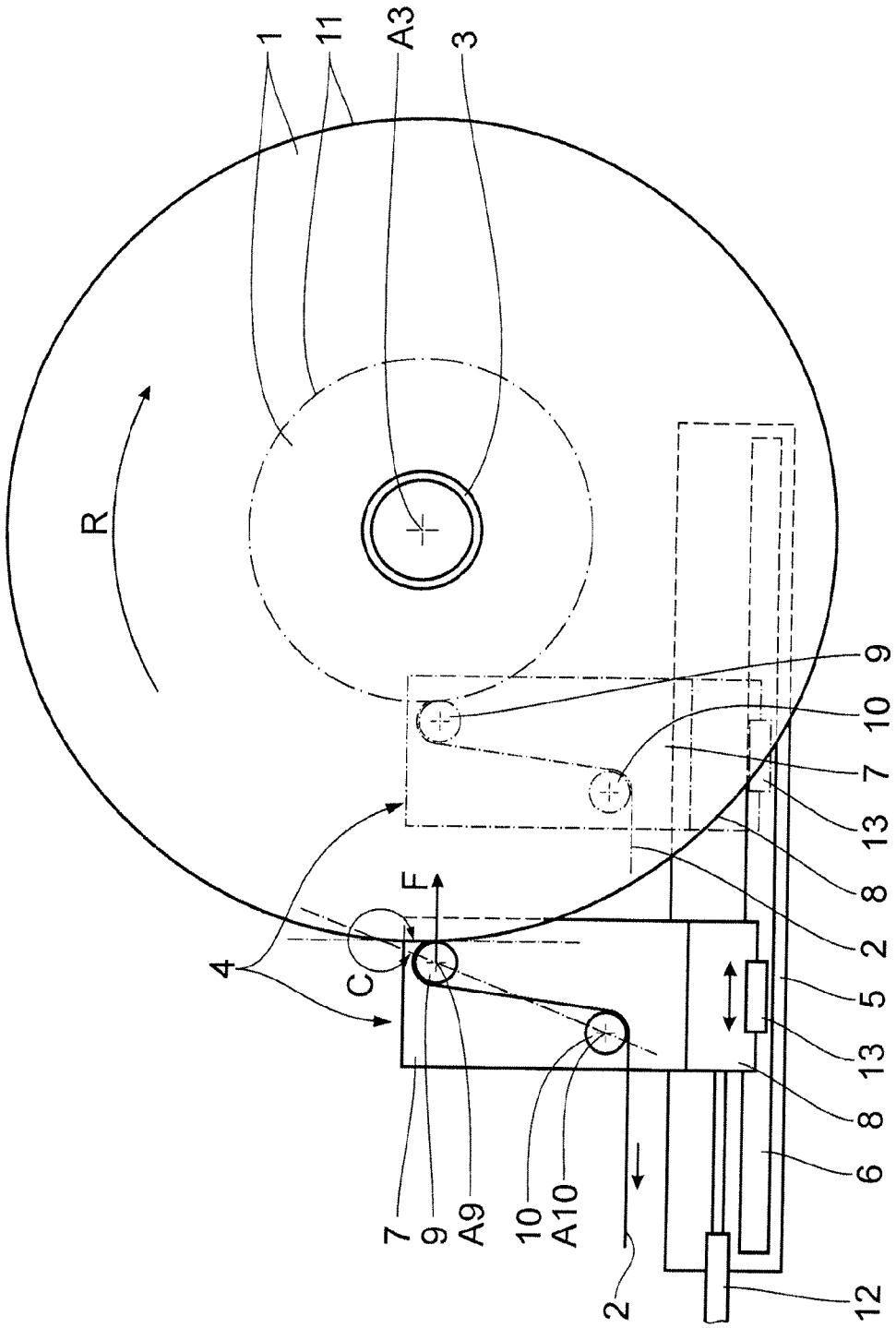

Fig. 1

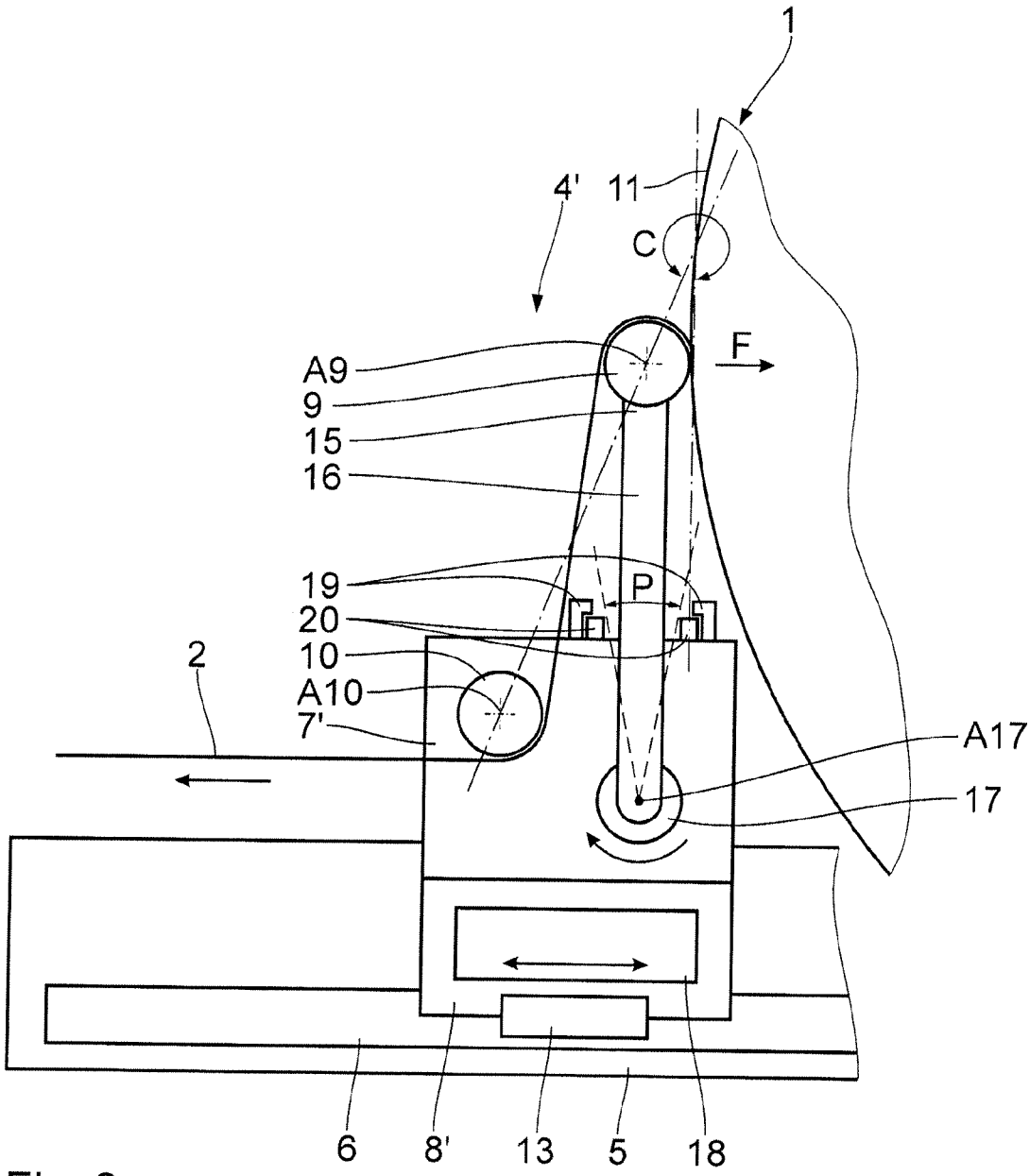

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/048187

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65H16/02 B65H23/182
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)
B65H

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
7 December 2010	17/12/2010

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2010/048187

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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