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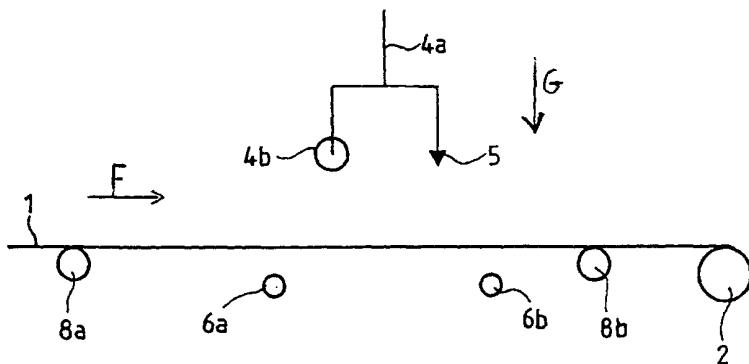
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(54) Title: APPARATUS AND METHOD FOR INITIATING THE WINDING OF WEBS



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(57) Abstract: The instant invention relates to an apparatus for winding a web arriving from a conveyance direction, comprising: primary winding roll (3) and secondary driving means (2), switching means (4a, 4b) for switching the winding from the secondary means (2) to the primary winding roll (3), and cutting means (5) to cut the at least one web (1) between the primary winding roll (3) and the secondary driving means (2), wherein the switching means comprise diverting (4b) situated opposite to the primary winding roll (3) with respect to the at least one web (1), said diverting means being movable along a transverse direction (G) intersecting the conveyance direction (F) to entrain the at least one web (1) towards the primary winding roll (3), whereby the at least one web (1) is cut and caused to be wound on the primary winding roll (3). The invention also relates to a method for winding a web, especially using the apparatus of the invention as well as a double pantograph frame suited to be used with said apparatus.

APPARATUS AND METHOD FOR INITIATING THE WINDING OF WEBS

5

FIELD OF THE INVENTION

The invention relates to an apparatus and a method for initiating the winding of webs on rolls, as well as a double pantograph frame suited to be used with said apparatus.

10

BACKGROUND OF THE INVENTION

In general, webs such as thin polyester foils or other sheet materials are manufactured in a continuous process and the final products are wound up on rolls for storage and transportation.

15

However, the continuous process of manufacturing is often interrupted by breaks of the web and the winding on the rolls has to start again. One possibility is to stop the manufacturing upstream from the winding unit; this however is obviously to be avoided. In case manufacturing is continued, the part of the web that is not wound up on the roll must be taken care of. For example, one possibility for restarting a winding unit after break is to wind a certain amount of the web on an auxiliary roll or to direct this amount of web towards a chute, until the irregularities of the break are overcome and later to continue the winding on the nominal roll after cutting of the web, in a controlled manner, from the auxiliary roll or from the chute. However, the switching from the auxiliary roll or the chute to the nominal roll and the controlled cutting are complicate and time consuming and therefore expensive.

The problem is even more severe when several nominal rolls of minor size are wound up simultaneously from the same large web by splitting the web along the 30 conveyance direction before winding. Up to now it was necessary to stop the winding of all rolls even when the break affected only one of the rolls resulting in a additional work load and higher manufacturing costs.

The problem is acute for (ultra) thin films with thickness as low as the micron 35 size and speeds up to 1000 m/min. One solution is to blast air on a web to divert it into a winding unit, where the air blast is controlled so that the web will come at the vicinity of the nip point of two rolls, allowing starting of winding. This way of

operating suffers from obvious drawbacks, i.e. harshness of the method that destroys films and difficulties for adapting the proper conditions to achieve a proper winding.

Thus, there is a need for an apparatus and a method that will allow the
5 (re)starting of the winding of (ultra) thin films at high speed.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an apparatus and a method for
10 starting the winding of webs on winding rolls, allowing an easy and fast start/restart
of the winding for one or several nominal rolls thereby reducing the work load and the
manufacturing costs.

The object is achieved with an apparatus according to claim 1 and 24 and a
15 method according to claim 29 and 37 as well as with a double pantograph frame
according to claim 26. Preferred embodiments are defined in the depending claims.

The apparatus and the method as defined above have the advantage to allow an
easy and fast switching from the secondary driving roll to the primary winding roll.
20 With the secondary driving roll being an auxiliary roll and the primary winding roll
being the storage roll of the final product, the invention allows for a simple and fast
start up of the winding on the latter.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1a to 1f are schematic side views of an apparatus according to the
25 invention, further illustrating the operating of said apparatus ;

Figure 2 is a schematic perspective view of an apparatus according to the
invention functioning for three webs.

Figure 3 is an enlarged view of a switching means according to the invention.

30

DETAILED DESCRIPTION OF THE INVENTION

Figs. 1a to 1h show the apparatus of the invention with respect to one unitary
web, while fig. 2 shows it for three webs.

Fig. 1a shows an apparatus according to the present invention for one unitary
35 web. A web 1 such as a polyester foil arrives from a conveyance direction indicated
by arrow F. In Fig. 1a, the apparatus is at the start point, i.e. the web is driven or
wound on the secondary roll 2, with a winding speed w1. This part of web 1 can be

either wound up on roll 2, or roll 2 can be a driving roll for directing web 1 into a chute (not shown). Roll 2 could be simply replaced by a chute having sucking means. To initiate the driving of web 1 on secondary roll 2, it is possible to use any means known in the art as for example, a leader system, a web transport table or suction channels; it may even be initiated by hand. Whatever the function performed, secondary roll 2 is designated below as the secondary driving roll. It shall be understood that said secondary roll is only an example of what can be a secondary means. As a matter of fact, a suction means connected to a chute or a chopper can also be used as the secondary driving means. The following description will be given 10 with respect to a secondary driving roll 2.

In fig. 1a, the primary winding roll 3 is situated below web 1, upstream with respect to secondary roll 2. The switching means 4a, 4b are situated above web 1, also upstream with respect to the secondary roll. Switching means 4a, 4b and 15 primary winding roll 3 are aligned according to a direction which is substantially perpendicular to the web. Another direction, transverse would also be appropriate. The switching means are represented in fig. 1a in the stand-by position.

The cutting means 5 can be located either at the vicinity of winding roll 3 or can 20 be grouped with switching means 4a, 4b. Fig. 1a shows an apparatus where switching means 4a, 4b and cutting means 5 are grouped. Cutting means 5 are preferably as wide as web 1 in order to allow the transversal cutting of web 1 in one stroke. However, instead of being as wide as web 1, cutting means 5 may also be narrow and move transversally, hereby creating a diagonal cut. The cutting element may be of any 25 type: straight or toothed blade cutting in the air, circular blade, shear knife, laser means, waterjet means...

Switching means 4a, 4b are movable along a transverse direction, as indicated by arrow G, in such a way that the moving path intersects the conveyance direction F. 30 Switching means comprise diverting means 4b and entraining means 4a, diverting means 4b being a roll, preferably an idle roll, entraining means 4a being shown as a translating carriage. The actuating means necessary for activating the switching means are not shown; they can comprise a motor transmitting its movement via gears, screw, etc. Cutting means 5 are located downstream with respect to diverting roll 4b. 35 In the shown embodiment, cutting means 5 further comprise sliding means on which the web can slide without damage, the cutting element (i.e. a wide toothed blade) of cutting means 5 being retractable (to avoid unwished cutting of the web) and activated at the desired time. Cutting means 5 (when the cutting element is retracted) also act as

diverting means (through said sliding means) in complement with roll 4b. This will be more apparent with respect to figure 3 below.

One pair of support rolls 6a and 6b (preferably of the idle roll type) are placed 5 below the web, left and right with respect to switching means 4a, 4b and primary winding roll 3. Additional support rolls 8a, 8b may be disposed higher than support rolls 6a, 6b. The function of said support rolls 6a and 6b is to support the conveyance of web 1 during the initiating of the winding on primary winding roll 3, i.e. when the switching means are in operation. Support rolls 6a, 8a on the left side may continue 10 to support the conveyance of web 1 after that winding has been initiated on primary winding roll 3. More generally, web 1 is conveyed in the apparatus according to means and methods known in the art.

The method of operation of the apparatus according to the invention is 15 illustrated in Figs. 1a to 1f.

As already indicated, Fig. 1a shows the situation with switching means 4a, 4b in a standby position not intersecting the conveyance path of web 1. The winding of web 1 takes place on secondary roll 2 with a given rotation speed w1.

20 In Fig. 1b, the switching means are lowered with diverting roll 4b as well as cutting means 5 (its cutting element being in retracted position to avoid cutting the web, as already mentioned) contacting the conveyed web 1 and entraining the web into a lower position, where web 1 is brought into contact with support rolls 6a, 6b 25 after being in contact with support rolls 8a, 8b. The step of the lowering procedure of the switching means involves a prolongation of the conveyance path of the web, and thus the rotation speed of secondary roll 2 is decreasing to a speed w2 which is lower than w1 ($w2 < w1$) so that the tension in web 1 is preferably kept substantially constant.

30 In Fig. 1c the switching means are at their lowest position, where web 1 thus forms a loop. When the switching means have finally reached this lowest end position, the rotation speed of secondary roll 2 will resume a speed w3 equal to w1. In this position, diverting roll 4b is preferably in contact (through web 1) with 35 primary winding roll 3, thus laying properly web 1 onto roll 3 and excluding the air between web 1 and roll 3. Web 1 envelopes the upper part of winding roll 3 from diverting roll 4b till cutting means 5 which are preferably located on the opposite side of roll 3 (without being in contact with it) with respect to diverting roll 4b. Diverting

roll 4b and cutting means 5 are preferably disposed on each side of winding roll 3 so that web 1 is caused to envelope a substantial part of the circumference of winding roll 3, preferably half of it. One will understand that web 1 is such that it forms a W, where the middle position is on the top of winding roll 3 and the lowest position at 5 the bottom of diverting roll 4b and of the sliding means of cutting means 5. Also, one will understand that winding roll 3 is given an appropriate rotation speed (in the same direction than web 1 is moving) before it is contacted by web 1 thus preventing cutting or destroying said web.

10 Once the switching means are in the lowest position as shown in fig. 1c, the cutting element of cutting means 5 is activated as shown in fig. 1d, i.e. the cutting blade is brought into contact with web 1. Hence, web 1 is cut and caused to be wound up on winding roll 3. The cutting element is then retracted in order not to hinder the correct initiation of the winding on primary winding roll 3. During the cutting 15 operation, cutting means 5 (including its cutting element) preferably do not enter into contact with primary winding roll 3 itself (or with the web already wound on the latter). Initiation of winding on roll 3 is automatically obtained due to the fact that web 1 is already enveloping a part of the circumference of said roll and will remain adhered on it due to the above mentioned air exclusion (in addition to that, other 20 means like electrostatic effect or water spraying may be used). Web 1 is preferably cut in the vicinity of primary winding roll 3, as shown, and more preferably at a distance of 0,1 to 20 mm from roll 3. Thus, this will avoid to the maximum that a flying loose end of web 1 hinders winding on roll 3 or wrinkles onto roll 3 over which web 1 is to be wound. Preferably, cutting means 5 are maintained at a substantially 25 identical distance of winding roll 3, whatever are its diameter and the amount of web already wound on it. Once web 1 is cut by cutting means 5, secondary roll 2 can stop rotating.

30 The actual rotation speeds of secondary roll 2 and primary roll 3 (as well as the rotation speeds of other rolls, if relevant) can be controlled by a torque control means (not shown, known per se), so as to avoid any possible overstretching of web 1 during lowering of switching means 4a, 4b and switching of web 1 from the secondary to the primary roll. For instance, it is possible to use a D.C. motor at constant current to drive secondary roll 2 in order to obtain a constant torque, i.e. a constant 35 tension in web 1.

In Fig. 1e, the switching means are brought back to the stand-by position.

Assuming now that web 1 is broken at one stage of the process, the winding on roll 3 will then be stopped, and web 1 will again be wound on secondary roll 2. The thread up method described above can then be repeated immediately.

5 Not shown are the means for initially conveying web 1 from the production apparatus into the described apparatus; these means are well known per se in the art. Also, winding roll 3 can be classically coupled with another winding roll, through rotating arms, for example in order to replace the first one if wished (for example, when it is fully wound or to switch from a starting roll to a nominal roll).

10

Fig. 1f shows another embodiment, at a stage corresponding to fig. 1c. In this case, the switching means comprises two diverting rolls 4b, 4'b that will come in contact at each side of winding roll 3, the cutting means being located in the vicinity of winding roll 3 and of one of the diverting rolls. In this case, cutting means 5 are not 15 coupled with switching means 4a, 4b, but mounted in the region of winding roll 3.

It should be understood that the described embodiments allow to initiate the winding on empty rolls as well as on rolls already supporting some wound web.

20 The apparatus of the invention is especially suited for the winding of a web split into smaller webs. Fig. 2 is a schematical view showing several winding apparatuses according to the invention in parallel for winding a split web 1 (i.e. webs 1a, 1b, 1c) onto several corresponding primary winding rolls 3 (only a first one is shown). It further comprises secondary driving means for driving each web 1a, 1b, 1c 25 at a proper speed. For example, the secondary driving means shown on Fig. 2 comprises an idle segmented roll (2) wherein each segment 7a, 7b, 7c corresponds to a respective web each of which is driven at an own speed by a respective chute (not shown). Of course, a person skilled in the art may imagine other types of secondary driving means able to fulfill this purpose.

30 The apparatus is represented with webs 1b and 1c wound up on the secondary roll 2, and with web 1a (corresponding to the front winding roll) being engaged at a stage as described on fig. 1c. With respect to web 1a, are only represented elements 8a, 6a, 6b, 8b (for conveying the web), winding roll 3, diverting roll 4b and the cutting means 5.

35 Assuming now that each web 1a, 1b and 1c is wound on secondary roll 2, i.e. on segments 7a, 7b and 7c, then when the lowering of the switching means for one web 1a of concern is initiated, the rotation speed (wa) can be different from the rotation speed of the neighboring segment (wb) so as to maintain preferably the

respective constant tension in webs 1a, 1b, 1c. Also, when a break occurs in one of webs 1a, 1b, 1c, the restart procedure may be performed only for the corresponding apparatus using the corresponding segment 7a, 7b, 7c of the segmented roll 2 while the winding on the other apparatuses continues uninterrupted. Thus, the other winding rolls continue to perform and the loss of web can be minimized.

Fig. 3 shows an enlarged view of a preferred switching means, comprising a double pantograph frame. Cutting means 5 comprise sliding faces 5a, 5b, 5c on which web 1 can safely slide while the cutting element 5d, preferably a blade, is retracted between said faces (blade 5d is not represented). Entrainment means 4a carrying the diverting idle roll 4b and cutting means 5 comprise the following elements: a movable T-shaped support 11, on the horizontal part 11a of which are mounted two ball bearings 12a and 12b. On the vertical part of support 11 is slidably mounted a carriage 13, said carriage comprising two pairs of ball bearings 14a, 14b, 15a and 15b. A first pantograph (the left one) is obtained by two parallel arms 17a, 18a articulated on carriage 13 (via ball bearings 14a, respectively 15a) and on arm 16a (also through ball bearings). Symmetrically, a second pantograph (the right one) is obtained by two parallel arms 17b, 18b articulated on carriage 13 (via ball bearings 14b, respectively 15b) and on arm 16b (also through ball bearings). Arms 16a and 16b bear respectively diverting roll 4b and cutting means 5, cutting means 5 being adjustable along direction F with respect to arm 16b in order to ensure a defined gap (in preferably the above mentioned range from 0,1 to 20 mm) between winding roll 3 and cutting means 5. An arm 19a is articulated on support 11 (via ball bearing 12a) and on arm 18a. Symmetrically, an arm 19b is articulated on support 11 (via ball bearing 12b) and on arm 18b. By translating carriage 13 with respect to support 11, diverting roll 4b and cutting means 5 are moved symmetrically with respect to each other. Additional means for retracting the pantograph frame to a closed position (i.e. the narrowest position of arms 16a, 16b as shown in fig. 3) can be provided, e.g. as a spring. When the switching means are lowered down to primary winding roll 3, diverting roll 4b abuts on the left side of said roll 3 (through web 1) and the left pantograph opens to an extent depending on the diameter of roll 3. Thus, the right pantograph opens to the same extent, and consequently, as the plane of symmetry of the double pantograph frame comprises the axis of rotation of the winding roll 3, the adjusted gap between cutting means 5 and winding roll 3 remains substantially identical regardless the diameter of roll 3. More generally, these switching means can accommodate cores or winding rolls of various diameter (and can, after cutting, follow the increase of diameter while winding on roll 3 if the switching means are not immediately retracted

after initiating the winding) and nevertheless allows to embody the preferred characteristics detailed in relation with fig. 1c and 1d.

The double pantograph frame of fig. 3 may also be adapted for use in the embodiment of fig. 1f, in which case a second roll 4'b is fitted at the end of arm 16b instead of

5 cutting means 5.

The invention was described with reference to preferred embodiments. However, many variations are possible within the scope of the invention; for instance the driving or winding roll can be any combination of one or more rolls, optionally of 10 varying diameters.

CLAIMS

1. An apparatus for initiating the winding on a roll of at least one web (1) arriving from a conveyance direction (F), comprising :
 - 5 - a primary winding roll (3),
 - secondary driving means (2) for driving the web,
 - cutting means (5),
 - switching means (4a, 4b) for switching the web driven by the secondary driving means to said primary winding roll,
- 10 wherein the switching means comprise diverting means (4b, 5) for contacting the web, said diverting means being located opposite to said primary winding roll with respect to the web driven by the secondary driving means and said switching means being movable towards the primary winding roll so as to intersect the web path, whereby the web is cut by said cutting means and caused to be wound on the primary winding roll.
- 15
2. The apparatus according to claim 1, characterized in that said diverting means (4b, 5) are movable at least till the proximity of the primary winding roll so that they cause the web to contact the primary winding roll.
- 20
3. The apparatus according to claim 2, characterized in that said diverting means (4b, 5) are able to cause the web to contact said primary winding roll on substantially the half of its circumference.
- 25
4. The apparatus according to any one of claims 1 to 3, characterized in that said diverting means comprise two parts (4b, 5 ; 4b, 4'b) contacting the web according to two longitudinally spaced regions, said two parts being able to position on opposite sides of said primary winding roll.
- 30
5. The apparatus according to any one of claims 2 to 4, characterized in that said diverting means (4b, 4'b) comprise at least one idle roll.
- 35
6. The apparatus according to any one of claims 2 to 5, characterized in that said diverting means are capable to contact said primary winding roll and press the web directly against said primary winding roll.
7. The apparatus according to claim 6, characterized in that said diverting means comprise at least one idle roll (4b) contacting said primary winding roll.

8. The apparatus according to claim 6, characterized in that said diverting means comprise two idle rolls (4b, 4'b) contacting said primary winding roll, said two idle rolls flanking said primary winding roll.

5

9. The apparatus according to any one of claims 1 to 8, characterized in that said cutting means (5) are able to cut the web at a position between said primary winding roll and said secondary driving means.

10 10. The apparatus according to any one of claims 1 to 9, characterized in that said cutting means (5) are able to cut the web in the vicinity of said primary winding roll.

11. The apparatus according to claim 10, characterized in that it comprises means for maintaining a substantially constant clearance between said cutting means (5) and said primary winding roll, when said cutting means are in position for cutting the web.

15

12. The apparatus according to any one of claims 1 to 11, characterized in that said cutting means (5) are mounted jointly with said diverting means on said switching means.

20

13. The apparatus according to claim 12, characterized in that said cutting means (5) comprise sliding means (5a, 5b, 5c) whereby said cutting means also act as diverting means.

25

14. The apparatus according to claim 12 or 13, characterized in that said switching means (4a, 4b) comprise a double pantograph frame, comprising a first (16a, 17a, 18a, 13) and a second (16b, 17b, 18b, 13) pantograph frame disposed symmetrically with respect to each other and operatively linked by linking means (11, 11a, 13) so that the change of position of said first pantograph frame causes a symmetrical variation of said second pantograph frame, an arm (16a) of said first pantograph frame carrying an abutment means (4b) and an arm (16b) of said second pantograph frame, disposed symmetrically to said arm (16a) of said first pantograph frame, carrying said cutting means (5) so that the abutment of said abutment means (4b) on said primary winding roll causes the positioning of said cutting means (5) with respect to said primary winding roll.

30

35

15. The apparatus according to claim 14, characterized in that said linking means consist in a support (11, 11a) and a carriage (13) slidably mounted on said support, said carriage defining one arm for each of said first and second pantograph frames and said support being linked to each of said first and second pantograph frames through 5 articulated arms (19a, 19b) for causing jointly variations of opening of said first and second pantograph frames.

16. The apparatus according to claim 14 or 15, characterized in that said abutment means is an idle roll (4b).

10 17. The apparatus according to any one of claims 14 to 16, characterized in that said abutment means (4b) forms at least one part of said diverting means.

15 18. The apparatus according to any one of claims 14 to 17, characterized in that the position of said cutting means (5) is adjustable in the longitudinal direction on said arm (16b) carrying it.

20 19. The apparatus according to any one of claims 14 to 18, characterized in that the plane of symmetry of said double pantograph frame comprises the axis of rotation of said primary winding roll when said double pantograph frame is in position for enabling said roll of said first pantograph frame to abut said primary winding roll.

25 20. The apparatus according to any one of claims 1 to 11, characterized in that said cutting means are mounted in the region of said primary winding roll.

21. The apparatus according to any one of claims 1 to 20, characterized in that said cutting means (5) are as wide as the web and are able to cut it in one stroke.

30 22. The apparatus according to any one of claims 1 to 20, characterized in that said cutting means (5) consist of a narrow unit with respect to the wide of the web, said narrow unit moving transversally.

35 23. The apparatus according to any one of claims 1 to 22, characterized in that it comprises means for varying the web conveyance speed of the second driving means so as to keep a substantially constant tension in the web driven by said secondary driving means during its deviation towards the primary winding roll by said switching means.

24. An apparatus for initiating the winding of several parallel webs on respective rolls, characterized in that, for at least one web or group of webs (1a, 1b, 1c), a corresponding apparatus according to any one of claims 1 to 23 is arranged to initiate its winding on a corresponding primary winding roll or group of primary winding rolls, independently from the other web(s).

5

25. The apparatus according to claim 24, characterized in that it comprises means for varying the conveyance speed of the secondary driving means for said web or group of webs independently from the conveyance speed of other webs, so as to keep a substantially constant tension in said web or group of webs driven by said secondary driving means during its deviation towards said corresponding primary winding roll or group of primary winding rolls.

10

26. A double pantograph frame, comprising a first (16a, 17a, 18a, 13) and a second (16b, 17b, 18b, 13) pantograph frame disposed symmetrically with respect to each other and operatively linked by linking means (11, 11a, 13) so that the change of position of said first pantograph frame causes a symmetrical variation of said second pantograph frame, an arm (16a) of said first pantograph frame carrying a roll (4b) and an arm (16b) of said second pantograph frame, disposed symmetrically to said arm (16a) of said first pantograph frame, carrying cutting means (5).

15

27. The double pantograph frame according to claim 26, characterized in that said linking means consist in a support (11, 11a) and a carriage (13) slidably mounted on said support, said carriage defining one arm for each of said first and second pantograph frames and said support being linked to each of said first and second pantograph frames through articulated arms (19a, 19b) for causing jointly variations of opening of said first and second pantograph frames.

20

28. The double pantograph frame according to claim 26 or 27, characterized in that said roll is an idle roll.

30

29. A method for initiating the winding on a roll of at least one web arriving from a conveyance direction (F), comprising the step of :
causing the web to be driven by secondary driving means ;
diverting, upstream of said secondary driving means, the web along a direction (G) transverse to the conveyance direction (F) towards a primary winding roll;
35 cutting the web; and
causing the web to be wound onto said primary winding roll.

30. The method according to claim 29, characterized in that it comprises, between step (ii) and step (iii), the additional step of causing the web to contact said primary winding roll.

5

31. The method according to claim 30, characterized in that the web is caused to contact said primary winding roll on a part of its circumference.

10 32. The method according to claim 31, characterized in that the web is caused to contact said primary winding roll on substantially half of its circumference.

33. The method according to any one of claims 30 to 32, characterized in that said additional step comprises the enclosing of the web between, on one hand, a diverting roll and cutting means and, on the other hand, said primary winding roll.

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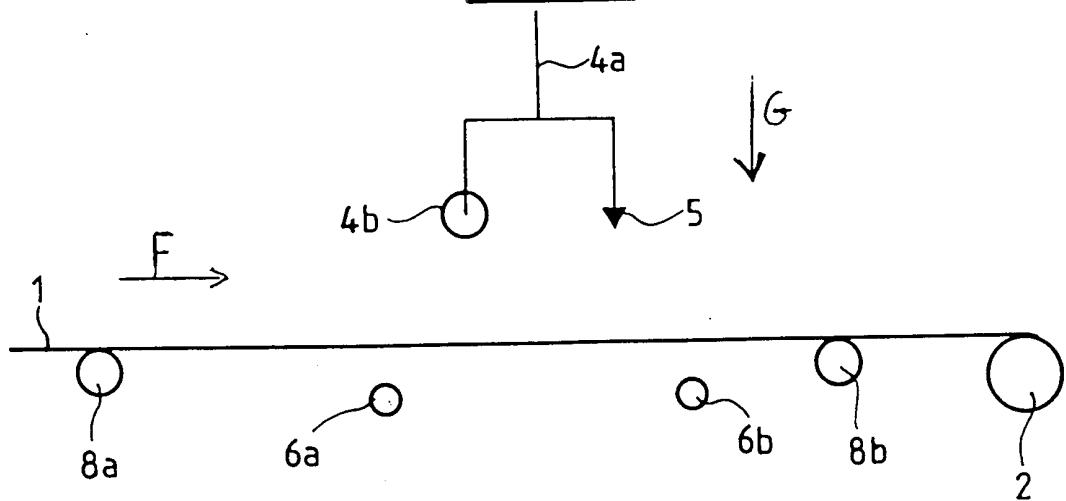
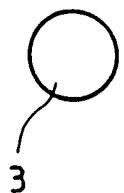
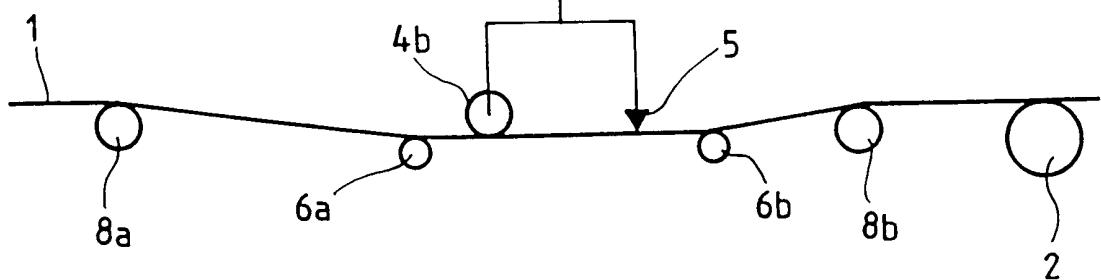
34. The method according to any one of claims 29 to 33, characterized in that, in step (iii), the web is cut in the vicinity of the primary winding roll.

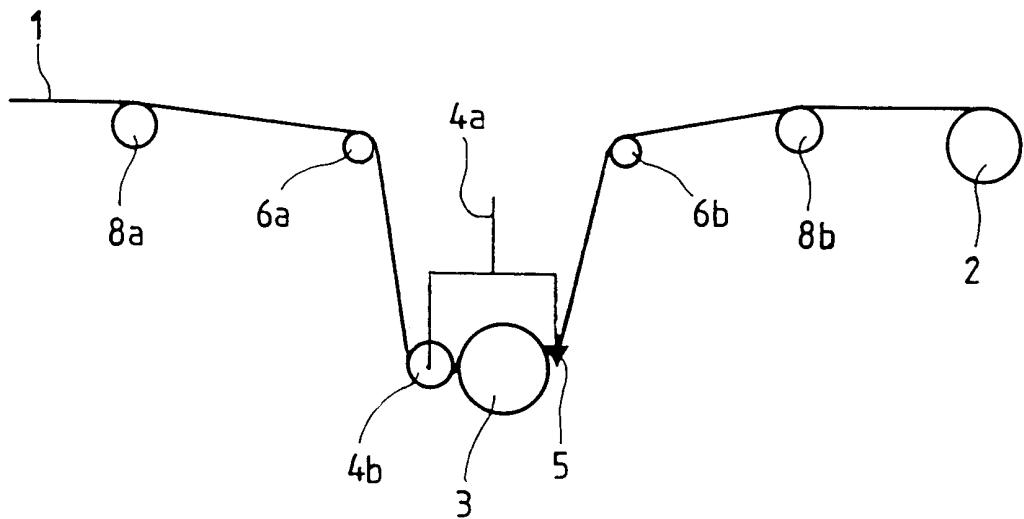
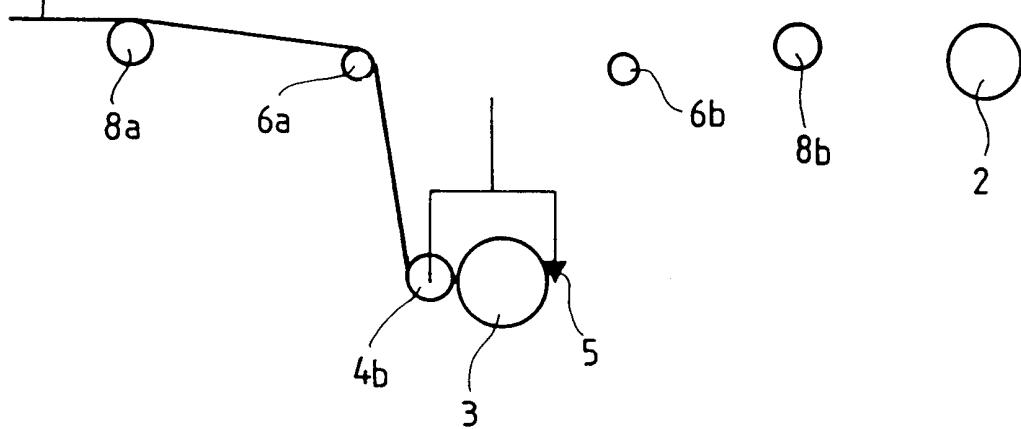
20 35. The method according to any one of claims 29 to 34, characterized in that, in step (iii), the web is cut between said primary winding roll and said secondary driving means.

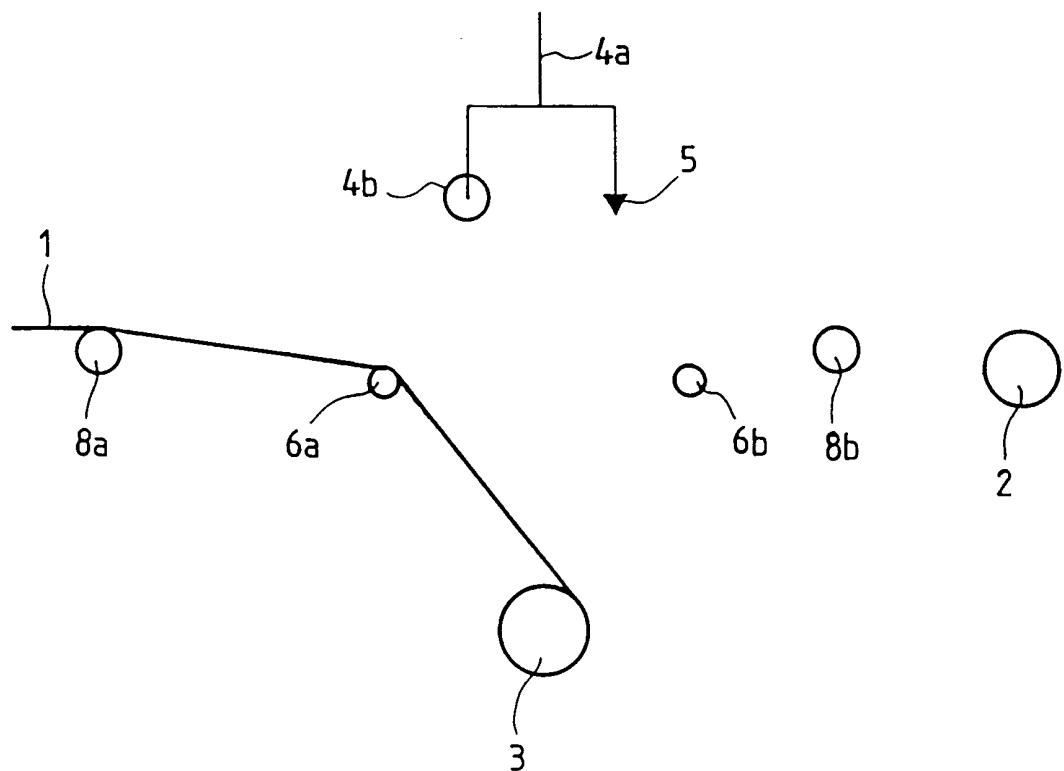
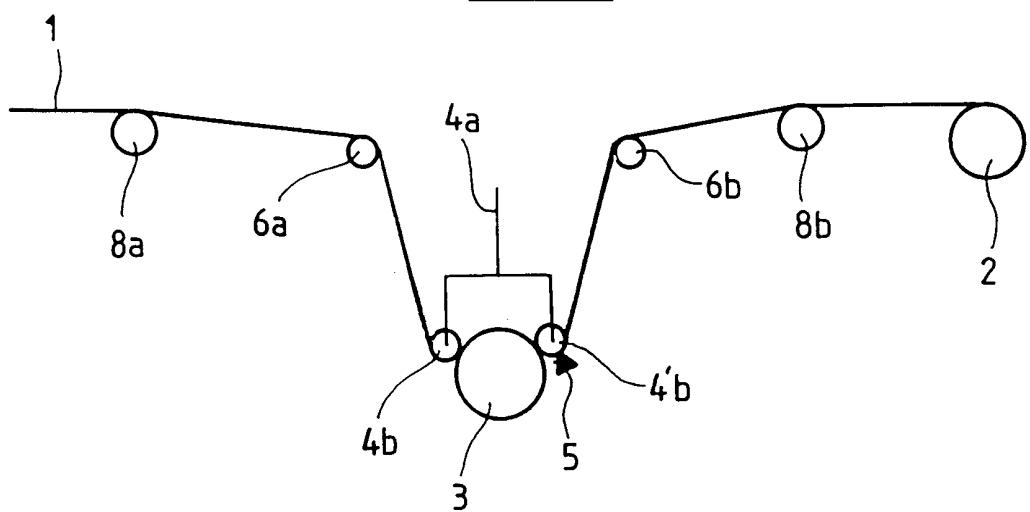
25 36. The method according to any one of claims 29 to 35, characterized in that, in step (ii), the web conveyance speed of said second driving means is varied so as to keep a substantially constant tension of the web during the whole step.

37. A method for initiating the winding of several parallel webs on respective rolls, characterized in that the winding is initiated by following the method according to any one of claims 30 to 36 for at least one web or group of webs on a corresponding primary winding roll or group of primary winding rolls, independently of said other webs.

38. The method according to any one of claims 29 to 37, characterized in that it uses at least one apparatus according to any one of claims 1 to 25.

FIG_1aFIG_1b

FIG_1cFIG_1d

FIG_1eFIG_1f

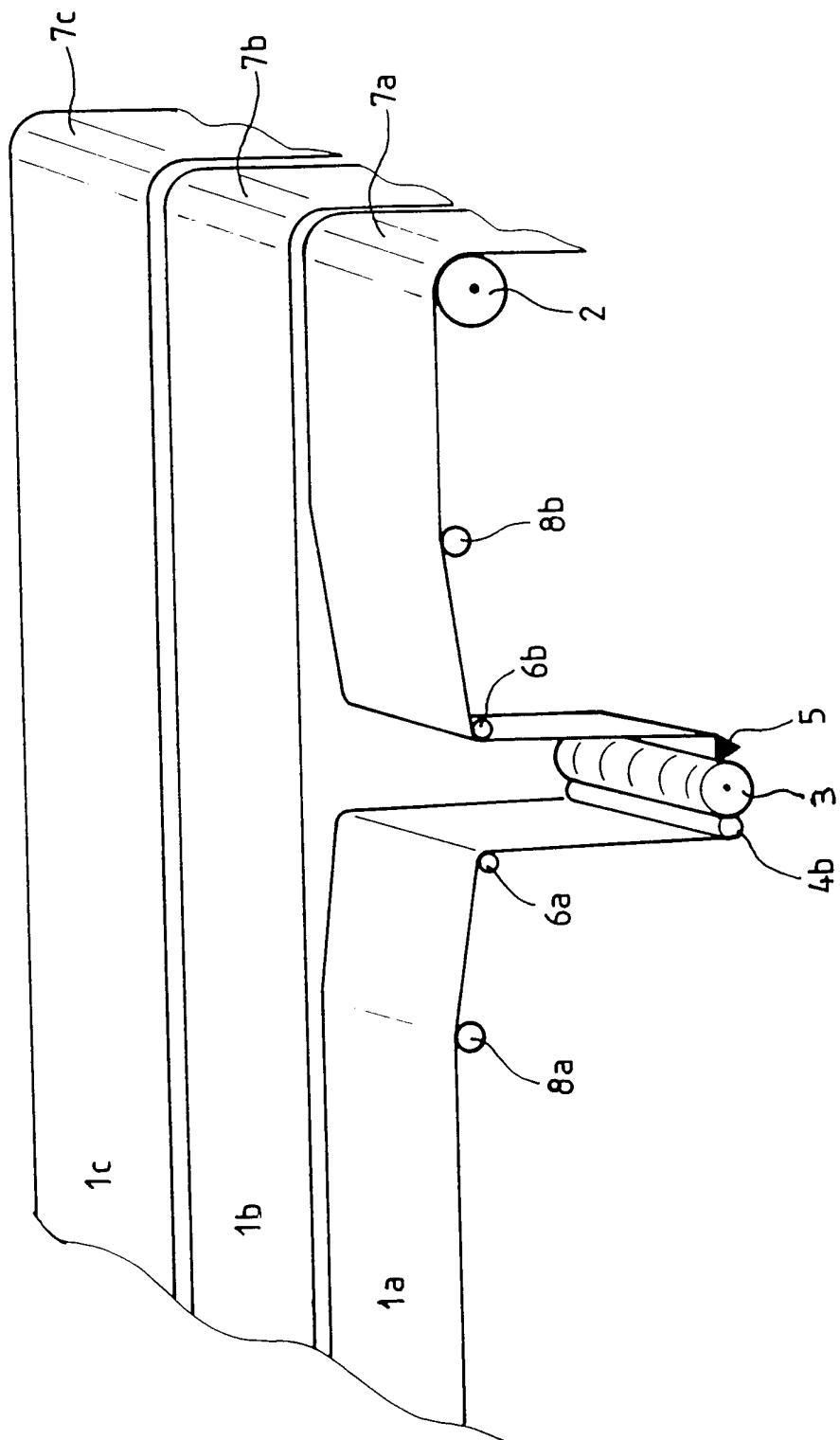
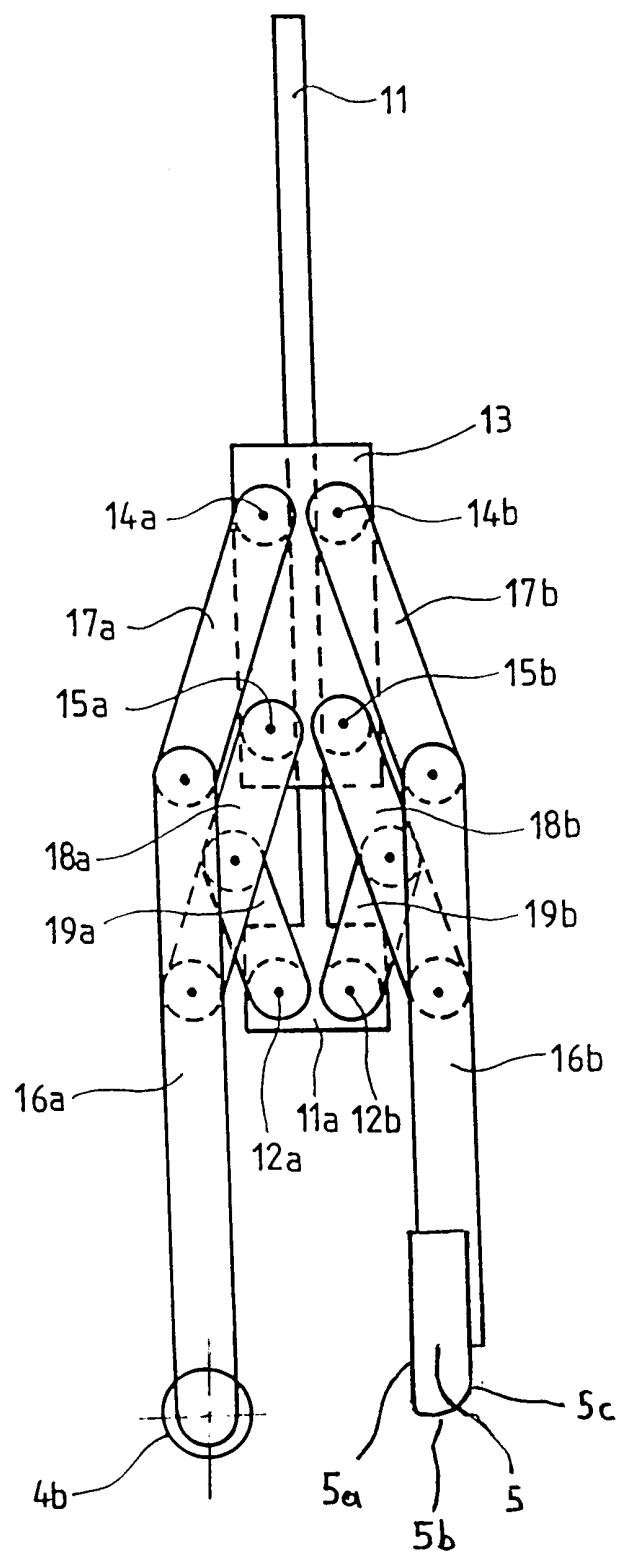
FIG_2

FIG. 3

F →

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/05437

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65H19/26 B65H19/28

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 B65H B26F

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, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category ^o	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2 942 796 A (FRANK A.GURNEY AND HARRY M. KEATING) 28 June 1960 (1960-06-28)	1,2, 9-12,20, 21, 29-31, 33,34,37
Y	the whole document -----	3,32
Y	DE 30 33 765 A (FUJI IRON WORKS) 29 October 1981 (1981-10-29) figures -----	3,32
Y	DE 32 39 922 A (WESER LENZE STAHLKONTOR) 3 May 1984 (1984-05-03) figures ----- -/-	3,32

 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

9 October 2000

Date of mailing of the international search report

18/10/2000

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INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/EP 00/05437

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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