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(54) **Method of applying adhesive in a slitter-winder of fiber web machine**

(57) The invention relates to a method of applying adhesive in a slitter-winder of a fiber web machine, which slitter-winder comprises an unwinder (50) for unwinding a parent roll, slitting section for slitting a fiber web (W) unwound from the parent roll into partial webs (W1; W2) and winder with winding stations (20) on at least one winding roll (10) for winding the partial webs (W1, W2) into partial web rolls (15), in which method an adhesive applying device (30) is adapted to apply adhesive on ends of partial webs (W1, W2) for attaching the ends of the partial webs (W1, W2) onto the partial web rolls (15), in which method the device (30) is moved in cross-direction of the main running direction of the partial webs (W1, W2) over the width of the partial webs on a support element (34). In the method at least two transverse movements of at least one adhesive applying device (30) are used for applying the adhesive onto the partial webs (W1, W2) and that during the first movement of the adhesive applying device (30) at least a part set of the partial webs (W1, W2) are provided with adhesive for attaching the tail of the partial web onto the wound partial web roll (15) and during the second movement of the adhesive applying device (20) at least a part set of the partial webs (W1, W2) not provided with adhesive during the first movement are provided with adhesive.

tion of the main running direction of the partial webs (W1, W2) over the width of the partial webs on a support element (34). In the method at least two transverse movements of at least one adhesive applying device (30) are used for applying the adhesive onto the partial webs (W1, W2) and that during the first movement of the adhesive applying device (30) at least a part set of the partial webs (W1, W2) are provided with adhesive for attaching the tail of the partial web onto the wound partial web roll (15) and during the second movement of the adhesive applying device (20) at least a part set of the partial webs (W1, W2) not provided with adhesive during the first movement are provided with adhesive.

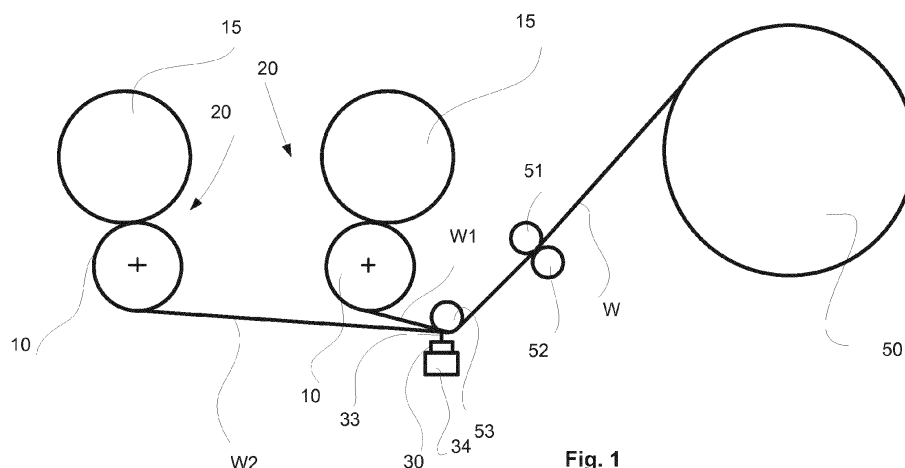


Fig. 1

Description

[0001] The invention relates to a method of applying adhesive in a slitter-winder of a fiber web machine according to the preamble of claim 1.

[0002] It is known that a fiber web, e.g. paper, is manufactured in machines which together constitute a paper-manufacturing line which can be hundreds of meters long. Modern paper machines can produce over 450,000 tons of paper per year. The speed of the paper machine can exceed 2,000 m/min and the width of the paper web can be more than 11 meters.

[0003] In paper-manufacturing lines, the manufacture of paper takes place as a continuous process. A paper web completing in the paper machine is reeled by a reel-up around a reeling shaft i.e. a reel spool into a parent roll the diameter of which can be more than 5 meters and the weight more than 160 tons. The purpose of reeling is to modify the paper web manufactured as planar to a more easily processable form. On the reel-up located in the main machine line, the continuous process of the paper machine breaks for the first time and shifts into periodic operation.

[0004] The web of the parent roll produced in paper manufacture is full-width and even more than 100 km long so it must be slit into partial webs with suitable width and length for the customers of the paper mill and wound around cores into so-called customer rolls before delivering them from the paper mill. This slitting and winding up of the web takes place as known in an appropriate separate machine i.e. a slitter-winder.

[0005] On the slitter-winder the parent roll is unwound, the wide web is slit on the slitting section into several narrower partial webs which are wound up on the winding section around winding cores, such as spools, into customer rolls. When the customer rolls are completed, the slitter-winder is stopped and the wound rolls i.e. the so-called set is removed from the machine. Then, the process is continued with the winding of a new set. These steps are repeated periodically until paper runs out of the parent roll, whereby a parent roll change is performed and the operation starts again as the unwinding of a new parent roll. Slitter-winders employ winding devices of different types depending on, inter alia, on the type of the fiber web being wound. On slitter-winders of the multistation winder type, the web is guided from the unwinding via guide rolls to the slitting section where the web is slit into partial webs which are further guided either from above or from below to the winding roll/rolls of the winding stations to be wound up onto cores into customer rolls. Adjacent partial webs are wound up on different sides of the winding roll / on different winding rolls. Multistation winders have one to three winding rolls and in them each partial web is wound to a partial web roll in its own winding station. During winding a winding nip is formed between the winding roll and the partial web roll to be wound.

[0006] As known from the prior art, in the slitter-winder the machine roll is unwound, the wide web is slit on the

slitting section into several narrower partial webs, into at least two partial webs, which are wound up on the winding section around winding cores, such as spools, into customer rolls. When the customer rolls reach desired length and diameter the partial webs are cut in cross-direction. Tails of the partial webs are attached to the surface of customer rolls by applying adhesive to the surface of the fiber web, which adhesive then attaches the tails to the surface of the customer rolls. When the customer rolls are completed, the slitter-winder is stopped and the wound rolls i.e. the so-called set is removed from the slitter-winder after which the process is continued with the winding of a new set. These stages are repeated periodically until paper runs out of the machine roll, whereby the machine roll change is performed and the operation starts again.

[0007] In US patent publication 4775110 is disclosed a prior art apparatus for automatically cutting and rolling up a web of material which comprises a winder with at least one feed drum. In this prior art arrangement the winder cuts the web and both sides of the cut location are provided with a trace of adhesive by adhesive spraying nozzles positioned along the entire width of the web and the end of the roll of material being wound up is glued on the fully wound roll.

[0008] In CA patent publication 2068260 (DE4115406) is disclosed a prior art winder for winding webs of material onto winding cores, which incorporate support roll around which the web wraps, at least in part and a web separating system and a system for applying a double-sided adhesive strip arranged within the wrap-around area of the support roll. An adhesive tape dispenser for an adhesive tape is arranged next to the support roll. The adhesive tape is guided transversely to the web around a free-wheeling pressure roll which is supported on a transversely movable side so that its adhesive tape can be pressed against the wrapped around support roll. The adhesive tape is applied onto the web while the winder is stopped. A cutting roll is arranged for cutting the tape and the web underneath it so that a tape is both on the end of the web for attaching the tail of the web on the finished roll and for attaching the beginning of the web to the core for winding the next roll.

[0009] In both of the above prior art arrangements after applying the adhesive and weakening/cutting the feed drum / the supporting roll is held still while the rolls in winding stations are rotated with a center drive and the web is moved so that the tails of the webs adhere on the rolls in winding stations. Thereafter the set change is done and when new cores for the next set are at position for winding, the winder is run at crawling speed so that the beginnings of the webs with adhesives adhere on the cores pressed against the feed drum / support roll.

[0010] From prior art is also known an adhesive applying arrangement for applying the beginning and end adhesive of hot melt adhesive by trade name Gecko in which separate adhesive nozzles are used and in which the web is cut between the end and beginning adhesives and the rolls are rotated separately by center drives of

winding stations.

[0011] In EP patent publication 0710158 is disclosed an prior art arrangement in which adhesive is applied onto a moving material web, wherein the adhesive is applied by means of at least one applicator device through at least one nozzle on the material web to constitute an adhesive strip in the longitudinal direction of the material web while the material web runs at an invariable distance from the nozzle end placed next to the material web and the adhesive is passed onto the material web through the nozzle in the applicator head.

[0012] In the prior art arrangements in which several nozzles located next to each other in cross direction of the web are used the overall structure of the arrangement is complicated and requires a lot of maintenance.

[0013] In the prior art arrangements in which tape is used as adhesive the applying of the adhesive on the web needs a support structure for the web on the other side. The support structure can be for example a roll or a drum and it must be done while the running of the web is stopped.

[0014] In WO publication 2008/148937 is described an apparatus for applying adhesive onto a moving web, containing an application head provided in connection with a support structure extending essentially in the transverse direction across the web, the support structure comprising a guide extending across the web into which the application head has been disposed movably, and the application head has been arranged to form onto the surface of the web an adhesive stripe essentially in the transverse direction in relation to the web running direction while the web is moving. This prior art apparatus comprises means for changing the movement direction of the application head during the application of adhesive and/or that the application apparatus includes means for changing the movement speed of the application head during the application of adhesive.

[0015] In WO publication 2011/076996 is disclosed an apparatus in a slitter winder which comprises an applicator head which is arranged to apply the adhesive onto the web surface and support member by means of which the apparatus can be mounted into the slitter winder and by means of which the apparatus can be arranged to be movably substantially in cross-direction with respect to the slitter winder.

[0016] Even though the above type of apparatuses with transverse type of movement of the adhesive applying device has in most cases proven to be well functioning but the method according to this prior art is not as such applicable in all types of winders, especially for multistation winders a new type of method is needed.

[0017] An object of the invention is to create a new method of applying adhesive in a slitter-winder of a fiber web machine, especially suitable for multistation type of winders.

[0018] A further object of the present invention is to provide a device for applying adhesive in a slitter-winder of a fiber web machine in which the disadvantages of

prior art are eliminated or at least minimized.

[0019] A further object of the present invention is to provide the effect of reliable adhesive applying in a slitter-winder of fiber web machine which has a simple structure.

[0020] In view of achieving the objects stated above and those that will come out later the method of applying adhesive in a slitter-winder of a fiber web machine in accordance with the invention is mainly characterized by what is presented in the characterizing part of claim 1.

[0021] In the method according to the invention in at least two transverse movements of at least one adhesive applying device are used for applying the adhesive onto the partial webs and that during the first movement of the adhesive applying device at least a part set of the partial webs are provided with adhesive for attaching the tail of the web onto the wound partial web roll and during the second movement of the adhesive applying device at least a part set of the partial webs not provided with adhesive during the first movement are provided with adhesive. By part set of partial webs are meant at least one partial web of the partial webs to be wound to the partial web rolls.

[0022] It should be noted that in this description and the claims by transverse movement of an adhesive applying device and by movement of an adhesive applying device in cross-direction is meant a movement of the adhesive applying device in direction that is transverse / cross-directional in relation to the main running direction of the web and the main running direction of the partial webs but if the web is running during the movement of the adhesive applying device the movement direction will be inclined in respect of the main running direction of the web and the main running direction of the partial webs such that the adhesive stripe applied will be substantially transverse / cross-directional in relation to the main running direction of the web. In case the web is stopped while the movement of the adhesive applying device no inclination is needed and the movement is substantially transverse / cross-directional in relation to the main running direction of the web / the partial webs.

[0023] It should also be noted that in this description by adhesive is meant glue or other in fluid from applicable adhesive properties having substance i.e. adhesive that is applied by a nozzle or corresponding means.

[0024] According to advantageous aspect of the method according to the invention is used in winders where there are winding stations at two different positions either on different positions on one winding roll or on two different winding rolls.

[0025] In the method according to the invention adhesive is applied onto the partial webs such that partial webs with different run to the winding stations on the winding roll / winding rolls first the partial webs with longer run to the winding stations are applied with adhesive and there after the partial webs with shorter run to the winding stations are applied with adhesive. Depending on the need also different order of applying adhesive on different part sets of partial webs can be used.

[0026] In the method according to an advantageous aspect of the invention, in which only one adhesive applying device is used, the adhesive applying device is moved from the home position, in which the adhesive applying device is positioned while no adhesive is applied, in cross-direction in relation to the movement direction of the partial webs over the width of the partial webs and adhesive is applied to the first set of partial webs and the adhesive applying device is returned to the home position and the adhesive applying device is moved from the home position in cross-direction in relation to the movement direction of the partial webs over the width of the partial webs and adhesive is applied to the second set of partial webs and adhesive applying device is returned to the home position. If further sets of partial webs are to be applied with adhesive the adhesive applying device is moved again over the width of the partial webs and returned until substantially all partial webs are provided with adhesive.

[0027] According to another aspect of the method according to the invention adhesive can also be applied during the return movement of the adhesive applying device.

[0028] In the method according to the invention advantageously a device is used which has one adhesive nozzle but also a device with two adhesive nozzles that are attached to the device which is movable along the support element that extends the width of the partial webs in cross-direction in relation to the running direction of the partial webs can be used. The nozzles are located in the adhesive applying device such that they are apart in main running direction of the web. Advantageously adhesive is applied by one of the nozzles onto one set of partial webs and with the other nozzle onto the other set of partial webs. Advantageously the distance between the nozzles in the main running direction of the web corresponds to the distance based on the time difference of the running times of each set to the correct location at the winding stations for the adhesive to adhere the tails.

[0029] According to an advantageous aspect of the invention, especially in connection with wide webs to be slitted into partial webs, devices are used for applying the adhesive. The devices are located substantially one after the other in the transverse / cross-direction such that one device is used for applying adhesive to partial webs with at least two movements according to the invention from one edge to about middle area of the web and the other is used for applying the adhesive to partial webs with at least two movements according to the invention from the about middle area to the other edge. The movements in the middle area are advantageously partially overlapping in the middle area.

[0030] According to one aspect of the invention also a device may also comprise two separate adhesive applying devices that are apart in the main running direction of the web.

[0031] The device for applying adhesive in a slitter-winder is advantageously located underneath the web

and under the slitter-winder and thus in the method the adhesive is advantageously applied on the bottom surfaces of the partial webs.

[0032] In the method according to the invention advantageously the adhesive is applied while the web is moving but it is suitable also for situations in which the adhesive is applied while the web run is stopped.

[0033] In the following the invention is discussed in more detail by reference to figures of accompanying drawings.

Figure 1 shows schematically one example for an application of the method according to the invention.

Figure 2 shows schematically another example for an application of the method according to the invention.

Figure 3 shows schematically examples for narrow webs.

Figure 4 shows schematically examples for wide webs.

[0034] In the following description same reference signs designate for similar components unless otherwise mentioned and it should be understood that the examples are susceptible of modification in order to adapt to different usages and conditions within the frames of the invention. In the following example the invention is explained in reference to a slitter-winder with reference to multistation winders but it should be understood that the invention is as well applicable in connection with slitter-winders with a different type of winder.

[0035] Fig. 1 schematically shows an exemplifying embodiment of the invention in which two winding rolls 10 are used. A web W is guided for example from an unwinding station 50 in between slitter blades 51, 52 or laser or water jet slitting means which slit the web W in the longitudinal direction into partial webs W1, W2. By reference sign W1 are indicated those partial webs that will be guided from the guide roll 53 to the first winding station 20 to be wound into first partial web rolls 15 and by reference sign W2 are indicated those partial webs that will be guided from the guide roll 53 to second winding station 20 to be wound into second partial web rolls 15. The partial webs W1, W2 are wound into partial web rolls 15 via the winding rolls 10 on respective winding stations 20. Each partial web roll is created around a core or equivalent winding spool. Substantially all partial webs W1, W2 pass via the first guide roll 53 and every second partial webs W1 are guided to the winding roll 10 of the first winding station 20 and the winding up thus occurs via winding roll 10 at the first winding stations 20. From the guide roll 53 the other every second partial webs W2 are guided to be wound up via the second winding roll 10 on second winding stations 20. The partial webs rolls 15 are wound on the upper half of the circumference of the wind-

ing roll 10.

[0036] Fig. 2 schematically shows an exemplifying embodiment of the invention in which one winding roll 10 is used. A web W is guided for example from an unwinding station 50 in between slitter blades 51, 52 or laser or water jet slitting means which slit the web W in the longitudinal direction into partial webs W1, W2. By reference sign W1 are indicated those partial webs that will be guided from the guide roll 53 to the first winding station 20 to be wound into first partial web rolls 15 and by reference sign W2 are indicated those partial webs that will be guided from the guide roll 53 to second winding station 20 to be wound into second partial web rolls 15. The partial webs W1, W2 are wound into partial web rolls 15 via the winding roll 10 on respective winding stations 20. Each partial web roll is created around a core or equivalent winding spool. The partial webs rolls 15 are wound on the upper half of the circumference of the winding roll 10.

[0037] In figures 1 and 2 an example of the invention is shown in the device 30 for applying adhesive there is one adhesive nozzle 33 that is attached to the device 30 which is located movable on a support element 34. The device 30 with the nozzle 33 is movable along the support element 34 that extends over the width of partial webs W1, W2 in cross-direction in relation to the running direction of the partial webs W1, W2 / of the web W. The home position of the adhesive applying device 30 is at the side of the web W. The device 30 for applying adhesive in a slitter-winder is advantageously located underneath the partial webs W1, W2 / the web W and thus in the method the adhesive is applied on the bottom surfaces of the partial webs.

[0038] In the method according to the invention in at least two transverse movements of the adhesive applying device 30 are used for applying the adhesive onto the partial webs W1, W2 and that during the first movement of the adhesive applying device 30 at least a part set of the partial webs W2, advantageously the part set of partial webs W2 that are passed to the second winding station further from the guide roll 53, are provided with adhesive for attaching the tail of the web onto the wound partial web roll 15 and during the second movement of the adhesive applying device at least a part set of the partial webs W1 not provided with adhesive during the first movement, advantageously the part set of partial webs W1 that are passed to the first winding station closer to the guide roll 53, are provided with adhesive.

[0039] In figure 3 is schematically shown the transverse / cross-directional location of the adhesive applying device in respect of the partial webs for the method according to the invention for narrow webs, 2 - 7 m to be slitted into partial webs. The support element 34 of the adhesive applying device is located in the transverse / cross-direction in relation to the main running direction S of the web W and the partial webs. In cases the web W is running during for the movement of the adhesive applying device the support element is inclined in respect of the main running direction S of the web / the partial

webs such that the adhesive stripe applied will be substantially transverse / cross-directional in relation to the main running direction S of the web. In case the web / the partial webs is / are stopped for the movement of the adhesive applying device the support element 34' is substantially transverse / cross-directional in relation to the main running direction S of the web as shown by broken line.

[0040] In figure 4 is schematically shown the transverse / cross-directional location of the adhesive applying device in respect of the partial webs for the method according to the invention for wide webs, 7 - 12 m, to be slitted into partial webs. The two support elements 34A, 34B of two adhesive applying devices are located in the transverse / cross-direction in relation to the main running direction S of the web W. In cases the web W is running during for the movement of the adhesive applying devices the support elements 34A, 34B are inclined in respect of the main running direction S of the web / partial webs such that the adhesive stripes applied will be substantially transverse / cross-directional in relation to the main running direction S of the web / the partial webs. In case the web / the partial webs is / are stopped for the movement of the adhesive applying devices the support element 34A', 34B' are substantially transverse / cross-directional in relation to the main running direction S of the web / the partial webs as shown by broken line. The support elements 34A, 34B; 34A', 34B' are located substantially one after the other in the transverse / cross-direction such that one device on one support elements 34A; 34A' is used for applying adhesive to partial webs with at least two movements according to the invention from one edge to about middle area of the web W and the other 34B; 34B' is used for applying the adhesive to partial webs with at least two movements according to the inventions from the about middle area to the other edge. As shown in the figure the support elements 34A, 34B; 34A', 34B' are advantageously partially overlapping in the middle area.

[0041] Above the invention has been described with reference to some preferred exemplifying embodiments of the same only, and the invention is, however, by no means to be strictly confined to the details of said embodiments and many modifications and variations are possible.

Claims

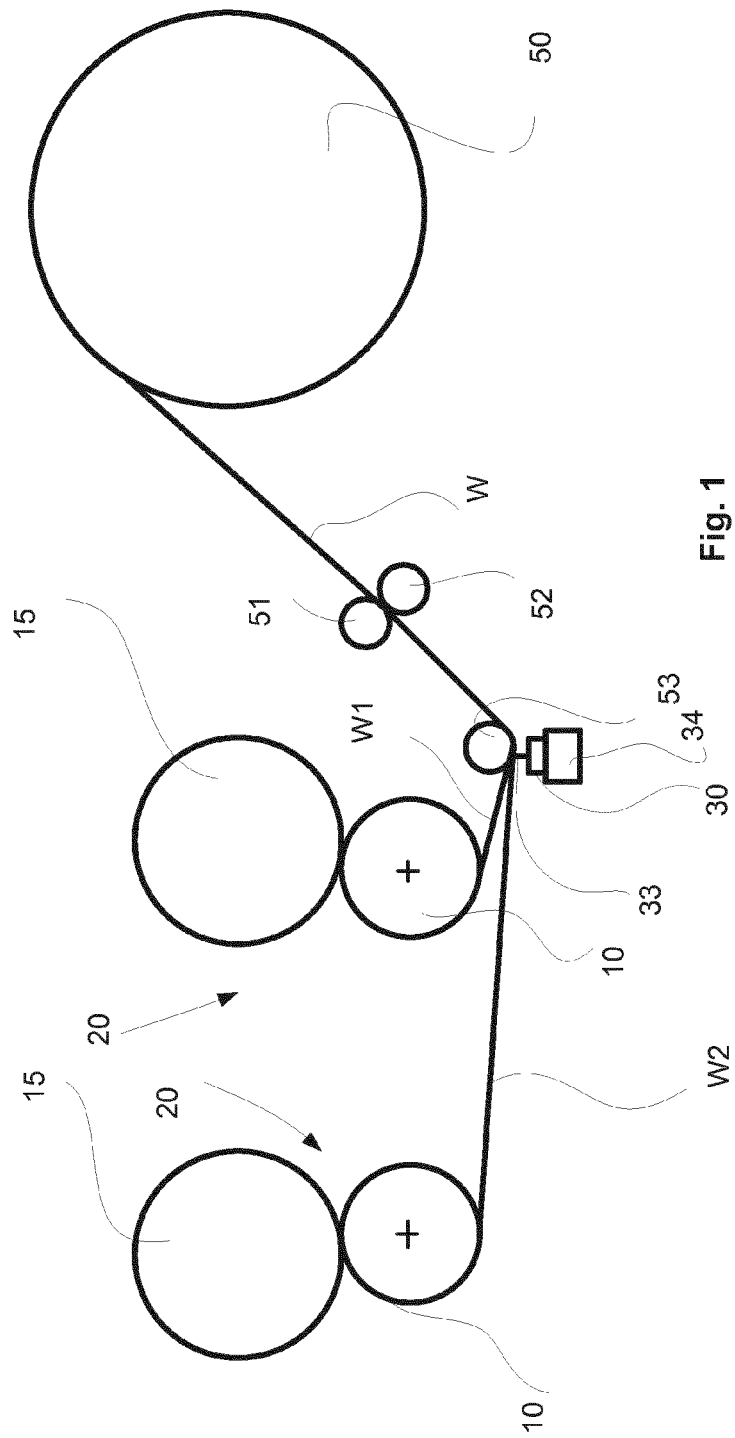
1. Method of applying adhesive in a slitter-winder of a fiber web machine, which slitter-winder comprises an unwinder (50) for unwinding a parent roll, slitting section for slitting a fiber web (W) unwound from the parent roll into partial webs (W1; W2) and winder with winding stations (20) on at least one winding roll (10) for winding the partial webs (W1, W2) into partial web rolls (15), in which method an adhesive applying device (30) is adapted to apply adhesive on ends of

partial webs (W1, W2) for attaching the ends of the partial webs (W1, W2) onto the partial web rolls (15), in which method the device (30) is moved in cross-direction of the main running direction of the partial webs (W1, W2) over the width of the partial webs on a support element (34), **characterized in, that** in the method at least two transverse movements of at least one adhesive applying device (30) are used for applying the adhesive onto the partial webs (W1, W2) and that during the first movement of the adhesive applying device (30) at least a part set of the partial webs (W1, W2) are provided with adhesive for attaching the tail of the partial web onto the wound partial web roll (15) and during the second movement of the adhesive applying device (20) at least a part set of the partial webs (W1, W2) not provided with adhesive during the first movement are provided with adhesive.

2. Method according to claim 1, **characterized in, that** the method is used in winders where there are winding stations (20) at two different positions either on different positions on one winding roll (10, fig. 2) or on two different winding rolls (10, fig. 1).
3. Method according to claim 1, **characterized in, that** in the method adhesive is applied onto the partial webs (W1, W2) such that partial webs (W1, W2) with different run to the winding stations (20) on the winding roll (10) / winding rolls (10), at first the partial webs (W2) with longer run to the winding stations (20) are applied with adhesive and thereafter the partial webs (W1) with shorter run to the winding stations (20) are applied with adhesive.
4. Method according to claim 1, **characterized in, that** in the method an adhesive applying device (30) with two nozzles spaced apart in the main running direction of the partial webs (W1, W2) and that adhesive for at least part of the partial webs (W1) is applied by one of the nozzles and that adhesive for the rest of the partial webs (W2) is applied by the other of the nozzles.
5. Method according to claim 1, **characterized in, that** in the method adhesive is applied during the return movement of the adhesive applying device (30).
6. Method according to claim 1, **characterized in, that** in the method a device (30) is used which has one or two adhesive nozzles that are attached to the device (30) that is movable along the support element (34) that extends the width of the partial webs in cross-direction in relation to the running direction of the partial webs (W1, W2).
7. Method according to claim 1, **characterized in, that** in the method the adhesive is applied while the partial

webs (W1, W2) are moving.

8. Method according to claims 6 or 7, **characterized in, that** in the method the partial webs (W1, W2) are moving while the adhesive is applied and the device (30) is moved on an inclined in respect to the main running direction (S) of the partial webs (W1, W2) located support element (34) such that the adhesive stripe applied is substantially transverse / cross-directional in respect of the main running direction (S) of the partial webs (W1, W2).



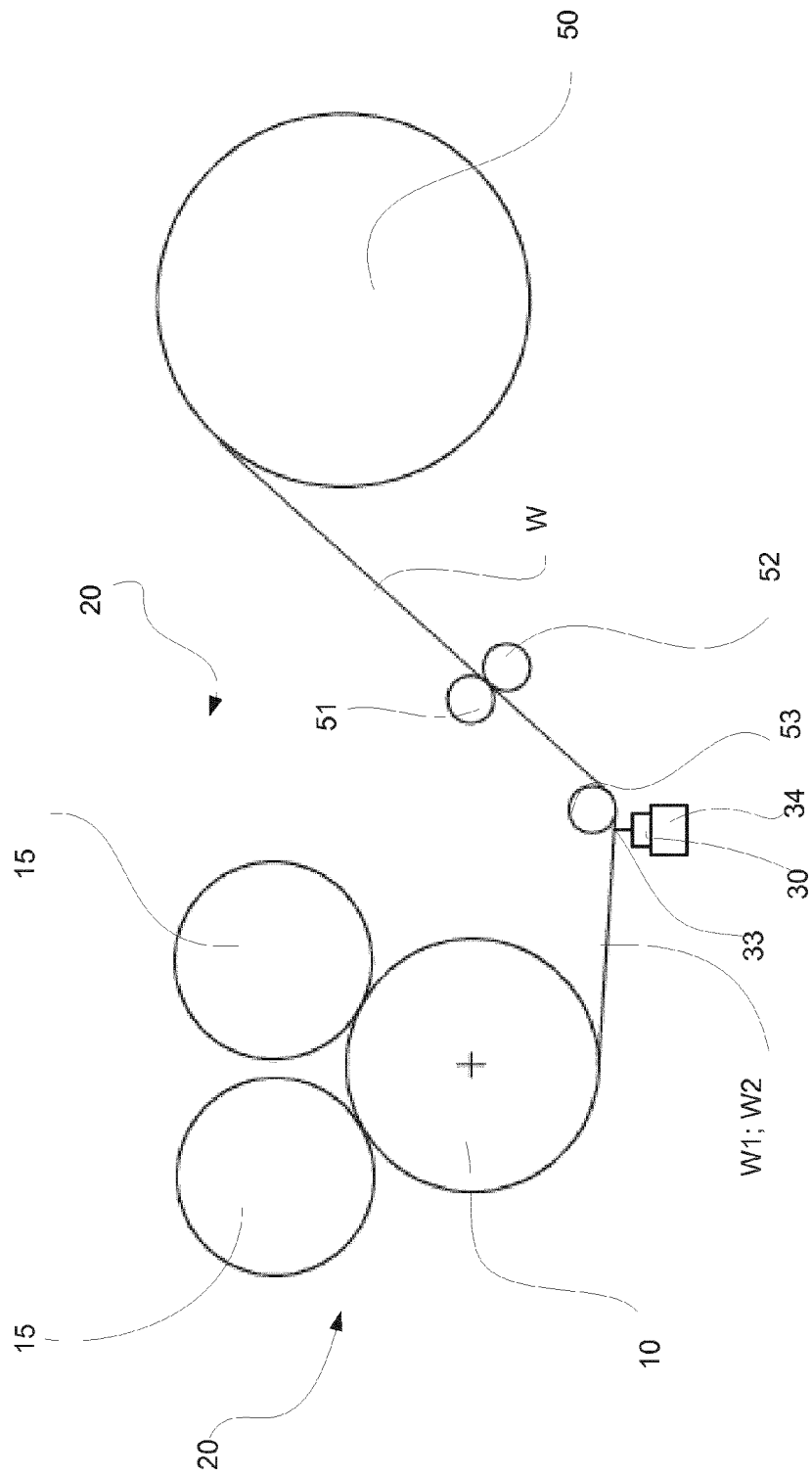


Fig. 2

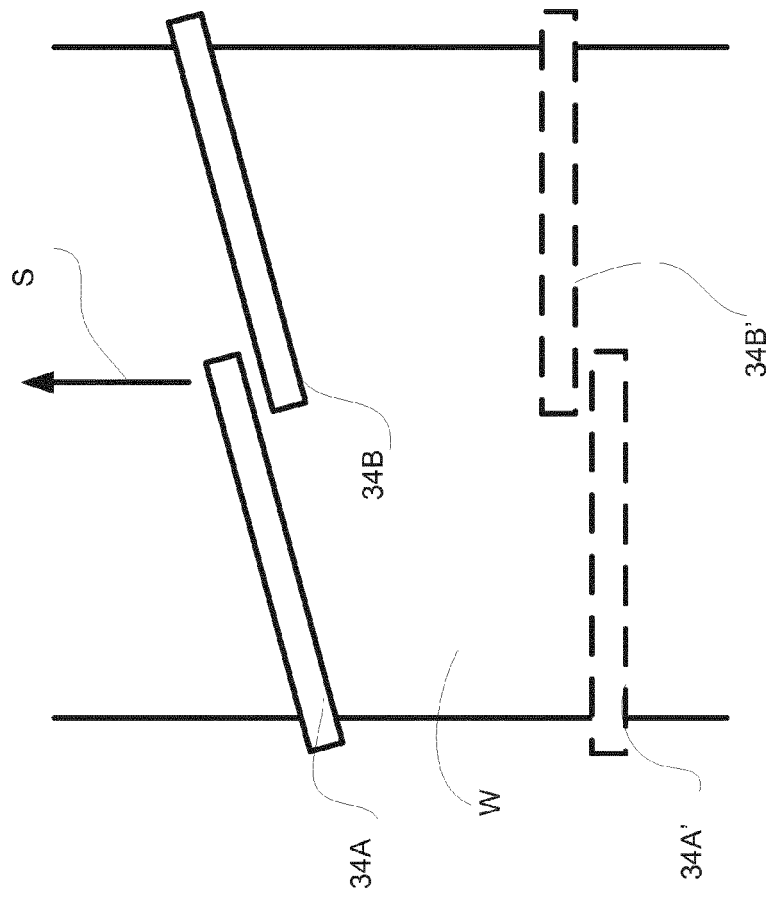


Fig. 4

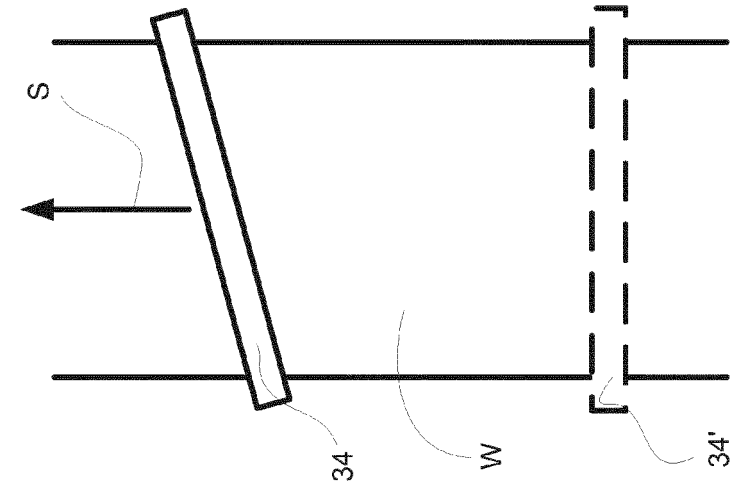


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 9052

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 0 744 365 A2 (VOITH SULZER PAPIERMASCH GMBH [DE] VOITH SULZER PAPIERTECH PATENT [DE]) 27 November 1996 (1996-11-27) * column 3, lines 29-50 * * column 5, lines 26-49 * * column 8, line 1 - column 9, line 21 * * figures 1,6-8 *	1-8	INV. B65H19/29
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Y,D	WO 2008/148937 A1 (METSO PAPER INC [FI]; HAAPANEN JAAKKO [FI]) 11 December 2008 (2008-12-11) * paragraphs [0023], [0024], [0026] - [0028], [0030], [0032] * * figures 3,4 *	8	TECHNICAL FIELDS SEARCHED (IPC) B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 October 2012	Examiner Cescutti, Gabriel
CATEGORY OF CITED DOCUMENTS 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 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			

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EPO FORM 1503 03 82 (P04G01)

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

EP 12 16 9052

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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