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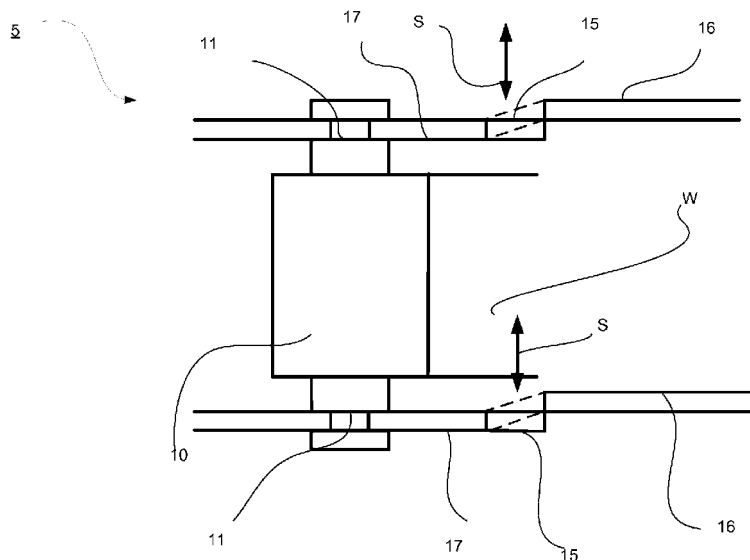
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(54) Method and arrangement in connection with an unwinder

(57) The invention relates to a method in connection with an unwinder (5) for a fiber web(W), according to which method a machine roll (10) is unwound to a fiber web (W) in the unwinder (5) and in which method the machine roll (10) is unwound in a first unwinding station of the unwinder (5) on first rails (17) down to a certain diameter and the machine roll (10) is unwound in a second unwinding station of the unwinder (5) on second rails (16) down from the certain diameter. The machine roll (10) is transferred from the first unwinding station on the first rails (17) to the second unwinding station on the second rails (16) during unwinding such that at least once during transferring the machine roll (10) is moved in its axial direction (S) while supported on movable / inclinable rail parts (15) between the first and the second rails (17;

16). The invention also relates to an arrangement in connection with an unwinder (5) for a fiber web(W), which unwinder (5) comprises a first unwinding station on first rails (17) for unwinding a machine roll (10) down to a certain diameter and a second unwinding on second rails (16) for unwinding the machine roll (10) down from the certain diameter. The unwinder (5) further comprises movable / inclinable rail parts (15) between the first rails (17) and the second rails (16) which first and second rails (17; 16) are not located on the same longitudinal line for providing transferring of the machine roll (10) from the first unwinding station on the first rails (17) to the second unwinding station on the second rails (16) during unwinding such that at least once during transferring the machine roll (10) is moved in its axial direction (S) while supported on movable / inclinable rail parts (15).



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Description

[0001] The present invention relates to production of fiber web, especially to a method and an arrangement in connection with an unwinder. More especially the invention concerns a method in connection with an unwinder according to the preamble of patent claim 1 and an arrangement in connection with an unwinder.

[0002] As known from the prior art, fiber web such as paper and board webs are manufactured in machines which together constitute a paper/board-manufacturing line which can be hundreds of meters long. Modern fiber web machines can produce more than 450 000 tons of paper a year. The speed of the machine can exceed 2000 m/min and the width of the fiber web can be more than 11 meters.

[0003] In manufacturing lines known from the prior art fiber web making takes place as continuous process. A fiber web completing in a machine is wound with a reel-up around a reeling shaft i.e. reel spool into a machine roll (a parent roll) the diameter of which can be more than 3,5 m and the weight more than 100 tons. The purpose of reeling is to modify the web manufactured as planar into a more easily processable form. In the reel-up the continuous process of the machine breaks for the first time and shifts into periodic operation. The machine roll web produced in paper/board-making is full-width and even more than 100 km long so it must be slit into partial webs with suitable width and the partial webs are wound to partial rolls (customer rolls) with suitable length for the customers of the paper/board mill. The slitting and winding take place as known from prior art in an appropriate separate machine i.e. in a slitter-winder.

[0004] As known from the prior art in fiber web production lines typically comprise an assembly formed by a number of apparatuses arranged consecutively in the production line. A typical production and treatment line comprises a head box, a wire section and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise finishing devices, for example a calender and/ or a coater. The production and treatment line also comprises typically at least one slitter-winder for forming customer rolls as well as a roll packaging apparatus. In connection with the slitter-winder and in connection with other finishing devices, especially those that are off-line the machine roll is unwound in an unwinder. The unwinder comprises typically two unwind stands (one at the tending side and one at the drive side of the unwinder) which carry the machine roll during unwinding. In the unwind stand the machine roll is coupled to drives for rotating the machine roll during unwinding.

[0005] As the state of the art discloses a machine roll is unwound at a slitter winder and the wide web is slit in the slitting section of the slitter winder into several narrower partial webs which are rewound at the winding section around winding cores such as bobbins to form customer rolls. When the customer rolls prepared at the

same time from each partial web are finished the slitter winder is stopped and the rolls, or the so-called set, are removed from the machine. After this the process is continued in rewinding a new set. These stages are repeated in cycles until paper runs out from the machine roll, whereby the reel is replaced and the operation start over as unwinding of the new machine roll. The partial web winder can be a carrier roll type winder where the partial web rolls are wound supported by carrier rolls and through a rewinding nip between the web roll being formed and a second carrier roll. The partial roll winder can also be a center winder where the partial web roll is supported at the center and the rewinding takes place through the nip between the web roll being formed and the winding cylinder.

[0006] When unwinding web from the unwinder a machine roll change is carried out when the machine roll is becoming empty; in many unwinders of slitter winders this is still performed entirely manually. A so-called automatic machine roll change is also known, whereby according to the state of the art methods the slitter winder is stopped and the old web is caught with a retaining means, for example suction means, and cut and subsequently the empty machine roll has been removed and replaced by the next machine roll to be unwound. The end of the new machine roll web has been taken to the joining station and the ends of the old web and the new web are joined together applying various splicing methods while the slitter winder and the unwinding apparatus have been stopped. An arrangement of this kind known in the prior art is disclosed in EP patent publication no. 1 163 178.

[0007] In an unwinding solution of another type the change of reel is carried out so that the old nearly empty reel is lifted off from the unwinding station so that a new reel can be brought to the unwinding station. A drawback with the solutions of this type known in the prior art is the decrease of capacity caused by the time consumed by the reel change.

[0008] Prior art also knows solutions for unwinder effecting continuously operating unwinding. US publication no. 6386477 discloses an unwinder which comprises two unwinding stations provided with integrated drives of their own, and a movable auxiliary drive. The movable drive allows maintaining web tension while the reel being unwound is transferred from the primary unwinding station to the secondary unwinding station. According to the publication the unwinding of a full reel is carried out at the primary unwinding station down to a certain roll diameter after which the reel is transferred to the secondary unwinding station for unwinding and a new full reel is brought to the primary unwinding station. Splicing the web, in other words changing the web to be unwound from the old reel to the new reel has been described as a so-called flying splice, where the end of the new web is connected to the running old web and the old web is severed at normal running speed.

[0009] Prior art patent publications FI 121007 and EP

1798172 also disclose unwinder in which two unwinding stations are used. In the method according to EP 17918172 the material web is unwound from the roll for a subsequent cutting in the longitudinal direction and for the following winding onto a plurality of shipping rolls and the material web is unwound from the rolls as long as the latter still has the complete size or a large size at the first unwinding position by a first drive with a high torque or with a gearbox as soon as the size of the roll has decreased to a predefined maximum size, the material web being unwound at the second unwinding position by a second drive with a low torque and the roll is unwound by first drive until a set of shipping rolls has been produced. In the method of FI patent the machine roll is unwound in the first unwinding station until a certain diameter has been reached and then the machine roll is moved to a second unwinding station in which the rest of the unwinding is accomplished. The machine rolls moved from the first unwinding station to the second unwinding station during a set change of in the process following slitter-winder.

[0010] One disadvantage in connection with unwinder that have two unwinding stations is that the horizontal movement in axial direction is not possible due to the reason that the machine roll must be moved between the unwinding stations centered. None of the above mentioned publications gives any hints to this movement in axial direction. In some cases the wound fiber web is not centered on the reeling shaft in axial direction or the fiber web is wound on the reeling shaft oscillated. In prior art the web is centered for splicing and slitting by moving the machine roll in an horizontal movement in axial direction. As the trend in unwinding systems is towards the unwinder with two unwinding stations this disadvantage of no possibility for horizontal movement in axial direction may constitute to difficult problems.

[0011] An object of the present invention is to provide a method and an arrangement in which the disadvantages and problems of prior art unwinder in connection with the horizontal movement in axial direction are eliminated or at least minimized.

[0012] To achieve the objects mentioned above and later the method according to the invention is mainly characterized by the features of the characterizing part of claim 1.

[0013] The arrangement according to the invention is mainly characterized by the features of the characterizing part of claim 5.

[0014] In some cases the fiber web is not wound on the reeling shaft centered or it is wound oscillated and in unwinder with two unwinding stations this the transfer between the unwinding stations is made possible even when the machine roll is not centered by the movable/inclinable rail parts. Advantageously the inclinable rail parts are inclined such that the machine roll can be transferred along them from the rails of the first unwinding station to the rails of the second unwinding station which rails of the first unwinding station to the rails of the second

unwinding are not on the same longitudinal line. Advantageously the movable rail parts are moved in axial direction of the machine roll such that the machine roll is transferred from the rails of the first unwinding station to the rails of the second unwinding station when being supported by the movable rail parts during the moving state of the movable rail parts.

[0015] According to a preferred embodiment of the present invention the web slit into partial webs at the slitting section of the slitter winder is rewound into partial web rolls having a certain diameter and the machine roll being unwound is unwound in the primary unwinding station by means of a drive coupled with the machine roll down to a certain diameter. Subsequently the machine roll is transferred from the primary unwinding station, and during the transfer the tension of the web is at least partly controlled by the drive of the transfer means of the unwinding apparatus and/or by means of a brake device and, after the transfer, a new machine roll is brought to the primary unwinding station. The end of the web of the new machine roll is taken to the vicinity of the splicing apparatus while the unwinding from the old machine roll is in progress.

[0016] The machine roll is removed from the primary unwinding station essentially in a horizontal movement to the secondary unwinding station and

[0017] The invention provides for the technical effect that is needed in connection with unwinder that is the possibility of using the movement of the machine roll in axial direction. The invention makes it possible to move the unwinding machine roll from one unwinding station to another unwinding station of the unwinder such that the web does not break and the unwinding is moved in axial direction and the transfer between unwinding stations can be done without centering the machine roll for the transfer. As the transfer between the unwinding stations is done non-centered and the end structures of the machine roll move along the transfer rails and along the movable rail parts that are movable in axial direction of the machine roll.

[0018] The invention and its operations are described below with reference to the appended schematic drawing of which

[0019] Figure illustrates schematically an embodiment of the invention.

[0020] The unwinder 5 comprises adjacent and parallel rails 16 and 17 to support the machine rolls 10 at both ends 11 of the reeling shafts via bearings in the same way. Preferably the rails 16, 17 are essentially horizontal whereby moving even the large roll to be unwound is as simple as possible. The unwinder 5 comprises a first unwinding station on rails 17 and a second unwinding station on rails 16. Both unwinding stations have a locking device (not illustrated) for the machine roll 10 for locking the unwinding machine roll 10 to the unwinding station and a drive (not illustrated) for rotating the machine roll 10 during unwinding. Both the drives have a motor and a coupling member via which the motor can be coupled

to the reeling shaft of the machine roll. The stationary drive here means that the drive can be coupled to the unwinding shaft while it is in the unwinding station. The unwinder may be modified so the second unwinding station does not have a stationary drive of its own at all but the drive of the machine roll and the control of the unwinding process is performed at the secondary unwinding station by the drive of a transfer apparatus. The unwinder comprises also transfer equipment which engages the machine roll for the transfer on rails 15, 16, 17 so that the movement and the position of the machine roll are determined by the transfer equipment. In connection with the transfer equipment, there is a drive and/or brake device, which is arranged to follow the transfer equipment while it moves. In this context the drive and/or braked device associated with the transfer equipment can be simply called a drive. The drive can in some embodiments be a simple brake means or a combination of a drive and a brake. The brake means can also be for example mechanical or electric. The unwinding is started at the first unwinding station and the machine roll 10 to be unwound is unwound at the first unwinding station down to a certain diameter after which the machine roll 10 is transferred to the second unwinding station, where the rest of the unwinding of the machine roll is carried out.

[0021] In figure a machine roll 10 is located at first unwinding station of the unwinder 5. The machine roll 10 is supported at both ends 11 on rails 17. The rails 17 extend horizontally or slightly inclined adjacent and parallel. As shown in the figure the rails 16 for the second unwinding station are not located on same longitudinal line as the rails 17 of the first unwinding station where the machine roll 10 needed to be moved horizontally in an axial movement is located. For the movement in axial direction the rail structure also comprises movable or inclinable rail parts 15. When the machine roll 10 needs to be moved in the axial direction the machine roll 10 is moved towards the movable/inclinable rail parts 15, the rail parts 15 are inclined such that they connect the rails of the first and second unwinding station and the machine roll 10 is moved to be transferred onto the rails 17 for second unwinding station. The rail parts 15 are connected to an actuator for the movement, which actuator is for example a hydraulic cylinder. The rail parts 15 can also be constructed such that one end of a rail part is connected to end of rail 16 and other end of rail part 15 is connected to rail 17 thus the rail parts 15 are moving in connection with rails 16, 17 and thus no separate actuator for the rail parts 15 in this example is needed. The actuator is connected to a control for activating the movement of the rail parts 15 between the rails 16 and 17. By the technical effect of the movable/inclinable rail parts 15 the unwinder with two unwinding stations not located on same longitudinal line can be connected and also the unwinding machine roll centered. The movable/inclinable rails parts 15 can also be constructed as rails for one of the unwinding stations i.e. to be used instead of rails 16 or rails 17.

[0022] It must be understood that only a few most pre-

ferred embodiments of the invention have been presented above. Thus it is obvious that the invention is not limited to the embodiments disclosed above but may be modified in many ways within the scope of protection defined by the appended patent claims. The features described in conjunction with the different embodiments may be used in conjunction with other embodiments as well and/or various combinations of the described features may be made within the frame of the basic idea of the invention, if so desired and if technical feasibility for this exists.

Claims

1. A method in connection with an unwinder (5) for a fiber web(W), according to which method a machine roll (10) is unwound to a fiber web (W) in the unwinder (5) and in which method the machine roll (10) is unwound in a first unwinding station of the unwinder (5) on first rails (17) down to a certain diameter and the machine roll (10) is unwound in a second unwinding station of the unwinder (5) on second rails (16) down from the certain diameter, **characterized in that** the machine roll (10) is transferred from the first unwinding station on the first rails (17) to the second unwinding station on the second rails (16) during unwinding such that at least once during transferring the machine roll (10) is moved in its axial direction (S) while supported on movable / inclinable rail parts (15) between the first and the second rails (17; 16).
2. A method according to claim 1, **characterized in that** the machine roll (10) is transferred from the first unwinding station to the second unwinding station via inclined rail parts (15) that connect the first rails (17) of the first unwinding station and the second rails (16) of the second unwinding station.
3. A method according to claim 1, **characterized in that** the machine roll (10) is transferred from the first unwinding station to the second unwinding station via movable rail parts (15) that are moved from the longitudinal line of the first rails (17) of the first unwinding station to the longitudinal line of the second rails (16) of the second unwinding station while the machine roll (10) is supported by the movable rail parts (15).
4. A method according to claim 1, **characterized in that** the movable / inclinable rail parts (15) are moved by an actuator.
5. An arrangement in connection with an unwinder (5) for a fiber web(W), which unwinder (5) comprises a first unwinding station on first rails (17) for unwinding a machine roll (10) down to a certain diameter and

a second unwinding on second rails (16) for unwinding the machine roll (10) down from the certain diameter, **characterized in that** the unwinder (5) further comprises movable / inclinable rail parts (15) between the first rails (17) and the second rails (16) which first and second rails (17; 16) are not located on the same longitudinal line for providing transferring of the machine roll (10) from the first unwinding station on the first rails (17) to the second unwinding station on the second rails (16) during unwinding such that at least once during transferring the machine roll (10) is moved in its axial direction (S) while supported on movable / inclinable rail parts (15).

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6. An arrangement according to claim 5, **characterized in that** in the unwinder (5) the first unwinding station is connected to the second unwinding station via inclined rail parts (15) that connect the first rails (17) of the first unwinding station and the second rails (16) of the second unwinding station.

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7. An arrangement according to claim 5, **characterized in that** in the unwinder (5) the first unwinding station is connected to the second unwinding station via movable rail parts (15) that connect the first rails (17) of the first unwinding station and the second rails (16) of the second unwinding station.

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8. An arrangement according to claim 5, **characterized in that** the unwinder comprises an actuator for moving / inclining the movable / inclinable rail parts (15).

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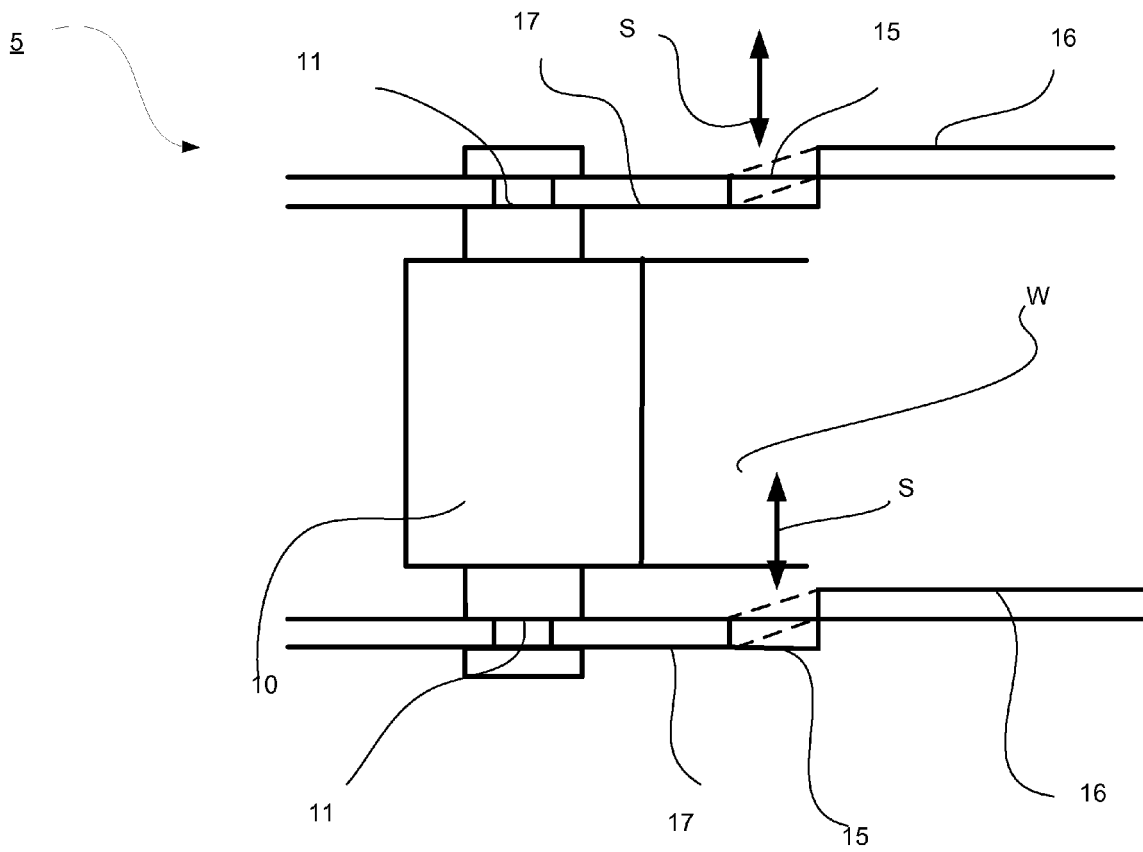
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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 1457

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 1 798 172 A2 (VOITH PATENT GMBH [DE]) 20 June 2007 (2007-06-20) * paragraphs [0001], [0021] - [0029] * * figures 3a,3b,4a,4b * -----	1-8	INV. B65H16/10 B65H19/18
A	EP 2 184 244 A2 (VOITH PATENT GMBH [DE]) 12 May 2010 (2010-05-12) * paragraphs [0004], [0005], [0010], [0012], [0016], [0020] * * figures 2a-27 * -----	2,4,6,8	
A	JP 56 056446 A (HASHIMOTO DENKI CO LTD) 18 May 1981 (1981-05-18) * figures 1,2 * * abstract * -----	1,5	
			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		9 November 2011	Cescutti, Gabriel
CATEGORY OF CITED DOCUMENTS		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	
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			

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EPO FORM 1503 03.82 (P04C01)

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

EP 11 17 1457

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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09-11-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1798172 A2	20-06-2007	AT 503712 T DE 102005000187 A1 EP 1798172 A2	15-04-2011 21-06-2007 20-06-2007
EP 2184244 A2	12-05-2010	DE 102008043482 A1 EP 2184244 A2	06-05-2010 12-05-2010
JP 56056446 A	18-05-1981	JP 1158203 C JP 56056446 A JP 57052298 B	25-07-1983 18-05-1981 06-11-1982

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1163178 A [0006]
- US 6386477 B [0008]
- FI 121007 [0009]
- EP 1798172 A [0009]
- EP 17918172 A [0009]