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(71) Applicant: **Valmet Technologies Oy**
02150 Espoo (FI)

(72) Inventors:
- **NISKALA, Antti**
  00320 HELSINKI (FI)
- **HAAPANEN, Jaakko**
  04430 JÄRVENPÄÄ (FI)
- **SALOJÄRVI, Jussi**
  40520 JYVÄSKYLÄ (FI)
- **PENTTILÄ, Kimmo**
  04410 JÄRVENPÄÄ (FI)
- **LUOMI, Seppo**
  04410 JÄRVENPÄÄ (FI)
- **HÄMÄLÄINEN, Timo**
  04420 JÄRVENPÄÄ (FI)
- **RIIHELÄ, Vesa**
  07190 HALKIA (FI)

(74) Representative: **Berggren Oy, Helsinki & Oulu**
P.O. Box 16
Eteläinen Rautatiekatu 10A
00101 Helsinki (FI)

(54) REEL-UP FOR REELING OF A FIBER WEB

(57) The invention relates to a reel-up for reeling of a fiber web (W) around a reel spool (15B) to form a parent roll (20B; 20A) by means of a reeling nip (N) formed between a reeling cylinder (10) of the reel-up and the parent roll (20B) under reeling, which reel-up has a primary reeling position and a secondary reeling position, which reel-up comprises the reeling cylinder (10), substantially horizontal rails (14) and for each end of the reel spool (15A; 15B) carriages (18) with locking clamps (16, 17). the substantially horizontal rails (14) comprise a recess (13), which forms an end position for the finished parent roll (20A) after reeling.

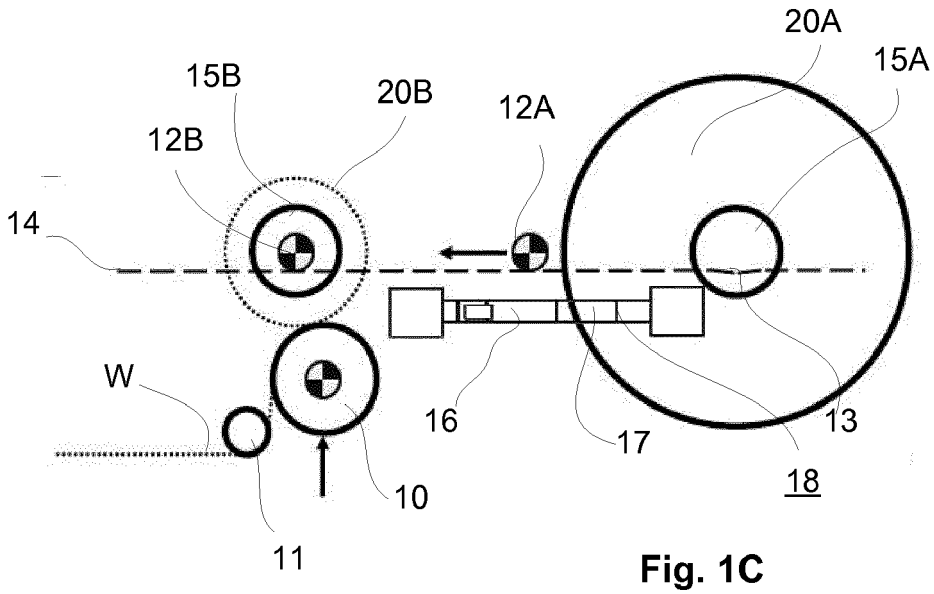

Fig. 1C

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Description

[0001] The invention relates to a reel-up for reeling of a fiber web. Especially the invention relates to a reel-up according to the preamble of claim 1.

[0002] As known from the prior art in fiber web producing processes typically comprise an assembly formed by a number of apparatuses arranged consecutively in the process 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 other sections and devices for finishing the fiber web, for example a sizer, a coating device, a calender. The production and treatment line also comprises at least one slitter-winder for forming customer rolls as well as a roll packaging apparatus. And as known, fiber webs, such as paper or board webs, are manufactured in machines together forming a fiber web manufacturing line, which may be hundreds of meters long.

[0003] In fiber web manufacturing lines, manufacturing operates as a continuous process. The finished fiber web being output from the machine is wound with a reel-up around a reeling shaft, i.e. a reel spool, into a parent roll (a machine roll), the diameter of which may be more than 5 meters and which may weigh more than 160 tons. The purpose of the reeling is to transfer the fiber web from its planar manufacturing form into a form in which it can be handled more easily.

[0004] At the reel-up the continuous process of the machine is interrupted for the first time, after which the process continues in stages. Every attempt is made to interlink these stages as smoothly as possible. The reel-up typically comprises a reeling cylinder and two pairs of carriages or two pairs of forks or a pair of carriages and a pair of forks, one carriage / fork for each end of the reel spool / parent roll for moving and supporting the reel spool and the parent roll to be reeled. The web is reeled around the reel spool to a parent roll by means of a reeling nip between the reeling cylinder and the parent roll under reeling, which reeling takes place in a primary stage in a primary position and in a secondary stage in a secondary position. In most prior art arrangements, the reel spool rotates during reeling on the rails supported by its rotating bearing housing.

[0005] The reel-up is thus a device that reels a material, which is produced as a continuous fiber web in a fiber web production line, into form of a roll; the parent roll. In the production process of the fiber web, the reeling is generally a first process part, wherein a continuous process is discontinued to be continued in sequences. The parent roll is formed around the reeling shaft that functions as core of reeling, i.e. the fiber web on one parent roll has a beginning and an end. At a reel-up a certain amount of fiber web is wound around the reel spool, typically without slowing down the running speed of the fiber web, after which the so-called turn-up is performed, in which the web is cut and directed to be reeled around a new empty reel spool. The smooth operation of the reel-up and especially the turn-up is very critical with regard to the function of the entire production line and, it is therefore important that handling of the reel spools, the parent rolls under reeling and the finished parent rolls is reliable and such, that the turn-up can be performed as required.

[0006] A prior art method described in the FI-patent 91383 (EP 0483092 B1) changed the size of parent rolls into a new order, since it was possible to build the first part of the parent roll without affecting the properties of the fiber web that was to be reeled. One feature that improved the technology was the progressive center torque of the parent roll that was provided by means of primary and secondary drives, enabling the versatile use of reeling parameters in building the parent roll. Prior art also discloses an example in which primary and secondary drive are engaged by a drive unit, with which the reeling shaft of the parent roll to be reeled is engaged during reeling with help of a cylinder arrangement located in connection with transmission. This arrangement has been described in US patent 5069394 and the drive arrangement is engageable and detachable by means of a cylinder device. In this kind of reel-ups the primary center drive and the primary carriage as well as the secondary center drive and the secondary reeling carriage move simultaneously, since the center drive is mechanically constructed in connection with the carriage and they are moved by same actuator.

[0007] A prior art method described in the US-patent 5370327 introduced idea that a parent roll would be built so that the parent roll would be on horizontal rails and at substantially the same vertical height throughout the reeling. The present invention relates to this type of reel-up. FI-patent 91383 also presented this type of solution, but before beginning to reel, the reeling shaft was moved along curved path into its initial reeling position. In the reel-up according to the US-patent 5370327 a moving reeling cylinder makes it possible to keep the center of the reeling shaft on a constant level. One advantage of this solution is changing the adjustment of the nip power from loading on the side of the parent roll to loading on the side of a constant mass reeling cylinder.

[0008] In US patent publication 5673870 is disclosed a reel apparatus for reeling a traveling web produced on a papermaking machine, which comprises a rotatable support drum, which is fixedly mounted in a frame and a pair of parallel, horizontally disposed rails mounted to the frame with the tops of the rails above the apex of the support drum. New reel spools are brought into supporting engagement on the rails at a location downstream of the apex of the support drum and intermediate the apex of the support drum and a jumbo-sized wound web roll (a parent roll) which is being wound while being powered by a center wind assist drive, as well as nipping engagement with the support drum. Each reel spool is supported in a pair of carriages which are mounted to travel over the rails. In the reel apparatus two sets of a complimentary pair of carriages can be disposed about a single pair

of rails to handle two different reel spools simultaneously as one reel spool begins the web reeling process and the other reel spool is finished being wound.

[0009] In WO publication 2010000915 is disclosed a reel-up for continuous reeling of fiber web around a reeling shaft to form a parent roll, the reel-up comprising a reeling cylinder, whereby a nip load can be formed between the parent roll and the reeling drum cylinder, the parent roll being arranged so as to be movable during the reeling along an substantially horizontal path from the starting point of the reeling to the point of transfer of the completed parent roll, the starting point of the reeling being upstream of the reeling cylinder and the point of transfer downstream of the same. Upstream of the reeling cylinder, there are primary support means for supporting the parent roll against the reeling cylinder and downstream of the reeling drum, there are secondary forks for supporting the machine roll against the reeling drum.

[0010] In EP patent application publication 310919 is disclosed a reel-up for reeling of a fiber web around a reel spool to form a parent roll by means of a reeling nip between a reeling cylinder of the reel-up and the parent roll under reeling, which reel-up has a primary reeling position and a secondary reeling position, which reel-up comprises the reeling cylinder, substantially horizontal rails and for each end of the reel spool loading arms and carriages and the primary reeling position is fixed.

[0011] One object of the invention is to further develop reel-ups of the kinds of reel-ups in which the parent roll moves on substantially horizontal rails and is substantially at the same vertical height throughout the reeling, especially in relation to the end position operations of the finished parent roll.

[0012] One object of the invention is to create a reel-up in which the disadvantages and problems of the reel-ups according to prior art are eliminated or at least minimized.

[0013] An object of the invention is to create a reel-up, which is simple, robust and reliable.

[0014] In order to achieve the above objects, the reel-up is mainly characterized by the features of the characterizing part of claim 1. Advantageous embodiments and features are disclosed in the dependent claims.

[0015] According to the invention the reel-up for reeling of a fiber web around a reel spool to form a parent roll by means of a reeling nip formed between a reeling cylinder of the reel-up and the parent roll under reeling, which reel-up has a primary reeling position and a secondary reeling position, which reel-up comprises the reeling cylinder, substantially horizontal rails and for each end of the reel spool carriages with locking clamps, wherein the substantially horizontal rails comprise a recess, which forms an end position for the finished parent roll after reeling.

[0016] According to an advantageous feature the locking clamps of the carriages are turnable to substantially horizontal position.

[0017] According to an advantageous feature the locking clamps comprise a substantially upright position, in which they provide a support position for the reel spool, and a substantially horizontal position, in which they provide a movement position for return movement of the carriage.

[0018] According to an advantageous feature the carriages with the locking clamps are turnable around the machine directional axis and one locking clamp is turnable around the cross-directional axis to a position in which the locking clamps are in substantially horizontal position.

[0019] According to an advantageous feature dry-end locking clamps of the carriages are turnable around the cross-directional axis to be opened by the turn towards or to the substantially horizontal level for releasing the finished parent roll to move to the recess of the end position.

[0020] According to an advantageous feature movements of the carriages are linear on the rails.

[0021] By the reel-up according the invention and its advantageous features many advantages are achieved, for example the end position of the finished parent roll is secured and the release form the finished parent roll from the carriage is more securely provided and achieved by the finished parent roll's own weight. Furthermore, the diameter of the reeling cylinder can be minimized as the space needed in vertical direction for the carriage during the return movement is smaller and thus the carriage needs less space for movement under the reeling spool. Also savings in process time can be achieved as the no separate transfer movement is needed due to the by the recess formed end position of the parent roll and due to the advantageous turnable locking clamps of the carriage.

[0022] In the following the invention is described in detail with reference to the accompanying drawing in which in figures 1A - 1D is schematically shown one advantageous example of reeling stages of a reel-up in accordance with the invention as a side view and
in figures 2A - 2B is schematically shown one example of a carriage of the reel-up in accordance with the invention.

[0023] During the course of this description like numbers and signs will be used to identify like elements according to the different views which illustrate the invention.

[0024] In figures 1A-1D is schematically shown an example of a reel-up in different reeling stages. The reel-up comprises a reeling cylinder 10, a guide roll 11 for guiding the fiber web W onto the reeling cylinder 10. The reel-up comprises reeling positions with a drives 12A, 12B and transfer rails 14 with carriages 18, each carriage 18 with two locking clamps 16, 17. The carriages 18 move linearly on advantageously substantially horizontal transfer rails 14. The transfer rails may deviate from the horizontal direction +/- 30°. The locking clamps 16, 17 and carriages 18 are located in connection with each of the

transfer rails 14 and correspondingly in connection with each end of the reel-spool 15A, 15B / the parent roll 20A / 20B. The locking clamps 16, 17 and the carriages 18 are located in this case symmetrically on the transfer rails 14 at each end of the reel spool.

[0025] The fiber web W is reeled around a reel spool 15A, 15B to a parent roll 20A, 20BB by means of a reeling nip N formed between the reeling cylinder 10 and the parent roll 20A, 20B under reeling, which reeling takes place in a primary stage in a primary position and in a secondary stage in a secondary position. The reeling cylinder 10 is driven by known methods, typically by a motor (not shown). The reeling cylinder 10 rotates and the parent roll 20A, 20B is formed around a reel spool 15A, 15B. The nip load is formed between the parent roll 20A, 20B under reeling and the reeling cylinder 10 and it is provided by moving the reeling cylinder 10. The reel spool 15A, 15B is mounted on bearings in bearing housings resting on the substantially horizontal transfer rails 14. The reeling is started and a parent roll 20B under reeling is formed around the reel spool 15B supported on the transfer rails 14 first in the primary position and rotated by the drive 12B to a desired diameter and then transferred to support of locking clamps 16,17 of the carriages 18 to be reeled in the secondary position and rotated by the drive 12A, in which secondary position the carriages 18 move the parent roll 20a, 20B under reeling along the substantially horizontal transfer rails 14. The nip load is formed between the parent roll 20A, 20B under reeling and the reeling cylinder 10 and it is provided by moving carriages 18. A finished parent roll 20A is moved along the rails 14 to end position at the end of the rails 14 wherefrom the finished parent roll 20A is transferred to next process step. The end position is formed as a recess 13, which helps to stop the finished parent roll 20A to the end position.

[0026] The transfer rails 14 of the reel-up are substantially linear and transfer and reeling in the reel-up is thus provided along these substantially linear transfer rails 14. Empty reel spool 15C is brought to the primary reeling position for example along gravity based storage rails with stoppers, by a crane or from an upper storage, advantageously located above the reel-up, or by transfer arms, as shown by dashed line alternatives in the figure 1A. The reel spool 15B is located rotatably by drive 12B on the transfer rails 14 to the primary reeling position. The reeling cylinder 10 is moved upwards to form the reeling nip N between the parent roll 20B under reeling and the reeling cylinder 10. As diameter of the parent roll 20B under reeling increases the reeling cylinder 10 moves downwards but holding the reeling nip N in operation. When the diameter of the parent roll 20B under reeling reaches the desired limit, the reeling is changed to the secondary reeling position and onto the support of the locking clamps 16, 17 and the carriages 18. The movement of the carriages 18 is from the pick-up position from the primary reeling position to the position in which the finished parent roll 20A is relieved to the end position i.e. to the recess 13 to be transferred for further treatment. The stopping of rotation of the parent roll 20A is done and the drive 12A is returned back on the transfer rails for reeling of the next parent roll. After the change of reeling position, the reeling is continued in the secondary reeling position until next change.

[0027] The reel-up for reeling of a fiber web W around a reel spool 15B to form a parent roll by means of a reeling nip N formed between a reeling cylinder 10 of the reel-up and the parent roll 20B under reeling has a primary reeling position and a secondary reeling position. The reel-up 10 comprises substantially horizontal rails 14 and for each end of the reel spool 15A; 15B carriages 18 with locking clamps 16, 17: wet-end locking clamps 16 and dry-end locking clamps 17 and the substantially horizontal rails 14 comprise a recess 13, which forms an end position for the finished parent roll 20A after reeling. The carriage 18 with the locking clamps 16, 17 is turnable around the machine directional axis to substantially horizontal position and thus the locking clamps 16, 17 comprise a substantially upright position, in which they provide a support position for the reel spool 15A, 15B, and a substantially horizontal position, in which they provide a movement position for return movement of the carriage. One locking clamps 17; the dry-end locking clamps 17 are be opened by the turn of the dry-end locking clamps 17 towards or to the substantially horizontal level around the cross-directional axis for releasing the finished parent roll 20A to move to the recess 13 of the end position and the carriage 18 with the locking clamps 16, 17turnable around the machine directional axis is turned to the substantially horizontal position for return movement of the carriage 18 back to the beginning position for reeling of the next parent roll in the secondary position. Movements of the carriages 18 are linear on the rails 14.

[0028] In figure 1A in the reel-up is shown in a situation, in which a parent roll 20B is reeled in the secondary reeling position, in which the reel spool 15A is in support of the locking clamps 16, 17 and the carriage 18. The reel spool 15A and thus also the parent roll 20B are rotated and moved by the secondary drive 12A. The parent roll 20B under reeling is nearly finished and thus diameter of the parent roll 20a is close to the desired diameter. New, empty reel spool 15C has been brought to the reel up to the primary reeling position for example along gravity based storage rails with stoppers, by a crane or from an upper storage, advantageously located above the reel-up and to be moved to the primary reeling position. The new reel spool 15B has been moved to the primary reeling position. The reeling cylinder 10 is in reeling nip N position with the almost finished parent roll 20B in the secondary reeling position. The fiber web W is guided via a guide roll 11 onto the reeling cylinder 10 and into the reeling nip N and onto the parent roll 20B. When the reeling is begun the new reel spool 15B is locked to primary reeling position and the reel-up is ready for the parent roll turn-up. The turn-up is timed according to the parent roll diameter/length, which can be set by the op-

erator. In the turn-up sequence, the reel spool 15B in the primary position is accelerated to the set running speed. The nip N is closed by the reeling cylinder 10 and the fiber web W is cut with the turn-up device (not shown) and guided to the new reel spool 15B.

[0029] In figure 1B the reel-up is shown in a situation when the reeling of the fiber web W has been changed after the turn-up to the primary reeling position and the finished parent roll 20A supported in the locking clamps 16, 17 of the carriage in the secondary reeling position and is moved along the rails 14 by the carriage 18 to be located to the end position i.e. to the recess 13 to be further transferred to next treatment stage. In the primary reeling position, the reel spool 15B and the parent roll 20B under reeling is rotated by the drive 12B to the reeling speed. The reeling cylinder 10 has been moved in substantially vertical direction upwards into reeling nip N contact with the parent roll 20B under reeling and as the reeling progresses the reeling cylinder 10 moves in substantially vertical direction downwards. The fiber web W is guided by the guide roll 11 onto the reeling cylinder 10 and via the reeling nip N onto the parent roll 20B under reeling. When the parent roll 20B diameter grows in the primary, the finished parent roll 20A will be removed from the carriage 18, and the parent roll rotation is stopped by secondary drive 12A.

[0030] In figure 1C the reel-up is shown in a situation when the finished parent roll 20A has been unloaded from the support of the locking clamps 16, 17 of the secondary reeling position and of the carriages 18. The rotation of the parent roll 20A has been stopped by the secondary drive 12A of the secondary reeling position and the secondary drive 12A is returned for continuation of the reeling of the next parent roll in the secondary position. The carriages 18 are to be moved to pick-up the parent roll 20B under reeling from the primary reeling position and the carriages 18 with the locking clamps 16, 17has been turned to substantially horizontal position to substantially below the height level of the carriage during the return movement of the carriages 18 for continuation of the reeling of the next parent roll in the secondary position. The reel spool 15B and thus also the parent roll 20B under reeling will be moved to the secondary reeling position. Also the reeling cylinder 10 will be moved to form the reeling nip N with the parent roll 20B under reeling to the secondary reeling position. The fiber web W is guided by the guide roll 11 onto the reeling cylinder 10 and onto the parent roll 20B under reeling. When the finished parent roll 20A is released from the carriages 18, the secondary carriages 18 will move to the primary position and reeling is changed to the secondary reeling position and to the carriages 18 and the locking clamps 16,17 will be closed. When the finished parent roll 20A is moved to the end position, it is first moved in vicinity of the end position and thus near the recess 13. Second locking clamps, the dry-end locking clamps 17 of the carriages 18 are opened by turning them around the cross-directional axis towards or to a substantially horizontal position and the finished parent roll 20A rolls to the recess 13. There after the carriages 18 with the locking clamps 16, 17 are turned to substantially horizontal position and the carriages 18 can be returned.

[0031] In figure 1D the reel-up is shown in a situation when the reeling of the fiber web W is continued in the secondary reeling position. The reel spool 15B and the parent roll under reeling 20B are in support of the locking clamps 16, 17 and the carriages 18. The reel spool 15B and the parent roll under reeling 20B are rotated by the secondary drive of the secondary reeling position and moved by the carriage 18 as the reeling progresses. A new, empty reel spool 15C is brought to the primary reeling position for start of the reeling of the next parent roll. When the carriages 18 move over the reeling cylinder 10, the nip load is controlled by the reeling cylinder actuators (not shown). First the reeling cylinder 10 moves downwards and later it moves slowly upwards to wait nip closing and the reel is ready for next sequence.

[0032] In figures 2A - 2B is shown an example of the carriages 18, each carriage comprising two locking clamps 16, 17. The carriages 18 with the locking clamps 16, 17 are turnable to substantially horizontal position and for example the dry-end locking clamps 17 are turned for example about n. 90° around the cross-directional axis towards or to a substantially horizontal position for opening the dry-end locking clamps 17 for releasing the finished parent roll to the recess 13. Thus the second locking clamps i.e. the dry-end locking clamps 17 of the carriages 18 are opened by the turn for letting the finished parent roll 20A to roll to the recess 13 of the end position. The carriages 18 with the locking clamps 16, 17 are turned to substantially horizontal position for return movement of the carriages 18 back to the beginning position for reeling of the next parent roll in the secondary position.

Reference signs used in the drawing

[0033]

10	reeling cylinder
11	guide roll
12A, 12B	drive
13	stopping groove
14	transfer rail
15A, 15B, 15C	reel spool
16	locking clamp
17	locking clamp
18	carriage
20A, 20B	parent roll
W	fiber web
N	reeling nip

Claims

1. Reel-up for reeling of a fiber web (W) around a reel

spool (15B) to form a parent roll (20B; 20A) by means of a reeling nip (N) formed between a reeling cylinder (10) of the reel-up and the parent roll (20B) under reeling, which reel-up has a primary reeling position and a secondary reeling position, which reel-up comprises the reeling cylinder (10), substantially horizontal rails (14) and for each end of the reel spool (15A; 15B) carriages (18) with locking clamps (16, 17), **characterized in that** the substantially horizontal rails (14) comprise a recess (13), which forms an end position for the finished parent roll (20A) after reeling.

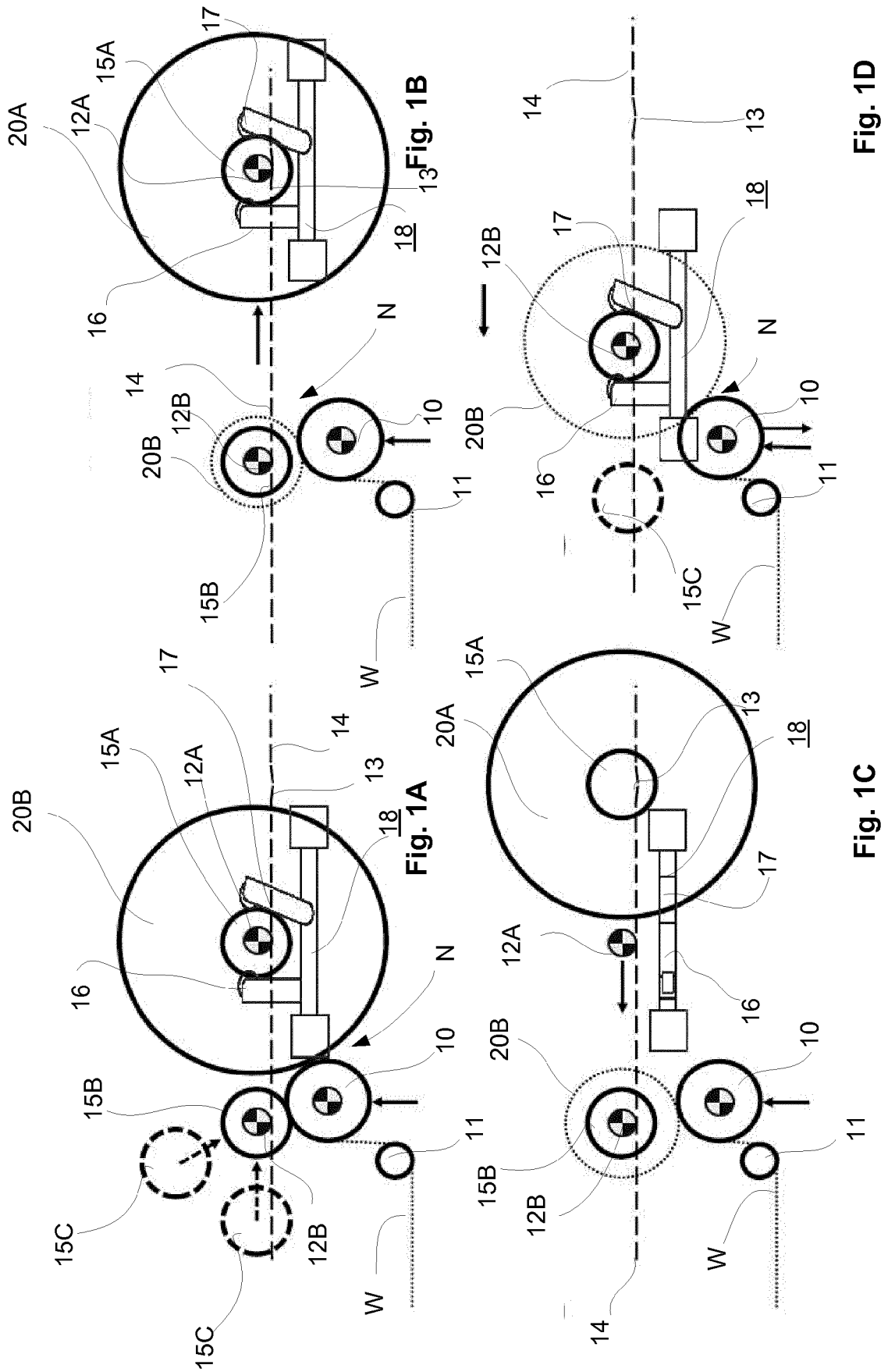
2. Reel-up according to claim 1, **characterized in that** the locking clamps (16, 17) of the carriages (18) are turnable to substantially horizontal position.

3. Reel-up according to claim 1 or 2, **characterized in that** the locking clamps (16, 17) comprise a substantially upright position, in which they provide a support position for the reel spool (15A, 15B), and a substantially horizontal position, in which they provide a movement position for return movement of the carriages.

4. Reel-up according to any of claims 2 - 3, **characterized in that** the carriages (18) with the locking clamps (16, 17) are turnable around the machine directional axis to the position in which the locking clamps (16, 17) are in substantially horizontal position.

5. Reel-up according to any of the claims 1 - 4, **characterized in that** dry-end locking clamps (17) of the carriages (18) are turnable around the cross-directional axis to be opened by the turn towards or to the substantially horizontal level for releasing the finished parent roll (20A) to move to the recess (13) of the end position.

6. Reel-up according to any of claims 1 - 5, **characterized in that** movements of the carriages (18) are linear on the rails (14).


20B
15A
12A
16
15B
15C
12B
15C
17
14
13
18
N
10
11
W
Fig. 1A
20A
12A
15A
17
16
13
18
14
12B
20B
15B
N
10
11
W
Fig. 1B
15A
20A
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12A
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20B
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Fig. 1C
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Fig. 1D

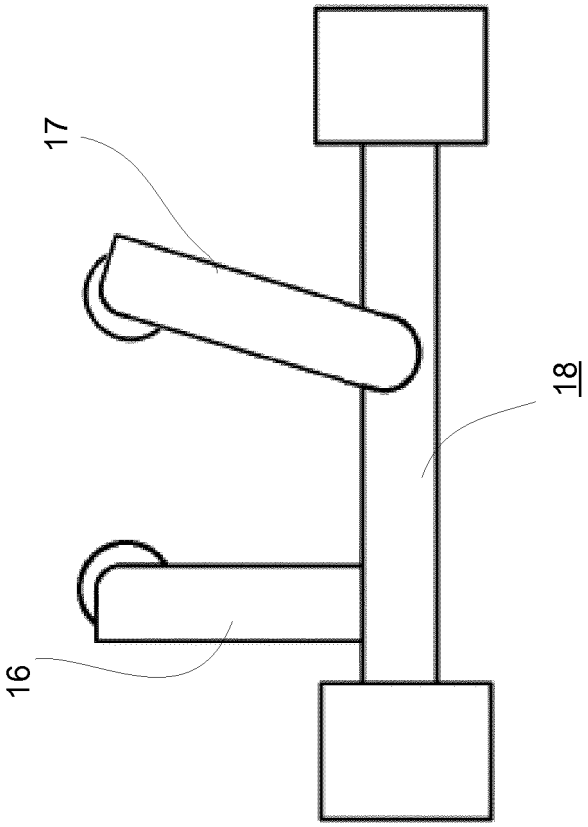

Fig. 2A

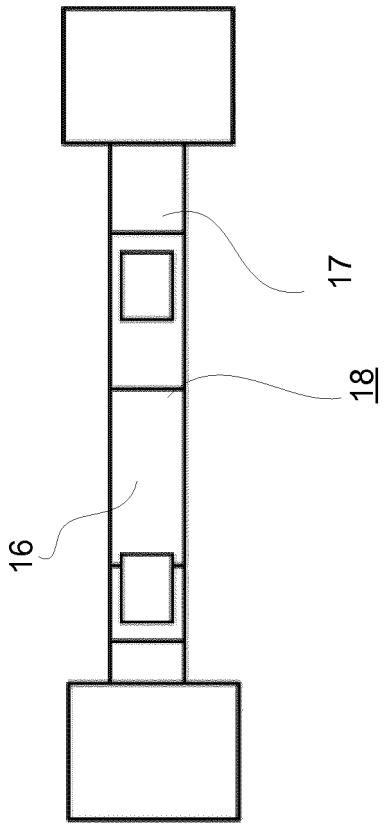

Fig. 2B

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EUROPEAN SEARCH REPORT

Application Number
EP 18 15 7064

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 2 703 683 A (EVANS RAYMOND L ET AL) 8 March 1955 (1955-03-08) * abstract; figures 1,2,5,12, 13 * * the whole document * -----	1,6 2-5	INV. B65H19/22 B65H18/02
X Y	WO 96/06033 A1 (BELOIT TECHNOLOGIES INC [US]) 29 February 1996 (1996-02-29) * abstract; figures 1-5 * * the whole document * -----	1,6 2-5	
Y	US 6 474 589 B1 (ENWALD PETRI [FI] ET AL) 5 November 2002 (2002-11-05) * abstract; figures 1,5 * * the whole document * -----	1-6	
Y,D	EP 0 483 092 B1 (VALMET CORP [FI]) 7 January 1998 (1998-01-07) * abstract; figures 4,5 * * the whole document * -----	1-6	
Y	US 6 036 137 A (MYREN H INGEMAR [SE]) 14 March 2000 (2000-03-14) * abstract; figures 1,2 * * the whole document * -----	1-6	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	31 July 2018	Piekarski, Adam

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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P : intermediate document

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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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 15 7064

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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31-07-2018

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