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(54) **Method and arrangement in the tail threading of a full width web in the dryer section of a fiber web machine**

(57) The invention relates to a method in the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups (R1 - R9). Each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run. On the side of the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17),

and the dryer fabric (18), the full width web (22) is blown off from the dryer cylinder (16). Moreover, the pocket space (20) formed by the turning roll (17) and two dryer cylinders (16) is provided with a vacuum. An intensified vacuum is created in tail threading in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17). The invention also relates to an arrangement in the tail threading of a full width web in the dryer section of a fiber web machine.

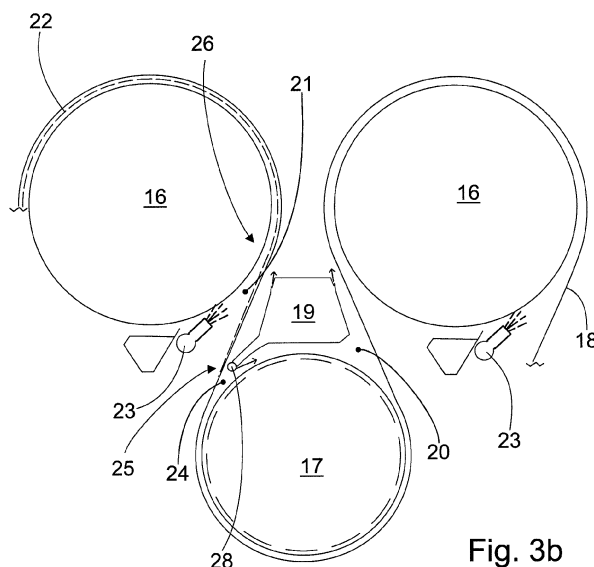


Fig. 3b

Description

[0001] The invention relates to a method in the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups and each dryer group includes dryer cylinders and turning rolls as well as one dryer fabric alternately supported on a dryer cylinder and on a turning roll as a single fabric run, and on the side of the opening gap formed by the dryer cylinder, which precedes the turning roll, and the dryer fabric, the full width web is blown off from the dryer cylinder, and a vacuum is created in the pocket space formed by a turning roll and two dryer cylinders. The invention also relates to an arrangement in the tail threading of a full width web in the dryer section of a fiber web machine.

[0002] So-called single fabric run is used in the dryer section of fiber web machines such as paper or board machines. In a single fabric run, steam heated dryer cylinders and rolls provided with a vacuum, such as the applicant's vac rolls, alternate with each other. The vac roll is also referred to as a turning roll. A runnability component is arranged in the pocket space formed by the dryer cylinders and the vac roll, and the runnability component is used for creating a vacuum in the pocket space. The runnability components are used during production for example to prevent the fluttering of the edges of the web. When production starts, the web is threaded by means of a web threading tail.

[0003] However, conventional tail threading takes time and results in much broke. This is why tail threading with a full width web has been suggested. Publication number W02009/141508 presents blow off blows, with which the tail of a full width web is detached from the surface of a dryer cylinder. In practice, the web can be detached, but despite the vac roll and the runnability component, it has been uncertain whether the web remains on the dryer cylinder. It has been necessary to start tail threading over and over again. Moreover, the blow off blows introduce much air, which disturbs the operation of the runnability components in tail threading.

[0004] An object of the invention is to provide a new kind of a method and arrangement in the tail threading of a full width web in the dryer section of a fiber web machine, where the method and arrangement are more reliable than earlier solutions and enable the tail threading of a full width web through the entire dryer section. The characteristic features of the method according to the invention are that an intensified vacuum is created in tail threading in the closing gap formed by a dryer fabric and a turning roll. Correspondingly, the characteristic features of the arrangement according to the invention are that the arrangement includes vacuum creating devices, which are arranged in the closing gap formed by a dryer fabric and a turning roll in order to create an intensified vacuum in tail threading. The intensified vacuum makes the web follow the dryer fabric and stay on its surface reliably. The intensified vacuum is only needed for a short

period of time, which is why power consumption remains reasonable. In fact, the other reforms according to the invention can even accomplish a reduction in total power consumption despite the intensified vacuum.

[0005] The invention is described below in detail by making reference to the enclosed drawings that illustrate some embodiments of the invention, in which:

Figure 1 is a side view of a fiber web machine,
 Figure 2a shows a drawing in principle of one dryer group of the dryer section of a fiber web machine, where the dryer group is equipped with runnability components,
 Figure 2b shows one pocket space equipped with a conventional runnability component, and the vacuum levels in principle,
 Figure 3a shows prior art blow off blows in the tail threading of a full width web,
 Figure 3b shows the first embodiment of the arrangement according to the invention during the tail threading of a full width web,
 Figure 4 shows another embodiment of the arrangement according to the invention during the tail threading of a full width web.

[0006] Figure 1 shows one conventional fiber web machine 10 seen from the side. The fiber web machine 10 includes, as successive partial entities, a forming section 11, a press section 12, a dryer section 13, and a finishing section 14. The finishing section comprises only a machine reel in the fiber web machine according to Figure 1. The dryer section 13 includes successive dryer groups 15 which are nine in number in the fiber web machine according to Figure 1. The dryer groups 15 are individualized by symbols R1 - R9.

[0007] Figure 2a shows one dryer group, of which there are several successively in the dryer section of a fiber web machine, as described above. The dryer group consists of dryer cylinders 16 and turning rolls 17, via which the dryer fabric 18 is adapted to travel as an endless loop. Single fabric run, where there is only a single dryer fabric in each dryer group, as presented is used at present to an increasing degree. In practice, the web travels between the dryer fabric and the heated dryer cylinder. Correspondingly, on a turning roll the web travels on the dryer fabric. In order to control the web, the turning roll is usually a grooved suction roll, where the vacuum effect achieved in the suction roll keeps the web attached to the dryer fabric. In addition to the turning roll provided with a vacuum, web control employs a runnability component 19, which is placed in the pocket space 20 formed by consecutive dryer cylinders and the turning roll. In Figure 2a, the runnability components are represented by the end plates indicated by the diagonal lines. The end plates are used for controlling air flows at the edges of the web. Moreover, Figure 2a illustrates the mere dryer fabric 18 without the web.

[0008] Figure 2b illustrates a runnability component 19

marketed by the applicant under the product name *HiRun™*, where the runnability component 19 is in practice a blow box. The blow box contains blow nozzles in the cross direction of the fiber web machine both on the inlet side and outlet side. The so-called high vacuum region is limited with respect to the pocket space with a normal vacuum to the vicinity of the dryer fabric by means of a vacuum divider placed in the cross direction of the fiber web machine, and the region is provided with a vacuum by means of suction. The region of influence of the vacuum is denoted by the broken line in Figure 2b. The runnability component presented is intended for use during production, when the web covers the dryer fabric, inhibiting leakage through the dryer fabric to the runnability component. In this case, the capacity of the runnability component is insufficient for the tail threading of a full width web.

[0009] However, the applicant has presented that the tail threading of a full width web is possible by arranging blow off blow equipment 23 in the opening gap formed by a dryer cylinder and a dryer fabric for detaching the web. The blow off blow is used for blowing off the tail of a full width web from the dryer cylinder 16 and guiding the tail to follow the dryer fabric 18. The blow off blows are in use during tail threading, and in the case illustrated in Figure 3a, the tail of the web has already progressed past the dryer cylinders illustrated. Despite the blow off blows, there have been problems in tail threading especially towards the end of the dryer section and between the dryer groups.

[0010] As was mentioned earlier, this invention relates to a method in the tail threading of a full width web in the dryer section of a fiber web machine. The dryer section includes successive dryer groups 15, and each dryer group 15 includes dryer cylinders 16 and turning rolls 17 as well as one dryer fabric 18 alternately supported on the dryer cylinder 16 and on the turning roll 17 as a single fabric run. Moreover, on the side of the opening gap 21 formed by the dryer cylinder 16, which precedes the turning roll 17, and the dryer fabric 18, the full width web 22 is blown off from the dryer cylinder 16 (Figures 3b and 4). For this purpose, the arrangement includes blow off blow equipment 23, which is adapted in the opening gap 21 formed by the dryer cylinder 16, which precedes the turning roll 17, and the dryer fabric 18. The blow off blow equipment enables the blow off of the full width web 22 from the dryer cylinder 16. Moreover, the pocket space 20 formed by the turning roll 17 and two dryer cylinders 16 is provided with a vacuum. For this purpose, the arrangement includes runnability components 19, which are adapted in the pocket spaces 20 formed by the turning roll 17 and two dryer cylinders 16. According to the invention, an intensified vacuum is created in tail threading in the closing gap 24 formed by the dryer fabric 18 and the turning roll 17. For this purpose, the arrangement includes vacuum creating devices 25, which are arranged in the closing gap 24 formed by the dryer fabric 18 and the turning roll 17 in order to create an intensified

vacuum in full width tail threading. The intensified vacuum makes the web, which has been detached by means of the blow off blow equipment, adhere to the surface of the dryer fabric. In this case, the vacuum created by the runnability components in combination with the turning roll has sufficient time to function, keeping the web and its tail under control. This also avoids fluttering of the web and dropping of the web from the dryer fabric. In other words, the tail threading of a full width web is possible. The intensified vacuum of the closing gap 24 is illustrated in Figure 3b. The intensified vacuum preferably extends across the width of full width tail threading. In other words, the intensified vacuum extends across the entire width of the web. Moreover, the intensified vacuum in the closing gap can be used for correcting the instability of the web caused by the previous detaching of the web in the travel direction of the web, and the full width web can be made to settle to the dryer fabric in a stable manner.

[0011] Figure 4 illustrates another embodiment of the arrangement according to the invention. In this embodiment, an intensified vacuum is also created in tail threading in the detachment point 26 of the dryer cylinder 16 and the dryer fabric 18. For this reason, the arrangement includes a second set of vacuum creating devices 27, which are placed in the vicinity of the detachment point 26 of the dryer cylinder 16 and the dryer fabric 18. At this point, the intensified vacuum assists the blow off blow so that immediately after the web has been detached from the dryer cylinder, the web adheres to the surface of the dryer fabric. At the same time, the second set of vacuum creating devices prevents at least some of the air traveling with the dryer fabric from entering the pocket space. Correspondingly, the first set of vacuum creating devices takes air away from the closing gap, thus avoiding the detachment of the web from the dryer fabric.

[0012] The intensified vacuum can be created in different ways. For example suction devices can be used. However, in the embodiments presented the intensified vacuum is created by blows. It is easy to control the blows, and the necessary components require little installation space. Here, the vacuum creating devices 25 and 27 consist of blow pipes 28 and 29, which essentially extend across the entire width of the web 22. The blow pipes may have separate nozzles, or the blow pipes may have holes or gaps to form the functional nozzles. The preferred dimensioning when using holes is 2 - 4 mm holes at a distribution of 200 - 600 mm.

[0013] In the embodiments presented, the vacuum creating devices 25 and 27 are fastened to the runnability component 19. In this case, separate support structures are unnecessary, and the vacuum creating devices can be installed at the exact desired location. For example, when using a round blow pipe, it is easy to adjust the direction of the blows by simply rotating the blow pipe. The runnability component can be utilized in other ways, too. The runnability component 19 is preferably adapted as a flow surface 30. In practice, the flow surface guides the blows and prevents the swirling of air. At the same

time, an efficient vacuum is created, and the location of the vacuum can be determined accurately. The flow surface 30 is illustrated especially in Figure 4.

[0014] The runnability component 19 in Figure 4 has two chambers, because the runnability component 19 includes a flow channel 31 for exhaust air. Here, the flow channel opens upwards from the pocket space and takes air along with it. In this way, the air brought by the first set of vacuum creating devices exits the pocket space in a controlled manner, and the intensification of the vacuum is enabled. There is a barrier 32 between the runnability component 19 and the turning roll 17, with the barrier 32 preventing the escape of air to the outlet side in the direction of travel of the web. The barrier also prevents the travel of the air that whirls with the turning roll into the closing gap. After tail threading, the vacuum creating devices for full width tail threading are closed, so there is no need for extra flow channels. The flow channel 31 includes barriers 33 in order to prevent the re-aeration of the pocket space. When the flow channel is closed, the travel of air into the pocket space through the flow channel is prevented during production. In this case, the runnability components work as planned.

[0015] The arrangement according to the invention accomplishes momentarily a greater vacuum than earlier, which is why the tail threading of a full width web is reliable in all situations. When the web covers the dryer fabric, the vacuum is in the region of 300 - 1,000 Pa, preferably 400 - 600 Pa, which is considerably higher than with conventional runnability components. A high capacity, or in practice a high air volume, is primarily only needed at the point of the tail of the web. In the solution according to the invention, the air capacity is directed to wherever it is needed at any given moment, which avoids unnecessary overdimensioning.

[0016] After tail threading, the air volumes and controls of the runnability components are restored to the normal, proven level. In full width tail threading, the runnability components are largely controlled according to the applicant's earlier invention. Air division is changed so that the runnability components of a single dryer group or several dryer groups are separate groups controlled with their own control equipment. At the beginning of tail threading, air is led for example only to the first two dryer groups. No vacuum is needed yet in the other dryer groups, because the tail of the full width web is only approaching. As the web moves on, new dryer groups are opened into operation and, correspondingly, full width tail threading blows are closed where the web already covers the dryer fabric. The progress of the web can be detected for example by means of vacuum measurement in each dryer group. When the web has passed through the entire dryer section, the control equipment and controls of specific dryer groups are returned to the running position. Even though the arrangement accomplishes momentarily clearly greater vacuum levels than conventional solutions, the air and energy consumption of the arrangement as a whole is considerably smaller than in

current solutions. Moreover, the elevated vacuum level on the outlet side of the runnability component has turned out to have very little significance, which is why it has been possible to focus on intensifying the inlet side. It is now possible to carry out transfers between dryer groups in particular reliably, which increases the likelihood of successful tail threading. As the dry matter content rises towards the end of the dryer section, simpler equipment and/or a lower vacuum level can be used in the latter part of the dryer section than in the early part, which saves energy.

[0017] The arrangement according to the invention accomplishes the tail threading of a full width web directly from the press section to the end of the dryer section. Moreover, automatic full width tail threading is accomplished starting from a break point without having to commence tail threading all the way from the press section. At the same time, the necessary air volume is reduced, and the structure of the runnability components is simplified. In practice, the runnability components can be provided with a vacuum by using blowers and the blow pipes can be provided with compressors when more intense intensification is required, but in easier cases a separate blower is sufficient.

[0018] The invention relates to a method in the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups (R1 - R9). Each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run. On the side of the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17), and the dryer fabric (18), the full width web (22) is blown off from the dryer cylinder (16). Moreover, the pocket space (20) formed by the turning roll (17) and two dryer cylinders (16) is provided with a vacuum. An intensified vacuum is created in tail threading in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17). The invention also relates to an arrangement in the tail threading of a full width web in the dryer section of a fiber web machine.

Claims

1. Method in the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups (R1 - R9) and each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run, and on the side of the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17), and the dryer fabric (18), the full width web (22) is blown off from the dryer cylinder (16), and a vacuum is created in the pocket space (20) formed by

a turning roll (17) and two dryer cylinders (16), **characterized in that** an intensified vacuum is created in tail threading in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17).

2. Method according to claim 1, **characterized in that** an intensified vacuum is created in tail threading in the detachment point (26) of the dryer cylinder (16) and the dryer fabric (18).
3. Method according to claim 1 or 2, **characterized in that** the intensified vacuum is created by blows.
4. Arrangement in the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups (R1 - R9) and each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run, and the arrangement includes blow off blow equipment (23), which is adapted in the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17), and the dryer fabric (18) for blowing off the full width web (22) from the dryer cylinder (16), and runnability components (19) adapted in the pocket spaces (20) formed by the turning roll (17) and two dryer cylinders (17) for creating a vacuum in each pocket space (20), **characterized in that** the arrangement includes vacuum creating devices (25) arranged in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17) for creating an intensified vacuum in tail threading.
5. Arrangement according to claim 4, **characterized in that** the arrangement further includes a second set of vacuum creating devices (27), which are placed in the vicinity of the detachment point (26) of the dryer cylinder (16) and the dryer fabric (18).
6. Arrangement according to claim 4 or 5, **characterized in that** the vacuum creating devices (25, 27) consist of a blow pipe (28, 29), which extends essentially across the entire width of the web (22).
7. Arrangement according to any of claims 4 - 6, **characterized in that** the vacuum creating devices (25, 27) are fastened to the runnability component (19).
8. Arrangement according to any of claims 4 - 7, **characterized in that** the runnability component (19) is adapted as a flow surface (30).
9. Arrangement according to any of claims 4 - 8, **characterized in that** the runnability component (19) includes a flow channel (31) for exhaust air.

10. Arrangement according to claim 8, **characterized in that** the flow channel (31) includes barriers (33).

5 Amended claims in accordance with Rule 137(2) EPC.

1. Method for the tail threading of a full width web in the dryer section of a fiber web machine, where the dryer section includes successive dryer groups (R1 - R9) and each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run, and on the side of the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17), and the dryer fabric (18), the full width web (22) is blown off from the dryer cylinder (16), and a vacuum is created by runnability components (19) in the pocket space (20) formed by a turning roll (17) and two dryer cylinders (16), **characterized in that**, in tail threading, the vacuum created by the runnability components (19) is intensified by vacuum creating devices (25) in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17).

2. Method according to claim 1, **characterized in that**, in tail threading, the vacuum is intensified by a second set of vacuum creating devices (27) in the detachment point (26) of the dryer cylinder (16) and the dryer fabric (18).

3. Method according to claim 1 or 2, **characterized in that** the vacuum is intensified by blows.

4. Arrangement for the tail threading of a full width web in the dryer section (13) of a fiber web machine (10), where the dryer section (13) includes successive dryer groups (R1 - R9) and each dryer group (15) includes dryer cylinders (16) and turning rolls (17) as well as one dryer fabric (18) alternately supported on a dryer cylinder (16) and on a turning roll (17) as a single fabric run, and the arrangement includes blow off blow equipment (23), which is adapted in the opening gap (21) formed by the dryer cylinder (16), which precedes the turning roll (17), and the dryer fabric (18) for blowing off the full width web (22) from the dryer cylinder (16), and a runnability component (19) adapted in the pocket space (20) formed by the turning roll (17) and two dryer cylinders (17) for creating a vacuum in the pocket space (20), **characterized in that** the arrangement further includes vacuum creating devices (25) arranged in the closing gap (24) formed by the dryer fabric (18) and the turning roll (17) for intensifying the vacuum created by the runnability components (19) in tail threading.

5. Arrangement according to claim 4, **characterized in that** the arrangement further includes a second set of vacuum creating devices (27), which are placed in the vicinity of the detachment point (26) of the dryer cylinder (16) and the dryer fabric (18). 5

6. Arrangement according to claim 4 or 5, **characterized in that** the vacuum creating devices (25, 27) consist of a blow pipe (28, 29), which extends essentially across the entire width of the web (22). 10

7. Arrangement according to any of claims 4 - 6, **characterized in that** the vacuum creating devices (25, 27) are fastened to the runnability component (19). 15

8. Arrangement according to any of claims 4 - 7, **characterized in that** the runnability component (19) is adapted as a flow surface (30). 20

9. Arrangement according to any of claims 4 - 8, **characterized in that** the runnability component (19) includes a flow channel (31) for exhaust air.

10. Arrangement according to claim 8, **characterized in that** the flow channel (31) includes barriers (33). 25

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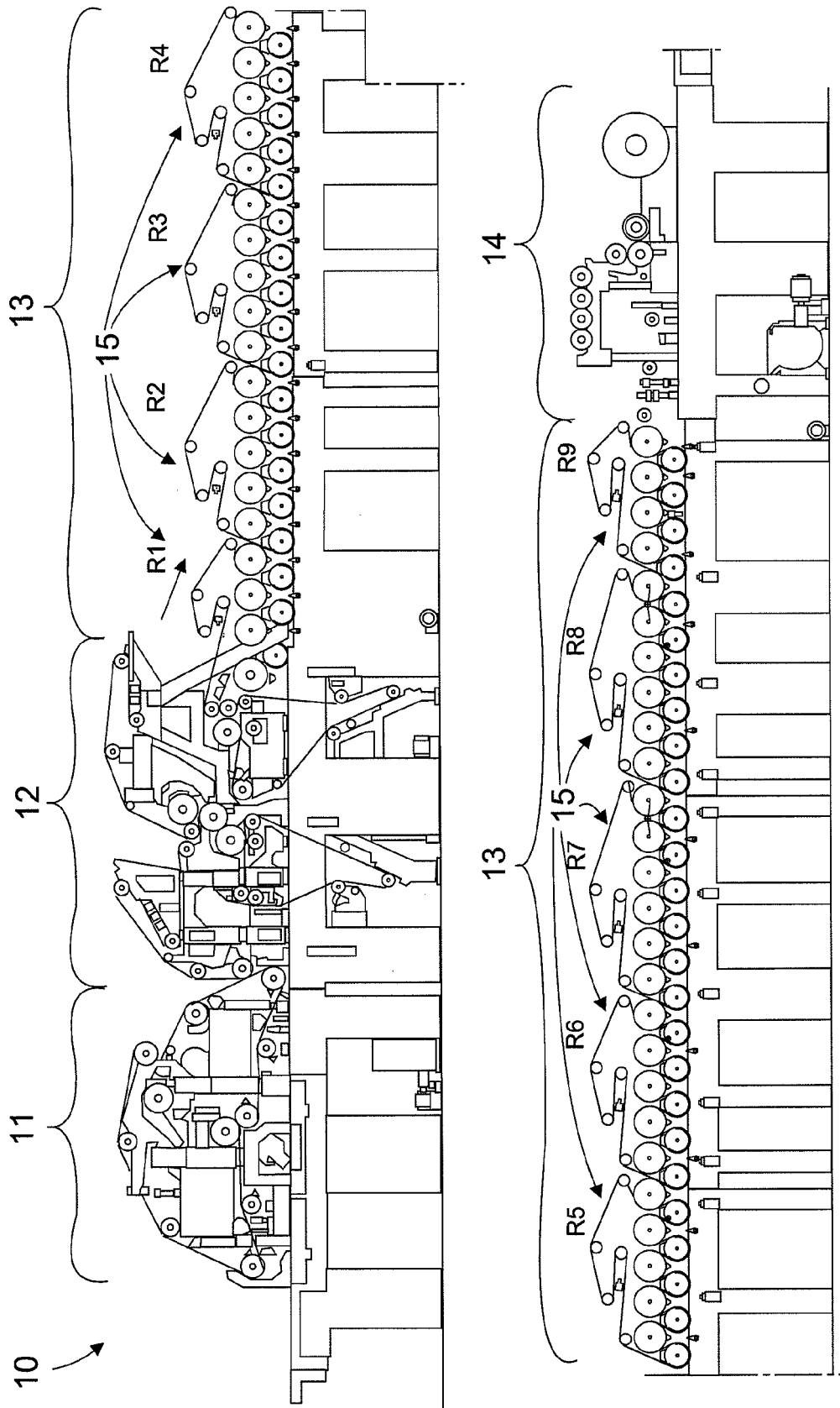
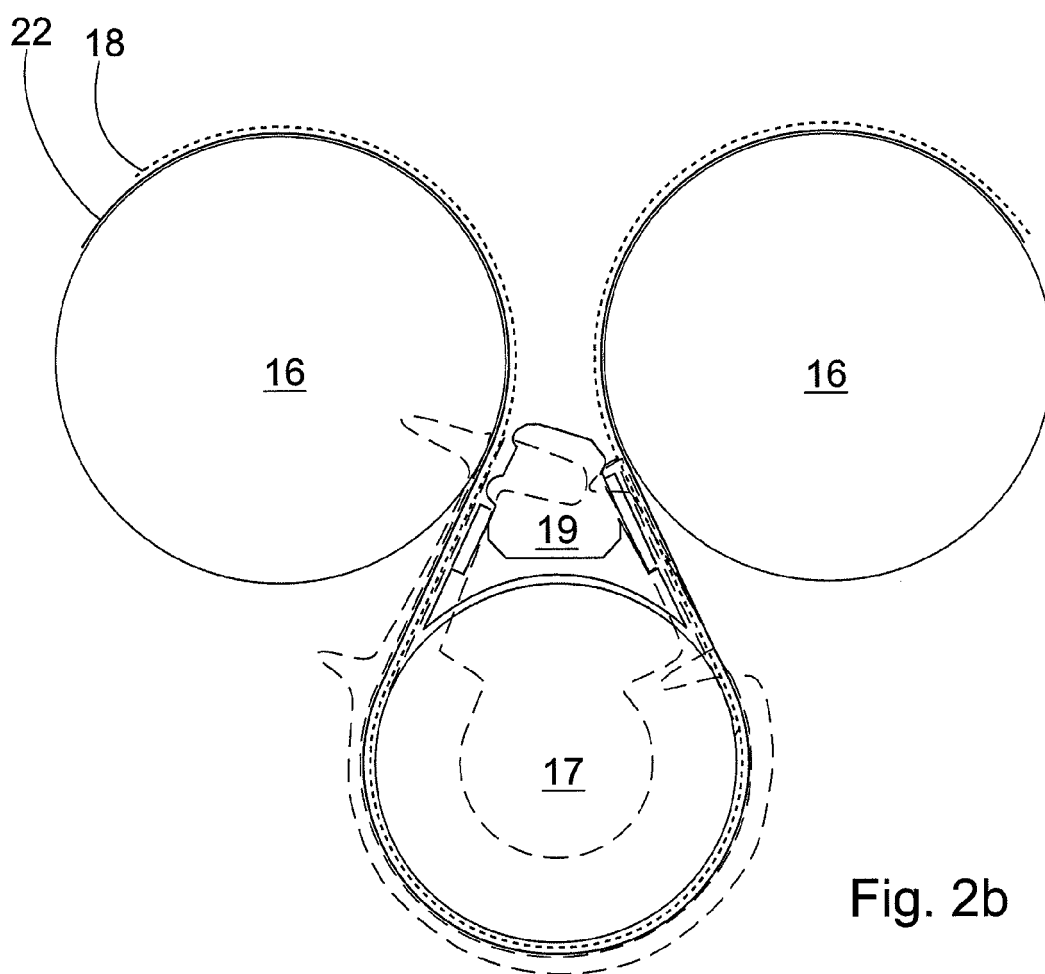
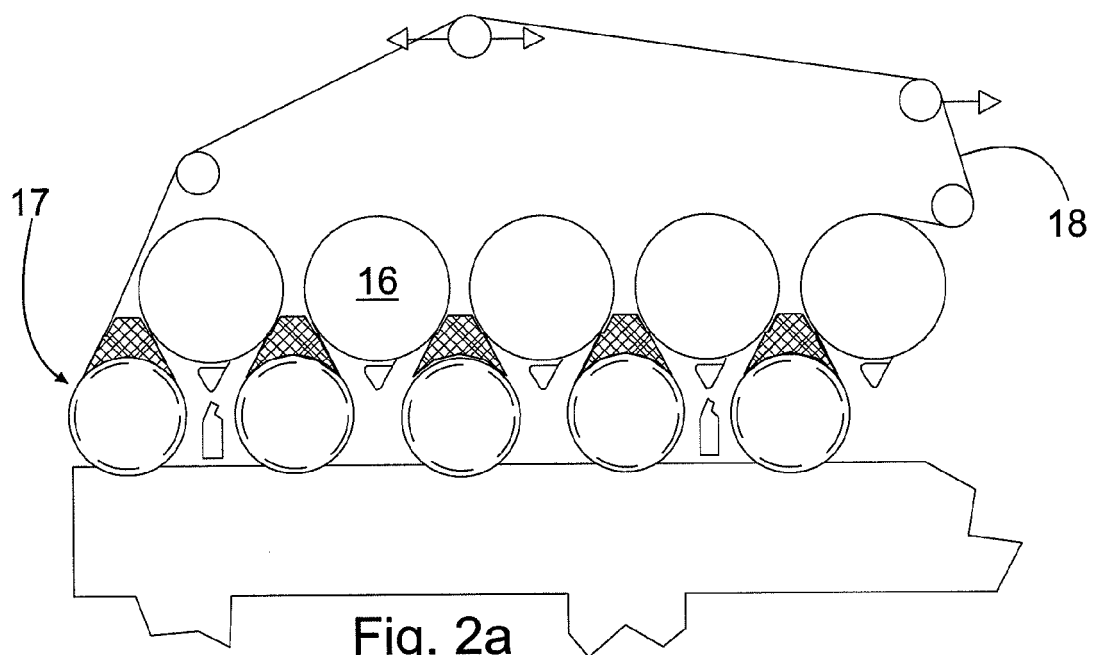


Fig. 1



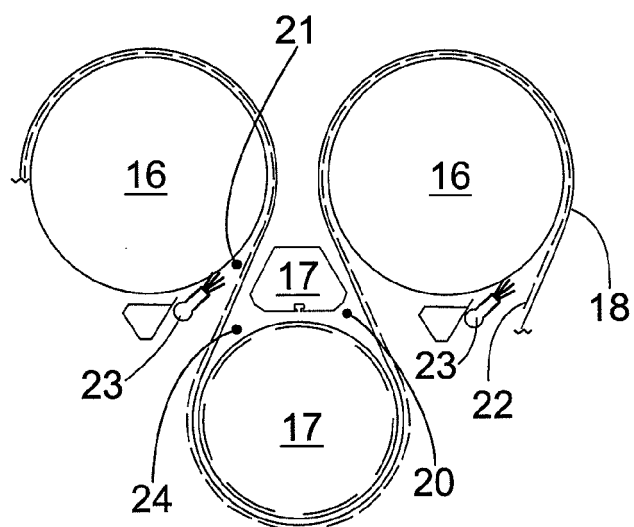


Fig. 3a

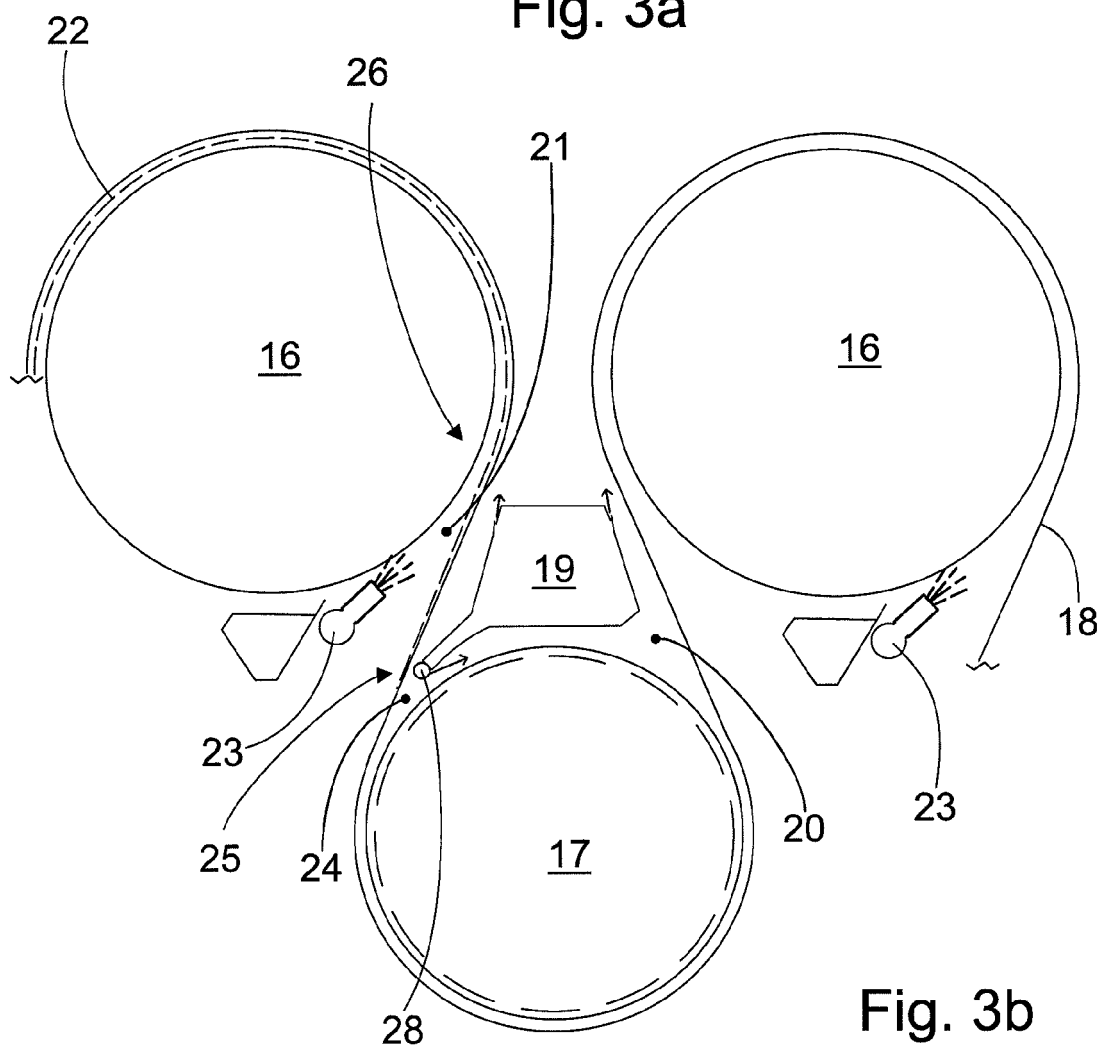


Fig. 3b

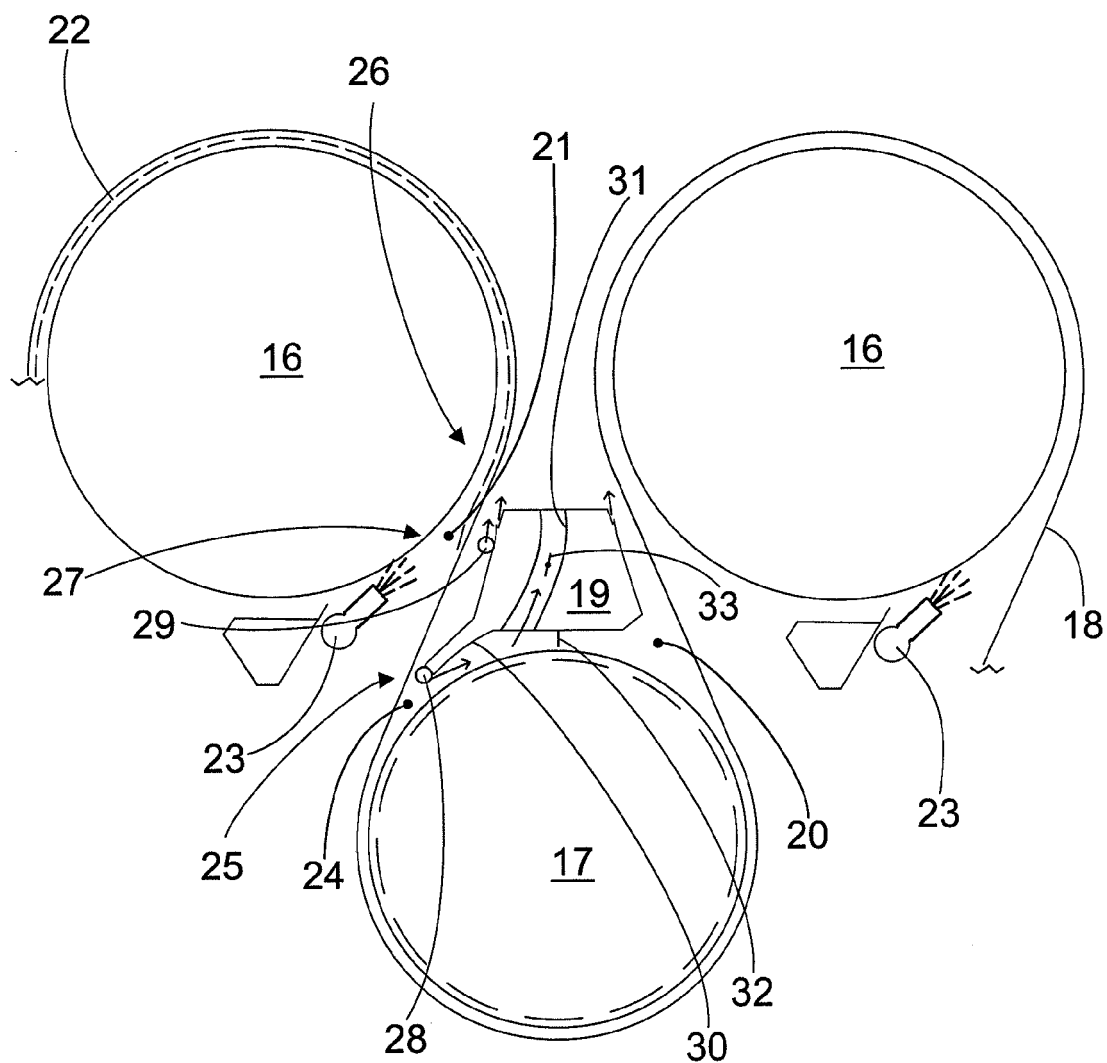


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 12 15 2810

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 May 2012	Examiner Beckman, Anja
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 03.02 (P04C01)

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

EP 12 15 2810

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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