



(51) International Patent Classification:
D21F 7/00 (2006.01) **D21G 9/00** (2006.01)

(21) International Application Number:
PCT/FI2009/050426

(22) International Filing Date:
22 May 2009 (22.05.2009)

(25) Filing Language: Finnish

(26) Publication Language: English

(30) Priority Data:
20085486 22 May 2008 (22.05.2008) FI

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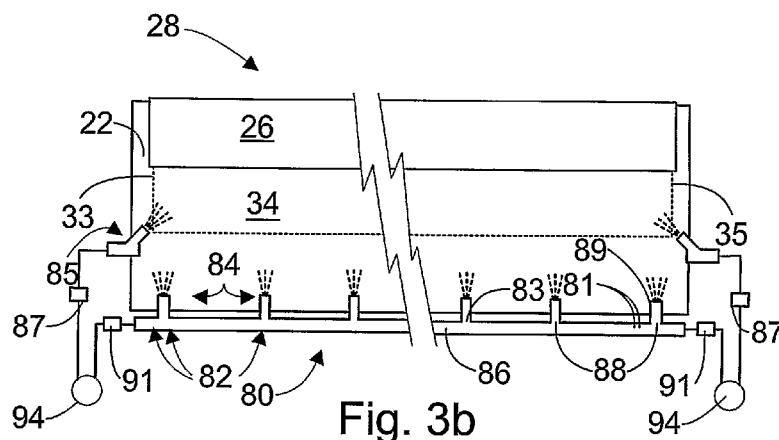
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: METHOD AND ARRANGEMENT IN TAIL THREADING OF A WEB IN THE DRYER SECTION OF A FIBER WEB MACHINE



(57) Abstract: The invention relates to a method in tail threading in the dryer section of a fiber web machine including successive dryer groups (38). The dryer group (38) includes dryer cylinders (22), turning rolls (24), vacuum boxes (62), one dryer fabric (26) traveling as single fabric run (20) via the dryer cylinders (22) and the turning rolls (24), and in tail threading of the web (34) the end (42) of the web (34) is led at full width through the dryer section (14). In addition, on the side of an opening gap (32) formed by a dryer cylinder (22) and the dryer fabric (26), the full width web (34) is blown off from the dryer cylinder (22), at least at the edges (33, 35) of the web (34). The invention also relates to a corresponding arrangement (28).

METHOD AND ARRANGEMENT IN TAIL THREADING OF A WEB IN THE DRYER SECTION OF A FIBER WEB MACHINE

The invention relates to a method in tail threading of a web in the dryer section of a fiber web machine including successive dryer groups, and with the dryer group including

- dryer cylinders,
- turning rolls,
- vacuum boxes,
- one dryer fabric traveling as single fabric run via the dryer cylinders and turning rolls, and
- in tail threading of a web, the web end is taken through the dryer section at full width.

The invention also relates to a corresponding arrangement.

A single fabric dryer section is commonly used as the dryer section of a fiber web machine. In a single fabric dryer section tail threading of the web is typically accomplished using a web threading tail, i.e. a tail. However, problems are occasionally encountered in the leading of the tail and particularly in the formation thereof. In addition, when tail threading of the web is accomplished with a tail, equipment is required for forming the tail. Patent US5232555 discloses a web transfer from a press section to a single fabric dryer section at the full web width. The procedure according to this patent could be possible in several machines but it has not been even tried as disclosed since tail threading is not described in more detail in the patent. In other words, the description is insufficient for one skilled in the art. The problem is the uncertainty about successful tail threading as well as possible clothing and equipment damages.

An object of the invention is to provide a method in tail threading of a web in the dryer section of a fiber web machine by which method tail threading is more reliable than before.

The characteristic features of the method according to this invention are that, on the side of an opening nip formed by a dryer cylinder and a dryer fabric, a full width web is blown off from the dryer cylinder at least at the web edges. Another
5 object of the invention is to provide a novel arrangement in tail threading in the dryer section of a fiber web machine by which method the blow air consumption can be kept as low as possible, however, without jeopardizing successful tail threading. The characteristic features of the arrangement according
10 to this invention are that blow off blow equipment is included on the side of the opening gap formed by a dryer cylinder and a dryer fabric, at least at web edges, for detaching a full width web from the dryer cylinder.

15 In the method, during tail threading of a web in a dryer section of a fiber web machine, the web end is led forward in the dryer section of a fiber web machine. The web refers to board and paper webs. A fiber web machine, in turn, refers to web forming machines used for producing paper or board. A fiber web
20 machine includes successive dryer groups including dryer cylinders, turning rolls and one dryer fabric. The dryer fabric travels as single fabric run via the dryer cylinders and turning rolls as a closed draw from one group to another. In full width tail threading of a web the web end is taken through the
25 dryer section at full width. In addition, the full width web is blown off from a dryer cylinder, at least at its edges. More precisely, blowing takes place on the side of an opening gap formed by a dryer cylinder and the dryer fabric. When the web is blown off from a dryer cylinder at least at both web edges,
30 a full width web can be transferred to travel following the dryer fabric. More precisely, the web can be transferred to travel in the opening gap following the dryer fabric instead of the cylinder. After the web has moved to the vicinity of the dryer fabric, the web reaches the subsequent dryer cylinder
35 traveling together with dryer fabric. With the web having a total width, or being full width, cutting of the tail is

avoided during tail threading of the web. On the other hand, reliable tail threading of the web is enabled at full width by at least the edge blows. Blows are thus directed to the web in the vicinity of the edges. When a blow is directed to the web edges, the web edges detach from the dryer cylinder. A blow is thus directed to both web edges said blow discharging from at least one opening/nozzle. As the web edges detach from the dryer cylinder, the center part of the web also detaches from the dryer cylinder. This detachment of the web edges is essential because faults and tears causing breaks initiate from the edges.

In one embodiment, blows are also directed to the center of the web. Although the web edges are the most essential areas that should be transferred from a dryer cylinder by means of blows to follow the dryer fabric, a successful full width tail threading procedure can be further improved by directing blows to the center part of the web as well. Blows directed to the center part of the web facilitate successful tail threading, particularly in wide fiber web machines.

In another embodiment, blows of different intensities are directed to the web in the cross direction of the web. Thus intensive blows are directed to the vicinity of the web edges and a less intensive one is directed to the center of the web. As stated above, the web edges are the most important part as regards successful tail threading of the web. A smaller blow at the center is sufficient to ensure web detachment from the dryer cylinder. Advantageously, a blow is directed to the web in a wide area but the blow is adjusted to be just correct for detaching the web from the dryer cylinder.

In a third embodiment, blows are adapted in the vicinity of the web end. In this case each blow is formed before the web arrives at the blow position and is turned off after the web has

passed the blow position. In this way the blow is formed at a time for merely a part of the blow positions covered by the dryer fabric only, and correspondingly, the blow is formed at a time for merely a part of the blow positions covered by the web as well. Thus the blow is not formed simultaneously for all blow positions. When blows are not formed at once for the entire dryer section, intensive blows can be directed to the points in which they are needed. Thus blows can be made more intensive in such blow positions that have the greatest significance in blowing as regards tail threading of the web.

In a fourth embodiment, the dry content value of the web at the first dryer cylinder is lower during tail threading than the value at the first dryer cylinder during operation. When the web is moister, the web attaches better to the dryer fabric. According to the embodiment, the web, the fabric or both can also be moisturized during tail threading. For example, fabric cleaning showers can be opened before the web arrives at a group in order that the web would attach to the fabric. Moisturizing of the web and the fabric can be done on both sides or on one side only. Advantageously, the contacting surface of the web and fabric is moisturized. When the web is moist and attaches better to the dryer fabric, a smaller blow is already sufficient for transferring the web from the surface of the dryer cylinder to the vicinity of the dryer fabric, i.e. to travel together with the dryer fabric.

In a fifth embodiment, the dry content value at the first dryer cylinder of the web arriving during tail threading is approximately five percentage units, even approximately 10 percentage units, lower than the value at the first dryer cylinder during operation. A web at a dry content five percentage units lower can be transferred to the dryer section from the press section. Such a lower dry matter content is achieved when at least one or more press nips are operated on relief. In addition, when the dry content, i.e. the dry content value, is approximately

five percentage units lower, web attachment to the dryer fabric is remarkably better than at a higher dry content value.

In a sixth embodiment a vacuum is created in a vacuum box before the web arrives at the vacuum box. Furthermore, the vacuum is created at a time for merely a part of the vacuum boxes covered by the dryer fabric only. The open surface of the vacuum box can have different vacuum zones and the vacuum can be applied to the vacuum box or the vacuum box can be depressurized by means of blows according to the ejector principle or a combination of these. When only the dryer fabric is present on top of the vacuum box, vacuum loss is great. In other words, a remarkable flow of air through the dryer fabric takes place. When merely a part of such vacuum boxes that are covered by the dryer fabric only has been depressurized, the vacuum loss decreases remarkably. Increased vacuum is useful when tail threading takes place as a full width web, but when tail threading takes place with a tail, a high vacuum can tear off the web heading to broke and make it travel along with the tail. When a web heading to broke goes along with the tail, this leads very likely to a break. When the web and the fabric cover the vacuum box, remarkable loss does not occur any more and the vacuum need not be turned off. A vacuum is thus maintained with vacuum boxes covered by the web avoiding in this way breaking of the web, or web breaks.

The invention is described below in detail by making reference to the enclosed drawings that illustrate one of the embodiments of the invention, in which

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Figure 1 is a side view of a fiber web machine,
Figure 2 shows an arrangement according to the invention in connection with a dryer cylinder, seen from the end of a turning roll,

Figure 3a shows an arrangement according to the invention in connection with a dryer cylinder, seen from the side of the dryer cylinder,

Figure 3b shows an arrangement according to the invention in connection with a dryer cylinder, seen from the side of the dryer cylinder,

Figure 4 shows two successive dryer groups equipped with an arrangement according to the invention, and

Figure 5 shows timing schemes of blows according to the invention.

Figure 1 shows one conventional fiber web machine 18 seen from the side. The fiber web machine 18 includes, as successive partial entities, a forming section 10, a press section 12, a dryer section 14, and a finishing section 16. The finishing section comprises only a machine reel in the fiber web machine according to Figure 1. The method and the arrangement according to the invention are designed for use in tail threading in the dryer section 14 of a fiber web machine 18 where only above-located single fabric run 20 is used. The dryer section 14 includes successive dryer groups 38 which are nine in number in the fiber web machine according to Figure 1. The dryer groups 38 are individualized by symbols R1 - R9. Advantageously, the web is fully wide during tail threading.

The fiber web machine 18 shown in Figure 1 can have an arrangement 28 according to the invention shown in Figure 2 in tail threading of the web 34 in the dryer section 14. The dryer section 14 shown in Figure 1 includes successive dryer groups 38 which include dryer cylinders 22, turning rolls 24, and one dryer fabric 26, as shown in Figure 2. The dryer fabric 26 is adapted to travel only as above-located single fabric run 20 via the dryer cylinders 22 and the turning rolls 24. During tail threading of the web 34, the end 42 of the web 34 is adapted to be taken through the dryer section 14 at full width. In addition, blow off blow equipment 80 is included on the side

of an opening gap 32 formed by a dryer cylinder 22 and the dryer fabric 26, at least at the web edges, for detaching the full width web 34 from the dryer cylinder 22.

5 Figures 3a and 3b illustrate an arrangement 28 according to the invention in connection with a dryer cylinder 22, seen from the side of the dryer cylinder 22. The blow off blow equipment 80 is located in the vicinity of the edges 33 and 35 of the web 34. When the blow off blow equipment 80 is located in the
10 vicinity of the edges 33 and 35 of the web 34, the edges 33 and 35 of the web 34 can be detached from the dryer cylinder 22 and the web 34 can be transferred to travel following the dryer fabric 26.

15 In arrangements according to the invention shown in Figures 3a and 3b, the blow off blow equipment 80 includes flow profiles 82 which are adapted to allow a greater flow of air 84 to the edges 33 and 35 of the web 34. The blow off blow equipment 80 includes a blow pipe 86 or several separate blow pipes 86. The
20 flow profiles 82 in the blow pipe 86 are openings 88. The openings, or the holes/gaps, are on the side wall of the pipe. Smaller pipes, nozzles, attached to the blow pipe can also be present in association with the openings. The outlet of such a nozzle can be formed by flattening. The size of the holes in
25 the openings is 2 - 10 mm, advantageously 3 - 8 mm. The distribution of, or the distance between the openings in the web edge area is 50 - 300 mm. The 'web edge area' refers here to an area of 0.2 - 1 m, advantageously of 0.3 - 0.6 m, from the web edge. In the following zone the distribution of the openings is
30 - 1500 mm, advantageously 400 - 1000 mm.

In Figure 3a, the blow pipes 86 are separate and they are located in the vicinity of the edges 33 and 35 of the web 34. When using openings/holes as described, the distribution is
35 denser at the web edge than at a distance from the web edge. In Figure 3b, the openings 88 are surrounded by orientation pipes

89 which can be located closer to the dryer cylinder/opening gap. Then the blow can be oriented extremely well.

In Figure 3b, one blow pipe 86 covers the entire width of the web and the blow pipe 86 is located in the vicinity of the edges 33 and 35 of the web 34. The flow profiles 82 at the center of the blow pipe 86 are center flow profiles 83. Center flow profiles ensure that the web is transferred to the vicinity of the dryer fabric in the center part of the web as well. The flow profiles 82 in the web blow pipe at the web edge, in turn, are edge flow profiles 81 which have an essential significance in transferring the web from a dryer cylinder to the vicinity of the dryer fabric. At its simplest, there is one edge flow profile at both edges and there are 1 - 10 center flow profiles at the center of the blow pipe.

As shown in Figure 3b, at least one piece of break blow equipment 85 is located outside the edges 33 and 35 of the web 34. Air is blown from each piece of break blow equipment 85 to the surface of the dryer cylinder 22 under the edge 33 or 35 of the web 34 at least partially cross-wise relative to the fiber web machine. When a break blow goes cross-wise relative to the fiber web machine between the web and the dryer cylinder, the following blow off blow, or a threading/guide blow, is capable of detaching the web from the dryer cylinder. The break blow equipment 85 is controlled by a break blow valve 87. The blow off blow equipment 80, in turn, is controlled by a blow off blow valve 91. The break blow valve and the blow off blow valve 91 are electrically controlled. Break blow and blow off blow nozzles can be adjustable for their orientation in the machine and cross directions. In addition, the blow pipe itself can be positioned relative to the dryer cylinder/opening gap.

The edge blow can also be positioned in separate pipes in which case the blows for the center part can be in a full width pipe of their own. The shape of the nozzle orifice can deviate from

a normal hole as long as the surface area and the medium flow remain corresponding. In addition, it is possible to use a short orifice nozzle, which provides a corresponding flow. The openings/nozzles at the edges can be, for example, laval nozzles, which are efficient. The medium can be brought to the blow equipment from both edges or from one edge only.

Although the edge blow equipment is typically already sufficient for detaching the web from the dryer cylinder and transferring the web to the vicinity of the dryer fabric, the blow pipes advantageously extend for a portion of over 30%, most advantageously for a portion of over 50%, of the web width. When the blows cover such a great portion of the web width, the web is transferred from the dryer cylinder to the vicinity of the dryer fabric more reliably than before.

Advantageously, the fiber web machine in which full width tail threading is used has a width of over 4 m, advantageously of over 6 m. In wide fiber web machines, the diagonal cutting distance is remarkably long in the cross direction of the web and simultaneously in the longitudinal direction. When the cutting length is long, the likelihood of problems occurring in cutting increases. In addition, during full width tail threading, less broke is conveyed to the pulper than when using a tail in tail threading. When using full width tail threading, the fiber web machine can also be taken to production faster than when using a tail. These advantages, too, are emphasized along with increasing machine widths. On the whole, it can be stated that when tail threading is accomplished with a full width web, forming of a tail as well as problems appearing in the tail leading and widening are avoided.

Figure 3b illustrates an arrangement according to the invention in connection with a dryer cylinder 22, seen from the side of the dryer cylinder 22. Blow off blow equipment 80 covers the entire width of the web 34. Then the transfer of the web from

a dryer cylinder 22 to travel with the dryer fabric 26 is reliable. For optimizing the air consumption, openings/nozzles are located relatively sparsely over that portion of the blow equipment that covers the center part of the web. Advantageously, the position of the web is measured and blows are adjusted based on the measurement such that the blows are turned on only in one blow group. In the blow position, the web is blown off from a dryer cylinder in the opening gap between the dryer fabric and the dryer cylinder.

During tail threading the dry content value of the web at the first dryer cylinder is lower than usual, for example, as low as approximately 40% instead of the usual dry content value of 45%. Then the machine is operated surprisingly with the press nips on relief during tail threading of the web, i.e. when tail threading takes place in the dryer section.

Figure 4 shows two successive dryer groups 38 equipped with an arrangement 28 according to the invention. The dryer section includes successive dryer groups. The dryer group 38 includes dryer cylinders 22, turning rolls 24, and one dryer fabric 26, which is adapted to travel only as above-located single fabric run 20 via the dryer cylinders 22 and the turning rolls 24. During tail threading of the web 34, the end 42 of the web 34 is adapted to be led at full width through the dryer section composed of the dryer groups 38. Blow equipment 60 is included on the side of the opening gap 32 of a dryer cylinder 22 at least at both edges for detaching the full width web 34 from the dryer cylinder.

In Figure 4 the arrangement 28 includes a control system 36 which is used to form an blow for merely a part of the blow equipment 60 at a time. In other words, the blow created in the vicinity of the dryer cylinders is formed depending on the position of the web. The flow is oriented exactly to those pieces of blow equipment that are located in the opening gaps

in the group in which the web is currently present. Thus the consumption of compressed air remains reasonable and tail threading can be accomplished with the full width web.

- 5 In the arrangement 28 shown in Figure 4, the blow is formed at a time for a blow equipment group which includes 1 - 8, advantageously 3 - 6 blow positions. In Figure 4 the blow positions included in the blow equipment groups are equal in number with the dryer cylinders comprised in the dryer group. A blow equipment group is the smallest unit for which the blow can be
10 adjusted. When the number of pieces of blow equipment, or dryer cylinders, in one blow equipment group is 1 - 8, advantageously 3 - 6, the consumption of air can be minimized.
- 15 The control system 36 of the arrangement 28 shown in Figure 4 includes sensors 52, control equipment 54, and adjustment equipment 92 for each blow equipment group 90. A pressure piping 96 is led from a pressure manifold 94 for creating an blow for the blow equipment 60. The sensors 52 determine the
20 position of the web 34. A sensor provides real-time information on the position at which the web is traveling forward. Overpressurization of the blow equipment can be accomplished by calculating the web position. If the web remains longer in a position, the calculation is not valid. In addition, such
25 errors accumulate and therefore it is necessary to determine the actual position of the web for the sake of accurate blow control. The sensor thus controls, by means of calculation, a delay over one group, and backward, it controls its own group with a delay when turning off blows. By locating a sensor
30 before the last cylinder, it is possible to control even immediately the following group.

Compressed air flows from the blow equipment 60' that is turned on, which is illustrated with broken lines. In turn, compressed
35 air does not flow from the blow equipment 60'' that is turned off. The flow of air from the blow equipment is thus oriented

to the group in which the web is currently present. After the web has passed the sensor 52, the blow can be transferred forward in the machine direction. The web is detached from a dryer cylinder on the side of an opening gap between the dryer cylinder and the dryer fabric. The length of the blow equipment, or the measure in the cross direction of the fiber web machine, is one blow off nozzle at minimum at both edges. More precisely, there is at least one blow-off blow, or blow-off nozzle, per each dryer cylinder at both web edges. For each dryer group, there is at least one piece of break blow equipment, or break nozzle, at both web edges. Adding blow-off blows, or blow-off nozzles, also to the center area speeds up tail threading and it is almost inevitable in fast machines. Blow equipment can form a continuous blow or separate blows. Advantageously, a blow is present in the vicinity of both web edges in which case it is possible to save in blow volumes. When a blow is present in the vicinity of both web edges, the web edges detach from the dryer cylinder. Once the web edges have detached, the entire web detaches. Most advantageously, the blow equipment has a width essentially equal to that of the dryer cylinder, i.e. the length of the blow equipment is equal to the web width and the blow covers the entire web width. When the blow covers the entire web width, the web can be reliably detached from the dryer cylinder and transferred to travel with the dryer fabric.

Figure 4 shows an arrangement 28 in tail threading of a web 34 in the dryer section 14 of a fiber web machine 18 (Figure 1). The arrangement 28 includes successive dryer groups 38 for drying a web 34. The dryer group 38 includes dryer cylinders 22, turning rolls 24, and one dryer fabric 26. The dryer fabric 26 is adapted to travel as single fabric run 20 via the dryer cylinders 22 and the turning rolls 24. The turning rolls have an open surface, which is illustrated by a broken line 30, representing the open surface, drawn in the vicinity of the surface 44 of the turning roll 24. A vacuum box 62 is arranged

in association with each turning roll 24 and a vacuum is created in said vacuum box before the web 34 arrives at the vacuum box 62. The arrangement 28 additionally includes a control system 36 for creating a vacuum for merely a part at a time of the vacuum boxes 63 covered by the dryer fabric 26 only. More precisely, the last vacuum box 63', covered by the fabric only, of the first dryer group 38', is depressurized. The vacuum boxes 63, covered by the fabric only, included in the second dryer group 38'', are not depressurized. The vacuum boxes 61 that are covered by the web 34 are depressurized. Applying a vacuum to the vacuum boxes, in which it is needed for leading a full width web, enhances full width tail threading. In other words, with the vacuum control, full width tail threading can be made to function remarkably more reliably than before. Advantageously, the position of the web is measured, i.e. the position of the web end is defined. When the position of the web is known, depressurizable vacuum boxes and/or blows can be selected according to the actual web travel. In principle, the vacuum boxes in the vicinity of which a vacuum is created, can also be selected by computational means. Most advantageously, a calculation method is used which is synchronized every now and then with the measured, i.e. the actual position of the web. Vacuum boxes can be depressurized in several vacuum box groups. Since a fiber web machine is long and breaks may occur in the progress of tail threading, measuring the web position makes the depressurization of the vacuum boxes more accurate.

A vacuum present in the vacuum boxes used in association with turning rolls aspirates air through the dryer fabric. If a web is also present in the vicinity of a dryer fabric used in association with a vacuum box, the vacuum aspirates the web into contact with the dryer fabric and it also aspirates air through the web for a slight amount. The amount of air passing the web is very small, in practice insignificant. In addition to this, a flow is generated from the vicinity of the web edges when the web is at the vacuum box and turning roll. The amount

of air penetrating the web and the dryer fabric is notably smaller than the amount of air penetrating the dryer fabric. When a vacuum is created at a time for merely a part of the vacuum boxes covered by the dryer fabric only, the required
5 vacuum level can be created at the vacuum boxes with a smaller vacuum requirement than when creating the vacuum simultaneously for all vacuum boxes. When the vacuum is applied at a time for merely a part of the vacuum boxes covered by the dryer fabric only, the vacuum can be applied in a position where it is
10 needed the most. During tail threading vacuum is needed in the vacuum boxes having the web or the web end in association therewith. Furthermore, a notable vacuum loss is present only at the vacuum boxes covered by the dryer fabric.

15 In the arrangement 28 shown in Figure 4, a vacuum is created at a time for a vacuum box group 50 which includes vacuum boxes 62 in a number corresponding to the number of turning rolls 24 located in the dryer group 38. A distribution deviating from this can also be used as such. A vacuum box group is the smal-
20 lest unit for which the vacuum can be adjusted. When the number of vacuum boxes covered merely by the dryer fabric is minimized, the vacuum loss can also be minimized.

As shown in Figure 4, the arrangement 28 includes a control
25 system 36 which is used to control which of the vacuum boxes 63 covered by the dryer fabric are depressurized. The most accurate adjustment is of course achieved when the vacuum box group includes only one vacuum box. Each vacuum box group must be depressurizable at a different time. Thus the control system 36
30 should include specific vacuum adjustment equipment 48 for each vacuum box group 50.

The control system 36 of the arrangement 28 shown in Figure 4 includes sensors 52, control equipment 54, and adjustment
35 equipment 48 for each vacuum box group 50. The sensors 52 determine the position of the web 34 at the dryer group 38. A

sensor provides real-time information on the position at which the web is traveling forward. Depressurization of vacuum boxes can be accomplished by calculating the web position. If the web remains longer in a position, the calculation is not valid. In addition, such errors accumulate and therefore it is necessary to determine the actual position of the web for the sake of accurate vacuum control. Advantageously there is one sensor for each dryer group, which allows receiving reliable information on the web transfer between the dryer groups.

The sensor can be composed of very different components. The sensor can be a pressure sensor, for example, having a good resistance to the conditions in the dryer section. With a sensor which is a pressure sensor it is easy to achieve sufficient accuracy through the dryer fabric. The sensor can also be an optical sensor or a distance sensor, such as an ultrasonic sensor. Such a non-contact sensor can even be installed in doctor equipment, for example, or on the side of a dryer group, in the frame construction of the fiber web machine. When the sensor is installed in the frame construction, the sensor is easily serviceable even during the operation.

As shown in Figure 4, the adjustment equipment 48 includes an electrically controlled valve. A command related to the position of a piece of the adjustment equipment 48 is sent with control equipment 54 to the adjustment equipment 48, more precisely to the electric valves. A vacuum piping 58 is led from a vacuum manifold 66 for creating a vacuum in the vacuum boxes 62. The vacuum piping 58 includes adjustment equipment 48 which is used to adjust the depressurization of the vacuum boxes. Thus, by using the solenoid valves, the vacuum is controlled for one vacuum group at a time. More precisely, the vacuum piping 58 is led to the vacuum boxes which have vacuum zones. In this embodiment the vacuum is led inside the vacuum boxes.

The arrangement shown in Figure 4 includes a doctor 64 for cleaning the dryer cylinder 22. Advantageously the doctor 64 is a knock off doctor 68, i.e. the arrangement 28 advantageously includes a knock off doctor 68. A knock off doctor is dimensioned to endure running of a full width web to the broke treatment at the concerned position. The advantages of a knock off doctor are emphasized if the blow equipment for detaching the web from a dryer cylinder covers only a portion of the web width. When the blow equipment covers merely a portion of the web width, the web may unintentionally get in contact with the doctor. If the doctor is a knock off doctor, it endures the stresses caused by the web contact.

A knock off doctor should prevent the web from winding around a dryer cylinder. Normal cleaning doctors prevent web winding only for a short moment. A knock off doctor should prevent the web from winding around a dryer cylinder also for a longer time. A knock off doctor should be hose-loaded and it can be a DST doctor, for example, which allows applying a high linear load during tail threading.

Linear loads of doctors are reduced after tail threading. Knock off doctors are thus used as cleaning doctors during the operation. When the linear loads are lower after tail threading, the power consumption of drives decreases notably after tail threading. Use of a conventional doctor can also be contemplated as a knock off doctor, but then there must be an efficient blow associated with the doctor to avoid access of the web to the doctor, and further, web winding around the dryer cylinder.

Figure 4 shows two successive dryer groups 38 each of them having dryer cylinders 22 and turning rolls 24 as well as one dryer fabric 26 adapted to travel via these. The size, number and mutual setting of the dryer cylinders and turning rolls can vary in different dryer group applications, but the run arrangement used in connection with them is the above-located single

fabric run. A vacuum is adapted to be created in the vacuum boxes located in association with the turning rolls.

As shown in Figure 4, the arrangement 28 includes a control system 36 with web break detection equipment 53 connected thereto. Blow off blow equipment 80 is also connected to the control system for detaching the full width web 34 from a dryer cylinder 22. In case of a web break, the web break is detected and blows for a new web pick-up are started at the break position. The break position at which tail threading is restarted can refer broadly to the dryer group at which the break occurred. Tail threading of the web becomes easier as it is not necessary to take the web again through the entire dryer section. Web break detection equipment is composed of web break cells. Advantageously said web break detection equipment, more precisely web break cells, is also used for timing the blows and aspirations.

Figure 5 shows timing schemes according to the invention for the tail threading blows of a full width web. Horizontal blow lines 71 represent the formation of the blows for each blow group PR1 - PR9. The Start points 73 of the blow lines 71 represent the start of the blow at a certain time t. The Start point 74 is the point of time at which the web is led from the press section to the dryer section. The Completed point 76 is the point of time at which the web has been successfully picked up to the entire dryer section. The oblique broken line between the Start point 74 and the Completed point 76 is the tail threading line 78 representing the advancement of the web in the dryer section. When the tail threading line 78 intersects with the blow line 71, the web has been successfully picked up to the blow group concerned. Blows are created only for the blow group at which the web end is currently traveling. Thus all blow groups are not overpressurized simultaneously. Hence the blow is directed to the correct position and it is the most intensive at the required point. In the Start point 74, a blow

has been created only at the first blow group PR1. Although the output of the blow is limited because the overpressure is discharged as a blow at the first blow group PR1 only, the flow associated with this blow group is remarkably intensive.

5

Figure 5 shows how each blow group PR1 - PR9 is overpressurized slightly before the web arrives at the blow group concerned PR1 - PR9, based on the calculation of the running speed. Once the web has been successfully picked up to the entire blow group, 10 the blow is stopped at this blow group with a slight delay. As such, the blow groups do not necessarily conform to the limits of the dryer groups in any way.

Timing of the blow groups can be applied to the vacuum boxes 15 with the difference that the latter are not closed after the web has passed the group concerned. Turning rolls are always turned on except if depressurization is controlled via the vacuum box according to the application. Since the vacuum output is limited because the vacuum is discharged via all 20 suction boxes, the flow is very small at each suction box. The flow is more intensive through the mere clothing than through the clothing and the web. Thus the flow reduces when the web has been successfully picked up to the vacuum box group concerned.

25

CLAIMS

1. Method in tail threading of a web in the dryer section of a fiber web machine including three successive dryer groups (38), and with the dryer group (38) including

5 - dryer cylinders (22),
 - turning rolls (24),
 - vacuum boxes (62),
 - one dryer fabric (26) traveling as single fabric run (20)
10 via the dryer cylinders (22) and the turning rolls (24),
 and
 - in tail threading of the web (34) the end (42) of the web (34) is led at full width through the dryer section (14), characterized in that, on the side of an opening gap (32)
15 formed by a dryer cylinder (22) and the dryer fabric (26), the full width web (34) is blown off from the dryer cylinder (22), at least at the edges (33, 35) of the web (34).

2. Method according to claim 1, characterized in that blows
20 are directed to the center of the web (34).

3. Method according to claim 1 or 2, characterized in that blows are directed to the web (34) at different intensities in the cross direction of the web (34).

25 4. Method according to any of claims 1 - 3, characterized in that during tail threading the dry content value of the web (34) at the first dryer cylinder (22) is lower than during the operation.

30 5. Method according to claim 4, characterized in that during tail threading the dry content value of the web (34) at the first dryer cylinder (22) is approximately 5 percentage units lower than during the operation.

35

6. Method according to any of claims 1 - 5, and with a vacuum being created in each vacuum box (62) before the web (34) arrives at the vacuum box (62), characterized in that the vacuum is created at a time for merely a part of the vacuum
5 boxes (63) covered by the dryer fabric (26) only.

7. Method according to any of claims 1 - 6, characterized in that a web break is detected and blows for picking up the web again are started from the break point.

10

8. Method according to any of claims 1 - 7, characterized in that blows are formed at a time for a blow group (90) including 1 - 8, advantageously 3 - 6 dryer cylinders (22).

15 9. Arrangement in tail threading of a web in the dryer section of a fiber web machine including three successive dryer groups (38), and with the dryer group (38) including

- dryer cylinders (22),

- turning rolls (24),

20 - vacuum boxes (62),

- one dryer fabric (26) adapted to travel as single fabric run (20) via the dryer cylinders (22) and the turning rolls (24), and

- in tail threading of the web (34) the end (42) of the web
25 (34) is adapted to be taken at full width through the dryer section (14),

characterized in that blow-off blow equipment (80) is included on the side of an opening gap (32) formed by a dryer cylinder (22) and the dryer fabric (26), located at least at the edges
30 (33, 35) of the web (34), for detaching a full width web (34) from the dryer cylinder (22).

10. Arrangement according to claim 9, characterized in that a center flow profile (83) is included at the center of the web
35 (34).

11. Arrangement according to claim 9 or 10, characterized in that the flow profiles (82) in the blow off blow equipment (80) are adapted to allow a greater flow to the edges (33, 35) of the web (34).

5

12. Arrangement according to any of claims 9 - 11, characterized in that the arrangement (28) includes a control system (36) for creating a vacuum at a time for merely a part of the vacuum boxes (63) covered by the dryer fabric (26) only.

10

13. Arrangement according to any of claims 9 - 12, characterized in that the arrangement (28) includes a knock off doctor (68).

15

14. Arrangement according to any of claims 9 - 13, characterized in that the arrangement (28) includes a control system (36) having web break detection equipment (53) and blow off blow equipment (80) connected thereto for detaching the full width web (34) from a dryer cylinder (22).

20

15. Arrangement according to claim 14, characterized in that the web break detection equipment (53) is adapted to be used also for timing of the blows formed by the blow off blow equipment (80).

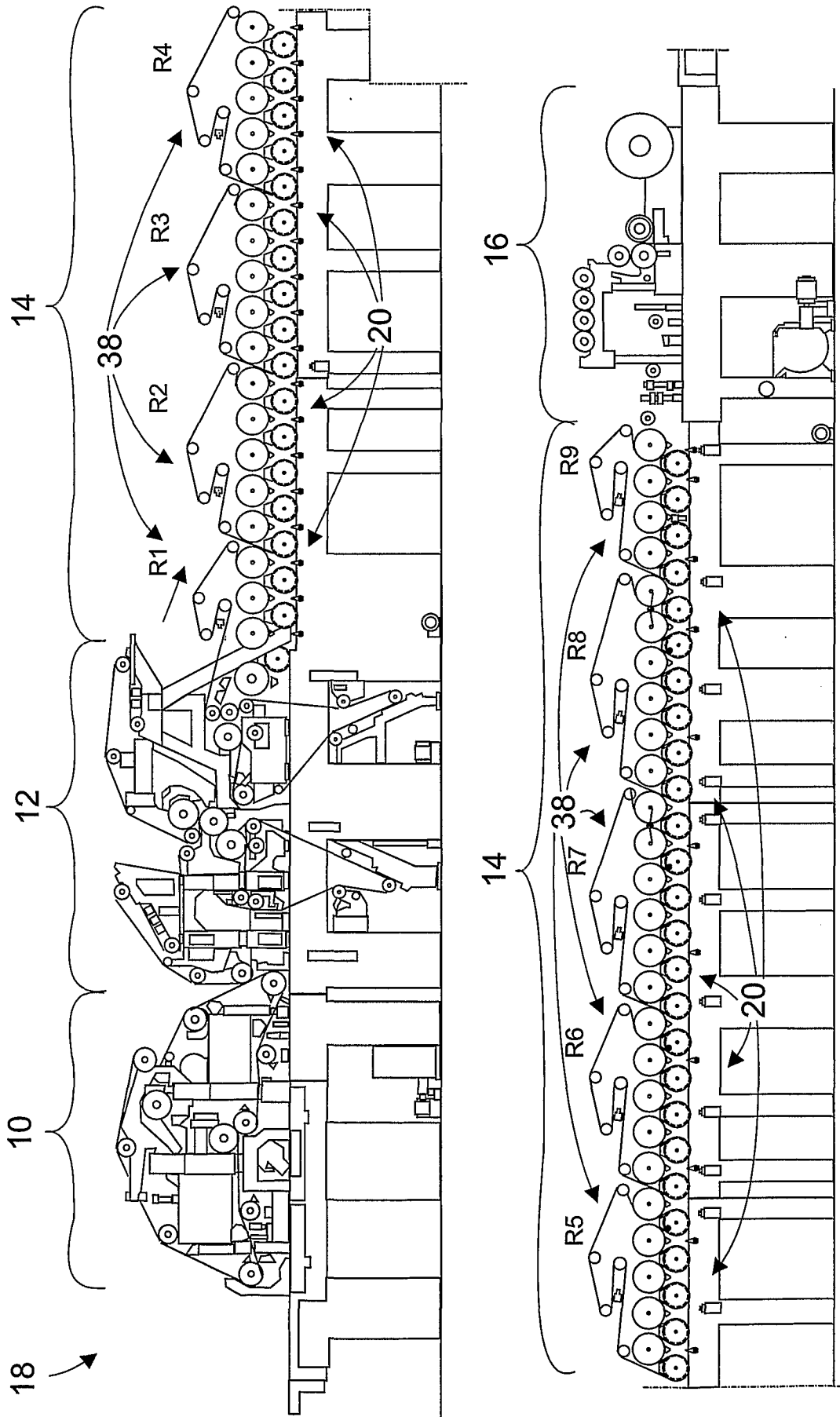
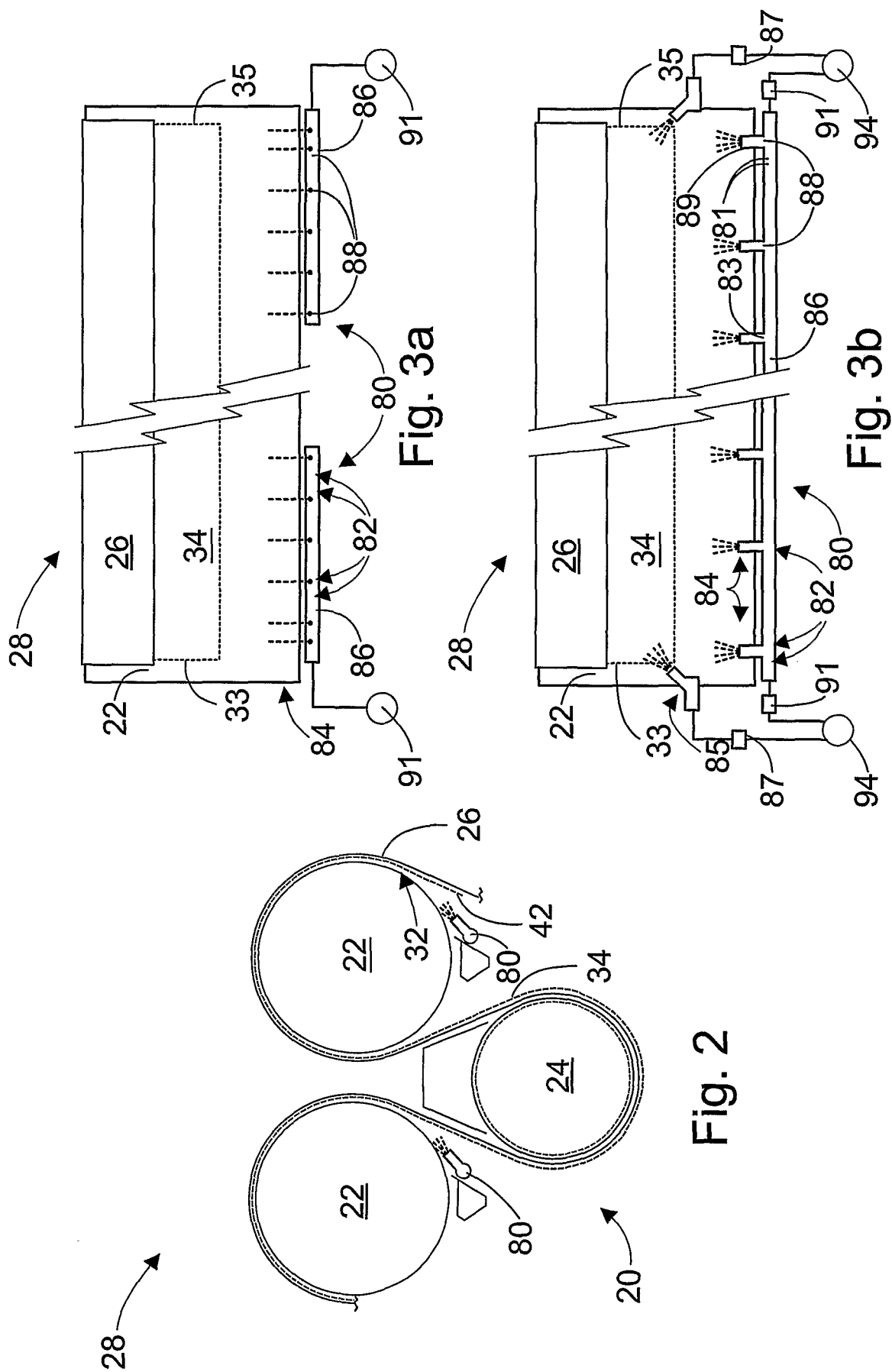


Fig. 1



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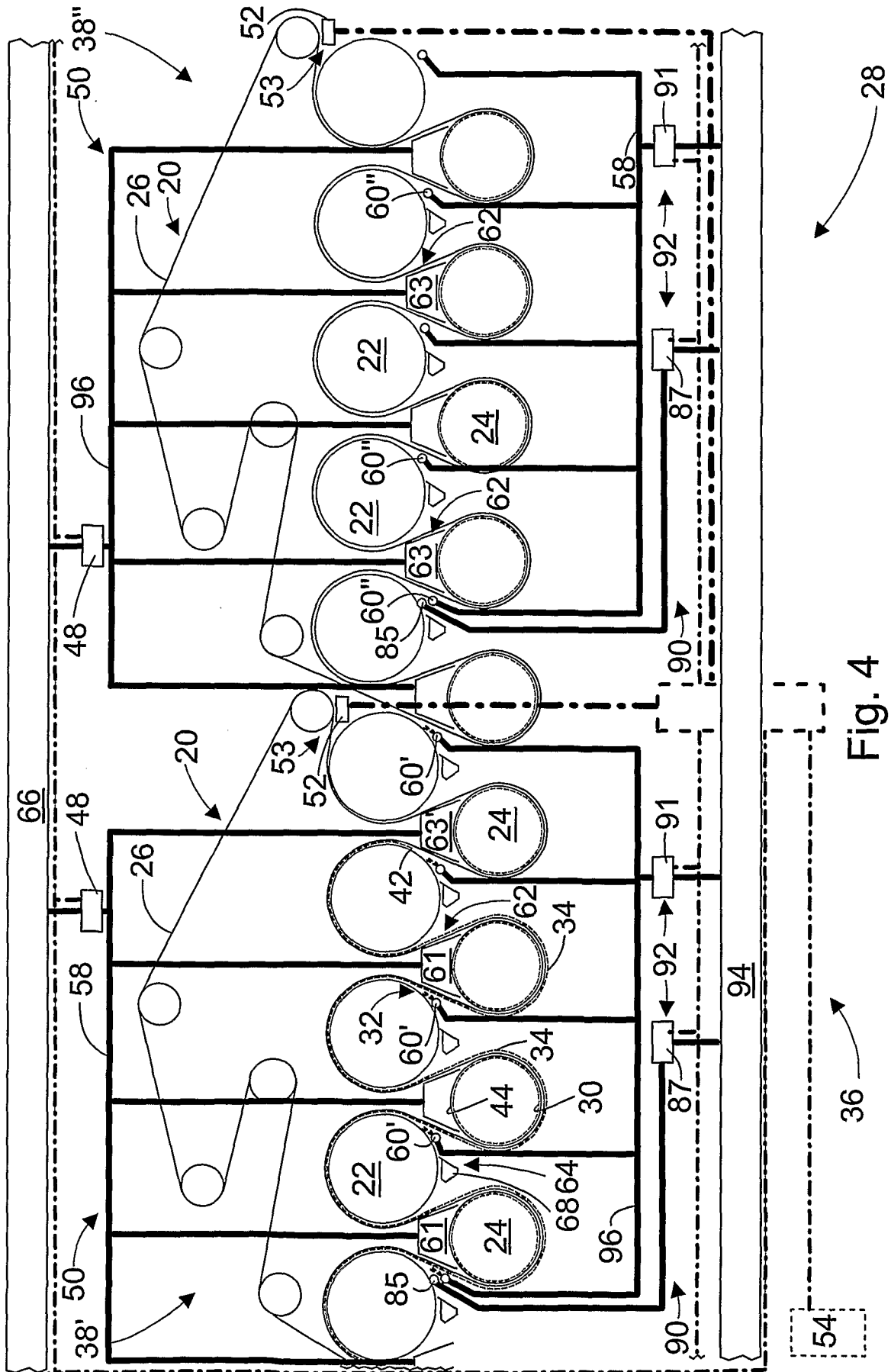


Fig. 4

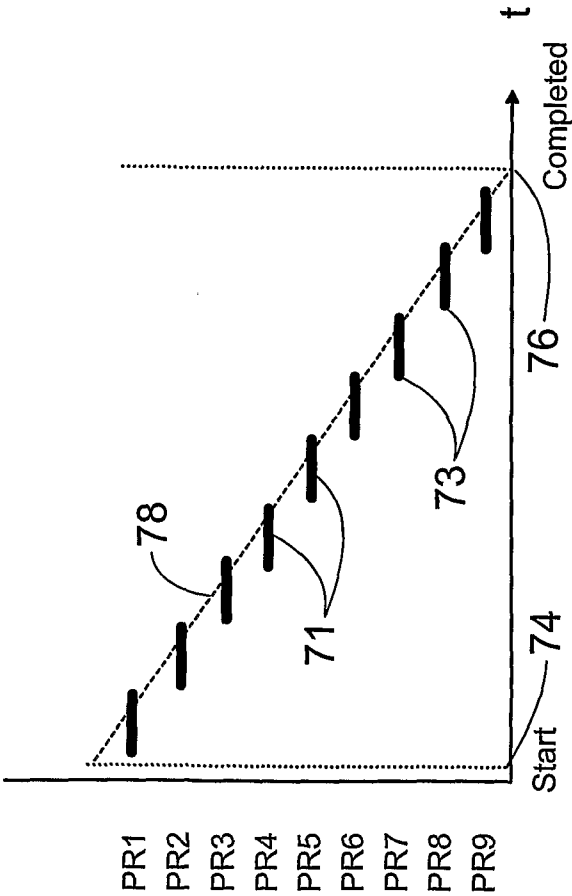


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI2009/050426

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: D21F, D21G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI, COMPDX, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002078588 A1 (KAHL PETER et al.) 27 June 2002 (27.06.2002), whole publication	1-3, 7, 9-11, 13-15
X	WO 2007023209 A1 (METSO PAPER INC et al.) 01 March 2007 (01.03.2007), whole publication	1, 6-9, 12-15
X	FI 93038 B (VALMET PAPER MACHINERY) 10 August 1995 (10.08.1995), whole publication	1, 6, 7, 9, 14, 15

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search

26 August 2009 (26.08.2009)

Date of mailing of the international search report

02 October 2009 (02.10.2009)

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2009/050426

Patent document cited in search report	Publication date	Patent family members(s)	Publication date
US 2002078588 A1	27/06/2002	EP 1156154 A2 DE 10024296 A1	21/11/2001 22/11/2001
WO 2007023209 A1	01/03/2007	DE 112006002218T T5 FI 20055450 A	03/07/2008 26/02/2007
FI 93038 B	10/08/1995	None	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2009/050426

CLASSIFICATION OF SUBJECT MATTER

Int.Cl.

D21F 7/00 (2006.01)

D21G 9/00 (2006.01)