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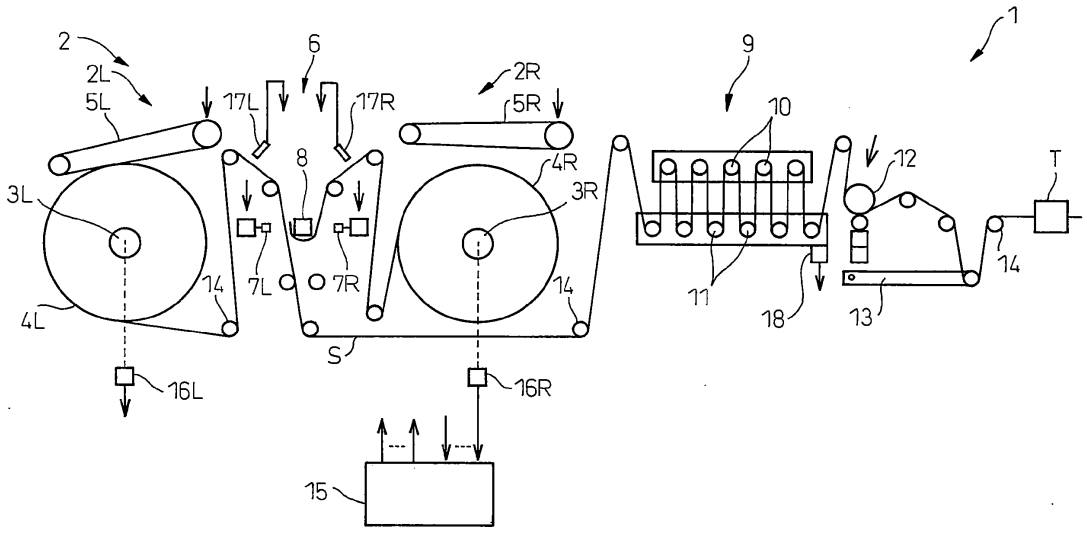
(54) BELT-FORM BODY SUPPLY DEVICE AND OPERATING METHOD THEREOF

(57) A belt-like material-feeding apparatus (1) for continuously feeding a belt-like material (S) to a treating unit (T), comprises a splicing unit (6) which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material, an accumulating unit (9) which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material, and a control unit which, prior to the splicing operation of the splicing unit, increases the amount of accumulation of the belt-like material to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, releases the belt-like material from the accumulating unit to decrease the amount of accumulation of the belt-like material.

Fig.1



EP 2 508 454 A1

Description

Technical Field

[0001] The present invention relates to a belt-like material-feeding apparatus and a method of operating the same.

Background Art

[0002] A belt-like material-feeding apparatus for continuously feeding a belt-like material to a treating unit, including a splicing unit which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material, and an accumulating unit which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material, in which, when the splicing operation of the splicing unit is completed, the amount of accumulation of the belt-like material is increased up to a maximum amount of accumulation of the accumulating unit and then a steady operation is conducted and, during the splicing operation, the belt-like material is released from the accumulating unit to decrease the amount of accumulation of the belt-like material (see PLT 1) has been known. This enables the belt-like material to be released from the accumulating unit during the splicing operation and, therefore, enables the belt-like material to be continuously fed.

[0003] The accumulating unit includes winding rolls and dancer rolls round which the belt-like material is alternately wrapped. The amount of accumulation of the belt-like material increases with an increase in the distance between the winding rolls and the dancer rolls and decreases with a decease in the distance between the winding rolls and the dancer rolls.

Citation List

Patent Literature

[0004]

PLT 1: Japanese Unexamined Patent Publication No. 7-137899

Summary of Invention

Technical Problem

[0005] The above belt-like material-feeding apparatus is operated steadily in a condition where the belt-like material is accumulated in large amounts in the accumulating unit. In the condition where the belt-like material is accumulated in large amounts, however, the distance is increased between the winding rolls and the dancer rolls. Thus, the belt-like material traveling through the splicing unit may lose stability i.e., the belt-like material may meander or may be wrinkled. When the belt-like material is comprised of a nonwoven fabric, particularly, meandering becomes a problem. When the belt-like material is comprised of a film, on the other hand, wrinkling becomes a problem, particularly.

Solution to Problem

[0006] According to one aspect of the invention, there is provided a belt-like material-feeding apparatus for continuously feeding a belt-like material to a treating unit, comprising: a splicing unit which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material; an accumulating unit which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material; and a control unit which, prior to the splicing operation of the splicing unit, increases the amount of accumulation of the belt-like material to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, releases the belt-like material from the accumulating unit to decrease the amount of accumulation of the belt-like material.

[0007] According to another aspect of the invention, further, there is provided a method of operating a belt-like material-feeding apparatus for continuously feeding a belt-like material to a treating unit, the apparatus comprising: a splicing unit which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material; and an accumulating unit which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material, wherein, prior to the splicing operation of the splicing unit, the amount of accumulation of the belt-like material is increased to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, the belt-like material is released from the accumulating unit to decrease the amount of accumulation of the belt-like material.

Advantageous Effects of Invention

[0008] The belt-like material can be stably fed during the steady operation while maintaining continued feeding of the belt-like material during the splicing operation.

Brief Description of the Drawings

[0009]

Fig. 1 is a general view of a belt-like material-feeding apparatus;
Fig. 2 is a view illustrating the operation of the belt-like material-feeding apparatus;
Fig. 3 is a view illustrating the operation of the belt-like material-feeding apparatus;
Fig. 4 is a view illustrating the operation of the belt-like material-feeding apparatus;
Fig. 5 is a time chart of the amount of accumulation of the belt-like material;
Fig. 6 is a time chart of the amount of accumulation of the belt-like material according to another embodiment; and
Fig. 7 is a flowchart for executing a control for feeding a belt-like material.

Description of Embodiments

[0010] Fig. 1 shows a case where the present invention is applied to a belt-like material-feeding apparatus in an apparatus for producing absorptive materials. Namely, the apparatus for producing absorptive materials comprises a plurality of treating units, and the belt-like material-feeding apparatus feeds the belt-like material to these treating units. The treating units subject the belt-like material to such treatments as cutting, embossing and shaping including folding, as well as to such treatments as application of an adhesive, assembling with another member and the like. The absorptive material may be, for example, a sanitary napkin, a panty liner, an incontinence pad or a diaper. Further, the belt-like material is a member forming the absorptive material, and is comprised of, for example, tissue paper, a nonwoven fabric or a plastic film such as of polyethylene. The belt-like material may be untreated or treated. The present invention can be, further, applied to the belt-like material-feeding apparatus for any other use.

[0011] Referring to Fig. 1, a belt-like material-feeding apparatus 1 for continuously feeding a belt-like material S to a treating unit T comprises a delivery unit 2 for delivering the belt-like material S to the treating unit T. The delivery unit 2 comprises a plurality of subunits, such as a left delivery unit 2L and a right delivery unit 2R. The left delivery unit 2L and the right delivery unit 2R, respectively, comprises belt-like material sources in the form of rolls 4L, 4R of belt-like materials rotatably held by hangers 3L and 3R, and delivery belts 5L and 5R for unwinding the belt-like materials from the rolls 4L and 4R and for delivering them. The delivery belts 5L and 5R are, respectively, wrapped round the drive rolls and the idle rolls and is driven to rotate, and the positions thereof can be so varied as to stay in contact with the outer circumferential surfaces of the rolls 4L, 4R or not to come in contact therewith. The belt-like material sources may assume a form other than the rolls. The belt-like material from the left delivery unit 2L and the belt-like material from the right delivery unit 2R may be the same or different. Further, the belt-like materials may be unwound and delivered from the rolls 4L and 4R by rotating the hangers 3L and 3R. This makes it possible to omit the delivery belts 5L and 5R.

[0012] When the delivery belts 5L and 5R are contacted with the outer circumferential surfaces of the rolls 4L and 4R to rotate them, the belt-like materials are unwound from the rolls 4L and 4R and are delivered. When the rotations of the delivery belts 5L and 5R are stopped or the delivery belts 5L and 5R are separated away from the outer circumferential surfaces of the rolls 4L and 4R, on the other hand, delivery of the belt-like materials is stopped. Either the left delivery unit 2L or the right delivery unit 2R is operated and, therefore, the belt-like material is delivered from either one of them.

[0013] The belt-like material-feeding apparatus 1 further comprises a splicing unit 6 which splices a second belt-like material to the first belt-like material being fed from the delivery unit 2 to the treating unit T to thereby switch the belt-like material S being fed to the treating unit T from the first belt-like material into the second belt-like material. Namely, when the belt-like material is being fed to the treating unit T from the left delivery unit 2L, the belt-like material from the right delivery unit 2R is spliced to the belt-like material that is being fed to thereby switch the belt-like material being fed to the treating unit T into the belt-like material from the right delivery unit 2R. Or when the belt-like material from the right feed unit 2R is being fed to the treating unit T, the belt-like material from the left delivery unit 2L is spliced to the belt-like material being fed to thereby switch the belt-like material being fed to the treating unit T into the belt-like material from the left delivery unit 2L. The splicing unit 6 comprises, for example, pushers 7L, 7R and a stationary member 8.

[0014] In the case where the belt-like material is comprised of a thermoplastic resin, the splicing unit can be comprised of a welding type including heaters at the tips of the pushers 7L and 7R. That is, the belt-like materials from the left delivery unit 2L and the right delivery unit 2R are arranged being overlapped between the pusher 7L, 7R and the stationary member 8, and are pushed by the pusher 7L, 7R onto the stationary member 8 and the heater is energized. As a result, the belt-like materials are welded to each other while being held, and thus are spliced together. At this moment, further, the belt-like material being fed is weld-cut. When the splicing operation is not conducted, on the other hand, the pushers 7L and 7R stay away from the stationary member 8 and, therefore, the belt-like materials pass through the splicing unit 6.

[0015] Alternatively, the two belt-like materials may be spliced together by adhesion. In this case, the belt-like materials may be comprised of a thermoplastic resin or a non-thermoplastic resin. There can be, further, provided a cutting tool for cutting the belt-like materials being fed.

[0016] The belt-like material-feeding apparatus 1, further, comprises an accumulating unit 9 which is arranged between the splicing unit 6 and the treating unit T and is

capable of temporarily accumulating the belt-like materials. The accumulating unit 9 comprises stationary winding rolls 10 and dancer rolls 11 capable of moving in a vertical direction, and the belt-like materials are alternately wrapped round the winding rolls 10 and the dancer rolls 11.

[0017] When the tension of the belt-like materials decreases in the accumulating unit 9, the dancer rolls 11 descend due to their own weights and the vertical position of the dancer rolls 11 becomes lower. As a result, the distance increases between the winding rolls 10 and the dancer rolls 11, and an amount of the belt-like materials accumulated in the accumulating unit 9 increases. When the tension of the belt-like materials increases, on the other hand, the dancer rolls 11 ascend and the vertical position of the dancer rolls 11 becomes higher. As a result, the distance decreases between the winding rolls 10 and the dancer rolls 11, and the amount of accumulation of the belt-like materials decreases. Thus, the vertical position of the dancer rolls 11 represents the amount of the belt-like materials accumulated in the accumulating unit 9. A weight may be added to the dancer rolls 11. Alternatively, the vertical position of the dancer rolls 11 may be controlled by using an actuator such as a servo motor.

[0018] In this case, the amount of the belt-like materials accumulated in the accumulating unit 9 is controlled depending upon the deliverying speed of the belt-like materials from the delivery unit 2. Namely, when the delivering speed of the delivery belts 5L and 5R is increased, the tension of the belt-like materials decreases and, therefore, the amount of accumulation of the belt-like materials increases. On the other hand, when the delivering speed of the delivery belts 5L and 5R is decreased, the tension of the belt-like materials increases and, therefore, the amount of accumulation of the belt-like materials decreases.

[0019] Referring to Fig. 1, further, between the accumulating unit 9 and the treating unit T, there are provided a taking roll 12 which takes the belt-like materials from the accumulating unit 9 and feeds them to the treating unit T, and a tension adjuster 13 for adjusting the tension of the belt-like materials. The feeding speed of the taking toll 12 is in synchronism with the rate of production speed or the delivery speed of the apparatus for producing absorptive materials. Therefore, the taking roll 12 feeds the belt-like materials to the treating unit T at a substantially constant speed.

[0020] In Fig. 1, reference numeral 14 denotes idle rolls.

[0021] A controller 15 is comprised of a computer including, for example, a CPU (microprocessor), memory, input ports and output ports. The delivery unit 2 is provided with rotational speed sensors 16L and 16R for detecting the rotational speeds of the rolls 4L and 4R, and tail end sensors 17L and 17R such as cameras for detecting the passage of tail ends of the belt-like materials. Further, the dancer rolls 11 are provided with a position sensor 18 for detecting the vertical position of the dancer rolls 11. The sensors 16L, 16R, 17L and 17R are connected to the input ports of the controller 15, and the output signals from the sensors are input to the controller 15. The feed belts 5L and 5R, pushers 7L and 7R and taking roller 12, on the other hand, are connected to the output ports of the controller 15, and are controlled based on the output signals from the controller 15.

[0022] Fig. 1 illustrates a condition where the belt-like material-feeding apparatus 1 is in a steady operation. In this example, the belt-like material S is fed from the left delivery unit 2L. The belt-like material is, then, fed to the treating unit T through the splicing unit 6 and the accumulating unit 9.

[0023] In this case, the dancer rolls 11 are maintained at nearly the highest position P, i.e., the amount of the belt-like material accumulated in the accumulating unit 9 is maintained at nearly a minimum amount. Specifically, the delivering speed of the delivery belt 5L is feedback controlled so that the dancer rolls 11 detected by the position sensor 18 are maintained at the highest position P.

[0024] Next, when the remaining amount of the belt-like material of the roll 4L in the left delivery unit 2L becomes smaller than a predetermined lower-limit amount, an operation for accumulating the belt-like material is conducted. Namely, the delivering speed of the left delivery unit 2L is increased and is maintained increased. As a result, the vertical position of the dancer rolls 11 gradually decreases, i.e., the amount of the belt-like material accumulated in the accumulating unit 9 increases gradually.

[0025] The remaining amounts of the belt-like materials of the rolls 4L and 4R can be calculated based upon the rotational speeds of the rolls 4L and 4R detected by the rotational speed sensors 16L and 16R. Alternatively, whether the remaining amounts of the belt-like materials of the rolls 4L and 4R are smaller than the lower-limit amount may be judged based upon the outer diameters of the rolls 4L and 4R which can be determined by photoelectric tube sensors, proximity sensors, limit switches or cameras. The lower-limit value, on the other hand, may be a constant value or may be set depending on the rate of production of the apparatus for producing absorptive materials. This makes it possible to decrease the effect of variation in the thickness of the belt-like materials in the rolls 4L and 4R.

[0026] Next, as shown in Fig. 2, when the dancer rolls 11 arrive at the lowest position, i.e., the amount of accumulation of the belt-like material increases up to the maximum amount of accumulation of the accumulating unit 9, and when the passage of the tail end of the belt-like material S is detected by the end sensor 17L, then the rotation of the delivery belt 5L is stopped. Therefore, the increment of the amount of accumulation of the belt-like material is stopped.

[0027] Next, the splicing operation by the splicing unit 6 starts. That is, as shown in Fig. 3, the pusher 7L is

activated to splice the tail end part of the belt-like material from the left delivery unit 2L to the leading end part of the belt-like material from the right delivery unit 2R. The leading end part of the belt-like material from the right delivery unit 2R has been arranged on the stationary member 8 in advance by, for example, an operator.

[0028] While the splicing operation is being conducted in this manner, the belt-like material accumulated in the accumulating unit 9 is continuously released to the treating unit T by the taking roll 12 and, thus, the belt-like material is continuously fed to the treating unit T. Therefore, the splicing operation is conducted without stopping the apparatus for producing absorptive materials. In the accumulating unit 9, on the other hand, the dancer rolls 11 gradually ascend and the amount of accumulation of the belt-like material gradually decreases.

[0029] Next, as shown in Fig. 4, when the dancer rolls 11 return back to the highest position, i.e., the amount of accumulation of the belt-like material returns back to the minimum amount of accumulation, then the splicing operation is completed. That is, the pusher 7L returns back to its initial position, and the belt-like material is released. At this moment, further, the delivery belt 5R is contacted with the circumferential surface of the roll 4R and is driven to rotate. As a result, the delivery of the belt-like material from the right delivery unit 2R starts.

[0030] While the belt-like material is being delivered from the right delivery unit 2R, a new roll 4L is set to the hanger 3L in the left delivery unit 2L, and the leading end of the new roll 4L is arranged on the stationary member 8.

[0031] Next, when the remaining amount of the belt-like material of the roll 4R becomes small in the right delivery unit 2R, the splicing operation is conducted again and the belt-like material is fed from the roll 4L of the left delivery unit 2L.

[0032] Namely, referring to Fig. 5, during the steady operation designated at STD, the amount of accumulation Q of the belt-like material in the accumulating unit 9 is maintained at a minimum amount of accumulation Qm. Next, when the remaining amount of the belt-like material becomes smaller than the lower-limit amount as designated at X in Fig. 5, the amount of accumulation of the belt-like material is increased in a subsequent period ACM. Next, when the amount of accumulation Q of the belt-like material increases to a maximum amount of accumulation QM as designated at Y in Fig. 5, the amount of accumulation Q of the belt-like material is decreased in a subsequent period SPL and, at this time, the splicing operation is conducted. Next, when the amount of accumulation Q of the belt-like material decreases down to the minimum amount of accumulation Qm as designated at Z in Fig. 5, the steady operation STD is resumed.

[0033] This stabilizes the behavior of the belt-like material traveling through the accumulating unit 9 during the steady operation. Therefore, meandering of or formation of wrinkles in the belt-like material is suppressed during the steady operation.

[0034] Further, in case the apparatus for producing absorptive articles stops due to some reasons and thus the taking roll 12 also stops, despite the rotation of the delivery belts 5L and 5R are stopped, the rolls 4L and 4R may continue to rotate due to inertia to deliver the belt-like material excessively, slack may occur in the belt-like material. However, the excess belt-like material is accumulated in the accumulating unit 9, preventing the belt-like material from being slackened. Therefore, the operation of the apparatus for producing absorptive articles can be easily resumed.

[0035] Accordingly, generally speaking, prior to the splicing operation of the splicing unit, the amount of accumulation of the belt-like material is increased to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, the belt-like material is released from the accumulating unit to decrease the amount of accumulation of the belt-like material.

[0036] The amount of accumulation QSTD of the belt-like material during the steady operation may be arbitrarily set as long as it is not the maximum amount of accumulation QM. Further, the amount of accumulation QSPL at the start of the splicing operation may be arbitrarily set as long as it is not the minimum amount of accumulation Qm. From the standpoint of stability in the behavior of the belt-like material during the steady operation and the period for the splicing operation, however, it is desired that the amount of accumulation QSTD of the belt-like material during the steady operation is set to be the minimum amount of accumulation Qm and the amount of accumulation QSPL of the melt-like material at the start of the splicing operation is set to be the maximum amount of accumulation QM.

[0037] On the other hand, the ratio (QSPL/QSTD) of the amount of accumulation QSTD of the belt-like material during the steady operation and the amount of accumulation QSPL of the belt-like material at the start of the splicing operation can be set to be, for example, 20 to 200. The amount of accumulation of the belt-like material can be expressed by a conveyed distance of the belt-like material in the accumulating unit 9.

[0038] In order to suppress a quick change in the amount of accumulation Q of the belt-like material, as shown in Fig. 6, the delivery belts 5L and 5R can be so controlled that the delivering speed gradually increases or gradually decreases. This decreases the load exerted on the delivery belts 5L and 5R, and suppresses the belt-like material from slackening or stretching in the accumulating unit 9.

[0039] Fig. 7 illustrates a routine for a belt-like material feed control according to an embodiment of the present invention.

[0040] Referring to Fig. 7, in step 100, it is judged if a remaining amount QR of the roll 4L, 4R that is feeding the belt-like material is smaller than the lower-limit amount LL. If QL $\geq$ LL, the routine proceeds to step 101 to conduct the steady operation. If QL < LL, on the other hand, the routine proceeds to step 102 where the oper-

ation of accumulation of the belt-like material is conducted. In subsequent step 103, it is judged if the amount of accumulation Q of the belt-like material has reached the maximum amount of accumulation QM of the accumulating unit 9 and the passage of the tail end of the belt-like material being fed is detected. If Q < QM or if the passage of the tail end of the belt-like material has not yet been detected, step 103 is repeated. If Q = QM and if the passage of the tail end of the belt-like material is detected, the routine proceeds to step 104 where the delivering operation by the delivery belts 5L, 5R is stopped. In subsequent step 105, the splicing operation is conducted by the splicing unit 6. In next step 106, it is judged if the amount of accumulation Q of the belt-like material has decreased down to the minimum amount of accumulation Qm. If Q > Qm, step 106 is repeated. If Q = Qm, the routine proceeds to step 107 where the splicing operation is completed. In next step 108, the delivering operation by the delivery belts 5L, 5R starts.

[0041] In the above embodiment, it is judged if the amount of accumulation Q of the belt-like material is the maximum amount of accumulation Qm or the minimum amount of accumulation Qm based on the detected vertical position of the dancer rolls 11. Alternatively, it is also allowable to judge if the dancer rolls 11 are at the highest position or the lowest position by using a photoelectric tube sensor, proximity sensor or limit switch, and judge if the amount of accumulation Q of the belt-like material is the maximum amount of accumulation QM or the minimum amount of accumulation Qm based on the above judged result.

Reference Signs List

[0042]

1	belt-like material-feeding apparatus
2	delivery unit
6	splicing unit
9	accumulating unit
10	winding rolls
11	dancer rolls
15	controller
T	treating unit

Claims

1. A belt-like material-feeding apparatus for continuously feeding a belt-like material to a treating unit, comprising:

a splicing unit which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material;

an accumulating unit which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material; and

a control unit which, prior to the splicing operation of the splicing unit, increases the amount of accumulation of the belt-like material to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, releases the belt-like material from the accumulating unit to decrease the amount of accumulation of the belt-like material.

2. The belt-like material-feeding apparatus according to claim 1, wherein the amount of accumulation of the belt-like material during the steady operation is a minimum amount of accumulation of the accumulating unit.

3. The belt-like material-feeding apparatus according to claim 1 or 2, wherein the control unit increases the amount of accumulation of the belt-like material up to a maximum amount of accumulation of the accumulating unit.

4. The belt-like material-feeding apparatus according to any one of claims 1 to 3, wherein the accumulating unit comprises winding rolls and dancer rolls round which the belt-like material is wrapped, and the control unit increases the distance between the winding rolls and the dancer rolls to increase the amount of accumulation of the belt-like material and decreases the distance between the winding rolls and the dancer rolls to decrease the amount of accumulation of the belt-like material.

5. The belt-like material-feeding apparatus according to any one of claims 1 to 4, wherein when the amount of accumulation of the belt-like material has decreased down to the amount of accumulation of the belt-like material during the steady state, the second belt-like material is delivered to the accumulating unit.

6. A method of operating a belt-like material-feeding apparatus for continuously feeding a belt-like material to a treating unit, the apparatus comprising:

a splicing unit which splices a second belt-like material to a first belt-like material being fed to the treating unit to thereby switch the belt-like material being fed to the treating unit from the first belt-like material into the second belt-like material; and

an accumulating unit which is arranged between the splicing unit and the treating unit and is capable of temporarily accumulating the belt-like material,

wherein, prior to the splicing operation of the splicing unit, the amount of accumulation of the belt-like material is increased to be larger than the amount of accumulation of the belt-like material during the steady operation and, during the splicing operation, the belt-like material is released from the accumulating unit to decrease the amount of accumulation of the belt-like material.

Fig.1

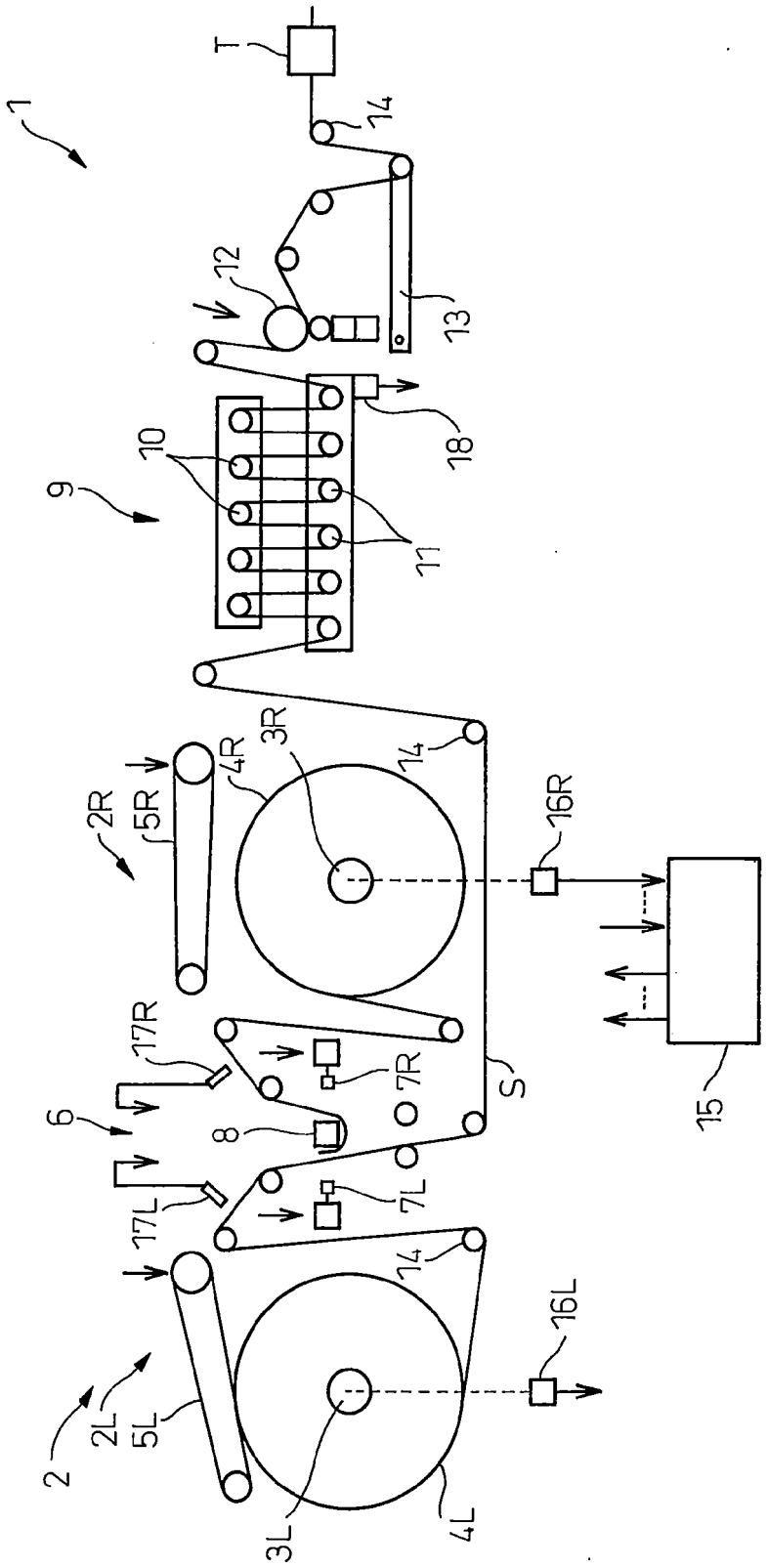

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Fig.2

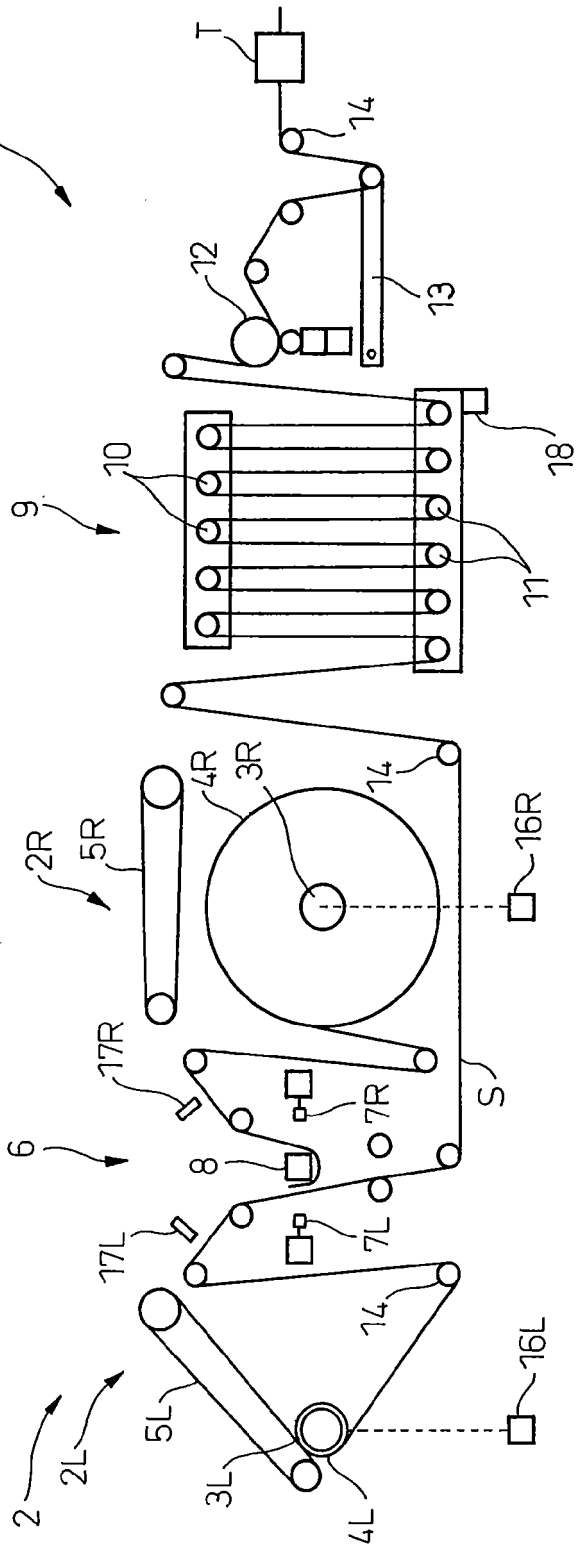
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Fig.3

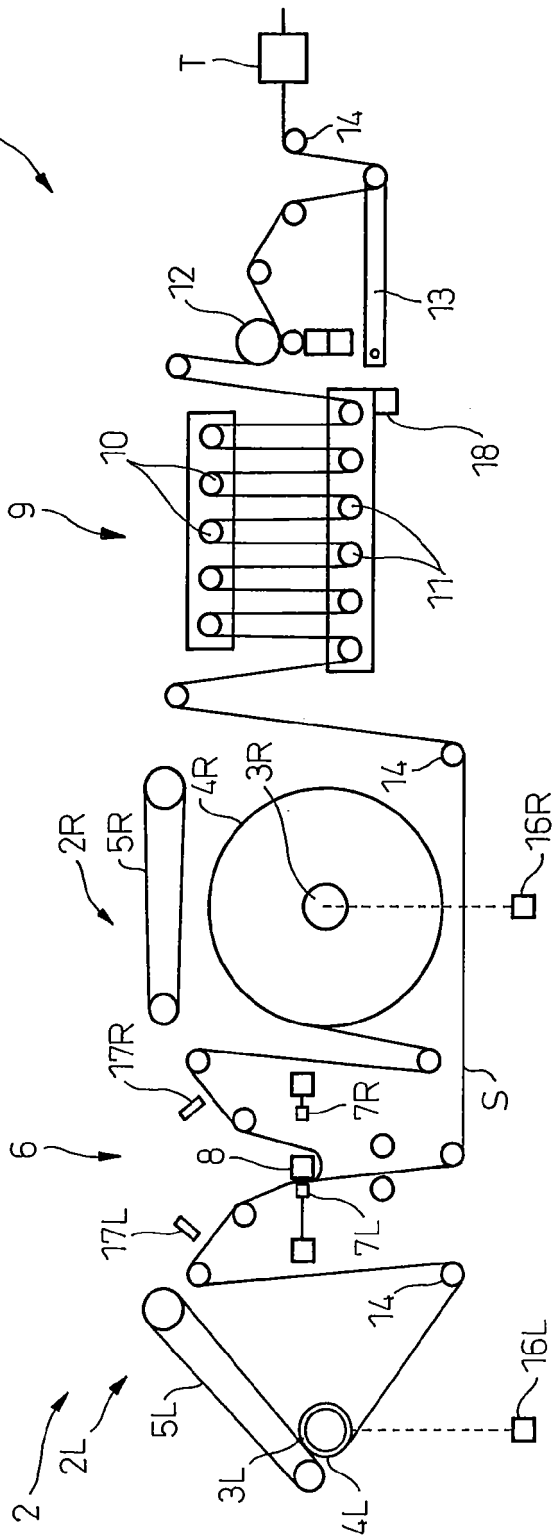
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Fig.4

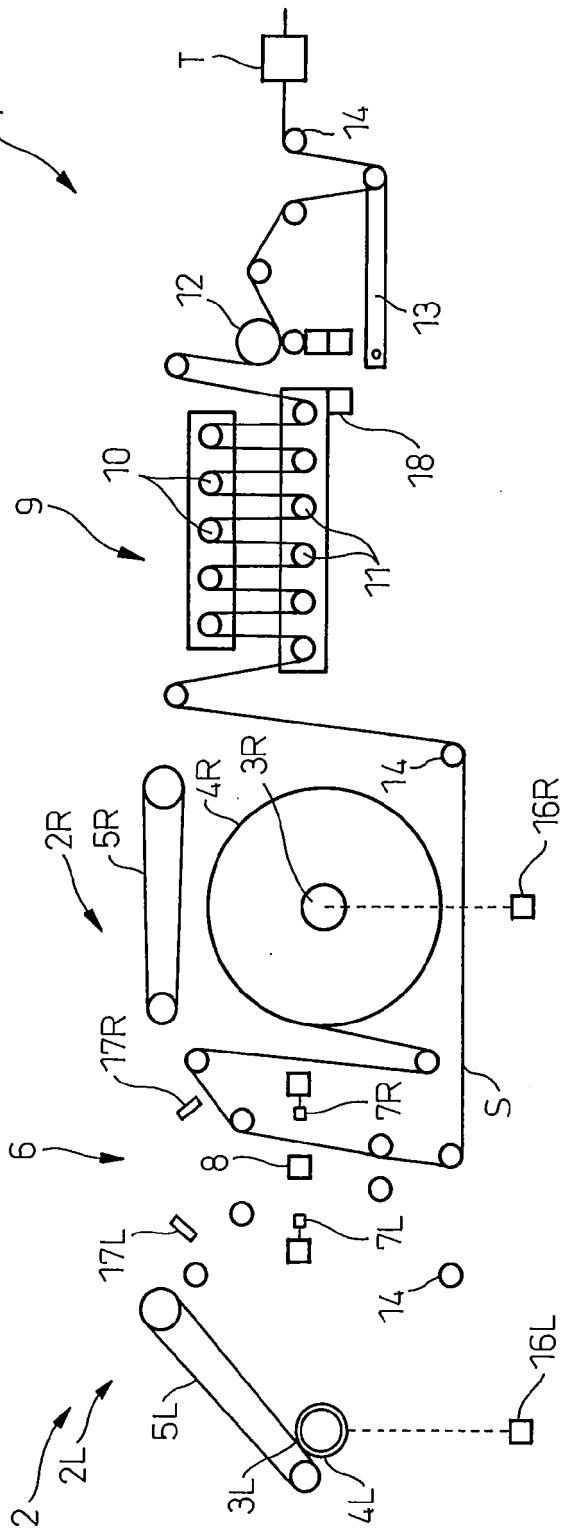
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Fig.5

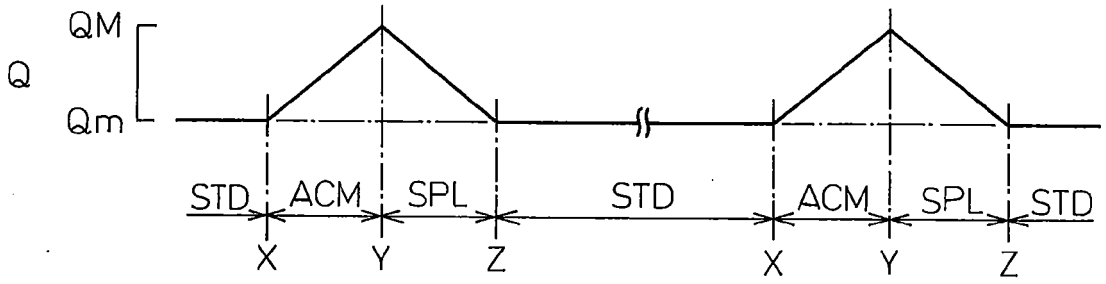
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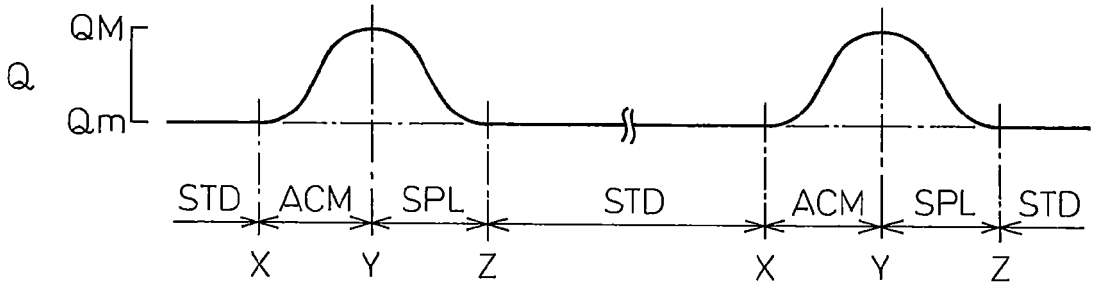
Fig.6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QM
Qm
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ACM
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STD
ACM
SPL
STD
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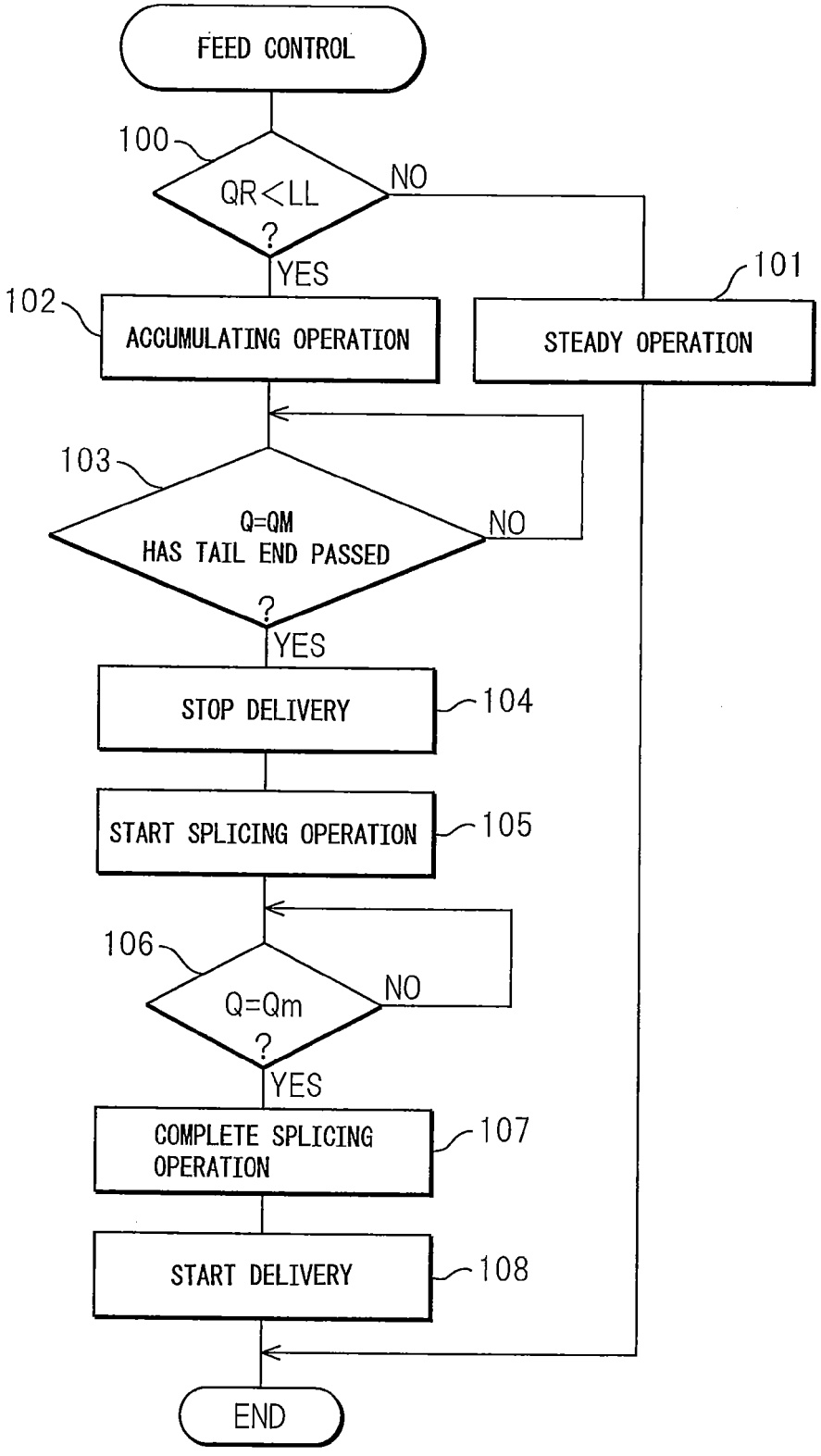
Y
Z
X
Y
Z

Fig.7


FEED CONTROL
100
QR<LL
?
NO
YES
101
102
ACCUMULATING OPERATION
STEADY OPERATION
103
Q=QM
HAS TAIL END PASSED
?
NO
YES
STOP DELIVERY
104
START SPLICING OPERATION
105
106
Q=Qm
?
NO
YES
COMPLETE SPLICING OPERATION
107
START DELIVERY
108
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/071758

A. CLASSIFICATION OF SUBJECT MATTER
B65H19/14(2006.01)i, *B65H23/185*(2006.01)i

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)
B65H19/14, B65H23/182-23/185

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010
Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 62-205954 A (Dainippon Printing Co., Ltd.), 10 September 1987 (10.09.1987), page 1, lower right column, lines 9 to 13; page 2, lower left column, lines 10 to 13; page 3, lower left column, line 16 to lower right column, line 4; page 3, lower right column, line 9 to upper left column, line 1; fig. 1 to 3 (Family: none)	1,4,6
X Y	JP 2004-067375 A (CKD Corp.), 04 March 2004 (04.03.2004), page 10, lines 26 to 28; page 12, lines 36 to 39; page 12, line 49 to page 13, line 12; page 13, lines 26 to 40; fig. 4 & JP 4121015 B2	1-3,6 5

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

* Special categories of cited documents:
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"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
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"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	Date of mailing of the international search report
15 December, 2010 (15.12.10)	28 December, 2010 (28.12.10)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/071758

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 58-059142 A (Idemitsu Petrochemical Co., Ltd.), 08 April 1983 (08.04.1983), page 3, lower left column, lines 10 to 13; drawings (Family: none)	5
A	JP 8-119499 A (Fujimori Kogyo Co., Ltd.), 14 May 1996 (14.05.1996), page 4, left column, lines 23 to 50; fig. 1, 3 (Family: none)	1-6

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 7137899 A **[0004]**