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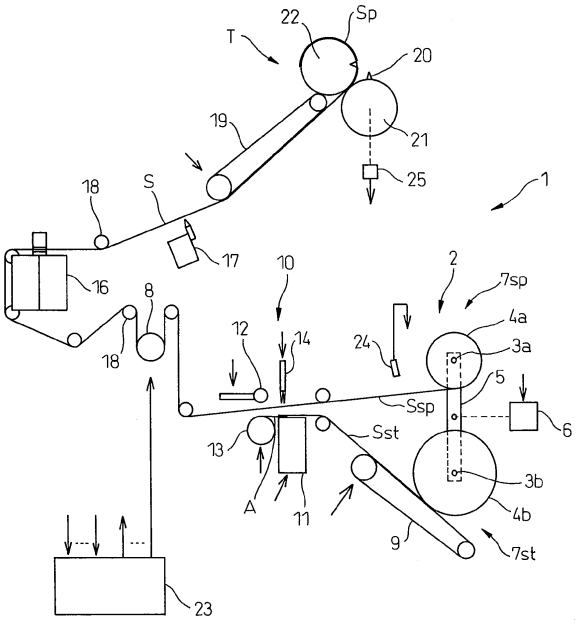
(54) **BELT-FORM BODY SUPPLY DEVICE AND METHOD OF OPERATION THEREOF**

(57) A belt-like material-feeding apparatus (1) for continuously feeding a belt-like material to an intermittently-treating unit (T) comprises a splicing unit (10) which splices a second belt-like material to a first belt-like material being fed to the intermittently-treating unit (T) to thereby switch the belt-like material being fed to the intermittently-treating unit from the first belt-like material into the second belt-like material, and a control unit for controlling the splicing timing of the splicing unit (10) based upon the treating timing of the intermittently-treating unit (T). When it is judged that a splicing region formed between the first belt-like material and the second belt-like material by the splicing operation of the splicing unit (10), is going to be treated by the intermittently-treating unit, the control unit controls the splicing unit (10) so as to retard the splicing operation.

Fig.1



EP 2 508 455 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 splicing unit which splices a second belt-like material to a first belt-like material being fed to thereby switch the belt-like material being fed from the first belt-like material into the second belt-like material (see PLT 1) has been known. The belt-like material is fed from the splicing unit to, for example, an intermittently-treating unit where it is intermittently treated.

[0003] The splicing operation in the splicing unit can be conducted using, for example, a pressure-sensitive adhesion member. In this case, a pressure-sensitive adhesion agent is contained in a splicing region that is formed between the first belt-like material and the second belt-like material. The treatment in the intermittently-treating unit, on the other hand, can be constituted by, for example, a treatment for cutting the belt-like material into a predetermined length or a treatment for compressing the belt-like material.

Citation List

Patent Literature

[0004] PLT 1: Japanese Unexamined Utility Model Publication No. 59-40248

Summary of Invention

Technical Problem

[0005] However, if the splicing region that has arrived at the intermittently-treating unit is cut or compressed, the pressure-sensitive adhesion agent contained in the splicing region may adhere to the cutting blade or to the compression roller. As a result, the belt-like materials or fiber scraps adhere to the cutting blade or to the compression roller, making it difficult to maintain good treatment, or the feed of the belt-like material must be interrupted to clean the cutting blade or the compression roller. In either case, the productivity of the products may decrease. This problem may also occur in the case where the splicing operation is conducted using an adhesive agent or heat-welding.

[0006] In this case, therefore, it is necessary to control the timing for forming the splicing region, i.e., the splicing timing of the splicing unit so that the belt-like material is treated by the intermittently-treating unit, except for the splicing region.

[0007] On the other hand, the treatment conducted by the intermittently-treating unit includes a treatment which should be conducted in the splicing region. In this case, the splicing timing must be controlled so that the splicing region is treated by the intermittently-treating unit.

[0008] That is, the splicing timing must be controlled based upon the treating timing of the intermittently-treating unit. The above publication is silent on this point.

Solution to Problem

[0009] According to one aspect of the invention, there is provided a belt-like material-feeding apparatus for continuously feeding a belt-like material to an intermittently-treating unit, comprising a splicing unit which splices a second belt-like material to a first belt-like material being fed to the intermittently-treating unit to thereby switch the belt-like material being fed to the intermittently-treating unit from the first belt-like material into the second belt-like material; and a control unit for controlling the splicing timing of the splicing unit based upon the treating timing of the intermittently-treating unit.

[0010] 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 an intermittently-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 intermittently-treating unit to thereby switch the belt-like material being fed to the intermittently-treating unit from the first belt-like material into the second belt-like material, wherein the splicing timing of the splicing unit is controlled based upon the treating timing of the intermittently-treating unit.

Advantageous Effects of Invention

[0011] The belt-like material can be suitably subjected to a treatment by the intermittently treating unit.

Brief Description of the Drawings

[0012]

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 an enlarged view of a splicing region;
Fig. 5 is a view illustrating the operation of the belt-like material-feeding apparatus;
Fig. 6 is a view illustrating the operation of the belt-like material-feeding apparatus;
Fig. 7 is a flowchart for executing a control for feeding a belt-like material; and
Fig. 8 is an enlarged view showing another embodiment of the splicing region.

Description of Embodiments

[0013] 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 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 made from wood pulp, release paper obtained by release-treating paper made from wood pulp, a nonwoven fabric of 10 to 35 g/m^2 made from a thermoplastic resin, 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.

[0014] Referring to Fig. 1, a belt-like material-feeding apparatus 1 for continuously feeding a belt-like material S to an intermittently-treating unit T comprises a delivery unit 2 for delivering the belt-like material S to the intermittently-treating unit T. The delivery unit 2 comprises belt-like material sources in the form of rolls 4a, 4b of the belt-like materials rotatably held by hangers 3a and 3b, a carrier 5 for carrying the rolls 4a, 4b and the hangers 3a, 3b, and an actuator 6 for rotating the carrier 5 by 180 degrees each time.

[0015] The hangers 3a, 3b and the rolls 4a, 4b are positioned at a feed position 7sp or at a standby position 7st. In an embodiment shown in Fig. 1, the hanger 3a and the roll 4a are positioned at the feed position 7sp while the hanger 3b and the roll 4b are positioned at the standby position 7st. When the carrier 5 is rotated by 180 degrees by the actuator 6, the hanger 3a and the roll 4a are brought to the standby position 7st, and the hanger 3b and the roll 4b are brought to the feed position 7sp.

[0016] The delivery unit 2, further, comprises an intermediate roll 8 for unwinding and delivering the belt-like material from the roll 4a, 4b at the feed position 7sp, and a delivery belt 9 for unwinding and delivering the belt-like material from the roll 4b, 4a at the standby position 7st. The delivery belt 9 is wrapped round a drive roll and an idle roll and is driven to rotate, and is contacted with the outer circumferential surface of the roll 4b, 4a at the standby position 7st.

[0017] The belt-like material sources may assume a form other than the rolls. The belt-like material from the roll 4a and the belt-like material from the roll 4b may be the same or different. Further, the belt-like materials may be unwound and delivered from the rolls 4a and 4b by rotating the hangers 3a and 3b. This makes it possible to omit the intermediate roll 8 and the delivery belt 9.

[0018] The belt-like material-feeding apparatus 1 further comprises a splicing unit 10 which splices a second belt-like material to a first belt-like material being fed from the delivery unit 2 to the intermittently-treating unit T to thereby switch the belt-like material S being fed to the intermittently-treating unit T from the first belt-like material into the second belt-like material. Namely, the belt-like material Sst from the roll 4b, 4a at the standby position 7st is spliced to the belt-like material Ssp from the roll 4a, 4b at the feed position 7sp, and the belt-like material Sst is fed to the intermittently-treating unit T.

[0019] The splicing operation of the splicing unit 10 is conducted by, for example, the adhesion and, concretely, a pressure-sensitive adhesion member. Namely, the splicing unit 10 comprises a holding unit 11 of a suction type which holds, in advance, the belt-like material Sst from the roll 4b, 4a at the standby position 7st together with the pressure-sensitive adhesion member A, a splicing roll 12 which pushes the belt-like material Ssp from the roll 4a, 4b at the feed position 7sp onto the pressure-sensitive adhesion member A, a delivery roll 13 arranged facing the splicing roll 12, and a cutting unit 14 which cuts the belt-like material Ssp from the roll 4a, 4b at the feed position 7sp.

[0020] The belt-like material S, next, arrives at the intermittently-treating unit T passing through the above intermediate roll 8, a meandering correction device 16 and an HMA (hot-melt adhesive)-applying unit 17, successively. In Fig. 1, reference numeral 18 denotes idle rolls, and 19 denotes a delivery roll for delivering the belt-like material S to the intermittently-treating unit T.

[0021] A controller 23 is comprised of a computer including, for example, a CPU (microprocessor), memory, input ports and output ports. A marker sensor 24, such as a camera, is provided neighboring the belt-like material Ssp between the roll 4a, 4b at the feed position 7sp and the splicing unit 10 to detect a marker provided in advance at a tail end part of the belt-like material of the roll 4a, 4b. Further, the intermittently-treating unit T is provided with a treating timing sensor 25 for detecting the treating timing of the intermittently-treating unit T. The treating timing sensor 25 can be comprised of an angular position sensor such as an absolute encoder that indicates the angular position of a cutting blade 20, or a position sensor that indicates the position of a belt-like material segment Sp or a product in the apparatus for producing absorptive articles. The sensors 24 and 25 are connected to the input ports of the controller 23, and the output signals from the sensors are input to the controller 23. The actuator 6, intermediate roll 8, delivery belt 9, suction unit 11, splicing roll 12, delivery roll 13, cutting unit 14 and delivery roll 19 are connected to the output ports of the controller 23, and are controlled based on the output signals from the controller 23.

[0022] In the embodiment shown in Fig. 1, the intermittently-treating unit T is comprised of a cutting unit which cuts the belt-like material into belt-like material segments Sp of a constant length. That is, the intermittently-treating unit T comprises a cutter roll 21 having a cutting blade 20, and an anvil roll 22 arranged facing the cutter roll 21. The belt-like material S is subjected to the cutting operation once whenever the cutter roll 21 and

the anvil roll 22 rotate by 360 degree. In other words, the cutting operation is conducted once whenever the belt-like material S is conveyed by the length of the belt-like material segment Sp. The rotations of the cutter roll 21 and the anvil roll 22 are in synchronism with the rate of production or the conveying speed of the apparatus for producing absorptive articles. Therefore, the belt-like material S is intermittently treated at a treating timing determined depending upon the rate of production or the conveying speed of the apparatus for producing absorptive articles. In the embodiment shown in Fig. 1, the belt-like material segment Sp is temporarily held on the anvil roll 22, and is sent to a next step. One absorptive article is produced from one belt-like material segment Sp.

[0023] In the intermittently-treating unit T, the belt-like material may be subjected to compression treatment. Therefore, the treatment in the intermittently-treating unit T includes at least one of cutting of the belt-like material and compression of the belt-like material. Alternatively, the belt-like material may be subjected to any further intermittent treatment, such as embossing, shaping including folding, application of an adhesive or assembling with another member.

[0024] Fig. 1 illustrates a condition where the belt-like material-feeding apparatus 1 is in a steady operation. In this condition, the belt-like material is delivered from the roll 4a at the feed position 7sp. The belt-like material then passes through the splicing unit 10, and is delivered to the intermittently-treating unit T at a nearly constant speed due to the intermediate roll 8 and the delivery belt 19. In this case, the delivery belt 9 is not driven to rotate and, therefore, no belt-like material is delivered from the roll 4b at the standby position 7st.

[0025] Next, as shown in Fig. 2, when a marker M is detected by the marker sensor 24, i.e., when the remaining amount of the belt-like material of the roll 4a becomes smaller than a predetermined lower-limit amount, it is judged if the timing is now suited for the splicing operation of the splicing unit 10.

[0026] When it is judged that the timing is not suited for the splicing operation, the splicing operation is retarded, i.e., the splicing operation is not conducted at this moment. Next, when the timing now becomes suited for the splicing operation, then the splicing operation is conducted.

[0027] The splicing operation is conducted as described below. Specifically, as shown in Fig. 3, the cutting unit 14 is actuated, and the belt-like material Ssp is thus cut. At the same time, the splicing roll 12 is actuated, and the belt-like material Ssp is thus pushed onto the pressure-sensitive adhesion member A. As a result, as shown in Fig. 4, a leading end part of the belt-like material Sst is spliced to a tail end part of the belt-like material Ssp, and a splicing region SPL including the pressure-sensitive adhesion member A is formed between the belt-like material Ssp and the belt-like material Sst. During the splicing operation, the delivery of the belt-like material Sst is continued due to the rotation of the splicing roll 12.

[0028] The leading end part of the belt-like material Sst has been arranged on the holding unit 13, in advance, by, for example, an operator. In this case, the pressure-sensitive adhesion member A has been partly attached to the leading end part of the belt-like material Sst and the remaining pressure-sensitive adhesion member A is held on the holding unit 13 with the adhesive surface facing upward. The belt-like material Ssp is pushed onto the adhesive surface.

[0029] The delivery belt 9 and the delivery roll 13 are actuated simultaneously with the start of the splicing operation and, as shown in Fig. 5, the belt-like material Sst is delivered to the intermittently-treating unit T from the roll 4b at the standby position. As a result, the belt-like material is continuously fed to the intermittently-treating unit T. In this case, the delivery belt 9 and the delivery roll 13 have been actuated and, thus the rotation of the roll 4b can be easily started. The belt-like material Ssp may be at least partly cut by the cutting unit 14 and may, thereafter, be completely cut by being delivered by the delivery belt 9 and the delivery roll 13.

[0030] Next, when the belt-like material Sst is delivered in a predetermined amount from the roll 4b, the carrier 5 is rotated clockwise as shown in Fig. 6, to move the roll 4b to the supply position 7sp. In addition, the rotation of the delivery belt 9 is stopped. As a result, the steady operation is resumed. On the other hand, the roll 4a is removed from the hanger 3a that has moved to the standby position 7st, and a new roll is mounted on the hanger 3a. Next, when the remaining amount of the belt-like material of the roll 4b becomes smaller than the lower-limit amount, the splicing operation is conducted again.

[0031] If the timing is suited for the splicing operation is judged as described below. That is, when the splicing operation is conducted, the splicing region SPL is formed as described with reference to Fig. 4, and the splicing region SPL then arrives at the intermittently-treating unit T. At this time, if the intermittently-treating unit T is at its treating timing, i.e., if the splicing region SPL is subjected to the cutting treatment, then the pressure-sensitive adhesion agent contained in the splicing region SPL may adhere to the cutting blade 20, as described in the beginning, which is undesirable.

[0032] Therefore, a timing at which the splicing region SPL that has arrived at the intermittently-treating unit T is not treated thereby is considered to be a timing suited for the splicing operation. In other words, if the splicing operation is conducted at a timing suited for the splicing operation, the thus formed splicing region SPL is not then treated at the intermittently-treating unit T. If the splicing operation is conducted at timings other than the timing suited for the splicing operation, the thus formed splicing region SPL is then treated at the intermittently-treating unit T.

[0033] In this case, if the timing is suited for the splicing operation can be judged based upon the treating timing of the intermittently-treating unit T and the time required for the splicing region SPL to arrive at the intermittently-

treating unit T from the splicing unit 10. The required time can be obtained from the length of the conveying passage from the splicing unit 10 to the intermittently-treating unit T and the conveying speed.

[0034] Accordingly, generally speaking, the splicing timing of the splicing unit 10 is controlled based on the treating timing of the intermittently-treating unit T. It is, further, judged if the splicing region SPL is going to be treated in the intermittently-treating unit T. If it is judged that the splicing region SPL is going to be treated in the intermittently-treating unit T, the splicing operation is retarded, and the splicing operation is executed if it is judged that the splicing region SPL is not going to be treated. In this case, if the splicing region SPL is going to be treated in the intermittently-treating unit T is judged when the remaining amount of the belt-like material from the roll 4a, 4b at the feed position 7sp has become smaller than the lower-limit amount.

[0035] Considering the fact that the cutting operation is conducted by the intermittently-treating unit T whenever the belt-like material S is conveyed by the length of the belt-like material segment Sp, there may a case where the splicing operation is retarded by a period required for the belt-like material S to be conveyed by the length of the belt-like material segment Sp. It is, therefore, desired that the conveying distance from the marker sensor 24 to the splicing unit 10 is set to be longer than the length of the belt-like material segment Sp.

[0036] Fig. 7 illustrates a routine for a belt-like material feed control according to an embodiment of the present invention.

[0037] Referring to Fig. 7, in step 100, it is judged if the marker M is detected by the marker sensor 24, i.e., when the remaining amount of the belt-like material of the roll 4a, 4b at the feed position became smaller than the lower-limit amount. If the marker M has not been detected, the processing cycle is ended. When the marker M is detected, on the other hand, the routine proceeds to step 101 where it is judged if the timing is now suited for the splicing operation. Step 101 is repeated until the timing becomes suited for the splicing operation. When the timing is now suited for the splicing operation, the routine proceeds to step 102 where the splicing operation is conducted. In subsequent step 103, the delivery belt 9 and the delivery roll 13 are actuated, and the belt-like material Sst is delivered from the roll 4b, 4a at the standby position 7st. In subsequent step 104, it is judged if the belt-like material Sst is delivered by the predetermined amount. Step 104 is repeated until the belt-like material Sst is delivered by the predetermined amount. When the belt-like material Sst is delivered by the predetermined amount, the routine proceeds to step 105 where the carrier 5 is rotated by 180 degrees.

[0038] The hangers 3a and 3b may be provided with revolution sensors to calculate the remaining amount of the belt-like material of the roll 4a, 4b based on the number of revolutions of the rolls 4a, 4b detected by the revolution sensors. Alternatively, if the remaining amount of the belt-like material of the roll 4a, 4b is smaller than the lower-limit amount, may be judged based upon the outer diameter of the roll 4a, 4b detected using a photoelectric tube sensor, proximity sensor, limit switch or camera. On the other hand, the lower-limit amount may be a constant value or may be set based on the rate of production of the apparatus for producing absorptive articles. This makes it possible to lower the effect of variation in the thickness of the belt-like material of the roll 4a, 4b.

[0039] Further, an accumulation unit may be arranged between the splicing unit 10 and the intermittently-treating unit T to temporarily accumulate the belt-like material.

[0040] As shown in Fig. 8, the splicing operation may be conducted using an adhesive agent A. In this case, the splicing region SPL containing the adhesive agent A is formed. Alternatively, when the belt-like material is comprised of a thermoplastic resin, the splicing operation may be conducted using the heat-welding. In this case, the splicing region SPL that is formed becomes harder than the other regions of the belt-like material. Therefore, if the cutting operation is conducted to the splicing region SPL, then the belt-like material may not be reliably cut or the cutting blade 20 may be damaged. The present invention, however, is free from this problem.

[0041] In the embodiment shown in Fig. 8, the tail end part of the belt-like material Ssp from the roll 4a, 4b at the feed position 7sp includes an excess portion Ex extending rearward beyond the adhesive agent A. In this embodiment, the excess portion Ex is included in the splicing region SPL. This is because if the excess portion Ex is subjected to the cutting operation, pieces of the belt-like material that are formed may scatter to contaminate the steps. In other words, according to the embodiment of the invention, the excess portion Ex is also prevented from being subjected to the cutting treatment.

[0042] According to the embodiments of the present invention described above, the splicing timing of the splicing unit 10 is controlled so that the splicing region SPL is not subjected to the treatment of the intermittently-treating unit T. Depending upon the kind of treatment of the intermittently-treating unit, however, the splicing timing of the splicing unit 10 may be controlled so that the splicing region SPL is subjected to the treatment of the intermittently-treating unit T.

Reference Signs List

[0043]

1	belt-like material-feeding apparatus
10	splicing unit
23	controller
T	intermittently-treating unit

Claims

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

   a splicing unit which splices a second belt-like material to a first belt-like material being fed to the intermittently-treating unit to thereby switch the belt-like material being fed to the intermittently-treating unit from the first belt-like material into the second belt-like material; and
   a control unit for controlling the splicing timing of the splicing unit based upon the treating timing of the intermittently-treating unit.

2. The belt-like material-feeding apparatus according to claim 1, further comprising a judging unit for judging if a splicing region formed between the first belt-like material and the second belt-like material by the splicing operation of the splicing unit, is going to be treated by the intermittently-treating unit, wherein when it is judged that the splicing region is going to be treated by the intermittently-treating unit, the control unit controls the splicing unit so as to retard the splicing operation.

3. The belt-like material-feeding apparatus according to claim 2, wherein when it is judged that the splicing region is not going to be treated by the intermittently-treating unit, the control unit controls the splicing unit so as to conduct the splicing operation.

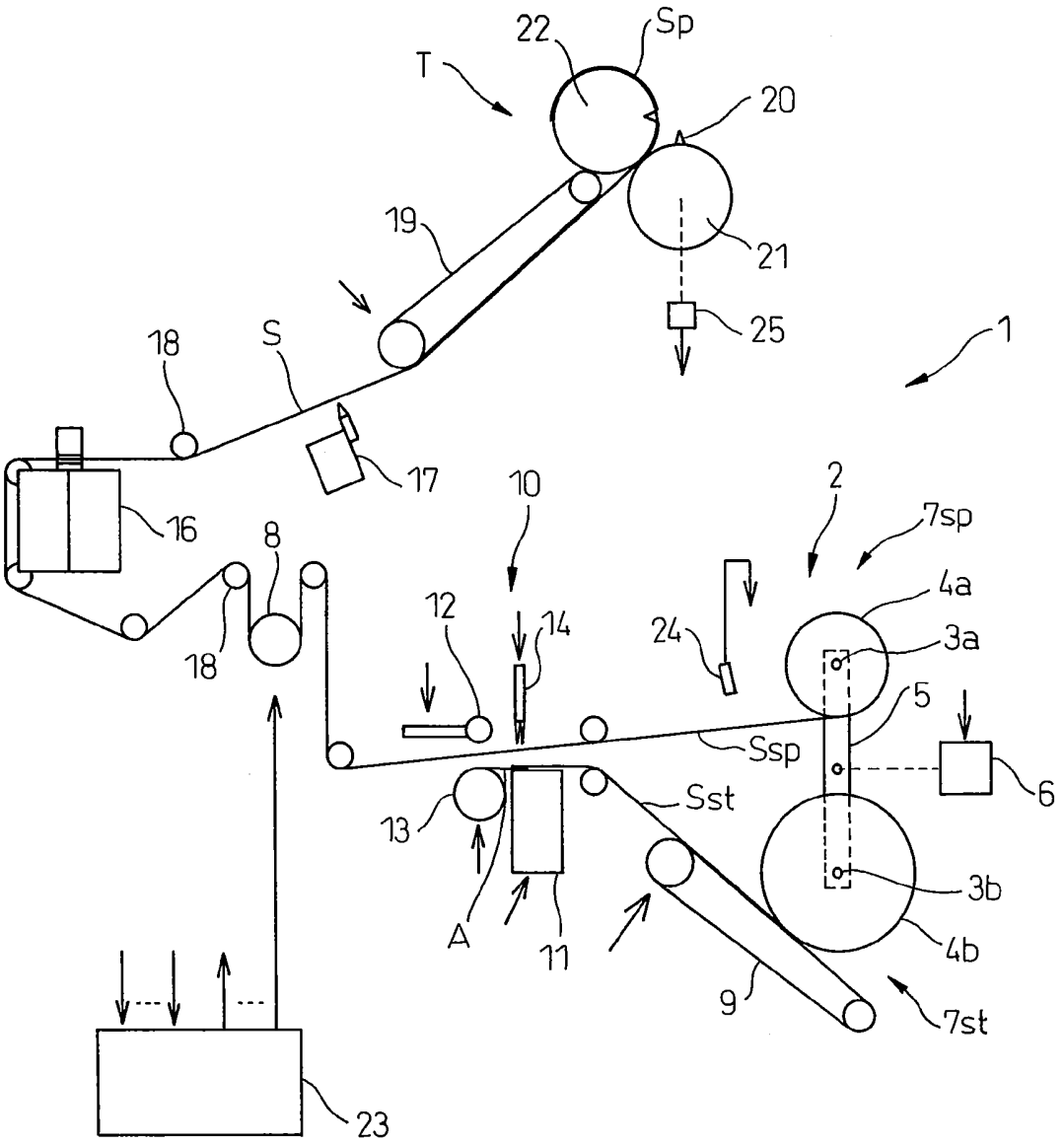
4. The belt-like material-feeding apparatus according to claim 2 or 3, wherein when the remaining amount of the first belt-like material is smaller than a lower-limit amount, the judging unit judges if the splicing region is going to be treated by the intermittently-treating unit.

5. The belt-like material-feeding apparatus according to any one of claims 1 to 4, wherein the treatment of the intermittently-treating unit includes at least one of cutting of the belt-like material and compression of the belt-like material.

6. The belt-like material-feeding apparatus according to any one of claims 1 to 5, wherein the splicing operation of the splicing unit is conducted by adhesion.

7. A method of operating a belt-like material-feeding apparatus for continuously feeding a belt-like material to an intermittently-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 intermittently-treating unit to thereby switch the belt-like material being fed to the intermittently-treating unit from the first belt-like material into the second belt-like material,
   wherein the splicing timing of the splicing unit is controlled based upon the treating timing of the intermittently-treating unit.

Fig.1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Sp
T
20
19
21
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1
18
S
17
16
10
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7sp
8
4a
12
14
24
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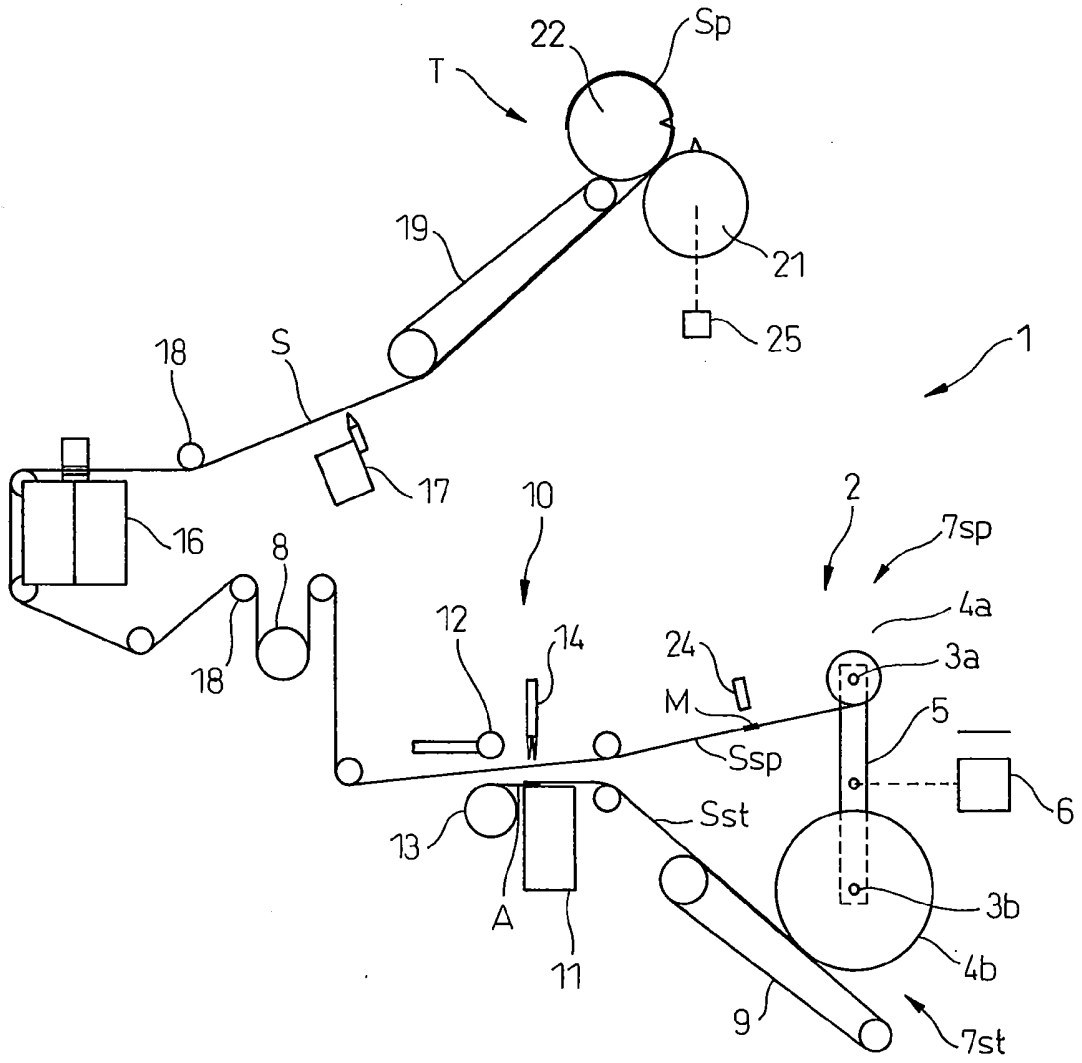
18
5
Ssp
6
Sst
13
3b
A
11
4b
9
7st
23

Fig.2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16
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A
3b
4b
11
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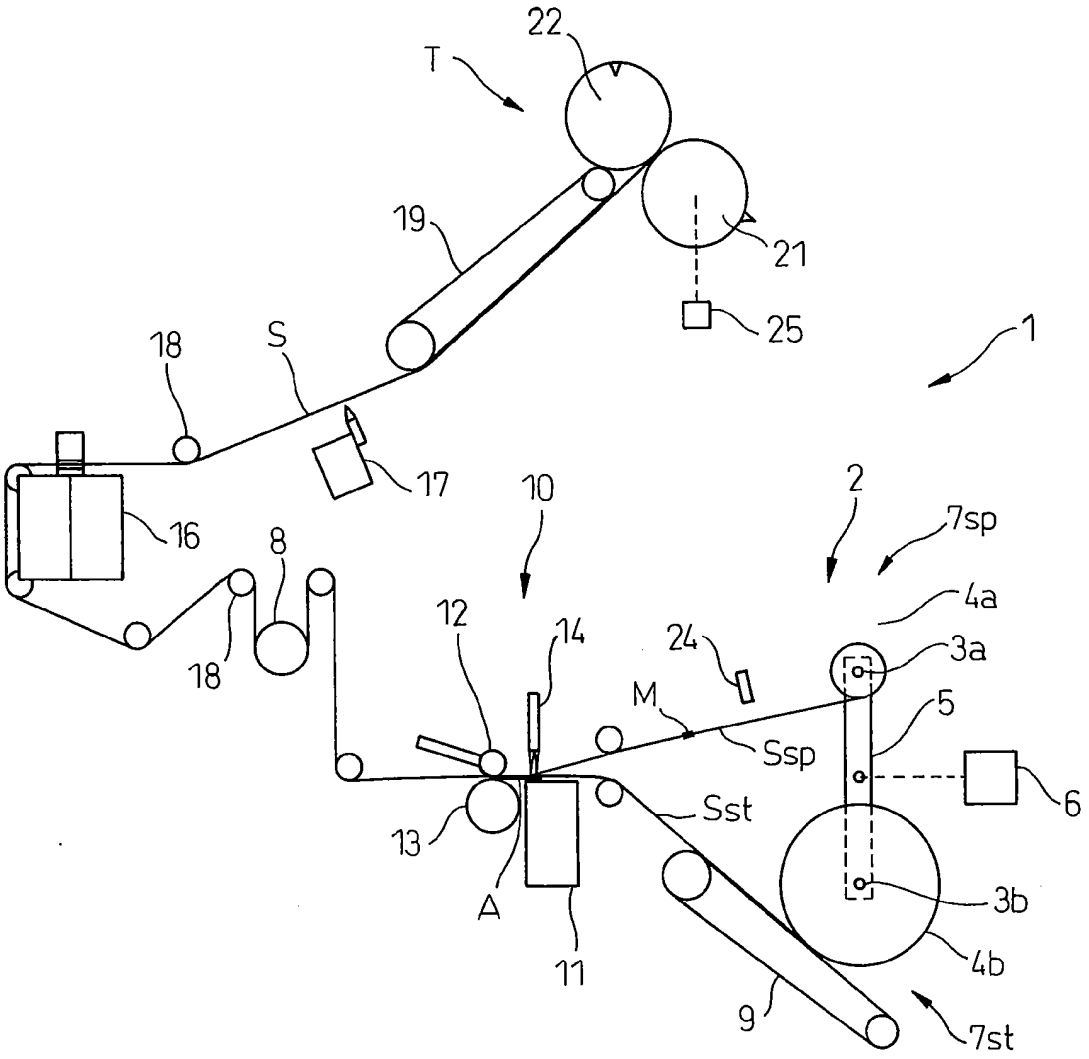
Fig.3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S
17
10
2
7sp
16
8
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13
A
3b
11
4b
9
7st

Fig.4

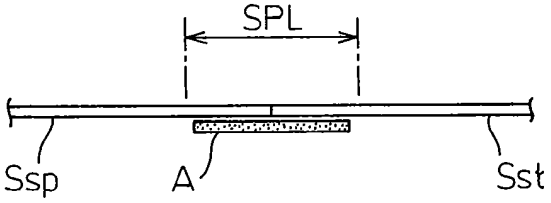
SPL
Ssp
A
Sst

Fig.5

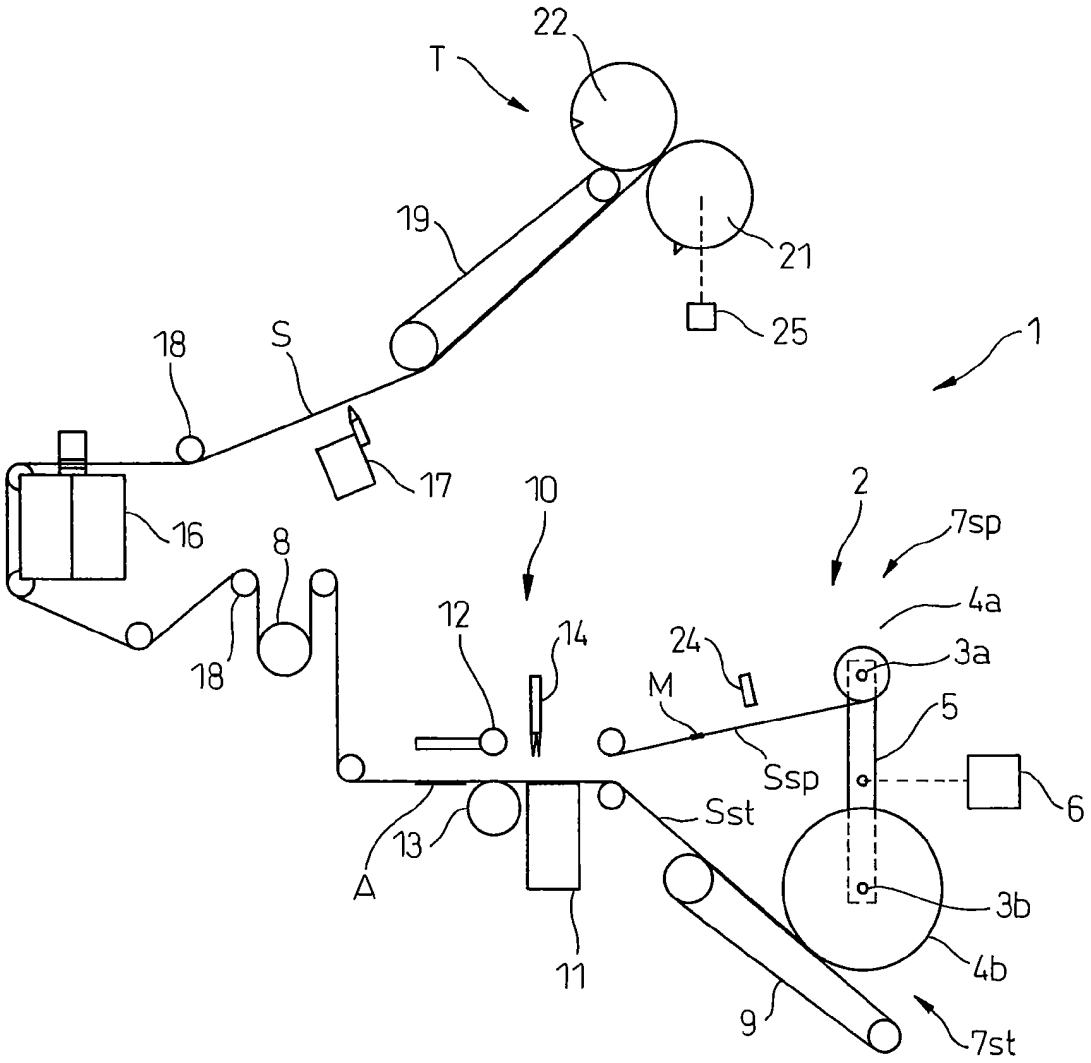
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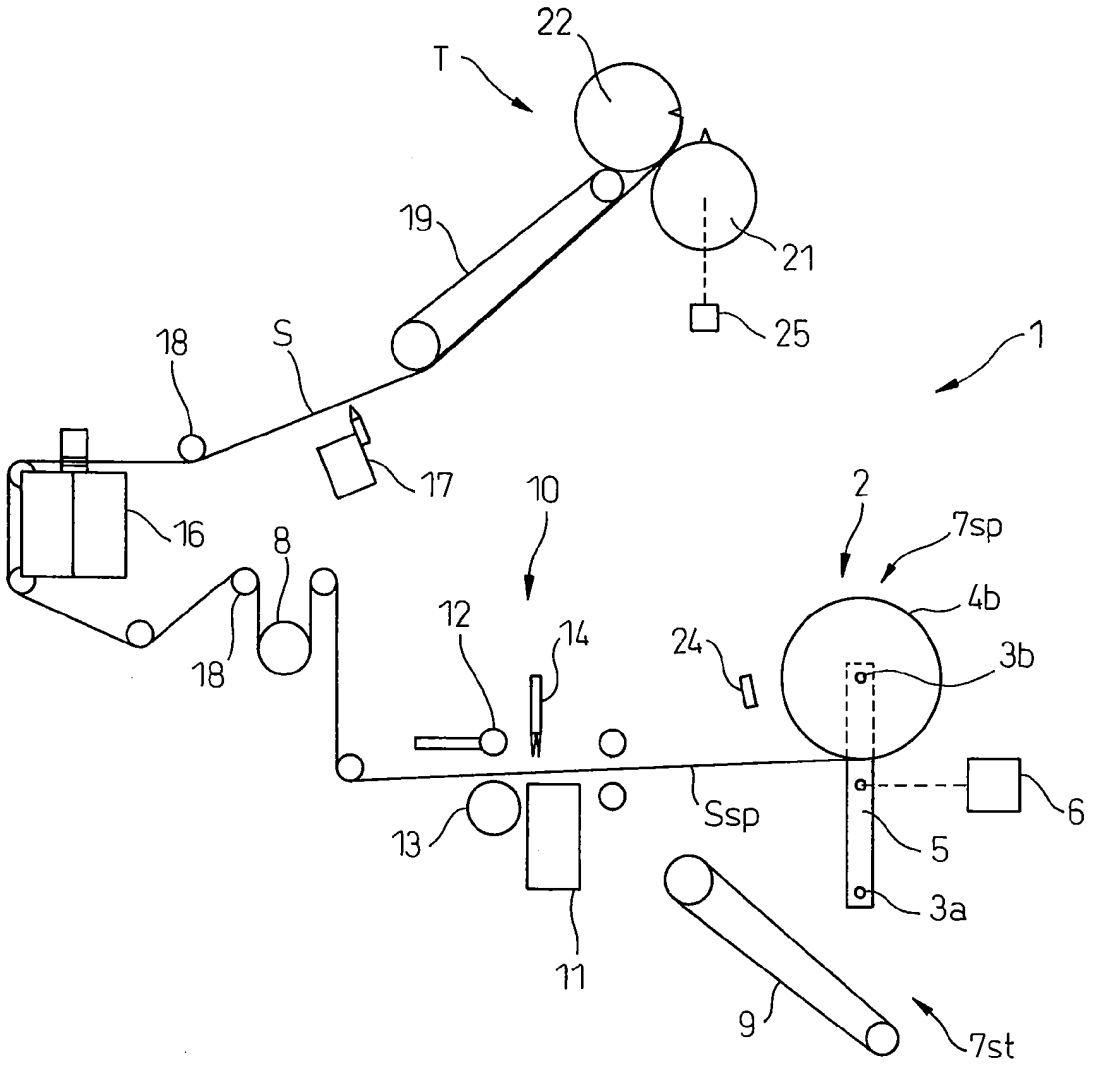
Fig.6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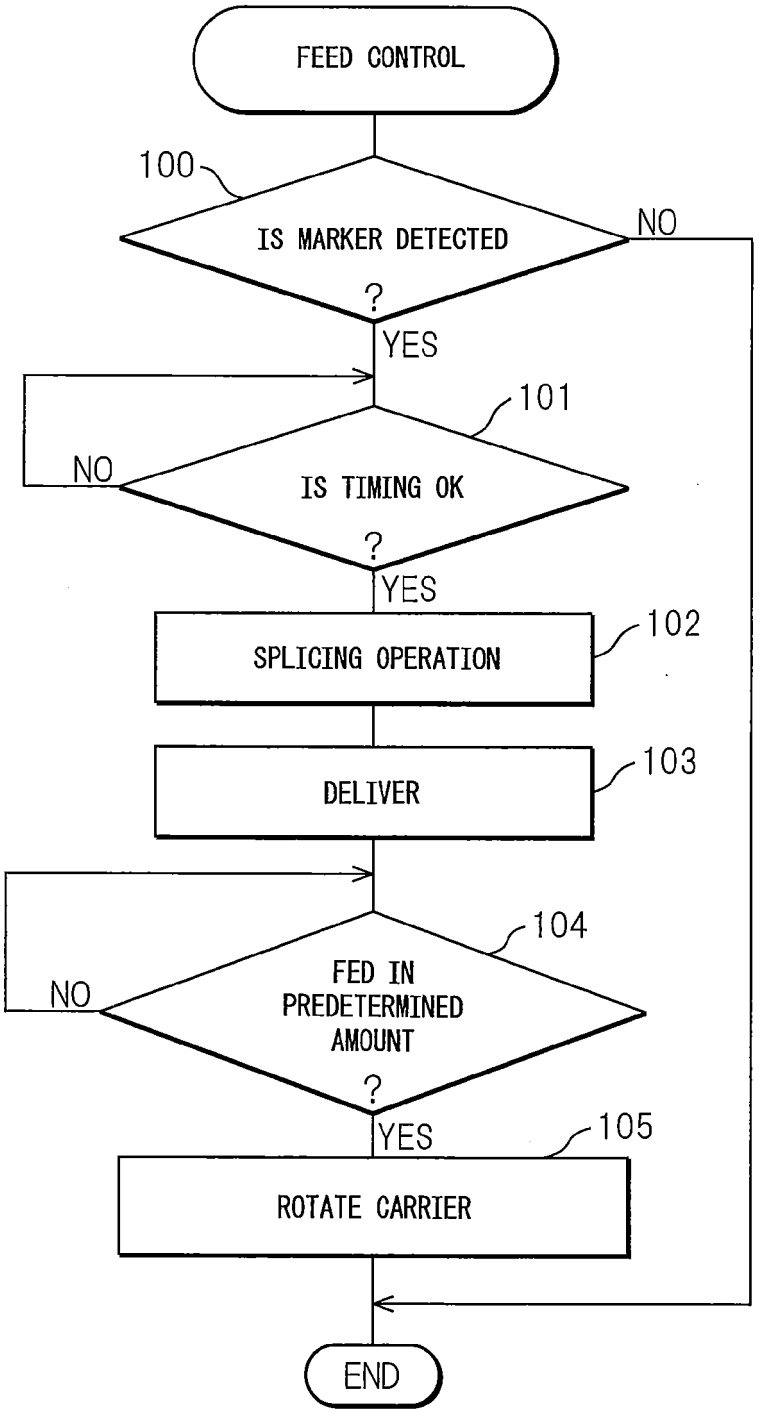
7st

Fig.7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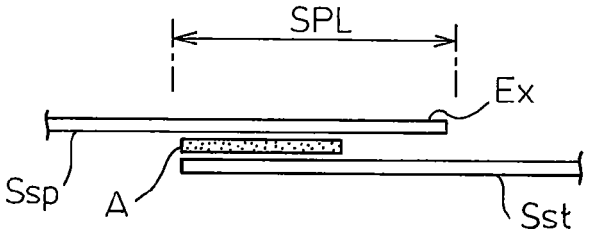
IS MARKER DETECTED
?
NO
YES
101
NO
IS TIMING OK
?
YES
102
SPLICING OPERATION
103
DELIVER
104
NO
FED IN PREDETERMINED AMOUNT
?
YES
105
ROTATE CARRIER
END

Fig. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2010/071757

A. CLASSIFICATION OF SUBJECT MATTER
B65H19/18(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)
B65H19/18

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 2001-048383 A (Mitsubishi Heavy Industries, Ltd.), 20 February 2001 (20.02.2001), page 2, right column, lines 27 to 38; page 4, left column, lines 10 to 22; page 4, left column, line 47 to right column, line 3; page 4, right column, line 42 to left column, line 5; fig. 1 to 4 & JP 3133037 B1	1-7
X A	JP 6-144662 A (Komori Corp.), 24 May 1994 (24.05.1994), page 3, right column, line 39 to page 4, right column, line 11; fig. 1 to 2 & JP 3110897 B2	1,5-7 2-4

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

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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.

Form PCT/ISA/210 (second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 59040248 A **[0004]**