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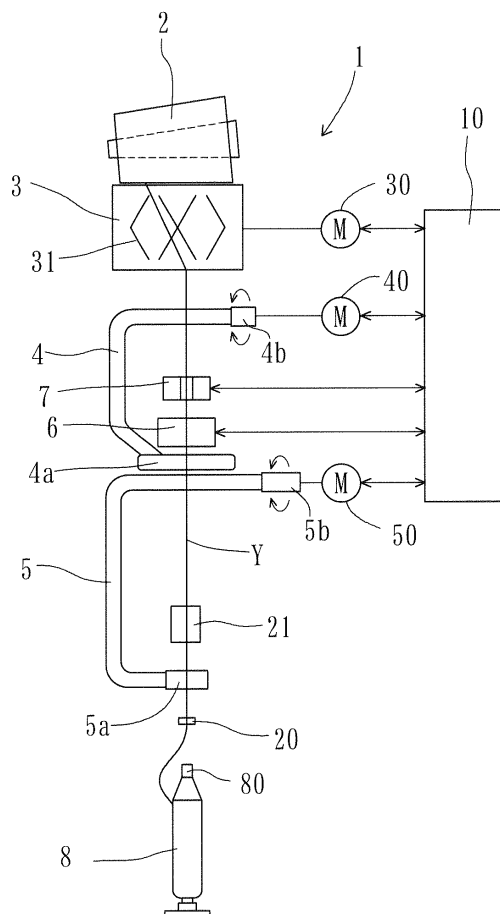
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(54) **Automatic winder and method for pulling out a yarn end from a winding package**

(57) The present invention aims to reliably prevent multiple portions of a yarn from being pulled out from a winding package, so as not to wind a defective yarn around the winding package. In an automatic winder, a yarn having been cut when rewound from a yarn supply bobbin 8 onto a winding package 2 is suctioned and caught to be guided into yarn splicing means for yarn splicing. With an intake port 4a for suctioning and catching a yarn Y' on the winding package 2 side being positioned close to the winding package 2, the winding package 2 is rotated in a winding direction 2a, and thereafter in a direction 2b opposite to the winding direction, so that the intake port 4a is moved away from the winding package 2 to guide the yarn Y' on the winding package side into the yarn splicing means.

FIG. 1



Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to an automatic winder in which a cut yarn is suctioned and caught to be guided into yarn splicing means, and particularly to a method for pulling out a yarn end from a winding package.

Description of the Background Art

[0002] Automatic winders unwind a number of spun yarns from yarn supply bobbins produced by a ring spinner or the like, and splice the unwound yarns before rewinding a predetermined amount of yarn around packages. In addition, the automatic winders include yarn splicing means for suctioning and catching yarns having been cut when being rewound from the yarn supply bobbins onto the winding packages, and guiding the yarns for splicing.

When suctioning and catching a yarn on the winding package side for guidance, the winding package is typically rotated in a direction opposite to a winding direction to draw (pull) out an end of the yarn from the winding package.

[0003] Incidentally, when the yarn on the winding package side is suctioned and caught, there is a possibility that a slack portion of the yarn, rather than the yarn end, might be suctioned and caught, so that plural portions of the yarn are drawn out from the winding package. This state is referred to as the "multi-pullout" (in particular, the state where two yarn portions are drawn out is referred to as the "double-pullout"). If yarn splicing is performed when the multi-pullout state has occurred, the plural portions of yarns are spliced, so that a defective yarn (a waste yarn) is wound around the winding package.

[0004] In order to prevent such a defect, for example, Japanese Laid-Open Patent Publication No. 7-82622 has proposed a pullout method for winding package. In this method, when a yarn from a winding package is suctioned and caught, the winding package is temporarily rotated in a direction opposite to a winding direction, as in the aforementioned usual conventional method (see, for example, claim 1 of Japanese Laid-Open Patent Publication No. 7-82622). As a result, in some cases, multi-pullout occurs because of a slack portion of the yarn being suctioned and caught, making it difficult to prevent a defective yarn from occurring.

SUMMARY OF THE INVENTION

[0005] Therefore, a problem sought to be solved by the present invention is to provide an automatic winder and a method for pulling out a yarn end from a winding package used therein that are capable of reliably preventing plural portions of yarn from being pulled out from

the winding package, so as not to wind a defective yarn around the winding package.

[0006] As a means for solving the above problem, the present invention provides a method for pulling out a yarn end from a winding package in an automatic winder in which a yarn having been cut when being rewound from a yarn supply bobbin onto the winding package is suctioned and caught to be guided into yarn splicing means for yarn splicing. The method includes a first step for rotating the winding package in a winding direction, with an intake port for suctioning and catching a yarn on the winding package side being positioned close to the winding package. The method further includes a second step for rotating the winding package in a direction opposite to the winding direction with the intake port being positioned close to the winding package after performing the first step, and then moving the intake port away from the winding package, to guide the yarn on the winding package side into the yarn splicing means.

[0007] Also, the present invention provides an automatic winder comprising means for performing control such that a yarn having been cut when being rewound from a yarn supply bobbin onto a winding package is suctioned and caught to be guided into yarn splicing means for yarn splicing. The control means includes a first function for rotating the winding package in a winding direction, with an intake port for suctioning and catching a yarn on the winding package side being positioned close to the winding package. The control means further includes a second function for rotating the winding package in a direction opposite to the winding direction with the intake port being positioned close to the winding package after performing the first step, and then moving the intake port away from the winding package, to guide the yarn on the winding package side into the yarn splicing means.

[0008] Preferably, the automatic winder includes means for detecting a yarn break, and the first and second steps (functions) are performed when the detecting means detects the yarn break.

[0009] More preferably, the first and second steps (functions) are performed when the detecting means detects the yarn break within a predetermined period of time immediately after a rewinding operation is started.

[0010] In the automatic winder according to the present invention and the method for pulling out a yarn end from a winding package in the automatic winder, as described above, the winding package is rotated in the winding direction, with the intake port being positioned close to the winding package. When multi-pullout has occurred, the winding package is rotated in the winding direction with a slack portion of the yarn being suctioned and caught, so that the yarn is rewound around the winding package. As a result, the slack portion of the yarn can be eliminated from the winding package. Thereafter, the winding package is rotated in the direction opposite to the winding direction, so that while being suctioned and caught reliably, the yarn on the winding package side can be drawn

out and guided into the yarn splicing means in such a manner as not to pull out multiple portions of the yarn.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a front view illustrating an automatic winder according to the present invention.

FIG. 2 is a side view of the automatic winder shown in FIG. 1.

FIG. 3 is a diagram for explaining a pullout method according to the present invention.

FIG. 4 is a diagram continued from FIG. 3 for explaining the pullout method according to the present invention.

FIG. 5 is a timing chart illustrating the relationship between the rotational operation of a winding package and the position of a suction mouth intake port.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Hereinafter, an automatic winder according to the present invention and a method for pulling out a yarn end from a winding package used therein will be described in detail with reference to the drawings.

[0013] FIG. 1 is a front view illustrating the automatic winder according to the present invention. FIG. 2 is a side view of the automatic winder shown in FIG. 1.

FIGS. 3 and 4 are diagrams for explaining the pullout method according to the present invention. FIG. 5 is a timing chart illustrating the relationship between the rotational operation of a winding package and the position of an intake port of a suction mouth.

[0014] The automatic winder includes a number of winding units 1 arranged in a line, and control devices 10 for controlling the winding units 1. The winding units 1 each include a yarn supply bobbin 8 produced by a ring spinner or the like, and a winding package 2 formed by rewinding a spun yarn Y from the yarn supply bobbin 8. The winding package 2 is in contact with a traverse drum 3 under pressure. The traverse drum 3 is connected to a motor 30 by which the traverse drum 3 is rotationally driven. Accordingly, the winding package 2 is rotated following the rotational drive of the traverse drum 3.

[0015] The rotational direction of the traverse drum 3 is controlled by the control device 10 connected to the motor 30. The traverse drum 3 has formed therein a groove 31 for guiding and traversing the yarn Y from the yarn supply bobbin 8. The winding unit 1 rotationally drives the traverse drum 3 to traverse and unwind the yarn Y from the yarn supply bobbin 8, so that the unwound yarn Y is rewound around the winding package 2. At this time, the yarn Y passes through a yarn guide 20, which stabilizes an unwound balloon, and a tension device 21, which controls winding tension.

[0016] The winding unit 1 further includes a yarn splicing device 6 such as splicer between the yarn supply

bobbin 8 and the winding package 2. The winding unit 1 further includes a suction mouth 4 for guiding an upper yarn Y' on the winding package 2 side into the yarn splicing device 6, and a suction pipe 5 for guiding a lower yarn Y'' on the yarn supply bobbin 8 side into the yarn splicing device 6. The suction mouth 4 and the suction pipe 5 are arm-like intake tubes. The winding unit 1 further includes a clearer (detection device) 7.

The clearer 7 detects, when the yarn Y is traveling, that the yarn Y is traveling (whether a yarn break has occurred) and also detects the thickness of the yarn Y. The clearer 7 detects a slub (yarn unevenness) based on the detected thickness of the yarn Y, cuts and eliminates the slub by a cutter (not shown) provided therein.

[0017] The suction mouth 4 and the suction pipe 5 each have an intake port 4a, 5a at one end. The winding unit 1 further includes an intake pipe 22 extending in the direction along which the units 1 are arranged (FIG. 2). The suction mouth 4 and the suction pipe 5 are connected to the intake pipe 22 by which intake airflow is provided at the intake ports 4a and 5a. The suction mouth 4 and the suction pipe 5 each have a rotational shaft 4b, 5b at the other end. The suction mouth 4 and the suction pipe 5 are connected to motors 40 and 50, respectively, by which the suction mouth 4 and the suction pipe 5 are rotationally driven about their respective rotational shafts 4b and 5b. The rotational drives and directions of the suction mouth 4 and the suction pipe 5 are controlled by the control device 10 connected to the motors 40 and 50.

[0018] The clearer 7 provides a detection signal to the control device 10 upon detection of a yarn break or slub in the traveling yarn Y. When a slub has been detected, the clearer 7 cuts the traveling yarn Y by the cutter, whereas when a yarn break has been detected, the cutter of the clearer 7 is not activated. As a result, the yarn Y is cut into an upper yarn Y' on the winding package side and a lower yarn Y'' on the yarn supply bobbin side. Thereafter, the control device 10 controls a rotational operation of the winding package 2 for yarn splicing, in a usual conventional method as described below. Reference should be made to FIG. 5 for the rotational operation of the winding package and the position of the suction mouth intake port in the usual conventional method.

[0019] The control device 10 stops the rotation of the motor 30. As a result, the traverse drum 3 and the winding package 2 stop rotating. By inertial rotation of the winding package 2, the upper yarn Y' is wound around the winding package 2. The drive of the motor 40 causes the suction mouth 4 to pivot upwardly about the rotational shaft 4b. The intake port 4a of the suction mouth 4 moves from its original position (bottom position) to the vicinity of the winding package 2 (top position) as shown in FIG. 2. At this time, the suction pipe 5 does not move, and therefore the intake port 5a remains at its bottom position. Each of the intake ports 4a and 5b generates intake airflow by virtue of the intake pipe 22.

[0020] With the intake port 4a of the suction mouth 4 being located in the vicinity of the winding package 2 (top

position), the winding package 2 is rotated by the rotational drive of the motor 30 in a direction opposite to rotation in a winding direction (hereinafter, the rotation in the winding direction is referred to as the "positive rotation", and the rotation in the opposite direction is referred to as the "negative rotation"). As a result, the upper yarn Y' is unwound from the winding package 2, so that the intake port 4a suctions and catches the upper yarn Y'. With the suction port 4a catching the upper yarn Y', the winding package 2 continues the negative rotation, and the suction mouth 4 is caused to pivot downwardly to return to its original position. As a result, the intake port 4a moves from the top position to the bottom position, guiding the upper yarn Y' downwards. Thereafter, the motor 30 stops operating, so that the rotation of the winding package 2 is stopped, and the unwinding of the upper yarn Y' is stopped.

[0021] At the same time, the intake port 5a of the suction pipe 5 located at its bottom position suctions and catches the lower yarn Y". With the intake port 5a catching the lower yarn Y", the suction pipe 5 is caused to pivot upwardly about the rotational shaft 5b. As a result, the suction port 5a moves from the bottom position to the top position, guiding the lower yarn Y" upwards.

[0022] The suction mouth 4 and the suction pipe 5 are operated in the above described manner to respectively guide the upper yarn Y' and the lower yarn Y" into the yarn splicing device 6. The yarn splicing device 6 then splices the upper yarn Y' and the lower yarn Y" together to form a single yarn Y. At this time, any slub in the yarn Y is cut, and the cut slub is suctioned and removed by the suction mouth 4 or the suction pipe 5. After the yarn splicing is completed, the motor 50 drives the suction pipe 5 to pivot downwardly to return to its original position, while the winding package 2 is caused to perform the positive rotation to restart an operation of rewinding the yarn Y from the yarn supply bobbin 8 onto the winding package 2.

[0023] In some cases, a yarn break might occur again within a predetermined period of time (e.g., 1.5 to 2.0 seconds) immediately after the restart of the rewinding operation. The yarn break can easily occur on such occasions as when the traveling yarn Y is trapped by a damaged portion of a core 80 of the yarn supply bobbin 8, or when a significant variation occurs in the tension of the yarn Y due to sloughing (i.e., slipping-off). In a period immediately after the restart of the rewinding operation, the winding package 2 is rotated at a relatively low speed because that period follows immediately after the start-up operation. When the clearer 7 detects a yarn break, the rotation of the winding package 2 is stopped by the control means 10 as described above. If the yarn Y breaks while the winding package 2 is being rotated at low speed, and the winding package 2 stops rotating after slowly rotating by inertia, the upper yarn Y' might be loosely wound around the winding package 2, with little tension being applied thereto, failing to be wound tightly. As a result, the upper yarn Y' might be wound while pro-

truding a slack portion Ya from the winding package 2 ((a) of FIG. 3).

[0024] In such a case, the slack portion Ya of the yarn Y is drawn out from the winding package 2 (i.e., multi-pullout) as shown in (a) of FIG. 3. In this state, if the winding package 2 is rotated in the aforementioned usual conventional method, the slack portion Ya of the yarn might be caught by the suction mouth 4, so that an end Yb of the yarn cannot be caught thereafter, producing a defective yarn in some cases. Therefore, if the yarn breaks within a predetermined period of time (e.g., two seconds) immediately after the start of the rewinding operation, the control device 10 controls the rotational operation of the winding package 2 for yarn splicing, in accordance with a method of the present invention as described below.

[0025] The following description will be made with reference to FIGS. 3 through 5. In particular, FIG. 5 is referenced for the rotational operation of the winding package and the position of the suction mouth intake port in the method of the present invention. From the state as shown in (a) of FIG. 3, the intake port 4a of the suction mouth 4 moves to the vicinity of the winding package 2 (the top position) as shown in (b) of FIG. 3. In (a) and (b) of FIG. 3, the winding package 2 is not rotating. In this state, the suction mouth 4 suctions and catches the slack portion Ya of the upper yarn Y' with the intake port 4a as shown in (b) of FIG. 3.

[0026] Then, with the intake port 4a being located at the top position, as shown in (c) of FIG. 3, the traverse drum 3 is rotated with the drive of the motor 30 to cause positive rotation of the winding package 2 (in a rotational direction 2a indicated by an arrow). As a result, the winding package 2 performs the positive rotation, with the slack portion Ya of the upper yarn Y' being suctioned and caught by the suction mouth 4 and therefore the position thereof being fixed. When the positive rotation of the winding package 2 is continued, the upper yarn Y' is wound around the winding package 2, with the slack portion Ya being eliminated as shown in (d) of FIG. 3. By further continuing the positive rotation of the winding package 2, the upper yarn Y' is tightly rewound while being held between the winding package 2 and the traverse drum 3 as shown in FIG. 4(e).

[0027] After the winding package 2 is rotated in the positive direction a predetermined number of times (or for a predetermined period of time) as shown in (c) and (d) of FIG. 3 and (e) of FIG. 4, the winding package 2 is rotated in the negative direction (rotational direction 2b indicated by an arrow) as shown in (f) of FIG. 4. As a result, the end Yb of the upper yarn Y' is unwound, and caught by the intake port 4a of the suction mouth 4. Thereafter, the suction mouth 4 is caused to pivot downwardly, so that the intake port 4a moves to the bottom position as shown in (g) of FIG. 4, unwinding the upper yarn Y' from the winding package 2 followed by guidance of the upper yarn Y' into the yarn splicing device 6.

[0028] As shown in FIG. 5, in the rotational operation

of the winding package in the method of the present invention, unlike the aforementioned usual conventional method, the winding package 2 is temporarily rotated in the positive direction to tightly rewind the upper yarn Y' and eliminate the slack portion Ya, thereby making it possible to prevent multi-pullout and therefore prevent occurrence of a defective yarn.

[0029] Then, by operating the suction pipe 5 and the yarn splicing device 6 in the same manner as in the aforementioned usual conventional method, the upper yarn Y' and the lower yarn Y'' are spliced together to form a single yarn Y before the restart of rewinding from the yarn supply bobbin 8 onto the winding package 2.

[0030] While in the above embodiment the winding package 2 performs the rotational operation in the method of the present invention when the yarn breaks within a predetermined period of time immediately after the start of the rewinding operation, the rotational operation in the method of the present invention may be performed upon each detection of a yarn break by the clearer 7 (in this case, the clearer 7 is not necessarily required to detect a slub), or the rotational operation may also be performed upon detection of a slub by the clearer 7 (as well as upon detection of a yarn break). It should be understood that if the winding package 2 is rotated in the method of the present invention when no slack portion Ya is present, the upper yarn Y' can be guided into the yarn splicing device 6 without problems.

[0031] In addition, the multi-pullout state easily occurs when the winding package 2 is small in diameter because the yarn can be wound with much slack. Accordingly, the winding unit 1 may include a sensor (not shown) for detecting the amount of yarn wound around the winding package 2, and the sensor may be connected to the control device 10 to detect the diameter of the winding package 2 based on the amount of wound yarn, making it possible to perform the rotational operation of the winding package 2 in accordance with the method of the present invention only when the winding package 2 is small in diameter.

Claims

1. A method for pulling out a yarn end (Yb) from a winding package (2) in an automatic winder in which a yarn (Y) having been cut when being rewound from a yarn supply bobbin (8) onto the winding package (2) is suctioned and caught to be guided into yarn splicing means (6) for yarn splicing, the method being **characterized by** comprising:

a first step for rotating the winding package (2) in a winding direction (2a), with an intake port (4a) for suctioning and catching a yarn (Y') on the winding package (2) side being positioned close to the winding package (2); and
a second step for rotating the winding package

(2) in a direction (2b) opposite to the winding direction with the intake port (4a) being positioned close to the winding package (2) after performing the first step, and then moving the intake port (4a) away from the winding package (2), to guide the yarn (Y') on the winding package (2) side into the yarn splicing means (6).

2. The method according to claim 1, **characterized in that** the automatic winder includes means (7) for detecting a yarn break, and the first and second steps are performed when the detecting means (7) detects the yarn break.
3. The method according to claim 1, **characterized in that** the automatic winder includes means (7) for detecting a yarn break, and the first and second steps are performed when the detecting means (7) detects the yarn break within a predetermined period of time immediately after a rewinding operation is started.
4. An automatic winder comprising means (10) for performing control such that a yarn (Y) having been cut when being rewound from a yarn supply bobbin (8) onto a winding package (2) is suctioned and caught to be guided into yarn splicing means (6) for yarn splicing, the automatic winder being **characterized by** the control means (10) performing:
 - a first function for rotating the winding package (2) in a winding direction (2a), with an intake port (4a) for suctioning and catching a yarn (Y') on the winding package (2) side being positioned close to the winding package (2); and
 - a second function for rotating the winding package (2) in a direction (2b) opposite to the winding direction with the intake port (4a) being positioned close to the winding package (2) after performing the first function, and then moving the intake port (4a) away from the winding package (2), to guide the yarn (Y') on the winding package (2) side into the yarn splicing means (6).
5. The automatic winder according to claim 4, **characterized by** comprising means (7) for detecting a yarn break, wherein the first and second functions are performed when the detecting means (7) detects the yarn break.
6. The automatic winder according to claim 4, **characterized by** comprising means (7) for detecting a yarn break, wherein the first and second functions are performed when the detecting means (7) detects the yarn break within a predetermined period of time immediately after a rewinding operation is started.

FIG. 1

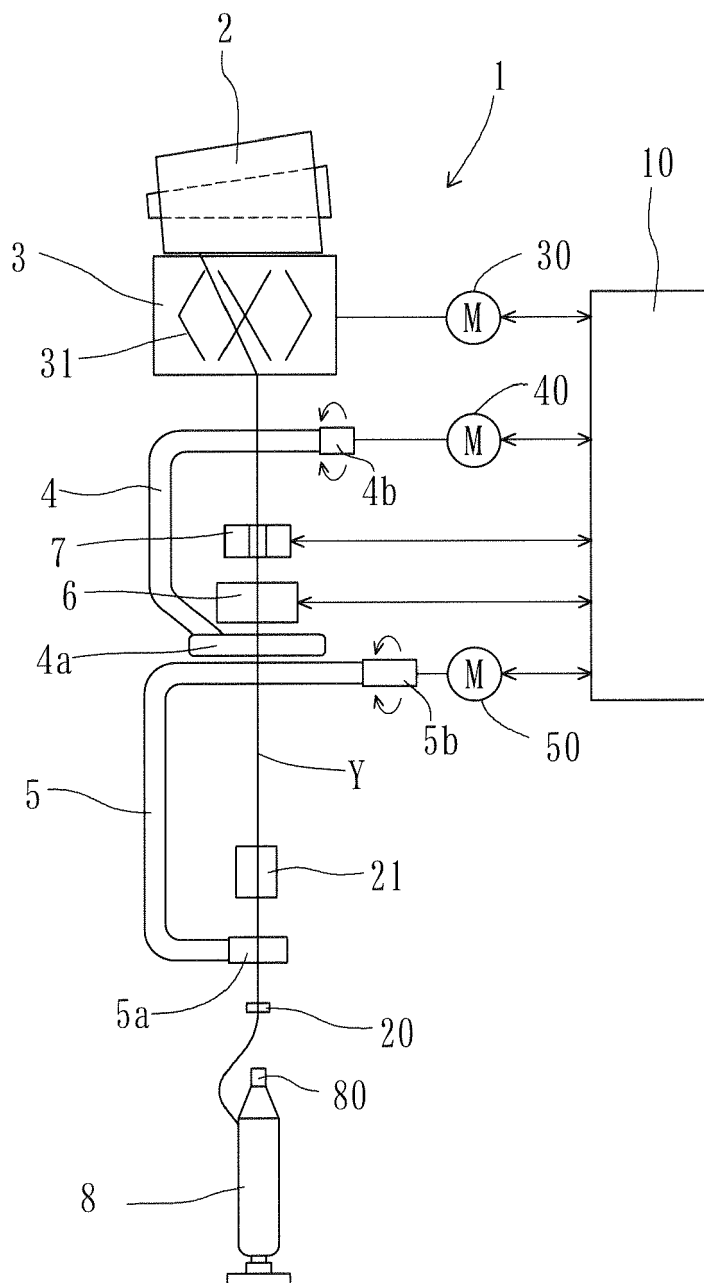


FIG. 2

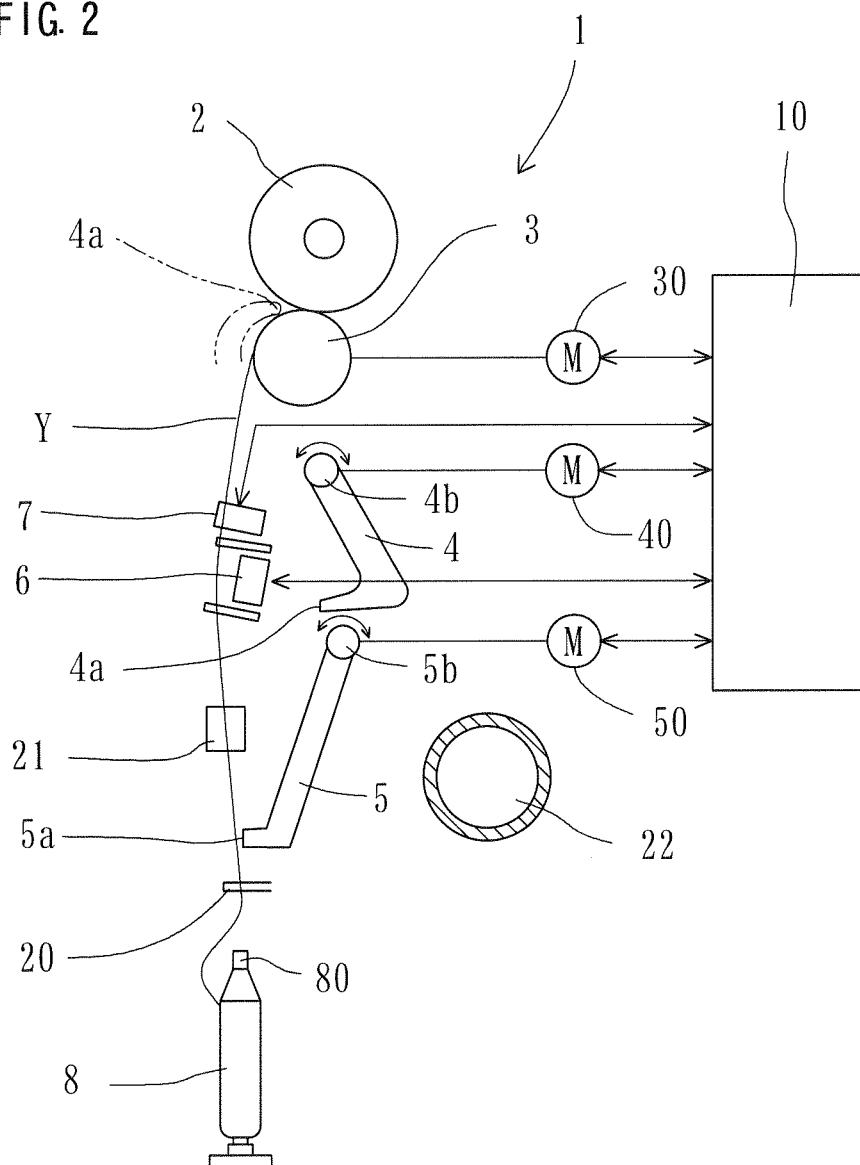


FIG. 3

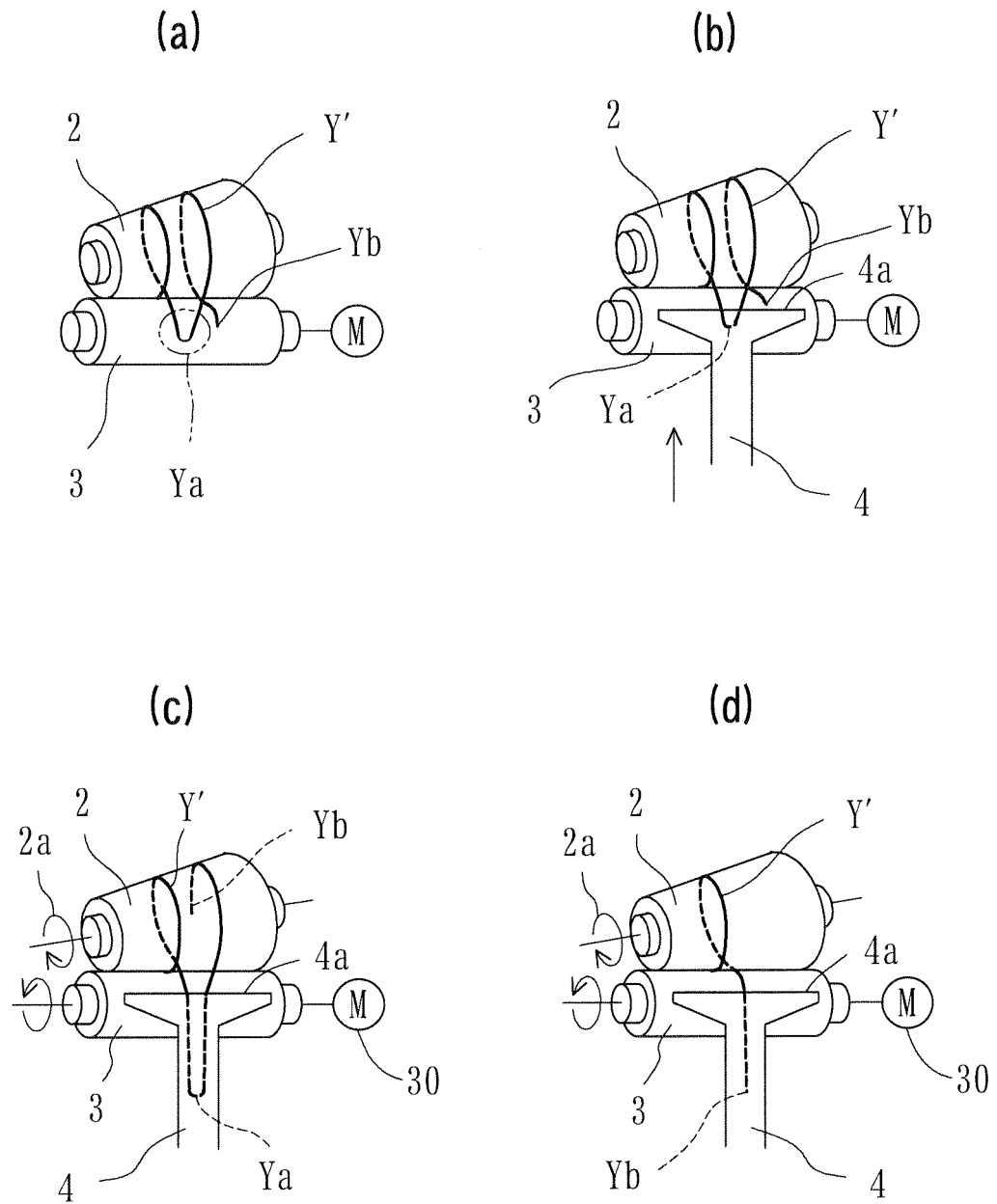


FIG. 4

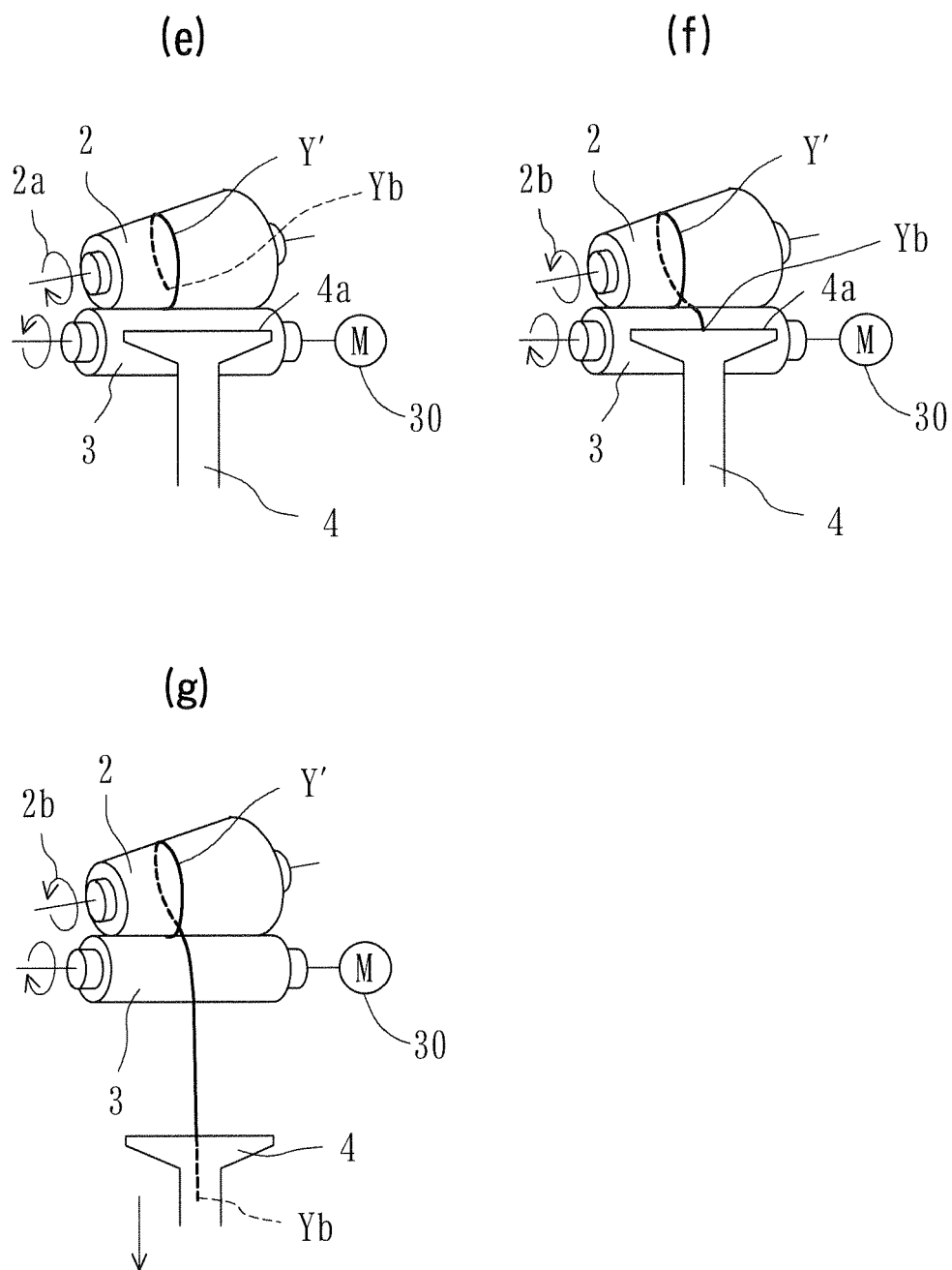
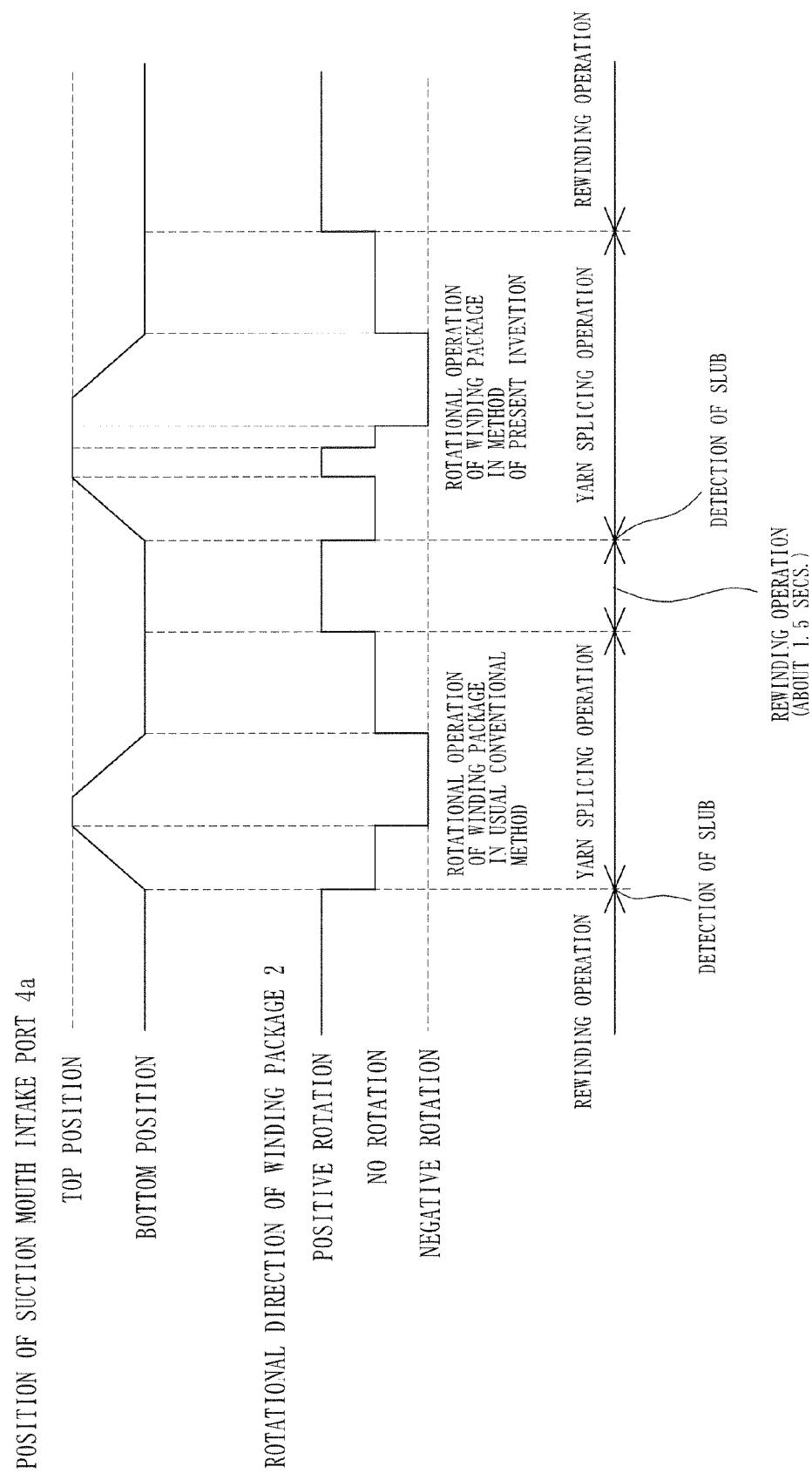


FIG. 5





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 535 945 A (ROHNER JOACHIM [DE] ET AL) 20 August 1985 (1985-08-20)	1,2,4-6	INV. B65H67/08
A	* column 2, line 6 - line 25 * * column 3, line 16 - line 19 * * column 3, line 35 - line 48 * * column 4, line 22 - line 31 * * column 8, line 59 - column 9, line 5 * -----	3	
A	US 5 605 296 A (HAASEN ROLF [DE] ET AL) 25 February 1997 (1997-02-25) * column 2, line 28 - line 60 * * column 3, line 55 - line 67 * * column 9, line 1 - column 10, line 17 * -----	1,2,4,5	
A	EP 0 639 525 A (SCHLAFHORST & CO W [DE]) 22 February 1995 (1995-02-22) * abstract * * column 2, line 1 - line 12 * -----	1,4	
A	FR 1 442 170 A (REINERS WALTER) 10 June 1966 (1966-06-10) * page 2, column 1 - column 2 * * claim * * figure * -----	1,4	TECHNICAL FIELDS SEARCHED (IPC) B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 August 2007	Examiner Guisan, Thierry
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)

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

EP 07 10 7811

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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24-08-2007

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 4535945	A	20-08-1985	CH	659461 A5		30-01-1987
			DE	3225379 A1		12-01-1984
			IT	1170434 B		03-06-1987
			JP	1802215 C		26-11-1993
			JP	5005745 B		25-01-1993
			JP	59031263 A		20-02-1984

US 5605296	A	25-02-1997	CH	690768 A5		15-01-2001
			DE	4434610 A1		04-04-1996
			IT	MI951884 A1		28-03-1996
			JP	3626795 B2		09-03-2005
			JP	8231127 A		10-09-1996

EP 0639525	A	22-02-1995	DE	4328035 A1		23-02-1995
			JP	3497571 B2		16-02-2004
			JP	7081848 A		28-03-1995

FR 1442170	A	10-06-1966	NONE			

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 7082622 A [0004] [0004]