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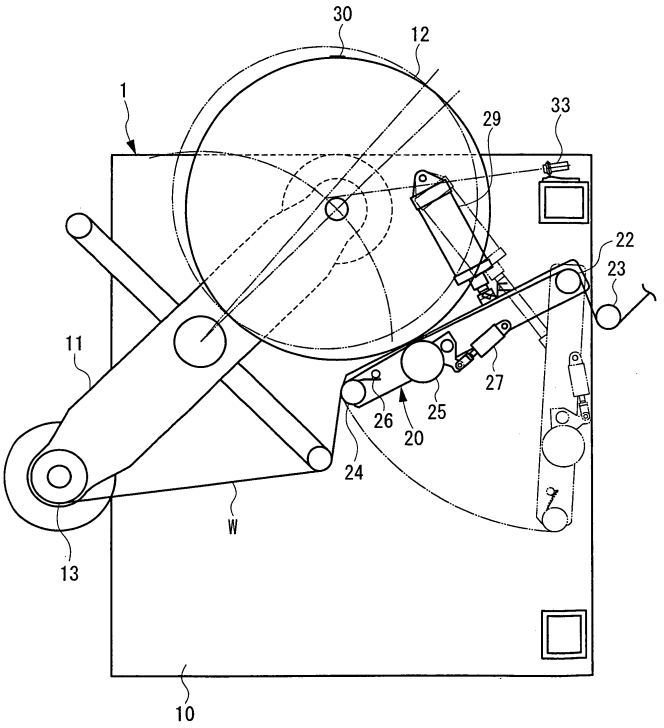
(54) **Strip continuous supply method and apparatus**

(57) In a feeding apparatus (1) which includes a turret arm (11) supporting a new paper roll (12) and an old paper roll (13) and supported pivotably, and a turret arm swing motor (14) for pivoting the turret arm (11), and which splices a web (W) of the new paper roll (12) to a web (W) of the old paper roll (13) and supplies the web (W) continuously, the turret arm swing motor (14) is driven before driving of a main unit to pivot the turret arm (11), thereby moving the new paper roll (12) to a web splicing standby position.

Fig.1



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Description

Technical Field

[0001] This invention relates to a strip continuous supply method and apparatus suitably applied, for example, to a feeding apparatus of a rotary printing press.

Background Art

[0002] In a machine where a roll (a rolled web) is unwound and used, such as a rotary press, an automatic web splicing unit is used, whereby when a roll being currently unwound (an old web roll) is nearing its end, this roll is automatically spliced to a new roll (a new web roll) , without stoppage of the operation of the machine, and the operation is continued.

[0003] With the automatic web splicing unit of an offset rotary press, the following procedure has been common practice: When the transport speed of the old web roll reaches a predetermined speed not lower than a low speed and when the length of the remaining web becomes a value corresponding to a predetermined time or less, a web splicing signal is issued. In response to this web splicing signal, the new web roll is moved to a web splicing standby position, and a paster unit (web splicing unit) is moved to a web splicing position. Also, the new web roll is rotated such that the peripheral speed of the new web roll equals the transport speed of the old web roll being unwound by a pre-drive device. In this state, web splicing is performed (see Japanese Unexamined Patent Publication No. 2005-96968).

[0004] However, when printing is started anew, the above-described automatic web splicing unit has encountered the following problems: The movement of the new web roll to the web splicing standby position, and the synchronization of the peripheral speed of the new web roll take time. During this period, the old web is unwound, and the length of the remaining paper in the roll becomes insufficient. At the time of printing (during printing-out), therefore, the paper remaining in the wound roll cannot be used as the old web roll, thus resulting in a waste. In other words, if the remaining roll having the insufficient length of the remaining paper is used as the old web roll, shutdown of the machine due to the absence of remaining paper is induced.

[0005] Under these circumstances, when printing is started newly, it has been customary practice to use a web roll of a certain size as the old web. However, at the start of new printing, adjustments for printing of a normal printing product, such as color matching and registration, have to be made. This has posed the problem that printing products obtained become wasted paper, thus causing wastes.

Summary of the Invention

[0006] The present invention has been accomplished as a solution to the above-described problems. The present invention provides a strip continuous supply method and apparatus which enable even a remaining web roll of a small diameter to be used as an old web roll at the start of new printing, thereby achieving the effective use of printing materials and improved productivity.

[0007] A first aspect of the present invention is a strip continuous supply method of a strip continuous supply apparatus which includes a turret arm supporting a new web roll and an old web roll and supported pivotably, and a turret arm drive device for pivoting the turret arm, and which splices a strip of the new web roll to a strip of the old web roll and supplies the strip continuously,
the strip continuous supply method comprising driving the turret arm drive device, before driving of a main unit, to pivot the turret arm, thereby moving the new web roll to a web splicing standby position.

[0008] A second aspect of the present invention is the strip continuous supply method according to the first aspect, further comprising moving a web splicing unit to the web splicing standby position before driving of the main unit, the web splicing unit including apressingmember for pressing the strip of the new web roll against the strip of the old web roll, and a cutting member for-cutting the strip of the old web roll.

[0009] A third aspect of the present invention is the strip continuous supply method according to the first aspect, further comprising driving new web roll drive means such that a peripheral speed of the new web roll becomes equal to a transport speed of the strip unwound from the old web roll, when the main unit begins to rotate, the new web roll drive means being adapted to rotate the new web roll.

[0010] A fourth aspect of the present invention is the strip continuous supply method according to the second or third aspect, characterized in that when a rotational speed of the main unit is equal to or higher than a preset rotational speed, the new web roll is moved to the web splicing standby position, and the web splicing unit is moved to the web splicing standby position, and the new web roll drive means is driven such that the peripheral speed of the new web roll becomes equal to the transport speed of the strip unwound from the old web roll.

[0011] A fifth aspect of the present invention is a strip continuous supply apparatus which includes a turret arm supporting a new web roll and an old web roll and supported pivotably, and a turret arm drive device for pivoting the turret arm, and which splices a strip of the new web roll to a strip of the old web roll and supplies the strip continuously,
further comprising a control device for driving the turret arm drive device, before driving of a main unit, to pivot the turret arm, thereby moving the new web roll to a web splicing standby position.

[0012] A sixth aspect of the present invention is the strip continuous supply apparatus according to the fifth aspect, further comprising a web splicing unit including a pressing member for pressing the strip of the new web

roll against the strip of the old web roll, and a cutting member for cutting the strip of the old web roll, and wherein the control device moves the web splicing unit to the web splicing standby position before driving of the main unit.

[0013] A seventh aspect of the present invention is the strip continuous supply apparatus according to the fifth aspect, further comprising new web roll drive means for rotating the new web roll, and wherein the control device drives the new web roll drive means such that a peripheral speed of the new web roll becomes equal to a transport speed of the strip unwound from the old web roll, when the main unit begins to rotate.

[0014] An eighth aspect of the present invention is the strip continuous supply apparatus according to the sixth or seventh aspect, characterized in that when a rotational speed of the main unit is equal to or higher than a preset rotational speed, the control device moves the new web roll to the web splicing standby position, and also moves the web splicing unit to the web splicing standby position, and further drives the new web roll drive means such that the peripheral speed of the new web roll becomes equal to the transport speed of the strip unwound from the old web roll.

[0015] According to the strip continuous supply method and apparatus having the above-described features, even the remaining web roll of a small diameter can be used as the old web roll at the start of new printing. Thus, effective utilization of printing materials can be achieved, and increased productivity can be gained because of a reduction in the time taken for a web splicing motion.

Brief Description of the Drawings

[0016] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is a schematic configurational view of a feeding apparatus (a strip continuous supply apparatus) showing an embodiment of the present invention;
Fig. 2 is an external view of an offset rotary press in the embodiment;
Fig. 3(a) is a control block diagram in the embodiment;
Fig. 3(b) is a control block diagram in the embodiment;
Fig. 3(c) is a control block diagram in the embodiment;
Fig. 4(a) is a flow chart for web splicing control in the embodiment;
Fig. 4(b) is a flow chart for web splicing control in the embodiment;
Fig. 4(c) is a flow chart for web splicing control in the embodiment;
Fig. 5(a) is a flow chart for web splicing control in the embodiment;
Fig. 5(b) is a flow chart for web splicing control in the embodiment;
Fig. 5(c) is a flow chart for web splicing control in the embodiment;
Fig. 5(d) is a flow chart for web splicing control in the embodiment;
Fig. 6(a) is a flow chart for web splicing control in the embodiment;
Fig. 6(b) is a flow chart for web splicing control in the embodiment;
Fig. 6(c) is a flow chart for web splicing control in the embodiment;
Fig. 7(a) is a flow chart for web splicing control in the embodiment;
Fig. 7(b) is a flow chart for web splicing control in the embodiment;
Fig. 7(c) is a flow chart for web splicing control in the embodiment; and
Fig. 7(d) is a flow chart for web splicing control in the embodiment.

Detailed Description

[0017] A strip continuous supply method and apparatus according to the present invention will be described in detail by an embodiment with reference to the accompanying drawings . Embodiment

[0018] Fig. 1 is a schematic configurational drawing of a feeding apparatus (a strip continuous supply apparatus) showing an embodiment of the present invention. Fig. 2 is an external view of an offset rotary press in the embodiment. Figs. 3 (a) to 3 (c) are control block diagrams in the embodiment. Figs. 4(a) to 4(c), Figs. 5(a) to 5(d), Figs. 6 (a) to 6(c), and Figs. 7 (a) to 7 (d) are flow charts for web splicing control in the embodiment.

[0019] In an offset rotary press, as shown in Fig. 2, a web (strip) W continuously supplied from a feeding apparatus (strip continuous supply apparatus) 1 is first subjected to various printings during its passage through printing units 2. Then, the web W is heated and dried during its passage through a dryer 3, and is then cooled during its passage through a cooling device 4. Then, the web W is controlled in tension or changed in direction during its passage through a web path device 5 and a drag device 6, and is then cut to a predetermined shape and folded by a folder 7.

[0020] The feeding apparatus 1, as shown in Fig. 1, is a so-called automatic web splicing unit serving the following functions: A turret arm 11 is pivotally supported by an apparatus body 10 to be pivotable about a central portion of the turret arm 11. Also, new and old paper rolls (new and old web rolls) 12 and 13 are mounted at the opposite ends (A-side and B-side) of the turret arm 11. When the web W is unwound from the old paper roll 13, and the paper roll nears its end, the web W from the new paper roll 12 is spliced to be continuous with the old paper roll 13, and is sent to the printing unit 2. The state shown

in Fig. 1 is a state where the old paper roll 13 being currently unwound nears its end, and the turret arm 11 is pivoted to move the next new paper roll 12 to a web splicing standby position.

[0021] The turret arm 11, as shown in Fig. 3(b), is pivoted by a turret arm swing motor (turret arm drive device) 14, and its swing angle is detected by a rotary encoder 15 for the turret arm swing motor. A pre-drive device for rotationally driving the new and old paper rolls 12 and 13 is built in the turret arm 11, and the pre-drive device accelerates beforehand the new paper roll 12 moved to the web splicing standby position until the surface speed (peripheral speed) of the new paper roll 12 equals the travel speed (transport speed) of the web W. In Figs. 3 (b) and 3 (c), an A-side new paper roll drive motor 16 and a B-side new paper roll drive motor 18 are provided as the pre-drive device for driving the new paper roll 12 (new web roll drive device) , and their rotational speeds are detected by a rotary encoder 17 for the A-side new paper roll drive motor and a rotary encoder 19 for the B-side new paper roll drive motor. The unwinding speed of the old paper roll 13 is detected by an old paper roll unwinding speed measuring rotary encoder 81.

[0022] In the apparatus body 10, a web splicing unit (paster unit) 20 is provided to be rockable by a web splicing unit throw-on and throw-off air cylinder 29. The web splicing unit 20 can rock from a throw-off position indicated by dashed double-dotted lines in Fig. 1 to a throw-onposition indicated by solid lines in Fig. 1 with respect to the new paper roll 12 moved to the web splicing standby position. In a state where the web splicing unit 20 has moved to the throw-on position, the web W unwound from the old paper roll 13 is passed through a clearance between the new paper roll 12 and the web splicing unit 20, passed over a plurality of rolls 22 and 23, and paid out toward the printing unit 2.

[0023] The web splicing unit 20 is provided with a fixed roll 24 for guiding the web W, and is also provided with a pressure contact roller (pressing member) 25 and a cutter (cutting member) 26 such that they can move toward and away from the web W. As shown in Fig. 3 (a) , the pressure contact roller 25 is driven by a pressure contact roller drive air cylinder 27, and the cutter 26 is driven by a cutter throw-on and throw-off air cylinder 28. The web splicing unit 20 is also mounted with a glue position detection sensor 31 which detects a double-sided adhesive tape 30 (see Fig. 1) at the leading end of the web of the new paper roll 12.

[0024] The apparatus body 10 is also mounted with a new paper roll stop position detection sensor 32 and a distance measuring instrument 33 for measuring a new paper roll diameter, as shown in Fig. 3(a). The new paper roll stop position detection sensor 32 is provided in a direction crossing the transport path of the new paper roll 12 given by the turret arm 11, and detects the outer diameter of the new paper roll 12 at the web splicing standby position. A transmission type photosensor or the like is adopted as the new paper roll stop position detection sensor 32. The distance measuring instrument 33 for measuring the new paper roll diameter is provided at a position where it opposes the circumferential surface of the new paper roll 12 when the new paper roll 12 stops at a diameter measuring position, in order to measure the distance to the circumferential surface of the new paper roll 12 by use of an ultrasonic wave or light (laser).

[0025] The turret arm swing motor 14, the A-side new paper roll drive motor 16, the B-side new paper roll drive motor 18, the pressure contact roller drive air cylinder 27, the cutter throw-on and throw-off air cylinder 28, and the web splicing unit throw-on and throw-off air cylinder 29 are drivingly controlled by a control device 40, as shown in Figs. 3 (a) to 3 (c).

[0026] The control device 40 comprises CPU 41, ROM 42, RAM 43, input/output devices 44a to 44n, and an interface 45 connected by a BUS line 74. To the BUS line 74, there are connected a memory 46 for storing the new paper roll, a memory 47 for storing an A-side new paper roll diameter measuring position, a memory 48 for storing a B-side new paper roll diameter measuring position, a memory 49 for storing a new paper roll diameter measuring position, a memory 50 for storing the value of a turret arm swing position measuring counter, a memory 51 for storing the output of the distance measuring instrument for measuring the new paper roll diameter, a memory 52 for storing the new paper roll diameter, a memory 53 for storing a turret arm width, a memory 54 for storing an A-side web splicing standby reference position, a memory 55 for storing a B-side web splicing standby reference position, a memory 56 for storing a new paper roll web splicing standby position, a memory 58 for storing the output of an A/D converter connected to a printing press rotational speed measuring rotary encoder, a memory 59 for storing a current printing press rotational speed, a memory 60 for storing the output of an A/D converter connected to an old paper roll unwinding speed measuring rotary encoder, a memory 61 for storing an old paper roll unwinding speed, a memory 62 for storing a new paper roll drive motor rotational speed during web splicing, a memory 63 for storing the output of an A/D converter connected to the rotary encoder for the A-side new paper roll drive motor, a memory 64 for storing the output of an A/D converter connected to the rotary encoder for the B-side new paper roll drive motor, a memory 65 for storing a current newpaper roll drive motor rotational speed, a memory 66 for storing a pressure contact roller throw-on timing, a memory 67 for storing a cutter motion timing, a memory 68 for storing the value of an A-side new paper roll rotational position measuring counter, a memory 69 for storing the value of a B-side new paper roll rotational position measuring counter, a memory 70 for storing an A-side operating position, a memory 71 for storing a B-side operating position, a memory 72 for storing a new paper roll operating position, and a memory 73 for storing a printing press speed during web splicing.

[0027] To the input/output device 44a, there are con-

nected a new paper roll selection button (1) 34 which is selected when the new paper roll (remaining paper roll) 12 is present on the A side of the turret arm 11, a new paper roll selection button (2) 35 which is selected when the new paper roll (remaining paper roll) 12 is present on the B side of the turret arm 11, a small-diameter mode switch 36, an input device 37 such as a keyboard, a display device 38 such as CRT or a display, and an output device 39 such as a printer or a floppy (registered trademark) disk drive.

[0028] To the input/output device 44b, the distance measuring instrument 33 for measuring the new paper roll diameter is connected via anA/D converter 75. To the input/output device 44c, the glue position detection sensor 31 and the new paper roll stop position detection sensor 32 are connected. To the input/output device 44d, there are connected the pressure contact roller drive air cylinder 27 (a valve 27a for this air cylinder 27), the cutter throw-on and throw-off air cylinder 28 (a valve 28a for this air cylinder 28), and the web splicing unit throw-on and throw-off air cylinder 29 (a valve 29a for this air cylinder 29).

[0029] To the input/output device 44e, a printing press rotational speed measuring rotary encoder 78 is connected via an A/D converter 76 and an F/V converter 77. To the input/output device 44f, an old paper roll unwinding speed measuring rotary encoder 81 is connected via an A/D converter 79 and an F/V converter 80.

[0030] To the input/output device 44g, the turret arm swing motor 14 is connected via a turret arm swing motor driver 82. To the input/output device 44h, the rotary encoder for turret arm swing motor 15 is connected via a turret arm swing position measuring counter 83. The rotary encoder 15 for the turret arm swing motor is also connected to the turret arm swing motor driver 82.

[0031] To the input/output device 44i, the A-side new paper roll drive motor 16 is connected via an A-side new paper roll drive motor driver 84. To the input/output device 44j, the rotary encoder 17 for the A-side new paper roll drive motor is connected via an A/D converter 85 and an F/V converter 86. To the input/output device 44k, an A-side new paper roll rotational position measuring counter 87 is connected. The rotary encoder 17 for the A-side new paper roll drive motor is also connected to the A-side new paper roll drive motor driver 84.

[0032] To the input/output device 441, the B-side new paper roll drive motor 18 is connected via a B-side new paper roll drive motor driver 88. To the input/output device 44m, the rotary encoder 19 for the B-side new paper roll drive motor is connected via an A/D converter 89 and an F/V converter 90. To the input/output device 44n, a B-side new paper roll rotational position measuring counter 91 is connected. The rotary encoder 19 for the B-side new paper roll drive motor is also connected to the B-side new paper roll drive motor driver 88. Also, the aforementioned glue position detection sensor 31 is connected to the A-side new paper roll rotational position measuring counter 87 and the B-side new paper roll rotational position measuring counter 91.

[0033] A printing press control device 92 and a remaining paper length meter 93 are connected to the interface 45. The remaining paper length meter 93 is a computing device which constantly monitors the remaining paper length of the old paper roll 13, and computes how many minutes will be taken as the remaining time until web splicing becomes necessary if the old paper roll 13 is unwound at the current web travel speed. Based on this computation, the remaining paper length meter 93 outputs a web splicing preparation start signal when the remaining time is not more than a preparation time. Its concrete features have already been rendered publicly known by Japanese Utility Model Registration No. 2568743. Thus, a detailed explanation for the remaining paper length meter 93 is omitted herein.

[0034] If, inwebsplicing (motion) control, asmall-diameter mode is set, and the small-diameter mode is selected, the control device 40 moves the new paper roll (remaining paper roll) 12 to the web splicing standby position (swings the turret arm 11 priorly), and moves the web splicing unit 20 to the web splicing stand by position, before start of printing, to eliminate wasteful paper feed. According to the control device 40, moreover, when the speed of the main unit becomes a slower speed (e.g., 8 rpm) or higher, the new paper roll (remaining paper roll) 12 is rotated to equate the peripheral speed of the new paper roll (remaining paper roll) 12 to the transport speed of the old paper roll 13 unwound by the pre-drive device (A-side new paper roll drive motor 16 or B-side new paper roll drive motor 18). As soon as the transport speed and the peripheral speed are synchronized, web splicing can be performed, and the new paper roll (remaining paper roll) 12 of the small diameter can be used.

[0035] Such web splicing control will be described in detail according to flow charts as Figs. 4(a) to 4 (c), Figs. 5(a) to 5(d), Figs. 6 (a) to 6(c), and Figs. 7(a) to 7(d).

[0036] In Step P1, it is determined whether the new paper roll selection button (1) 34 is ON or not. If ON, the memory 46 for storing the new paper roll is overwritten with 1 in Step P2. Then, in Step P3, it is determined whether the new paper roll selection button (2) 35 is ON or not. If not ON in Step P1, the program shifts to Step P3.

[0037] If ON in Step P3, the memory 46 for storing the new paper roll is overwritten with 2 in Step P4. Then, in Step P5, it is determined whether a printing press drive signal has been transmitted from the printing press control device 92. If YES in Step P5, the program shifts to Step P83 to be described later. If NO in Step P5, it is determined in Step P6 whether the small-diameter mode switch 36 is ON or not.

[0038] If ON in Step P6, the value of the memory 46 for storing the new paper roll is loaded in Step P7. If not ON in Step P6, the program returns to Step P1. Then, in Step P8, it is determined whether the value of the memory 46 for storing the new paper roll is 1. If YES, the A-side new paper roll diameter measuring position is loaded from the memory 47, and stored into the memory 49 for

storing the new paper roll diameter measuring position, in Step P9. Then, in Step P10, the new paper roll diameter measuring position is loaded from the memory 49 for storing the new paper roll diameter measuring position. If NO in Step P8, the B-side new paper roll diameter measuring position is loaded from the memory 48, and stored into the memory 49 for storing the new paper roll diameter measuring position, in Step P11. Then, the program shifts to the aforementioned Step P10.

[0039] Then, in Step P12, a normal rotation command is outputted to the turret arm swing motor driver 82. Then, in Step P13, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50. Then, if, in Step P14, the value of the turret arm swing position measuring counter 83 reaches a value corresponding to the new paper roll diameter measuring position, the output of the distance measuring instrument 33 for measuring the new paper roll diameter is loaded, and stored into the memory 51, in Step P15.

[0040] Then, in Step P16, the diameter of the new paper roll is computed from the output of the distance measuring instrument 33 for measuring the new paper roll diameter, and stored into the memory 52. Then, in Step P17, the width of the turret arm is loaded from the memory 53. Then, in Step P18, it is determined whether the diameter of the new paper roll is equal to or larger than the width of the turret arm.

[0041] If YES in Step P18, the output of the new paper roll stop position detection sensor 32 is loaded in Step P19. Then, if, in Step P20, the output of the new paper roll stop position detection sensor 32 is ON, a stop command is outputted to the turret arm swing motor driver 82 in Step P21.

[0042] If NO in Step P18, the value of the memory 46 for storing the new paper roll is loaded in Step P22. Then, in Step P23, it is determined whether the value of the memory 46 for storing the new paper roll is 1. If YES, the A-side web splicing standby reference position is loaded from the memory 54 in Step P24.

[0043] Then, in Step P25, the diameter of the new paper roll is loaded from the memory 52 for storing the new paper roll diameter. Then, in Step P26, the web splicing standby position for the new paper roll is computed from the A-side web splicing standby reference position and the diameter of the new paper roll, and stored into the memory 56. Then, in Step P27, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50.

[0044] If NO in Step P23, the B-side web splicing standby reference position is loaded from the memory 55. Then, in Step P29, the diameter of the new paper roll is loaded from the memory 52 for storing the new paper roll diameter. Then, in Step P30, the web splicing standby position for the new paper roll is computed from the B-side web splicing standby reference position and the diameter of the new paper roll, and stored into the memory 56. Then, the program shifts to the aforementioned Step P27.

[0045] Then, if, in Step P31, the value of the turret arm swing position measuring counter 83 has reached a value corresponding to the web splicing standby position for the new paper roll, the program shifts to the aforementioned Step P21.

[0046] Then, in Step P32, a throw-on signal is outputted to the valve 29a for the web splicing unit throw-on and throw-off air cylinder, whereafter in Step P33 the output of the A/D converter 76 connected to the printing press rotational speed measuring rotary encoder 78 is loaded, and stored into the memory 58.

[0047] Then, in Step P34, the current rotational speed of the printing press is computed from the output of the A/D converter 76 connected to the printing press rotational speed measuring rotary encoder 78, and stored into the memory 59. Then, in Step P35, it is determined whether the current rotational speed of the printing press is greater than zero, namely, whether the printing press has begun to rotate. If YES, the program shifts to Step P36. If NO, the program returns to Step P33.

[0048] Then, in Step P36, the diameter of the new paper roll is loaded from memory 52 for storing the new paper roll diameter. Then, in Step P37, the output of the A/D converter 79 connected to the old paper roll unwinding speed measuring rotary encoder 81 is loaded, and stored into the memory 60. Then, in Step P38, the unwinding speed of the old paper roll is computed from the output of the A/D converter 79 connected to the old paper roll unwinding speed measuring rotary encoder 81, and stored into the memory 61.

[0049] Then, in Step P39, the rotational speed of the new paper roll drive motor during web splicing is computed from the unwinding speed of the old paper roll and the diameter of the new paper roll, and stored into the memory 62. Then, in Step P40, the value of the memory 46 for storing the new paper roll is loaded. Then, in Step P41, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0050] If YES in Step P41, a rotational speed command for the new paper roll drive motor during web splicing is outputted to the A-side new paper roll drive motor driver 84 in Step P42. Then, in Step P43, the output of the A/D converter 85 connected to the rotary encoder 17 for the A-side new paper roll drive motor is loaded, and stored into the memory 63. Then, in Step P44, the current rotational speed of the new paper roll drive motor is computed from the output of the A/D converter 85 connected to the rotary encoder 17 for the A-side new paper roll drive motor, and stored into the memory 65. Then, in Step P45, it is determined whether the current rotational speed of the A-side new paper roll drive motor 16 is equal to the rotational speed of the new paper roll drive motor at the time of web splicing. If YES in Step P45, the program shifts to Step P46. If NO in Step P45, the program returns to Step P43.

[0051] If NO in Step P41, a rotational speed command for the new paper roll drive motor during web splicing is outputted to the B-side new paper roll drive motor driver

88 in Step P47. Then, in Step P48, the output of the A/D converter 89 connected to the rotary encoder 19 for the B-side new paper roll drive motor is loaded, and stored into the memory 64. Then, in Step P49, the current rotational speed of the new paper roll drive motor is computed from the output of the A/D converter 89 connected to the rotary encoder 19 for the B-side new paper roll drive motor, and stored into the memory 65. Then, in Step P50, it is determined whether the current rotational speed of the B-side new paper roll drive motor 18 is equal to the rotational speed of the new paper roll drive motor at the time of web splicing. If YES in Step P50, the program shifts to the aforementioned Step P46. If NO in Step P50, the program returns to Step P48.

[0052] Then, if, in Step P46, a web splicing signal has been transmitted from the remaining paper length meter 93, the output of the glue position detection sensor 31 is loaded in Step P51. Then, if, in Step P52, the output of the glue position detection sensor 31 is ON, the value of the memory 46 for storing the new paper roll is loaded in Step P53. Then, in Step P54, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0053] If YES in Step P54, a pressure contact roller throw-on timing is loaded from the memory 66 in Step P55. Then, in Step P56, the value of the A-side new paper roll rotational position measuring counter 87 is loaded, and stored into the memory 68. Then, if, in Step P57, the value of the A-side new paper roll rotational position measuring counter 87 has reached a value corresponding to the pressure contact roller throw-on timing, a throw-on signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder in Step P58.

[0054] Then, in Step P59, a cutter motion timing is loaded from the memory 67. Then, in Step P60, the value of the A-side new paper roll rotational position measuring counter 87 is loaded, and stored into the memory 68. Then, if, in Step P61, the value of theA-side newpaper roll rotational position measuring counter 87 has reached a value corresponding to the cutter motion timing, a throw-on signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder in Step P62. Then, in Step P63, a throw-off signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder.

[0055] If NO in Step P54, a pressure contact roller throw-on timing is loaded from the memory 66 in Step P64. Then, in Step P65, the value of the B-side new paper roll rotational position measuring counter 91 is loaded, and stored into the memory 69. Then, if, in Step P66, the value of the B-side new paper roll rotational position measuring counter 91 has reached a value corresponding to the pressure contact roller throw-on timing, a throw-on signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder in Step P67.

[0056] Then, in Step P68, a cutter motion timing is loaded from the memory 67. Then, in Step P69, the value of the B-side new paper roll rotational position measuring counter 91 is loaded, and stored into the memory 69. Then, if, in Step P70, the value of the B-side newpaper roll rotational position measuring counter 91 has reached a value corresponding to the cutter motion timing, a throw-on signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder in Step P71. Then, the program shifts to the aforementioned Step P63.

[0057] Then, in Step P72, a throw-off signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder. Then, in Step P73, a throw-off signal is outputted to the valve 29a for the web splicing unit throw-on and throw-off air cylinder. Then, in Step P74, the value of the memory 46 for storing the new paper roll is loaded. Then, in Step P75, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0058] If YES in Step P75, the A-side new paper roll operating position is loaded from the memory 70, and stored into the memory 72 for storing the new paper roll operating position, in Step P76. Then, in Step P77, the new paper roll operating position is loaded from the memory 72 for storing the new paper roll operating position. If NO in Step P75, the B-side new paper roll operating position is loaded from the memory 71, and stored into the memory 72 for storing the new paper roll operating-position in Step P78 . Then, the program shifts to the aforementioned Step P77.

[0059] Then, in Step P79, a normal rotation command is outputted to the turret arm swing motor driver 82. Then, in Step P80, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50. Then, if, in Step P81, the value of the turret arm swing position measuring counter 83 has reached a value corresponding to the new paper roll operating position, a stop command is outputted to the turret arm swing motor driver 82 in Step P82. Then, the program returns to Step P1.

[0060] If YES in the aforementioned Step P5, the speed of the printing press during web splicing is loaded from the memory 73 in Step P83. Then, in Step P84, the output of the A/D converter 76 connected to the printing press rotational speed measuring rotary encoder 78 is loaded, and stored into the memory 58. Then, in Step P85, the current rotational speed of the printing press is computed from the output of the A/D converter 76 connected to the printing press rotational speed measuring rotary encoder 78, and stored into the memory 59.

[0061] Then, in Step P86, it is determined whether the current rotational speed of the printing press is equal to or greater than the speed of the printing press during web splicing (a preset speed; low speed) . If YES, a determination is made in Step P87 as to whether a web splicing signal has been transmitted from the remaining paper length meter 93. Upon transmission of this signal, the program shifts to Step P88. If NO in Step P86, the program returns to Step P84.

[0062] Then, in Step P88, it is determined whether the

value of the memory 46 for storing the new paper roll is 1. If YES, the A-side new paper roll diameter measuring position is loaded from the memory 47, and stored into the memory 49 for storing the newpaper roll diameter-measuringposition, in Step P89. Then, in Step P90, the new paper roll diameter measuring position is loaded from the memory 49 for storing the new paper roll diameter measuring position. If NO in Step P88, the B-side new paper roll diameter measuring position is loaded from the memory 48, and stored into the memory 49 for storing the new paper roll diameter measuring position, in Step P91. Then, the program shifts to the aforementioned Step P90.

[0063] Then, in Step P92, a normal rotation command is outputted to the turret arm swing motor driver 82. Then, in Step P93, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50. Then, if, in Step P94, the value of the turret arm swing position measuring counter 83 has reached a value corresponding to the new paper roll diameter measuring position, the output of the distance measuring instrument 33 for measuring the new paper roll diameter is loaded, and stored into the memory 51, in Step P95.

[0064] Then, in Step P96, the diameter of the new paper roll is computed from the output of the distance measuring instrument 33 for measuring the new paper roll diameter, and stored into the memory 52 . Then, in Step P97, the turret arm width is loaded from the memory 53. Then, in Step P98, it is determined whether the diameter of the new paper roll is equal to or greater than the turret arm width.

[0065] If YES in Step P98, the output of the new paper roll stop position detection sensor 32 is loaded in Step P99. Then, if, in Step P100, the output of the new paper roll stop position detection sensor 32 is ON, a stop command is outputted to the turret arm swing motor driver 82 in Step P101.

[0066] If NO in Step P98, the value of the memory 46 for storing the new paper roll is loaded in Step P102. Then, in Step P103, it is determined whether the value of the memory 46 for storing the new paper roll is 1. If YES, the A-side web splicing standby reference position is loaded from the memory 54 in Step P104.

[0067] Then, in Step P105, the diameter of the new paper roll is loaded from the memory 52 for storing the new paper roll diameter. Then, in Step P106, the web splicing standby position of the new paper roll is computed from the A-side web splicing standby reference position and the diameter of the new paper roll, and stored into the memory 56. Then, in Step P107, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50.

[0068] If NO in Step P103, the B-side web splicing standby reference position is loaded from the memory 55 in Step P108. Then, in Step P109, the diameter of the new paper roll is loaded from the memory 52 for storing the new paper roll diameter. Then, in Step P110, the web splicing standby position of the new paper roll is computed from the B-side web splicing standby reference position and the diameter of the new paper roll, and stored into the memory 56. Then, the program shifts to the aforementioned Step P107.

[0069] Then, if, in Step P111, the value of the turret arm swing position measuring counter 83 has reached a value corresponding to the web splicing standby position of the new paper roll, the program shifts to the aforementioned Step P101.

[0070] Then, in Step P112, a throw-on signal is outputted to the valve 29a for the web splicing unit throw-on and throw-off air cylinder. Then, in Step P113, the diameter of the new paper roll is loaded from the memory 52 for storing the new paper roll diameter. Then, in Step P114, the output of the A/D converter 79 connected to the old paper roll unwinding speed measuring rotary encoder 81 is loaded, and stored into the memory 60. Then, in Step P115, the unwinding speed of the old paper roll is computed from the output of the A/D converter 79 connected to the old paper roll unwinding speed measuring rotary encoder 81, and stored into the memory 61.

[0071] Then, in Step P116, the rotational speed of the new paper roll drive motor during web splicing is computed from the unwinding speed of the old paper roll and the diameter of the new paper roll, and stored into the memory 62. Then, in Step P117, the value of the memory 46 for storing the newpaper roll is loaded. Then, in Step P118, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0072] If YES in Step P118, a rotational speed command for the newpaper roll drive motor during web splicing is outputted to the A-side new paper roll drive motor driver 84 in Step P119. Then, in Step P120, the output of the A/D converter 85 connected to the rotary encoder 17 for the A-side new paper roll drive motor is loaded, and stored into the memory 63. Then, in Step P121, the current rotational speed of the new paper roll drive motor is computed from the output of the A/D converter 85 connected to the rotary encoder 17 for the A-side new paper roll drive motor, and stored into the memory 65. Then, in Step 122, it is determined whether the current rotational speed of the A-side new paper roll drive motor 16 is equal to the rotational speed of the new paper roll drive motor during web splicing. If YES in Step P122, the program shifts to Step P123. If NO in Step P122, the program returns to Step P120.

[0073] If NO in Step P118, a rotational speed command for the newpaper roll drive motor during web splicing is outputted to the B-side new paper roll drive motor driver 88 in Step P124. Then, in Step P125, the output of the A/D converter 89 connected to the rotary encoder 19 for the B-side new paper roll drive motor is loaded, and stored into the memory 64. Then, in Step P126, the current rotational speed of the B-side new paper roll drive motor 18 is computed from the output of the A/D converter 89 connected to the rotary encoder 19 for the B-side new paper roll drive motor, and stored into the memory 65. Then, in Step 127, it is determined whether the current

rotational speed of the new paper roll drive motor is equal to the rotational speed of the new paper roll drive motor during web splicing. If YES in Step P127, the program shifts to the aforementioned Step P123. If NO in Step P127, the program returns to Step P125.

[0074] Then, in Step P123, the output of the glue position detection sensor 31 is loaded. Then, if, in Step P128, the output of the glue position detection sensor 31 is ON, the value of the memory 46 for storing the new paper roll is loaded in Step P129. Then, in Step P130, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0075] If YES in Step P130, a pressure contact roller throw-on timing is loaded from the memory 66 in Step P131. Then, in Step P132, the value of the A-side new paper roll rotational position measuring counter 87 is loaded, and stored into the memory 68. Then, if, in Step P133 , the value of the A-side new paper roll rotational position measuring counter 87 has reached a value corresponding to the pressure contact roller throw-on timing, a throw-on signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder in Step P134.

[0076] Then, in Step P135, a cutter motion timing is loaded from the memory 67. Then, in Step P136, the value of the A-side new paper roll rotational position measuring counter 87 is loaded, and stored into the memory 68. Then, if, in Step P137, the value of the A-side new paper roll rotational position measuring counter 87 has reached a value corresponding to the cutter motion timing, a throw-on signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder in Step P138. Then, in Step P139, a throw-off signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder.

[0077] If NO in Step P130, a pressure contact roller throw-on timing is loaded from the memory 66 in Step P140. Then, in Step P141, the value of the B-side new paper roll rotational position measuring counter 91 is loaded, and stored into the memory 69. Then, if, in Step P142, the value of the B-side new paper roll rotational position measuring counter 91 has reached a value corresponding to the pressure contact roller throw-on timing, a throw-on signal is outputted to the valve 27a for the pressure contact roller throw-on and throw-off air cylinder in Step P143.

[0078] Then, in Step P144, a cutter motion timing is loaded from the memory 67. Then, in Step P145, the value of the B-side new paper roll rotational position measuring counter 91 is loaded, and stored into the memory 69. Then, if, in Step P146, the value of the B-side new paper roll rotational position measuring counter 91 has reached a value corresponding to the cutter motion timing, a throw-on signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder in Step P147. Then, the program shifts to the aforementioned Step P139.

[0079] Then, in Step P148, a throw-off signal is outputted to the valve 28a for the cutter throw-on and throw-off air cylinder. Then, in Step P149, athrow-off signal is outputted to the valve 29a for the web splicing unit throw-on and throw-off air cylinder. Then, in Step P150, the value of the memory 46 for storing the new paper roll is loaded. Then, in Step P151, it is determined whether the value of the memory 46 for storing the new paper roll is 1.

[0080] If YES in Step P151, the A-side newpaper roll operating position is loaded from the memory 70, and stored into the memory 72 for storing the new paper roll operating position, in Step P152. Then, in Step.P153, the newpaper roll operating position is loaded from the memory 72 for storing the new paper roll operatingposition. If NO in Step P151, the B-side new paper roll operating position is loaded from the memory 71, and stored into the memory 72 for storing the new paper roll operating position, in Step P154. Then, the program shifts to the aforementioned Step P153.

[0081] Then, in Step P155, a normal rotation command is outputted to the turret arm swing motor driver 82. Then, in Step P156, the value of the turret arm swing position measuring counter 83 is loaded, and stored into the memory 50. Then, if, in Step P157, the value of the turret arm swing position measuring counter 83 has reached a value corresponding to the new paper roll operating position, a stop command is outputted to the turret arm swing motor driver 82 in Step P158. Then, the program returns to Step P1.

[0082] In the present embodiment, a description has been offered of the feeding apparatus 1 which has the automatic web splicing device for continuously supplying the printing unit 2 with the web W unwound from the new and old paper rolls 12 and 13 supported at the opposite ends of the turret arm 11. In the feeding apparatus 1, as described above, before the main unit is driven, the turret arm swing motor 14 is driven to pivot the turret arm 11, whereby the new paper roll (remaining paper roll) 12 can be moved to the web splicing standby position. When printing is started anew, therefore, even a small-diameter remaining paper roll can be used stably as the old web roll, without causing shutdown of the main unit due to the absence of remaining paper. Accordingly, effective utilization of printing materials can be accomplished, and an increase in productivity can be achieved because of a reduction in the time taken for a web splicing motion.

[0083] Moreover, the web splicing unit 20, which has the pressure contact roller 25 and the cutter 26, can also be moved to the web splicing standby position before the main unit is driven. Thus, a further reduction in the time for the web splicing motion can be made, and the actions and effects of the present embodiment stated above are further enhanced.

[0084] Furthermore, control is exercised such that when the rotational speed of the main unit becomes equal to or higher than a slower speed, the peripheral speed of the new paper roll (remaining paper roll) 12 moved to the web splicing standby position is equated to the transport speed of the web W unwound from the old paper roll

by the A-side new paper roll drive motor 16 and the B-side new paper roll drive motor 18 for rotating the new paper roll 12. Thus, a further reduction in the time for the web splicing motion can be made, and the actions and effects of the present embodiment stated above are further enhanced.

[0085] The strip continuous supply method and apparatus according to the present invention can be applied not only to an offset rotary press, but also to a web material supply apparatus in a machine such as a corrugator or a laminator.

[0086] While the present invention has been described by the above embodiment, it is to be understood that the invention is not limited to this embodiment, but may be varied in many other ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the appended claims.

Claims

1. A strip continuous supply method of a strip continuous supply apparatus (1) which includes a turret arm (11) supporting a new web roll (12) and an old web roll (13) and supported pivotably, and a turret arm drive device (14) for pivoting the turret arm (11), and which splices a strip (W) of the new web roll (12) to a strip (W) of the old web roll (13) and supplies the strip (W) continuously,
the strip continuous supplymethod comprising driving the turret arm drive device (14), before driving of a main unit, to pivot the turret arm (11), thereby moving the new web roll (12) to a web splicing standby position.

2. The strip continuous supply method according to claim 1,
further comprising moving a web splicing unit (20) to the web splicing standby position before driving of the main unit,
the web splicing unit (20) including a pressing member (25) for pressing the strip (W) of the new web roll (12) against the strip (W) of the old web roll (13), and a cutting member (26) for cutting the strip (W) of the old web roll (13).

3. The strip continuous supply method according to claim 1,
further comprising driving new web roll drive means (16, 18) such that a peripheral speed of the new web roll (12) becomes equal to a transport speed of the strip (W) unwound from the old web roll (13) , when the main unit begins to rotate,
the new web roll drive means (16, 18) being adapted to rotate the new web roll (12).

4. The strip continuous supply method according to claim 2 or 3, **characterized in that**
when a rotational speed of the main unit is equal to or higher than a preset rotational speed, the new web roll (12) is moved to the web splicing standby position, and the web splicing unit (20) is moved to the web splicing standby position, and
the new web roll drive means (16, 18) is driven such that the peripheral speed of the new web roll (12) becomes equal to a transport speed of the strip (W) unwound from the old web roll (13).

5. A strip continuous supply apparatus (1) which includes a turret arm (11) supporting a new web roll (12) and an old web roll (13) and supported pivotably, and a turret arm drive device (14) for pivoting the turret arm (11), and which splices a strip (W) of the new web roll (12) to a strip (W) of the old web roll (13) and supplies the strip (W) continuously,
further comprising a control device (40) for driving the turret arm drive device (14), before driving of a main unit, to pivot the turret arm (11), thereby moving the new web roll (12) to a web splicing standby position.

6. The strip continuous supply apparatus according to claim 5,
further comprising a web splicing unit (20) including a pressing member (25) for pressing the strip (W) of the new web roll (12) against the strip (W) of the old web roll (13), and a cutting member (26) for cutting the strip (W) of the old web roll (13), and
wherein the control device (40) moves the web splicing unit (20) to the web splicing standby position before driving of the main unit.

7. The strip continuous supply apparatus according to claim 5,
further comprising new web roll drive means (16, 18) for rotating the new web roll (12), and
wherein the control device (40) drives the new web roll drive means (16, 18) such that a peripheral speed of the new web roll (12) becomes equal to a transport speed of the strip (W) unwound from the old web roll (13), when the main unit begins to rotate.

8. The strip continuous supply apparatus according to claim 6 or 7, **characterized in that**
when a rotational speed of the main unit is equal to or higher than a preset rotational speed, the control device (40) moves the new web roll (12) to the web splicing standby position, and also moves the web splicing unit (20) to the web splicing standby position, and further drives the new web roll drive means (16, 18) such that the peripheral speed of the new web roll (12) becomes equal to the transport speed of the strip (W) unwound from the old web roll (13).

Fig.1

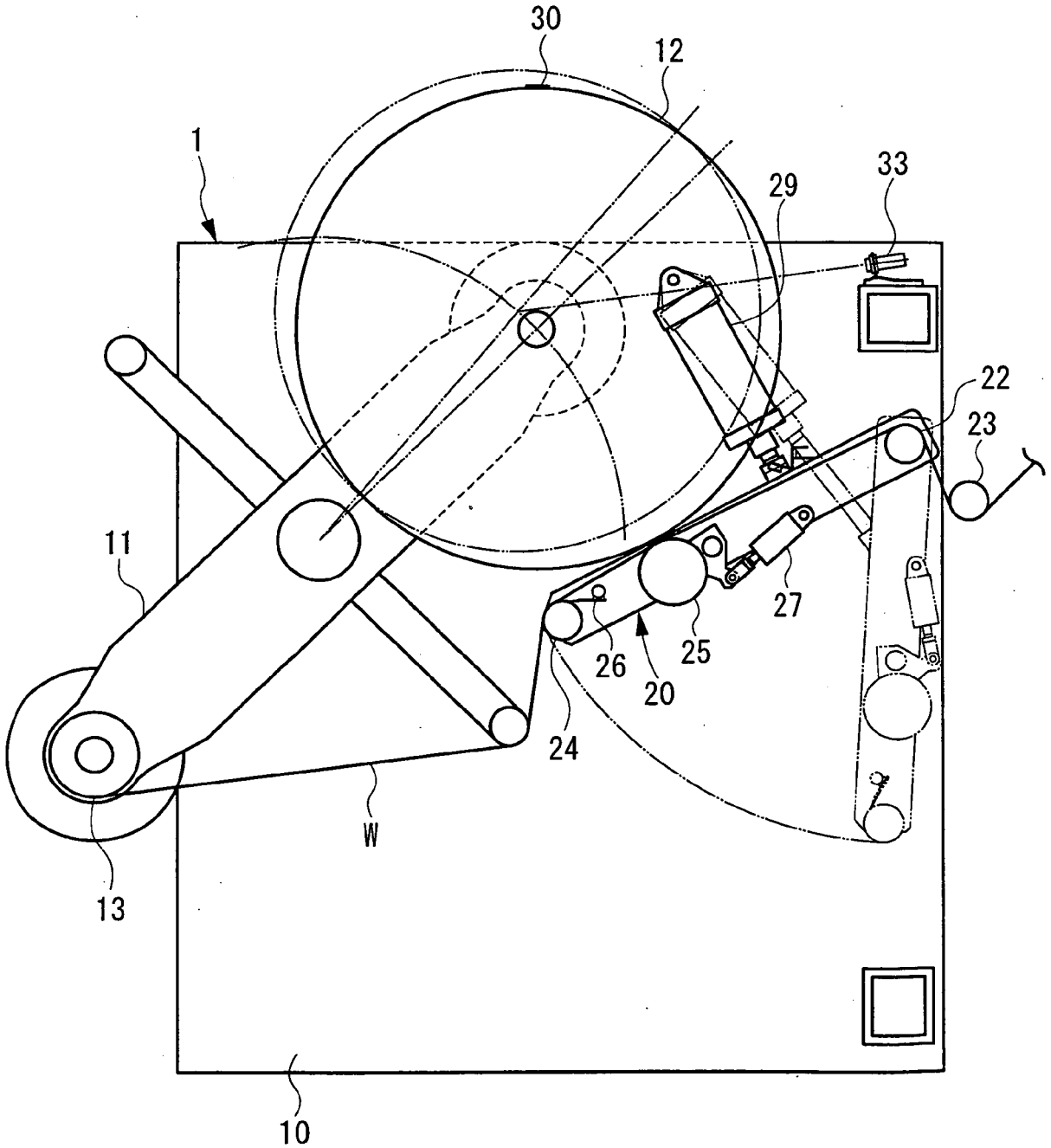


Fig. 2

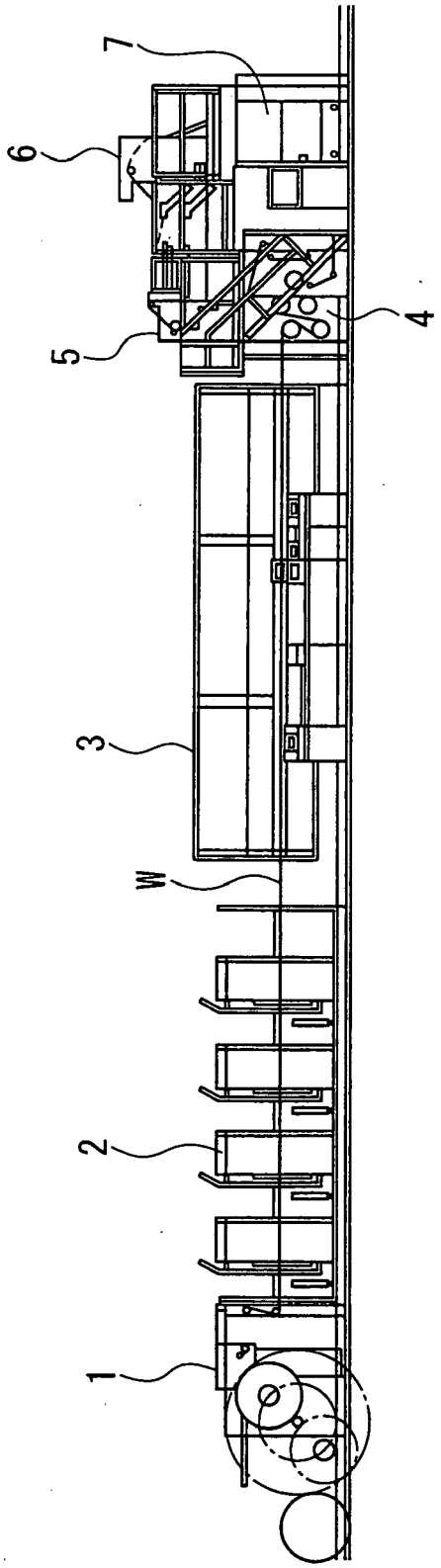


Fig. 3(a)

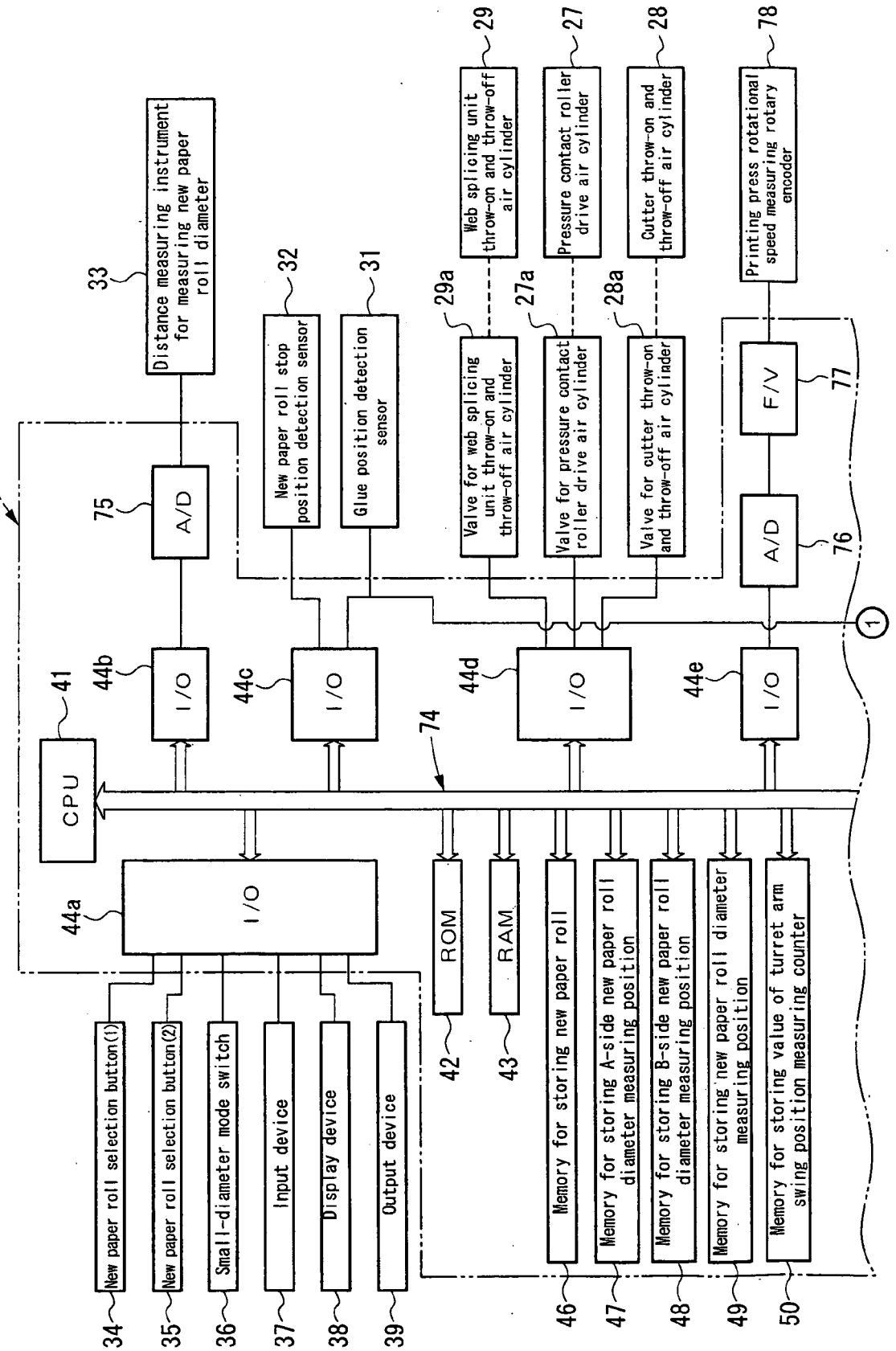

40
41
CPU
44a
I/O
44b
I/O
44c
I/O
44d
I/O
44e
I/O
74
75
A/D
76
A/D
77
F/V
78
Printing press rotational speed measuring rotary encoder
33
Distance measuring instrument for measuring new paper roll diameter
32
New paper roll stop position detection sensor
31
Glue position detection sensor
29a
Valve for web splicing unit throw-on and throw-off air cylinder
27a
Valve for pressure contact roller drive air cylinder
28a
Valve for cutter throw-on and throw-off air cylinder
29
Web splicing unit throw-on and throw-off air cylinder
27
Pressure contact roller drive air cylinder
28
Cutter throw-on and throw-off air cylinder
①
34
New paper roll selection button(1)
35
New paper roll selection button(2)
36
Small-diameter mode switch
37
Input device
38
Display device
39
Output device
42
ROM
43
RAM
46
Memory for storing new paper roll
47
Memory for storing A-side new paper roll diameter measuring position
48
Memory for storing B-side new paper roll diameter measuring position
49
Memory for storing new paper roll diameter measuring position
50
Memory for storing value of turret arm swing position measuring counter

Fig. 3(b)

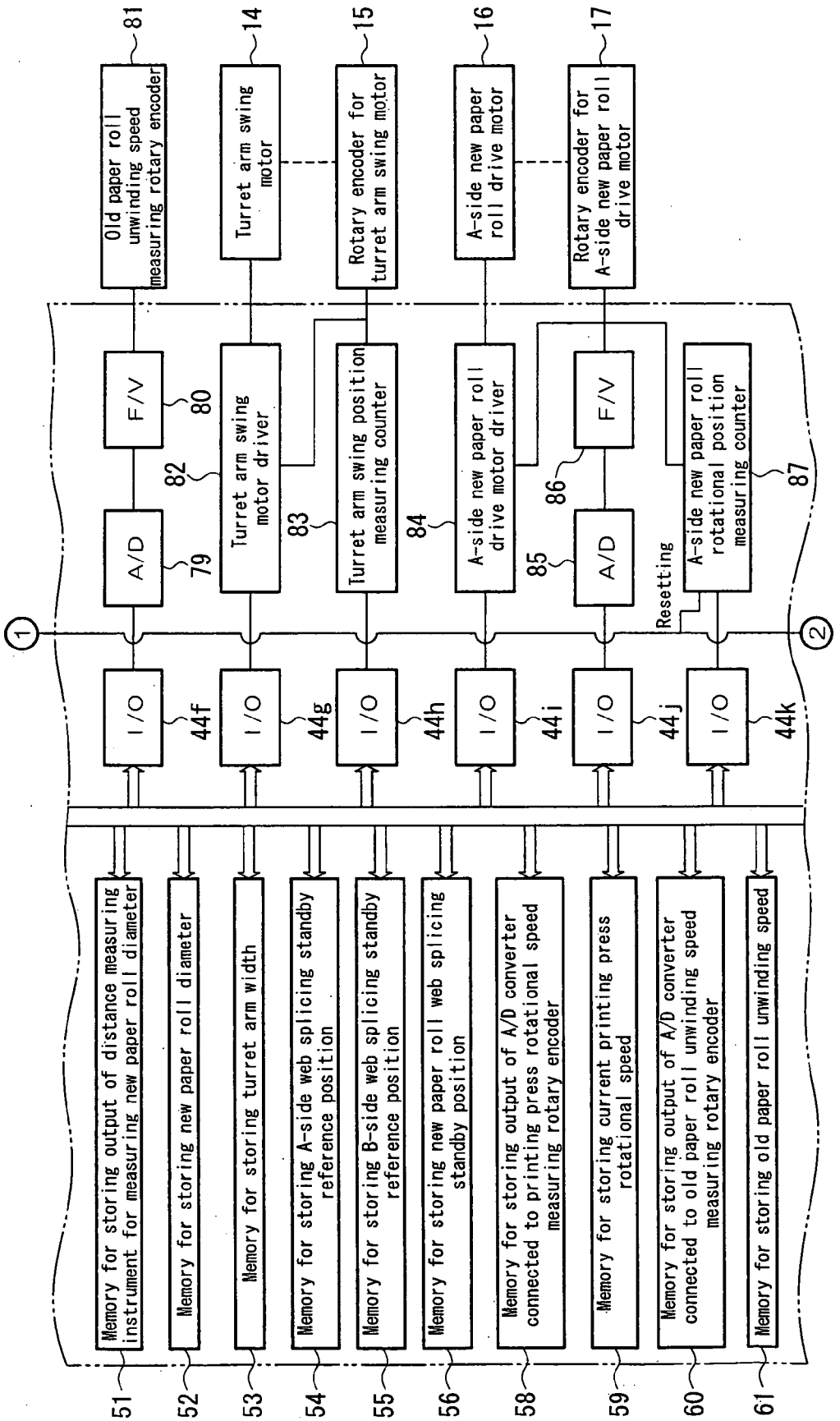

Old paper roll unwinding speed measuring rotary encoder
81
Turret arm swing motor
14
Rotary encoder for turret arm swing motor
15
A-side new paper roll drive motor
16
Rotary encoder for A-side new paper roll drive motor
17
F/V
80
A/D
79
82
Turret arm swing motor driver
83
Turret arm swing position measuring counter
84
A-side new paper roll drive motor driver
85
A/D
86
F/V
Resetting
A-side new paper roll rotational position measuring counter
87
I/O
44f
I/O
44g
I/O
44h
I/O
44i
I/O
44j
I/O
44k
①
②
Memory for storing output of distance measuring instrument for measuring new paper roll diameter
51
Memory for storing new paper roll diameter
52
Memory for storing turret arm width
53
Memory for storing A-side web splicing standby reference position
54
Memory for storing B-side web splicing standby reference position
55
Memory for storing new paper roll web splicing standby position
56
Memory for storing output of A/D converter connected to printing press rotational speed measuring rotary encoder
58
Memory for storing current printing press rotational speed
59
Memory for storing output of A/D converter connected to old paper roll unwinding speed measuring rotary encoder
60
Memory for storing old paper roll unwinding speed
61

Fig. 3(c)

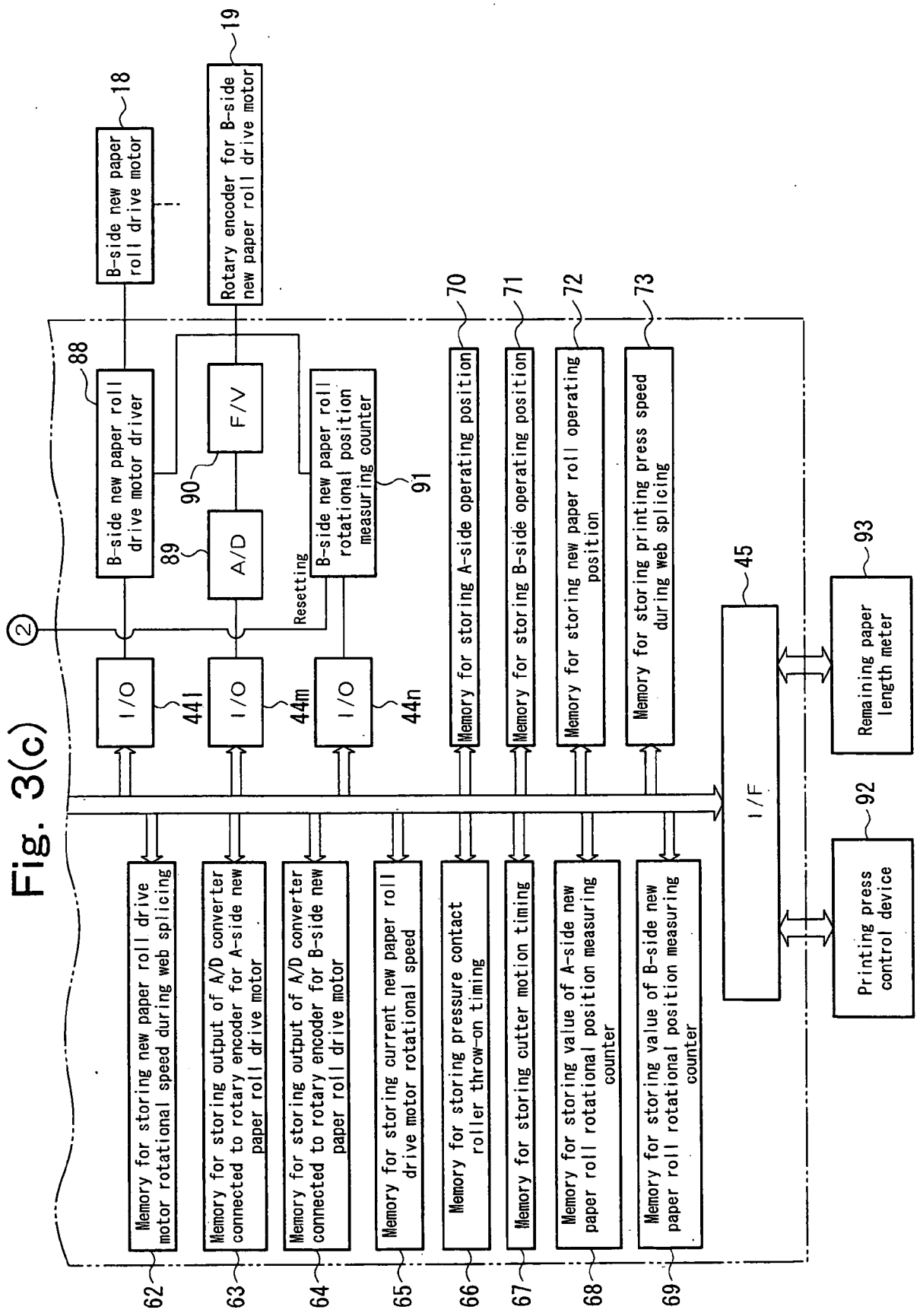

B-side new paper roll drive motor
18
Rotary encoder for B-side new paper roll drive motor
19
B-side new paper roll drive motor driver
88
F/V
90
A/D
89
Resetting
B-side new paper roll rotational position measuring counter
91
I/O
44l
I/O
44m
I/O
44n
Memory for storing A-side operating position
70
Memory for storing B-side operating position
71
Memory for storing new paper roll operating position
72
Memory for storing printing press speed during web splicing
73
45
I/F
Remaining paper length meter
93
Printing press control device
92
Memory for storing new paper roll drive motor rotational speed during web splicing
62
Memory for storing output of A/D converter connected to rotary encoder for A-side new paper roll drive motor
63
Memory for storing output of A/D converter connected to rotary encoder for B-side new paper roll drive motor
64
Memory for storing current new paper roll drive motor rotational speed
65
Memory for storing pressure contact roller throw-on timing
66
Memory for storing cutter motion timing
67
Memory for storing value of A-side new paper roll rotational position measuring counter
68
Memory for storing value of B-side new paper roll rotational position measuring counter
69

Fig.4(a)

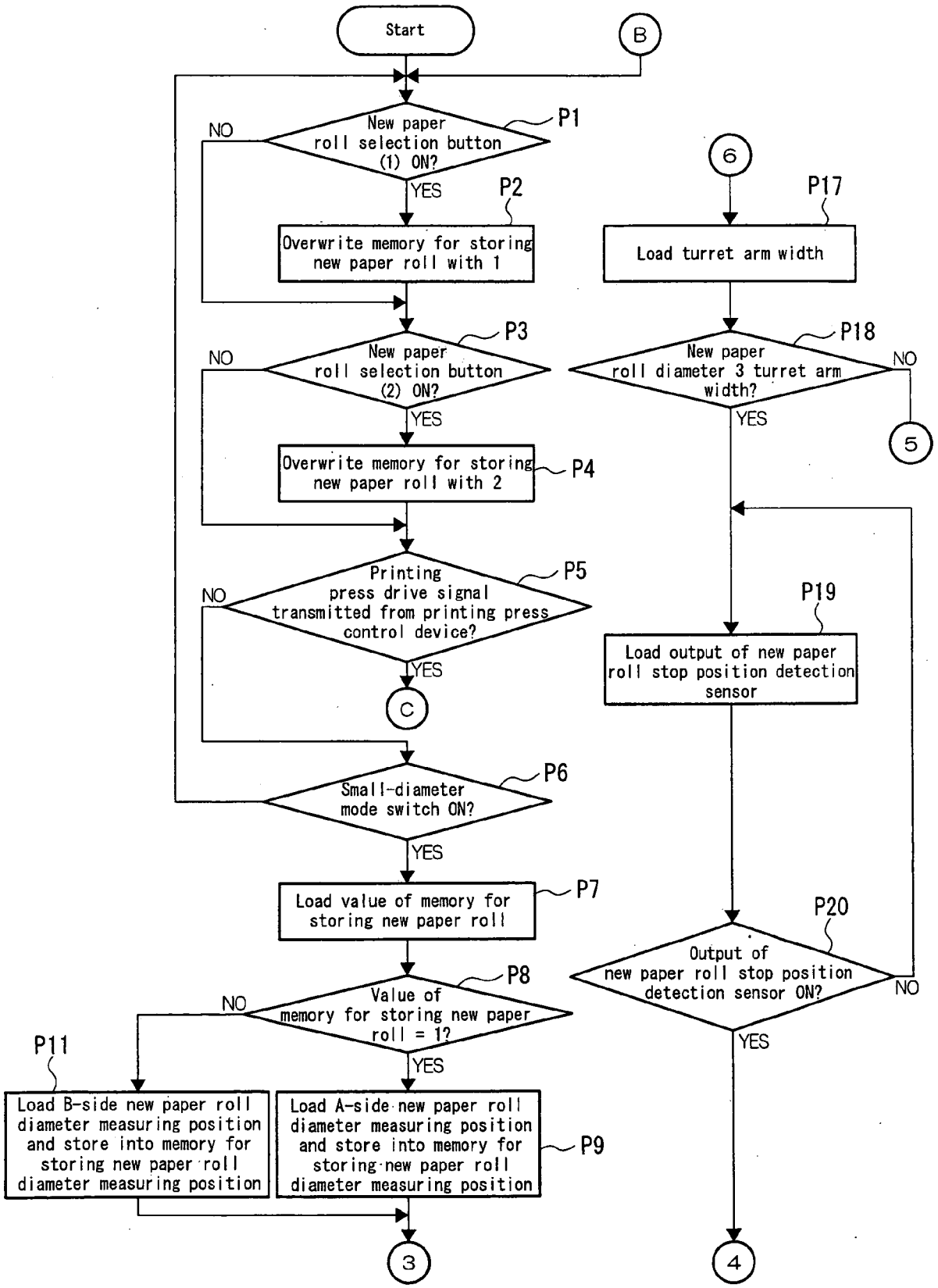

Start
B
New paper roll selection button (1) ON?
P1
NO
YES
Overwrite memory for storing new paper roll with 1
P2
New paper roll selection button (2) ON?
P3
NO
YES
Overwrite memory for storing new paper roll with 2
P4
Printing press drive signal transmitted from printing press control device?
P5
NO
YES
C
Small-diameter mode switch ON?
P6
YES
Load value of memory for storing new paper roll
P7
Value of memory for storing new paper roll = 1?
P8
NO
YES
Load B-side new paper roll diameter measuring position and store into memory for storing new paper roll diameter measuring position
P11
Load A-side new paper roll diameter measuring position and store into memory for storing new paper roll diameter measuring position
P9
3
6
Load turret arm width
P17
New paper roll diameter 3 turret arm width?
P18
NO
YES
5
Load output of new paper roll stop position detection sensor
P19
Output of new paper roll stop position detection sensor ON?
P20
NO
YES
4

Fig.4(b)

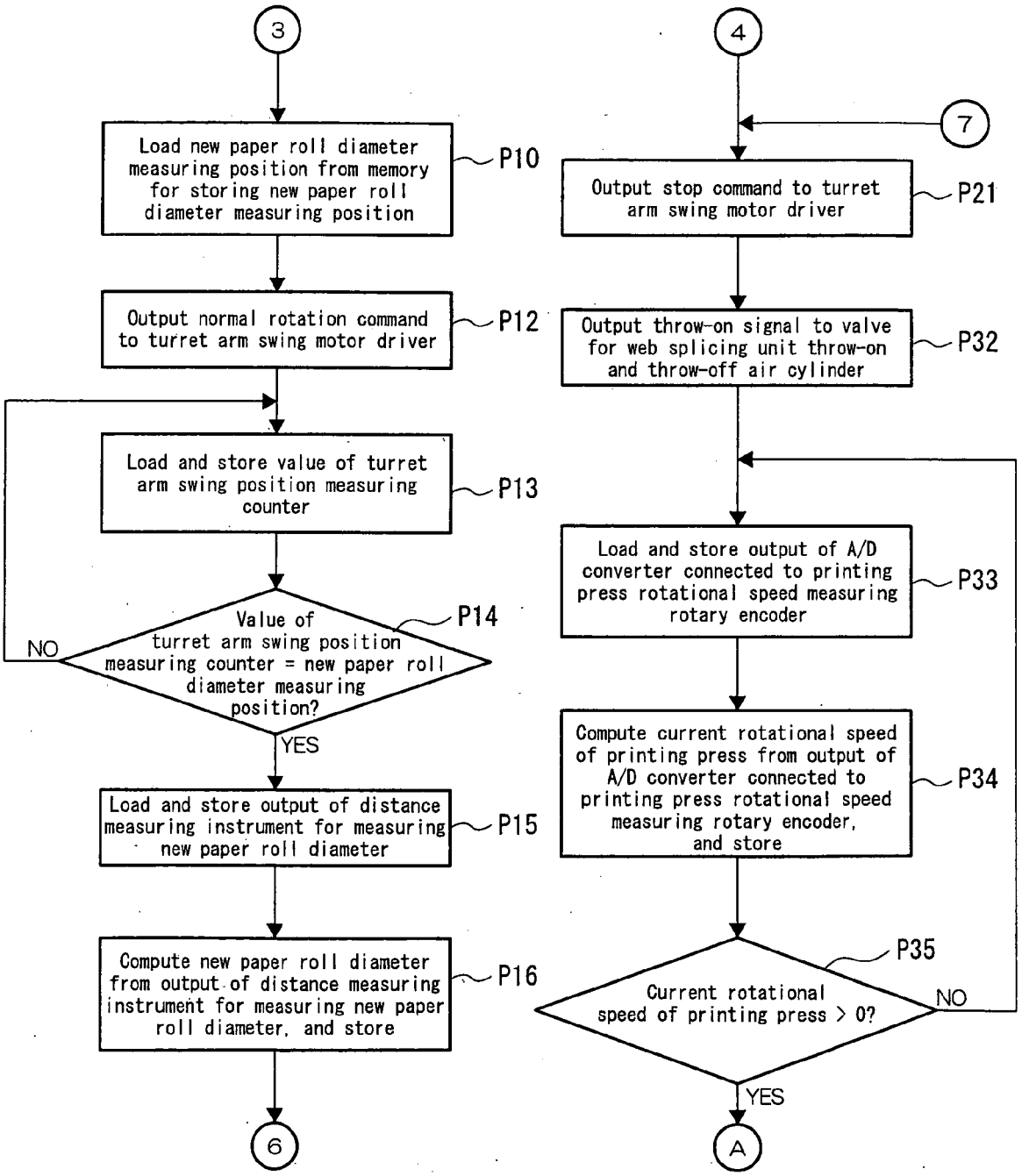

3
Load new paper roll diameter measuring position from memory for storing new paper roll diameter measuring position
P10
Output normal rotation command to turret arm swing motor driver
P12
Load and store value of turret arm swing position measuring counter
P13
Value of turret arm swing position measuring counter = new paper roll diameter measuring position?
P14
NO
YES
Load and store output of distance measuring instrument for measuring new paper roll diameter
P15
Compute new paper roll diameter from output of distance measuring instrument for measuring new paper roll diameter, and store
P16
6
4
7
Output stop command to turret arm swing motor driver
P21
Output throw-on signal to valve for web splicing unit throw-on and throw-off air cylinder
P32
Load and store output of A/D converter connected to printing press rotational speed measuring rotary encoder
P33
Compute current rotational speed of printing press from output of A/D converter connected to printing press rotational speed measuring rotary encoder, and store
P34
Current rotational speed of printing press > 0?
P35
NO
YES
A

Fig.4(c)

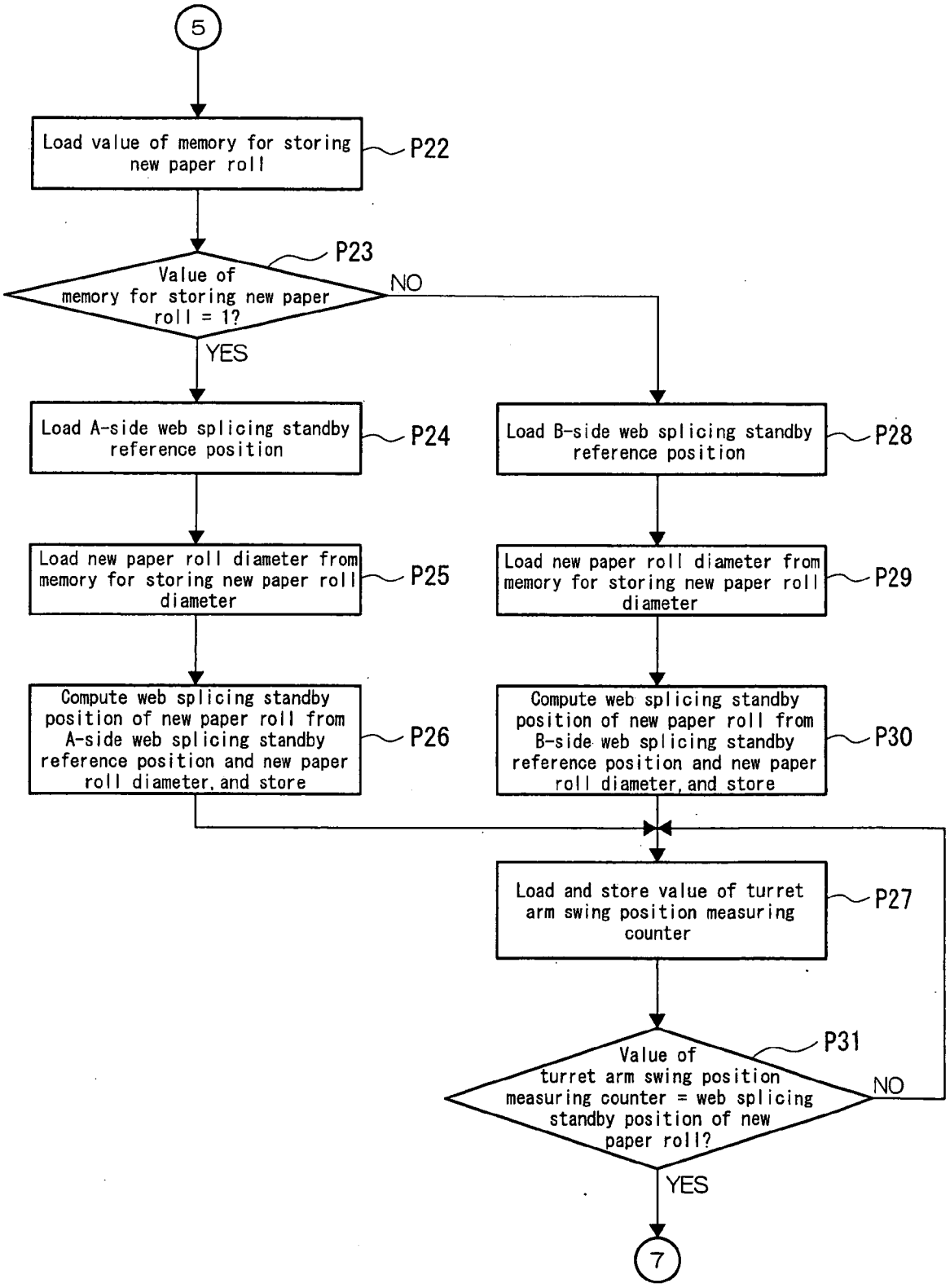

5
Load value of memory for storing new paper roll
P22
Value of memory for storing new paper roll = 1?
P23
NO
YES
Load A-side web splicing standby reference position
P24
Load new paper roll diameter from memory for storing new paper roll diameter
P25
Compute web splicing standby position of new paper roll from A-side web splicing standby reference position and new paper roll diameter, and store
P26
Load B-side web splicing standby reference position
P28
Load new paper roll diameter from memory for storing new paper roll diameter
P29
Compute web splicing standby position of new paper roll from B-side web splicing standby reference position and new paper roll diameter, and store
P30
Load and store value of turret arm swing position measuring counter
P27
Value of turret arm swing position measuring counter = web splicing standby position of new paper roll?
P31
NO
YES
7

Fig.5(a)

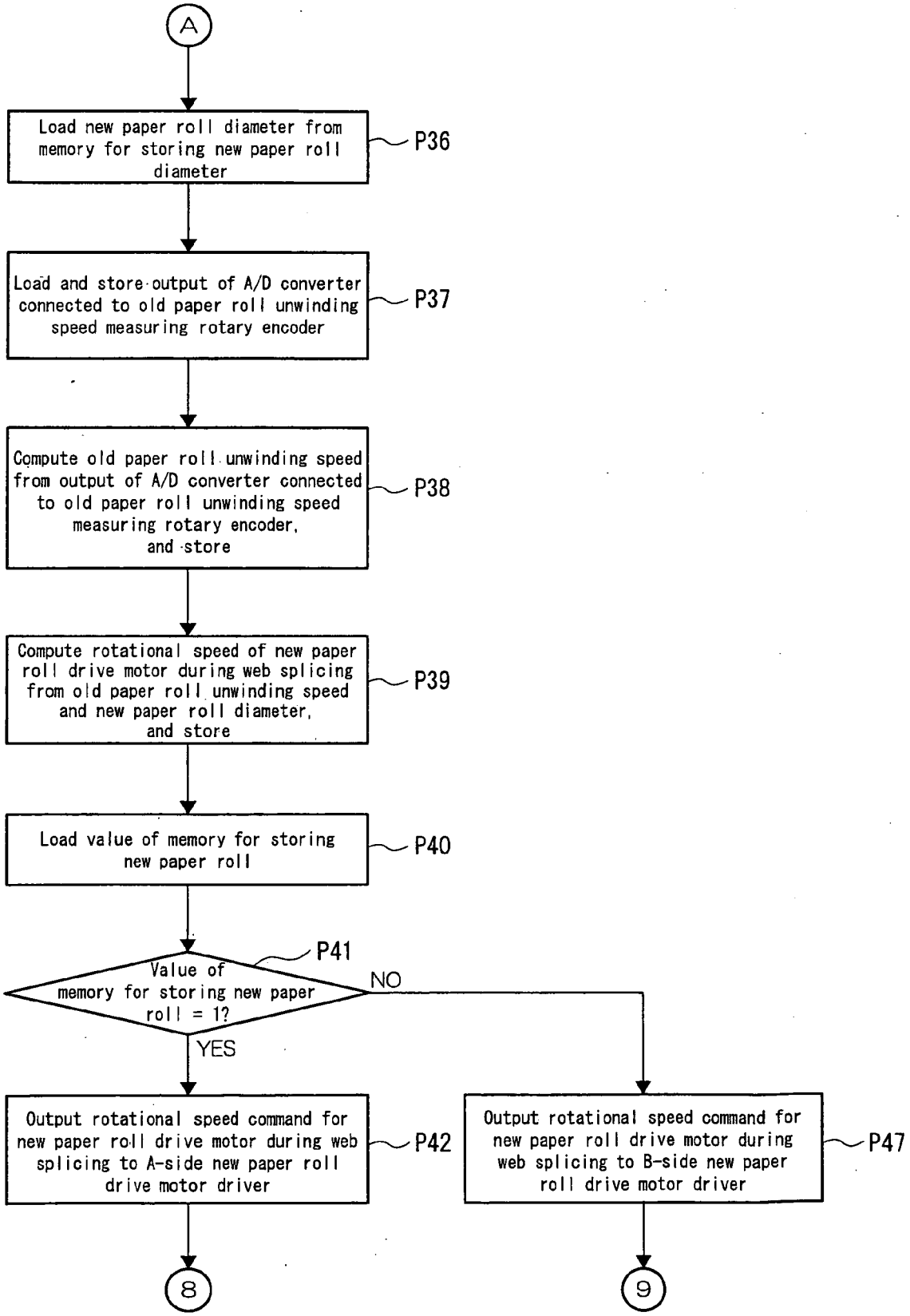

A
Load new paper roll diameter from memory for storing new paper roll diameter
P36
Load and store output of A/D converter connected to old paper roll unwinding speed measuring rotary encoder
P37
Compute old paper roll unwinding speed from output of A/D converter connected to old paper roll unwinding speed measuring rotary encoder, and store
P38
Compute rotational speed of new paper roll drive motor during web splicing from old paper roll unwinding speed and new paper roll diameter, and store
P39
Load value of memory for storing new paper roll
P40
Value of memory for storing new paper roll = 1?
P41
NO
YES
Output rotational speed command for new paper roll drive motor during web splicing to A-side new paper roll drive motor driver
P42
Output rotational speed command for new paper roll drive motor during web splicing to B-side new paper roll drive motor driver
P47
8
9

Fig.5(b)

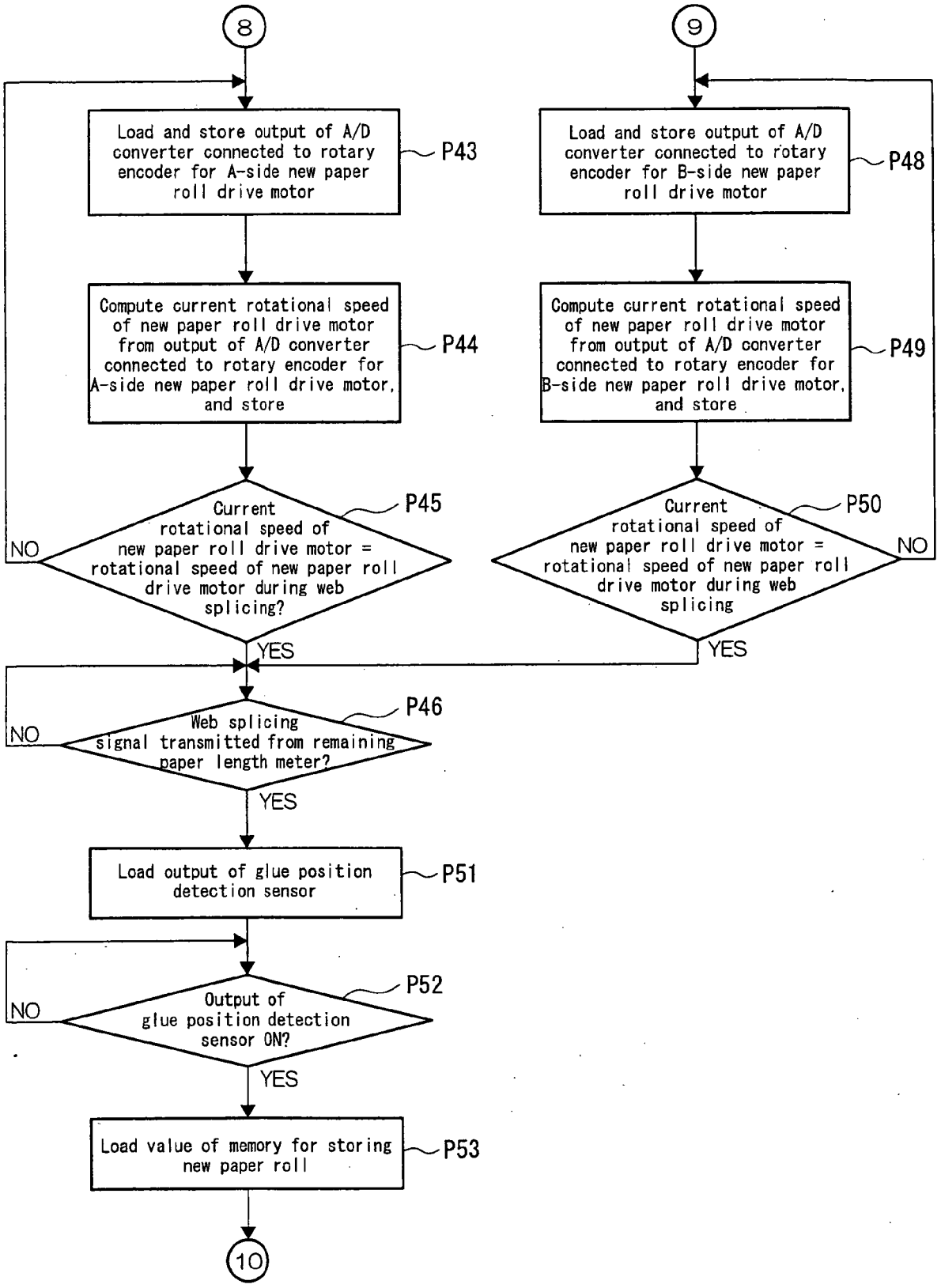

8
9
Load and store output of A/D converter connected to rotary encoder for A-side new paper roll drive motor
P43
Load and store output of A/D converter connected to rotary encoder for B-side new paper roll drive motor
P48
Compute current rotational speed of new paper roll drive motor from output of A/D converter connected to rotary encoder for A-side new paper roll drive motor, and store
P44
Compute current rotational speed of new paper roll drive motor from output of A/D converter connected to rotary encoder for B-side new paper roll drive motor, and store
P49
Current rotational speed of new paper roll drive motor = rotational speed of new paper roll drive motor during web splicing?
P45
NO
YES
Current rotational speed of new paper roll drive motor = rotational speed of new paper roll drive motor during web splicing
P50
NO
YES
Web splicing signal transmitted from remaining paper length meter?
P46
NO
YES
Load output of glue position detection sensor
P51
Output of glue position detection sensor ON?
P52
NO
YES
Load value of memory for storing new paper roll
P53
10

Fig.5(c)

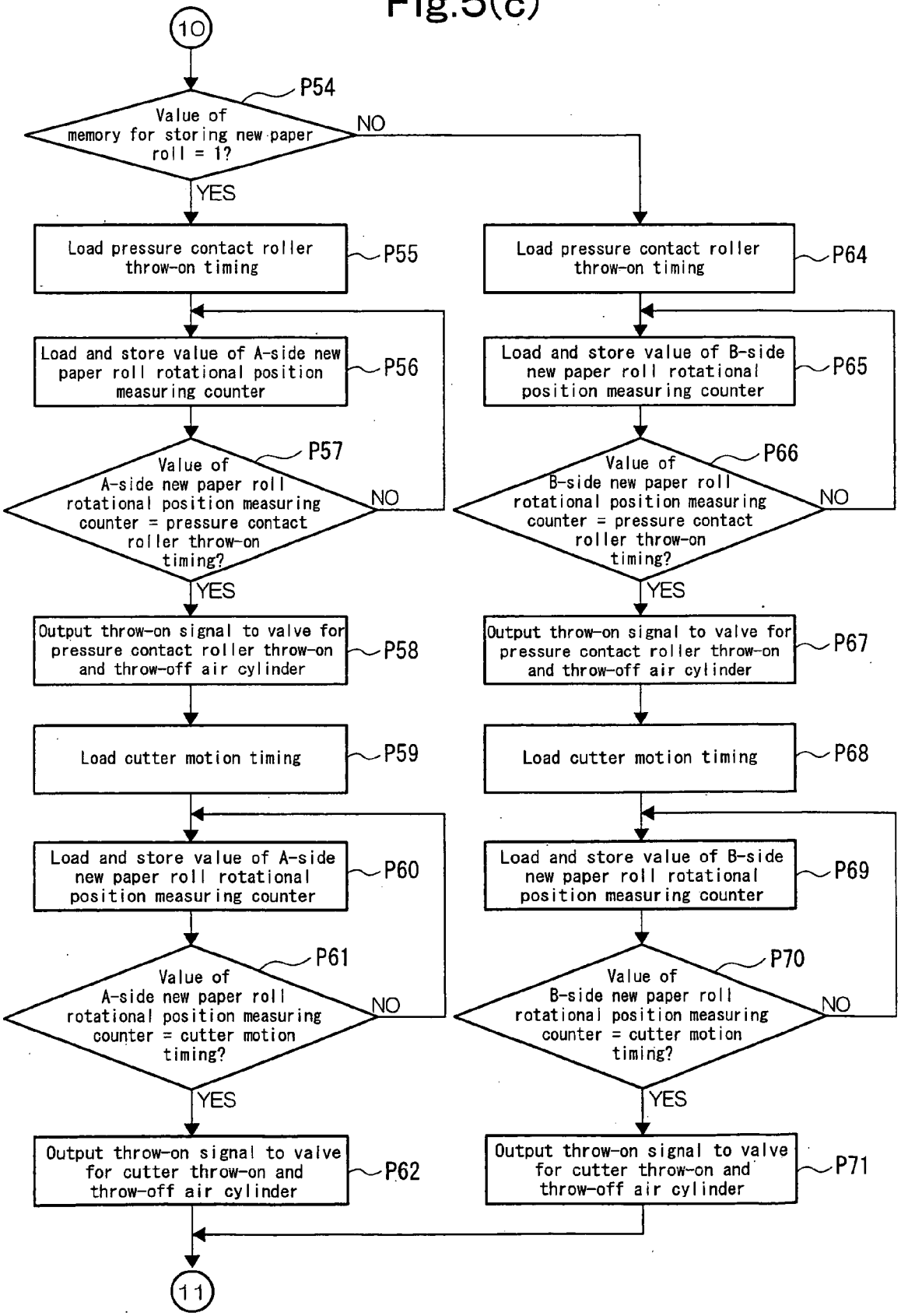

10
P54
Value of memory for storing new paper roll = 1?
NO
YES
Load pressure contact roller throw-on timing
P55
Load and store value of A-side new paper roll rotational position measuring counter
P56
Value of A-side new paper roll rotational position measuring counter = pressure contact roller throw-on timing?
P57
NO
YES
Output throw-on signal to valve for pressure contact roller throw-on and throw-off air cylinder
P58
Load cutter motion timing
P59
Load and store value of A-side new paper roll rotational position measuring counter
P60
Value of A-side new paper roll rotational position measuring counter = cutter motion timing?
P61
NO
YES
Output throw-on signal to valve for cutter throw-on and throw-off air cylinder
P62
Load pressure contact roller throw-on timing
P64
Load and store value of B-side new paper roll rotational position measuring counter
P65
Value of B-side new paper roll rotational position measuring counter = pressure contact roller throw-on timing?
P66
NO
YES
Output throw-on signal to valve for pressure contact roller throw-on and throw-off air cylinder
P67
Load cutter motion timing
P68
Load and store value of B-side new paper roll rotational position measuring counter
P69
Value of B-side new paper roll rotational position measuring counter = cutter motion timing?
P70
NO
YES
Output throw-on signal to valve for cutter throw-on and throw-off air cylinder
P71
11

Fig.5(d)

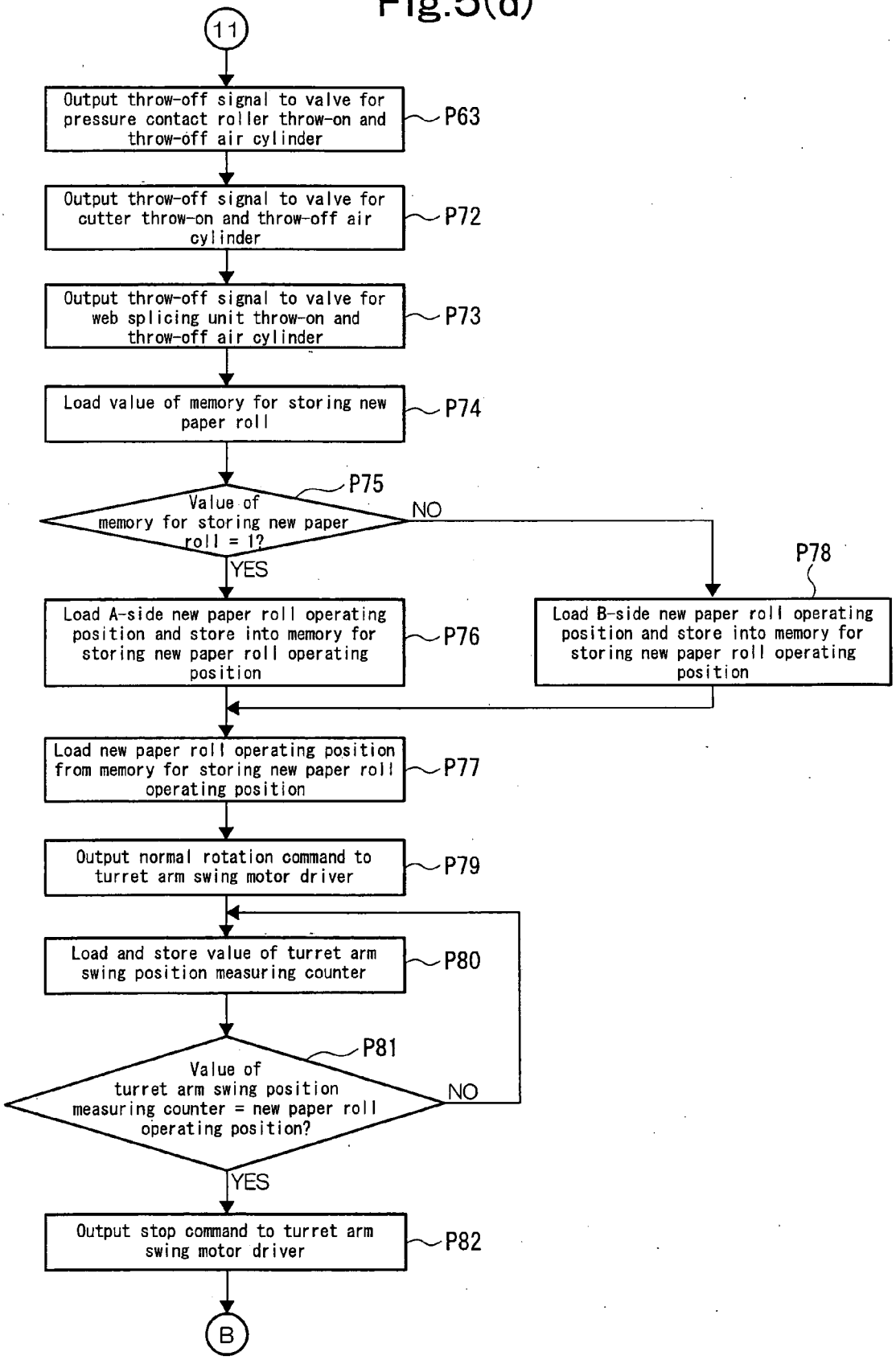

11
Output throw-off signal to valve for pressure contact roller throw-on and throw-off air cylinder
P63
Output throw-off signal to valve for cutter throw-on and throw-off air cylinder
P72
Output throw-off signal to valve for web splicing unit throw-on and throw-off air cylinder
P73
Load value of memory for storing new paper roll
P74
P75
Value of memory for storing new paper roll = 1?
NO
YES
P78
Load A-side new paper roll operating position and store into memory for storing new paper roll operating position
P76
Load B-side new paper roll operating position and store into memory for storing new paper roll operating position
Load new paper roll operating position from memory for storing new paper roll operating position
P77
Output normal rotation command to turret arm swing motor driver
P79
Load and store value of turret arm swing position measuring counter
P80
P81
Value of turret arm swing position measuring counter = new paper roll operating position?
NO
YES
Output stop command to turret arm swing motor driver
P82
B

Fig.6(a)

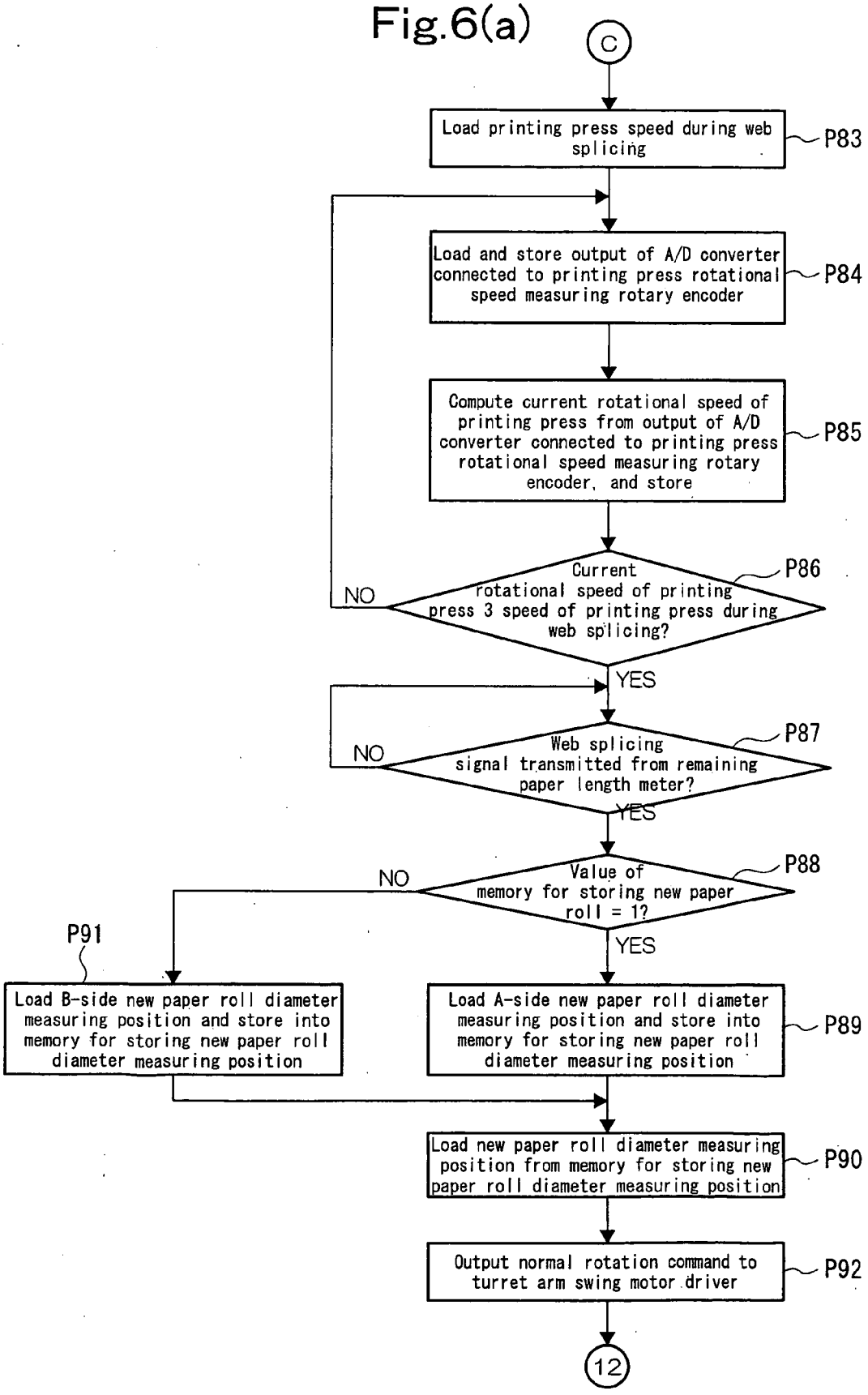

C
Load printing press speed during web splicing
P83
Load and store output of A/D converter connected to printing press rotational speed measuring rotary encoder
P84
Compute current rotational speed of printing press from output of A/D converter connected to printing press rotational speed measuring rotary encoder, and store
P85
Current rotational speed of printing press 3 speed of printing press during web splicing?
P86
NO
YES
Web splicing signal transmitted from remaining paper length meter?
P87
NO
YES
Value of memory for storing new paper roll = 1?
P88
NO
YES
P91
Load B-side new paper roll diameter measuring position and store into memory for storing new paper roll diameter measuring position
Load A-side new paper roll diameter measuring position and store into memory for storing new paper roll diameter measuring position
P89
Load new paper roll diameter measuring position from memory for storing new paper roll diameter measuring position
P90
Output normal rotation command to turret arm swing motor driver
P92
12

Fig.6(b)

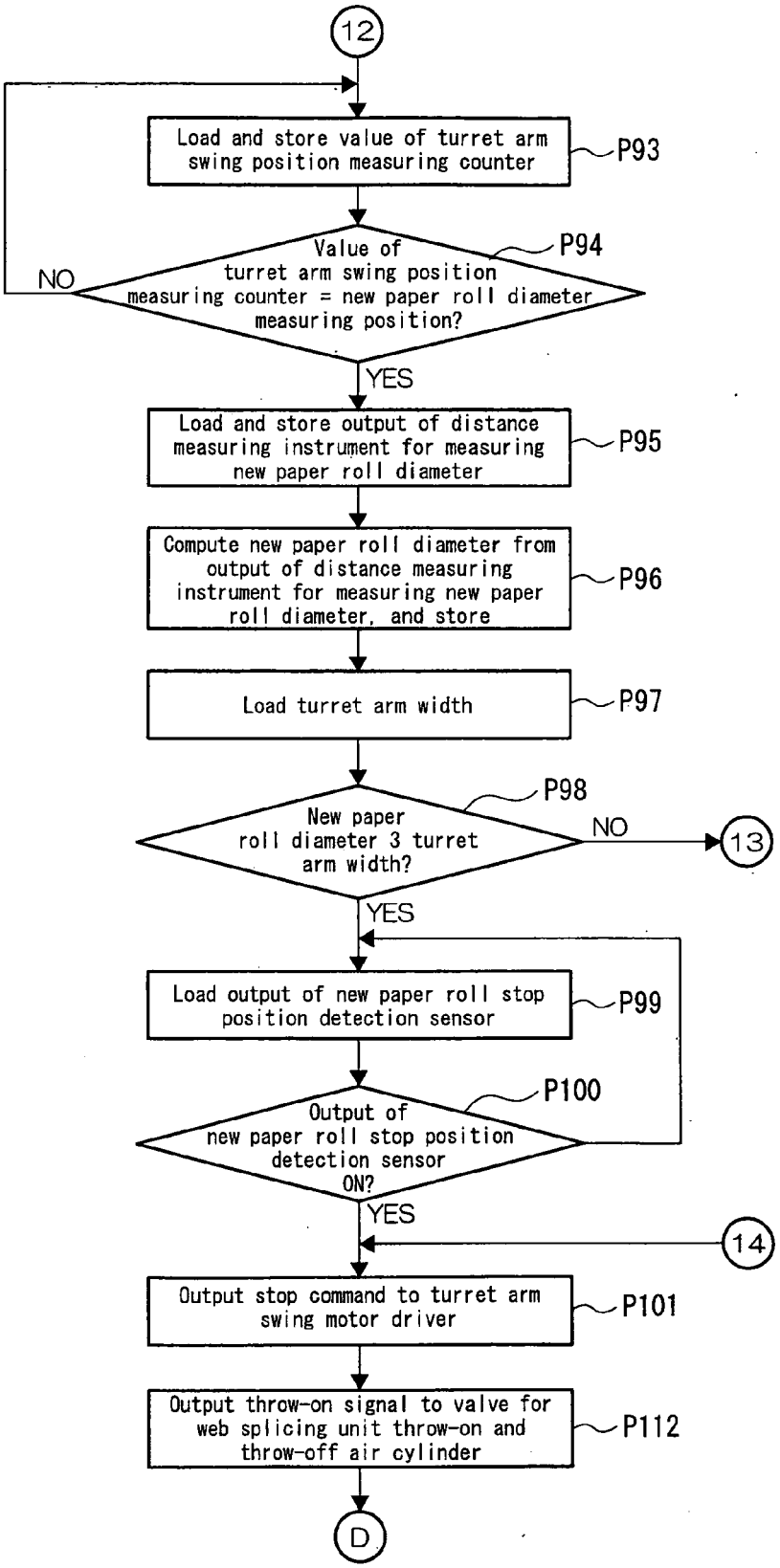

12
Load and store value of turret arm swing position measuring counter
P93
Value of turret arm swing position measuring counter = new paper roll diameter measuring position?
P94
NO
YES
Load and store output of distance measuring instrument for measuring new paper roll diameter
P95
Compute new paper roll diameter from output of distance measuring instrument for measuring new paper roll diameter, and store
P96
Load turret arm width
P97
New paper roll diameter 3 turret arm width?
P98
NO
13
YES
Load output of new paper roll stop position detection sensor
P99
Output of new paper roll stop position detection sensor ON?
P100
YES
14
Output stop command to turret arm swing motor driver
P101
Output throw-on signal to valve for web splicing unit throw-on and throw-off air cylinder
P112
D

Fig.6(c)

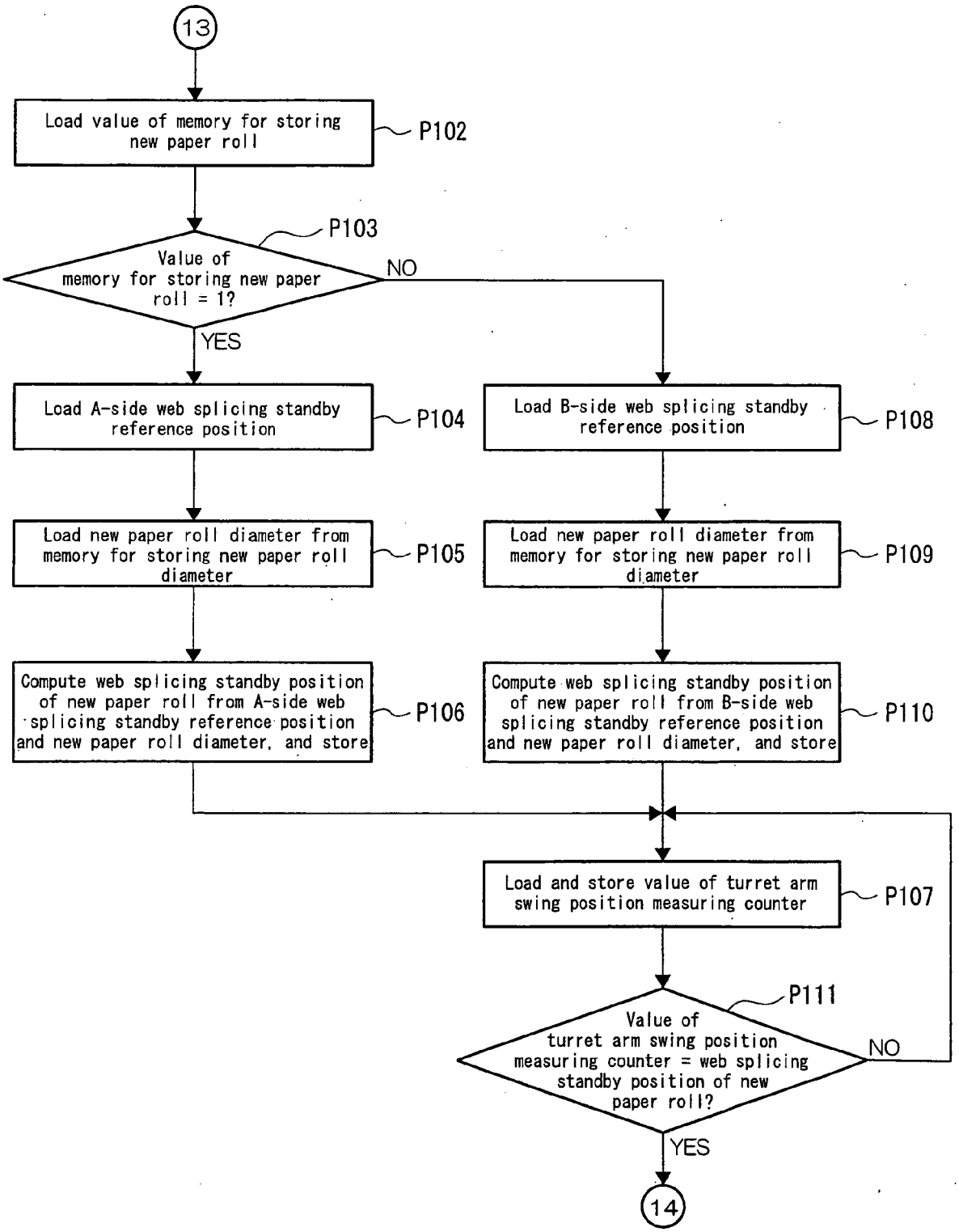

13
Load value of memory for storing new paper roll
P102
P103
Value of memory for storing new paper roll = 1?
NO
YES
Load A-side web splicing standby reference position
P104
Load B-side web splicing standby reference position
P108
Load new paper roll diameter from memory for storing new paper roll diameter
P105
Load new paper roll diameter from memory for storing new paper roll diameter
P109
Compute web splicing standby position of new paper roll from A-side web splicing standby reference position and new paper roll diameter, and store
P106
Compute web splicing standby position of new paper roll from B-side web splicing standby reference position and new paper roll diameter, and store
P110
Load and store value of turret arm swing position measuring counter
P107
P111
Value of turret arm swing position measuring counter = web splicing standby position of new paper roll?
NO
YES
14

Fig.7(a)

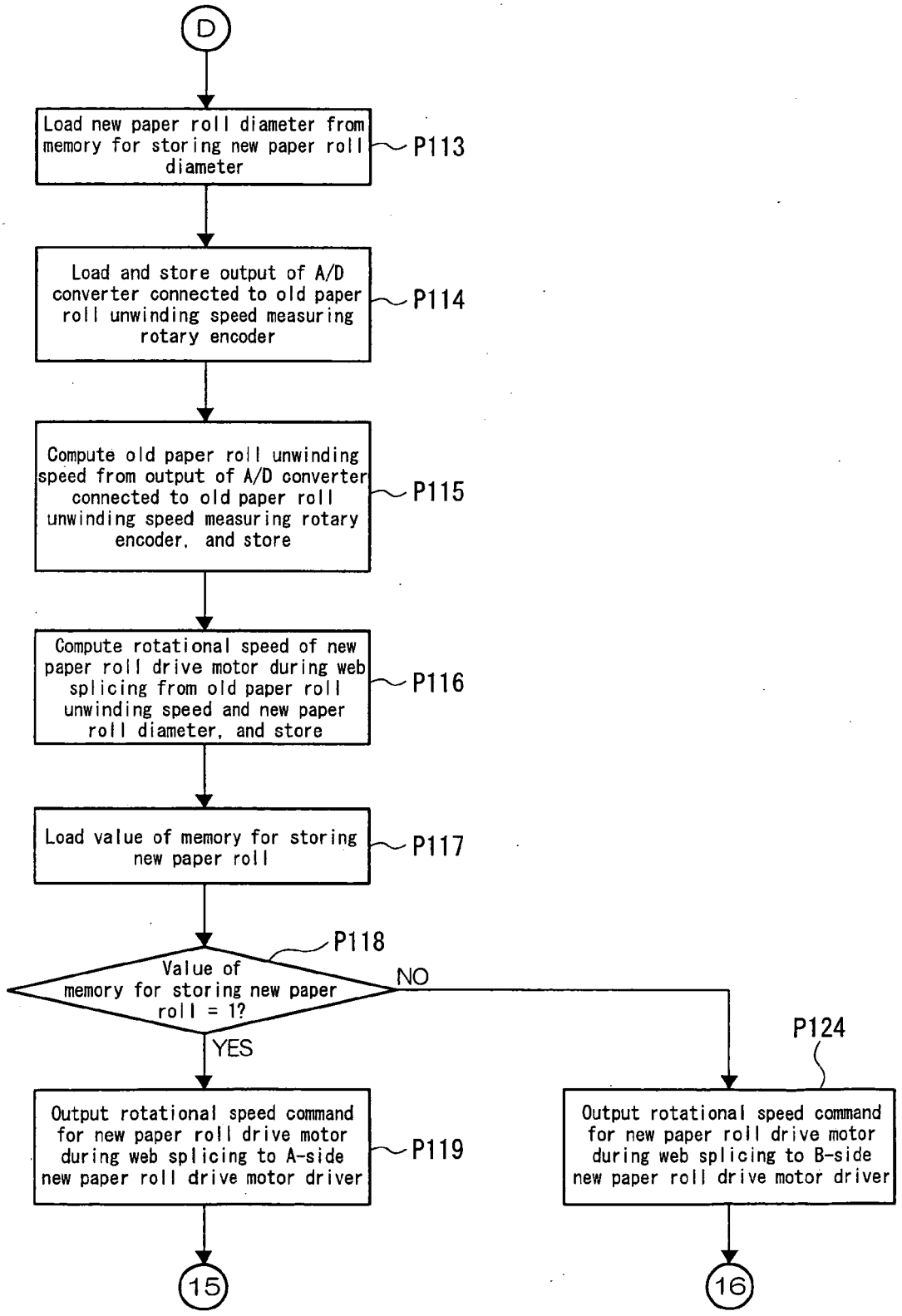

D
Load new paper roll diameter from memory for storing new paper roll diameter
P113
Load and store output of A/D converter connected to old paper roll unwinding speed measuring rotary encoder
P114
Compute old paper roll unwinding speed from output of A/D converter connected to old paper roll unwinding speed measuring rotary encoder, and store
P115
Compute rotational speed of new paper roll drive motor during web splicing from old paper roll unwinding speed and new paper roll diameter, and store
P116
Load value of memory for storing new paper roll
P117
P118
Value of memory for storing new paper roll = 1?
NO
YES
P124
Output rotational speed command for new paper roll drive motor during web splicing to A-side new paper roll drive motor driver
P119
Output rotational speed command for new paper roll drive motor during web splicing to B-side new paper roll drive motor driver
15
16

Fig.7(b)

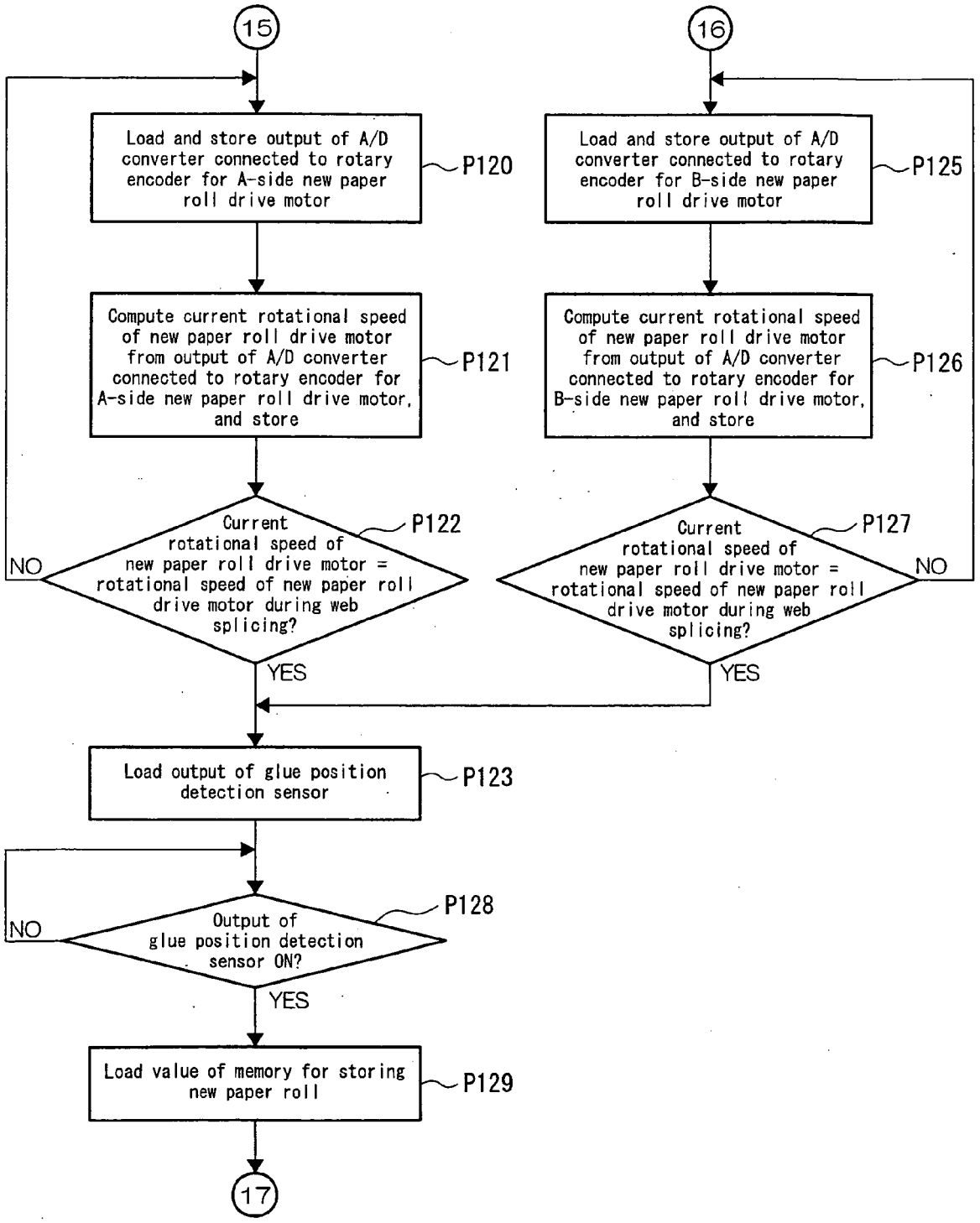

15
16
Load and store output of A/D converter connected to rotary encoder for A-side new paper roll drive motor
P120
Load and store output of A/D converter connected to rotary encoder for B-side new paper roll drive motor
P125
Compute current rotational speed of new paper roll drive motor from output of A/D converter connected to rotary encoder for A-side new paper roll drive motor, and store
P121
Compute current rotational speed of new paper roll drive motor from output of A/D converter connected to rotary encoder for B-side new paper roll drive motor, and store
P126
Current rotational speed of new paper roll drive motor = rotational speed of new paper roll drive motor during web splicing?
P122
NO
YES
Current rotational speed of new paper roll drive motor = rotational speed of new paper roll drive motor during web splicing?
P127
NO
YES
Load output of glue position detection sensor
P123
Output of glue position detection sensor ON?
P128
NO
YES
Load value of memory for storing new paper roll
P129
17

Fig.7(c)

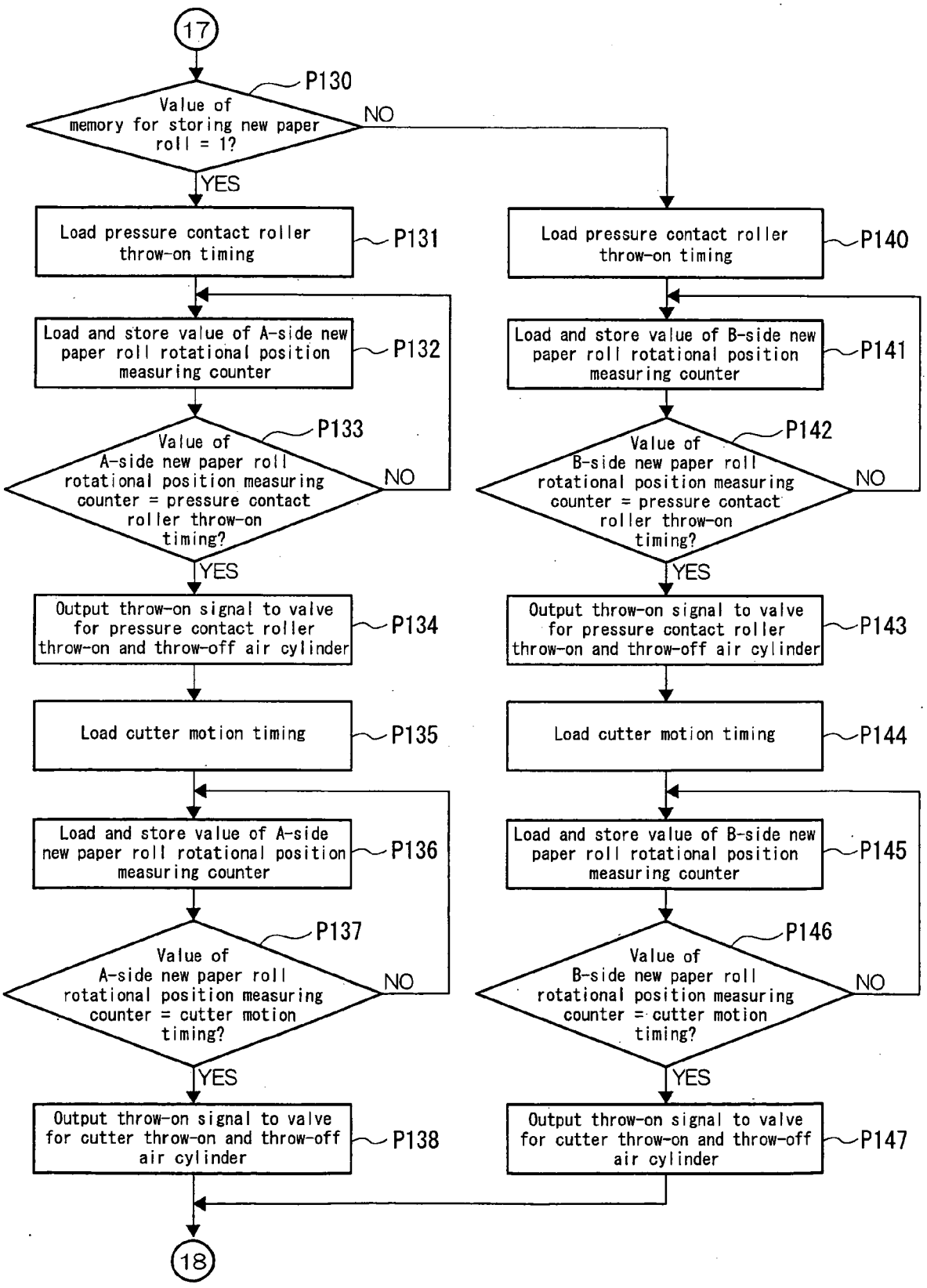
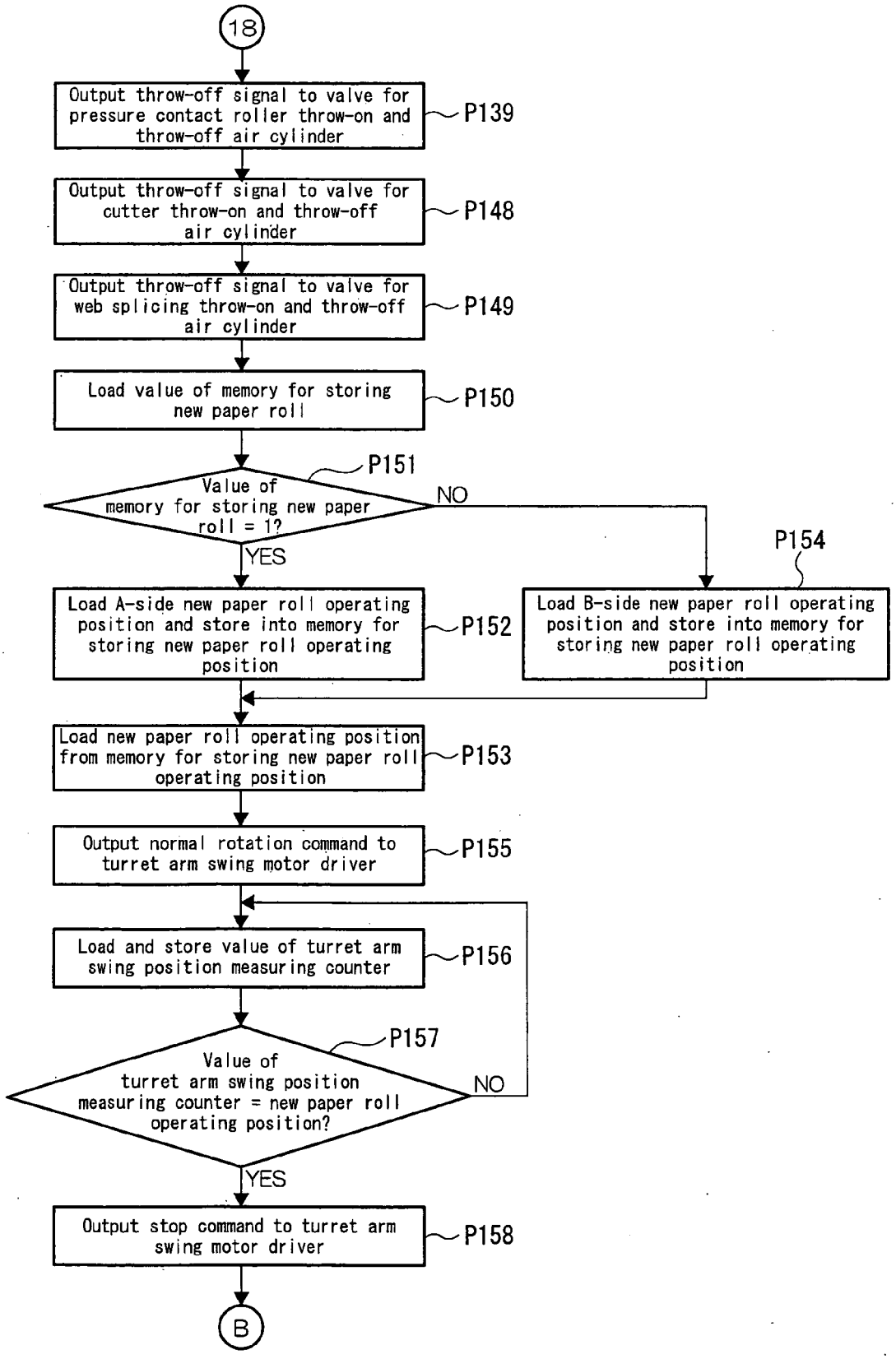

17
P130
Value of memory for storing new paper roll = 1?
NO
YES
Load pressure contact roller throw-on timing
P131
Load and store value of A-side new paper roll rotational position measuring counter
P132
P133
Value of A-side new paper roll rotational position measuring counter = pressure contact roller throw-on timing?
NO
YES
Output throw-on signal to valve for pressure contact roller throw-on and throw-off air cylinder
P134
Load cutter motion timing
P135
Load and store value of A-side new paper roll rotational position measuring counter
P136
P137
Value of A-side new paper roll rotational position measuring counter = cutter motion timing?
NO
YES
Output throw-on signal to valve for cutter throw-on and throw-off air cylinder
P138
Load pressure contact roller throw-on timing
P140
Load and store value of B-side new paper roll rotational position measuring counter
P141
P142
Value of B-side new paper roll rotational position measuring counter = pressure contact roller throw-on timing?
NO
YES
Output throw-on signal to valve for pressure contact roller throw-on and throw-off air cylinder
P143
Load cutter motion timing
P144
Load and store value of B-side new paper roll rotational position measuring counter
P145
P146
Value of B-side new paper roll rotational position measuring counter = cutter motion timing?
NO
YES
Output throw-on signal to valve for cutter throw-on and throw-off air cylinder
P147
18

Fig.7(d)


18
Output throw-off signal to valve for pressure contact roller throw-on and throw-off air cylinder
P139
Output throw-off signal to valve for cutter throw-on and throw-off air cylinder
P148
Output throw-off signal to valve for web splicing throw-on and throw-off air cylinder
P149
Load value of memory for storing new paper roll
P150
P151
Value of memory for storing new paper roll = 1?
NO
YES
P154
Load A-side new paper roll operating position and store into memory for storing new paper roll operating position
P152
Load B-side new paper roll operating position and store into memory for storing new paper roll operating position
Load new paper roll operating position from memory for storing new paper roll operating position
P153
Output normal rotation command to turret arm swing motor driver
P155
Load and store value of turret arm swing position measuring counter
P156
P157
Value of turret arm swing position measuring counter = new paper roll operating position?
NO
YES
Output stop command to turret arm swing motor driver
P158
B

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