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(54) **PRINT SHEET WINDER**

(57) A printing paper winding device greatly expanding the range of base material types that can be wound by enabling winding of even the printing paper with a base material having a low resistance to bending stresses or printing paper having RFID labels carrying the IC chips.
In view of the possibility of reducing bending stresses by dividing the movability region of the tension roller into four regions in order to enable the successive detection of the position or posture of the tension roller and by making the bending angle of the printing paper in the winding path close to a more obtuse angle, the winding control unit of the present invention, which determines whether the tension region where the tension roller is positioned is a first tension region, second tension region, third tension region, or fourth tension region, controls the drive unit so as to limit the tension roller to a tension region in which the winding is possible in the direction such that the bending angle of the printing paper in the winding path, which follows the winding of the printing paper, is close to a more obtuse angle.

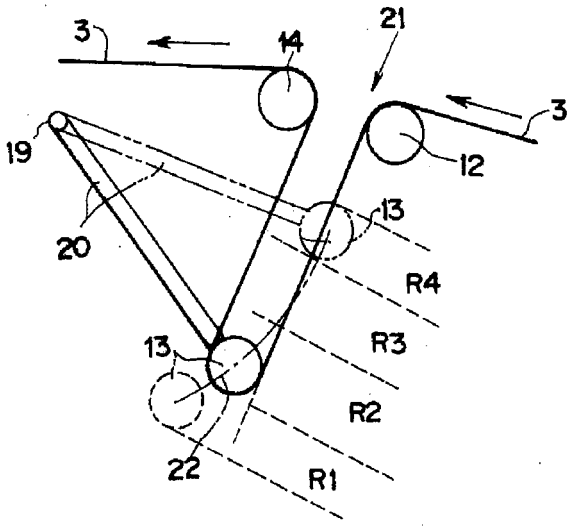

FIG. 5

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a printing paper winding device, and more particularly to a printing paper winding device provided independently of a printer for conducting printing on printing paper.

2. Description of the Invention

[0002] Some conventional printing paper winding devices are configured as external devices separate from a printer. Such devices are installed in front of the paper discharge opening of a printer and successively wind up a continuous band of paper or printing paper (includes base paper from which labels were peeled off) that was printed upon by the printer and discharged therefrom.

[0003] Such a printing paper winding device comprises a winding shaft for winding up band-like printing paper on which printing has been performed by a printer, a drive unit (for example, a drive motor) for rotary driving the winding shaft, and a tension roller that comes into contact with the printing paper upstream of the winding shaft.

[0004] The tension roller reciprocates in the predetermined tension region, while maintaining the contact with the printing paper, as the printing paper is printed upon, discharged, and wound up, can apply tension to the printing paper so as to absorb the slack of the printing paper, and can thereby stabilize the winding strength on the winding shaft.

[0005] In such printing paper winding device, the leading end of the band-like printing paper discharged from a printer is usually fixed to the winding shaft, the tension roller is set to a state where it can come into contact with the printing paper, and then the drive unit is started to begin the winding of the printing paper.

[0006] However, because the tension roller reciprocates along the predetermined reciprocating path as the printing paper is being wound up, the driver unit has to be ON/OFF controlled, the winding speed is constant, and the winding path of the printing paper assumes a zigzag shape. The resultant problem is that bending stresses or bending pressure accompanies the winding operation and that a limitation is placed of the base material of the printing paper that can withstand the winding pressure. Thus, a large bending stress is applied in the zone where the winding path bends at an acute angle. The resultant problem is that the printing paper is ruptured or the labels attached to the base paper are peeled off.

[0007] Furthermore, when the printing paper has the labels (RFID labels) that have placed thereon IC chips in which data can be read and written remotely, if the winding path is bent at a very acute angle, disconnection in the RFID label or fracture of the IC chip can occur.

[0008] Furthermore, the above-described printing paper winding device is controlled integrally with a printer by a printer control unit and driving thereof is substantially impossible, with the exception of special printers. Therefore, the device does not have a function of appropriately winding up the printing paper printed in and discharged from any printer and lacks versatility in forming combinations with printers.

SUMMARY OF THE INVENTION

[0009] The present invention was created to resolve the above-described problems and it is an object thereof to provide a printing paper winding device that can wind up even the printing paper having a base material with a low resistance to bending stresses.

[0010] It is another object of the present invention to provide a printing paper winding deice that can wind up even the printing paper that has RFID labels which carry IC chips.

[0011] Yet another object of the present invention is to provide a printing paper winding device that can wind up even the printing paper with poor resistance to winding pressure or bending pressure.

[0012] It is yet another object of the present invention to provide a printing paper winding device that can substantially expand the range of base material types suitable for winding.

[0013] One more object of the present invention is to provide a printing paper winding device that can be independently controlled even when it is arranged independently from a printer and can appropriately wind up printing paper on which printing has been performed and discharged from any printer.

[0014] The present invention is based on the possibility of reducing bending stresses by dividing the movability region of the tension roller into four regions in order to enable the successive detection of the position or posture of the tension roller and by making the bending angle of the printing paper in the winding path a more obtuse angle, and the invention provides a printing paper winding device comprising a winding shaft for winding up band-like printing paper on which printing has been performed by a printer, a drive unit for rotary driving the winding shaft, and a tension roller that comes into contact with the printing paper upstream of the winding shaft and can apply $_{a}$ tension to the printing paper by reciprocating in a prescribed tension region, following the winding of the printing paper, this printing paper winding device further comprising a first sensor and a second sensor capable of detecting the portion of the tension region in which the tension roller is positioned and a winding control unit for determining, based on the output signals of the first sensor and second sensor, whether the tension region in which the tension roller is positioned is a first tension region in which the bending angle of the winding path of the printing paper becomes minimum, a second tension region, a third tension region, or a fourth tension region

in which the bending angle of the winding path of said printing paper becomes maximum, those tension regions being arranged continuously and adjacently to each other, wherein the winding control unit controls the drive unit so as to limit the tension roller to the tension region in which winding can be conducted in the direction such that the bending angle of the winding path that follows the winding of the printing paper is close to a more obtuse angle.

[0015] The winding control unit can control the tension region where the tension roller is positioned so that the tension region becomes closer to the fourth tension region.

[0016] A dip switch that can select the tension region where the tension roller is positioned can be provided, and the winding control unit can control the tension region where the tension roller is positioned according to setting conditions that are set with the dip switch.

[0017] A first fixed guide roller positioned upstream of the tension roller for guiding and introducing the printing paper from the printer into the printing paper winding device and a second fixed guide roller for guiding the printing paper from the tension roller onto the winding shaft can be provided and the control can be conducted so that the bending angle of the winding path of the printing paper formed by the printer, the first fixed guide roller, and the tension roller is made close to a more obtuse angle, the bending angle of the winding path of the printing paper formed by the first fixed guide roller, the tension roller, and the second fixed guide roller is made close to a more obtuse angle, and the bending angle of the winding path of the printing paper formed by the tension roller, the second fixed guide roller, and the winding shaft is made close to a more obtuse angle.

[0018] The printing paper can have a label having placed thereon an IC chip in which data can be read and written remotely.

[0019] There can be provided a roller arm for holding the tension roller, a roller rotary shaft that rotatably supports the roller arm and can move the tension roller reciprocally in the forward and backward direction so as to cross the winding path, and a sensor plate that can rotate about the roller rotary shaft and has alternately formed therein detection protrusions and detection recesses that can be detected by the first sensor and the second sensor.

[0020] The winding control unit can control the printing paper winding device independently from the printer control unit of the printer for printing on the printing paper.

[0021] After the tension roller has been positioned in the fourth tension region and initial setting for winding has been carried out, the tension roller moves in the direction of the first tension region as the printing paper is being printed upon and discharged from the printer, and at the point in time in which the winding path extends to a maximum length (in other words, at the point in time in which the bending angle of the winding path becomes minimum), the winding operation is restarted, at the point in time in which the tension roller reaches the fourth tension region and the winding path becomes maximum (in other words, at the point in time in which the bending angle of the winding path becomes maximum), the winding operation is stopped and the system waits for the printing and discharge of the printing paper from the printer. Then, the above-described operations are repeated.

[0022] In the case where the printing paper has the usual bending strength, the control is preferably conducted so as to reciprocate the tension roller in the regions other than the first and fourth tension regions, that is, in the intermediate second tension region and third tension region, in order to provide a margin for the reciprocating movement of the tension roller.

[0023] However, when printing paper with a low bending strength or printing paper carrying RFID labels is used, the control is preferably conducted so as to reciprocate the tension roller as close to the fourth tension region as possible.

[0024] In the printing paper winding device in accordance with the present invention, the movability region of the tension roller is divided into four regions, the tension region of the first tension region, second tension region, third tension region, and fourth tension region in which the tension roller is positioned can be determined, and when the printing paper with a small resistance to bending stresses is wound, the control of the drive unit is so conducted that the bending angle of the winding path through which the tension roller passes is made close to a more obtuse angle. Therefore, the bending angle of the printing paper is prevented from becoming a more acute angle, the bending stresses can be reduced, the range of the printing paper types suitable for winding is expanded, and even the printing paper with the RFID labels removably attached thereto can be correctly wound, while avoiding the rupture of the RFID labels.

BRIEF DESCRIPTION FO THE DRAWINGS

[0025]

Fig. 1 is a schematic side view of the printing paper winding device 2 of an embodiment of the present invention and the printer 1 connected to the printing paper winding device 2;

Fig. 2 is a perspective view of the printing paper winding device 2;

Fig. 3 a side view of the vertical wall surface section 11A taken from the surface on the opposite side from the surface where the tension roller 13 is positioned;

Fig. 4 is a table showing tension regions where the tension roller 13 is positioned, those regions being distinguished by the detection signals of the first sensor 24 and second sensor 25;

Fig. 5 is an explanatory drawing schematically describing each tension region;

Fig. 6 is a plan view showing the RFID label continuous body 40 (printing paper);

Fig. 7 is a main enlarged side view of the tension roller 13 and winding unit 15 portion illustrating a state in which the tension roller 13 is positioned in the first tension region R1; and

Fig. 8 is a main enlarged side view of the tension roller 13 and winding unit 15 portion illustrating a state in which the tension roller 13 is positioned in the fourth tension region R4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0026] In accordance with the present invention, the drive unit is controlled so as to limit the tension roller to a tension region in which winding can be conducted in the direction such that the bending angle of the winding path that follows the winding of the printing paper is close to a more obtuse angle. Therefore, a printing paper winding device suitable for winding even the printing paper with a low resistance to bending stresses can be realized.

[0027] The printing paper winding device 2 of an embodiment of the present invention will be explained below with reference to Fig. 1 to Fig. 8.

[0028] Fig. 1 is a schematic side view of a printer 1 and of the printing paper winding device 2 connected to the printer 1. The printer 1 has a supply unit 4 for a printing paper 3 such as labels or tags, a detector 5 for detecting the position of the printing paper 3, a printing unit 6 for conducting printing on the printing paper 3, a cutting unit 7 for cutting the end section of the printed printing paper 3 after it has been wound up by the printing paper winding device 2, and a printer control unit 8 for controlling the aforementioned units.

[0029] The printing unit has a thermal head 9 and a platen roller 10. The printing paper 3 is sandwiched between the thermal head 9 and the platen roller 10, and the printing paper 3 is discharged and transported toward the printing paper winding device 2 by the rotation of the platen roller 10 and the predetermined information is printed on the printing paper 3.

[0030] The cutting unit 7 may be driven by the printer control unit 8 to cut mechanically the printing paper 3, or can comprise a member for cutting the end section of the printing paper 3 manually.

[0031] Fig. 2 is a perspective view of the printing paper winding device 2. The printing paper winding device 2 has a device body 11, a first fixed guide roller 12 for guiding and introducing the printed printing paper 3 into the printing paper winding device 2, a tension roller 13, a second fixed guide roller 14 for guiding the printing paper 3 from the tension roller 13, a winding unit 15 for winding the printing paper 3 into a roll, a control unit 16, a power source switch 17, and a winding control unit 18.

[0032] A roller rotary shaft 19 is provided at the vertical wall surface section 11A in the device body 11. A roller arm 20, which can rotate in both the direct direction and the reverse direction is mounted on the roller rotary shaft 19. The tension roller 13 is rotatably mounted on the distal end section of the roller arm 20, and the tension roller 13 is positioned so as to cross the winding path 21 (for example, shown as a zigzag line in Fig. 1) of the printing paper 3 at a right angle.

[0033] The tension roller 13 can reciprocate up and down along a circular are, as shown by arrows in Fig. 1, according to the winding state of the printing paper 3 along a circular arc guide groove 22 formed in the vertical wall surface section 11A, thereby changing the length of the winding path 21 from minimum to maximum and, correspondingly to this change, changing the bending angle of the winding path 21 from maximum to minimum.

[0034] Fig. 3 is a side view of the vertical wall surface section 11A taken from the surface on the opposite side from the surface where the tension roller 13 is positioned. The position of the tension roller 13 can be detected with a sensor plate 23, a first sensor 24, and a second sensor 25.

[0035] The sensor plate 23 is mounted on the roller rotary shaft 19 and can rotate together with the tension roller 13 about the roller rotary shaft 19. Two detection protrusions (first detection protrusion 26 and second detection protrusion 27) and three detection recesses (first detection recess 28, second detection recess 29, and third detection recess 30) that can be detected with the first sensor 24 and the second sensor 25 are formed alternately on the peripheral section of the sensor plate 23.

[0036] Transmission-type or reflection-type detectors can be employed for the first sensor 24 and the second sensor 25, and they are arranged on the circumference in the positions enabling the detection of the first detection protrusion 26, second detection protrusion 27, first detection recess 28, second detection recess 29, and third detection recess 30.

[0037] In the lowermost position (lower dead center, first tension region) of the tension roller 13 shown by the solid line in Fig. 3, the first sensor 24 is close to the second detection recess 29, and the second sensor 25 is close to the third detection recess 30.

[0038] The roller rotary shaft 19 is preferably arranged above (in the vertical direction) the tension roller 13, and depending on the mutual arrangement thereof, a posture can be naturally assumed under gravity in which the tension roller 13 is positioned below (in the vertical direction) inside the circular arc guide groove 22. In this way, the tension roller 13 can constantly apply the predetermined tension to the printing paper 3 that comes into contact therewith from above, as shown in Fig. 1 and Fig. 2.

[0039] Furthermore, if necessary, the tension roller 13 can be constantly impelled toward the lowermost section (lower dead center) inside the circular arc guide groove 22 by mounting a tension spring 31 (Fig. 1) on the roller arm 20.

[0040] Fig. 4 is a table showing tension regions where the tension roller 13 is positioned, those regions being distinguished by the detection signals of the first sensor 24 and the second sensor 25. Fig. 5 is an explanatory drawing schematically describing each tension region.

[0041] The state shown by a solid line in Fig. 3 illustrates the lower dead center 13 (lowermost point in the first tension region R1). In this state, the first sensor 24 detects the position of the second detection recess 29, and the second sensor 25 detects the position of the third detection recess 30.

[0042] As the tension roller 13 rises inside the circular arc guide groove 22, the first sensor 24 and the second sensor 25 detect the first detection protrusion 26, second detection protrusion 27, first detection recess 28, second detection recess 29, and third detection recess 30, and based on the detection signals thereof, the winding control unit 18 determines the tension region (first tension region R1, second tension region R2, third tension region R3, and fourth tension region R4 arranged continuously and adjacently to each other) in which the tension roller 13 is positioned.

[0043] The detection timing of the tension regions (boundary sections of the first tension region R1, second tension region R2, third tension region R3, and fourth tension region R4) of the tension roller 13 can be adjusted by appropriately designing the circumferential angles of the first detection protrusion 26, second detection protrusion 27, first detection recess 28, second detection recess 29, and third detection recess 30 about the roller rotary shaft 19 of the sensor plate 23 and the relative positions of the first sensor 24 and second sensor 25.

[0044] Returning to Fig. 1 and Fig. 2, the winding unit 15 has a drive motor (drive unit) 32, a winding shaft 33, which is rotary driven by the drive motor 32, a rewind core 34 that is removably fit onto the winding shaft 33, rotates integrally with the winding shaft 33, and serves to wind up the printing paper 3 thereupon in the form of a roll, and a pair of plate-shaped paper guides 35 provided at both ends of the rewind core 34 and serving to guide the printing paper 3.

[0045] The control unit 16 is provided in the portion of the device body 11 in the vicinity of the winding unit 15. The control unit has a start-stop button 36 for starting and stopping the rotation drive of the winding shaft 33, a status display unit 37 comprising a LED that indicates the operation status of the start-stop button 36, and a winding direction display unit 38 that indicates the winding direction of the printing paper 3 with an arrow.

[0046] When the start-stop button 36 is pushed and the operation of winding up the printing paper 3 is carried out, the status display unit 37 is turned on, and when the winding is stopped, the status display unit 37 is turned off.

[0047] The winding direction display unit 38 displays the indication of rear winding or face winding of the printing paper 3. The printing paper 3 can be a continuous label or tag paper having no adhesive surface, or it can be a label continuous body in which a plurality of label pieces 3B are removably attached to a band-like based paper 3A, as shown by way of an example in Fig. 2. In the case of such label continuous body, the winding operation in which the label pieces 3B are wound up on the inner side (rear side) as a roll on the winding shaft 33 (rewind core 34) is called the rear winding and the winding operation in which the label pieces are wound up on the outer side (face side) is called the face winding.

[0048] The power source switch 17 serves to turn ON/OFF the power source of the printing paper winding device 2. However, even if the power source switch 17 is turned ON, the drive motor 32 (drive unit) is not actuated and the operation of winding the printing paper 3 is not started.

[0049] The winding control unit 18 drive controls the winding unit 15 and control unit 16 based on the detection signals of the first sensor 24 and the second sensor 25, that is, based on the tension region (R1, R2, R3, or R4) in which the tension roller 13 is positioned, and controls the printing paper winding device 2, regardless of the control signal from the printer control unit 8 (Fig. 1) of the printer 1, that is, independently from the printer control unit 8.

[0050] In the printing paper winding device 2 and printer 1 of such configuration, the printing paper winding device 2 is placed on the printer 1 according to the posture thereof, the printing paper 3 discharged and extending from the side of the printer 1 is wrapped around the first fixed guide roller 12, tension roller 13, and second fixed guide roller 14 of the printing paper winding device 2 in the state shown in Fig. 1 or Fig. 2, the leading end section of the printing paper 3 is attached and fixed to the rewind core 34 of the winding shaft 33, and the power source switch 17 is turned on.

[0051] In the case where the entire printing paper 3 is in a loosened state and the tension roller 13 is in the lowermost point (lower dead center, first tension region Rl), when the printing paper 3 is set on the winding path 21, the winding control unit 18 checks that the tension roller 13 is in the first tension region R1 when the operation of wrapping the printing paper 3 about the winding shaft 33 (rewind core 34) is started. In this state, the operator continuously pushes the start-stop button 36, and as long as the signal thereof is outputted, the winding shaft 33 is rotary driven by the drive unit (drive motor 32) at a speed lower than the usual winding speed, and the winding of the printing paper 3 with the winding shaft 33 is temporarily stopped and the initial set state is assumed at the point in time in which the tension roller 13 reaches the fourth tension region R4 (more accurately, at the point in time the tension roller reached the boundary section of the third tension region R3 and the fourth tension region R4).

[0052] The usual winding speed in the printing paper winding device 2 is set higher than the carry-out speed in the process of printing and discharging the printing paper 3 with the printer 1.

[0053] Furthermore, at the point in time in which a transition is made from the first tension region R1 to the second tension region R2 and the third tension region R3, the winding speed can be raised so that the start operation and winding operation can be executed at a high speed.

[0054] It goes without saying that, depending on the initial set operation of the operator, the tension roller 13 can be in the tension region other than the first tension region R1, but in this case, too, the winding control unit 18 determines the tension region in which the tension roller 13 is present, in the same manner as described above, rotary drives the winding shaft 33 at a speed lower than the usual winding speed as long as the signal from the start-stop button 36 is outputted, and temporarily stops the winding of the printing paper 3 with the winding shaft 33 to obtain the initial set state at the point in time in which the tension roller 13 reaches the fourth tension region R4.

[0055] At the point in time in which such initial set state has been completed, the tension roller 13 is in a state of being set in the fourth tension region R4, the printer 1 is started in this state, and if the printing paper 3 is printed upon and discharged, the tension roller 13 descends from the fourth tension region R4 via the third tension region R3 along the circular art guide groove 22 in the direction of the second tension region R2 and the first tension region R1, while maintaining the contact under the predetermined tension with the printing paper 3 in winding path 21.

[0056] At the point in time in which the tension roller 13 descends and reaches the first tension region R1 (more accurately, the point in time in which it reaches the boundary section of the second tension region R2 and the first tension region Rl), the winding of the printing paper 3 with the winding shaft 33 is restarted, the tension roller 13 rises along the circular arc guide groove 22, following this winding operation, moves through the second tension region R2 and the third tension region R3, and reaches again the fourth tension region R4, thereby stopping the winding. In this stop state, the system waits for subsequent printing and discharging of the printing paper 3 by the printer 1 and, as soon as the printing paper 3 is discharged, the winding is restarted, as described above, at the point in time in which the tension roller 13 reaches the first tension region R1.

[0057] The winding operation can be ended by pushing the start-stop button 36 in the control unit 16.

[0058] In the usual winding operation, the first tension region R1 and the fourth tension region R4 can be ensured as margin regions by conducting control so that the tension roller 13 reciprocates within the second tension region R2 and the third tension region R3.

[0059] In this way, the operator can conduct the winding operation of the initial setting of the printing paper 3 at a rate lower than the usual winding rate by merely continuously pushing the start-stop button 36 in the control unit 16. Therefore, at the time of the initial setting control of the printing paper 3, the rotation of the printing paper 3 can be started at one's own will and the winding operation can be conducted safely and reliably.

[0060] The present invention is especially advantageous when the printing paper 3 with a low resistance to bending stresses is wound. In this case, by contrast with the above-described usual winding operation, the winding unit 15 or the drive motor 32 thereof can be controlled so as to limit the tension region of the tension roller 13 to the predetermined range.

[0061] The explanation will be provided below by taking a RFID label continuous body as an example of printing paper with a low resistance to bending stresses.

[0062] Fig. 6 is a plan view illustrating the RFID label continuous body 40 (printing paper). The RFID label continuous body 40 has a band-like base paper 41 and a plurality of RFID labels 42 removably attached to the base paper 41.

[0063] The RFID label 42 (Radio Frequency Identification label) has a label body 43, an IC chip 44 incorporated into the label body 43, and an antenna 45.

[0064] The IC chip 44 can read and write data remotely with the external data read/write device (not shown in the figure) via an antenna 45, and data can be electronically written into the IC chip 44 and read therefrom.

[0065] The portions of the RFID label continuous body 40 where the RFID labels 42 are located have especially low resistance to bending stresses.

[0066] Fig. 7 is a main enlarged side view of the tension roller 13 and the winding unit 15 portion, this figure illustrating a state in which the tension roller 13 is positioned in the first tension region R1.

[0067] As shown in Fig. 7, when the tension roller 13 is positioned in the first tension region R1, the bending angle of the winding path 21 of the RFID label continuous body 40 becomes minimum. More specifically, the first bending angle $\theta 1$, second bending angle $\theta 2$, and third bending angle $\theta 3$ become minimum, and in the state in which the tension roller is positioned in the first tension region R1, the bending stress becomes maximum.

[0068] The first bending angle $\theta 1$ is the bending angle of the winding path 21 of the RFID label continuous body 40 formed by the printer 1, the first fixed guide roller 12, and tension roller 13.

[0069] The second bending angle $\theta 2$ is the bending angle of the winding path 21 of the RFID label continuous body 40 formed by the first fixed guide roller 12, tension roller 13, and second fixed guide roller 14.

[0070] The third bending angle $\theta 3$ is the bending angle of the winding path 21 of the RFID label continuous body 40 formed by the tension roller 13, second fixed guide roller 14, and winding shaft 33.

[0071] In particular, in the location of the tension roller 13, the second bending angle $\theta 2$ formed by the printing paper 3 becomes more obtuse and the effect of bending stresses on the RFID label continuous body 40 is maximized.

[0072] Fig. 8 is a main enlarged side view of the tension roller 13 and the winding unit 15 portion, which is similar to that shown in Fig. 7, this figure illustrating a state in which the tension roller 13 is positioned in the fourth tension region R4.

[0073] In the state shown in Fig. 8, the first bending angle $\theta 1$, second bending angle $\theta 2$, and third bending

angle θ3 become maximum, and in the state in which the tension roller is positioned in the fourth tension region R4, the bending stresses become minimum.

[0074] In accordance with the present invention, the control is conducted so that the first bending angle θ1, second bending angle θ2, and third bending angle θ3 become closer to more obtuse angles, or so that the tension region where the tension roller 13 is positioned becomes closer to the fourth tension region R4.

[0075] More specifically, a dip switch 46 (Fig. 1, Fig. 2) is provided in the device body 11, and the tension region in which the tension roller 13 is to be positioned can be selected with the dip switch 46.

[0076] When the usual printing paper 3 is wound up, the winding control unit 18 controls the drive motor 32 so that the tension roller 13 reciprocates within the second tension region R2 and the third tension region R3 (more accurately, between the boundary between the first tension region R1 and the second tension region R2 and the boundary between the third tension region R3 and the fourth tension region R4), but in the case of a RFID label continuous body 40, the drive motor 32 is ON/OFF controlled so that the tension roller 13 reciprocates from the second tension region R2 to the fourth tension region R4 (more accurately, the uppermost portion or upper dead center of the fourth tension region R4) or from the third tension region R3 to the fourth tension region R4 (more accurately, the uppermost portion or upper dead center of the fourth tension region R4).

[0077] For example, in the case where the tension roller 13 is reciprocated between the third tension region R3 and the fourth tension region R4, the winding control unit 18 turns on the drive motor 32 and starts the winding operation of the RFID label continuous body 40 when the tension roller 13 reaches the third tension region R3 (more accurately, the boundary between the second tension region R2 and the third tension region R3), and when the upper dead center of the fourth tension region R4 is reached, the drive motor 32 is turned OFF and a state of waiting for the supply of the RFID label continuous body 40 from the printer 1 is assumed.

[0078] In this way, the drive motor 32 is controlled so as to limit the tension roller 13 to a tension region that enables winding in the direction such that the bending angle of the winding path 21, which follows the winding of the RFID label continuous body 40, is close to a more obtuse angle. In this case, the RFID label continuous body 40 undergoes bending in the sections of the first fixed guide roller 12, tension roller 13, and second fixed guide roller 14, and the RFID label 42 and the like can be prevented from being fractured or inadvertently disconnected.

[0079] Furthermore, at a small bending angle such as shown in Fig. 7, in particular in the section of the first fixed guide roller 12 and the second fixed guider roller 14, the RFID label 42 does not follow the turning of the base paper 41 and can peel off from the base paper 41 (see virtual line in the figure), and such peeling phenomenon of the RFID label 42 can be also avoided by increasing the bending angle so as to make it close to the obtuse angle, as shown in Fig. 8.

Claims

1. A printing paper winding device comprising:

a winding shaft for winding band-like printing paper on which printing has been performed by a printer;
a drive unit for rotary driving the winding shaft; and a tension roller that comes into contact with the printing paper upstream of the winding shaft and can apply a tension to the printing paper by reciprocating in a prescribed tension region, following the winding of the printing paper, said printing paper winding device further comprising:
a first sensor and a second sensor capable of detecting the portion of said tension region in which said tension roller is positioned; and
a winding control unit for determining, based on the output signals of the first sensor and second sensor, whether said tension region in which said tension roller is positioned is a first tension region in which the bending angle of the winding path of said printing paper becomes minimum, a second tension region, a third tension region, or a fourth tension region in which the bending angle of the winding path of said printing paper becomes maximum, those tension regions being arranged continuously and adjacently to each other; wherein
said winding control unit controls said drive unit so as to limit the tension roller to the tension region in which winding can be conducted in the direction such that said bending angle of said winding path that follows the winding of said printing paper is close to a more obtuse angle.

2. The printing paper winding device according to claim 1, wherein
said winding control unit controls said tension region where said tension roller is positioned so that the tension region becomes closer to said fourth tension region.

3. The printing paper winding device according to claim 1, further comprising a dip switch that can select said tension region where said tension roller is positioned, wherein said winding control unit can control said tension region where said tension roller is positioned according to setting conditions that are set with the dip switch.

4. The printing paper winding device according to claim

1, further comprising:

a first fixed guide roller positioned upstream of said tension roller for guiding and introducing said printing paper from said printer into the printing paper winding device and
a second fixed guide roller for guiding said printing paper from said tension roller onto said winding shaft, wherein control is conducted so that
said bending angle of said winding path of said printing paper formed by said printer, said first fixed guide roller, and said tension roller is made close to a more obtuse angle,
said bending angle of said winding path of said printing paper formed by said first fixed guide roller, said tension roller, and said second fixed guide roller is made close to a more obtuse angle, and
said bending angle of said winding path of said printing paper formed by said tension roller, said second fixed guide roller, and said winding shaft is made close to a more obtuse angle.

5. The printing paper winding device according to claim 1, wherein
said printing paper has a label having placed thereon an IC chip in which data can be read and written remotely.

6. The printing paper winding device according to claim 1, further comprising:

a roller arm for holding said tension roller;
a roller rotary shaft that rotatably supports the roller arm and can move said tension roller reciprocally in the forward and backward direction so as to cross said winding path; and
a sensor plate that can rotate about the roller rotary shaft and has alternately formed therein detection protrusions and detection recesses that can be detected by said first sensor and said second sensor.

7. The printing paper winding device according to claim 1, wherein said winding control unit controls the printing paper winding device independently from the printer control unit of the printer for printing on said printing paper.

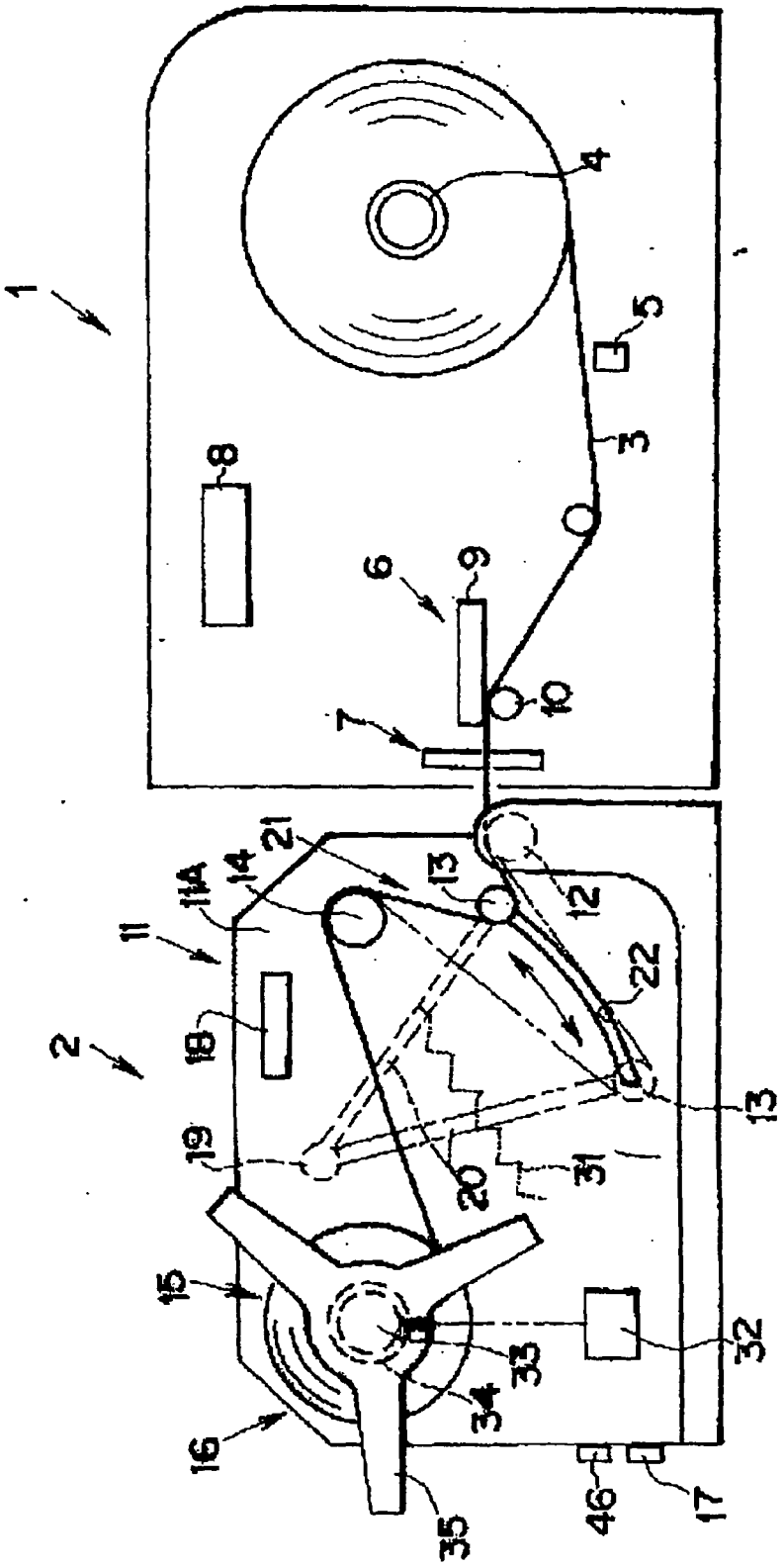
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FIG. 1

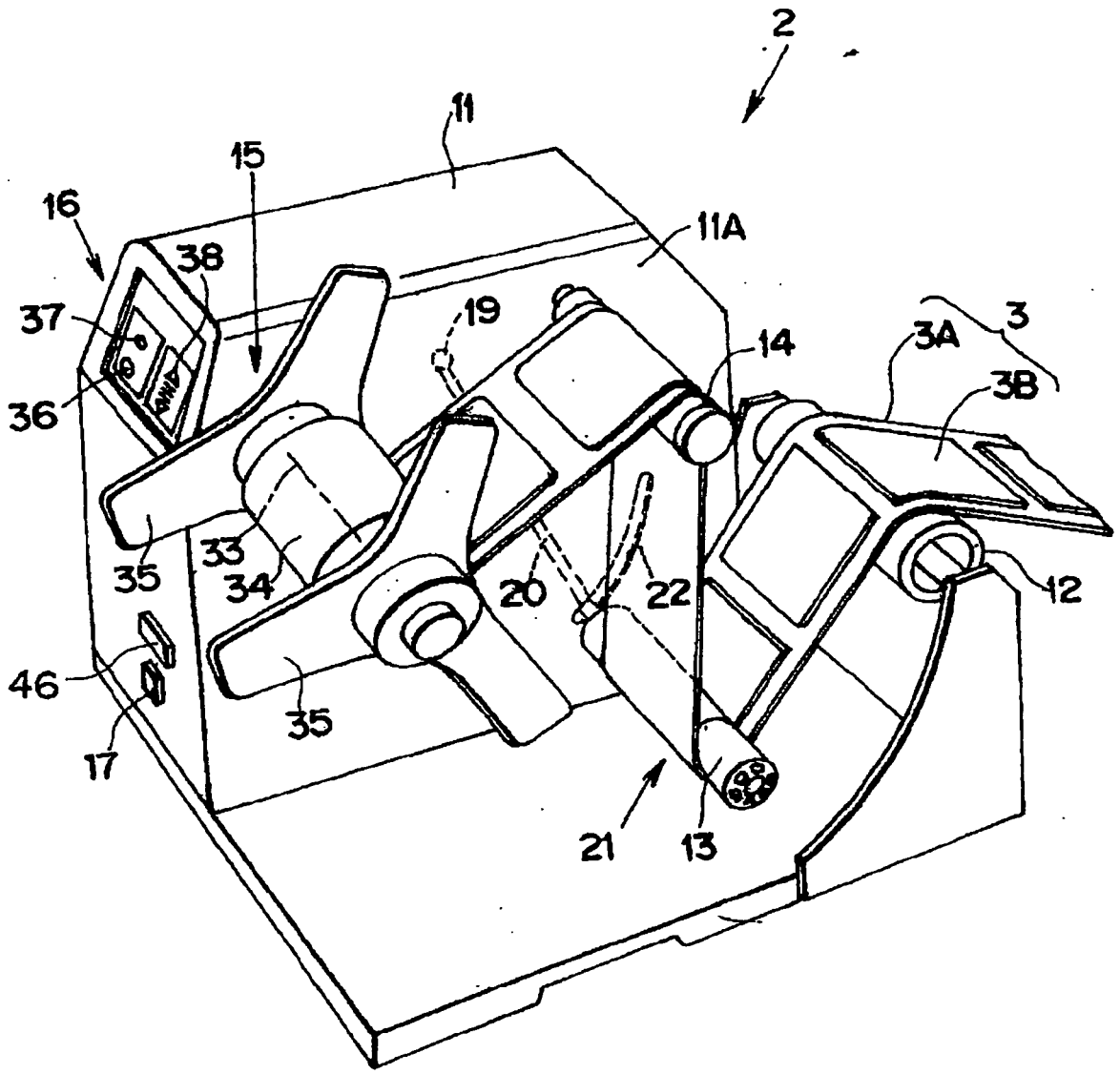

FIG. 2

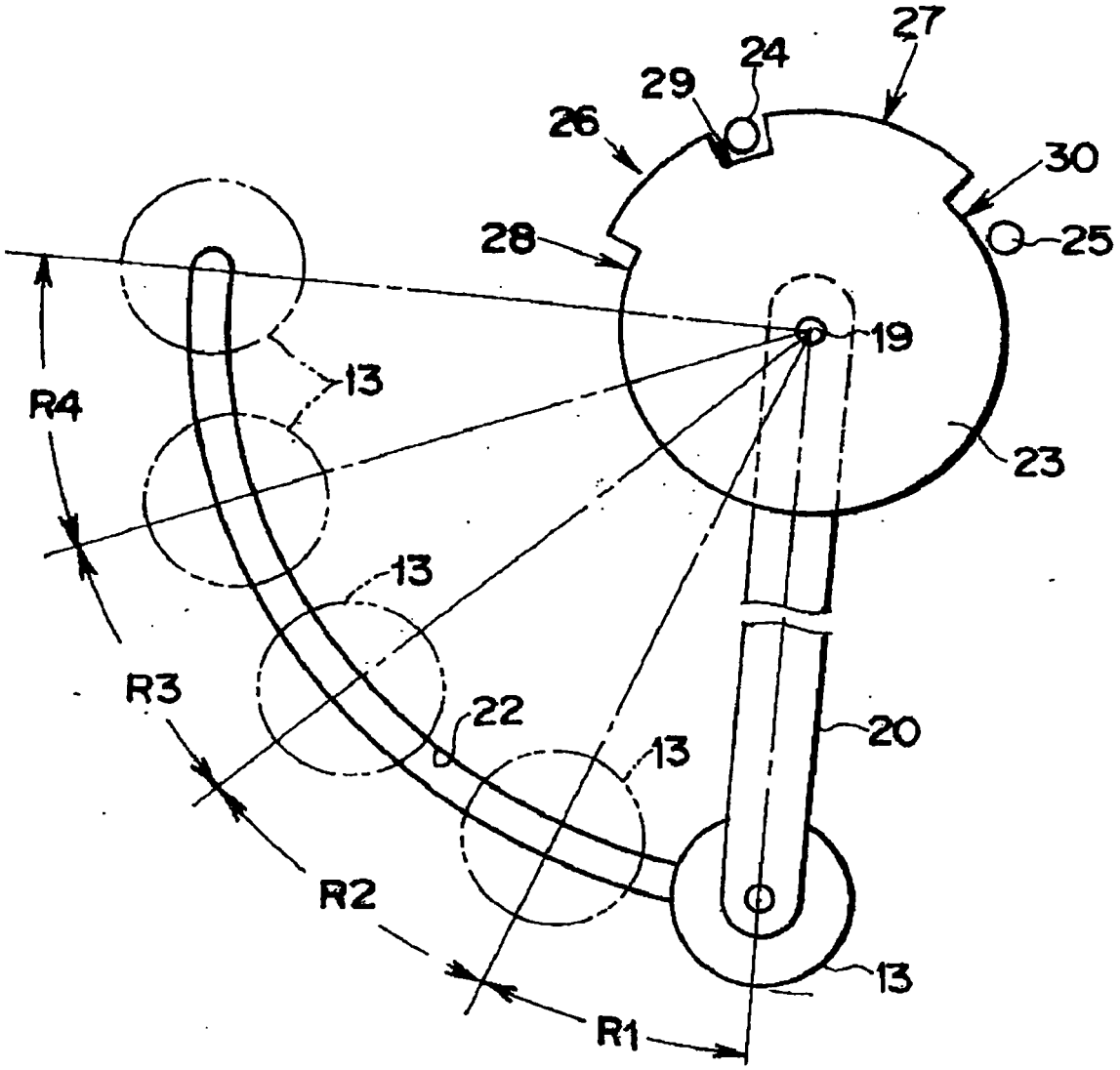

FIG. 3

FIG. 4

	FIRST SENSOR	SECOND SENSOR
FIRST TENSION REGION	L	L
SECOND TENSION REGION	H	L
THIRD TENSION REGION	H	H
FOURTH TENSION REGION	L	H

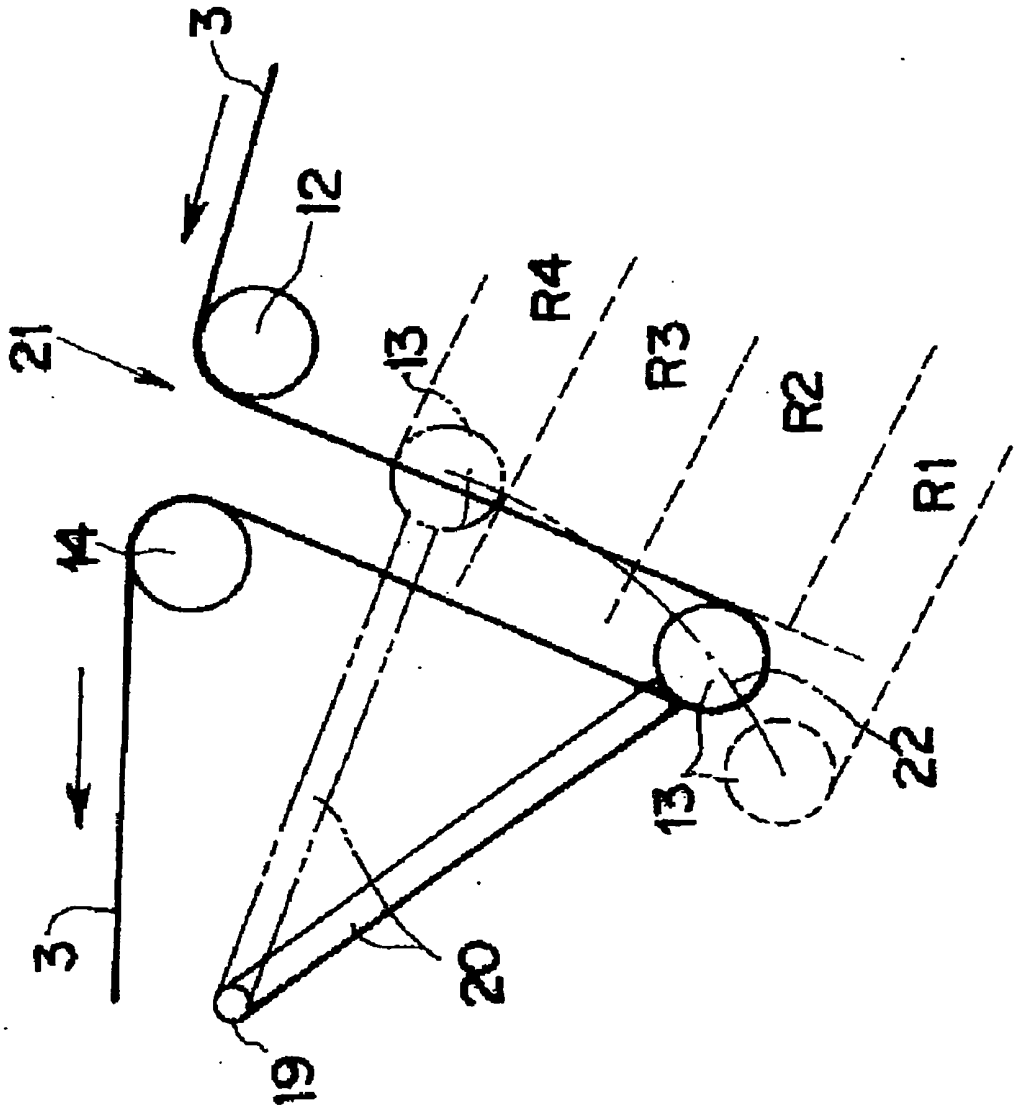

FIG. 5

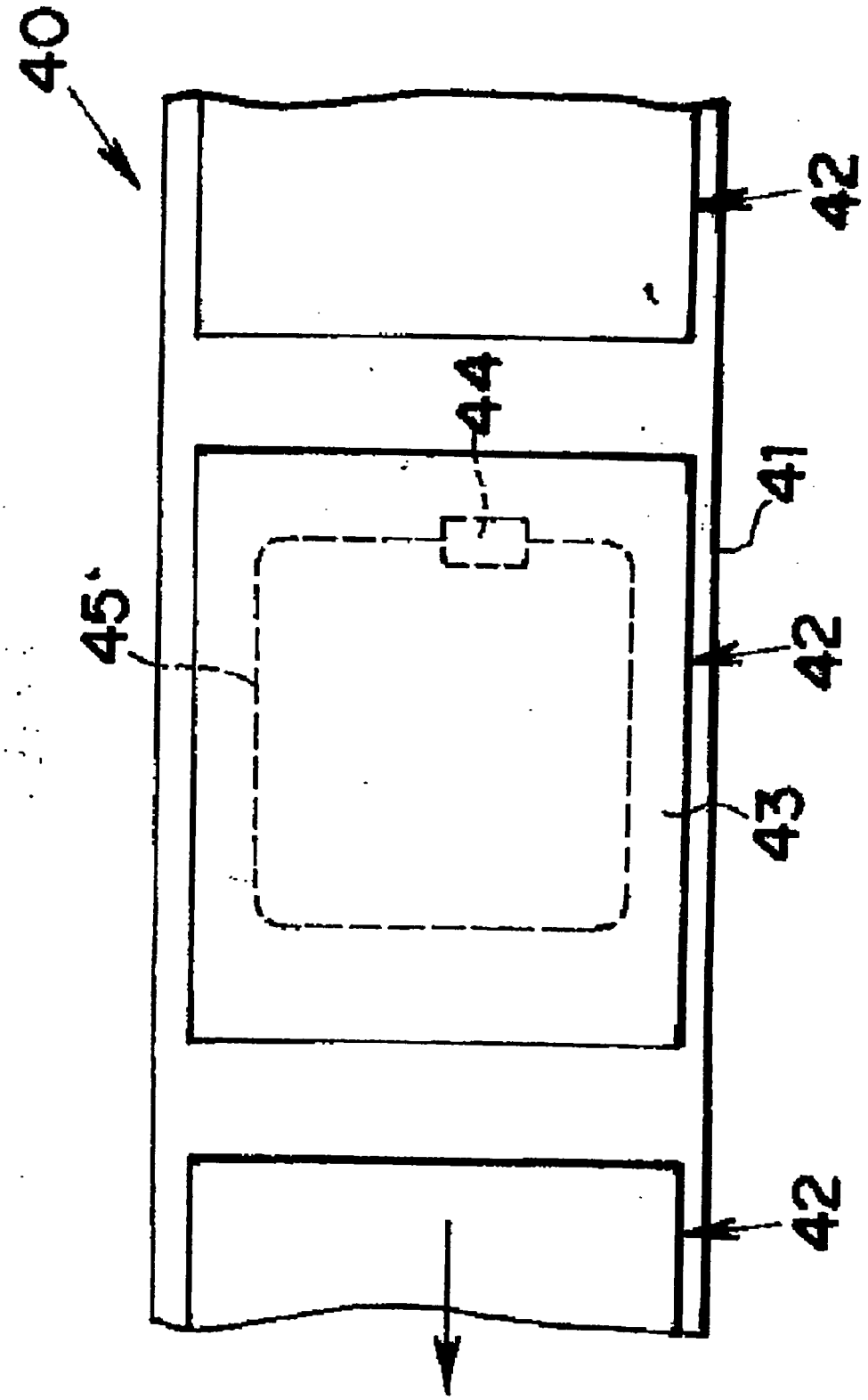

FIG. 6

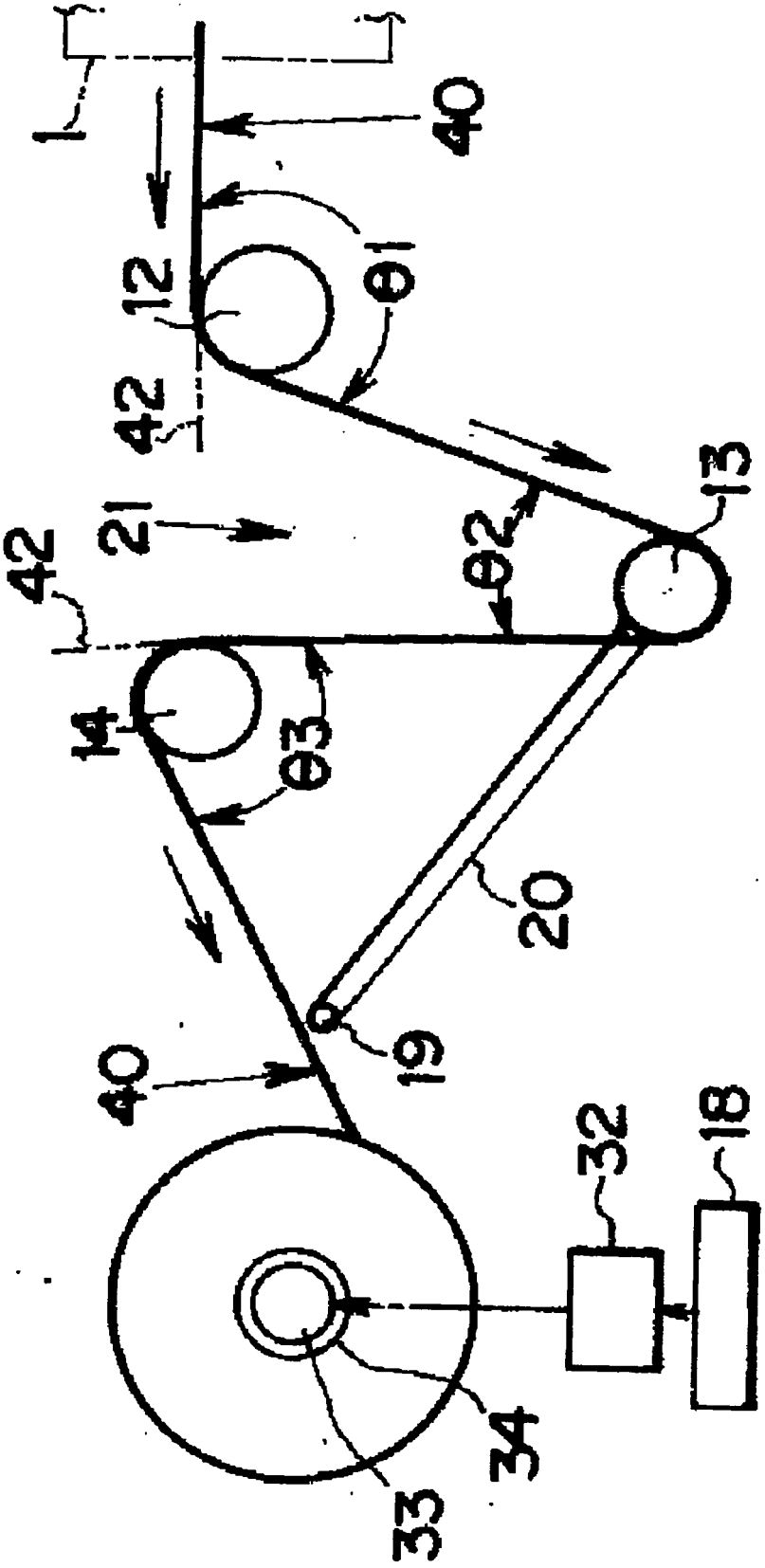

FIG. 7

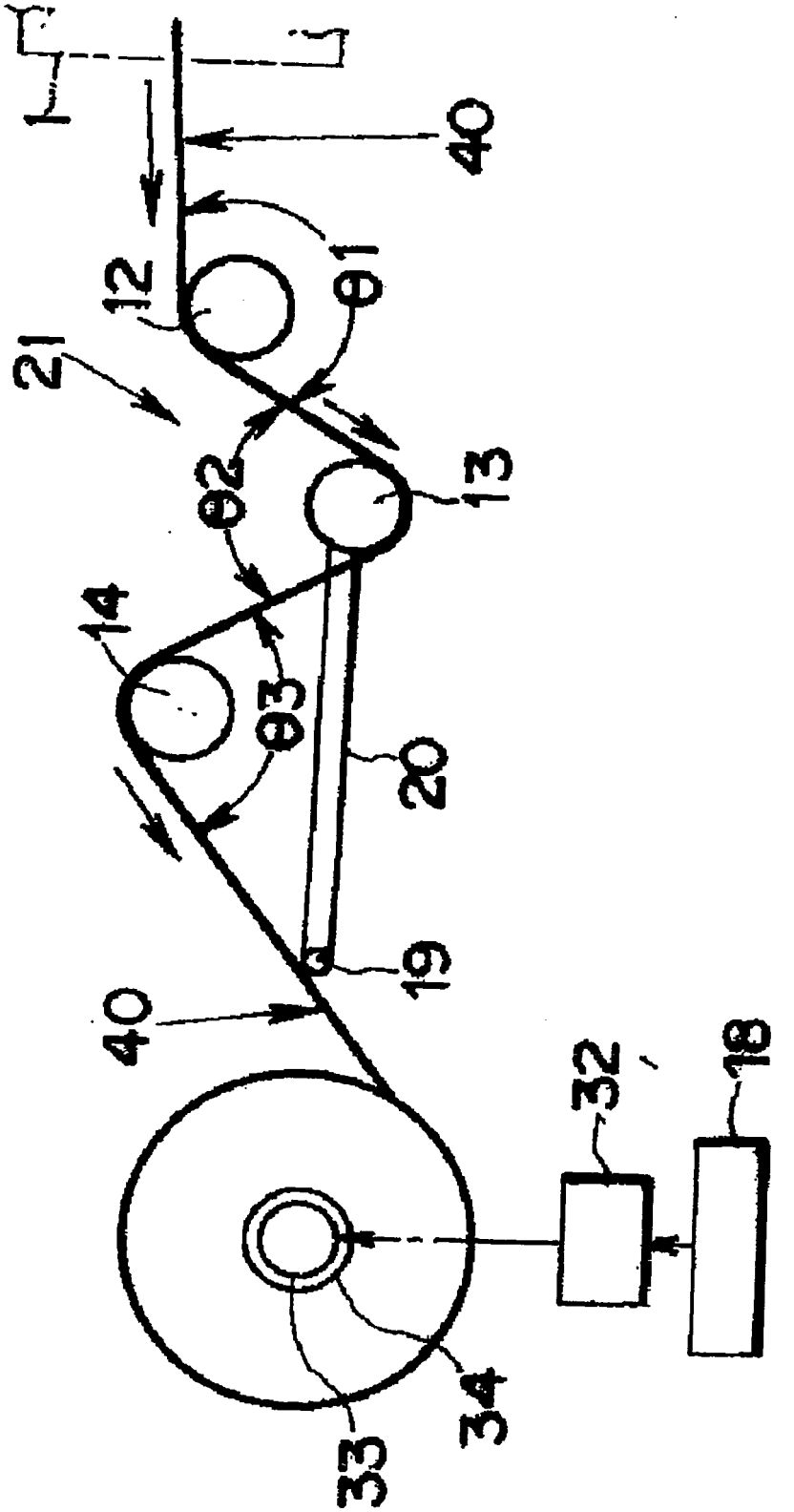

FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/023784

A. CLASSIFICATION OF SUBJECT MATTER
B65H23/195(2006.01), ***B41J15/16***(2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65H23/195(2006.01), ***B41J15/16***(2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2006
Kokai Jitsuyo Shinan Koho 1971-2006 Toroku Jitsuyo Shinan Koho 1994-2006

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2000-318896 A (Fuji Machinery Co., Ltd.), 21 November, 2000 (21.11.00), Full text; Figs. 1, 3 (Family: none)	1-7
A	JP 2003-252501 A (Ishida Co., Ltd.), 10 September, 2003 (10.09.03), Full text; Figs. 3 to 7 (Family: none)	1-7
A	JP 2003-191554 A (Kabushiki Kaisha Sato), 09 July, 2003 (09.07.03), Full text; Figs. 1, 2 (Family: none)	1-7

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

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

Date of the actual completion of the international search	Date of mailing of the international search report
17 February, 2006 (17.02.06)	28 February, 2006 (28.02.06)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2005/023784

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 4-116050 A (Sharp Corp.), 16 April, 1992 (16.04.92), Full text; Fig. 3 (Family: none)	1-7

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