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(54) **Sheet handling device**

Vorrichtung zum Handhaben von Bögen

Dispositif de manipulation de feuilles

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(56) References cited:
US-A- 6 005 687

- **PATENT ABSTRACTS OF JAPAN vol. 015, no. 065 (M-1082), 15 February 1991 (1991-02-15) & JP 02 292076 A (RICOH CO LTD), 3 December 1990 (1990-12-03)**
- **PATENT ABSTRACTS OF JAPAN vol. 018, no. 138 (M-1573), 8 March 1994 (1994-03-08) & JP 05 319615 A (RICOH CO LTD), 3 December 1993 (1993-12-03)**
- **PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) & JP 2004 196483 A (SHARP CORP), 15 July 2004 (2004-07-15)**
- **PATENT ABSTRACTS OF JAPAN vol. 012, no. 064 (M-672), 26 February 1988 (1988-02-26) & JP 62 211263 A (CASIO COMPUT CO LTD; others: 01), 17 September 1987 (1987-09-17)**

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Description

[0001] The invention relates to a sheet handling device comprising a sheet transport path, a transport mechanism adapted to advance a sheet along the transport path with a non-uniform speed, and upper and lower discharge rollers forming a discharge mechanism arranged at the transport path for taking over the sheet from the transport mechanism and discharging it into a tray.

[0002] Ink jet printers, for example, often work on a scanning principle. That is, a carriage which includes a number of ink jet printheads reciprocates across a sheet. In each pass of the carriage, a number of pixel lines are printed on the sheet by means of the printheads which eject droplets of ink onto the sheet in accordance with image information supplied to the printheads. Between the printing passes, a transport mechanism advances the sheet by a suitable sheet advance step. In large format printers, the sheet advance movement is simultaneously performed in different parts of the printer. For example, while a leading part of a sheet is already discharged onto the tray by the discharge mechanism, a rear part of the sheet may still be printed and advanced by the transport mechanism.

[0003] In order to achieve a high printing speed, the sheet advance movements have to be performed as quickly as possible. However, the printing quality depends on the accuracy of the sheet advance movements. When the sheet is simultaneously advanced by different transport means, one transport means may influence the accuracy of the movement of another transport means. For example, a discharge mechanism that discharges the printed sheet onto a tray may exert a force onto the sheet portion which is still printed. This problem is even more pronounced in large format printers where the load that has to be exerted to move the sheet is higher. Moreover, the faster the sheet advance step is to be performed, the more power is required of the transport means. This leads to a higher load on the sheet and an increased noise generation.

[0004] From JP 62211263 A, a transport mechanism for discharging a sheet is known that transports the sheet from a pair of fixing rollers towards a discharge tray. A first driving roll is driven at a peripheral speed which is higher than that of the fixing rolls. Thereby, a waving of the sheet is to be decreased. However, the driving roll exerts a pulling force on the sheet during the fixing process.

[0005] JP 08268615 A also shows a transport mechanism for discharging a sheet that transports the sheet from a pair of fixing rollers towards a discharge tray. A sheet is held between the fixing rollers and first carrying rollers while a previous sheet is discharged by further carrying rollers at a speed which is higher than the paper carrying speed of the fixing rollers. The first carrying rollers are driven by means of a torque limiter but nevertheless exert a pulling force on the sheet while it is held between the fixing rollers and first carrying rollers.

[0006] From JP 2004196483 A, a transport mechanism is known which is adapted to appropriately maintain the amount of deflection of a sheet being conveyed along a curved path between two pairs of conveyance rollers. The amount of deflection of the sheet is measured by a pivotable contact arm, and the peripheral speed ratio of the two pairs of conveyance rollers is controlled to appropriately maintain the amount of deflection. However, a constant amount of deflection can only be maintained when the two pairs of conveyance rollers are continuously driven and their speed variations are small.

[0007] From WO 2004/041542 A1, a device for delivering a printed coupon is known wherein a web is advanced into a reserve chamber by a transport roller which participates in printing the web. The web is further advanced by a pair of discharge rollers at a discharge opening of the chamber. The transport rollers and the discharge rollers are operated to hold the web under tension against a resiliently pivotable arm during the printing process and to pull the web against a cutting edge after the printing is completed. Thus, a pulling force is exerted on the web during printing and also for cutting the web after printing.

[0008] US 6 005 687 A discloses a scanner with a separating unit, first transporting means, an intermediate transport path, second transporting means, and a reading unit. When due to a difference of transport speed a tension of a document sheet within the intermediate transport path increases above a certain limit, the document sheet presses a push button of a microswitch mounted at the intermediate transport path. Thereby, the scanning is interrupted, or the transport speed of either of the transporting means is changed to reduce the tension.

[0009] JP 02 292076 A discloses a sheet ejection system wherein an ejection roller is set at a higher peripheral speed than a platen roller and is provided with a torque limiter in order to eject a sheet at a higher speed than its transport speed in a printing section as soon as the sheet is released from a friction force in the printing section.

[0010] JP 05 319615 A discloses a paper sheet feeding mechanism for an image forming device. A looseness sensor is arranged at a bent paper passage between feeding rolls and resist rollers, and the conveying speed of the feeding rolls is changed to be lower than that of the resist rollers when the paper sheet is lifted from the looseness sensor.

[0011] It is an object of the invention to provide a sheet handling device which allows a high printing speed and a high accuracy of sheet advance movements that are relevant to printing accuracy.

[0012] According to the invention, this object is achieved by a sheet handling device of the type indicated above, wherein the transport mechanism is adapted to stepwise advance the sheet, wherein the discharge mechanism is adapted to convey the sheet with a momentary speed that is different from that of the transport mechanism; wherein a portion of the transport path be-

tween the transport mechanism and the discharge mechanism is curved along a buffer space to allow the sheet to bend within the buffer space and thereby to absorb the speed difference between the transport mechanism and the discharge mechanism, a path sensor being arranged at the buffer space, and a signal of the path sensor being input to a drive controller of the discharge mechanism; wherein the path sensor is adapted to detect a distance between said portion of the transport path and the sheet when it is bent into the buffer space and wherein the transport mechanism and the discharge mechanism are adapted to be driven in such a way, by the input of the path sensor to the drive controller allowing the speed of the discharge rollers to be controlled, that a section of the sheet which is within the buffer space is mechanically stress relieved, thus avoiding a tension of the sheet between the transport mechanism and the discharge mechanism and wherein the discharge mechanism is adapted to continuously advance the sheet while the transport mechanism stepwise advances the sheet.

[0013] Thereby, the sheet is buffered between the transport mechanism and the discharge mechanism. Thus, the sheet does not couple the transport mechanism to the discharge mechanism. In particular, the discharge mechanism does not exert a force on the transport mechanism through the sheet, because a tension of the sheet between the transport mechanism and the discharge mechanism is avoided. For example, the buffer space is situated in the sheet transport path between a sheet support element and the discharge mechanism; the sheet support element supports the sheet during the printing process. The transport mechanism and the discharge mechanism are adapted to be driven in such a way that the sheet section in the buffer space is mechanically stress relieved. For that purpose, the transport mechanism and the discharge mechanism may be driven in such a way that the length of the sheet section in the buffer space is always larger than a minimal length, unless a leading or a trailing edge of the sheet is yet within the buffer space.

[0014] Useful details and further developments of the invention are indicated in the dependent claims.

[0015] In a preferred embodiment, the curved portion of the transport path comprises a curved guide plate, said guide plate passing in approximately a half turn around the buffer space. When the sheet is present in the buffer space and is conveyed by the discharge mechanism, the length of the sheet section that is accommodated in the buffer space will be reduced, and the sheet will be lifted from the curved guide plate. Then, the buffer space offers room for a further advance of the sheet by the transport mechanism.

[0016] Preferably, the transport mechanism and the discharge mechanism are controlled to have like average speeds.

[0017] A path sensor is arranged at the buffer space; the path sensor being adapted to detect a distance between the portion of the transport path and the sheet when it is bent into the buffer space; and a signal of the path sensor is input to a drive controller of the discharge mechanism. Thereby, when the sheet traverses the buffer space, the path sensor is sensitive to the length of the sheet section that is within the buffer space. For example, the path sensor may detect a situation where the path of the sheet section within the buffer space has reached a certain minimum length, or the path sensor may detect a situation where the sheet section within the buffer space has reached a certain tension. In a straightforward example, the discharge mechanism is operated as long as a further reduction of the length of the sheet section between the sheet support element and the discharge mechanism is possible without inducing an unallowable tension in the sheet.

[0018] The transport mechanism is adapted to stepwise advance the sheet. This applies to printers or copiers that work on a scanning principle as has been described above.

[0019] The discharge mechanism is adapted to continuously convey the sheet while the transport mechanism stepwise advances the sheet over the sheet support element during the printing process. When the discharge mechanism continuously advances the sheet, the power of the discharge mechanism can be reduced as compared to the requirements for stepwise advancing the sheet. Moreover, a continuous discharging of the sheet into the tray is more convenient and gives an impression of a higher printing speed. Preferably, the speed of the discharge mechanism is adapted or adaptable to different printing modes and average sheet advance speeds of the transport mechanism for each printing mode. By continuously conveying the sheet, the acceleration forces that are applied to the discharge mechanism and to the sheet are significantly reduced. This has also the additional advantage of reducing the noise generation.

[0020] A preferred embodiment of the invention will now be described in conjunction with the drawings in which:

Fig. 1 is a schematic partial cross-sectional view of a printer; and

Fig. 2 shows a detail of a sheet handling device of the printer shown in Fig. 1.

[0021] As is shown in Fig. 1, an ink jet printer comprises a platen which is intermittently driven to rotate in order to advance a sheet 12, e. g. a sheet of paper, in a direction indicated by an arrow A over the top surface of a sheet support plate. A number of transport rollers are rotatably supported in a cover plate and form a transport nip with the platen. The transport rollers and the platen form a transport mechanism for stepwise advancing the sheet 12. Thereby, the sheet 12, which is supplied from a reel via a guide plate, is paid out through a gap formed between an edge of the cover plate and the surface of the sheet support plate.

[0022] A carriage which includes a number of ink jet

print heads (not shown) is mounted above the sheet support plate so as to reciprocate in a direction that is perpendicular to the plane of the drawing across the sheet 12. In each pass of the carriage, a number of pixel lines are printed on the sheet 12 by means of the print heads which eject droplets of ink onto the sheet in accordance with image information supplied to the print heads. For the sake of simplicity, guide and drive means for the carriage, ink supply lines and data supply lines for the print heads, and the like, have not been shown in the drawing.

[0023] The top surface of the sheet support plate has a regular pattern of suction holes (not shown) through which the sheet 12 is sucked against the flat surface of the support plate and is thereby held in a flat condition, especially in the area which is scanned by the carriage, so that a uniform distance between the nozzles of the printheads and the surface of the sheet 12 is established over the whole width of the sheet, and a high print quality can be achieved.

[0024] The sheet 12 is further advanced along a curved guide plate 112 that turns the sheet upside down and reverses the transport direction of the sheet 12. As is shown in Fig. 1 and, in more detailed view, in Fig. 2, the sheet 12 is guided to a discharge nip formed between a plurality of upper discharge rollers 116 and lower discharge rollers, that are mounted on common axles, respectively. The discharge rollers form a discharge mechanism for continuously conveying the sheet, as will be described below.

[0025] From the discharge nip, the sheet 12 is discharged onto a tray 124. The tray 124 has a top surface 126 for supporting the sheets and has stops at which the trailing edges of the sheets 12 will be aligned.

[0026] A discharge sensor is arranged near the discharge nip to indicate when the trailing edge of the sheet 12 has been discharged from the discharge nip. The discharge sensor is of conventional design and comprises an arm that is pivotable about an axis.

[0027] A top frame member of the tray 124 carries a tray-full sensor which is also of conventional design comprising an arm that is pivotably mounted on the frame member.

[0028] The curved guide plate 112 surrounds a buffer space 160 for the sheet 12 and passes in approximately a half turn around the buffer space 160. When a leading edge of the sheet 12 has reached the discharge rollers, the discharge rollers engage the sheet 12 and may advance the sheet 12 towards the tray 124. Thereby, sheet 12 may be lifted from the guide plate 112 when its trailing portion is still held on the sheet support plate. Thereby, a section 12p of the sheet 12 traverses the buffer space 160 on a bent path that has a shorter length than the path along the guide plate 112. The buffer space 160 is adapted to accommodate varying lengths of the sheet section 12p between the sheet support plate and the discharge rollers. Thereby, the sheet 12 is buffered so that speed differences between the transport rollers and the platen on the one side and the discharge rollers on the other side are absorbed, so that the sheet section 12p is mechanically stress relieved. Thus, the discharge rollers will not exert a force on that part of the sheet that is held on the sheet support plate nor on the platen and the transport rollers.

[0029] At the guide plate 112, a path sensor is mounted having a pivotable arm that extends into the buffer space 160. At the end of the arm, a rod 162b extends transverse to the plane of the drawing of Fig. 2. When the sheet 12 is lifted from the guide plate 112, the sheet 12 engages the rod 162b and pivots the arm. Thereby, the path sensor detects how far the sheet 12 is lifted from the guide plate 112, indicating the length of the path of the sheet section 12p that traverses the buffer space 160.

[0030] The path sensor shown in figure 2 is a contact sensor, as a mechanical contact is established to detect a distance between the portion of the transport path and the sheet 12. Alternatively a contactless sensor (not shown) may be provided, such as a magnetic, optical or capacitive sensor. For instance an optical sensor may be used. Such a sensor can be composed of a modulated infrared light emitting diode at the light-emitting side and a modulating photosensitive integrated circuit at the light receiving side of the sensor. By modulating the emitted signal disturbing external light influences and noise can be filtered.

[0031] An advantage of the contactless path sensor is that mechanical contact of the sensor with the paper is avoided, in particular damaging the medium by mechanical interaction of the pivoting arm is avoided. A further advantage is the increased reliability and accuracy of the sensor measurements compared to the contact sensor. In a contact sensor, paper dust can be generated due to mechanical interaction with the medium, which may negatively influence the reliability of the measurements.

[0032] A signal of the path sensor is input to a drive controller 164 for the discharge rollers. When the sheet is discharged by the discharge rollers, the discharge rollers are continuously driven to convey the sheet 12 with a speed corresponding to an average advance speed of the sheet along the sheet support plate. Thereby, a continuous discharge movement of the sheet 12 is combined with the stepwise advancing of the sheet over the sheet support plate during the printing process.

[0033] Due to the input of the path sensor to the drive controller 164, the speed of the discharge rollers can be controlled to assure that the sheet section 12p is always lifted from the guide plate 112 in a degree so as to be mechanically stress relieved. When the length of the path of the sheet section 12p becomes to short, the speed of the discharge rollers is reduced, and vice versa. Thereby, the sheet 12 is discharged onto the tray 124 with an almost constant speed.

[0034] The discharge rollers may be driven via free wheel clutches, so that they may temporarily rotate at a higher speed when the leading edge of a new sheet is pushed into the discharge nip.

[0035] An example has been described, where the

sheet is stepwise advanced during the printing process and is continuously advanced through the discharge nip. The buffering of the sheet assures that the discharge rollers do not exert a force via the sheet section 12p onto that part of the sheet that is being printed at the sheet support plate nor on the transport rollers nor the platen. Thereby, a high printing accuracy is achieved.

Claims

1. A sheet handling device comprising a sheet transport path, a transport mechanism adapted to advance a sheet (12) along the transport path with a non-uniform speed, and upper (116) and lower discharge rollers forming a discharge mechanism arranged at the transport path for taking over the sheet (12) from the transport mechanism and discharging it, wherein the transport mechanism is adapted to stepwise advance the sheet (12); the discharge mechanism being adapted to convey the sheet (12) with a momentary speed that is different from that of the transport mechanism; a portion of the transport path between the transport mechanism and the discharge mechanism being curved along a buffer space (160) to allow the sheet (12) to bend within the buffer space (160) and thereby to absorb the speed difference between the transport mechanism and the discharge mechanism; a path sensor being arranged at the buffer space (160), and a signal of the path sensor being input to a drive controller (164) of the discharge mechanism,
   wherein the path sensor is adapted to detect a distance between said portion of the transport path and the sheet (12) when it is bent into the buffer space (160), the transport mechanism and the discharge mechanism being adapted to be driven in such a way, by the input of the path sensor to the drive controller (164) allowing the speed of the discharge rollers to be controlled, that a section (12p) of the sheet (12) which is within the buffer space (160) is mechanically stress relieved, thus avoiding a tension of the sheet (12) between the transport mechanism and the discharge mechanism, and
   wherein the discharge mechanism is adapted to continuously advance the sheet while the transport mechanism stepwise advances the sheet.

2. The sheet handling device of claim 1, wherein said curved portion of the transport path comprises a curved guide plate (112) passing in approximately a half turn around the buffer space (160).

3. The sheet handling device of claim 1 or 2, wherein the transport mechanism and the discharge mechanism are controlled to have like average speeds.

4. The sheet handling device of any one of the preceding claims, wherein said path sensor is contactless.

5. A printer comprising the sheet handling device of any one of the preceding claims.

6. The printer of claim 5, wherein said printer is an inkjet printer.

Patentansprüche

1. Bogenhandhabungsvorrichtung, aufweisend einen Bogentransportpfad, einen Transportmechanismus, der dazu eingerichtet ist, einen Bogen (12) mit einer nicht gleichförmigen Geschwindigkeit entlang des Transportpfades zu fördern, und obere (116) und untere Ausgaberollen, die einen an dem Transportpfad angeordneten Ausgabemechanismus zum Übernehmen des Bogens (12) von dem Transportmechanismus und Ausgeben desselben bilden, wobei der Transportmechanismus dazu eingerichtet ist, den Bogen (12) schrittweise zu fördern; wobei der Ausgabemechanismus dazu eingerichtet ist, den Bogen (12) mit einer Momentangeschwindigkeit zu befördern, die sich von derjenigen des Transportmechanismus unterscheidet; wobei ein Abschnitt des Transportpfades zwischen dem Transportmechanismus und dem Ausgabemechanismus entlang eines Pufferraumes (160) gekrümmt ist, um ein Biegen des Bogens (12) innerhalb des Pufferraumes (160) zu gestatten und **dadurch** den Geschwindigkeitsunterschied zwischen dem Transportmechanismus und dem Ausgabemechanismus aufzufangen; wobei ein Wegsensor an dem Pufferraum (160) angeordnet ist und
   wobei ein Signal des Wegsensors in eine Antriebssteuerung (164) des Ausgabemechanismus eingegeben wird,
   wobei der Wegsensor dazu eingerichtet ist, einen Abstand zwischen dem besagten Abschnitt des Transportpfades und dem Bogen (12) zu detektieren, wenn der Bogen (12) in den Pufferraum (160) gekrümmt wird, wobei der Transportmechanismus und der Ausgabemechanismus dazu eingerichtet sind, derart angetrieben zu werden, indem die Eingabe des Wegsensors an die Antriebssteuerung (164) es gestattet, die Geschwindigkeit der Ausgaberollen zu steuern, daß eine mechanische Belastung eines Abschnitts (12p) des Bogens (12), der sich innerhalb des Pufferraums (160) befindet, abgebaut wird und somit eine Spannung des Bogens (12) zwischen dem Transportmechanismus und dem Ausgabemechanismus vermieden wird, und
   wobei der Ausgabemechanismus dazu eingerichtet ist, den Bogen kontinuierlich zu fördern, während der Transportmechanismus den Bogen schrittweise fördert.

2. Bogenhandhabungsvorrichtung nach Anspruch 1, bei der der besagte gekrümmte Abschnitt des Transportpfades eine gekrümmte Führungsplatte (112) aufweist, die in annähernd einer halben Wendung um den Pufferraum (160) verläuft.

3. Bogenhandhabungsvorrichtung nach Anspruch 1 oder 2, bei der der Transportmechanismus und der Ausgabemechanismus gesteuert werden, um ähnliche Durchschnittsgeschwindigkeiten zu haben.

4. Bogenhandhabungsvorrichtung nach einem der vorstehenden Ansprüche, bei der der besagte Wegsensor berührungslos ist.

5. Drucker, aufweisend die Bogenhandhabungsvorrichtung nach einem der vorsehenden Ansprüche.

6. Drucker nach Anspruch 5, wobei der Drucker ein Tintenstrahldrucker ist.

Revendications

1. Dispositif de manutention de feuille comprenant un trajet de transport de feuille, un mécanisme de transport adapté de manière à faire avancer une feuille (12) le long du trajet de transport avec une vitesse non uniforme, et des rouleaux de déchargement supérieur (116) et inférieur formant un mécanisme de déchargement agencé au niveau du trajet de transport afin de prélever la feuille (12) sur le mécanisme de transport et de la décharger, dans lequel le mécanisme de transport est adapté afin de faire avancer la feuille (12) pas à pas ; le mécanisme de déchargement étant adapté afin de transférer la feuille (12) avec une vitesse instantanée qui est différente de celle du mécanisme de transport ; une partie du trajet de transport entre le mécanisme de transport et le mécanisme de déchargement étant incurvée le long d'un espace tampon (160) afin de permettre à la feuille (12) de s'incurver à l'intérieur de l'espace tampon (160) et ainsi d'absorber la différence de vitesse entre le mécanisme de transport et le mécanisme de déchargement ; un capteur de trajet étant agencé au niveau de l'espace tampon (160), et un signal du capteur de trajet étant délivré à une unité de commande d'entraînement (164) du mécanisme de déchargement,
dans lequel le capteur de trajet est adapté de manière à détecter une distance entre ladite partie du trajet de transport et la feuille (12) lorsqu'elle est incurvée dans l'espace tampon (160), le mécanisme de transport et le mécanisme de déchargement étant adaptés afin d'être entraînés d'une telle manière, par l'entrée du capteur de trajet sur l'unité de commande d'entraînement (164) permettant la commande de la vitesse des rouleaux de déchargement, qu'une section (12p) de la feuille (12) qui est à l'intérieur de l'espace tampon (160) soit libérée de contraintes mécaniques, évitant ainsi une traction sur la feuille (12) entre le mécanisme de transport et le mécanisme de déchargement, et
dans lequel le mécanisme de déchargement est adapté de manière à faire avancer la feuille en continu lorsque le mécanisme de transport fait avancer la feuille pas par pas.

2. Dispositif de manutention de feuille selon la revendication 1, dans lequel ladite partie incurvée du trajet de transport comprend une plaque de guidage courbe (112) passant approximativement sur un demi-tour autour de l'espace tampon (160).

3. Dispositif de manutention de feuille selon la revendication 1 ou 2, dans lequel le mécanisme de transport et le mécanisme de déchargement sont commandés de manière à présenter des vitesses moyennes identiques.

4. Dispositif de manutention de feuille selon l'une quelconque des revendications précédentes, dans lequel ledit capteur de trajet est sans contact.

5. Imprimante comprenant le dispositif de manutention de feuille selon l'une quelconque des revendications précédentes.

6. Imprimante selon la revendication 5, dans laquelle ladite imprimante est une imprimante à jet d'encre.

Fig. 1

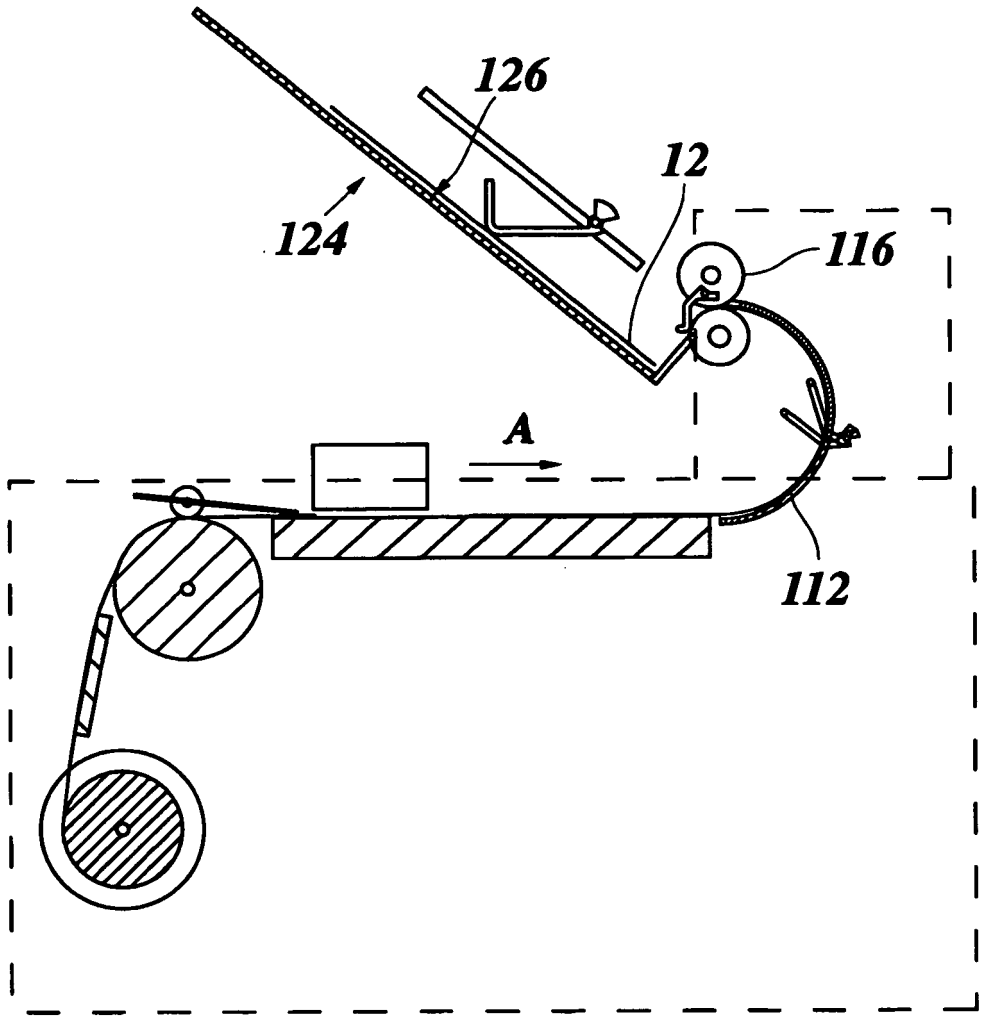
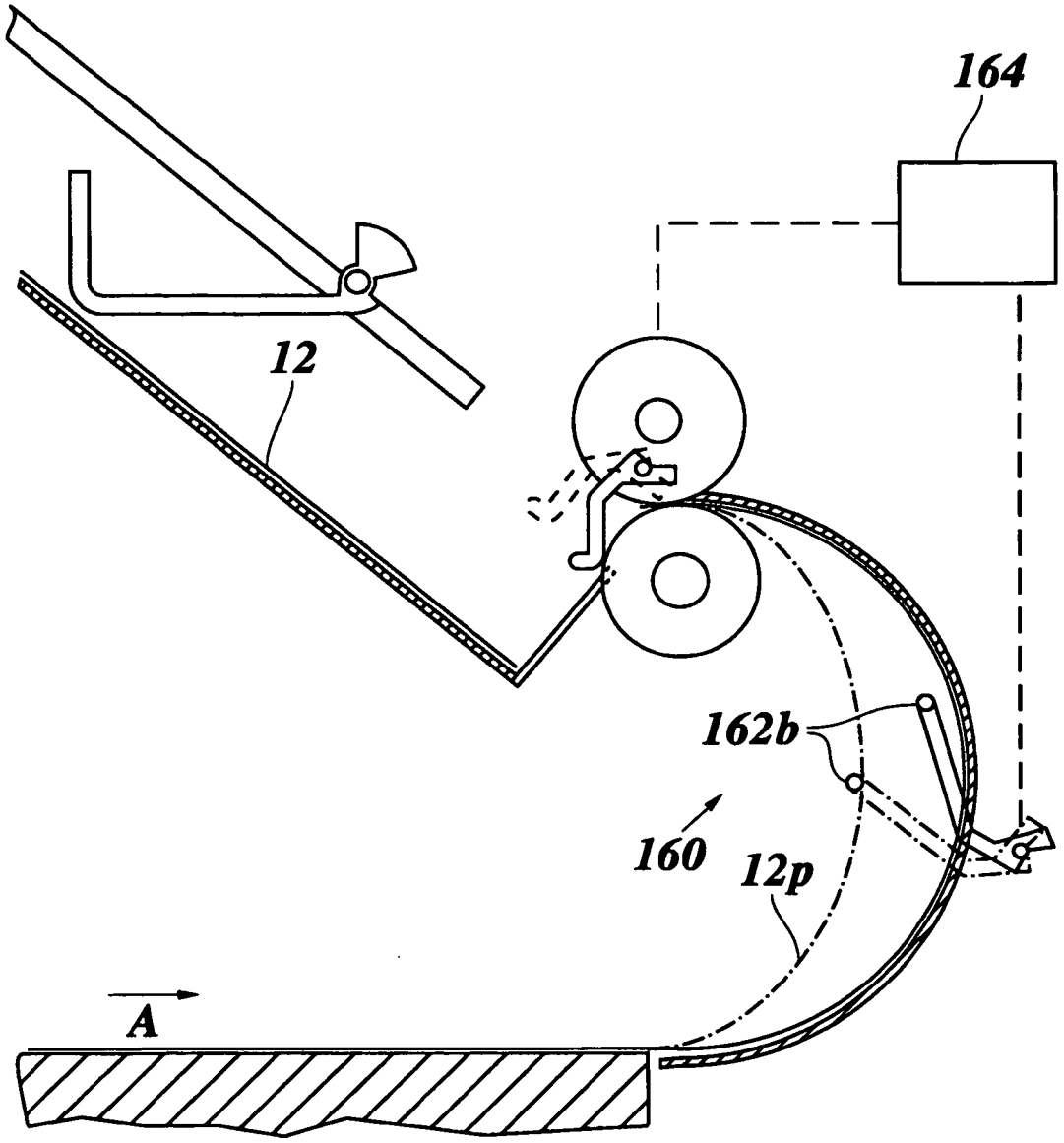


Fig. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 62211263 A **[0004]**
- JP 08268615 A **[0005]**
- JP 2004196483 A **[0006]**
- WO 2004041542 A1 **[0007]**
- US 6005687 A **[0008]**
- JP 2292076 A **[0009]**
- JP 5319615 A **[0010]**