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(54) **METHOD AND APPARATUS FOR DEPOSITING SHEET OF PAPER ONTO A STACK**

VERFAHREN UND VORRICHTUNG ZUR ABLAGE VON PAPIERBÖGEN AUF EINEN STAPEL

PROCEDE ET APPAREIL POUR DEPOSER UNE FEUILLE DE PAPIER SUR UNE PILE

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- **PATENT ABSTRACTS OF JAPAN vol. 011, no. 158 (M-591), 22 May 1987 (1987-05-22) & JP 61 291363 A (TOSHIBA CORP), 22 December 1986 (1986-12-22)**

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Description

FIELD OF THE INVENTION

[0001] The invention relates to depositing a sheet of paper onto a stack of sheets, preferably for use in a printing press, particularly an electro graphically operating press, where the sheet to be deposited is grasped by at least one rotationally drivable sheet conveyor member with the front edge of the sheet fed into a receptacle, and to deposit on the stack of sheets, the sheets' front edge is released from a receptacle, preferably through the use of a stop, particularly, a stack edge.

BACKGROUND OF THE INVENTION

[0002] Rotational sheet conveyors for feeding sheets into a receptacle for stacking are identified in DE-A-23 09 075. From US-A-4 629 174 a rotational sheet conveyor is known with receptacles which open and close automatically with the rotation of the conveyor.

[0003] During the course of stack formation, particularly in electro graphically produced prints where the toner is applied on the print material sheet, a print image that is not uniformly distributed on the sheet, in addition to repetition, can result in the formation of a skewed or uneven stack. As a result, sheet depositing with a rotating sheet conveyor member may be impaired or at a minimum, imprecise sheet depositing may occur.

SUMMARY OF THE INVENTION

[0004] Therefore, the underlying objective of the invention is to carry out a controlled depositing of the sheet of paper onto the stack of sheets. According to the invention, this objective is achieved by causing the sheet's front edge to be released from the receptacle of the rotating sheet conveyor member prior to the depositing of the sheet onto the stack of sheets, and instead, it is deposited into a receptacle of an intermediate transport member, where it is further released for depositing onto the stack of sheets.

[0005] An intermediate transport member is therefore beneficially provided, according to the invention that is particularly suitable for controlled depositing. The intermediate transport member with a receptacle for the deposit of the front edge of the sheet of paper is arranged so that the sheet's front edge can be passed out of the receptacle of the sheet conveyor member into the receptacle of the intermediate transport member through the rotation of the sheet conveyor member. For the mobility of the intermediate transport member, no separate drive is provided that would require coordination with the drive or with the rotary position of the sheet conveyor member. Instead, a beneficial automatic control of the movement processes results if the intermediate transport member is coupled with the rotationally drivable sheet conveyor member for mobility. For coupling and control of the movement of the intermediate transport member, at least one curved path that rotates with the sheet conveyor member is provided, i.e. a cam plate. With this, the timing of the processes and movement directions can be easily mechanically coordinated with each another.

[0006] There is preferably also a stop, particularly, a stack edge, with respect to which the intermediate member is movable relative to a sliding out of the sheet front edge out of its receptacle.

[0007] A more preferable arrangement of the apparatus, according to the invention, can be provided so that the intermediate transport member is suspended movably by a lever assembly with, preferably at least one of the lever arms of the lever assembly, being supported movably on at least one curved path, at least indirectly via an intermediate element. A particularly favorable arrangement is present, in that the lever assembly includes an essentially horizontally oriented level arm and an essentially vertically oriented level arm that are connected to each other with play remaining, and a separate curved path is provided in each case to allow for their movement processes.

[0008] To assure a continuous secure abutment of the elements on the curved paths and/or to assure automatic return of the elements to their idle or starting positions, the apparatus is preferably configured so that the intermediate transport member or coupling elements provided are spring-fitted.

[0009] A more secure, more reliable, controlled method for receiving and depositing the sheet is achieved by causing the receptacle of the intermediate transport member to be formed in the shape of a gripper mouth instead of, for example, in the shape of a simple slot. Such a gripper mouth formation can be achieved through use of simple clamp legs that are formed, for example, as leaf springs.

[0010] The invention, and its objects and advantages, will become more apparent in the detailed description of the preferred embodiment presented below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] An exemplary embodiment of the invention from which further inventive features can ensue (but to which the invention is not limited in its scope), is shown in the drawing. The schematic figures are as follows:

FIG. 1 is an apparatus according to the invention in a lateral view; and
FIG. 2 is an enlarged detailed view from FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0012] Referring now to the accompanying drawings, FIG. 1 shows an apparatus according to the invention, schematically in a lateral view. The apparatus includes a rotationally drivable sheet conveyor member 1 that has two slot-shaped receptacles for sheet's front edges that

are arranged in a manner where they are diametrically opposed to one another. Coaxially arranged cam plates 10, 11 rotate with the sheet conveyor member.

[0013] Moreover, the apparatus includes the lever arm assembly with a horizontal lever arm 2 and a vertical lever arm 3. The vertical lever arm 3 is suspended in a movably swinging manner on the horizontal lever arm 2. This occurs through the use of a pivot 7 that is guided in a longitudinal hole 5 that offers some play of the lever arm 3. The lever arm 2 is controllably supported on the cam plate 10 with a ball bearing 6, and is rotatably attached at a pivot 4. The lever arm 3 controllably abuts onto the cam plate 11. Springs 13 and 19 ensure the secure respective abutments of the lever arms. The system is arranged on a mount 14.

[0014] A sheet 9, to be deposited on a stack 12, arrives from a path for print material and reaches the last transport rollers 8 of the path. These transport rollers 8 pass the sheet 9 to the sheet conveyor member 1 by pushing it into a free slot of the sheet conveyor member 1. However, the sheet 9 is not released directly onto the stack 12 from the sheet conveyor member 1. At the lower end of the vertical lever arm 3, instead, there is a gripper mouth 15 that acts as an intermediate transport mechanism for the sheet 9. The sheet 9 is passed into this gripper mouth 15 through the rotation of the sheet conveyor member 1. Due to the eccentricity of the cam plate 11, during further rotation of the sheet conveyor member, the vertical lever arm 3 endures a pendulum swing (to the left, in the representation in the drawing) about the pivot 7. In this manner, the gripper mouth 15 moves relatively through a stack edge 16, where the sheet is slid out of the gripper mouth 15, and thereafter it falls onto the stack 12.

[0015] The pendulum movement of the vertical lever arm 3 occurs against the spring force of a spring 17 that vertically pulls the lever arm 3 in the play 5 downward, and adapts to the stack height. Moreover, the gripper mouth 15 is not rigidly attached to the vertical lever arm 3 but rather, is secured to it only with a spring 18, so that the gripper mouth 15 participates in the previously mentioned movement to the left but does not need to change its angular position with the lever arm 3; but instead, it can keep its horizontal orientation. This prevents the gripper mouth from getting jammed in its relative movement on the top side of the stack 12, with respect to the stack edge 16, since it does not require non-positively any swiveling path.

[0016] FIG. 2 shows a detailed view of FIG. 1. Identical components are designated with the same reference numbers as in FIG. 1. The gripper mouth 15 has two clamping elements 20, 21. They are coupled jointly via a pivot 22 on the vertical lever arm 3, and are swiveled and pulled by the spring 18 against a stop 23 of the lever arm 3. The spring 18 is attached on its end, opposite the gripper mouth on an extension 24 of the lever arm 3.

[0017] The movement process of the apparatus can be briefly described as follows:

[0018] During rotation of the sheet conveyor member 1, the installed cam plates 10, 11 participate in the movement. If a sheet 9, to be deposited, was conveyed via the sheet conveyor member 1 against the stack edge 16, then this sheet 9 has simultaneously threaded into the gripper mouth 15. After the sheet conveyor member 1 is rotated out of the region of the sheet 9, the gripper mouth 15 is lowered over the cam plate 10. Finally, the gripper mouth 15 is placed on the stack 12.

[0019] In order to compensate for differences in height in the stack 12, an elongated hole guide 5 is located on the vertical lever arm 3. The tension spring 17 ensures that the gripper mouth 15 is actually resting on the stack 12. In the next step in the representation, the gripper mouth 15 must now proceed through the stack edge 16, while being moved away to the left. This is accomplished via the cam plate 11. The cam plate 11 deflects the vertical lever arm 3 over the pivot 7, to the left. To prevent the gripper mouth 15 from jamming with the stack 12 during this rotational movement, the gripper mouth is installed in a spring-fitted manner on the vertical lever arm 3. As a consequence, the gripper mouth 15 remains horizontally oriented during the lateral swinging. The sheet 9 can thus be concisely released over the stack 12.

[0020] The benefit with this additional device, on the sheet conveyor member, is that the sheet is still reliably deposited on a stack, even in the case of a skewed stack surface. In the included representations, only one sheet conveyor member is shown with the corresponding mechanics. In the total unit of an extension, however, there are preferably, two sheet conveyor members with the corresponding mechanics. If a stack has become oriented at a different height below the two sheet conveyor members, the two-gripper systems compensate for the unevennesses, independently of each other.

[0021] The stack height differences arise due to a one-sided print image, for example. Gradually, a skewed stack is formed, corresponding to a one-sided toner layer, for example.

Claims

1. An apparatus for depositing a sheet of paper (9) on a stack (12) of sheets of paper, for use in a printing press, including at least one rotationally drivable sheet conveyor member (1) with at least one receptacle where said front edge of said sheet is to be deposited, an intermediate transport member (15) with a receptacle where said front edge of said sheet (9) is to be deposited that is arranged so that said sheet's front edge can be passed out of said receptacle of said at least one rotationally drivable sheet conveyor member (1) into said receptacle of said intermediate transport member (15) through said rotation of said rotationally drivable sheet conveyor member, **characterized by** said intermediate transport member being coupled with said rotationally

drivable sheet conveyor member for mobility with at least one cam plate (10,11) that rotates along with said sheet conveyor member (1), being provided for coupling and control of said movement of said intermediate transport member.

2. The apparatus according to Claim 1, **characterized by** a stop (23), which is movable by said intermediate member (15) through a sliding of said sheet's front edge out of its receptacle.

3. The apparatus according to Claim 1 or 2, **characterized by** said intermediate transport member (15) being suspended movably by a lever assembly.

4. The apparatus according to Claim 3, **characterized by** at least one lever arm (3) of said lever assembly is supported movably on at least one cam plate at least indirectly via an intermediate element.

5. The apparatus according to Claim 4, **characterized by** said lever assembly including an essentially horizontally oriented level arm (2) and an essentially vertically oriented level arm (3) that are connected to each other with some play remaining, and a separate cam plate is provided to allow their movement processes.

6. The apparatus according to Claim (1), **characterized by** said intermediate transport member coupling elements are spring-fitted (13,19).

7. The apparatus according to Claim 1, **characterized by** said receptacle of said intermediate transport member being formed as a gripper mouth (15).

Patentansprüche

1. Vorrichtung zum Ablegen eines Papierbogens (9) auf einem Papierbogenstapel (12) für den Einsatz in einer Druckmaschine mit mindestens einem rotierend antreibbaren Bogenförderelement (1) mit mindestens einer Aufnahmeeinrichtung, in der die Vorderkante des Bogens abzulegen ist, einem Zwischentransportelement (15) mit einer Aufnahmeeinrichtung, in der die Vorderkante des Bogens (9) abzulegen ist, wobei die Bogenvorderkante durch die Drehbewegung des rotierend antreibbaren Bogenförderelements aus der Aufnahmeeinrichtung des mindestens einen rotierend antreibbaren Bogenförderelements (1) heraus und in die Aufnahmeeinrichtung des Zwischentransportelements (15) überfiihrbar ist, **dadurch gekennzeichnet, dass** das Zwischentransportelement über mindestens eine mit dem Bogenförderelement (1) rotierende Nockenplatte (10, 11) beweglich mit dem rotierend antreibbaren Bogenförderelement gekoppelt und zur Kopplung und Steuerung der Bewegung des Zwischentransportelements vorgesehen ist.

2. Vorrichtung nach Anspruch 1, **gekennzeichnet durch** einen Anschlag (23), der **durch** das Herausgleiten der Vorderkante des Bogens aus der Aufnahmeeinrichtung des Zwischenelements (15) **durch** dieses bewegbar ist.

3. Vorrichtung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** das Zwischentransportelement (15) über eine Hebelanordnung beweglich aufgehängt ist.

4. Vorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** mindestens ein Hebelarm (3) der Hebelanordnung zumindest indirekt über ein Zwischenelement beweglich an mindestens einer Nokkenplatte gehalten ist.

5. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Hebelanordnung einen im Wesentlichen horizontal ausgerichteten Hebelarm (2) und einen im Wesentlichen vertikal ausgerichteten Hebelarm (3) umfasst, die mit einem gewissen Spiel miteinander verbunden sind, und dass für die Bewegungsabläufe der Hebelarme eine besondere Nokkenplatte vorgesehen ist.

6. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Kopplungselemente des Zwischentransportelements federnd gelagert (13, 19) sind.

7. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Aufnahmeeinrichtung des Zwischentransportelements als Greiferöffnung (15) ausgebildet ist.

Revendications

1. Appareil permettant de déposer une feuille de papier (9) sur une pile (12) de feuilles de papier, utilisé dans une presse d'imprimerie, comprenant au moins un élément convoyeur de feuilles (1) pouvant être entraîné en rotation avec au moins un réceptacle, où ledit bord frontal de ladite feuille doit être déposé, un élément de transport intermédiaire (15) comprenant un réceptacle où ledit bord frontal de ladite feuille (9) doit être déposé, est configuré de manière que ledit bord frontal de la feuille puisse passer dudit réceptacle dudit élément convoyeur de feuilles (1) pouvant être entraîné en rotation dans ledit réceptacle dudit élément de transport intermédiaire (15) par ladite rotation dudit élément convoyeur de feuilles (1) pouvant être entraîné en rotation, **caractérisé en ce que** ledit élément de transport intermédiaire est cou-

plé audit élément convoyeur de feuilles (1) pouvant être entraîné en rotation pour être mobile avec au moins un disque à came (10, 11) qui tourne avec ledit élément convoyeur de feuilles (1) prévu pour coupler et commander ledit déplacement dudit élément de transport intermédiaire.

2. Appareil selon la revendication 1, **caractérisé en ce qu'**une butée (23) peut être déplacée par ledit élément intermédiaire (15) par glissement dudit bord frontal de la feuille hors de son réceptacle.

3. Appareil selon la revendication 1 ou 2, **caractérisé en ce que** ledit élément de transport intermédiaire (15) est maintenu en suspension mobile par un ensemble de levier.

4. Appareil selon la revendication 3, **caractérisé en ce qu'**au moins un bras de levier (3) dudit ensemble de levier est supporté amovible sur au moins un disque à came, au moins indirectement, via un élément intermédiaire.

5. Appareil selon la revendication 4, **caractérisé en ce que** ledit ensemble de levier comprend un bras de levier essentiellement horizontal (2) et un bras de levier essentiellement vertical (3) raccordés l'un à l'autre avec un léger jeu et un disque à came distinct est prévu pour permettre leurs déplacements.

6. Appareil selon la revendication 1, **caractérisé en ce que** lesdits éléments de couplage de l'élément de transport intermédiaire sont équipés de ressorts (13, 19).

7. Appareil selon la revendication 1, **caractérisé en ce que** ledit réceptacle dudit élément de transport intermédiaire est formé d'un bec de préhension (15).

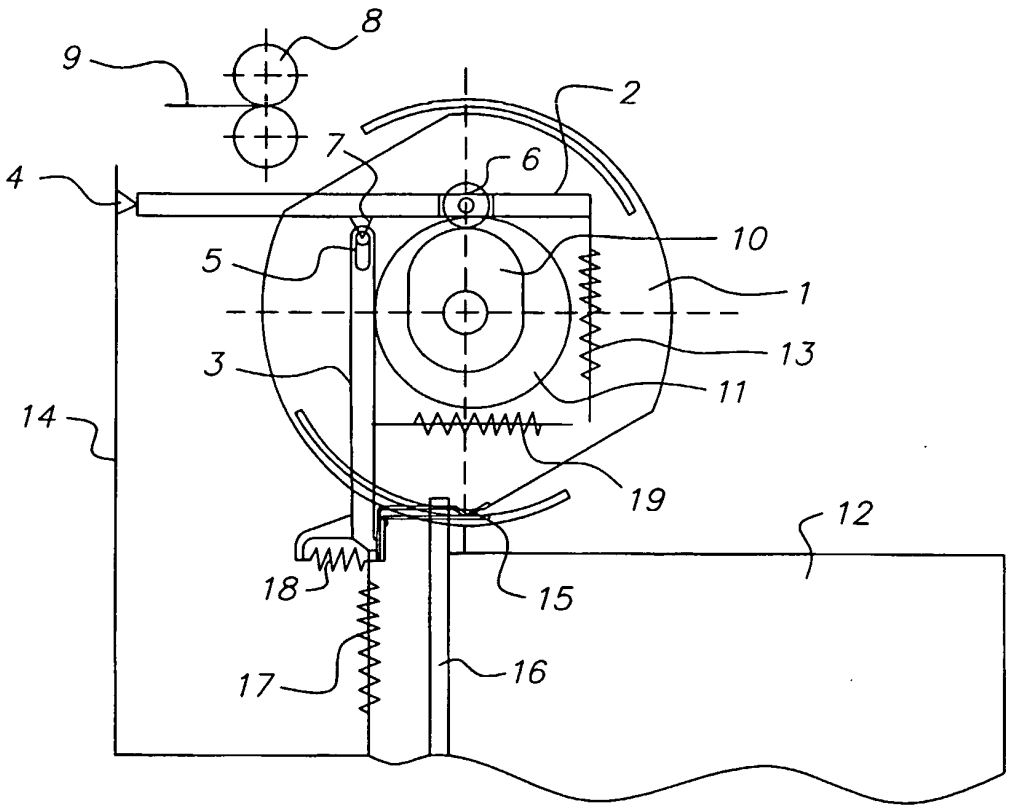

FIG. 1

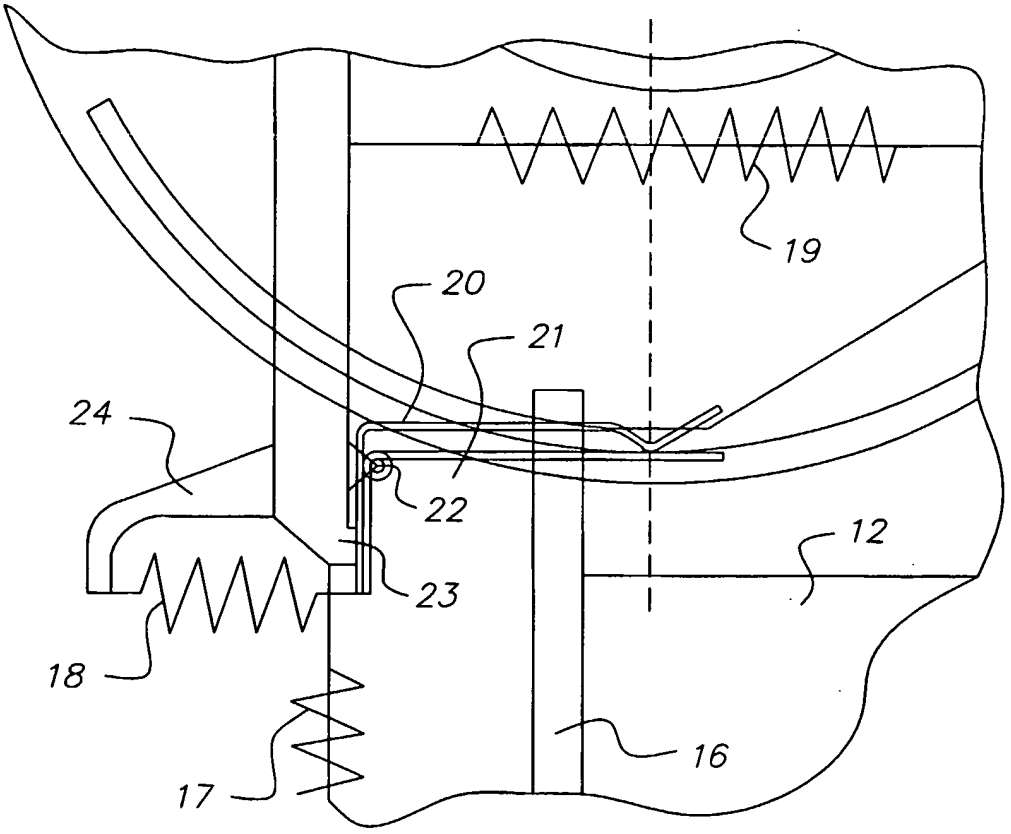

FIG. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 4629174 A **[0002]**