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(56) References cited:

CH-A- 674 977

GB-A- 2 270 306

US-A- 3 966 192

US-A- 4 588 180

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Description

[0001] The invention relates to a method for manufacturing books. In particular, the invention relates to a method and apparatus for manufacturing books.

[0002] There are several steps involved in conventional methods for manufacturing books from printed sheets. Each step in the process involves operation of equipment in a batch manner. For example, stacks of sheets are printed off and then transferred to a folding unit for folding. One of the problems with conventional book manufacturing systems is the amount of handling required during the manufacturing process. It is also essential to operate each of the items of equipment at maximum efficiency.

[0003] It is an object of the invention therefore to provide a method and apparatus for efficient manufacture of books.

[0004] US-A-3 966 192 describes a sheet pile elevator for printing machines. Sheets are mounted on a sheet pile table which is lifted by roller chains.

[0005] GB-A-270306 describes a feeder-folder apparatus for folding rectangular pieces into a V-shaped configuration.

[0006] According to one aspect, the invention provides a method for manufacturing books including the steps of:-

printing sheets of paper;

stacking the printed sheets on a pallet;

loading the pallet with the stack of printed sheets into a printed sheet elevator apparatus of the type comprising:-

a support platform for receiving the pallet with the stack of printed sheets, the support platform having lifting points adjacent the corners of the stack;

drive means for driving a drive train extending between the drive means and the lifting points;

the drive train comprising a separate drive chain connected to each lifting point; each drive chain, being trained over at least one chain guide;

lifting means for pulling the lifting points and hence the support platform upwardly in synchronisation with the operation of a sheet folding unit, the drive chains being operated substantially simultaneously by the drive means;

loading the pallet onto the support platform through an end entry towards but spaced-apart from a primary guide means, at the opposite end from the end

entry the sheets being drawn in a sheet feed direction;

lifting the support platform upwardly by rotating the chain guides about an axis of rotation which is transverse to the sheet feed direction;

initial lifting of the support platform to engage a secondary guide means to guide the stack against the primary guide means for delivery of a single sheet from the top of the stack to the folding unit;

lifting the support platform upwardly in synchronisation with the operation of the folding unit;

folding the sheets as the sheets are delivered to the folding unit;

gathering the folded pages to form a book;

applying a cover; and

binding the book.

[0007] In one embodiment of the invention, the method includes the step of guiding each chain over at least some of the sprockets with a chain engagement means to ensure engagement of the chain with the sprockets.

[0008] Preferably the method includes the step of detecting the end of the stack, and, in response, stopping the drive means and the folding unit.

[0009] Preferably the method includes the step, after completion of the stack, of returning the support platform to a lowered pallet receiving position.

[0010] In a preferred embodiment of the invention, the method includes the step of wrapping the stack with a plastics film after printing and stacking to retain a substantially constant humidity of the paper sheets prior to delivery to the support platform for the folding unit.

[0011] Preferably the books are bound by applying a hot melt adhesive and the method includes the step of curing the adhesive prior to packing the books.

[0012] Most preferably the books are cured by leading them along a circuitous conveyor prior to packaging.

[0013] In one embodiment of the invention, the method includes the steps, after binding, of:- trimming the book; weighting each book; comparing the book weight with a check weight; and rejecting any books not conforming to the check weight.

[0014] Preferably the method includes the steps of:- collecting waste paper generated in the book manufacturing process; shredding the waste; compacting the shredded waste paper; and recycling the compacted waste paper.

[0015] The invention also provides a printed sheet elevator apparatus comprising:-

a support platform for receiving a stack of printed

sheets, the support platform having lifting points adjacent the corners of a stack;

drive means for driving a drive train extending between the drive means and the lifting points;

the drive train comprising a separate drive chain connected to each lifting point; each drive chain being trained over at least one chain guide lifting means for pulling the lifting points and hence the support platform upwardly in synchronisation with the operation of a sheet folding unit, the drive chains being operated substantially simultaneously by the drive means;

characterised in that:

the elevator apparatus has an end entry for loading a pallet on which the stack is placed and an opposite end exit from which a sheet is drawn from the stack in a sheet feed direction;

the axis of rotation of the chain guides in the form of sprockets over which the chains are led being transverse to the sheet feed direction;

and in that the elevator apparatus includes:-

primary guide means for aligning the sheets for delivery through the end exit; and

secondary guide means for controlled delivery of the stack to the primary guide means on initial lifting of the support platform.

[0016] The secondary guide means preferably comprises a pair of side guide arms adjacent the end exit, each guide arm including a lower inturned portion, and guide bars extending from the support platform to engage the inturned portions of the guide arms when the support platform is in a lowered pallet receiving position, the guide bars running in the guide arms for aligning the stack for take-off of single sheets.

[0017] In a particularly preferred embodiment of the invention chain engagement means are provided over at least some of the sprockets to ensure engagement of the chain with the sprockets.

[0018] In one embodiment of the invention, the apparatus includes switch means for disabling the drive means when the support platform is raised and/or lowered beyond preset positions.

[0019] The invention also provides books whenever manufactured using the method of the invention and/or utilising the apparatus of the invention.

[0020] The invention will be more clearly understood from the following description thereof, given by way of example and with reference to the accompanying drawings in which :-

Fig. 1 is a perspective view of an apparatus for presenting stacks of printed sheets to a folding machine;

Fig. 2 is a perceptive view of the apparatus of Fig. 1 with a stack of sheets in position;

Fig. 3 is a perspective view from one side of the apparatus of Figs. 1 and 2;

Fig. 4 is a side elevational view of the apparatus in use;

Fig. 5 is a plan view of the apparatus;

Fig. 6 is a perspective view of a stack of sheets used in the method and apparatus of the invention;

Fig. 7 is a side view of a detail of the apparatus;

Fig. 8 is a perspective cross-sectional view of the detail of the apparatus;

Figs. 9(a) and 9(b) are cross-sectional views along the lines IX-IX in Fig. 8 with a support platform of the apparatus in different positions of use; and

Fig. 10 is a side view of another detail of the apparatus.

[0021] In a method for manufacturing books according to the invention, large sheets of paper are first printed using conventional printing techniques. The printed sheets are then stacked on a pallet 2 which holds a stack 3 of typically several hundred printed sheets. To ensure that optimum condition of the paper is retained and hence to optimise manufacturing efficiency, the stack of sheets 3 is preferably wrapped with a plastics film pending the further steps in the method of the invention.

[0022] The pallet 2 with the stack 3 in position is then loaded onto an apparatus according to the invention indicated generally by the reference numeral 5 which delivers single printed sheets to a folding unit, only portion 6 of which is illustrated. The sheets are folded in the folding unit and then the folded pages are gathered to form a book to which a cover is applied. The book is then bound, in this case by applying a hot melt adhesive. The adhesive is cured by passing the book along a circuitous conveyor to a quality checking and packing station.

[0023] As one of the quality control procedures each book is individually weighed, after trimming, and the weight is compared with a check weight to ensure that the book has the correct number of pages.

[0024] During the operation of the method of the invention waste paper is generated at several stages, for example, during trimming. The waste is collected, shredded, compacted and recycled.

[0025] In more detail, the apparatus 5 according to the

invention comprises a support platform 10 for receiving a pallet 2 of a stack 3 of printed sheets. The support platform 10 has four lifting points provided by lifting lugs 11 which are located in use adjacent the corners of a pallet 2 as will be particularly apparent from Fig. 2. The apparatus 5 also includes lifting means for pulling the lifting lugs 11 upwardly in synchronisation with the operation of the folding unit 6.

[0026] The lifting means comprises drive means provided by a drive shaft 15 for driving a drive train extending between the drive shaft 15 and the lifting lugs 11. The drive train comprises a separate drive chain 16 connected to each lifting point 11, the drive chains 16 being operated substantially simultaneously by the drive shaft 15 for controlled and accurate lifting of the support platform 10 and hence presenting a sheet from the top of the stack 3 to the folding unit 6. Each of the drive chains 16 is trained over a number of sprockets 18 which are driven by the drive shaft 15. An end 20 of each drive chain 16 is mounted to an associated lifting lug 11 and the other end 21 of the chain 16 is a free end which is provided with a counterweight 22 to retain the chain 16 in position and ensure that the chain remains in contact with the sprockets 18. In addition, a segment-shaped chain engagement 25 means is positioned over at least the main driven sprockets, to ensure that the chain 16 is retained in positive contact with the sprockets of the sprocket wheel. In this way, the drive is optimised to ensure that all the lifting points 11 and hence the support platform and top row sheet in the stack 3 is presented to the folding unit in such a way that the folding unit is synchronised with the presentation of the sheets so that the folding unit operates at optimum operating conditions.

[0027] The uppermost sheet in the stack 3 is separated from the stack by a separator unit 30. A control unit 31 having a sheet engaging extension arm 32 monitors the delivery of sheets to the folding unit from the stack and ensures that the drive shaft 15 is driven in synchronisation with the operation of the folding unit.

[0028] The apparatus 5 also includes a guide means for guiding the stack into an aligned position on the support platform 10 for delivery of single sheets from the top of the stack 3 to the folding unit 6. The guide means is provided by guide strips 40 against which the stack 3 is engaged. The guide means also includes secondary guide means provided by a pair of side angle-shaped guide arms 45 which include a lower intumed portion 46 as illustrated particularly in Figs. 9(a) and 9(b). The platform 10 includes projecting bars 50 which run in the guide arms 45. The arrangement is such that when a pallet 2 with a stack 3 is loaded by means of a forklift truck onto the platform 10, the stack 3 is not pushed against the guide strips 40. On lifting of the platform 10, the bars 50 ride up along the lower portion 46 of the guides 45 which causes the stack 3 to move inwardly against the guide strips 40. In this way, the stack 3 is presented to the folding unit in a consistent and optimum

manner at all times.

[0029] As will be particularly apparent from Fig. 10, switch means is provided by upper and lower limit switches 59,60 which are operated by a switch arm 63 carried by the platform 10. The switches 59,60 cause the drive means to be disabled when the platform 10 is raised and/or lowered beyond preset positions.

[0030] The method and apparatus of the invention particularly allows a folding unit to be loaded with stacks of printed sheets for folding in a highly efficient and optimum manner for folding. Minimum handling is required and a high level of efficiency and quality is achieved with the folding unit as the sheets are always presented to the folding unit in a consistent manner. Manufacturing efficiency is thereby optimised.

[0031] Many variations on the specific embodiment of the invention described will be readily apparent and accordingly the invention is not limited to the embodiments hereinbefore described which may be varied in detail.

Claims

1. A method for manufacturing books comprising the steps of:-

printing sheets of paper;

stacking the printed sheets on a pallet (2);

loading the pallet (2) with the stack (3) of printed sheets into a printed sheet elevator apparatus of the type comprising:-

a support platform (10) for receiving the pallet (2) with the stack (3) of printed sheets, the support platform (10) having lifting points (11) adjacent the corners of the stack (3);

drive means (15) for driving a drive train (16, 18) extending between the drive means (15) and the lifting points (11);

the drive train (16, 18) comprising a separate drive chain (16) connected to each lifting point (11); each drive chain being trained over at least one chain guide (18);

lifting means (15, 16) for pulling the lifting points (11) and hence the support platform (10) upwardly in synchronisation with the operation of a sheet folding unit (6), the drive chains (16) being operated substantially simultaneously by the drive means (15);

loading the pallet (2) onto the support platform

(10) in a feed direction through an end entry towards but spaced-apart from a primary guide means (40), at the opposite end from the end entry the sheets being drawn in a sheet feed direction;

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lifting the support platform (10) upwardly by rotating the chain guides (18) about an axis of rotation which is transverse to the sheet feed direction;

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initial lifting of the support platform (10) to engage a secondary guide means (45) to guide the stack (3) against the primary guide means (40) for delivery of a single sheet from the top of the stack (3) to the folding unit (6);

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lifting the support platform (10) upwardly in synchronisation with the operation of the folding unit (6);

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folding the sheets as the sheets are delivered to the folding unit(6);

gathering the folded pages to form a book;

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applying a cover; and

binding the book.

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2. A method as claimed in claim 1 including the step of guiding each chain (16) over at least some of the chain guides in the form of sprockets (18) with a chain engagement means (25) to ensure engagement of the chain (16) with the sprockets (18).

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3. A method as claimed in any preceding claim including the steps of detecting the end of the stack (3), and, in response, stopping the drive means (15) and the folding unit (6).

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4. A method as claimed in claim 3 including the step, after completion of the stack (3), of returning the support platform (10) to a lowered pallet receiving position.

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5. A method as claimed in any preceding claim including the step of wrapping the stack (3) with a plastics film after printing and stacking to retain a substantially constant humidity of the paper sheets prior to delivery to the support platform (10) for the folding unit.

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6. A method as claimed in any preceding claim wherein the books are bound by applying a hot melt adhesive and the method includes the step of curing the adhesive prior to packing the books, preferably the books are cured by leading them along a circu-

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itous conveyor prior to packaging.

7. A method as claimed in any preceding claim including the steps, after binding, of:- trimming the book; weighting each book; comparing the book weight with a check weight; and rejecting any books not conforming to the check weight.

8. A printed sheet elevator apparatus comprising:-

a support platform (10) for receiving a stack (3) of printed sheets, the support platform (10) having lifting points (11) adjacent the corners of a stack (3);

drive means (15) for driving a drive train (16, 18) extending between the drive means (15) and the lifting points (11);

the drive train (16, 18) comprising a separate drive chain (16) connected to each lifting point (11); each drive chain being trained over at least one chain guide (18);

lifting means (15, 16) for pulling the lifting points (11) and hence the support platform (10) upwardly in synchronisation with the operation of a sheet folding unit (6), the drive chains (16) being operated substantially simultaneously by the drive means (15);

characterised in that:

the elevator apparatus has an end entry for loading a pallet (2) on which the stack (3) is placed and an opposite end exit from which a sheet is drawn from the stack in a sheet feed direction;

the axis of rotation of the chain guides in the form of sprockets (18) over which the chains (16) are led being transverse to the sheet feed direction;

and in that the elevator apparatus includes:

primary guide means (40) for aligning the sheets for delivery through the end exit; and

secondary guide means (45) for controlled delivery of the stack (3) to the primary guide means (40) on initial lifting of the support platform (10).

9. Apparatus as claimed in claim 8 wherein the secondary guide means comprises a pair of side guide arms (45) adjacent the end exit, each guide arm (45) including a lower intumed portion (46), and

guide bars (50) extending from the support platform (10) to engage the inturned portions (46) of the guide arms (45) when the support platform is in a lowered pallet receiving position, the guide bars (50) running in the guide arms (45) for aligning the stack (3) for take-off of single sheets. 5

10. Apparatus as claimed in claim 8 or 9 wherein chain engagement means (25) are provided over at least some of the sprockets (18) to ensure engagement of the chain (16) with the sprockets (18). 10

11. Apparatus as claimed in any of claim 8 to 10 including switch means (59, 60) for disabling the drive means (15) when the support platform (10) is raised and/or lowered beyond preset positions. 15

Patentansprüche 20

1. Verfahren zum Herstellen von Büchern, das die Schritte umfaßt:

Papierblätter zu bedrucken; 25

die bedruckten Blätter auf einer Palette (2) zu stapeln;

die Palette (2) mit dem Stapel (3) bedruckter Blätter in eine Hebeeinrichtung für bedruckte Blätter des Typs zu legen, der aufweist: 30

eine Tragplattform (10) zum Aufnehmen der Palette (2) mit dem Stapel (3) bedruckter Blätter, wobei die Tragplattform (10) Hebe- 35
punkte (11) benachbart den Ecken des Stapels (3) aufweist;

Antriebsmittel (15) zum Antreiben einer Antriebszugeinrichtung (16, 18), die zwischen den Antriebsmitteln (15) und den Hebe- 40
punkten (11) verläuft;

wobei die Antriebszugeinrichtung (16, 18) eine mit jedem Hebepunkt (11) verbundene, getrennte Antriebskette (16) aufweist; 45
und jede Antriebskette über wenigstens eine Kettenführung (18) gezogen wird;

Hebemittel (15, 16) zum Ziehen der Hebe- 50
punkte (11) und folglich der Tragplattform (10) nach oben synchron mit dem Betrieb einer Blattfalteinheit (6), wobei die Antriebsketten (16) im wesentlichen gleichzeitig durch die Antriebsmittel (15) betätigt 55
werden;

die Palette (2) in einer Zuführrichtung

durch einen Endeingang in Richtung auf, aber beabstandet von einem primären Führungsmittel (40) auf die Tragplattform (10) zu legen, wobei die Blätter an dem dem Endeingang gegenüberliegenden Ende in einer Blattzuführrichtung gezogen werden;

die Tragplattform (10) durch Drehen der Kettenführungen (18) um eine Drehachse, die quer zu der Blattzuführrichtung ist, nach oben zu heben;

die Tragplattform (10) anfangs anzuheben, um ein sekundäres Führungsmittel (45) zu ergreifen, um den Stapel (3) für Abgabe eines einzelnen Blatts von der oberen Fläche des Stapels (3) an die Falteinheit (6) gegen das primäre Führungsmittel (40) zu führen;

die Tragplattform (10) synchron mit dem Betrieb der Falteinheit (6) nach oben zu heben;

die Blätter zu falten, wenn die Blätter an die Falteinheit (6) abgegeben werden;

die gefalteten Seiten zum Bilden eines Buches zu sammeln;

einen Deckel anzubringen; und

das Buch zu binden.

2. Verfahren nach Anspruch 1, das den Schritt umfaßt, jede Kette (16) über mindestens einige der Kettenführungen in der Form von Transportrollen (18) mit einem Ketteneingriffsmittel (25) zu führen, um Ineinandergreifen der Kette (16) mit der Transportrolle (18) sicherzustellen.

3. Verfahren nach einem vorhergehenden Anspruch, das die Schritte umfaßt, das Ende des Stapels (3) zu ermitteln und als Reaktion das Antriebsmittel (15) und die Falteinheit (6) anzuhalten.

4. Verfahren nach Anspruch 3, das den Schritt umfaßt, nach Abschluß des Stapels (3) die Tragplattform (10) in eine abgesenkte Palettenaufnahmeposition zurückzuführen.

5. Verfahren nach einem vorhergehenden Anspruch, das den Schritt umfaßt, den Stapel (3) nach Bedrucken und Stapeln mit einer Kunststoffolie zu umwickeln, um eine im wesentlichen konstante Feuchtigkeit der Papierblätter vor Abgabe an die Tragplattform (10) für die Falteinheit beizubehalten.

6. Verfahren nach einem vorhergehenden Anspruch, bei dem die Bücher gebunden werden, indem ein Heißkleber aufgetragen wird, und das Verfahren den Schritt umfaßt, den Kleber vor Verpackung der Bücher auszuhärten, vorzugsweise werden die Bücher durch Führen derselben entlang eines Kreislaufbandes vor Verpackung ausgehärtet. 5
7. Verfahren nach einem vorhergehenden Anspruch, das die Schritte nach Binden umfaßt: das Buch abzukanten; jedes Buch zu wiegen; das Buchgewicht mit einer Prüfliste zu vergleichen; und jegliche Bücher auszumustern, die nicht mit dem Prüfgewicht übereinstimmen. 10
8. Hebeeinrichtung für bedruckte Blätter, die umfaßt: 15
- eine Tragplattform (10) zum Aufnehmen eines Stapels (3) bedruckter Blätter, wobei die Tragplattform (10) Hebepunkte (11) benachbart den Ecken eines Stapels (3) aufweist; 20
- Antriebsmittel (15) zum Antreiben einer Antriebszugeinrichtung (16, 18), die zwischen den Antriebsmitteln (15) und den Hebepunkten (11) verläuft; 25
- wobei die Antriebszugeinrichtung (16, 18) eine mit jedem Hebepunkt (11) verbundene, getrennte Antriebskette (16) aufweist; und jede Antriebskette über wenigstens eine Kettenführung (18) gezogen wird; 30
- Hebemittel (15, 16) zum Ziehen der Hebepunkte (11) und folglich der Tragplattform (10) nach oben synchron mit dem Betrieb einer Blattfalteinheit (6), wobei die Antriebsketten (16) im wesentlichen gleichzeitig durch die Antriebsmittel (15) betätigt werden; 35
- dadurch gekennzeichnet, daß: 40
- die Hebeeinrichtung einen Endeintritt zum Laden einer Palette (2), auf der der Stapel (3) vorgesehen wird, und einen Ausgang am gegenüberliegenden Ende aufweist, von dem ein Blatt in einer Blattzuführrichtung aus dem Stapel gezogen wird; 45
- wobei die Drehachse der Kettenführungen in der Form von Transportrollen (18), über die die Ketten (16) geführt werden, quer zu der Blattzuführrichtung ist; 50
- und daß die Hebeeinrichtung umfaßt: 55
- primäre Führungsmittel (40) zum Ausrichten der Blätter für Ausgabe durch den Endaus-

gang; und

sekundäre Führungsmittel (45) für gesteuerte Ausgabe von dem Stapel (3) an die primären Führungsmittel (40) bei beginnendem Anheben der Tragplattform (10).

9. Vorrichtung nach Anspruch 8, bei der das sekundäre Führungsmittel ein Paar Seitenführungsarme (45) benachbart dem Endausgang aufweist, wobei jeder Führungsarm (45) einen unteren, nach innen gedrehten Teil (46) und Führungsstäbe (50) aufweist, die sich von der Tragplattform (10) erstrecken, um die nach innen gedrehten Teile (46) der Führungsarme (45) zu ergreifen, wenn die Tragplattform sich in einer abgesenkten Palettenaufnahme-position befindet, wobei die Führungsstäbe (50) in den Führungsarmen (45) zum Ausrichten des Stapels (3) zum Abnehmen einzelner Blätter laufen.
10. Vorrichtung nach Anspruch 8 oder 9, bei der Ketteneingriffsmittel (25) über mindestens einigen der Transportrollen (18) vorgesehen sind, um Eingriff der Kette (16) mit den Transportrollen (18) sicherzustellen.
11. Vorrichtung nach einem der Ansprüche 8 bis 10, die Schaltmittel (59, 60) zum Ausschalten des Antriebsmittels (15) umfaßt, wenn die Tragplattform (10) angehoben und/oder über voreingestellte Positionen hinaus abgesenkt wird.

Revendications

1. Procédé de fabrication de livres comprenant les étapes :

d'impression de feuilles de papier ;
d'empilage des feuilles imprimées sur une palette (2) ;
de chargement de la palette (2) avec la pile (3) de feuilles imprimées dans un dispositif élévateur de feuilles imprimées du type comprenant :

une plate-forme de support (10) pour recevoir la palette (2) avec la pile (3) de feuilles imprimées, la plate-forme de support (10) ayant des points de levage (11) adjacents aux coins de la pile (3) ;

un moyen d'entraînement (15) pour entraîner un train d'entraînement (16, 18) s'étendant entre le moyen d'entraînement (15) et les points de levage (11) ;

le train d'entraînement (16, 18) compre-

nant une chaîne d'entraînement séparée (16) connectée à chaque point de levage (11) ; chaque chaîne d'entraînement étant entraînée sur au moins un guide de chaîne (18) ;

un moyen de levage (15, 16) pour tirer les points de levage (11) et de ce fait la plate-forme de support (10) vers le haut en synchronisation avec le fonctionnement d'une unité de pliage de feuille (6), les chaînes d'entraînement (16) étant actionnées sensiblement simultanément par le moyen d'entraînement (15) ;

de chargement de la palette (2) sur la plate-forme de support (10) dans un sens d'alimentation à travers une extrémité d'entrée vers un moyen de guidage principal (40) mais éloignée de celui-ci, les feuilles étant extraites au niveau de l'extrémité opposée à l'extrémité d'entrée dans un sens d'alimentation de feuilles ;

de levage de la plate-forme de support (10) vers le haut en faisant tourner les guides de chaîne (18) autour d'un axe de rotation qui est transversal au sens d'alimentation des feuilles ; de levage initial de la plate-forme de support (10) en vue d'engager un moyen de guidage secondaire (45) en vue de guider la pile (3) contre le moyen de guidage principal (40) pour la fourniture d'une feuille unique à partir du haut de la pile (3) à l'unité de pliage (6) ; de levage de la plate-forme de support (10) vers le haut en synchronisation avec le fonctionnement de l'unité de pliage (6) ; de pliage des feuilles au fur et à mesure que les feuilles sont fournies à l'unité de pliage (6) ; de rassemblement des pages pliées en vue de former un livre ; d'application d'une couverture ; et de reliure du livre.

2. Procédé selon la revendication 1, comportant l'étape de guidage de chaque chaîne (16) par-dessus au moins certains des guides de chaîne en forme de dents (18) avec un moyen d'engagement de chaîne (25) pour garantir l'engagement de la chaîne (16) avec les dents (18).

3. Procédé selon l'une quelconque des revendications précédentes, comportant les étapes de détection de la fin de la pile (3), et, en réponse, d'arrêt du moyen d'entraînement (15) et de l'unité de pliage (6).

4. Procédé selon la revendication 3, comportant l'étape, après l'achèvement de la pile (3), de renvoi de la plate-forme de support (10) à une position de ré-

ception de palette abaissée.

5. Procédé selon l'une quelconque des revendications précédentes, comportant l'étape d'enveloppement de la pile (3) avec une pellicule en plastique après l'impression et l'empilage en vue de conserver une humidité sensiblement constante des feuilles de papier avant la fourniture à la plate-forme de support (10) pour l'unité de pliage.

6. Procédé selon l'une quelconque des revendications précédentes, dans lequel les livres sont reliés en appliquant une colle thermofusible et le procédé comporte l'étape de séchage de la colle avant d'emballer les livres, de préférence les livres sont séchés en les conduisant le long d'une bande transporteuse de circuit avant leur emballage.

7. Procédé selon l'une quelconque des revendications précédentes, comportant les étapes, après la reliure, de : rognage du livre ; pesage de chaque livre ; comparaison du poids du livre avec un poids de contrôle ; et rejet de n'importe quel livre non conforme au poids de contrôle.

8. Dispositif élévateur de feuilles imprimées comprenant :

une plate-forme de support (10) pour recevoir une pile (3) de feuilles imprimées, la plate-forme de support (10) ayant des points de levage (11) adjacents aux coins d'une pile (3) ;

un moyen d'entraînement (15) pour entraîner un train d'entraînement (16, 18) s'étendant entre le moyen d'entraînement (15) et les points de levage (11) ;

le train d'entraînement (16, 18) comprenant une chaîne d'entraînement séparée (16) connectée à chaque point de levage (11) ; chaque chaîne d'entraînement étant entraînée sur au moins un guide de chaîne (18) ;

un moyen de levage (15, 16) pour tirer les points de levage (11) et de ce fait la plate-forme de support (10) vers le haut en synchronisation avec le fonctionnement d'une unité de pliage de feuille (6), les chaînes d'entraînement (16) étant actionnées sensiblement simultanément par le moyen d'entraînement (15) ;

caractérisé en ce que

le dispositif élévateur a une extrémité d'entrée pour charger une palette (2) sur laquelle la pile (3) est placée et une extrémité de sortie opposée à partir de laquelle la feuille est extraite de

la pile dans un sens d'alimentation de feuilles ;

l'axe de rotation des guides de chaîne en forme de dents (18) par-dessus lesquels les chaînes (16) sont menées (16) étant transversal au sens d'alimentation des feuilles ; 5

et en ce que le dispositif élévateur comporte :

un moyen de guidage principal (40) pour aligner les feuilles pour leur fourniture à travers l'extrémité de sortie ; et 10

un moyen de guidage secondaire (45) pour une fourniture contrôlée de la pile (3) au moyen de guidage principal (40) lors du levage initial de la plate-forme de support (10). 15

9. Dispositif selon la revendication 8, dans lequel le moyen de guidage secondaire comprend une paire de bras de guidage latéraux (45) adjacents à l'extrémité de sortie, chaque bras de guidage (45) comportant une partie inférieure tournée vers l'intérieur (46), et des barres de guidage (50) s'étendant depuis la plate-forme de support (10) en vue d'engager les parties tournées vers l'intérieur (46) des bras de guidage (45) quand la plate-forme de support se trouve dans une position de réception de palette abaissée, les barres de guidage (50) s'étendant dans les bras de guidage (45) pour aligner la pile (3) pour la prise de feuilles individuelles. 20 25 30

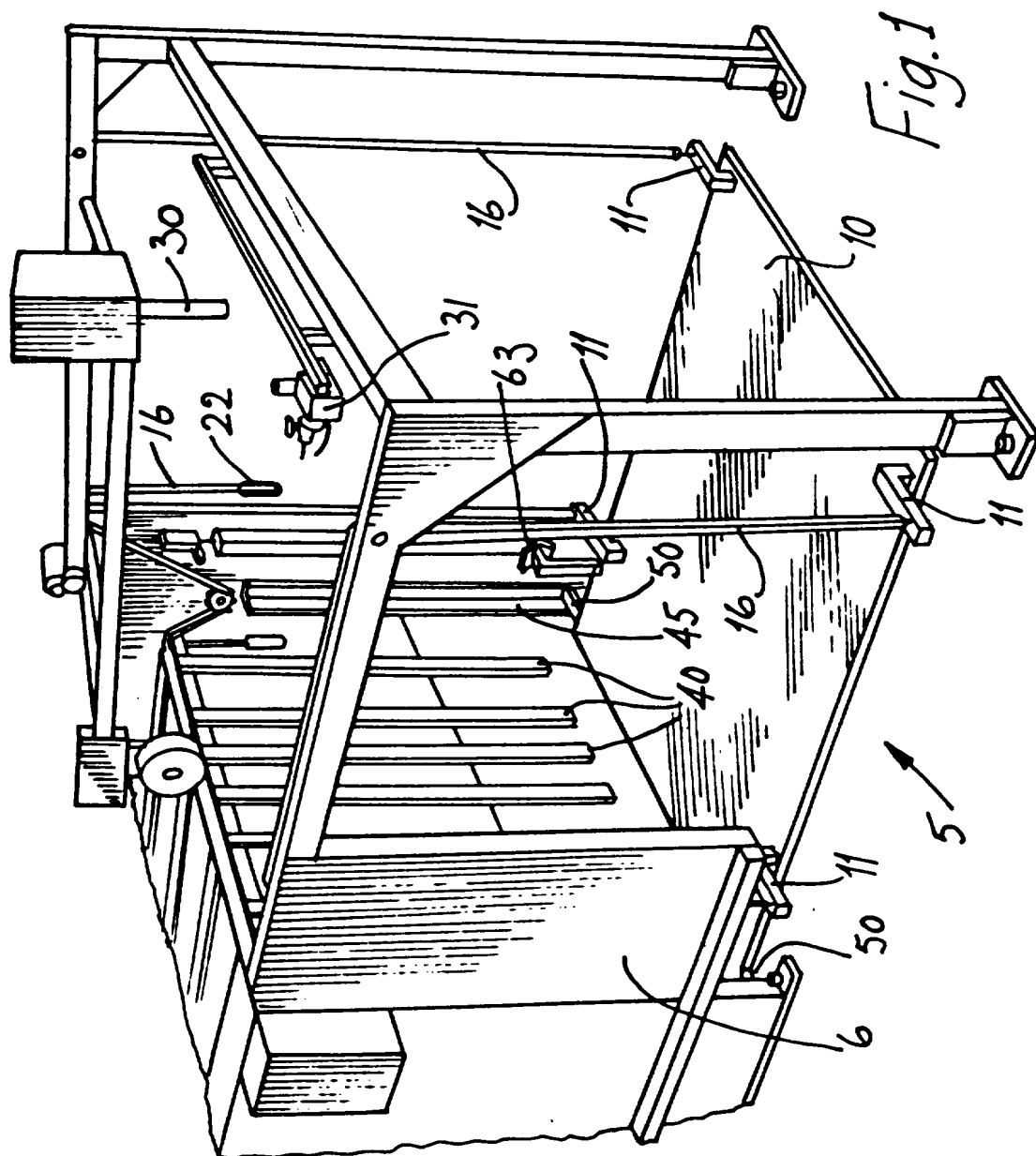
10. Dispositif selon la revendication 8 ou 9, dans lequel des moyens d'engagement de chaîne (25) sont fournis par-dessus au moins certaines des dents (18) en vue de garantir l'engagement de la chaîne (16) avec les dents (18). 35

11. Dispositif selon l'une quelconque des revendications 8 à 10, comportant un moyen de commutation (59, 60) pour désactiver le moyen d'entraînement (15) quand la plate-forme de support (10) est élevée et/ou abaissée au-delà de positions préréglées. 40

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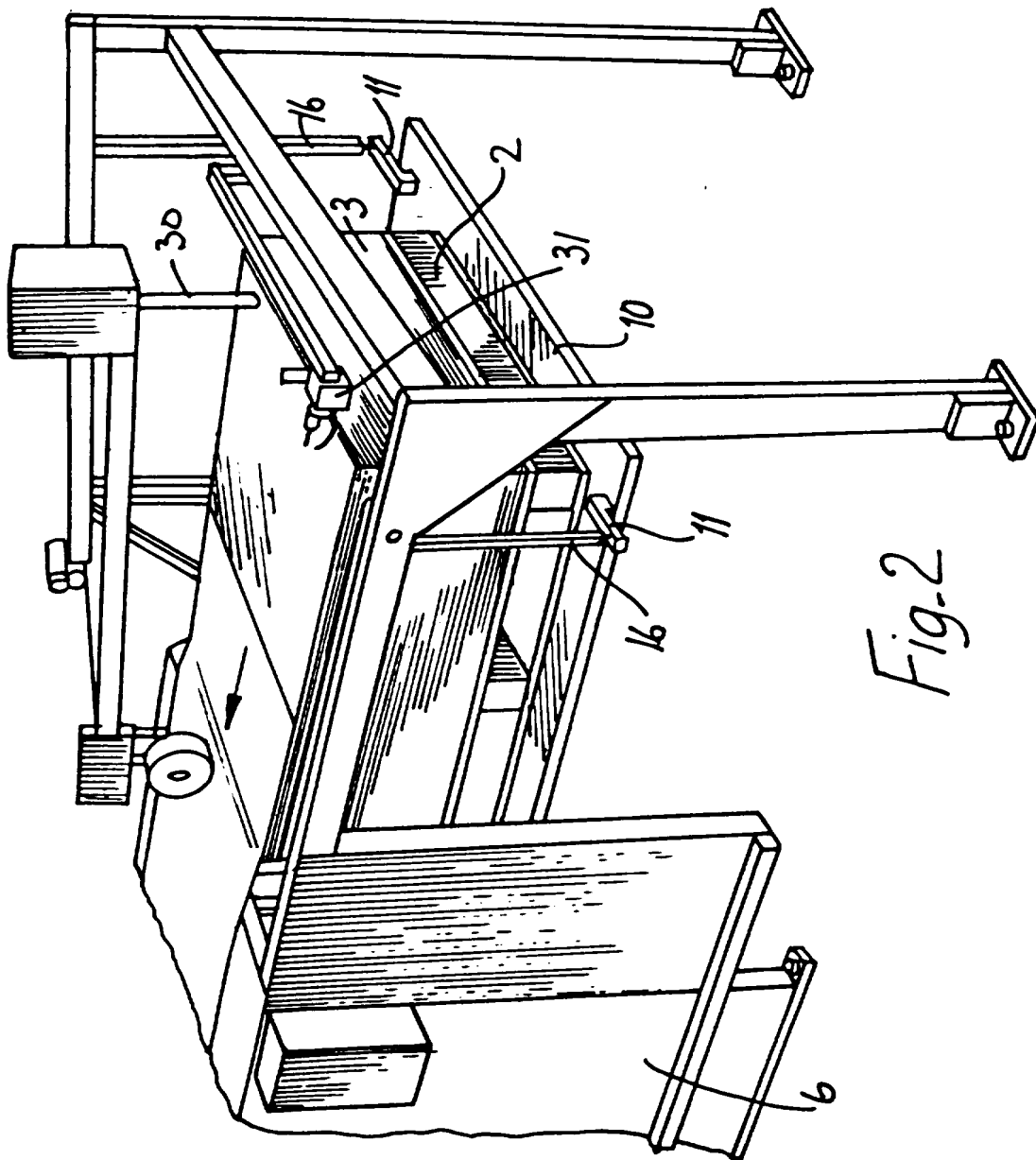


Fig-2

