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⑰ **Sheet feeder.**

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Description

This invention relates generally to an electrophotographic printing machine and more particularly concerns an apparatus for advancing successive flexible sheets from a stack thereof.

In the process of electrophotographic printing, a photoconductive member is charged to a substantially uniform potential so as to sensitize the surface thereof. The charged portion of the photoconductive member is exposed to a light image of an original document being reproduced. Exposure of the charged photoconductive member selectively dissipates the charge thereon in the irradiated areas. This records an electrostatic latent image on the photoconductive member corresponding to the informational areas contained within the original document. After the electrostatic latent image is recorded on the photoconductive member, the latent image is developed by bringing a developer material into contact therewith. Generally, the developer material comprises toner particles adhering triboelectrically to carrier granules. The toner particles are attracted from the carrier granules to the latent image forming a toner powder image on the photoconductive member. The toner powder image is then transferred from the photoconductive member to a copy sheet. The toner particles are heated to affix the powder image permanently to the copy sheet.

In a commercial printing machine of the foregoing type, the copy sheets are stacked on a horizontal tray. The tray moves in a vertical direction. An elevator system is employed to advance the tray automatically in an upward vertical direction so as to position successive uppermost sheets in contact with the sheet feeder. When the supply of copy sheets in the tray is below a pre-selected level, the printing machine is automatically de-energized, and the elevator moves the tray downwardly to an inoperative position for loading a new stack of copy sheets therein. A system of this type is fairly complex and limits the printing machine configurations. It is desirable to simplify the copy sheet stacking and feeding system and to eliminate the elevator system associated therewith. Various approaches have been devised for sheet feeding. The following disclosures appear to be relevant:

US—A—3 615 129 discloses a duplex tray for receiving copy sheets having a fused toner image on one surface thereof. After the requisite number of copy sheets are received in the duplex tray, a sheet feeder sequentially feeds these sheets through the printing process for creating images on the opposite side thereof.

US—A—3 937 455 describes a sheet feeder having a vertically oriented hopper storing a stack of sheets therein. Rollers are positioned at the bottom of the hopper to engage successive sheets and advance them downwardly to a scanner of a facsimile scanner.

US—A—3 947 018 discloses a sheet feeder having a vacuum transport for advancing succes-

sive bottom sheets from a stack of sheets. An air cushion is formed between the bottom sheet and the plate adjacent thereto, and between the bottom edge of the sheets and the bottom edge guide. A follow-up plate engages the top sheet of the stack and applies a slight downward force on the stack.

US—A—4,348,019 describes a stack of vertically oriented sheets positioned in a magazine with the bottom end of the magazine being open. A pair of feed rollers advances successive sheets downwardly from the magazine through the open end thereof.

US—A—3,827 687 discloses putting a stack of papers in a cassette of fixed volume, and pivoting the cassette into an upright position in which the upper end of the top sheet engages a sheet extractor.

US—A—3 877 809 similarly discloses putting a stack of papers, of finite height, into an open-topped box which is insertable in a pivotally-mountable holder, to permit the sheets projecting from the box to be extracted *seriatim*.

EP—A—109018 discloses apparatus for pushing a stack of upright sheets of cardboard horizontally towards an air knife and sheet-feed rollers.

A pair of feed rollers advances successive sheets downwardly from the magazine through the open end thereof.

The present invention provides a sheet stacker which overcomes disadvantages of known stackers, and which is as claimed in the appended claims.

Other aspects of the invention will become apparent from the following description with reference to the accompanying drawings, in which:

Figure 1 is a schematic elevational view depicting an electrophotographic printing machine incorporating the present invention therein;

Figure 2 is an elevational view showing the sheet feeder associated with the sheet feeding and stacking apparatus of the Figure 1 printing machines;

Figure 3 is a schematic, perspective view showing the flow of air used to separate the sheets of the stack of the sheet feeder and stacker used in the Figure 1 printing machine;

Figure 4 is a schematic, perspective view showing one embodiment of the support for the stack of sheets in the sheet feeder and stacker used in the Figure 1 printing machine;

Figure 5 is a schematic, perspective view illustrating another embodiment of the support for the stack of sheets in the sheet feeder and stacker used in the Figure 1 printing machine;

Figure 6 is a schematic, perspective view depicting another embodiment of support used in Figure 1 printing machine;

Figure 7 is a fragmentary, sectional elevational view showing a portion of the Figure 6 stack support;

Figure 8 is a schematic, perspective view illustrating the housing for holding the stack of sheets

in the feeder and stacker used in the Figure 1 printing machine; and

Figure 9 depicts the Figure 8 housing in an operative position wherein successive outermost sheets are in a feeding relationship with Figure 2 sheet feeder, and in an inoperative relationship wherein a new stack of sheets may be loaded in the Figure 8 housing.

For a general understanding of the features of the present invention, reference is made to the drawings. In the drawings, like reference numerals have been used throughout to identify identical elements. Figure 1 schematically depicts the various components of an illustrative electrophotographic printing machine incorporating the sheet feeding and stacking apparatus of the present invention therein. The sheet feeding and stacking apparatus of the present invention may be employed for stacking and advancing original documents as well as copy sheets. It will become evident from the following discussion that this apparatus is equally well suited for use in a wide variety of printing machines and is not necessarily limited in its application to the particular printing machine shown herein.

Inasmuch as the art of electrophotographic printing is well known, the various processing stations employed in the Figure 1 printing machine will be shown hereinafter schematically and their operation described briefly with reference thereto.

As shown in Figure 1 the electrophotographic printing machine employs a belt 10 having a photoconductive surface 12 deposited on a conductive substrate 14. Preferably, photoconductive surface 12 is made from a selenium alloy with photoconductive substrate 14 being made from an aluminum alloy. Other suitable conductive materials and conductive substrates may also be employed. Belt 10 moves in the direction of arrow 16 to advance successive portions of photoconductive surface 12 sequentially through the various processing stations disposed about the path of movement thereof. Belt 10 is entrained about a stripping roller 18, tensioning roller 20 and drive roller 22. Stripping roller 18 is mounted rotatably so as to rotate with the movement of belt 10. Tensioning roller 20 is resiliently urged against belt 10 to maintain belt 10 under the desired tension. Drive roller 22 is rotated by motor 24 coupled thereto by suitable means such as a drive belt. As roller 22 rotates, it advances belt 10 in the direction of arrow 16.

Initially, a portion of the photoconductive surface passes through charging station A. At charging station A, a corona generating device, indicated generally by the reference numeral 26 charges photoconductive surface 12 to a relatively high, substantially uniform potential.

Next, the charged portion of photoconductive surface 12 is advanced through imaging station B. At imaging station B, an original document 28 is positioned face down on platen 30. Lamps 32 illuminate original document 28 disposed upon platen 30. Light rays reflected from the original

document are transmitted through lens 34. Lens 34 focuses the light image of the original document onto the charged portion of the photoconductive surface of belt 10 to dissipate the charge thereon selectively. This records an electrostatic latent image on the photoconductive surface which corresponds to the informational areas contained within the original document. Thereafter, belt 10 advances the electrostatic latent image recorded on the photoconductive surface to development station C.

At development station C a pair of magnetic brush rollers, indicated generally by the reference numerals 36 and 38, advance developer material into contact with the electrostatic latent image. The latent image attracts toner particles from the carrier granules of the developer material to form a toner powder image on the photoconductive surface of belt 10.

Belt 10 then advances the toner powder image to transfer station D. At transfer station D, a copy sheet is advanced into contact with the powder image. Transfer station D includes corona-generating device 40 which sprays ions onto the backside of the copy sheet. This attracts the toner powder image from photoconductive surface 12 of belt 10 to the sheet.

The sheet feeding and stacking apparatus, indicated generally by the reference numeral 44, advances successive copy sheets to transfer station D. Sheet feeding and stacking apparatus 44 includes a housing 46 supporting stack of sheets 48 in a substantially vertical orientation. Upright 50 engages one side of the stack of sheets 48 and moves the stack of sheets toward sheet feeder 52. In this way, successive outermost sheets from one side of stack 48 are continuously in a feeding relationship with sheet feeder 52 so as to be advanced thereby to transfer station D. After transfer of the toner powder image to the copy sheet, the copy sheet is advanced by conveyor 42 to fusing station E. The detailed structure of sheet feeding and stacking apparatus 44 will be described hereinafter with reference to Figures 2 through 7, inclusive.

Fusing station E includes a fuser assembly, indicated generally by the reference numeral 54, which permanently affixes the transferred powder image to the copy sheet. Preferably, fuser assembly 54 includes a heated fuser roller 56 and a back-up roller 58. The sheet passes between fuser roller 56 and back-up roller 58 with the powder image contacting fuser roller 56. In this manner, the powder image is permanently affixed to the copy sheet.

After fusing the toner powder image to the copy sheet, the copy sheets are advanced by conveyor 60 to catch tray 62 for subsequent removal from the printing machine by the operator.

Invariably, after the copy sheet is separated from photoconductive surface 12 of belt 10, some residual particles remain adhering thereto. These residual particles are removed from photoconductive surface 12 at cleaning station F. Cleaning station F includes a rotatably mounted fibrous

brush 64 in contact with photoconductive surface 12 of belt 10. The particles are cleaned from photoconductive surface 12 and belt 10 by the rotation of brush 64 in contact therewith. Subsequent to cleaning, a discharge lamp (not shown) floods photoconductive surface 12 with light to dissipate any residual electrostatic charge remaining thereon prior to the charging thereof for the next successive imaging cycle.

It is believed that the foregoing description is sufficient for purposes of the present application to illustrate the general operation of an electrophotographic printing machine incorporating the features of the present invention therein.

Referring now to the specific subject matter of the present invention, the general operation of the sheet feeding and stacking apparatus will be described hereinafter with reference to Figure 2 through 7, inclusive.

As shown in Figure 2, sheet feeder 52 of sheet feeding and stacking apparatus 44 includes a pair of belts 66 having a multiplicity of substantially equally spaced apertures or holes 68 therein. Belts 66 are entrained over spaced support rollers 70 and 72. Roller 70 is coupled to clutch drive 74 which rotates roller 70 so as to advance belts 66. Vacuum plenum 76 is disposed adjacent the underside of belts 66. Blower 78 is coupled to plenum 76 via duct 80. A solenoid-actuated valve 82 is positioned in duct 80. When valve 82 is open, air is exhausted by blower 78 from plenum 76. In this way, a copy sheet on one side of stack 48 closely adjacent to belt 66 is attracted thereto. When the clutch is energized, the belts move the copy sheet to transfer station D (Figure 1). When valve 82 is closed, air is not exhausted from plenum 76 and the copy sheets are not attracted to belt 66. The air exhausted by blower 78 is fed to an air knife which directs a supply of air to the side edges of the stack of sheet, as shown more clearly in Figure 3.

Referring now to Figure 3, there is shown stack 48 having air flow directed toward the side edges thereof as indicated by arrows 84. An air knife (not shown) receives the air being exhausted from blower 78 and directs this flow of air toward the side edges of stack 48, as indicated by arrows 84. This facilitates the separation of the outermost copy sheet adjacent sheet feeder 52. In this way, the outermost copy sheet is attracted to belts 66 more readily and does not remain adhering to the remainder of the sheets of stack 48. Stack 48 is moved continuously toward sheet feeder 52. The foregoing is shown more clearly in Figure 4.

Turning now to Figure 4, there is shown one embodiment of stack supports 86. Stack supports 86 are substantially L-shaped with one leg 86(a) thereof engaging the bottom edge of stack 48 and the other leg 86(b) engaging the outermost sheets of stack 48 remote from sheet feeder 52. Stack supports 86 move toward sheet feeder 52 as indicated by arrow 88 so as to position an outermost sheet of stack 48 con-

tinuously adjacent sheet feeder 52. Stack supports 86 are mounted on a plate 87, which in turn, is mounted on slides 89. The slide mechanism minimizes friction and enables the stack supports to move, under the influence of gravity, toward the sheet feeder. One skilled in the art will appreciate that a drive mechanism, e.g. a belt drive or a rack and pinion system, may be utilized in lieu of gravity to move the stack supports toward the sheet feeder.

Turning now to Figure 5, there is shown another embodiment of the stack support. As shown thereat, legs 86(b) are mounted on conveyor 90 and extend in a substantially perpendicular direction thereto, i.e. substantially perpendicular to the planar surface of conveyor 90. Legs 86(b) engage the outermost sheet of stack 48 opposed to sheet feeder 52. As conveyor 90 moves in the direction of arrow 88, legs 86(b) move in conjunction therewith. In this way legs 86(b) move stack 48 toward sheet feeder 52.

Figure 6 depicts another embodiment of the stack support. As shown thereat, stack support member 100 includes a generally planar member 102 having two endless, curvilinear grooves 104 and 106 therein. Grooves 104 and 106 are race tracks. A plurality of balls 108 is positioned in grooves 104 and 106, balls 108 providing a rolling support for the stack. When the stack 48 is moving toward the sheet feeder, balls 108 move in the direction of arrow 110 in portions 104(a) and 106(a) of grooves 104 and 106. The balls return to their initial position in portion 104(a) and 106(a) by travelling in the direction of arrow 112, through portions 104(b) and 106(b) of grooves 104 and 106, respectively. In this way, the balls in grooves 104 and 106 move in a continuously recirculating path.

Turning now to Figure 7, there is shown a fragmentary, sectional elevational view depicting the detailed structure of groove 104. Groove 104 is identical to groove 106. As shown thereat, portion 104(a) of groove 104 is of a depth less than portion 104(b) thereof. Thus, as balls 108 move in portion 104(a) the exterior circumferential surface thereof extends above surface 114(a) of planar member 114. Strip 116 is positioned on balls 108. In this way, strip 116 supports the side edge of the stack as balls 108 move in portion 104(a) of groove 104. During the return path, i.e. after balls 108 move from portion 104(a) to portion 104(b), balls 108 have the exterior circumferential surface thereof below surface 114(a) of planar member 114. Cover 118 covers portion 104(b). Thus, when balls 108 are in the portion 104(b), they are merely returning to their initial position in portion 104(a). Inasmuch as there is a multiplicity of balls in portions 104(a) and 104(b) of groove 104, the balls are continually moving in a recirculating path. When balls 108 are in portion 104(a) they support strip 116 above surface 114(a) of planar member 114 and support the side edge of the stack rollably relative thereto. However, when balls 108 are in the return por-

tion, i.e. portion 104(b) of groove 104, they are beneath surface 114(a) and no longer provide support for the side edge of the stack. In this way, flexible strips 116 move with the stack with only rolling friction impeding motion.

Stack 48 is placed in housing 46. Housing 46, as shown in Figure 8, includes slots 92 for receiving stack supports 86. Opening 94 is positioned to receive belts 66 of sheet feeder 52. Thus, the bottom edge of stack 48 rests on surface 96 of housing 46 with stack supports 86 moving therealong through slots 92. Housing 46 is substantially an open-ended box to enable successive stacks of copy sheets to be loaded therein. In loading and unloading copy sheets from housing 46, housing 46 pivots about rods 98. Thus, housing 46 is mounted pivotably about rods 98 in the frame of sheet feeding and stacking apparatus 44.

With reference to Figure 9, there is shown housing 46 in the operative position, and in the inoperative position for receiving a new stack of copy sheets. As shown in Figure 9, when stack support 86 reaches a predetermined position, a signal is generated indicating that the copy sheets in copy housing 46 are depleted. Housing 46 is then pivoted about rods 98 so that a new stack of sheets 48 may be loaded in the open end thereof. In the loading or inoperative position, housing 46 pivots about rods 98 away from stack support 86. In this manner, an additional supply of copy sheets may be readily placed within housing 46. After stacks 48 have been loaded in housing 46, housing 46 pivots about rods 98 in a counter-clockwise direction so as to position stacks 48 in a substantially vertical direction. Thus, housing 46 returns to the operative position wherein stack support 86 is in engagement with the side of stack 48 remote from sheet feeder 52.

It is clear that sheet feeder 52 advances *seriatim* successive outermost sheets from stack 48 in a direction substantially opposed to the gravitational force exerted on the advancing sheet. Thus, each successive sheet advances in a substantially-vertical upward direction opposed to the direction of the gravitational force. The foregoing arrangement has total mechanical movement as opposed to electrical impulses. Moreover, this system reduces the size and complexity of the sheet feeding and stacking system by eliminating any elevator systems while providing a simpler sheet path.

In recapitulation, it is evident that the sheet feeding and stacking apparatus of the present invention supports a stack of sheets in a substantially vertical orientation. Successive outermost sheets are advanced in an upward direction against gravity. When additional sheets have to be added to the housing storing the sheets in the sheet feeder, the housing is pivoted to an inoperative position to facilitate the loading of a new stack of sheets therein. Thereafter, the housing is pivoted to its operative position wherein the stack of sheets is positioned vertically. Thus, the sheet feeding and stacking apparatus of the present invention significantly

reduces the complexity and cost associated with devices hereinbefore employed.

Claims

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1. Apparatus (44) for feeding flexible sheets successively from a stack (48) thereof, including: a holder (50) in which a stack of sheets is able to be held so that each sheet is substantially-vertical;

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means (52) for extracting end sheets in succession from one end of the stack and feeding them upwardly against gravity; and

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at least one upright member (86) for engaging the outermost sheet of the other end of the stack, and being movable for moving the stack en bloc toward the sheet extractor so as to position outermost sheets of the stack successively in feeding relationship therewith, the holder being movable between an operative position, in which the sheets can be extracted and fed *seriatim*, and an inoperative position spaced from the extractor, to permit a new stack of flexible sheets to be loaded into the holder, the holder including a housing (46) having in at least one surface at least one slot (92) through which the or an upright member projects into the interior of the holder, the upright member being movable along the length of the slot to push the stack into engagement with the extractor.

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2. Apparatus according to claim 1, in which the housing has in it an opening (94) adjacent the extractor to enable the outermost sheet of the one end to be placed in engagement with the extractor whilst it is still within the housing.

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3. Apparatus (44) for feeding flexible sheets successively from a stack (48) thereof, including: means (50) for holding a stack of sheets so that each sheet is upright, including a substantially-planar member (100) having in its upper surface at least one groove (104) extending in an endless curvilinear path, and balls (108) positioned in one portion of the groove and engaging the bottom face of the stack, whereby rolling motion of the balls moves the stack supported thereby in the respective direction, while the balls in another portion of the groove, and moving in the opposite direction, are spaced below the same bottom face;

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means (52) for extracting sheets in succession from one end of the stack and feeding them upwardly against gravity; and

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means (90) for moving the stack of sheets towards the extractor.

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4. Apparatus according to claim 3, wherein the plurality of balls disposed in the groove support a strip (116) positioned between the respective balls and the bottom face of the stack for low-friction movement therewith.

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5. Apparatus according to claim 3 or 4, wherein the balls in the said one portion of the groove have a portion of their exterior surface protruding above the surface of the planar member, while the balls in the said another portion of the groove are spaced below the surface of the planar member.

6. Apparatus according to any of claims 3—5, wherein the plurality of balls rolls in a recirculating path containing both said portions of the groove.

7. Apparatus according to any preceding claim, wherein the extractor includes:

at least one endless belt (66) having at least one generally-planar surface moving in a substantially-vertical direction; and

means (78) for reducing the air pressure between the outermost sheet of the one end of the stack and the belt so as to suck the sheet into contact with the adjacent planar surface of the belt for movement therewith in upward direction.

8. Apparatus according to any preceding claim, including at least one air knife for directing a flow of air (84) toward the side faces of the stack to facilitate separation of successive outermost sheets at one end of the stack from the remainder of the stack.

Patentansprüche

1. Vorrichtung (44) für den Vorschub flexibler Blätter aufeinanderfolgend von einem Blattstapel (48) aus, mit:

einem Halter (50), in dem ein Blattstapel so gehalten werden kann, daß jedes Blatt im wesentlichen vertikal ist;

einer Einrichtung (52) zum Abziehen von Endblättern der Reihe nach von einem Ende des Stapels und Vorschieben derselben entgegen der Gravitation nach oben, und

wenigstens einem aufrechtstehenden Element (86) für den Eingriff mit dem äußersten Blatt des anderen Stapelendes, und das zur Bewegung des Stapels im ganzen in Richtung der Blatt-Abzugseinrichtung bewegbar ist, um äußerste Blätter des Stapels aufeinanderfolgend mit dieser in einem Vorschub-Verhältnis anzuordnen, wobei der Halter zwischen einer Betriebsstellung, in der die Blätter der Reihe nach abgezogen und vorgeschoben werden können, und einer mit Abstand von der Abzugseinrichtung angeordneten Außerbetriebsstellung bewegbar ist, um einen neuen Stapel flexibler Blätter in den Halter laden zu können, wobei der Halter ein Gehäuse (46) umfaßt, das in wenigstens einer Fläche wenigstens einen Schlitz (92) aufweist, durch den hindurch das oder ein aufrechtstehendes Element in das Innere des Halters hineinragt, wobei das aufrechtstehende Element entlang der Schlitzlänge bewegbar ist, um den Stapel bis zum Eingriff mit der Abzugseinrichtung zu schieben.

2. Vorrichtung nach Anspruch 1, in welcher das Gehäuse eine der Abzugseinrichtung benachbarte Öffnung (94) aufweist, so daß das äußerste Blatt des einen Endes in Eingriff mit der Abzugseinrichtung angeordnet werden kann, während es sich noch im Gehäuse befindet.

3. Vorrichtung (44) für den Vorschub flexibler Blätter aufeinanderfolgend von einem Blattstapel (48) aus, mit:

einer Einrichtung (50) zum Halten eines Blatt-

stapels, so daß jedes Blatt aufrechtstehend ist, einschließlich eines im wesentlichen ebenflächigen Elementes (100), des in seiner oberen Fläche wenigstens eine in einer endlosen krummlinigen Bahn verlaufende Nut (104) und in einem Abschnitt der Nut angeordnete und mit der Unterseite des Stapels im Eingriff stehende Kugeln (108) aufweist, wobei rollende Bewegungen der Kugeln den dabei abgestützten Stapel in der jeweiligen Richtung bewegen, während die Kugeln, die sich in einem anderen Abschnitt der Nut befinden und sich in der entgegengesetzten Richtung bewegen, mit Abstand von derselben Unterseite angeordnet sind,

einer Einrichtung (52) zum Abziehen von Blättern der Reihe nach von einem Stapelende und Vorschieben derselben entgegen der Gravitation nach oben, und

einer Einrichtung (90) zum Bewegen des Blattstapels in Richtung der Abzugseinrichtung.

4. Vorrichtung nach Anspruch 3, in welcher die Mehrzahl von in der Nut angeordneten Kugeln einen Streifen (116) stützt, der zwischen den jeweiligen Kugeln und der Unterseite des Stapels zur Bewegung mit demselben mit geringer Reibung angeordnet ist.

5. Vorrichtung nach Anspruch 3 oder 4, in welcher die Kugeln in den genannten einen Nutenabschnitt mit einem Teil ihrer Außenfläche über die Oberfläche des ebenflächigen Elementes überstehen, während die Kugeln in dem genannten anderen Nutenabschnitt mit Abstand unterhalb der Oberfläche des ebenflächigen Elementes angeordnet sind.

6. Vorrichtung nach wenigstens einem der Ansprüche 3 bis 5, in welcher die Mehrzahl von Kugeln innerhalb einer beide genannten Nutenabschnitte umfassenden Umlaufbahn rollt.

7. Vorrichtung nach wenigstens einem vorhergehenden Anspruch, in welcher die Abzugseinrichtung versehen ist mit:

wenigstens einem endlosen Band (66), das wenigstens eine allgemein ebene Fläche aufweist, die sich in einer im wesentlichen vertikalen Richtung bewegt, und

einer Einrichtung (78) zur Reduzierung des Luftdrucks zwischen dem äußersten Blatt des einen Stapelendes und dem Band, um das Blatt bis zum Kontakt mit der benachbarten ebenen Fläche des Bandes zur Bewegung mit demselben in einer Richtung nach oben anzusaugen.

8. Vorrichtung nach wenigstens einem vorhergehenden Anspruch, mit wenigstens einem Luftmesser um Richten einer Luftströmung (84) auf die Seitenflächen des Stapels, um die Abtrennung aufeinanderfolgender äußerster Blätter an einem Stapelende vom Rest des Stapels zu erleichtern.

Revendications

1. Dispositif (44) pour introduire successivement des feuilles flexibles à partir d'un empilage (48) de feuilles, comprenant:

—un support (50) dans lequel un empilage de feuilles peut être maintenu de façon que chaque

feuille soit pratiquement verticale;

—un moyen (52) pour extraire les feuilles d'extrémité à la suite les unes des autres à partir d'une extrémité de l'empilage et les introduire vers le haut à l'encontre de la pesanteur; et

—au moins un élément vertical (86) pour venue en contact avec la feuille la plus à l'extérieur de l'autre extrémité de l'empilage, et mobile de manière à déplacer l'empilage *en bloc* dans la direction de l'extracteur de feuilles de manière à placer successivement les feuilles les plus à l'extérieur de l'empilage en relation d'introduction avec celui-ci, le support étant mobile entre une position en ordre de marche dans laquelle les feuilles peuvent être extraites et introduites *en série*, et une position inopérante espacée de l'extracteur afin de permettre le chargement dans le support d'un nouvel empilage de feuilles flexibles, le support comprenant un logement (46) ayant dans au moins une surface au moins une fente par l'intermédiaire de laquelle l'élément vertical ou un élément vertical est en saillie dans l'intérieur du support, l'élément vertical étant mobile suivant la longueur de la fente pour pousser l'empilage et le mettre en contact avec l'extracteur.

2. Dispositif selon la revendication 1, dans lequel le logement comporte une ouverture (94) contiguë à l'extracteur de manière à permettre à la feuille la plus à l'extérieur de la première extrémité d'être placée en contact avec l'extracteur alors qu'elle est encore dans le logement.

3. Dispositif (44) pour introduire successivement des feuilles flexibles à partir d'un empilage (48) de feuilles comprenant:

—un moyen (50) pour supporter un empilage de feuilles de façon que chaque feuille soit verticale, comprenant un élément pratiquement plan (100) ayant dans sa surface supérieure au moins une rainure (104) qui s'étend dans un trajet curviligne sans fin, et des billes (108) placées dans une partie de la rainure et venant en contact avec la face inférieure de l'empilage, d'où il résulte que le mouvement de roulement des billes déplace l'empilage ainsi supporté dans la direction respective, alors que les billes dans l'autre partie de

la rainure, et se déplaçant dans la direction opposée, sont espacées audessous de la même face inférieure;

5 —un moyen (52) pour extraire des feuilles à la suite les unes des autres à partir d'une extrémité de l'empilage et les introduire vers le haut à l'encontre de la pesanteur; et

—un moyen (90) pour déplacer l'empilage de feuilles dans la direction de l'extracteur.

10 4. Dispositif selon la revendication 3, dans lequel la multitude de billes disposées dans la rainure supportent une bande (116) placée entre les billes respectives et la face inférieure de l'empilage pour un mouvement à faible coefficient de frottement avec elle.

15 5. Dispositif selon la revendication 3 ou la revendication 4, dans laquelle les billes dans ladite partie de la rainure ont une portion de leur surface extérieure qui est en saillie au-dessus de la surface de l'élément plan, alors que les billes de l'autre partie de la rainure sont espacées audessous de la surface de l'élément plan.

20 6. Dispositif selon l'une quelconque des revendications 3 à 5, dans lequel la multitude de billes roulent dans un trajet de remise en circulation contenant les deux parties de la rainure.

25 7. Dispositif selon l'une quelconque des revendications précédentes dans lequel, l'extracteur comprend:

30 —au moins une courroie sans fin (66) ayant au moins une surface généralement plane qui se déplace dans une direction pratiquement verticale et

35 —un moyen (78) pour réduire la pression d'air entre la feuille la plus à l'extérieur de la première extrémité de l'empilage et la courroie de manière à aspirer la feuille pour la mettre en contact avec la surface plane adjacente de la courroie pour déplacement avec elle dans la direction du haut.

40 8. Dispositif selon l'une quelconque des revendications précédentes, comprenant au moins un couteau d'air pour diriger un courant d'air (84) vers les faces latérales de l'empilage afin de faciliter la séparation du reste de l'empilage, des feuilles successives les plus à l'extérieur à une extrémité de l'empilage.

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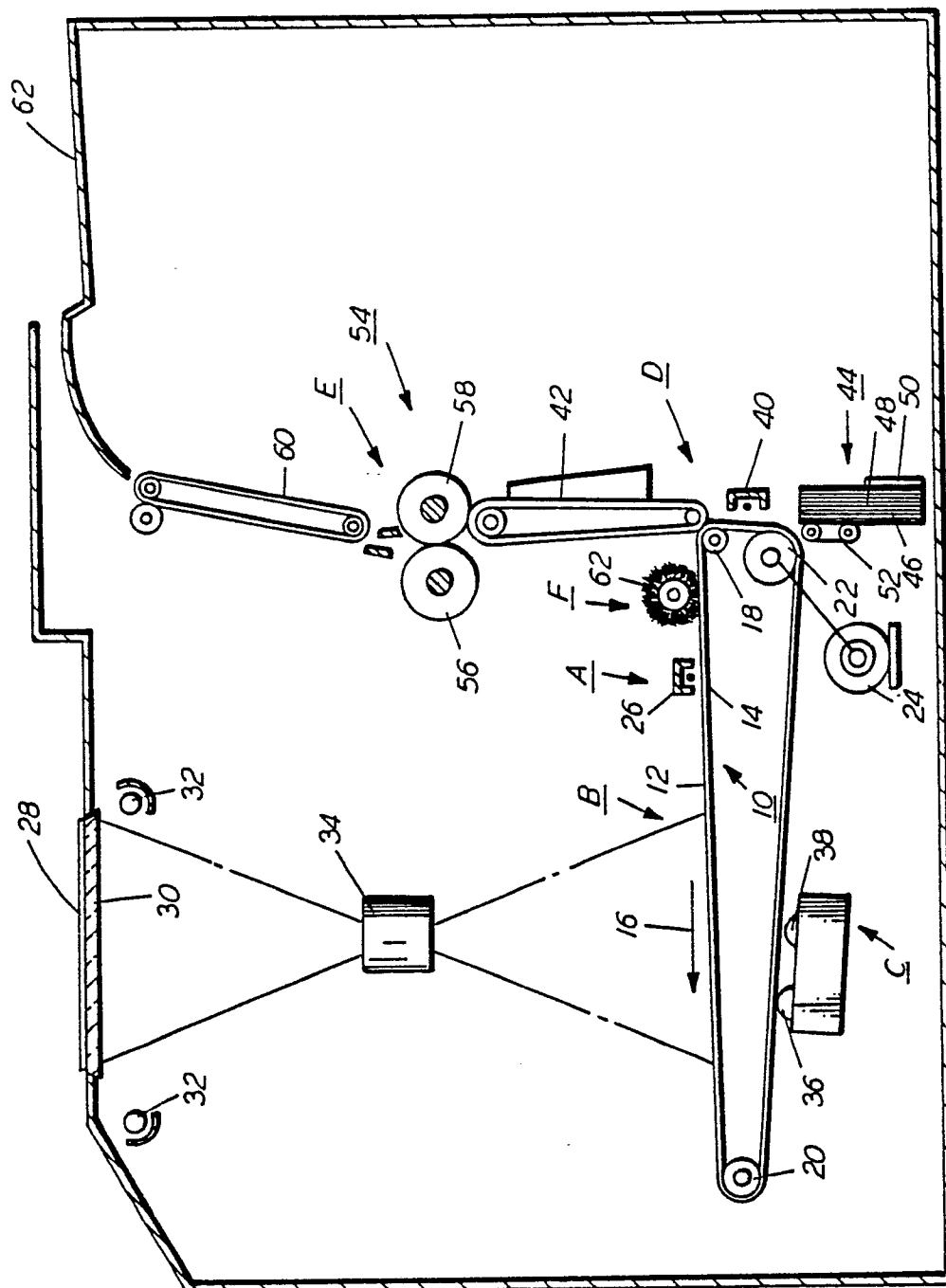


FIG. 1

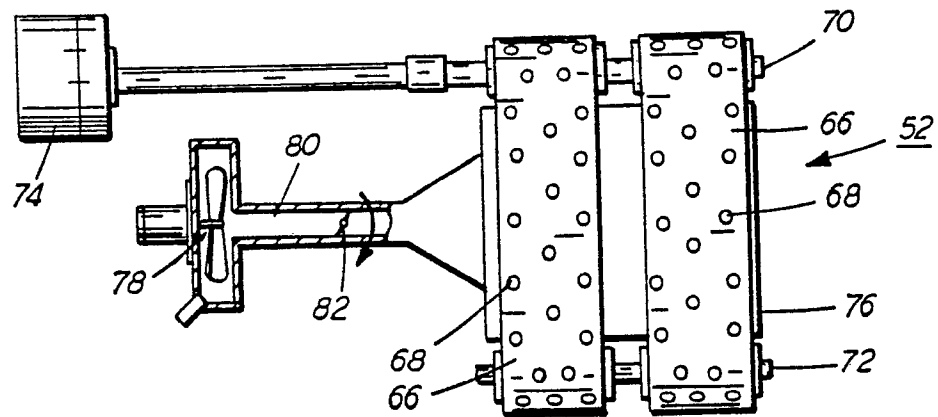


FIG. 2

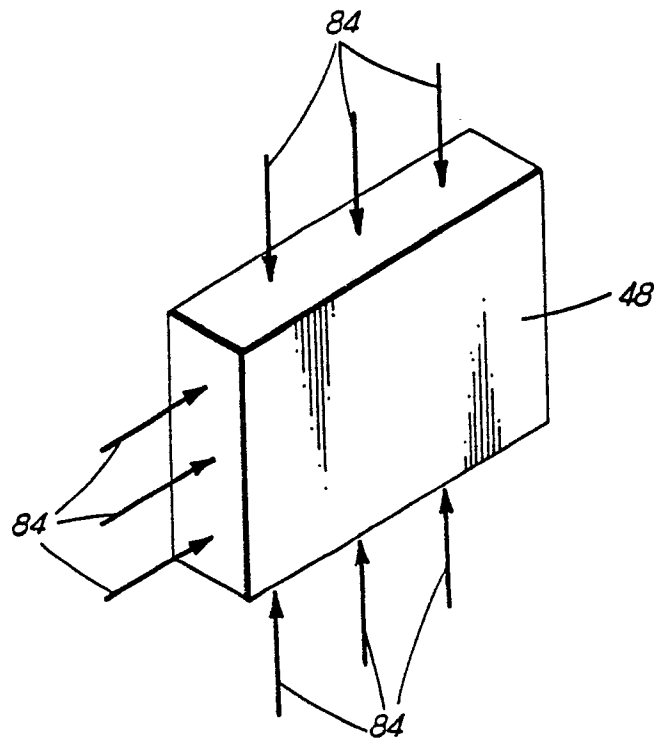


FIG. 3

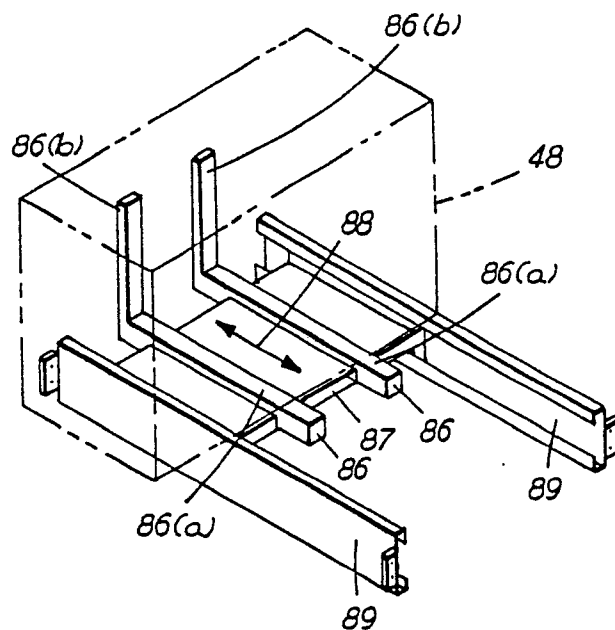


FIG. 4

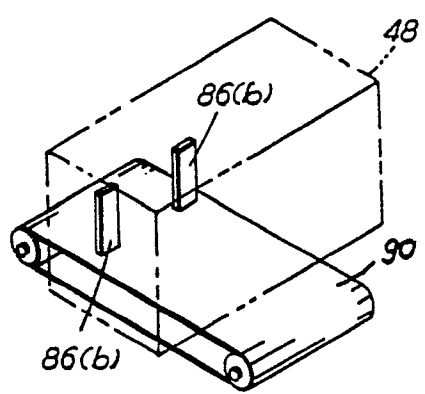


FIG. 5

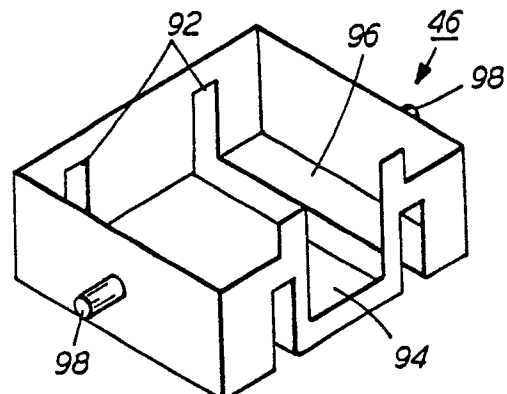


FIG. 8

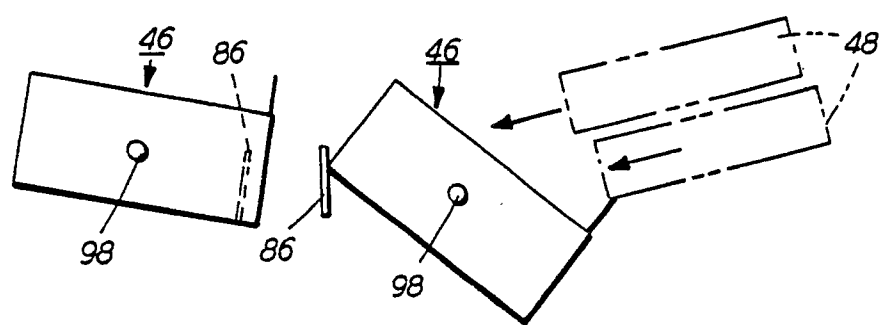


FIG. 9

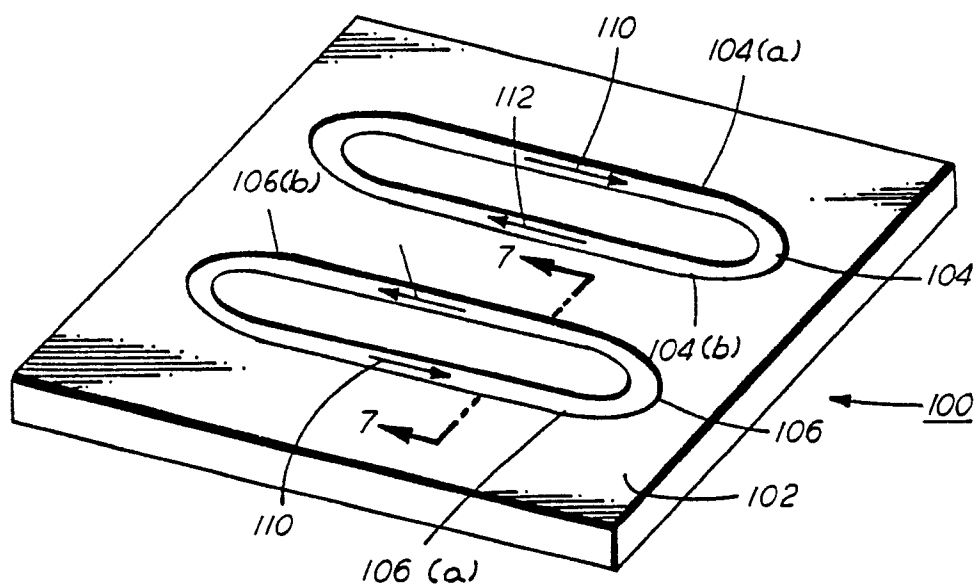


FIG. 6

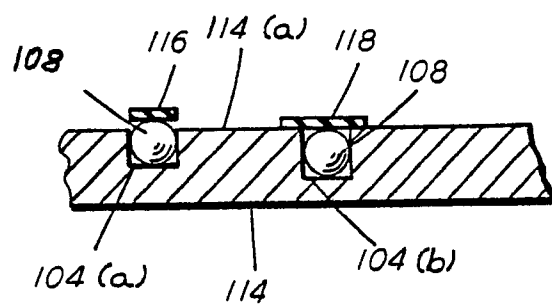


FIG. 7