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3,570,844

POSITIONABLE SEPARATOR

Filed July 11, 1968

2 Sheets-Sheet 1

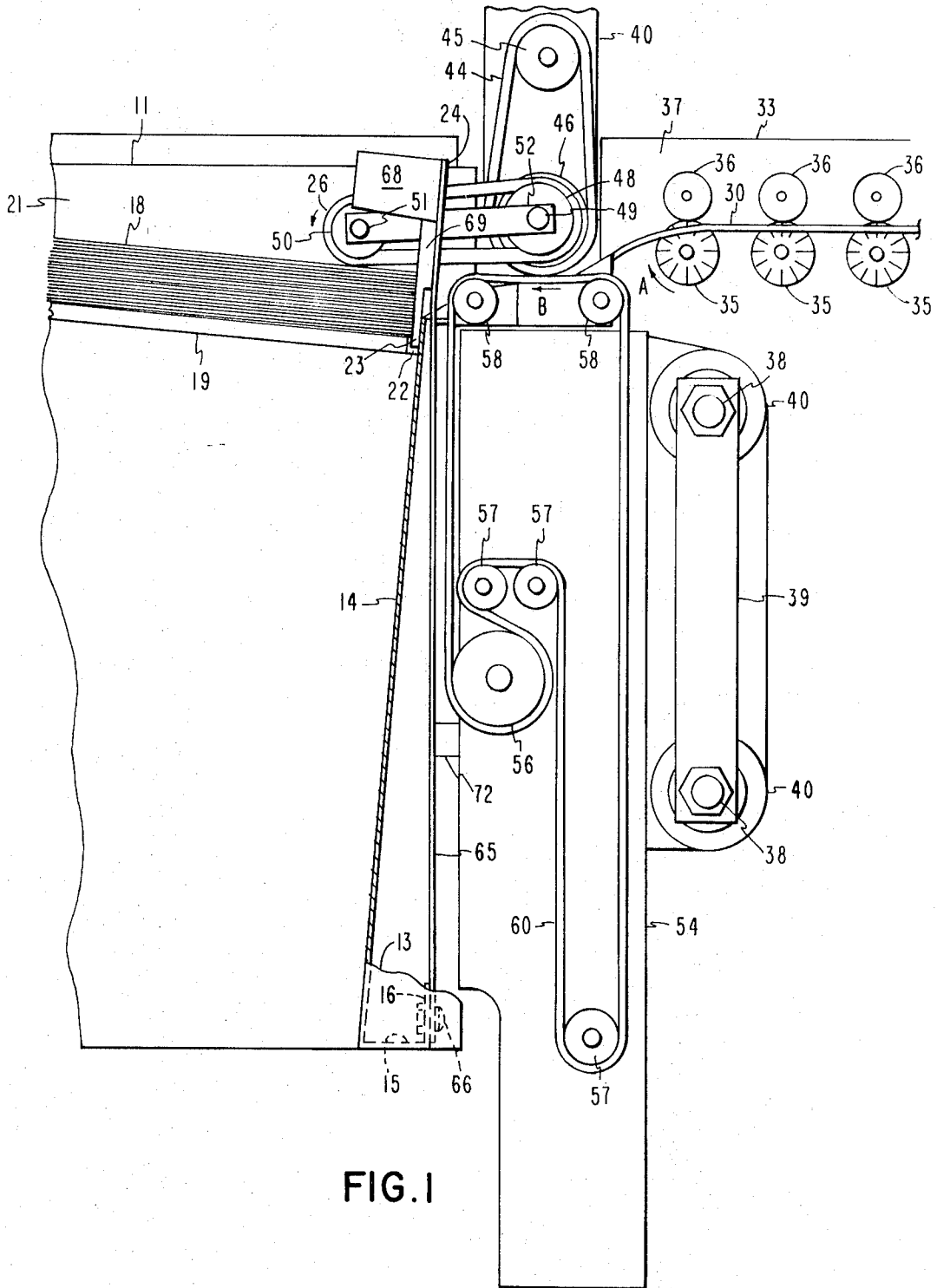


FIG. 1

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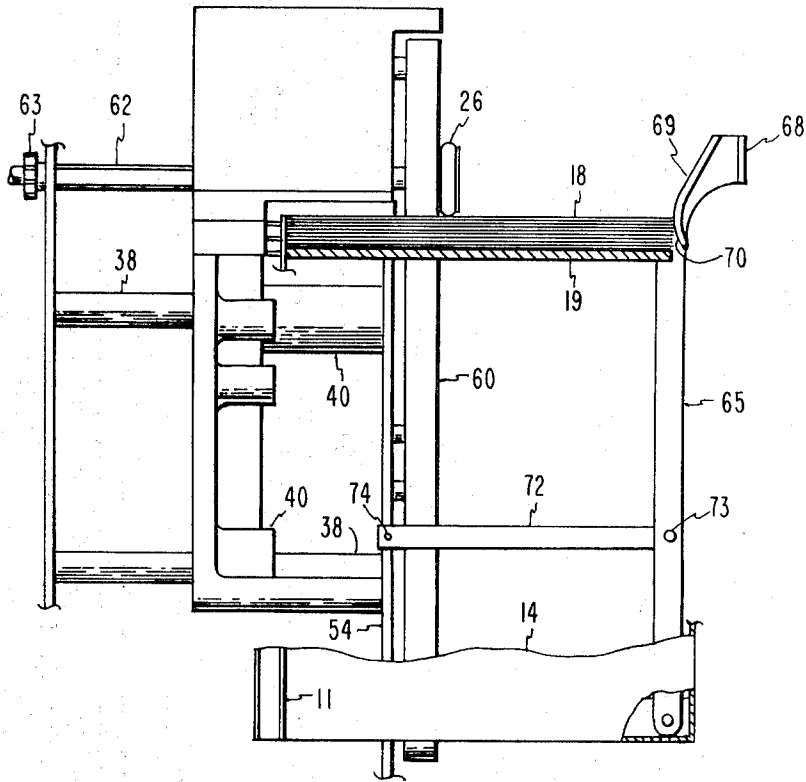


FIG. 2

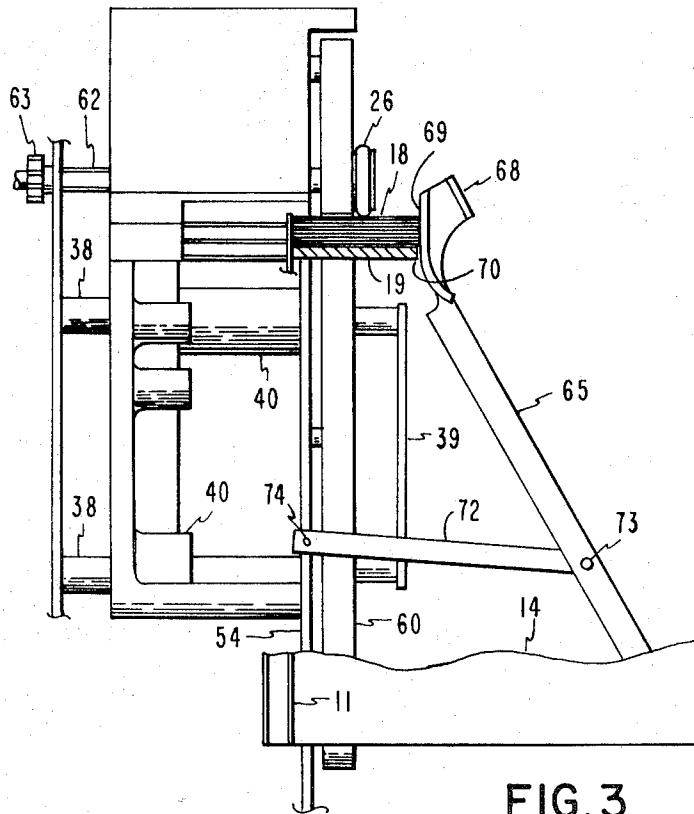


FIG. 3

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POSITIONABLE SEPARATOR

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7 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure pertains to a document separator which is adjustable to feed various size documents by positioning the separator in accordance with the width of the document stack to be processed.

BACKGROUND OF THE INVENTION

This invention relates to document handling and more particularly to a positionable separator for feeding documents of varying size.

Numerous document handling machines utilize a guide rail or surface along which an aligned edge of a document is transported and with respect to which the principal operations such as data entry or reading are related. When a uniform size of documents is to be encountered or documents of reasonably similar width are to be used, a fixed drive arrangement can usually be established that will tolerate the anticipated variations in document conditions. However, when widely different documents are to be processed by the same machine a variation of the feeding conditions must be provided preferably requiring little or no discretionary action on the part of the operator. Use of a variable side guide permits various width documents to be maintained against an aligning surface which is helpful, but does not solve the problem of variation in restraining forces associated with documents of varying width and material when the separating mechanism is arbitrarily positioned without compensation for these variable factors.

The resistance of the document to transport is a combination of adherence of the top document initially to the balance of the stack and subsequently to the bed of the document path and the resistance generated by contact with the aligned edge surface. The prior force is exerted generally along the document center line while the latter occurs along the marginal edge adjoining the aligned edge surface. The drive force must be applied to document to minimize any resulting couple which tends to skew the document away from continuous contact with the aligned edge. Further in correcting any misalignment the document rear portion should be the first portion realigned followed by the forward portion to minimize the possibility of document damage.

SUMMARY OF THE INVENTION

In the device of the instant invention a friction feed is utilized which shears the documents one at a time from the top of the deck supported in the hopper. An aligned edge is provided along which the cards are transported through the operating stations with a requirement that intimate contact be continuously maintained throughout the length of the document. To assure proper alignment of documents in the hopper a movable outside edge guide is provided which is pivotally connected to the device and contacts the transverse edge of the documents opposite that engaged by the aligned edge to confine the deck therebetween. The friction feed is mounted on a separator assembly which can be reciprocated transversely with respect to the document deck. The separator assembly and outside edge guide are inter-connected by a

linkage to affect proportional positioning of the feeding device with respect to the document width indicated by the space intermediate the aligned edge and the outside edge guide.

5 It is an object of this invention to provide an improved feeding mechanism that will effectively deliver documents of widely varying widths from a hopper. It is also an object of this invention to achieve delivery of varying width documents with a simplified structure that eliminates the necessity of operator discretion.

10 The foregoing and other objects, features and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation partially broken away and partially in section of a hopper, separator assembly and a document aligner including the positionable separator of this invention. FIG. 2 is an end elevation partially in section and partially broken away of the document handling device of FIG. 1 showing the separator and edge guide adjusted to a position for handling wide documents. FIG. 3 is an end elevation view of the document handling device similar to that of FIG. 2 but having a separator and edge guide positioned to deliver narrow documents from the hopper.

DETAILED DESCRIPTION

Referring to FIG. 1, a document handling machine carries a vertical plate 11 mounted on the machine frame. Rigidly secured to the vertical plate and extending perpendicularly therefrom is a sheet member 13 which presents an upwardly extending inclined wall surface 14 which defines the hopper front wall. Member 13 has the lower marginal portion flanged to present a horizontal portion 15 and a terminal vertical portion 16. Documents 18 within the hopper are supported on a bed plate 19, which is forwardly inclined and is reciprocated upwardly and downwardly in such manner that the inward transverse edge surface follows along the inclined surface 14 of the hopper front wall. The bed plate 19 is generally rectangular in configuration with a cut out portion 22 in the forward margin extending from the outward transverse side to permit the downwardly depending end 23 of the edge guide 24 to be moved laterally along the hopper front wall surface 14 without interference. The hopper bed plate 19 is, upon actuation of a means not shown, elevated to bring the uppermost document of stack 18 supported thereon into engagement with the picker belt 26 as shown.

Also mounted on the machine frame is a bottom guide plate 30 the upper surface 31 of which defines the under-surface of the document path and a vertical side guide plate 33 which defines a continuing portion of the transverse edge guide surface along which the aligned edge of a document being transported is guided. Projecting through elongated apertures in the bottom plate 30 are a series of combined driving and alignment rolls 35 formed of resilient segmented material which are rotated in the direction of arrow A by a drive means not shown. The drive rolls 35 are mounted on axes slightly angled in the horizontal plane to cause peripheral surface portions to progress toward the side guide plate during the period of projection through the elongated apertures within the card path, and are driven in cooperation with the contacting idler rolls 36. Accordingly a document being moved under the control of these drive rolls 35 is urged against the confining surface 37 of the plate 33.

Also seen in FIGS. 2 and 3 are a pair of shafts 38 extending horizontally from a position of rigid support

on the machine frame and having their outward ends rigidly interconnected by a bracket member 39. The separator assembly is mounted for horizontal reciprocating movement along the shafts 38. The separator frame 40 includes a pair of bosses 42 having axial bores there-
 through in which are mounted recirculating ball bush-
 ings surrounding the shafts 38. The separator frame 40 carries a separator belt 44 which is trained about the pulleys 45, 46 and picker belt 26 which has a drive pulley 48 mounted on shaft 49, which also drives the separator belt pulley 46, and is trained about a second pulley 50 which is pivotally mounted on a pin 51 supported by a bracket 52 extending from and pivotally mounted about the axis of shaft 49.

A restraint plate 54 is secured to the separator frame 40 as a portion of the separator assembly and has pivotally mounted thereon a series of pulleys 56, 57 which cooperate with a pair of pulleys 58 mounted on the separator frame 40 to provide a path about which the restraint belt 60 is trained. Power is provided to the separator assembly by a polygon shaft 62 which extends from the separator assembly and passes through and moves axially with respect to a pinion 63 driven by a means not shown. Shaft 62 provides a direct drive to the separator belt 44 and picker belt 26. The restraint belt 60 is driven from shaft 62 by a gear reduction power train (not shown) which drives the pulley 56 causing the belt to move in the direction of arrow B.

An outside guide is formed as an elongated lever 65 having its lower terminal end pivotally connected to the flange 16 about the pin 66. At the upper end of the lever is a handle portion 68 and an edge guide element which provides an interior stack engaging surface 70. The edge guide lever 65 and the separator assembly are interconnected by a link 72 pivotally connected at one end to edge guide lever 65 about pin 73 and at the opposite end to the separator assembly restraint plate 54 about pin 74.

The separator assembly functions with the separator belt 44 moving tangentially at its lowermost projection in the document path at the transport speed of the machine. The picker belt 26 which is driven from a common shaft 49 moves at a slightly slower speed while the restraint belt 60 which engages the lower surface of a document within the separator assembly, moves in the opposite direction, as indicated by arrow B, at a greatly reduced speed. Thus the picker belt 26 shears a document from the top of the stack 18 within the hopper, the document is thereafter drawn into engagement with the separator belt 44 which accelerates it to transport speed and delivers it to the processing portion of the machine. The document engaging surface of separator belt 44 has a much greater coefficient of friction than the document engaging surface portion of the restraint belt 60 so that a single document coming between the separator and restraint belts is propelled by the separator belt with insignificant interference from the restraint belt. But, should the picker belt shear two documents simultaneously from the stacker or should two documents be present within the document path intermediate separator belt 44 and restraint belt 60, the restraint belt would exert a force on the lower document greater than the frictional force between the documents and thereby prevent the lower document from being transported into the document path of the machine prior to the exit of the upper of the two documents.

In operation a deck or stack 18 of documents to be processed is placed on the hopper bed plate 19 with one transverse side of the deck abutting the wall 21 which defines a portion of the surface along which the documents are directed for processing and the forward edges abut the inclined forward wall surface 14 of the hopper. The outside edge guide lever 65 is thereupon pivoted to bring the edge guide surface 70 into engagement with the uppermost documents of stack 18. Movement of the

edge guide lever 65 simultaneously reciprocates the separator assembly along the shafts 38 to place the center line on separator belt 44 at a position approximately one-third the distance between the edge surface or transverse boundary wall defined by the vertical surface 21 of plate 11 and the outside edge guide surface 70 which indicates the position of the outside transverse side of the document stack. As seen in FIG. 2, the separator assembly and edge guide lever 65 are aligned to deliver wide documents while in FIG. 3, the separator assembly and edge guide lever 65 are shown in an alternative position for the delivery of narrow documents.

The positioning of separator edge guide lever 65 affords a gauge means through the interconnecting link 72 to place the separator belt 44 a predetermined proportional distance along the width of the document stock 18 to be processed throughout the range of widths of documents encountered by the hopper. Further the use of an edge guide which is moved into contact with the outer transverse edge of the document stack disposed in the hopper also provides a guide surface 70 which serves to prevent rotation or "spinning out" of the documents as they proceed from the hopper through the separator. It has been found that with a positioning of the axis of separator belt 44 approximately one third the distance from the stationary hopper side wall surface 21 to the outside edge guide surface 70 best compensates for the varying frictional conditions which occur from the sequence of operations initiating with the shearing of the document from the deck and terminating with completion of transport through the separator. In the structure of the instant invention, positioning the outside edge guide accomplishes the guide function and positions the separator at the overall optimum position without further action or judgment on the part of a machine operator.

While the invention has been particularly shown and described with reference to a preferred embodiment thereof, it will be understood that various changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A sheet feeding device for a document hopper comprising a bed for supporting a deck of documents within said hopper; a stationary guide member defining a surface forming a longitudinally extending boundary wall along which documents moving from said hopper are guided; document separating means mounted on said machine including picker means for engagement with a bed supported document deck to shear documents one at a time from the balance of the deck; an edge guide mounted for selective movement with respect to said longitudinally extending boundary wall for positioning a bed supported document deck therebetween; and a proportional linkage interconnecting said edge guide and said separator means for proportional transverse movement with respect to one another and said longitudinally extending boundary wall to cause said separator means to engage the document deck in a predetermined transversely spaced proportional relation intermediate said boundary wall and said edge guide.

2. The sheet feeding device of claim 1 wherein said separator means further includes a document driving member for engagement with a document sheared from a deck by said picker means and acceleration of said document to the machine transport speed.

3. The sheet feeding device of claim 2 wherein said interconnecting means maintains the centerline of the document engaging portion of said separator means drive member at a location substantially one third the distance from said longitudinally extending boundary wall to said edge guide.

4. The sheet feeding device of claim 3 wherein said separator means comprises a separator assembly including said picker means and document driving member for engaging the topmost document of said deck, said separator

5

assembly being mounted on said machine for reciprocating motion in a direction perpendicular to said transverse boundary wall.

5 5. The sheet feeding device of claim 2 wherein said edge guide is pivotally connected to a stationary portion of said hopper and presents a surface portion engageable with one transverse side of said document deck and said interconnecting means comprises linkage means pivotally connected to said separator assembly at a first position and pivotally secured to said edge guide at a second position spaced from said first position, said second position being intermediate said guide pivotal connection with said hopper and said document deck engaging surface portion.

6. The sheet feeding device of claim 5 wherein said edge guide deck engaging surface portion engages the transverse side of said document deck in said hopper opposite said longitudinally extending boundary wall at

6

a location closely adjacent the longitudinal end thereof adjoining said separator assembly.

7. The sheet feeding device of claim 6 wherein said longitudinally extending boundary wall is vertically positioned and the document supporting surface of said bed is downwardly inclined in the direction of said separator assembly.

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