

[54] **LIFTABLE BAIL BAR FOR ALLOWING RETURN OF MULTI-PLY SEPARATED SHEETS TO STACK**

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[51] Int. Cl. **B65h 3/52**

[58] Field of Search 271/4, 126, 122, 125, 118, 271/117, 160, 165, 166, 167, 157, 110, 137, 271/DIG. 9

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UNITED STATES PATENTS

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Primary Examiner—James B. Marbert

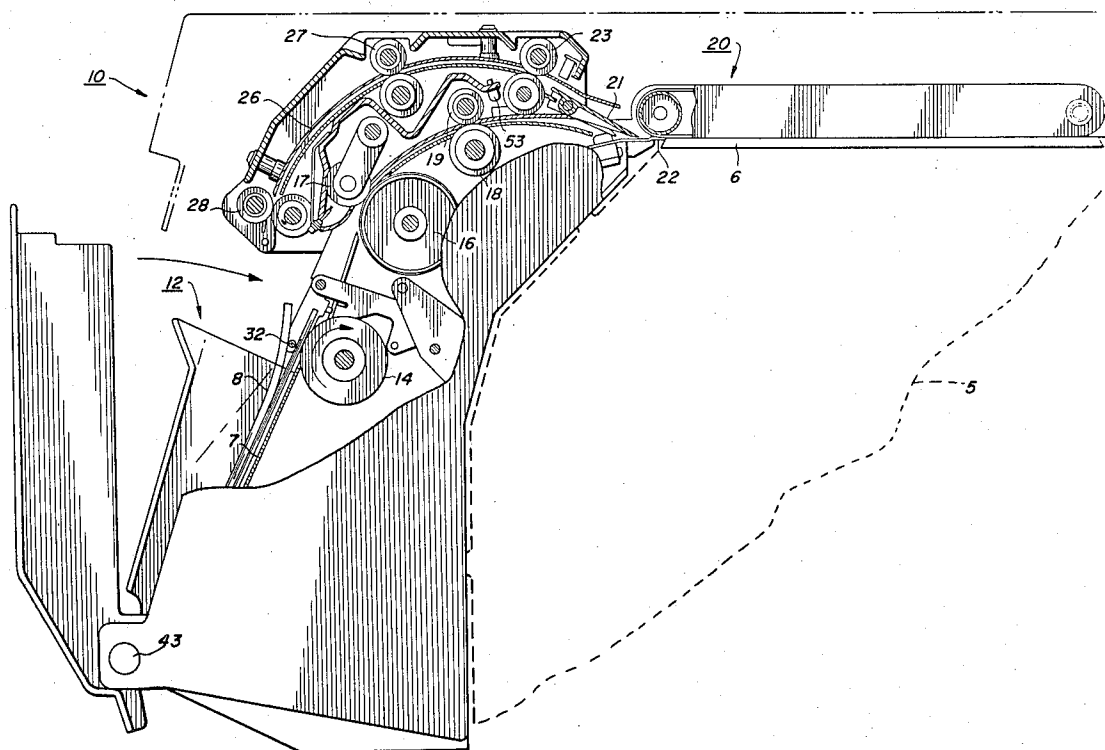
Assistant Examiner—Bruce H. Stoner, Jr.

[57]

ABSTRACT

A bail bar for forcing a stack of sheets against a separator roll to assist feeding of the sheets from the stack. A feed roll for feeding a single sheet forward and a reversing roll for returning multi-ply removed sheets other than the single sheet are provided downstream of the feed roll. The bail bar is liftable from atop the stack to minimize drag on a separated sheet and allow the multiple sheets pushed toward the stack by the reversing roll to be returned thereto.

2 Claims, 4 Drawing Figures



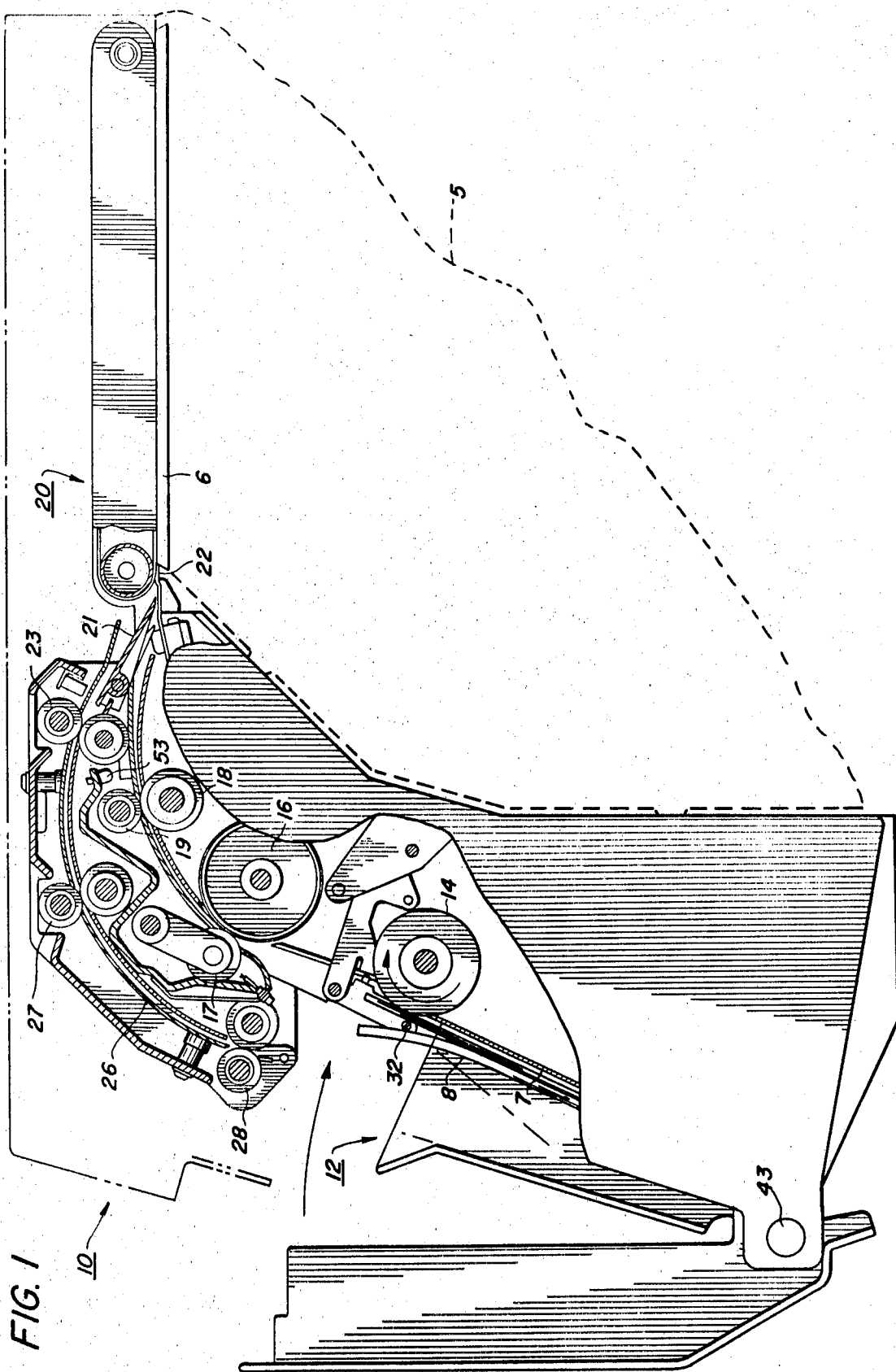


FIG. 1a

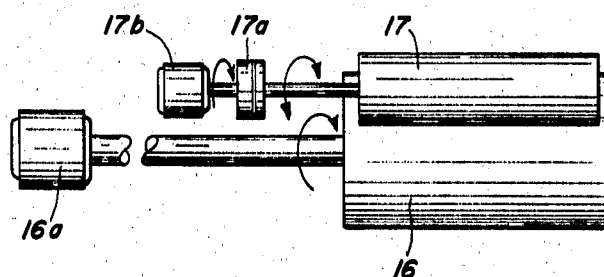


FIG. 2

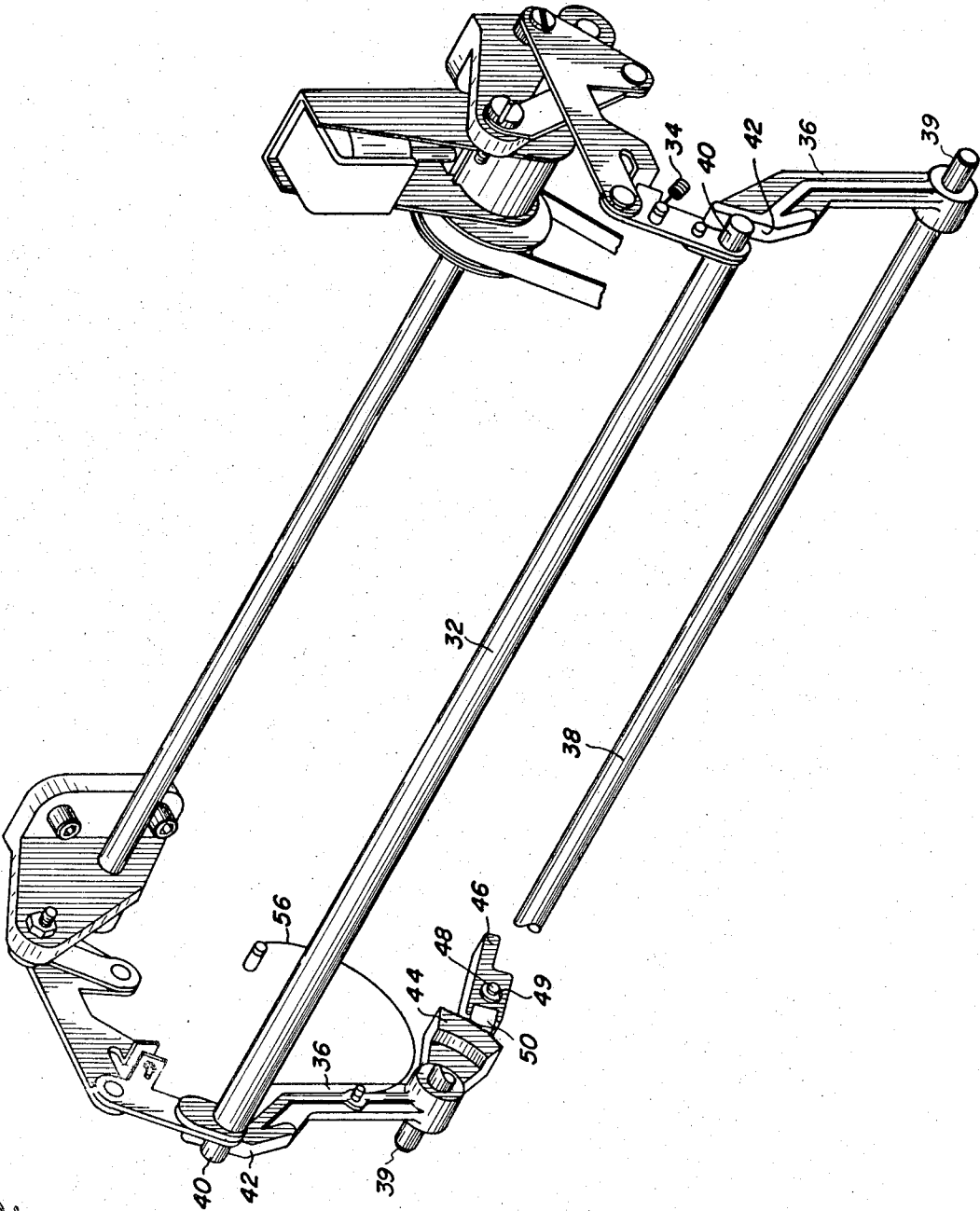
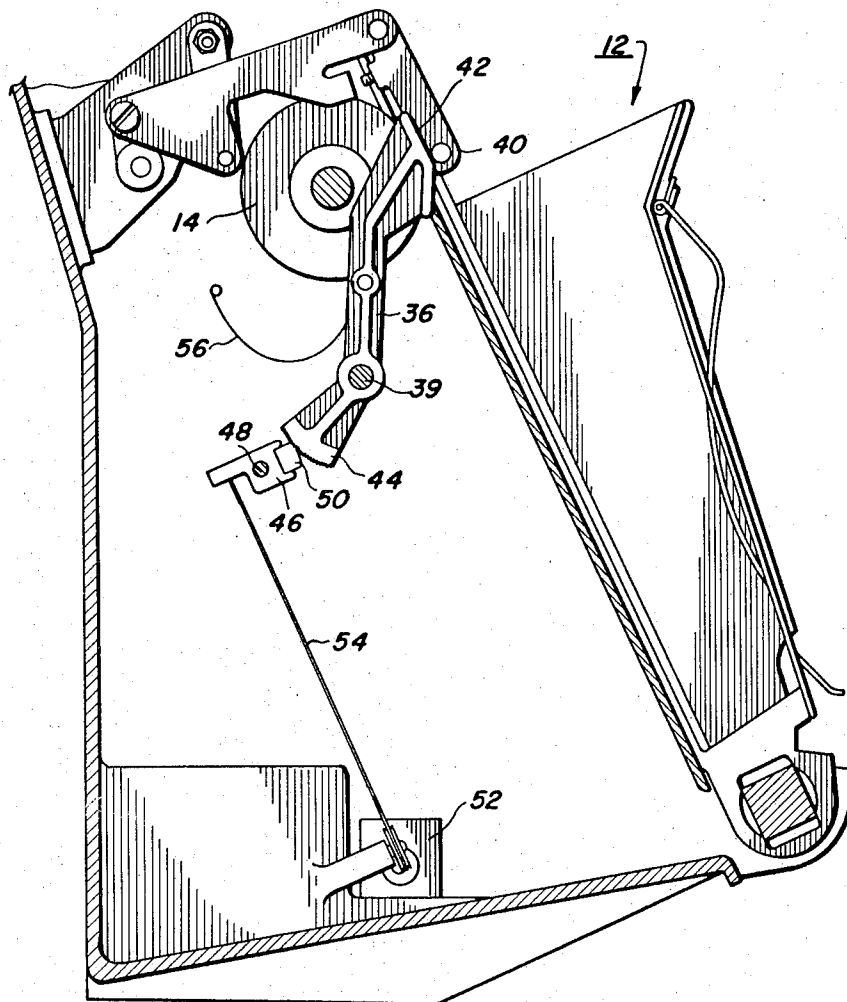


FIG. 3



LIFTABLE BAIL BAR FOR ALLOWING RETURN OF MULTI-PLY SEPARATED SHEETS TO STACK

BACKGROUND OF THE INVENTION

In order to more fully utilize the high speed copying capabilities of modern reproduction machines, it is desirable to employ an automatic document handler for placing original documents to be copied on the platen of the reproduction machine and removing them therefrom to minimize the necessity for operator involvement with the reproduction machine. To accomplish this, the document handling device first must separate the document to be copied from others awaiting copying. Following this, the document must be brought into position on the machine platen. There, the document is normally located in a certain position, copied and removed, to enable succeeding copies to be placed on the platen. The document handler must be designed to positively separate, feed, position, and return the documents to the document tray.

Under all circumstances the document must be handled with care to avoid tearing, creasing, or other mutilation or damage thereto. This is particularly true where the document is one of a kind. In attempting to design an automatic handler which will provide minimal wear and tear on the documents while assuring positive feeding thereof, prevent misfeeds or multi-feeds, and minimize jams in the document handler, a number of problems may be encountered.

SUMMARY OF THE INVENTION

This invention relates to an automatic document handler employing a bail bar to separate documents being fed by an automatic document handler from the documents returned by the automatic document handler. The bail bar is also utilized to provide a normal force on the paper to enable a feeder roll therebeneath to positively feed a single document or a number of documents from the stack beneath the bail bar. Bail bar pressure on the feed roll is released after initial feeding of each document to allow multi-fed documents to be returned to the document stack by a suitable multiple document rejecting mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view in cross-section showing a document handler incorporating the improved bail bar mechanism of the present invention in operative association with a document reproduction machine;

FIG. 1a is a schematic representation of the roll mechanism employed to reject multi-ply fed documents and assure feeding of one document at a time to the document reproduction machine.

FIG. 2 is an isometric view showing details of the document separating bail bar mechanism;

FIG. 3 is a side view of a portion of the document handler of FIG. 1 showing further details of the separating bail bar lift mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, there is shown a document handler designated generally by the numeral 10 incorporating the bail bar mechanism of the present invention. The document handler 10 may be used with any suitable document processing apparatus, such as a re-

production machine 5 which is provided with a platen 6 on which the document to be copied is placed.

Document handling apparatus 10 includes a supply tray 12 for storing both documents 7 to be copied and documents 8 which have been copied. From tray 12, one or a number of documents are advanced from the bottom of supply 7 by an intermittently operated primary feed roll 14 into the nip of retard roll pair 16, 17. The lower roll 16 is driven in a document feeding direction by suitable means such as motor 16a (as shown by the dotted line arrow in FIG. 1) while the upper roll 17 is driven in the reverse or document reject direction by a suitable drive means such as motor 17b through a slip coupling 17a.

Frictional engagement between roll 16 and roll 17 normally provides sufficient driving force on roll 17 to override the drive input to roll 17 (i.e., the coupling slips) and thereby allows roll 16 to turn roll 17 in the document feeding direction.

When a single document is fed between rolls 16, 17, frictional engagement of roll 16 with one side of the document and the corresponding frictional engagement of roll 17 with the opposite side of the document is also sufficient to drive roll 17 in the document feed direction.

However, should more than one document be presented between roll pair 16, 17, the frictional engagement between roll 16 and the undersurface of the bottom document and between roll 17 and the upper surface of the top document will be greater than the frictional engagement between the multiple documents. Under these circumstances, the slip clutch driving roll 17 will not slip and roll 17 will be rotated in a document rejection direction by motor 17b to return the excess documents to the tray.

The document emerging from retard roll pair 16, 17 passes into the nip of intermediate roll pair 18, 19 and from there underneath deflector plate 21 to platen transport 20. Transport 20, which preferably comprises a belt-type conveyor, first carries the document forward onto platen 6 until the entire document is positioned thereon. Transport 20 is then reversed to bring the document trailing edge against register 22. Register 22 locates the document in copying position following which the copy or copies are made by the reproduction apparatus 5.

When copying is completed, platen transport 20 is again started in reverse to move the document backwards off platen 6, register edge being previously retracted for this purpose. Deflector 21, which was previously lowered, guides the returning document upwardly into the nip of return roll pair 23. Roll pair 23 move the document along suitable return guides 26 through second and third return roll pairs 27, 28 respectively and back into tray 12. For a more complete description of an automatic document handler, reference may be had to U.S. application Ser. No. 251,492, now U.S. Pat. No. 3,829,082 filed May 8, 1972 in the name of August Hoyer.

To maintain copy documents which have been designated for convenience by the numeral 8, segregated from the documents 7 awaiting copying and prevent inadvertent or premature refeeding of the returned documents 8 by feed roll 14 following feeding of the last one of the documents 7, a displaceable bail or separator bar 32 is provided. Bail 32 is disposed substantially opposite to, and above primary feed roll 14 to prevent docu-

ments resting thereon from contacting roll 14. The bail 32 is biased against primary feed roll 14 by suitable springs 34, forcing the documents against roll 14 to provide frictional engagement between roll 14 and the document resting thereagainst for positive feeding of the document by the roll 14. As stated heretofore, in the event that more than one document is carried up toward the separator roll pair 16, 17, due to the frictional force between the lowermost document and the document lying thereagainst, the retard roll 17 will operate in reverse to drive the excess documents back into the tray.

Ordinarily, the documents in the tray are forced against the feed roll 14 by the bail 32. To allow the excess documents to be returned to the tray, the bail is lifted from the documents by a suitable mechanism to be hereinafter described.

To provide the required bail lift, lever arms 36 mounted on a rotatable shaft 38 are provided on each side of the document handler. The arms 36 are non-rotatably mounted on shaft 38 while extensions 39 of shaft 38 are rotatably mounted in suitable bearings (not shown) on the frame of the document handler. Bail 32 is provided with extensions 40 adapted for engagement with bearing ends 42 of levers 36. The opposite end of one of the levers 36 is provided with an arcuate sector 44 having serrations thereon. A second lever 46, pivotally mounted on a shaft pin 48 and secured thereto by a snap ring 49 is provided with a resilient pad 50 adapted for contact with the serrated surface on lever 36 upon rotation of lever 46 about pin 48. The arcuate sector 44 has an axis coinciding with the axis of shaft 38 to provide constant spacing between pad 50 and the serrations on sector 44 irrespective of the orientation of lever 36 for reasons to be hereinafter explained.

Actuating means, such as solenoid 52 is operatively connected to lever 46 to displace pad 50 a predetermined distance along an arc about pivot pin 48. As illustrated, the solenoid is connected to lever 46 by a cable 54, although it should be understood the solenoid could be directly connected to the lever. Further, a pneumatic cylinder, an electric motor with suitable cams or linkages or other similar devices could be utilized to impart pivotal movement to lever 46.

In the illustrated embodiment, solenoid 52 is actuated by a suitable control circuit (not shown) in response to the presence of a document at a selected location along the document path. For purposes of illustration only, a photodetector 53 is mounted on the document handler to detect the presence of a fed document immediately downstream from feed roller pair 18, 19. It should be understood that the detector could be mounted immediately downstream from roll pair 16, 17 if desired. The signal from the photodetector causes the solenoid 52 to be energized to rock lever 46 about pivot 48 to lift bar 32, removing the pressure on documents 7 to allow multiply fed documents to be returned to the tray by retard roller 17.

Since the quantity and thickness of the documents placed between bar 32 and feed roller 14 is variable and decreases as documents are fed from therebetween, the actual position of the bar 32 relative to the roll 14 is variable. The bail bar lift mechanism is therefore adapted to lift the bar a preselected distance from the stack of documents 7, irrespective of the actual location of the bar relative to the feed roll 14.

To accomplish this, a light spring 56 is provided on lever 36 to maintain bearing ends 42 against extensions 40 on bar 32 at all times. The arcuate sector 44 on lever 36 is designed to provide constant spacing between the surface thereof and the lift pad 50 on lever 46 irrespective of the bail bar location relative to the feed roll 14. Thus, a preselected stroke of the solenoid will move pad 50 of lever 46 about a preselected arc to contact sector 44 of lever 36 and lift bar 32 the desired distance from the top of the stack 7, for example, 0.010 inches, irrespective of the actual orientation of the bar 32 and the lever 36 when the lift mechanism is actuated.

By removing bail bar pressure from the documents when the separated document has reached a preselected position, a number of advantages are obtained. Drag on the separated document is reduced, thereby reducing the force necessary for forwarding the document by subsequent means such as the feed roll pair 16, 17. Multiply fed documents may freely fall back into the tray after being urged toward the tray by the retard roll 17. A further advantage is obtained by the cyclical movement of the bar 32 in that the documents in the tray are vibrated thereby, enhancing settlement and alignment of the documents in the document tray.

While I have described a preferred embodiment of my invention, it should be understood that the invention is not limited thereto, but may be otherwise embodied within the scope of the following claims.

What is claimed is:

1. Apparatus for separating and feeding individual sheets of material from a stack of sheet material comprising:

separator means adapted for frictional engagement with the bottom sheet in the stack to displace the sheet in a direction parallel to the plane of the sheet;

pressure means, adapted for engagement with the top of the stack to provide a force normal to the plane of the sheets for maintaining the bottom sheet in frictional engagement with said separator means;

feed means for engaging and feeding the separated sheets away from the stack, said feed means including a first feed roll positively driven in the feed direction;

a second feed roll adapted for cooperation with said first roll, said second roll being urged in a direction opposed to the first feed roll direction, friction between said first and second rolls or between said rolls and a single sheet of material causing said second roll to rotate in the feed direction, reduced friction between multiple sheets presented between said first and second rolls allowing said second roll to rotate in a direction opposite from said feed direction to push the multiple sheets back toward the stack; and,

means for relieving the pressure exerted on the top of the stack by said pressure means after engagement of the separated sheet by said feed means to minimize the drag on the separated sheet caused by frictional contact between the separated sheet and the adjacent sheet in the stack and allow the multiple sheets pushed toward the stack by said second roll to be returned thereto.

2. Apparatus according to claim 1 wherein said pressure means includes a bail bar adapted for engagement with the top of the stack; and

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biasing means associated with said bail bar to force
said bar against the top of the stack to force the
bottom sheet of the stack into engagement with
said separator means; said means for relieving the
pressure exerted by said bar including lift means 5

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for moving said bar off the top of the stack after en-
gagement of the separated sheet by said feed
means.

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