United States Patent [19]

Bookless

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[54] **MECHANISM FOR SEPARATING SIDE GUIDES AND RAISING PIN SEPARATORS**

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[52] **U.S. Cl.** **271/171,** 271/170

[51] **Int. Cl.** **B65h 1/04**

[58] **Field of Search** 271/61, 21, 19, 18, 36, 271/170, 171

[56] **References Cited**

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[57] **ABSTRACT**

An improved apparatus for separating spring biased side guides and raising spring biased pin separators to prepare a pin feed tray to receive a stack of paper sheets.

3 Claims, 7 Drawing Figures

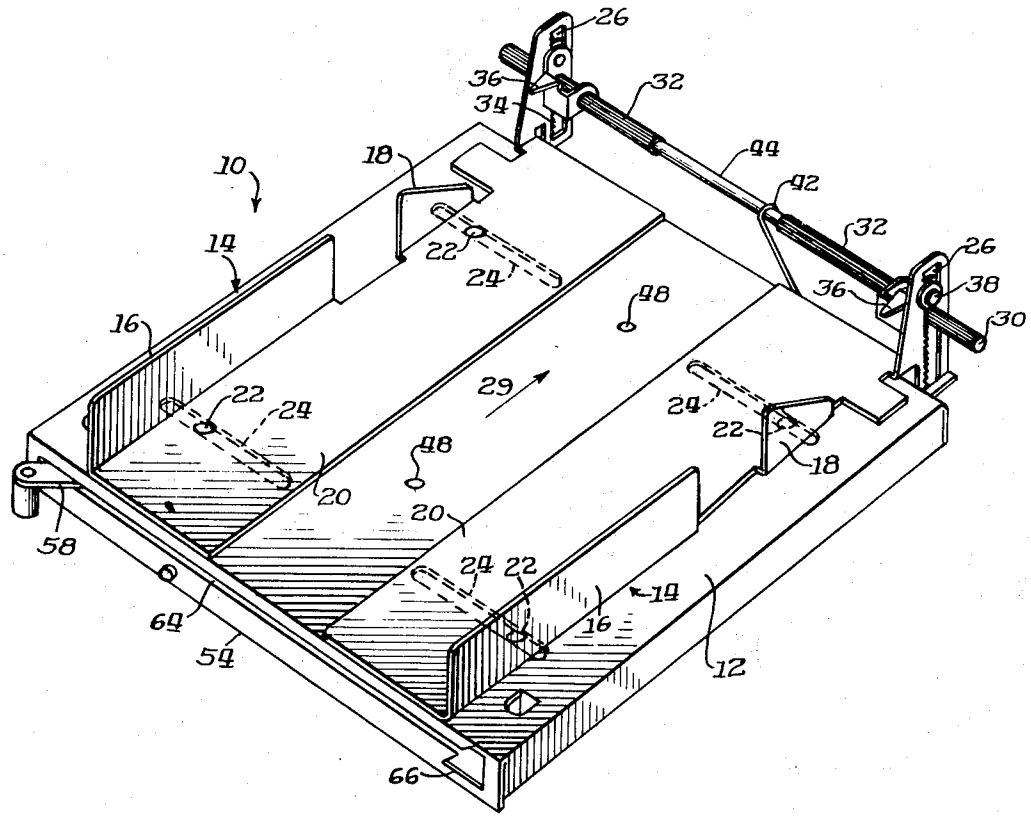
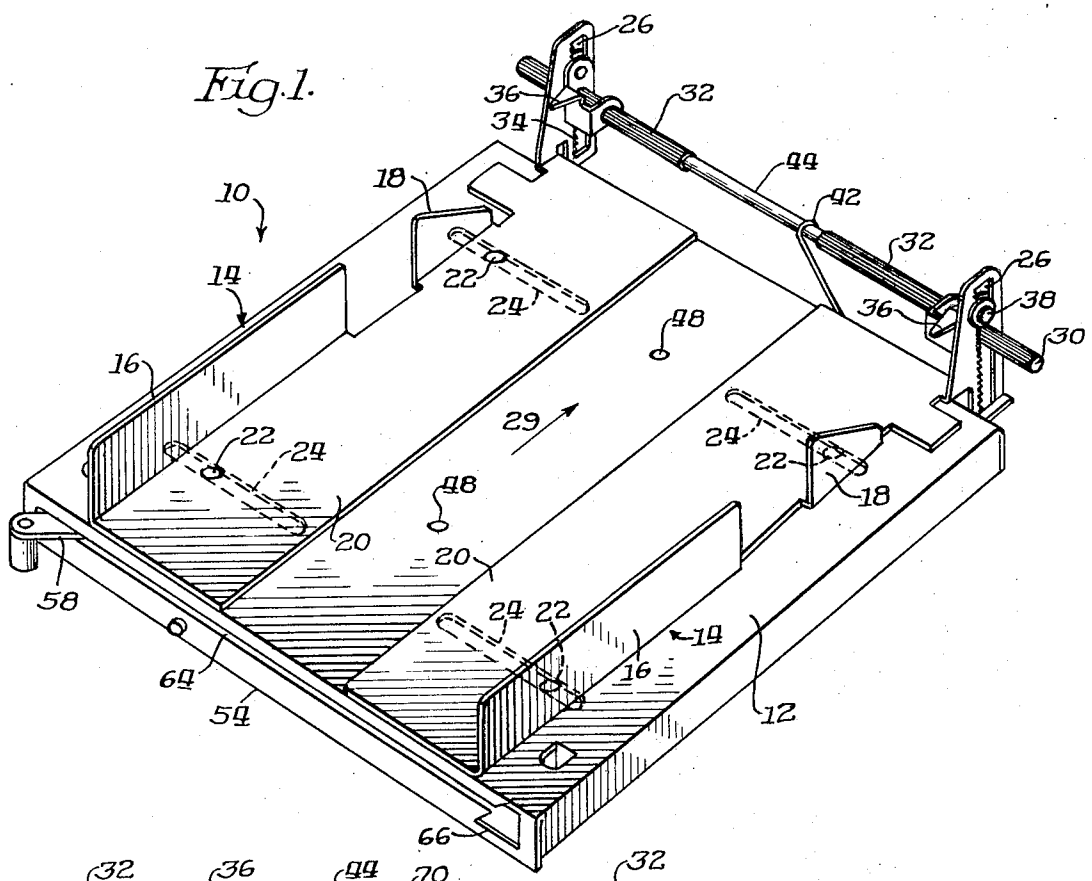


Fig. 1.



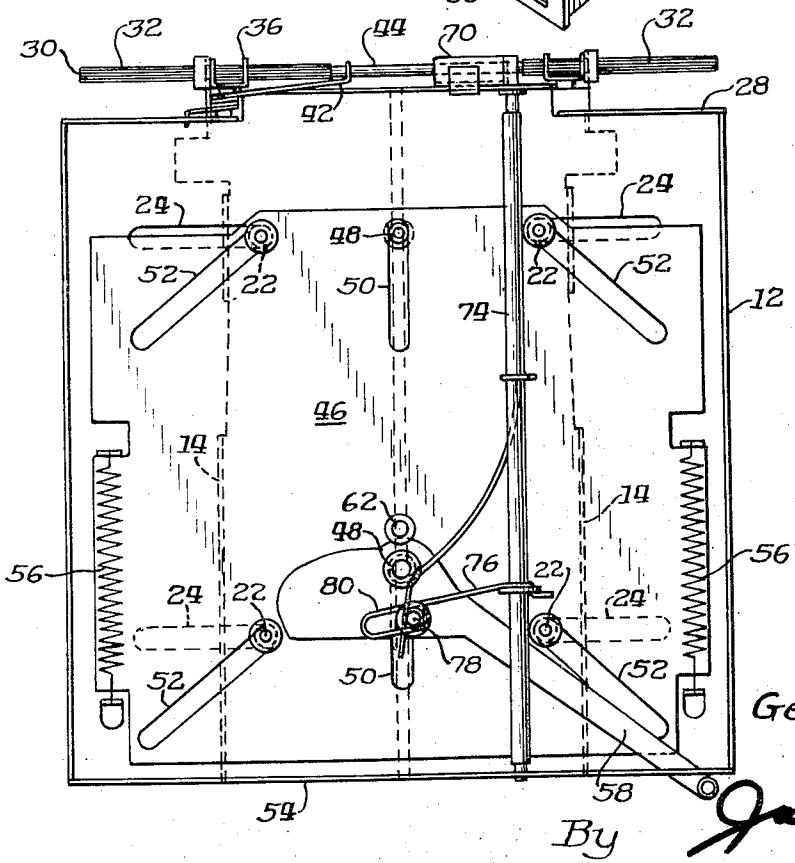
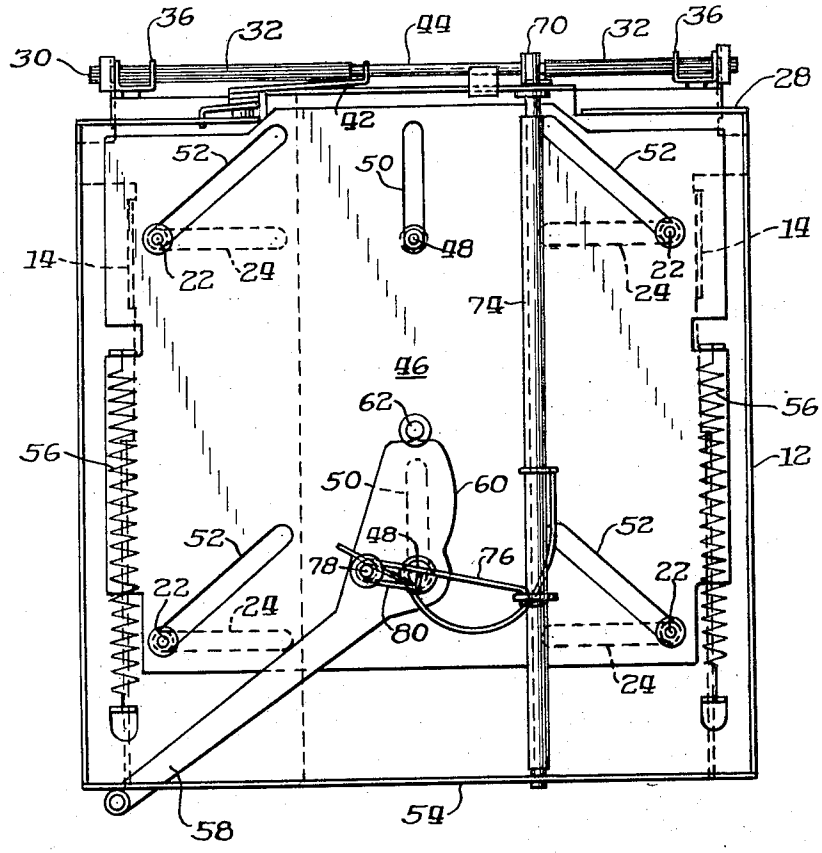


Fig. 2.

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Fig. 3.



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SHEET 3 OF 3

Fig. 6.

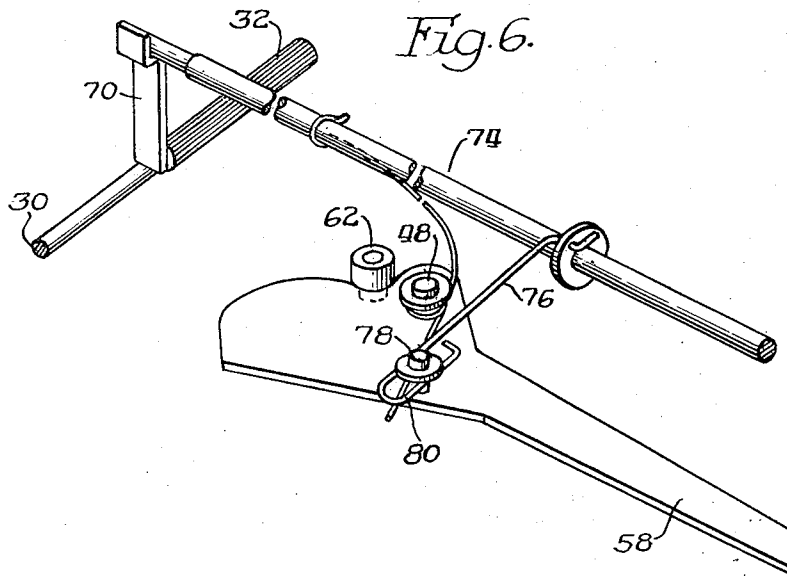


Fig. 5.

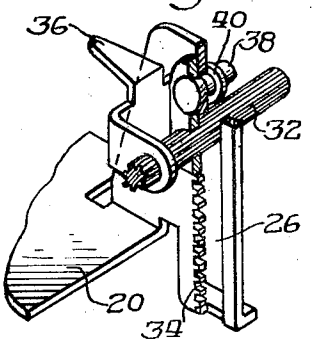


Fig. 4.

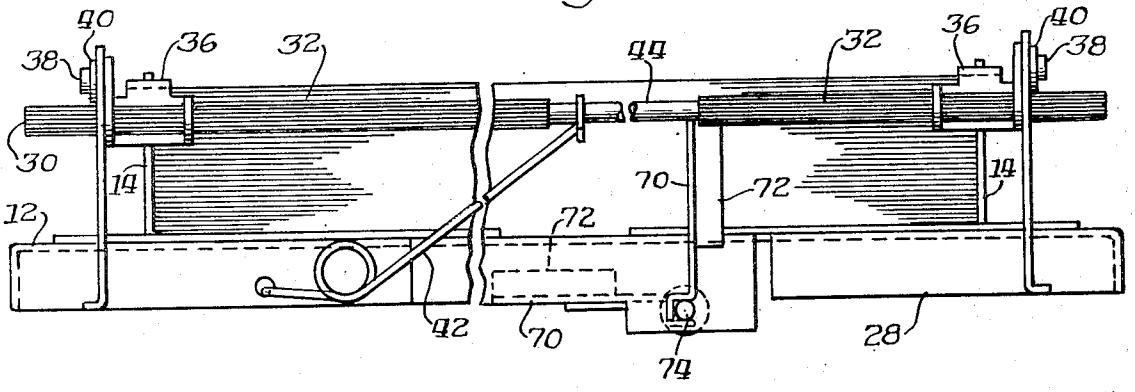
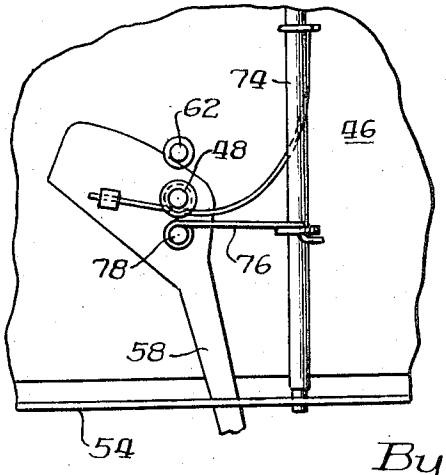


Fig. 7.



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MECHANISM FOR SEPARATING SIDE GUIDES AND RAISING PIN SEPARATORS

CROSS-REFERENCE TO A RELATED APPLICATION

This application is related to copending application Ser. No. 159,859, now U.S. Pat. No. 3,738,646 filed of even date herewith in the name of Casimir S. Samczyk and is an improvement on the invention claimed therein.

BACKGROUND OF THE INVENTION

This invention relates to sheet feeding apparatus that separates sheets for feeding one at a time to a duplicating machine. More particularly, it relates to a pin feed tray.

The problem of feeding a single sheet from a stack has long been recognized in the duplicating art. One solution to this problem has been the use of pins disposed on top of the leading edge of the top sheet. Generally, two pins are utilized, one at each corner. The pins are mounted on a table which supports the stack of sheets and such an arrangement has come to be known as a "pin feed tray."

The manner in which the pins are mounted has varied and each has its disadvantages. Pin feed trays in which the pins are mounted to move separately have the disadvantage that the pins may not apply the same pressure at their respective corners. Differences in the holding pressure can cause the sheets to skew as they are fed into the duplicator and cause it to jam.

In some trays the pins are mounted on lever arms attached to the feed table. As the stack of sheets depletes the pins lower in an arc. Because they are lowering in an arc, their angular relationship with the stack changes and again significantly different holding pressures are applied from the top to the bottom sheet in the stack. If the pins are mounted for gravitational lowering they are susceptible to hanging up prior to reaching the stack.

Although some prior art devices have equalized the pressure at the corners by mounting the pins on a horizontal rod these devices are subject to binding if the rod is tipped out of the horizontal.

Commonly the pins include a downward projection that functions as a front stop. The stack abuts the front stop during loading to position the stack longitudinally with respect to the pins. The frictional forces between the stack and the front stop restrain the pins from dropping onto the stack. Thus the operator must move the stack into abutment with the front stop and then pull it away to permit the pins to drop.

A pin feed tray overcoming the above disadvantages was invented and is the subject of the related application. That tray includes separate mechanisms for raising the pins and separating the side guides to facilitate replacing the paper supply.

SUMMARY OF THE INVENTION

This invention improves upon the feed tray of the related application by utilizing a single mechanism to raise the pins and separate the side guides. The operator can prepare the tray to receive a new stack of paper sheets by the movement of a single lever.

After the stack has been inserted the lever is returned to its initial position to position the side guides and pins in their operative modes. In one of the preferred forms, the side guides center the stack before the pins drop into position on top of the stack. In another embodiment, those actions take place simultaneously.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of this invention will be explained further in conjunction with the drawings in which:

FIG. **1** is a perspective view of a tray constructed in accordance with the principles of the invention.

FIGS. **2** and **3** are plan views of the underside of the tray shown in FIG. **1.**

FIG. **4** is an end view of the tray shown in FIG. **1.**

FIG. **5** is a perspective view of a portion of FIG. **1.**

FIG. **6** is a perspective view of a portion of FIGS. **2** and **3.**

FIG. **7** is an alternate embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the figures wherein like reference numerals designate like parts a pin feed tray is indicated generally at **10** in FIG. **1.** The tray **10** includes a feed table **12** having side guides **14** mounted on the feed table **12.**

The preferred embodiment illustrated in FIG. **1** has been designed to accept cartridge loaded paper, i.e., paper contained in a box. One end of the box is removed to expose the paper when it is loaded on the tray **10.** Accordingly, the side guides **14** include a guide **16** for the cartridge and a guide **18** for the paper within the cartridge. The paper guides **18** are closer together than the cartridge guides **16.** However, conventional side guides **14** of equal separation can be used with this invention and the term "side guide" as used herein is not limited to the illustrated type of side guide.

The side guides **14** include flanges **20** which rest on the feed table **12.** The side guides **14** are laterally slideable on the table **12** and include pegs **22** which extend beneath the table **12** through four lateral slots **24** formed in the table **12.** The lateral slots **24** restrain the pegs **22** from moving longitudinally and thus maintain the side guides **14** in alignment. As will be described hereinafter the side guides **14** automatically center a paper supply and means are provided to separate the side guides **14** during paper insertion.

A pair of vertical toothed guide slots **26** are provided in an extension of the side guides **14.** The guide slots **26** are disposed beyond the leading edge **28** of the feed table **12.**

The "leading" edge of a tray is the edge nearest the duplicator. The "longitudinal" direction is the direction of paper travel (see the arrow **29** in FIG. **1**) and the "lateral" direction is perpendicular to the longitudinal direction.

A rod **30** is horizontally mounted in the guide slots **26.** Splined portions **32** are formed on the rod **30** and engage the teeth **34** in the guide slots **26.** The guide slots **26** are narrow enough to maintain the splines **32** in engagement with the teeth **34** as the rod **30** moves vertically up and down in the guide slots **26.** That engagement prevents the rod **30** from tipping out of its horizontal orientation.

A pair of pin separators **36** are mounted on the rod **30** for lateral sliding movement along the rod **30.** Pegs

38 extend from the pins 36 through the guide slots 26. The pegs 38 are captured by E-rings 40.

The mounting details are better illustrated in FIGS. 4 and 5. The pegs 38 are slideable in the guide slots 26 and thus the rod and pin assembly can move up and down without changing the orientation of the pins 36 with respect to a depleting stack of paper.

A spring 42 rides on an unsplined portion 44 of the rod 30 and biases the pins 36 downwardly. Thus the pins 36 remain in contact with a paper supply as it decreases in height.

FIG. 1 represents the tray 10 when it contains a supply of paper. For reasons of clarity the stack of paper sheets has been omitted from the figure. As is apparent to those of ordinary skill in the art, the side guides 14 would abut opposite edges of the stack and the pins 36 would rest on the leading corners of the uppermost sheet in the stack. This explains the raised position of the pins 36 and as will become apparent later, the separation of the side guides 14.

FIG. 2 is the underside of the tray 10. To make the side guides 14 self-centering, a plate 46 is mounted for longitudinal movement guided by the coaction of pegs 48 extending from the feed table 12 and two longitudinal slots 50. Four angular slots 52 in the plate 46 capture the pegs 22 extending from the side guides 14. The coaction of the angular slots 52, the lateral slots 24 and the pegs 22 causes the side guides to separate when the plate 46 is moved toward the leading edge 28 of the feed table 12 and to come together as the plate 46 is moved toward the rear edge 54 of the table 12.

A pair of springs 56 bias the plate 46 toward the rear edge 54 and consequently bias the side guides 14 together. FIG. 2 illustrates the position when the side guides 14 are in closest proximity. The peg and slot mechanism insures that the side guides 14 are always equispaced from the center of the table and because the springs 56 are of sufficient strength to urge the side guides 14 together until they both contact the paper stack, by separating the side guides 14, placing the stack between them and releasing the side guides 14 the stack will automatically be centered.

The mechanism for separating the side guides 14 for inserting a new stack of paper includes a lever 58 pivoted to the feed table 12 at 48. A cam 60 is formed in the lever 58 to act upon a cam follower 62 which is attached to the plate 46. As seen in FIG. 1, the lever may be moved from left to right through a slot 64 into a lock 66. The lock 66 is necessary because the lever is biased by a spring 68 to the position shown in FIGS. 1 and 2.

It is readily appreciated that so moving the lever 58 (left to right in FIG. 1 and right to left in FIG. 2) will force the cam follower 62 and the plate 46 toward the leading edge 28 of the feed table 12. FIG. 3 depicts the assembly in that condition. Conversely, removing the lever 58 from the lock 66 permits the side guides 14 to come together and position a stack of paper.

To raise the pins 36 a lifter 70 is provided to rotate from the position shown in phantom in FIG. 4 to the position shown in solid therein and thereby raise the rod 30. As the lifter 70 is rotated it engages the unsplined portion 44 of the rod 30. In its raised position the front face 72 of the lifter acts as a front stop for longitudinally positioning a stack of paper on the tray 10.

The lifter 70 is attached to a rod 74 that is rotatably mounted on the underside of the table 12. A link 76 is attached to a projection on the rod 74 and on a peg 78 extending from the lever 58.

As seen in FIG. 3, moving the lever 58 into the lock 66 rotates the rod 74 and thus raises the pins 36. It will be remembered that so moving the lever 58 also separates the side guides 14. Consequently the tray 10 is prepared to receive a stack of paper.

Upon releasing the lever 58 and returning it to the position shown in FIGS. 1 and 2 it is desirable that the side guides 14 close first, and the pins 36 are lowered thereafter. It is for this reason that the loop 80 is formed in the link 76 such that the link 76 is loosely mounted on the peg 78.

FIG. 6 illustrates the relationship when the lever 58 has been partially returned to the position of FIGS. 1 and 2 from an initial position shown in FIG. 3. The cam follower 62 has been returned to its rearward most position which closes the side guides 14. However, the peg 78 has not yet contacted the right side of the loop 80 and therefore the lifter 70 is still in its fully raised position. Further motion of the lever 58 will cause the peg 78 to contact the right side of the loop 80 and rotate the lifter 70 to the position shown in FIG. 2.

The single lever loading feature of this invention can be enjoyed without successively closing the side guides 14 and lowering the pins 36. In FIG. 7 the loop 80 has been eliminated and thus the side guides 14 will close and the pins 36 will drop simultaneously.

Thus, to insert a stack of paper on the tray 10 the lever 58 is moved into the lock 66. With the pins 36 raised and the side guides 14 separated a stack of paper may be positioned against the front stop 72. Returning the lever to its initial position closes the side guides 14 on the stack and drops the pins 36 into their operative positions overlying the leading corners of the stack.

I claim:

1. In a pin feed tray having a feed table, a pair of downwardly biased vertically slideable pin separators, and a pair of laterally slideable side guides biased to a position of closest proximity the combination comprising:

a rotatable rod having a lifter for raising said pins;

a slideable plate for separating said side guides;

a manually operable lever mounted to the underside of said tray for movement between first and second positions;

means associated with said lever for sliding said plate to a position in which said side guides are separated as said lever is moved from said first position to said second position; and

a link coupling said lever and said rod for rotating said rod and lifting said pins as said lever is moved from said first position to said second position.

2. The combination set forth in claim 1 wherein said link is attached to said lever such that upon movement of said lever from said second position to said first position said pins and said side guides are simultaneously moved toward their biased positions.

3. The combination set forth in claim 1 wherein said link is loosely attached to said lever such that upon movement of said lever from said second position to said first position said side guides move toward their biased position prior to said pins moving toward their biased position.

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