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Samczyk

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[54] **PIN FEED TRAY**

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[73] Assignee: **Bell and Howell Company**, Chicago, Ill.

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

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

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

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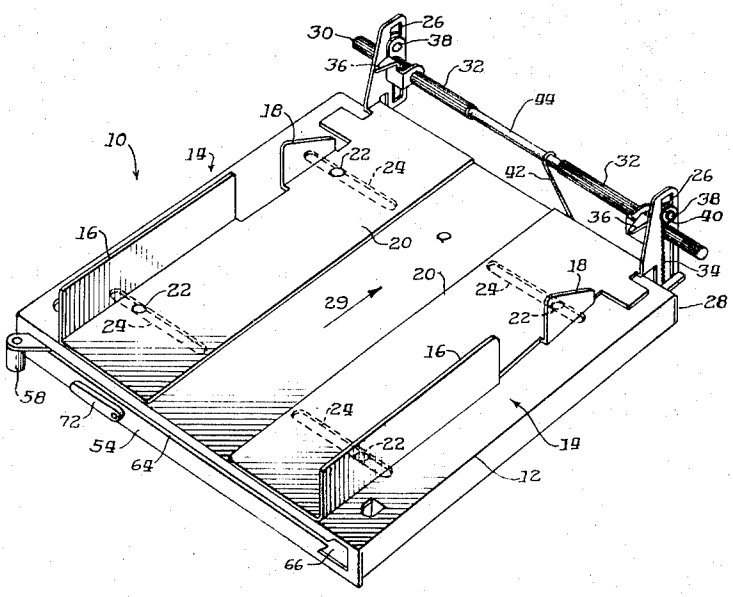
Assistant Examiner—Bruce H. Stoner, Jr.

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[57] **ABSTRACT**

An improved pin feed tray in which pin separators are mounted on a horizontal rod which has splines engaging teeth formed in vertical guide slots. The side guides are self-centering and apparatus is provided to raise the pins and separate the side guides.

8 Claims, 5 Drawing Figures

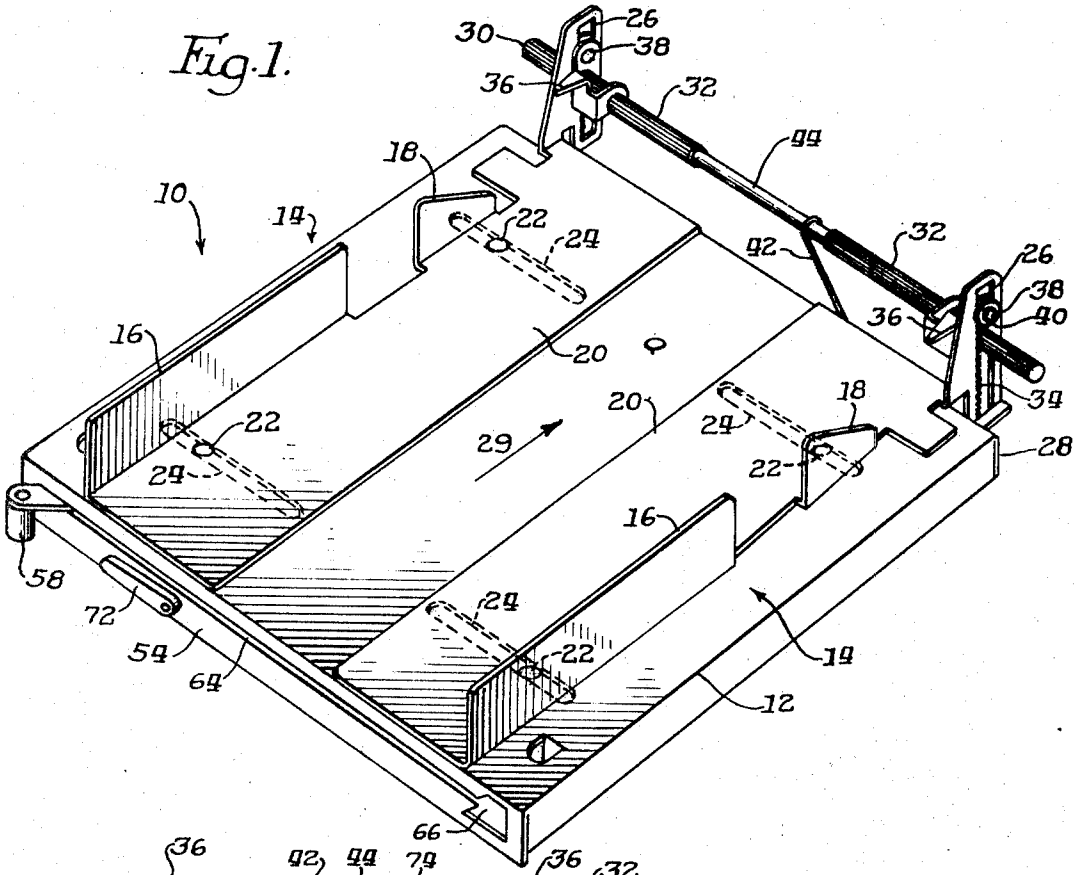


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SHEET 1 OF 2

Fig. 1.



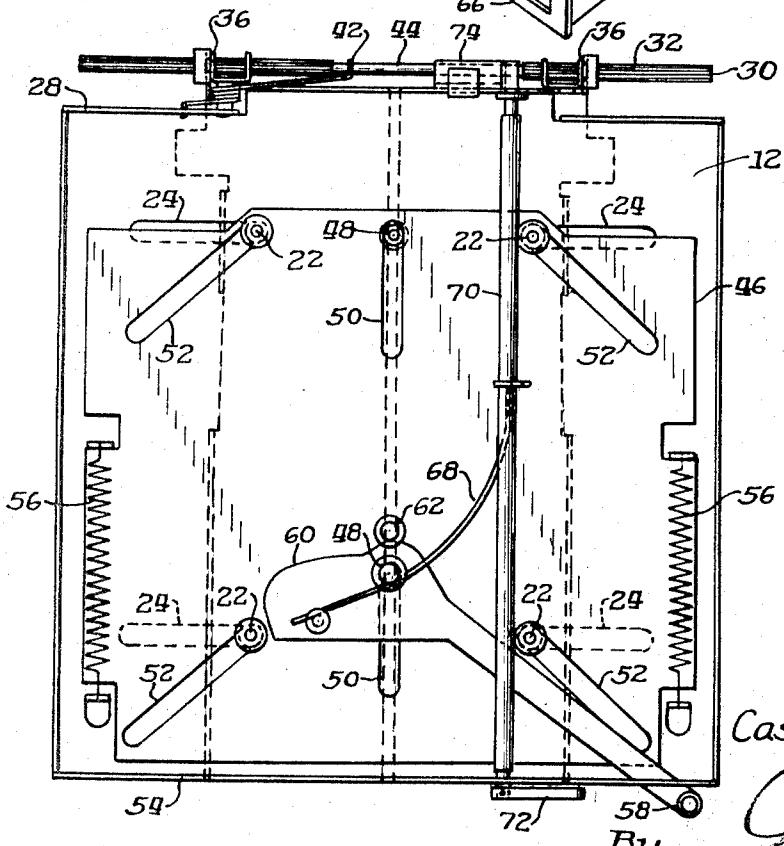


Fig. 2.

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Fig. 3

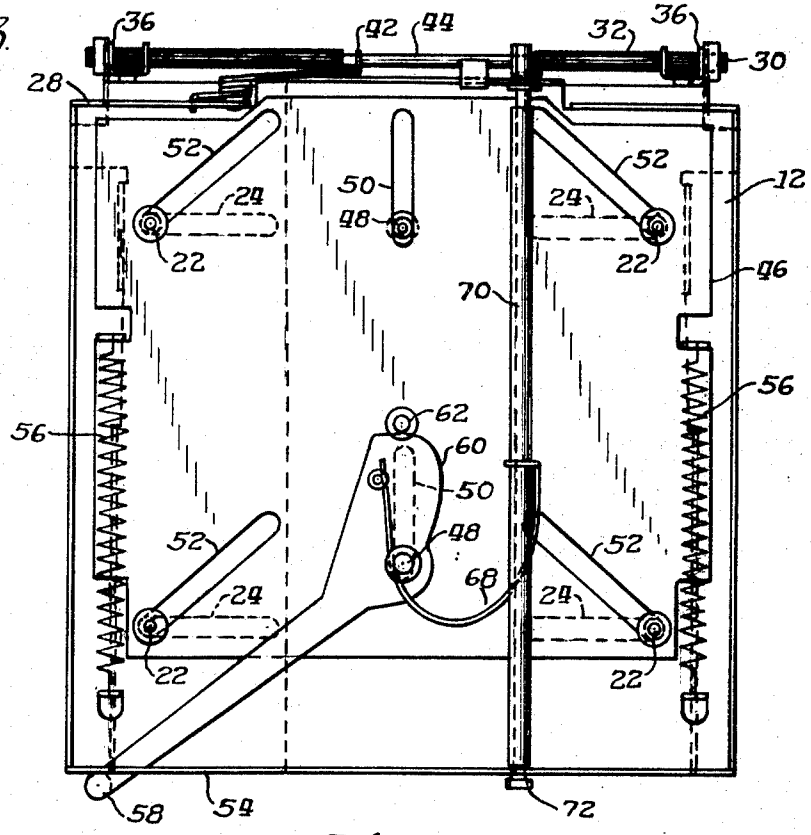


Fig. 4

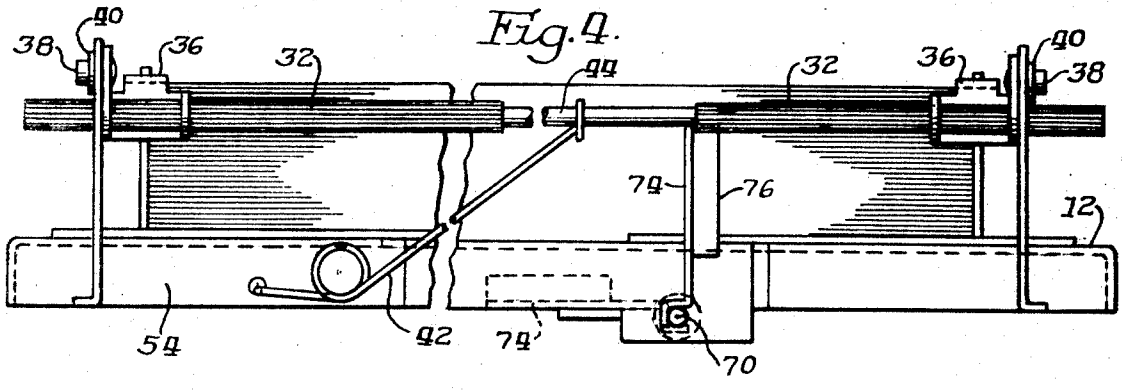
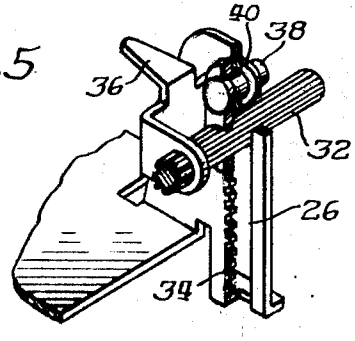


Fig. 5



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PIN FEED TRAY

CROSS REFERENCE TO A RELATED APPLICATION

This application is related to copending application Ser. No. 159,909, filed of even date herewith in the name of George W. Bookless.

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.

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.

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.

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.

SUMMARY OF THE INVENTION

This invention presents a pin feed tray which overcomes the aforementioned disadvantages among others. The pins are mounted on a splined rod which travels vertically in teeth formed in the side guides. The pins are laterally slideable and are laterally adjustable with the side guides. The splined rod is spring biased downwardly. The engagement of the splines with the teeth prevents the rod from tipping out of the horizontal.

Because the pins are linked through the shaft they apply equal pressure at their respective corners. Furthermore, because they travel vertically and not in an arc they maintain nearly a constant pressure from the top to the bottom sheet in a stack. The spring biasing eliminates the problems associated with gravitational pins.

A manually rotatable rod having a handle at one end and a lifter at the other is provided to raise the pins. As the rod is rotated, the lifter rides on an unsplined portion of the shaft and raises the pins.

A manually operable lever is provided to separate the side guides. A cam on the lever moves a slotted plate linearly. Posts projecting from the side guides ride in the slots and cause the side guides to move laterally when the plate is moved.

An improvement has been made the subject of the related application. In the improvement a link between the lever and the rod allows both the pins to be raised and the side guides to be separated by a single manipulation of the lever.

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 this 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**.

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 en-

gagement 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 48 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 to permit paper insertion, the mechanism best shown in FIGS. 2 and 4 has been provided. A rod 70 is rotatably mounted on the underside of the feed table 12. A manually operable handle 72 is provided to rotate the rod 70. A lifter 74 is positioned at one end of the rod 70 to engage the unsplined portion 44 of the pin supporting rod 30 and raise the pins 36 as the lifter 74 is rotated from the position shown in phantom in FIG. 4 to the position shown in solid lines therein. When it is in the raised position the front face 76 of the lifter 72 serves as a front stop to position the stack longitudinally.

Thus to place a stack of paper on the tray 10 the lever 58 is positioned in the lock 66 and the pins 36 are raised by rotating the handle 72. The paper supply is urged against the front stop 76 and the lever 58 is released from the lock 66 allowing the side guides 14 to close on the stack. The paper supply is now properly positioned on the tray 10. Returning the handle 72 to its original position allows the pins 36 to drop onto the leading corners of the stack and the tray is ready to separate the sheets for feeding one at a time to the duplicator.

I claim:

1. A pin feed tray for mounting on a duplicator to feed paper one sheet at a time to the duplicator comprising:
   - a substantially stationarily mounted feed table;
   - a pair of side guides mounted on said feed table for laterally locating a stack of paper sheets;
   - a pair of vertical toothed guide slots disposed adjacent the leading edge of said table;
   - a horizontal rod disposed in said guide slots adjacent said leading edge of said table, said rod having splined portions that engage said teeth in said guide slots for vertical movement within said slots; and
   - a pair of pins carried by said horizontal rod and mounted for vertical sliding movement along said guide slots with said rod and disposed such that they overlie the leading corners of said stack of sheets.

2. The pin feed tray set forth in claim 1 further comprising spring means for biasing said rod to its lowest position in said slots and a manually operable rotatable lifter for engaging said rod and raising said pins when said lifter is rotated upwardly.

3. The pin feed tray set forth in claim 2 wherein said lifter includes front stop means for positioning said paper stack longitudinally when said lifter is in its raised position.

4. A sheet separating mechanism for use with a duplicator that comprises:
   - a substantially stationary feed table;
   - a pair of side guides for laterally positioning a stack of paper sheets;
   - a pair of guide means including vertical slots disposed beyond the leading edge of said table;
   - a rod having splined portions passing through said slots for vertical movement therein, said splined portions being adapted to be engaged within said vertical slots for vertically positioning said rod relative to said feed table;
   - a pair of pin separators mounted on said rod and in said slots for vertical movement with said rod, said separators being disposed to overlie the leading edges of said stack of paper sheets; and
   - a manually operable lifter that is rotatable from a position below said stack to a raised position, said lifter including a first portion that engages and slides along said rod to raise said rod and pins and including a second portion which is a front stop for longitudinally positioning said stack when said lifter is in its fully raised position.

5. A pin feed tray comprising:
a substantially stationarily mounted feed table;
a pair of side guides mounted on said table for lateral movement toward and away from each other;
a pair of vertical toothed slots mounted for movement with said side guides;
a horizontal rod passing through said slots having splines engaging said teeth such that said rod may move vertically in said slots and cannot tip from the horizontal;
a pair of pin separators mounted for lateral sliding movement along said rod and for vertical sliding movement within said slots as said rod is moved vertically within said slots, said pins being disposed such that they overlie the leading corners of a stack of paper sheets on said tray.

6. The pin feed tray set forth in claim 5 further comprising spring means for biasing said rod downwardly and manually operable lifter means for engaging said rod and lifting said pins to permit placement of a stack of paper sheets on said tray.

7. The pin feed tray set forth in claim 5 further comprising spring means for biasing said side guide to a position of closest proximity and manually operable means for separating said side guides to permit placement of a stack of paper sheets therebetween.

8. The pin feed tray set forth in claim 7 further comprising spring means for biasing said rod downwardly and manually operable lifter means for engaging said rod and lifting said pins to permit placement of a stack of paper sheets on said tray.

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