United States Patent

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[72] Inventors **Charles T. Bergman**
Watertown and
Jack E. Weidner, Whitefish Bay, Wisconsin

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[73] Assignee **Brandt Automatic Cashier Co.**
Watertown, Wisconsin
a corporation of Wisconsin

[54] **APPARATUS FOR FEEDING PAPER CURRENCY**
2 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **271/39**
[51] **Int. Cl.** **B65h 1/18**
[50] **Field of Search** 198/25, 145, 167, 103; 235/98; 271/41, 36, 39

[56] **References Cited**

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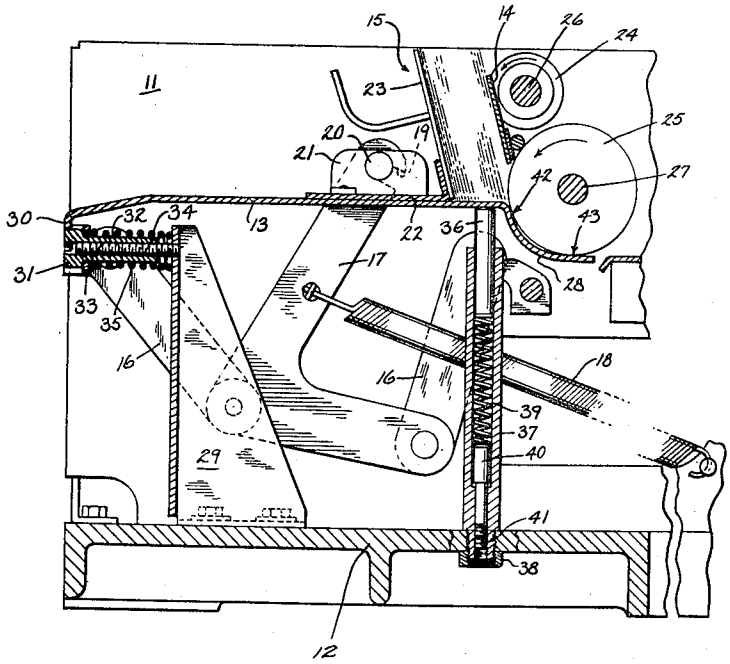
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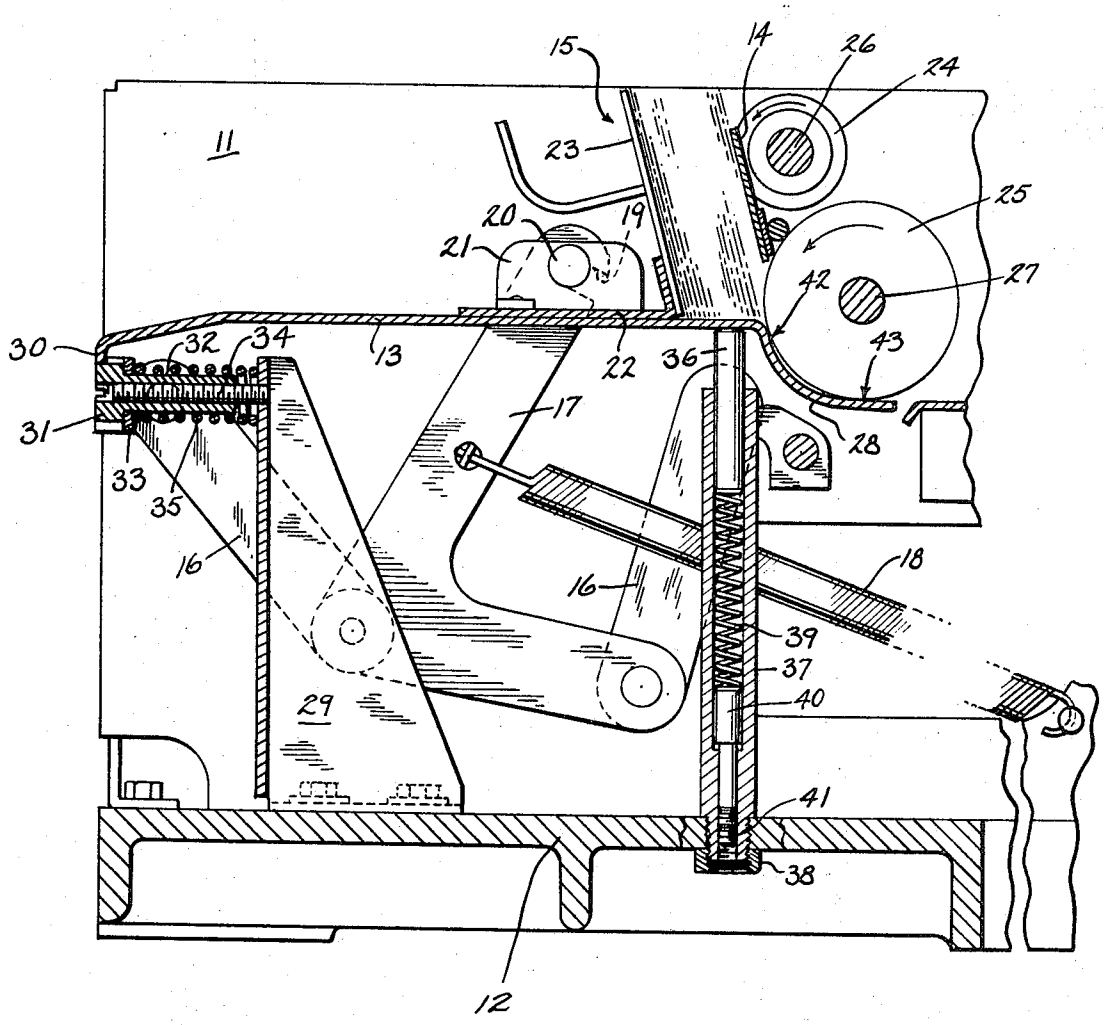
Primary Examiner—Richard E. Aegerter
Attorney—Thomas W. Ehrmann and Adrian L. Bateman, Jr.

ABSTRACT: A receiving compartment of a paper currency counting machine is shown in which a stack of bills is supported on edge on a feed runway and held by a spring biased removable bill follower against upper and lower feed rollers. The feed runway is hinged intermediate its outer end on an adjustable support and has an arcuate portion at its inner end adjacent the lower feed rollers. The feed runway is urged upward by a pair of spaced adjustable biasing means to have the arcuate portion engage the lower feed rollers along two spaced lines of contact. The endmost bill of the stack of bills can be removed from engagement with the feed rollers by a shiftable feed stop plate and the feed runway can be retracted from engagement with the lower rollers, both actions contributing to the halting of the flow of bills.



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Fig. 1

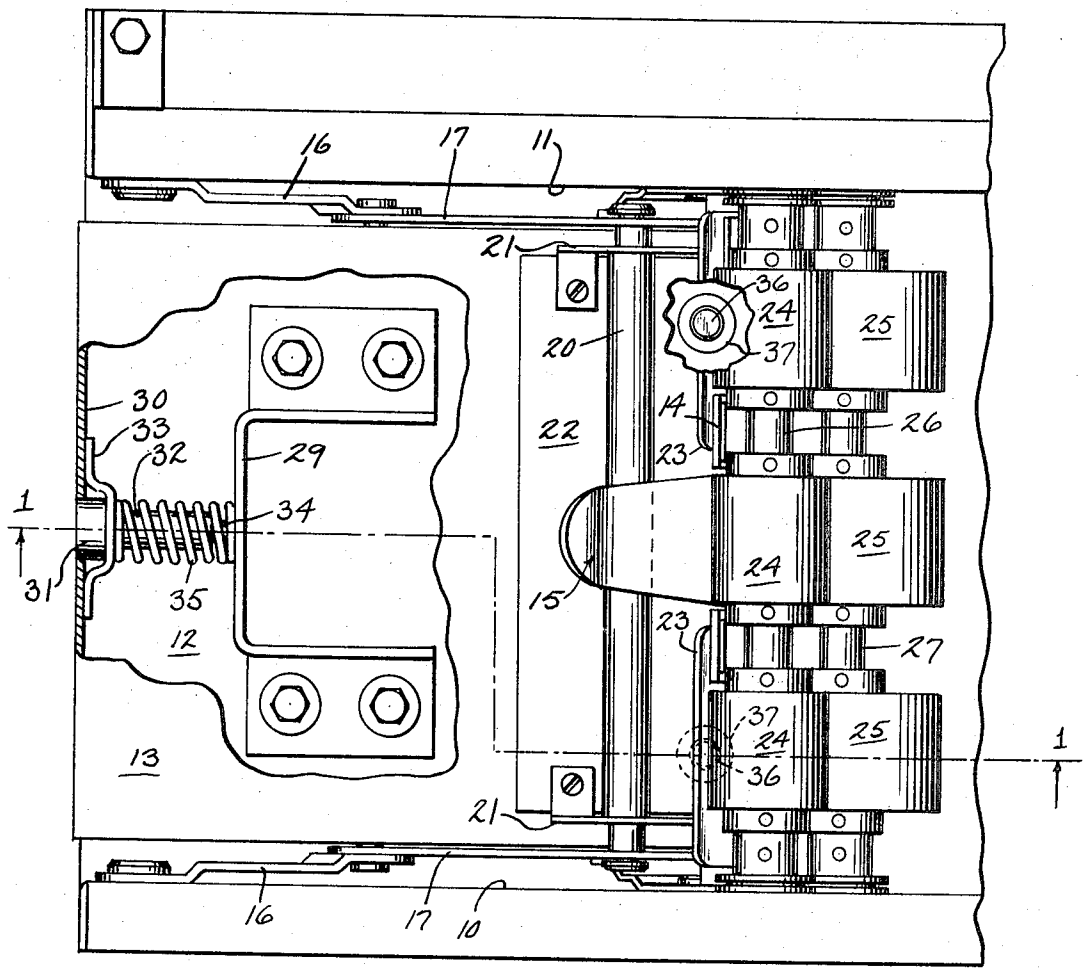


INVENTORS
CHARLES T. BERGMAN
JACK E. WEIDNER

BY
Thomas W. Ehrmann

ATTORNEY

Fig. 2



INVENTORS
CHARLES T. BERGMAN
JACK E. WEIDNER

BY Thomas W. Sherman

ATTORNEY

APPARATUS FOR FEEDING PAPER CURRENCY

BACKGROUND OF THE INVENTION

This invention relates to paper currency handling equipment, and particularly to improvements in apparatus for feeding bills singly from a stack of bills.

Paper currency handling equipment has been developed to perform functions such as the counting of a stack of currency. An example of a currency counting machine is fully described and disclosed in U.S. Pat. No. 3,214,096 which issued on Oct. 26, 1965 to Arnold R. Buchholz, George V. Johnson, and Arnold Krause for "Paper Currency Counter". Paper currency handling equipment generally requires for its efficient operation that the bills be fed singly from a source into or through the machine. Thus, in the currency counter machine disclosed in the aforementioned U.S. Pat., while provision is made for detecting the presence of more than one bill at a time being fed through a section in which counting is accomplished, the efficient operation of the machine requires that the feeding of more than one bill at a time be an unusual occurrence.

While the feeding of bills singly from a source is desirable, it is not easily obtained because of the physical character of paper currency. Single feeding is particularly difficult to achieve when handling new currency. The new currency has a tendency to stick together and the edges of the new bills are bent as a result of the shearing operations in their manufacture. Thus, it is quite difficult to separate a single bill from a stack of bills of new currency.

The purpose of the invention is to provide an improved apparatus for the feeding of bills singly from a stack of bills into a paper handling machine, and particularly to provide for adjustment of cooperating elements of the feeding mechanism whereby the mechanism may be set up to function under optimum conditions.

SUMMARY OF THE INVENTION

The invention comprises the combination, in a paper currency handling apparatus having a base, spaced front and rear frames, and bill feed means including feed rollers, of a feed runway for supporting a stack of bills, the feed runway having an arcuate discharge portion at its inner end to cooperate with the feed rollers, the outer end of the feed runway being centrally supported on an adjustable support by which the longitudinal position of the arcuate portion relative to the feed rollers may be adjusted, the feed runway projecting from said adjustable support means and being urged upwardly to have the arcuate portion engage the feed rollers by a pair of spaced biasing means that are adjustable to vary the tension on the arcuate portion of the feed runway.

The invention may be incorporated in a paper currency handling apparatus in which the retraction of the feed runway from engagement with the feed rollers and the shifting of the stack of bills out of engagement with the feed rollers halts the flow of bills. The invention may further reside in the provision of a removable bill follower that biases the stack of bills toward the feed rollers and holds the same at the proper angle regardless of the size of the stack.

In the description which follows, a preferred embodiment of the invention is disclosed in sufficient detail to enable a person skilled in the art to make and use the same. It should be appreciated, however, that only a preferred embodiment is disclosed and changes can be made thereto without departing from the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a view in vertical section through the feeding compartment of a paper currency counter and showing the invention incorporated therein; and

FIG. 2 is a top plan view of the receiving compartment of FIG. 1 with portions broken away for clarity of illustration.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, the invention is shown incorporated in the receiving compartment of the paper currency counter of the type disclosed and described in the aforementioned U.S. Pat. The receiving compartment is defined generally by spaced front and rear frames **10** and **11**, respectively, each of which rises vertically from a base **12**, and by a thin metal feed runway **13**. The receiving compartment is adapted to receive bills arranged in stacked form (as shown in FIG. 1) with bills resting at their lower edges on the feed runway **13**. The bills are held slightly inclined against a feed stop plate **14** by a bill follower **15** supported at each side by a linkage which is spring biased toward the feed stop plate **14**. The linkage for each side of the bill follower **15** includes a pair of links **16** each supported at one end on a respective frame **10** or **11** and a bell crank lever **17** which is pivotally mounted at its fulcrum to the free end of one of the links **16** and is pivotally mounted at the end of one arm to the free end of the other of the links **16**. The second, or free, arm of the bell crank lever **17** projects upwardly to a point above the feed runway **13** on a respective side thereof and is urged toward the feed stop plate **14** by an extension spring **18**. The end of the free arm of the lever **17** is provided with a slot **19** which receives a stub shaft **20** on an ear **21** secured to a heel plate **22** of the bill follower **15**. The heel plate **22** mounts the inclined follower plate **23** which engages the stack of bills.

Removal of the endmost bill in the stack is accomplished by driven upper and lower feed rollers **24** and **25** which are mounted on shafts **26** and **27**, respectively. The feed rollers **24** and **25** are spaced along their respective shafts **26** and **27** and the shafts are journaled in the front and rear frames **10** and **11**. The shafts are driven by suitable gearing or belt drives (not shown) and the lower feed rollers **26** are driven at a greater peripheral speed than the upper feed rollers **24**. The feed stop plate **14** is provided with suitable upper and lower cutouts through which the peripheries of the upper and lower feed rollers **24** and **25** may project to engage the endmost one of the bills of the stack. When the elements are in their bill feeding position, the feed rollers, which are driven counterclockwise as viewed in FIG. **1**, will cause the endmost one of the stack of bills to be moved downwardly to a nip defined between the bottom feed rollers **25** and a downwardly arcuate portion **28** of the feed runway **13**.

The feed runway **13** is adjustably supported centrally of its outer end. Specifically, a standard **29** is secured to and rises from the base **12**. The outer end of the runway **13** includes a downwardly bent portion **30** having a central opening to accommodate the head **31** of a runway trip screw **32**. A bent bracket **33** is secured to the inside of the bent portion **30** of the runway **13** and the shank of the runway screw **32** projects through an opening in the bracket **33**. The screw **32** is internally threaded and receives a set screw **34**. The set screw **34** is held at its outer end in the support **29**. A compression spring **35** surrounds the shank of the screw **32** and is biased between the support **29** and the bracket **33**. The feed runway **13** is thereby supported and its free end can flex up and down on the screw **32** against the force of the spring **35** with the fit of the screw **32** in the bracket **33** being sufficiently loose to accommodate the necessary motions. Also, the longitudinal position of the outer end of the feed runway relative to the standard **29** may be adjusted by turning the runway screw **32**. The compression spring **35** holds the bracket **33** against the head **31** to maintain a constant position of the feed runway **13** on the screw **32**.

The arcuate portion **28** is normally urged upwardly to engage the lower feed rollers **25** by a pair of spaced biasing means which are disposed on each side of the longitudinal center line of the feed runway. The biasing means each include an upper runway plunger **36** disposed within a tube **37** having a reduced threaded portion in its lower end which is received in the base **12** with a nut **38** securing the tube **37** to the base **12**. A compression spring **39** is biased within the tube

37 between the upper plunger 36 and a lower plunger 40 having a reduced portion received in a reduced counter bore of the tube 37. The position of the lower plunger 40 within the tube 37, and consequently the amount of force exerted by the upper plunger 36 on the feed runway 13, is controlled by a set screw 41 received within an internally threaded portion of the reduced counter bore of the tube 37.

In a manner disclosed in the aforementioned U.S. Pat., the feeding of bills from the receiving compartment is halted without requiring the stopping of the feed rollers 24 and 25. That is, at the end of a predetermined count or at any other time that it is desired to halt the flow of bills, the feed stop plate 14 is shifted to move the stack of bills from engagement with the feed rollers 24 and 25. Also, the arcuate end 28 of the feed runway 13 is retracted from engagement with the lower feed rollers 25 against the urgings of the spring-biased upper plungers 36. Together, these actions will prevent the feeding of bills from the stack.

To obtain the best delivery of single bills from the stack, it is necessary that the lower feed rollers 25 and the arcuate bent portion 28 of the feed runway 13 mate in a proper relationship. This proper relationship depends upon the position of the arcuate end 28 relative to the lower feed rollers 25 and the amount of pressure exerted upon the feed runway 13. This is assured by permitting longitudinal adjustment of the runway 13 by the screw 32 so that the arcuate portion properly mates with the feed rollers 25 and by the adjustment of the force urging the arcuate portion upwardly into engagement with the feed rollers 25.

It has also been found that removal of single bills from the stack is facilitated by so shaping the arcuate portion 38 so that it makes contact with the lower rollers 25 at two spaced lines. One line of contact, identified by the reference numeral 42, is immediately adjacent the level surface the runway 13 so that it is immediately below the bottom edge of the endmost bill in the stack. The second line of contact, indicated generally by the reference numeral 43, is at a point approximately at the lowermost point on the periphery of the lower feed rollers 25. These lines of contact 42 and 43 are maintained by adjusting the position of the feed runway 13 in a longitudinal direction and by adjusting the amount of pressure exerted by the arcuate end 28 upon the lower feed rollers 25, as described above.

The feed rollers 25 are preferably made of a material, such as polyurethane, which exhibits a high coefficient of friction. It has been found that coating the upper surface of the arcuate portion with polyurethane will also increase performance. The bill follower 15 maintains the stack of bills at a proper angle for feeding into the feed rollers 24 and 25. The heel plate 22 will ride on the top surface of the runway 13 to insure that the angular position of the follower plate 23 does not change as the size of the stack changes.

By providing the adjustment of the contact between the feed runway and feed rollers the ability of the paper handling apparatus to remove bills, and particularly new bills, from a stack has been greatly improved.

We claim:

1. In a paper currency handling apparatus including a base, spaced front and rear frames rising from the base, and bill feed means disposed transversely of the frames including feed rollers, the combination comprising:

a feed runway disposed between said frames and forming a receiving compartment therewith, said feed runway having a level portion adapted to support a stack of bills with the endmost bill of the stack engaged by said feed rollers to remove bills singly from the stack, said feed runway also having an arcuate portion at its inner end that extends downwardly and outwardly from said level portion to engage said feed rollers;

support means connected to said base and adjustably mounting the outer end of said feed runway remote from said feed means at a point centrally of said feed runway whereby the longitudinal position of said feed runway may be adjusted relative to said feed rollers;

and a pair of spaced, individually adjustable biasing means one of which is disposed on each side of the centerline of said feed runway, said biasing means engaging the underside of said runway adjacent said arcuate portion to urge said arcuate portion upwardly into engagement with said feed rollers with a force that may be varied by adjustment of said biasing means.

2. In a paper currency handling apparatus including a base, spaced front and rear frames rising from the base, and bill feed means disposed transversely of the frames including feed rollers, the combination comprising:

a feed runway disposed between said frames and forming a receiving compartment therewith, said feed runway having a level portion adapted to support a stack of bills with the endmost bill of the stack engaged by said feed rollers to remove bills singly from the stack, said feed runway also having an arcuate portion at its inner end that is so shaped as to engage said feed rollers solely at two spaced lines of contact, one of said lines of contact being adjacent said level portion of said feed runway and the other of said lines of contact being adjacent the lowest point of the periphery of said feed rollers;

support means connected to said base and adjustably mounting the outer end of said feed runway remote from said feed means at a point centrally of said feed runway whereby the longitudinal position of said feed runway may be adjusted relative to said feed roller; and

a pair of spaced, adjustable biasing means one of which is disposed on each side of the centerline of said feed runway, said biasing means engaging the underside of said runway adjacent said arcuate portion to urge said arcuate portion upwardly into engagement with said feed rollers with a force that may be varied by adjustment of said biasing means.