

[54] **PRINT CUTTING MECHANISM FOR BORDERED AND BORDERLESS PRINTS**

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[52] U.S. Cl. .... **83/368, 83/255, 83/213,**  
**83/557, 83/561, 83/623**

[51] Int. Cl. .... **B26d 5/02**

[58] Field of Search ..... **83/213, 240, 368, 539,**  
**83/553, 557, 561, 564, 600, 620, 623, 255**

[56] **References Cited**

**UNITED STATES PATENTS**

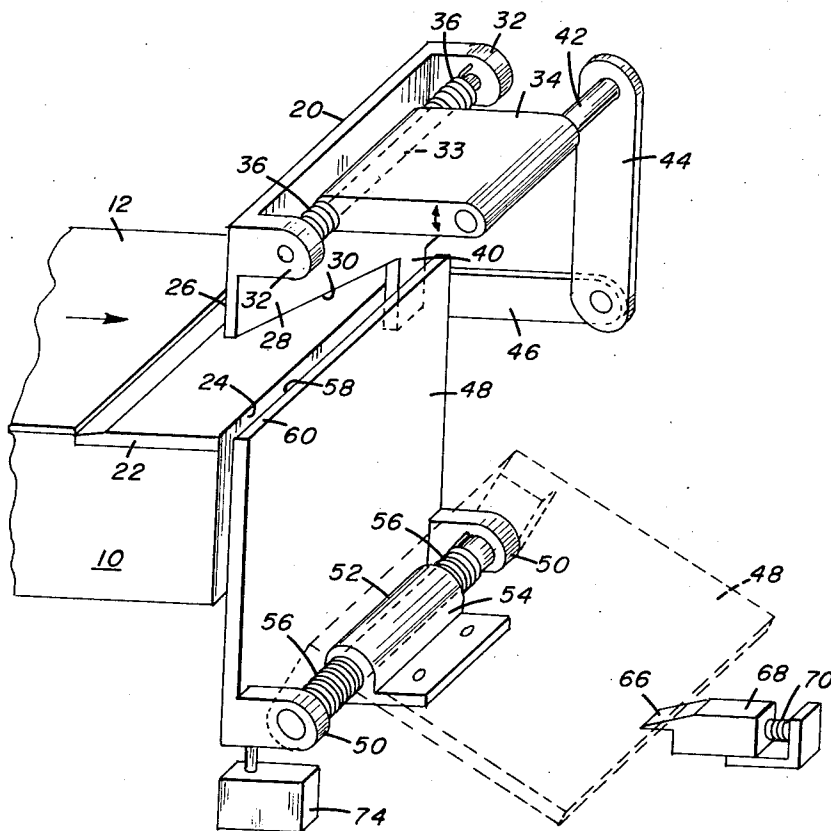
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Primary Examiner—Donald R. Schran  
Attorney, Agent, or Firm—S. W. Gremban

[57] **ABSTRACT**

A print cutting mechanism for cutting prints from a web and operable in a first mode to cut individual bordered prints from a web containing bordered prints, and in the second mode to cut individual borderless prints from a web containing borderless prints. The cutting mechanism is provided with a stationary bed blade having a cutting edge, and a movable cutting knife having two cutting edges spaced apart a distance slightly greater than the distance between the leading and trailing ends of two adjacent borderless prints. In the first mode of operation, the cutting edge of the stationary bed blade cooperates with one of the two cutting edges of the knife to sever individual prints having a border. In the second mode of operation, a movable bed blade is moved to a borderless print cutting position in which a cutting edge thereof is spaced from the cutting edge of the stationary bed blade a distance slightly greater than the distance between the leading and trailing ends of two adjacent borderless prints on the web. Accordingly, when the movable cutting knife is moved between the stationary and movable bed blades, the cutting edges of the knife and blades cooperate to cut out the border portion between the two adjacent prints to provide an individual borderless print.

**8 Claims, 7 Drawing Figures**



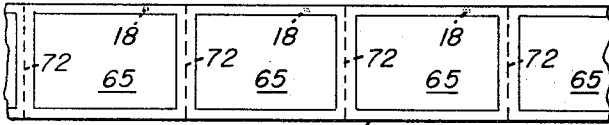


FIG. 1

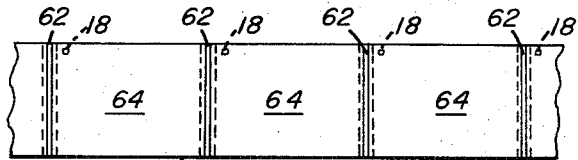


FIG. 2

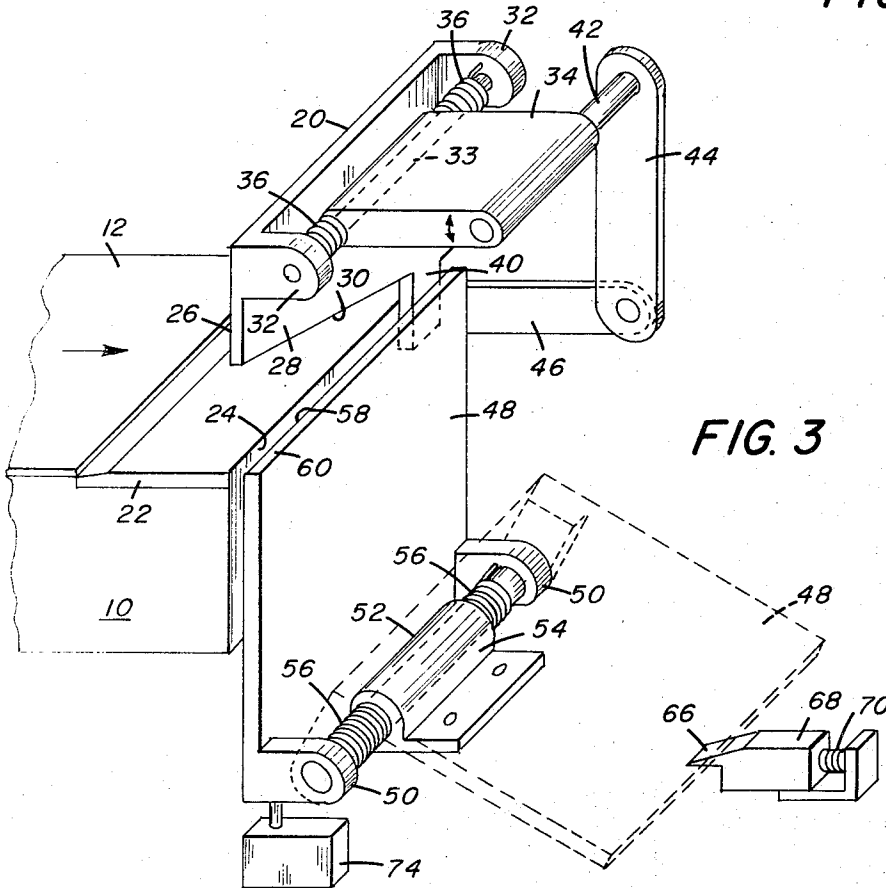


FIG. 3

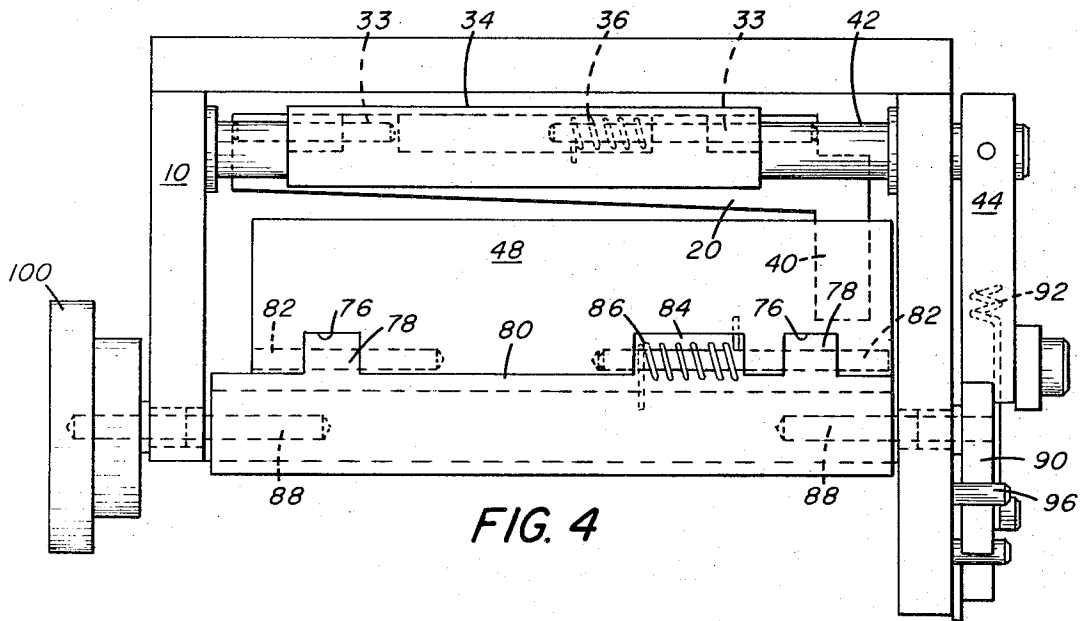


FIG. 4

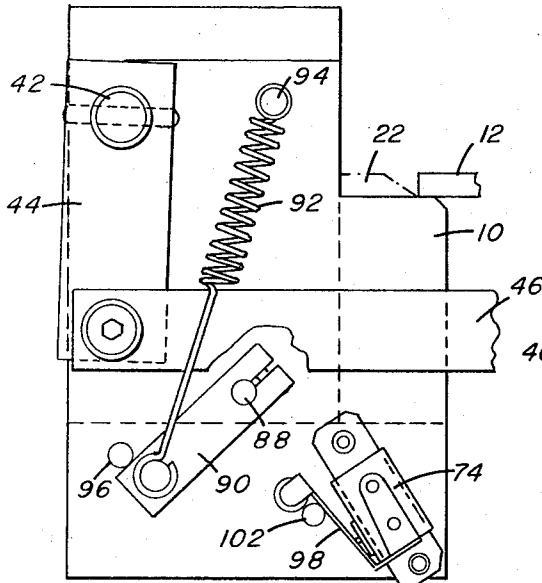


FIG. 5

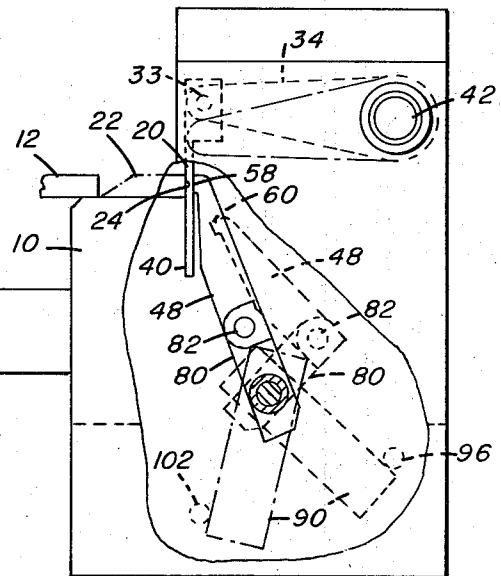


FIG. 6

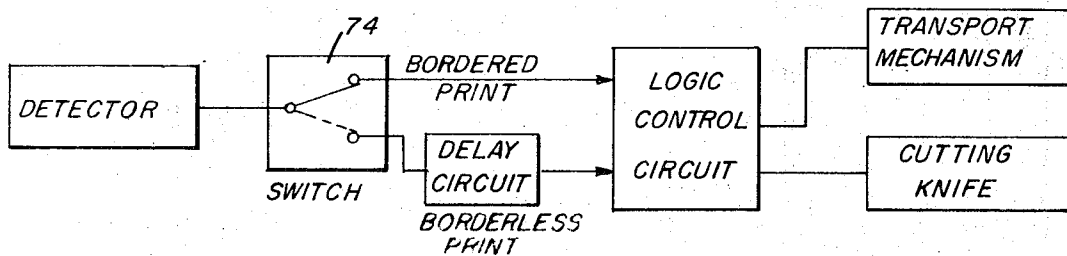


FIG. 7

## PRINT CUTTING MECHANISM FOR BORDERED AND BORDERLESS PRINTS

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

This invention relates generally to cutting mechanisms, and more specifically to a print cutting mechanism operable in one mode to cut individual bordered prints, and in another mode to cut individual borderless prints.

#### 2. Description of the Prior Art

It is well known in the art to provide a cutting mechanism comprising a stationary bed blade having a cutting edge, and a movable knife having a cutting edge coacting therewith to make a single cut along a single line. Although it is possible with such a cutting mechanism to cut individual bordered and borderless prints from a web, such an operation is time consuming, requiring considerable additional operator handling of the web and equipment including two separate cutting actions to produce a borderless print.

It is further known in the prior art to provide a cutting mechanism having a stationary bed with spaced apart bed blades having cutting edges, and a movable cutting knife of a width substantially equal to the distance between the blades and provided with a pair of spaced cutting edges. A material is placed across the blades, and the cutting knife moved between the blades causing the coacting cutting edges of the blades and knife to cut out a portion of the material of a width substantially equal to the distance between the bed blades. Although the described cutting mechanism is capable of repetitively cutting a portion of material of a predetermined width with one cutting stroke, it suffers from the disadvantage that it is only capable of operating in one mode, and cannot be readily altered to cut a material along a single line if such is desired.

### SUMMARY OF THE INVENTION

In accordance with a preferred embodiment of the invention, a print cutting mechanism is disclosed comprising a stationary bed blade having a cutting edge, and a movable cutting knife having a pair of cutting edges spaced apart a distance slightly greater than the distance between the leading and trailing ends of two adjacent borderless prints on a web. The print cutting mechanism is operable in a first mode to cut individual bordered prints from a web containing bordered prints, and in a second mode to cut individual borderless prints from a web containing borderless prints. In the first mode of operation, the cutting edge of the stationary bed blade coacts with one of the two cutting edges of the movable cutting knife to make a single cut intermediate the border portion between two adjacent prints to cut individual bordered prints. In the second mode of operation, a movable bed blade is moved to a borderless print cutting position in which a cutting edge thereof is spaced from the cutting edge of the stationary bed blade a distance slightly greater than the distance between the leading and trailing ends of two adjacent borderless prints. The cutting edges of the movable cutting knife coact with the blade edges of the stationary and movable bed blades to cut out the border portion between two adjacent prints to provide individual borderless prints. In the first mode of operation, the web is transported to a position in which the cutting

edge of the stationary bed blade is precisely in register with a line intermediate the border portion between two adjacent prints. Such web transport is achieved by any suitable logic controlled transport mechanism or the like which is responsive to the output of a detector mounted to sense a chop mark on the web. In the second mode of operation, the web is transported substantially the same distance to a precise position in which the adjacent edges of two prints preferably partially extend between the cutting edges of the movable cutting knife. Since the chop mark is normally applied to the back surface of the print paper web during the printing operation, such mark is normally applied between the leading and trailing ends of a print along the print edge when bordered prints are made. This is possible because the entire periphery of a bordered print on the web is supported by a print holder during exposure. Since the print holder does not support the side edges of a web containing borderless prints, the chop mark cannot be applied between the leading and trailing ends of a print along the print edge, and hence is applied adjacent a leading or trailing end of a borderless print along the print edge which is supported by the print holder. Accordingly, since the positions of the chop marks are different for bordered and borderless prints, a delay circuit of any suitable type is provided to accommodate this difference so that the logic control circuit for the transport mechanism and movable knife will actuate the movable knife to cut the paper web intermediate the prints on the web no matter what type of prints it contains.

It is accordingly one of the objects and advantages of this invention to provide a print cutting mechanism operable in a first mode to cut individual bordered prints from a web containing bordered prints, and in a second mode to cut individual borderless prints from a web containing borderless prints.

Another object and advantage of the invention is to provide a print cutting mechanism having a delay circuit for the movable cutting knife in the second mode of operation to compensate for the difference in positions of the chop marks on the bordered and borderless print webs.

Another object and advantage of this invention is to provide a print cutting mechanism for cutting both bordered and borderless prints that is of simple design and construction, thoroughly reliable and efficient in operation, and economical to manufacture.

The invention and its objects and advantages will become more apparent from the detailed description of the preferred embodiments presented below.

### BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiments of the invention presented below, reference is made to the accompanying drawings, in which:

FIG. 1 is a segmental top plan view of a web containing a plurality of bordered prints and illustrating by dotted lines where the web would be cut to provide individual bordered prints;

FIG. 2 is a top plan view similar to FIG. 1 of a web containing a plurality of borderless prints and illustrating by dotted lines where the web would be cut to provide individual borderless prints;

FIG. 3 is a schematic view in perspective illustrating one embodiment of a print cutting mechanism for cutting bordered and borderless prints;

FIG. 4 is a front elevational view of another embodiment of a print cutting mechanism of this invention;

FIG. 5 is a right side elevational view of the mechanism of FIG. 4;

FIG. 6 is a left side elevational view of the mechanism of FIG. 4 with a portion thereof broken away to show in full lines the movable bed blade of the print cutting mechanism in a borderless print cutting mode, and in broken lines the movable bed blade in a bordered print cutting mode; and

FIG. 7 is a block diagram illustrating one form of control system for the print cutting mechanism.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

Because photographic print cutting mechanisms are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. Web transport mechanisms, logic circuits and delay circuits not specifically shown or described herein should be understood to be selectable from those known in the art.

With reference to FIG. 3 of the drawing, one embodiment of a print cutting mechanism of this invention is disclosed comprising a frame 10 supporting a horizontal bed 12 over which one of two paper webs 14, 16 containing bordered or borderless prints respectively are transported by any suitable web transport mechanism illustrated in block diagram form in FIG. 7. The webs 14, 16 are provided with chop marks 18 on the back thereof (FIGS. 1 and 2) and a detector (FIG. 7) is provided for detecting the chop marks and feeding a signal to a logic control circuit for operating the web transport mechanism and a movable cutting knife 20 in timed relation to transport, precisely position, and cut the web. The bed 12 is provided at the leading end thereof with a stationary bed blade 22 having an upper surface lying in the plane of the upper surface of bed 12. The bed blade 22 is constructed of any suitable material, and further has a cutting edge 24. The cutting knife 20 is mounted for reciprocal movement and has a pair of spaced cutting edges 26, 28 of which edge 26 is movable into shearing engagement with cutting edge 24 for cutting a web. The lower cutting surface 30 of knife 20 is inclined with respect to the horizontal to provide a progressively movable shearing action as cutting knife 20 is moved downwardly relative to cutting edge 24 of stationary bed blade 22. The knife 20 has laterally extending flanges 32 pivotally mounted on shaft 33 extending through flanges 32 and through one end of an arm 34. Helical springs 36 encircle portions of shaft 34 interposed between flanges 32 and arm 34, and have one end connected to flanges 32 and the opposite end connected to arm 34 for pivotally urging knife 20 in a clockwise direction causing a depending tab 40 thereon to continually bear against cutting edge 24 of stationary bed blade 22 for guiding cutting edge 26 into shearing engagement with cutting edge 24. A crank pin 42 which is rotatable about a fixed axis is secured to one end of a crank 44, and extends through and is rigidly secured to the opposite end of arm 42. The opposite end of crank 44 is pivotally connected to a link 46 reciprocally movable by any suitable cam means or the like, not shown. Accordingly, crank 44 and arm 34 are pivoted about pin 42 through a small arc for imparting reciprocal movement to knife 20. The

arcuate movement of arm 20 urges cutting edge 26 of knife 20 against stationary cutting edge 24 to provide excellent shearing action.

The print cutting mechanism is further provided with a pivotally movable plate-like bed blade 48 having laterally extending flanges 50 pivotally mounted on a shaft 52 journaled in a bracket 54 rigidly secured to a frame member, not shown, of the print cutting mechanism. Helical springs 56 encircle portions of shaft 52 interposed between flanges 50 and bracket 54, and have one end secured to the flange and the other end secured to the bracket for pivotally urging movable bed blade 48 to a borderless print cutting position as illustrated in full lines in FIG. 3 of the drawing in which a cutting edge 58 of blade 48 bears against depending tab 40. In this position, upper surface 60 of blade 48 is substantially in the same plane as the upper surface of stationary bed blade 22. With movable bed blade 48 in the borderless print cutting position, if a web 16 is properly positioned with a border portion 62 between two prints in register with spaced apart cutting edges 24, 58 of the stationary and movable bed blades respectively, one downward stroke of cutting knife 20 will completely sever border portion 62 between the adjacent prints to provide a borderless print 64 as illustrated in FIG. 2. When it is desired to cut a bordered print 65, movable bed blade 48 is preferably manually moved in a clockwise direction to a retracted position illustrated by dotted lines in FIG. 3 of the drawing. During such movement, the end of blade 48 initially engages a beveled surface 66 on a spring-mounted latch 68 for urging the latch outwardly. When the end of cutting blade 48 is moved past beveled end 66 of latch 68, the latch is urged inwardly by spring 70 over the end of blade 48 for releasably holding the blade in its retracted position.

In those situations in which a bordered print 65 is cut, the web chop mark 18 between the leading and trailing ends of a print and adjacent the print edge is detected, and the logic control circuit activated causing the transport mechanism to initially advance web 14 and brake it in a precise position in which a line 72 (illustrated by dots in FIG. 1) intermediate the border portion between the prints is in register with cutting edge 24 of stationary bed blade 22. The logic control then actuates cutting knife to sever a bordered print 65. When a borderless print 64 is cut, the chop mark 18 which is positioned adjacent a leading or trailing end of a print is detected, and the logic control circuit activated initially causing transport and braking of web 16 with the leading and trailing edges of adjacent prints illustrated by full lines in FIG. 2 slightly within the cutting edges 24, 58 of the fixed and movable bed blades respectively illustrated by dotted lines. The logic control then actuates cutting knife to sever a borderless print 64. In order to accommodate the difference in position of the chop marks 18 on the bordered and borderless print webs 14, 16 for the same print cutting machine, a delay circuit (FIG. 7) of any suitable type is interposed between the detector and logic control circuit in a borderless printing mode to prevent activation of the logic control circuit until the borderless web 16 is in the same position relative to cutting knife 20 as the bordered web 14. The delay circuit is activated by a microswitch 74 on the frame actuated by flange 50 when bed blade 48 is moved to its borderless print cutting position. Accordingly, in each print cutting position, cut-

ting knife 20 will sever the web intermediate the leading and trailing ends of any two adjacent prints. Alternatively, the detector can be mounted for slidable movement longitudinally of the web, and mounted in one position relative to the web for detecting chop marks on a bordered print web 14, and a different position for detecting chop marks on a borderless print web 16.

With reference to the embodiment of the print cutting invention disclosed in FIGS. 4-7, parts similar to parts described heretofore will be denoted by the same numerals. In this embodiment, bed 12 and stationary bed blade 22 are secured to any suitable frame 10 as described heretofore. The cutting knife 20, which is pivotally mounted on aligned shafts 34 journaled through one end of arm 34, is reciprocally driven by substantially the same mechanism described heretofore. Springs 36, only one of which is shown, encircle shafts 34 and are mounted to urge knife 20 in a clockwise direction causing depending tab 40 to engage cutting edge 24 of bed blade 20. One end of a cam actuated link 46 is pivotally secured to one end of crank 44, and the opposite end of crank 44 is secured to shaft 42, which is rotatable about a fixed axis and secured to the opposite end of arm 34.

A substantially rectangular movable bed blade 48 is provided which is movable between a borderless print cutting position as illustrated in full lines in FIG. 6, and a retracted position as illustrated in dotted lines in the same view. The movable bed blade 48 has notches 76 (FIG. 4) along the lower edge into which projections 78 from a support plate 80 extend. The bed blade 48 and support plate 80 are hingedly secured together by pins 82 extending through openings in bed blade 48 and projections 78. The bed blade 48 is provided with an additional notch 84 through which one of pins 82 extends, and a spring 86 encircles pin 82 within notch 84 for biasing bed blade 48 in counter-clockwise direction (FIG. 6) against tab 40. The support plate 80 is provided with laterally extending spindles 88 (FIG. 4) secured thereto and extending through and journaled for rotation in side plates of frame 10. An arm 90 is secured to one of the spindles 88 (FIG. 5), and an over-center spring 92 connects the free end of arm 90 to a bolt 94 threaded into frame 10. In the position shown in FIG. 5, spring 92 urges arm 90 against a stop pin 96 for holding support plate 80 and bed blade 48 in the borderless print cutting position. In this position, with the borderless print web 16 properly positioned over the stationary and movable bed blades 22, 48, one downward stroke of knife 20 cuts out the border portion 62 between two prints 64 as illustrated by dotted lines in FIG. 2. Proper positioning of the borderless print web 16 is facilitated by microswitch 74 adapted when released by switch arm 98 to interpose the delay circuit in the operation of the logic control circuit as illustrated in FIGS. 5 and 7. A knob 100 is secured to the end of the other spindle 88 (FIG. 4), and by manually turning the knob, movable bed blade 48 can be moved to its retracted position illustrated by dotted lines in FIG. 6. The bed blade 48 is held in the retracted position by over-center spring 92 which urges arm 90 into engagement with a stop pin 102. During such movement, switch arm 98 is depressed by arm 90 thereby activating switch 74 for disconnecting the delay circuit from the logic control. In addition, bordered print web 14 is properly positioned over station-

ary bed blade 48 such that one downward stroke of knife 20 cuts the print web intermediate the border portion as illustrated by dotted line 72 in FIG. 1.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove.

We claim:

1. In a print-cutting mechanism for cutting bordered and borderless prints, the combination comprising:

a stationary bed blade having a cutting edge over which a web is transported having prints spaced apart a predetermined distance;

a movable bed blade having a cutting edge and movable between a retracted position in which said print cutting mechanism is in a bordered print cutting mode, and a borderless print-cutting position in which said cutting edge of said movable bed blade is spaced from said cutting edge of said stationary bed blade a distance substantially equal to said predetermined distance and said print-cutting mechanism is in a borderless print cutting mode; and

a movable cutting knife having two cutting edges spaced apart a distance substantially equal to said predetermined distance and movable between a normal non-cutting position and a cutting position in which one of said two cutting edges of said cutting knife coacts with said cutting edge of said stationary bed blade when said movable bed blade is in its retracted position to sever a print having a border, and said two cutting edges coact with said cutting edges of said stationary and movable bed blades when said movable bed blade is in its borderless print-cutting position to sever a borderless print.

2. The invention according to claim 1 and further comprising resilient means for biasing said movable bed blade into its borderless print-cutting position.

3. The invention according to claim 1 and further comprising resilient means for biasing said movable bed blade into its borderless print cutting position, and latch means for releasably latching said movable bed blade in its retracted position.

4. The invention according to claim 1 wherein said movable bed blade is mounted for pivotal movement between its retracted and borderless print-cutting positions, and further comprising resilient means for biasing said movable bed blade to its borderless print-cutting position, and latch means for releasably latching said movable bed blade in its retracted position.

5. The invention according to claim 1, and further comprising means for sensing a chop mark on said web, and means responsive to said sensing means for transporting said web a precise distance to position a leading end of a print a selected distance from the edge of said stationary bed blade to provide a border thereon when the web is cut with the print-cutting mechanism in its bordered print-cutting mode.

6. The invention according to claim 5, and further comprising delay means for the operation of said movable cutting knife, and control means for said delay means responsive to said movable bed blade when moved to its borderless print-cutting position to permit said transporting means to transport said web a sufficient distance so that the leading end of a print is sub-

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stantially in register with the edge of said stationary bed blade.

7. The invention according to claim 1, and further comprising stop means for said movable bed blade to limit movement of said movable bed blade between its retracted and borderless print-cutting positions.

8. The invention according to claim 1, and further including means for moving said movable bed blade between its retracted and borderless print-cutting positions, said moving means comprising a pivotally

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mounted support plate hingedly connected to said movable bed blade, resilient means interposed between said support plate and movable bed blade for biasing said movable bed blade toward said cutting knife, and a knob secured to said support plate for pivotally moving said support plate and said movable bed blade between its retracted and borderless print-cutting positions.

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UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,831,478 Dated August 27, 1974

Inventor(s) Luther M. Wright and William A. Epps

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 63, delete the word "blade" and insert the word--cutting--.

Column 6, line 41, delete the word "pring" and insert the word--print--.

Column 7, line 6, delete the word "pring" and insert the word--print--.

Signed and sealed this 10th day of December 1974.

(SEAL)  
Attest:

McCOY M. GIBSON JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents