United States Patent [19]

Moss

[11] **3,889,111**

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[54] **DEVICE FOR POSITIONING STOCK IN A PRINTING MECHANISM**

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[73] Assignee: **The Bendix Corporation**, Southfield, Mich.

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[52] **U.S. Cl.** ..... **250/237 R**; 226/45; 250/548; 250/561

[51] **Int. Cl.** **H01j 5/16**

[58] **Field of Search** ..... 250/548, 561, 222 PC, 223, 250/237; 226/45, 30

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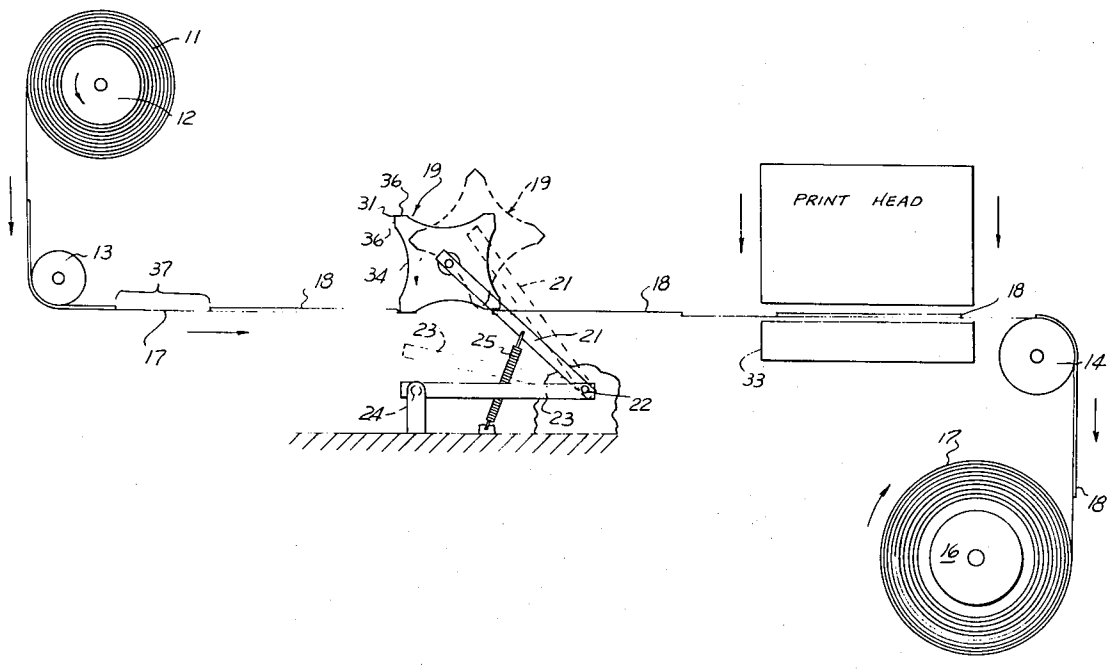
Assistant Examiner—D. C. Nelms
Attorney, Agent, or Firm—Lester L. Hallacher

[57] **ABSTRACT**

A device for accurately positioning stock in a printing mechanism is described. The labels are printed on a rolled stock of paper which travels past the printing mechanism. It therefore is necessary to accurately stop the linear motion of the paper so that the area of the paper where printing is to take place is properly positioned with respect to the printing mechanism. The invention achieves this result. The invention includes an element for sensing the edges of the labels upon which printing takes place. The sensing element slides along the rolled stock as the stock travels toward the printing mechanism. Because of the configuration of the sensing element, contact with the edge of the label causes the sensing element to rotate. An opaque element is fixedly coupled to the sensing element. During sliding the opaque element prevents light from a source from impinging upon a photodetector. Rotation of the sensing element momentarily displaces the opaque element, thereby permitting light to fall upon the photodetector, thus producing an output signal which is utilized to stop movement of the paper until a printing operation is completed.

9 Claims, 3 Drawing Figures



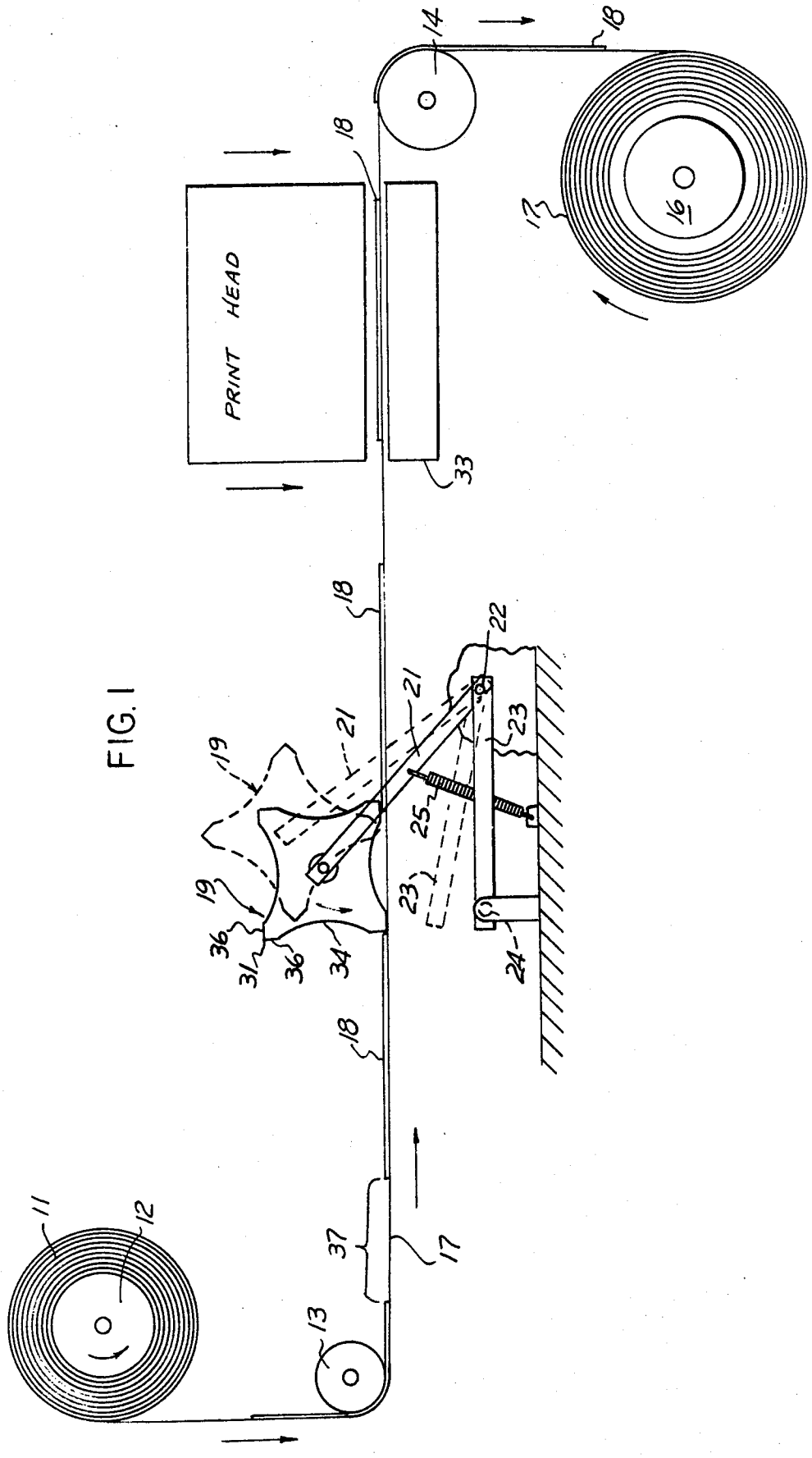


FIG. 1

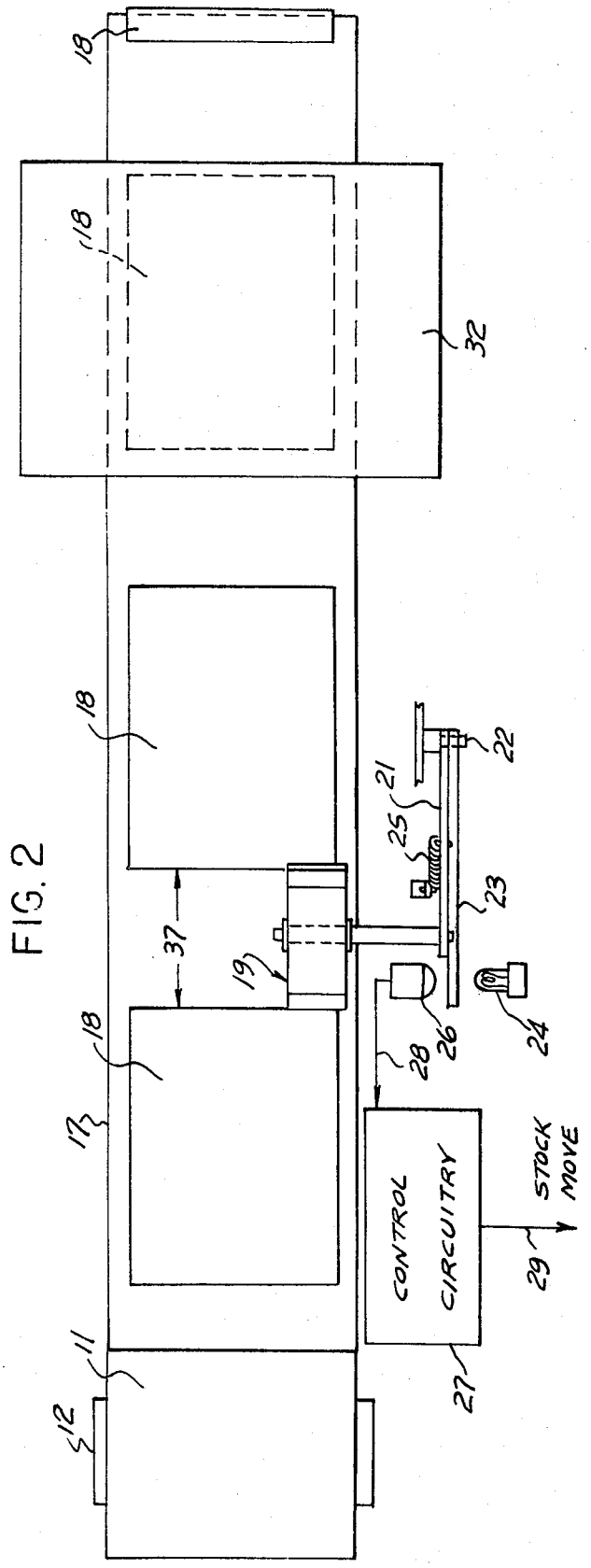

18
18
32
18
22
21
25
23
37
19
18
26
24
28
17
CONTROL CIRCUITRY
STOCK MOVE
29
27
11
12

FIG. 2

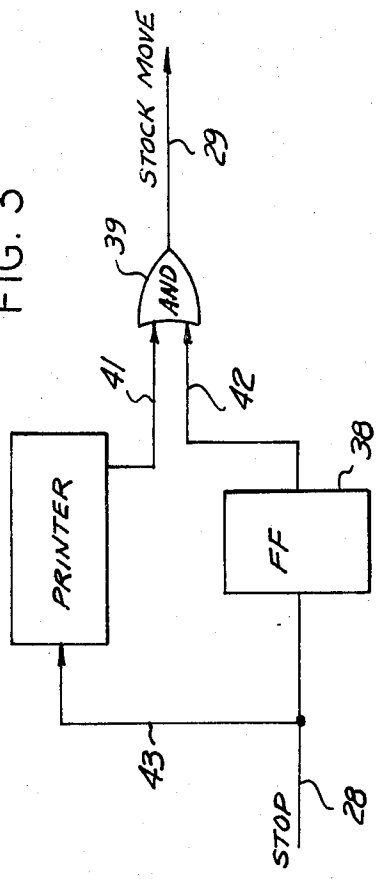

STOCK MOVE
29
39
AND
41
42
PRINTER
FF
38
43
STOP
28

FIG. 3

DEVICE FOR POSITIONING STOCK IN A PRINTING MECHANISM

BACKGROUND OF THE INVENTION

There are many printing operations in which printing takes place on a continuous roll of stock to form labels containing either binary coded or alphanumeric information. In such systems the roll of stock is pulled past the printing mechanism and stopped so that the printing operation takes place at the desired area on the stock and sharp clear printing obtained. After the printing operation is finished, movement of the paper stock past the printing mechanism is resumed and the printed material removed while a succeeding area of the rolled stock is positioned under the printing mechanism so the next label can be printed. Because there are specific areas on the paper stock where the printing is to occur, it is necessary to affect the stoppage of the paper stock such that the printing areas are accurately positioned with respect to the printing mechanism.

Because of the necessity of the accurate stoppage of the paper stock, various types of devices have been constructed to sense the movement of the paper. One such device includes a small wheel, the rotational rate of which is directly proportional to the linear motion of the paper stock. These devices can be satisfactory for some purposes. However, if the wheel slips with respect to the paper, inaccurate positioning of the paper results.

Another type of prior art device consists of a photodetector element positioned on one side of the paper. A light source is positioned on the other side of the paper so that the light shines through the paper and is detected by the photodetector. Opaque marks are spaced along the paper with the spacing representing the desired length of paper between printing areas. The opaque marks block the light indicating that a particular length of paper has passed through the printing mechanism. Blockage of the light results in the generation of a stop signal so that the area of the paper where printing is to take place is positioned with respect to the printing mechanism. These systems are not fully adequate because variations in the thickness of the paper and slight wobbling of the paper can cause erroneous blockage of the light resulting in inaccurate stoppage of the paper.

SUMMARY OF THE INVENTION

The invention is directed to a mechanism for causing the stoppage of a roll of paper at accurate positions so that printing upon the paper can be effected at a specified area on the paper. The preferred embodiment is described with respect to controlling the motion of paper in a printing mechanism. It should be understood that the invention can be used to control the motion of any stock in other types of mechanism. Thus, the invention can also be used, for example, to control sheet metal on a shear, plastic in a punch, etc. In the first preferred embodiment contemplated by the invention the paper stock is in the form of a continuous roll of backing carrying a series of equally spaced labels upon which the printing will occur. After the printing operation, the labels can be peeled from the backing; and because of an adhesive on the backing of the labels, they can be applied to any object the labels are intended to identify. The inventive mechanism is arranged to detect

the edge of a label and to generate a signal coincident with the detection. The signal is used to stop the motion of the paper stock so that a label is properly positioned with respect to the printing mechanism. After the printing operation is completed, motion of the rolled material is resumed until the next label edge is detected to again stop the paper so that another label is positioned for printing.

In an alternative preferred embodiment of the invention, the printing can occur directly upon the rolled material so that no label edges are available for detection. In the alternative embodiment, performations are placed at selected positions along the roll of material and the sensing element senses the edges of the perforations thereby effecting the generation of the stop signal.

The inventive sensing device includes a rotatably mounted element which slides along the paper stock during passage through the printing mechanism. When the sliding sensing element comes into contact with the edge of a label, the sensing element rotates causing the generation of the stop signal. Because in normal operation the sensing element slides along the stock, the slippage problem found in prior art systems utilizing rotating elements is eliminated. This constitutes a marked advance over the prior art systems in which the rotation of the sensing element is intended to be directly proportional to the linear motion of the stock, because in such systems slippage of the sensing element results in inaccurate stoppage of the paper.

The rotational axes of the sliding element is coincidence with the longitudinal axis of a shaft, one end of which is connected to a pivot point. When the sliding element contacts either the edge of a label or a perforation in the stock, the sliding element rotates, thereby displacing the shaft about the pivot point. Rigidly attached to the shaft is an opaque member which is angularly disposed with respect to the shaft. When the sliding member rotates, thereby displacing the shaft, the opaque member also is displaced in space. During the sliding of the element, the opaque member is in its normal position and is disposed between a light source and a photodetector so that light cannot impinge upon the detector. Upon rotation of the sliding element because of contact with the edge of a label, the displacement of the opaque member allows light to impinge upon the photodetector resulting in the generation of a stop signal which is used to stop the movement of the paper stock through the printing mechanism. The area, or position, of the paper upon which printing is intended to occur is thus located under the printing mechanism. After printing is completed, motion of the stock is resumed until the sliding element contacts the next edge, thereby repeating the process.

CROSS REFERENCE TO RELATED APPLICATION

The printing mechanism schematically illustrated herein can be of the type described in application Ser. No. 418,722 filed Nov. 23, 1973 now U.S. Pat. No. 3,848,257, by James R. Moss entitled "Device for Printing Coded Labels and the Like," and also assigned to the assignee of the instant application.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a preferred embodiment of the instant invention.

FIG. 2 is a top view of the preferred embodiment shown in FIG. 1.

FIG. 3 is a preferred embodiment of exemplary control circuitry which can be used with the instant invention.

DETAILED DESCRIPTION

As shown in FIG. 1, the invention includes a Roller 12 supporting a supply of Stock 11 upon which printing will occur. Roller 12 is rotatably mounted about its longitudinal axis so that the Stock unrolls as a pulling force is applied thereto. The Stock passes over an Idler Roller 13 which is used to guide the Stock into a horizontal position for feeding through the printing mechanism. After passing through the printing mechanism, the Stock passes over another Idler Roller 14 and then to a Take-up Roller 16. A driving mechanism, such as a stepping motor, is coupled to Roller 16 to cause rotation thereof and thereby causes the Stock material to be pulled through the printing mechanism. This technique of passing paper through various types of mechanisms is well known to those skilled in the art and, accordingly, additional detail is not required herein.

The Stock upon which printing will occur consists of a Backing 17 upon which a plurality of Labels 18 have previously been applied. The Labels 18 have an adhesive on the back thereof so that they cling to the Backing 17. After printing occurs, the Labels are removed from the Backing and are then capable of being adhesively applied to an article to be identified by the printed label.

The invention consists of a generally square Slider Element 19 rotatably supported about its axis of symmetry on a Shaft 21. Shaft 21 is pivotally attached to a fixed Pivot Point 22. Accordingly, Shaft 21 is free to pivot about the Pivot Point 22 and Slider Element 19 is free to rotate about the Shaft 21.

Fixedly attached to Shaft 21 is an Opaque Element 23. Because Element 23 is fixedly attached to Shaft 21, rotation of Shaft 21 about Pivot Point 22 results in the physical displacement of Element 23 in the manner indicated by dotted lines.

As best seen in FIG. 2, Opaque Element 23 extends between a Light Source 24 and a Photodetector 26. Because Element 23 is opaque, light cannot pass from Source 24 to Detector 26 when Opaque Element 23 is in the position assumed when Sensing Element 19 is in the first sliding position illustrated by solid lines in FIG. 1. However, when Slider Element 19 rotates because of contact with the edge of a Label 18, in a manner described hereinafter, Opaque Element 23 is displaced from the normal position and permits light to impinge upon Photodetector 26. Photodetector 26 then provides a signal on Line 28. This signal is used as a stop signal to actuate Control Circuitry 27 in a manner described hereinafter. Obviously, if desired, the displacement of Opaque Element 23 can be used to break an otherwise continuous illumination of Photodetector 26 by Source 24. The output signal on Line 29 of Control Circuitry 27 controls the motion of the Stock through the mechanism, thereby permitting the accurate stopping of Labels 18 at the desired locations in response to the detection of the leading edges of the Labels.

Referring again to FIG. 1, the invention is utilized to detect the presence of a Label 18 so that the motion of the Stock through the printing mechanism is stopped at a time when a Label 18 is located beneath the Printing Head 32 and over the Printing Surface 33. Upon the complete stoppage of the motion, the Printing Head 32 prints on the Label, and after the printing operation is completed, provides a signal to Control Circuitry 27 so that the motion of the paper is resumed until the next succeeding Label is properly located under the Printing Head.

FIG. 1 also shows a preferred embodiment of the configuration and arrangement of the Label Detecting Mechanism. The Slider Element 19 is generally square in configuration and therefore contains four sharp Corners 31. It should be noted, however, that the square configuration of Slider 19 is not essential as triangular, or hexagonal and other polygonal configurations can be utilized, the primary considerations being the presence of sharp edges in the vicinity of the Corners 31 of the Slider Element and the symmetry about the rotational axis 21. The Sensing Element is mounted to rotate about the axis of symmetry, which also can be defined as the intersection of the diagonals of the polygon.

Sensing Element 19 also is provided with Concave Areas 34 on each side thereof. Because of the presence of the Concave Areas 34, slight waves or fluctuations in the paper which can be caused by insufficient paper tension or variations in paper thickness will flow into the Concave Areas thereby rendering the system insensitive to such variations and improving the accuracy of the system.

Positioned between the Sharp Edges 31 and Concave Areas 34 of Sensing Element 19 are Flat Areas 36. In normal operation two of the Areas 36 will slide along the moving Stock so that Opaque Element 23 remains interposed between Light Source 24 and Photodetector 26. The span between successive Sharp Edges 31 exceeds the Spacing 37 between two Labels. For this reason when the first Flat Area 36 leaves contact with the Label and falls between two Labels, the Slider Element 19 is on a very slight angle and assists in causing Element 19 to rotate. When the Flat surface 36 contacts the edge of a Label, the Sharp Edge 31 and Surface 36 prevent Sensing Element 19 from sliding onto the Label; this causes Slider Element 19 to rotate into the position indicated in dotted lines on FIG. 1. This rotation causes Opaque Element 23 to rise above Light source 24, thereby permitting light to impinge upon Photodetector 26, thus providing a stop signal for the printing mechanism. Accordingly, Print Head 32 is positioned at a known location from the Slider Element 19 so that a Label is available directly under the Print Head 32 when the stop signal is provided.

As Sensing Element 19 and the edge of a Label come into contact, the Label pushes against one of the Flat Surfaces 36 causing rotation in the counterclockwise direction for the example shown. Rotation continues until Element 19 is in the position shown in dotted lines, at which time the Label has passed under Element 19. Accordingly, Element 19 drags along the surface of the Label. Friction between Slider Element 19 and the Label 18 causes rotation to continue until the Sensing Element 19 returns to its normally flat position under the assistance of a Spring 25. Return of Element 19 to the normal position also results in Opaque Element 23 returning to the normal position to again break the light extending from Source 24 to Photodetector 26. The Sensing Element 19 then continues to slide along the Label until contact with the edge of the next

Label is made to generate another stop signal upon the next rotation of Sensing Element **19.**

If desired, Slider **19** can be used to detect perforations in the Stock, rather than the edges of the Labels. In this usage the total width of Slider will exceed the width of the perforations to prevent the Slider from extending into the perforations. Protrusions on the Slider **24** will be slightly narrower than the perforations and will carry the sharp edges. Accordingly, the protrusions will slide along the stock between perforations and will catch the edge of the perforations to effect rotation of Slider **19.** However, because the width of Slider **19** exceeds the width of the perforations, Slider **19** is prevented from extending into the perforations and either tearing or binding the Stock.

FIG. **3** shows an exemplary type of Control Circuit which can be used with the invention. The stop signal on Line **28** of Photodetector **26** is applied to a Flip-Flop **38.** Ordinarily, no signal will be present, and the output of Flip-flop **38** available on Line **42** will thus be a logic ONE condition. This is applied as an input to AND Gate **39** which receives another logic ONE input from Printer **32.** The input from Printer **32** on Line **41** will be a logic ONE in the instances when printing is not taking place within the printer. Thus, with both input Terminals **41** and **42** of AND Gate **39** at the logic ONE condition, the signal available on output Line **29,** which is the output line of Control Circuitry **27,** is a logic ONE; in this condition, the stock moves through the printer.

When a stop signal is applied to Line **28** of Flip-Flop **38,** the Flip-Flop changes states so that the input on Line **42** of AND Gate **39** is a logic ZERO, thereby changing the logic ONE condition on output Line **29** to logic ZERO. This causes the movement of the stock through the printing mechanism to stop. The logic ONE input on Line **28** is also applied to the Printer **32** over Line **43** so that printing begins. When printing begins, the signal on Line **41** becomes a logic ZERO. The logic ONE condition on Line **28** is retained for only the short period of time during which Opaque Element **23** is displaced from the normal position in which it interrupts the light between Source **24** and **26.** As soon as the normal interrupting position is returned, the input on Line **42** returns to logic ONE. However, because the input on Line **41** is now a logic ZERO, the logic ZERO condition of output Line **29** remains. This condition continues until Printer Mechanism **32** generates a signal indicating that the printing operation has been completed, at which time a logic ONE is again available on Line **41** and AND Gate **39** is again enabled and resumption of motion of the paper through the mechanism is affected. It should be noted that the actual control circuitry used with the inventive system can vary substantially within the purview of those skilled in the art dependent upon the exact control functions which are desired for the stock upon which printing is made.

I claim:

1. A device for sensing and positioning stock in a feed mechanism, said stock including edges spaced at selected positions to define positions at which an operation will occur in said feed mechanism comprising:

a sensing element arranged to slide along said stock and positioned to contact said edges, said sensing element having sharp portions in the vicinity of said contact so that said sharp portions contact said edges;

shaft means, said sensing element being rotatably mounted on said shaft means, said shaft means being pivotably mounted with respect to a fixed point;

light opaque fixedly coupled to said shaft means;

light source means and light detection means, said light opaque means being normally interposed with said light source means and said light detection means;

said sensing element being symmetrically configured about the point of rotation with respect to said shaft and being configured so that rotation of said sensing element displaces said opaque element and permits light from said light source to impinge upon said light detector.

2. The device of claim **1** wherein said sensing element is a multisided polygon and said sharp portions are located at the intersections of said sides of said polygon.

3. The device of claim **2** wherein said sensing element further includes concave areas partially extending across said sides of said polygon.

4. The device of claim **2** wherein said polygon is four sided.

5. The device of claim **3** wherein said polygon is four sided.

6. In a system for printing labels present on a continuous backing, said packing being pulled from a supply roller to a storage roller past a printing mechanism, a device for accurately positioning said labels in the proximity of said printing mechanism comprising:

means for sensing the edges of said labels as said labels travel toward said printing mechanism, said means for sensing having a point of symmetry and being configured to slide along said backing, said means for sensing having a plurality of sharp corners symmetrically disposed about said point of symmetry;

means for rotatably supporting said means for sensing at said point of symmetry, said means for supporting being pivotably mounted with respect to a fixed pivot point;

light means, light detection means situated in the proximity of said light means;

light opaque means interposed said light means and said light detection means, said opaque means being fixedly coupled to said means for supporting;

said means for sensing being configured so that contact of said corners with the edges of said labels rotates said means for sensing to displace said point of symmetry and move said opaque means permitting light from said source to impinge upon said detection means.

7. The system of claim **6** wherein said sensing element is a multisided polygon and said sharp corners are located at the intersections of the sides of said polygon.

8. The system of claim **7** wherein said sensing element further includes concave areas partially extending across the sides of said polygon.

9. The system of claim **8** wherein said polygon is four sided.

* * * * *