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Alverth et al.

[11] **3,881,383**

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[54] **WEB SEVERING DEVICE**

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[73] Assignee: **Uniweb International, Inc.**, Elmhurst, Ill.

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[52] U.S. Cl. **83/308**; 83/341; 83/346; 83/673

[51] **Int. Cl.**..... **B26d 1/36**

[58] **Field of Search** 83/308, 304, 305, 309, 83/341, 674, 673, 346

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Attorney, Agent, or Firm—John L. Parker, Esq.

[57] **ABSTRACT**

A web severing device for printing presses or the like is provided having a pair of rollers mounted on the press on opposite sides of the web, with the rollers being movable toward or away from each other to engage or disengage the web. One of the rollers carries a severing blade so that when the roller engages a moving web, the motion of the web transmits rotary motion to the roller, causing the roller to swing its blade against the web and thereby sever it.

10 Claims, 5 Drawing Figures

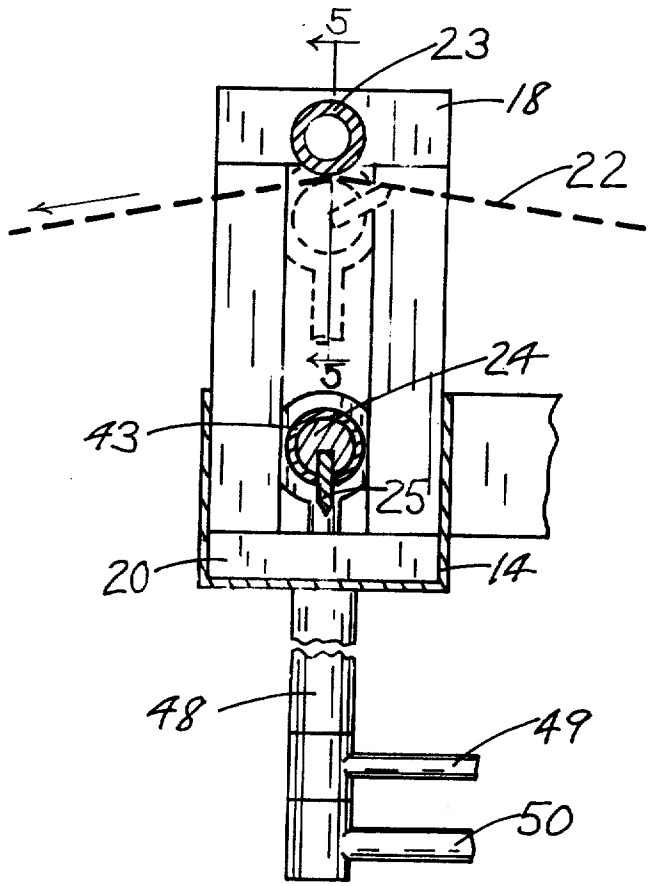
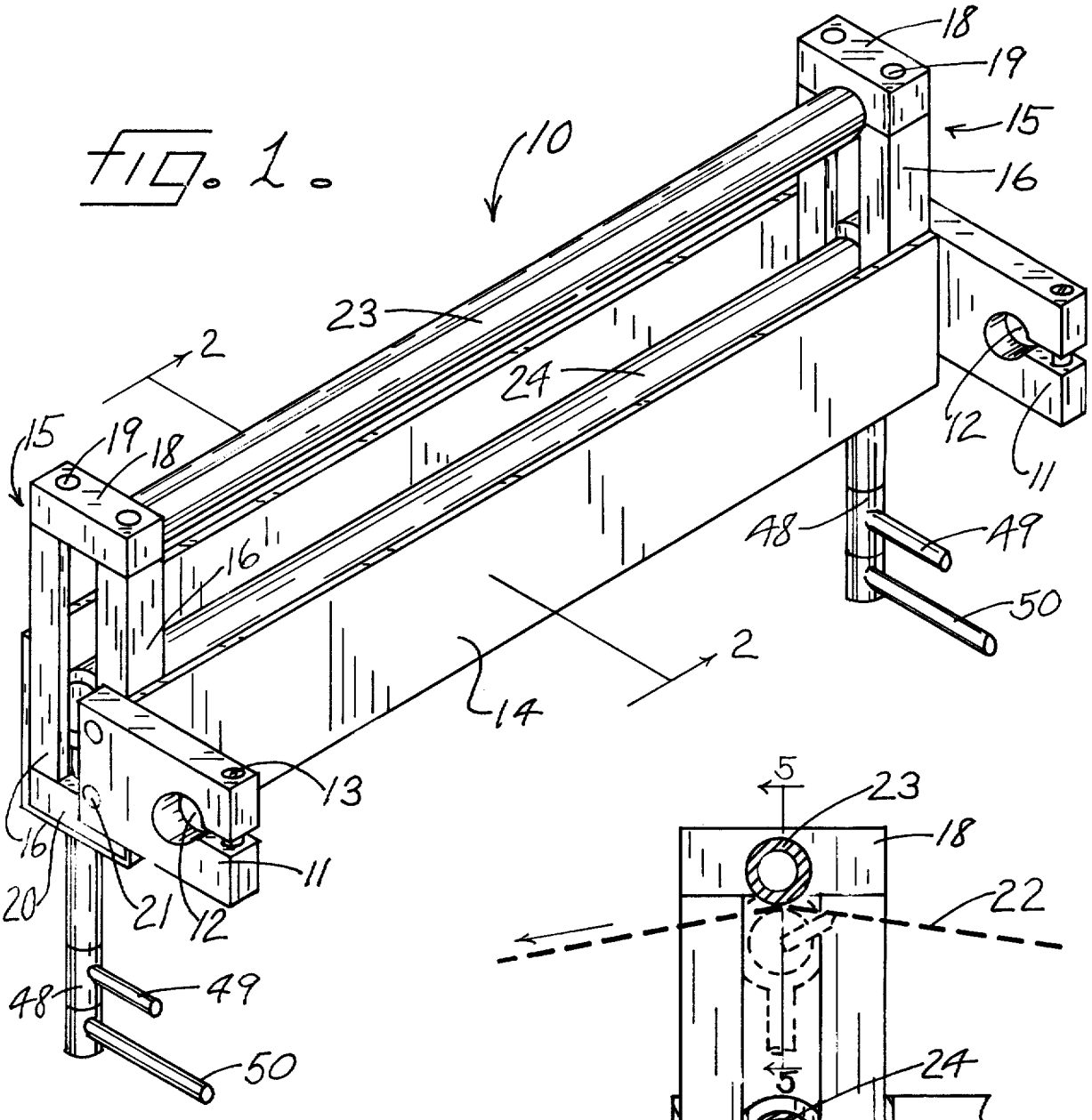


FIG. 1.


10
18
19
15
16
23
2
24
12
11
48
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14
13
21
20

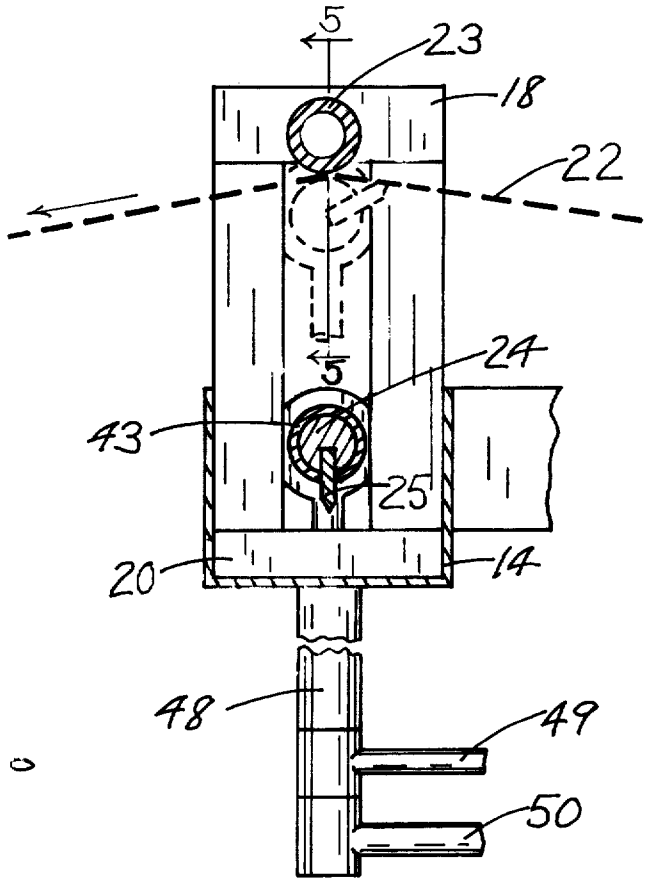

5
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18
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24
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FIG. 2.

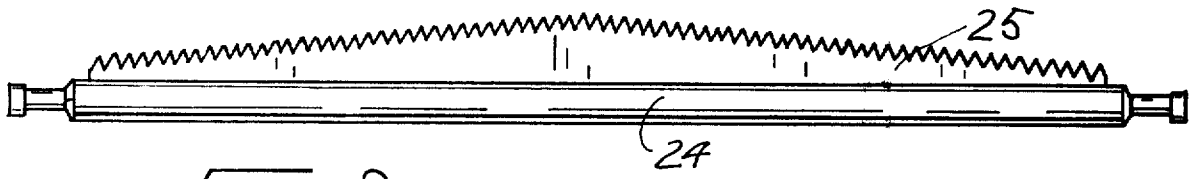


FIG. 3.

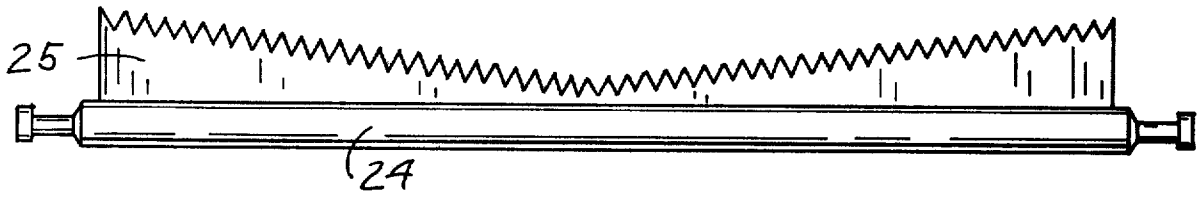


FIG. 4.

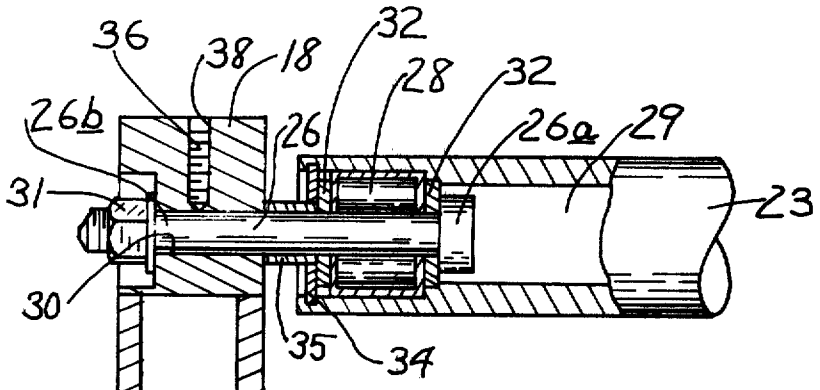
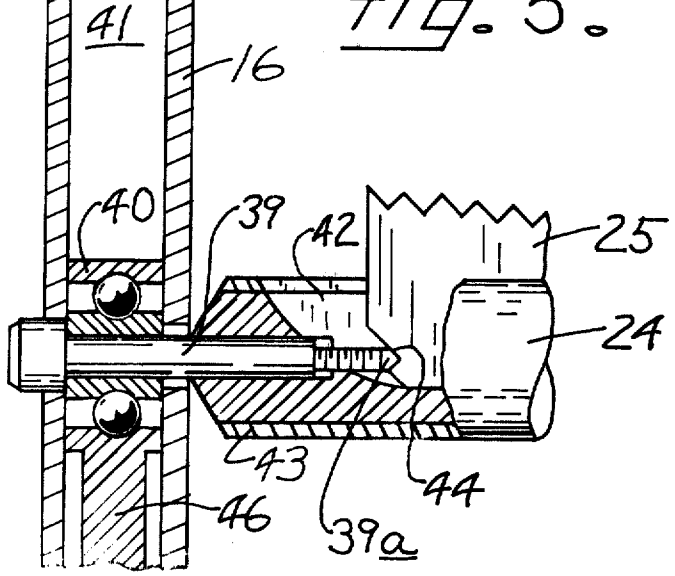


FIG. 5.



WEB SEVERING DEVICE

DESCRIPTION OF THE INVENTION

The present invention relates to a severing device for continuous webs, and particularly to such a web severing device for use with high speed printing presses.

Web severing devices have been used with high speed newspaper presses for some years. In the event of a web break, such presses typically cannot be brought to a stop fast enough to prevent damage to the press occasioned by the continued high speed movement of torn portions of the web through the press. The web severing devices function to quickly sever the web entirely at some point or points upstream or downstream of the web handling equipment, so that the torn portions of the web cannot continue into the press. These devices usually include a knife blade mounted perpendicular to the plane of the moving web, with the blade being actuated guillotine style toward the web to sever it. Retraction of the blade is accomplished utilizing the bias of springs. Web severing action is initiated either by the operator manually tripping a switch, or automatically in response to a signal received from a web break detector located along the web path.

Unfortunately, conventional web severing devices (e.g., see Cooksey U.S. Pat. No. 3,272,049) often pose substantial safety hazards to the press operators and have other disadvantages. While presses fitted with such conventional devices are running, there is usually little danger of injury to the operator since it is unlikely he would place his hands or arms in the cutting path of the severing blade. However, there are occasions when an operator, in the course of loading ink fountains, changing plates or blankets or adjusting roller pressures while the press is in operation, may inadvertently trip the severer at a time when his hand or some other part of the body is in the cutting path of the blades.

A more frequently occurring danger situation is encountered during press start up or make ready. At such times even though no web is positioned in the press, conventional severing devices are nevertheless fully operational and susceptible of being tripped accidentally. Inevitably the press operator must, during start up, move between the various printing units in checking the equipment and getting it ready to operate. At these times the operator often finds it necessary to grasp various parts of the equipment in order to hoist himself up or into a space between units, and in doing so there is always the possibility that he will touch and trip the severer actuating mechanism during a time when his arm or hand is located in the cutting path of the blade.

In these danger situations, the construction of conventional severing devices is such that, upon being tripped, the cutting knives will mash or chew and seriously injure the press operator's fingers, hand, arm or the like. Such conventional devices also posses other disadvantages, e.g., if accidentally tripped they will sometimes nuisance cut a stationary web when the press is stopped momentarily.

A principal object of the present invention is to overcome these and other disadvantages of conventional devices by providing a web severing device which provides complete press operator safety and yet which is effective to cleanly and quickly cut a moving web at any web speed or in any direction. A related object is to provide a web severing device which cannot be accidentially tripped by a press operator during press start up, so that the danger of serious harm to the operator's hands or the like is substantially removed.

A related object of the invention is to provide a web severing device which cannot be triggered into cutting action unless there is a moving web present in the press, and in which cutting energy for the severing action is derived solely from the energy of the moving web itself. A further related object is to provide such a web severing device which will not nuisance cut a stationary web.

Still another object of the invention is to provide a web severing device in which the only driving force required to sever the web is that derived from motion of the web itself. Another object is to provide a severing device which utilizes swing type cutting blade action against the web, thereby severing it with a greater degree of deftness and certainty than heretofore. Yet another related object is to provide such a web severing device in which the efficiency of the severing action increases in direct proportion to the speed of the moving web.

It is also an object of the invention to provide a web severing device which is compact, has few moving parts, and which avoids coil spring fatigue problems encountered with conventional devices.

Moreover, it is another object of the invention to provide such a web severing device which may readily be operated on a printing press in conjunction with a web break detector so that the severing device will be automatically triggered upon detection of a web break. An allied object is to provide such a web severing device which is responsive to interconnecting logic circuitry that will trigger a series of such devices in any desired sequence upon detection of a web break. Yet another related object is to provide such a web severing device with high speed interlock control circuitry so that the severer will not be armed for triggering until a predetermined web speed is reached.

Other objects and advantages of the present invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

FIG. 1 is a perspective view of a web severing device illustrative of the present invention.

FIG. 2 is a vertical cross-sectional view taken through the line 2—2 of FIG. 1, showing active (dotted lines) and inactive positions of the cutting mechanism.

FIGS. 3 and 4 show two ilustrative forms of knife blades that may be used with the present invention, and the blade mounting structure.

FIG. 5 shows a fragmentary, enlarged, vertical sectional view taken through the line 5—5 in FIG. 2.

While the invention is described in connection with certain preferred embodiments, it will be understood that we do not intend to limit the invention to those embodiments. On the contrary, we intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning now to the drawings, there is shown in FIG. 1 an illustrative web severing device **10** carrying end clamps **11** suitable for attachment to either the side frame of a printing press (not shown) or to a web break detector (also not shown). As shown, the end clamps **11** are C-shaped, forming openings **12** for accommodating an appropriate portion, such as a bar or the like, of the press frame or detector structure, and are provided with suitable clamping screws **13.**

The illustrative web severer **10** includes an elongated trough-like base member **14**, to each end of which a generally rectangular upstanding frame **15** is secured. Each end frame **15** includes a pair of vertically disposed channel members **16** spaced apart from and facing one another, and secured together by means of a head plate **18** (see fasteners **19**) and corresponding foot plate **20**. As shown in the drawings, the end clamps **11** are secured to the channels **16** of the frame **15** (see fasteners **21**) in such a manner that the clamps extend laterally outwardly from the severer for mounting attachment to the press frame or web break detector. When installed on the press, the severer is positioned so that it is generally beneath and straddles a web **22** of paper moving through the press (see FIG. **2**).

In carrying out the invention, a pair of elongated upper and lower cylinders or rollers **23, 24** are arranged respectively above and below the paper web **22**; one of the rollers (as shown, the lower roll **24**) is provided with a suitable cutting edge or blade **25**; and means is provided for moving the cutting roll into and out of severing engagement with the web.

As illustrated in the drawings, the upper and lower rolls **23, 24** are mounted within the structure provided by the base **14** and its associated end frames **15**. Thus the upper roll **23** extends between the end frames **15** and is rotatably secured between the opposing head plates **18** by means of a pair of stub shafts **26**, which in this instance take the form of shoulder bolts. As will be seen particularly from FIG. **5**, the upper roll **23**, which may be formed as a hollow metal tube, is journalled on the stub shafts **26** by way of a roller bearing **28** provided at each end of the roll within a suitable roll recess **29**. The head protion **26***a* of the shoulder bolt is disposed within the roll recess **29**, and the shank portion **26***b* of the bolt extends through the roller bearing **28**, out the end of the roll, and thence through an appropriately located recess **30** in the head plate **18** for engagement by a nut **31**. Washers **32** are provided on either side of the roller bearing **28**, and a snap ring retainer **34** located in the outer end of the roll recess **29** maintains the stub shaft **26** and roller bearing **28** assembly in place. A ferrule-like shaft spacer **35** is interposed between the upper roll **23** and the end frame **15** to keep the roll free of rubbing engagement with the head plate **18**, and a shaft position locking screw **36** is provided in a suitable head plate recess **38** for accommodating slight vertical adjustment of the upper roll as desired. The upper roll **23** is accordingly fixed against vertical or horizontal movement with respect to the end frames **15**, but is freely rotatable for purposes described below.

In contradistinction to the mounting of the upper roller, the lower roller **24**, which carries the cutting blade **25**, is mounted between the end frames **15** in such manner that it is vertically movable in up and down fashion toward and away from the upper roller. In this instance, mounting of the blade roller **24** between the end frames **15** is accomplished by way of stub shafts **39** screw threaded into the ends of the roller, which shafts are journalled in ball bearings **40** slidably disposed in vertical tracks **41** formed by the facing channel members **16** of the end frames. The lower roller is preferably of solid construction and carries a longitudinal slot **42** for receiving the marginal edge of the blade opposite its cutting edge.

As will be seen from FIG. **5**, the stub shafts **39** also serve to lockably secure the cutting blade **25** to the roller **24**. Thus the ends of the blade **25** are provided with notches **44** for engagement by the pointed ends **39***a* of the stub shafts.

For the purpose of affording up and down motion of the lower roller bearings **40** within the end frame tracks **41**, a piston rod **46** is secured to the outer race of each ball bearing **40**, and a fluid pressure (e.g.,) pneumatic) operated piston and cylinder **48** arrangement is provided at each end of the severer to actuate the rods. In this instance, a single acting, push type arrangement is employed, using a solenoid actuated, one way pneumatic cylinder with valve in head and a spring return. Upward thrust of the piston rods **46** (and the cutting roller) results from admission of compressed air into the bottom of the cylinders **48** (see fluid pressure inlet and outlet conduits **49, 50**); upon release of air pressure, the springs cause the piston rods (and cutting roller) to return.

In keeping with the invention, the lower roller **24**, with its cutting blade **25** hanging in inoperative position, is adapted to be moved upwardly and into engagement with the web **22** by the piston and cylinder arrangement. Thereupon the motion or momentum of the web is utilized to cause the roller **24** to rotate and thereby swing its blade **25** into cutting engagement with the web.

It may be desirable to cover the blade roller **24** with a layer of rubber, polyurethane or other suitable traction-improving material **43** to enhance the ability of the moving web **22** to rotate the roller into cutting position, thereby reducing the contact pressure between roller and web required to positively sever the web. With some web materials it may be preferred to otherwise treat the lower roller surface to improve traction between it and the web material, for example by sand blasting the roller surface. Or, both the upper **23** and lower **24** rollers may be provided with high friction type surfaces.

Operation of the web severer **10** can easily be visualized upon reference to FIG. **2**. In the "at rest" position (solid lines), the blade **25** hangs downwardly under force of gravity. Upon triggering of the web severer due to a web break, which usually also accompanies signalling of a shut down of the press, the solenoid actuated piston and cylinder arrangement immediately causes the piston rods to push the lower (cutting) roller upwardly. Upward motion continues until engagement takes place between the top surface of the cutting roller (opposite the blade) and the moving web. The movement of the web then rotates the lower roller until the knife blade contacts and severs the web (see dotted lines in FIG. **2**). Rotary motion of the cutting roller continues until the side of the blade contacts the upper roller. Alternatively, stops (not shown) may be employed to prevent the cutting roller from rotating to the point where the blade contacts the upper roller.

When the press is at rest (in response to the shut down signal), and after the press reset button has been activated, the solenoid is de-energized, the direction of compressed air flow in the pneumatic cylinders is reversed, and the spring return causes the pistons to return the lower roller to its original at rest position. The blade returns to its hanging position by force of gravity, and the cycle is completed.

The cutting blade **25** may be shaped in various styles without in any way detracting from the invention. Thus, in FIG. **3** the blade is generally convex with respect to

the roller axis; FIG. 4 shows a concave shape. Both of these exemplary blade styles include serrations or saw teeth. Of course the number and size of such teeth may be varied over a wide range, and they need not be of uniform size or shape. For example, alternate high and low teeth may be employed. In some instances it may not be necessary to provide teeth at all.

One of the advantages of the invention is that the energy in the moving web is utilized not only to rotate the cutting roller, but to impale the web on the cutting edge of the blade, thus utilizing a servo-effect to assist in severing strong web materials.

Many variations are of course possible without departing from the spirit of the invention. For example, the particular single acting, push type, pneumatic piston and cylinder arrangement disclosed herein could be replaced by other arrangements. For example, a rotary cylinder could be used as well, or a rack and pinion arrangement, or a cable. It would also be possible to mount the cutting blade on the stationary rather than the movable roller, although the latter is preferred. In some situations it may be advantageous for both upper and lower rollers to be movable toward and away from each other. Also, the web severer need not be mounted vertically across a horizontal web; the invention may be utilized as well with angularly disposed webs.

The highly advantageous safety features of the invention will be immediately apparent. No longer need the press operator run the risk of loss of, or damage to, his fingers or hands as a result of inadvertent tripping of the severing mechanism during press start-up. This is because cutting motion of the severing blade cannot take place unless the press is running and a continuous web is moving through it (to provide the energy to rotate the cutting roller and thereby swing the blade to cut the web). Moreover, the operator is protected even when the blade is in the inactive position, since the high sides of the base member **14** serve to guard the blade against inadvertent access by the operator's fingers or the like, As an ancillary feature, the web severing device of the invention may, if desired, by employed with interlock type electrical control circuitry, so that the device cannot be armed for triggering until a given web speed through the press is reached.

Another advantage of the web severing device illustrative of the present invention is that any chance of an inadvertent nuisance cut of a stationary web is avoided, since web motion is a requisite to achieving severing action by the blade.

Yet another important feature of the instant web severing device is that it may readily be bolted to a web break detector to operate in tandem with it. In this way the web may be cut immediately adjacent to a tear or break which occurs, thereby reducing the quantity of unuseful web that must be discarded.

One or more severing devices of the invention also advantageously may be electrically interconnected together with one or more web break detectors, placed at spaced locations on the web handling equipment, and operated in any desired sequence by way of suitable logic circuitry. For example, when a detector senses a web break, a first severing device may be triggered, then later a second, third, etc., severer may be tripped.

While the invention has been described particularly with reference to its use with letterpresses, it will be understood that it is equally useful with other types of presses as well as other types of web handling equipment, In the printing art, for example, the invention may also be used successfully with offset or gravure type presses.

We claim as our invention:

1. A web severing device for a press or the like comprising, in combination, a pair of rotatable rollers freely rotatable in either direction, means for mounting the rollers on the press in generally parallel, spaced apart relationship, said rollers being positioned transverse to the direction of motion of the web and straddling the path of the web so that the web passes between the rollers, means for moving said rollers toward or away from each other to thereby engage or disengage the web between the rollers, and means including a severing blade carried by one of said rollers for severing a moving web, said one of said rollers being operable upon engagement with a moving web to rotate and thereby swing the blade against the web to sever it.

2. The web severing device defined by claim **1** in which one of the rollers is fixed and the other roller is movable toward or away from the fixed roller, and in which the severing blade is carried by the movable roller.

3. The web severing device defined by claim **2** in which the path of the web is horizontal and the rollers are vertically spaced apart straddling the web.

4. The web severing device defined by claim **3** in which the severing blade when inoperative hangs downwardly from the movable roller, and when operative swings upwardly to engage and sever the web.

5. The web severing device defined by claim **2** in which the means for moving the movable roller comprises a fluid pressure operated piston and cylinder arrangement having a piston rod secured to each end of the movable roller.

6. The web severing device defined by claim **5** in which each end of the movable roller is journaled in a bearing slidably disposed in a track extending between the two rollers, and each piston rod is secured to the bearing for effecting sliding movement of the bearing within the track.

7. The web severing device defined in claim **1** in which the severing blade has a cutting edge which is concave with respect to the axis of the roller which carries it.

8. The web severing device defined by claim **1** in which the severing blade has a cutting edge which is convex with respect to the axis of the roller which carries it.

9. The web severing device defined by claim **1** in which the severing blade is a knife blade having a serrated cutting edge.

10. The web severing device defined by claim **1** in which the blade is freely swingable in either direction to sever the web.

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