May 25, 1965 C. A. GEIGER ETAL 3,185,784

WEB BREAK DETECTOR

Filed Sept. 5, 1962

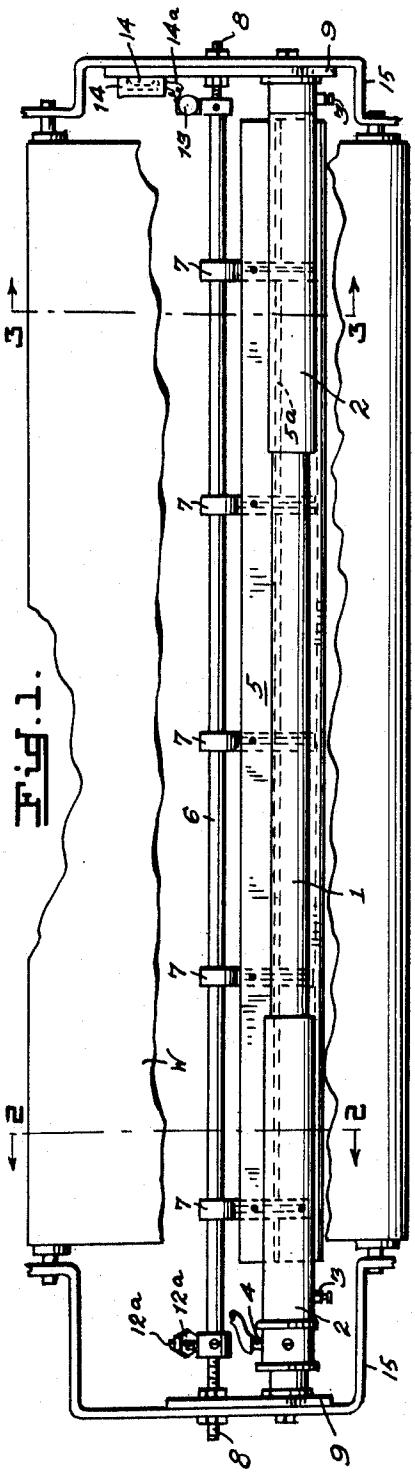


Fig. 1.

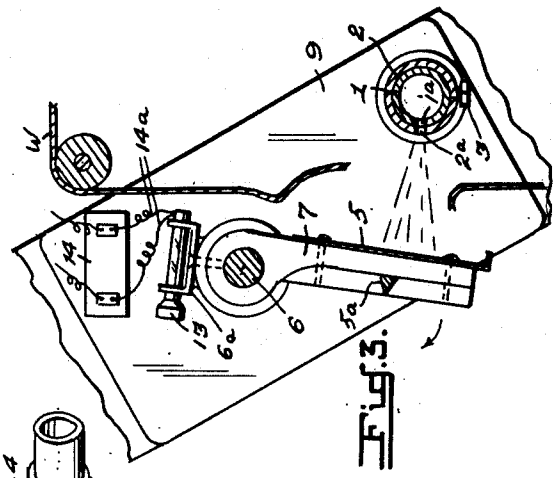


Fig. 3.

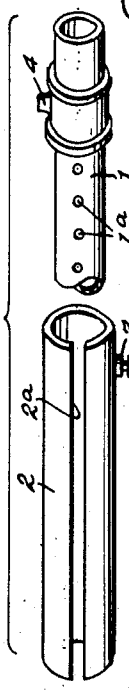


Fig. 4.

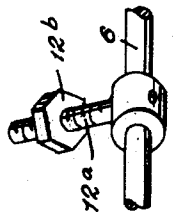


Fig. 5.

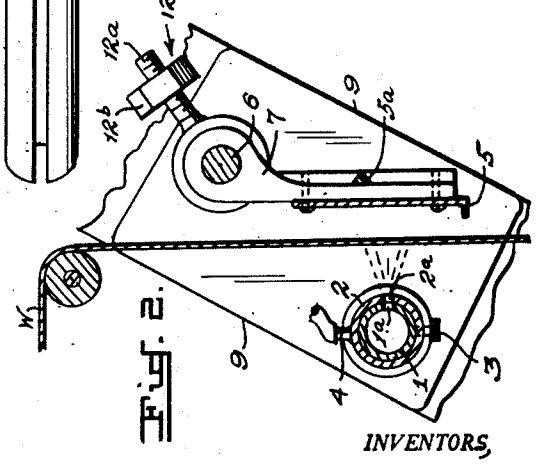


Fig. 2.

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WEB BREAK DETECTOR

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This invention broadly relates to sensing means for detecting the exisence of web breaks in a roller press and automatically initiates corrective measures to minimize damages resulting from such a condition in rotary-type roller press equipment employing a continually moving sheet of paper or the like called a "web" which passes through the machine at a high rate of speed.

Though this invention is not limited in its application to any particular type of roller press, for purposes of clarity, we will describe the application of our improvement in connection with a rotary-type printing press operation.

Basically, in rotary-type printing, large continuous presses take roll paper stock in at one end and deliver completely printed and folded "signatures" or sections at the other end. On such a reel-fed or as commonly referred to "web-fed" rotary press, the travel of paper or "web" through the machine and the folding of the pages are entirely automatic. Such "webs" frequently travel at speeds of 50 m.p.h. or more through the machine. In order to maintain proper tension, alignment and other influencing parameters affecting the travel and printing of the web and to assure proper time delays between successive operations, the web passes over, under and between a plurality of rollers employed in these rotary presses.

The type impression or printing on the web is obtained by means of two cylinders which are spaced apart from one another a distance approximately equal to the thickness of the web. One called the impression cylinder carries the plate or type, and the other, the packing cylinder, carries the necessary packing, with the web passing between the two. Under such conditions, it is apparent that a substantial amount of tension is exerted on the paper or "web" at all times. It frequently occurs that because of this tension coupled with unknown weak sections in the web, the web will rupture or tear at any point in the printing press. Should this rupture occur, for example, adjacent the aforementioned impression and packing cylinders, because of the high speeds involved, the loose end of the web will "whip" about and invariably wind itself around one or the other of the impression or packing cylinders. This condition is referred to as a "wrap-up" and when this situation occurs, the critical area between these cylinders becomes filled with three or more layers of web and results in so severely deforming the impression plates as to render them useless.

By way of further example, a common operation immediately following the printing is that of "heat setting" which rapidly evaporates the volatile substance matter in the wet ink, thereby setting it. This is accomplished by passing the web through an oven whose temperature is maintained between 300–550 degrees F., depending on the type of paper and/or ink being used. A web rupture occurring at this point of course immediately sets fire to the web and could possibly lead to serious consequences without proper safeguards. The present invention will

obviate these exemplary aforementioned undesired results by bringing the entire press operation to a halt within a few revolutions.

These and other problems have besieged the printing industry for many years. Prior attempts at providing adequate detection means have included devices referred to in the trade as "web-detector shoes" which are flat, elongated devices that actually ride on and are supported by the moving web and are electrically or mechanically connected to an arresting mechanism. When such a shoe of this prior art type detects a web break by no longer being supported by the web thereby falling through the plane of the web, the arresting gear is actuated and the presses are braked to a stop. These prior art devices have not proved entirely satisfactory however, in that they have a tendency under certain conditions to smear the ink before it has dried and set thereby causing substantial amounts of spoilage and loss of time. Because of this serious drawback, pressmen will invariably operate their presses with their web detectors in a non-operative position thereby giving no measure of protection at all to the machine.

Attempts have also been made and are currently under investigation and development for sonic, and electromagnetic means or combinations thereof for detecting web breaks in web-fed equipment and processing, however, none of these has as yet proved satisfactory either from a standpoint of effectiveness nor feasible from a standpoint of economic cost. The present invention however obviates the aforementioned deficiencies of the present state of the art by providing an effective and low cost web-break detector which operates on a low-pressure pneumatic principle, i.e. nothing but a stream of air is in contact with the moving web.

Accordingly, an object of this invention is to provide a web-break detector which operates on pneumatic principles so as to eliminate any contact of the device with the web.

It is another object of this invention to provide a web-detector means which in no way can disturb a fresh ink deposit but yet maintain its effectiveness in web-breaking detection.

It is another and further object of this invention to provide a web-break detecting means which will have universal application to any and all web fed machines.

An additional object of this invention is to provide a web-break detecting means which when activated is able to energize a plurality of electrical circuits for performing any number of corrective emergency operations.

These and other objects will become more obvious and apparent from the following description which when taken in connection with the accompanying drawings discloses a preferred embodiment thereof and wherein:

FIGURE 1 shows a front view of the web-break detector; and

FIGURE 2 illustrates a cross-sectional view with a fully operative web taken on line **2—2**; and

FIGURE 3, shows a cross-sectional view with a ruptured web taken on line **3—3**; and

FIGURE 4 is an exploded view showing a slotted sleeve and portion of the hollow tube with air egress holes; and

FIGURE 5 is a detail perspective view of the threaded counterweight.

Referring now with more particularity to the details of FIGURE 1, there is shown therein two end plates **9**

each of which carries an adjustable rotatable pivot pin 8. Carried between pivot pins 8 is a shaft 6. Mounted at regular intervals along shaft 6 are a plurality of depending bracket members 7 rigidly connected to and carrying an elongated vane member 5 whose length extends substantially the width of moving web W. Elongated vane 5 in the embodiment herein described is fabricated of sheet metal, however such member may equally as well be formed of any substantially non-porous material, for example, plastic or canvas or the like. By mounting on one face of vane 5 a stiffening member 5*a*, a greater degree of rigidity is imparted thereto, thereby reducing flexure of the vane.

At one end of shaft 6 and rigidly mounted thereto is an adjustable counterweight mechanism 12 comprised essentially of a threaded shaft 12*a* extending radially outwardly therefrom and carrying a heavy threaded weight 12*b* which may be selectively positioned thereon. By selectively positioning weight 12*b* on shaft 12*a*, it is possible to impart various torques on shaft 6 by which its angular position with respect to end plate 9 and web W may be changed.

At the other end of shaft 6 there is rigidly mounted thereon a small block 6*a* carrying a conventional mercury switch 13 whose circuit is either opened or closed, depending on the angular position of shaft 6. Annexed to one of end plates 9 adjacent mercury switch 13 is a terminal block 14 connected to switch 13 by means of electrical conductor wire 14*a*.

Additionally carried by end plates 9, and parallel to shaft 6 and juxtaposed the lower end of vane 5 as depicted in FIGURE 2 is a hollow tube 1 rotatable about its longitudinal axis and containing a plurality of nozzles or holes 1*a* extending in a straight line substantially the entire length of said tube. Tube 1 is a conduit for pressurized air which may egress through holes 1*a* and thereby function as a pneumatic exhaust means. Conventional connector 4 on one end of tube 1 permits connecting an air supply thereto. Slidably carried on each end of tube 1 and concentric therewith is a sleeve 2 extending over a selected portion of each end. In the preferred embodiment, this may amount to 15% to 25% of the total length of tube 1. As shown in FIGURES 3 and 4 each of sleeves 2 has connected thereto a locking adjustment 3 which is comprised, in the embodiment shown, of a screw means 3*a* passing through sleeve 2 and abutting in locking engagement against hollow tube 1. Each of sleeves 2 additionally has a slot 2*a* along its length whereby it may be rotatably positioned relative to tube 1 so that the slots 2*a* may be positioned over holes 1*a* or alternatively holes 1*a* may be covered and effectively blocked to prevent egress of pressurized air therefrom. Sleeves 2 are employed to close holes 1*a* whenever a web of narrow extent is being processed, thereby reducing air consumption. In operation the device will function as follows: End plates 9 carrying the web-break detector heretofore described are rigidly mounted to the frame of a conventional rotary printing press, a portion 15 of which is illustrated in FIGURE 1. The web-break detector is arranged so that web W passes between tube 1 and vane 5. Tube 1 is located approximately one-half inch away from web W and is so oriented with respect thereto that pressurized air at five to six p.s.i. egressing from holes 1*a* impacts perpendicularly against the web. Counter weight 12 is then adjusted so that shaft 6 and the thereto appended vane 5 are rotated in a manner as to align vane 5 parallel with web W as shown in FIGURE 2. So long as web W in its travel through the press remains whole and unbroken, the pressurized air egressing from holes 1*a* will merely impact the web slightly with no undesirable effects thereon. However, should a ruptured section of web pass through the web-break detector as shown in FIGURE 3, the pressurized air egressing from holes 1*a* will no longer impact against the web W but will then impact against

vane 5 inducing a torque thereon; being rigidly connected to shaft 6, vane 5 will then rotate shaft 6 about its longitudinal axis and thereby energize mercury switch 13 carried on one thereof, completing an electrical relay circuit into a conventional control panel, not shown. The control panel may of course be so designed as to immediately activate any member of operations safeguards necessary to prevent any damage to the press as a result of the web break or rupture. For example, a conventional braking system could be energized which could halt the presses within three revolutions; additionally since most press installations have the printing cylinder shaft mounted on an accentric, under conditions of a web break in the area of the printing and packing cylinder, where a potential "wrap-up" can be expected, the aforesaid control panel may be arranged to trigger a pneumatic ram connected to the eccentric which would, when activated, shift the impression cylinder so that a "wrap-up" would not in any way injure the plates. These and other corrective and preventive actions could be initiated from the control panel.

In the embodiment herein described the web-break detector will energize when approximately twenty-five per cent of the web width is ruptured, however, it can be readily seen that because of the versatile adjusting features of this apparatus, this adjustment may be set for whatever the particular application requires.

It will be understood that various changes in the details, materials, steps and arrangements of parts, which have been herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art within the principle and scope of the invention as expressed in the appended claims.

What is claimed and desired to be secured by Letters Patent of the United States is:

1. A web-break detector for mounting on a web-fed apparatus and having the moving web pass through said detector comprising the combination of: a pair of spaced apart end plates, a pivot pin mounted on each of said end plates, an elongated support shaft carried by said pivot pins, a plurality of depending bracket members having one end thereof rigidly attached to said shaft, an elongated vane member conjoining the other ends of said brackets and extending substantially the width of the moving web, an adjustable counterweight mechanism rigidly mounted near one end of said shaft and extending radially therefrom, a small block mounted on the other end of said shaft and carrying thereon a conventional mercury switch; a hollow tube rotatably carried by the aforesaid end plates extending the width of the moving web, said tube juxtaposed the lower end of said vane, a plurality of air egress holes extending linearly substantially the length of said tube, concentric slotted sleeves carried on each end of said tube, a locking mechanism appended to each of said slotted sleeves for selectively positioning the sleeves with respect to said hollow tube; and means mounted on said hollow tube for receiving pressurized air.

2. An air operated web-break detector for mounting on a continuous web-fed apparatus wherein said web passes through the aforesaid detector, comprising: a plurality of pressurized air emitting nozzles extending substantially the width of the web, a torque responsive member juxtaposed said nozzles and separated in spaced apart relation therefrom by the aforesaid moving web therebetween, said torque responsive means actuatable by said air emitting nozzles whenever the web therebetween becomes interrupted, and an electrical switch means rigidly mounted to said torque responsive means and activated upon movement of said torque responsive means; and wherein said pressurized air emitting nozzles are carried by a hollow conduit, said conduit being pivotable about

its longitudinal axis and provided with means for receiving pressurized air; said torque responsive means comprising an elongated sheet of substantially non-porous material, a support rod pivotally journaled at its end thereof, and a plurality of bracket members rigidly connecting said elongated sheet to said support rod; and wherein said conduit provided with a plurality of nozzles thereon carries at each end thereof a rotatably adjustable sleeve member, a narrow slot extending the length of said sleeve, and a locking adjustment means carried by said sleeve for securingly positioning said slot relative to said nozzles.

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