April 13, 1965 O. COOKSEY 3,178,527

AIR ACTUATED WEB BREAK DETECTOR

Filed Feb. 1, 1963

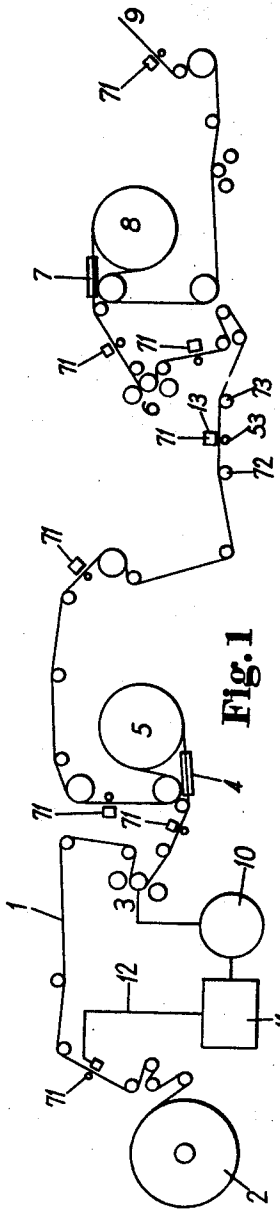


Fig. 1

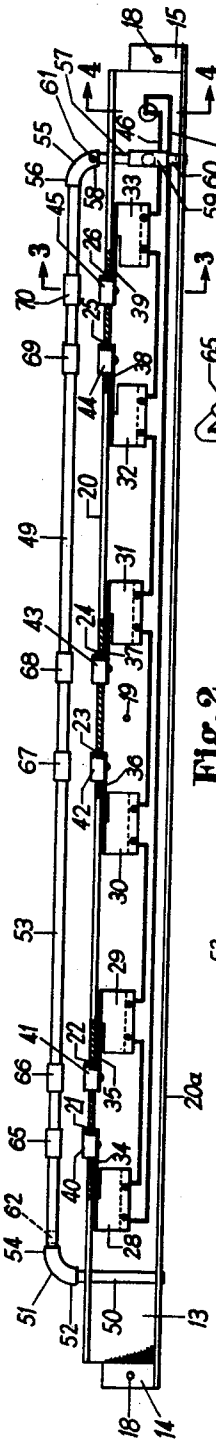


Fig. 2

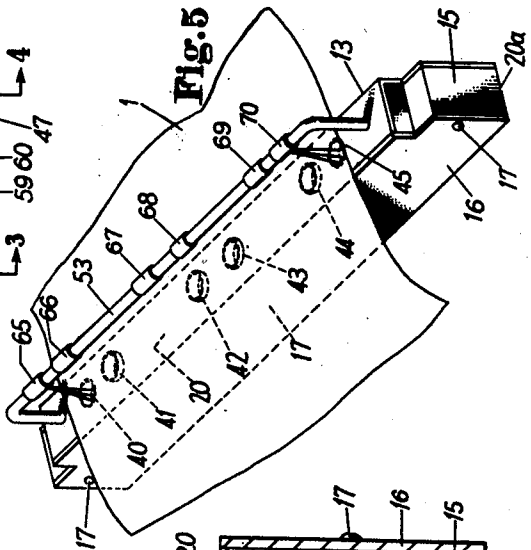


Fig. 5

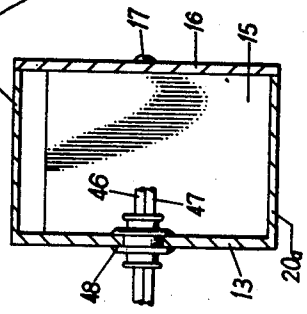


Fig. 4

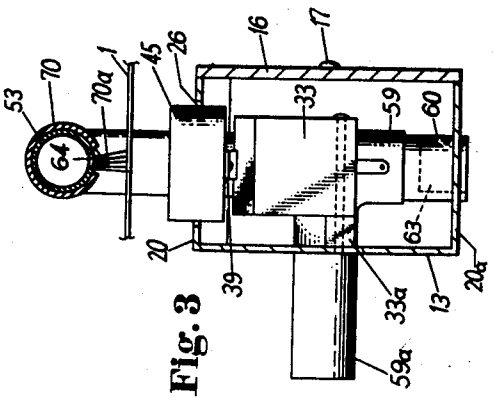


Fig. 3

INVENTOR.
OTHA COOKSEY,

BY

Young, Utsler, Shaver & Foster

ATTORNEYS.

United States Patent Office 3,178,527 Patented Apr. 13, 1965

3,178,527

AIR ACTUATED WEB BREAK DETECTOR

Otha Cooksey, 2639 Kings Highway, Louisville, Ky.

Filed Feb. 1, 1963, Ser. No. 255,597
9 Claims. (Cl. 200—61.18)

The invention relates to a web break detector, and more particularly to a bar-like detector device in association with web handling machines which will cause such machines to shut down instantly should a break occur in the web. It will be understood by one skilled in the art that the device of the present invention may be used in connection with any web handling machinery, including web forming and web printing machinery. The device may be used with webs of any suitable material including paper, fabric, plastic and the like.

For purposes of an exemplary showing, the device will be described with respect to a printing press with a long paper web passing therethrough. In the past, printing presses were used which had large printing drums revolving at relatively slow speeds. In such machines, the rate of travel of the paper web was such that detector devices which shut down the press after a web break occurred would suffice, even though there was a short time delay between the break and the detector response. In general, if the break occurred somewhere in the press ahead of the detector, the detector would not function until the loose end of the web was drawn through it. So long as there was a portion of the paper web in the detector, the detector would not function.

In recent years, the printing industry has turned to the use of high speed presses with small diameter printing rolls. It is imperative that a high speed press shut down instantly upon a break in the paper web. The speed of such a press is so great that even a slight delay may cause a portion or portions of the broken web to wrap around the printing rolls. This causes great pressure between the printing and blanket rolls, resulting generally in damage to the printing plates as well as to the press itself. This in turn results in further losses and expense due to "down time," material waste and labor costs.

Furthermore, the high speed presses are generally arranged so that the paper web is printed both sides, and often the web carries wet ink on both sides during at least a portion of its travel through the press.

All of the above mentioned factors have tended to make the shutting down of the press instantly upon a web break a problem of increasing importance and increasing difficulty. A number of detector devices have been used. For example, some have spring loaded arms or similar means, the ends of which ride on the paper web in the margins. When the web breaks the arms fall, actuating switches to shut down the press. Such detectors, having means riding on the paper web, require sufficient and continuous margins in the printed matter on the web, and cannot be used when the margins are narrow or are oriented perpendicular to the web length.

Photocell means have also been applied to various detector devices, but these require that the web be removed entirely from a position over the detector before they will function. Thus, if a break occurs considerably ahead of a photocell detector, the web must continue to travel until the broken end thereof has passed through the detector device, thus preventing an instantaneous detector reaction.

Air operated detecting means have also been used, comprising an air emitting device on one side of the web, and an air actuated device on the other side of the web. In general, however, such devices have required the web to enter and leave at different angles, the web sliding over the air emitting portion of the detector. Such devices, of course, cannot be used with a web having wet ink on both sides.

It is therefore an object of the present invention to provide a web break detector which is not subject to the above mentioned limitations.

It is an object of the present invention to provide a web break detector which will react instantaneously upon the occurrence of a web break.

It is a further object of the invention to provide such a detector which will react instantaneously when a web break occurs ahead of or behind the detector, with portions of the web still extending within the detector.

It is an object of the invention to provide such a detector through which a web with wet ink on both sides may pass without touching.

It is an object of the invention to provide a web break detector which may be quickly and easily adjusted for use with any width web.

It is a further object of the invention to provide a web break detector which will operate in any position without change or adjustment.

It is an object of the invention to provide a detector which is simple in structure and easy and inexpensive to manufacture.

These and other objects of the invention which will be described hereinafter or will be obvious to one skilled in the art upon reading these specifications, are accomplished by that construction and arrangement of parts of which an exemplary embodiment will now be described. Reference is made to the accompanying drawings wherein:

FIG. 1 is a diagrammatic representation of a printing press showing the device of the present invention installed at various places along the path of the web.

FIG. 2 is a front elevation of the web break detector, with the front cover plate removed.

FIG. 3 is a cross sectional view taken along the section line 3—3 of FIG. 2.

FIG. 4 is a cross sectional view taken along the section line 4—4 of FIG. 2.

FIG. 5 is a perspective view showing the detector actuated by a slack web.

Briefly, in the practice of the invention, a printing press is provided with one or more web break detectors, each of which comprises an air delivery portion and an air receiving switch containing portion. These portions are in spaced relationship with the web running therebetween and out of contact with either of them. FIG. 1 is a diagrammatic representation of a typical but simplified magazine press. The web 1 is fed into the entrance end of the press from a roll 2. The web is printed on one side by the rolls generally indicated at 3. The web then passes through a heating means generally indicated at 4 and then over a cooling drum 5. The other side of the web is printed by the rolls generally indicated at 6 and again is passed through heating means at 7 and about a cooling drum 8 to the exit end of the press 9, where it receives further treatment such as rolling or cutting, by means not shown.

As indicated above, many presses of this type are designed to print the web on both sides simultaneously. Since the web does not touch any portion of the detector device of the present invention, it makes no difference whether the web is wet on one or both sides at any given time. In the usual press, one or more motors operate on the same or different shafts from which power is derived to rotate the various roller elements and to actuate the various mechanical parts. Such a motor is diagrammatically represented at 10. The motor 10, as well as all other facilities including electricity, air gas, water and the like, are controlled by a master control system diagrammatically represented at 11. When the detector is

actuated, as hereinafter described, it will shut down all of the above mentioned facilities instantaneously through the master control 11 to which it is connected as at 12.

The detector device of the present invention is most clearly shown in FIGS. 2, 3 and 4. The main body of the detector is made up of a channel member 13. The channel member may be made of any suitable material including aluminum, steel or the like. Mounting blocks 14 and 15 may be affixed to the ends of the channel 13 by any suitable means including screws or the like. The mounting blocks 14 and 15 may be provided with suitable perforations (not shown) to receive bolts or the like by which the channel 13 may be affixed to any desired portion of the press. As shown in FIGS. 3 through 5, the channel may be closed by a front cover plate 16, held in place by screws 17 in the perforations 18 in the blocks 14 and 15, and the perforation 19 in the channel 13. The upper face 20 of the channel 13 is provided with a plurality of spaced perforations 21 through 26. The rear wall 27 of the channel 13 has mounted thereon a plurality of micro switches 28 through 33, held in proper position by spacer elements, one of which is shown at 33*a* in FIG. 3. Micro switches 28 through 33 are provided with arms 34 through 39 respectively. Cup members 40 through 45 are mounted on the ends of these switch arms. The cup members may be made of any suitable light material such as plastic or the like. If a detector is located near a heating unit, and is itself subjected to some heat therefrom, it may be found desirable to make the cups of aluminum or other metallic substance which will not be affected by such heat.

It will be noted from FIG. 2 that when the switch arms 34 through 39 are in their normal unactuated position, portions of the cup members 40 through 45 will extend through the perforations 21 through 26 respectively. Thus, when the detector device is in its normal unactuated condition, the cups will extend above the surface of the upper face 20 of the channel 13.

For purposes of an exemplary showing, the micro switches in FIG. 2 have been illustrated as connected in series by leads 46 and 47. It will be understood by one skilled in the art that these switches could be connected in parallel if the electrical system of the press so required. The leads 46 and 47 pass through the rear wall 27 of the channel 13 through a bushing 48 of plastic, rubber, or the like. The leads 46 and 47 will connect the detector device to the master control system, as is diagrammatically illustrated by elements 11 and 12 of FIG. 1.

The air carrying portion of the detector, which is affixed to and lies in parallel spaced relationship to the channel member 13 is best illustrated in FIGS. 2, 3 and 5. The air carrying pipe or conduit, generally indicated at 49, may be of one piece construction. In the exemplary showing, however, the pipe 49 is made up of several pieces. A vertical pipe section 50 extends through perforations in the upper face 20 and lower face 20*a* of the channel member 13, and is held in place by any suitable means (not shown), including screws, clamps or the like. An elbow member 51 may be permanently affixed to the vertical portion 50, by brazing, soldering or the like, as at 52. A long horizontal pipe member 53 is connected to the elbow 51 as at 54. The other end of the pipe member 53 is affixed to a second elbow 55 as at 56. A vertical pipe member 57 is affixed to the elbow 55 as at 58. The member 57 extends through a perforation in the face 20 of the channel member 13, and is attached to a T-member 59 (see FIGS. 2 and 3), located within the channel member. The T-member 59 has an arm 59*a* which extends through a perforation in the rear wall 27. An additional vertical pipe member 60 may be affixed to the T-member 59 and passed through a perforation in the lower face 20*a* of the channel member.

While all of the joints 52, 54, 56 and 58 may be permanent in nature, it will often be found convenient to make the joints at 54 and at 58 removable. The joint at 54 may be made a snug fit and the joint at 58 may also be made a snug fit with the pipe member 53 held firmly in place by means of a set screw 61. In this way, elbow 55 and pipe member 53 may be made removable from the detector for purposes of adjustment, and for access to cup members 40 through 45.

The end of pipe member 53 which extends into the elbow 51 at 54 is provided with a plug 62 (see FIG. 2). The pipe member 60 is also provided with a plug 63 (FIG. 3). The pipe member 53 is provided with perforations respectively located directly over and facing each of the cup members 40 through 45. Such a perforation is illustrated at 64 in FIG. 3 Rotatable sleeve members 65 through 70 may be located on pipe member 53 at each of the perforations. As illustrated in FIG. 3, each sleeve member is provided with a slot (shown at 70*a*), so that each of the perforations in the pipe member 53 may be opened or closed by rotation of its sleeve member.

The portion 59*a* of the T-member 59 will have affixed thereto suitable conduit means from an air source. Air entering the T-member at 59*a* will travel through the pipe member 53 and exit through any holes therein which have been uncovered by sleeve members 65 through 70.

The operation of the detector device of the present invention is as follows. As many such detectors as are needed are affixed to the printing press by means of bolts or the like passing through blocks 14 and 15. The detector device is arranged in such a way as to be perpendicular to the path of the web. The web is caused to pass between the channel member 13 and the pipe member 53 without touching either of them (FIG. 3). When the press is in operation, air passing through opened perforations in the pipe 53 will strike that surface of the web nearest the pipe. The air pressure is so regulated that as long as the web 1 is passing through the press properly and is sufficiently taut, the air impinging thereon will have no effect (FIG. 3). If a break occurs at the detector, the air will no longer impinge upon the web 1, but rather will hit the cup 45 causing it and switch arm 39 to move downwardly, actuating micro switch 33 to shut off the press instantly.

If, on the other hand, the break occurs ahead of or behind the detector, the web 1 will become slack, and air from the perforation 64 will force the web against the cup 45 again actuating micro switch 33 to shut off the press instantly. In usual practice, it has been found that only two perforations in the pipe 53 need be used at any one time. Generally perforations coming nearest the web edges are chosen.

The drawings herein illustrate an exemplary placement of the micro switches, cups and closable perforations in the pipe 53. It will be understood by one skilled in the art that the number and placement of these elements does not constitute a limitation on the present invention. It will further be understood by one skilled in the art, that the exemplary arrangement illustrated will enable the detector of the present invention to be used with a number of different web widths.

It has been found that the use of cups such as those illustrated at 40 through 45 permit the most efficient use of air, enable the air pressure to be relatively low, and prevent the channel member when enclosed by the face plate from becoming air locked. The relationship of the distance between the upper channel face 20 and the pipe 53, the diameters of the cup 45 and the air perforation 64, and the amount of air pressure required will depend largely upon the purpose for which the detector is used and the type of web caused to pass therethrough. In an examplary use on a typical magazine press, a detector was used wherein the pipe 53 was fabricated of one-half inch diameter thick wall copper tubing. The holes 64 were drilled in the tubing with a number 33 drill and the cups 40 through 45 had a diameter of one inch. The pipe 53 was spaced an inch and a quarter above the top

surface 20 of the channel member 13, and an air pressure of 1½ pounds was used.

Since the web break detector of the present invention will instantly shut down the press upon a break in the web, whether the break occurs at the detector or ahead of or behind it, it has been found that fewer such detectors are required than when prior detectors have been used. This is true because the detector is actuated even if portions of the web lie between the pipe 53 and the upper face 20, since air acting upon the slack web will still cause the cups to be depressed. Such a situation is illustrated in FIG. 5. In this figure a break has occurred elsewhere, and the web 1 lies in the detector in slack condition. Collars 65 and 70 have been opened to utilize the air holes thereunder and the air acting upon the slack web has caused cups 40 and 45 to be depressed.

It will be understood by one skilled in the art that the detector of the present invention may be used in any position. This is illustrated in FIG. 1, where a series of detectors 71 is shown in various orientations. This feature enables the detector to be placed anywhere in the path of the web through the press. Further, when the detector is oriented with the pipe 53 below the web and the channel member above, the air passing through the holes 64 can give support to the web when the detector is positioned in a long span between supporting rolls. This is diagrammatically shown in FIG. 1 by the detector placed between rolls 72 and 73. While in normal use, two air holes are generally sufficient, if it is desired that the detector afford additional support to the web, more than two air holes may be opened by adjusting various of the collars 65 through 70. In practice, the use of the device not only as a detector, but as an additional web support, has been found especially advantageous where the web passes from an ink carrying roll across a long unsupported span. The ink on the rolls is often tacky in nature, and in such instances the web has a tendency to travel part way around the roll before it pulls free, making problems of proper register more difficult. With the pipe 53 below the web for additional support the tendency of the web to override the ink roll is diminished, thus decreasing the strain on the web and reducing the problems of proper registry.

Modifications may be made in the invention without departing from the spirit of it. The invention having been described in an exemplary embodiment, what is claimed as new and desired to be secured by Letters Patent is:

1. In a web handling machine having a master control system, a detector device for instantly shutting down said machine upon the occurrence of a break in the web, comprising an air delivery means on one side of said web, a switch means on the other side of said web connected to said master control system, said switch means being located to remain at all times covered by said web when said web is in its normal path of travel, and having operating means located to be contacted by said web if said web becomes slack, said air delivery means and said switch means being in parallel spaced relationship to each other, said detector device being located in said machine with reference to a rectilinear portion of the path of travel of the web therethrough, and with both said air delivery means and said switch means out of contact with said web as it passes intact through said machine, said switch means being actuated by air from said air delivery means when a break occurs in said web and said web is withdrawn from between said air delivery means and said switch means, said switch means being actuable also by said web when said web becomes slack due to a break therein, and is depressed against said switch means by air from said air delivery means.

2. The structure claimed in claim 1 wherein said air delivery means is a conduit extending transversely of said web and having a perforation facing said web.

3. The structure claimed in claim 2 wherein said switch means comprises a micro switch having an operating arm and an air receiving cup mounted on said arm.

4. The structure claimed in claim 1 wherein said air delivery means is a conduit extending transversely of the web and provided with perforations facing the web at spaced intervals, and means for selectively closing said perforations.

5. The structure claimed in claim 4 wherein said switch means comprises a plurality of micro switches, each of said micro switches having an operating arm and an air receiving cup mounted on said arm, said cups being respectively located opposite the perforations in said conduit.

6. The structure claimed in claim 5 wherein said micro switches are located in an elongated housing, with said cups extending through holes therein, and wherein said conduit is mounted at its ends on said housing.

7. The structure claimed in claim 6 wherein said last mentioned means comprise slotted sleeves rotatably mounted on said conduit.

8. The structure claimed in claim 6 wherein the distance between the conduit and the said cups is such that the web will be forced by air pressure against said cups if said web becomes slack.

9. In a device of the character described, an elongated support having a top, a plurality of micro switches located in spaced relationship on said support beneath said top, said micro switches connected into a single electrical circuit whereby the operation of any one of said micro switches is electrically equivalent, with respect to said circuit, to the operation of any other of said micro switches in said plurality, each micro switch having an operating means with a portion extending through and beyond perforations in said top of said support, said support extending beyond the side edges of a web to be treated, a manifold for gas under pressure mounted at its ends on said support, and extending parallel to and in spaced relationship to the top of said support, said manifold having jet forming means located opposite each of the operating means for said micro switches, means for closing off any of said jet forming means lying at and beyond the edges of said web, the spacing between said jet forming means and said micro switch operating means being sufficient for the passage of a web therebetween in a normal path of travel, out of contact with any operating jet forming means and said switch operating means, said switch operating means being actuated by gas from said jet forming means when a break occurs in said web and said web is withdrawn from between said switch operating means and said jet forming means, said switch means being actuable also by said web when said web becomes slack due to a break therein and is depressed against said switch operating means by gas from said jet forming means.

References Cited by the Examiner

UNITED STATES PATENTS

2,176,139	10/39	Lofgren	251—145
2,274,268	2/42	Hercik	200—61.18
2,647,539	8/53	Stearns	251—145
2,884,495	4/59	Frankel	200—61.13
3,039,463	6/62	Dickey, et al.	251—145

BERNARD A. GILHEANY, *Primary Examiner.*

ROBERT K. SCHAEFER, *Examiner.*