

June 10, 1958

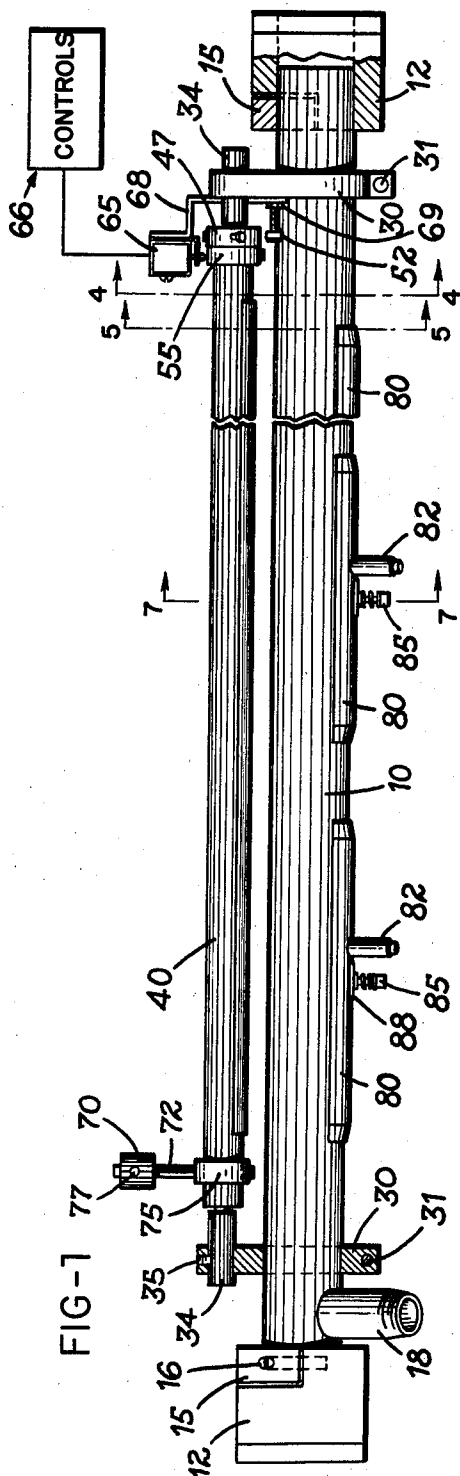
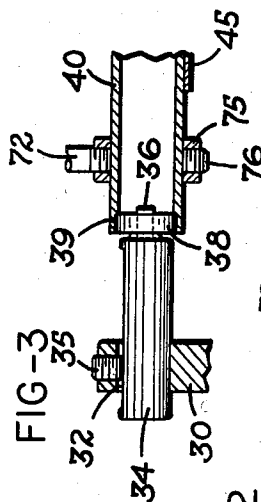
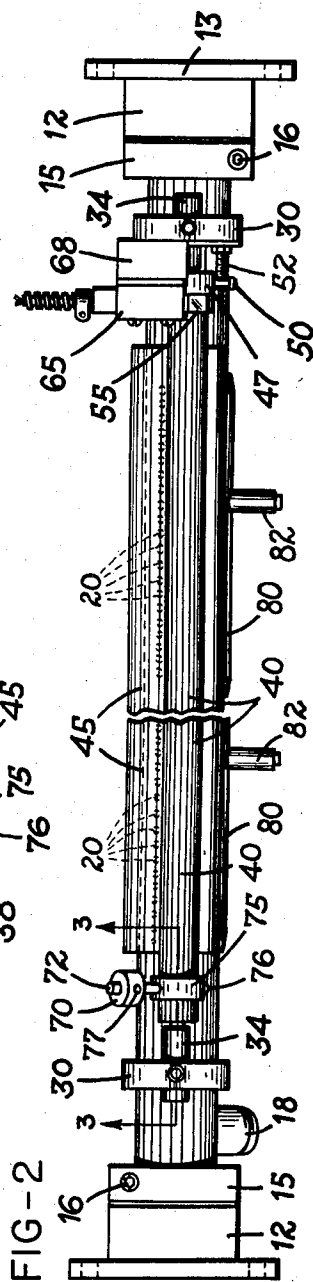
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2,838,303

WEB BREAK DETECTION

Filed Aug. 21, 1956

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG-4

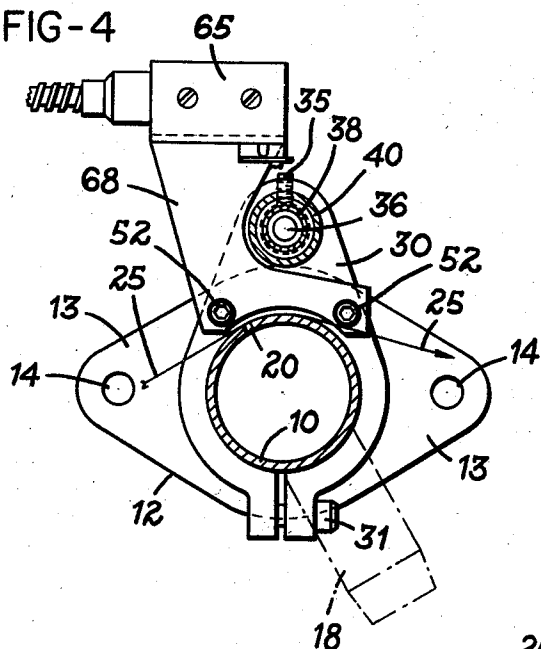


FIG-5

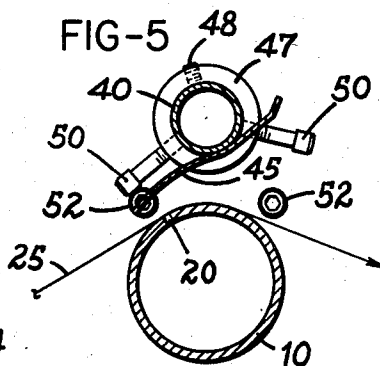


FIG-6

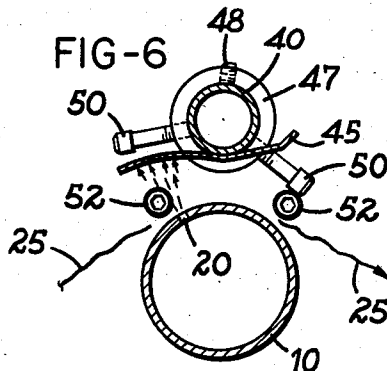


FIG-7

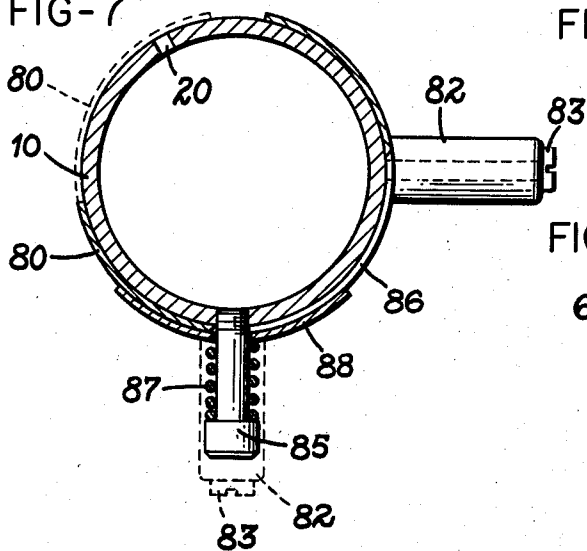


FIG-8

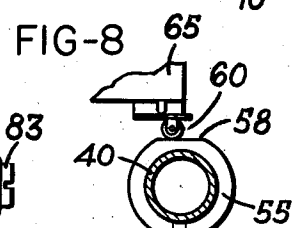
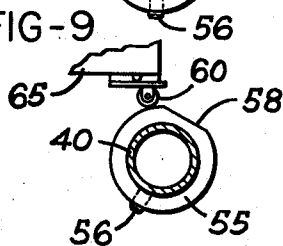


FIG-9



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WEB BREAK DETECTION

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4 Claims. (Cl. 271—2.1)

This application relates to a device for detecting a break or hole in a web of sheet material such as, for example, in a web of paper being fed to a printing press.

The primary object of this invention is to provide a web break detector which will shut down the apparatus to which the web is being supplied, or which will actuate suitable signalling or warning devices, whenever a fault, such as a hole, tear, or break is detected in the web of material being fed to the apparatus.

A further object of the invention is to provide a web break detector in which the web of material passes over a manifold having longitudinally aligned openings therein from which a large volume flow of low pressure air is passed to provide an air bearing between the web and the manifold, thereby substantially reducing frictional drag on the web as it passes over the manifold.

Another object of this invention is to provide a web break detector in which the web is passed over a supply of low pressure air and in which a vane is supported on the opposite side of the web from the air supply, held in spaced relation to the web so as to be insensitive to slight flapping movement of the web, and wherein movement of the vane due to passage of air through a break or hole in the web will result in actuation of an emergency control device.

An additional object of the invention is to provide such a web break detector including means for adapting the detector to use with different widths of web material.

Another object of the invention is to provide such a web break detector which is adaptable for mounting to address a web traveling in any direction with respect to vertical, including a counterweight for positioning the vane which may be adjusted through 360° with respect to the vane to provide the necessary bias thereon regardless of the relative position of the vane with respect to horizontal.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a front plan view of a web break detector in accordance with the invention, with certain parts shown in section for purposes of illustration;

Fig. 2 is a top plan view of the device shown in Fig. 1;

Fig. 3 is an enlarged section taken on line 3—3 of Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 1, with some parts omitted for purposes of illustration;

Fig. 5 is a section taken on line 5—5 of Fig. 1, with the parts in normal running position;

Fig. 6 is a section similar to Fig. 5 showing the parts in position detecting a break in the web;

Fig. 7 is a section taken on line 7—7 of Fig. 1;

Fig. 8 is a view showing the relation between the control actuating parts, with the vane in the normal position shown in Fig. 5; and

Fig. 9 illustrates the parts in Fig. 8 in a position cor-

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responding to that where the vane is moved as shown in Fig. 6.

Referring to the drawings, which illustrate preferred embodiments of the present invention, the web break detector includes a tubular manifold 10 supported at its opposite ends within mounting blocks 12, each of which includes an extended face 13 (Fig. 4) provided with holes 14 for receiving mounting bolts. Each of the mounting blocks also includes a generally crescent shaped sector 15 removable from the mounting block and held in place by suitable bolts 16, providing for adjustment and removal of manifold 10.

Air under pressure is supplied to the interior of manifold 10 from a pipe 18 extending from one end of the manifold and adapted for connection to a suitable source of air under pressure. Such air is preferably supplied at a pressure of 5 p. s. i. or less, and passes from the manifold through a plurality of small holes, slits, or the like generally aligned along the manifold and indicated at 20.

The web 25 of sheet material passes over the manifold and over these holes 20, and the flow of low pressure air from the holes provides an air bearing which eliminates much of the frictional drag which might result from passage of the web over the manifold.

The low pressure air provides a means for detecting breaks, holes, tears or other such flaws in the web material as it passes over the manifold. Thus, for example, the detector may be suitably mounted on or adjacent to a printing press or the like and the web of material to be printed upon can be passed over the manifold as it is supplied to the press. The present detector will then actuate a suitable control means or warning device whenever such a flaw in the web of material advancing to the press permits an air flow through the web.

The detector apparatus includes a pair of supporting brackets or clamps 30 slit at their lower ends and adapted for tightening about manifold 10 by a bolt 31 extending through the slit end of the bracket in a conventional manner. These brackets 30 are secured at opposite ends of manifold 10 and each bracket includes a mounting hole 32 (Fig. 3) within which a stub shaft 34 is secured by a suitable set screw 35. At one end of shaft 34 there is carried a smaller extension shaft 36 adapted to be fixed to the inner race of a conventional ball bearing 38, the outer race of which is press fitted into counter-bored portions 39 at opposite ends of a tubular rod 40. In this manner the rod 40 is supported in spaced parallel relation to manifold 10, and the web 25 may be passed through the space provided between the rod and the manifold.

A vane 45 is secured to rod 40 along a substantial length of the rod and extends laterally from the rod over the holes 20 in manifold 10. This vane is preferably supported in spaced relation with respect to web 25 so as to be insensitive to slight fluttering or flapping movements of the moving web or to changes in thickness of the web resulting, for example, when a seam in the web material passes over manifold 20. This arrangement prevents actuation of the web break detector when a loose web flaps as it is fed to the press or when a seam in the web material passes by the detector. Such controlled sensitivity is a desirable feature heretofore unavailable in feeler type detectors which include fingers riding directly upon the web, and prevents unnecessary and undesirable actuation of the control means or warning means by the detector.

The spacing between web 25 and vane 45 is provided by a stop means including a collar 47 fixed to one end of rod 40 by a suitable set screw 48. Stop bolts 50 extend

outwardly from collar 47 and are adapted to engage other stop bolts 52 projecting from the face of the adjacent rod mounting bracket 39. As will be apparent from an inspection of Figs. 5 and 6, the stop bolts 50 and 52 define the positions of vane 45 and rod 40 as the normal position, shown in Fig. 5, and as the break detecting position shown in Fig. 6.

Movement of vane 45 under the influence of air passing through a break in the web, as shown in Fig. 6, will result in a rotation of rod 40 about its own axis until movement of the vane is limited by the stop means. Such rotation of rod 40 may be utilized in any convenient way to actuate an appropriate signalling or control means to energize a warning light or buzzer, or to operate a suitable controller which will shut down the press so that the imperfect portions of the web may be removed or the condition remedied in some other way.

A suitable control means may be provided as shown in Figs. 1, 2, 8 and 9, wherein a cam 55 is secured to rod 40 by a suitable set screw 56, such cam including a flat portion 58 upon which a roller follower 60 rests in the normal position of the rod 40 and vane 45. Follower 60 is arranged to actuate a switch 65 (Fig. 1) which is in turn adapted to actuate a suitable controller, indicated generally at 66, which may be arranged to interrupt feeding of the web material or to actuate a warning device, as may be desired. Switch 65 is supported on a suitable Z-shaped bracket 68 which is fixed to rod supporting bracket 39 by suitable lock nuts 69 threaded on the stop bolts 52. It will be apparent to those skilled in the art that movement of cam follower 60 may be used to open or close switch 65 as desired, and depending upon the type of switch selected, and that operation of the switch may be employed in any suitable manner to actuate an emergency control which may be the controller or any suitable signalling means.

In order to urge vane 45 into its normal position shown in Fig. 5, a counterweight 70 is supported upon a rod 72 extending generally radially from a collar 75 which is in turn fixed to rod 40 by a set screw 76. Weight 70 is also adjustably fixed to rod 72 by a suitable set screw 77. By adjusting the position of collar 75 on rod 40, and appropriately changing the distance of weight 70 from collar 75, it is possible to bias rod 40 into the normal operating position shown in Fig. 5 regardless of the position in which the entire detector apparatus is supported. In other words, no matter what the angle may be between vane 45 and horizontal, it is possible to position the counterweight so that it will urge rod 40 to rotate toward manifold 10, into the position shown in Fig. 5, and appropriate adjustment of weight 70 on rod 72 will compensate for addition or subtraction of the weight of vane 45 to the biasing force of the counterweight.

The holes or openings 20 are arranged in groups along the length of manifold 10, and means are provided for covering one or more of such groups of holes when a web of lesser width than the full capacity of the detector is passed across the manifold. For example, referring to Figs. 2 and 7, the holes may be divided into three groups each group of which is provided with a retractable cover 80 in the form of an elongated crescent shaped member, of greater than 180° radial length about manifold 10. The inner diameters of such covers are arranged for a sliding fit between the cover and the manifold, and a handle 82 is secured to each cover by a bolt 83, providing for rotation of the cover about the manifold between open and closed positions, as shown by full and dotted lines, respectively, in Fig. 7. Each cover is guided and centered with respect to its associated group of holes 20 by means of a centering bolt 85 threaded into manifold 10 and passing through an elongated slot 86 in the cover. Also, each bolt 85 provides an abutment for a spring 87 pressing against a shoe 88 for holding the cover in set position upon the manifold. Therefore, once

a cover member 80 is moved to a given position the spring and shoe will retain it in such position until the cover is forcibly reset to another position. It will be apparent that by closing one or more of the groups of holes 20 with an associated cover 80 it is possible to select the desired effective width of the detector.

The present invention thus provides a web break detector which readily senses flaws in the moving web due to breaks, holes or the like and yet is insensitive to flapping movements of the web or overlapping seams and the like. In addition, the detector is adaptable to mounting in an infinite number of positions ranging from upright to inverted without in any way affecting the operation or sensitivity of the detector.

While the form of apparatus herein described constitutes a preferred embodiment of the present invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A web break detection device comprising means for directing a large volume flow of relatively low pressure air against the traveling web across substantially the entire width thereof, a vane supported on the opposite side of the web from said air directing means and movable under the pressure of air passing through a break in the web, said vane being substantially equal in length to the width of said web for sensing a flow of air through said web at any position across the width thereof, means urging said vane normally toward said web, stop means positioning said vane in spaced relation to the traveling web, said urging means being yieldable under the pressure of air passing through a break in the web and against said vane, and means operable by movement of said vane from its normal position to actuate an emergency control.

2. A web break detection device of the character described comprising a tubular manifold having a plurality of openings therein arranged longitudinally along one side thereof, means for supporting said manifold across the path of travel of the moving web with the moving web covering said openings, means supplying air under pressure to said manifold to provide for a large volume low pressure flow of air through said openings against the web traveling over said manifold, a vane supported on the opposite side of the web from said openings and adapted for movement by the low pressure air emanating from said openings, means supporting said vane in spaced relation to said manifold and the web for retaining said vane in a position insensitive to flapping movements of said web, and means operable upon movement of said vane due to pressure of air passing through a break in the web to actuate an emergency control.

3. A web break detection device comprising a tubular manifold member having a plurality of openings therein arranged longitudinally along one side thereof, means for supporting said member across the path of travel of a moving web of material with said openings directed at the web, means for supplying air under pressure to said manifold to provide for a large volume low pressure flow of air through said openings against the web traveling across said manifold, a rod including bearing supports at opposite ends thereof supporting said rod for rotation about its own axis, means mounting said bearing supports in spaced relation to said manifold for carrying said rod substantially parallel to said manifold and providing a space between said rod and said manifold for passage of said web, a vane secured along one side thereof to said rod and extending over said openings, means yieldably urging said vane toward said manifold providing for swinging movement of said vane away from said manifold under pressure of air passing through an opening in the web and against said vane, a cam fixed to said rod for rotation therewith in relation to swinging move-

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ment of said vane, and control means operable by said cam in response to rotation of said rod.

4. A web break detection device comprising a tubular manifold member having a plurality of openings therein arranged longitudinally along one side thereof, means for supporting said member across the path of travel of a moving web of material with said openings directed at the web, means for supplying air under pressure to said manifold to provide for a large volume low pressure flow of air through said openings against the web traveling across said manifold, a rod including bearing supports at opposite ends thereof supporting said rod for rotation about its own axis, means mounting said bearing supports in spaced relation to said manifold for carrying said rod substantially parallel to said manifold and providing a space between said rod and said manifold for passage of said web, a vane secured along one side thereof to said rod and extending over said openings, stop means defining a normal operating position of said vane, a counterweight secured to said rod in spaced rela-

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tion to said axis for urging said rod to rotate into said normal operating position of said vane, said counterweight having an adjustable connection with said rod providing for movement of said counterweight about substantially the entire circumference of said rod to provide a universal adjustment of the effective weight of said counterweight for overcoming the gravitational effects on said vane, said counterweight being proportioned in weight to provide for swinging movement of said vane away from said manifold under pressure of air passing through an opening in the web and against said vane, and means responsive to rotation of said rod away from said stop means to operate an emergency control.

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