

Nov. 19, 1957

F. J. MARKEY

2,813,535

PURGED WEB EDGE DETECTOR

Filed April 3, 1956

FIG. 1

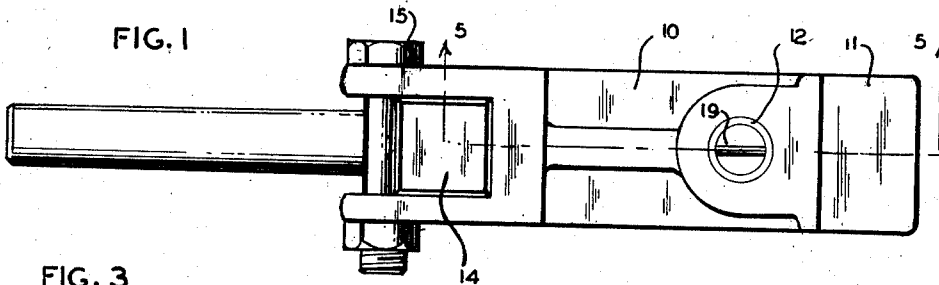


FIG. 3

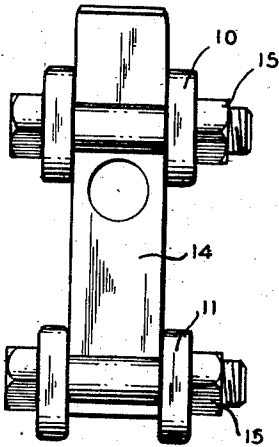


FIG. 2

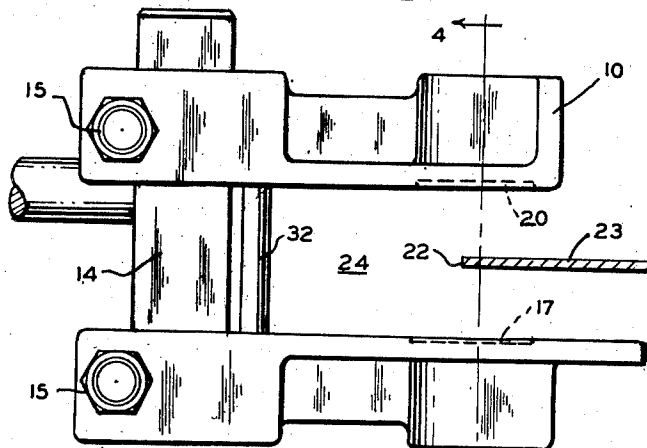


FIG. 4

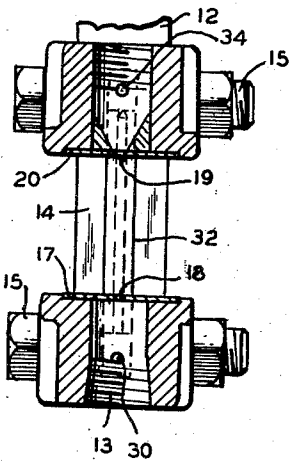
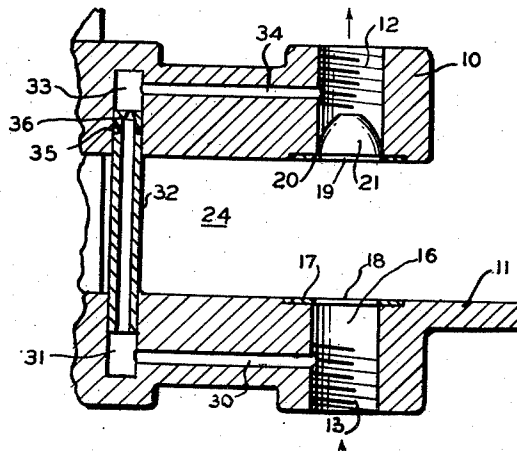


FIG. 5



INVENTOR.
FRANK J. MARKEY
BY *James J. Byrne*
ATTORNEYS

1

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PURGED WEB EDGE DETECTOR

Frank J. Markey, Hammond, Ind., assignor to Askania Regulator Company, Chicago, Ill., a corporation of Illinois

Application April 3, 1956, Serial No. 575,806

3 Claims. (Cl. 137—83)

The present invention relates to the detection of the position of a lateral edge of a longitudinally traveling web, such as paper, textile or other relatively thin material. Fluid under pressure is supplied to a detector device whereby a stream of fluid is caused to flow across a gap or throat formed by the device to a receiver opening and chamber within the detector device. The web is inserted in the gap and passes therethrough in a manner normal to the fluid stream, whereby as the edge of the web is closely adjacent to the fluid stream, lateral movement of the web may intercept more or less of the cross section of the stream.

The fluid stream being delivered at a constant volume rate and pressure, the magnitude of fluid pressure developed in the receiver chamber is a direct function of the fluid stream cross-section passing the sensed edge, which is determined by the degree of interception of the stream by the marginal portion of the web adjacent said edge. Thus, the magnitude of pressure in the receiver chamber being a direct function of the lateral position of the web edge, a measure or signal is developed which may be used for various purposes, such as the control of the lateral position of the web.

One known form of detector device for this type of use employs spaced delivery and receiver chamber structures for the delivery and reception of fluid under pressure, such structures being provided with facing surfaces provided with opposed elongate slots, the longitudinal dimensions of the slots being disposed transverse to the edge of the web material to be sensed, and each slot opening into one of said chambers and being considerably smaller in area than the cross-sectional area of the latter.

In the instance where the signal pressure is used for control of the lateral position of the web edge, a signal pipe connects the receiver chamber to a relay regulating signal pressure translating device, for example, a flexible diaphragm assembly having one or two signal pressure chambers and the diaphragm of which positions a relay control member in accordance with magnitude of the signal pressure. In this type system, it has been found that relay control response that is proportional to the cross sectional area of the stream that passes by the web edge may be impaired due to internal pressure conditions arising as a result of the fluctuation of the diaphragm, resulting in sudden changes in volume in the system, which changes are unaccompanied by commensurate instantaneous changes of the signal pressure, because the receiver port greatly restricts free passage of pressure fluid into and out of the system.

In other instances, the pressure within the signal system may become negative or less than that of the surrounding atmosphere, whereby relay control may be momentarily lost, causing hunting by the control system.

Another problem existing in this type signal system arises from the accumulation of foreign matter in and about the receiver opening and also the delivery opening. Such accumulation occurs, particularly in detection of

2

web materials such as paper and textiles, fine particles of such material, lint and other airborne matter tending to gather about the receiver opening, due partly to flow of the fluid stream from the delivery opening to the receiver opening, and partly to sudden changes in internal pressure within the system, causing a pumping action which tends to carry material into the receiver and deposit it in the port and chamber. Any such accumulation which tends to clog the opening or otherwise interfere with reception of the fluid stream directed to the receiver opening results in decreasing the sensitivity of the signal system and tends to vary the response characteristics thereof.

Generally, the successful solution to both aforementioned problems proposed by my copending application for United States Patent, Serial No. 529,737 rests in the introduction into the signal pressure system of a continuous supply of pressurizing fluid at a rate sufficiently high to insure a positive pressure in the system, thereby eliminating the control stability problem, the effect of a positive pressure also providing a supply of counterflow or purging fluid that flows from the receiver port whereby the entry of foreign matter therein and the accumulation thereof of such matter is prevented.

Particularly, the invention relates to a novel and improved manner of introducing the pressurizing fluid into the signal system and to a novel detector arrangement having built in provision of a novel arrangement for conducting purging fluid from the passage supplying fluid to the jet discharge orifice direct to the receiver chamber.

In the accompanying drawings:

Fig. 1 is a plan view of a detector device embodying the present invention wherein the signal pipe is removed to show the threaded bore opening therefor leading to the delivery chamber.

Fig. 2 is a side elevational view of the detector device of Fig. 1.

Fig. 3 is a rear elevational view of the detector device.

Fig. 4 is a vertical section on line 4—4 of Fig. 2.

Fig. 5 is a vertical section on line 5—5 of Fig. 1.

Referring now to the drawings, a detector employing a jet of fluid under pressure, such as air, for the detection of the position of an edge of a web of material is depicted as comprising a pair of members 10 and 11 supported in spaced apart relation and respectively having threaded passages 12 and 13 therein and attached to a support device 14 by holding devices 15, the arrangement allowing for adjustment of the spacing of the supports.

The passage 13 in the support 11 has supplied thereto at constant volume rate fluid, such as air, under pressure, whereupon a pressure head is built up in chamber 16, a plate 17 having an elongate, narrow discharge slot 18 therein being secured across the inner end of the passage 13. A stream of air is discharged from the slot or delivery orifice 18 and impinges upon a like slot or receiver port 19 in a similar plate 20 secured to the arm 10 across the inner end of passage 12, the magnitude of pressure in the chamber 21 immediately behind the receiver port 19 depending on the percentage of the air stream impinging on the port, which in turn is determined by the degree of interception of the stream by the marginal portion adjacent the sensed edge 22 of a web 23 of material passing through the throat 24 formed by the two supports 10 and 11.

The delivery orifice 18 and the receiver port 19 are disposed with their longitudinal dimensions transverse to the lateral edge 22 of the web 23 whereby a substantial range is provided wherein the position of the edge 22 may be sensed, and rendering variation of signal pres-

sure developed in the receiver chamber 21 linearly responsive to lateral changes in the position of edge 22.

The signal pressure may be transmitted from the chamber 21 to a point of use such as a relay regulating signal pressure translating device, by a signal pipe threaded into the tapped passage 12.

As indicated before, the present invention is based on an improvement of the manner in which purging fluid is introduced into the signal system, particularly the signal chamber 21, and to a detector structure arranged for accomplishing such introduction, by means providing a passage from the supply chamber 16 to the receiver chamber 21, that in no way interferes with making adjustment of the throat width as permitted by means 14 and 15.

A passage 30 in the support 11 leads from the delivery chamber 13 to a bore 31 the axis of which is extended in the directions of adjusting movement of members 10, 11, and in which is secured a tube 32. The tube 32 extends across the throat 24 and is inserted in an aligned bore 33 in the support 10, from which a passage 34 leads to the receiver chamber 21. Sealing means in the form of an O-ring 35 surrounding the tube 32 provides a fluid-tight but adjustable seal between the tube 32 and the support bore 33, and a pressure drop-providing orifice 36 in the tube 32 reduces the pressure at which purging fluid is delivered to receiver chamber 21, to a level sufficiently low to insure non-interference with satisfactory development of signal pressure therein.

From the foregoing description, the advantages of the herein disclosed invention will be apparent, and it will be evident that changes in the details of structural arrangement may be resorted to within the scope of the invention as defined by the appended claims.

I claim:

1. A detector for sensing the lateral position of a body edge by fluid jet development of a pressure, said detector comprising a pair of structures spaced apart across a throat for clearance of the body, said structures having orifices opening into said throat in registered opposition, one of said structures having an internal passage communicating with said orifice thereof for supply to the latter of fluid for discharge, the other having an internal passage communicating with said orifice thereof for development of a signal pressure by fluid discharged across said throat from the first to the second said orifice, said structures having therein branch internal passages that respectively open into said supply and pressure development passages, means providing a passageway interconnecting said branch passages, and completing a flow path for purging fluid and means providing a flow restriction in said flow path.

2. A detector according to claim 1, wherein at least one of said structures is supported for adjustment toward and away from the other, and said passageway providing means comprises a tube having its axis disposed in the direction of adjustment movement of said structure, said tube extending between said structures, having end portions entered in bores therein that communicate with said branch passages, and means providing a slip-permitting seal between at least one of said end portions and the structure surrounding the bore wherein it is entered.

3. A detector according to claim 2, wherein said tube is provided with an internal bore having a region of smaller cross sectional area than the cross sectional area of the branch passage that opens into said supply passage and constituting said flow restriction providing means.

No references cited.