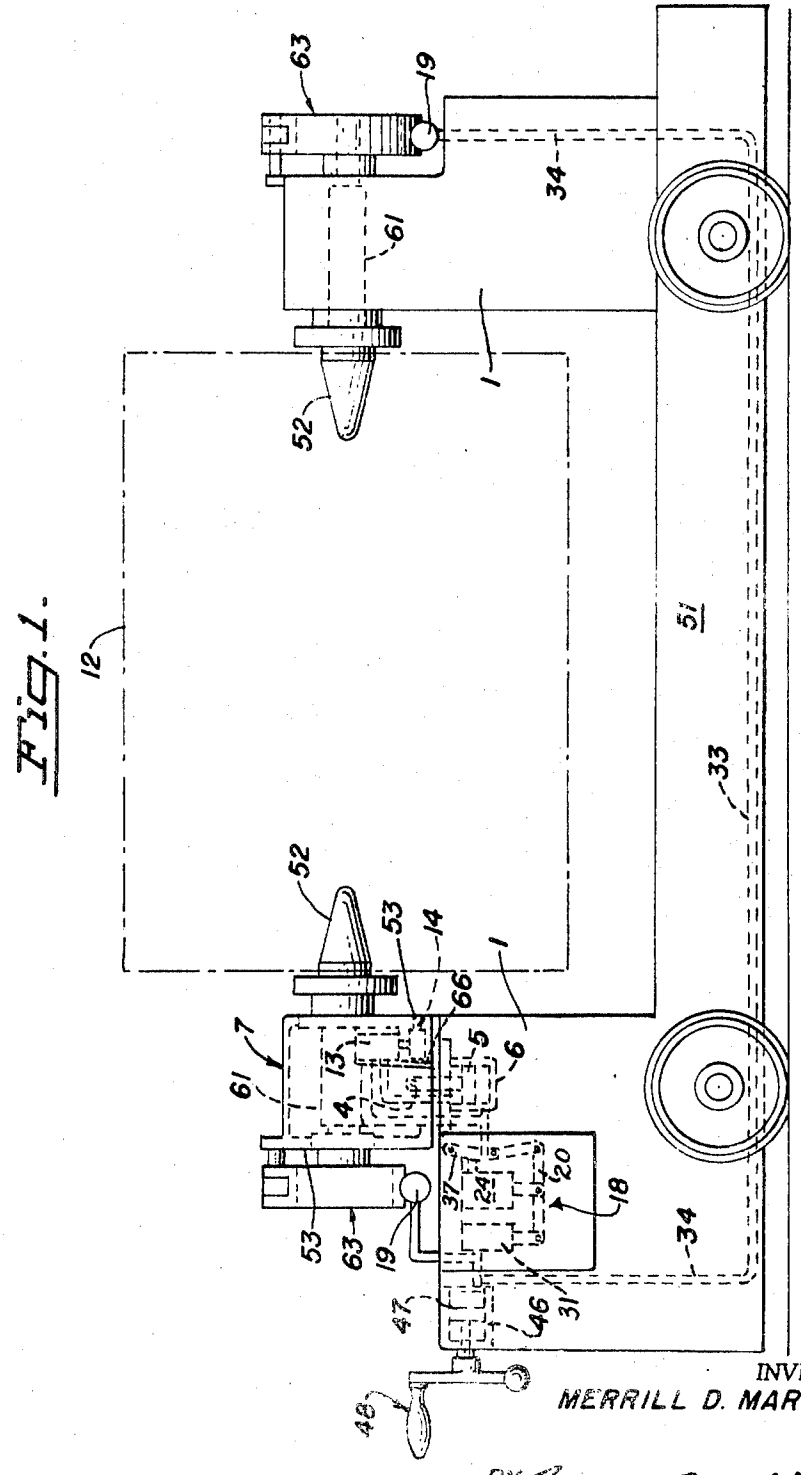
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AUTOMATIC BRAKE CONTROL FOR UPRIGHT WEB ROLL STANDS

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Fig. 1.



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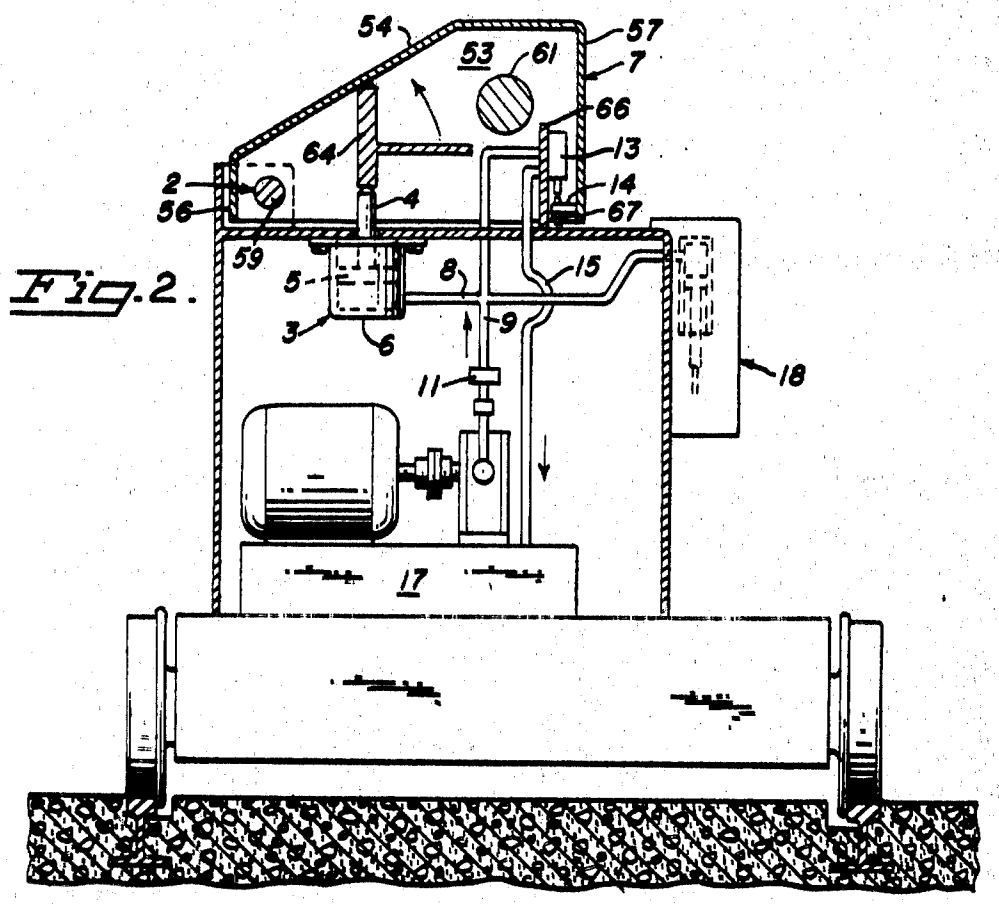


Fig. 2.

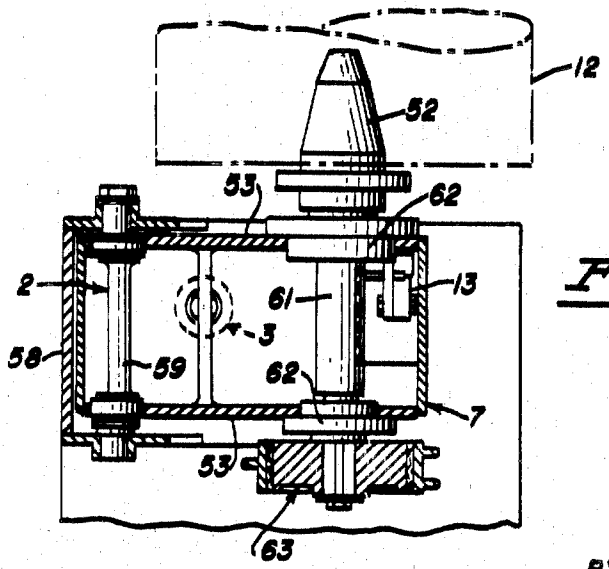


Fig. 3.

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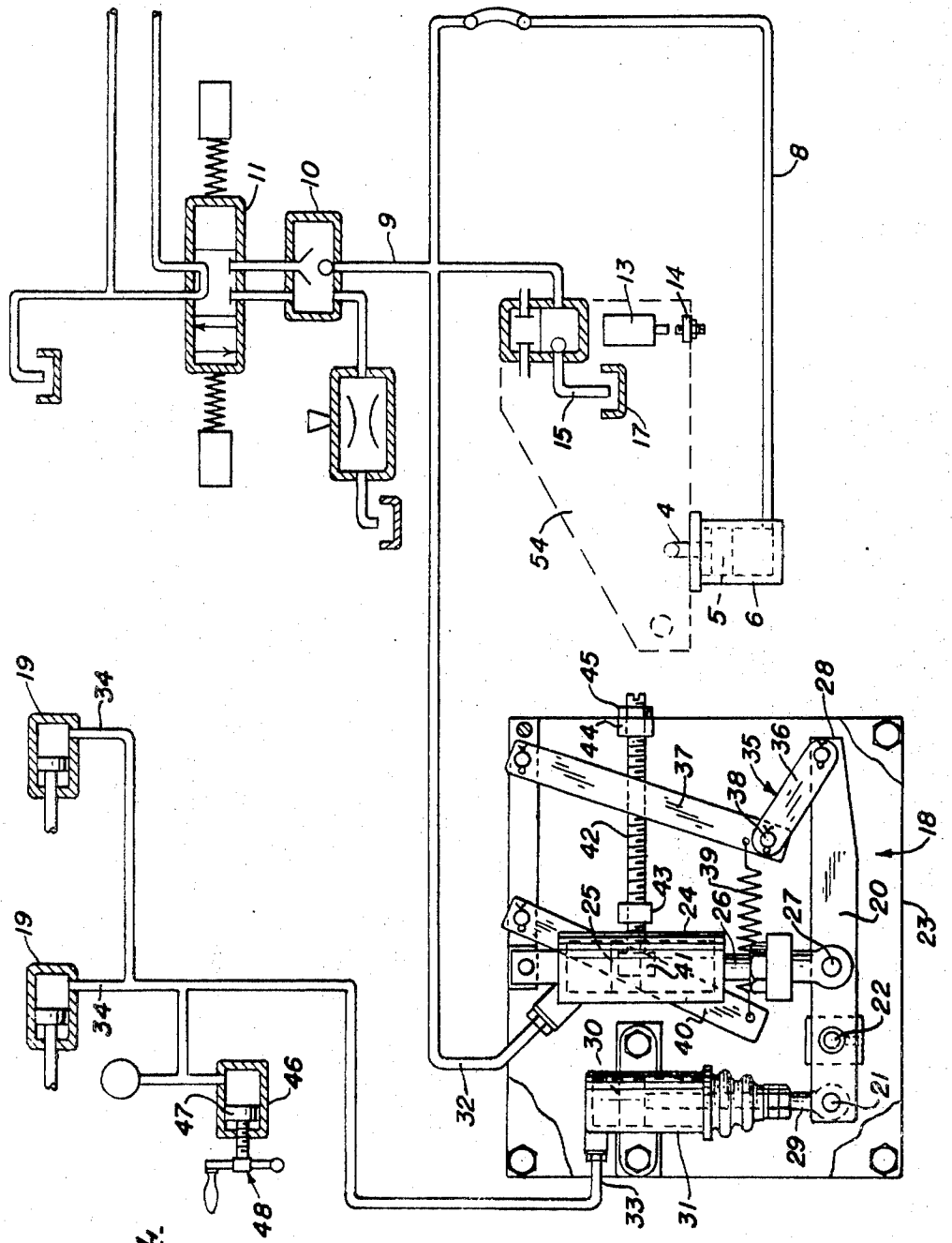


Fig. 4.

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3,488,014

AUTOMATIC BRAKE CONTROL FOR UPRIGHT WEB ROLL STANDS

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Int. Cl. B65h 23/16
U.S. Cl. 242—75.46 9 Claims

ABSTRACT OF THE DISCLOSURE

On an upright web roll stand, spaced uprights hold conical chuck spindles in axial registry to extend into the core of a web roll and rotatably hold the web roll for unwinding. Each spindle has a hydraulic brake for maintaining optimum tension on the roll. One of the chuck spindles is supported in a substantially vertically adjustable housing pivoted on the top of its upright, the axis of the pivot being generally parallel with the axis of the chuck spindle. The pivoted housing rests on the top of a hydraulic piston rod so as to be adjustable about its pivot. A hydraulic sensor system actuated by the weight of the web roll exerted on said pivoted housing controls the hydraulic brake tension on the chuck spindles according to the combined effect of the variation of the roll diameter and the weight of the roll.

BACKGROUND OF THE INVENTION

Automatic brake controls were successfully used on the type of web roll stands wherein the chuck spindles were held in swingable arms, as shown in U.S. Patent No. 3,276,711 issued on Oct. 4, 1966, and U.S. Patent No. 3,306,551 issued on Feb. 28, 1967, to Merrill D. Martin, wherein the arm lifting cylinders were part of the hydraulic control system. However, there is no successful automatic brake control on web roll stands with non-swingable uprights, therefore manual adjustment of brake pressure on the spindles prevailed and still prevails. In the herein invention the principle of the hydraulic system of said Patent No. 3,306,551 is applied to web rolls with non-swingable uprights, by a novel pivoted support of one of the spindle chucks the weight of which bears on an actuating cylinder which in turn operates the hydraulic sensor and regulator system for the brake control, thereby obviating the difficulties heretofore experienced on the type of web roll stands with non-swingable uprights.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a web roll stand with a pair of uprights.

FIG. 2 is a sectional view of the upright with the adjustable chuck spindle support.

FIG. 3 is a fragmental sectional detail view.

FIG. 4 is a hydraulic system diagram for the device.

DETAILED DESCRIPTION

In a web roll stand with spaced uprights **1**, in constant perpendicular attitude, the chuck spindle supporting structure on one of said uprights **1** is fulcrumed on a pivot **2** and rests on a hydraulic raising device **3**.

The hydraulic sensor and regulator system

As shown in the flow diagram in FIG. 4, which is similar to the flow diagram in said U.S. Patent No. 3,306,551, a piston rod **4** of piston **5** working in a cylinder **6** supports a bearing casing **7** of said chuck spindle supporting structure. As the weight and diameter of the web roll **12** varies during unwinding, the pressure exerted on the piston **6** varies correspondingly and through the hydraulic sensor and regulator system corresponding braking force is applied to both chuck spindles.

The hydraulic sensor and regulator system flows through an intake conduit **8** into the intake end of the lifting cylinder **6**. A conduit **9** connects the intake conduit **8** through a usual check valve **10** to the manually operated main valve **11**.

When the main valve **11** is opened to the conduit **9** then fluid under pressure flows into the cylinder **6** and pushes the piston **5** for raising and holding the bearing casing **7** in suitable chuck aligning position in the web roll **12**.

In order to correctly align the chuck spindles with the axis of the web roll **12** a stroke limiting valve **13** (FIGURE 2) is acted upon by an adjustable abutment **14** on the casing **7** so that after a predetermined rise of the casing **7** when the chuck spindle on the bearing casing **7** is in proper axial alignment, the abutment **14** opens the normally closed limiting valve **13** to a by-pass conduit **15**, thereby to by-pass flow from conduit **9** at a rate to limit the pressure in the intake conduit **8** thereby to hold the piston **5** at its predetermined aligning position.

The sensor and regulator device **18** is interconnected between the brake cylinder **19** and the intake conduit **8** so as to transmit variation of hydraulic pressure in the cylinder **6** and intake conduit **8** to the brake cylinders **19**.

The sensor and regulator device **18** (FIGURE 4) is substantially as shown on said U.S. Patent No. 3,306,551. It includes a lever **20** pivoted near one end thereof on a pivot **22**, which latter is supported on a plate **23** suitably mounted on the adjacent upright **1** of the unwind stand. On the plate **23** there is also pivotally mounted an end of a sensor cylinder **24**. A sensor piston **25** works in the sensor cylinder **24**. The piston rod **26** of the sensor piston **25** is suitably fulcrumed by a sensor pivot **27** to the lever **20** nearer to the lever pivot **22** then to the free end **28** of lever **20**.

To the lever end **21** is pivoted the piston rod **29** of a regulator piston **30** working in a regulator cylinder **31**. To the top of the sensor cylinder **24** is connected a sensor conduit **32** which connects to the intake conduit **8** or to conduit **9**. The outlet end of the regulator cylinder **31** is connected by a regulator conduit **33** and its branches **34** to the intake ends of the brake cylinders **19** on the chuck spindles.

As the pressure decreases in the raising cylinder **6** according to the weight of the paper roll or web roll **12**, the pressure in the sensor cylinder is also decreased permitting the sensor piston **25** to rise, thereby lowering the other end **21** of the lever **20** and pulling down the regulator piston **30**, thereby relieving part of the pressure in the braking cylinders **19**.

The weight of the web roll **12** and its diameter change together as the web is unwound, hence the regulation of brake pressure is compensated to the combined change of the web roll. For this purpose and adjustable balancing device **35** is pivoted upon the free end of the lever **20**. This balancing device **35** includes toggle links **36** and **37**, pivoted to one another. Toggle link **36** is pivoted to the free end of the lever **20** and the longer toggle link **37** is pivoted to the plate **23** in such manner that the toggle pivot **38** of the links **36** and **37** is normally offset toward the sensor cylinder **24**. A sensor coil spring **39** has one end hooked into the longer toggle link **37** above the toggle pivot **38**, and has its other end hooked into the lower end of a spring link **40** which latter is pivoted at its other end to the plate **23** in substantially horizontal registry with the top pivot of the longer toggle link **37**.

On the spring link **40** is a lug **41** in which is journalled the end of an adjusting screw **42**. This adjusting screw **42** is guided in a lug **43** on the plate **23** and is threaded into a threaded lug **44** near the edge of the plate **23**. The pull of the coil spring **39** presses the link lug **41** against the end of the adjusting screw **42** and this predetermines the tension of the sensor coil spring **39**. A nut **45** on the

outer end of the adjusting screw **42** bears against the threaded lug **44** to lock the adjusting screw **42** in the adjusted position.

The adjusted pull exerted by the sensor spring **39** holds the toggle pivot **38** in a predetermined position and thus holds the free end of the lever **20** in an initial position wherein the pistons **25** and **30** respectively in the sensor cylinder **24** and in the regulator cylinder **31** are substantially at the same level, the cylinders being substantially equal. This is an initially balanced attitude with predetermined resistance corresponding to the change of weight of the web roll as it is unwound.

A brake master cylinder **46** has its piston **47** adjusted by a suitable manual adjusting device **48** to a normal initial brake pressure in the brake cylinders **19**.

The adjustable chuck spindle support

The uprights **1** are supported on a wheeled base **51**, and usual means not herein shown, are provided to adjust the uprights so as to vary the distance between them for accommodating the web roll **12**. A chuck spindle **52** is suitably journalled at the top of each upright **1** so as to extend into and engage the core of the web roll **12**.

One of the chuck spindles **52** is journalled in the adjustable bearing casing **7** on the adjacent upright **1**. This casing **7** is in the form of a hood including opposite sides **53** (FIGURE 2) transverse to the axis of the adjacent chuck spindle **52**, a top **54** sloping toward a lower end wall **56**, and a higher end wall **57**. A pivot bracket **58** fixed on the top of the upright **1** holds a pivot shaft **59** extended through the sides **53** adjacent the lower end wall **56**, whereby the casing **7** is pivoted about an axis generally parallel with the axis of the chuck spindle **52**. The shaft **61** of the chuck spindle **52** is supported in suitable bearings **62** in the perpendicular sides **53** of the hood casing **7**. A suitable hydraulic brake **63** is mounted on the end of the chuck spindle shaft **61**, and another hydraulic brake **63** is on the fixed chuck spindle, each brake being controlled through one of the brake cylinders **19**, as heretofore described.

A fixed rib **64** extended from one side **53** to the other and parallel with the end walls **56** and **57** rests on the free end of the piston rod **4** to transmit pressure of the weight of the web roll on the hydraulic control system. The limiting valve **13** is mounted on a fixed bracket wall **66** and the by-pass actuating abutment **14** is extended from the adjacent end wall **57** of the casing **7** and it is preadjusted by an abutment screw **67** to actuate the by-pass in the properly aligned position of the chuck spindle **52** in the end wall **57**.

OPERATION

In operation, pressure in the raising cylinder **6** raises the piston **5** and through the piston rod **4** and the rib **64** raises the casing **7** about its pivot shaft **59**. After the axis of the chuck spindle **52** is slightly beyond the axially aligned position with the fixed chuck spindle **52** on the opposite upright **1**, and with the axis of the web roll **12**, the abutment **14** actuates the by-pass or limiting valve **13** to stop the rising of the casing **7**. Then the main valve **11** is closed and the weight of the web roll **12** is exerted on the liquid and the lifting piston **5** and the casing **7** are pushed slightly down into the proper chuck spindle aligning position, where the abutment **14** is disengaged from the limiting valve **13** which latter is allowed to return to its normally closed position. The weight of the web roll **12** is thus held on the closed hydraulic circuit, thereby the pressure presses down the sensor piston **25** in the sensor cylinder **24** so far as it is permitted by the pre-adjusted tension of the coil spring **39**. The movement of the lever **20** is the combined result of the increased pressure on the sensor piston **25** and of the pre-adjusted tension of the sensor spring **39**. This result movement or force upon the lever **20** correspondingly raises the other end **21** of the lever **20** and thereby pushes the regulator piston **30** into the regulator cylinder **31**, forcing fluid under pressure in the closed brake circuit through the regulator conduit **33** and its branches **34** into the brake cylinders **19** for correspondingly applying the brakes on the chuck spindles **52**. As the web roll **12** is unwound its diameter as well as its weight decreases and the pressure in the raising cylinder **6** raises the piston **5** and the casing **7** slightly, thereby actuates the by-pass limiting valve **13** and relieves the pressure in the system until the pressure and the weight of the cylinder is balanced, whereupon the casing **7** lowers into alignment and shuts off the limiting by-pass valve **13**. Due to the combined effect of the reduced pressure in the system and in the sensor cylinder **24** and of the pull of the pre-adjusted sensor spring **39**, the toggle links brake in further about the middle fulcrum **38** thereby raising the free end **28** of the lever **20** and correspondingly lowering the regulator piston **30** and thus decreasing the pressure in the brake cylinders **19**.

In this manner the brake action on the spindle chucks **52** of the unwind stand is automatically regulated according to the decrease of the diameter and weight of the web roll **12**, and constant tension is maintained on the web as it is unwound by the usual processing machine. One of the chuck spindles remains in fixed alignment, and the other chuck spindle **52** is maintained in substantial alignment with minimal play for the brake tension regulation as hereinbefore described.

The proportions and forces exerted by the sensor and regulator devices are substantially as described in said Patent No. 3,306,551, so as to produce the substantially constant tangential tension on the web unwound from web roll **12** through out the winding operation.

I claim:

1. In an unwind stand having stationary uprights and opposite chuck spindles adjustable toward one another to engage a web roll axially, each chuck spindle having a fluid actuated brake thereon, the improvement comprising:

(a) an adjustable journal support for at least one of said chuck spindles,

(b) fluid actuated raising means to raise said support so as to align the chuck spindle thereon with the axis of the web roll,

(c) a fluid actuated sensor system interconnected with said fluid actuated support raising means,

(d) a brake pressure regulator actuated by said sensor system according to the fluid pressure exerted in said fluid actuated support raising means by said web roll, for decreasing the brake resistance of said brakes to the rotation of said chuck spindles in accordance with the decrease of the weight and diameter of said web roll during unwinding thereby to maintain substantially constant tension on the web during the unwinding of said web roll,

(e) normally closed fluid by-pass means interconnected with said fluid actuated means to limit the raising of said chuck spindle support by by-passing liquid from said fluid actuated means whenever the fluid pressure overbalances said web roll,

(f) and means operated by the raising of said support beyond the axial alignment of the chuck spindle thereon for opening said normally closed by-pass means, thereby decreasing the pressure in said fluid actuated raising means and in said sensor and regulator system correspondingly to the decrease of pressure in said fluid actuated raising means.

2. The invention defined in claim **1** and said adjustable journal support comprising,

(g) a hood,

(h) journals for supporting a spindle chuck on said hood,

(i) means to pivotally connect said hood to the adjacent upright for adjustment of the position of said chuck spindle,

(j) a resting member formed in said hood spaced from said pivot,

(k) a moving member of said fluid actuated raising means engaging said resting member for raising said hood.

3. The invention defined in claim 2, wherein said fluid actuated raising means includes,

(l) a cylinder connected into said fluid actuated sensor system,

(m) said moving member being a piston working in said cylinder,

(n) and means to transmit the load on said chuck spindle and on said hood through said resting member to said piston.

4. The invention defined in claim 2, wherein the pivot axis of said pivotal connection means is generally parallel with and spaced from said chuck spindle.

5. The invention defined in claim 1, and

(g) said adjustable journal support includes journal casing,

(h) pivot support pivotally connecting the journal casing to the adjacent upright,

(i) said fluid actuated raising means engaging said journal casing at a point spaced from said pivot support for raising and lowering said casing about the axis of said pivot support,

(j) said means for opening said by-pass means including members on said by-pass means and on said casing coacting when said casing is moved,

(k) and means to pre-adjust the relation between said coacting members for operating said by-pass at a predetermined casing position relatively to the axis of said chuck spindle.

6. The invention defined in claim 5, and

(l) the axis of said pivot support being generally parallel with the axis of the journal of the adjacent chuck spindle.

7. The invention defined in claim 1 and

(g) said adjustable journal support including a journal casing,

(h) means to pivotally connect said journal casing to the adjacent upright, the pivot axis being spaced from the axis of the adjacent chuck spindle,

(i) said means for opening said by-pass means including coacting members on said by-pass means and on said casing operating when said casing is moved about said pivot,

(j) means to pre-adjust at least one of said coacting members for operating said by-pass at a predetermined casing position relatively to the alignment of the chuck spindle thereon.

8. The invention defined in claim 7 and

(k) said fluid actuated raising means engaging said journal casing between said pivot support and said coacting members.

9. The invention defined in claim 8, wherein the axis of said pivot support is generally parallel with the axis of the chuck spindle on said casing.

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