June 10, 1958 J. J. TOMASCH 2,838,252

WEB TENSION CONTROL

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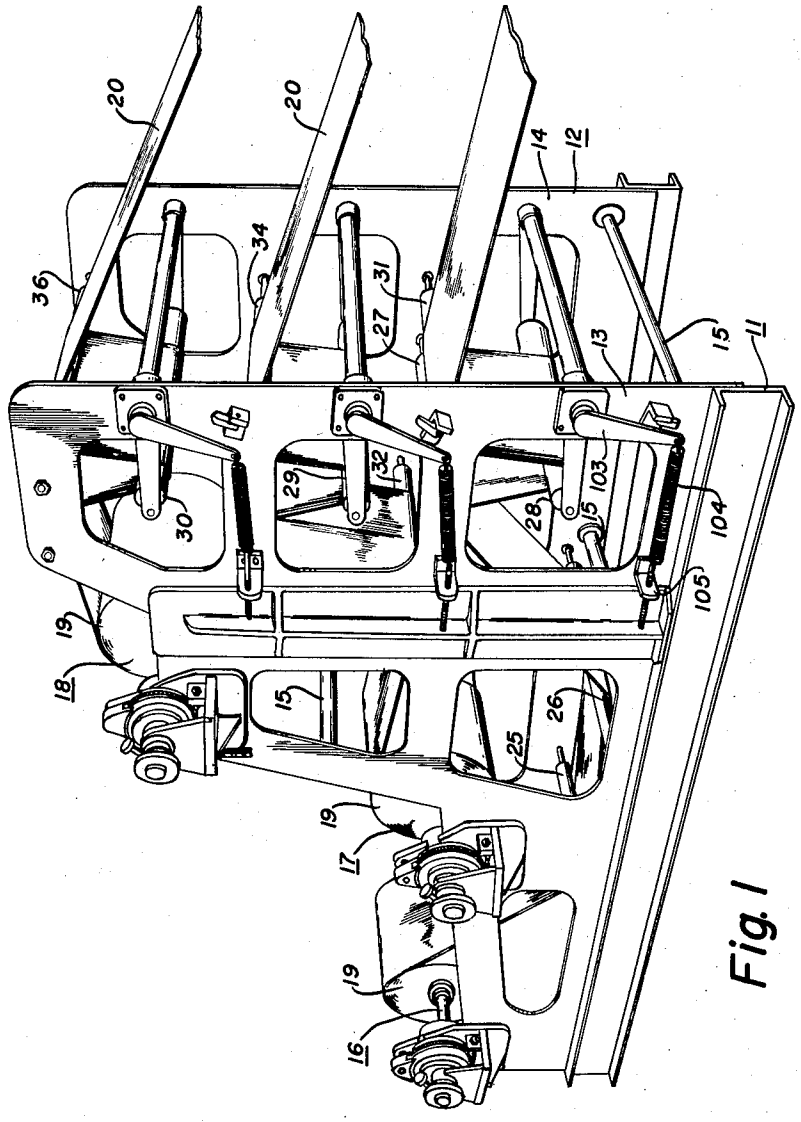


Fig. 1

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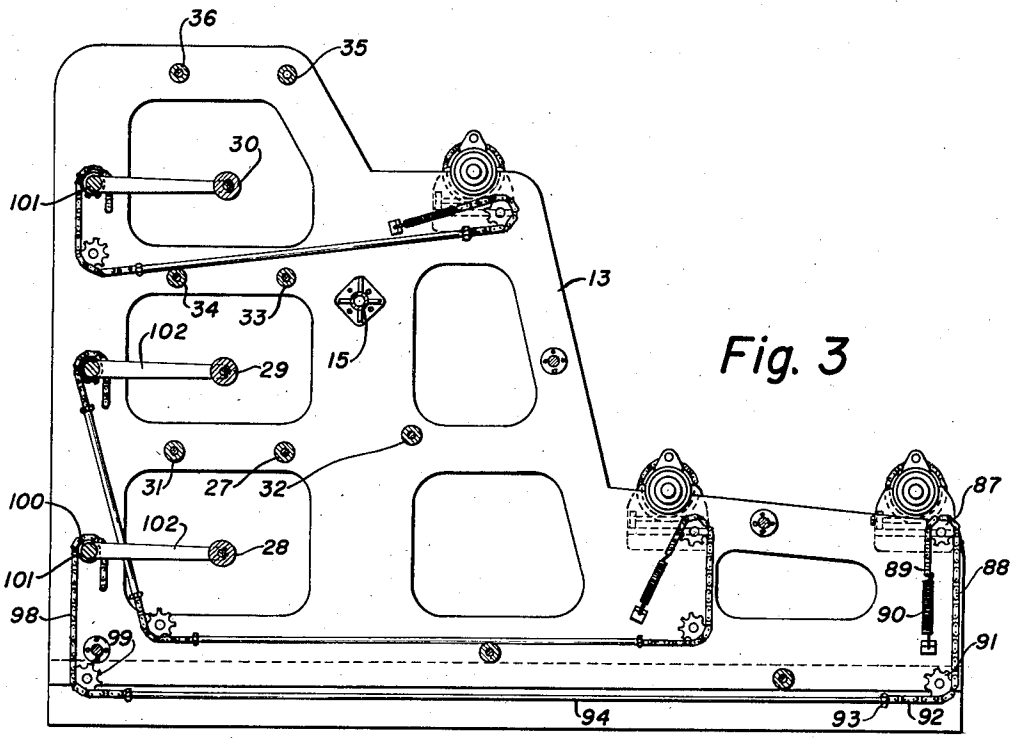


Fig. 3

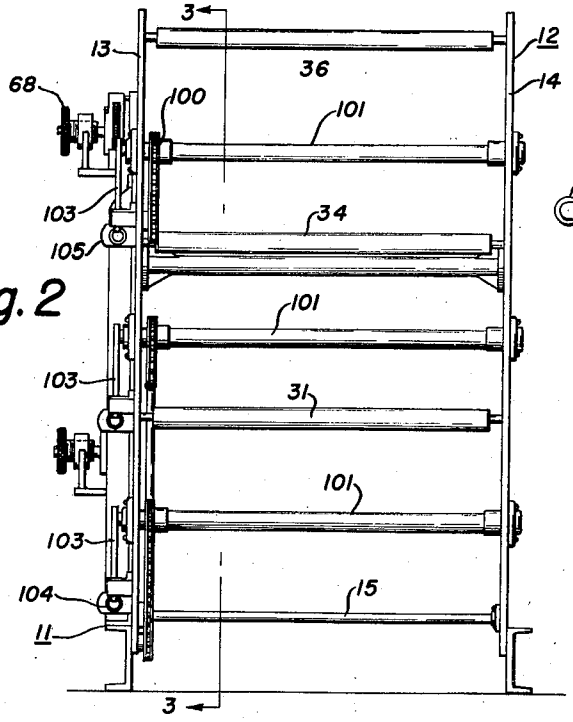


Fig. 2

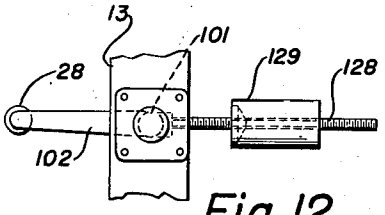


Fig. 12

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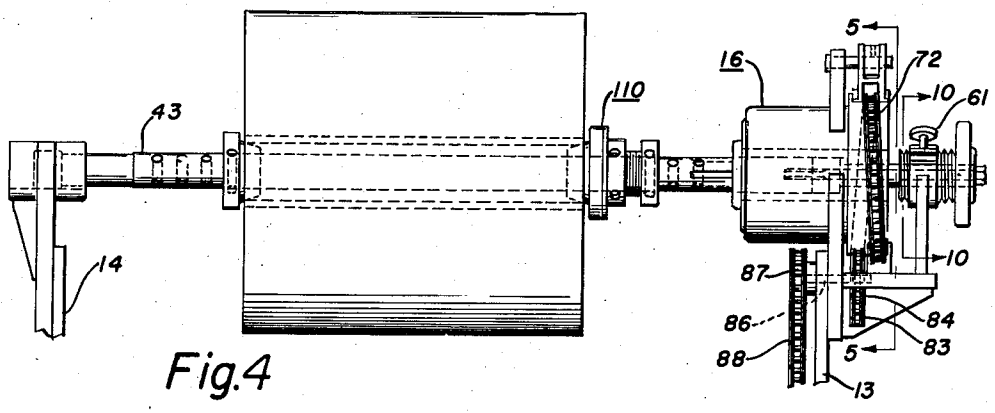


Fig.4

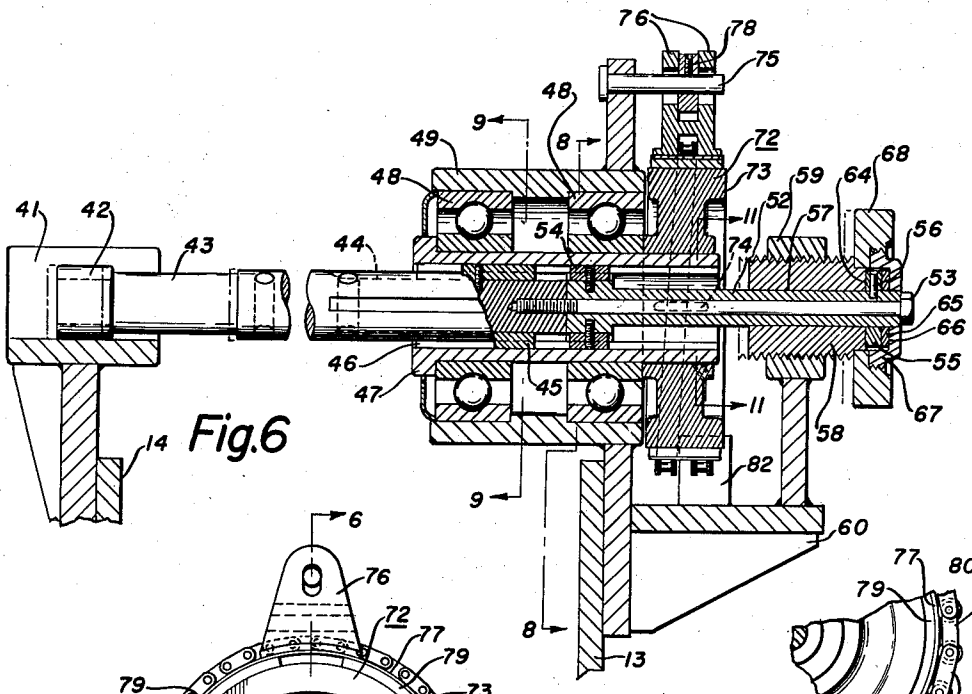


Fig.6

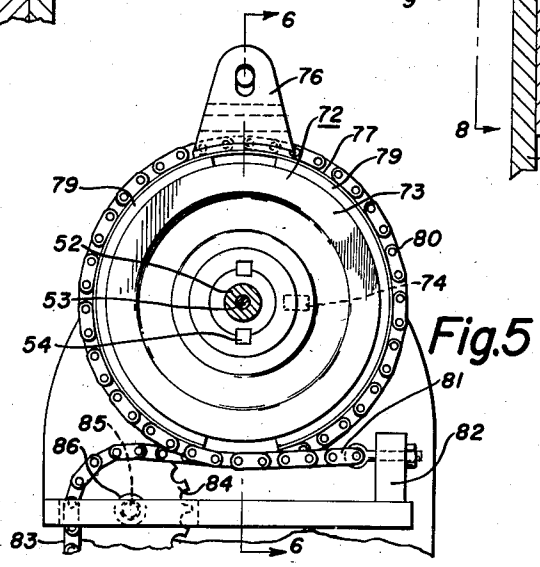


Fig.5

Fig.13

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WEB TENSION CONTROL

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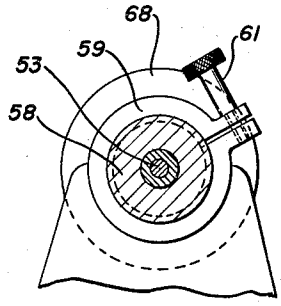


Fig. 10

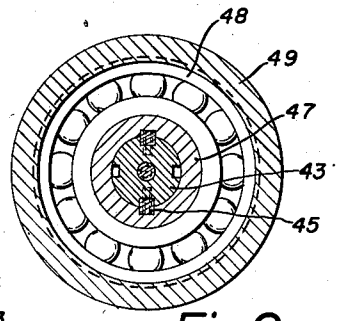


Fig. 9

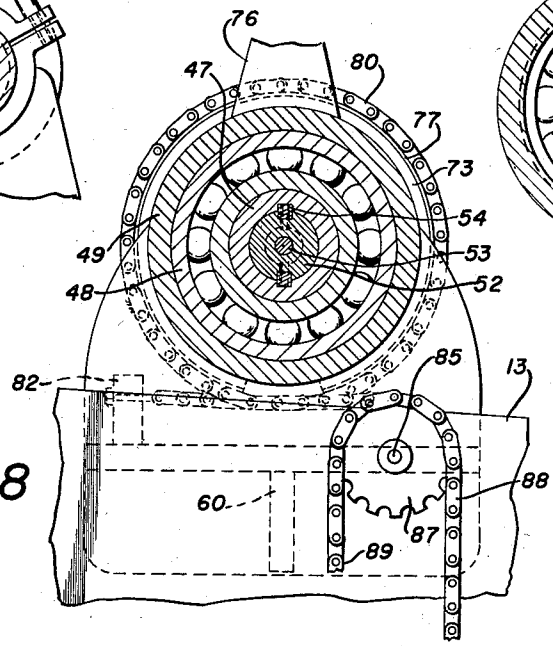


Fig. 8

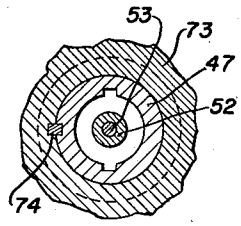


Fig. 11

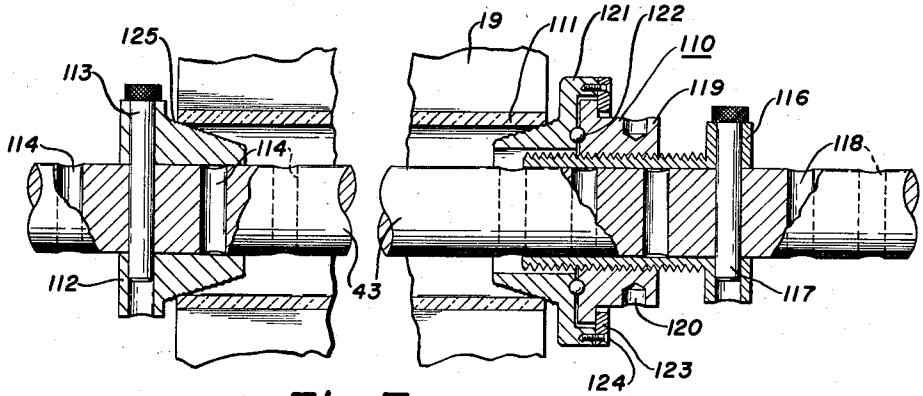


Fig. 7

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2,838,252

WEB TENSION CONTROL

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Application May 1, 1953, Serial No. 352,480

4 Claims. (Cl. 242—75.43)

The invention relates in general to web tension control devices and more particularly to a rapid acting brake and adjustable spindle mechanism used in a frame which carries a rolled web.

The invention may be used in the paper industry wherein rolls of paper are unwound from a reel and passed over guide rolls into a printing or binding machine. The paper rolls must be properly aligned so that the web or paper will accurately travel from the supporting frame into the receiving paper machine. Since the machine which receives the paper may have varying speed requirements, it is essential that the roll of paper be controlled as to frictional drag in order to provide the correct tension on the paper and to prevent the paper from unrolling too fast. Brakes on the spindle carrying the paper roll have previously been used; however, their greatest difficulty has been in that their action is not quick enough and the paper will either tear because of too great a frictional drag on the paper roll or else the brake will not act quickly enough resulting in a surplus of paper between the roll and the paper receiving machine with consequent loss of proper tension on the paper web.

An object of the invention is to provide a rapid acting brake for a rotatable spindle.

Another object of the invention is to provide a rapid acting brake for a spindle carrying a rolled web wherein the spindle is longitudinally adjustable for proper alignment of the web while running.

Another object of the invention is to provide a brake mechanism utilizing a flexible brake band almost completely encompassing a brake drum.

Another object of the invention is to provide a brake mechanism utilizing a chain circumscribing a flexible steel brake shoe having brake linings almost completely circumscribing a rotatable brake drum wherein the chain may move relative to the steel strap to provide a rapidly engageable and disengageable frictional drag.

Another object of the invention is to provide a frame for supporting a plurality of rolled webs wherein each web travels under a swing roll with the swing roll mechanically and positively interconnected with a rapid acting brake mechanism to adjust the tension on the web.

Another object of the invention is to provide a longitudinally adjustable spindle adjustable while rotating by a threaded interconnection between the rotating spindle and the frame.

Other objects and a fuller understanding of this invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of the entire web tension control frame;

Figure 2 is a front end view of the frame;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is a partial rear view of a roll, spindle and brake mechanism;

Figure 5 is a sectional view taken on the line 5—5 of Figure 4;

Figure 6 is a sectional view on the line 6—6 of Figure 5;

Figure 7 is an elevational sectional view taken through the paper roll and spindle;

Figure 8 is a partial view taken on the line 8—8 of Figure 6;

Figure 9 is a sectional view on the line 9—9 of Figure 6;

Figure 10 is a sectional view taken on the line 10—10 of Figure 4;

Figure 11 is a sectional view on the line 11—11 of Figure 6;

Figure 12 is a modification showing a counterweight; and

Figure 13 is a modified form of chain.

The Figures 1 to 11 show the complete web tension control machine **11**. The machine **11** has a frame **12** which includes first and second side frame members joined together by spacing members **15**. The frame **12** journals first, second, and third reel mechanisms **16**, **17**, and **18**, each of which are substantially identical and interchangeable. Each reel mechanism is adapted to carry a spool or roll of paper **19**. While rolls of paper have been shown, it will be understood that any rolled web may be utilized and of any width up to the maximum capacity of the machine **11**. This machine has particular adaptation to the paper industry wherein paper webs **20** may be unrolled from the rolls **19** and fed into a paper receiving machine, not shown, from the front of the machine **11**. The web **20**, coming off the roll on the reel mechanism **16**, travels under an idler roller **25**, an idler roller **26**, then up over an idler roller **27**, and down under a swing roller **28**. It then passes over an idler roller **31** and out to the machine receiving the paper web. In a similar fashion the paper web from the reel mechanism **17** travels under an idler roller **32**, over and idler roller **33**, under a swing roller **29**, and over an idler roller **34** to the machine receiving the paper web. The web from the roll on the reel mechanism **18** travels over an idler roller **35**, under a swing roller **30**, and over another idler roller **36**. It will be noted that the reel mechanism **18** is placed above the other two reel mechanisms **16** and **17** in order to conserve floor space in the machine and further that the swing rollers **28**, **29**, and **30** are mounted in vertical alignment. All the rollers **25** through **36** are journaled in the side frames **13** and **14** and preferably mounted on ball bearings to minimize the frictional bearing resistance.

The reel mechainsms are identical, hence, only one will be explained in detail. The details of construction are shown in Figures 4 through 11. The Figure 4 generally shows the reel mechanism **16** from the rear of the machine. The side frame **14** has a U-shaped bearing support **41** which supports a roller bearing **42** on one end of a spindle **43**. The other end of the spindle **43** has a keyway **44** receiving a key **45** therein. The key **45** is slidably received in a keyway **46** in a spindle sleeve **47**. The key **45** interconnects the spindle **43** and spindle sleeve **47** for positive common rotation yet permits relative longitudinal movement of the spindle **43** relative to the spindle sleeve **47**. The spindle sleeve is journaled in ball bearings **48** and the outer races of the bearings **48** are carried in a bearing housing **49** fastened to the side frame member **13**. A cylindrical spindle extension **52** is fastened to the second end of the spindle **43** by a bolt **53**. This spindle extension **52** is keyed by keys **54** to the spindle sleeve **47** so that it turns therewith. A steel disk **55** in connected by a pin **56** to the spindle extension **52** so that it rotates with the spindle **43**. The spindle extension **52** extends closely within a bore **57** in a male

threaded member 58 made of brass. The threaded member 58 rotatably engages a split spring nut 59 fixedly carried on the frame member 13 by a bracket 60. The split nut 59 may be clamped on the brass member 58 by a manually operated threaded bolt 61, best shown in Figure 10.

The threaded member 58 has an end face 64 which is contacted by a rotating face on the steel disk 55. The opposite face of the steel disk 55 contacts a face of a brass washer 65. The opposite face of the brass washer 65 engages the under side 66 of a threaded cap 67 threaded into a hand wheel 68. The hand wheel 68 has a press fit for fixed interconnection with the threaded member 58. Thus, when the manual threaded bolt 61 is loosened, an operator may grasp the hand wheel 68 rotating it and the threaded member 58. This will cause a push or a pull on the steel disk 55 which longitudinally shifts the spindle 43. This longitudinal shifting is shown in dash-dot lines in Figure 6. The manual threaded bolt 61 may then be tightened upon the threaded member 58 to retain the selected longitudinal position. When the spindle 43 is rotating, the steel disk 55 also rotates and bears against the end face 64 of the brass member 58 and against the face of the brass washer 65. This steel-to-brass rotational connection prevents seizing, and the longitudinal clearance between the brass member 58, the steel disk 55, and the brass washer 65 is preferably made only sufficient to permit running clearance.

The reel mechanisms 16, 17, and 18 each include a brake mechanism 72. These brake mechanisms include a brake drum 73 fixedly attached to the spindle sleeve 47 as by the key 74. A pivot pin 75 is carried on the frame member 13 and pivotally supports mounting ears 76. The mounting ears 76 have a flexible and resilient steel strap 77 as a brake shoe attached thereto. The mounting ears 76 are provided with an adjusting screw 78 to raise and lower the brake shoe 77 relative to the brake drum 73. Arcuate brake lining segments 79 are fixedly attached to the inside of the steel strap 77. A first roller chain 80 extends around the periphery of the steel strap 70 and lies between the mounting ears 76 but is not fastened to the steel strap 77. A first end 81 of the chain 80 is fastened to the frame member 13 by a bracket 82. The second end 83 of the chain 80 meshes with approximately ninety degrees of a sprocket wheel 84. This sprocket wheel 84 is fixedly attached to a sprocket shaft 85 journaled at 86 to the frame member 13. A second sprocket wheel 87 is fixedly attached to the sprocket shaft 85, and hence, rotates in direct accordance with the sprocket wheel 84. The second end 83 of the chain 80 hangs free below the sprocket wheel 84. A second roller chain 88 meshes with the sprocket wheel 87 as shown in Figure 8. A first end 89 of the chain 88 is connected by a coil spring 90 to the frame member 13 as shown in Figure 3. The chain 88 extends around a sprocket wheel 91 journaled near the bottom of the frame member 13. The second end 92 of the chain 88 is adjustably attached by a coupling 93 to a stiff tube 94. A chain 98 extends from the opposite end of the tube 94 around a sprocket wheel 99 and a sprocket wheel 100. The sprocket wheel 99 is journaled to the frame member 13 and the sprocket wheel 100 is fixedly attached to a swing roller shaft 101. As shown in Figure 1, a spring arm 103 is fixedly attached to the shaft 101. A swing roller arm 102 is also fixedly attached to the shaft 101; hence, the sprocket wheel 100, shaft 101, arm 102, and spring arm 103 rotate together. The shaft 101 is journaled in the frame member 13. A coil spring 104 extends to an adjustable fastening bracket 105 on the frame member 13.

The machine receiving the paper web 20 from the tension control machine 11 may have varying demands as to speed and acceleration of the web 20. As the web 20 is accelerated by the receiving machine, the swing roller 28 will swing upwardly. As viewed in Figure 3, this will rotate counterclockwise the sprocket wheels 100, 99, 91, and 87. As viewed in Figure 5, this movement will be clockwise on the sprocket wheel 84. This loosens the roller chain 80 to release the frictional engagement of the brake lining 79 and brake drum 73. The natural resiliency of the steel strap 77 permits this decrease of frictional engagement. The coil spring 90 is primarily for the purpose of counteracting the weight of the stiff tube 94 but also acts through the sprocket wheels 87 and 84 to release the braking torque. The coil spring 104 is to counteract a preponderance of the weight of the swing roller 28. Thus, the tension in the web 20 is only sufficient to support a small portion of the weight of the swing roller 28. When the machine is running normally, the swing roller 28 is in a vertical position such that the force transmitted to the brake mechanism 72 is just sufficient to establish the frictional drag on the brake drum 73 at a value to maintain the required web tension. If the web receiving machine has an increased demand, the swing roller 28 will move upwardly to release the braking torque; and if the web receiving machine has a decreased demand, the swing roller 28 will move downwardly to immediately apply an increased braking torque. Since all rollers 25 through 36 are mounted on ball bearings, the frictional resistance is held to a minimum and thus the machine 11 responds at a maximum rate to the varying demands.

The roller chain 80 is not attached to the steel strap 77 and it will be observed that as the sprocket wheel 84 rotates clockwise as viewed in Figure 5, the roller chain 80 shifts counterclockwise on the surface of the steel strap 77. This relative rotational movement between the chain 80 and the brake shoe strap 77 permits rapid actuation of the brake mechanism 72 and also assures that the frictional drag may be completely eliminated without dragging of the brake linings at either top or bottom. This is a considerable improvement over the prior art forms of brakes wherein two rigid arcuate brake shoes are pivoted at one end and variably clamped against the brake drum by movement of the other end. Further, the flexible and resilient brake shoe strap 77 permits substantially equal forces everywhere around the periphery of the brake drum 73 to thus utilize the brake lining 79 in the most efficient manner.

The Figure 13 shows a modified form of roller chain 80A wherein the side links 95 of the chain are sufficiently narrow that the rollers 96 of the roller chain 80A rollably contact the brake shoe strap 77. This will provide a rolling friction rather than sliding friction of the chain relative to the brake shoe to thus help establish even more rapid and positive energization and de-energization of the brake mechanism 72.

The Figure 7 shows a sectional view through the spindle 43 showing the roll engaging mechanism 110. The roll of paper 19 has a hollow cylindrical core 111 which characteristically is made of hard cardboard, wood, or the like. A cone 112 is connected by a headed pin 113 to the spindle 43 in any one of a series of holes 114. These holes 114 provide longitudinal adjustment of the cone 112. A male threaded collar 116 is connected by another headed pin 117 in any one of a series of holes 118. A nut 119 is threaded on the collar 116 and the nut 119 may have spanner holes 120 for receiving a spanner wrench. A cone 121 is journaled to the nut 119 by a thrust bearing illustrated by the balls 122. The cone 121 is retained on the nut 119 by a flange washer 123 and bolts 124. The cones 112 and 121 may have serrated teeth 125 on the conical surface thereof to bite into the roll core 111. Thus, the roll 19, core 111, and cones 112 and 121 are locked to the spindle 43 for common rotation. To remove the roll 19, the nut 119 may be backed off the threaded collar 116. This will loosen the cone 121 so that one or both pins 113 and 117 may be removed. The entire spindle 43 may be quickly removed from the machine by unscrewing the bolt 53 which will separate the spindle 43 from the spindle extension 52.

The spindle 43 and keys 45 will then slide longitudinally out of the spindle sleeve 47. The process is reversed to replace a new roll on the cones 112 and 121.

The Figure 12 shows a modified construction for relieving the preponderance of the weight of the swing roller 28. The Figure 12 is a side view of a portion of the frame member 13, viewed generally as in Figure 1. The swing roller arm 102 has a rearward extension shown as a threaded arm 128 threadably carrying a counterweight 129. Rotation of the counterweight 129 will change the proportion of weight of the swing roller 28 which is counterbalanced. The modification of Figure 12 is merely by way of example, and it will be readily observed by those skilled in the art that other forms and mountings may be used for a counterweight, as well as different means for adjusting the position of the counterweight relative to the swing roller shaft 101.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A web tension control device for a rolled web, comprising, a frame, a spindle mechanism including a revoluble spindle journaled in said frame for carrying said rolled web, a swing roll under which the web is adapted to travel and disposed for up and down movements in said frame in accordance with increased and decreased tension, respectively, in said web, and a brake mechanism interconnecting said spindle and said frame to variably brake said spindle in accordance with the up and down position of said swing roll, said spindle mechanism including said spindle and an adjustment mechanism for longitudinally adjusting said revoluble spindle relative to said frame, said spindle adapted to carry said rolled web, a bearing housing on said frame journaling a revoluble spindle sleeve, an end of said spindle extending into said spindle sleeve and positively interconnected therewith for common rotation yet permitting longitudinal movement of said spindle relative to said sleeve, a threaded handwheel interconnecting said frame and said spindle to provide longitudinal adjustment of said spindle and hence transverse adjustment of said rolled web, said brake mechanism including a brake drum fixedly attached to said spindle sleeve for rotation therewith, a flexible and resilient strap extending around said brake drum, brake lining fixedly carried on the inner peripheral surface of said strap and disposed to contact the outer peripheral surface of said brake drum, a chain having first and second ends, means to link said first end of said chain to said frame, said chain extending completely around and overlapping and contacting the outer periphery of said strap but not attached thereto, said swing roll being linked to said second end of said chain to pull on said chain with downward movements of said swing roll to bring said brake lining into frictional engagement with said brake drum and upward movements of said swing roll causing release of said frictional engagement of said brake lining and said brake drum.

2. A web tension control device for a rolled web, comprising, a frame, a spindle mechanism including a revoluble spindle journaled in said frame for carrying said rolled web, a swing roll under which the web is adapted to travel and disposed for up and down movements in said frame in accordance with increased and decreased tension, respectively, in said web, and a brake mechanism interconnecting said spindle and said frame to variably brake said spindle in accordance with the up and down position of said swing roll, said spindle mechanism including said spindle and an adjustment mechanism for longitudinally adjusting said revoluble spindle relative to said frame, said spindle adapted to carry said rolled web, a bearing housing on said frame journaling a revoluble spindle sleeve, an end of said spindle extending into said spindle sleeve, means to positively interconnect said spindle and said spindle sleeve for common rotation yet permitting longitudinal movement of said spindle relative to said sleeve, a flange fixed to the outer end of said spindle to rotate therewith and having first and second faces substantially normal to said spindle axis, a nut mounted on said frame substantially coaxial with said bearing, a hollow male threaded member threadably engaging said nut, said spindle being received within said male member, said male member having an end face disposed to contact the rotating first face of said flange, a handwheel fixedly attached to said male member and outboard thereof, a washer disposed about said spindle and having a third face disposed to contact the rotating second face of said flange, a cap engaging said handwheel, and a fourth face on said washer disposed to contact a fifth face on the under side of said cap, said handwheel being rotatable to transversely shift said rolled, web, said brake mechanism including, a brake drum having a substantially cylindrical outer peripheral surface fixedly attached to said spindle sleeve for rotation therewith, a pivot pin fixedly carried in said frame and having an axis spaced from and substantially parallel to the axis of said spindle, first and second spaced swingable mounting ears swingably carried on said pivot pin, a flexible and resilient strap circumscribing approximately three hundred thirty degrees of arc and fixedly mounted on said spaced swingable mounting ears, brake lining fixedly carried on the inner peripheral surface of said strap and disposed to contact the outer peripheral surface of said brake drum, a sprocket wheel shaft journaled in said frame on an axis substantially parallel to said spindle axis and spaced therefrom beyond the periphery of said brake drum, first and second sprocket wheels fixedly attached to said sprocket wheel shaft for rotation therewith, said first sprocket wheel lying generally within the plane of said brake drum and said second sprocket wheel lying outside said plane, a first roller chain having first and second ends, means to link said first end of said chain to said frame, said chain extending around and contacting the outer periphery of said strap but not attached thereto and meshing with said first sprocket wheel near said second end of said first chain, a second roller chain having a first and second end, a coil spring linking said first end of said second chain to said frame, said second chain meshing with said second sprocket wheel, said swing roll carrying a third sprocket wheel to partially rotate in accordance with up and down movements of said swing roll, said second end of said second chain meshing with said third sprocket wheel, whereby downward movements of said swing roll causing a pull on said second chain against the urging of said spring to thus bring said brake lining into frictional engagement with said brake drum outer surface against the urging of said strap, and upward movements of said swing roll causing release of said spring to move said brake lining out of frictional engagement with said brake drum.

3. A web tension control device for a rolled web, comprising, a frame, a spindle mechanism including a revoluble spindle journaled in said frame for carrying said rolled web, a transversely movable roll around which the web is adapted to travel and disposed for transverse movements in said frame in accordance with increased and decreased tension in said web, and a brake mechanism interconnecting said spindle and said frame to variably brake said spindle in accordance with the transverse position of said roll, said spindle mechanism including an adjustment mechanism for longitudinally adjusting said revoluble spindle relative to said frame, said spindle adapted to carry said rolled web, a threaded handwheel interconnecting said frame and said spindle to provide longitudinal adjustment of said spindle and hence trans-

verse adjustment of said rolled web, said brake mechanism including a brake drum fixedly attached to said spindle for rotation therewith, a flexible and resilient brake shoe extending around said brake drum, a chain extending completely around and overlapping and contacting the outer periphery of said brake shoe but not attached thereto, said transverse roll being linked to an end of said chain to pull on said chain with movement of said transversely movable roll in a first direction to brake said brake drum and movement of said transversely movable roll in a second direction causing release of braking engagement on said brake drum.

4. A web tension control device for a rolled web, comprising, a frame, a spindle mechanism including a revoluble spindle journaled in said frame for carrying said rolled web, a swing roll around which the web is adapted to travel and disposed for swinging movements in said frame in accordance with increased and decreased tension in said web, and a brake mechanism interconnecting said spindle and said frame to variably brake said spindle in accordance with the swinging position of said swing roll, said spindle mechanism including an adjustment mechanism for longitudinally adjusting said revoluble spindle relative to said frame, said spindle adapted to carry said rolled web, a bearing housing on said frame journaling a revoluble spindle sleeve, an end of said spindle extending into said spindle sleeve and positively interconnected therewith for common rotation yet permitting longitudinal movement of said spindle relative to said sleeve, a threaded handwheel interconnecting said frame and said spindle to provide longitudinal adjustment of said spindle

and hence transverse adjustment of said rolled web, said brake mechanism including a brake drum fixedly attached to said spindle sleeve for rotation therewith, a flexible and resilient strap extending around said brake drum, brake lining fixedly carried on the inner peripheral surface of said strap and disposed to contact the outer peripheral surface of said brake drum, a chain extending completely around and overlapping and contacting the outer periphery of said strap but not attached thereto, said swing roll being linked to an end of said chain to pull on said chain with movement of said swing roll in a first direction to bring said brake lining into frictional engagement with said brake drum and movement of said swing roll in a second direction causing release of said frictional engagement of said brake lining and said brake drum.

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