

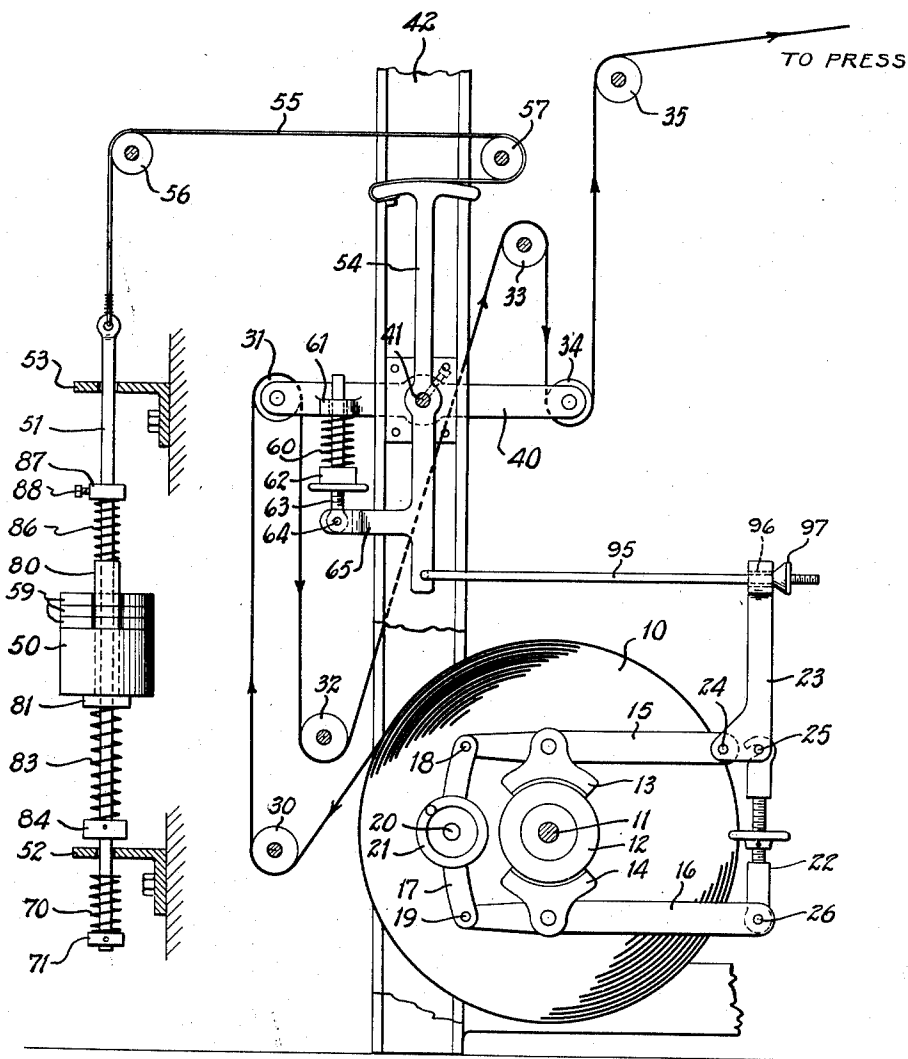
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WEB TENSION APPARATUS

2,623,703

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2 SHEETS—SHEET 1



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2 SHEETS—SHEET 2

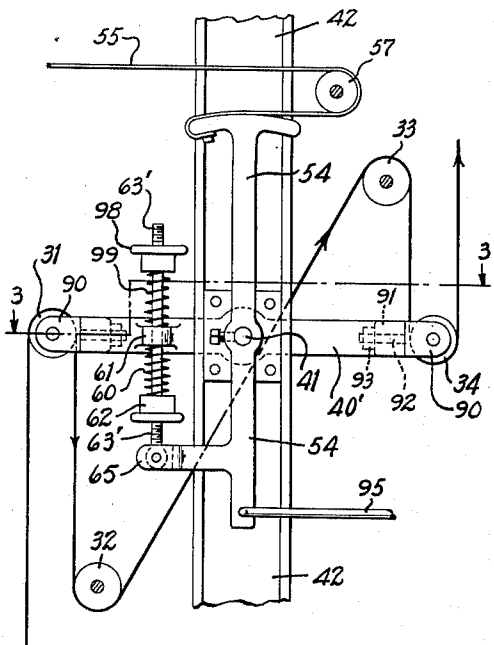


Fig. 2

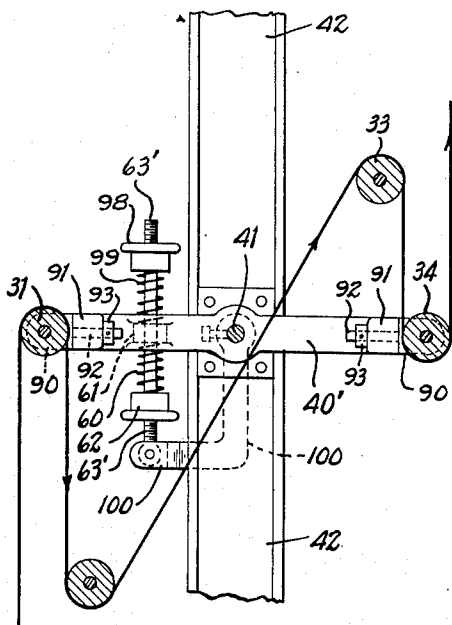
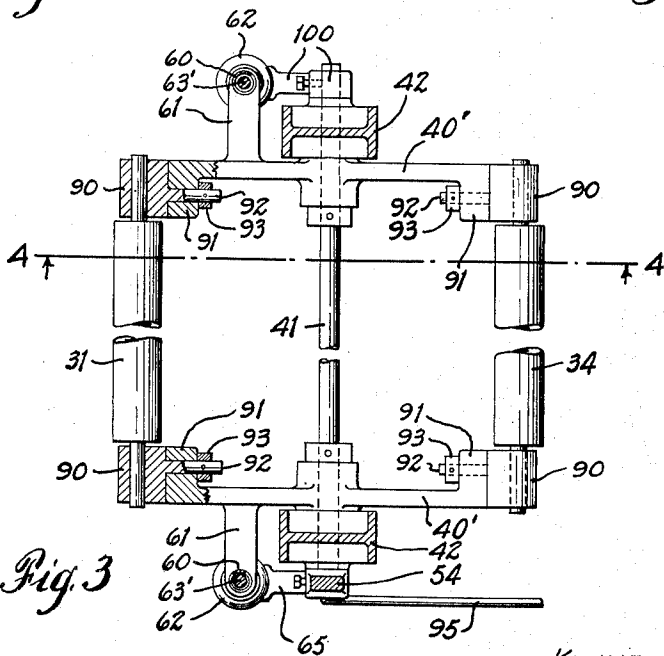


Fig. 4



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WEB TENSION APPARATUS

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The present invention relates to new and useful improvements in web tension apparatus particularly useful in controlling the feed of a paper web to a high speed rotary printing press.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawings, referred to herein and constituting a part hereof, illustrate embodiments of the invention, and together with the description, serve to explain the principles of the invention.

The present invention has for its object the provision of a novel and improved web tension apparatus which will maintain a substantially constant tension on the web regardless of the diameter of the web roll. A further object of the invention is the provision of an improved web tension apparatus by which a predetermined degree of tension on the web can be easily and accurately established and maintained substantially constant throughout the running of the roll. Still another object of the invention is the provision of a web tension apparatus for rotary printing presses which maintains a substantially constant degree of tension on the web at widely different speeds of operation.

Of the drawings:

Figure 1 is a side elevation, partially schematic, showing a typical, preferred and illustrative embodiment of the present invention;

Figure 2 is an end elevation showing a portion of a modified embodiment of the present invention, the remainder of the parts being arranged and constructed as shown in Figure 1;

Figure 3 is a horizontal sectional view taken on the line 3-3 of Figure 2; and

Figure 4 is a vertical section taken on the line 4-4 of Figure 3.

Referring now in detail to the illustrative embodiment of the invention as shown in Figure 1 of the accompanying drawings, the invention is shown as applied to a conventional web roll support in which a web roll 10 is rotatably mounted by means of a shaft 11 journaled in suitable bearings, not shown, the web roll being fast to a brake drum 12 having a deeply grooved surface in which are seated brake shoes 13 and 14 each having an

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arcuate V-shaped face. The brake shoes are pivotally mounted on brake levers 15, 16 which levers are interconnected by a supporting link 17 to which they are pivoted at 18 and 19. Supporting link 17 is mounted on a horizontal screw rod 20 which may be turned by hand wheel 21 and provides for the side leg or axle movement of the brake drum 12 and web roll 10.

The outer ends of the levers 15 and 16 are interconnected by means of an adjustable toggle comprising turnbuckle 22 and lever 23, the lever 23 being provided with two pivots 24 and 25. Pivot 24 is connected to the outer end of lever arm 15, while the other pivot 25 receives the hook end of the turnbuckle 22, the other end of the turnbuckle being pivotally connected at 26 to lever 16. Rocking movement of the lever 23 thus serves to press the brake shoes 13 and 14 against the brake drum 12 with varying degrees of force depending upon the force applied to the upper end of lever 23.

Means are provided for automatically controlling the force applied to the brake lever 23 in accordance with the tension of the web drawn from the web roll 10 so as to maintain the tension substantially constant whether the roll is full or nearly exhausted, and regardless of the running speed of the web. For this purpose the web delivered from the web roll 10 passes over guide roll 30, pilot roll 31, guide rolls 32, 33, pilot roll 34, and guide roll 35 as it is fed to the press, thus providing at least one loop in the web tending to move at least one pilot roller from its normal position against the force exerted by a weight connected to the pilot roll.

As embodied, the pilot rollers 31 and 34 are rotatably mounted at their ends in pivoted arms 40, one such arm being provided at each end of the rollers 31 and 34 and the rollers 31 and 34 preferably being spaced substantially equal distances from the axis about which the arms 40 rotate. The arms 40 are interconnected by means of shaft 41 on which they are made fast and are supported in the side frames 42.

Weight means are provided for opposing the movement of the pilot rollers 31 and 34 under the influence of the web tension and for this purpose weight 50 is carried by a guide rod 51 vertically slidable in guides 52, 53 and is connected to the upper end of bell crank 54 by means of cable 55 passing over pulleys 56 and 57. Bell crank 54 is mounted for pivotal movement on the rotatable shaft 41, and the lower end of bell crank 54 is pivotally connected to a tension member in the form of rod 95 and passes through aperture 96 in the upper end of lever 23, being

adjustably connected thereto by means of the threaded nut 97. In order to vary the normal tension of the web fed from the web roll 10, additional weights 59 may be added to or removed from the guide rod 51, thereby changing the normal tension and making it possible to establish an accurate and predetermined tension on the web.

Means are provided for controlling the predetermined normal braking force in accordance with the tension of the web as it is actually delivered from the roll. For this purpose the pilot roller supporting arms 40 are connected at one end to the bell crank 54 so that any increase in tension on the web beyond the desired normal tension causes the pressure on brake shoes 13 and 14 to be relieved sufficiently to reduce the tension to normal. A compression spring 60 is compressed between lug 61 on arm 40 and a hand wheel 62 on threaded rod 63, the lower end of this rod being pivotally connected at 64 to the arm 65 of the bell crank 54. By means of this resilient connection between the arms carrying the pilot rollers and the bell crank 54, any counterclockwise pivotal movement of the arms 40 causes a substantially equal movement of the bell crank 54, the compression spring 60 serving to prevent the transmission of minor, rapid movements of the arms 40 to the bell crank, while the weights 50 and 59 serve to oppose counterclockwise movement of the arms 40 and also apply a normal pressure to the brake shoes 13 and 14.

In order to maintain the same tension on the web as the roll starts its rotation, on starting up the press, as is to be maintained on the web when running at normal speeds, spring means are provided which are normally inactive but come into operation on acceleration of the web such as occurs in starting up the press. This acceleration causes a counterclockwise rotation of the pilot roller supporting arms 40, and any excessive movement of the arms 40 raises the weight guide rod 51 sufficiently to compress the spring 70 between the guide 52 and collar 71 fixed to the end of rod 51, thereby increasing the force acting on the bell crank 54 and tending to restore it to its normal running position, thereby substantially preventing a complete release of the braking force applied by the shoes 13 and 14 against the web roll.

In order to permit extremely rapid changes in the braking force applied to the web roll in spite of the large mass of weights 50 and 59, the weights are resiliently mounted on the guide rod 51, so that the guide rod may move rapidly without a corresponding movement of the weights. Any sudden movement of the bell crank 54 results only in a gradual change in the position of the weights and does not cause any undue force to be applied to the bell crank. For this purpose weights 50 and 59 are supported by means of a sleeve 80 having an enlarged lower end 81 on which the weights rest, the sleeve being vertically slidable on the guide rod 51. Sleeve 81 is supported by means of compression spring 83 which in turn is supported by means of collar 84 fast to the guide rod 51. Spring 83 is preferably a long, soft spring so that it is substantially compressed by the weights even to two-thirds or half its original length, and thus permits rapid movement of the rod 51 with only a slow, gradual movement of the weights 50 and 59. Thus rapid variation in tension such as might result from irregularities or other imperfections in the web

roll as the web roll nears exhaustion do not cause a corresponding movement of the weights and the weights assume and remain in a substantially constant position. In case the pilot roller assembly suddenly moves from a condition of increasing tension to one of decreasing tension, there is no excessive increased application of the brake, as might result if the weights were not resiliently mounted.

In order to vary the effect of spring 83 in supporting the weights 50 and 59, while avoiding the necessity of changing the spring 83, a second spring 86 is provided, coiled about rod 51 and compressed between the upper end of sleeve 80 and a collar 87 adjustably secured by set screw 88. By increasing the compression of spring 86, the weights 50, 59 follow the movement of rod 51 more closely and give a less resilient connection between the weights and the brake.

In accordance with the modified embodiment of the invention as shown in Figures 2, 3 and 4 of the accompanying drawings, means are provided for allowing a fractional width web to be controlled as it is fed to the press, such fractional width webs usually being one-quarter, one-half or three-quarters the width of a normal web. As embodied the web roll is supported and braked in accordance with the construction shown in Figure 1, and the spring supported weighted means are likewise in accordance with the construction shown in Figure 1. Pilot rollers 31 and 34 over which the web is guided as it is drawn from the web roll 10 to the press, are mounted in the ends of the pilot roller supporting arms 40' which are free to turn with reference to their supporting shaft 41. At each end, the rollers 31 and 34 are rotationally mounted in bearing blocks 90 which are swivelled in lugs 91 formed at the ends of the supporting arms 40', this swivelling being accomplished by means of the pivot shafts 92 extending at right angles to the shaft 41 and being fixed to the bearing blocks 90 passed through suitable apertures in the lugs 91 and retained in position by means of the rollers 93. Supporting arms 40' are capable of independent rotational movement with respect to the shaft 41, and the rollers 31 and 34 may be parallel to each other or if one of the supporting arms 40' moves to a greater extent than the other, the rollers 31 and 34 assume a skew position.

Means are provided for normally maintaining the pilot rollers 31 and 34 parallel to each other while permitting them to move at either end to a larger extent than at the other end. For this purpose bell crank 54 is provided with an outwardly extending arm 65 on which is supported an upwardly extending guide rod 63' passing upwardly through the lug 61 formed on supporting arm 40'. Rod 63' is threaded to receive a hand wheel 62 on its lower portion and a hand wheel 98 on its upward portion, springs 60 and 99 being compressed by these hand wheels against the lug 61. By varying the position of the hand wheels 62 and 98, the resiliency of the springs 60 and 99 may be controlled, lug 61 always tending to remain centrally located between the hand wheels but subject to any force applied to move the supporting arm 40'.

At the far side of the tension controlling mechanism, and as shown in Figure 4, a lever 100 is provided fixed to shaft 41 and supporting a similar rod 63' which extends upwardly through lug 61 on the other independently moveable pilot roller supporting arm 40'. As previously described, other hand wheels 62 and 98, and com-

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pression springs 60 and 99 are provided between the lever 100 and this pilot roller supporting arm 40' so as to control the position of the pilot roller supporting arm with reference to the shaft 41.

When a fractional width web is to be run, and located near one end of the web tension mechanism, the hand wheels 62 and 98 at that end are adjusted so as to allow a normal amount of resiliency in the springs 60 and 99 at that end, while the hand wheels 62 and 98 at the other end are tightened so as to reduce the resiliency of these springs and tend to hold the pilot roller supporting arm 40' in a fixed position at that end with reference to the shaft 41. In other words, when running a quarter width web roll at the side adjacent the bell crank 54, the hand wheels 62 and 98 adjacent the quarter width web would be loosened to provide relatively great resiliency in the springs 60 and 99, while the distant hand wheels 62 and 98 cooperating with the lever 100 would be tightened so as to permit substantially no movement of the pilot roller supporting arm 40' with reference to the shaft 41.

As described in connection with the embodiment shown in Figure 1, any movement of the shaft 41 is transmitted to the brake through the rod 95, and reacts mutually with the weights 50 and 59 through the flexible connection 55.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What is claimed is:

1. Web tensioning apparatus for applying tension to the web drawn from a web roll including in combination a web roll support, brake means for variably opposing rotation of the web roll, a pilot roller to be moved by changes in the tension of the web drawn from the roll, means for controlling the braking means in accordance with the position of the pilot roller so that a reduction in tension of the web increases the force with which the brake means is applied and vice versa, a weight maintaining the pilot roller in a normal position against the tension of the web and means interconnecting the weight and pilot roller including guide means on which the weight is movable and spring means to oppose movement of the weight on said guide means in either direction away from an intermediate and normal position, whereby sudden movements of the pilot roller in either direction may take place without corresponding movements of the weight, said weight being connected normally to oppose movement of the pilot roller by tension of the web.

2. Web tensioning apparatus as claimed in claim 1 in which the weight is connected to a vertically movable guide rod through a supporting spring.

3. Web tensioning apparatus as claimed in claim 1 in which a spring separate from the spring means opposing movement of the weight connects the pilot roller to the brake for actuation of the brake.

4. Web tensioning apparatus as claimed in claim 1 in which the pilot roller is mounted for movement on a pivoted member, a spring connects the second pivoted member to the first piv-

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oted member for movement thereby, said pivoted member forming part of the controlling means and spring means connecting the second pivoted member to the brake for controlling the brake means, said spring means connecting the weight to the second pivoted member for energization of the brake by the weight.

5. Web tensioning apparatus for applying tension to the web drawn from a web roll including in combination a web roll support, brake means for variably opposing rotation of the web roll, a pilot roller to be moved by changes in the tension of the web drawn from the roll, means for controlling the braking means in accordance with the position of the pilot roller so that a reduction in tension of the web increases the force with which the brake means is applied and vice versa, including pivoted arms in which the pilot roller is mounted for movement by the tension of the web, a lever pivotally mounted and connected to be moved by the pilot roller supporting arms and to vary the braking force of the brake means, a weight to move the pivoted lever to energize the brake and spring means resiliently connecting the weight to the pivoted lever.

6. Web tension apparatus as claimed in claim 5 in which the pivoted lever and pivoted arms are coaxial.

7. Web tension apparatus as claimed in claim 6 in which the pivoted lever and arms are resiliently interconnected.

8. Web tension apparatus for applying tension to the web drawn from a web roll including in combination a web roll support, brake means for variably opposing rotation of the web roll, a pilot roller to be moved by changes in the tension of the web drawn from the roll, a weight, resilient means connecting the weight to the brake means for energizing the brake and permitting the brake means to be rapidly varied without substantial movement of the weight, and means for varying the braking force by movement of the pilot roller.

9. Web tension apparatus according to claim 8 in which means are provided for adjusting the resiliency of the resilient connecting means.

10. In a web tension controlling device, a pivotally movable member to be connected to actuate a web roll braking means, a pair of independently movable arms, a pilot roller journaled in said arms, said arms being coaxially pivoted with respect to said member, and separate spring means connecting each of said arms with said member for moving said member by movement of the roller, while permitting the roller to move into or out of parallelism with the pivotal axis of said member.

11. A web tension controlling device as claimed in claim 10 in which each spring means comprises a pair of aligned coil springs mounted on the member and connected between them to an arm.

12. A web tension controlling device as claimed in claim 11 in which means are provided for variably compressing the springs.

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