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R. McC. JOHNSTONE

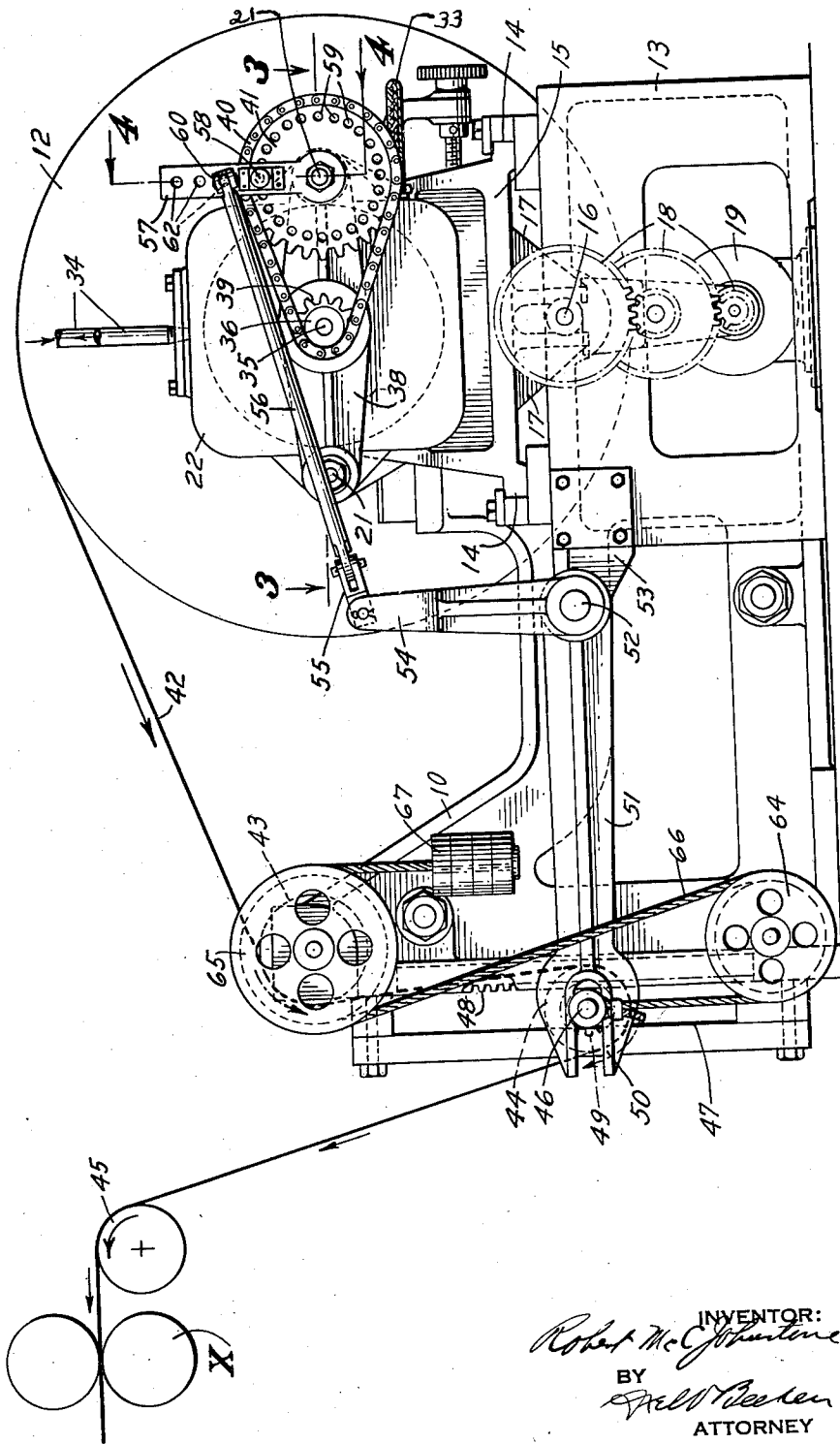
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BRAKE MECHANISM

Filed Aug. 23, 1935

3 Sheets-Sheet 1

Fig. 1.



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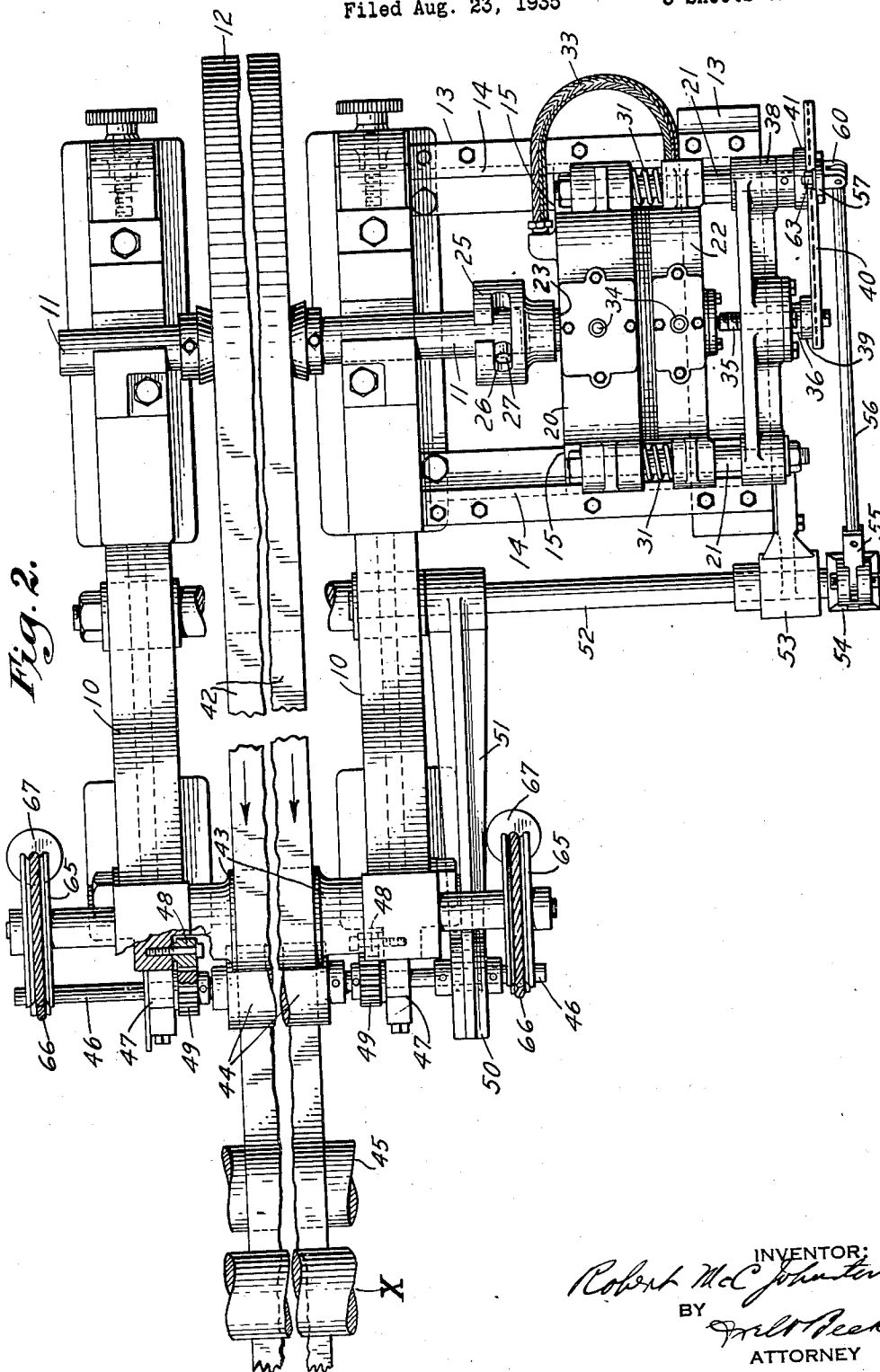
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BRAKE MECHANISM

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Fig. 3.

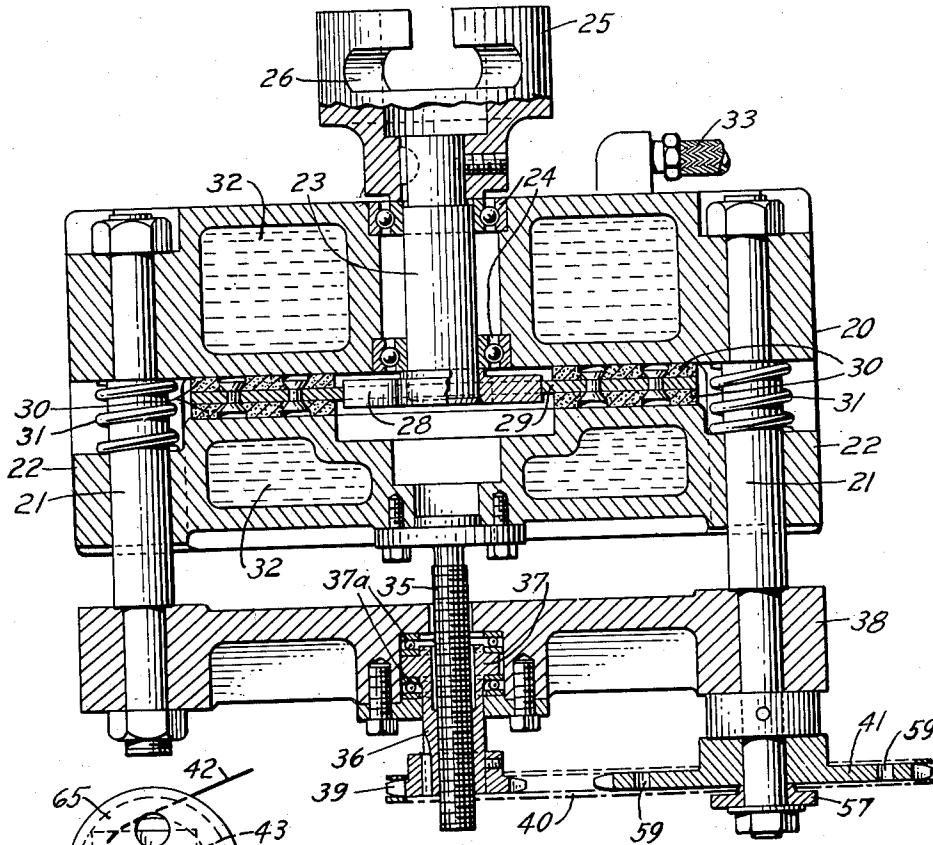


Fig. 4.

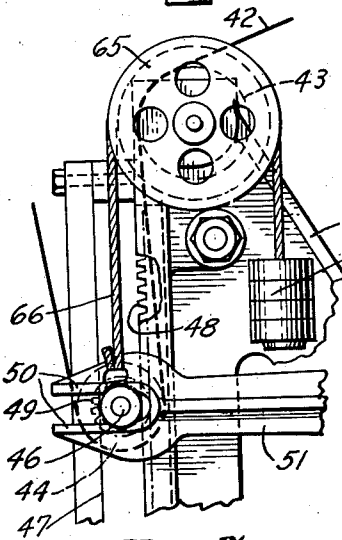
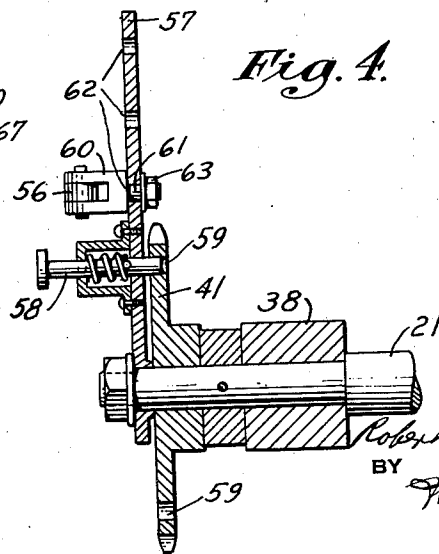


Fig. 5.

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BRAKE MECHANISM

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6 Claims. (Cl. 242-75)

This invention relates to web roll supporting means having brake mechanism for automatically controlling the tension of the web issuing therefrom, and has for its main object and feature the provision of an effective and simple brake and control mechanism capable of adjustment as a unit with the web roll supporting means to center the web with respect to a web pulling machine such as a carbon coating, printing or other machine.

Other objects and advantages will appear from the following description, taken in connection with the accompanying drawings, in which a preferred form of the invention is disclosed, and in which:

Fig. 1 is a side elevation of an unwinding stand carrying a web roll of flexible material, and provided with a tension-controlled brake;

Fig. 2 is a plan view of Fig. 1 with the central portion of the web and rollers broken away;

Fig. 3 is a horizontal section through the brake substantially on the plane of line 3-3 of Fig. 1;

Fig. 4 is a fragmentary vertical section substantially on the plane of line 4-4 of Fig. 1; and

Fig. 5 is a fragmentary view showing a modified form of threading the flexible connection supporting the weight of the tension controlling means.

The specific arrangement shown in the drawings discloses the invention applied to an unwinding stand carrying a roll of flexible material from which a web is drawn for feeding a web-pulling machine such as a printing press, coating machine or the like, indicated generally at X. The unwinding stand frame 10 is provided with the mill roll shaft 11, adapted to receive the roll of paper 12; and in accordance with usual practice shaft 11 may be continuous or may be in sections and carrying the usual chucks on opposite sides of roll 12.

One end of shaft 11 extends beyond frame 10 and over brake stand 13, which is provided with guide ways 14 in which brake base 15 is slidably mounted for transverse adjustment in line with mill roll shaft 11. The transverse motion is imparted in any desirable manner, as by screw 16 (Fig. 1) journaled in brake stand 13 and having a threaded engagement with lugs 17 projecting downwardly from brake base 15. Screw 16 may be turned in either direction by any desired means, as by gear train 18 and reversible motor 19 for purposes hereinafter indicated.

Upon brake base 15 there is mounted a variable pressure brake adapted for accurate adjustment to regulate the web tension. The brake includes

a plurality of elements, at least one of which is mounted to rotate with the roll-supporting means, and at least one of which is mounted independently thereof. Said elements may comprise a rotary member arranged for connection with and rotation by mill roll shaft 11, and non-rotating members frictionally engaging the rotatable member with adjustable pressure. The specific form illustrated includes a fixed brake shoe 20 mounted rigidly on base 15 and carrying horizontal guide rods 21 (Fig. 3) bolted to shoe 20. Sliding brake shoe 22 is slidably mounted on guide rods 21.

Brake shaft 23 is rotatably mounted in ball bearings 24 in a suitable bore through fixed brake shoe 20 in alignment with mill roll shaft 11, and is provided with a suitable coupling engaging the end of shaft 11, adapted to transmit both rotary and axial movement. A suitable arrangement includes hollow driving head 25 on the outer end of brake shaft 23, provided with bayonet slot 26 engaged by pin 27 on the end of mill roll shaft 11 (Fig. 2). The rotary brake disk is mounted on the inner end of brake shaft 23 between brake shoes 20 and 22 and preferably is movable axially of brake shaft 23 to provide even pressure on both shoes regardless of the position of the shoes. A convenient arrangement is illustrated, including a driving plate 28 (Fig. 3) on the inner end of brake shaft 23, engaging annular steel brake disk 29 provided with suitable brake facing 30 on both sides, positioned for frictional engagement with cooperating surfaces on brake shoes 20 and 22. Disk 29 is axially slidable but non-rotatable on driving plate 28, as by giving plate 28 a hexagonal or other non-circular peripheral contour, with a close but transversely sliding fit in a registering opening in the center of brake disk 29. Coil springs 31 on guide rods 21 between brake shoes 20 and 22 tend to keep the shoes apart and out of engagement with brake disk 29. The brake shoes 20 and 22 may be water-cooled, and are shown with water jackets 32 connected at the bottom by flexible pipe 33 and at the top to inlet and outlet lines 34.

A suitable arrangement is provided for gradual adjustment of the brake pressure, preferably by rotation of a threaded member. In the form shown, pressure screw 35 mounted on sliding brake shoe 22 is threaded through pressure sleeve 36 rotatably mounted by flange 37 and thrust ball bearings 37a in a suitable bore in yoke 38 mounted on guide rods 21. Small sprocket 39 is rotated through chain 40 by large sprocket 41 rotatably mounted on the outer end of a guide

rod 21. Yoke 38 and sliding brake shoe 22 are spaced so that when shoe 22 is fully retracted, brake disk 29 can be slid from driving plate 28 and withdrawn for repair or replacement.

The brake is operated by a suitable device responsive to variations in web tension. This preferably includes a roller held against the web under relatively fixed pressure and shifted transversely to the web path by variations in the web tension. In the illustrated embodiment web 42 runs from the mill roll 12 over guide roller 43, thence downwardly under tension roller 44 and up over guide roller 45 to a processing machine (not shown), forming a downwardly extending loop of web in which tension roller 44 rests.

Tension roller 44 revolves freely on tension roller shaft 46, and is provided with means for restricting its vertical movement to a fixed path and for maintaining it in horizontal position, transversely aligned with the web. This may include vertical guideways 47 in which shaft 46 is slidable at either side of roller 44, and vertical racks 48 mounted on the unwinding stand frame 10 positioned to maintain engagement with pinions 49 fixed on tension roller shaft 46 adjacent guideways 47 and severing to keep tension roller 44 in horizontal alignment when shaft 46 is supported and moved by engagement with one end only, as by the control mechanism to be described.

An arrangement is provided for regulating the brake pressure in accordance with vertical movements of tension roller 44. In the embodiment shown, tension roller shaft 46 passes between the parallel jaws of a fork 50 on the end of tension lever arm 51 fixed at its other end to rock shaft 52 journaled in the unwinding stand frame 10 and in bracket 53 on brake stand 13. Rocker arm 54 is fixed to the outer end of rock shaft 52, forming with tension lever arm 51 a bell crank lever. The upper end of rocker arm 54 is connected through universal joint 55 with link 56, the other end of which is connected to the large sprocket 41, so that vertical movements of fork 50 will oscillate sprocket 41 and vary the brake pressure.

The connection of link 56 with the brake mechanism is preferably detachable and adjustable to permit regulation of the effect of movements of tension roller 44. Such connection may comprise a connecting arm 57 pivoted at its lower end on the end of the guide rod 21 carrying large sprocket 41. Arm 57 is adjustably connected to large sprocket 41 by spring-actuated plunger 58 (Fig. 4) entering one of the series of socket openings 59 concentrically arranged in sprocket 41. Link 56 is adjustably connected to the upper part of arm 57 by a universal joint, as by pivoting the end of link 56 in a fork 60 bearing against the face of arm 57 and having a pivot stud 61 passing through one of a vertical series of openings 62 in connecting arm 57 and rotatably retained therein as by nut 63.

The downward pressure on tension roller 44 should be such that when web 42 is under the desired tension, roller 44 will be in an intermediate position as shown in Fig. 1. This can be attained to a certain extent by properly designing the weight of tension roller 44 and connected parts, and the length and weight of tension lever arm 51. It is desirable however to provide means for adjusting such downward pressure on roller 44, and our arrangement for this purpose is disclosed, adapted either to add or

subtract an adjustable amount of pressure applied to said roller 44.

This is accomplished by mounting on opposite sides of unwinding stand frame 10, and in line with the ends of tension roller shaft 46, lower pulleys 64 below the ends of shaft 46, and upper pulleys 65 above the ends of shaft 46. Cables 66 may run from the ends of shaft 46 downwardly around pulleys 64 as in Fig. 1, thence upwardly over pulleys 65, carrying adjustable sectional weights 67 at their ends, as shown in Fig. 1 in full lines, thereby adding the pull of weights 67 to the downward pressure on tension roller 44; or cables 66 may run from the ends of shaft 46 directly up over pulleys 65 as shown in Fig. 5, thereby subtracting the pull of weights 67 from the downward pressure on roller 44.

The method of operation will in general be evident from the detailed description. When the mill roll 12 is placed on the unwinding stand 10 driving head 25 is in retracted position with bayonet slot 26 in alignment with pin 27, and motor 19 is operated to shift the entire brake unit toward roll 12, positioning pin 27 in slot 26. When web 42 is threaded over rollers 44 and 45 and through the processing machine, the start of said machine applies traction to the web; but as the tension roller 44 is in lowermost position the brake is set to prevent rotation of mill roll 12.

Tension on the web increases until it is sufficient to lift tension roller 44, rotating large sprocket 41 to the right and retracting sliding brake shoe 22 gradually until the increasing tension on web 42 overcomes the decreasing resistance of the brake, and mill roll 12 starts to rotate, feeding web 42 to the processing apparatus. When the downward pressure of tension roller 44 is set for a predetermined tension on web 42, as by adjusting weight 67, such tension will be automatically maintained; for any decrease in tension will cause the tension roller 44 to drop, increasing brake pressure and building up the tension, while any rise in tension above the optimum will lift roller 44, decrease brake pressure and reduce the tension.

This method of operation automatically takes care of the necessary gradual reduction in brake pressure as the diameter of roll 12 decreases and the speed of rotation increases and does not depend directly on operating conditions such as the rate of roll rotation, the number of revolutions made, or the roll diameter. It is moreover responsive to any changes in conditions, either in the feed roll or the processing machine, that might affect the web tension. If the web should break, the brake would immediately be applied and stop the roll promptly, without requiring any resetting or adjustment when starting up after a break.

The arrangement shown is adjustable for several purposes. By retracting plunger 58, tension roller 44 is disconnected from the brake, which may be adjusted by rotating manually the large sprocket 41, either for retracting sliding brake shoe 22 so that brake disk 29 may be slid off driving plate 28 and removed for replacement or repair, or to adjust the position of sliding brake shoe 22 so that the brake pressure will be suitable to maintain tension roller 44 in an intermediate position when running at the desired tension. Such brake adjustment may be needed to compensate for wear, changes in tension or for other reasons; and when the brake is properly set, plunger 58 is set in the proper opening 59 to locate roller 44 appropriately under running conditions. The

braking effect of movements of roller 44 can also be adjusted by locating pivot stud 61 in the appropriate opening 62.

The universal joints at the ends of link 56 permit transverse movement of the brake on stand 13, either for engaging and disengaging driving head 25 with the mill roll shaft 11, or for adjusting the lateral position of mill roll 12 while in operation, as the bayonet slot 26 engages pin 27 in operation so that transverse movements of the brake in either direction are transmitted to the mill roll, and therefore said roll can be transversely aligned during unwinding by operation of motor 19.

While the invention has been described as applied to paper unwinding apparatus, numerous features are applicable to other types of apparatus. In the illustrated embodiment web pressure is applied by gravity, and the expressions "horizontal" and "vertical" have been used; but while such an arrangement has special advantages, other arrangements are possible, and the terms are used by way of description and not of limitation.

I claim:

1. Apparatus for controlling brake action including a brake provided with rotary means for varying the brake pressure, and operating means having a concentrically and radially adjustable connection with said rotary means.

2. Apparatus for controlling brake action including a brake, a control member under pressure, operating connections between the control member and the brake, and means for varying the pressure on said member including a pulley below the member, a pulley above the member, a flexible cable connected to the member and an adjustable weight mounted on said cable, the construction and arrangement being such that the gravitational pull of said weight is added to the pressure on said member when the cable is passed under the lower pulley and then over the upper pulley, and is subtracted from said pressure when the cable is passed directly over the upper pulley.

3. Braking apparatus including a plurality of complementary brake elements, rotatable means for regulating the operative engagement of said elements, an oscillating control member, means for rotating said rotatable member at a predetermined rate in response to a given movement of said control member, and means for varying said rate.

4. Web supply means including: rotatable supporting means to carry a roll of web supply the end of which is threaded into a web-pulling machine; a plurality of complementary brake elements carried concentrically of the axis of the web roll, at least one of which is mounted to rotate with the supporting means and at least one of which is mounted independently thereof and is movable, to vary the operative engagement of said brake elements, in a direction lengthwise of the axis of said supporting means; rotatable means, coincidental with the axis of said supporting means to regulate the operative engagement of said brake elements; an oscillating control member arranged eccentric with respect to the axis of said supporting means; transmission means between the oscillating control

member and said rotatable means; a base member, adjustable in a direction lengthwise of the axis of the supporting means, carrying the supporting means, the brake elements, the rotatable means, the oscillating control member and the transmission means; a floating roller, mounted independently of the base member, to engage a loop in the web and thereby to respond to variations in tension of the web; and adjustable connections between the floating roller and the oscillating control member.

5. Web supply means including: rotatable supporting means to carry a roll of web supply the end of which is threaded into a web-pulling machine; a plurality of complementary brake elements carried concentrically of the axis of the web roll, at least one of which is mounted to rotate with the supporting means and at least one of which is mounted independently thereof and is movable, to vary the operative engagement of said brake elements, in a direction lengthwise of the axis of said supporting means; rotatable means, coincidental with the axis of said supporting means to regulate the operative engagement of said brake elements; an oscillating control member arranged eccentric with respect to the axis of said supporting means; transmission means between the oscillating control member and said rotatable means; a base member, adjustable in a direction lengthwise of the axis of the supporting means, carrying the supporting means, the brake elements, the rotatable means, the oscillating control member and the transmission means; a floating roller, mounted independently of the base member, to engage a loop in the web and thereby to respond to variations in tension of the web; and connections, including a universal joint, between the floating roller and the oscillating control member.

6. Web supply means including: rotatable supporting means to carry a roll of web supply the end of which is threaded into a web-pulling machine; a plurality of complementary brake elements carried concentrically of the axis of the web roll, at least one of which is mounted to rotate with the supporting means and at least one of which is mounted independently thereof and is movable, to vary the operative engagement of said brake elements, in a direction lengthwise of the axis of said supporting means; rotatable means, coincidental with the axis of said supporting means to regulate the operative engagement of said brake elements; an oscillating control member arranged eccentric with respect to the axis of said supporting means; transmission means between the oscillating control member and said rotatable means; a base member, adjustable in a direction lengthwise of the axis of the supporting means, carrying the supporting means, the brake elements, the rotatable means, the oscillating control member and the transmission means; a floating roller, mounted independently of the base member, to engage a loop in the web and thereby to respond to variations in tension of the web; and connections between the floating roller and the oscillating control member adjustable concentrically and radially with respect to said control member.

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