

May 14, 1940.

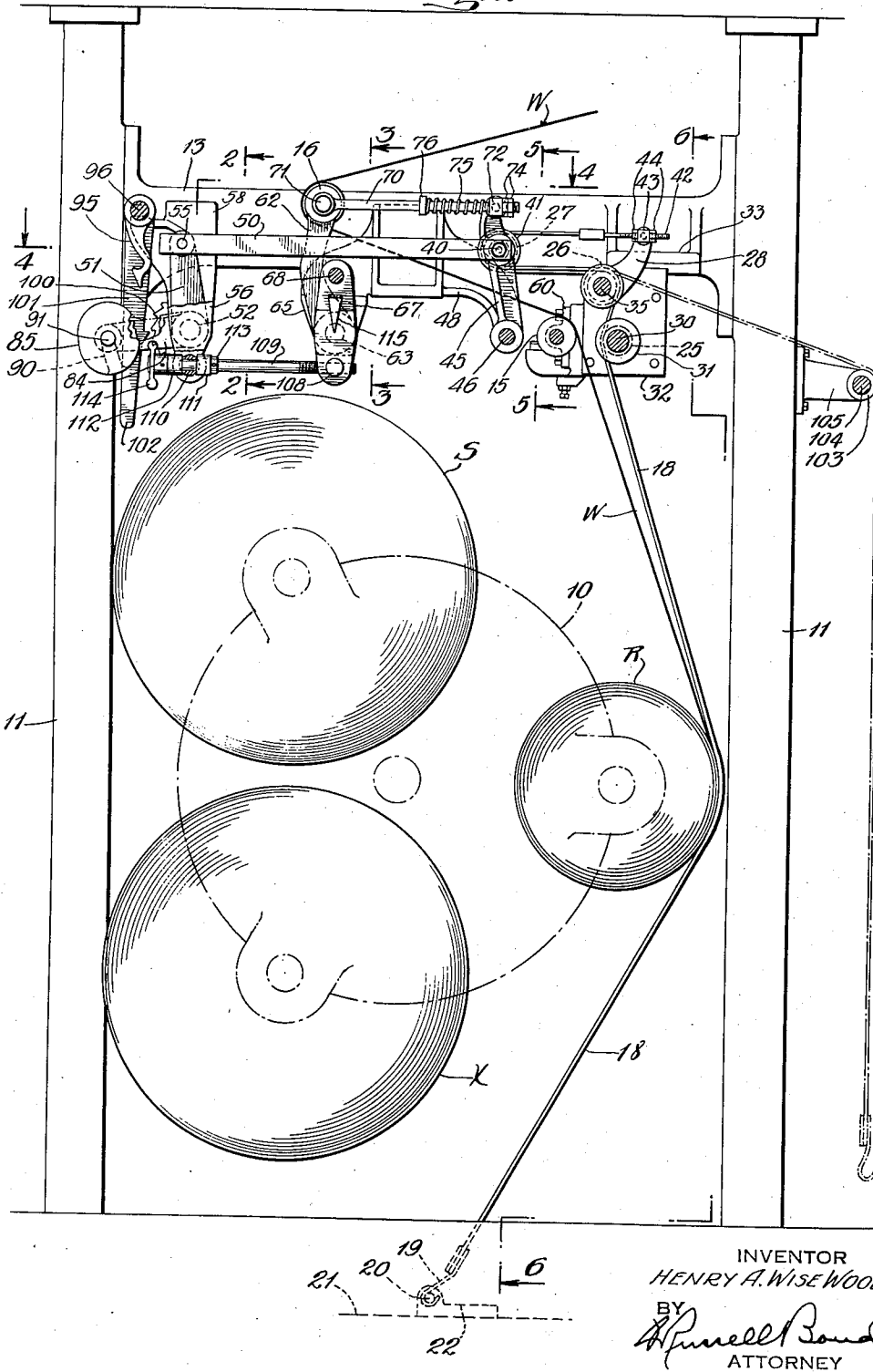
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2,200,438

TENSIONING MEANS

Original Filed March 19, 1936 3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

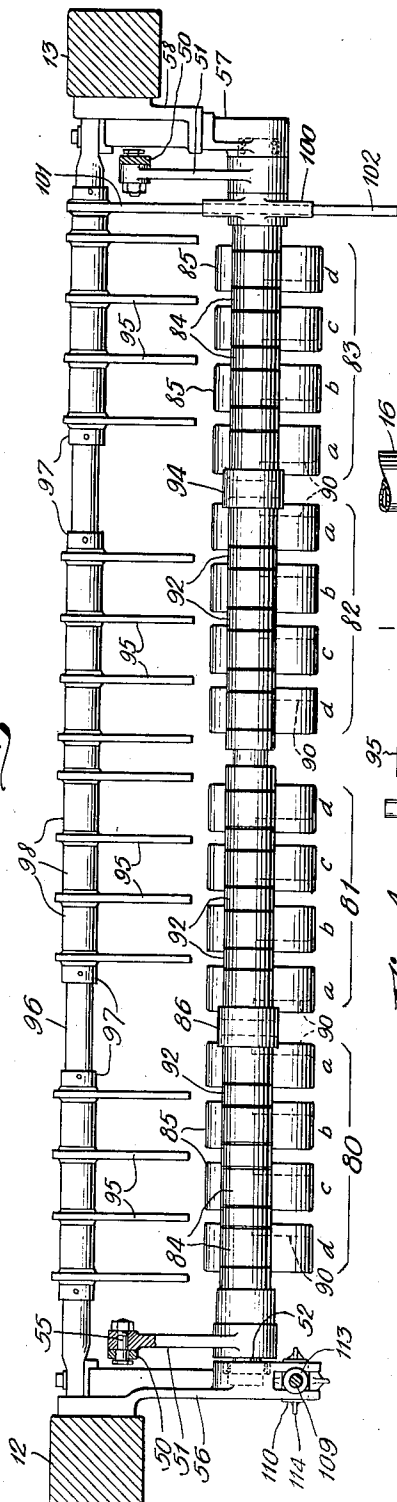


Fig. 4.

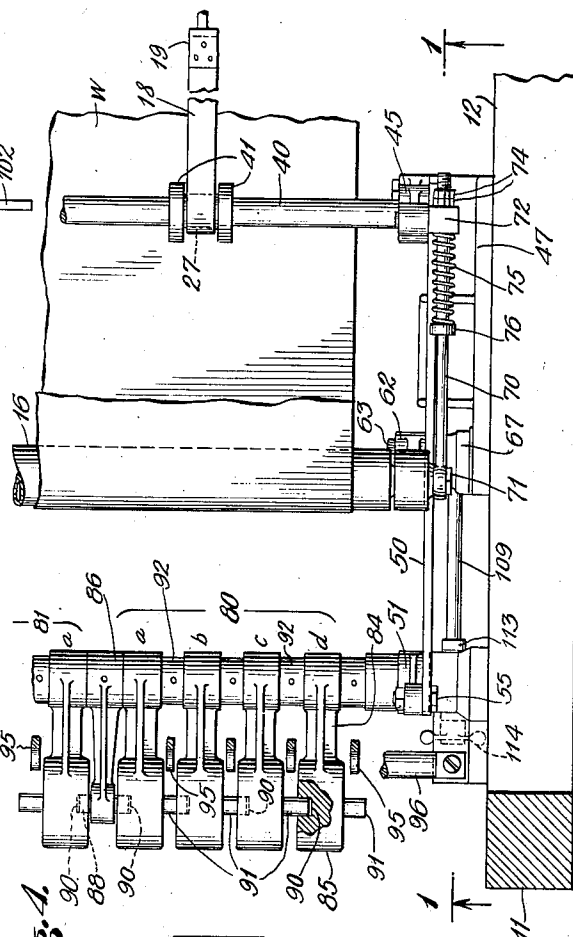
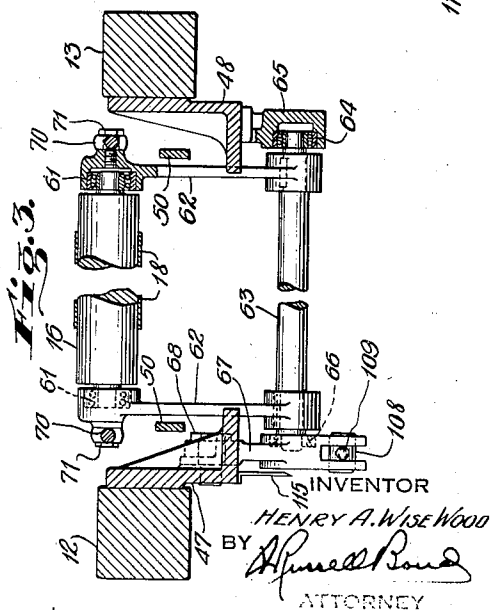


Fig. 3.



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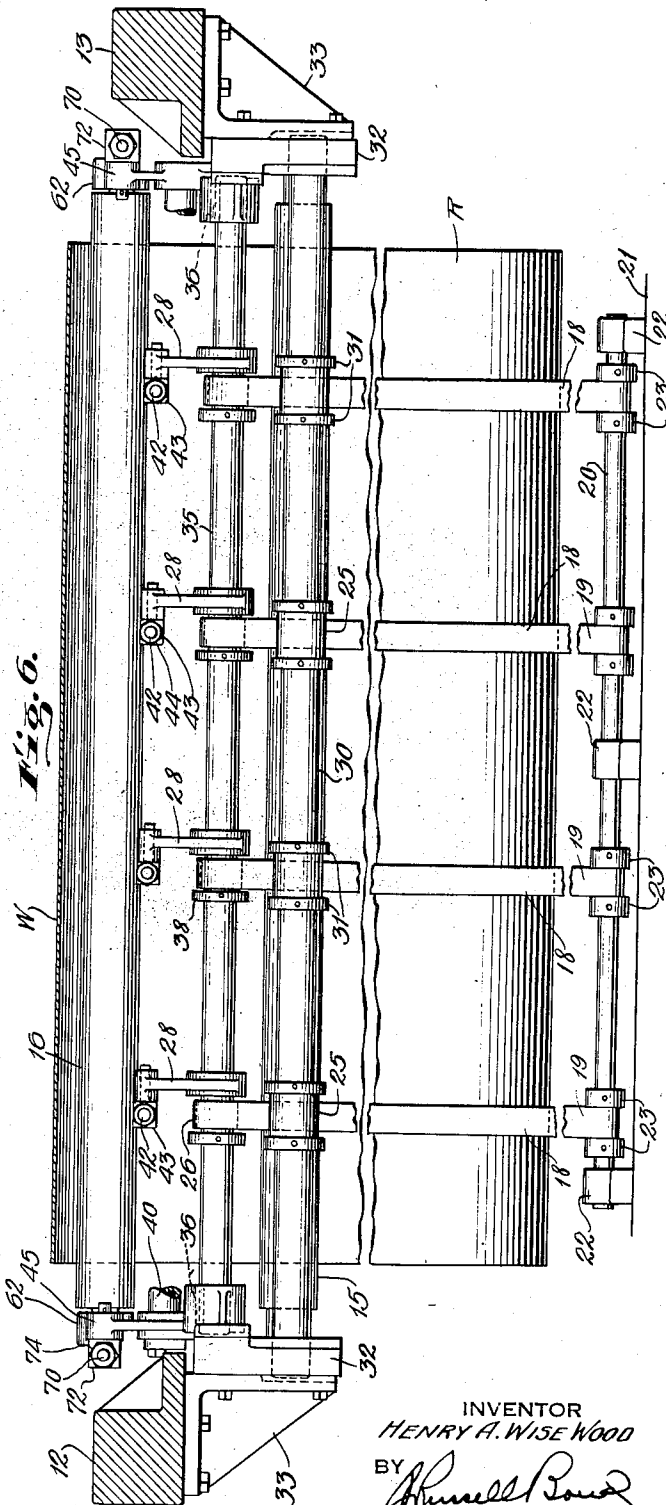
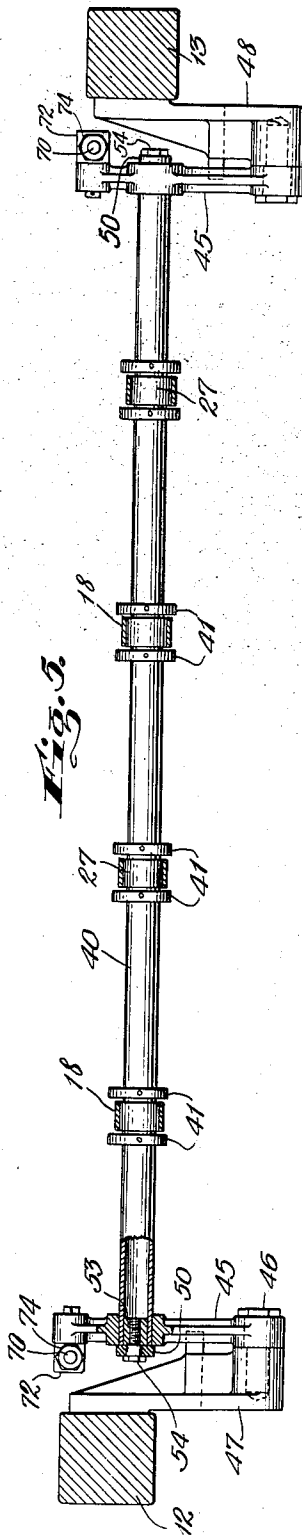
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TENSIONING MEANS

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2,200,438

TENSIONING MEANS

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13 Claims. (Cl. 242—75)

The present invention relates to a novel means for controlling the rotation of a web roll from which a running web is being drawn off and fed into a machine. The invention is particularly adapted for use in a web printing press, although obviously it may be employed in other web-using machines. The web rolls used in web presses are often quite heavy and it is difficult to control the rotation of the roll in relation to the speed of the press to which the web is supplied.

There are three principal types of controllers used to regulate the speed of an unwinding web roll with reference to the machine to which the web is fed: 1. A spindle brake which applies a braking action to the center of the web roll. 2. A running belt or belts which contact with the peripheral surface of the web roll and are preferably driven at a speed slightly below that of the running web. 3. A strap or straps bearing against the surface of the unwinding roll and controlling its rotation by friction.

In its broader aspects the present invention is applicable to any one of these types of control and contemplates the provision of means responsive to the tension of the running web for modifying the braking action on the roll.

My invention lends itself more particularly to the friction strap type of control, and the preferred embodiment of my invention illustrated herewith and described hereinafter is of this type.

In general this embodiment comprises a series of straps which bear frictionally against the periphery of the unwinding roll. These straps are bowed by the roll and hence partly wrapped about the same, and the straps are kept taut by tensioning means, the pull of which is opposed by the pull of the running web.

An object of my invention is to provide means for varying the pull of said tensioning means to regulate the friction on the web roll, thereby producing more or less tension in the web, as desired.

In my preferred embodiment the tensioning means for the straps comprises a series of weights and it is an object of my invention to provide novel means for applying these weights to effect the desired pull on the straps.

Another object of the invention is to provide means for hanging up any or all of the weights so as to reduce or entirely relieve the pull on the straps.

Another object of the invention is to provide for disconnecting one or more of the straps when fractional width web rolls are used and to reduce the pull on the straps accordingly.

My invention also provides novel means for producing slack in the tension straps to permit of disconnecting any one or all of them as may be desired.

A further object of the invention is to provide adjusting means associated with the web control which will take care of a web roll which is wound tighter at one end than at the other.

Other objects of my invention will appear in the following description of a preferred embodiment and thereafter the novelty and scope of the invention will be pointed out in the claims.

In the accompanying drawings;

Figure 1 is a view in vertical section of the tensioning device applied to a web roll carried by a rotatable magazine reel, the section being taken substantially on the line 1—1 of Fig. 4;

Fig. 2 is a view in vertical section taken on the line 2—2 of Fig. 1 and showing particularly the weights and the means for hanging them up;

Fig. 3 is a view in vertical section taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmental view in horizontal section taken on the irregular line 4—4 of Fig. 1;

Fig. 5 is a view in vertical section taken on the line 5—5 of Fig. 1; and

Fig. 6 is a view in vertical section taken on the irregular line 6—6 of Fig. 1.

Shown diagrammatically in Fig. 1 is a magazine reel 10 adapted to support three web rolls; namely, a running roll R from which a running web W is drawn off and fed into a printing press, a fresh roll S to which the web W will be spliced when the roll R has been substantially exhausted, and a third roll X which will supply the running web when the roll S is substantially exhausted. The details of the reel are not shown because they are well known in the art. Only a portion of the frame of the printing press is illustrated; namely, certain vertical columns 11 between which are supported horizontal beams 12 and 13. The tensioning device is carried on these beams. The running web, as it is unwound from its web roll, passes over an idler roller 15 and about a floating roller 16, and thence runs on to the press (not shown).

Bearing against the running roll R are tension straps 18, each of which is anchored at one end, by means of a hook 19, to a common anchor shaft 20 which is secured to the foundation 21 by brackets 22. These hooks are held against longitudinal movement on the shaft 20 by means of collars 23 pinned to the shaft, as shown in Fig. 6. There are four tension straps 18 and each strap passes about an idler roller 25, over an

idler roller 26, around a floating roller 27, and thence to an anchorage arm 28. The rollers 25 of the several straps are mounted to turn freely on a shaft 30, being retained against axial movement by collars 31 pinned to the shaft. The shaft 30 is mounted in brackets 32 which in turn are carried by brackets 33 depending from the beams 12 and 13. The rollers 26 are mounted to turn freely on a shaft 35 which is also mounted in the brackets 32 and is secured against rotation in its mounting by keys 36. Fixed to the shaft 35 are the anchor arms 28, one for each strap, and between these arms and collars 38 pinned to the shaft 35 the rollers 26 are confined against axial displacement. The rollers 27 are mounted to turn freely on a shaft 40 (see Figs. 4 and 5), being confined against axial displacement by collars 41 pinned to said shaft. Each strap is attached at its upper extremity to a threaded terminal rod 42 which pierces a poppet 43 and is adjustably clamped thereto by jam nuts 44 screwed upon the rod and bearing respectively against opposite sides of said poppet. The poppets are rotatably mounted in the anchor arms 28.

As the roll *R* diminishes in diameter, the resultant slack in the straps is taken up by shifting the shaft 40 bodily toward the left, as shown in Fig. 1, thereby lengthening the bight in the straps formed by the rollers 27 between the idlers 26 and anchor arms 28. Obviously, by adjusting the position of the shaft 40, the braking effect of the straps on the roll *R* may be regulated. The shaft 40 is mounted at opposite ends thereof in a pair of arms 45. These arms are pivoted on studs 46 carried by brackets 47 and 48 depending from the beams 12 and 13 respectively. Links 50 connect the shaft 40 and hence the arms 45 to another pair of arms 51 keyed to a weight shaft 52. As shown in Fig. 5, the shaft 40 is tubular and is fitted with a plug 53 in each end, in which is threaded a stud 54. These studs form the pivotal bearings for connecting links 50 to the shaft 40. At their opposite ends the links 50 are pivotally connected to the arms 51 by means of studs 55, as shown in Fig. 2.

The weight shaft 52 is journaled at opposite ends thereof in brackets 56 and 57. The bracket 56 depends from the beam 12 and the bracket 57 is secured to another bracket 58 carried by the beam 13. As will be explained more fully hereinafter the shaft 52 is urged to turn counterclockwise, as viewed in Fig. 1, by means of weights, thereby pulling the straps taut against the running roll. However, this pull is opposed by the tension in the running web.

The idler roller 15 over which the running web passes is journaled in fixed bearings 60 carried by the brackets 32. The floating roller 16 is mounted in ball bearings 61 in the free ends of a pair of arms 62 which are keyed to a shaft 63 (Fig. 3). At one end this shaft 63 is journaled in ball bearings 64 in a bracket 65 depending from the bracket 48. At the other end the shaft 63 is journaled in ball bearings 66 in an arm 67 pivoted on a stud 68 secured to the bracket 47. A spring rod 70 is pivotally connected by a stud 71 to each arm 62. These spring rods penetrate a pair of poppets 72 pivotally mounted, respectively, in the arms 45 (see Fig. 5) above the shaft 40. The projecting free end of each spring rod is threaded to receive a nut 74 adapted to bear against the right hand face of the poppet, as viewed in Fig. 1. A coil spring 75 on the rod 70 bears against the oppo-

site face of the poppet, being compressed between the poppet and a collar 76 pinned to the spring rod. Thus, while the weight biased shaft 52 keeps the straps taut and in frictional engagement with the running roll the degree of friction is modified in accordance with the pull of the running web which develops a counter force exerted through the springs 75 against the arms 45 which bear the floating roller 27.

As will now be explained, the weight bias on shaft 52 is adjustable. As shown in Fig. 2, there are four sets of weights 80, 81, 82 and 83 mounted on the shaft 52, each set comprising four weights identified individually by the letters *a*, *b*, *c* and *d*. Each weight comprises an arm 84 rotatably mounted on the shaft 52 and bearing at its free end a substantially cylindrical weight block 85. Fixed to the weight shaft between sets 80 and 81 (see Fig. 4) is an arm 86 provided with a cross pin 88 at its free end projecting from opposite sides of the arm. This pin is adapted to enter arcuate slots 90 in the adjacent blocks 85 of weights 80*a* and 81*a*. As shown in Fig. 1, each arcuate slot is struck from the shaft 52 as a center and extends downwardly from the middle of the block, opening out through the periphery of the block. The weights 80*a* and 81*a* when thus resting on the cross pin 88 impose a load on the shaft 52 which will tend to turn it counterclockwise, as viewed in Fig. 1. However, if desired, either one or both of the blocks 80*a* and 81*a* may be raised clear of the cross pin 88 to reduce or to relieve this load, and the load may be increased by adding the weight of any desired number of the other blocks in the sets 80 and 81. To this end, each of these blocks is formed with an arcuate slot 90 in the side facing the arm 86 and has a pin 91 projecting from the opposite side. Each pin 91, except those of the end weights *d*, is adapted to enter the arcuate slot of the next adjacent block to serve as a support therefor. The weights are confined against axial displacement on shaft 52 by the hub of arm 86 and by collars 92 pinned to the shaft.

An arm 94 is fixed to the shaft 52 between the sets of weights 82 and 83. The construction of this arm is exactly like that of arm 86 having a supporting cross pin adapted to cooperate with arcuate slots in the adjacent blocks of weights 82*a* and 83*a*, respectively. The weights of sets 82 and 83 are like the weights of sets 80 and 81, respectively, being formed with arcuate slots in the sides facing arm 94 and with pins projecting from the opposite sides thereof.

Means are provided for hanging up each weight to relieve the shaft of its load, such means comprising a set of hooks 95 on which the pins 91 may be supported. These hooks are suspended from a shaft 96 supported by and fixed to the brackets 56 and 58. The hooks are confined against axial displacement by collars 97 pinned to the shaft 96, and intervening spacers 98. While there is a hook 95 for each pin 91 whereby any one of the weights may be hung up on its hook 95, it will be obvious that owing to the pin-and-slot connection between successive weights of each set, the inner weight *a* of a set cannot be hung up without simultaneously hanging up all the rest of the weights of the set. Hence, in reducing the number of weights loading the shaft, the outside weights *d* are first hung up on their respective hooks, then weights *c*, and so on.

Since it is desirable to unhook one or more

straps 18 from shaft 20 when fractional width web rolls are used, I provide a ratchet segment 100 which is keyed to the weight shaft 52 and is adapted to cooperate with a pawl 101 pivoted on shaft 96 and having a tooth. The pawl is extended to form a handle 102 by which its tooth may be moved into or out of engagement with the ratchet 100. To disconnect one or more straps, the reel 10 is rotated until a large roll such as roll S bows the straps outwardly to a maximum extent. This causes the weight shaft 52 to be turned clockwise, as viewed in Fig. 1. The handle 102 is then grasped and operated to engage the pawl with the ratchet 100. This locks the shaft 52 so that the weights cannot exert tension on the straps when the reel is rotated in reverse direction to withdraw the roll from the straps. Any one of the straps may then be unhooked from the anchor shaft 20 and be supported in idle position by hanging it over an idler roller 103. The rollers 103 are carried by a shaft 104 supported in brackets 105 secured to the press columns 11. The weight load on the shaft may then be reduced by hanging up a certain number of weights on their hooks 95, after which pawl 101 may be withdrawn from engagement with the ratchet 100, thereby permitting the weight shaft to return to operative position.

The operation of the tensioning device will now be clear. The running web W is drawn into the press at a rate which is controlled by the speed of the press, which rate is substantially constant, particularly where splicing of the web to a fresh roll is accomplished without slowing down the press. To keep the web taut and under a predetermined tension the unwinding web roll R must be braked. However, the braking load on the roll cannot be maintained at a constant value, but must be adjusted to the diminishing diameter of the roll and must take care of any variables due to inertia or momentum of the heavy web roll, particularly when the web is spliced to a fresh roll and the reel is operated to move such roll into engagement with the straps. The straps 18 are pulled taut by the weights acting on shaft 52, this load being communicated through arms 51 and links 50 to the floating roller 27 which takes up slack in the straps. The weights impose a constant load, but this load is opposed by the tension of the running web exerted through spring rods 70 and springs 75 against the arms 45 which carry the floating roller 27. The pull of the web tends to lift the weights and relieve the tension in the straps 18. Conversely when there is slack in web W the full pressure of the tension weights is brought into play to press the straps against the running roll R and thereby tend to slow down the rotation of the roll. Thus, a very sensitive automatic control of web tension is provided in which variations of web tension are maintained within a very small tolerance owing to the automatic adjustment of friction on the web roll in direct response to the pull of the running web.

It is desirable, if not absolutely essential that the tension at one edge of the web W be the same as that at the opposite edge. Not infrequently web rolls are wound more tightly at one end than at the other. In such case one edge of the running web would be slack as compared with the opposite edge and one of the springs 75 would not be doing its share of the work. To remedy this condition I provide means for skewing the floating roller 16. As explained above,

the shaft 53, to which are keyed the arms 62 that carry the roller 16, is mounted at one end in an arm 67 pivoted at 68 to the bracket 47. By adjusting arm 67 pivotally, shaft 53, and hence roller 16, will be skewed out of parallel to roller 15. To this end, the lower end of arm 67 is bifurcated and carries a pin 108 (Figs. 1 and 3). This pin is pierced by an adjusting screw 109 in threaded engagement therewith. Near its opposite end (the left hand end, as viewed in Fig. 1) the screw 109 penetrates a pin 110 which is secured in a forked lower extension of the bracket 56 (see Fig. 2). Adapters 111 and 112 are mounted on screw 109 at opposite sides of pin 110 and bear respectively against opposed flattened seats on the pin. The adapters 111 and 112 are confined against axial displacement by a collar 113 and a hand wheel 114, respectively, both of which are mounted upon and pinned fast to the screw 109. It will be manifest that by turning the hand wheel 114 in one direction or the other the arm 67 may be adjusted, as desired, on its pivot 68, and the floating roller 16 may be correspondingly skewed to take care of uneven winding of the web roll and equalize the tension at opposite edges of the running web. The extent to which the arm 67 is adjusted may be gauged by a fixed pointer 115 depending from the bracket 47.

While I have described a preferred embodiment and mode of operation it will be understood that this is to be taken as illustrative and not limitative of my invention, and that I reserve the right to make various changes in form, construction, arrangement of parts, and mode of operation, without departing from the spirit and scope of my invention as set forth in the following claims.

I claim:

1. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a strap partly enveloping the roll, an anchorage for the strap at each end thereof, tensioning means comprising a load connected to the strap near one end thereof to pull the strap taut and thereby impose a drag on the roll, means opposing the pull of said load, said opposing means being directly responsive to the tension of the web whereby the drag on the roll will vary in inverse proportion to the tension of the web, said load comprising a series of sequentially connected weights, a shaft on which the weights are pivoted, and readily detachable means for suspending any desired number of said weights in inoperative position independent of said shaft and in said machine to reduce the load as desired.

2. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling rotation of said roll to tension said web, said device comprising a strap partly enveloping the roll, an anchorage for the strap at each end thereof, tensioning means for the strap including a rotatable weight shaft and means connecting the strap intermediate its anchorages to the shaft, an arm fixed to the shaft, a plurality of weighted arms pivoted on the shaft, one-way connections for sequentially connecting each of the arms starting with the fixed arm to the next adjacent arm so as to apply a turning load on the shaft in such direction as to pull the strap taut against the roll, means for supporting each weighted arm in its disconnected position to reduce said load as desired, and means respon-

sive to the tension of the web opposing the pull of said load.

3. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a plurality of straps partly enwrapping the roll, a pair of anchorages, means connecting said straps at opposite ends thereof to the anchorages, such connections to one of the anchorages being detachable, tensioning means for the straps including a rotatable weight shaft and means connecting the straps intermediate the anchorages to the shaft, an arm fixed to the shaft, a plurality of weighted arms pivoted on the shaft, one-way connections for sequentially connecting each of the arms starting with the fixed arm to the next adjacent arm so as to apply a turning load on the shaft in such direction as to pull the straps taut against the roll, means for supporting each weighted arm in disconnected position to reduce said load as desired, means responsive to the tension of the web opposing the pull of the load, the shaft being movable against the pull of the load to an idle position, and means for locking the shaft in said idle position to slacken the tension in the straps and permit of detaching any of the straps.

4. In a web-using machine arranged to draw a web from a rotary web roller, a device for controlling the rotation of said roll to tension said web, said device comprising a plurality of straps partly enwrapping the roll, a pair of anchorages, means connecting said straps at opposite ends thereof to the anchorages, such connections to one of the anchorages being detachable, tensioning means for the straps including a rotatable weight shaft and means connecting the straps intermediate their anchorages to the shaft, an arm fixed to the shaft, a plurality of weighted arms pivoted on the shaft, one-way connections for sequentially connecting each of the arms starting with the fixed arm to the next adjacent arm so as to apply a turning load on the shaft in such direction as to pull the straps taut against the roll, means for supporting each weighted arm in disconnected position to reduce said load as desired, means responsive to the tension of the web opposing the pull of the load, the shaft being movable against the pull of the load to an idle position, means for locking the shaft in said idle position to slacken the tension in the straps and permit of detaching any of the straps, and means for supporting any of the detached straps clear of the roll.

5. In a web-using machine arranged to draw a web from a rotary web roll, a floating web roller about which the web is guided, a plurality of straps partly enwrapping the web roll, a pair of anchorages to which the opposite ends of the straps are attached, a floating strap roller about which the straps are guided, a load connected to the floating strap roller to draw the straps taut and thereby impose a frictional drag on the web roll, means connecting the web roller and the strap roller at opposite ends thereof whereby the tension of the web will oppose the tension of the straps, and adjustable means for skewing the web roller so as to equalize the tension at opposite edges of the web.

6. In a web-using machine arranged to draw a web from a rotary web roll, a floating web roller about which the web is guided, a plurality of straps partly enwrapping the web roll, a pair of anchorages to which the opposite ends of the straps are attached, a floating strap roller about

which the straps are guided, a load connected to the floating strap roller to draw the straps taut and thereby impose a frictional drag on the web roll, resilient thrust means interposed between the web roller and the strap roller at opposite ends thereof whereby the tension of the web will oppose the tension of the straps, and adjustable means for skewing the web roller so as to equalize the tension at opposite edges of the web.

7. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a brake element adapted to bear against the rolls, means comprising a plurality of weighted arms acting on said element to impose a frictional drag on the roll, means for supporting certain of the arms in inactive position to reduce the drag on the roll as desired, and means responsive to the tension of the web opposing the pull of the weights.

8. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a strap partly enwrapping the roll, a fixed anchorage for the strap at one end thereof, a plurality of weighted arms adapted to apply tension to the other end of the strap, means for suspending any desired number of said arms in inoperative position so as to reduce the tension of the straps as desired, and means responsive to the tension of the web opposing the pull of the weights on the strap.

9. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a brake element adapted to bear against the roll, means comprising a plurality of pivoted weights acting on said element to impose a frictional drag on the roll, means for suspending certain of the weights independent of their pivot, whereby the drag on the roll will be varied, and means responsive to the tension of the web opposing the pull of the weights.

10. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a strap partly enwrapping the roll, a fixed anchorage for the strap at one end thereof, a plurality of weights independently movable to apply varying tension to the other end of the strap, means for moving certain of the weights into inoperative position in the machine and maintaining same in said inoperative position so as to reduce the tension of the straps as desired, and means responsive to the tension of the web opposing the pull of the weights on the strap.

11. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a brake element adapted to bear against the roll, means comprising a plurality of weights acting on said element to impose a frictional drag on the roll, means for holding certain of the weights out of action in the machine to vary at will the drag on the roll, means responsive to the tension of the web opposing the pull of the weights, said last means comprising a floating roller about which the web is passed and operative connections between the roller and said weights, said roller being adjustable laterally at one end so as to skew the roller to equalize the tension at opposite edges of the web.

12. In a web-using machine arranged to draw

a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a strap partly enwrapping the roll, an anchorage for the strap at one end thereof, a plurality of pivoted weights adapted to apply tension to the other end of the shaft, a shaft on which the weights are pivoted, means for suspending any desired number of said weights in inoperative position and maintaining them in said inoperative position in the machine so as to reduce the tension of the straps as desired, and means responsive to the tension of the web opposing the pull of the weights on the strap.

13. In a web-using machine arranged to draw a web from a rotary web roll, a device for controlling the rotation of said roll to tension said web, said device comprising a brake element adapted to bear against the roll, means acting on said element to impose a frictional drag on the roll, means for retaining a portion of said first mentioned means in inactive position to reduce the drag on the roll as desired, and means responsive to the tension of the web opposing the pull of the first mentioned means.

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