Nov. 11, 1952 T. R. BENNETT ET AL 2,617,610

WEB-TENSIONING MECHANISM FOR USE ON PRINTING MACHINES

Filed March 8, 1950 3 Sheets-Sheet 1

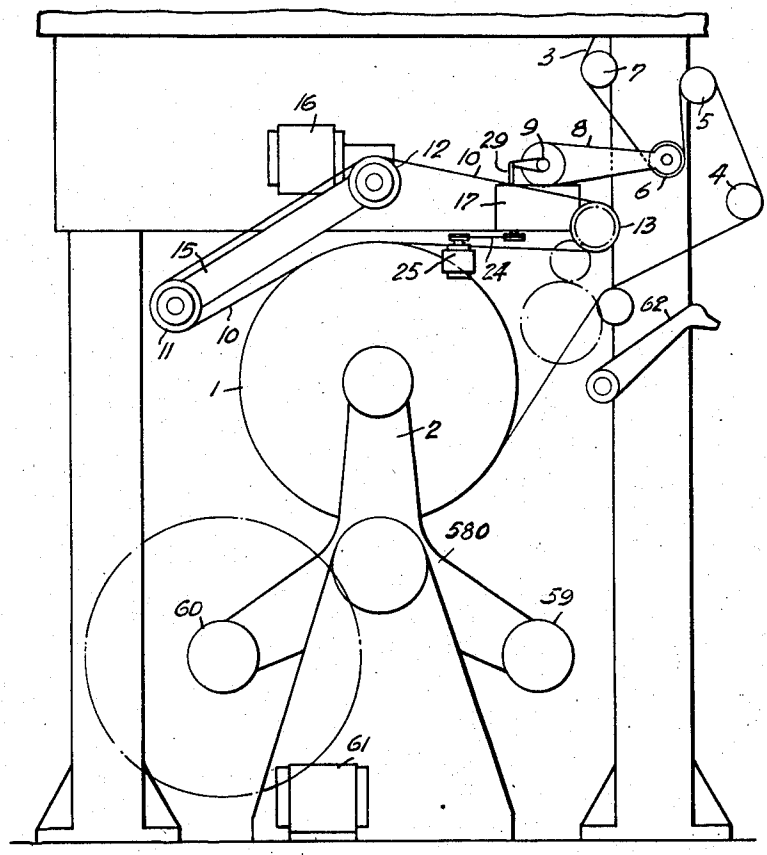


FIG. 1.

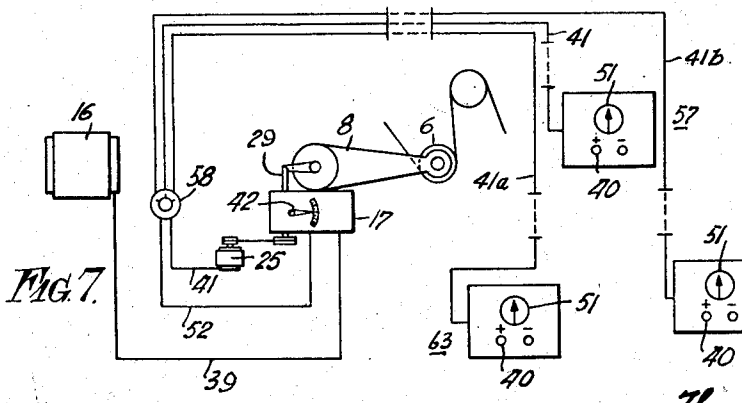


FIG. 7.

INVENTORS.
Thomas R. Bennett
Claude E. Phillis
BY Albert J. Horton
ATTORNEY.

Nov. 11, 1952 T. R. BENNETT ET AL 2,617,610

WEB-TENSIONING MECHANISM FOR USE ON PRINTING MACHINES

Filed March 8, 1950 3 Sheets-Sheet 2

FIG. 3.

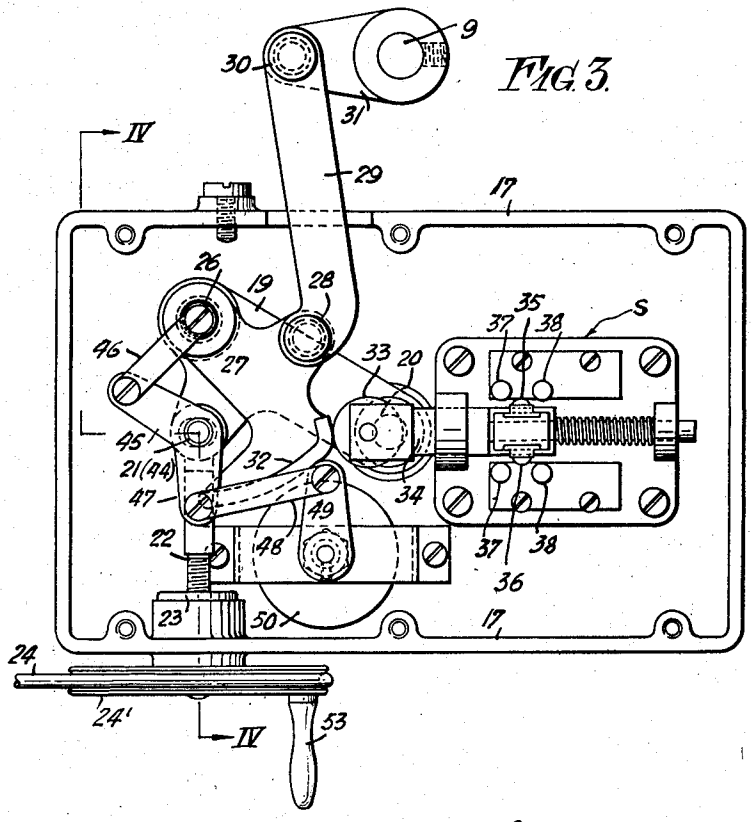
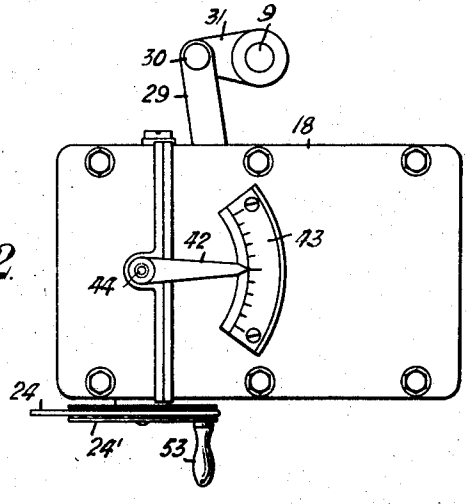


FIG. 2.



INVENTORS.
Thomas R. Bennett
Claude E. F. Willis
BY Albert J. Horton
ATTORNEY.

Nov. 11, 1952 T. R. BENNETT ET AL 2,617,610

WEB-TENSIONING MECHANISM FOR USE ON PRINTING MACHINES

Filed March 8, 1950 3 Sheets-Sheet 3

FIG. 4

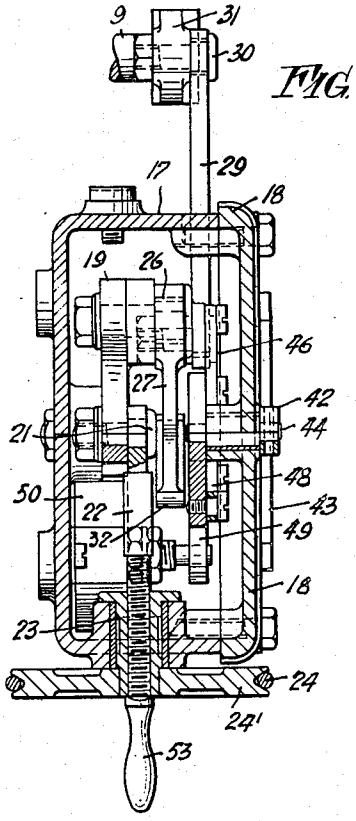


FIG. 6.

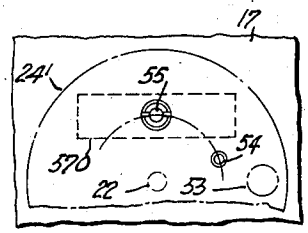
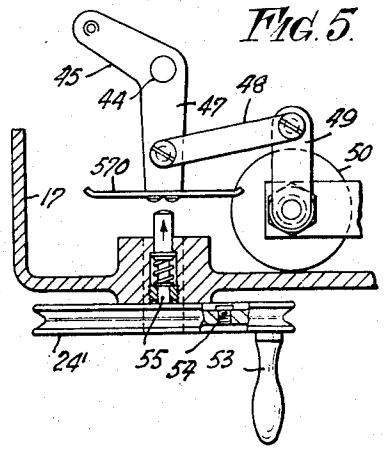


FIG. 5.



INVENTORS
Thomas R. Bennett
Claude E. F. Willis
BY Albert J. Horton
ATTORNEY.

Patented Nov. 11, 1952 2,617,610

UNITED STATES PATENT OFFICE

2,617,610

WEB-TENSIONING MECHANISM FOR USE ON PRINTING MACHINES

Thomas Richard Bennett, Kingsbury, London, and Claude Edward Frederick Willis, Norbury, London, England, assignors to R. Hoe & Co., Inc., New York, N. Y., a corporation of New York

Application March 8, 1950, Serial No. 148,304
In Great Britain March 14, 1949

3 Claims. (Cl. 242—75)

1

This invention relates to mechanism for use in controlling the tension in a web passing to a web using machine or a box making machine. The invention is concerned with apparatus of the type which comprises a component which moves in response to change in the tension in the web and which causes by its movement the operation of a tension regulating device so as to maintain the tension at a sensibly constant value.

Now according to one feature of the present invention there is provided, in web-tensioning apparatus of the kind referred to, a tension control mechanism which comprises a support, a switch-operating component movable on the support with the tension responsive component, the switch operating component being operatively associated with a switch to effect electrical operation of the tension regulating device and means to adjust the setting of the support and hence the nominal setting of web tension, the said means comprising an electric motor the control circuit of which can be extended to a remote control station. Preferably the support is mounted to pivot on a fixed pivot and the switch operating component is pivotally mounted on a pivot on the support at a point remote from its pivotal mounting. The switch-operating component is conveniently formed with a cam to engage a switch actuating device in the region of the pivotal mounting of the support so that co-operation is substantially unaffected by the rocking movement of the support.

According to a further feature of the invention in web tensioning apparatus of the kind referred to there is provided a remote control system comprising an electric motor to operate the tension regulating device, a switch to control the energisation of the motor and controlled by the tension responsive component and a second electric motor to adjust the nominal position of the operation of the switch, the control circuit of the second motor extending to the remote control station. The apparatus would also include an electrical potentiometer or similar device which will transmit to the remote control station a signal enabling the actual setting to be indicated at that station.

The invention is illustrated in the accompanying drawings in which Figure 1 is a side elevation showing in elevation a web supply arrangement incorporating the parts according to this invention, Figure 2 is a side elevation of the main component or control box according to this invention, Figure 3 is a view corresponding to

2

Figure 2 but with a cover removed to show the mechanism within the box and Figure 4 is a sectional side elevation approximately on the line IV—IV Figure 3, Figures 3 and 4 being on a larger scale than Figure 2. Fig. 5 is a local sectional plan and Figure 6 is a local side elevation of a modification. Figure 7 is a pictorial wiring diagram of that part of the control circuit of a web-consuming machine with which this invention is concerned.

Referring further to Figure 1 which indicates generally the kind of mechanism with which the invention is concerned, a web roll 1 is supported to rotate in a support 2 and the web 3 from this roll is taken over rollers 4—7 whence it passes to the machine operating on the web. The roller 6 is a floating roller and is carried at the outer end of an arm structure 8 carried by a spindle 9. Thus this roller is free to rise and fall in response to change in the tension in the web 3. Tension is regulated by a series of belts of which one is indicated at 10, the belts passing over rollers 11, 12, 13. The rollers 12 are so driven by a drive taken from the web-consuming machine that the speed of the belts 10 is slightly below the speed at which the machine draws the web forwardly, the belts thus imposing a tension in the web. The degree of tension is regulated by mounting the roller 11 in a frame 15 which can swing about the centre of the roller 12 and so vary the pressure of the belts 10 against the running roll 1, and the degree of their wrap about its periphery. The rocking of the frame 15 is effected by a reversible motor 16.

The mechanism so far referred to is well-known and it is therefore believed to be unnecessary to give further details. The invention is concerned with the mechanism by which the motor 16 is regulated to effect control in the tension of the web 3.

Reference will now be made to Figures 2, 4 and 7. In Figures 2 and 4 there is indicated a control box 17 having a cover 18 which is removed in Figure 3. In this box there is provided a support or bracket 19 which is mounted for rocking movement about a fixed pivot 20. This bracket is pivotally connected at 21 at a point displaced from the fixed pivot 20 to a screwed rod 22 engaging a nut 23 fixed in the wall of the box 17. The nut is coupled as by gearing or as shown by a flexible band 24 passing over a pulley 24' to a reversible electric motor (shown at 25 in Figure 1) so that when the circuit of this motor is closed the nut 23 is

rotated and in consequence the bracket 19 is caused to rock on its pivot 20 in one direction or the other.

The bracket 19 has pivotally mounted on it at 26 again at a point remote from its fixed pivot 20 a lever 27 to which is pivotally connected at 28 one end of a strut 29 the other end of which is pivotally connected at 30 to an arm 31 on the spindle 9 of the arms 8 carrying the floating roller 6. This lever 27 has a cam surface 32 disposed to engage a roller 33 at the end of a switch-operating rod 34 to operate a double-acting switch S shown in Figure 3, and comprising wiper contacts 35, 36 to engage contacts 37, 38 connected respectively in the "forward" and "reverse" lines of the motor 16. The cam 32 and the roller 33 on the switch operating rod 34 are disposed to engage in the region of the fixed pivot 20 of the bracket 19 so that movement of the bracket about that pivot 20 has little or no effect on the co-operation between the cam 32 and the roller 33.

The nominal setting of the bracket 19 and hence the nominal setting for the tension in the web is determined by energisation of the motor 25 under the control of a remote tension-setting controller hereinafter referred to. Since the motor 25 operates through the screw 22 the bracket 19 becomes in any position to which it is moved under the remote control, a fixture on which the lever 27 can rock about its pivot 26 in response to change in the web tension (either by an increase or a decrease of tension) with respect to that corresponding to the nominal value corresponding to the setting of the bracket 19. When such change occurs, the lever 27 is caused to rock in one or other direction on the bracket 19 and its cam surface 32 operates to control the position of the switch-operating rod 34 and so to close the "increase" or the "decrease" side of the switch S. When this occurs the motor 16 is energised to rock the frame 19 which operates to counteract the change in tension and to restore it to the value corresponding to that of the setting of the bracket 19. The depletion of the running roll tends to reduce the pressure of the belts 10 and to lower the tension on the web. This causes a lowering of the roller 6, which then acts through the controls to lower the belts 10 and restore the normal web tension. In order that the nominal value of the web-tension can be set by local hand operation at the web supply station, the pulley 24' which is normally driven by the motor 25, is provided with an operating handle 53 by which the rod 22 can be rotated to produce as has been described, the tension regulation which is normally effected by energisation of the motor 25. The rollers 5, 6 and 7 are positioned in such relationship that a greater tension on the web is produced if the roller 6 is held by the web at a relatively high elevation than if it is held at a lower elevation. By adjusting the mechanism for increasing and decreasing tension to operate in a low portion of the arc through which the roller 6 can swing, a relatively low web tension will be maintained, or by adjusting it to operate in a high portion a higher web tension will result. Hence by means of the handle 53, the pulley 24' may be rotated to so adjust the controls, that the floating roller 6 will be carried at the level that will produce the desired normal web tension.

For the purpose of affording a local visual indication of the nominal tension setting, there is

provided a pointer 42 to move over a fixed scale 43. The pointer 42 is secured to a spindle 44 having an arm 45 coupled by a link 46 to the lever 27, the link being free to pivot on the lever 27 about the point at which the lever is pivoted to the strut 29. When the bracket 19 is adjusted by the motor 25 or by the hand-wheel 24' the movement of the bracket 19 will operate through the link 46 to cause the pointer 42 to indicate the change in nominal web tension. As however the link 46 can pivot about the pivot on which the lever 27 rocks in response to fluctuation in web tension with respect to the nominal setting, the fluctuations will not cause the pointer 42 to move with those fluctuations.

As has been stated the tension regulating apparatus is adapted for remote control from a control station. A convenient arrangement is shown in Figure 7 in which the control line of the motor 16 from the switch S (which is within the control box 17), is indicated at 39 and in which the control line 41 of the motor 25 is taken to "increase" or "decrease" switches 40 on a control panel 57 located at any convenient position in the machine room. For example it can be located at the delivery of a printing machine. By operation of these push buttons 40 (or any equivalent switch mechanism) the nominal tension setting of the web-tension can be regulated by control exercised from this remote panel.

The nominal web-tension setting is indicated locally by the pointer 42. To enable a related indication of nominal web tension to be given at the tension control station 57 the arm 45 is extended by a second arm 47 which is linked by a link 48 to the arm 49 of an electrical potentiometer 50. This potentiometer is included by a transmission line 52 in circuit with an electrical indicating instrument 51 at the control station.

It will in many cases be desirable to arrange the tension control of a web-supply mechanism to be adapted for selective control from a number of control stations which are indicated in Figure 7 by the references 63, 64 each having increase or decrease switches 40 and a tension indicator 51. To enable such selection to be made the lines 41, 41*a* and 41*b* of the tension control mechanism are taken to a selector switch 58 by which those lines can be switched to the various remote control panels 57, 63, 64, the switch enabling the motor 25 and the potentiometer 50 to be connected to any one of those control panels.

So as to minimize any tendency for the floating roller 6 to "hunt" or oscillate and so to cause corresponding hunting in the value of applied web tension, the "increase" and "decrease" sides 37, 38 of the control switch S are so spaced that the movable switch component 35 has an idle movement in which no control is effected. This enables any small fluctuation in web-tension after an "increase" or a "decrease" control has been exercised to occur without regulation and this enables conditions to settle down after such a control has been applied.

Reference will now be made to Figures 5 and 6. These figures illustrate an arrangement which can be employed to prevent the screw-thread of the rod 22 from jamming in the nut 23 at each limit of the travel of the rod especially when it is operated by hand. The hand-wheel 24' has a limiting abutment 54 on it and in the side wall of the box 17 is provided a stop pin 55 which is normally held by a spring 56 in a retracted position clear of the abutment 54. On the arm 47

is secured a trip plate 570 which swings with the arm 47, so either one end or the other of the plate 570 will press down the stop pin 55 when the arm 47 approaches a position corresponding to either limit of travel of the screwed rod 22. When this engagement occurs, the stop pin 55 is forced outwardly against the action of its spring 56 and so comes into position to oppose continued movement of the abutment 54 and hence of the nut 23, beyond the limiting position.

In the arrangement as shown in Figure 1 the invention is applied to the familiar web-renewing mechanism in which the support 2 for the roll 1 is in the form of a 3 arm spider 580 which has two other roll positions 59, 60 of which the roll positions 59 can be regarded as that of an expiring roll and the roll position 60 as that of a freshly loaded roll, the spider 580 being turned (as by motor 61) to carry its roll positions successively into position to enable a web passing from the running roll to be joined to the web of a replacement roll and the running web is severed by mechanism indicated at 62. In such equipment the pressure of the belts 10 is reduced by the depletion of the running roll and consequently the belts must be lowered at frequent intervals in order to maintain a constant web tension. This apparatus forms no part of the present invention and is in any case well known so that further description in this application is believed to be unnecessary.

We claim:

1. Web tension control mechanism comprising in combination a tension-responsive component supported for movement in response to change in tension, a tension regulating device to effect change in web-tension, a tension control mechanism comprising a pivoted support, an electric switch to control actuation of the regulating device, a switch operating component pivotally mounted on the support at a point remote from the pivot of the support, the said switch-operating component having a cam switch-operating surface operatively to engage the switch in the region of the pivot of the support, an electric motor to adjust the angular setting of the support and means coupling the switch-operating component to the responsive component for movement therewith.

2. Web tension control mechanism comprising

in combination a tension-responsive component supported for movement in response to change in tension, a tension regulating device to effect change in web-tension and a tension control mechanism comprising a support mounted to swing on a fixed pivot, a switch operating component which is mounted to swing on the support on a pivot remote from the pivot of the support, an electric switch to control the operation of the tension regulating device, the switch operating component effecting actuation of the switch by its pivotal movement on the support, means coupling the switch operating component to the responsive component for movement therewith, a screw and nut gear to adjust the support on its pivot, an electric motor to rotate the rotatable member of the gear, a manually operable component to rotate the rotatable member of the gear and means controlled by the movement of the support to hold the rotatable member of the gear against rotation beyond extreme limiting positions.

3. Web tension control mechanism comprising in combination a tension-responsive component supported for movement in response to change in tension, a tension regulating device to effect change in web-tension and a tension control mechanism comprising a pivoted support, an electric switch to control actuation of the regulating device, a switch-operating component pivotally mounted on the support at a point remote from the pivot of the support, the said switch-operating component having a cam switch-operating surface operatively to engage the switch in the region of the pivot of the support, and means coupling the switch-operating component to the responsive component for movement therewith.

THOMAS RICHARD BENNETT.
CLAUDE EDWARD FREDERICK WILLIS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,170,840	Morse	Feb. 8, 1916
1,869,614	Phythian	Aug. 2, 1932
2,361,856	McMullen et al.	Oct. 31, 1944