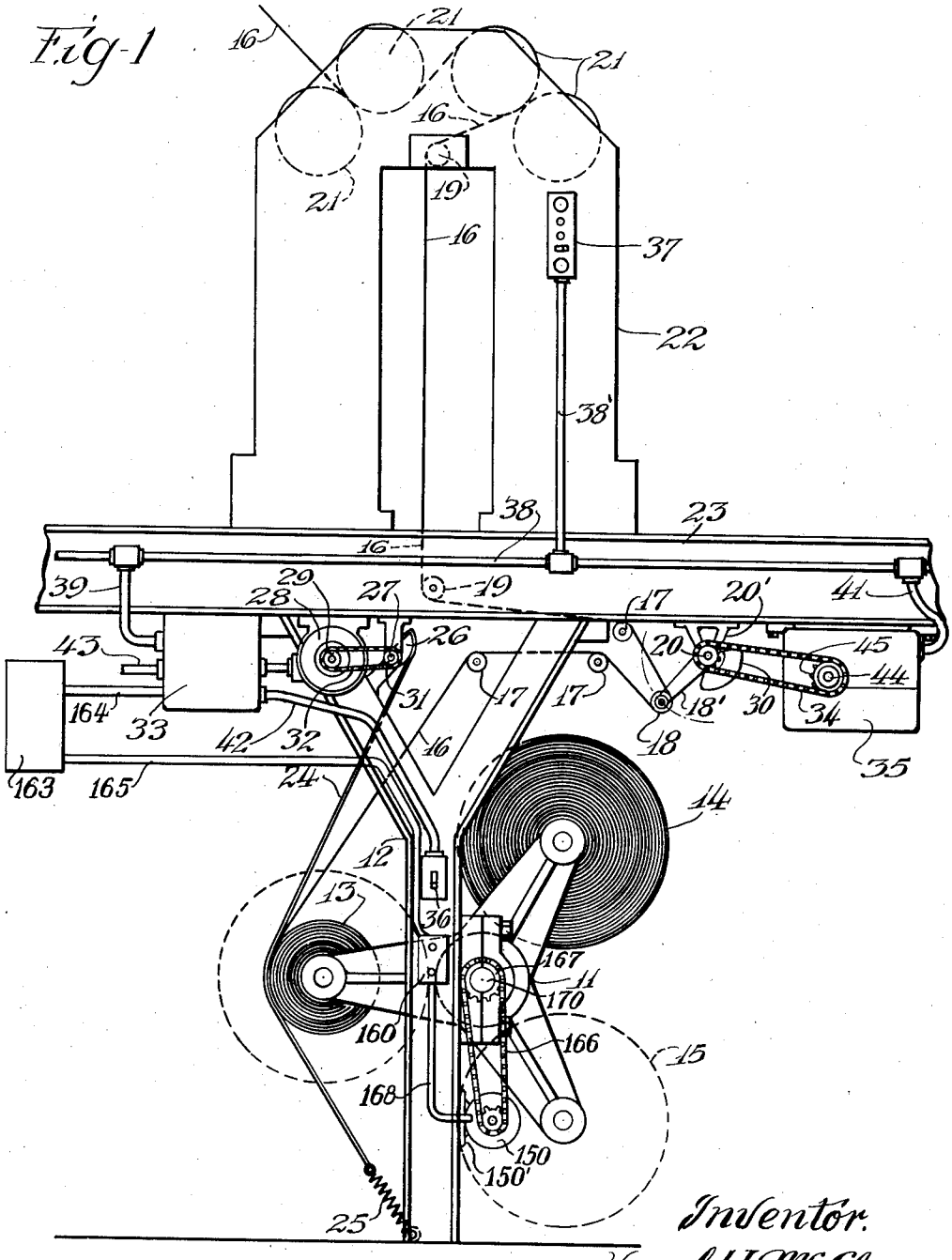
Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 1

Fig-1



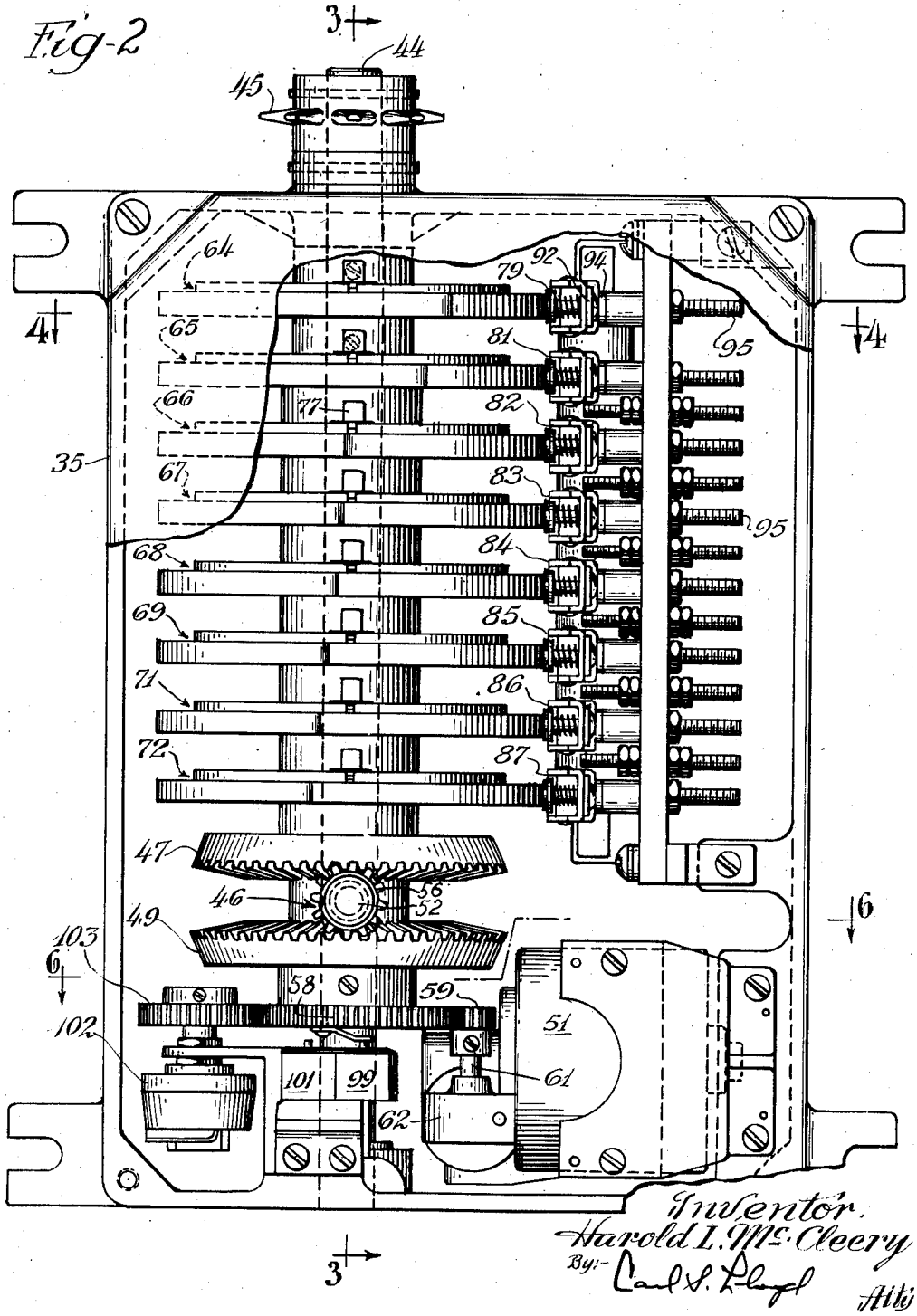
Inventor.
Harold L. McCleery
By:- Carl L. Lloyd
Atty.

Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 2

Fig-2



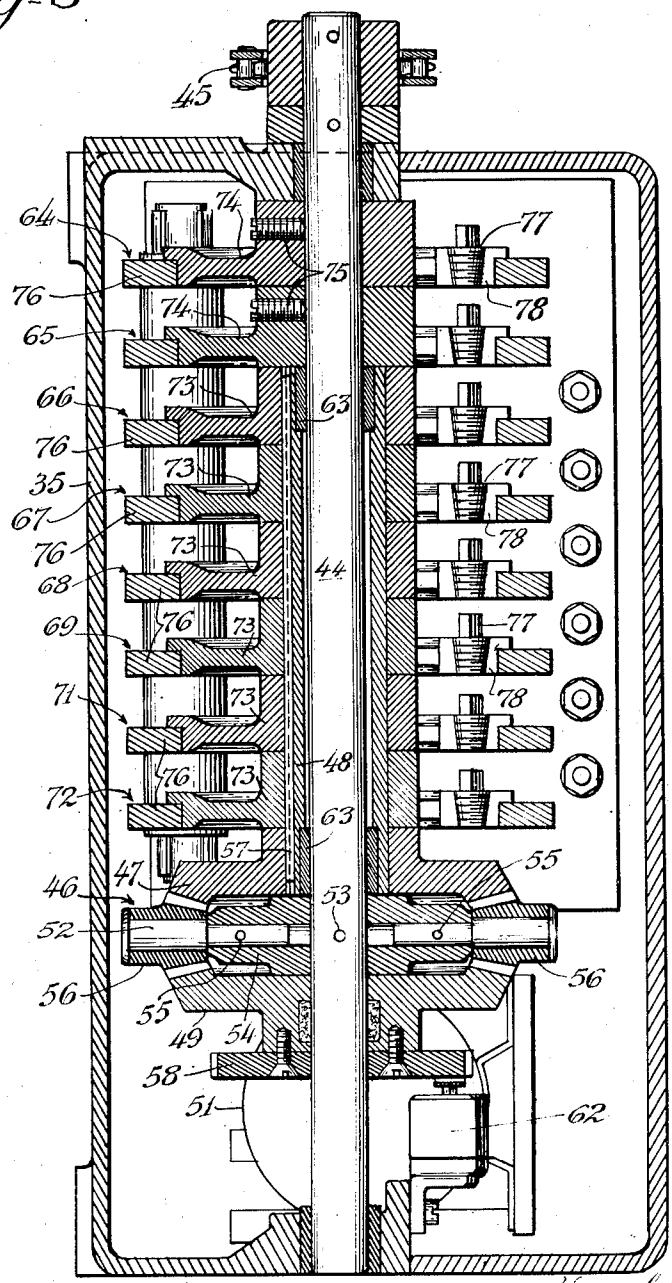
Inventor.
Harold L. McCleery
By: Carl S. Lloyd
Atty

Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 3

Fig-3



Inventor.
Harold L. McCleery,
By: C. L. S. Lloyd Atty

Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 4

Fig-4

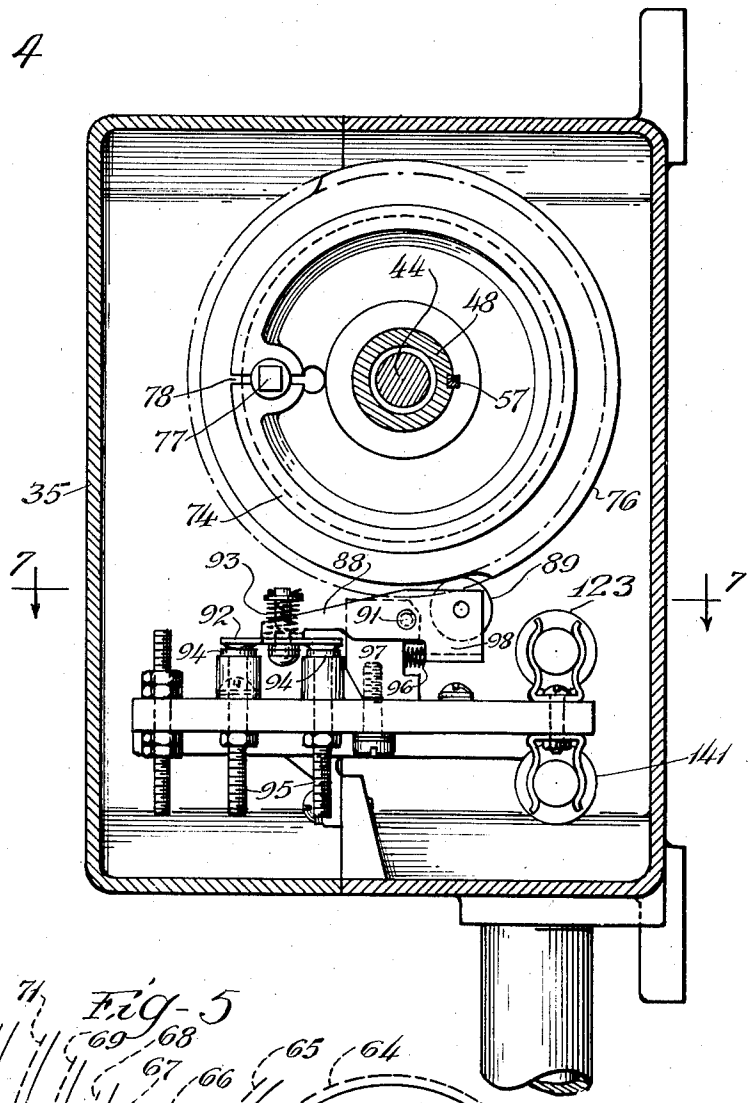
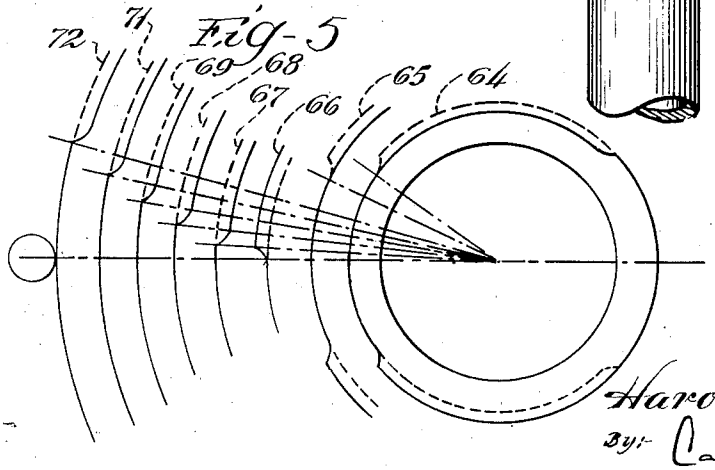


Fig-5



Inventor.
Harold L. McCleery
By: Carl S. Klopf
Atty.

Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 5

Fig-6

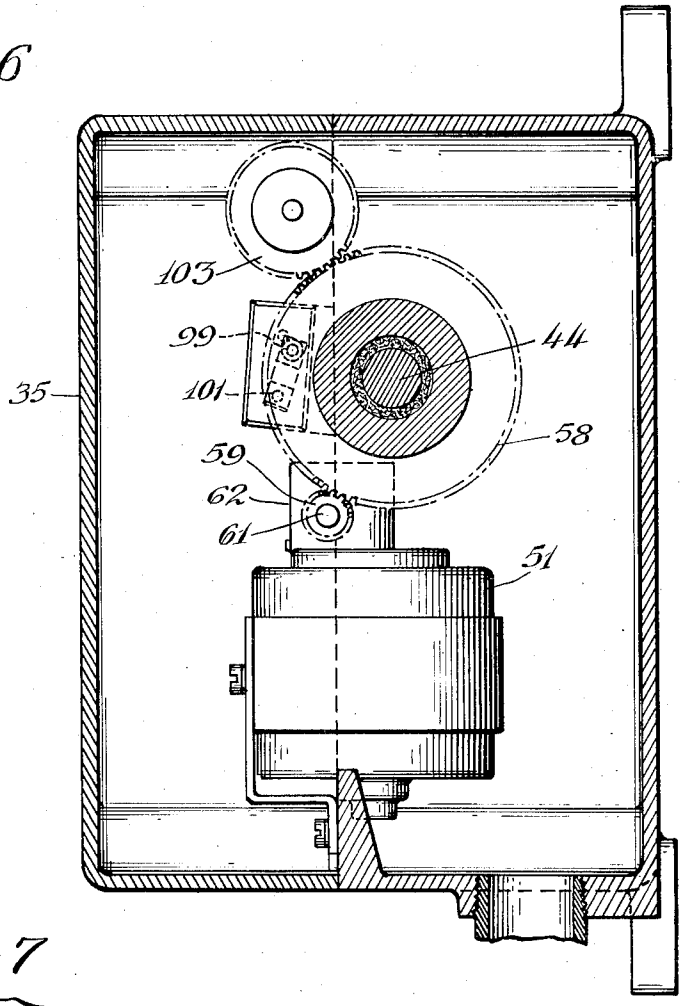
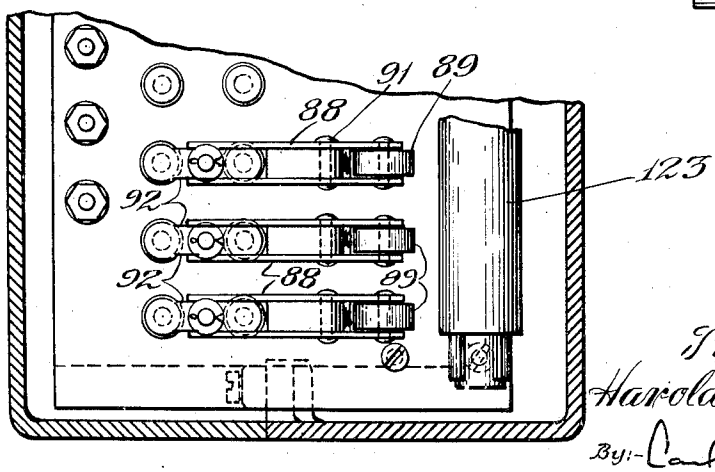


Fig-7



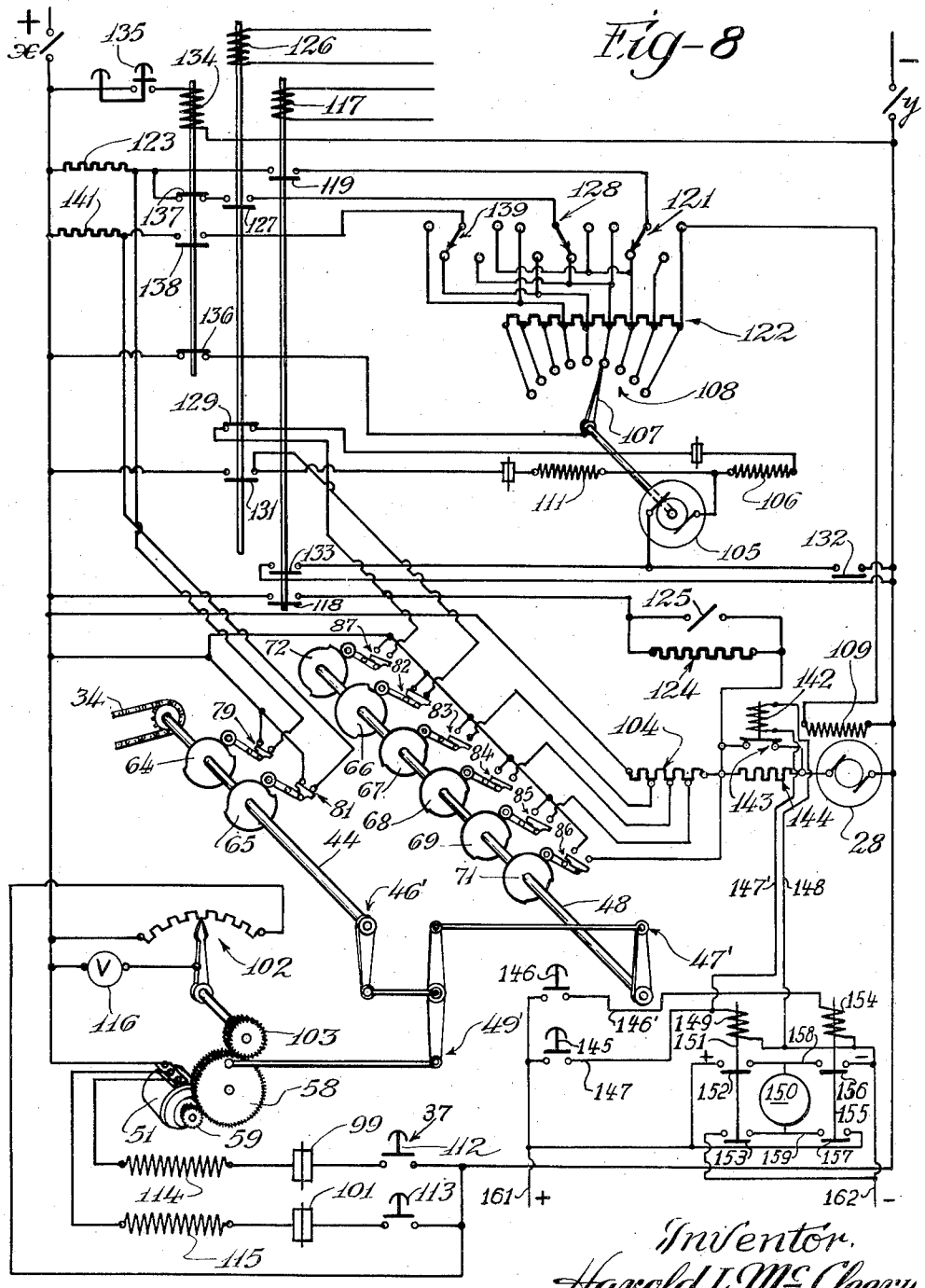
Inventor.
Harold L. McCleery
By:- Carl S. Lloyd Atty.

Dec. 7, 1943. H. L. McCLEERY 2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Filed July 22, 1940 6 Sheets-Sheet 6

Fig-8



Inventor.
Harold L. McCleery
By Carl S. Lloyd
Atty.

Patented Dec. 7, 1943 2,336,112

UNITED STATES PATENT OFFICE

2,336,112

WEB TENSION EQUIPMENT FOR PRINTING PRESSES

Harold L. McCleery, Downers Grove, Ill., assignor to Allan J. Cline, Chicago, Ill.

Application July 22, 1940, Serial No. 346,740

16 Claims. (Cl. 242—75)

This invention relates to web tension equipment of the general type disclosed in Cline et al. Patent No. 1,618,975 issued March 1, 1927, and provides various additional features of control and automatic regulation in connection with the fundamental elements disclosed in that patent. Said elements comprise primarily tension straps positioned to contact the surface of a web roll while the web is being drawn therefrom into the press, a torque motor for exerting the pull on said straps to tighten the same against the roll with the desired degree of tension, and means for controlling the torque of said motor, such means including a floating roller contacting the web at a point between the roll and the press, and devices actuated by the roller, as it changes position, to vary the torque of the motor.

It is the general object of the present invention to provide improvements and additional features in tension equipment of this type, which will improve its efficiency and suitability for use in conjunction with modern high speed presses under conditions existing in the press rooms of newspapers of large circulation.

One of the particular objects of the invention is to provide a preselected value of running tension which will be automatically maintained as the roll decreases in size and will compensate for any changes in the coefficient of friction between the paper and the tension straps or equivalent elements.

A further object is to provide, in apparatus of this character, corrective devices responsive to variations in tension of the running web to offset tendencies toward tension changes and thus maintain a practically constant web tension.

Another object is to provide means whereby the pre-selected range of normal tension (which may be a relatively small range as compared with the total range of movement of the floating roller) may be changed by the pressmen from some remote point, such as a station in the press room, which is normally at a level above the reel room in which the web rolls are located. In this connection, provision is also made for preventing operation of such pre-selecting means from any point other than a designated station.

It is also an object of the invention to provide predetermined values of tension for quick stops and slowdowns which are different from and are not affected by the value or setting of the normal running tension, and which have maximum limits so that the braking effect of the straps or other tension members upon the web roll is automatically reduced or terminated when predetermined tension is developed in the web.

Other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

In the drawings:

Fig. 1 is an elevational view, partly diagrammatic, of a typical reel and press unit with tension equipment embodying my invention applied thereto;

Fig. 2 is a detailed view of the drum switch and differential mechanism employed in the embodiment of the invention illustrated, one of the side plates being broken away for convenience in illustration;

Fig. 3 is a longitudinal sectional view of said drum switch and differential mechanism taken substantially on the section line 3—3 in Fig. 2 and showing also the chain for driving the sprocket on the differential shaft;

Fig. 4 is a transverse sectional view thereof taken substantially on the section line 4—4 of Fig. 2;

Fig. 5 is a schematic view showing the relative positions of the various cams of the drum switch when properly set;

Fig. 6 is a cross-sectional view taken substantially on the section line 6—6 of Fig. 2 and illustrating a pilot motor and associated mechanism whereby one of the elements of the differential may be adjusted;

Fig. 7 is a fragmentary view showing certain of the contact elements of the drum switch, the same being taken substantially on the line 7—7 of Fig. 4; and

Fig. 8 is a diagram showing the electrical circuits employed and the mechanical elements included therein, said elements being shown only schematicaly and in certain instances in somewhat different, though equivalent, form for clarity of illustration.

Referring first to Fig. 1, a standard three arm reel 11 is mounted on a Y-shaped supporting structure 12 of the press, and is adapted to support three web rolls 13, 14 and 15. The roll 13, as shown, is partially unwound, and the web lead 16 is shown passing over guide rollers 17 and a floating roller 18 and additional guide rollers 19 to the cylinders 21 of a press unit 22 mounted on a horizontal frame work and floor, generally indicated at 23. The roller 18 is carried by an arm 18' secured to a shaft 20 journaled in brackets 20' depending from the frame

23, said shaft also having a counterweight 30 secured thereto.

For purposes of providing proper tension on the web, tension members acting on the surface of the web roll 13 are employed, being shown in the present instance as tension straps 24 held at their lower ends by springs 25 attached to the frame or base, and at their upper ends extending over a drum 26 on a cam shaft 27 adapted to be rotated in forward or reverse direction by means of a torque motor 28, having a driving connection with said shaft by means of sprockets 29 and 31 mounted on the motor shaft and said cam shaft 27, respectively, and a driving chain 32 taking over said sprockets. The pressure of the straps 24 (of which there are ordinarily several spaced across the length of the web roll) against the roll is thus governed by the torque transmitted to the drum 26 from said torque motor 28.

The action of the torque motor 28 is in turn governed through a controller indicated generally in Fig. 1 by the reference numeral 33, and through the action of the floating roller 18, the movement of which is transmitted to a drum switch control, generally indicated in Fig. 1 by the numeral 35, by a chain-and-sprocket connection 34 between the shaft 20 and said control.

An "on" and "off" switch 36 is provided in the reel room, being shown as mounted on the support 12, and is for the purpose of cutting off the power to the torque motor and deenergizing all of the electric elements of the tension equipment when the reel tender wishes to drop the straps off the roll to permit leading the web into the press.

A remote control station 37 for adjusting or pre-selecting the various values of tension for running purposes is shown as mounted on the frame of the press unit 22, although, if desired, this station may be mounted near the folder or on an adjacent column near the press, in which case all of the tension stations for the several units of a press combination may be grouped together for convenient operation by the pressmen.

Suitable conduits 38 and 38' are provided for the electric wiring leading to and from the station 37, and branches 39 and 41 lead from said conduit 38 to the controller 33 and the drum switch control 35, respectively. A conduit 42 connects the controller 33 with the switch 36 and a conduit 43 connects said controller 33 with the main press controller (not shown).

The details of the drum switch contained in the housing 35 are illustrated in Figs. 2 to 7, inclusive.

Referring first to Figs. 2 and 3, a shaft 44 extends lengthwise through the housing 35 and has on an end thereof outside of said housing a sprocket 45 forming part of the chain-and-sprocket drive 34 previously mentioned. Said shaft is thus rotated in accordance with the movement of the floating roller 18.

A differential mechanism is contained in said housing 35 at the inner end of said shaft 44 and comprises a central element 46 secured to said shaft 44, an element 47 secured to a sleeve or tube 48 rotatably mounted on said shaft 44, and an element 49 rotatably mounted on said shaft 44, the latter element being geared to a pilot motor 51 mounted in said housing 35 and serving to effect adjustment of said differential element 49 in manner and for purposes which will hereinafter appear. The differential element 46 comprises a multi-diameter shaft 52 extending through the shaft 44 to which it is secured by means of a pin 53, said shaft 52 having a central bracing and spacer member 54 secured thereto by means of pins 55 and having pinions 56 rotatably mounted on the outer ends thereof and meshing with the differential gears 47 and 49. The member 47 is keyed to the hollow shaft or tube 48 by means of a key 57 and the member 49 is geared to the motor 51 by means of gearing comprising a ring gear 58 mounted on the shaft 44 concentrically with said member 49, a pinion 59 mounted on a stub shaft 61 and meshing with said gear 58, and back gearing contained in a housing 62 mounted adjacent the end of the housing of the motor 51, said back gearing being driven from the motor shaft in manner which is well-known in the art.

The hollow shaft or tube 48 is mounted on bearings 63 on the shaft 44, and keyed to said tube in addition to the differential member 47 are a number of cam assemblies indicated by the numerals 66, 67, 68, 69, 71 and 72. Adjacent said cam assemblies, but secured directly to the shaft 44, are two additional assemblies identified by the numerals 64 and 65.

The cam assemblies 66 to 69, inclusive, 71 and 72 include hubs 73 secured to the tube 48 by means of the key 57, and the assemblies 64 and 65 include hubs 74 which are secured to the shaft 44 by means of set screws 75. Said assemblies also include cam members 76 which are adjustably secured to the hubs 73 and 74 by means of tapered plugs 77 which extend into slots 78 in one side of the hubs 73 and 74 and serve to spread the diameter of the latter to cause them to expand within bore of the cams and thus lock the latter in place. By partially or completely removing the plugs, the diameter of the hubs is reduced sufficiently to permit circumferential adjustment of the cams.

The cam assemblies 64 to 69, inclusive, 71 and 72 serve to operate a corresponding number of switches, identified respectively, by the reference numerals 79 and 81 to 87, inclusive, which control the operation of the torque motor 28 and associated electrical equipment in manner which will later be described. The construction of said switches is best shown in Fig. 4, from which it will be noted that they comprise pivoted members 88, each carrying a roller 89 on one side of a pivot 91 and a contact member 92 on the other side of said pivot, said contact member having a spring connection indicated at 93 with the pivoted member or arm 88, and being adapted to bridge contacts 94 mounted on binding posts 95. The roller 89 is held in contact with the appropriate cam 76 by means of a spring 96 positioned between a fixed frame part 97 and a shoulder 98 on the member 88.

Referring again to the differential mechanism shown in Figs. 2 and 3, the member 49 is adapted to be fixedly held in any adjusted position to which it may be moved by operation of the motor 51 (which may be operated by the pressman from the station 37 or other remote point) and with said member set to a desired position, movement of the shaft 44 caused by movement of the floating roller 18 will operate the differential member 46 which, through the pinions 56, will cause the differential member 47 to rotate forward or backard, thereby rotating therewith the cam assemblies 67 to 69, inclusive, 71 and 72. Inasmuch as the element 49 is held in fixed position by the back gearing previously described, the element 47 will be rotated by the element 46 at twice the angular speed of the latter.

Limit switches 99 and 101 are provided to restrict the total angular movement of the element 49 to a range corresponding to the total angular movement of the floating roller 18 in order to provide a range of pre-selected values of tension which will always be within the operating range of the floating roller. Said range in a commercial embodiment of the invention employed by the applicant's assignee is from zero to 72 degrees representing a weight curve for the floating roller building up from zero to approximately 200 pounds maximum in the web.

A potentiometer 102 (shown in Fig. 2 and in the diagram in Fig. 8) is geared by means of a gear 103 and the gear 58 to the differential member 49, and serves, in manner which will be hereinafter described, to provide at a remote point an indication of the relative angular position of the floating roller, which in turn is an approximate indication of the relative amount of tension being carried in the web.

Instead of allowing the normal regulation of the torque motor 28 to be governed by the entire displacement of the floating roller, such regulation, in accordance with the present invention, is confined for a given tension setting to a much smaller range of movement of said roller, as, for example, five degrees. Within this five degree range, the torque of the torque motor 28 is governed entirely by the four cam members 67, 68, 69 and 71 and associated switches 83, 84, 85 and 86, which, as shown in Fig. 8 of the drawings, are connected at spaced points to resistance 104 in the armature circuit of the torque motor 28. Said contacts are opened or closed in succession by one degree movement of the floating roller.

In the event the tension in the web is insufficient to hold the floating roller within the five degree range, the armature contacts 83 to 86, inclusive, will all be closed and the contact 87 will thereupon be closed by means of the cam 72. The closing of the latter contact will energize a reversible pilot motor 105 through an associated increase field 106 and said pilot motor will thereupon operate an arm 107 of a field rheostat 108 which is in series with the shunt field 109 of the torque motor 28, the movement of said arm 107 being in this event in clockwise direction, viewing Fig. 8, and serving to increase the field strength of said torque motor 28. The tension straps 24 are thereby tightened against the roll 13, thus providing an increased pull on the web which will bring the floating roller 18 back up to the position where the contact 87 will be opened and the regulation will again be accomplished through the armature contacts 83 to 86, inclusive.

In the event the tension in the web should increase to the extent that the floating roller 18 is lifted beyond the pre-selected five degree range, the armature contacts 83 to 86, inclusive, will all be opened, after which the contact 82 will be closed, thereupon closing the circuit of the pilot motor 105 through a decrease field 111, thereby operating said pilot motor in the reverse or decrease direction, moving the rheostat arm 107 in counter-clockwise direction to decrease the field strength of the torque motor 28. This will reduce the pressure of the tension straps 24 upon the roll 13 and correspondingly reduce the tension in the web, allowing the floating roller to settle back to the preset five degree range with the contacts 82 and 87 open and with the regulation of the torque motor being accomplished through the armature contacts 83 to 86, inclusive.

For clarity of illustration, the contacts 79 and 81 to 87, inclusive, and the cams 64 to 69, inclusive, 71 and 72 are shown in somewhat different arrangement in the diagrammatic view, Fig. 8, than they are in the other figures, and the differential elements, indicated in this figure by the reference character 46', 47' and 49', are shown as a lever system, the equivalency of which will be apparent to those skilled in mechanics.

As will now be evident, the selection of the five degree range of operation on the floating roller curve is accomplished by interposing the differential device, or equivalent lever system, between the cam shaft 48 and the shaft 44, which is directly operated by the floating roller 18. The selection may be made from a remote point, as the station 37, by operation of increase or decrease push buttons, identified in Fig. 8 by the numerals 112 and 113, respectively, which cause operation of the adjusting pilot motor 51 through its increase field 114 or its decrease field 115, as the case may be. By operation of said motor 51 in increase or decrease direction the five degree regulating range may be shifted up or down on the floating roller curve at the will of the pressman, the operation of the motor causing a change in the position of the differential element 49 and a consequent change in the angular displacement between the elements 47 and 46. As previously noted, the element 49 is held in any adjusted position by means of the back gearing associated with the motor 51.

The relative position of the selected five degree range in the seventy-two degree range of the floating roller 18, or, in other words, the approximate amount of tension being carried in the web, is indicated at a remote point, preferably at the station 37, by means of a voltmeter 116 controlled by the potentiometer 102 hereinbefore mentioned. The potentiometer arm, being directly connected to the member 49 of the differential, will move correspondingly from an "off" or zero position, so the voltmeter reading will be in direct proportion to the displacement of said member 49 from its zero position.

Once the member 49 has been preset and the amount of tension to which the operator wishes to regulate has been determined, the movement of the floating roller 18 on the differential member 46 will rotate member 47 to operate the armature contacts of the torque motor 28 to obtain the necessary regulation. If the armature contacts 83—86 are unable to hold the floating roller within the five degree range, the contacts 82 or 87 will operate the pilot motor 105 to reset the field of the torque motor to the proper value as previously explained, so that the net torque from said torque motor will be sufficient to hold the floating roller within the five degree pre-selected position.

Provision is also made for proper control of the tension in cases of emergency stops, slowdowns and pasters, the latter term being applied to the joining of the web of a new or replacement roll to the web running to the press from an expiring roll. The means whereby such control is accomplished are illustrated primarily in Fig. 8.

When an emergency stop is required, braking is applied to the press, which results in the energizing of a "stop" relay 117 which is connected to the main press control (not shown). A contact 118 in the circuit shown in said Fig. 8 (in which the positive and negative sides of the supply line are indicated by the letters x and y, respectively) is thereby closed and provides additional voltage to the armature of the torque

motor 28. A contact 119 is also closed by this relay to provide additional field strength through a "stop" tap changer 121, which can be preset to include more or less of the resistance 122 of the rheostat 108 and thus give the field strength required for a given speed of deceleration of a particular press. The drum switch contact 79 is in this circuit and is set to open at about a thirty-five degree position of the floating roller 18, said contact being independent of the differential mechanism previously described and thus not affected by any changes in the adjustment of the latter. Therefore if too much stop tension is obtained and the web pulls the floating roller beyond the thirty-five degree position, the contact 79 opens and thereby inserts a resistance 123 in the shunt field circuit to decrease the amount of torque provided by the torque motor 28. This allows the floating roller to settle down, which in turn again closes the contact 79, so that during the stopping period said contact, which is opened and closed by the cam assembly 64, acts as an automatic regulator for the amount of stop tension.

The closing of the contact 118 by the stop relay 117 causes short-circuiting of the normal regulating resistance 104 of the torque motor circuit in case of an emergency stop to insure sufficient current to the torque motor armature for the preset stop tension. The tension value can be regulated by cutting in or out a resistance element 124 in this short circuit by means of a roll length switch 125, which may be a manually operated toggle switch. For full and three-quarter length rolls said switch is closed to short out said resistance 124, whereas for half and quarter length rolls the resistance is inserted by opening the switch.

During a normal slowdown or decrease of the press speed a "decrease" relay 126 is energized (by a coil on the main control) and this provides the proper amount of decrease tension through the same contact 79 which controls the tension on an emergency stop. A contact 127 on this relay is closed when the relay coil is energized, thus closing a circuit through a "decrease" tap changer 128 and the rheostat 108 of the torque motor field. Simultaneously a contact 129 is opened to prevent the pilot motor 105 from being operated in the increase direction. Also a contact 131 is closed, which energizes the decrease field 111 of the pilot motor 105, provided the large motor on the press is running and the circuit is closed by means of an interlock 132 (which is shown in Fig. 8 although normally located on the main control panel). Thereupon the arm 107 of the rheostat 108 in the torque motor field will be automatically brought back to the "off" position in order to insure that when the press is restarted there will be a minimum of tension in the web until a running speed is attained.

It is also necessary that the pilot motor 105 bring the rheostat arm 107 back to the "off" position in case of an emergency stop of the press, and since the interlock 132 is open during the stopping period (by reason of the fact that the main motor is not running), the circuit is completed to accomplish this purpose by means of a third contact, numbered 133, on the stop relay 117. On an emergency stop the decrease relay 126 is energized as well as the stop relay 117, and therefore the pilot motor 105 receives energy through the contact 131 and the decrease field 111, the circuit being completed through the armature of said pilot motor 105 and the contact 133 on the stop relay to the negative side y of the supply line. This will cause rotation by the motor in the decrease direction to bring the rheostat arm 107 to its "off" position, thus insuring that when the press is restarted there will be a minimum amount of tension in the web. As will be understood, the tension will be automatically restored to the pre-selected value when the interlock 132 is closed at the time the large press motor begins running. Thereafter the pilot motor 105 will receive energy when occasion requires either through the contact 82 or the contact 87 to reset the torque motor field rheostat 108 to the proper position for normal regulation of the torque motor through the armature contacts 83 to 86, inclusive, of the drum switch within the pre-selected five degree range on the floating roller curve.

For providing the right value of tension for making pasters, a third relay 134, called the "paster" relay, is provided. This relay is adapted to be energized by means of a push button 135 and when energized opens a contact 136 in circuit with the arm 107 of the rheostat 108, thereby deenergizing said arm.

The energizing of this relay also opens a contact 137 which is normally closed and is in series with the contact 127 on the decrease relay 126. The opening of said contact 137 insures that the decrease tension will be cut out.

A third contact 138 is provided on the paster relay and is closed when the relay coil is energized, thereby closing a circuit to the drum switch contact 81 which is associated with the cam assembly 65. This contact is associated with the floating roller in manner similar to the contact 79 except that it is set for opening at about a twenty-five degree position of the floating roller. When said contact 81 is closed at the time the paster relay is energized, current will flow through the contact 138, a paster tap changer or pre-adjusting dial 139 and the proper amount of resistance in the rheostat 122 to the torque motor shunt field 109. As operation of the torque motor increases the tension and causes the floating roller 18 to be lifted to approximately the twenty-five degree position, the contact 81 will be opened by reason of the position of the cam 65, and this will cause insertion in the torque motor field circuit of a regulating resistance identified by the numeral 141, thereby decreasing the pull on the web as a result of the lessening of the torque applied by the torque motor 28, and allowing the floating roller to settle back to a position where the contact 81 is again closed. This contact thus becomes an automatic regulator for the value of the paster tension.

The regulating resistances 123 and 141 are shown in Fig. 4 of the drawings in the form of resister tubes identified by corresponding reference numerals.

The cams 64 to 69, inclusive, 71 and 72 are shown in Fig. 8 as in the starting or zero position of the apparatus, at which time the contacts 79, 81 and 82 are closed.

As the reel 11 (Fig. 1) is further turned after the making of a paster to bring the new roll 14 to the running position (the position occupied by the roll 13 in Fig. 1) and to move the reel arms carrying the core of the roll 13 to reloading position (the position occupied by the roll 15 in Fig. 1), the pressure of said new roll 14 against the straps 24 produces a braking action on the roll

thereby lessening the amount of torque required of the torque motor 28. To compensate for this increased strap tension a relay 142, a contactor 143 and a resistor 144 are provided in the torque motor armature circuit (see Fig. 8).

The relay 142 is connected in parallel with a forward contactor coil 149 of the reel rotation controller 163 (see Fig. 1), so that said relay is energized automatically when the reel is rotated in forward direction. This results in opening the contacts 143 and thus inserting the resistance 144 in the armature circuit of the torque motor 28 to reduce the tension or torque produced thereby to a predetermined value suitable for this condition. When the new roll reaches its running position and is running normally, the relay 142 is automatically deenergized (by release of a forward contactor button 145 of the reel controller 163, or in other suitable manner) and this allows the contacts 143 to close, thus shunting out the resistance 144, with consequent increase in the torque applied by the motor 28.

To further illustrate the means whereby said relay 142 is operated as just described, I have shown diagrammatically in the lower right-hand portion of Fig. 8 the reel rotation motor, indicated by the reference numeral 150, and the connections for forward and reverse operation thereof, together with the connections to said relay 142. Said motor 150 is fed from a separate source of power, the positive and negative lines of which are identified, respectively, by the numerals 161 and 162, this being desirable because a different voltage is ordinarily used for the reel rotation than that employed for the tension circuit and because alternating current is sometimes used instead of direct current which is customarily employed for the tension circuit. The forward operation of said motor is controlled by the forward contactor button 145 and the forward contactor coil 149 above mentioned, and the reverse operation is controlled by a reverse contactor button 146 and reverse contactor coil 154. A relay 151, operated by the forward contactor coil 149, is provided with contacts 152 and 153 for connecting the motor through wires 158 and 159 with the positive and negative sides of the line, respectively, and a relay 155, operated by the reverse contactor coil 154, is provided with contacts 156 and 157 for connecting said motor to the positive and negative sides of the line, respectively, when the reverse contactor button 146 is actuated. The reverse contactor button 146 is connected with the coil 154 by wire 146', and the forward contactor button 145 is connected with the coil 149 by wire 147. Said wire 147 has a branch 147' connecting with one end of the relay coil 142, and the other end of said coil is connected to the negative side of the supply line by wire 148. It will thus be apparent that when the circuit is closed by pressing the forward contactor button 145, said relay 142 will be energized and release of said button will result in de-energization of said coil 142, as above stated.

In Fig. 1 I have shown the reel rotation motor 150 mounted upon a bracket 150' secured to the upright 12, said motor being connected by a chain 166 with a sprocket 167 on the reel shaft 170. The forward and reverse rotation station is shown in blocked-in form at 160 and is connected to the motor 150 by wiring in a conduit 168. Said forward and reverse rotation station is connected with the reel rotation controller 163 by wiring contained in a conduit 165, and said controller 163 is connected with the tension controller 33 by wiring in a conduit 164, for the purpose of making interconnection between the coil 142 and the forward rotation contactor 145, as above described.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

What I regard as new and desire to claim by Letters Patent is:

1. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement.

2. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, means controlled by the movement of said roller to regulate the action of said motor, said means including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, and means for adjusting said limited regulating range up or down within said total range.

3. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, and a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid.

4. Web tension equipment for printing presses

comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid, and means for adjusting the position of one of the members of said differential whereby the said limited regulating range of the floating roller may be moved up or down within said total permitted range of angular displacement thereof.

5. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid, and means including a pilot motor and means whereby the same may be controlled by the pressman from a remote point for adjusting the position of one of the members of said differential whereby the said limited regulating range of the floating roller may be moved up or down within said total permitted range of angular displacement thereof.

6. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid, means for adjusting the position of one of the members of said differential whereby the said limited regulating range of the floating roller may be moved up or down within said total permitted range of angular displacement thereof, and means controlled by said adjusting means for indicating at a remote point the relative position of the preselected normal regulating range of the floating roller.

7. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid, means for adjusting the position of one of the members of said differential whereby the said limited regulating range of the floating roller may be moved up or down within said total permitted range of angular displacement thereof, and means controlled by said adjusting means for indicating at a remote point the relative position of the preselected normal regulating range of the floating roller, said last-mentioned means comprising a potentiometer including an arm movable in unison with said adjusting means and a voltmeter, the reading of which is determined by the position of said arm.

8. Web tension equipment for printing presses comprising a strap or friction apron arranged to

press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, means controlled by the movement of said roller to regulate the action of said motor, said means including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, and means including a pilot motor connected with said devices for operation thereby at the upper and lower limits of said range for varying the torque of said torque motor to thereby vary the tension in the web and thus bring said floating roller back within said normal regulating range in case it moves out of the same in either direction.

9. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, including devices for limiting the normal regulating range of said floating roller to a relatively small part of its total permitted range of angular displacement, said means comprising regulating resistance arranged to be included in variable amount in the circuit of said torque motor, a series of contacts connected with said resistance, means operated through the action of said floating roller to operate said contacts and thereby control the amount of resistance in the circuit in accordance with the position of the floating roller, a differential mechanism, one element of which is connected to said contact operating means to actuate the same and another element of which is connected with said floating roller to be actuated thereby, whereby said normal regulating range may be narrowed as aforesaid, and means including a pilot motor connected with said devices for operation thereby at the upper and lower limits of said range for varying the torque of said torque motor to thereby vary the tension in the web and thus bring said floating roller back within said normal regulating range in case it moves out of the same in either direction.

10. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means including switch contacts operated by said floating roller, regulating resistance arranged to be included in variable amount in the circuit of said torque motor by operation of said contacts to control the action of said motor under normal running conditions, a stop relay, means controlled by the energizing of said stop relay for causing said torque motor to apply the proper degree of stop tension, and means including a regulating contact operated by the floating roller upon movement thereof to a predetermined extent after said stop relay has been energized to decrease the torque applied by said torque motor, thereby providing automatic regulation of the stop tension.

11. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, means controlled by the movement of said roller to regulate the action of said motor, said means including switch contacts operated by said floating roller, regulating resistance arranged to be included in variable amount in the circuit of said torque motor by operation of said contacts to control the action of said motor under normal running conditions, a stop relay, means controlled by the energizing of said stop relay for causing said torque motor to apply the proper degree of stop tension, and means including a regulating contact operated by the floating roller upon movement thereof to a predetermined extent after said stop relay has been energized to decrease the torque applied by said torque motor, thereby providing automatic regulation of the stop tension, and a roll-size selector switch for preselecting the stop tension for different length rolls.

12. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means including switch contacts operated by said floating roller, regulating resistance arranged to be included in variable amount in the circuit of said torque motor by operation of said contacts to control the action of said motor under normal running conditions, a paster relay, means controlled by the energizing of said paster relay for causing said torque motor to apply the proper degree of paster tension, and means including a regulating contact operated by the floating roller upon movement thereof to a predetermined extent after said paster relay has been energized to decrease the torque applied by said torque motor, thereby providing automatic regulation of the paster tension.

13. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means in-

cluding switch contacts operated by said floating roller, regulating resistance arranged to be included in variable amount in the circuit of said torque motor by operation of said contacts to control the action of said motor under normal running conditions, a movable support upon which a replacement roll is mounted, a relay automatically operable upon movement of said support in bringing the replacement roll into running position against said strap, and means controlled by said relay for temporarily increasing the amount of resistance in said circuit and thus decreasing the torque of the motor at the time of such movement of said replacement roll against said strap.

14. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means including a series of contacts and regulating resistance for normal control of the torque applied by said motor, a field for said torque motor, a field rheostat, a pilot motor for controlling the latter, a stop relay, means controlled by operation of said stop relay for regulating the strength of said torque motor field to provide the proper degree of tension for an emergency stop and for causing said pilot motor to adjust said rheostat to insure that the torque motor will apply a minimum of tension to the web when the same is being rethreaded preparatory to the next run of the press.

15. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, and means controlled by the movement of said roller to regulate the action of said motor, said means including a series of contacts and regulating resistance for normal control of the torque applied by said motor, a field for said torque motor, a field rheostat, a pilot motor for controlling the latter, a decrease relay, means controlled by operation of said decrease relay for regulating the strength of said torque motor field to provide the proper degree of tension for a normal slowdown and for causing said pilot motor to adjust said rheostat to insure that the torque motor will apply a minimum of tension to the web when the same is being rethreaded preparatory to the next run of the press.

16. Web tension equipment for printing presses comprising a strap or friction apron arranged to press against the surface of a web-roll from which the web is drawn into the press, a torque motor operatively connected to said strap for applying a continuous strain thereto to cause the same to exert a braking force upon the surface of the web-roll, a floating roller positioned to contact the web and being movable in accordance with the amount of tension therein, means controlled by the movement of said roller to regulate the action of said motor, said means including a series of contacts and regulating resistance for normal control of the torque applied by said motor, a field for said torque motor, a field rheostat, a pilot motor for controlling the latter, a stop relay, means controlled by operation of said stop relay for regulating the strength of said torque motor field to provide the proper degree of tension for a stop and for causing said pilot motor to adjust said rheostat to insure that the torque motor will apply a minimum of tension to the web when the same is being rethreaded preparatory to the next run of the press, and means for automatically increasing the tension from said minimum to a preselected regulated value when the press attains a running speed.

HAROLD L. McCLEERY.