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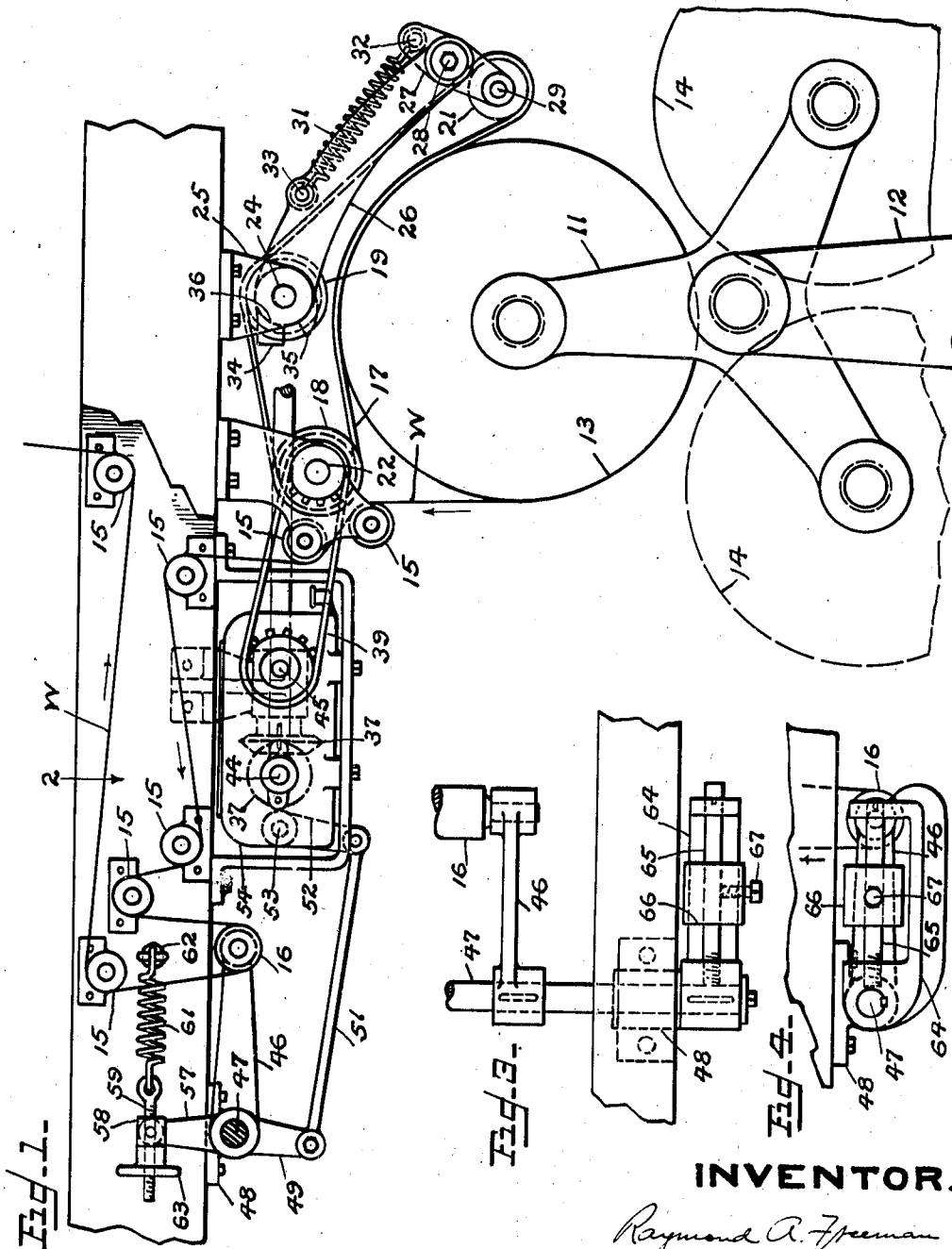
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WEB ROLL CONTROLLING MECHANISM FOR PRINTING MACHINES

Filed Feb. 15, 1935

2 Sheets-Sheet 1



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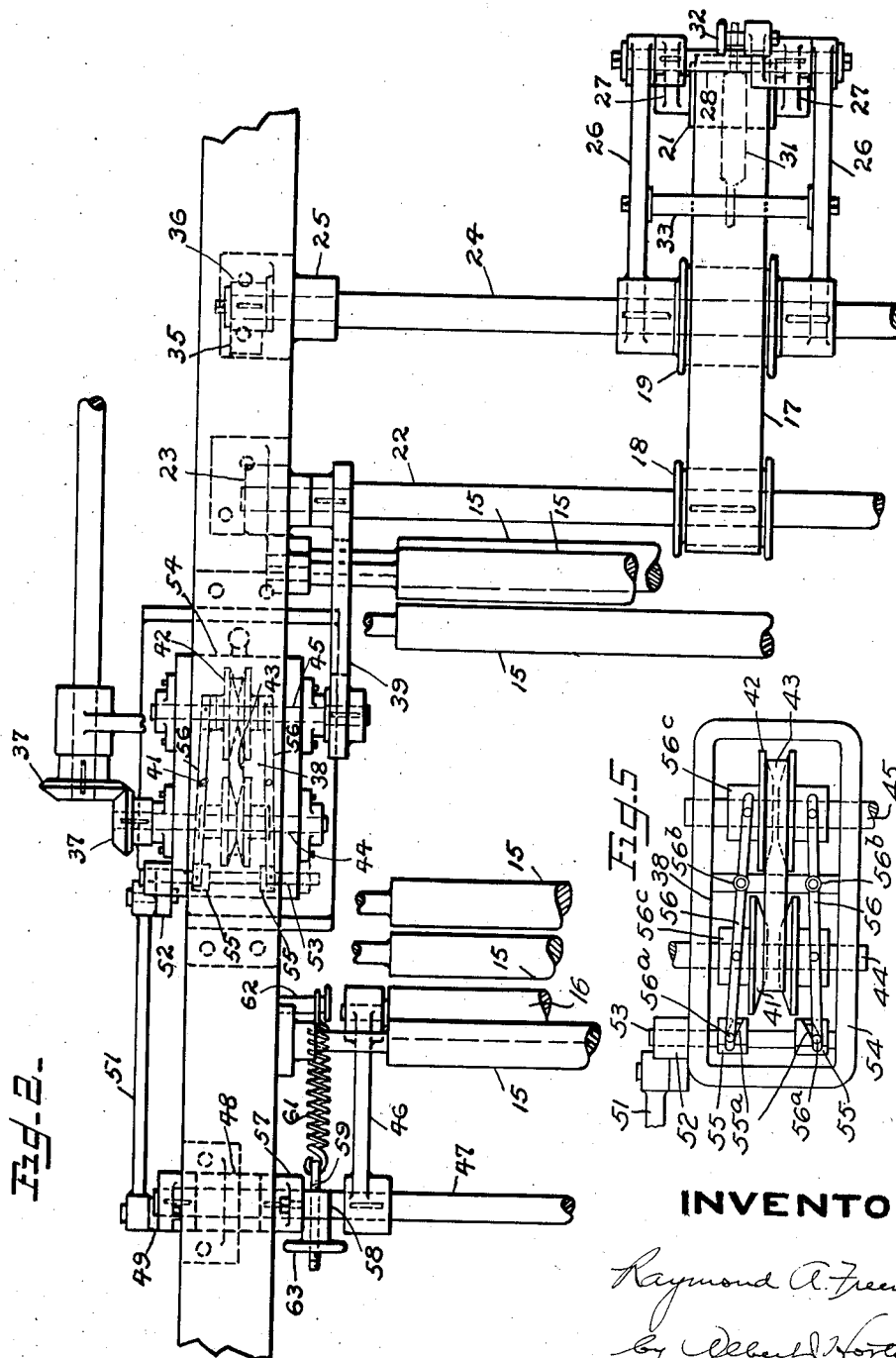
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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WEB ROLL CONTROLLING MECHANISM FOR
PRINTING MACHINES

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9 Claims. (Cl. 242—75)

The invention relates to means for controlling the feed of a web in printing machines to maintain a substantially constant predetermined tension on the running web which is drawn from the web roll.

In a printing machine, in which a floating roller runs in a loop in the web and the roller is spring biased, any increase in web tension is accompanied by a rise of the floating roller, while a decrease is accompanied by a fall of the floating roller. In other words, an increase in web tension indicates that the web is being fed slower than it is being used, while a decrease in web tension indicates an excess feed from the web roll. If the speed of the web roll can be constantly controlled so that it will feed the web at the same rate as the said web is being used, the floating roller will neither rise nor fall and the web tension will not change. If, in addition, the web tension corresponding to any given position of the floating roller is known, the web may be run at a predetermined and constant tension by the maintenance of the proper speed relation between the web supply roll and the printing machine. By connecting the floating roller with means for controlling the feed of the web in such a manner that a small movement of the floating roller corresponds to a substantial variation in the feed of the web, this proper speed relation may be maintained without sufficient motion of the floating roller to involve any appreciable change in web tension.

The principal object of the invention is to control the feed of a web by means of a variable speed mechanism which will be automatically regulated in response to changes in position of a floating roller running in a loop in the web.

Another object is to provide a means for adjusting the force exerted on the web by a floating roller, to correspond to the predetermined tension at which it is desired to have the web run.

Another object is to provide an endless belt for the web roll, which will maintain sufficient wrap and pressure upon the periphery thereof to prevent slippage even under emergency stop conditions and to provide means to drive the belt, the speed being varied as required to maintain the floating roller in a substantially constant position.

It is also an object to provide a means for controlling the feed of a web, which is of generally improved construction, whereby the device will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 shows a side elevation of a portion of a printing machine frame with parts broken away, also a web roll support, and further includes a driven belt engaging the periphery of the running web roll and mechanism for varying the speed of the belt in response to any variation in the running web tension;

Figure 2 shows a plan view of Figure 1, as taken in the direction of the arrow 2;

Figure 3 shows a detail plan view of modified form of web tension adjustment for use with a floating web guide roller;

Figure 4 is an end elevation of the view shown in Figure 3; and

Figure 5 is an enlarged plan view of the variable speed mechanism as shown in Figure 2, with cover removed.

In Figure 1, a preferred web roll supporting means is shown which includes a web roll supporting reel 11, rotatably mounted on a support 12, which reel is adapted to support a plurality of rolls such as a running web roll 13 and replacement rolls 14, from which webs are successively fed to a printing machine. The web W of the running web roll is led over suitable guide rollers 15, each having a fixed axis, and also over a floating web guide roller 16 which has a movable axis.

A belt mechanism is provided wherein one or more belts are arranged in running relation with the periphery of the web roll, the belts being provided with sufficient tension and automatically maintaining sufficient wrap about the roll to prevent slippage of the roll under conditions when there is a tendency for the roll to run ahead. Said mechanism includes a belt 17 which engages the peripheral surface of the web roll, and also a drive pulley 18 and two idler pulleys 19 and 21 which support said belt. The drive pulley 18 is secured to a drive shaft 22, supported in end bearings 23 on the machine frame, and one idler pulley 19 is freely mounted on an idler shaft 24, said shaft 24 being freely mounted on end bearings 25 on the machine frame. The other idler pulley 21 is carried by a pivotal sup-

porting structure which is adapted to swing in a manner which will maintain the belt in a wrapped relation with the periphery of the web roll and retain it in such relation as the roll diameter decreases. Said structure includes two arms 26—26 secured to the idler shaft 24, and positioned at each side of the idler pulley 21, and levers 27—27 pivotally mounted on a shaft 28 mounted at the free ends of said arms. The said idler pulley 21 is freely mounted on a short shaft 29, supported between the lower ends of the levers 27, and a spring 31 is provided to bias the said lower ends of the levers 27 outward to thereby maintain the belt in a constantly taut position. Said spring 31 has one end thereof attached to a pin 32, secured within an upwardly extended portion of one lever 27, and the other end to a tie-rod 33 secured between the arms 26—26. It will thus be observed that as the web roll diameter decreases, the arms 26—26 will rock about the axis of the shaft 24 to follow the changing periphery of the roll, and with the aid of the spring biased idler 21, will maintain both the desired pressure and wrap of the belt upon the periphery of the roll. A stop is provided to limit the downward movement of the arms 26—26, which includes a fixed stop lug 34, provided on one end bearing 25, and a movable lug 35 provided on a collar 36 secured to one end of the shaft 24, as shown in Figures 1 and 2.

The belt pulley drive shaft 22 is driven from the main drive of the printing machine, indicated at 37, through a variable speed mechanism indicated at 38, and a sprocket and chain drive indicated at 39. The variable speed drive preferably comprises an interengaged cone structure, wherein the driving members are preferably in a substantially meshed relation, such as in a drive known commercially as the P. I. V. drive, and are adapted to have their positions changed while running to thereby increase or decrease the speed of the pulley drive shaft 22 and the belt 17. The conical drive members of the variable speed mechanism as best shown in Figure 5, comprise driving cones 41 and driven cones 42 with a belt or chain 43 connecting same in preferably a 1:1 driving relation, said cones being mounted on shafts 44—45 respectively, the shaft 44 being connected with the main machine drive 37, and the shaft 45 being connected with the sprocket chain drive 39. Under normal running conditions, that is, when the web is feeding at the desired tension, the variable speed drive members will remain in their original 1:1 driving relation, but if the normal web feeding tension changes, the driving relation of the position of the variable speed drive members 41 and 42 will be altered to increase or decrease the speed of the web roll belt 17, to thus control the web feed and return the same to normal running condition.

Cooperating with the variable speed mechanism, to make the desired changes in the driving relation of the conical members, is the floating roller 16, which, as previously stated, runs in a loop in the web as shown in Figure 1. Said floating roller 16 is rotatively supported at the ends of rocker arms 46, and the said rocker arms are secured to a rock shaft 47, which is rotatively mounted in end bearings 48, on the machine frame. A lever 49, secured to one end of the rock shaft 47, has a link 51 connecting same with a control lever 52 on the variable speed mechanism, said control lever being secured to a shaft 53, which is suitably supported in a housing 54 for the variable speed mechanism. Lugs 55, also se-

cured to the shaft 53 and formed with helical grooves 55a, are engaged by pins 56a carried by shifter members 56—56, which latter are pivoted at 56b and connected to thrust collars 56c movable axially on the shafts 44—45 and adapted to change the relative position of the driving and driven cones 41 and 42, and thereby alter the speed of the web roll belt 17 when the floating roller moves and rocks the shaft 47.

It is thus apparent that a change in the position of the floating roller will effect the variable speed changing mechanism. For example, any downward movement of the floating roller 16 will through the direct mechanical connection constituted by the arms 46, shaft 47, lever 49, link 51, lever 52, shaft 53, and lugs 55, automatically adjust the speed of the variable speed mechanism to decrease the speed of rotation of the variable speed shaft 45, which through the sprocket and chain drive 39 will decrease the speed of the belt 17 to retard the speed of the web roll. This reduction in the roll speed will immediately compensate for those factors tending to cause this downward movement of the floating roller so that the readjustment will produce only a negligible change in the web tension. If the reverse condition occurs, that is, if the floating roller rises, the variable speed mechanism will be altered to effect an increase in the speed of the belt 17 and thereby counteract the tendency to increase the tension on the running web.

The direct mechanical connection, between the roller 16 and the variable speed mechanism, causes no excessive change in the belt speed, as is obtained in the use of electrically or mechanically actuated clutches, and therefore no tendency of overrunning will be present causing the web tension to vary from one extreme to the other while the compensating mechanism is hunting for the correct adjustment, and cause possible injury to the web. By the use of the mechanism of this invention, speed changes will be quickly, positively, and smoothly effected under control of the tension on the running web, the changes in tension of which, occur in most instances, gradually and smoothly and raise or lower the arms 46 in the same manner. When the change in tension is compensated for, the arms 46 come to rest, whereby the compensating action immediately stops, without overrunning.

It will be understood that with the particular structure of the mounting for the belt 17, the arm 26 will assume such a position that the belt will automatically maintain the wrap necessary to prevent slippage as the diameter of the roll decreases.

Means is also provided to vary the force exerted by the floating web roller 16 upon the web, which preferably includes an arm 57 secured to the rock shaft 47, a block 58 on said arm, an eye bolt 59 freely movable within said block and a spring 61 stretched between the head portion of said eye bolt and a stationary pin or lug 62 on the machine frame. A hand wheel 63, screwed on the outer threaded end of the eye-bolt, may be adjusted to increase or decrease the spring tension as required to correspond to the desired tension at which the web is to be run. Having once obtained the required tension for a particular run, the same will be maintained during the entire run through the action of the variable speed mechanism and associated members.

A modified structure for adjusting the force exerted by the floating roller upon the web is shown in Figures 3 and 4, which includes an arm

64, secured to the rock shaft 47, a rod 65 supported within a yoked portion of said arm and a weight 66 slidably mounted on said rod. By adjusting said weight 66 along the arm rod 65, the desired tension of the web may be provided, and when once suitably adjusted, the weight may be locked by means of a set screw 67 positioned therein.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being had to the claims rather than to the foregoing description to indicate the scope of the invention.

What I claim is:

1. In a tensioning mechanism for controlling a web roll from which a web is being fed to a printing or like machine, an endless belt engaging the periphery of the web roll, means including a variable speed mechanism adapted to smoothly change the speed of and to drive said belt at various speeds, a roller adapted to be disposed in a loop in the web, an arm secured at one end to a rocker shaft and supporting said roller at the other end, said shaft being journaled in a fixed machine part, a lever arm secured to said shaft and a link connected at each end directly to said lever arm and to said variable speed mechanism respectively whereby said lever arm will be continuously in operable connection with said variable speed mechanism to actuate the same, to change the speed of said belt directly and smoothly in response to all changes in position of the roller due to the effect thereon of changes in the web loop caused by differences in web tension.

2. In a tensioning mechanism for controlling a web roll from which a web is being fed to a printing or like machine, an endless belt engaging the periphery of the web roll, means including a variable speed mechanism to drive said belt, a roller adapted to be disposed in a loop in a web, an arm secured at one end to a rocker shaft and supporting said roller at the other end, said shaft being journaled in a fixed machine part, a lever arm secured to said shaft and being continuously in operable connection with said variable speed mechanism to actuate the same, to instantaneously change the speed of said belt in response to all changes in position of the roller due to the effect thereon of changes in the web loop caused by differences in web tension, another lever secured to said shaft, and a spring secured at one of its ends to the free end of said last named lever and at its other end to a fixed machine part, and being tensioned to exert a predetermined force thereon to rock said shaft and transmit the exerted force to the web through said arm and the roller supported thereby, to apply a determined tension on the web.

3. In a tensioning mechanism for controlling a web roll from which a web is being fed to a printing or like machine, an endless belt engaging the periphery of the web roll, means including a variable speed mechanism to drive said belt, a roller adapted to be disposed in a loop in the web, an arm secured at one end to a rocker shaft and supporting said roller at the other end, said shaft being journaled in a fixed machine part, a lever arm secured to said shaft and being continuously in operable connection with said variable speed mechanism to actuate the same, to change the speed of said belt in response to and simultane-

ously with all changes in position of the roller due to the effect thereon of changes in the web loop caused by differences in web tension, another lever secured to said shaft, and a weight mounted on said last named lever to exert a predetermined force thereon to rock said shaft to transmit the exerted force to the web through said arm and the roller supported thereby, to apply a determined tension on the web, said weight being slidable lengthwise along the aforesaid lever to vary the exerted force.

4. In mechanism for directly controlling the speed of a web roll by the tension on the web running therefrom, means to rotate the web roll, drive means, a variable speed mechanism connecting said drive means to said web roll rotating means, said variable speed mechanism having mechanically operable speed varying means including a swingable actuating lever, a floating roller disposed in a loop in the running web, an arm supporting said roller and being mounted for swinging movement in response to all changes in the web loop caused by changes in web tension, a lever arm operably connected to said roller supporting arm, and a link extending between and with each of its ends directly connected to the free end of said lever arm and to the swingable actuating lever of said variable speed mechanism respectively whereby it will be continuously in operable connection with said swingable lever and said arm.

5. In a web tensioning mechanism for controlling a web roll from which a web is being fed to a printing machine, means in driving engagement with the web roll, a variable speed mechanism for controlling the speed of said web roll driving means, a floating web roller engaging a loop in the web and movable in response to changes in web tension, an arm supporting the roller, another arm extending at an angle from and connected to the roller supporting arm and a link directly connecting said other arm to said variable speed mechanism so that any sensible operable movement of the floating web roller is simultaneously imparted to the variable speed mechanism to control the same in response to the movement of the floating roller, whereby said variable speed mechanism will be adjusted to alter the speed of the web driving means.

6. In a mechanism for controlling the rotation of a web roll by the tension on a web running therefrom to a machine operating upon the said web, an endless belt in engagement with the web roll, means connected to the machine for driving the belt including a variable speed device having an operating member, movement of which simultaneously varies the speed of the belt, and a floating roller running in a loop in the web and directly connected to the operating member, whereby the pull on the web supplies the power required to effect an adjustment of the variable speed mechanism.

7. In a mechanism for controlling the rotation of a web roll by the tension on a web running therefrom to a machine operating upon the said web, an endless belt in engagement with the web roll, means connected to the machine for driving the belt including a variable speed device having an operating member, any movement of which simultaneously varies the speed of the belt, a floating roller running in a loop of the web and moving in response to variation in tension of the said web, and means mechanically connecting the floating roller to the said operating member, and having substantially no lost motion, whereby any

variation of web tension affecting the position of the roller instantaneously changes the speed of the belt.

8. In a mechanism for controlling the rotation of a web roll by the tension on a web running therefrom to a machine operating upon the said web, an endless belt in engagement with the web roll, means connected to the machine for driving the belt including a variable speed device having an operating member, movement of which simultaneously varies the speed of the belt, and a roller rotatably mounted in a movable support mechanically connected directly to the said operating member, the running web being looped around the said roller, and variation in tension on said web bodily moving the said roller and supplying

the force required to move the said operating member and thereby varying the speed of the belt.

9. In a mechanism for controlling the rotation of a web roll by the tension on a web running therefrom to a machine operating upon the said web, drive means for rotating the web roll, including a variable speed device having an operating member, movement of which simultaneously varies the speed of the roll, and a floating roller running in a loop in the web and directly connected to the operating member, whereby the pull of the web supplies the power required to effect an adjustment of the variable speed mechanism.

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