

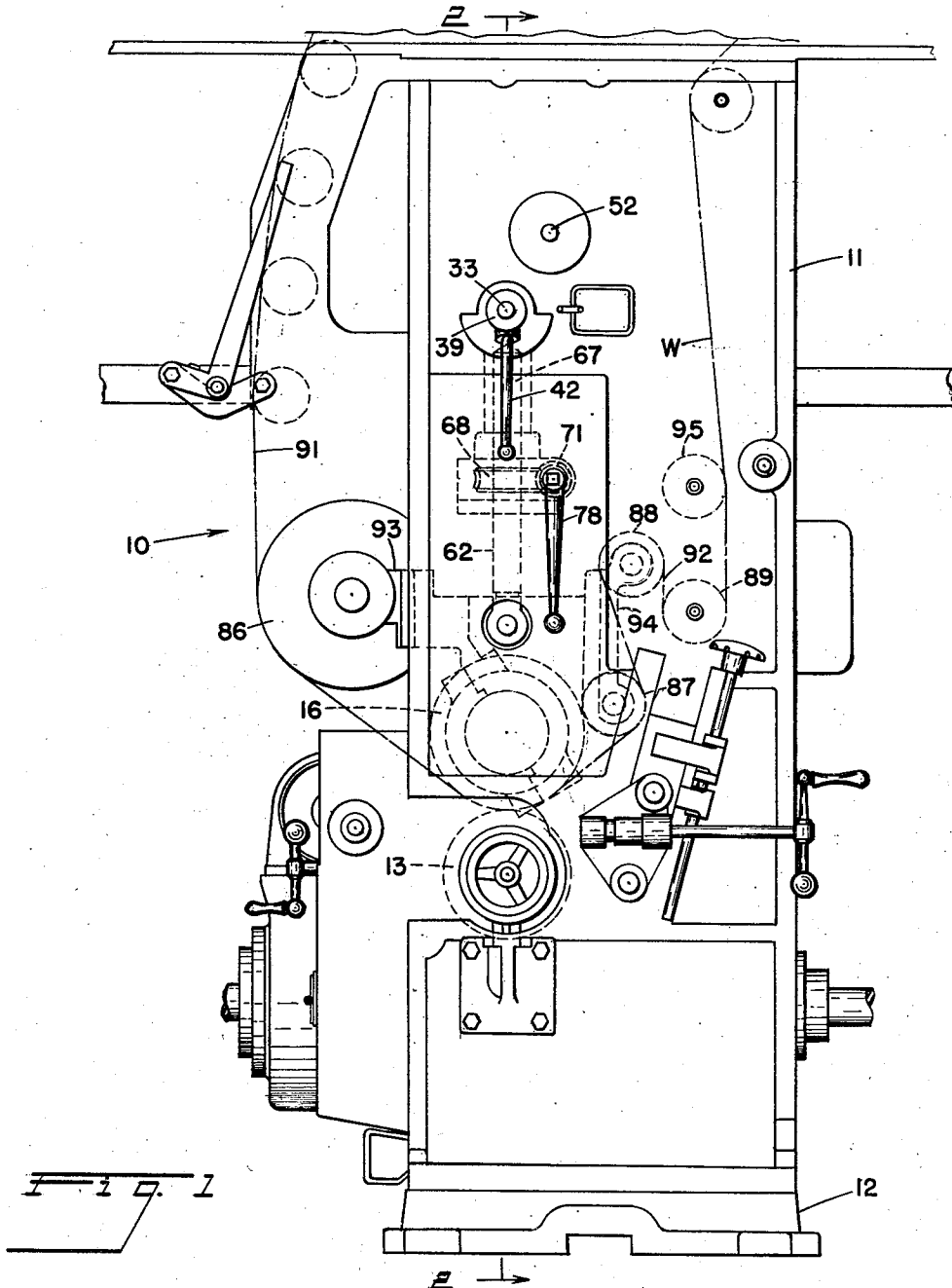
April 20, 1954

Filed July 21, 1948

**A. VEGELL**  
WEB TENSION RETAINING DEVICE  
FOR ROTARY PRINTING MACHINES

**2,675,756**

5 Sheets-Sheet 1



INVENTOR.  
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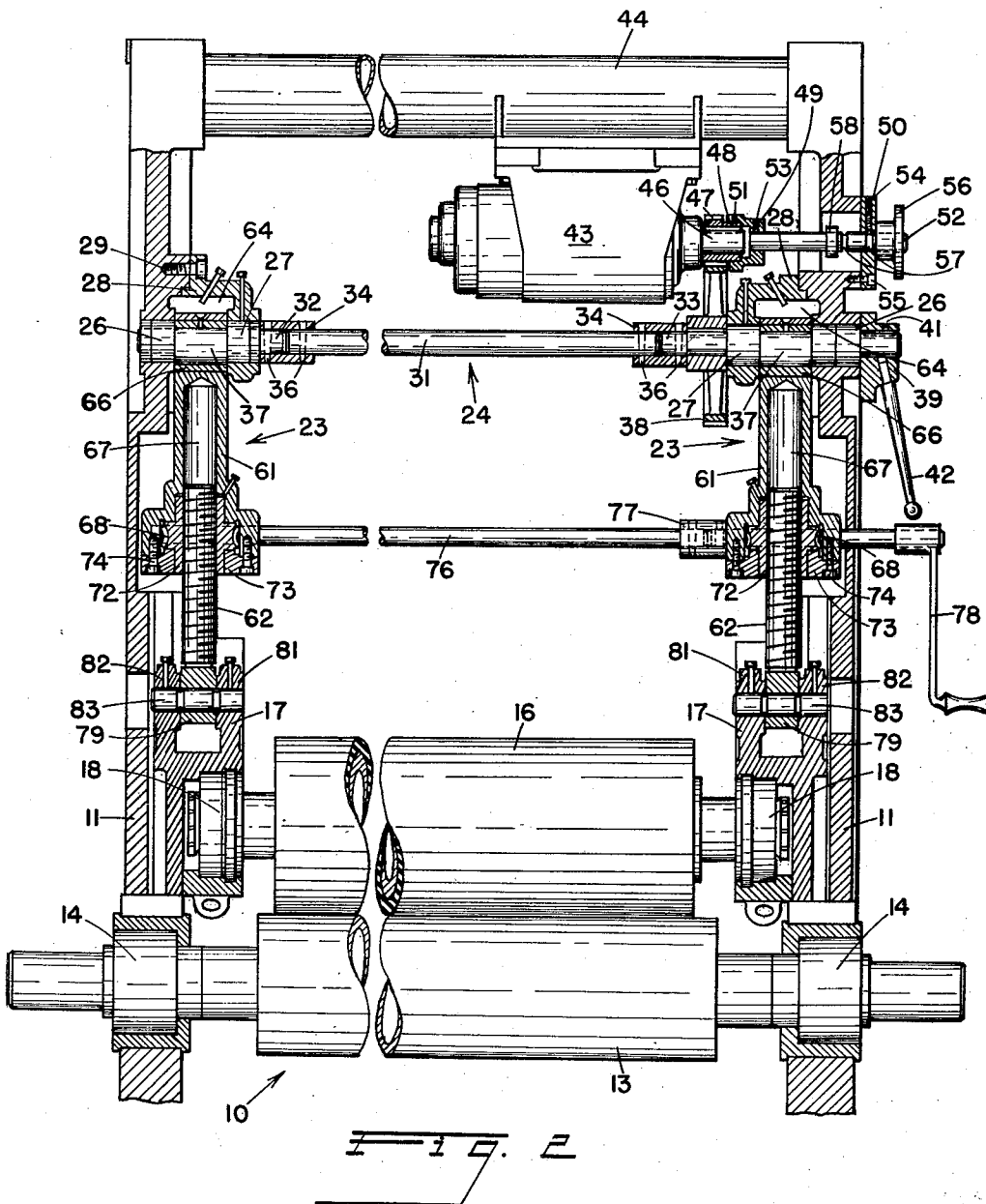
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5 Sheets-Sheet 2

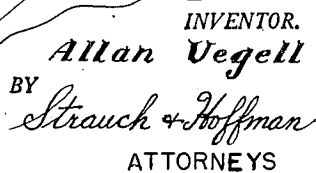


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WEB TENSION RETAINING DEVICE  
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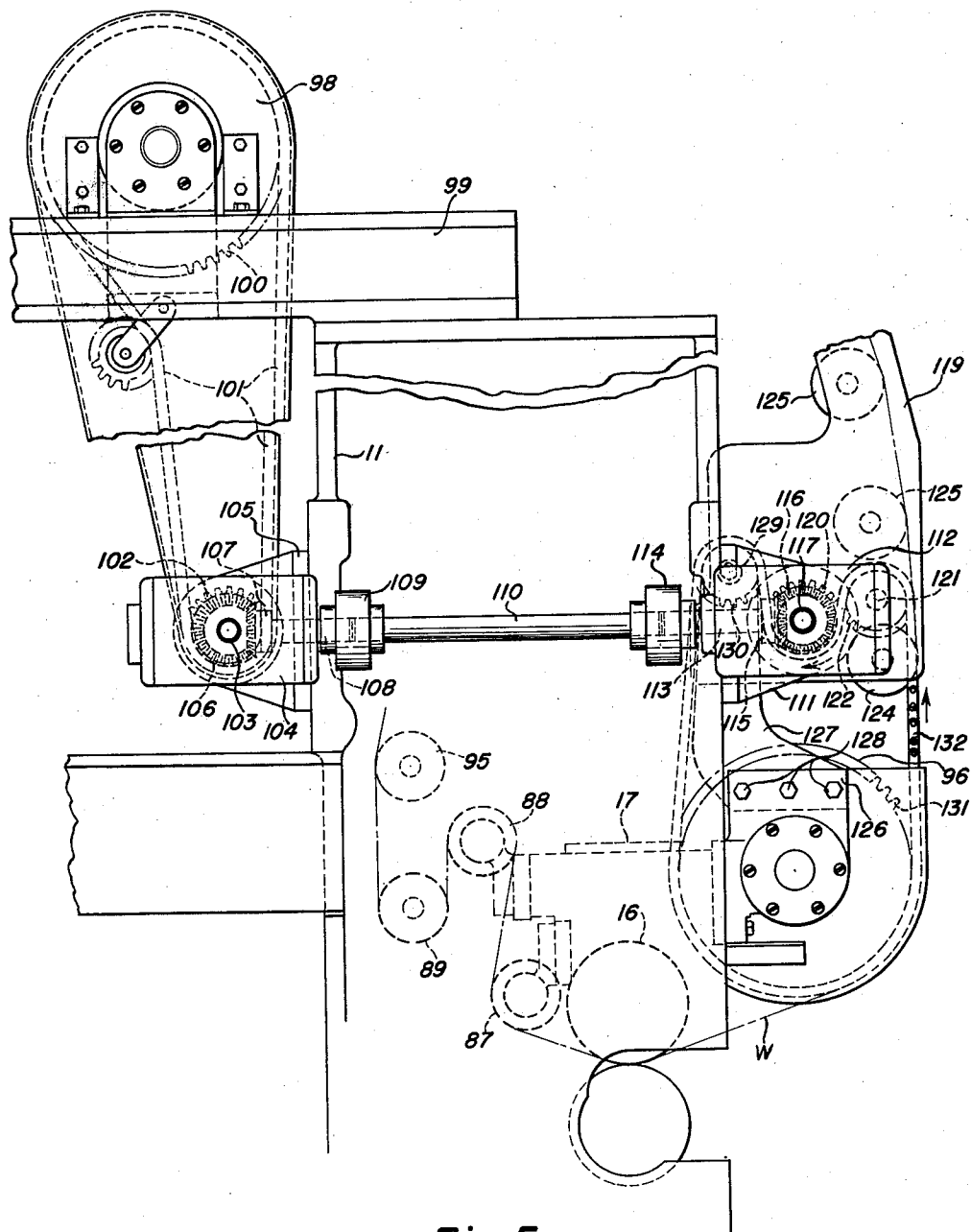


**Fig. 5**

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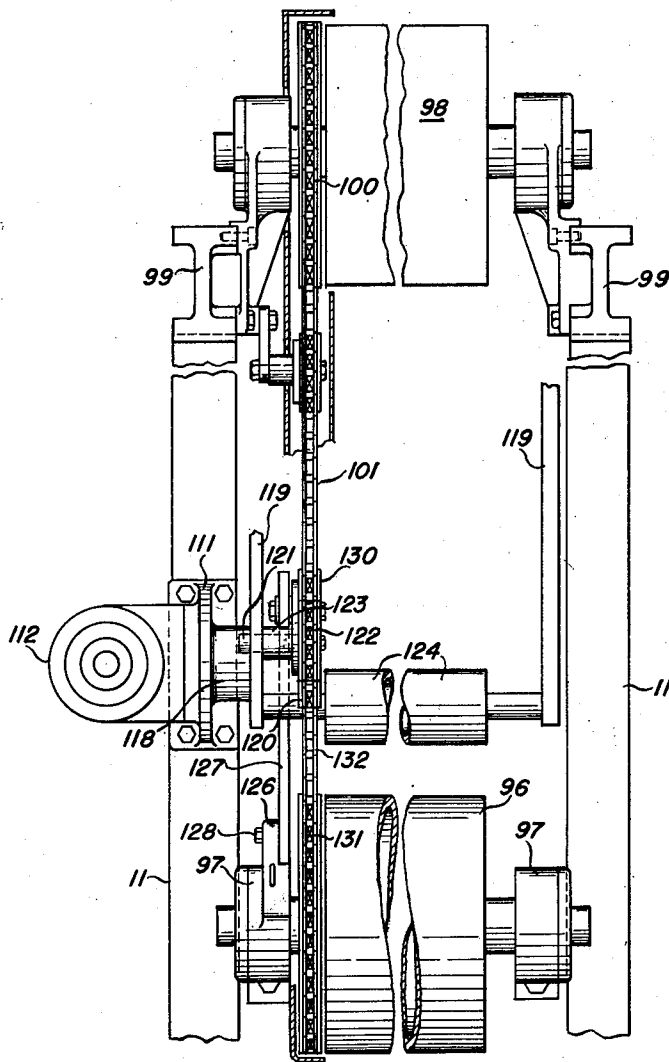


Fig. 6

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## UNITED STATES PATENT OFFICE

2,675,756

WEB TENSION RETAINING DEVICE FOR  
ROTARY PRINTING MACHINESAllan Vegell, Elmhurst, Ill., assignor to Standard  
Process Corporation, Chicago, Ill., a corpora-  
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Application July 21, 1948, Serial No. 39,919

11 Claims. (Cl. 101—247)

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This invention relates to printing presses and more particularly to web tensioning devices which retain the web at a constant tension when the impression roll is separated from the printing roll of a printing couple. The present application is a continuation-in-part of my pending applica-  
5 tion Serial No. 695,955, filed September 10, 1946, now abandoned.

It is often necessary to separate the impression roll from the printing roll during printing as a  
10 convenient method of inspecting or cleaning the printing or impression rolls, and considerable difficulty has been encountered in that such separation usually disturbs registry of the web with the printing roll, a condition that must be cor-  
15 rected by adjustment. This produces waste and loss of time.

The major object of this invention is therefore to provide a novel web tensioning device in a printing apparatus which retains the web under  
20 constant tension when the impression roll is separated from the printing roll and which returns the web to exact registry with the printing roll when the printing couple is returned to opera-  
25 tive position.

It is a further object of this invention to provide novel related and oppositely movable rollers which cause the web to remain under a constant  
30 tension when the impression roll is separated from and returned toward the printing roll.

A further object of this invention is to provide a positive separating mechanism which disen-  
35 gages and engages the printing couple without affecting registry of the web with the printing roll.

An additional object of the invention, in one embodiment thereof, resides in the provision of a web guiding roll, in the form of a drying cy-  
40 linder for the web movable with the impression roll relative to the printing roll, together with a flexible drive element for rotating said cylinder at synchronized speed with the movement of the paper web and means simultaneously oper-  
45 able with the web tensioning means in relative movement between the impression roll and printing roll to automatically take up slack in said flexible driving element.

Further objects of the invention will presently appear as the description proceeds in connection with the appended claims and the annexed draw-  
50 ings in which:

Figure 1 is a side elevational view of a print-  
55 ing press illustrating roll separating and web tensioning maintaining apparatus according to a preferred embodiment of the invention;

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Figure 2 is a vertical sectional view taken substantially on line 2—2 of Figure 1 and illustrating chiefly the impression roll lifting mechanism;

Figure 3 is an elevational view partly in sec-  
5 tion of one of the impression roll supports and illustrating various web engaging rollers;

Figure 4 is a sectional view taken on line 4—4 of Figure 3;

Figure 5 is a fragmentary side elevation illus-  
10 trating another embodiment of the invention having means movable with the impression roll and web tensioning means for automatically taking up slack in a drive chain for a web drying  
15 cylinder; and

Figure 6 is an end elevation thereof.

Like reference characters indicate like parts throughout the several views.

Referring to Figures 1 and 2, numeral 10 designates a printing press having vertical side frame members 11 rigid with a base 12. A printing roll  
20 13 is journaled in the frame members 11 in suitable bearing assemblies as at 14.

An impression roll 16 is journaled at each end in a carrier 17 in suitable bearing assem-  
25 blies 18. The axes of rolls 13 and 16 are horizontal and parallel. Each carrier 17 is vertically slidably mounted in a guide bracket 19 (Figures 3 and 4) which is formed from frame 11 and two angle pieces 21 secured to the frame by any suit-  
30 able means such as bolts 22. Angle pieces 21 are spaced to receive opposite edges 20 of carrier 17 and to guide vertical slidable movement of the carrier in bracket 19.

Each carrier 17 comprises the lower end of an  
35 impression roll support 23 which is mounted on a horizontal shaft 24. The ends of shaft 24 are journaled in suitable bearing assemblies 26 and 27 in frame 11 and retaining member 28 respectively. Retainers 28 prevent axial movement of  
40 supports 23 on shaft 24 and are secured to frame 11 by suitable bolts 29.

Shaft 24 has a central section 31 with stub shafts 32 and 33 axially connected thereto by collars 34 which telescope adjacent ends of the  
45 shafts and are fastened thereon as by tapered pins 36 which extend through aligned holes in the collar and shafts. The provision of a sectional shaft 24 allow greater ease of assembly of the parts.

Each of the stub shafts 32 and 33 has an en-  
50 larged, eccentric cam portion 37 around which the upper end of each support 23 is journaled for a purpose to be later described. A ring gear 38 is keyed to the inner end of shaft 33 and held  
55 against axial movement by collar 34 and retainer

28. On the outer end of shaft 33, a hub 39 is keyed and is held in place by set screw 41. A radial handle 42 is removably secured to a reduced portion of the hub, and shaft 24 may be rotated about its axis by turning handle 42.

Shaft 24 may also be rotated by motor 43 which is secured in any suitable manner to a tubular frame cross member 44 extending between the side frames 11 of the printing press. Drive shaft 46 of motor 43 has a gear 47 slidably splined thereto and designed to engage with gear 38 to impart mechanical rotation to shaft 24. Gear 47 has an elongated hub portion 48 which is secured in a cup-shaped member 49 by means of a set screw 51. A shaft 52 is secured in the bottom of cup-shaped member 49 by set screw 53, and its opposite end is slidably mounted in a disk 50 carrying a ball and spring detent assembly 54. Disk 50 is bolted to frame 11 by bolts 55. A knob 56 is fastened to the extreme end of shaft 52 to the right. Two annular grooves 57 are provided in shaft 52 and they cooperate with detent assembly 54 to lock gear 47 in the desired position. A stop 58 is fastened to shaft 52 in any suitable manner and it prevents gear 47 from being disengaged completely from drive shaft 46.

Each support 23 consists of three main parts; the upper rigid part 61 which is mounted on shaft 24, a middle part 62 which is carried by the upper part 61 and the lower part or carrier 17 which is fastened to part 62 and which carries the impression roll 16. The upper end of part 61 has an opening 64 in which a bearing member 66 is sweated, and cam 37 of shaft 24 is journaled therein. Below bearing 66, part 61 merges into a hollow shaft having a bore 67 which receives part 62. The lower end of part 61 increases in size to receive and support a worm gear 68 and worm 71. Worm gear 68 has an elongated, internally threaded hub portion 72 and is held in place by retaining ring 73 which is fastened by screws 74 to the lower end of part 61. Worm gears 71 at opposite sides of the frame are carried by horizontal shaft 75 which is made of two parts and is connected as at 77 by a connection similar to that used on shaft 24. On the outer end of shaft 76, a crank 78 is non-rotatably connected thereto for a purpose to be later described. Middle section 62 engaged in the threaded hub 72 of worm gear 68 is threaded except at its lower end boss 79 which is received between ears 81 and 82 of carrier 17. Boss 79 and ears 81 and 82 have aligned holes through which a pin 83 is inserted to pivotally connect part 62 to carrier 17. A pivotal connection is necessary to permit of angular movement of parts 61 and 62 relative to parts 17 during adjustment of rotatable cams 37.

Carriers 17 have impression roll 16 rotatably mounted thereon, and also rotatably support the opposite ends of idler rollers 86, 87 and 88 which rotate freely about horizontal axes. Another horizontal, freely rotatable idler roller 89 is journaled at opposite ends in frame sides 11, and a web W to be printed is threaded around the several rolls as illustrated in Figure 3 in which the printing roll and impression roll are shown in operative position.

Each carrier 17 has rigidly secured thereto a bearing bracket 93 for rotatably supporting opposite ends of roller 86. A vertically extending bearing bracket 94 having upper and lower journals for receiving one of the ends of idler rollers 87 and 88 is also rigidly secured to each carrier

17 on the opposite side of the printing couple from roller 86. A further horizontal idler roller 95 is mounted between frame members 11 above roller 89.

The arrangement is such that web portion 91 leaving roller 86 is substantially parallel to and moving in the same direction during printing as the web portion 92 between rollers 89 and 88. Here web portions 91 and 92 are parallel and vertical. Web W is passed beneath roller 89, vertically upward at 92, over the top of roller 88 and downwardly beneath roller 87 into the printing couple.

When it is desired to begin a printing operation and after web W has been threaded about the various rolls as indicated, the first step necessary is the adjustment of the printing pressure in the printing couple formed by the printing roll and the impression roll. This is accomplished by turning handle 78 which rotates shaft 76 and worms 71 turn worm gears 68 whereby the internal threads on hubs 72 of worm gears 68 force threaded shafts 62 upwardly or downwardly depending upon the direction of rotation of handle 78. As shafts 62 are connected to carriers 17 which support the impression roll 16, movement of shafts 62 is transmitted to carriers 17 and the impression roll mounted thereon is either moved closer to or away from the printing roll to increase or decrease the printing pressure as may be desired.

It may later become necessary before the web has been completely printed to move the impression roll away from the printing roll in order to inspect or clean the printing roll without disturbing the printing pressure or the tension on the web and to return the web to exact printing registry with the printing roll when the rolls are returned to operative position. Impression roll 16 may be quickly separated from printing roll 13 without changing the printing pressure adjustment by rotating hand lever 42 in either direction. Rotation through one half a revolution of shaft 24 causes cams 37 to raise supports 23 thereby quickly separating the impression roll from the printing roll. An optional manner of raising the impression roll is to connect motor 43 to drive shaft 24 by manipulation of clutch knob 56.

Since the web portions 91 and 92 are vertical and parallel, and carrier 17 moves vertically when impression roll 16 is raised, idler rollers 86, 87 and 88 will always maintain their relative positions to the impression roll, and any slack in web W is taken up by increase in the length of the web portion at 92 due to the fact that idler roll 89 is on frame members 11 and idler roll 88 moves relatively thereto with carriers 17.

As impression roll 16 is raised, assuming web W to be under tension from the feed and take-up apparatus, roller 86 moves vertically upwardly along web portion 91 and there is thus a tendency for slack to form in web portion 91 and on one side of the printing couple. On the other side of the printing couple, upward movement of roller 88 with the impression roll tends to take up this slack by increasing the length of the vertical web portion 92 between rollers 88 and 89, a distance equal to the vertical movement of roller 86. Above roller 89, the web does not move when impression roll 16 is raised.

Hence, when impression roll 16 is raised, the web is maintained under existing tension between rollers 86 and 89, the slack tending to form at one side of the couple being taken up at the other side of the couple. When the im-

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pression roll is returned into printing position, the length of web between rollers 86 and 89 is redistributed to the position shown in Figure 3, thereby becoming automatically registered with the printing roll. The web is maintained under tension at all times so that it is entirely under control for restoring registration.

In the embodiment of the invention shown in Figures 5 and 6 of the drawings, the web guiding roller 86 of Figures 1 and 3 is in the form of a cylinder 96 receiving steam or other heating medium for the purpose of drying the printed web. This cylinder is journaled at its ends in suitable bearings, mounted in brackets 97 secured rigidly to the respective vertically movable carriers 17 for the impression roll 16.

The cylinder 96 and a similar pre-heating cylinder 98 for the web are positively driven or rotated at a speed synchronized with the movement of the paper web through the press by the press operating motor. The cylinder 98 is suitably mounted and supported between and upon the horizontal beams or rails 99 secured upon the upper ends of the side frame members 11. To one end of the cylinder 98 a large diameter drive sprocket 100 is secured and is driven by the chain 101 connected with a relatively small diameter sprocket 102 fixed to one end of a shaft 103 journaled in a cylindrical housing 104 formed upon a bracket member 105 rigidly bolted to one vertical edge face of one of the vertical frame members 11. With shaft 103 the press operating motor (not shown) is suitably connected. Within the housing 104, a beveled gear 106 is fixed to the shaft 103 and is in constant mesh with a similar gear 107 fixed to one end of the stub shaft 108 which is coupled at its other end by sleeve 109 with an axially aligned shaft 110 extending horizontally across the outer side of frame member 11.

To the other vertical edge face of frame member 11 a bracket 111 is also secured and carries a cylindrical housing 112. A second stub shaft 113 journaled in one side of this cylinder is coupled by sleeve 114 to the other end of shaft 110. Within the cylinder 112, the shaft 113 carries the beveled gear 115 in constant mesh with the similar gear 116 fixed to one end of the shaft 117 journaled in a cylindrical boss 118 projecting inwardly from the bracket 111 and through one of the vertical side members of a dryer frame 119. The shaft 117 at its other end has a chain driving sprocket 120 suitably fixed thereto. Upon a stud shaft 121 fixed in the side member of frame 119 an idler sprocket 122 is journaled for free rotation and is axially positioned in the plane of the sprocket 120 by the spacer sleeve 123.

Below the idler sprocket 122, a web guiding roller 124 is mounted between the side members of frame 119. Additional guide rollers 125 are preferably also mounted between said frame members above the bracket 111.

One of the mounting brackets 97 for cylinder 96 is provided at the top thereof with an up-standing flange 126 to which the lower end of an arm 127 extending vertically upward therefrom is securely bolted as at 128. In the upper end of this arm a stud shaft 129 is suitably fixed and upon said shaft a chain tensioning sprocket 130 is mounted for free rotation and disposed in the common vertical plane of the sprocket members 120 and 122, and it will be noted that the opposed peripheral portions of the sprockets 120 and 130 are in substantial vertical alignment,

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with the sprocket 130 spaced vertically above the sprocket 120.

At the inner side of arm 127 and in the vertical plane of sprockets 120, 122 and 130, a large diameter sprocket 131 is fixed to one end of the drying cylinder 96. The drive chain 132 engaged with this sprocket extends upwardly from the outer side thereof over the idler sprocket 122, then downwardly around the driven sprocket 120 and upwardly therefrom over the tensioning sprocket 130 and thence downwardly to the inner side of sprocket 131.

It will be evident from the above description that in normal press operation, rotation will be transmitted from shaft 110 to the chain drive sprocket 120, in the direction indicated by the arrow in Figure 5 of the drawings, and chain 132 is positively driven to rotate the drying cylinder 96 in the direction of movement of the printed web and in peripheral contact with the unprinted side thereof. The sprocket and gear ratios are such that the peripheral speed of rotation of the cylinders 96 and 98 is accurately synchronized with the movement of the paper web through the press.

When it is desired to inspect the printing cylinder, the impression roll 16 together with tensioning rollers 87 and 88 and the drying cylinder 96 are lifted vertically upward in the manner above explained. Thus sprocket 130 mounted on the upper end of arm 127 will be correspondingly moved upwardly with respect to the now stationary chain driving sprocket 120, it being understood of course that operation of the press motor has been stopped. In this upward movement of sprocket 130, it will freely rotate in a clockwise direction on the stud shaft 129 so that the length of the chain section extending between said sprocket and the stationary sprocket 120 will be increased, thereby taking up slack which would otherwise form in the chain 132 below the cylinder 96.

As the cylinder moves upwardly relative to the chain it will be slightly rotated in the clockwise direction on the chain which is held stationary by drive sprocket 120. Since impression roll 16 and guide rollers 87 and 88 move upwardly relative to stationary roller 89 the web W will be drawn inwardly against the periphery of cylinder 96 and follow the upward movement thereof.

In the return or downward movement of the impression roll and drying cylinder a counter-clockwise movement of the cylinder and web will occur. Thus in the vertical movement of cylinder 96 in each direction relative sliding movement between the cylinder and web is prevented so that the web surface will not be scratched or marred.

It will thus be clear that a substantially constant uniform tension is maintained upon the drive chain for the drying cylinder as well as upon the paper web in the vertical movement of the impression roll and drying cylinder to and from operative position with respect to the printing cylinder. It will of course be apparent that the chain drive units for the drying cylinders of a battery of presses may be interconnected with each other and gear 106 and driven by a single motor.

The invention may be embodied in other specific forms without departing from the spirit of essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the

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appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by the United States Letters Patent is:

1. In a web printing press, a printing roll, an impression roll and a web drying cylinder mounted and arranged for unitary movement to and from operative position relative to the printing roll, means for rotating said cylinder comprising an endless chain, a power driven sprocket engaged with one side of said chain, spaced idler sprockets engaged with the opposite side of said chain, one of said idler sprockets being mounted in axially fixed position relative to the driving sprocket, and means at a point spaced from said driving sprocket in the direction of movement of said cylinder away from said printing roll mounting the other idler sprocket for unitary movement with the impression roll and drying cylinder to maintain said chain under substantially constant tension during such movement.

2. In a web printing press, a frame, a printing cylinder mounted in said frame, an impression cylinder, a slide supporting said impression cylinder for linear movement in the frame toward and from the printing cylinder, and means defining the web path through the press between said printing and impression cylinders, comprising a first idler roller mounted on a fixed axis in the frame around which the web enters the press, a second idler roller mounted on said slide for movement therewith and having its axis disposed in parallel relation to the axis of said first idler roller and spaced therefrom in the direction of movement of the impression cylinder away from the printing cylinder such that the plane of the web between said first and second idler rollers is substantially parallel to the direction of movement of the slide, the web extending from said first roller around said second roller and thence between the printing and impression cylinders, the first and second idler rollers contacting opposite sides of the web, whereby constant uniform tension of the web is maintained in the movement of the impression cylinder relative to the printing cylinder.

3. In a web printing press, a frame, an axially fixed printing roll mounted in said frame, an impression roll, an idler roll, a web drying cylinder, common means slidably mounting said impression roll, said idler roll and said cylinder on said frame for unitary movement toward and away from said printing roll, an endless loop driving element for said cylinder, the respective paths of said web and said driving element each having a predetermined length when said impression roll is in operative relation with respect to said printing roll, and separate axially fixed means mounted in said frame and respectively interposed in the paths of said web and said element to maintain the respective paths at said predetermined lengths throughout the range of movement of said mounting means.

4. In a web printing press, a frame, a printing roll mounted on said frame, a slide movable on said frame to and away from said printing roll, first and second idler rolls and an impression roll mounted in fixed relation for unitary movement with said slide, said impression roll and printing roll defining a web printing pass, said idler rolls being arranged in such spaced parallel relation that the planes of the web on its infeed run to-

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ward said slide and its outfeed run from said slide are substantially parallel to the direction of slide movement to form a web path having oppositely facing open ended loops whereby when said slide is moved with relation to said printing roll, the length of one loop is increased and the length of the oppositely facing loops is decreased thereby maintaining the web path at constant length and the web at substantially constant tension.

5. The printing press of claim 4 together with means for moving said impression cylinder relative to said slide.

6. In a web printing press having a frame, a printing roll mounted on said frame, an impression roll coacting therewith to define a web printing pass, means mounting said impression roll for movement to and away from said printing roll, a pair of web guiding rolls positioned on said mounting means respectively at opposite sides of the axis of said impression roll, first and second web guides on said frame in such spaced parallel relation to said web guiding rolls that the infeed and outfeed web runs between such rolls and guides are substantially parallel to the direction of movement of said mounting means, said web passing over said impression roll between said guiding rolls in an upwardly facing open ended loop and over said one of said guiding rolls between said impression roll and one of said web guides in a downwardly facing open ended loop whereby when said means is moved relative to said printing roll, the length of one loop is increased and the length of the oppositely facing loop is decreased thereby maintaining the web path at substantially constant length.

7. In a web printing press having a frame, a printing roll mounted on said frame, a slide mounted on said frame for movement toward and away from said printing roll, a drying cylinder mounted on said slide, an endless loop flexible driving element for said drying cylinder, coacting means on said frame and said slide contacting said flexible driving element operable when said slide is moved away from said printing roll to maintain said driving element at substantially constant tension and to rotate said cylinder in a direction to feed said web in a predetermined amount toward said impression roll, and coacting roller means on said slide and said frame contacting said web to feed said web away from said impression roll in said predetermined amount during movement of said slide from said printing roll to thereby maintain said web at substantially constant tension during movement of said slide with respect to said frame.

8. In a web printing press, a frame, a printing roll rotatably mounted on said frame, a slide mounted for movement on said frame in a translatory path normal to the axis of said printing roll, an impression roll journaled on said slide about an axis parallel to that of said printing roll, infeed and outfeed web guide structure defining oppositely extending web runs leading toward and from said slide and which are both parallel to the direction of slide movement whereby a web fed through said web guide structure and between said printing and impression rolls will be maintained under uniform tension irrespective of the position of said slide relative to said printing roll.

9. In a web printing press, a frame, a printing roll mounted on said frame, a slide mounted on said frame for translatory movement toward and from said printing roll in a path normal to

the axis of said printing roll, first and second web guiding rolls and an impression roll disposed therebetween journaled on said slide about spaced axes parallel to that of said printing roll, a third web guiding roll journaled on said frame about an axis parallel to those of said rolls and in spaced relation from said first web guiding roll in the direction of movement of said slide toward said printing roll such that a web run between said first and third web guiding rolls is substantially parallel to the direction of slide movement, a fourth web guiding roll journaled on said frame about an axis parallel to those of said rolls and in spaced relation from said second web guiding roll in the direction of movement of said slide from said printing roll such that a web run between said second and fourth web guiding rolls is substantially parallel to the direction of slide movement whereby a web which is fed through said rolls in a path extending serially from said fourth guiding roll around said second guiding roll, between said impression and printing rolls, around said first roll to said third guiding roll will be maintained under uniform tension throughout the movement of said slide in its path.

10. In a web printing press, a printing roll, an impression roll and a web feeding roll mounted and arranged for unitary movement to and from an operative position relative to the printing roll. means for rotating said web feeding roll comprising an endless chain, a power driven sprocket engaged with one side of said chain, spaced idler sprockets engaged with the opposite side of said chain, one of said idler sprockets being mounted in axially fixed position relative to the driving sprocket, and means at a point spaced from said driving sprocket in the direction of movement of said web feeding roll away from said printing roll

mounting the other idler sprocket for unitary movement with the impression roll and web feeding roll to maintain said chain under substantially constant tension during such movement.

11. In a web printing press, a frame, an axially fixed printing roll mounted in said frame, an impression roll, an idler roll, a web feeding roll, common means slidably mounting said impression roll, said idler roll and said web feeding roll on said frame for unitary movement toward and away from said printing roll, an endless loop driving element for said web feeding roll, the respective paths of said web and said driving element each having a predetermined length when said impression roll is in operative relation with respect to said printing roll, and separate axially fixed means mounted in said frame and respectively interposed in the paths of said web and said element to maintain the respective paths at said predetermined lengths throughout the range of movement of said mounting means.

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