

April 7, 1942.

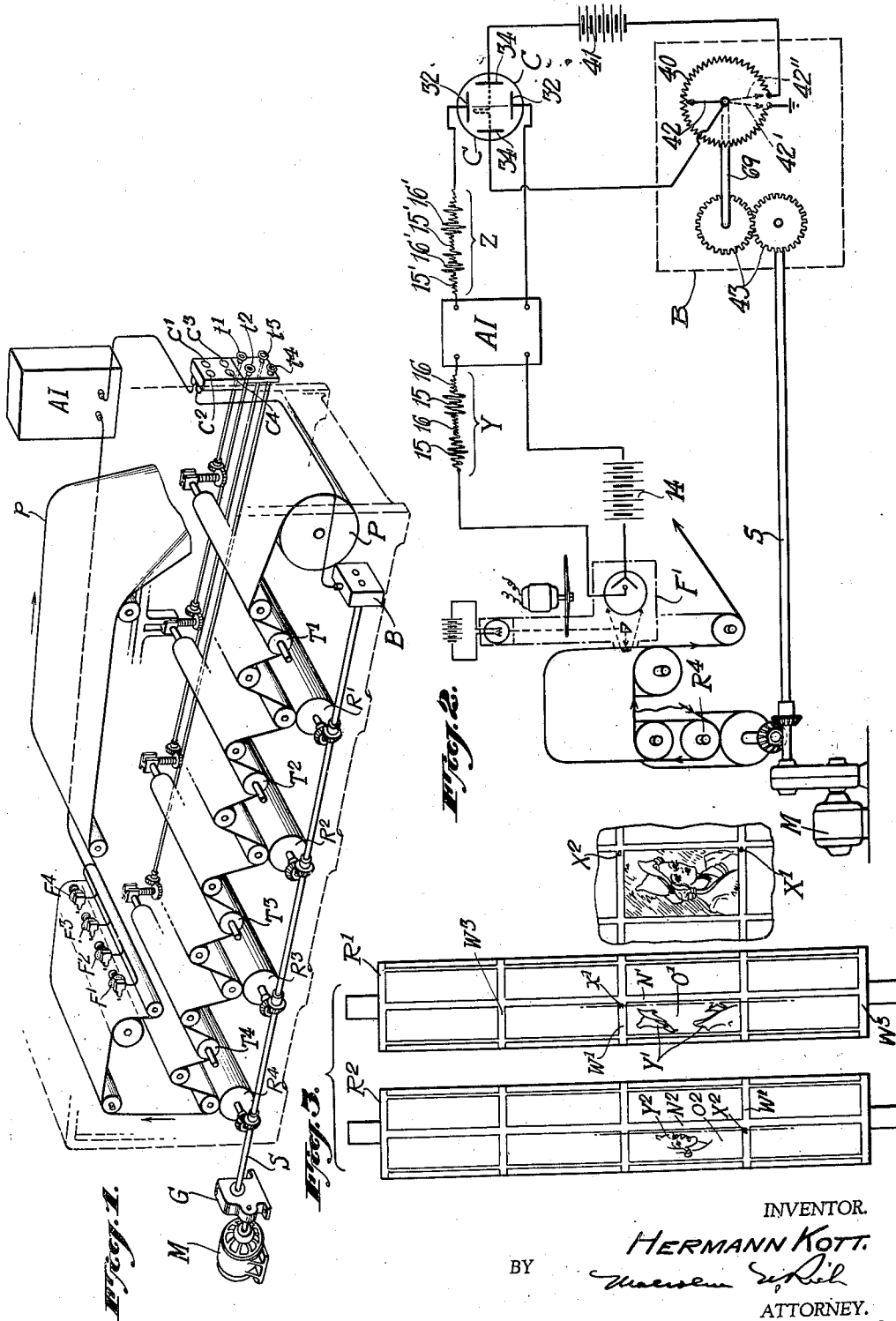
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2,278,933

CONTROL MECHANISM FOR PRINTING PRESSES

Filed June 2, 1938

6 Sheets-Sheet 1



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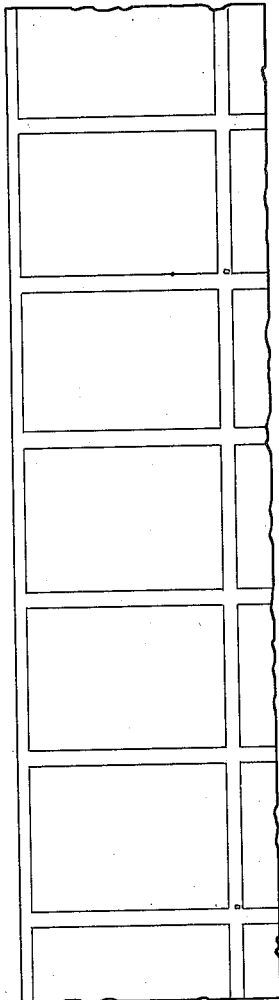
2,278,933

CONTROL MECHANISM FOR PRINTING PRESSES

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Fig. 5.



RELATIONSHIP OF SPOTS TO TIMER, 4 SPACES TO 1 REVOLUTION (OPTIONAL)

Fig. 7.

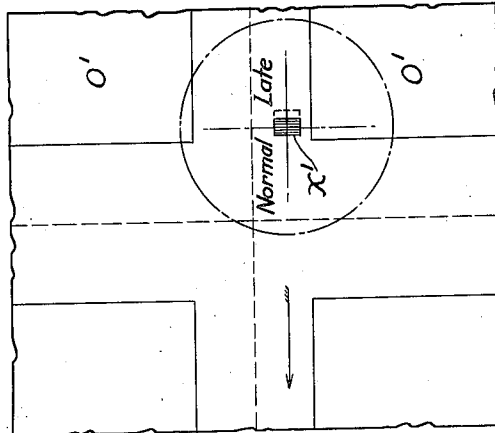


Fig. 6.

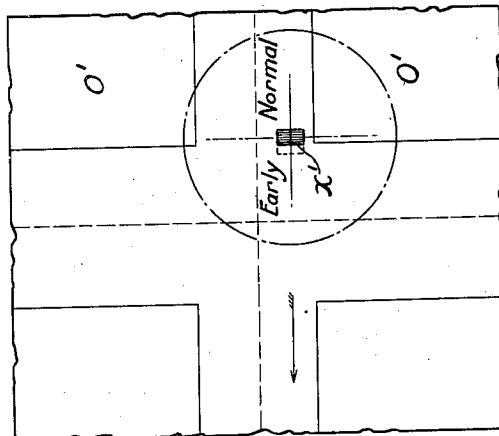
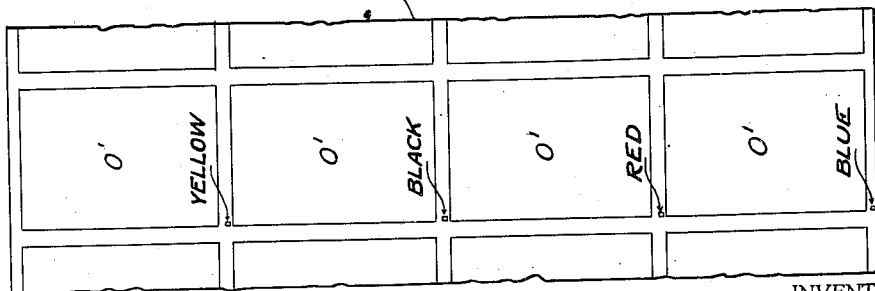


Fig. 4.



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CONTROL MECHANISM FOR PRINTING PRESSES

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6 Sheets-Sheet 3

Fig. 8.

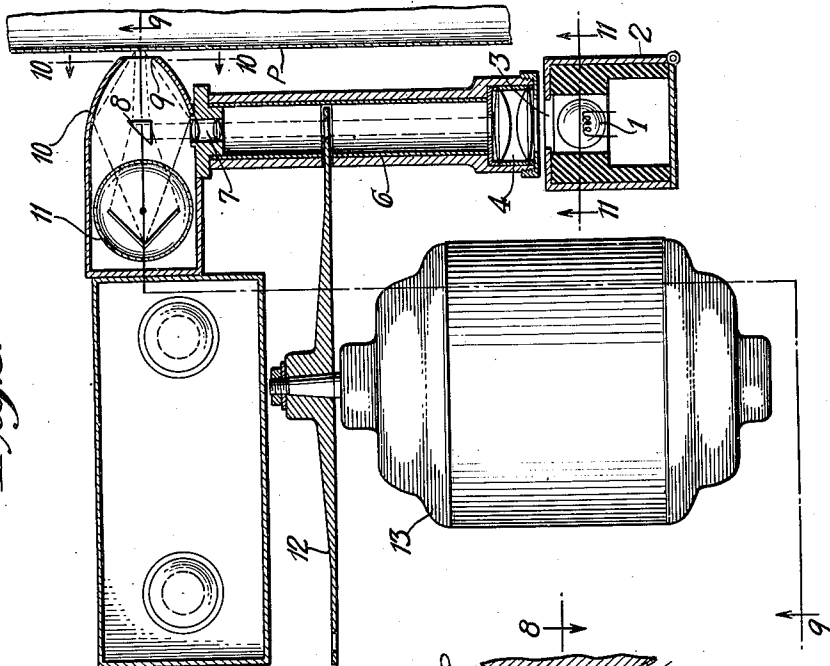


Fig. 10.

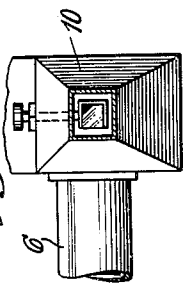


Fig. 11.

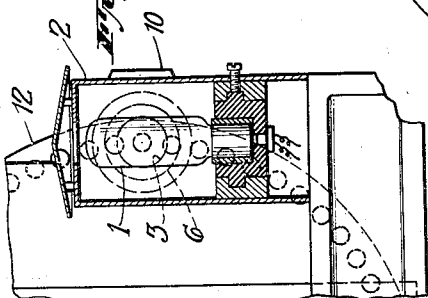
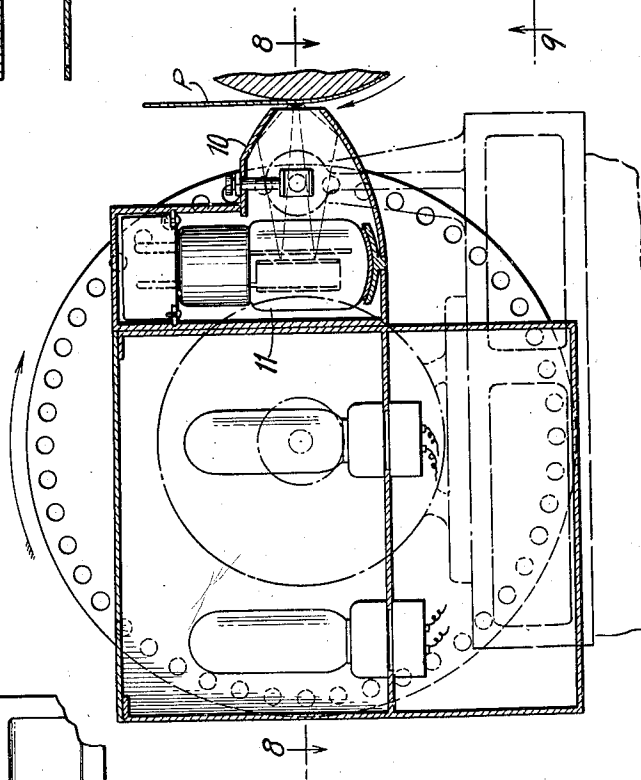


Fig. 9.



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CONTROL MECHANISM FOR PRINTING PRESSES

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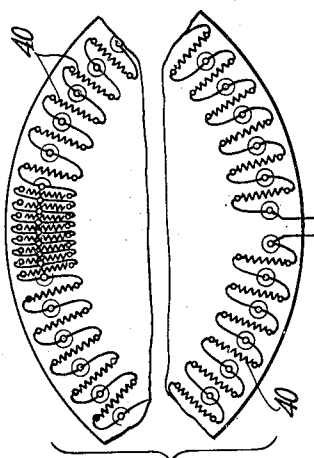
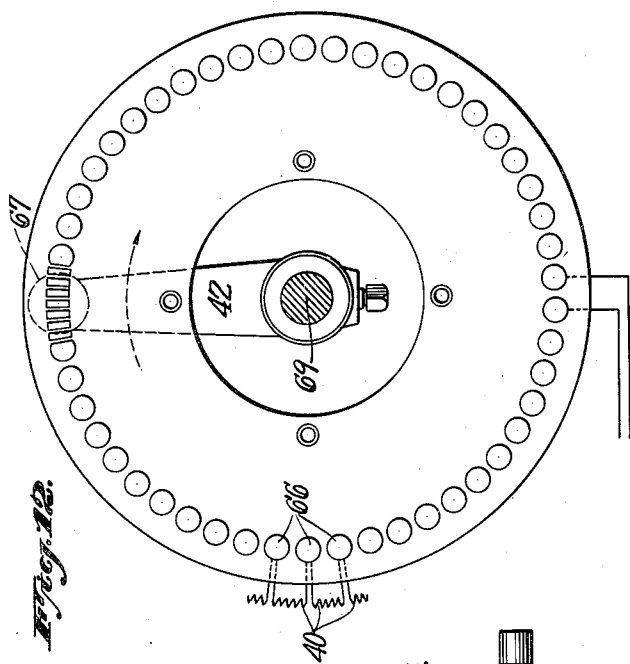


Fig. 14.

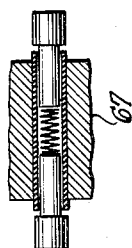
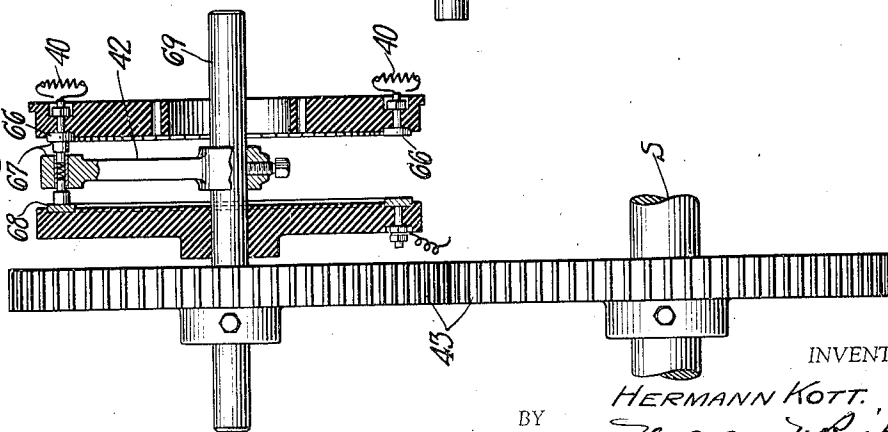


Fig. 15.



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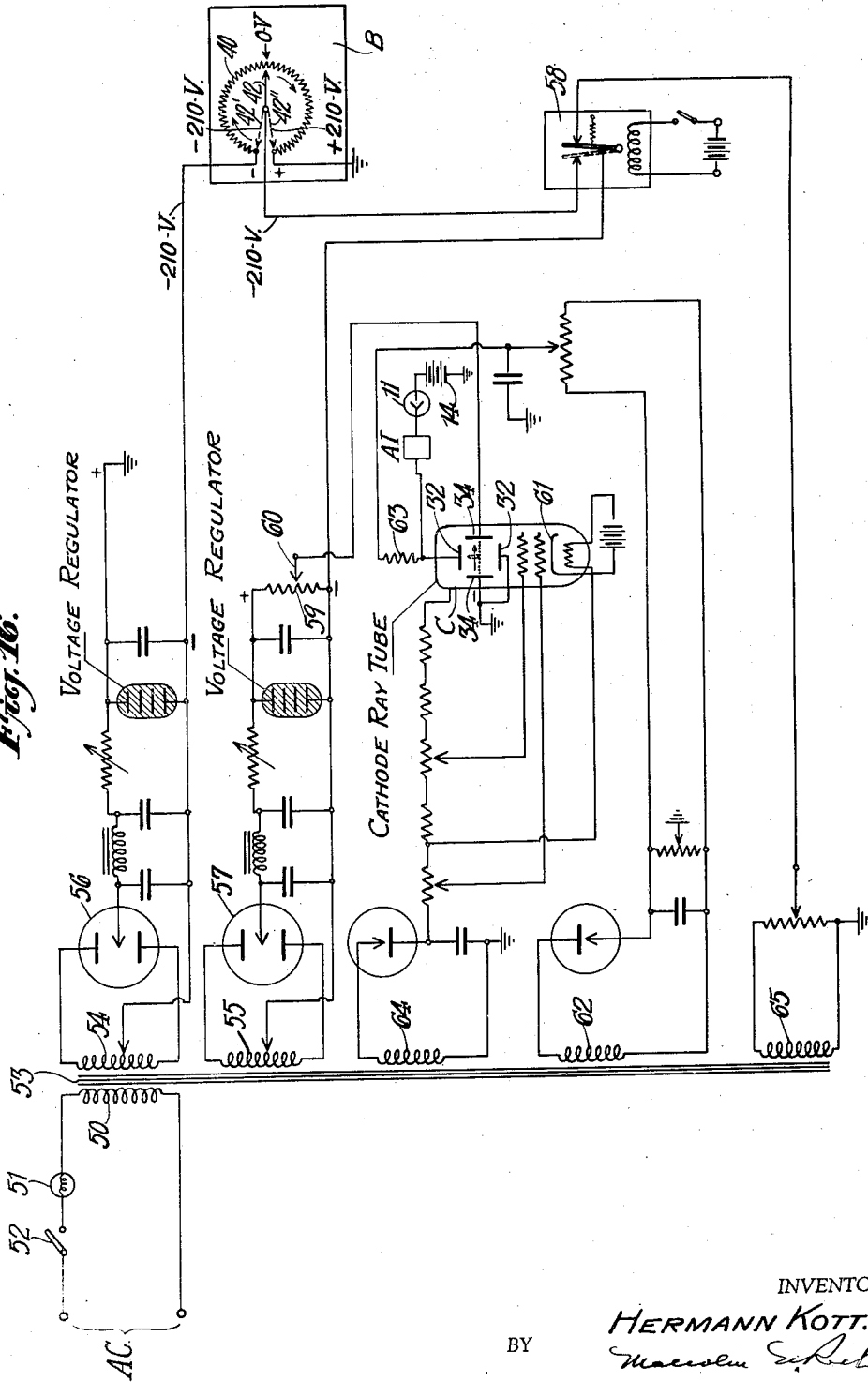
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CONTROL MECHANISM FOR PRINTING PRESSES

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Fig. 16.



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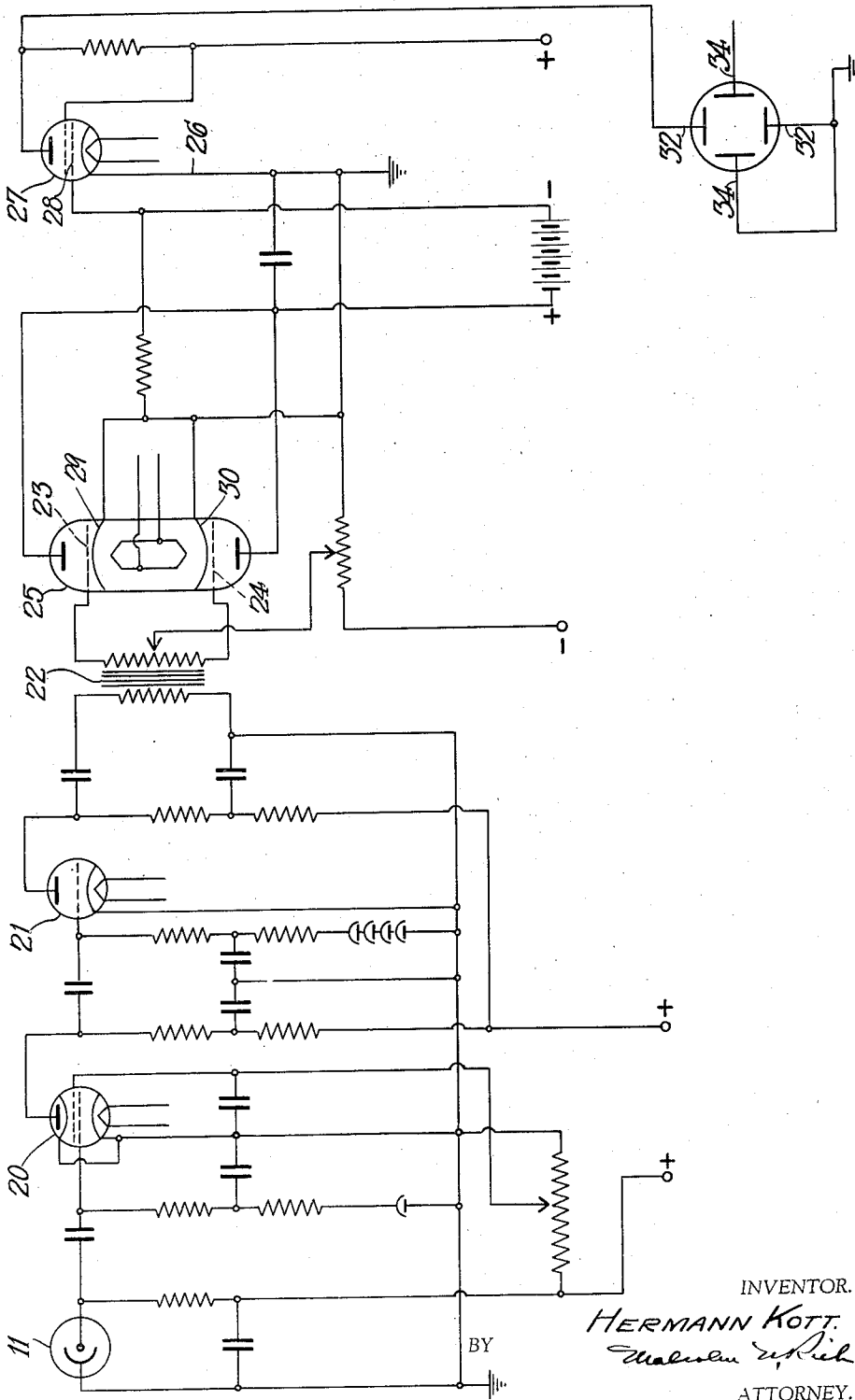
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CONTROL MECHANISM FOR PRINTING PRESSES

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6 Sheets-Sheet 6

Fig. 17.



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UNITED STATES PATENT OFFICE

2,278,933

CONTROL MECHANISM FOR PRINTING PRESSES

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mesne assignments, to Speedy Gravure Cor-
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Application June 2, 1938, Serial No. 211,365

12 Claims. (Cl. 177—311)

This invention relates to printing presses and more particularly to high speed multi-color printing presses. In such presses a strip of paper is passed from an unwinding roll through a succession of printing rolls. Each said printing roll applies onto successive spaced areas of the paper surface a desired pattern, design or printed matter in a different color to produce a desired composite multi-color pattern, design or printed matter in each said spaced area. It is essential that each color be accurately registered or super-posed one over the other within said spaced areas to form the desired composite printed matter.

Heretofore in the art, the mechanical difficulties in the press mechanism inducing off-registration of color in the said spaced areas have been reduced to a negligible factor. It has been found necessary, however, to provide manually operative means whereby the tension on the paper strip may be increased or decreased as it passes to each printing roll, to eliminate off-registration of color incident to variation in paper stretching.

One of the objects of the present invention is to provide means whereby the manual adjustment of said tensioning means is facilitated. Another object is to provide means to detect and to visually indicate the degree and the direction of off-registration of each color during the operation of the press so that manual adjustment of the said tensioning means is facilitated. Still another object is to provide an improved means for controlling the operation of a multi-color printing press. Other objects and advantages will be apparent as the invention is more fully disclosed.

In accordance with these objects I have devised the means illustrated in the accompanying drawings, wherein

Fig. 1 is a schematic drawing illustrating a printing press improved in accordance with the means of the present invention;

Fig. 2 is a schematic drawing illustrating the means of the present invention;

Fig. 3 is a diagrammatic drawing illustrating the printing process to which the present invention is directed as an improvement and the manner of incorporating the same therewith;

Figs. 4-7 inclusive illustrate one feature of the invention in its various aspects.

Figs. 8, 9, 10 and 11 illustrate a sectional plan, a sectional elevation, a horizontal elevation and a second sectional elevation along planes 8-8 (Fig. 9), 9-9 (Fig. 8), 10-10 (Fig. 8) and 11-11 (Fig. 8) respectively, of a second feature of the present invention;

Figs. 12, 13, 14 and 15 illustrate in detail a third feature of the present invention;

Fig. 16 illustrates diagrammatically a fourth feature of the present invention; and

Fig. 17 illustrates diagrammatically a fifth feature of the present invention.

The present invention as illustrated in the drawings comprises in its broadest concept means to apply to the moving paper a succession of series of transversely aligned spots or indexing lines, one for each color being printed, each said spot or indexing lines being applied simultaneously with the application of its respective color in a determined relation to the spaced area upon the paper within which the color is to be applied. Obviously the indexing means may, if desired, be an aperture rather than a printed spot. Subsequent to the application of all of the spots or indexing means, means is provided to scan the paper longitudinally along each path traversed by each said spot or indexing means, the said means being located in a plane transversely to the longitudinal axis of the paper. The scanning means is supplied with a carrier frequency and the modulations of the carrier frequency incident to the passage of the spots past the scanning means is converted into electrical energy and the modulations inverted to produce a greater impulse of electrical energy when the spot is scanned than when the unprinted portion of the paper is scanned. The inverted electrical energy thus produced from each said scanning means is applied across the vertical plates of a cathode ray tube. Means are provided to periodically move the cathode ray beam along a straight line path between the horizontal plates of the cathode ray tube in synchronism with the rate of travel of the moving paper and the frequency of the said spots transversely located thereon so as to locate the beam midway between said horizontal plates at the exact time the said spot, with perfect registration of the spot on the paper, would pass the said scanning means. If perfect registration of the spot occurs at the time the cathode beam is centrally located midway between the horizontal axis, the electrical impulse generated in the scanning means and inverted as above noted will cause the beam to be vertically deflected along the vertical center axis of the tube.

If the spot is not so located the vertical displacement will occur either before or after the cathode beam has reached the mid point in traversing the horizontal path. By locating the said cathode ray beams in a position relative to

the press and relative to the manually operative means provided on the press for varying the paper tension, the press operator upon observing the extent of and the direction of vertical displacement of the cathode beam from the horizontal path of travel may operate the said tensioning means forward or reverse to bring any color back into registration and the effect of such operation may be noted within a relatively short time interval depending upon the speed of operation of the press.

Referring to the drawings (Fig. 1) I have illustrated schematically the main operating elements of a modern high speed multi-color printing press which has been improved in accordance with the present invention. The press includes a plurality of printing rolls R1, R2, R3 and R4 each driven from a common drive shaft S, actuated by a prime mover M through suitable speed regulator means G.

The paper strip *p* from unwinding roll P passes over a tensioning roll T1 (T2, T3 and T4) before passing through each printing roll R1 (R2, R3 and R4 respectively). Each tensioning roll T1, (T2, T3 and T4) is provided with a manually operative means *t1* (*t2*, *t3* and *t4* respectively) movable forwardly or reversely to actuate mechanism moving tensioning roll T1 in a direction adapted to increase or decrease the tension on the paper strip *p*. As the specific structure of and the specific mode of operation of the press per se or the tensioning means per se forms no part of the present invention, further description of the same need not be made for those skilled in the art.

The improvement of the present invention consists in the provision of means to detect and to visually indicate the degree and direction of off-registration of each color, during the operation of the press, so that adjustment of each of the tensioning rolls T1, T2, T3 and T4 by manually operative means *t1*, *t2*, *t3* and *t4* respectively may be facilitated.

To facilitate the detection of off-registration of each color, I provide on each printing roll R1 (R2, R3 and R4), a spot X1 (X2, X3, and X4), of known or determined size and configuration. Each said spot X1 (X2, X3 and X4), is located preferably in one of the longitudinal webs or marginal areas W1 (W2, W3 and W4), in a determined position relative to a transverse web or marginal area N1. The space O1 lying between these said longitudinal and transverse webs W and N represents the area within which the printing roll R1 applies the desired colored inscription as indicated in Fig. 3.

With spots X1, X2, X3 and X4 so located on rolls R1, R2, R3 and R4 respectively the paper strip *p* in passing successively through printing rolls R1, R2, R3 and R4 will acquire in addition to the composite printing desired within the spaced areas O1, the several dots X1, X2, X3 and X4 in the marginal areas or webs, identified by color (yellow, black, red and blue) in Fig. 4, in exactly the transverse relationship indicated, provided each color is perfectly registered within the spaced areas O1. Where, however, tensioning means T2, for example, is improperly adjusted spot X2 might be displaced to either dotted position indicated in Figs. 6 and 7, depending upon whether the paper tension at T2 permitted area O1 to arrive at the roll too early or too late for perfect registration of color thereon.

The means to detect off-registration of color as indicated by the location of spot X1, X2, X3 and X4 on the paper *p*, comprises photo-sensitive

means F1, F2, F3 and F4 (one for each color printed) each located in the same plane transverse to the direction of paper travel in a position to scan the respective webs W1, W2, W3 and W4 wherein spots X1, X2, X3 and X4 are located as the paper strip *p* passes from the last printing roll R4 to the usual cutting and folding means (not shown) associated with the press. Each said means F1, F2, F3 and F4 is identical structurally and the structural features of the same are illustrated in Figs. 8 to 11 inclusive.

Referring to these figures, means F1 (for example) comprises a source of light radiation 1 inclosed within housing 2 provided with an opening 3 through which radiation from source 1 may be projected and lens means 4 to concentrate the radiation and to direct the same along light tunnel 6 through lens 7 to prism 8 thence at right angles through opening 9 of parabolic reflector 10 onto the moving surface of paper *p*. The light striking the surface of paper *p* is reflected back through opening 9 and is collected by the reflector 10 and reflected onto photo-cell 11 which is energized thereby to pass an electric current bearing a known relation to the intensity of the light radiation falling thereon. As the light radiation passes through light tunnel 6 it is chopped up into light impulses by means of perforated disc 12 rotated at a known and constant speed by motor means 13. The electric current thereby passed by photo-cell 11 incident to reflected radiation from paper *p* is similarly chopped up or pulsated.

With this arrangement, the intensity of the pulsating electric current generated or passed by photo-cell 11 remains a constant maximum until spot X1 carried by the moving paper *p* passes by opening 9. The light reflecting properties of spot X1 being different from that of the uncolored paper changes the intensity of the reflected radiation which immediately affects the intensity of the electric current passing through the photo-cell 11. By the use of suitable filters, the intensity changes incident to the different colors at each means F1, F2, F3 and F4 may be approximately equal.

Referring to Fig. 2, I have schematically indicated the general result obtained by the detecting means above described. Photo-cell 11, energized by battery 14, normally passes a direct current therethrough varying in intensity with variation in the intensity of light radiation falling thereon. When the light radiation is pulsated, as by means 12, the direct current is similarly pulsated and is similar in wave form to alternating current, with its maximum intensity during the time interval the uncolored area of the moving paper *p* reflects the radiation and its minimum intensity when the colored spot X1 interrupts the normal reflection, resulting in a graphic wave form indicated at Y wherein 15 is maximum and 16 minimum intensities.

Before this current from means F1 (F2, F3 or F4) can be put to use in accordance with the present invention this wave form must be inverted so that the maximum current 15 is reduced to a minimum current and the minimum current 16 is raised to a maximum current. This is accomplished by the amplifying and inverting means schematically illustrated and identified as A1 in Figs. 1 and 2 and more specifically shown in Fig. 17. The amplified and inverted current from each photo-sensitive device F1, F2, F3 and F4 is then applied to cathode ray tubes C1, C2, C3 and C4 respectively (Fig. 1) to produce a separate visual indication of the exact position of

each spot X1, X2, X3 and X4 relative to the desired position of perfect registration, as will be more fully hereinafter described.

Referring to Fig. 17, the electrical circuit involved in the amplifying and inverting of the relatively small pulsating direct current passing through photo-cell F1 is shown, with battery 14 (Fig. 2) displaced by direct current obtained from an alternating current source. The pulsating direct current passing through photo-cell 11 is impressed upon one grid of a pentode tube 20, the amplified plate current of the tube 20 being in turn impressed upon the grid electrode of triode tube 21 and further amplified in accordance with well known prior art practice.

The thus amplified pulsating direct current is then passed through primary winding of alternating current transformer 22. Each end of the secondary winding of transformer 22 is connected to the grid electrodes 23 and 24 of full wave rectifier 25, the plate electrodes of rectifier 25 being tied together and connected to ground potential and to cathode 26 of triode amplifying tube 27, the grid 28 of said tube 27 being connected over suitable resistance back to cathodes 29 and 30 of rectifier 25. The output current of triode tube 27 is inverted as to wave form with respect to the wave form of the output current of triode tube 21. Thus amplified and inverted the current from means AI has the wave form indicated at Z (Fig. 2) wherein 15' and 16' indicate minimum and maximum intensities respectively. This inverted current from means AI is then impressed across the vertical electrodes 32—32 of a cathode ray tube C, the periodic maximum intensities 16' operating to displace vertically the horizontally traveling cathode ray beam passing between horizontal electrodes 34—34 of the cathode ray tube C.

Cathode ray tube C is one well known in the art, and the schematic illustration of the tube in Figs. 2 and 16 is believed sufficient for those skilled in the art. In the normal operation of this type of tube a single beam of cathode radiation is projected along the axial center of the tube between vertical electrodes 32—32 and horizontal electrodes 34—34 of the tube and impinges upon a ground glass plate forming the top of the tube causing the plate to glow at the point of impact. By varying the electrical potentials between horizontal electrodes 34—34 the cathode beam can be deflected horizontally towards either electrode. By similarly varying the electrical potentials between electrodes 32—32 the same cathode beam may be vertically deflected towards or away from either electrode 32—32.

In the instant invention, I provide means to cause the cathode beam in each cathode ray tube to repeatedly traverse a horizontal path from one electrode 34 to the other at a periodicity bearing a known relation to the mechanically fixed rotating speed of the plurality of printing rolls and hence bearing a known relation to the periodicity or frequency of spot application by the rolls onto the surface of moving strip P and provide means to bring the position of the beam and the occurrence of the maximum intensity voltage 16' on electrodes 32—32 with consequent vertical displacement of the same into co-incidence at the axial center, when normal or exact registration of color exists. Any displacement of color registration (early or late) will then be evidenced by a vertical displacement of the cathode beam from the horizontal path, before

or after the beam has passed the vertical axial center of the tube.

I accomplish this result by timer means B (Figs. 1 and 2), which is more particularly illustrated in Figs. 12 to 15 inclusive which timer means B preferably is arranged to energize simultaneously the plurality of electrodes 34—34 of the plurality of cathode ray devices C (C1 to 4 inclusive) indicated in the drawings Figure 1, although separate timer means for each set of electrodes 34—34 may be employed if desired. As schematically illustrated in Fig. 2, timer means B is essentially a split electrical resistance coil 40 one end of which is electrically connected to one terminal of source 41 of electric current. The opposite terminal of source 41 is electrically connected to one electrode 34 of cathode ray tube C. The opposite electrode 34 of the cathode ray tube C is connected to a rotatable contact arm 42 and contact arm 42 is connected for rotation through suitable gearing 43 to drive shaft S actuated by prime mover M.

As indicated (Fig. 2) when contact arm 42 is in the dotted line position 42' the full resistance of coil 40 is in the circuit and when the arm 42 is in the dotted line position 42'' the minimum resistance is in the circuit. The gearing 43 is selected relative to the spacing between successively printed spots X1 (X2, X3 and X4), so that the arm 42 will be in the solid line position shown each time a spot X1 is due to pass by the point of observation to intercept the light beam at photo-sensitive means F1. In this position the voltage or potential on each electrode 34—34 is approximately equal and the cathode beam is located horizontally mid-way between the electrodes 34—34. The electrical impulse induced in photo-sensitive means F1 by means of spot X1 and inverted by means AI will accordingly vertically displace the cathode beam at this point. If the electrical impulse occurs early or late by reason of the off-registration of the particular color being printed by the roll carrying spot X1, then the vertical displacement of the cathode ray beam will fall to one side or the other of the vertical center line, and the horizontal distance away from the axial center that the vertical displacement occurs bears a determined relation to the extent of off-registration.

The press operator on observing on which side of the vertical center line the vertical displacement of the cathode beam occurs on each cathode ray tube C1, C2, C3 and C4 can thereupon adjust manually operative means t1 (t2, t3 or t4), to move tensioning roll T1 (T2, T3 or T4), in the direction adapted to bring the vertical displacement of the cathode ray beam back to the vertical center.

Referring to Fig. 16, the circuit arrangement for a single cathode ray tube is illustrated, wherein means are provided to draw current from an alternating current source A. C. in place of battery 41 (Fig. 2). This circuit arrangement is duplicated for each cathode ray tube C1, C2, C3 and C4.

The alternating current from source A. C. is passed through primary winding 50 to transformer 53 with lamp 51 and switch means 52 in series therewith as is customary in the art. Two secondary windings 54 and 55 are provided on transformer 53. Each of these windings 54 and 55 are approximately of equal number of turns and are adapted to draw current at approximately equal voltages, preferably about 210 v. as indicated. The current drawn by each

winding 54 and 55 is rectified by rectifiers 56 and 57 respectively and smoothed out as customary in the art by the use of the choke coil and condenser arrangement indicated and is then passed across the voltage regulator device indicated. The negative side of one of these circuits is then electrically connected to one side of resistance coil 40 of timer B. The opposite side of resistance coil 40 is grounded. The negative side of the other of these circuits is connected through press relay switch 58 to rotatable contact arm 42 of timer B, and from this circuit also is drawn current through resistance 59 and mid-tap connection 60 for application to one horizontal electrode 34 of cathode ray tube C. The opposite electrode 34 of the cathode ray tube C is connected to ground potential.

Thus connected as contact arm 42 of resistance coil 40 rotates from dotted position 42' to dotted position 42'' the electrical potential will vary on the electrode 34 electrically connected therewith from -210 v. to a zero voltage (at position 42) then to +210 v. and then jump the space gap between the coil ends to -210 v. and repeat the cycle of varying voltages.

The cathode ray beam emanating from cathode 60 at cathode ray tube C will accordingly repeatedly traverse the horizontal path indicated in dotted lines between electrodes 34-34 in the direction shown by the arrow.

To center the beam horizontally between electrodes 34-34 electrodes 32-32 are energized by an electric potential drawn by the circuit energized by current drawn by secondary 62 known in the art as a beam centering circuit. On this circuit I superpose the current from photo-sensitive tube 11 of means F inverted as by means AI as hereabove described utilizing resistance 63 to prevent the current from by-passing back to the circuit supplying the primary beam centering voltage to electrodes 32-32. The inverted pulsating current from photo cell 11 having periodic peak voltages representing the periodic interruptions of the reflected light radiation falling on the cell 11 by the passage of spot X past the housing opening 9, will displace the cathode beam vertically as shown by inverted V, when the said spot X passes opening 9 coincidentally with the arrival of contact arm 42 of timer B to the point where a zero potential is applied across electrodes 34-34. If the spot X and the position of arm 42 are out of phase the inverted V will be displaced to one side or the other of the vertical center line of the electrodes 32-32 and 34-34.

The circuit indicated as being supplied by secondary winding 64 is the power supply circuit for cathode ray tube C and is common to the art. The circuit indicated as being supplied by secondary winding 65 is an alternating current sweep voltage circuit to operate the cathode beam between electrodes 34-34 when the press is not running. The current from this circuit is supplied through press relay switch 58 to electrodes 34-34 when the press stops and relay switch assumes solid line position. As the press starts switch 58 is thrown over automatically to dotted line position again to connect the current from timer B to the electrodes 34-34 as above described.

Referring to Figs. 12 to 15 inclusive the details of timer means B may be seen. Instead of the continuous coil 40 schematically illustrated in Fig. 2, I prefer to provide a plurality of con-

tacts 66, connecting to the contacts resistance coils 40 electrically in series to form the single coil 40 schematically indicated in Fig. 2. Arm 42 is provided with a contact 67 adapted to make spring engaged wiping contact with contacts 66 as it rotatively passes thereover. To facilitate the connection of contact arm 42 in the electrical circuit indicated in Fig. 16, I provide a ring contact 68 for engagement by contact arm 42 substantially as indicated which ring contact 68 is electrically connected as indicated in Fig. 16 for contact arm 42. This permits relatively free rotation of contact arm 42 by shaft 69 actuated by gears 43 driven by main drive shaft S.

From the above description and drawings, it is apparent that many modifications and adaptations may be made in the present invention without departing from the nature and scope thereof, and all such modifications and adaptations are contemplated as fall within the scope of the following claims.

What I claim is:

1. Web register mechanism for multi-cylinder printing presses having a printing cylinder to apply an impression to a web in register with an impression printed by another cylinder of the press on a predetermined portion of the web, means for driving the cylinders in synchronism to feed to the first named cylinder a web having indexing means thereon spaced apart longitudinally of the web to correspond to the desired spacing of said impressions, electrical means responsive to the register of the indexing means with respect to the first named cylinder, means operated in synchronism with the rotation of the cylinders to actuate the electrical means to permit the said electrical means to respond to an actuating current supplied thereto during that portion of the revolution of the first named cylinder when the said predetermined portion of the web should not register with said cylinder, an electrical circuit connected to the said electrical means to supply an actuating current thereto, means to energize the said circuit by an alternating current to produce a carrier current of a predetermined frequency, and a photoelectric means in said circuit for detecting said indexing means and varying the amplitude of said carrier current to supply an actuating current to the electrical means.

2. Web register mechanism for printing presses having a plurality of printing cylinders, means for driving said cylinders in synchronism to feed a web having longitudinally spaced apart indexing means thereon to a printing cylinder, photoelectric means for detecting said indexing means, an electro-responsive device having a first means to maintain a normal electro-responsive operation synchronized with the said drive means and having a second means to vary said operation from normal, an electrical circuit for energizing the second means, means to produce an alternating electric current in the said circuit to produce a carrier current of a predetermined frequency, and connections to vary the amplitude of said carrier current by the photoelectric means.

3. Web register responsive mechanism comprising a machine having drive means for presenting a web having longitudinally spaced apart indexing means thereon to a desired location, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with said

drive means to move the instrumentality in a normal path and in synchronism with the web drive means, an electrical circuit having means therein to vary the movement of the instrumentality out of the said normal path, means to produce an alternating electric current in the said circuit to produce a carrier current of a predetermined frequency, and connections to vary the amplitude of the said carrier current by the photoelectric means.

4. Web register responsive mechanism comprising a machine having drive means for presenting a web having longitudinally spaced apart indexing means thereon to a desired location, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with said drive means to move the instrumentality in a normal path and in synchronism with the web drive means, an electrical circuit having means therein to vary the movement of the instrumentality out of the said normal path, means to direct a light beam intermittently to the detecting means with a predetermined periodicity to produce an alternating electric current in the said circuit to produce a carrier current of a predetermined frequency, and connections to vary the amplitude of the said carrier current by varying the light applied to the photoelectric means from the indicia.

5. Web register responsive mechanism comprising a machine having drive means for presenting a web having longitudinally spaced apart indexing means thereon to a desired location, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with said drive means to move the instrumentality in a normal path and in synchronism with the web drive means, an electrical circuit having means therein to vary the movement of the instrumentality out of the said normal path, a source of light directed toward the detecting means, an apertured disc to interrupt the light from said source, means to rotate the disc at a predetermined speed to subject the detecting means to periodically varying light to produce an alternating electric current in the said circuit to produce a carrier current of a predetermined frequency, and connections to vary the amplitude of the said carrier current by varying the light applied to the photoelectric means from the indicia.

6. Web register responsive mechanism comprising a machine having drive means for presenting a web having longitudinally spaced apart indexing means thereon to a desired location, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with said drive means to move the instrumentality in a normal path and in synchronism with the web drive means, an electrical circuit having means therein to vary the movement of the instrumentality out of the said normal path, means to produce an alternating electric current in the said circuit to produce a carrier current of a predetermined frequency, connections to vary the amplitude of the said carrier current by the photoelectric means, and a phase inverter to convert low amplitude variations of the carrier current into large amplitude variations of current supplied to the force varying means in the electrical circuit.

7. Web register responsive mechanism comprising a machine having drive means for pre-

senting a web having indexing means thereon to a desired location, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with the said drive means to move the instrumentality in a normal path and in synchronism with the web drive means, a second means to deflect the movable instrumentality out of the said normal path, and means controlled by the photoelectric means for actuating the said second means.

8. Web register mechanism for high speed multi-color printing presses having a plurality of printing cylinders, means for driving said cylinders in synchronism to feed a web having indexing means thereon to a printing cylinder, photoelectric means for detecting said indexing means, means for producing a movable instrumentality, means driven in synchronism with the said cylinder drive means to move the instrumentality in a normal path and in synchronism with the rotation of the cylinders, a second means to deflect the movable instrumentality out of the said normal path, and means controlled by the photoelectric means for actuating the said second means.

9. Web register responsive mechanism comprising a machine having driven means for presenting a web having indexing means thereon to a desired location, photoelectric means for detecting said indexing means, a cathode ray tube having first electrodes to maintain a normal path of cathode ray beam, second electrodes to deflect the beam out of the said normal path, means controlled by the said photoelectric means to energize the second electrodes, means driven in synchronism with said drive means to energize the first electrodes with a constantly varying potential to cause the beam to move in said normal path in timed relation to the said drive means.

10. Web register mechanism for high speed multi-color printing presses having a plurality of printing cylinders, means for driving said cylinders in synchronism to feed a web having indexing means thereon to a printing cylinder, photoelectric means for detecting said indexing means, a cathode ray tube having first electrodes to maintain a normal path of cathode ray beam, second electrodes to deflect the beam out of the said normal path, means controlled by the said photoelectric means to energize the second electrodes, means driven in synchronism with the said drive means to energize the first electrodes with a constantly varying potential to cause the beam to move in said normal path in timed relation to the said drive means.

11. Web register responsive mechanism comprising a machine having drive means for presenting a web having indexing means thereon to a desired location, photoelectric means for detecting said indexing means, a cathode ray tube having first electrodes to maintain a normal path of a cathode ray beam, second electrodes to deflect said beam out of the said normal path, means controlled by said photoelectric means to energize said second electrodes, means for energizing the first electrodes, and means driven in synchronism with said drive means to vary the energization of said first electrodes to cause the beam to move back and forth therebetween in timed relation to said drive means.

12. Web register responsive mechanism comprising a machine having drive means for presenting a web having indexing means thereon to

a desired location, photoelectric means for detecting said indexing means, means for directing a beam of light onto said web in the path of said indexing means, means for varying the intensity of said beam periodically, a cathode ray tube having first electrodes to maintain a normal path of a cathode ray beam, second electrodes to deflect said cathode ray beam out of said normal path, means controlled by the fluctuating current delivered by said photoelectric means in response to variation in the intensity of said

beam of light to energize said second electrodes and deflect said cathode ray beam out of its normal path upon passage of an indicium before said photoelectric device, and means driven in synchronism with said web driving means to energize said first electrodes with a constantly varying potential to cause said cathode ray beam to move in said normal path in timed relation to said web driving means.

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