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Albrecht

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[54] **MULTIPLE POINT INK CONTROL APPARATUS FOR PRINTING PRESSES**

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[21] Appl. No.: **172,065**

[52] **U.S. Cl.** **101/365**

[51] **Int. Cl.** **B41f 31/04**

[58] **Field of Search** 101/365, 366, 148

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Primary Examiner—J. Reed Fisher

[57] **ABSTRACT**

Ink control apparatus for printing presses which includes means for adjusting the position of a doctor blade relative to an ink roll to meter the ink supply and remote control means for modifying the position of the doctor blade even while the press is in operation. The apparatus also includes means for use in multi-color presses for selectively connecting the remote control to the doctor blade adjusting means of each unit to enable all of the doctor blades to be adjusted from the remote location.

6 Claims, 10 Drawing Figures

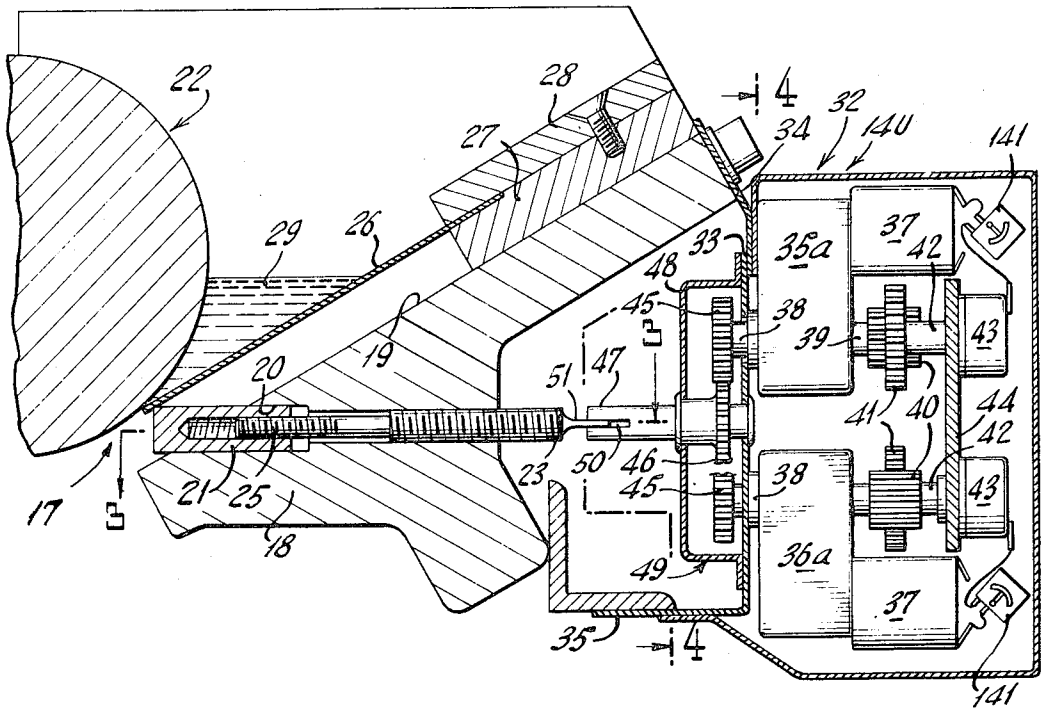


Fig. 1.

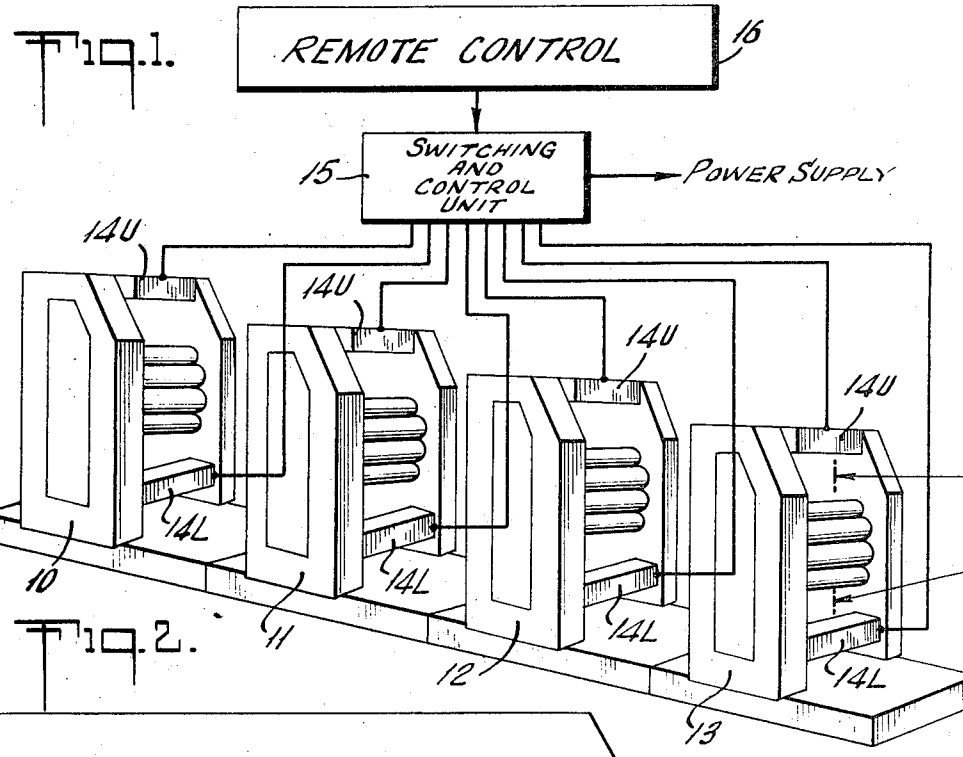


Fig. 2.

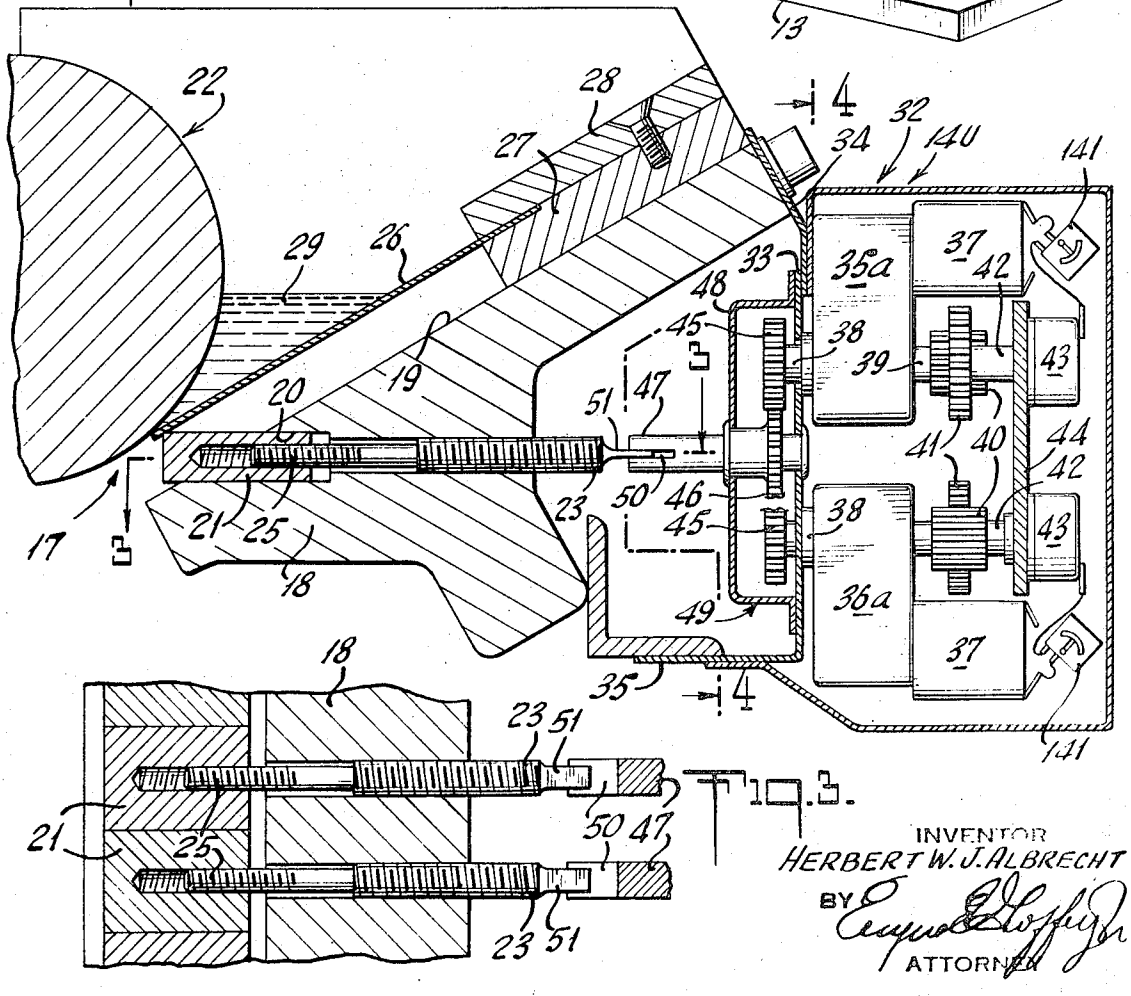


Fig. 3.

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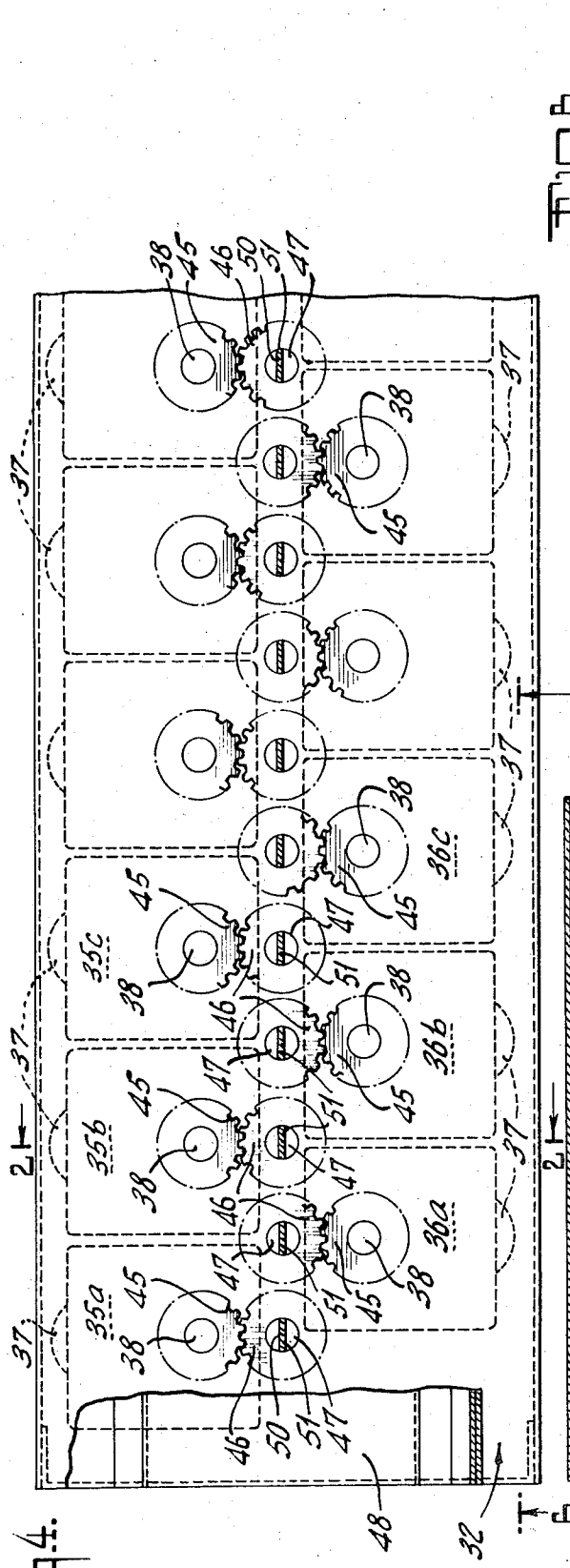


FIG. 4.

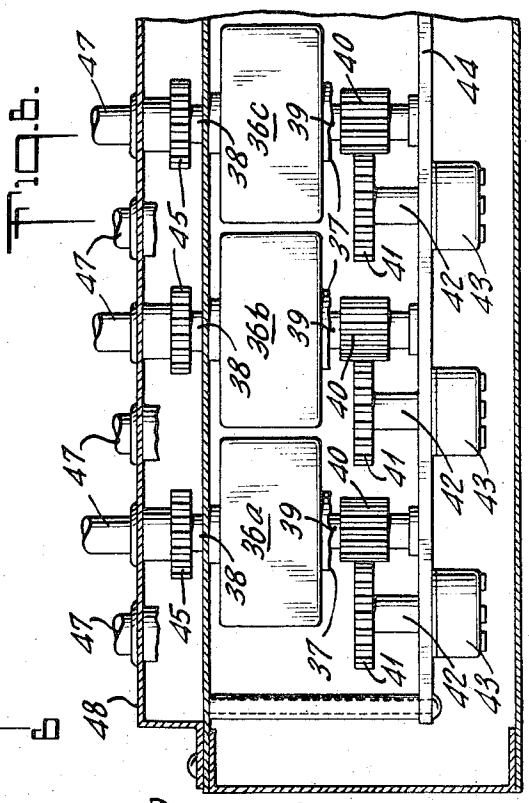


FIG. 6.

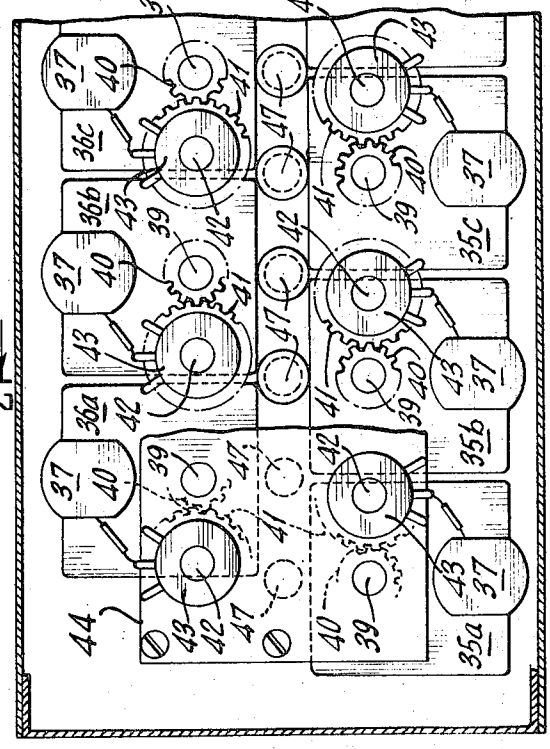


FIG. 5.

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FIG. 8.

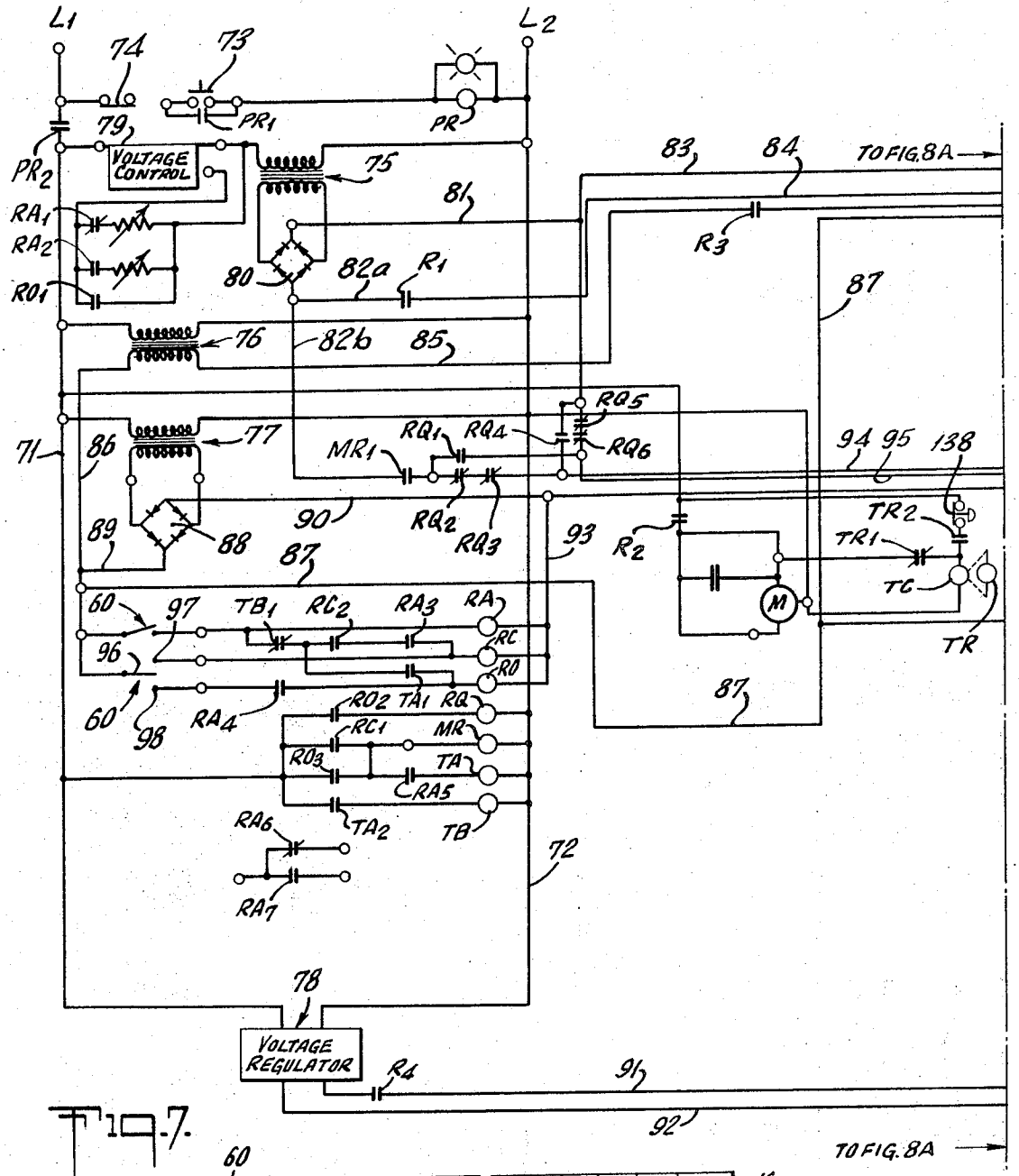
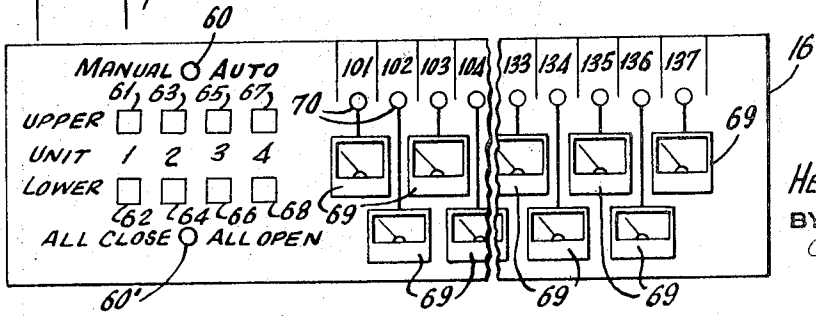


FIG. 7.



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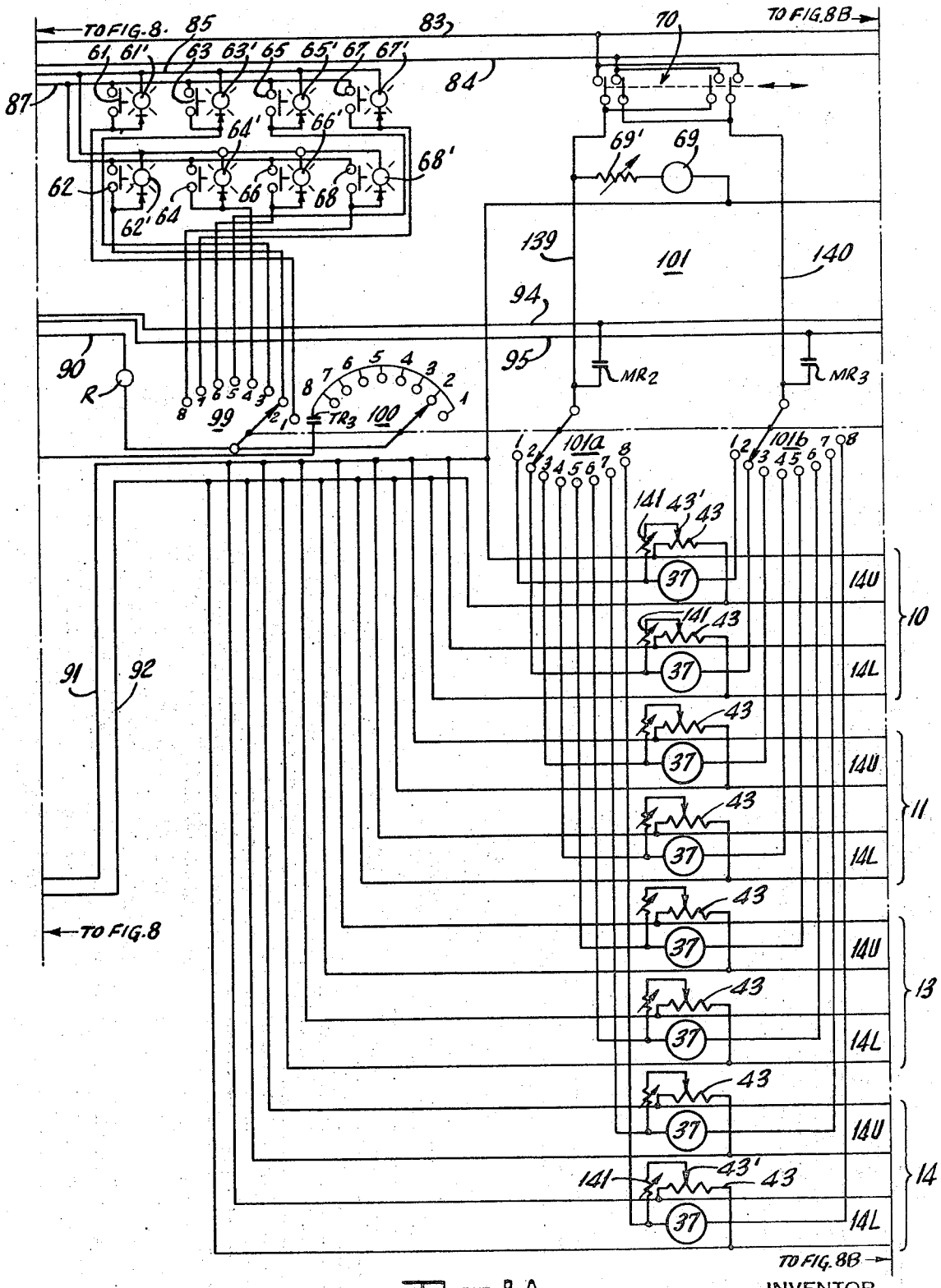


FIG. 8A.

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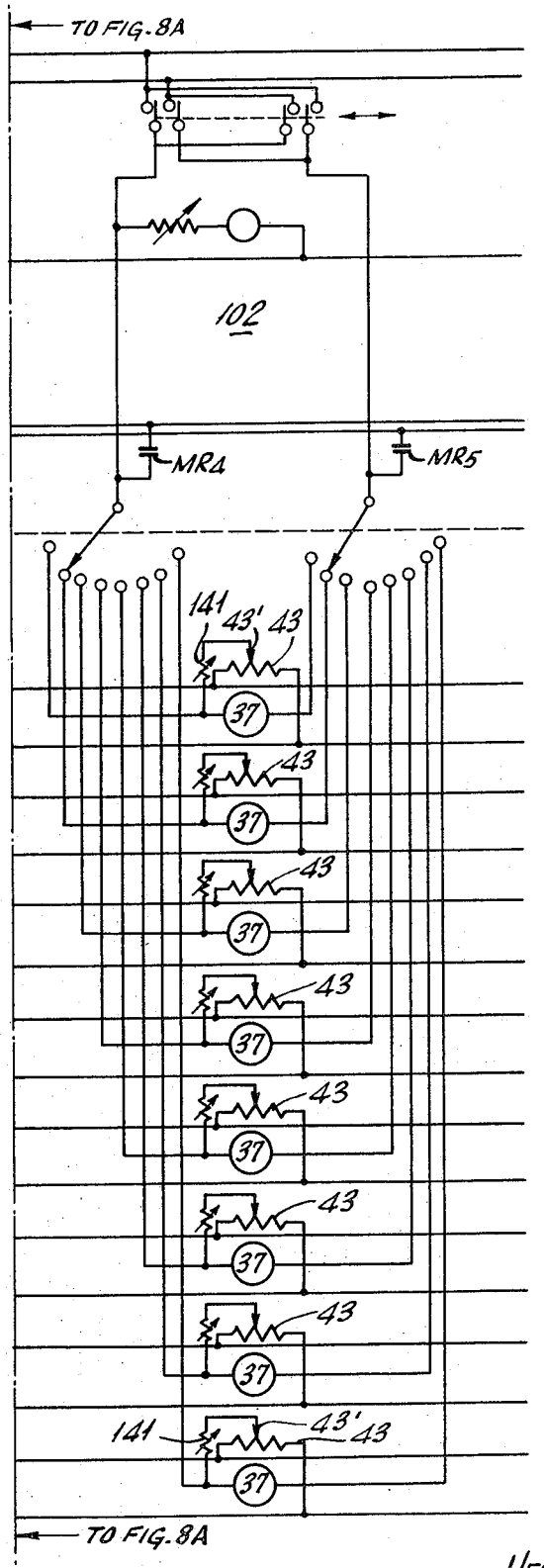


FIG. 8B.

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MULTIPLE POINT INK CONTROL APPARATUS FOR PRINTING PRESSES

This invention relates to printing apparatus and more specifically to novel and improved apparatus for the control of the ink supply on printing presses and particularly multi-color offset presses and the like.

U. S. Pat. No. 3,559,573 granted on Feb. 2, 1971 to George E. Hantscho entitled Ink Fountain Assembly and Blade Adjusting Means Therefor, discloses means for controlling individual portions of a doctor blade relative to the ink roll in order to provide a uniform supply of ink throughout the length of that roll. In multi-color offset presses for simultaneously printing both sides of a web, three or more printing units are often required in which case at least six doctor blades must be precisely adjusted in order to control properly the quantity of ink of each color being fed to each ink roll and more specifically to individual sections of each ink roll. For instance, in normal practice utilizing apparatus as disclosed in the aforesaid patent, at least thirty to forty individual pressure applying blocks or keys are provided for the adjustment of a single doctor blade and, in a four color press, approximately 320 individual adjustments must be made to effect the desired results. Such a procedure is not only time consuming and expensive in making the initial press adjustments, but further adjustments are often required during operation should there be a change in the viscosity of the ink being fed to one or more of the ink rollers.

This invention provides a novel and improved remote control means which not only enables an operator to change simultaneously the adjustment of all the keys on any selected doctor blade, but also to individually change the adjustment of each key in order to provide a desired rate of ink supply throughout the length of the ink roll. Moreover, means are provided for initially aligning the individual keys on each blade to apply uniform pressure throughout the length of each doctor blade and then retract all keys to obtain a preliminary setting. Suitable indicators are provided to enable the operator to monitor the position of each individual key associated with each doctor blade and enable individual and precise adjustments to be made while the press is in operation to obtain a desired color composition of the material printed on the web.

Another object of the invention resides in the provision of novel and improved means for actuating each key on each of the doctor blades of a multi-color offset press and, at the same time, providing a precise indication of the position of each key.

Still another object of the invention resides in the provision of a novel and improved remote control unit including position indicating means for the keys of each group associated with a single doctor blade and means for automatically switching said remote control units to any selected group of keys for adjusting the keys simultaneously or individually to achieve the desired ink supply.

Still another object of the invention resides in the provision of novel and improved ink control means for printing presses.

The above and other objects and advantages of the invention will become more apparent from the following description and accompanying drawings forming part of this application.

IN THE DRAWINGS:

FIG. 1 is a diagrammatic perspective view of a multi-color offset press with ink control apparatus in accordance with the invention;

FIG. 2 is a cross-sectional view of key control means for adjusting the clearance between a doctor blade and the associated ink roll and taken along the line 2—2 of FIG. 4;

FIG. 3 is a cross-sectional view of FIG. 2 taken along the line 3—3 thereof;

FIG. 4 is a cross-sectional view of FIG. 2 taken along the line 4—4 thereof;

FIG. 5 is a cross-sectional view of FIG. 2 taken along the line 5—5 thereof with parts broken away;

FIG. 6 is a cross-sectional view of FIG. 4 taken along the line 6—6 thereof;

FIG. 7 is a front elevational view of the remote control apparatus in accordance with the invention; and

FIGS. 8, 8A and 8B are circuit diagrams of remote control and key control apparatus in accordance with the invention.

Printing presses and particularly multi-color offset presses require careful control of the supply of ink to the ink rolls in order to provide the desired color characteristics in the finished printed material. In multi-color offset presses which may comprise as many as four different color units for printing simultaneously both sides of the web, the ink supplied to eight separate ink rolls must be carefully and accurately controlled. Control of the ink supply to an ink roll is effected by the use of a doctor blade and the spacing of the blade from the ink roll must be substantially uniform throughout its length. One form of device for controlling the spacing of the doctor blade from the ink roll is disclosed in the aforementioned U.S. Pat. No. 3,559,573 which utilizes a plurality of independent blocks or keys placed in contiguous relationship throughout the length of the blade and which keys are independently adjustable to provide an accurate and uniform clearance between the blade and the ink roller. In many instances as many as forty blocks or keys are utilized on a single doctor blade so that in the operation of a four unit press at least 320 individual adjustments must be made. Inasmuch as the viscosity of the ink may vary by reason of temperature, humidity and other conditions, it is frequently necessary to readjust the doctor blades during the course of a printing operation. Since the manual adjustment of the doctor blades is tedious and time consuming, substantial delays are often encountered in effecting the adjustments in order to maintain color uniformity. This invention provides novel and improved means for remotely controlling the adjustments on each of the doctor blades of a multi-color press and which enables the operator to adjust each doctor blade quickly and precisely upon initiation of the printing operation and during the course thereof in order to produce the desired colors on the finished printed material. The invention also enables the precise adjustment of selected portions of each doctor blade so that the required ink distribution throughout the length of an ink roller can be obtained.

Referring to FIG. 1, which is a diagrammatic representation of the invention as applied to a four color offset press, the illustrated offset press consists of four different color units 10, 11, 12 and 13. Each of the press units includes upper and lower control assemblies 14U and 14L, each of which is connected to a switching and control unit 15 which in turn is connected to the re-

mote control unit 16, the latter unit being illustrated more clearly in FIG. 7.

The upper and lower control assemblies 14U and 14L are identical and, accordingly, only the upper unit 14U will be described. The control 14U is shown in FIGS. 2 through 6 and is interconnected with the ink control apparatus generally denoted by the numeral 17. Inasmuch as the ink control apparatus 17 is disclosed in detail in the aforementioned United States patent, only a brief description of the apparatus is deemed necessary for the purposes of this application. More specifically, the ink control apparatus includes a longitudinally disposed support 18 having an upper inclined portion 19. The left side of the support 18 as shown in FIG. 2 has a longitudinal slot 20 for slidably receiving a plurality of contiguous blocks or keys 21 arranged to move toward and away from the ink roller 22. The position of each block 21 is controlled by an adjusting screw 23, with each screw having two threaded sections 24 and 25. The pitch of the threads in the threaded sections 24 and 25 differ slightly so that very minute displacement of the associated block can be obtained by rotation of the adjusting screw. A doctor blade 26 is secured to the inclined surface 19 of the support 18 by a pair of blocks 27 and 28, the latter being suitably secured in position on the support 18 as shown. The doctor blade 25 overlies the front edges of the blocks or keys 21 as shown in FIG. 2 and cooperates with the ink roller 22 to form a reservoir for the ink 29. With this arrangement and by controlling the torque of the motors in the control assembly, in the manner to be described, all of the blocks or keys 21 can be urged against the doctor blade with substantially uniform force. In this way the blocks can be uniformly positioned whereupon the blade will be precisely aligned with its associated ink roll. After the initial setting of the blocks 21, they can be retracted uniformly to provide the desired initial spacing between the blade and the ink roll for the start of the printing operation.

The operation of each of the adjusting screws 23 is accomplished by a control assembly, such as the assembly 14U shown in FIGS. 2, 4, 5 and 6.

The control assembly includes an elongated housing 32 having a front wall 33 and upper and lower brackets 34 and 35 for securing the housing to the longitudinal support 18. The front wall 33 of the housing 32 carries a plurality of upper gear boxes 35*a*, 35*b*, 35*c*, etc., and a plurality of lower gear boxes 36*a*, 36*b*, 36*c*, etc. Each of the gear boxes 35*a*, 35*b*, 35*c* and 36*a*, 36*b*, 36*c*, etc., includes a drive motor 37 and front and rear output shafts 38 and 39. Each output shaft 39 carries a spur gear 40 which engages a second spur gear 41 carried by a shaft 42 of an associated potentiometer 43. The potentiometers 43 are all carried by a plate 44 suitably secured within the housing 32. With this arrangement rotation of any motor 37 will drive its associated gear box which in turn will affect rotation of the associated potentiometer 43. The output shaft 38 of each gear box 35*a*, 35*b*, 35*c* and 36*a*, 36*b*, 36*c*, etc., carries a spur gear 45 which meshes with a second spur gear 46 carried by a shaft 47 journelled in the front wall 33 of the housing 32 and wall 48 of the front housing portion 49. Each shaft 47 includes a slot 50 to receive a flattened end portion 51 extending outwardly from an adjusting screw 23. Thus, operation of each motor not only rotates its associated potentiometer 43, but it also rotates the associated adjusting screw 23 to displace the cooperating block or key 21 toward or away from the doctor blade 26. Moreover, by utilizing upper and lower rows of gear boxes and motor assemblies 35*a*, 35*b*, 35*c* and 36*a*, 36*b*, 36*c*, etc., with the lower assemblies being offset from the upper assemblies, it is possible to provide a plurality of closely spaced shafts 47 and thus permit the utilization of an increased number of blocks 21 and adjusting screws 23 in order to provide more precise control over the adjustment in the doctor blade. For convenience in illustrating the construction of the control assembly 14U, it will be observed that FIG. 5 of the drawing is an inverted view of the right side of FIG. 2 so that the relative positioning of the components will be more clearly understood.

Operation of each control assembly 14U and 14L of each press section is operated by a master remote control 16 illustrated in FIG. 7. As will be described, the remote control 16 can be automatically switched to any one of the control assemblies 14U and 14L to modify the supply of ink to the associated ink roller, and the relative positions of the blocks or keys 21 associated with any given ink roller are indicated by appropriate meters on the remote control 16. More specifically, the remote control 16 includes a switch 60 which may be utilized to simultaneously operate the motors of any selected control assembly 14U or 14L. Switches 61, 62, 63, 64, 65, 66, 67 and 68 enable the control 16 to be connected to any one of the assemblies 14U or 14L at which time the meters 69 will each provide an indication of the setting of the associated key 21. Switches 70 permit individual adjustment of each of the keys, and in the instant embodiment of the invention 37 individual keys are provided for the adjustment of each doctor blade on the associated ink roller. For convenience the individual control circuits on the master control are denoted generally by the numerals 101 through 137.

The electrical circuitry for the selection of a specific control assembly 14U or 14L and the operation thereof to obtain the desired adjustment of each of the keys or blocks 21 is illustrated in FIGS. 8, 8*a* and 8*b*. Electrical energy for operation of the control is fed to the input terminals L1 and L2 with L1 being connected to conductor 71 through contact PR2 of the relay PR and the terminal L2 being connected directly to the conductor 72. To energize the conductors 71 and 72 the normally open switch 73 connected in series with the normally closed switch 74 and relay PR between terminals L1 and L2 is closed to energize relay PR and close the self-holding contacts PR1. This closes contacts PR2 to supply energy to the system. To interrupt power the switch 74 is opened momentarily to deenergize relay PR.

Four separate power supplies including transformers 75, 76 and 77 and a voltage regulator 78 are connected across conductors 71 and 72 to provide four separate operating voltages. More specifically, the primary of transformer 75 is connected in series with a voltage control 79 across conductors 71 and 72. The secondary voltage of the transformer is rectified by a full wave bridge rectififer 80 and the rectified output is fed to leads 81 and 82*a* and 82*b*. The conductor 81 is connected to lead 83 while conductor 82*a* is fed through normally closed contacts R1 of relay R to the conductor 84. As will be shown, conductors 83 and 84 provide energy for operation of the motors 37. The transformer 76 has its primary winding connected between conductors 71 and 72 and its secondary to conductors 85 and 86, the latter conductor being in turn connected to

conductor 87 through normally open contacts R3 of relay R1. This transformer provides energy for the pilot lights 61' through 68' associated with switches 61 through 68. Transformer 77 which provides energy for the low voltage relays R, RA, RC and RO has its primary connected between conductors 71 and 72 and its secondary voltage is fed through a full wave bridge rectifier 88 to conductors 89 and 90. The voltage regulator 78 is also connected between conductors 71 and 72 is connected to conductors 91 and 92 through contacts R4 of relay R for operation of the meters 69 which indicate the precise setting of each key.

The automatic switch 60 is connected to conductor 60 and through the coil of relay RA and conductor 93 to the conductor 90, through contacts TB1, RC1, RA3 and the coil of relay RC to conductor 93 and also through contacts TB1, TA1 and the coil of relay RO to conductor 93. When switch 60 is open the individual motors 37 on any selected upper or lower control assembly 14U and 14L can be operated by the switches 70. Upon closure of the switch 60 all motors 37 of the selected control assembly will operate to move the blocks or keys to a completely closed position with each motor causing its associated block 21 to exert substantially uniform pressure on the doctor blade 26.

The double pole single throw switch 60' operates all the motors 37 of a selected control assembly 14U or 14L to either open or close the blocks 21, that is, increase or decrease the ink supply. This is accomplished by controlling the application and polarity of the voltage produced by the supply 75 to the conductors 94 and 95 which in turn energizes the motors 37 through contacts of relay MR. More specifically, if the arm 96 of switch 60' is moved to contact 97, relay RC will operate to close contact RC1 and energize relay MR to close all MR contacts and thereby operate the motors 37 to move the blocks 21 to the closed position 37. If the contact arm 96 is moved the contact 98 relay RO is energized which in turn energizes relay RQ through closed contacts RO2 and relay MR through contacts RO3. Relay MR closes contacts MR1 and MR2, MR3, etc., and the operation of contacts RQ1 through RQ6 reverses the polarity of the voltage from power supply 75 as applied to conductors 94 and 95 to cause the motors 37 to rotate in the opposite direction and retract the associated blocks or keys 21.

Selection of the upper and lower control assemblies of a particular press unit is accomplished by a selector switch having contact banks 99, 100, and 101*a*, 101*b*, 102*a*, 102*b* through 137*a* and 137*b*. In the instant embodiment of the invention utilizing eight control assemblies 14U and 14L, each of the contact banks includes eight contacts and a cooperating contact arm. All of the contact arms are driven by a common drive motor M. Assume that switch 62 had been closed so that the arms of all the switch banks had stopped on contact 2 and that switch 61 is depressed. Since the switches 61 through 68 are interlocked so that depression of one switch will release the others, contact 3 of bank 100 will be energized. In so doing, relay R is deenergized closing contact R2 and operating motor M. At the same time the timer TC operates for a period of time as, for instance, 10 seconds. Normally the arm of switch bank 100 will locate the energized contact which in this case is contact 3 and apply energy to relay R to open R2 and stop motor M. If energy is applied to L1 and L2 and none of the rheostats 61 to 68 are depressed motor M will run until the timer TC energizes relay TR. Thereupon TR1 opens, TR2 closes, and TR3 closes to maintain energy on relay R and maintain the motor M in the off position. To again operate the motor, the energy to L1 and L2 must be interrupted or reset switch 138 must be depressed to deenergize relay TR by opening the holding circuit including contacts TR2. With the foregoing arrangement any of the control assemblies 14U or 14L of any one of the press units 10 to 14 can be selected for adjustment of the individual motors.

As previously pointed out, each motor of each control assembly operates an individual potentiometer 43 and the motors are operated by double pole double throw switches 70. Since each of the control sections of the remote control 16 are identical only the section 101 will be described. The switch 70 connects the conductors 83 and 84 to the conductors 139 and 140 which in turn are connected to the arms of the switch banks 101a and 101b. With the arms on contacts 2 of the banks the motor 37 of the control assembly 14L of press unit 10 will be operated by actuation of the switches 70.

The meters 69 are operated by the voltage supply 78 through contacts R4 of relay R when the latter is energized. The lead 91 is connected to one side of each of the meters 69 and to one side of each of the potentiometers 43 while the lead 92 is connected to the other side of each of the potentiometers 43. The other side of each meter 69 is connected through a calibrating rheostat 69' to the lead 139 while the movable arm 43' of each potentiometer is connected through a calibrating rheostat 141. The rheostat 69' enables all meters to be adjusted uniformly with the application of a constant voltage while the rheostats 141 are used to provide uniform meter readings with all of the keys or blocks 21 in precisely aligned positions against the doctor blade 26. With the foregoing arrangement the precise positions of all keys 21 can be determined by the mere observation of the meters 69.

In the adjustment of the ink supply of a press using this invention, push button 61 for instance is depressed and energy is applied to leads L1 and L2 by operation of switch 72. The motor M then operates until the arms of the step switch each arrive at contact 1 of each bank. The switch 60 is then closed and causes relay RA to open contacts RA1 and close contacts RA2 applying a low voltage to the motors 37 to move the keys 21 against the doctor blade 26 with uniform force since the motors will stall after exerting a given force because of the low voltage applied to them. The operation is controlled by timing relay TA for a given period of time as for instance 30 to 40 seconds. At the end of that time contacts TA1 and TA2 close energizing relays RO and timer TB. Relay RO closes contacts RO1 to apply an above normal voltage to the motors 37 but of a reversed polarity to retract or open the keys 21 about 0.001 inch to 0.002 inch. The timer TB operates for only a few seconds whereupon contacts TB1 open to terminate the operation. Thereafter the keys or blocks can be moved in unison by the switch 60' or can be moved independently by the individual switches 70.

While only one embodiment of the invention has been illustrated and described, it is understood that alterations, changes and modifications can be made without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. Ink control means for a printing press having at least one unit which includes an ink roll and an ink control assembly having a doctor blade for metering the supply of ink fed to the roll, a plurality of keys mounted for movement toward and away from the doctor blade to adjust the ink supply and means for operating said keys comprising reversible electric motors for moving each of said keys toward and away from said blade means including a variable impedance mechanically coupled to each of said motors, remotely located control and indicating means electrically connected with said motors and said variable impedance means to control movement of said keys and indicating the positions of said keys relative to said ink roll, said control and indicating means having a power supply and including a first circuit with means for producing a low voltage of a given polarity and a second circuit with means for producing at least a normal operating voltage of a reversed polarity relative to said low voltage and of a higher voltage relative to said low voltage, means including a first switch connected to said low voltage circuit for energizing all said motors by said low voltage circuit so as to move all said keys against the said doctor blade with uniform force to initially align all said keys, each of said motors stalling after said keys have exerted a given force upon said doctor blade because of the said low voltage applied to each said motor, means including a second switch connected to said normal operating voltage circuit for energizing all of said motors by said normal operating voltage circuit for applying at least a said normal voltage to all said motors for a predetermined period so as to retract all said keys to an initial operating position, each of said motors including individual speed reducing means coupled to each motor, and rotatable means coupled to each key for movement thereof toward and away from said doctor blade, each of said speed reducing means having an output shaft coupled to one of said rotatable means for operation of the associated key.

2. Ink control means according to claim 1 wherein said printing press includes a plurality of units, each including at least one control assembly, and said ink control means includes switching means for selectively connecting said remote control to said motors and variable impedance means in said ink control assemblies.

3. Ink control means according to claim 2 wherein said variable impedance means comprises a potentiometer, said indicating means includes a meter and a power supply and each of said potentiometers is interconnected with one of said meters and said power supply to provide a direct indication of the position of the associated key.

4. Ink control means according to claim 3 wherein said second circuit produces a normal voltage and a voltage slightly higher than said normal voltage, said normal voltage being the normal operating voltage for said motors, a first timing relay operable in response to the first said switch means and interconnected with said motors and power supply to energize said motors with said low voltage to move the keys toward the associated doctor blade for a predetermined period of time and a second timing relay interconnected with the first timing relay and power supply and operable to actuate said second switch means at the termination of said first period of time to apply said high voltage to said motors with reversed polarity for a second predetermined period of time to retract said keys and means for applying said normal voltage to said motors for adjustment of said keys during normal operation.

5. Ink control apparatus according to claim 2 wherein said switching means comprises a stepping switch with the number of contact banks equalling twice the number of keys on each control assembly and the number of contacts on each bank being at least equal to the number of control assemblies whereby corresponding contacts of each bank connect corresponding key motors of each assembly to said remote control.

6. Ink control apparatus according to claim 5 wherein said stepping switch includes an additional bank of contacts and said remote control includes a selector switch having a number of positions at least equal to the number of control assemblies and connections between said selector switch and the last said contact bank for automatically connecting a selected control assembly to said remote control.

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