

Feb. 15, 1966

R. E. OSTWALD
AUTOMATIC LIQUID CONTROL AND SCANNING DEVICE
FOR DUPLICATING MACHINES

3,234,871

Filed Sept. 17, 1963

3 Sheets-Sheet 1

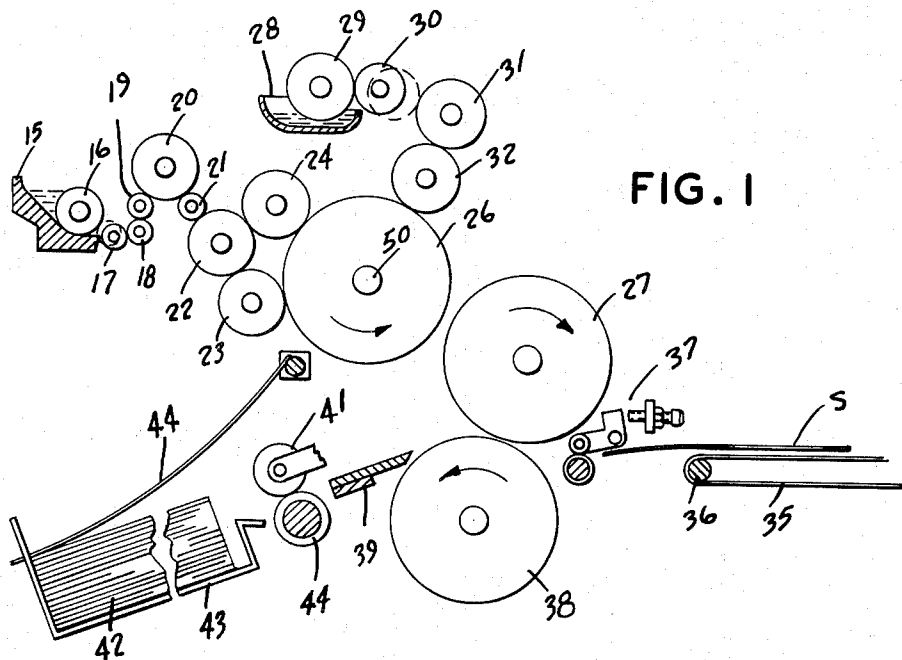


FIG. 1

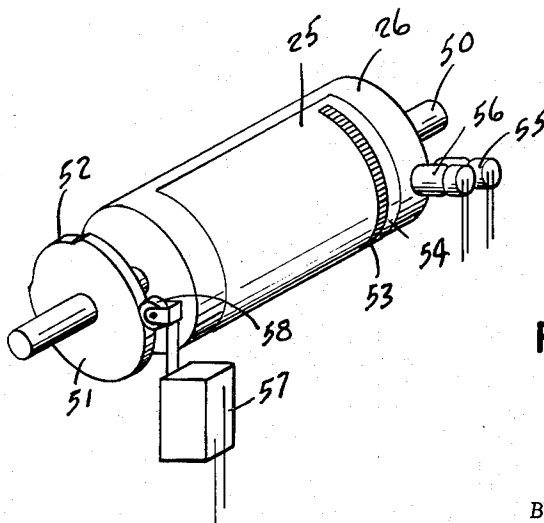


FIG. 2

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3 Sheets-Sheet 2

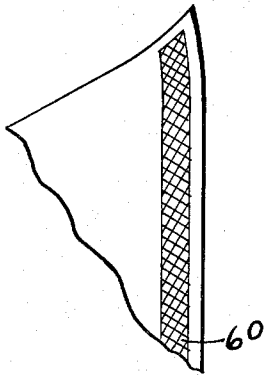


FIG. 4

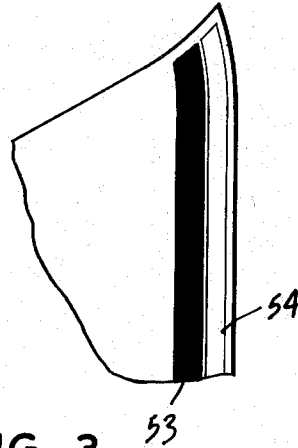


FIG. 3

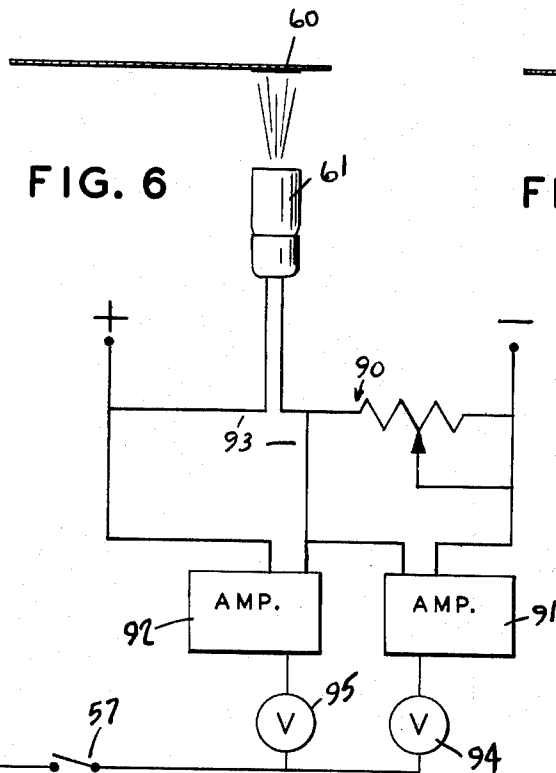


FIG. 6

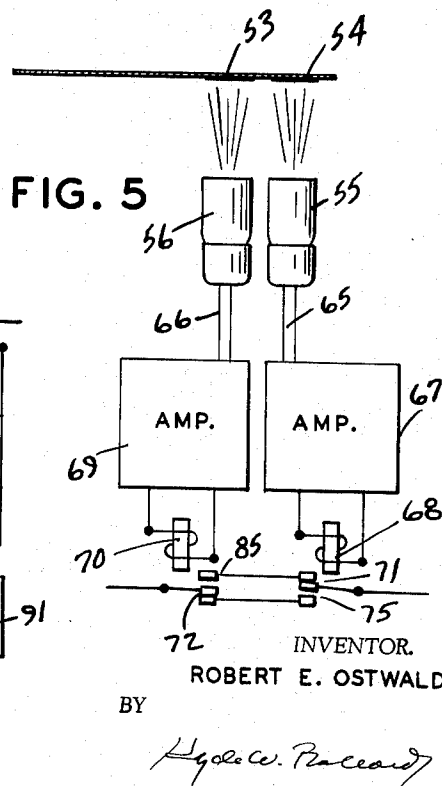


FIG. 5

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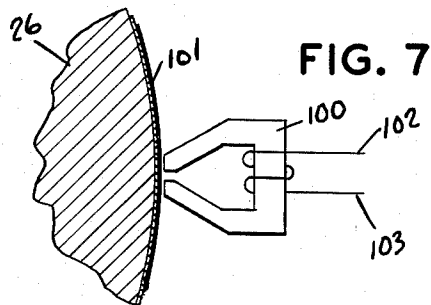


FIG. 7

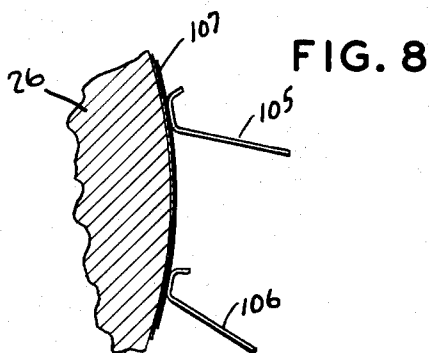


FIG. 8

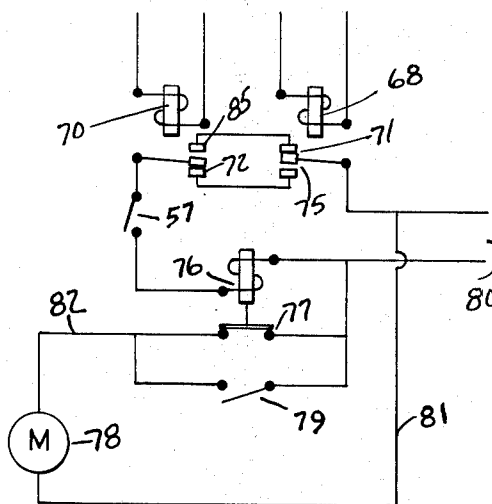


FIG. 9

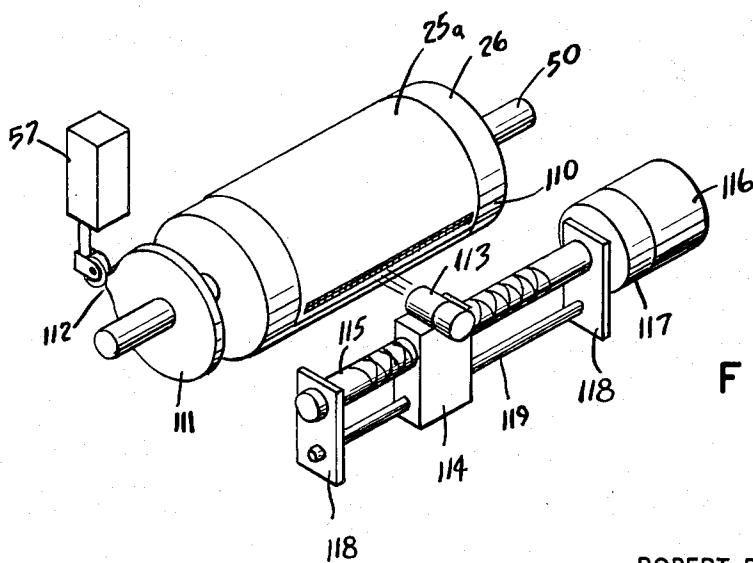


FIG. 10

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3,234,871

AUTOMATIC LIQUID CONTROL AND SCANNING DEVICE FOR DUPLICATING MACHINES

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5 Claims. (Cl. 101-142)

This invention relates to lithographic duplicators, and more particularly to an improvement in the duplicator or printing press described in detail in my U.S. Patent 3,034,427.

In an offset printing press water solution will feed from a fountain on the press roller which contacts the master in order to wet non-image areas on the master. Then the master is passed under the ink rollers with the result that the aqueous solution previously applied to the master prevents the non-image areas from accepting ink. Thus only the areas having the desired image receive ink for subsequent transfer to the medium which is to be printed. In a press of this sort it will be apparent that control of the aqueous solution is important. Should the supply of the solution fall below an adequate minimum or above a maximum, good images will not be formed. The same is also true of the ink supply. A condition in which the supply of aqueous solution is inadequate or the supply of ink is excessive causes too much ink to be transferred to the master, or more accurately, ink will be applied to the non-image areas. This is called "scumming." Either condition produces unsuitable copy and requires the operator to make frequent inspection of the copy to determine whether an adjustment is needed to the ink and/or water feed. Fully automatic or unattended operation of this type of offset printing press is therefore impossible or very wasteful.

A further object of the invention is to provide automatic means for monitoring the ink/water balance of an offset lithographic press so that excess or inadequate supply of either fluid may be corrected automatically. Alternatively, the press may be shut down until a manual adjustment is made by the operator. This, of course, eliminates substantial waste of paper.

A further object of the invention is to provide a duplicating master sheet having a telltale or test band which is scanned by suitable photoelectric cells to energize an electric circuit when the density of the test band is outside predetermined acceptable limits.

A further object of the invention is to provide a master sheet for duplicating offset presses provided with an axially extending test band and means for axially scanning the test band to determine comparative ink acceptance.

A further object of my invention is to provide in an offset press suitable automatic feeding devices for the aqueous solution and the ink solution which are sensitive to impulses transmitted by a photoelectric cell.

Further objects will be apparent from the specification and drawings in which

FIG. 1 is a schematic view of a printing press to which the present invention is applicable,

FIG. 2 is a perspective of the master cylinder of the printing press,

FIG. 3 is a fragmentary detail of one form of the master sheet constructed in accordance with the present invention,

FIG. 4 is a fragmentary detail of a master sheet showing a modified form using a single instead of a double test band,

FIG. 5 is a schematic view showing the master sheet of FIG. 3 and the detecting apparatus,

FIG. 6 is a schematic view showing the master sheet of FIG. 4 with appropriate automatic valves for controlling ink and water supplies,

FIG. 7 is a modified form in which the photo cell

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is replaced with a magnetic pickup for use with magnetic ink,

FIG. 8 is a modified form employing a brush pickup which measures the resistance of electrically conducting solutions,

FIG. 9 shows the circuit for use with the apparatus of FIGS. 7 and 8, and

FIG. 10 is a perspective showing a scanning mechanism in which the detecting band is positioned axially on the master sheet.

Referring now more particularly to the drawings, a printing press to which the present invention is suitably adapted may be provided with an ink fountain 15 from which the ink is transferred by the ink roller 16 to a series of intermediate rollers 17, 18 and 19. The ink continues in its path to rollers 20 and 21 which transfer the ink to the ink spreader 22 and from thence to the ink form rollers 23 and 24. These last rollers serve to contact the plate or master sheet 25 which is wrapped around the periphery and secured to the master cylinder 26. This cylinder is movable to contact the periphery of the blanket cylinder 27. The aqueous solution is deposited in a trough or fountain 28 from whence it is picked up by roller 29 and transferred to ductor roller 30 and spreader roller 31 to the water applicator roller 32.

As described in my patent mentioned above, the sheets "S" to be printed are fed from a supply onto an endless belt 35 shown trained over a roller 36. From thence they pass through the sheet detector assembly 37 and between the nip of the blanket cylinder 27 and the impression cylinder 38. The stripper 39 directs these sheets between rollers 40 and 41 where they are in turn delivered to the printed stack of sheets 42 in the receiver 43. These sheets are maintained in the receiver 43 by means of the paper retainer 44.

The description of the pertinent parts of an offset press is generally illustrative of conventional practice and is well known in the art. Where the supply of aqueous solution fed from the receiver 28 or the supply of ink fed from the ink fountain 15 varies beyond the proper limits poor copies will be made and unless this condition is immediately detected by the operator, the press continues to run causing a substantial waste of paper stock and material.

Referring now to FIG. 2, the master cylinder 26 is journaled on a shaft 50, which also carries a circular cam 51 having a dwell 52. The master sheet 25 is provided with a light-ink receptive band 53 and a light non-ink receptive band 54, or if white stock is being used the provision of a separate band may not be necessary. Two photoelectric cells 55 and 56 are mounted to be sensitized or energized by means of the bands 53 and 54. Cam 51 actuates microswitch 57 by means of a cam follower 58 so that the sensing of cells 55 and 56 is properly timed to occur during the passage of the bands 53 and 54 in front of the cells.

FIG. 3 illustrates the ink receptive band 53 and the non-ink receptive band 54, on a large scale. During the sensing part of the cycle if band 54 is free of ink, then cell 55 will not be energized. Should the band 54 become coated with ink then this condition will be detected by the photo cell 55 to stop the press or to increase the amount of aqueous solution supplied to the rollers 31 and 32. The dark band 53 is of an insensitive color which permits conductance in the photo cell. As long as the supply of ink is adequate this color will not diminish and photo cell 56 will not be energized. Should the ink decrease to the point where improper copies are produced this condition will result in a light or lighter band 53, thus energizing cell 56 to stop the press or to increase the ink flow to the ink fountain 15.

A comparable result may be achieved by a single band 60 such as shown in FIG. 4. In this case a reticulated or screen pattern is employed with only one photo cell 61. As the supply of ink increases, cell 61 detects this condition to operate the proper control mechanism and if the band becomes lighter than a predetermined minimum flow, this condition will also be detected by the cell 61 to make the proper adjustment or to stop the machine.

Referring now to FIGS. 5 and 9 the electrical circuit for stopping the printing press will be described in conjunction with the double cell arrangement shown in FIGS. 2 and 3. Photo cells 55 and 56 are connected by suitable pairs of leads 65 and 66 to photo tube amplifiers shown in FIG. 5. Amplifier 67 is conditioned to actuate a relay 68 and amplifier 69 is conditioned to actuate a relay 70. Relay 68 has normally closed contact 71 whereas relay 69 has a normally closed contact 72. These contacts 71 and 75 are connected in series as shown in FIGS. 5 and 9 when in the normal operating position. In the event that the light band 54 becomes dark, photo cell 55 will energize relay 68 through amplifier 67 to close contact 75, which in turn completes a circuit through normally closed contact 72 to the timing switch 57. When switch 57 is closed by cam 52, circuit is completed and latch relay 76 which opens contact 77 thus stops the main press motor 78. A bypass line 79 is utilized to operate the press even when contact 77 may be open and the press motor 78 is connected to the main power line 80 through leads 81 and 82. In the event that band 53 becomes too light the press is stopped in much the same way due to the energizing of relay 70 through amplifier 69 which in turn opens contact 72 and closes contact 85. This completes a circuit through contact 71 and switch 57 to relay 76 likewise energizes this relay and opening contacts 77 to stop the press motor. In this circuit it may be assumed that the conditions of too much ink and too little ink are mutually exclusive.

Referring now to FIG. 6 a single photo cell 61 may be used in connection with a bridge circuit to stop the press motor or to actuate valves for increasing or decreasing the supply of ink and water. In this event a bridge circuit shown schematically at 90 is utilized to energize an amplifier 91 for the low water or an amplifier 92 for the low ink. In the event the balancing voltage across the side of the bridge 93 varies from a predetermined value the amplifiers 91 and 92 are adjusted to operate a water valve 94 or ink valve 95. Timing switch 57 may be used in the circuit to solenoid actuated valves 94 and 95 in the same manner that relays 68 and 70 in FIG. 9 are controlled. It will be understood that the amplifiers 91 and 92 may be used to stop the press motor 78 instead of controlling the fluid flow individually and also that the fluid valves 94 and 95 may be used in the circuit of FIG. 9.

FIGS. 7 and 8 show modifications in which a magnetic pickup 100 is used to determine the density of magnetic ink deposited on a test strip 101 on master. The magnetic pickup is provided with leads 102 and 103 which may be connected directly to relay 76 through the trigger switch 57 as shown in the circuit of FIG. 9. A further modification is shown in FIG. 8 in which brush pickups 105 and 106 may be employed to activate a suitable relay such as 76 when it is desired to detect the density of a conductive ink deposit on a test strip 107.

Instead of scanning the master sheet 25 around a portion of its periphery it is possible to utilize a modified version shown in FIG. 10 in which the master sheet 25a is scanned axially through a test band 110. In this event the master cylinder 26 is likewise mounted on shaft 50 and provided with a cam 111 which has a lobe 112. The trigger or timing switch 57 of FIG. 2 may be used in the form of FIG. 10. A photo cell 113 is mounted upon a travelling block 114 having a double internal thread permitting it to travel back and forth on the traverse shaft 115 connected to a motor 116 having a built-in gear reduction 117. The shaft 115 is suitably journaled in

mounting brackets 118, 118 and the traversing block 114 is provided with a guide rod 119 anchored to brackets 118. The photo cell 113 traverses back and forth across the test strip 110 to scan all areas of the strip sequentially whenever cam 111 closes the switch 57. In this way a series of readings across the master may be obtained so that ink density in an axial direction may be determined and the supply corrected with the circuit of FIG. 6 or the press motor stopped with the circuit of FIG. 9 as may be desired. Alternatively the master may be scanned both axially and circumferentially by using a combination of the photo cells mounted as shown in FIGS. 2, 6 and 10. In this way complete control of the press and maintenance of accurate fluid deposit on the master sheet are accomplished.

The present invention has been described in connection with an offset printing press described in my Patent No. 3,034,427 which utilizes a blanket cylinder. It is equally applicable, however, to a lithographic or planographic printing press which makes contact directly from the master to the paper.

It will thus be understood that I have provided an effective apparatus for automatically indicating and/or correcting deficiencies in the ink and water supplies of a duplicating machine. The invention eliminates production of poor and unsatisfactory copies due to improper feeding of ink and water. As previously noted the invention may be utilized to stop the machine so that the operator may make a manual correction in the supply or the device may be utilized automatically to compensate for the indicated deficiency.

Having thus described my invention I claim:

1. In a duplicating machine having a master cylinder, a blanket cylinder, an impression cylinder, means for feeding sheet material between the blanket cylinder and the impression cylinder, an ink supply, a master on said master cylinder, means for transferring ink from the ink supply to the master, a water supply, means for transferring water from the water supply to the master, a control area on said master responsive to the relative amounts of water and ink transferred to the master, means for sensing the reflectivity of said control area, means for controlling the supply of water to the water supply, means for controlling the supply of ink to the ink supply, and electrical circuits between the sensing means and the ink and water controlling means for regulating the amount of makeup ink and water delivered to the ink supply and the water supply in accordance with the image transmitted by the control area.

2. Apparatus in accordance with claim 1 in which the sensing means comprises a photoelectric cell and the connecting means includes an amplifier connected to the water and ink control means.

3. Apparatus in accordance with claim 1 in which the control area on said master is a reticulated band.

4. Apparatus in accordance with claim 1 in which the control area on the master is a band extending axially across the master cylinder and in which the sensing means comprises a scanning device traveling axially across the master cylinder.

5. Apparatus in accordance with claim 1 in which the control area comprises a magnetically sensitive material and sensing means comprises an electro magnetic pickup.

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