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I. R. BOGUE  
PLATE PROCESSOR

3,621,772

Filed Sept. 4, 1969

2 Sheets-Sheet 1

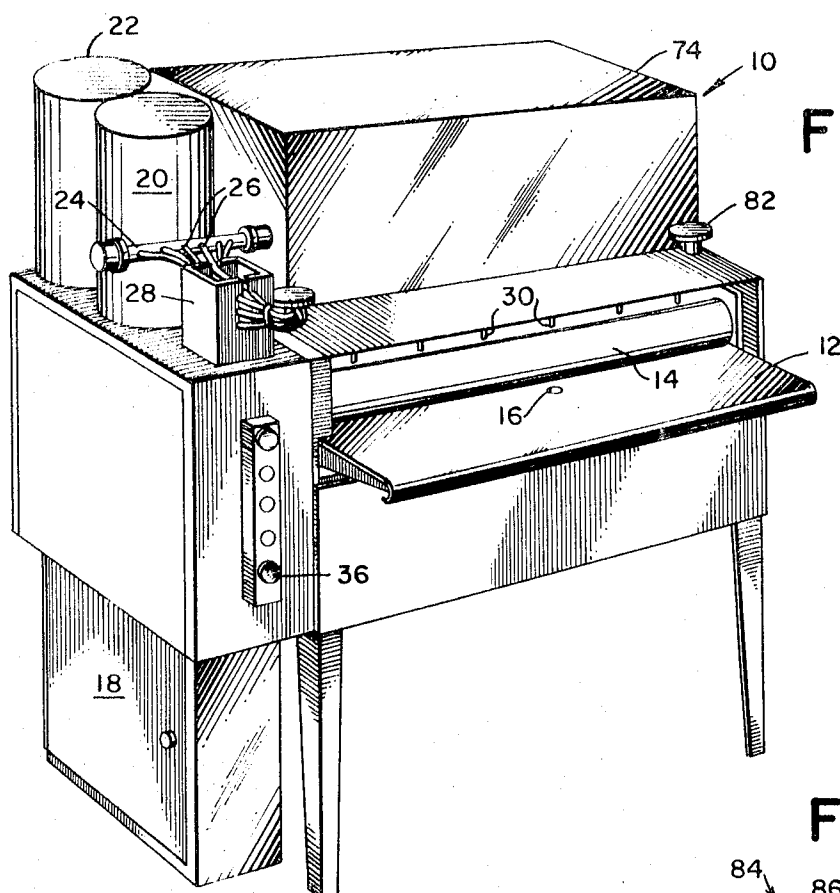
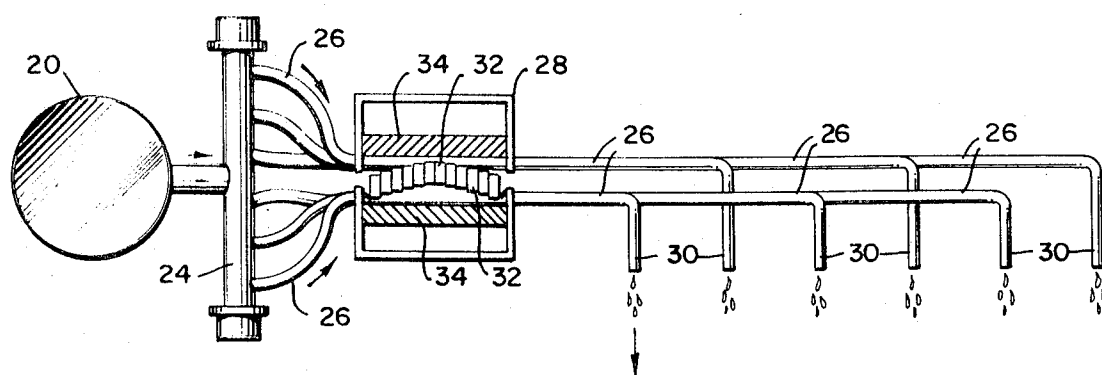
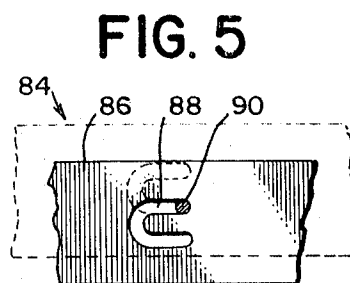


FIG. 1

FIG. 2



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2 Sheets-Sheet 2

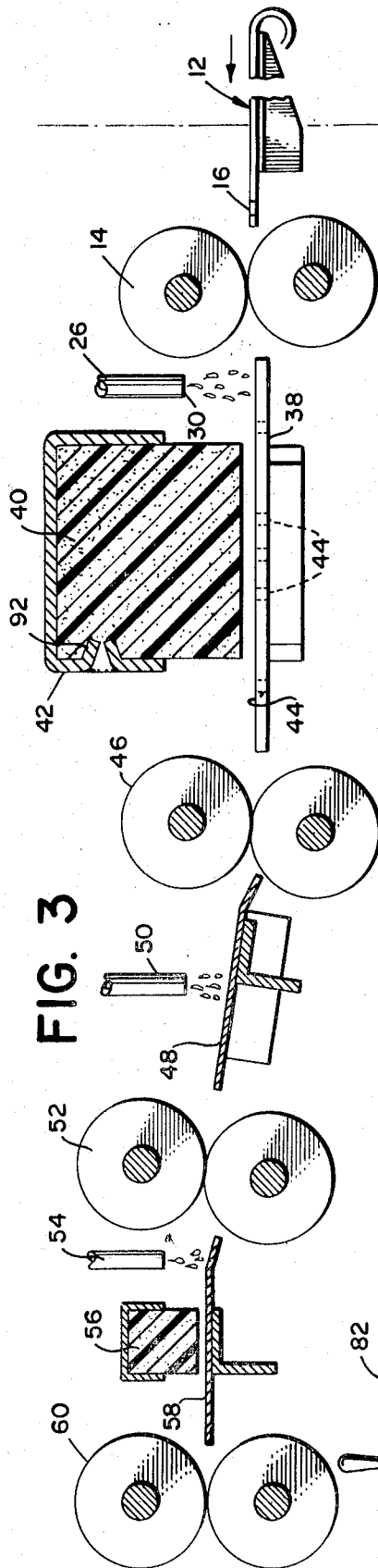


FIG. 3

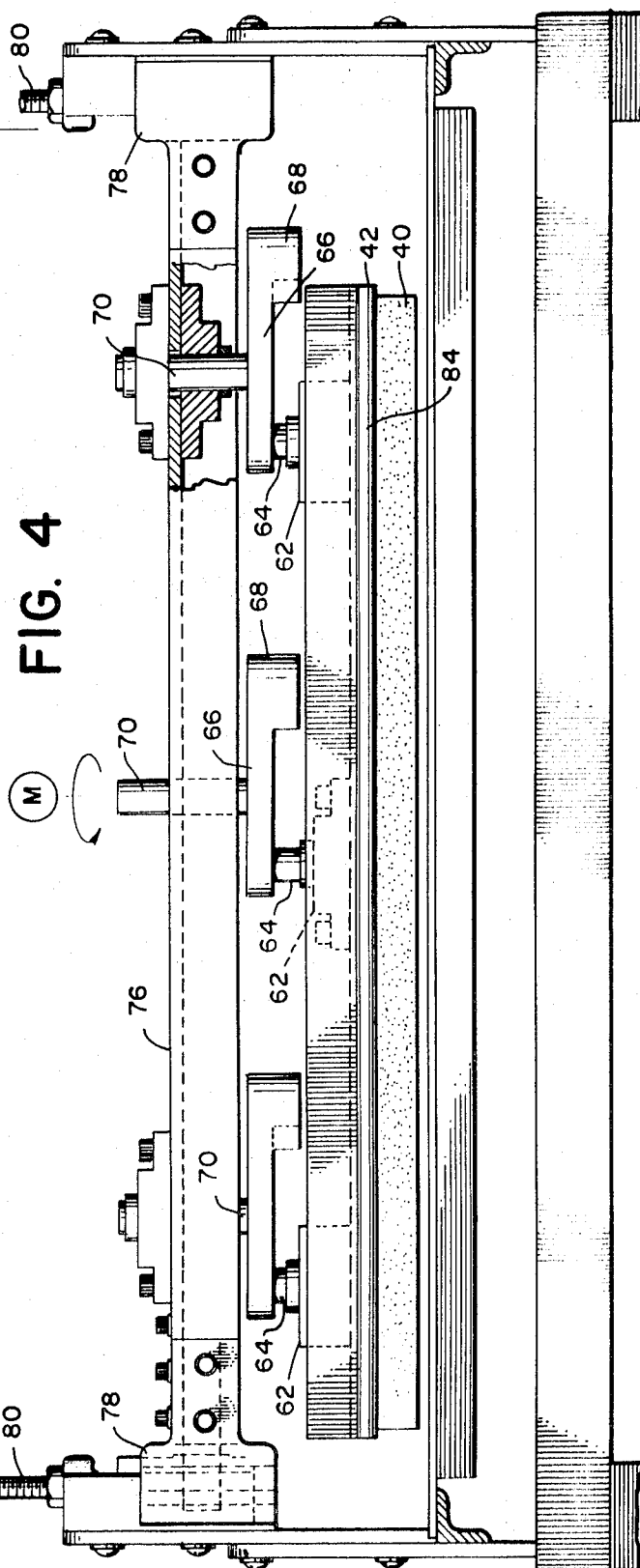


FIG. 4

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3,621,772

## PLATE PROCESSOR

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6 Claims

### ABSTRACT OF THE DISCLOSURE

A processor is presented for lithographic plates wherein the plate is advanced through a series of opposed rollers to successive processing stations. The developer is delivered through a series of spaced apart, individually supplied dispensing ports, each of the ports being fed by a positive displacement pump, and the developer is scrubbed on the plate by a unitary oscillating sponge. Oscillation and deactivation of successive stations throughout the processor are time-coordinated with the passage of the plate through the processor.

### BACKGROUND OF THE INVENTION

#### (1) Field of the invention

This invention relates to the field of processors for lithographic printing plates. More particularly, this invention relates to the field of automatic processing lithographic plates wherein a previously exposed plate is introduced into a processor wherein it is developed by the delivery and scrubbing of a developer, and then washed and squeegeed, and then possibly further treated, and then delivered from the discharge end of the processor ready for printing use.

#### (2) Description of the prior art

The field of automatic processing of lithographic plates is a rapidly developing area in printing technology. Machines of the "dip and dunk" type have been proposed wherein the plate is successively immersed in different baths of material. The "dip and dunk" machine has several significant disadvantages such as that its height must be two or two-and-one-half times as great as the minimum dimension of the plate, and its use is limited to the few kinds of plates which do not require scrubbing for developing. Other types of machines have employed belt or roller transporting techniques wherein the materials to be applied in the developing process are applied either through spray or drip nozzles or by bath immersion. Probably the most satisfactory and most widely adopted type of machine is the pinch roller type wherein the plate is advanced through successive stages of the machine between the nips of pairs of opposed rollers. Some of these roller-type machines accomplish the application of materials by partially immersing various rollers in baths of the material, but this application method introduces complications or special requirements with regard to the composition of the rolls and also presents problems in controlling the amount of material being delivered by the rolls. Another application method involves the use of spray nozzles, either gravity or pump fed. Examples of roller and spray nozzle machines may be seen in the products offered by John Stark Laboratories, Inc. and by the Wood Company. However, the spray nozzle type of machine also has problem areas in that the nozzles or delivery ports tend to become blocked and clogged due to solvent evaporation during periods when the ports are not flowing. The clogging problem is particularly acute in gravity feed machines, and it has heretofore been a problem in pump-fed machines wherein the ports are fed from a single pump whereby the output of the pump may

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flow totally through one or more unclogged ports while no flow passes through clogged ports thus resulting in uneven distribution of material to the plate.

Most of the plate processors known in the art also incorporate scrubbing devices for scrubbing the developer solution onto the plate. The devices now known in the art are deficient in that they lack adequate capacity for adjustment of the scrubbing mechanism. Furthermore, although it is desirable to use a single unitary sponge for the scrubbing device, presently available processors have difficulty in adequately retaining a single unitary sponge while performing the oscillating scrubbing motion necessary for developing.

### SUMMARY OF THE INVENTION

The present invention overcomes the several disadvantages of the prior art discussed above as well as effecting other general improvements in plate processing machinery. The plate processor of the present invention is time-sequenced so that chemicals to be applied at various stages in the processing operation are only delivered when the plate has advanced to the proper location in the machine. Advancement of the plate through the machine is accomplished by sets of opposed rollers through which the plate passes, the rollers also acting as squeegees to dry the plate as it passes through the various stages. The developer material is delivered through a series of spaced apart flow nozzles each of which is supplied, in effect, by a separate positive displacement fluid pump wherein a series of cam operated fingers press against flexible tubes to positively deliver fluid from a reservoir or manifold to the several output ports. The positive displacement nature of the pump insures that clogging of the delivery ports will be overcome since the pump will build up pressure behind any closed port to blow out the clogging material and clear the port. The pump used in the present invention is a peristaltic-type positive displacement pump wherein each outlet port is fed by a separate supply line.

The processor of the present invention is further characterized by the structure of the scrubbing mechanism wherein a unitary sponge is housed in a retaining structure and can be adjusted to a limited extent to compensate for wear or unevenness. The processor of the present invention is further characterized in that the various stages are time-sequenced so that the chemicals to be delivered to the plate and the associated processing steps such as scrubbing are coordinated with the passage of the plate through the processor.

Accordingly, one object of the present invention is to provide a novel and improved plate processor for lithographic printing plates.

Another object of the present invention is to provide a novel and improved processor for lithographic printing plates wherein an accurate supply of chemical developer to the plate is assured.

Still another object of the present invention is to provide a novel and improved plate processor for lithographic plates wherein positive displacement pumps are employed to assure the delivery of the developer to the plate.

Still another object of the present invention is to provide a novel and improved plate processor for lithographic plates wherein a unitary scrubbing sponge is retained in a novel housing.

Other objects and advantages will be apparent and understood from the following detailed description and drawings:

### BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings, wherein like elements are numbered alike in the several figures;

FIG. 1 is a perspective view of the plate processor of the present invention.

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FIG. 2 is a schematic representation of the pump and supply system for delivering developer in the present invention.

FIG. 3 is a schematic representation of the successive treatment stations encountered by a lithographic plate in passing through the processor of the present invention, the stations being depicted from the front or entrance of the machine to the rear or exit from the machine from right to left as viewed in FIG. 3.

FIG. 4 is a view, partly in section, of the scrubbing head of the present invention.

FIG. 5 is a partial view of a detail of the sponge-retainer structure of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, the plate processor 10 of the present invention has an inlet platform 12 leading directly to a first set of opposed rollers 14. A proximity switch 16 is located at the mid-point between the sides of platform 12 and is positioned in platform 12 at a point just immediately upstream of rollers 14, and proximity switch 16 serves to activate and deactivate time-sequenced solid-state control circuitry housed in cabinet 18 to initiate and terminate the operating sequences and functions of the processor machine in a desired sequence. Supply tanks 20 and 22 contain, respectively, a liquid lacquer developer and a liquid gum material to be deposited on a plate as it passes through processor 10. The lacquer developer may be any standard type of known developer for developing exposed lithographic plates, such as the lacquer developer disclosed in U.S. Patent No. 2,865,873, and the gum material may be any standard type of gum material as used in the art.

The lacquer developer flows from tank 22 to a manifold tube 24, and then from manifold tube 24 to a series of individual supply lines 26. Each of these supply lines 26 passes through the housing of a peristaltic pump 28, and the supply lines 26 are, on leaving pump 28, arranged to form a series of uniformly spaced apart discharge or supply ports 30 immediately downstream of rollers 14. The supply lines 26, each of which remains integral all the way from manifold 24 to the supply ports 30, is preferably made of silicon rubber tubing so that it can be used with peristaltic pump 28 and also so that it can resist the lacquer chemistry which would adversely affect other types of tubing.

Referring now to FIG. 2, the peristaltic pump and the supply lines are shown in more detail. Peristaltic pump 28 is a cam-operated finger pump such as Model T-8 of Sigmamotor, Inc. of Middleport, N.Y. As shown in FIG. 2, supply tank 20 feeds manifold 24 which in turn is connected to feed a series of six individual flexible supply lines 26. Of course, it will be understood that the number of supply lines is illustrative only and could be any desired number. The supply lines 26 all enter the housing a peristaltic motor 28 and are aligned in two equally divided groups of three tubes aligned one on top of the other on opposite sides of the pump. The supply lines are positioned between a series of cam-operated fingers (the operating cam is not shown) and reaction plates 34. The fingers 32 are caused to press against the aligned tubes sequentially from left to right to thereby impart a unidirectional positive displacement flow of the liquid in the tubing to deliver the fluid to the supply ports 30. The fingers 32 interact individually with each of the supply lines 26 so that the fingers and each supply line cooperate to form, in effect, six separate and distinct positive displacement supply pumps. The operating speed of the pumps may be varied, as desired, by varying the speed at which the operating cam is driven. A silicon-controlled rectifier having a control setting at 36 (see FIG. 1) is used to provide a complete range of speed control. Since each tube and the fingers constitute a separate positive displacement pump, a continuous supply of fluid is assured

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at each of the supply ports 30 when the pump is operating. Any clogging of any of the supply ports 30, either because of solvent evaporation or from other causes will result in a build up of pressure along the clogged tube until the pressure becomes sufficiently high to expel the clot and free the tube. Thus, a supply of the lacquer is assured at each of the supply ports 30 as long as the pump 28 is operating. The supply ports 30 are spaced substantially equidistantly across the width of the plate passage through plate processor 10 so that an evenly distributed supply of developer is delivered to a plate as it passes through the machine.

Referring now to FIG. 3, a schematic representation is shown of the various processing stations and operations as a plate passes through the processor. Starting at the right of FIG. 3, an aluminum lithographic plate, which has been previously exposed and which is ready for developing, will be placed on inlet platform 12 and will be manually advanced toward the set of opposed rollers 14. Assuming that the processor has been previously turned on, the rolls 14, and all of the succeeding rolls (which are chain-driven and controlled from the circuitry in cabinet 18) will be counterrotating with respect to each other at a predetermined speed. When the exposed plate passes over proximity switch 16 the time delay circuitry is activated. The plate is then grabbed between the nip of counterrotating rollers 14 and is delivered to the upper surface of a fixed platform 38. As the leading edge of the plate passes over the forwardmost edge of platform 38 a time delayed signal activates peristaltic pump 28 whereby lacquer developer is pumped from supply tank 20 and delivered through the array of supply ports 30 to the exposed surface of the lithographic plate. The plate then passes under a scrubbing sponge 40 which is held in sponge retainer 42. Sponge 40 is mounted, as will be more fully described hereinafter with respect to FIG. 4, for eccentric or oscillating motion so that it comes in contact with and performs a scrubbing action across the exposed face of the lithographic plate after the developer solution has been deposited thereon. In this manner, a controlled amount of developer is delivered to the plate through the supply lines 26 and the exhaust port 30 and is then scrubbed across the exposed surface of the plate by sponge 40. Platform 38 is stationary to provide the support on which the plate is based during the scrubbing action of sponge 40, and it will be understood that the spacing between plate 38 and sponge 40 is appropriately selected to insure that there will be full and adequate contact between the sponge and the exposed surface of the plate. Plate 38 is provided with a plurality of through holes 44 to allow for the removal of excess developer to a sump (not shown) after the plate leaves the platform.

As the leading edge of the plate passes beyond platform 38 it enters into the nip of opposed rollers 46 which serve the dual purpose of both advancing the plate leftwardly toward the rear of the machine and also providing a squeegee action to remove the developer solution from the surface of the plate. The plate then passes to another platform 48 where it is rinsed with water from a series of water supply ports 50 arranged across the width of the machine, the excess water also flowing to a sump. The plate then passes through the nip of another pair of opposed rollers 52 which also serve the dual purpose of advancing the plate leftwardly toward the rear of the machine and also providing a squeegee action to remove the water. As the leading edge of the plate passes through rolls 52 another series of spaced apart supply lines 54 is actuated by a time delayed actuating signal to supply a liquid gum material to the upper surface of the plate, and this gum material is brushed across the surface of the plate by a sponge 56 which moves back and forth perpendicular to the plane of the paper to provide a brushing action as the plate moves leftwardly toward the rear of the machine. A stationary support plate 58 provides a backing platform to support the plate during this brush-

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ing action of sponge 56 and a sump is provided to receive excess gum. The leading edge of the plate then passes into the nip of a final pair of rollers 60 which again serve the dual purpose of performing a squeegee action to remove excess gum and also to move the plate leftwardly to the rear and exit of the machine.

As was pointed out in the foregoing illustrative description of the passage of a plate through the processor, the activation of the supply lines 26 and 54 and the sponges 40 and 56 are controlled by time delay circuitry so that these elements are activated in accordance with the position of the leading edge of the plate. Similarly, when the trailing edge of the plate passes over proximity switch 16, the solid-state time delay circuitry is also affected so that (1) pump 28 is shut down to terminate flow through supply lines 26 when the trailing edge of the plate passes the supply ports 30, (2) oscillating sponge 40 is shut off after the trailing edge of the plate passes by the rear end of the sponge, and (3) supply line 54 and sponge 56 are shut down after the trailing edge of the plate passes by the rear end of sponge 56. The time delay activation and deactivation of these various processor elements and stations results in economy of operation since the dispensing of the relatively expensive lacquer developer and gum compounds is closely controlled so that they are dispensed only when the plate is in position to receive these compounds; and unnecessary wear on the sponge elements is also eliminated by sequential activation and deactivation of the sponges.

A plate delivered from the left or rearward end of the processor is fully developed and ready for use as a lithographic printing plate when it leaves the processor, although some minor drying time may be needed.

Referring now to FIG. 4, a detail of the mounting of oscillating sponge 40 is shown. For purposes of understanding the relationship between FIGS. 3 and 4, it is to be noted that a side end view of the sponge is shown in FIG. 3 and a front view of the sponge is shown in FIG. 4. As can be seen in FIG. 4, sponge 40 is a unitary elongated sponge mounted in retainer 42. Three journal elements 62 are fastened to the top of retainer 42, and a shaft 64 is rotatably mounted in each of the journal elements. Each of the shafts 64 extends eccentrically from one end of a drive arm 66 which has a counterweight 68 at the other end thereof. Each of the drive arms is fixed to a rotating shaft 70. Of the three shafts 70 shown in FIG. 4, the central shaft is driven by a motor 72 while the end shafts 70 on either side of central shaft 70 are rotatable, but not driven, whereby the counterweights attached thereto provide stability for the unitary sponge element. As can be seen from the structure described in FIG. 4, upon actuation of motor 72 sponge 40 moves in an eccentric or oscillating motion to provide the desired scrubbing action for the plate which passes beneath the sponge.

For the sake of appearance of the processor, motor 72 is enclosed within a housing 74 (see FIG. 1).

Still referring to FIG. 4, a provision has been made for vertical adjustment of the sponge. The entire sponge assembly, including the drive arms 66, counterweights 68, shafts 70 and motor 72 are vertically fixed with respect to a crossbar 76, and the opposed ends 78 and crossbars 76 are each connected to an adjusting screw 80. Each adjusting screw 80 has a turn handle 82 (only one of which is shown in FIG. 4) whereby either end of crossbar 76 can be raised or lowered by turning the adjusting screw attached to that end. Of course, it will be understood that only a limited motion of one end of the crossbar can be obtained with respect to the other end, but that limited movement is sufficient to provide an adequate range of adjustment between the ends of crossbars 76 to compensate for any wear along the long dimension of unitary sponge 40. The adjusting handles 82 can also be seen in FIG. 1.

Referring now to FIG. 5, a detail of the front surface of sponge retainer 42 is shown. In order to facilitate changing of the sponge, it is desirable that the front sur-

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face 84 of the retainer (see also FIG. 4) be vertically adjustable. To that end, a segment 86 of the front surface is movable and has a plurality of U-shaped slots 88 which ride on pins 90 which protrude from front surface 84. Movable segment 86 is shown in the downwardmost position in FIG. 5, and, as can easily be seen, it can be moved to an upper position by translating it to the right, then upwardly, and then to the left to mount the empty leg of the U on pin 90 as shown in the dotted position in FIG. 5. When the movable segment 86 is thus moved to the upper position a new sponge can be slid into retainer 42, and movable segment 86 is then moved to the downwardmost position to retain the front edge of the sponge and prevent inadvertent escape of the sponge. To further assist in keeping the sponge in retainer 42 and to prevent any undesired bunching of the sponge during the oscillating motion of the sponge, a series of protrusions 92 (see FIG. 3) extend from the rearward wall of retainer 42 into the sponge to actually penetrate and grab the sponge to thereby retain the sponge against undesired movement with respect to the retainer.

While a preferred embodiment has been shown and described, various modifications and substitutions may be made without departing from the spirit and scope of this invention. Accordingly, it is to be understood that this invention has been described by way of illustration and not limitation.

What is claimed is:

1. A processing machine for lithographic plates including:

an entrance for the introduction of a plate to said machine;

an exit for discharge of a plate from said machine;

a plurality of pairs of opposed rollers spaced apart between said entrance and exit, said plate passing between the rollers of each pair in sequence;

scrubbing means mounted downstream of a first pair of said rollers;

means for imparting oscillating motion to said scrubbing means to cause said scrubbing means to scrub a plate during passage through said machine;

a plurality of supply ports between said scrubbing means and said first pair of rollers, said supply ports being spaced apart in the direction of the axis of said rollers; and

positive displacement pumping means connected to each of said supply ports for generating independent flows of a developer to each of said ports from a storage tank;

said pumping means including a plurality of individual supply lines, each of said supply lines being connected to a separate one of said supply ports, the flow and pressure in each of said supply lines being independent of the others of said supply lines.

2. A processing machine as in claim 1 wherein: said positive displacement pumping means includes a common variable speed motor connected to induce flow through each of said supply lines.

3. A processing machine as in claim 2 wherein: said pumping means includes a plurality of adjustable fingers to induce flow through each of said tubes supply lines.

4. A processing machine as in claim 1 wherein said scrubbing means includes:

a unitary sponge; and

a housing encasing the front and rear of said sponge, the rear of said housing having projections embedded in said sponge, and the front of said housing having a movable segment covering part of the front of said sponge in one position and being movable to another position to free said sponge.

5. A processing machine as in claim 4 including: means for vertically adjusting each end of said sponge housing.

6. A processing machine as in claim 1 including: sponge means between said scrubbing means and said exit;

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means for supplying a gum solution to said plate between said scrubbing means and said sponge means; and  
means for coordinating the operation of said pumping means, said scrubbing means, said gum supply means and said sponge means to initiate action of each in the presence of the leading edge of a plate and terminate action of each after passage of the trailing edge of each.

References Cited

UNITED STATES PATENTS

2,555,874 6/1951 Coughlin ----- 95—89  
2,577,793 12/1951 Miller ----- 118—240 X

8

3,218,950 11/1965 Liedl et al. ----- 95—94 X  
3,431,864 3/1969 Jones ----- 417—477 X  
3,448,720 6/1969 Graham ----- 118—314 X  
3,475,128 10/1969 Thiers ----- 417—477 X

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