

- [54] **APPARATUS FOR DEVELOPING
OFFSET PRINTING PLATES**
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- [51] Int. Cl. **B41m 5/00**
- [58] Field of Search 101/463-467;
95/89, 94; 118/DIG. 23, 109

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[57] **ABSTRACT**

Apparatus for developing offset printing plates wherein means are provided to simultaneously develop both sides of a two surface planographic offset printing plate or one surface of two single surface planographic offset printing plates placed back to back. The apparatus includes means for dispensing developer solution to opposed plate surfaces at the same time, rubbing means to simultaneously rub the opposed surfaces to assist the chemical action of the developer solution, washing means for removing developer solution from the opposed surfaces and propelling means for moving the plate or plates through the apparatus. The developer solution dispenser supplies developer solution at a uniform hydraulic pressure over the full surface area of the off-set printing plate without the use of spray nozzles.

8 Claims, 4 Drawing Figures

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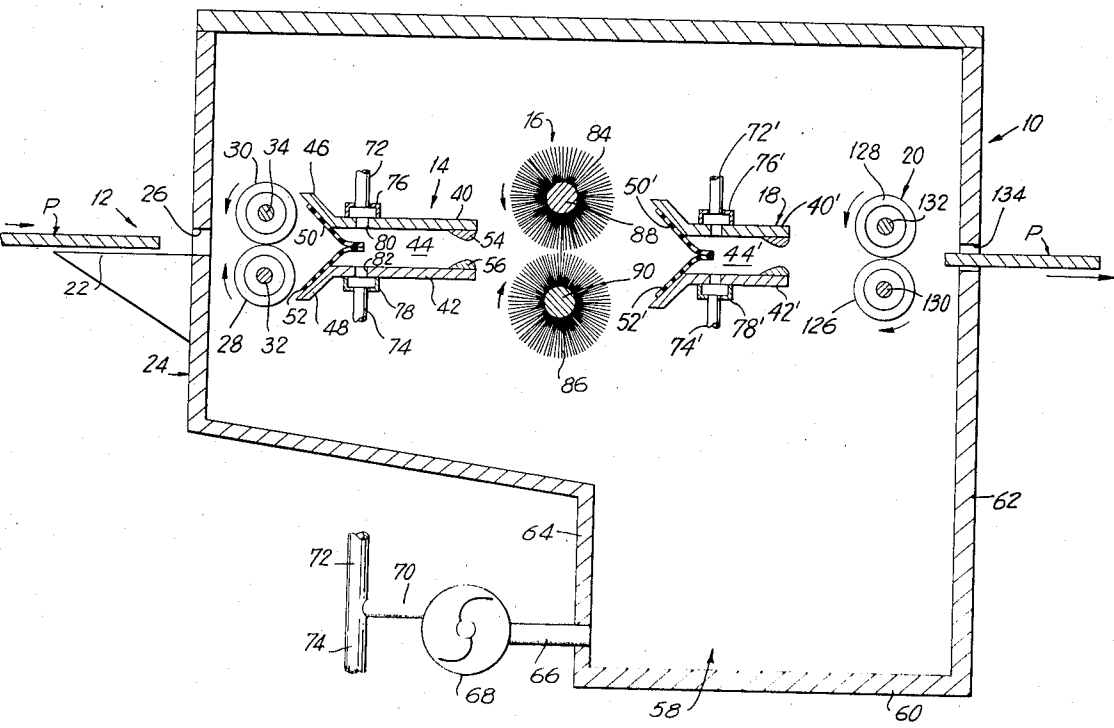
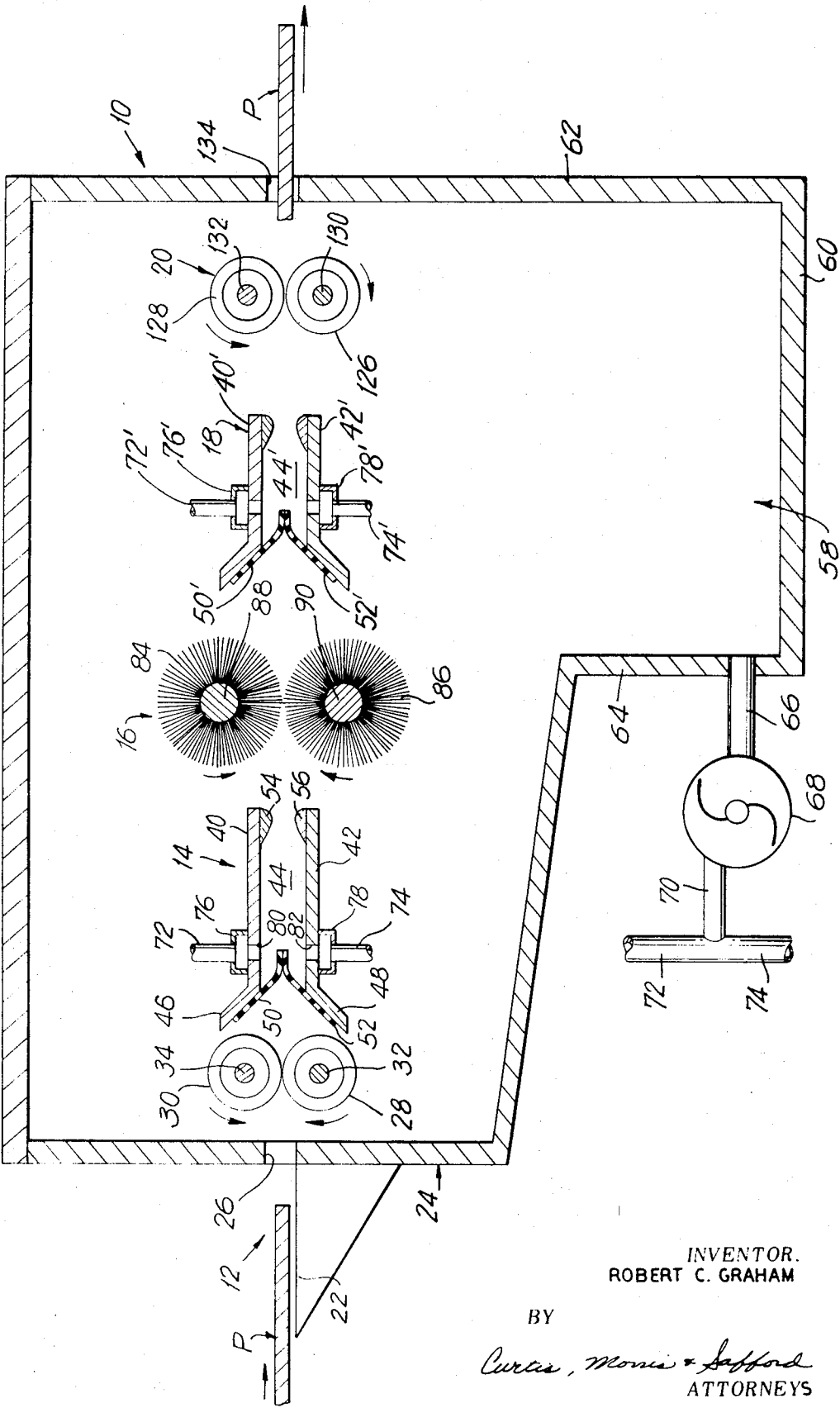


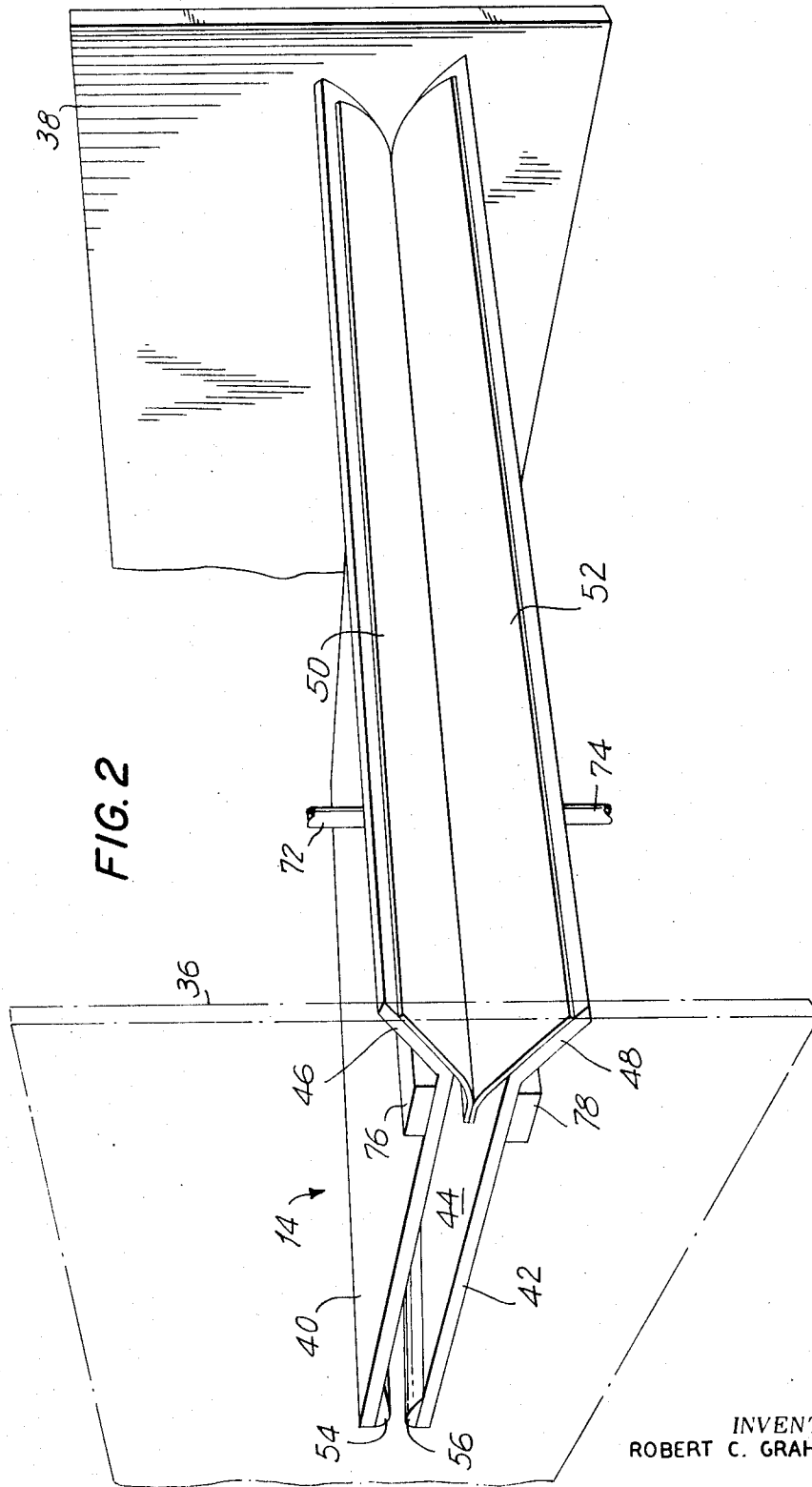
FIG. 1



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FIG. 3

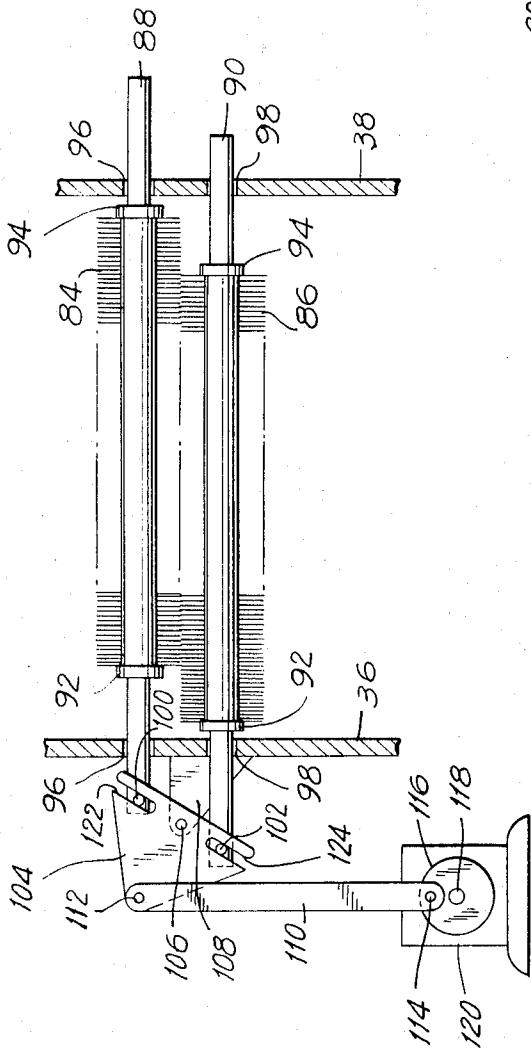
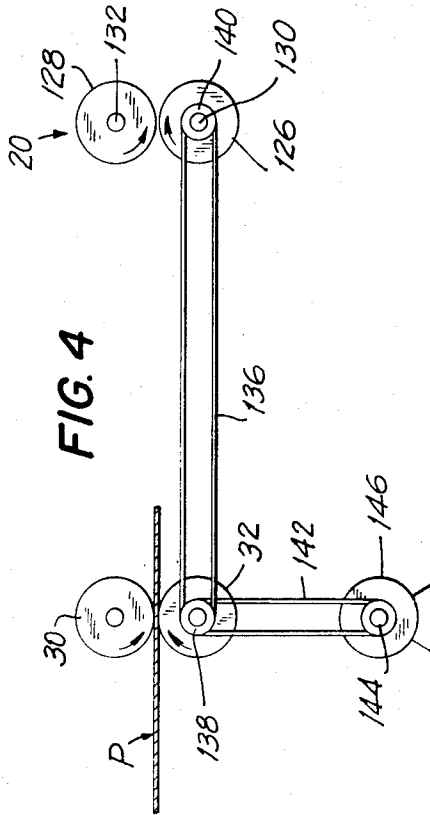


FIG. 4



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APPARATUS FOR DEVELOPING OFFSET PRINTING PLATES

This invention relates to an apparatus for preparing planographic offset printing plates used in the lithographic printing process and more particularly to an apparatus for simultaneously developing both surfaces of a two surface planographic printing plate or the single surface of two plates placed back to back.

It has long been known in the lithographic industry that a subtractive presensitized offset printing plate may be developed by what is known as the one-step hand developing process. In such a process, the subtractive presensitized lithographic printing plate is covered by the manufacturer at the factory with a light sensitive material containing resins and pigments so as to eventually render a lithographic printing plate. Typical of these subtractive plates are the Minnesota Mining and Manufacturing Company's type "K," "S" and "T" plates, Azoplate Corporation's N-25, N-50 and N-100 plates, Polychrome Corporation's "FG" and "FGA" plates, Eastman Kodak's "LN" plate and du Pont's Lydel plate. Some of these plates are coated with the light sensitive coating on one surface and some are coated on two surfaces of, for example, a sheet of properly prepared aluminum foil, in thicknesses of from 0.003 to 0.025 inch and in sizes of about 10 × 14 inches to 60 × 80 inches.

In processing a plate as described above, the light sensitive layer is first covered with a negative stencil, which may be a photo-lithographic negative, and the stencil is held in intimate contact with the plate while being exposed to a strong light source such as a carbon arc. The area struck by light is converted to an insoluble phenol or photo-polymerized so as to become unaffected by processing chemicals at a later stage. The shaded or unexposed area remains potentially soluble in processing fluids. If both sides of the plate are coated with the light sensitive coating, then, generally, both sides are exposed to negatives prior to developing to allow for the economical use of both sides of the printing plate, for instance, when printing two jobs from one piece of aluminum on a lithographic press.

When the hand developing process is used to develop such plates, a developing solution of the proper solvent for the plate is poured over the exposed surface of the plate and allowed to soak into the coating. Then a brush, pad or sponge is used to move the developer around over the surface of the plate and to scrub the surface of the plate to work the developing solvent into the unexposed areas of the coating. Since the unexposed portions of the covering are soluble in the processing fluids, the scrubbing removes the unexposed areas of the coating allowing only the image area to remain.

The disadvantages of a hand operation for developing offset printing plates are: The process is slow and expensive; there is no uniformity of time and pressure in rubbing the plate; defective printing often results from inadequate development or rubbing or too much development or rubbing; working with too little developing solution causing defective development of the plate; drying of the developer in areas of a plate before rubbing is completed due to the large and cumbersome size of some lithographic plates; and the time and inconvenience required for hand development.

A further disadvantage of hand developing is that while hand methods give development over the entire surface of the plate, different types of areas, as for example, very fine screen halftones, require additional effort to remove the unwanted coating in the fine areas.

A still further difficulty with the hand method is in the processing of a two-sided sensitized plate where one side is developed and the plate is turned over and the other side is developed. During the first development, solution may seep under the plate and adversely affect the image thereon. When the first side is completed, if it is not thoroughly washed, it may be affected when it is placed face down to process the second side.

Briefly, the difficulties associated with conventional hand developing of offset lithographic printing plates are overcome by providing for a developer apparatus which has a receiving station therein for receiving an exposed printing plate either a single plate with two surfaces to be developed or two one surface plates placed back to back with the exposed surfaces facing outwardly. A partially enclosed developer dispensing station is also provided where developer solution is introduced and dispensed evenly over the complete surface of both exposed surfaces of the plate under pressure and for a period of time sufficient to cause proper soaking of the coatings without the use of spray nozzles. A rubbing station is positioned after the developer station where rubbing material, properly suited for processing the plate and assisting the chemical action of the developing solution, contacts both surfaces of the plate. After the rubbing station the plate is passed through a second developer station similar to the first to remove all traces of unwanted coating from the two sides of the plate and the plate is discharged from a discharge station.

Suitable plate transport means is provided to propel the plate through all of the stations.

The developer dispensing station comprises two plates spaced apart which are provided with side walls to define a developing chamber. At the entrance of this chamber, a pair of flexible rubber membranes are mounted and the exit end of the chamber is baffled so that the exit slit is about one half the height of the internal height of the chamber. The chamber is provided with manifolds on the top and bottom to allow the introduction of developer fluid from a reservoir through a pump and the fluid is delivered at 90° to the plate travel at a pressure of from 5 to 40 p.s.i.

The developer dispensing apparatus constructed as outlined above will provide uniform pressure, agitation and quantity of developer fluid against the two sides of the plate processed within the chamber. Further, the flexible membranes and the restricted output dimension of the dispenser limit the flow of developer fluid so that the fluid flows out of the chamber at one end only.

In the Drawing

FIG. 1 is a diagrammatic sectional side view of an apparatus constructed according to the present invention; FIG. 2 is a perspective view of the developer dispensing station;

FIG. 3 is a diagrammatic front view of the scrubbing station of the apparatus of FIG. 1; and

FIG. 4 is a diagrammatic side view of the driving mechanism of the apparatus of FIG. 1.

Referring to FIG. 1, there is illustrated a developer apparatus 10 which has therein a receiving station 12

for receiving a planographic printing plate P, a dispensing station 14 where a developing solution is dispensed onto two opposed surfaces of the plate P, a rubbing station 16 where the solution is rubbed into the opposed surfaces of the plate, a second developing station 18 for dispensing developer again onto the opposed surfaces of the plate P and a discharge station 20 where developer is wiped from plate P and where plate P is discharged from the apparatus 10.

The receiving station 12 is provided with a shelf 22 on which plate P may be supported and which is fixed to end wall 24 of the housing enclosing apparatus 10. End wall 24 has an opening 26 therein through which a plate P may be inserted so as to be engaged between propelling roller 28 and back up roller 30 to transport plate P into the apparatus and into the dispensing station 14.

Propelling roller 28 and backup roller 30 are secured to shafts 32 and 34, respectively, and the ends of shafts 32 and 34 are rotatably mounted within the side plates 36 and 38 (see FIG. 2) of the housing enclosing apparatus 10. The shaft 32 of propelling roller 28 is driven, as will be explained more fully hereinafter, and the distance between rolls 28 and 30 is adjustable to accommodate plates P of varying thicknesses so that a plate passing through rolls 28 and 30 is frictionally engaged on each side by the peripheral surfaces of the rolls so that movement of plate P between rolls 28 and 30 drives the backup roll 30 at the same rotational speed as propelling roll 28.

Developing fluid dispensing station 14 is provided with an upper platen 40 and a lower platen 42 spaced apart so that a plate P may pass therebetween. The platens extend between side walls 36 and 38 to define an interior developing chamber 44 which is open at the forward and trailing ends of platens 40 and 42.

Platens 40 and 42 are substantially flat plate members and have forward portions 46 and 48, respectively, which are angled outwardly. Secured to the inner face of each angled segment 46 and 48 are flexible membranes 50 and 52, respectively, which extend inwardly between platens 40 and 42. The membranes 50 and 52 act as a dam to prevent developing fluid from exiting from developing chamber 44 but are sufficiently flexible to allow a plate P to be passed therebetween. When a plate P is passed between the membranes 50 and 52 the rearward segment of the membranes are pressed into intimate contact with the opposed surfaces of the plate by the pressure of the fluid within chamber 44 to form a fluid tight seal and thus preclude developing fluid from exiting chamber 44 at the forward end of the chamber.

The rearward portion of each platen 40 and 42 are provided with opposed internally facing buffer strips 54 and 56, respectively, which act as a restriction for the developing solution exiting from chamber 44 and serve as spacers to space the plate P from the opposed inner surfaces of each of the platens 40 and 42.

A developer fluid reservoir 58 formed by the side walls 36 and 38, bottom wall 60, end wall 62 and upstanding wall 64 is provided to store a supply of developer fluid. An outlet line 66 through wall 64 leads to the inlet end of a high volume positive displacement pump 68 and through outlet line 70 of pump 68 to branched lines 72 and 74. Line 72 leads to a manifold 76 fixed to the upper side of platen 40 and line 74 leads to a similar manifold 78 fixed to the underside of platen

40. The platens 40 and 42 are provided with suitable openings 80 and 82, respectively, beneath the respective manifolds 76 and 78 to distribute developing fluid under pressure uniformly across the width of the platens.

Pump 68 is adapted to deliver developing fluid to chamber 44 under pressure of from 5 to 40 p.s.i. and the openings 80 and 82 are oriented so that the developing fluid is delivered to chamber 44 so that it impinges upon a plate P within the chamber at substantially 90° to the path of plate travel through the chamber. Pump 68 has sufficient overcapacity and pressure development capability to fill chamber 44 almost immediately and to maintain the chamber filled with developing fluid as a plate P is transported therethrough. The developing fluid runoff from the rear of chamber 44 is collected in reservoir 58 to be recycled to chamber 44. Suitable provision may be made to check the chemical activity of the developer fluid and replenish the supply to maintain the desired concentration for adequate developing of the lithographic plates.

The buffer strips 54 and 56 maintain a slight contacting pressure against opposed surfaces of the plate P and allow for a build up of a liquid level to contact the exposed surfaces of the plate to insure complete wetting of the plate in chamber 44.

After the plate P passes through the developer dispensing station 14 it is guided through the scrubbing station 16. Scrubbing station 16 includes an upper cylindrical brush roller 84 and a lower cylindrical brush roller 86 mounted on shafts 88 and 90, respectively, and the rollers are spaced so as to provide for intimate contact for the bristles of the two brush roller surfaces on the opposed surfaces of a plate P passed therebetween. Brushes 84 and 86 are constructed preferably of high density nylon or polypropylene bristles of from 0.002 to 0.010 inch diameter but may be also flat brushes, sponges or pads, or cloth covered rollers.

As best seen in FIG. 3, rollers 84 and 86 are respectively rotatably mounted on shafts 88 and 90 and are fixed in relative position on shafts 88 and 90 by end cap members 92 and 94. The shafts 88 and 90 are slidably disposed through axially aligned through bores 96 and 98 in side plates 36 and 38 of the housing and one end of each shaft 88 and 90 is provided with an extending lug member 100 and 102, respectively.

An oscillating plate 104 is provided which is pivotally mounted at a central portion as at 106 to a fixed support member 108 secured to side plate 36 and pivotally connected to one end a drive rod 110 as at 112. Drive rod 110 has its other end pivotally mounted as at 114 to a circular flange 116 secured to the output shaft 118 of a motor 120. As motor 120 operates to rotate flange 116, the drive rod 110 moves through a substantially vertical reciprocating path to oscillate plate 104.

Plate 104 includes cutout portions 122 and 124 to receive the extending lugs 100 and 102 on shaft 88 and 90, respectively, and as plate 104 is oscillated, shafts 88 and 90 are reciprocated along a linear path transverse to the path of travel of plate P between the brush rollers 84 and 86.

While brush rollers 84 and 86 are reciprocating back and forth transversely to the path of travel of plate P, the movement of plate P between the brush rollers causes the brushes to rotate at plate P. A mechanical assist to aid this rotation of the brush rollers may be in-

corporated, if desired, but is not essential to the successful operation of the apparatus.

Referring again to FIG. 1, the scrubbing action of brushes 84 and 86 will leave loose residual coating material on the scrubbed surfaces of plate P and, after passing through brush rollers 84 and 86, then enters the developing station 18 which is similar to developing station 14.

Developing station 18 includes upper and lower platens 40' and 42' with flexible membranes 50' and 52' through which plate P passes to enter chamber 44' without causing appreciable loss to the fluid tight seal at the forward end of the chamber. The opposed surfaces of the plate P are subjected to developing fluid under pressure which is delivered through manifolds 76' and 78' which are in turn fed through lines 72' and 74' from pump 68 as in the developing station 14.

After leaving the developing station 18, the leading edge of plate P passes between a second propelling roller 126 and a backup roll 128 at discharge station 20. Propelling roller 126 and backup roll 128 are secured to shafts 130 and 132, respectively, and shafts 130 and 132 are rotatably mounted within side plates 36 and 38. Shaft 130 is driven and the distance between rolls 126 and 128 is adjustable to accommodate plates P of varying thicknesses so that the plate is frictionally engaged on each side of the peripheral surfaces of the rolls. The plate is driven by propelling roller 126 through an opening 134 in end wall 63 to a suitable receiving area outside the apparatus 10.

The rollers 126 and 128 are covered with a soft elastomeric material or rubber and wipe the excess developer fluid from the plate P, by a squeegee action, to provide a substantially dry delivery of the plate P to the operator for inspection and further processing as may be required.

With reference now to FIG. 4, it is seen that propelling rollers 28 and 126 are operatively joined by a drive belt 136 which passes over pulleys 138 and 140 fixed to shafts 32 and 130, respectively. Pulley 138 is provided with a second belt receiving groove to engage a drive belt 142 which is in turn engaged about a pulley 144 secured to the output shaft of a speed reducing motor 146. The pulleys fixed to drive rollers 28 and 126 are driven so as to propel plate P through apparatus 10 at a uniform speed selected in accordance with the time required for proper processing of the plate.

It is to be understood that substitution for the rotary oscillating brushes 84 and 86 in the scrubbing station 16 may be made with other materials, for example rollers having on their outer periphery a velour brush-like cloth or by flat plates covered with sponge, brush or velour cloth material.

It is thus seen that an apparatus is provided wherein both sides of a single planographic offset printing plate or a single surface of two planographic offset printing plates placed back to back are simultaneously developed on one pass through the apparatus. The opposed surfaces to be developed are scrubbed in a scrubbing station in a uniform manner to assure uniform quality of developing and because the developing solution is supplied to the developing chamber so as to completely cover the coated surface of the offset plate with developing fluid under pressure problems of foaming of the developer solution due to the presence of wetting agents in the developer solution are precluded.

What is claimed is:

1. An apparatus for simultaneously developing opposed surfaces of planographic offset printing plates comprising:

means for moving a planographic offset printing plate into, through and out of the apparatus,

a developing station within said apparatus for simultaneously developing opposed surfaces of said planographic offset printing plate,

said developing station including spaced upper and lower platen members mounted between spaced side wall members defining a developing chamber therebetween,

said developing chamber being oriented along the path of travel of planographic offset printing plates through said apparatus and including an entrance end and a discharge end,

said entrance end of said developing chamber being provided with opposed flexible membranes adapted to admit a planographic offset printing plate into said chamber while maintaining a fluid tight seal against said planographic offset printing plate to preclude leakage of fluid from said chamber at said entrance end,

said discharge end of said chamber being provided with fluid flow restricting means to restrict the flow of fluid from said discharge end of said chamber, said chamber being provided with opposed manifolds on the exterior surface of said upper and lower platens to deliver developing fluid under pressure from a source of developing fluid, and

each said platen including an opening therein communicating with said manifolds and said chamber to deliver developing fluid under pressure across the width of said chamber to the opposed surfaces of said planographic offset printing plate at substantially 90° to the direction of travel of said plate through said chamber and wherein said developing fluid is dispensed under pressure over the complete surface of each of the opposed surfaces of said planographic printing plate while said plate is within said chamber.

2. Apparatus as defined in claim 1 including plate scrubbing means to scrub each opposed surface of said plate after said plate is discharged from said developing chamber to remove exposed portions of the coating on said planographic offset printing plate.

3. Apparatus as defined in claim 2 wherein said plate scrubbing means comprises opposed cylindrical brush rollers rotatably mounted within said apparatus and oriented so that the path of travel of said planographic offset printing plate passes between said opposed brush rollers and said brush rollers being mounted so as to be in frictional contact with the opposed surfaces of said plate thereby to be rotated by the movement of said plate between said brush rollers as said brush rollers scrub the opposed surfaces of said plate.

4. Apparatus as defined in claim 2 including a second developing station in said apparatus after said plate scrubbing means to supply developing fluid under pressure to the opposed surfaces of said planographic offset printing plate to rinse the opposed surfaces of said plate to remove loose residual coating material from the plate surface.

5. Apparatus as defined in claim 4 including wiping means to wipe excess developing fluid from the opposed surfaces of said planographic offset printing

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plate prior to discharge of the plate from said apparatus.

6. Apparatus as defined in claim 5 wherein said wiping means comprises opposed roller members covered with a soft elastomeric material and positioned to frictionally engage the opposed surfaces of said plate thereby to wipe said surfaces by a squeegee action.

7. Apparatus as defined in claim 1 wherein said developing fluid is supplied from a reservoir of developing fluid in said apparatus by a high volume positive displacement pump through branched supply lines to each

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said manifold at a pressure of from 5 to 40 p.s.i.

8. Apparatus as defined in claim 1 wherein said flow restricting means at said discharge end of said chamber comprises inwardly facing buffer strips fixed to each said upper and lower platen, said buffer strips being adapted to contact a planographic offset printing plate moving through said chamber thereby to cooperate with the developing fluid flowing into said chamber to build up a fluid head of developing fluid to contact each opposed surface of said plate.

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