This invention relates to an apparatus for processing two sides of a printing plate comprising means for pre-soaking both sides of a printing plate with developer, opposed rotary brush means mounted adjacent said pre-soaking means and adapted to contact both sides of said plate, and opposed scrubber pad means mounted adjacent said brush means.
APPARATUS FOR PROCESSING TWO SIDES OF A PRINTING PLATE

This is a continuation, of application Ser. No. 215,533, filed Jan. 5, 1972, now abandoned.

The invention relates to an apparatus for simultaneously processing two sides of a printing plate, for example, a planographic printing plate as is used in the lithographic printing process. 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 "hand developing process." In this process, the carrier, which is usually a thin sheet of aluminum, is first coated by the manufacturer with a light-sensitive coating usually containing, among other things, one or more resins and the plate is then sold in the presensitized condition to the customer.

Some printing plates are available with such a subtractive coating on two sides thereof. In this case, the customer exposes one side at a time or, in suitable equipment, both sides simultaneously, through a master, to a source of strong actinic light such as a carbon arc, for example. The light-sensitive coating when subjected to such a light is converted in such a manner that, after development, the image areas are retained on the plate surface and the non-image areas are removed. After development, for example by rubbing a developing agent into the surface of the plate by means of a sponge, the plate may be fixed and/or washed and finally a coating of gum arabic or similar material is applied to the surface of the plate to protect the image-free areas thereof. The plate is then ready for the printing press.

Where this hand developing process is employed to produce a printing plate, the following procedure is generally followed: From a typewritten set-up or make-up equivalent to the material to be printed and provided in any desired manner with typed articles, pictures of various kinds of art work of different sizes and the like, all assembled onto a suitable cardboard or other support, a master is prepared in the conventional manner. The image of the master is then transferred onto the sensitized printing member, such as is described above, by a suitable exposure means.

The printing member thus prepared is then subjected to a developing operation using the "chemistry" prescribed by the manufacturer of the printing member. This chemistry is worked into the exposed coating by hand rubbing, for example with a sponge, and the non-image areas are subtracted or removed from the carrier leaving an exact replica of the image on the plate carrier. The printing member is then fixed and/or washed and a solution of gum arabic, or a similar solution, is applied to the plate surface, resulting in a printing plate which is ready for the press.

As described above, some plates have a light-sensitive coating on two sides of the carrier or support, thus resulting in advantages to the printer who is then able to print two different jobs from a single printing member. This means that each side of the printing member must be exposed, as described above, and each side must be hand developed and processed in a sink, as described above.

The disadvantages of hand development of offset printing plates are numerous. The process is slow and expensive. Uniformity of pressure in applying the developing solution to remove the undesired coating is almost impossible to attain and exposure to the developing solution is uneven. Thus, defective printing often results from an inadequate development of under-development of an area or from applying varying pressure by hand, which may adversely affect the desired printing image. Drying of the developer on certain portions of the plate before it can be rubbed in to remove the undesired coating also may leave a residue on the plate. A further difficulty with the hand method is in the application of the developing solution. It is presently the practice of the craftsman to pour a quantity of developer onto a developing sponge or pad and onto the center of the plate, which quantity is supposedly sufficient to process the plate, and the craftsman then works his sponge from the "reservoir." This procedure may lead to a high degree of contamination of the processing fluids by the removed photosensitive coating as well as a change in the chemistry of the fluid because of evaporation, which will, in turn, either reduce the efficiency of the chemistry resulting in incomplete removal of the undesired coating in highly critical areas of half-tones, or increase its potency resulting in image attack.

Further, the development of a two-sided plate by developing one side at a time in a sink and turning the plate over can result in damage to the first developed side by pieces of contaminated material in the sink being forced back into the image or non-image areas of the first developed side when the second side is developed. These defects may not become apparent until the plate is clamped into a printing press and the expense of developing the plate has been incurred. All of these problems become more critical with increase-ling plate sizes.

The present invention overcomes the difficulties associated with the conventional hand development of such plates by providing an enclosed developer apparatus which includes a receiving station for receiving a printing plate, a continuous transport system, a developing station in which the developer is applied to both sides of the plate simultaneously and evenly over the complete surface of both sides, including a pre-soak section to soften the coating, a rubbing or scrubbing section consisting of an assembly of a set of rotary cleaning brushes and a set of free-floating velour type cloth coated scrubber pads mounted one above and one below the plate in such a manner as to facilitate easy entrance of the plate between the cleaning brushes and scrubber pads. Whereas the scrubbing pads have a reciprocating movement traversely across the surface of the plate, each half in a direction opposite to the other, this motion may or may not be extended to the brush station. When no plate is in the developing system, the top and bottom cleaning and scrubbing devices rub against each other. Attached to the end of the scrubbing pad assembly are furthermore squeegee means which contact the following transport-squeegee rollers for reasons described below.

Prior to entering the cleaning and scrubbing section, as just described, the developer is applied onto both sides of the plate in a unique pre-soak chamber. While the plate is being moved forward through the pre-soak chamber, the coating on the non-image areas is softened, enabling the following cleaning and scrubbing assembly to effectively clean or remove all unwanted coating even in the smallest areas. This assures a highest quality image. Developer is further applied to the
plate continuously in the cleaning and scrubbing section, both into or through the actual cleaning brushes and between the scrubber pads. By reciprocating this entire assembly whereby the top half moves in direction opposite to the lower half and by continuously introducing developer into or through the cleaning brushes and into the scrubber pads, the removed coating which would eventually foul the cleaning brushes and scrubber pads is effectively and continuously washed away. However, should small bits of removed coating remain on the plate after exiting the scrubber pads, this coating will be picked off by the following nip rolls which carry the plate from the developing station into the adjacent stations of the processing unit. To accomplish this, the roller pair is covered with a synthetic soft material which has a greater affinity for the removed coating than the metal of the plate. The particles picked off by the roller pair, in turn, are continuously removed by the reciprocating squeegee assembly attached to the scrubbing unit. This roller pair, in addition to propelling the plate forward, serves furthermore as nip rolls to remove excess developer from the plate.

The pre-soak chamber is of such a length that at the speed of travel of the plate, the coating in the non-image areas will be thoroughly softened prior to entering the cleaning and scrubbing section. The developer in this chamber is continuously recirculated and re-filtered, thus any material dissolved away in this station is automatically removed from the system.

In the cleaning and scrubbing unit assembly, the plate is continuously supplied with additional developer, as described above, in order to obtain maximum developing efficiency. This developer is also continuously recirculated and continuously filtered in order to keep the developer clean at all times. Specifically, in the scrubber pad section of the unit, the developer which is forced in under pressure from both sides adds to the developing action by the hydraulic forces created. These hydraulic forces are also used in conjunction with a weight on the top floating half of the scrubbing section to regulate the desired work force exerted by the pads on the plate surface to attain optimum development. A further benefit of these hydraulic forces which are applied to both sides of the plate resides in helping keep the plate in the center of line of travel.

The preferred arrangement of the cleaning brushes is a whisk broom arrangement providing spacings in between the tufts. This type of arrangement offers optimum cleaning efficiency with a minimum of hang up since the spacing of the tufts allows removed material to be washed away continuously by the developer being supplied as the coating is removed. The brushes may rotate either with or opposite to plate travel. The tips of the bristles can further be contacted with a bar to help "flick" off coating particles. A reciprocating action, as mentioned above, can be added as a further aid in accomplishing optimum development.

The invention will be further illustrated by reference to the accompanying drawings in which FIG. 1 is a view in elevation, partially in section, of one embodiment of the apparatus of the invention, and FIG. 2 is a perspective view of the infed rollers, presoak assembly, and rotary cleaning brushes.

Referring to FIG. 1, the apparatus comprises a left upper side plate 2 and left lower side plate 4, which side plates support the infed rollers 6 and 8, respectively, between which a plate 10 may be passed or transported into the apparatus. Upon entering the apparatus, the plate passes first through a presoak assembly 12, which is formed of the upper and lower plates 14 and 16, respectively, and which are mounted on the presoak assembly mounting plates 18 and 20, respectively. A liquid developer is passed into the chamber formed by the plates 14 and 16 through the developer supply conduits 22 and 24 which are connected to a suitable source of developer under pressure, not shown.

Upon exiting from the presoak assembly, the plate 10 is passed between a pair of rotatable cleaning brushes 26 and 28 which are rotatable with the shafts 30 and 32, respectively. These rotary brushes may rotate in a direction opposite to the plate travel or in the direction of plate travel. Further, in a preferred embodiment as shown in the drawings, they also reciprocate in directions opposite to each other. The brushes 26 and 28 may be reciprocated by the brackets 29 connecting the mountings of the shafts 30 and 32 to the brackets 34 and 36, which latter are reciprocated by the reciprocator shafts 38 and 40, respectively.

Additional developer may be supplied through the hollow shafts 30 and 32 and through the channels 42 extending from the hollow shafts 30 and 32 to the exterior of the brushes 26 and 28, whereby the developer is forced between the bristles or tufts of the brushes to the surface of a plate 10 passing between the brushes. Additional developer may be supplied through the spray tubes 44 and 46, respectively, onto both sides of the plate and, in addition, these spray tubes are mounted against the surfaces of the brushes 26 and 28 so that they interrupt the brush tuft travel to flick coating particles free from the bristles and thereby prevent the brushes from becoming blinded with coating particles. The interruption of the brush tuft travel is shown in FIG. 1.

Also secured to the upper bracket 34 and the lower bracket 36 are a pair of scrubber pads 48 and 50, respectively, which reciprocate together with the brackets 34 and 36 and the cleaning brushes 26 and 28. These scrubber pads are combined with a suitable soft material, such as velour for example. The scrubber pads are secured to the brackets 34 and 36 by means of appropriate mounting brackets 52 and 54 and 56 and 58, between which the pads 48 and 50 are connected. Developer is supplied between the scrubber pads through the conduits 64 and 66 which are connected to a suitable source of developer under pressure, not shown. The pressure of the scrubber pads 48 and 50 against a plate passed between them may be varied by adding one or more weights 67 to the top supporting bracket 34 of the scrubber pads.

Upon exiting from the reciprocating scrubber pads, the plate passes between the squeegee rollers 68 and 70, respectively. If any coating particles remain on the surface of the plate they usually will attach themselves to the surface of the squeegee rollers since these rollers are covered with a material such as synthetic rubber, for example, which has a greater affinity for the particles of the coating than does the metal of the plate. Particles adhering to the squeegee rollers 68 and 70 are removed by the cleaning pads 72 and 74, respectively, which are secured to the brackets 34 and 36, respectively, by the mountings 76 and 78, respectively. These cleaning pads 72 and 74 reciprocate together with the
scrubber pads and rotary cleaning brushes and thus traverse the surface of the squeegee rollers, effectively cleaning them. The squeegee rollers are mounted in the right upper side plate 79 and right lower side plate 80.

Referring to FIG. 2, a fragmentary perspective view of the presoak assembly, cleaning brushes, and reciprocating rotary cleaning brushes is shown. As will be noted from FIG. 2, the cleaning brushes 26 and 28 reciprocate, in the preferred embodiment, in a direction opposite to each other and effectively clean a plate passed between them from the presoak assembly 12. When no plate is between the brushes 26 and 28, they are in contact with each other.

The apparatus is constructed so that the upper section is pivoted at the right-hand end thereof and may be opened and closed in a calm shell fashion. When closed, the presoak assembly, cleaning assembly, brush assembly, and scrubber pad assembly appear as shown in FIG. 1. The lower rollers 8 and 70 may be driven in order to transport a plate through the apparatus.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

What is claimed is:

1. Apparatus for processing two sides of a printing plate, comprising: a pre-soak chamber adapted to maintain a body of developer in continuous contact with both sides of a printing plate and having a length such that the coating, on the areas of said plate which are to be removed, is softened during the passage of said plate through said pre-soak chamber, a pair of rotary brush means mounted directly opposite one another adjacent the outlet of said pre-soak chamber, and a pair of scrubbing pad means mounted adjacent said brush means, said brush means and said scrubbing pad means being adapted to contact both sides of said plate and subject both sides of said plate to identical mechanical action and including means for continuously supplying equal amounts of developer to both sides of said plate.

2. Apparatus in accordance with claim 1 wherein the pair of brush means are reciprocatable.

3. Apparatus in accordance with claim 2 wherein the brush means are reciprocatable in opposite directions.

4. Apparatus in accordance with claim 2 wherein the scrubber pad means are reciprocatable with the brush means.

5. Apparatus in accordance with claim 2 wherein the brush means and scrubbing pad means include means for applying additional pressure to the upper section.

6. Apparatus in accordance with claim 1 wherein the means for supplying equal amounts of developer to both sides of the plate includes means for forcing said developer under pressure between the tufts of the brush means.

7. Apparatus in accordance with claim 1 which includes means to interrupt brush tuft travel, whereby coating particles are flicked from the bristles of said brush means.

8. Apparatus in accordance with claim 1 wherein the scrubber pad means are soft cloth covered pads and the means for supplying equal amounts of developer to both sides of the plate includes means for forcing said developer under pressure through said pads.

9. Apparatus in accordance with claim 1 wherein the brush means and scrubbing pad means are mounted on complementary upper and lower sections and said upper section is free-floating, whereby the pressure applied to a plate passing therebetween is the weight of said upper section.

10. Apparatus in accordance with claim 1 which includes squeegee roller means mounted adjacent the discharge end of the scrubbing pad means and having a greater affinity for loose coating material than does the plate being processed.

11. Apparatus in accordance with claim 10 which includes wiper means for cleaning loose coating material from the surfaces of the squeegee roller means.

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