

[54] **PRINTING PLATE PROCESSOR AND MEANS FOR OPENING AND CLOSING THE SAME**

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[58] Field of Search 95/89 R, 94 R; 49/340; 118/109, 111, 120, 240, 241, 242, DIG. 23; 101/463

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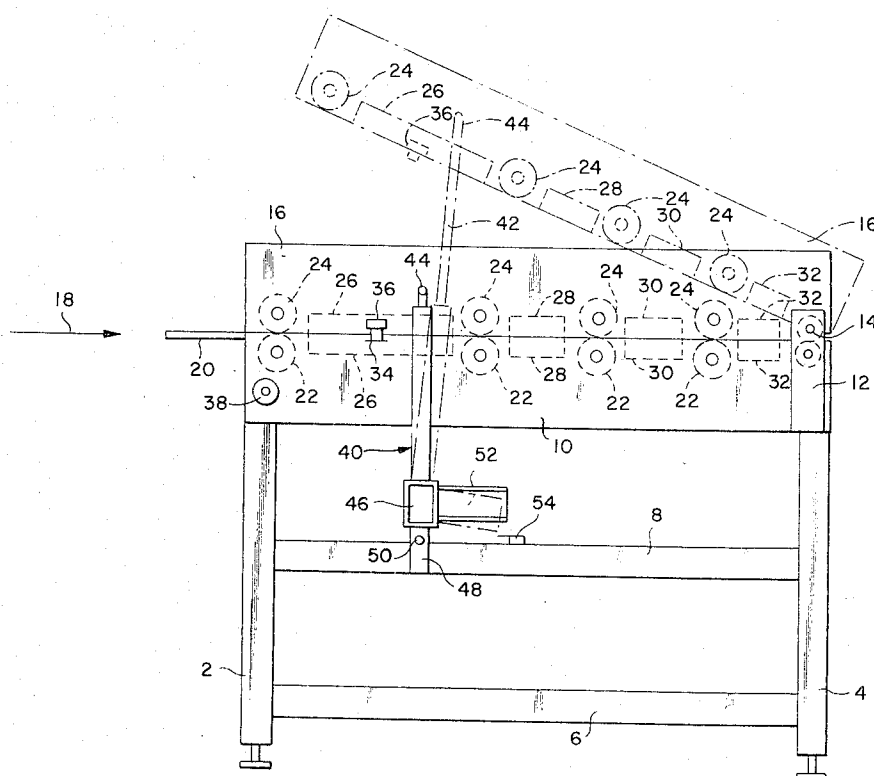
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[57] ABSTRACT

A printing plate processor through which an exposed printing plate travels in a straight line path, which is divided into a fixed lower section and a pivotal upper section, pivotally mounted on the lower section adjacent one end thereof, along a plane coincident with the path of travel of the plate therethrough and having an extension jack, having one end attached to the lower section and the other end attached to the upper section to pivot the upper section about its pivot point, and thereby lower and raise the upper section, feed rollers, a multiple treatment processing unit, having at least a part thereof mounted in the upper section and at least a part thereof mounted in the lower section and including a plurality of squeegee-transport rollers, a developing section, having at least one developer dispenser, at least one reciprocable cleaning brush supplied with additional developer and at least one scrubbing pad supplied with additional developer, a washing section, a lacquering or gumming section and a drying section, and exit rollers. A fixing section, similar to the developing section, can be included in the processing unit ahead of the washing section.

10 Claims, 2 Drawing Figures



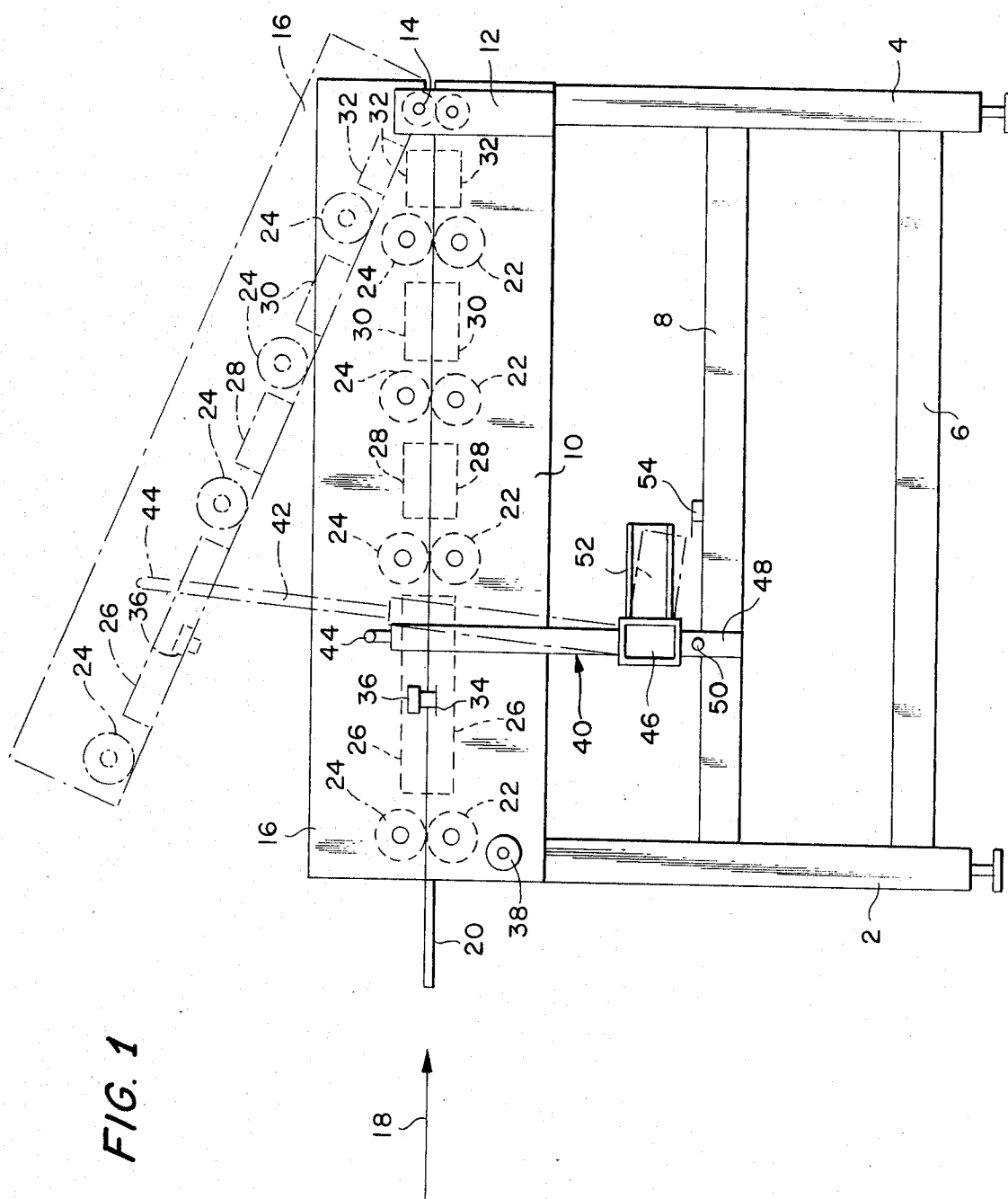
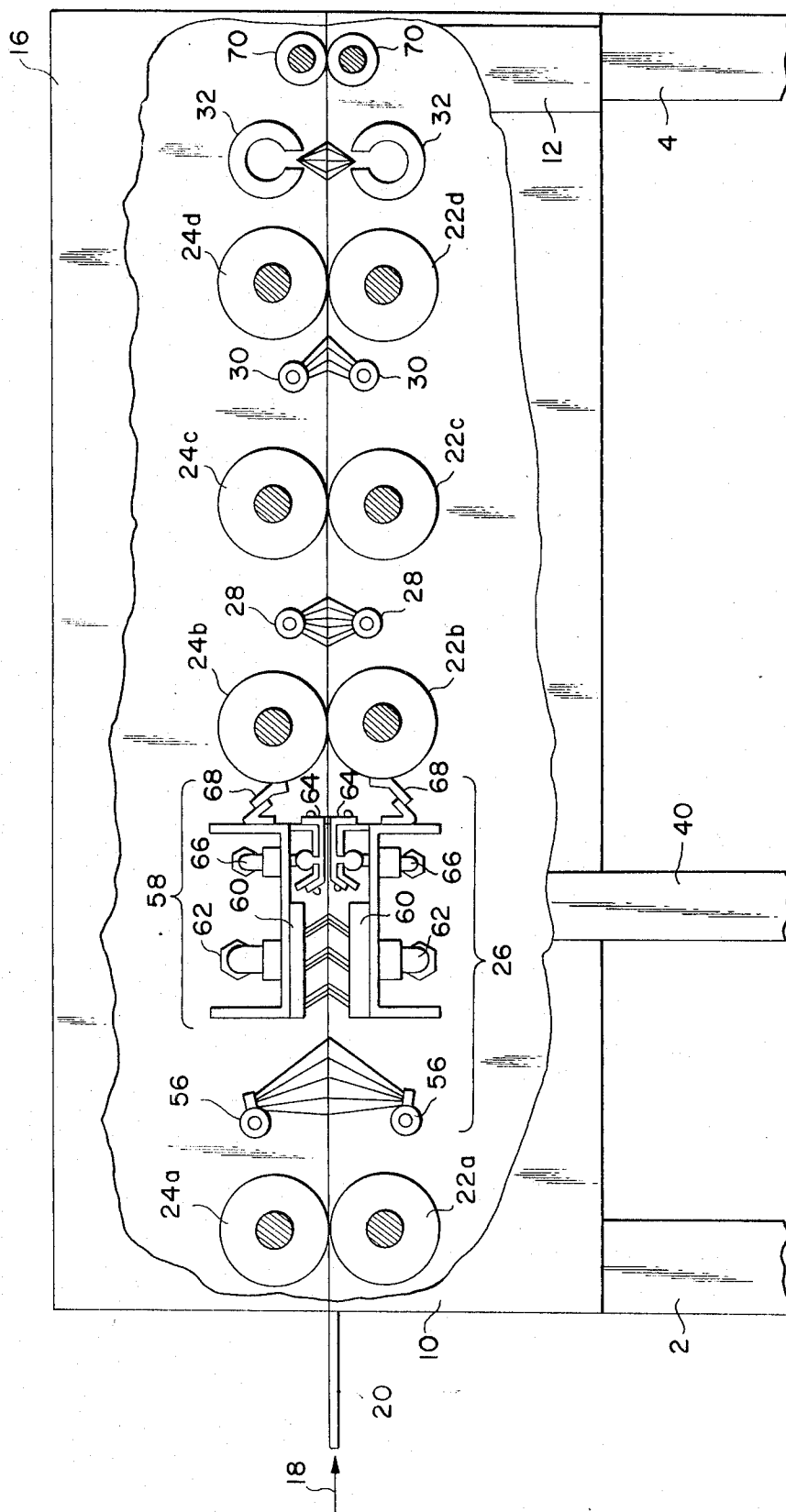


FIG. 2



PRINTING PLATE PROCESSOR AND MEANS FOR OPENING AND CLOSING THE SAME

The present application is a continuation-in-part of application Ser. No. 191,192, filed Oct. 21, 1971 by the present invention and now abandoned.

This invention relates to an apparatus for processing printing plates and, more particularly, to a printing plate processing apparatus with opening and closing means to permit cleaning and servicing.

Conventional offset printing plates usually comprise a thin sheet of aluminum coated with a light-sensitive layer which contains, among other things, one or more resins. Such sensitized printing plates may be made ready for printing by the platemaker by various manual techniques. For example, the plate-maker either purchases the raw aluminum and then treats it in various fashions, known to the industry, to prepare it for coating with one of several commercially available light-sensitive emulsions, or he purchases the aluminum prepared for such coating. The coatings are then applied to the aluminum carrier in one of several known ways and the coating is then dried. These presensitized plates are then ready for use in printing by the printer. Alternately, the platemaker may purchase a prepared, precoated plate conventionally known as "presensitized offset printing plate."

The presensitized offset printing plate is thereafter exposed, through a stencil, to a source of strong actinic light, for example, a carbon arc. The light-sensitive coating, when subjected to such 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 or vice versa.

It is also known in the lithographic industry that the exposed printing plate may then be developed by what is known as the "hand developing process." In this process, the plate is first rubbed with a sponge or the like saturated with a developing agent to rub the developing agent into the surface of the plate. The plate may be fixed and/or washed and finally, a coating of material, such as, gum arabic, is applied to the surface of the plate to protect the image-free areas. The plate is then ready for the printing press.

More specifically, this hand-developing process for producing a printing plate involves the following procedure: From a typewritten setup or makeup, equivalent to the material to be printed and provided in any desired manner, including 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 plate, as previously described, by a suitable exposure technique.

The printing member thus prepared is then subjected to a developing operation utilizing the "chemistry" prescribed by the manufacturer of the printing plate. This "chemistry" is worked into the exposed coating by hand-rubbing, for example, with a sponge, until the non-image areas are subtracted or removed from the carrier leaving an exact replica of the image on the plate carrier. Obviously, in the alternate process, the image areas may be removed leaving the non-image areas on the carrier plate. 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, result-

ing in a printing plate which is ready for the printing press.

There are numerous disadvantages to this hand-processing of offset printing plates. First of all, the process is slow and expensive. In addition, it is almost impossible to uniformly apply the "chemistry" to remove the undesired coating and uneven exposure to the "chemistry" is attained. Therefore, defective printing often results from an inadequate development or underdevelopment 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.

In order to overcome the difficulties of hand-processing and to speed up the process, a variety of automatic and semi-automatic processing equipment is now available. Some of this equipment is built in such a fashion that the plate is turned around during processing and returned to the operator's side of the machine. Other equipment has also been designed for straight through-put so that the equipment can be installed in in-line systems.

While this automatic and semiautomatic equipment has been an improvement, it is also subject to the inherent problem of lack of accessibility. In the operation of processing equipment of this type, the equipment necessarily becomes dirty and contaminated through use and, therefore, must be cleaned periodically. In present day automatic and semiautomatic processing equipment, such cleaning is a major undertaking. Another problem inherent in present commercially available equipment is that the plates become jammed in the equipment at times and have to be removed. Such jamming may result if the edges of the thin metal plates are inadvertently bent over or the plate has an undesirable curve or bulge. This will cause the plate to mistrack in the apparatus and thus, become jammed. It is also possible to inadvertently insert the plate askew in the machine so that it will not follow its normal path or will run sideways in the machine and thus, become lodged or jammed.

It is, therefore, the primary object of the present invention to overcome the above-mentioned difficulties of the prior art and to provide a novel processing apparatus which is easily accessible for repair, cleaning and other servicing.

While the apparatus of the present invention is applicable to any of a variety of printing plate processing apparatus, and particularly to printing plate developing apparatus where developing fluid is supplied to the apparatus under pressure, the invention is best adapted for use in conjunction with a processing apparatus in which the plate travels in a straight line path through the machine, starting with an exposed plate and ending with a dried plate ready for use by the printer. Such processing apparatus generically includes a developing section, which is supplied with a developing fluid under pressure, a washing section, a lacquering or gumming section and a drying section. The developer section generally includes a station in which developer fluid is sprayed under pressure onto the exposed surface of the plate in order to develop the plate and permit removed coating to flow free of the plate, a cleaning section where moving brushes and additional developer spray clean the surface of residual unwanted portions of the

coating, and a scrubbing section where moving pads, supplied with additional developing fluid under pressure, remove the last traces of unwanted coating from the plate. After passing through the developing section, a second or third application of developing fluid may be applied if required. Following the developing section may be a similar section where a fixing solution is applied to the plate. The plate then enters a washing section where it is washed free of any residual developing and fixing fluids. From the washing section, the plate then passes to a lacquering or gumming section where a protective coating, such as, gum arabic, is applied. Finally, the plate passes to a drying section where the plate is dried and discharged as a completed plate ready for the printing press.

While such apparatus may utilize the conventional approach of processing a printing plate which is coated and imaged on one side only, it preferably utilizes a technique in which a plate is coated and imaged on both sides or two back-to-back plates coated and imaged on one side are processed simultaneously. In the former, driven rollers, which transport the plate through the apparatus are located below the plane of travel of the plate through the apparatus while at least a part of the processing components of the system and idler rollers cooperating with the driven rollers are located above the plane of travel of the plate through the apparatus. While such apparatus normally has a hinged lid or a cover which may be removed in some fashion in order to clean or service the apparatus or to remove a jammed plate, such cleaning, servicing and plate removal are not without difficulty. Once the cover has been lifted or removed, it is necessary to remove one or more of the idler rollers and/or a part or all of one or more of the processing components of the system in order to clean or service all or part of the apparatus or to remove a jammed plate. This, of course, could be simplified by making the idler rollers and the processing components readily removable. However, in such apparatus, if the processing components are not positively and accurately mounted or if one processing component is not perfectly aligned in the proper plate with relation to the others, the plate will not be processed properly. This is true since all of the processing components must apply a predetermined, critical pressure against the plate being processed as it passes through the apparatus. This, of course, would require rather complex and accurately machined mechanisms for removably latching the processing components and rollers in place. However, even with rollers and processing components which can be readily removed, the labor and time involved in removing such items are in and of themselves a serious problem. The problems of cleaning, servicing or removing a jammed plate from apparatus adapted to process one side of a printing plate are multiplied manifold in apparatus adapted to simultaneously process both sides of a plate coated and imaged on both sides or two back-to-back plates coated and imaged on one side. Where both sides of the plate are to be processed simultaneously, it is necessary that both sides of the plate be subjected to exactly the same physical and chemical action and thus that a predetermined, critical pressure must be applied to the plate traveling between the duplicate processing components. In addition, the processing components must be perfectly aligned with one another above and below the plate.

In accordance with the present invention, processing apparatus of the character described above, or any one or more components thereof, is divided into a lower fixed section and an upper pivotal section along a plane parallel to the path of travel of the plate member passing through the apparatus. An opening and closing means is operatively connected to the pivotally mounted upper section. Obviously, where the apparatus is divided along a plane parallel to the path of travel of the path through the apparatus, the opening and closing means must be capable of lifting the heavy upper section, carrying the idler rollers and one or more of the processing components. Therefore, the opening and closing device must be a positive-acting mechanism adapted to raise the upper section without sway or misalignment of any type in such movement, which might damage the apparatus. It is also an absolute necessity, in this type of apparatus, that the closing of the apparatus as well as the opening be by positive action and that, when closed, the halves are accurately matched and sealed. The opening and closing means may include a jack of any conventional type, such as, an electric screw-type, a pneumatic type or a hydraulic type. A screw-type jack is particularly desirable for use in the present invention, since such a jack can be used to obtain a predetermined pressure between the two sections of the machine when it is in its closed position, this, also maintaining a predetermined pressure between the driving and driven rollers of the apparatus, which transport the plate through the apparatus, and a predetermined pressure between the processing components and the plate. This is particularly true where the apparatus is designed to process a plate coated and imaged on both sides or two back-to-back coated and imaged on one side. One jack can be mounted on one side of the apparatus or a pair of jacks can be mounted on either side of the apparatus, if desired. As a matter of convenience, the opening of the apparatus is actuated by a switch on the apparatus itself or on a convenient control panel. With the apparatus opened along a plane coincident with the path of the printing plate through the apparatus, it is easily accessible to the operator, and the operator can remove a damaged plate, repair or service the machine in any manner, clean the machine or, for that matter, remove a plate for study during any phase of the processing. Another very distinct advantage of opening the apparatus along a plane coincident with the path of the printing plate through the apparatus is that an automatic pressure-type circuit breaker can be positioned on the two sections of the machine so that when the machine is initially opened, the power circuit to the processing apparatus is broken, thus, making the machine completely safe for an operator to service. Such a pressure-type circuit breaker also has the advantage that it will not reenergize the processing apparatus power system until the two sections have been completely closed, thus, guaranteeing that the two sections will be properly positioned with relation to one another prior to the insertion of a printing plate into the apparatus.

The present invention will be better understood when read in conjunction with the drawings wherein:

FIG. 1 is an overall view of the apparatus of the present invention in its normal operating position and, in broken outline form, in its open position for cleaning or other servicing, and

FIG. 2 is a detailed view, partially in section, of the processing portion of the apparatus of FIG. 1.

Referring specifically to the FIG. 1, a base is composed of legs 2 and 4 with cross members 6 and 8. Fixedly mounted adjacent the top of legs 2 and 4 is the lower section 10 of the processing apparatus. Fixedly attached to the lower section 10 are upstanding support plates 12, mounted on either side of lower section 10. The upper portion of support plates 12, which extend above lower section 10, carrying pivot means 14. The upper section 16 of the processing apparatus is operatively coupled to the lower section 10 through pivot means 14, thereby permitting the upper section 16 to be pivoted upwardly as shown in the broken outline form.

A planographic printing plate, which has been sensitized and imaged by exposure to a desired master, is inserted into the machine in the direction shown by the arrow 18. As a matter of convenience in feeding the machine, a protruding feed table 20 is located at the feed end of the lower section 10 of the processing apparatus. As the plate passes into the machine, it is transported therethrough, in a straight line path, by means of lower driven rollers 22. In intimate contact with the top of the plate being processed, and driven by contact with the plate, are upper idler rollers 24.

Mounted along the path of travel of the plate and between transport rollers 22-24 are the processing components of the apparatus. Shown specifically are a developing section 26, a washing section 28, a lacquering or gumming section 30 and a driving section 32.

The driven rollers 22 are driven continuously so long as power is supplied to the processing apparatus and the upper section 16 and the lower section 10 are in contact with one another. With the machine in its closed position, an upper portion 34 and a lower portion 36 of a pressure-type circuit breaker are in contact with one another and the circuit supplying power to the processing apparatus is completed. When, however, the upper section 16 of the machine is raised, the contact between portions 34 and 36 of the circuit breaker is broken and power is no longer supplied to the processing apparatus. This represents a significant safety feature in that all power is off when the processing apparatus is not closed and is not in its operating position.

At such time as it is desired to open the machine for repair or service of any type, switch 38 is thrown in one of the two directions to operate jack 40 and raise the upper section 16 of the processing apparatus. Switch 38 may be an appropriate toggle switch mounted either on the side of the lower section of the processing apparatus or on a separate control panel. Jack 40 may take any one of several forms. Jack 40, preferably, is a screwtype electrically-operated jack. However, any type of pneumatic, hydraulic or similar jack can also be utilized. Extension rod 42 of jack 40 is pivotally connected to the upper section 16 of the machine by means of pivot 44. The lower cylinder section 46 of the jack 40 is mounted on cross member 8 through mounting plate 48 and pivot means 50. Also mounted on the cylinder portion 46 of jack 40 is an appropriate motor housing or support 52. As may be seen from the drawing, when the switch 38 is actuated and extension rod 42 of the jack 40 is extended, the motor housing 52 pivots downwardly and in doing so will contact limit switch 54. The limit switch 54 turns off the power to

the jack 40, thereby preventing it from overrunning or overextending.

In the actual operation of the apparatus, during normal processing of a planographic printing plate, the master power control is on and sections 10 and 16 of the machine are in contact with one another and power is being supplied to the entire processing sequence. A plate is fed into the machine as shown and driven rollers 22 drive the plate through the processing apparatus. Since upper idler rollers 24 are in intimate contact with the plate, the plate will, in turn, drive the idler rollers. When it is desired to repair or service the machine, switch 38 is thrown to the up position, thereby actuating jack 40. Jack 40 raises the upper section 16 of the machine until the motor housing 52 contacts limit switch 54. When limit switch 54 is contacted, the power is shut off to the jack and the upper section 16 stops at a predetermined upper position. As soon as jack 40 begins to operate to open the upper section 16 of the processing apparatus, contact between portions 34 and 36 of the circuit breaker separate and the power to the entire processing sequence is shut off. This, as previously indicated, is a significant safety factor when one is working on the machine.

In accordance with FIG. 2 of the drawings, a planographic printing plate, sensitized on both sides and imaged on both sides by exposure to a desired master, is inserted into the apparatus in the direction of the arrow 18. Alternatively, two plates, each sensitized and exposed on only one side may be inserted in back-to-back relation. The plate passes through a pair of feed rollers 22a and 24a, and thence to the developing section 26. The developing section 26 is made up of a pair of shielded developer dispensers 56, which introduces developer onto the plate to soften the coating in the non-image areas. Developer is fed to the dispensers 56 from a suitable source of developer under pressure (not shown). The plate then passes to cleaning and scrubbing subassembly 58. Cleaning and scrubbing subassembly 58 is made up of cleaning brushes 60. The cleaning brushes 60 may be flat brushes as shown or rotary brushes. Cleaning brushes 60 are reciprocable and thus these brushes rub against the plate to clean the softened, unwanted coating from the plate. In order to assist this cleaning action, developer solution is also supplied between the tufts of the brushes through conduits 62 to provide a simultaneous washing action. This developer fluid is also under pressure from a source of developer fluid (not shown). The plate then passes to scrubbing pads 64, mounted on subassembly 58, which are also reciprocable with the brushes 60. These scrubber pads 64 are covered with a suitable soft material, such as, velour, for example. The scrubbing pads are also supplied with developer under pressure through conduits 66 from a suitable source of developer (not shown). Upon exiting from the scrubber pads, the plate passes between squeegee rollers 22b and 24b. 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 which has a greater affinity for the particles of coating than does the metal of the plate. Particles adhering to the squeegee rollers 22b and 24b are removed by the cleaning pads 68. These cleaning pads 68 reciprocate together with scrubber pads 64 and brushes 60 and thus traverse the surface of the squeegee rollers 22b and 24b

to effectively clean them. As indicated, the entire sub-assembly 58 is reciprocable to thus reciprocate brushes 60, scrubber pads 64 and cleaning pads 68. After passing through transport-squeegee rollers 22 and 24b, the plate is propelled between water wash tubes 28 to the rinse transport-squeegee rollers 22c and 24c. This pair of rollers now assumes the propulsion of the plate and passes it between gum dispensing tubes 30 to the gum applicator transport-squeegee rollers 22d and 24d. These rollers, in turn, pass the plate between a pair of air drying tubes 32 to the exit rolls 70, which guide the now developed, rinsed, gummed and dried planographic plate out of the apparatus in condition for mounting on the press. Prior to passing through the washing section 28, the plate may pass through a fixing section similar to the developer section 26. In any event, whether the apparatus is adapted to process both sides of a plate coated and imaged on two sides, two back-to-back plates or a single plate coated and imaged on only one side, at least a part of the processing components will be located in the upper section 16 of the apparatus and because of this, the top is extremely heavy and must be perfectly aligned and held against lower section 10 at a critical pressure. It is also obvious that even without any part of the processing equipment mounted in upper section 16, the transport and squeegee rolls themselves are so large and heavy in a planographic plate processor that the upper section is extremely difficult to move and must be raised with sufficient power to accomplish this.

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. A printing plate processor for processing a plate coated and imaged on both sides or a pair of plates, in back-to-back relation, coated and imaged on one side only and wherein said plate travels through said processor along a straight line path, comprising a fixed lower section and a pivotal upper section, pivotally mounted on said lower section adjacent one end thereof; said upper section and said lower section being separated along a plane coincident with the path of travel of said plate through said processor; a pair of feed roller means, a pair of discharge roller means and a pair of processing

means adapted to contact both sides of said plate and subject said both sides of said plate to identical mechanical action; one each of said pairs of feed means, discharge means and processing means being mounted in said lower section and the other of said pairs being mounted in said upper section; and extension jack means, having one end thereof attached to said lower section and the other end thereof attached to said upper section, to lower and raise said upper section, maintain proper alignment between said sections during opening and closing and apply a predetermined pressure to said plate when said processor is closed and said plate is being processed.

2. A processor in accordance with claim 1 wherein the jack means is a screw-type jack means.

3. A processor in accordance with claim 2 wherein the jack means is electrically operated.

4. A processor in accordance with claim 1 wherein each of the processing means includes a developing section.

5. A processor in accordance with claim 4 wherein the developing section includes at least one developer dispenser and reciprocable cleaning and scrubbing means.

6. A processor in accordance with claim 5 wherein the reciprocable cleaning and scrubbing means includes at least one reciprocable cleaning brush means and at least one reciprocable scrubbing pad means.

7. A processor in accordance with claim 6 wherein the cleaning brush means includes means for supplying additional developer and the scrubbing pad means includes means for supplying additional developer.

8. A processor in accordance with claim 4 wherein each of the processing means includes a washing section, a lacquering section and a drying section sequentially mounted following the developing section.

9. A processor in accordance with claim 1 wherein a normally-closed, pressure-type circuit breaker is operatively connected to the upper section and the lower section to break the power circuit to the processor when the upper section is opened.

10. A processor in accordance with claim 1 wherein a limit switch means is operatively mounted adjacent the jack means to turn off the power to said jack means when the upper section is opened to a predetermined position.

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