United States Patent [19]

Hovekamp

[11] **3,896,470**

[45] **July 22, 1975**

[54] **AUTOMATIC PROCESSOR FOR OFFSET PLATES**

[75] Inventor: **John C. Hovekamp,** Mansfield, Ohio

[73] Assignee: **Buckler Industries, Inc.,** Mansfield, Ohio

[22] Filed: **Apr. 11, 1973**

[21] Appl. No.: **350,129**

[52] **U.S. Cl.** **354/317;** 354/328

[51] **Int. Cl.** **G03d 5/00;** G03d 3/04

[58] **Field of Search** ..... 95/89 R, 99; 354/297, 317, 354/318, 324, 325, 328

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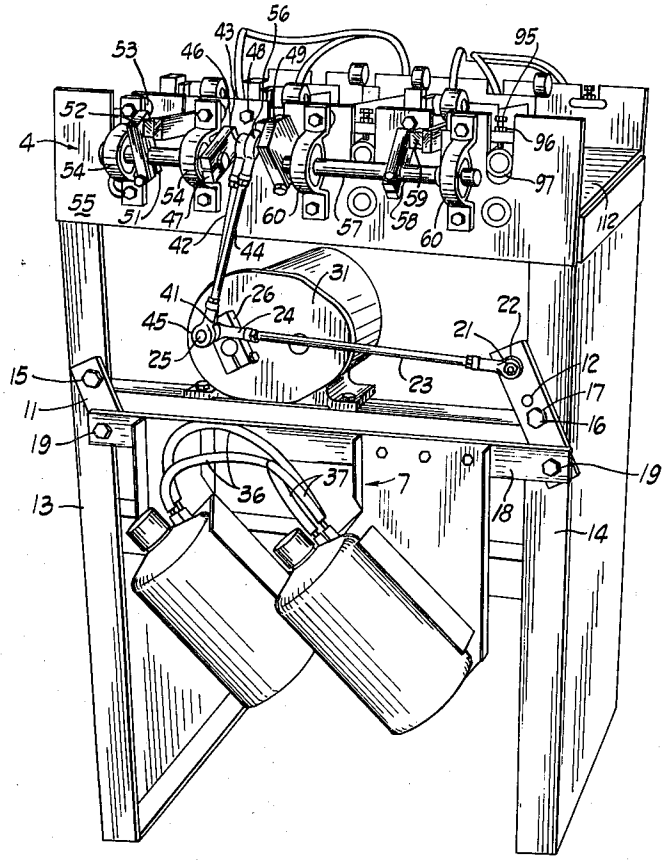
Primary Examiner—Fred L. Braun

Attorney, Agent, or Firm—Cain and Lobo

[57] **ABSTRACT**

An automatic integrated processor which sequentially develops, washes and, if desired, applies gum to the exposed surface of an offset photolithographic plate in appropriately separated processing stages. The exposed surface of the plate is subjected to a linear, reciprocating rubbing action by plural sponges, which rubbing action produces results surprisingly similar to those produced by a manual rotary action. A fully assembled processor of this invention requires only that it be connected to a water supply, a source of power, and to a reservoir for used, waste fluids. A single electric motor is adapted (a) to drive plural pairs of coupled drive rolls, (b) to reciprocate the sponges in frictional contact with a generally horizontal offset plate and (c) to agitate angularly disposed containers for developer and gum. The translation of the rotary motion of the electric motor to linear reciprocation in mutually orthogonal planes is effected by direct rod-actuated drives with swivel rod-ends. The fully assembled processor may be transported through a standard 36 inch wide doorway, eliminating the drawbacks characteristic of machines which are to be assembled at the installation site.

9 Claims, 8 Drawing Figures



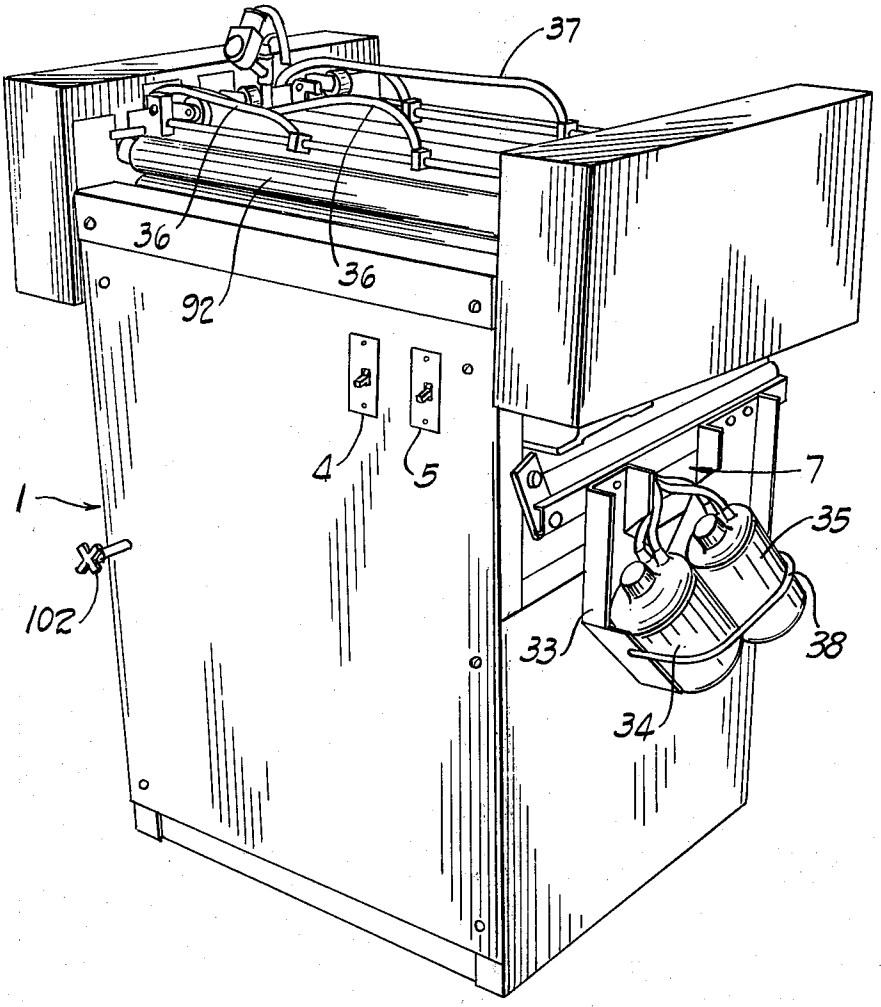


Fig 1

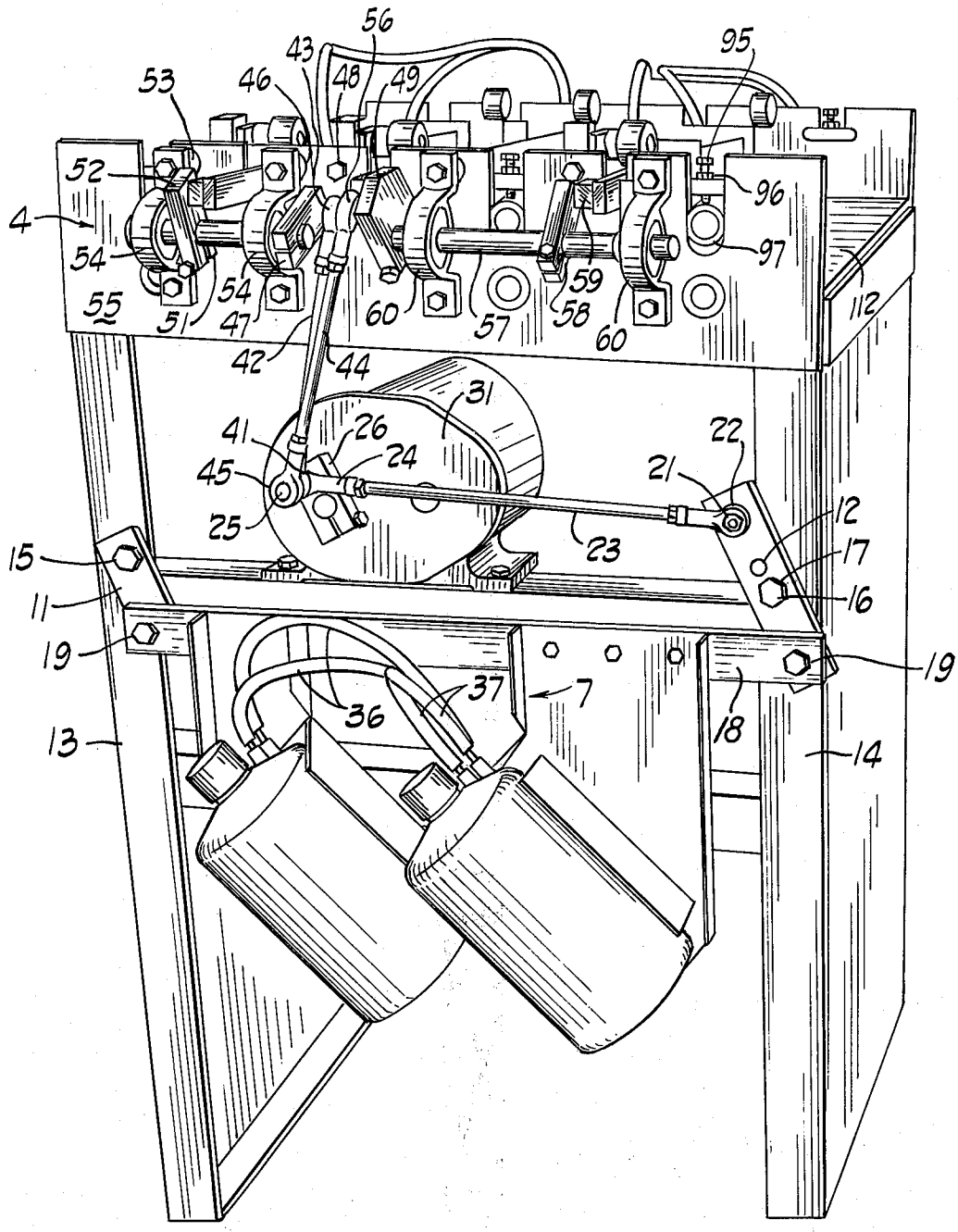

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Fig.2

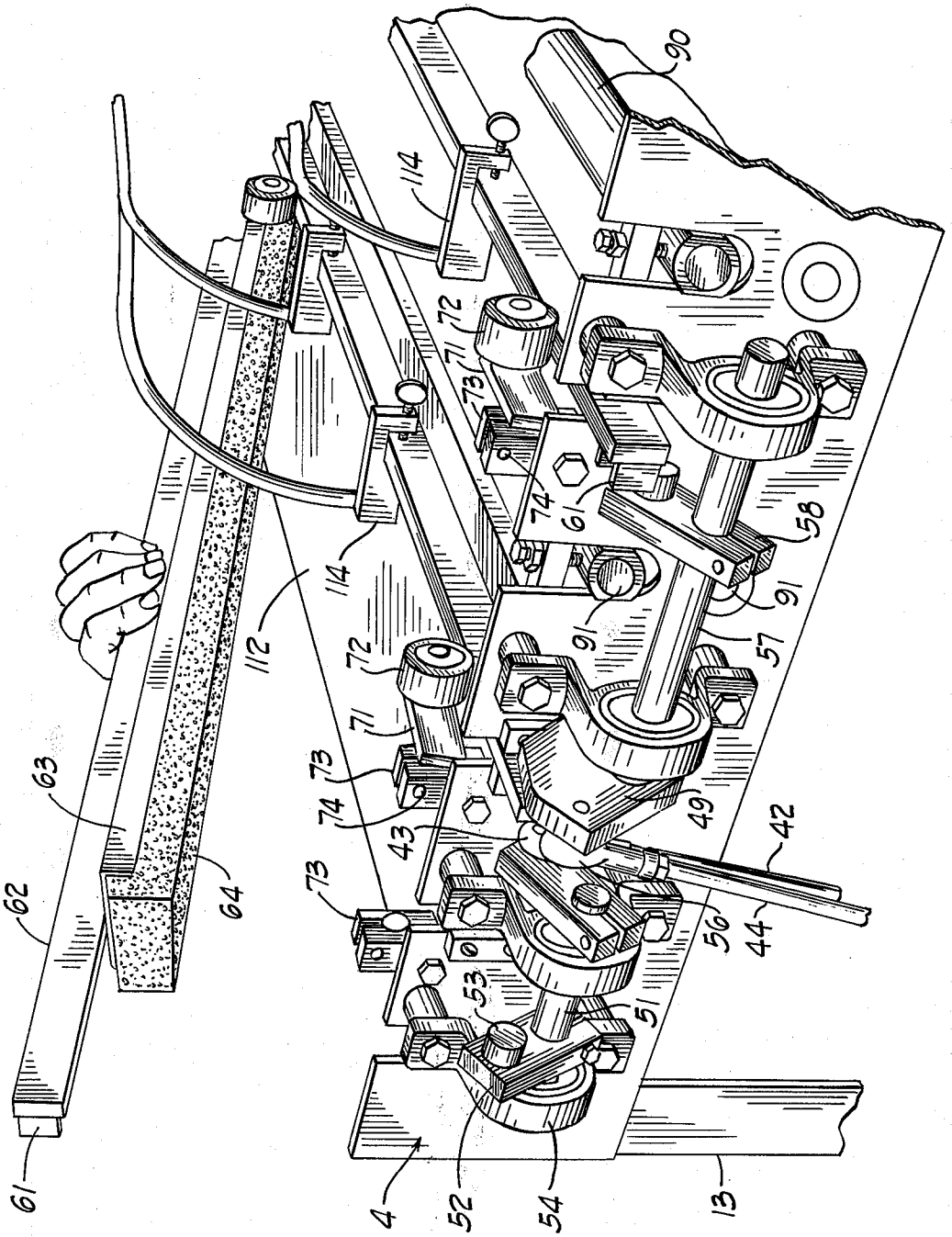

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Fig. 3

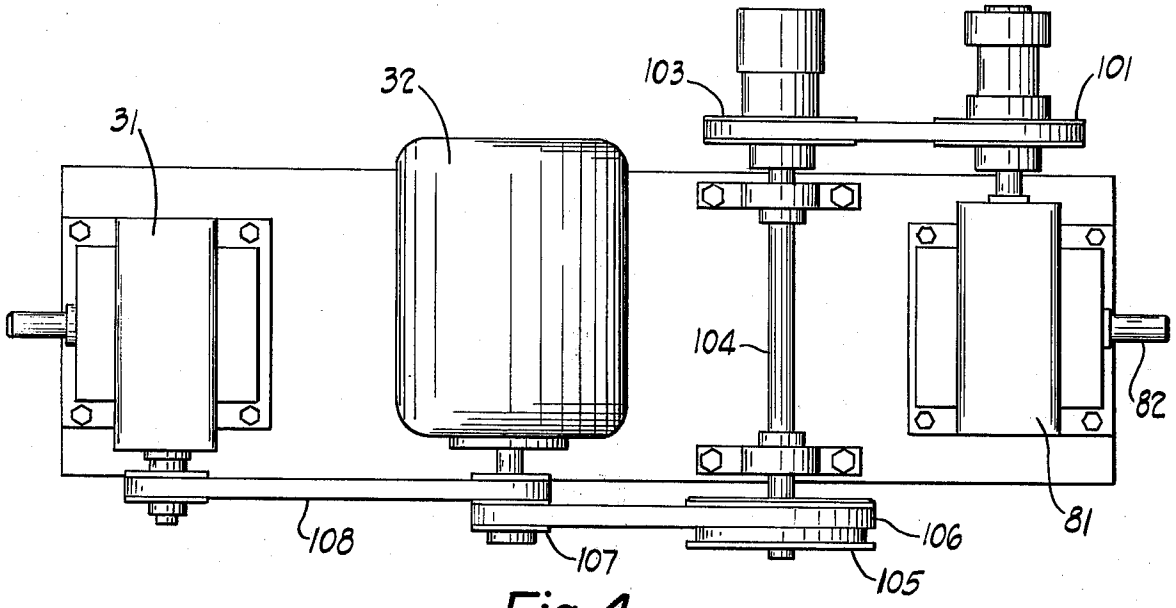

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Fig. 4

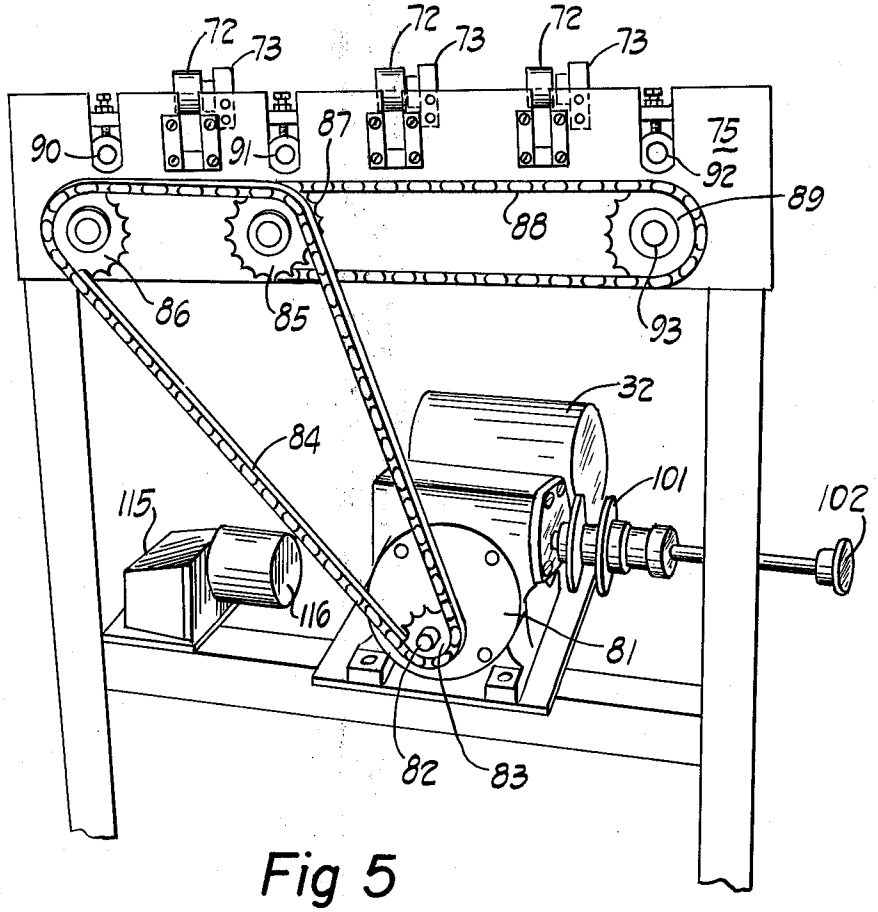

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Fig 5

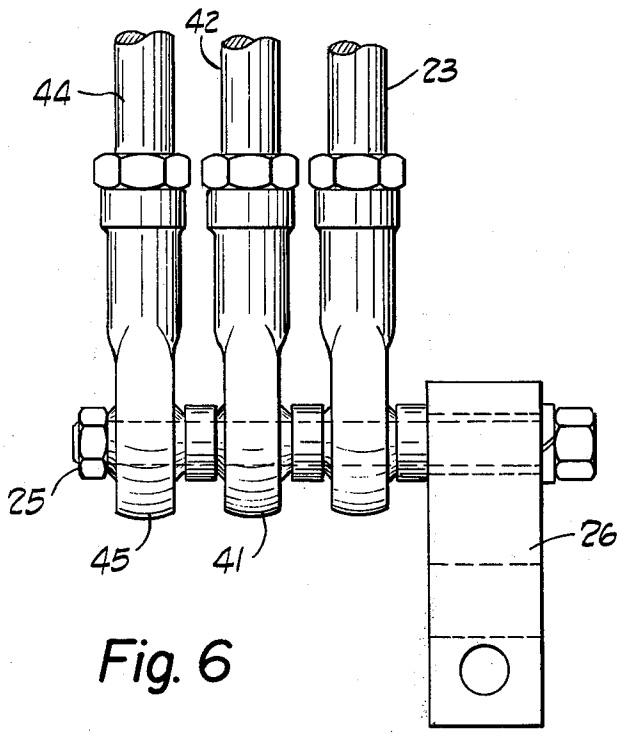


Fig. 6

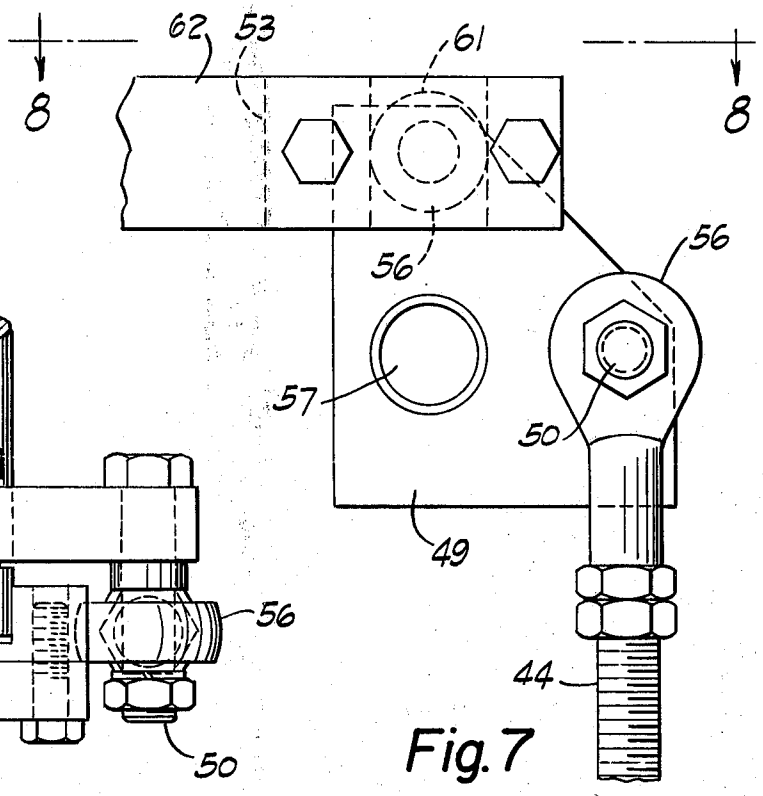


Fig. 7

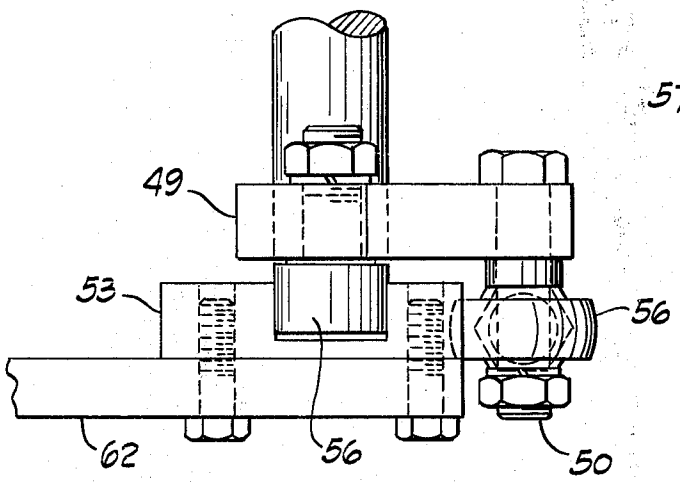


Fig. 8

AUTOMATIC PROCESSOR FOR OFFSET PLATES

BACKGROUND OF THE INVENTION

Though manual development, washing and gum application, also referred to as "gumming," is still practiced by the occasional user of photolithographic plates, the large scale commercial utilization of offset plates has made automatic processing of exposed plates an economic necessity. Numerous machines have been proposed to execute otherwise manually performed tasks and have met with qualified success. Machines specifically adapted to process exposed photolithographic plates automatically are disclosed in U.S. Pat. Nos. 3,608,464; 3,593,641; 3,589,261; 3,562,834; 3,448,720; and others.

In general, the more successful machines have emulated the rotary, heretofore manual movement, particularly for the development of the plate. Consequently, it has been popularly believed that failure of other modes of mechanical rubbing motion as a substitute for manual rubbing is a foregone conclusion.

Moreover, the more successful machines are relatively large, enormously complicated and, not unexpectedly, require a capital investment which precludes their acquisition by a small user of plates. With respect to size, it is noted that available machines, for plates from about 25 inches to about 33 inches in width, will not pass, fully assembled, through a standard 36 inches wide doorway and consequently must be assembled at the installation site, preferably by a qualified factory representative. Similarly a factory-trained maintenance person is generally required to diagnose and rectify malfunctions of prior art machines due to the complicated inter-relationship of moving parts and the large number of electrical circuits. Thus, there has been a growing need for a simple, inexpensive automatic plate processor which will not only be easy to acquire but easy to maintain; and which is mechanically as ruggedly reliable as it is photographically, routinely reproducible in results. This invention is directed to such a need.

SUMMARY OF THE INVENTION

It is, therefore, a general object of this invention to provide a new and improved apparatus for converting rotary motion about a first axis to linear reciprocating motion along a second axis in transversely spaced relationship with the first axis.

It is another general object of this invention to provide a new and improved self-contained, integrated automatic processor for exposed lithographic plates typified by those used in modern offset printing machines.

It is a further general object of this invention to provide a new and improved self-contained, integrated automatic processor, for exposed lithographic plates typified by those used in modern offset printing machines which processor may be delivered to a purchaser, ready-to-use, requiring only that it be connected to a water supply, optionally a recirculating water supply, a source of power, and a reservoir for disposal of used processing fluids.

It is a more specific object of this invention to provide an automatic processor which utilizes simple components, coacting in the framework of a disciplined geometry, wherein a main requirement is that a fully assembled machine may be transported through a standard 36 inches wide doorway.

It is another object of this invention to provide a machine, less than 36 inches wide in the direction of travel of an exposed plate being processed, in which width a developing stage, a washing stage and a gumming stage are coplanarly disposed, but essentially compartmentalized by at least three pairs of coupled drive rolls which perform the dual function of minimizing contamination of fluids into adjacent stages and of transporting the exposed plate, sequentially, through each stage.

It is a particular object of this invention to emulate the process results of a desirable, manual rotary motion for rubbing the exposed surface during processing, by utilizing a surprisingly effective, simple rectilinear reciprocating motion, transmitted to rubbing surfaces such as sponges, which engage the exposed surface of the plate in frictional sliding contact.

It is another object of this invention to provide an automatic machine with a linearly reciprocable, integral agitator or shaker for bottles or containers of difficulty homogenizable processing fluids.

It is still another object of this invention to effect (a) positive, accurate transport of the exposed plate by the drive-rolls, (b) linear reciprocation of the sponges and (c) continuous agitation of the processing fluid containers, by dual, gear-reduction drive means driven by, and disposed on either side of, a single electric motor.

It is also a specific object of this invention to provide a machine with built-in safeguards both for the operator and the plate being processed; specifically, a torque limiter for the drive mechanism of the drive-rolls defeats transport of a plate which is advertently fed askew; the supply of chemicals may be adjusted both in flow rate and location to avoid splashing; and out-of-phase reciprocating sponges, spaced apart from each other at a distance less than the length of a plate, negates the net torque generated by the sponges during development of a thin plate.

It is another, more particular object of this invention to provide direct, uniquely adapted, plural, rod-actuated drives (1) for oscillating, simultaneously, at least one pair of shafts, one in an opposite direction from the other, to provide out-of-phase reciprocating action to contiguous sponges in a generally horizontal plane, coplanarly with the exposed surface of the plate; and (2) for agitating the fluid containers in a plane orthogonal to the horizontal plane. The plural drives may be effectively operated, without binding, though one end of each of three rods is journalled on a single stub shaft rotatable in a vertical plane.

It is still another specific object of this invention to provide a novel and improved apparatus for shaking difficulty miscible liquids wherein the liquids' containers are angularly disposed in a substantially vertical plane and linearly reciprocated by direct rod means driven by a rotary drive means not in the same vertical plane.

A still further object of this invention is to provide a new and improved apparatus for connecting rotary motion about a first axis into linear reciprocating motion along a second axis in transversely spaced relationship with said first axis, a new and improved automatic processor for offset plates, a new and improved process for developing and washing exposed offset plates, and a new and improved shaker for agitating a difficultly miscible liquid, each of which obtains one or more of the objects and advantages set forth hereinabove.

These and other objects, features and advantages of the processor of this invention will become apparent to those skilled in the art from the following description of preferred forms thereof, reference being had to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the automatic offset plate processor of this invention, from the receiving or infeed end of the machine where exposed plates are fed into a first pair of drive rolls.

FIG. 2 is an elevation perspective view of the right side of the processor showing the direct rod-actuated drives for reciprocating the sponges and simultaneously shaking the fluid containers.

FIG. 3 is a partial plan view, in perspective, of the right side of the processor showing direct rod means for reciprocating the sponges, and the manner in which the sponges are manually replaced.

FIG. 4 is a plan view of a single motor drivingly engaged with gear reducers disposed on opposite sides of the motor.

FIG. 5 is a side elevation perspective view, partially broken away for clarity, of the chain drive for driving the pairs of coupled drive rolls.

FIG. 6 is a fragmentary enlarged view, from the infeed end, showing three rod-ends journalled in a stub shaft in a crank arm.

FIG. 7 is a fragmentary enlarged view, from the infeed end, showing a rocker arm for the intermediate sponge bar assembly and a rod-end pivotally disposed on the rocker arm.

FIG. 8 is a fragmentary enlarged plan view of FIG. 7.

In the figures of the drawing, like reference numerals are used to denote like parts. Some of the parts are dimensionally exaggerated for clarity of illustration and to facilitate the description of the drive means and the manner in which it benefits the operation of the automatic processor.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

According to the present invention, the automatic offset plate processor develops, washes and applies gum to an exposed photopolymer aluminum lithographic plate on which a wipe-on or presensitized offset planographic printing plate image may be developed as is described in U.S. Pat. Nos. 3,448,720 and 3,562,834, inter alia.

It will be understood that the self-contained processor of this invention is a complete and continuous processor, which in addition to sequential developing and washing stages, provides a coating of gum arabic to preserve the plate. It will be apparent that, should normal preservation of the plate be dispensed with, the apparatus to be described hereinafter may be easily modified to exclude the gumming step.

A self-contained or integrated processor is one in which all the desired steps that are prerequisites of the ultimate in plate-processing are carried out, automatically, once the machine is placed in operation, except for feeding each plate into the infeed or feed-end and recovering processed plates from the out-feed or discharge end. An integrated processor is placed in operation by moving a fully-assembled processor into the processing room, connecting it to a water-supply, a source of power, such as any available electric supply at conventionally designated line voltage, and a drain to a reservoir or treating facility adapted to receive and dispose of waste processing chemicals. The processor is referred to as being complete, because with the fluid containers provided with suitable chemicals, only wash water need be supplied before the machine is connected to a source of power for its automatic operation.

Exposed plates are fed exposed surface upward, usually manually, individually and sequentially, permitting essentially continuous operation. Operation of the machine may be interrupted at will, for example, to replenish processing chemicals, for work recesses, and the like, without having to make more than simple, routine adjustments, if any.

Referring now to FIG. 1, there is illustrated a self-contained automatic offset lithoplate processor indicated generally at 1, with covers to protect (a) a chain drive mechanism, for receiving, transporting, and discharging a plate, (b) sponges or applicator means having a rod-actuated drive mechanism adapted to reciprocably rub the exposed surface of the plate, and (c) pump means for supplying chemicals, and other components, as will be described hereinafter. The processor is placed in fluid communication with a source of washing fluid, preferably water, by connecting it with a water supply, and a power-cable from the processor is plugged into a line receptacle (details not shown). The length of the processor in the direction of travel of a plate, is less than 36 inches, with all the covers on, and fully assembled.

Processing chemicals, such as are well-known in the art, for developing and gumming the exposed plate, are difficult to maintain in homogeneous solution. They are, therefore, continuously agitated in a shaker, indicated generally at 7. The shaker 7 is disposed below a rod-actuated drive mechanism (see FIG. 2), covered in FIG. 1, on the right hand side of a person positioned so as to present a plate to the infeed end of the processor. In descriptions hereinafter, the right hand side of the processor will be referred to as the front and the opposite, or the left hand side, will be referred to as the rear of the machine.

Referring now to FIG. 2, the shaker comprises a pair of rocker arms 11 and 12 pivotally disposed on vertical frame members 13 and 14 which are part of the support structure of the processor. Suitable pivots 15 are provided by bolts 16 journalled in bearing means 17, preferably ball bearings, secured in the rocker arms. The lower end of each rocker arm 11 and 12 pivotally supports a horizontal support bar 18 near its end, at pivot 19, preferably utilizing a similar bolt and bearing means as those described immediately hereinbefore. The upper end of the rocker arm 12 is provided with a bolt or pin 21 on which is pivotally secured a swivel rod-end 22 of a rod 23, the other end of the rod 23 also having a swivel rod-end 24 pivotally disposed on a stub-shaft or pin 25. The stub-shaft 25 projects from a rotatable crank arm 26 driven by any suitable drive means. Preferred drive means is a variable speed reduction gear means 31 powered by a motor means such as an electric motor 32. (see FIG. 4)

It will be recognized that swivel rod-ends are desirable to accommodate angulation of any rod which otherwise would 'bind'. Because the rod 23 may be disposed on the stub shaft 25, so as to place the rod 23 in essentially the same vertical plane as the rocker arms

11 and 12 and the support bar 18, the bottles may be agitated by a parallelogram motion imparted by a rod 23 without swivel ends. However, the use of swivel ends permits such flexibility, with respect to the plane of movement of the rod 23, as is necessary in this particular embodiment when the vertical plane is not the same. Other means may be used for this purpose, such as, for example, a flexible rod with predetermined rigidity, so chosen as to flex to the extent necessary to permit angulated motion of the flexible rod which may utilize conventional, fixed or non-swivelling rod-ends. Alternatively, a conventional rod with fixed rod-ends may be modified by sectioning the rod to provide at least two spring-connected sections. A rod end on one section may be pivotally disposed on the stub shaft 25, and a rod end on the other section may be pivotally disposed on the bolt 21. A longitudinally flexible spring, of predetermined rigidity, which will flex during operation sufficiently to permit angulated transmission of the rotary motion of the stub shaft 25, without binding, may be disposed intermediate the two rod sections. Still another means, utilizing direct rod actuation, includes a rod with conventional, fixed rod-ends and a universal joint intermediate its length.

It will also be recognized that the rotary movement of the crank arm may be converted to the desired rocking motion of the support bar by utilizing a flexible cable and an oppositely directed spring return, instead of a direct-rod actuated means; but a flexible cable and spring return is generally not as satisfactor as direct rod actuation.

The support bar 18 has fixedly disposed thereon a bottle holder or carriage 33 adapted to hold a developer bottle 34 and a gum bottle 35. The bottles 34 and 35 are angularly, removably disposed in the holder 33, preferably at an angle in the range from about 30° to 50° from the horizontal, and most preferably at about 45°, by a spring 38. It has been discovered that an angularly disposed fluid container provides surprisingly good mixing and reliably maintains homogeneity of the fluids. A pair of developer fluid lines 36 and a pair of gum lines 37 conduct developer and gum from the bottles 34 and 35 respectively.

Rotation of the crank arm 26 produces a back-and-forth rocking motion of the rocker arm 12 and reciprocates the bottles 34 and 35. Fluids from the bottles are conducted through lines 36 and 37 and applied to the exposed surface of a plate to be processed, as will be described hereinafter.

Referring further to FIG. 2, and also to FIGS. 3 and 6, the stub shaft 25 has pivotally disposed thereon swivel rod-ends 41 and 45 of rods 42 and 44 respectively. The other swivel rod-end 43 of the rod 42 is pivotally disposed on a pin 46 projecting from a rocker arm 47. The rocker arm 47 is secured on a first shaft 51, at a predetermined angle in such a manner as to impart a rocking motion, symmetrically about a vertical axis, to a second rocker arm 52 provided with a cam 53. The first shaft 51 is journalled in bearings 54 in pillow blocks mounted on a front, or right hand, side-plate 55. The swivel rod-end 48 of rod 44 is pivotally disposed on a pin 50 secured in a rocker plate 49. The rocker plate 49 has a projecting cam 56 (see FIGS. 7 and 8) disposed at the same distance from a second shaft 57, on which it it is fixedly secured, as the pin 50. Another rocker arm 58, with a cam 59, is secured on the second shaft 57 intermediate bearings 60 in which the shaft 57 is journalled. The bearings 60, in pillow blocks, are mounted on the side-plate 55. The rocker arm 47 and the rocker plate 49 are so connected by the rods 42 and 44 to the stub shaft 25 as to provide out-of-phase oscillations of the first and second shafts; preferably, when the first shaft rotates clockwise, the second shaft rotates counter-clockwise. As explained hereinbefore, though swivel rod-ends are preferred, other direct rod-actuated means which will permit angulation during operation may be used.

Each of the cams on the rocker arm 52, the rocker plate 49 and the rocker arm 58 is engaged in cam follower blocks 61 provided near one end of a sponge bar assembly. Each sponge bar assembly comprises a bar 62 which extends to the left hand side of the processor. The sponge bar 62 supports a channel 63 in which an elongated sponge 64 is removably disposed. A similar intermediate sponge and a gum sponge (neither shown) are also removably disposed by any suitable means, such as prongs, in three similar sponge assemblies. Each of the sponges is so disposed as to be in frictional sliding contact with the plate to be processed, the sliding contact being actuated by the action of the cams and cam follower blocks. Commercially available sponges, natural or synthetic are preferred, though any suitable resilient porous surface will provide an adequate rubbing surface. The rocker arms 52 and 58 and rocker plate 49 reciprocate the sponge bar assemblies rectilinearly across the plate in a direction orthogonal to the direction of travel of the plate as it is processed. The sponges reciprocated by rocker arm 52 and rocker plate 49 are referred to as a pair of developing sponges, and the sponge reciprocated by rocker arm 58 is referred to as a gumming or gum sponge. As will presently be apparent the sponge reciprocated by rocker plate 49, also referred to as the intermediate sponge, performs a dual function, the edge on the infeed or plate-feeding side rubbing developer solution, and the edge on the outfeed or plate-discharging side, rubbing washing water over the plate. Simultaneous, oppositely directed reciprocation of the pair of developing sponges, relative to each other, balances and offsets the torques generated by the sponges so as not to damage an offset plate fed to the processor.

Each sponge bar assembly is provided near each end with adjustable pressure means, to set a desired rubbing pressure for each sponge. This may be effected by a Z-shaped roller pressure arm assembly 71 having a pressure roller 72 rotatably disposed on one end, and the other end adjustably, fixedly disposed in a block 73 mounted to the front side-plate 55. Similar roller pressure arm assemblies are disposed in blocks on a rear side-plate 75 (as seen in FIG. 5). The block 73 is split and provided with a bolt 74 to fixedly secure one end of the roller pressure arm.

Referring now to FIGS. 4 and 5, a reduction gear means or gear reducer 81 is disposed on the other side of the electric motor 32, that is opposite from the reduction gear means 31, and is drivingly engaged with the motor 32, as will be described hereinafter. The reduction gear means 81 is provided with a shaft 82 on which a 12-pitch sprocket 83 is keyed. A drive chain 84 is operatively trained upon the sprocket 83 and sprockets 85 and 86 which are disposed above sprocket 83. Sprocket 85 is keyed to the lower of a pair of coupled drive rolls 91, also referred to as wash rollers, adapted to pressingly receive an offset plate therebetween and

urge it onwards. Sprocket **86** is keyed to the lower of a pair of coupled drive rolls **90**, also referred to as gum rolls, and which are also adapted to pressingly receive a plate therebetween and urge it onwards. Sprockets **85** and **86** are preferably 17-pitch sprockets, and in operation, impart the same rotational speed to the coupled drive roll pairs **91** and **91**. The lower roll of the wash roll pair **90** is provided with a second sprocket **87**, keyed to the same shaft as sprocket **85**, and substantially abutting it. A drive chain **88** is operatively trained on the sprocket **87** and drivingly engages a sprocket **89** which is keyed to the lower of a pair of coupled drive rolls **92**, also referred to as feed rolls, adapted to recieve an offset plate therebetween and to urge it toward the wash rolls **91**. The sprocket **89** is preferably a 20-pitch sprocket and is provided with a torque limiter **93** with an adjustable running torque, such as is commercially available from Morse Chain.

The gear reducer **81** is provided with a variable speed drive, such as is commercially available from Browning, which includes a manually controlled sheave **101** with a control knob **102** which permits choice of a desired driven speed. The correct speed is held by spring tension. The variable speed drive also includes a spring loaded sheave **103** fixedly disposed on one end of a shaft **104** of a drive-belt relay. The other end of the shaft **104** is provided with a flanged sheave **105** on which a timing belt **106** is trained and then drivingly engaged on a wide sheave **107** keyed to the shaft of the electric motor **32**. The sheave **107** is wide enough to accommodate two timing belts **108** and **106** which respectively drive the reduction gear **31** and the flanged sheave **105**. The flange on the motor side of the sheave **105** serves to minimize the interference of one belt with the other on the sheave **107**.

The drive rolls pairs and sponge assemblies are disposed between side-plates **55** and **75** above a drain pan. A deck **112**, with suitable drain means to permit liquids to run into the drain pan is so disposed between the side plates **55** and **75** as to support an offset plate of predetermined width in a face upward position during processing, that is, with the exposed surface of the plate facing upward. It is preferably to provide a slight incline for the deck **112**, such as, for example, 1 inch in 27 inches, the deck sloping downwards towards the outfeed end of the processor. The sponges **64** are in abutting, rubbing contact with the deck, the desired pressure being adjustably by loosening the bolt **74**, pressing down on the roller **72** and securely tightening the bolt **74**.

The processor, replete with necessary chemicals for developing an offset lithoplate and protecting the developed plate, is placed in operation by switching on the electric motor **32** and individual gear motors for each of the chemicals, by means of switches **4** and **5** seen on the feed-end panel of the machine in FIG. **1**. The speeds of the gear motors are preselected to pump a predetermined amount of chemicals.

Developing fluid is applied to the exposed surface of a plate as soon as it is fed through feed rolls at the infeed end of the processor. Developing fluid is conveniently provided through plural flexible tubes **36** which deliver fluid from a bottle in the shaker. The tubes **36** are positioned, intermediate the feed rolls **92** and the first developing sponge **64**, by brackets **114** which are adjustably disposed on the sponge bar **62** of the first developing sponge. The developing fluid is pumped from the bottle by any conventional pumping means such as a rotary pump **115** driven by a variable speed gear motor **116**. It is preferred to use a separate rotary pump for each tube which dispenses developing fluid, only one of which is shown in FIG. **5**.

Developing fluid applied to the plate is rubbed by first one, and then the other of the pair of developing sponges **64***b* and **64***b*. The feed rolls **92** continue to urge the plate onwards to the wash rolls **91**. The correct or most desirable roller pressure between the rolls of each pair of coupled drive rolls is set by a lock nut **96** and adjusting screw **95** adapted to exert pressure on roller bushings **97**.

Water for the washing stage is provided by a water wash spray bar having a plurality of holes (not shown) through which water is jetted into the nip of the wash rolls **91**. The water serves to rinse the developed plate, and the second of the pair of developing sponges provides an additional power washing and scrubbing action.

The wash rolls **91** squeeze excess water from the plate and urges the plate to the gumming stage. The wash rolls also serve to anchor the plate, as it travels, so that the simultaneous rubbing action, in the same direction, of the second developing sponge and the gumming sponge, does not torque the plate excessively.

For gumming the plate, gum is applied intermediate the wash rolls **91** and the gum sponge in a manner analogous to the application of developling fluid, through gum dispensing flexible tubes **37** which are positioned, adjustably, with brackets **114** on the gum sponge bar. Again, as before, gum is pumped from the gum bottle by any conventional pumping means such as a rotary pump driven by a variable speed gear motor, and a separate pump for each tube is preferred. The gum is rubbed onto the surface of the plate by the gum sponge and is urged towards the gum-rolls **90** where excess gum is squeezed from the plate. The plate is discharged from the gum rolls, fully developed and coated with a protective coating of gum.

It will be apparent from the foregoing description of the instant automatic processor that the developing, washing and gumming stages are essentially compartmentalized, that is, substantially separate and distinct from each other. The developing stage is defined by the zone between the developing rolls and the infeed edge of the intermediate or second of the pair of developing sponges; the washing stage is defined by the zone between the outfeed edge of the intermediate sponge and the wash rolls; and the gumming stage is defined by the zone between the wash rolls and the gum rolls. The slight incline of the deck, sloping downwardly from the infeed to the outfeed ends of the processor, ensures a flow of liquids toward outfeed end and at the same time, helps prevent undue contamination of developing fluid by water, and contamination of the water by gum respectively.

It will also be apparent that, for economy of utilization of chemicals, a multiplicity of plates is most advantageously processed sequentially and essentially continuously. It will be apparent that the machine may also be operated for a single plate at a time.

Used fluids flowing off the exposed surface of a plate being processed, and through suitable openings provided in the deck **112**, drain into the drain pan and thereafter into a reservoir for waste fluids. Alternatively, the drain pan may be connected directly to a

waste line which may be disposed of in a suitable manner.

The apparatus of this invention is broadly applicable to any mechanism wherein a rotary motion about a first axis is to be converted to a linear or rectilinear reciprocating motion along a second axis in transversely spaced relationship with the first axis by utilizing a shaft means disposed for oscillation about the third axis which is angularly related to the second axis. Such an apparatus may be adapted for use in any machine wherein the aforementioned conversion of motion is desired, and is particularly applicable to processors of the type described herein to effect linear reciprocation of an elongate member including a rubbing means such as a brush, sponge or applicator. As is well known in the art, such processors of offset plates may include any conveyor means for the plates, such as, for example, a conveyor belt or drive rolls.

Modifications, changes, and improvements to the preferred form of the invention herein disclosed, described and illustrated may occur to those skilled in the art who come to understand the principles and precepts thereof. Accordingly, the scope of the patent to be issued herein should not be limited to the particular embodiments of the invention set forth herein, but rather should be limited by the advance of which the invention has promoted the art.

What is claimed is:

1. In a self-contained processor for processing an exposed surface of individual photolithographic plates sequentially and essentially continuously through developing, washing and gumming stages wherein conveyor means is adapted to receive and urge each of said plates under rubbing means in frictional contact with said exposed surface, and drive means is disposed in operative relationship with said rubbing means, said drive means including a first crank arm rotatable about a first axis, a stub shaft mounted on said first crank arm in spaced relation with said first axis and having an axis extending parallel with said first axis, first and second drive shafts, each said drive shaft being mounted in spaced relation with said first and stub shaft axes for rotation about an axis extending transversely of said first and stub shaft axes, each said drive shaft having a crank arm thereon; nonrotatable first and second rubbing means extending parallel with each other and mounted to reciprocate rectilinearly, each on an axis extending in spaced parallel relation with said first and stub shaft axes, first and second direct rod means having ends, one end of each said direct rod means being mounted on said stub shaft, the other end of said first and second rod means being mounted on said crank arm of said first and second drive shafts, respectively, in spaced relation with the said axis thereof whereby rotation of said stub shaft about said first axis oscillates said drive shafts about their axis, respectively, means and providing engagement between said first and second drive shafts and said first and second rubbing means, respectively, said last named means including means whereby each said rubbing means is reciprocated in response to said oscillation of said drive shafts, respectively.

2. The self-contained processor according to claim **1** in which said first and second rubbing means are reciprocated 110° out of phase.

3. The self-contained processor of claim **1** wherein reciprocation of each said rubbing means is effected by a rocker arm fixedly disposed on each said drive shafts, respectively each said rocker arm having a cam cooperatingly engaged in a cam follower operating each said rubbing means, respectively.

4. The self-contained processor of claim **3** wherein each said rod means has swivel ends.

5. The self-contained processor according to claim **3** in which said first and second rubbing means are reciprocated 110° out of phase.

6. In a self-contained processor having conveyor means for transporting therethrough an individual photolithographic plate so that an exposed surface of said plate is processed sequentially and essentially continuously through developing, washing and gumming stages, a first drive means for oscillating plural rubbing surfaces engaging said exposed surface and a second drive means for engaging and driving said conveyor means, the improvement comprising first and second reciprocable, nonrotatable rubbing means to reciprocate said rubbing surfaces in frictional, sliding contact with said exposed surface, bottle shaker means for holding containers without tipping the fluids used in processing each said exposed surface and stirring the fluids therein by rocking said containers about an axis transverse of their height, said first drive means including a crank arm mounted for rotation about a first axis, a stub shaft mounted on said crank arm in spaced relation with said first axis and having an axis extending parallel with said first axis, first, second and third direct rod means, each said direct rod means having ends, one end of each of said direct rod means journalled on said stub shaft, the other end of said first and second rod means being operationally interconnected with said first and second rubbing means, respectively, to reciprocate said rubbing means, respectively, in response to rotation of said crank arm, and the other end of said third rod being operationally interconnected with said bottle shaker means to rock the containers therein about said transverse axis in response to rotation of said crank arm.

7. The processor according to claim **6** in which said first and second direct rod means are operationally interconnected with said first and second rubbing means, respectively, by means including first and second drive shaft means each mounted for rotation about an axis extending transversely of and in spaced relation with said first axis and being interconnected with said other end of said first and second direct rod means and said first and second rubbing means, both, respectively; said interconnection between said other end of said direct rod means and drive shaft means, respectively, being in spaced relation with said axis of said drive shaft means, respectively, whereby rotation of said stub shaft about said first axis oscillates each said drive shaft means about its axis.

8. A self-contained processor for processing an exposed surface of individual photolithographic plates sequentially and essentially continuously through developing, washing and gumming states, utilizing conveyor means adapted to receive and urge each of said plates under rubbing surface means, said processor comprising:

a. first drive means disposed in operative relationship with said rubbing surface means near one side of said conveyor, including

i. a crank arm rotatable about a first axis, and stub shaft means disposed on said crank arm in spaced

relationship with said first axis, and having an axis extending parallel with said first axis,

ii. said rubbing surface means being rectilinearly reciprocable nonrotatably, along a second axis transversely spaced from and parallel with said first axis and said stub shaft means axis to rub said exposed surface;

iii. shaft means in operable engagement with said rubbing surfaces means and disposed for rotation about a third axis, spaced from and extending transversely of said first and second axes;

iv. rod means having ends, one end of said rod means mounted on said stub shaft means, the other end of said rod means engaging said shaft means and said shaft means oscillating about said third axis in response to rotation of said stud shaft about said first axis, said oscillation of said shaft means reciprocating said rubbing means, and

b. a second drive means, engaging and driving said conveyor means.

9. A self-contained processor for processing exposed individual photolithographic plates sequentially and essentially continuously through substantially compartmentalized developing, washing and gumming stages, said processor comprising:

a. a first pair of coupled drive rolls adapted to receive a plate therebetween, with the exposed surface of said plate facing upward, and to urge said plate to the developing stage,

b. means for applying developer fluid to said exposed suurface in the developing stage.

c. a first nonrotatable, rectilinearly reciprocable rubbing means having a resilient first rubbing surface adapted to be disposed in frictional sliding contact with said exposed surface to rub said developer fluid on said exposed surface, said first rubbing surface being reciprocable upon said exposed surface

d. second rectilinearly reciprocable rubbing means having a resilient second rubbing surface adapted to be disposed in frictional sliding contact with said exposed surface and spaced apart from said first rubbing surface by a distance less than the longitudinal dimension of said plate in the direction of its travel, said second rubbing surface being reciprocable upon said exposed surface, but out of phase with said first rubbing surface, to offset the torque generated by said first rubbing surface,

e. means for applying washing fluid to said exposed surface in the washing stage,

f. a second pair of coupled drive rolls adapted to strip excess washing fluid from said exposed surface and to urge said plate to the gumming stage,

g. means for applying gum to said exposed surface in the gumming stage,

h. third rectilinearly reciprocable rubbing means having a resilient third rubbing surface adapted to be disposed in frictional sliding contact with said exposed surface to rub said gum on said exposed surface, said third rubbing surface being reciprocable upon, said exposed surface,

i. a third pair of coupled drive rolls adapted to strip excess gumming fluid from said exposed surface,

j. bottle shaker means to agitate containers of said developer fluid and gum reciprocable in simple rectilinear motion in a plane essentially orthogonal to the plane of motion of said first, second and third rubbing surfaces,

k. a first drive means, said drive means comprising

i. a crank arm mounted for rotation about a first axis, said first axis extending parallel with the direction of reciprocation of said rubbing surfaces, a stub shaft mounted on said crank arm in spaced relation with said first axis for rotation with said crank arm about said first axis,

ii. first, second and third rod means, having ends, one end of each of said rod means journalled on said stub shaft,

iii. means interconnecting the other end of said first rod means and said first rubbing means to effect rectilinear reciprocation of said first rubbing means in response to rotation of said stub shaft about said first axis,

iv. means interconnecting the other end of said second rod means and said second and third rubbing means to effect rectilinear reciprocation of said second and third rubbing means in response to rotation of said stub shaft about said first axis,

v. means interconnecting the other end of said third rod means and said bottle shaker means to effect rectilinear reciprocation of said bottle shaker means in response to rotation of said stub shaft about said first axis, and

a second drive means, disposed in driving engagement with said drive rolls, to actuate said drive rolls to transport each of said plates through said stages.

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