Aug. 31, 1965 W. WANIELISTA ETAL 3,203,335

DEVELOPING APPARATUS FOR PHOTOGRAPHIC EQUIPMENT

Filed Feb. 29, 1960 4 Sheets-Sheet 1

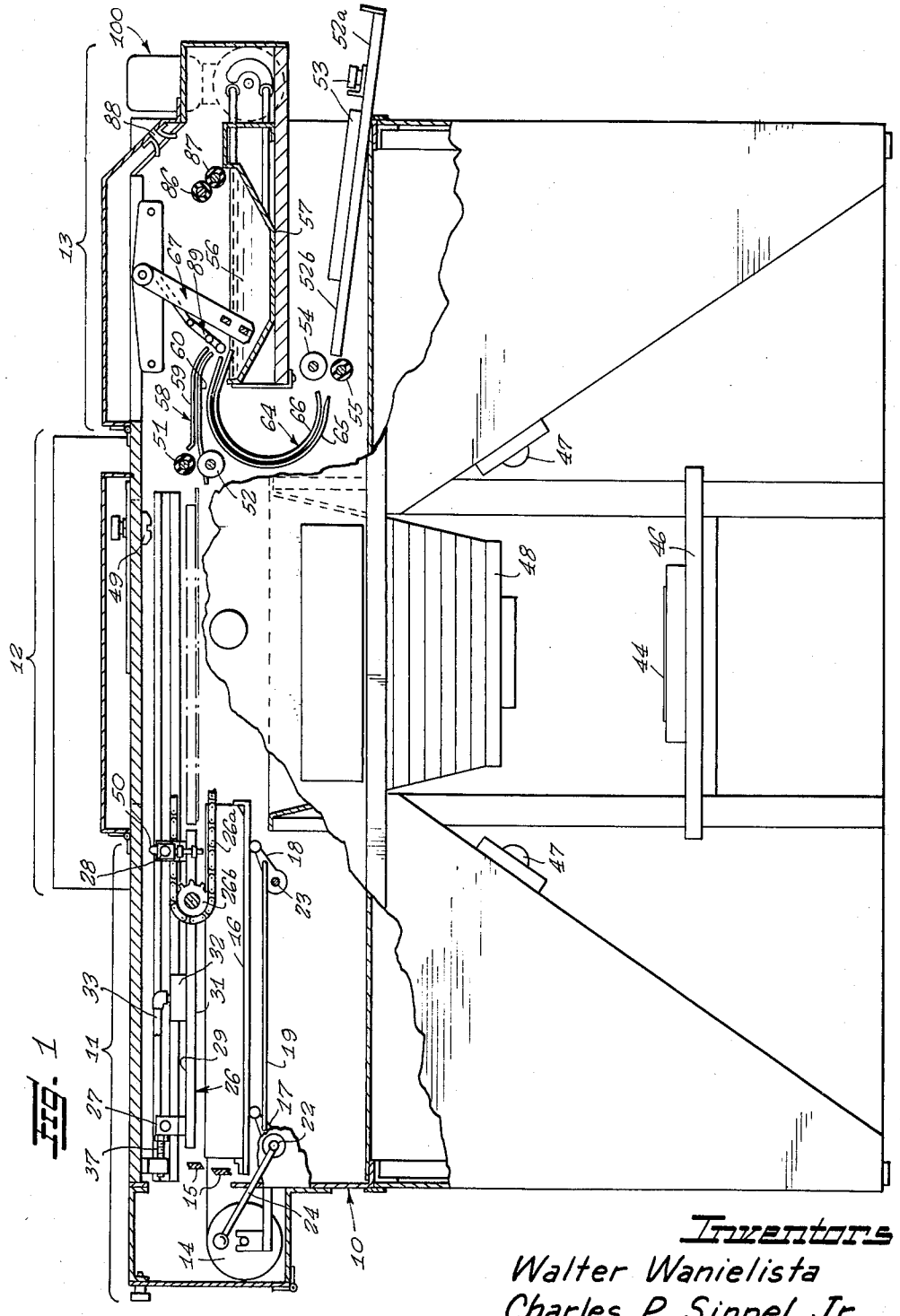


Fig. 1

Inventors
Walter Wanielista
Charles P. Sippel Jr.

By Hill, Sherman, Meroni, Gross & Simpson Attys

Aug. 31, 1965 W. WANIELISTA ETAL 3,203,335

DEVELOPING APPARATUS FOR PHOTOGRAPHIC EQUIPMENT

Filed Feb. 29, 1960 4 Sheets-Sheet 2

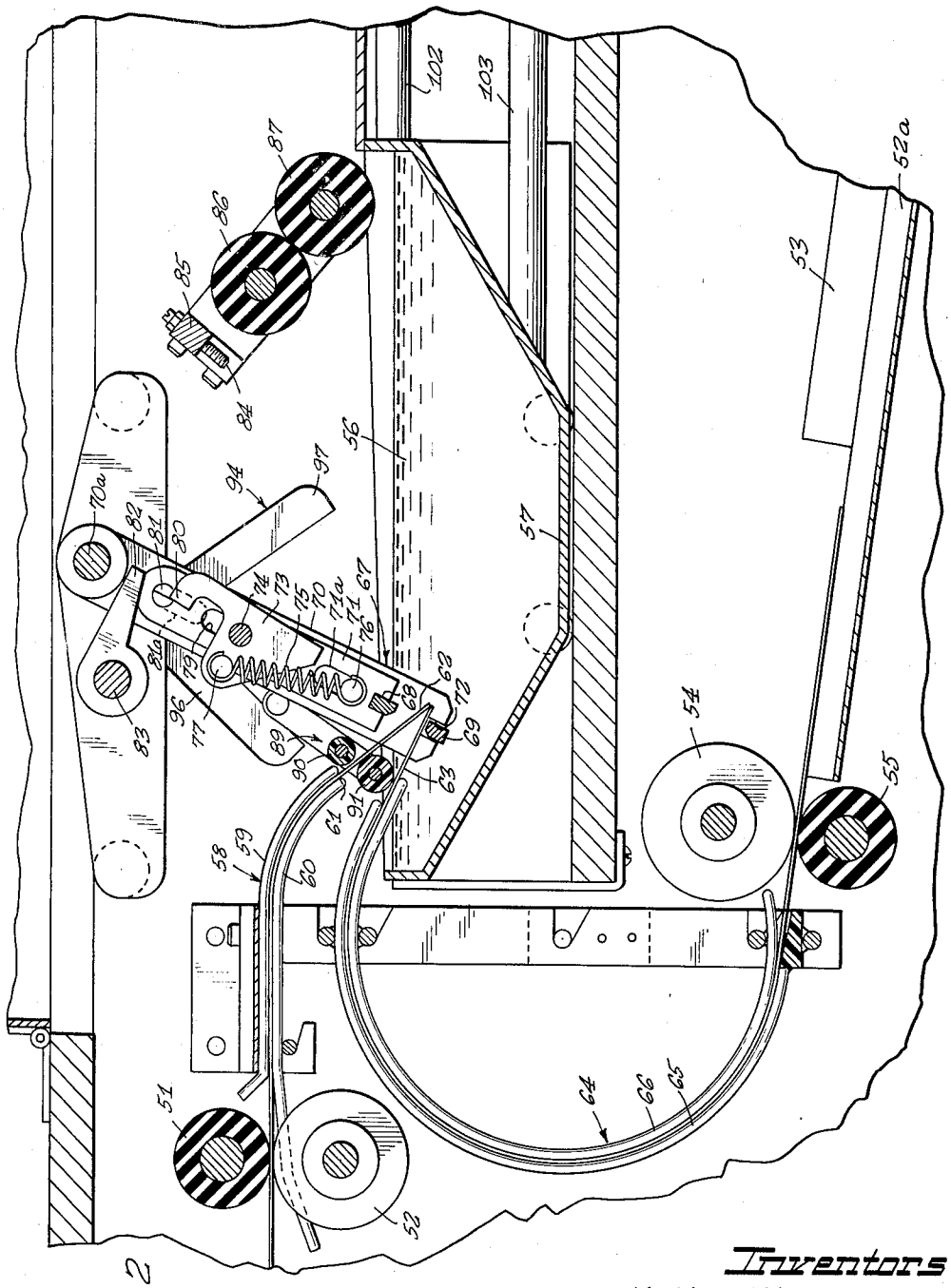


Fig. 2

Inventors
Walter Wanielista
Charles P. Sippel Jr.

By Hill, Sherman, Meroni, Gross & Simpson Attys

Aug. 31, 1965 W. WANIELISTA ETAL 3,203,335

DEVELOPING APPARATUS FOR PHOTOGRAPHIC EQUIPMENT

Filed Feb. 29, 1960 4 Sheets-Sheet 3

FIG. 3

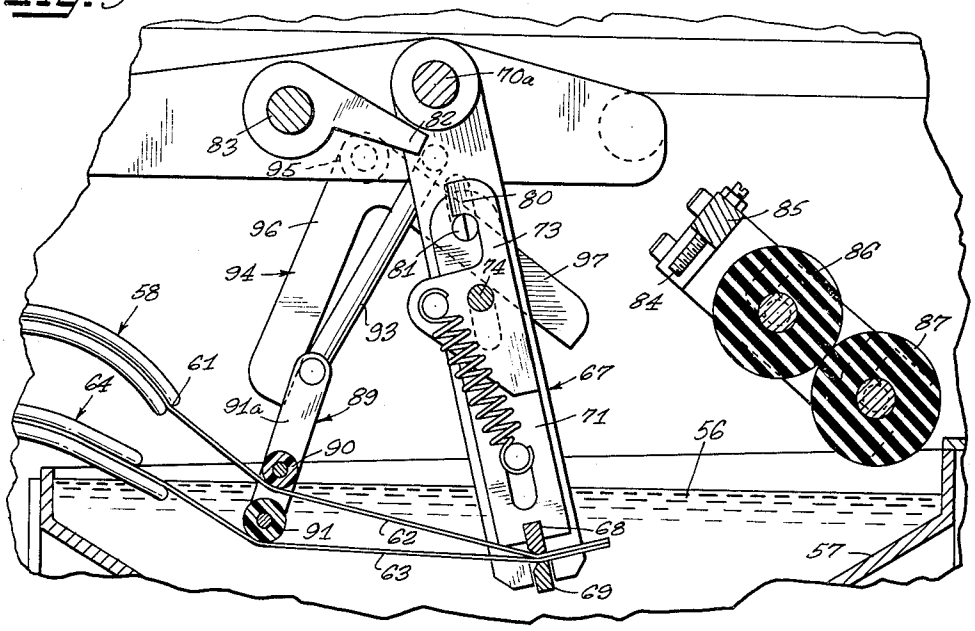
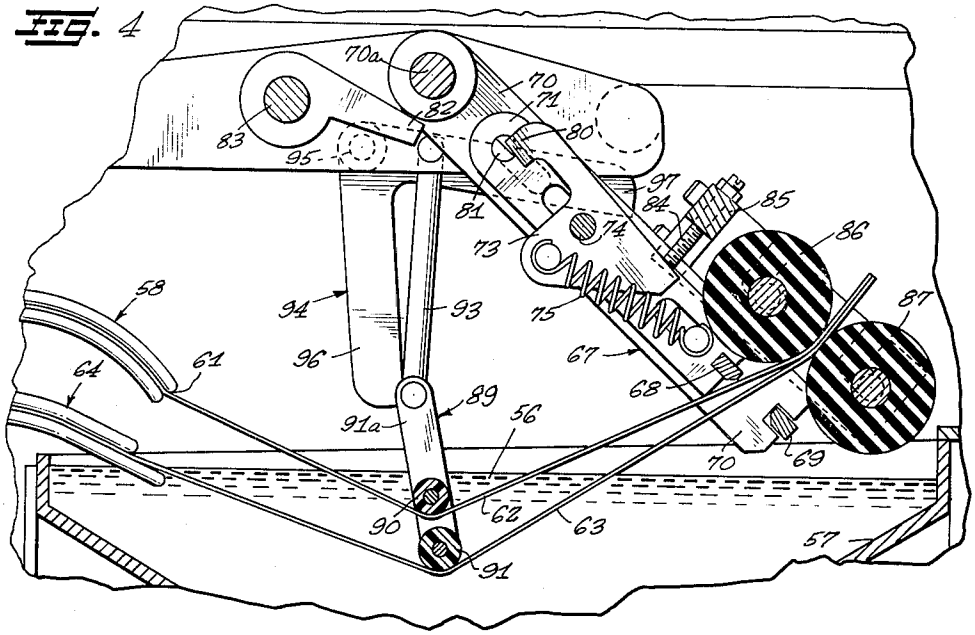


FIG. 4



Inventors
Walter Wanielista
Charles P. Sippel Jr.

By Hill, Sherman, Meroni, Gross & Simpson Attys

Aug. 31, 1965 W. WANIELISTA ETAL 3,203,335

DEVELOPING APPARATUS FOR PHOTOGRAPHIC EQUIPMENT

Filed Feb. 29, 1960 4 Sheets-Sheet 4

FIG. 5

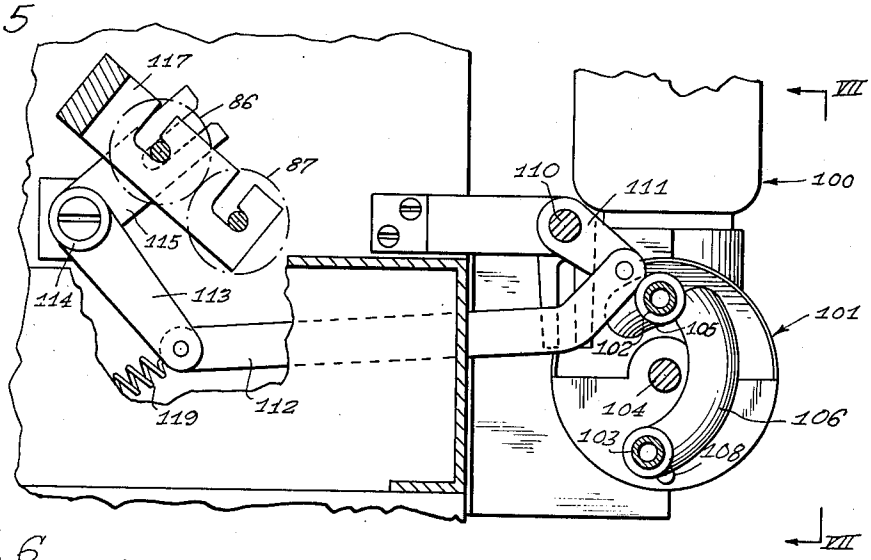


FIG. 6

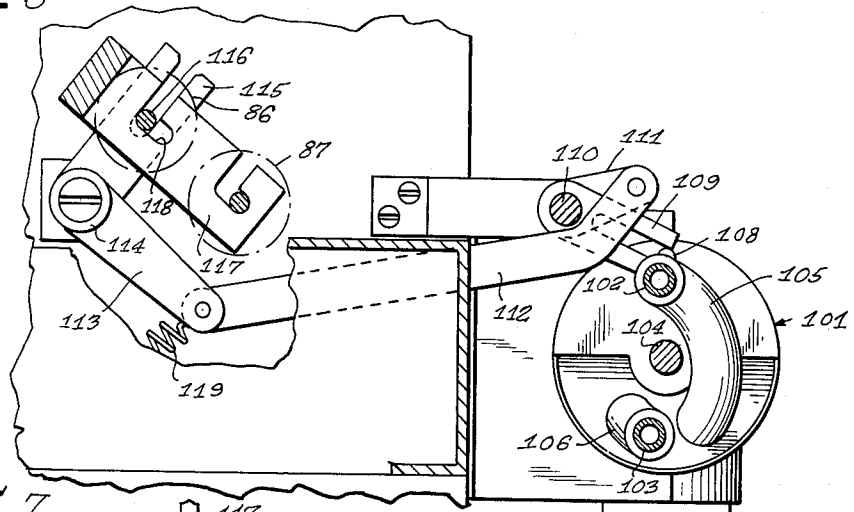
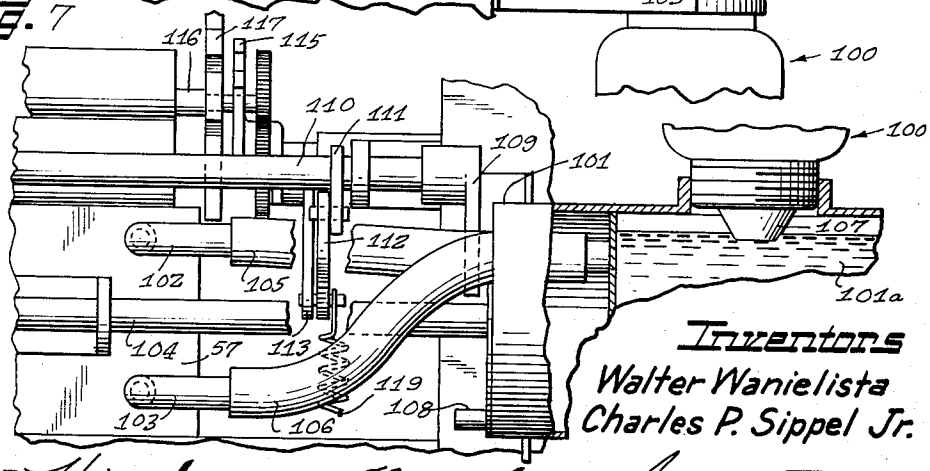


FIG. 7



Inventors
Walter Wanielista
Charles P. Sippel Jr.

By Neil. Sherman Meroni Gross & Simpson Attys

United States Patent Office 3,203,335 Patented Aug. 31, 1965

3,203,335 DEVELOPING APPARATUS FOR PHOTOGRAPHIC EQUIPMENT

Walter Wanielista, Westchester, and Charles P. Sippel, Jr., Villa Park, Ill., assignors, by mesne assignments, to A. B. Dick Company, Chicago, Ill., a corporation of Illinois

Filed Feb. 29, 1960, Ser. No. 11,764
4 Claims. (Cl. 95—89)

The present invention relates to improvements in reproducing mechanisms such as for making printing plates and particularly to an apparatus for receiving a sheet bearing a latent image and aligning it with a press sheet drawing the sheets through a pool of developing liquid and subsequently pressing the sheets together to transfer the image to the press sheet.

The present invention contemplates the provision of a machine for substantially automatically performing a series of steps involved in making plates for offset printing machines. Individual photographically sensitized sheets are provided from a supply roll at a storage supply station, carried to an exposure station where a latent image is produced on the sensitized face of the sheet, and subsequently delivered to a developing station where the latent image on the sensitized paper is developed and transferred to a press plate member. The present invention relates primarily to the mechanism for effectively assembling the sheet with the latent image and the press sheet, submerging them in a bath of developing liquid and pressing them together to transfer the image.

An object of the invention is to provide a mechanism which will accurately align a photographically sensitized sheet bearing a latent image with a press sheet and draw the sheets through a developing liquid while maintaining the sheets separated for full contact with the liquid and thereafter automatically press the sheets together to transfer the image to the press sheet.

Another object of the invention is to provide improved guiding mechanisms for the sheets which will not abrade the sheet surfaces and which are capable of a long operating life without wear and consequent scratching of the sheet surfaces.

A further object of the invention is to provide a mechanism for developing and transferring a latent image on a sheet wherein the mechanism can be simply put in operative condition by inverting a fixture supporting a container of developing liquid and the mechanism may be placed in inoperative condition by again turning the container to upright position.

Another object of the invention is to provide an improved mechanism for handling and conveying the sheets bearing the latent image and the press sheets in a reproducing mechanism of the type described above.

Other objects and advantages will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings, in which:

FIGURE 1 is a side elevational view of an overall machine for making photographic copies or duplicates or printing plates, having parts broken away for purposes of illustration;

FIGURE 2 is a side elevational view with parts removed of a mechanism for developing a latent image on a sheet and transferring the image to a press sheet;

FIGURE 3 is a fragmentary side elevational view of some of the mechanism of FIGURE 2 illustrating the sheets being drawn through a pool of developing liquid;

FIGURE 4 is a fragmentary side elevational view of the mechanism of FIGURE 3 showing the mechanism at a more advanced stage of operation;

FIGURE 5 is a fragmentary side elevational view, with parts broken away, showing the mechanism for filling or draining the container of developing liquid, with the parts in position for filling the container;

FIGURE 6 is another view of the mechanism of FIGURE 5 with the parts in position for draining the container; and

FIGURE 7 is a vertical sectional view, with parts broken away, taken substantially along line VII—VII of FIGURE 5.

As shown on the drawings:

In FIGURE 1 the reference numeral 10 indicates generally a housing for the photographic assembly embodying the principles of the invention, the assembly being divided for purposes of description into three sections identified as a storage supply station 11, an exposure station 12, and a developing station 13. The storage supply station 11 is made light tight, as are the other stations of the machine, and includes a roll 14 of photographically sensitized sheet material, such as paper, supplied to a vertically movable platform 16 and cut off in sheet lengths by cutter 15. In some instances, the platform 16 may be replaced by a magazine containing individual sheets.

The platform 16 is supported on a pair of opposed arms 17 and 18 connected by means of rods 19 and secured to their respective shafts 22 and 23. The connected arms serve to raise and lower the platform 16 by the operation of a manually operated crank arm 24 secured to the shaft 22 and accessible outside of the housing 10. The individual sheets from the platform 16 are conveyed through the photographic assembly by means of a carrier indicated generally at 26. The carrier 26 in a preferred form includes cross top rails 27 and 28 secured to a top plate 29. A lower plate 31, beneath the top plate 29, has a grooved face and is joined to the upper plate 29 to provide a vacuum plate or holder generally referred to as a vacuum back, for transporting individual sheets of the paper from the platform 16 when it is elevated, to the exposure station 12, and subsequently to feed the sheets to the developing station 13. Affixed to the top plate 29 is a vacuum box 32 which is connected by means of a tube 33 to a suitable source of reduced pressure such as a pump. When the carrier 26 is in the storage supply station 11, the platform 16 is raised and the cutter 15 automatically severs a sheet from the supply on the roll 14. The sheet is moved against the lower plate 31 which grips it for carrying it through the machine after the platform is lowered by the operation of the crank 24. Although the illustrated form of the invention contemplates a vertically movable magazine, it will be appreciated that the relative movement could also be effected by vertical adjustment of only the vacuum back or by vertical adjustment of both the magazine and vacuum back.

The carrier 26 is moved through the assembly and supported and guided such as by connecting the cross top rails 27 and 28 to rollers or slides guided on rails extending longitudinally through the machine, inwardly from the side walls of the housing 10.

The carrier assembly 26 is positioned automatically in the storage supply station 11, in proper relation to the platform 16 to receive a sheet, by the provision of a stop 37 which may be adjustable to control the position of the sheet on the carrier.

The carrier assembly 26 is detachably secured to a chain 26*a* passing over suitable sprockets such as 26*b* one of which may be driven by a crank wheel, not shown, accessible from outside of the housing to drive the carrier assembly from the supply station 11 to the exposure station 12. In the exposure station 12, the sheet of

sensitized paper transported by the carrier assembly 26 is exposed to produce a latent image on its sensitized face. A copy 44 to be reproduced is supported on a vertically adjustable copy table 46 and is illuminated by spaced lights 47. A camera assembly, indicated generally at 48 includes a lens system which focuses the image on the sensitized paper sheet above. The sensitized paper sheet is exposed for an appropriate time interval dependent upon an electrically operated timer, not shown.

The carrier 26 is automatically stopped in position to be exposed to the image projected by the camera mechanism 48, by an adjustable stop mechanism including a catch 49 which releasably receives a latch 50 on the cross rail 28. After the image sheet is exposed to the image the latch is released and the sheet is transferred to the developing station by the carrier being moved forwardly until the image sheet extends between a pair of rubber-covered feed rollers 51 and 52 mounted on shafts.

The mechanism of the developing station 13, including the feed rollers 51 and 52, is preferably driven by a single motor operatively connected to drive chains and sprockets and cams. Inasmuch as the particular details of the drive connections are not significant and will be apparent with the description of the structure and function of the elements driven thereby, they will not be described in detail.

In the developing station 13, a press plate preferably in the form of a sensitized aluminum sheet is supplied to the machine by being positioned on a press plate support 52*a* provided with suitable positional adjustment mechanism 53. The aluminum sheet press plate, which for convenience may be referred to as a press sheet, is sufficiently long to be received in the nip between a pair of separable feed rollers 54 and 55 which are suitably driven by the development station motor. Upon energization of the motor the press sheet feed rollers 54 and 55 are closed to feed the sensitized press sheet upwardly, and the image sheet feed rollers 51 and 52 are also closed to feed the image sheet forwardly. The two sheets will be brought together in alignment and submerged beneath the surface of a developing liquid 56 in a developing tank 57.

As illustrated in FIGURES 1 through 4, a first upper guide cage 58 guides an image sheet 62 forwardly toward the container 57 when the feed rolls 51 and 52 are closed. The first or upper guide cage 58 may be formed of upper and lower guide members 59 and 60 which are coated with a suitable non-abrasive material, particularly at their lower tips 61. The lower tip of the upper guide member 59 has been found to require an especially heavy coating and is preferably coated with a discrete thickness of material sufficient to provide an anti-abrading peripheally continuous contact surface. A material such as polytetrafluoroethylene is suitable for use in practicing the principles of this invention. The guide members may be formed of a plurality of parallel shaped curved rods or wire-form members which are secured to each other by suitable cross members, with each of the guide members being separably removable for cleaning or for repair.

It is further contemplated by the present invention to form an anti-abrading support surface 52*b* on the press plate support 52*a* by coating the surface presented to the sensitized aluminum sheet with a thin coating of polytetrafluoroethylene.

A lower or second guide cage 64 is provided for a press sheet 63 with the guide cage being formed of separate guide members 65 and 66. These guide members may also be constructed of separate shaped rods extending in the direction of movement of the sheet and fixedly attached to each other with each of the members being individually removable for disassembly.

The guide cages direct the sheets together in an aligned relationship to a carrier 67.

The carrier 67 is provided with upper and lower gripping bars 68 and 69 which extend across the machine to grip the leading end of the sheets 62 and 63 between them.

For gripping, the bars are moved together to the position shown in FIGURE 3. To effect this purpose, the bars are supported and carried on downwardly depending arms 70 which are secured and hung on an upper cross shaft 70*a* that is pivotally driven to swing the arms 70 and the gripper bars through a path to drag the sheets through the liquid developer 56 in the container 57.

The lower gripper bar 69 is positioned in a slot 72 in the arm 70 and biased upwardly by a spring, not shown. The upper gripper bar 68 is secured to the lower end of a plate 71, having a slot 79 therein to be vertically guided by a pin 74. The pins 76 and 81 are secured to the plate and extend into slots 71*a* and 81*a* respectively in the arm 70.

For gripping the paper, the plate 71 is pushed downwardly from the position of FIGURE 2 to the position of FIGURE 3 by an arm 82 on a shaft 83 which is pivoted by a cam driven by the developing station motor. A latch pin 81 on the plate 71 drops beneath a hook 80 on a latch plate 73 pivotally mounted on the pin 74. This holds the plate 71 down and holds the gripping bar 68 against the sheets. The latch plate 73 is urged continually toward latched position by a coiled tension spring 75, connected at its lower end to the pin 76, and at its upper end to a pin 77 eccentrically mounted on the latch plate. The spring 75 thus serves a dual purpose, that of urging the latch plate 73 toward latched position and that of urging the plate 71 upwardly to separate the gripper bars when the latch plate 73 is released.

The latch plate 73 is released in the manner illustrated in FIGURE 4, when the carrier arm 70 has swung to its extreme right and a trip pin 84 adjustably mounted in a block 85 strikes the lower end of the latch plate. This pivots it to release position, releasing the pin 81 and permitting the plate 71 to snap upwardly carrying the upper gripper bar 68 away from the lower gripper bar 69.

When the lead ends of the sheets are brought to the location of FIGURE 4 where the gripper bars 68 and 69 are separated, the sheets have been fed between a pair of pressure rolls to press the sheets together and transfer the image from the image sheet 62 to the press sheet 63. The sheets are then drawn from the machine through a convenient slot 88 in the housing 10, FIGURE 1, and peeled apart to obtain the finished printed press sheet.

Means are provided to separate the sheets during the path of travel of the carrier 67 through the pool of developing liquid to insure flow of the liquid between the sheets and contact with the surfaces thereof, and to insure submergence of the sheets.

This mechanism takes the form of a separator 89.

The separator has an upper bar 90 which is positioned adjacent the discharge end of the upper guide 58 so as to hold the image sheet 62 downwardly and reduce the drag of the sheet on the end 61 of the guide 58 when the sheets are being pulled through the developing fluid, in the manner illustrated in FIGURE 3. The guide 58 is shaped to direct the lead end of the sheet 62 between the gripper bars in the position of FIGURE 2, and the curvature necessary to accomplish this creates a sharp point of contact between the sheet and the upper guide member 58. The positioning of the separator bar 90 reduces the angle and the drag pressure thereby reducing the wear over continued use of the machine. The upper separator bar 90 also insures submergence of the upper sheet as it is being pulled through the liquid in the manner illustrated in FIGURES 3 and 4.

A lower separator bar 91 is positioned between the sheets so that they are separated when received by the gripper bars 68 and 69 in FIGURE 2. The lower separator bar 91 stays between the sheets to insure that developing liquid gets between them when the sheets are being drawn through the developing liquid as shown in FIGURES 3 and 4. The separator bars 90 and 91 extend

across between a separator support including a lower arm **91***a* which is suspended on an offset upper arm **93**. The connection between the two arms is rigid and the upper arm is offset so that a driving means in the form of a bellcrank **94** may engage the offset portion and drive the separator **89** in a trailing fashion behind the carrier **67**. The upper end of the arm **93** is pivotally supported on the frame for the mechanism and the separator bars will be directly adjacent the gripper bars **68** and **69** in the position of FIGURE 2. They will remain substantially in this position as the carrier moves forwardly to the position of FIGURE 3. At this point the pin **74** strikes the forward arm **97** of the bellcrank and the rear arm **96** engages the offset portion of the arm **93** thereby driving the separator bars **90** and **91** a spaced distance behind the carrier.

The developing liquid **56** is supplied to the open developing container from a closed supply container **100** such as a bottle. The supply container is suitably mounted such as by threading to the top of a supply container mount **101** which is hollow so as to have a transfer chamber **101***a* therein. Connected to communicate between the transfer chamber and an upper level in the developing container is a filling level conduit **102** which determines the level of the liquid in the developing container **57**. Also communicating between the transfer chamber **101***a* and the developing container or tank **57** is a drain conduit **103**. The filling level conduit **102** and drain conduit **103** may include flexible tubes **105** and **106** respectively which permit the mount **101** to be pivoted through 180° on its supporting shaft **104**. The pivotal support of the mount permits the supply container **100** to be turned to the inverted position, as illustrated in FIGURE 5, when the machine is in operation, or to be turned to an upright position, as illustrated in FIGURE 6 when the machine is at rest in storage condition.

The supply container **100** is arranged to have an opening member **107** which projects down into the transfer chamber **101***a* with an air space above it so that the liquid in the container **57** is maintained at a constant level. That is, when the liquid drops air will be permitted to enter through the opening **107** of the supply container and liquid will flow down into the transfer chamber until the opening **107** is again covered.

It will thus be seen that the bottle can be tipped down to automatically drain the tank **57** at the end of the day's run, and can be easily tipped upwardly to inverted position to again automatically fill the tank at the start of a day's run.

The pressure rollers **86** and **87** are automatically separated when the machine is put in the rest or storage position by a linkage which is connected between the supply container mount **101** and the rollers. As illustrated in FIGURES 5 through 7, the mount **101** has an eccentric pin **108** thereon received by the bifurcated end of an arm **109** secured to a shaft **110**. Also secured to this shaft is an arm **111** connected to a link **112** which transfers movement of the arm **111** to a crank arm **113** secured to a pivotal pin **114** which carries a bifurcated arm **115**. The end of the arm **115** extends over a shaft **116** of the roller **86** so as to move the roller to an open position away from the roller **87** or toward the roller **87**. With the linkage above described, when the supply container **100** is swung to the lower upright position as illustrated in FIGURE 6, the pressure rollers are automatically separated. This permits cleaning the rollers and, as illustrated in FIGURE 6, the rollers are supported in an end member **117** which permits them to be removed. The separation of the rollers also prevents the developing fluid from drying on the surface and causing the rollers to stick together.

When the supply container **100** is tilted to the inverted position of FIGURE 5, the rollers **86** and **87** are moved together for operation. A tension spring **119** aids in urging the rollers together.

In general operation of the mechanism, the operator, as illustrated in FIGURE 1, moves the arm **24** to cause the platform **16** to elevate a sheet up against the vacuum back of the carrier **26**. The carrier is then moved forwardly to the exposure station **12** and a latent image is placed on the sheet. The carrier is then moved forwardly to insert the leading end of the sheet between the feed rollers **51** and **52** and the developing motor is started whereupon the feed rollers **51** and **52** are moved together and the feed rollers **54** and **55** are moved together. The image sheet and the press sheet are fed upwardly through the guide cages **53** and **64**, to be gripped by the gripping bars **68** and **69** and drawn through the developing liquid **56**, held separated and submerged by the separator bars **90** and **91**. The sheets are received and pressed together to transfer the image to the press sheet by the pressing rollers **86** and **87**.

Thus it will be seen that we have provided an improved reproducing mechanism meeting the objectives and advantages hereinbefore set forth. The arrangement automatically and simply develops and transfers the image to a press plate virtually in one simultaneous operation and provides a reliable mechanism which is relatively simple to construct and maintain.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, and it is to be understood that the invention is not limited to the specific forms disclosed, but covers all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by the invention.

We claim as our invention:

1. In a reproducing mechanism, a container for a pool of developing liquid, first means for guiding a sheet bearing a latent image toward said pool, second means for guiding a press sheet toward said pool, a carrier means receiving the sheets from said guide means and simultaneously moving said sheets into the liquid, a sheet separator including an upper bar positioned above the uppermost of said sheets and a lower bar positioned between said sheets, a separator support moving the separator from a first position where the upper bar guides the uppermost sheet as it leaves the first guiding means to prevent abrasion and to successive positions in a trailing relation to said carrier means while said separator guides both sheets through the pool of liquid to maintain the sheets separated and hold the upper sheet submerged, and means positioned to receive the sheets from the carrier means and press the sheets together to transfer the image to said press sheet.

2. In a reproducing mechanism, a container for a pool of developing liquid, first means for guiding a sheet bearing a latent image toward said pool, second means for guiding a press sheet toward said pool, a carrier means for gripping the lead ends of the sheets as they leave said guiding means, a sheet separator including an upper bar positioned above the uppermost sheet and a lower bar positioned between said sheets, means for driving the carrier means from a sheet receiving position adjacent said sheet separator in a path through the pool of liquid, pressing means positioned to receive the sheets from the carrier means and press said sheets together to transfer the image to said press sheet, and means for driving the sheet separator in a trailing position spaced a substantial distance behind said carrier means for maintaining the sheets separated and holding the sheets submerged.

3. In a reproducing mechanism, a container for a pool of developong liquid, first means for guiding a sheet bearing a latent image toward said pool, second means for guiding a press sheet toward said pool, a swingable carrier means receiving the sheets from said guide means and simultaneously moving said sheets into the liquid, a sheet separator including an upper bar positioned above the uppermost of said sheets and a lower bar positioned between said sheets, a swingable separator support mov-

ing the separator from a first position where the upper bar guides the uppermost sheet as it leaves the first guiding means to prevent abrasion and to successive positions in a trailing relation to said carrier means while said separator guides both sheets through the pool of liquid to maintain the sheets separated and hold the supper sheet submerged, and means positioned to receive the sheets from the carrier means and press the sheets together to transfer the image to said press sheet.

4. In a reproducing mechanism, a container for a pool of developing liquid, first means for guiding a sheet bearing a latent image toward said pool, second means for guiding a press sheet toward said pool, a swingable carrier means for gripping the lead ends of the sheets as they leave said guiding means, a swingable sheet separator including an upper bar positioned above the uppermost sheet and a lower bar positioned between said sheets, means for driving the carrier means from a sheet receiving position adjacent said sheet separator in a path through the pool of liquid, pressing means positioned to receive the sheets from the carrier means and press said sheets together to transfer the image to said press sheet, and

means for driving the sheet separator in a trailing position spaced a substantial distance behind said carrier means for maintaining the sheets separated and holding the sheets submerged.

References Cited by the Examiner

UNITED STATES PATENTS

1,328,305	1/20	Sussman	95—89
1,664,731	4/28	Beidler	95—94
1,819,536	8/31	Beidler	95—94
2,031,010	2/36	Simjian	95—89
2,664,801	1/54	Eisbein	95—89
2,732,778	1/56	Limberger	95—77.5
2,751,814	6/56	Limberger	95—89
2,762,281	9/56	Kleinstra	95—89
2,839,978	6/58	Trump	95—89 X
2,865,275	12/58	Ruijs	95—89

NORTON ANSHER, *Primary Examiner.*

D. B. LOWE, E. E. FULLER, L. W. VARNER, JR., *Examiners.*