Aug. 2, 1966 W. WANIELISTA ETAL 3,263,590

PROCESSOR FOR PHOTO-DIRECT MATERIAL

Filed July 9, 1963 5 Sheets-Sheet 1

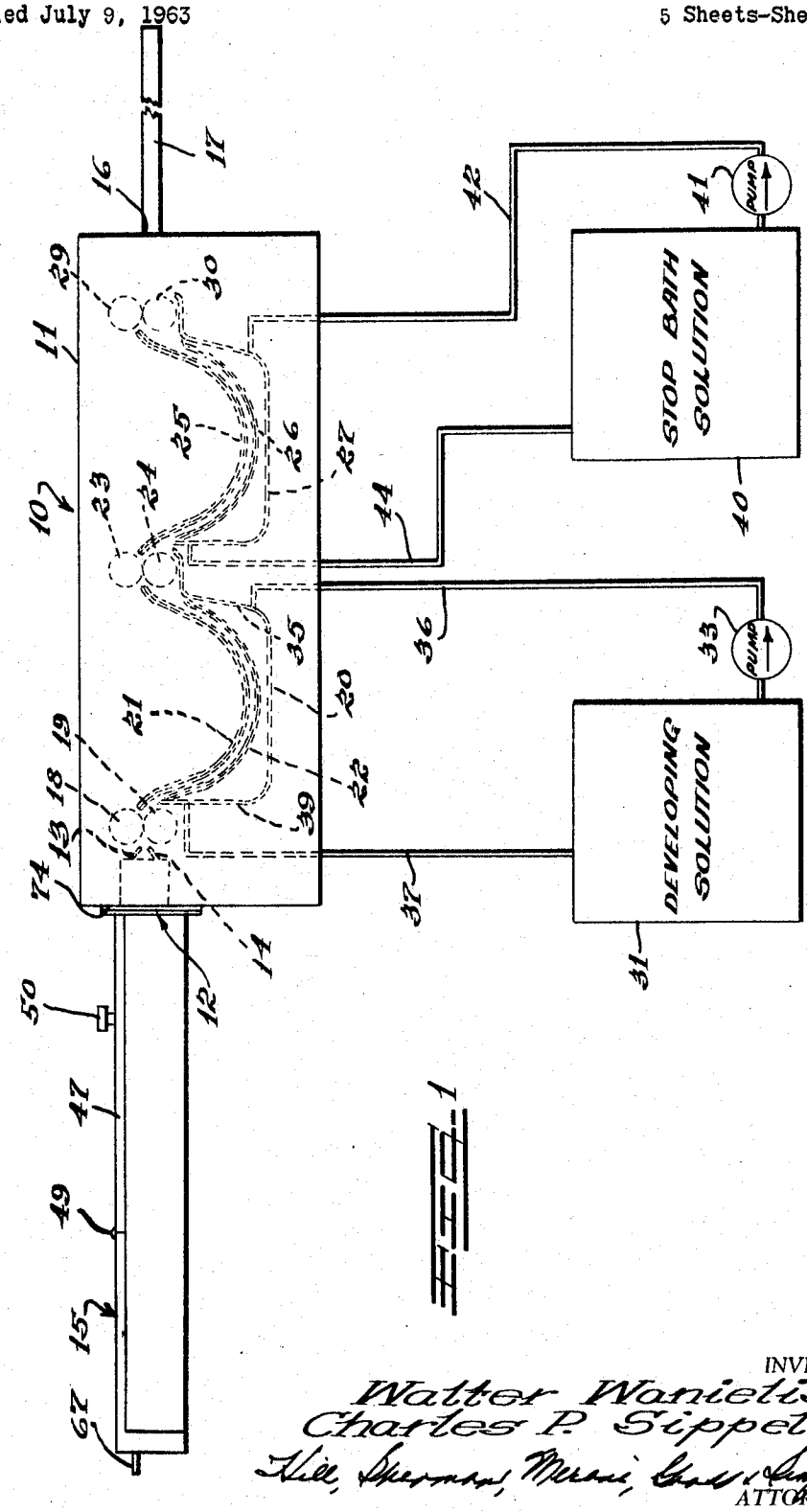


FIG. 1

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Filed July 9, 1963 5 Sheets-Sheet 2

FIG. 3

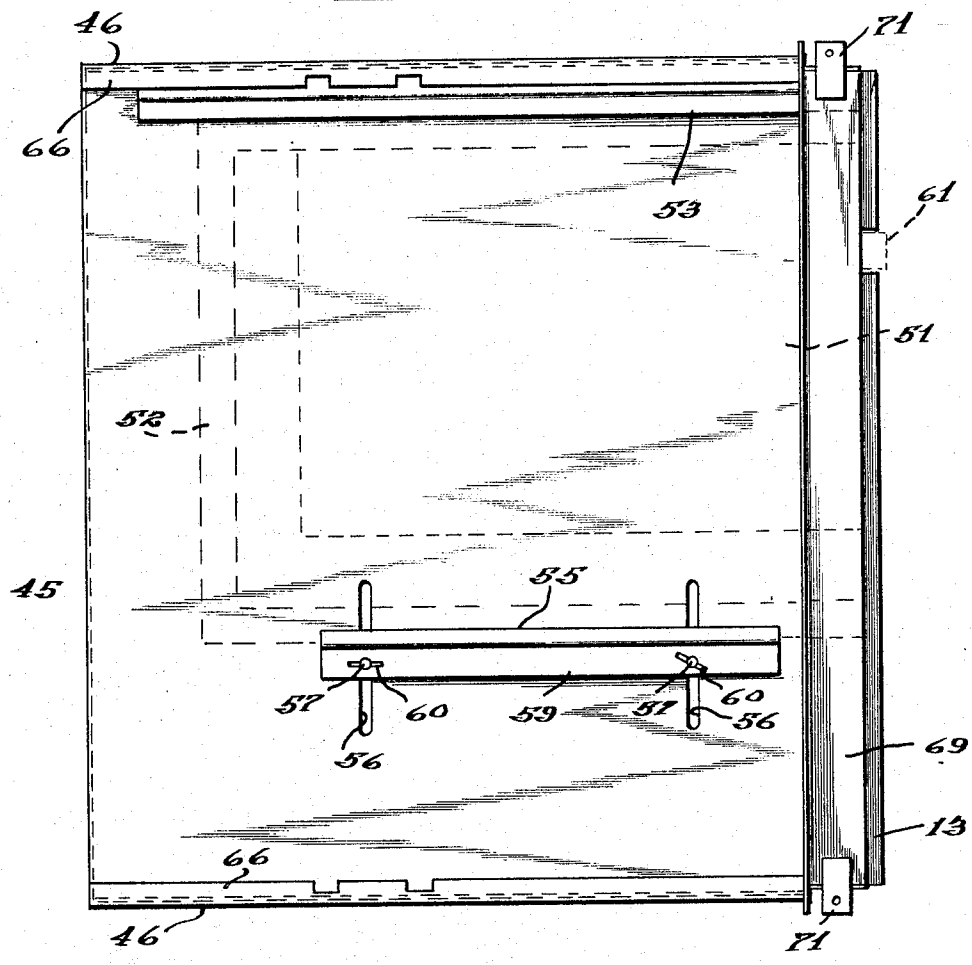
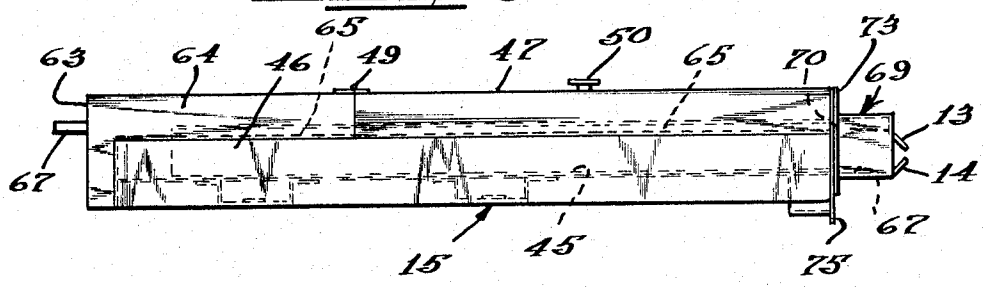


FIG. 2

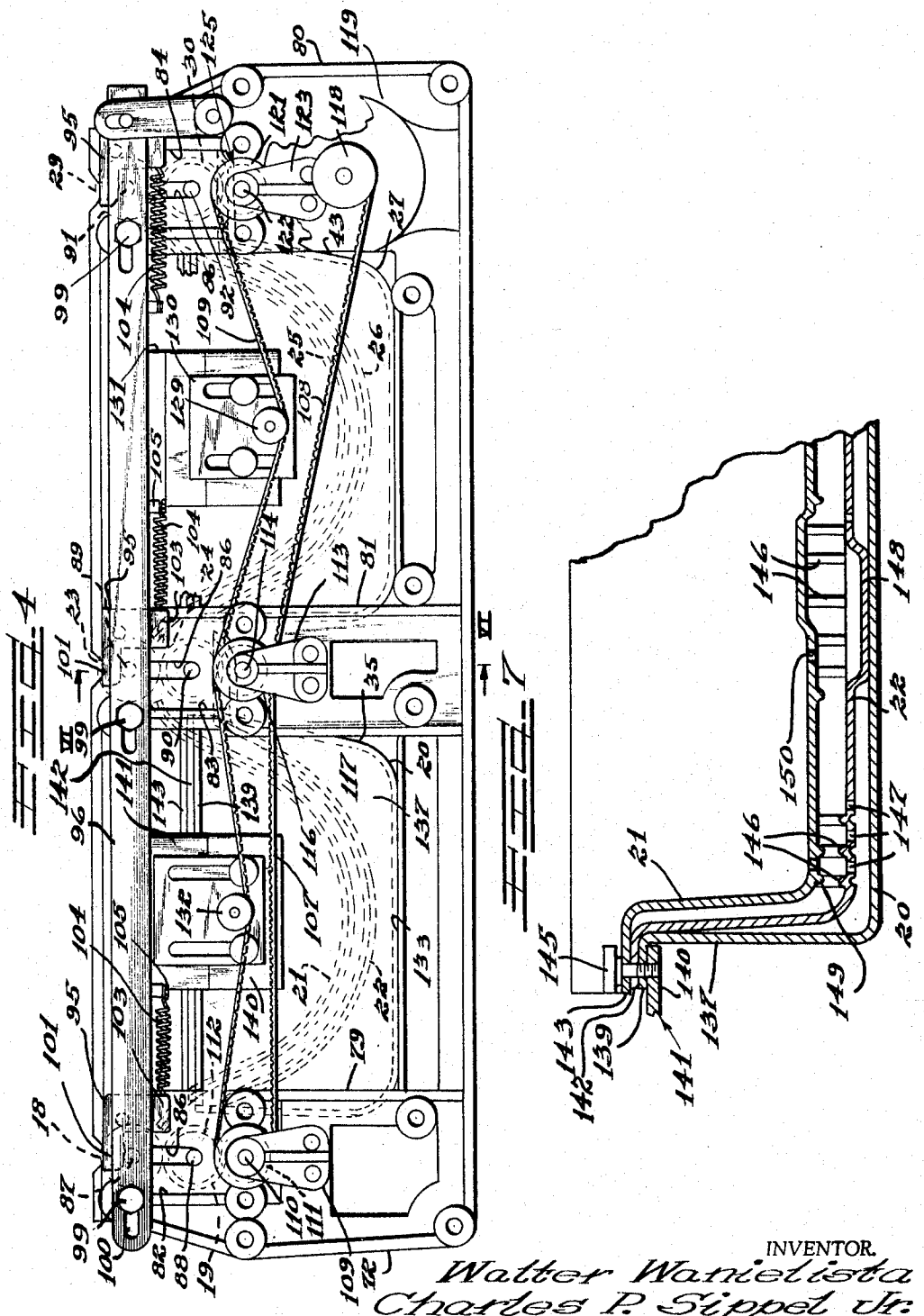


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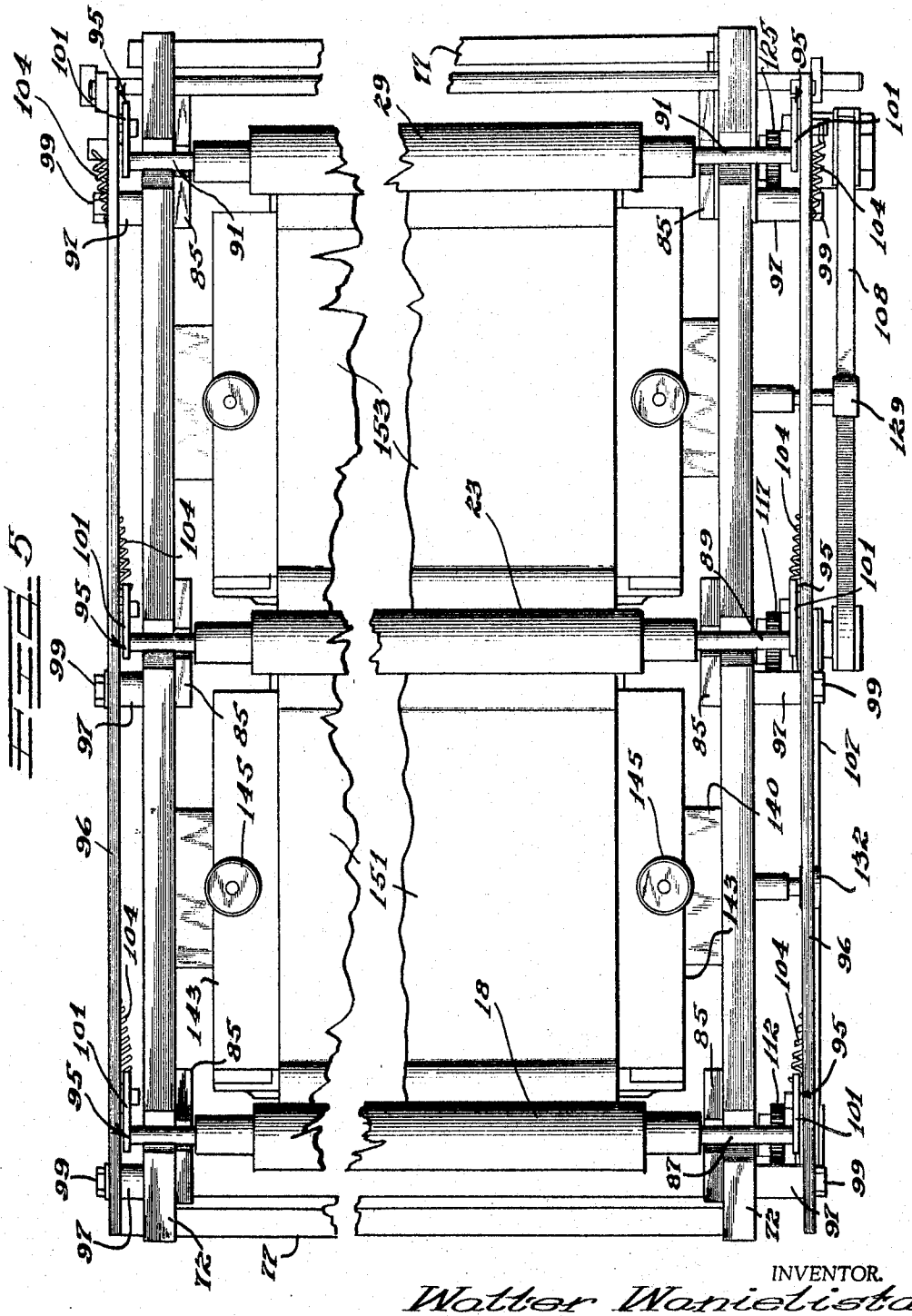
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PROCESSOR FOR PHOTO-DIRECT MATERIAL

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FIG. 5



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PROCESSOR FOR PHOTO-DIRECT MATERIAL

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FIG. 6

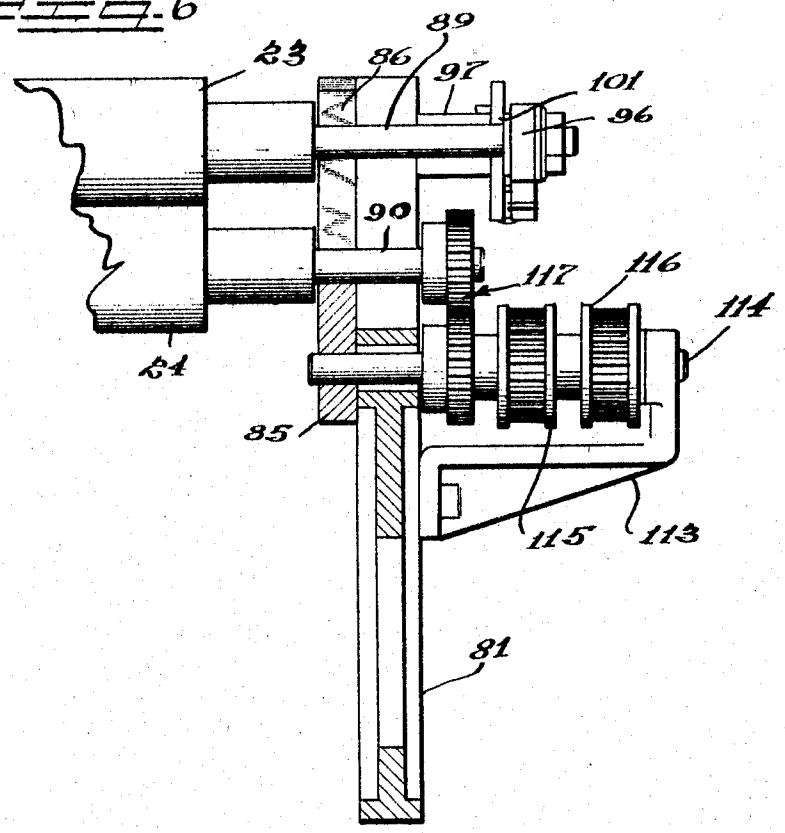
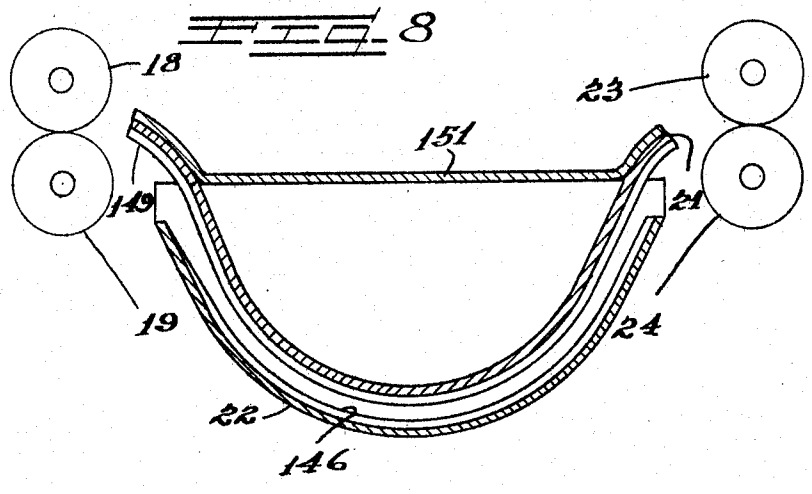


FIG. 8



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United States Patent Office 3,263,590 Patented August 2, 1966

3,263,590

PROCESSOR FOR PHOTO-DIRECT MATERIAL

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Filed July 9, 1963, Ser. No. 293,694
1 Claim. (Cl. 95—94)

This invention relates to improvements in apparatus for processing photo-direct material, such as printing plates and the like.

A principal object of the invention is to provide a novel and improved apparatus for processing photo-direct material such as printing plates and the like in a continuous processing operation.

Another object of the invention is to improve upon the processing of photo-direct materials, such as sensitized printing plates and the like, by utilizing power driven pinch or squeegee rolls for progressing the printing plates through developing and stop bath solutions, and by providing an improved form of guide means between the squeegee rolls for immersing the material in the developing and stop bath solutions.

A further object of the invention is to provide a continuous apparatus for developing sensitized printing plates and the like, in which the developing solutions and stop bath solutions are contained in trays arranged in series, and in which vertically spaced guide troughs serve to immerse the plates in the trays and squeegee rolls progress the plates through the trays and serve to squeegee the solutions from the plates.

A still further object of the invention is to improve upon the precessors heretofore used in the processing of photo-direct printing plates and the like by arranging the developing and stop bath solutions in trays in series and utilizing squeegee rolls to progress the material through the trays and squeegee the solution therefrom and by continuously circulating the developing and stop bath solutions through the trays.

A still further object of the invention is to provide an improved means for guiding and immersing photo-direct printing plates in developing and stop bath solutions, so arranged as to avoid damage to the plates and to accommodate the circulation of solution through the guide means during the operation of processing the printing plates.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a diagrammatic view in side elevation of a processor for photo-direct material constructed in accordance with the principles of the present invention;

FIGURE 2 is a view in side elevation of the loading tray, for loading photo-direct printing plates for processing in the processing apparatus;

FIGURE 3 is a plan view of the loading tray shown in FIGURE 2;

FIGURE 4 is a view in side elevation of the processor;

FIGURE 5 is a fragmentary plan view of the processor shown in FIGURE 2;

FIGURE 6 is a fragmentary transverse sectional view taken along line VI—VI of FIGURE 4;

FIGURE 7 is a fragmentary sectional view taken substantially along line VII—VII of FIGURE 5, with certain parts broken away in order to illustrate certain details of the guide means for immersing and guiding the printing plates through the developing and stop bath solutions; and

FIGURE 8 is a transverse sectional view taken through

the guides and showing the association of the guides with the squeegee and feed rolls.

In the embodiment of the invention diagrammatically illustrated in FIGURE 1 of the drawings, I have shown a processor **10** contained within a casing **11**, which may be of any suitable form and has an inlet end **12** into which extends upper and lower guides **13** and **14**, of a loading tray **15** for loading photo-direct sensitized printing plates into the processor **10**. The casing **11** also has a discharge opening **16** having a tray **17** in association therewith for receiving the processed printing plates. The tray **17** may be made from a plastic or a like material.

The processor has a pair of upper and lower power driven feed rolls **18** and **19**, respectively, in association with the inlet **12**, a tank **20** for developing solution at the output or discharge ends of said rolls, upper and lower guides trays **21** and **22**, respectively, in association with the feed rolls **18** and **19**, and nested in said tank for immersing and guiding the plates through the developing solution, upper and lower squeegee rolls **23** and **24**, respectively, at the output ends of the guides **21** and **22** for squeegeeing developing solution from the plate and feeding the plate in the space between respective upper and lower guide trays **25** and **26** nested in a tank **27**, for stop bath solution.

Upper and lower squeegee rolls **29** and **30**, respectively, are provided at the output end of the upper and lower guides **25** and **26**, for squeegeeing stop bath solution from the developed plate and advancing the developed plate onto the tray **17**.

The rolls **18**, **19**, **23**, **24** and **29** and **30** may be rubber covered rolls of a conventional form, and are all of the same construction so need not herein be described in detail.

A tank **31** for developing solution of substantially the capacity of the tank or tray **20** may be mounted on the ground separate from the processor, for storing and supplying developing solution to the processor.

A centrifugal pump **33** is connected with the tank **31** to supply developing solution to the tray **20** through a front wall **35** of said tray, by means of a pressure line **36** leading from the pump **33** to the tray **20** and entering the tray through a front wall **35**, adjacent the lower end portion of said wall. A return line **37** leads from a rear wall **39** of the tray **20**, adjacent the upper end portion thereof, for returning developing solution to the tank **31**. The tank **31** may have substantially the same capacity as the tray **20** and the pump **33** may maintain a continuous circulation of developing solution through the tray **20**.

In a like manner, a tank **40** for stop bath solution is mounted separately from the tray **27**. Stop bath solution is circulated through the tray **27** by a centrifugal pump **41** and pressure line **42** leading from said pump into the tray **27** through the front wall thereof. Stop bath solution is returned to the tank **40** through a return line **44** connected from the back wall of the tray **27** to the tank **40**.

The loading tray **15** is shown in FIGURES 1, 2 and 3 as being in the form of a shallow rectangular tray or box having a flat bottom **45**, parallel spaced side walls **46**, and a hinged cover **47**.

The cover **47** is shown in FIGURES 1 and 3 as being hinged intermediate its ends by a transversely extending hinge member **49**, and as having spaced knobs **50** to be grasped by the hand to hinge the forward end portion of the cover upwardly, when it is desired to place an exposed printing plate **51** in said tray. The printing plate **51** may be a conventional form of paper plate having a photo sensitive emulsion on its side, which is its top side when passing through the processor, and having a tab **61** extend-

ing from its advance end, to be grasped by the rolls **18** and **19**.

The printing plate **51** is shown as being mounted in a transport holder **52** placed in the loading tray **15** between a fixed side guide **53** and an adjustable side guide **55**, mounted on the bottom **45** in parallel spaced relation with respect to the side walls **46** and extending upwardly of said bottom. The bottom **45** has parallel transversely extending slots **56** therein through which extend bolts **57**. The bolts **57** may extend through flanges **59** of the adjustable side guide **55** and may have thumb nuts **60** threaded on the upper ends thereof, for retaining the side guide in position when adjusted to retain a selected size of transport plate to the loading tray in position to accommodate the tab **61** of the printing plate to be engaged by the squeegee rolls **18** and **19** and progressed, emulsion side up, along the tank **20** between the upper and lower guides **21** and **22**.

The cover **47** has a back wall **63** extending perpendicular to and downwardly along the rear ends of the side walls **46** beneath the bottom **45** and has parallel depending side walls **64** having inturned flanges **65** which rest on inturned flanges **66** extending inwardly of the flanges **46**. A handle **67** is provided on the back wall **63**, to accommodate removal of the cover, when desired.

The upper and lower guides **13** and **14** are in the form of vertically spaced angularly forwardly extending lips, the lower of which lips or guides extend angularly upwardly and forwardly of a bottom plate **67** of a light seal **69**. The upper guide **13** extends angularly downwardly and forwardly of a front wall **70** of the light seal **69** and terminates in alignment with and in vertically spaced relation with respect to the lower guide **14**. The upper guide **13** is broken away intermediate its ends to receive the tab **61** of a printing plate **51**. Mounting brackets **71** extending laterally from opposite sides of the top of the light seal **69** are provided to mount the forward end portion of the loading tray on opposite side frame members **72** of the processor **10** to extend within the loading or inlet slot **12** of the casing **11**, with the guides **13** and **14** in position to guide a printing plate to pass into the nip between the squeegee rolls **18** and **19**. The light shield **69** has a vertical flange **73** extending about the rear end portion thereof and abutting a front wall **75** of the loading tray **15**. The flange **73** is adapted to abut a rear wall **74** of the casing **11**, to position the light shield **69** within said casing with the center of the space between the guides **13** and **14** in alignment with the nip between the squeegee rolls **18** and **19**, to guide the tabs **61** on the leading ends of the printing plates to be engaged by said squeegee rolls and pulled from the transport tray and pushed through the developing solution by said rolls along the guide formed between the upper and lower guide trays **21** and **22**.

Referring now in particular to FIGURES 4, 5, 6, 7, and 8, the processor **10** includes the parallel spaced side frame members **72**, spaced apart at their forward and rear end portions by spacer bars **77**, and shown as being in the form of an open framework. The open framework extends within and is enclosed by the casing **11**. Each side frame member **72** has end posts **79** and **80** respectively, and a central post **81**. The posts **79**, **80** and **81** have relatively wide upwardly opening slotted portions **82**, **83** and **84** respectively formed therein and registering with bearing plates **85**, **85** having vertically extending upwardly opening slots **86** formed therein. The bearing plates **85**, **85** are secured to the insides of the respective posts **79**, **80** and **81** as by machine screws or a like fastening means threaded in bosses formed integrally with said posts. The slots **86**, **86** in the bearing plates **85** form bearings for the respective squeegee rolls **18** and **19**, **23** and **24** and **29** and **30**. As shown in FIGURES 4 and 5, the slots **86** in the bearing plates **85**, secured to the insides of the posts **79** are adapted to receive and form bearings for upper and lower shafts **87** and **88** of the respective squeegee rolls **18** and **19**. In a like manner the slots **86** in the bearing plates **85**, secured to the insides of the posts **80**, are adapted to receive and form bearings for shafts **89** and **90** of the respective upper and lower squeegee rolls **23** and **24**, while the slots **86** in the bearing plates **85**, secured to the insides of the posts **81**, are adapted to receive and form bearings for upper and lower shafts **91** and **92** of the respective upper and lower squeegee rolls **29** and **30**.

A means is provided for maintaining pressure between said squeegee rolls and accommodating quick release of said rolls, which is shown in FIGURE 4 as being a series of bellcranks **95** transversely pivoted to bars **96** and operatively associated with the upper roll shafts. The bars **96** and bellcranks **95** are mounted to extend along the outer sides of the side frame members **72**, for limited slidable movement with respect thereto. As shown in FIGURES 5 and 6, the bars **96** are spaced outwardly of the side frame members **72** by spacer bosses **97** suitably mounted on said side frame members and having bolts **99** extending outwardly therefrom extending through slots **100** formed in the spacer bars **96** and slidably supporting said spacer bars on the side frame members **72**, and accommodating limited slidable movement of said spacer bars with respect to said side frame members.

Each bellcrank **95** has a generally horizontally extending lever arm **101**, extending over and engaging an upper roll shaft, when the bars **96** are in the position shown in FIGURE 4. Each bellcrank **95** also has a depending lever arm **103** having a tension spring **104** connected to the lower end thereof. Each tension spring **104** extends forwardly of the lever arm **103** and is fixedly connected to a pin **105** threaded in the bottom of the bar **96** and depending therefrom. The springs **104** are pretensioned to maintain the desired pressure on the upper squeegee rolls to maintain a pressurized nip between said rolls during operation of the apparatus. When, however, it is desired to relieve pressure from the rolls, it is merely necessary to move the bars **96** forwardly a distance sufficient to release the lever arms **101** from the top roll shafts. The rolls may then be readily lifted from their slots.

The means for driving the rolls **18**, **19**, **23**, **24**, **29** and **30** is shown in FIGURE 4 as comprising a series of toothed belts **107** and **108**, commonly known as timer belts. As shown in FIGURE 4 a bracket **109** is mounted on the outside of the post **79** and extends outwardly therefrom and forms an outboard support for the outer end of a shaft **110**, journalled at its inner end in the associated bearing plate **95**. The shaft **110** has a spur gear **111** keyed or otherwise secured thereto adjacent the post **79** and meshing with and driving a spur gear **112** keyed or otherwise secured to the outer end of the shaft **88**. The spur gears **111** and **112** are maintained in mesh by the tension of the springs **104** and the bellcranks **95** pressurizing the squeegee rolls **18** and **19**.

A similar bracket **113** is mounted on and extends outwardly of the center post **80**. The bracket **113** forms an outboard bearing support for a drive shaft **114** having two toothed drive pulleys **115** and **116** keyed or otherwise secured thereto. The drive pulley **115** meshes with and drives the timer belt **107**. The pulley **116** meshes with and is driven from the timer belt **108**. A spur gear drive **117** is provided from the shaft **114** to the shaft **90** supporting and driving the lower squeegee roll **24**.

The belt **108** meshes with a toothed pulley **118** driven from a motor **119** at the forward end portion of the processor. The motor **119** may be a speed reducer type of motor of a conventional form in which the pulley **118** is driven from said motor through speed reducer gearing (not shown). The timer belt **108** also meshes with and drives a toothed pulley **121** spaced above the pulley **118** and driving a transverse shaft **122**. The shaft **122** is mounted at its outer end in an outboard bearing support bracket **123** secured to the post **79** and extending out-

wardly therefrom. The shaft **122** like the shaft **100** is journalled at its inner end in an associated bearing plate **85**. A spur gear drive **125** is provided from the shaft **122** to the squeegee roll shaft **92**. A tension idler **129** on a vertically adjustable plate **130** depending from a bracket member **131** is provided to maintain the proper tension on the belt **108**. A similar tension idler **132** is provided to maintain the proper tension on the belt **107**.

The developing tray **20** is suitably supported between the side frame members **72**, **72** on a tray **133** which also forms a support for the stop bath tray **27**. The tray **20** is of a generally trough-like form having opposite end walls **137** having lips **139** extending over inwardly extending flanges **140** of bracket members **141**. The lower guide tray **22** has lips **142** extending from opposite ends thereof and extending over the lips **139** and supported thereon. The upper guide tray has similar lips **143** extending outwardly from opposite ends thereof over the lips **141** and supported thereon. The lips **139**, **142** and **143** are apertured to receive a bolt **144** extending through the apertured portions thereof and mounted in and extending upwardly of the flange **140**. A nut in the form of a knob **145** is threaded on said bolt to retain the guide trays thereto.

As shown in FIGURES 7 and 8 the lower guide tray **22** is formed on a uniform curve from its entering to its discharge ends and has a series of parallel spaced ribs **146** extending upwardly from the bottom thereof and extending therealong in the direction of travel of the printing plate between the guides **21** and **22**. Passageways **147** lead through the bottom of the guide **22** in the spaces between the ribs **146**, **146** to allow developer to pass into the lower guide.

The upper guide **21** is of a tray-like form, similar to the lower guide **22** and is formed in a uniform curve conforming to the curve of the tray **22** and has a series of parallel spaced ribs **149**, **149** depending from the bottom thereof in the direction of travel of the printing plate and spaced vertically from the ribs **146**, to provide a guide between the upper and lower guides, spacing the printing plate from the plane surface of the guides **21** and **22**. Passageways **150** lead through the bottom of the upper guide **21** between the ribs **149** to allow developer to pass upwardly into the guide **21**. The entering and discharge ends of the guide **21** are curved to extend closely adjacent the nips between the respective squeegee and guide rolls. A cover **151** extends across the top of the upper guide tray **21**.

The tray **27** for stop bath solution is similar to the tray **20** for developing solution, and is mounted between the side frame members **72**, **72** in the same manner the tray **20** is mounted between said side frame members. The upper and lower guides **25** and **26** are likewise similar to the guides **21** and **22** and are mounted between the side frame members **72**, **72** in the same manner the guides **21** and **22** are mounted between said side frame members. The trays **25** and **26** have perforate bottoms and ribs, like the ribs **146** and **149**, space the printing plate from the bottoms of said guides and guide the printing plate through the stop bath solution in the same manner the printing plate is guided through the developing solution. A cover **153** covers the upper guide tray **25**.

The processor is usually used in a dark room, although it is so shielded from light that it need not be used in a dark room. When it is desired to develop an exposed photo-direct printing plate, the plate which may be carried in a transport holder is placed in the loading tray by placing the transport holder between the side guides **53** and **55** with the tab **61** on the leading end of the printing plate in position between the rolls **18** and **19**. The motor **120** being energized, the rolls **18** and **19** will pull the plate from the transport holder and push the plate to and along the guide formed between the upper and lower guides **21** and **22**. At the same time the centrifugal pump **33** will circulate developing solution through the developing tank **20** in a direction opposite to the direction of travel of the plate. The centrifugal pump **41** also circulates stop bath solution through the stop bath tray **27** in an opposite direction to the direction of travel of the plate through the tray. In passing through the guide formed between the upper and lower guides **21** and **22**, the plate passes with its emulsion side up and is pushed along the guide formed between the guides **21** and **22** and immersed into the developing solution by said guides and then guided upwardly to the squeegee rolls **23** and **24**, which squeegee developing solution from the plate and push the plate along the guide formed between the upper and lower guides **25** and **26**, immersing the plate in the stop bath solution and guiding the plate upwardly to the squeegee rollers **29** and **30**. The squeegee rolls **29** and **30** draw the plate onto the plastic tray **17** and squeegee the stop bath solution therefrom when drawing the plate onto said plastic tray.

It may be seen from the foregoing that a simplified form of loading and processing apparatus has been provided for processing or developing photo-direct printing plates with little, if any, manual control, and that an effective guide has been provided for the plate, guiding and immersing the plate in the developing solution and in the stop bath solution, in which a series of squeegee rolls progress the plate through the processor, and the squeegee rolls successively drawing the plate through the developing and stop both solutions, also squeegee the solutions from the plate and draw the plate entirely through the processor, depositing it in a developed form on the plastic tray **17**.

It may further be seen that an improved and simplified form of bearing support means for the squeegee rolls has been provided accommodating ready removal of the rolls from their bearing supports, and besides maintaining pressure in the nips between the rolls, maintaining the rolls in driving engagement with the drive gears therefor.

While we have herein shown and described one form in which our invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

We claim as our invention:

In a device for processing photo-direct material, characterized by a loading tray, a developing tray and a stop bath solution tray arranged in series and a receiving tray at the discharge end of said stop bath solution tray, a pair of squeegee rolls at the entering end of said developing tray pushing a sensitized printing plate into said tray and guide means in said tray maintaining the sensitized printing plate immersed in the solution therein, a pair of squeegee rolls between said trays squeegeeing the developing solution from said plate and pushing the plate through said stop bath tray and guide means in said stop bath tray in association with said squeegee rolls for immersing the printing plate in the stop bath solution, other squeegee rolls at the discharge end of said guide means, squeegeeing stop bath solution from the printing plate, each set of squeegee rolls being vertically aligned and having shafts extending from opposite ends thereof, the improvement comprising a frame having a plurality of transversely aligned longitudinally spaced upwardly opening slots therein, forming bearing and mounting means for said rolls shafts, the shafts for the lower of said rolls each having a gear thereon, a drive gear directly beneath each gear and meshed therewith, means for driving said drive gears at the same rates of speed, a separate bar slidably mounted on each side of said frame, for limited slidable movement in the direction of said frame, a plurality of bellcranks transversely pivoted on each bar, each bellcrank having a lever arm engageable with the shaft of the uppermost squeegee roll, spring means connected between said bars and bellcranks and pressurizing said squeegee rolls and maintaining said gears in driving engagement with each other, said lever arms being releasable from said shafts by movement of said bars along said frame to

accommodate removal of said squeegee rolls from said slots.

References Cited by the Examiner

UNITED STATES PATENTS

2,993,427	7/1961	Lovercheck	95—96
2,995,363	8/1961	Pittwood	271—51
3,019,717	2/1962	Gacki	95—96
3,062,122	11/1962	Smith et al.	95—89
3,067,999	12/1962	Skeen	271—51
3,104,603	9/1963	Schwienbacher	95—89

FOREIGN PATENTS

1,128,292	5/1962	Germany.
762,807	12/1956	Great Britain.
768,621	2/1957	Great Britain.

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C. B. PRICE, *Assistant Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,263,590 August 2, 1966

Walter Wanielista et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the drawings, Sheets 1 to 5, line 2 thereof, and in the heading to the printed specification, line 2, for the title, "PROCESSOR FOR PHOTO-DIRECT MATERIAL", each occurrence, read -- PROCESSOR FOR SENSITIZED PRINTING MATERIAL --; column 1, lines 10, 17 and 52, and column 6, line 43, for "photo-direct", each occurrence, read -- sensitized printing --; column 1, lines 13, 34, 41 and 55, column 5, line 66, and column 6, line 20, for "photo-direct", each occurrence, read -- sensitized --; column 2, line 8, strike out "photo-direct".

Signed and sealed this 26th day of September 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents