Jan. 12, 1965 S. L. HERSH 3,165,047

PHOTOGRAPHIC PROCESSING APPARATUS

Original Filed Feb. 6, 1961 5 Sheets-Sheet 1

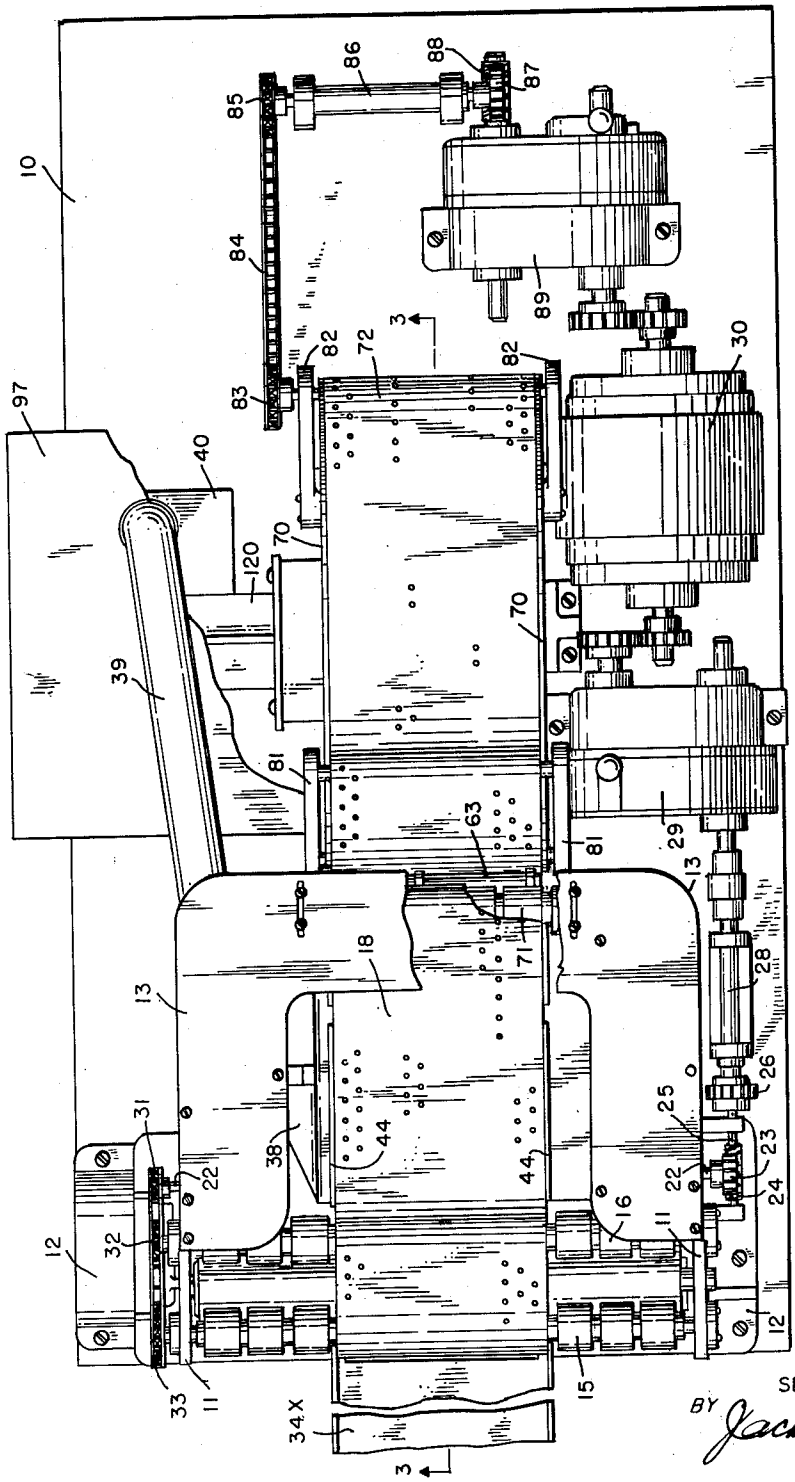


FIG. 1

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PHOTOGRAPHIC PROCESSING APPARATUS

Original Filed Feb. 6, 1961 5 Sheets-Sheet 2

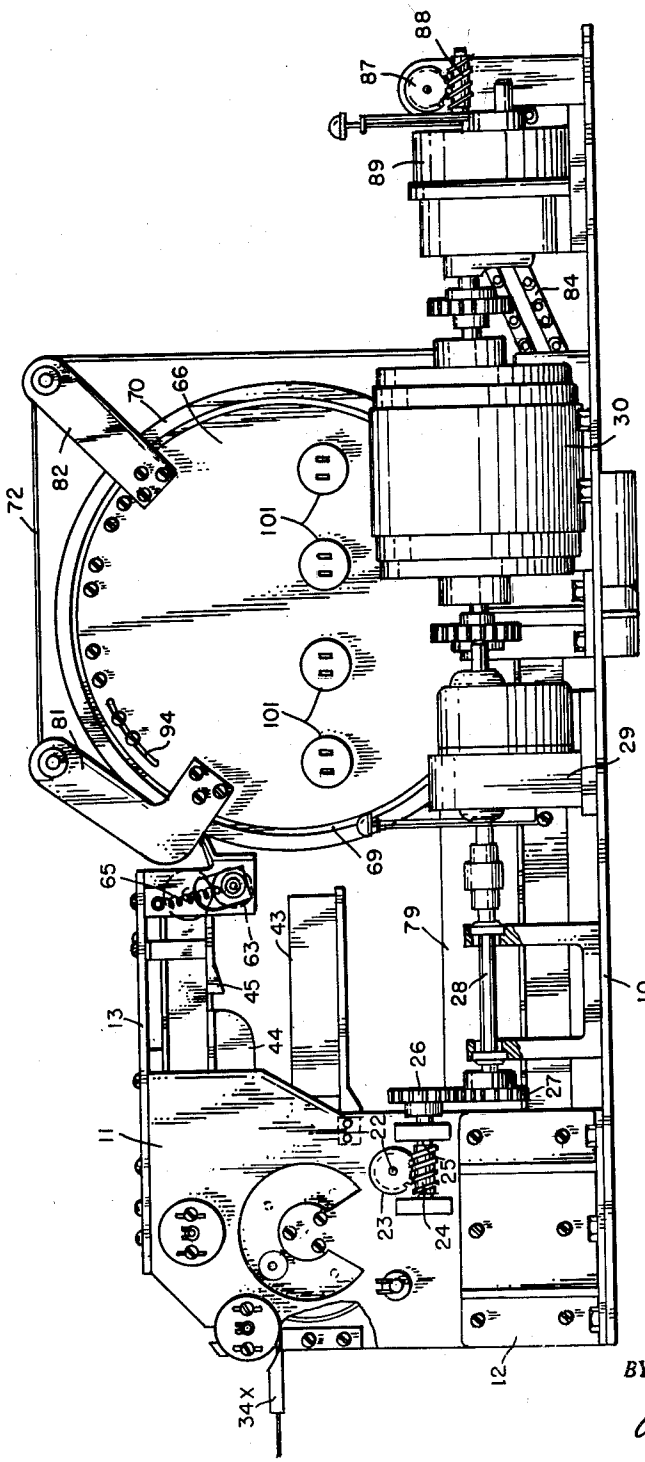


FIG. 2

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PHOTOGRAPHIC PROCESSING APPARATUS

Original Filed Feb. 6, 1961 5 Sheets-Sheet 3

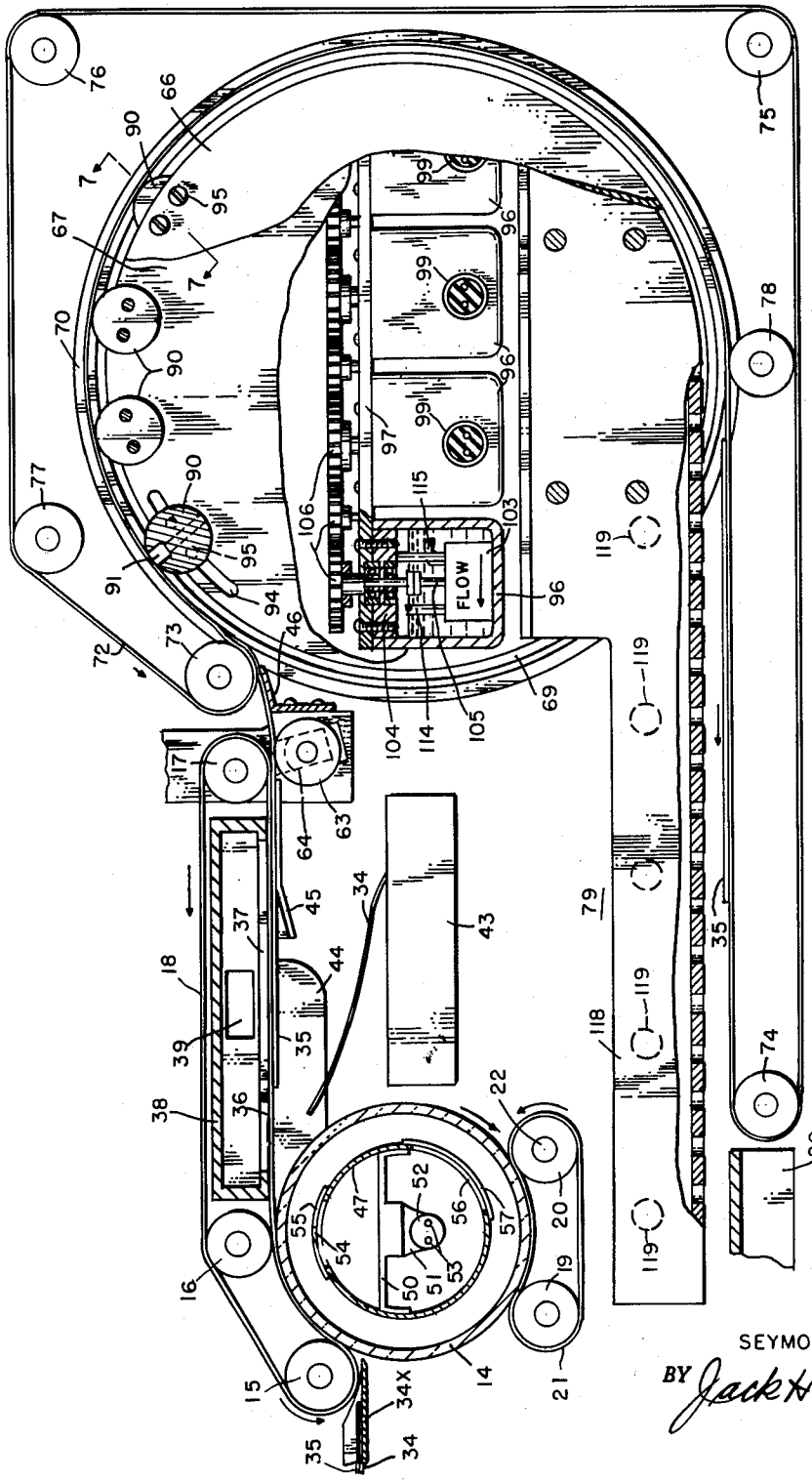


FIG. 3

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PHOTOGRAPHIC PROCESSING APPARATUS

Original Filed Feb. 6, 1961 5 Sheets-Sheet 4

FIG. 4

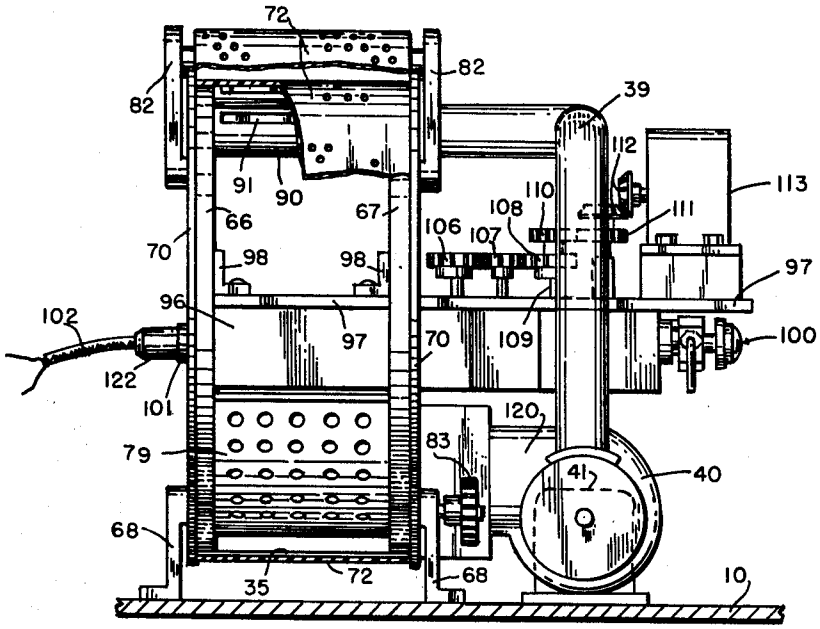


FIG. 5

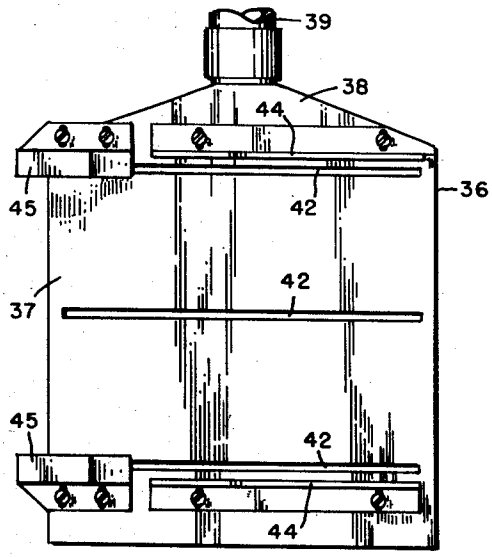


FIG. 6

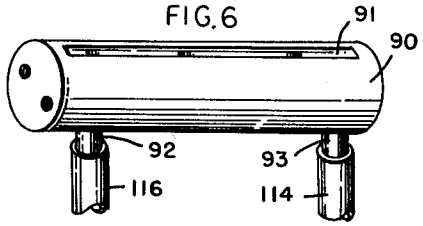
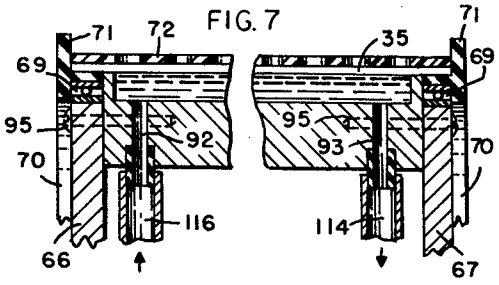


FIG. 7



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PHOTOGRAPHIC PROCESSING APPARATUS

Original Filed Feb. 6, 1961 5 Sheets-Sheet 5

FIG. 8

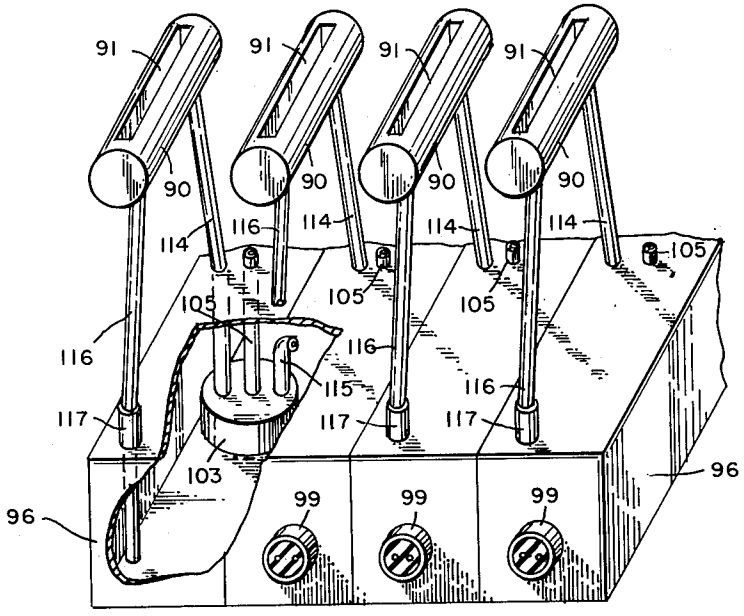
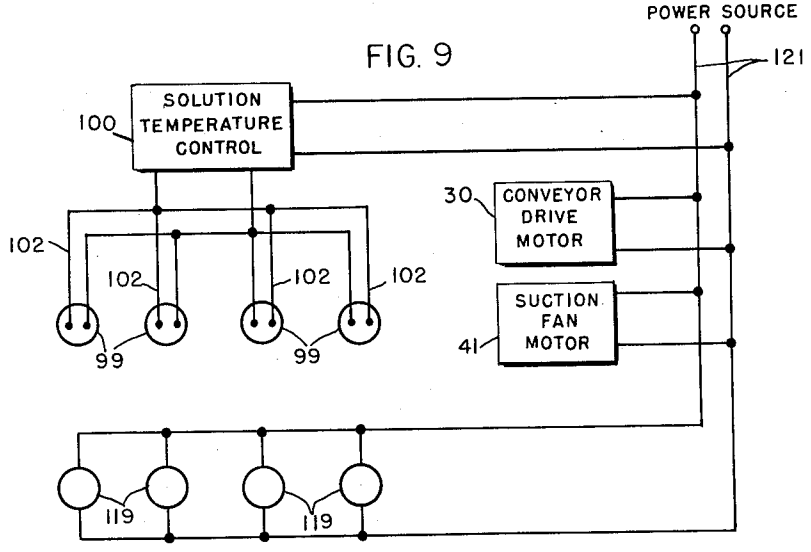


FIG. 9



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United States Patent Office 3,165,047 Patented Jan. 12, 1965

3,165,047

PHOTOGRAPHIC PROCESSING APPARATUS

Seymour L. Hersh, Freehold, N.J., assignor to the United States of America as represented by the Secretary of the Army

Original application Feb. 6, 1961, Ser. No. 87,505, now Patent No. 3,104,602, dated Sept. 24, 1963. Divided and this application Mar. 1, 1962, Ser. No. 176,832

9 Claims. (Cl. 95—77.5)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalty thereon.

This application is a divisional application of the application by the same inventor bearing Serial No. 87,505, filed in the U.S. Patent Office on February 6, 1961, for Photographic Processing Apparatus, now Patent No. 3,104,602.

This invention relates to a machine for handling and processing photographically sensitized elements and particularly to the semiautomatic processing sequence including registering of an original such as a processed negative upon the surface of a sensitized sheet, exposing the sheet through the negative, and processing the exposed sheet.

Machines have been used heretofore for printing and processing photographic materials but have failed to provide the fast and efficient technique offered by the present invention wherein an exposing means is particularly devised for direct integration of its function with that of the subsequent single or multiple step chemical processing operations. The chemical processing operations are carried out upon a compact cylindrical device wherein the exposed sensitive sheets are presented successively to processing heads which apply a film of solution to the emulsion sid of the sheet only. Thus the operation is completed without the use of multiple open trays in which the sheets are completely immersed and withdrawn. This latter operation is wasteful of space and solutions. Moreover when the sheets are so immersed, drying becomes a wasteful power and time consuming operation.

The mechanism of the invention provides a hollow glass cylinder rotated on its axis and having an elongated lamp therein. A guide platen facilitates the feeding of a sheet of printing paper and a negative registered in contact therewith into the printing section of the device where they are carried along between the periphery of the cylinder and a driven apron at the upper portion of the cylinder. While passing through this conveying means the sheet is printed by the light emerging from a slot in a housing surrounding the lamp.

Immediately upon emerging from this conveyor means the negative and printing sheet separate and the sheet, continuing its movement, engages a second conveying means having a second driven apron. The second apron may be an extension of the first mentioned apron. This apron is porous and engages the printing sheet to move it in a cylindrical path in contact with the cylinder and while so traveling the sheet encounters a plurality of processing units of special construction to be described hereinafter. Each unit has a small elongated outwardly open solution chamber extending across the print. When no print is present the chamber is open and a solution circulating pump of the vacuum type runs idly. When a print covers the open chambers and seals off the vacuum leak, solution circulates in the chambers to process the print which is then conveyed to an infra red drying station.

The complete system which will subsequently be described provides perfectly coordinated handling and timing control of the negative and printing sheet at every instant while they are printed and during the chemical processing of the print.

It is a primary object of the invention to provide an apparatus for uniformly feeding individual exposed cut sheets of printing material through a succession of processing steps without immersing the sheets in the solutions.

A further object of the invention is to provide an apparatus for feeding exposed printing sheets through a series of processing stations in a continuous motion and achieving optimum conditions for high quality results at each station.

A further object of the invention is to provide a continuously operating apparatus wherein exposed sheets of printing material are processed by automatically applying individual solutions for each step in the process to the emulsion side of the sheet only in a thin film while the sheets pass through the apparatus and removing the processing liquid from the applicator when no sheet is present.

A further object of the invention is to provide an apparatus for processing exposed printing sheets wherein the solutions are applied to the sheets through lateral slots in solution applying units while the sheets move thereover and wherein the presence of the sheets covering the slots acts to initiate flow of solution through the slots.

A further object of the invention is to provide an apparatus for processing exposed printing sheets wherein the sheets are moved through the apparatus by driving contact with their edges and narrow edge margins only of their emulsion faces.

Other objects and features of the invention will more fully appear from the following description and will be particularly pointed out in the claims.

To provide a better understanding of the invention it will be described in connection with the accompanying drawings wherein:

FIGURE 1 is a top plan view of the apparatus.

FIGURE 2 is a side elevation of the apparatus.

FIGURE 3 is a cross section on line 3—3 FIGURE 1.

FIGURE 4 is an end elevation looking from the right.

FIGURE 5 is a bottom plan view of the suction chamber of the apparatus.

FIGURE 6 is a detail perspective view of one of the chemical solution applying units of the apparatus.

FIGURE 7 is a detail cross sectional view through the apparatus at one of solution applying units.

FIGURE 8 is a partially schematic perspective view of the solution pumping system of the apparatus.

FIGURE 9 is a circuit diagram showing the power supply connections for the apparatus.

The apparatus is compactly integrated and preferably its components are mounted upon a common base **10**. The device executes photographic functions known as contact printing and chemical processing. A negative or other transparent subject of a similar sheet like form is placed in contact with a cut sheet of printing material of a size corresponding to the negative and both are held in register while they are fed into the left hand end of the apparatus where they are held together in close contact while they are fed through an exposing station. It is also possible to use a continuous strip of printing material.

The elements of this station are supported by side frame plates **11** which are in turn supported on the base **10** by brackets **12**. The side plates are tied together at their top edges by a top plate **13**. Between the side plates is rotatively mounted a hollow glass cylinder **14** which is supported and driven upon its axis by a plurality of rolls and conveyor aprons associated therewith. Certain of these rolls and their associated apron also serves as conveying means for the negative and printing paper. A single apron serving all of the components of the apparatus may be used. Rolls **15** and **16** are mounted in bearings in the side plates **11** and are parallel to the axis of the cylinder **14**. The top plate **13** is extended toward the

right a substantial distance and its outer end is provided with a pair of brackets within which is rotatably mounted the roll 17 whose axis desirably is parallel to roll 16 and at the same distance from the base 10.

An endless belt or conveyor apron 18 travels around the rolls 15, 16 and 17. The apron may be of any suitable porous fabric or perforated plastic sheet material and travels around roll 15 over the upper surface of roll 16, around roll 17 and back to the cylinder 14, where it passes between the cylinder and roll 16, over a portion of the surface of the cylinder and back to the roll 15. The apron is as wide as the widest material being processed.

A pair of rolls 19 and 20 over which travel a belt 21 are positioned at the bottom portion of the cylinder in such manner that the upper run of the belt 21 firmly engages the cylinder. The rolls 19 and 20 are supported in bearings received in the side plate 11 and the shaft 22 of roll 20 is extended beyond the side plate to receive a driving worm gear 23. The gear 23 is engaged by a worm 24 which is journaled in bearings secured in the side plate 11. A worm driving shaft 25 has a gear 26 secured thereto which meshes with a gear 27 upon a shaft 28 supported upon the base 10 and coupled to the output shaft of a speed changing box 29 the input shaft of which is driven by a motor 30 secured to the base 10. The rolls 19 and 20 and the belt 21 are thus driven by the motor 30. Any suitable driving means may however be utilized.

The end of the shaft 22 opposite to its driven end is also extended and has fixed thereon a sprocket 31 which receives a sprocket chain which in turn travels over sprockets 32 and 33 secured to the extended shafts of the rolls 15 and 16 which are thus also driven by the motor 30.

As will appear more fully hereinafter the negative and the printing sheet are led into the point where the surface of the cylinder 14 meets apron 18. To assist such insertion a guide platen 34*x* having side flanges to engage the edges of the printing material is secured in position to direct the material to the bite between the cylinder 14 and apron 18 and to insure the proper registering of the negative and printing sheet.

The registered negative and printing sheet are clamped between the apron 18 and the cylinder 14 and carried along with the driven cylinder to a position substantially at the horizontal tangent point of the cylinder where the negative 34 separates from the sensitive sheet 35 at which time the printing sheet is fed to the bottom surface 36 of an upwardly acting suction platen 37 which holds it in position in contact with the perforated apron while it is carried to the chemical processing station to be described hereinafter. The suction platen 37 is shown in FIGS. 3 and 5 and consists of a suction chamber 38 secured to the top plate 13 and positioned between the top and bottom runs of the apron 18 with its bottom face 36 in contact with the bottom run thereof. The face 36 etxends completely across the apron and covers a substantial portion thereof along its length. The suction chamber is provided with a suction conduit 39 which is connected to the suction port of a centrifugal blower 40 driven in any suitable manner such as by the motor 41.

The bottom surface 36 of the suction chamber is provided with a plurality of slots 42 extending in the direction of travel of the apron 18 which itself is made of porous material or it may be made of thin plastic sheet material perforated with small openings arranged to allow free passage of air through the slots and the perforations. Thus when a partial vacuum is created in the chamber 38 atmospheric pressure will act to hold the printing sheet against the apron 18 as it is fed to the processing station. The length of the vacuum chamber desirably should be sufficient to support substantially the full length of the longest sheet of material to be processed or at least it should prolong the travel of the sheet sufficiently to permit the negative 34 to emerge from between the cylinder 14 and the apron 18 and fall by gravity into a container 43 directly below the vacuum chamber.

The vacuum chamber has edge guides 44 and slotted guides 45 for accurately aligning the printing sheet. The slotted guides completely embrace the edges of sheet and precisely guide the forward edge thereof into the conveyor means on the chemical processing station. A deflecting lip 46 may be placed in the path of the sheet to finally properly position its leading edge.

A cylinder 47 within and concentric to the glass cylinder 14 constitutes a lamp housing having a reflector made of sheet metal supported in fixed position upon the common axis. Any suitable means may be used to support this lamp housing.

Near the outer ends of the housing 47 are secured supporting strips 50 upon which are mounted lamp sockets 51 within which are received a fluorescent lamp 52 or other suitable light source extending lengthwise of the cylinder 14. Suitable electrical connections 53 supply power for the lamp. The inner surfaces of the housing are polished and all other surfaces thereof desirably are finished in optical black. Exposure of the print is made through a narrow slot 54 extending lengthwise of the housing and at least as long as the lateral dimension of the printing material. Desirably means should be provided to vary the width of the slot 54 to adjust the quantity of light flux reaching the print. This may be done by providing a plurality of interchangeable plates such as the plate 55 within which the slot is cut. The plates are screwed to the upper portion of the housing 47. The casing has an aperture therein slightly larger than the largest slot provided by the plates 55 to thus permit light from the lamp to reach the printing sheet 35. Desirably the housing 47 has an opening 56 which is normally closed by a cover 57. This opening provides for servicing the parts inside the housing including replacement of lamps and the like.

If desired an additional guide roller 63 may be provided to engage the bottom face of the printing sheet 35 at the point where it emerges from the slotted guides 45 and just before it enters the chemical processing station. This roll desirably consists of a plurality of discs distributed across the width of the sheet 35 and is rotatably supported in a frame 64 which is connected at its ends to upwardly acting springs 65 which apply light pressure to the sheet by contact of the discs therewith. The frame 64 is guided in suitable slots in the brackets in which the roll 17 is mounted.

The exposed cut sheet of material 35 is fed to and through the processing station which supports, guides and transports, the sheet. Most of the components of this station are supported upon side frames in the form of circular discs 66 and 67 of metal such as aluminum of substantial thickness which are supported by brackets 68 secured to the base 10 in parallel relation and a distance apart substantially equal to the width of the processed sheets.

Upon the periphery of each of the discs 66 and 67 are secured ball bearings 69 upon the outer movable member of which is received a tire 70 of resilient material such as rubber or plastic having an upstanding flange 71. The tires are so dimensioned that the flanges 71 are spaced a distance apart to freely receive and accurately guide the printing sheet and with the aid of the apron or belt 72 cause the sheet to be conveyed through the processing station, and thence to the dryer to be described.

The apron 72 is guided and driven in its travel by a series of rolls. It is made of perforated plastic sheeting or porous fabric and is substantially the same width as the printing sheet. The apron passes around a roll 73 which rotates counter clockwise and is positioned to cause the apron 72 to engage the periphery of the tires 70 from where it continues clockwise around the discs 66 and 67 and thence at the bottom of the discs the apron extends horizontally to the left where it engages the roll 74 suit-

ably supported upon the base 10. The apron then travels back toward the right passing over roll 75 pivoted in supports fastened to the base and rising substantially vertically to and over the rolls 76 and 77 and back to the roll 73. An additional roll 78 may be inserted at the bottom of the discs to provide better support for the apron as it leaves the discs.

It will be seen that the apparatus thus far described provides a complete conveyor system for the negative and printing sheet during the processing cycle. The apron 72 as it leaves the bottom portion of the chemical processing station carries the finished, but slightly damp print to a drying device 79 to be described thence, to a receptacle 80 adjacent to the roll 74.

The rolls 73 and 77 are rotatively supported in a pair of brackets 81 secured to the side of discs 66 and 67 while the roll 76 is mounted in brackets 82 secured to the discs.

Suitable means is provided for driving the apron 72. As shown the shaft upon which the roll 75 pivots is extended and has fixed thereto a sprocket 83 over which a chain 84 passes. This chain in turn is driven by a sprocket 85 fixed to a shaft 86 rotatably supported in brackets secured to the base 10. The shaft 86 also has a worm gear 87 fixed thereon meshing with a worm 88 secured to the output shaft of speed changing unit 89 the input shaft of which is gear driven by the motor 30 the shaft of which is double ended. The change speed unit is supplied with means for changing its driving ratio and thus varying the speed of the apron 72.

Along the upper periphery of the chemical processing station are secured a plurality of processing units 90, angularly spaced at a distance found to be most effective. These processing units may be arranged to perform a variety of processing operations. In the example illustrated the units are arranged to successively develop, short stop, fix and wash the print. One of the processing units is shown in detail in FIG. 7. They may be made of any suitable corrosion resistant material such as Teflon or metal which is non-corrosive.

The units 90 are secured between the side plates 66 and 67 in any suitable manner as by screws engaging their end faces. The units are provided with slots 91 which extend laterally across the path of the apron 72 and which constitute solution chambers of small liquid capacity which function to apply processing solutions to the emulsion of the printing sheet. The slots are positioned to present their open side tangential to the curve of the apron 72. As printing sheets are conveyed through the processing station by the apron they are caused to pass successively over the slots 91 and in doing so close the open side thereof. Each slot or chamber 91 is provided with ports 92 and 93 communicating with opposite ends of the slots. The ports are connected with a system, to be described hereinafter, for applying a constant flow of processing solution to the slots. The slots are relatively narrow and shallow and thus provide for rapid change of solution. Desirably a thin end wall is provided at each end of the slots 91. Fresh solution is thus constantly reaching the emulsion of the printing sheet as it passes thereover.

As shown in the drawings the body of the individual units 90 are substantially cylindrical. They may however be of any suitable conformation. It is also within the scope of the invention to provide a unitary member of Teflon or other non-corrosive material having slots therein for all of the processing steps. However the use of individual processing units permits adjustment of their position along the path of travel of the printing sheets whereby the timing of the processing steps may be varied. Such adjustments may be provided by forming circular slots 94 in and concentric to the periphery of the side plates 66 and 67. Within these slots are received the screws 95 for securing the units 90 in position. The screws 95 serve as guiding means when the units are repositioned. Only the developing unit is shown as adjustable. The other units 90 may also be made adjustable in the same manner to still further regulate the time periods for various processing steps.

The processing solutions are supplied to the unit 90 from a plurality of tanks 96 which desirably may be at least partially received within the space between the side plates 66 and 67. There are four such tanks shown in FIG. 3 and FIG. 8 closely spaced and secured to a supporting platform 97. The platform and the tanks extend through the plate 67 to the right in FIG. 5 a substantial distance beyond the plate. The platform is secured to both plates 66 and 67 by brackets 98 or other suitable means. The elongated contour of the tanks provide a considerable capacity for solution and each tank is provided with an electric heater 99 projecting into the liquid within the tanks.

When it is desired to execute a very fast developing operation the heaters maintain the solutions at a temperature elevated above room temperature and thus shorten the time cycle for processing prints or other photographic units.

At least one of the tanks is provided with a thermostatic control unit 100 connected to a power source and having its controlled output connected to the heaters 99. As shown the first tank which is normally used for developing contains the control unit and has its sensing member immersed in the solution. The control 100 may be of conventional construction and has a manual adjustment for selecting the desired temperature. This first tank is longer than the others to accommodate the sensor of the control member.

Desirably the heater in each tank is provided with conventional double contact connectors 101.

Controlled power from the member 100 is fed to the heaters 99. Any one or all of the heaters may be rendered active by coupling power to the connectors 101 through separate power leads 102. Any suitable means for feeding power to the heaters may however be used.

Each of the tanks 96 contain a power driven pump 103 immersed in the processing liquid and desirably situated close to the bottom of the tank and supported from the tank cover plate 104. Each tank and pump assembly is in turn secured to the platform 97. The pumps which may be of the meshed gear type are provided with a vertical drive shaft 105 which is extended by means of a coupling to project through the cover plate and platform. Desirably the shaft is provided with ball bearings received in the cover plate and platform.

The upper end of each drive shaft has secured thereon a driving gear 106 which are interconnected by three idler gears 107 intermeshing therewith. The idler gears are rotatively mounted on vertical stud shafts secured in the platform 97. The center idler gear meshes with and is driven by a gear 108 rotatably mounted upon a shaft 109 fixed to the platform. The gear 108 has fixed thereto a second gear 110 which meshes with another gear 111 connected to one of a pair of miter gears 112. The gear 111 and one of the miter gears are axially coupled and rotate upon a stud shaft secured to the platform 97. The other miter gear is secured to the shaft of a motor 113 secured to the platform. Thus all of the pumps are driven by the motor 113.

The solution circulating system of the apparatus is best shown in FIG. 10. Each pump is provided with a suction tube 114 and an outlet spout 115 which empties into the liquid in the tank desirably below the solution surface. The suction tubes 114 are extended and coupled to one of the ports in each of the units 90, as for example, the port 93 of each unit. The other ports 92 are connected to liquid conduits 116 extending through the top of each tank and down into the solution to a point close to the bottom of the tank. If desired a check valve 117 may be inserted in each conduit 116 to prevent draining solution therefrom when flow therein is stopped.

Operation of the flow system is as follows. The pumps are operated constantly during the processing operation.

If no print is present to cover the slots 91 atmospheric pressure is maintained therein by flow of air through the perforations in the apron 72. Therefore there is no flow of liquid in the system because no reduction of pressure takes place in the liquid lifting conduits 116. When a print covers the slot 91 in any of the units 90 atmospheric pressure is excluded and pressure therein is reduced by the pump causing liquid to be drawn from the tank through the conduit 115, laterally through the slot, down the suction tube 114 and into the pump and is then discharged through the spout 115 into the tank. When the print uncovers the slot 91 atmospheric pressure immediately is restored in the slot and circulation of solution stops even though the pumps continue to operate. Thus solutions are automatically applied to the printing sheet as it passes across the slot and such application automatically stops when the print has completed the travel across the slot.

It should be noted that the successful function of the novel processing system of the invention is due in part to the fact that the solution flow through the slots 91 is motivated from the low pressure side of the pumps 103. As the print moves through the processing station atmospheric pressure maintains its emulsion face in close contact with the peripheral edges of the slots 91 which provides a seal against leakage of solution and since there is no positive pressure outward at this point leakage of solution is practically eliminated.

When the print has traversed all of the processing units 90 it is completely processed and is carried by the apron 72 to the drying means 79 which consists of an enclosed chamber 118 one end of which is received between the side plates 66 and 67 and its other end extends to the left to a position where the completed and dried prints are discharged by the extended portion of the apron 72. Thus the path of the prints doubles back to a position close to their point of entry at the printing station. This structure greatly reduces the space occupied by the apparatus.

The bottom wall of the chamber is perforated and spaced a short distance from the apron 72. Its right hand end is curved to the contour of the apron. A plurality of electric heaters 119 are positioned at intervals within the chamber and connected to a suitable source of current as shown in FIG. 9.

Air under pressure is fed to the chamber and is heated by the heaters 119. It then flows through the perforations and upon the prints as they travel to the discharge point. A conduit 120 connects the discharge from the centrifugal blower 40 to the drier 79 thus the blower 40 provides a large flow of air under pressure to the drier and through its connection 39 also provides vacuum for the chamber 38.

Power is supplied to the apparatus from source 121 as shown in FIG. 9. Each component may be provided with a suitable control switch not shown. The units 99 may be placed in operation by attaching coupling members 122 at the end of cables 102 to the respective double contact connectors 101.

The operation of the apparatus is very flexible with respect to the quantity of light flux reaching the unit during exposure and also the timing of the development steps may be controlled within close limits to produce the highest possible quality in the finished print or to produce special effects departing from normal processing procedures.

The light flux may be regulated in various ways. The operating voltage on the lamp 52 may be varied to provide up to 25% variation in intensity. The distance from the lamp to the exposing slot may be varied. Neutral density filters may be inserted in the path of light reaching the exposing slot. As pointed out hereinbefore the width of the exposing slot may be changed by changing the interchangeable plates 55. In addition to this method the slot width may be changed by a suitable manual adjusting mechanism.

To further adapt the apparatus to various requirements the processing time cycle is varied by varying the speed of travel of the apron 72 which is accomplished by adjusting the speed changing unit 89 until the desired optimum is achieved. This facility provides for the use of different types of printing emulsions and also for different types and concentrations of developing and other processing solutions.

In the above connection the mechanism for adjusting the slot width may be mechanically coupled to the speed control means on the speed changing units 89. This coupling means should be so constructed that the change in slot width would automatically change the processing time to provide optimum quality in the finished print.

It should be noted in the use of the apparatus that processing time cycles may be held to a certain schedule and compensation in processing required by changes in exposure time or other factors may be achieved by adopting the well known two bath developing technique wherein the proportions of the ingredients in each bath may be varied to achieve the required adaptation to produce optimum results without a correction in processing time. Such a processing technique also permits the two conveying aprons 18 and 72 to operate at the same speed, which is a desirable condition, even though by conventional developing techniques the two aprons should operate at different speeds when compensation is required to produce optimum results.

Operation of the apparatus with the aprons traveling at different speeds is however a practical procedure. When the apron 72 is traveling faster than the apron 18 the bite between the apron 72 and the tires 70, when the print to be processed first enters the processing station, is sufficiently firm to overcome the relatively light friction imposed upon the print at this time by the suction of the chamber 38 holding it against the apron 18. Having entered the processing station the print is conveyed therethrough at the speed of the apron 72. The roll 63 functions as a directional element in guiding the print at this point and exerts practically no friction holding back the print when its speed of travel is increased by the apron 72.

Since the same frictional forces are acting when the speed of the apron 18 is faster than that of apron 72 there will be slippage of the apron 18 upon the print when transfer from one apron to the other takes place. Since the driving friction of apron 18 is light there will be no damage to the print, which is dry at this time, and moreover it will not buckle or wrinkle since at this time the edges of the print are received in the guiding grooves of the members 45.

As explained above the processing units 90 are or may be adjusted peripherally of the discs 66 and 67 to present their slots 91 at different distances along the path of travel of the prints. In this manner processing times may be varied.

As pointed out above the apparatus of the invention has wide scope in its operation and general utility. In this connection it should be pointed out that contact reproductions may be produced from the smallest negative or other subject up to the maximum size capacity of the apparatus.

What is claimed is:

1. Photographic proceessing apparatus comprising a conveyor system to receive and convey an exposed printing sheet to and through its chemical processing stations, said conveyor including a perforated conveyor apron of a width substantially that of one of the dimensions of the printing sheet, a pair of narrow parallel circular movable edge guiding and print moving members in line with and engaging the edges and a narrow marginal portion of the printing sheet, said print moving members coacting with said conveyor apron to move said printing sheet

emulsion side inward in a curved path about the periphery of said circular print moving members, a plurality of print processing units extending between said print moving members and engaging the emulsion face of the print as it is held between the apron and print moving members, a slot like chamber in each of said processing units extending laterally substantially the full width of said apron and having their open side tangentially engaging the emulsion of the printing sheet acting to apply processing solution to the emulsion side of the print only as the print moves thereover and vacuum pumping means for continuously maintaining a flow of processing solution through said chamber only when a print is in processing position across and closing the open side of said chambers.

2. Photographic processing apparatus according to claim 1 and wherein said conveyor apron is composed of two in line sections one section feeding printing sheets to the other, power means to drive said conveyors and independent means to adjust the speed of travel of the said apron sections.

3. Photographic processing apparatus comprising a perforated apron type conveyor system for manipulating a transparency and a printing sheet during its processing steps, means to continuously drive the conveyor, means for processing the exposed printing sheet consisting of a pair of axially alinged fixed circular plates held in parallel spaced relationship, the said plates being substantially in line with the edges of said conveyor apron, narrow large diameter anti-friction bearings having inner and outer races mounted on the periphery of said plates, flanged tires of resilient material secured upon the outer race of said bearings, the flanges thereof being spaced a distance equal to the width of the printing sheet and substantially the same as the width of said apron, said apron transversing said tires and holding the marginal edges of the printing sheet in contact with said tires while the sheet is carried around said plates emulsion side inward to a discharge point, at least one processing unit secured between said plates and having a slot like chamber therein extending laterally substantially the full width of the apron and opening outwardly at a position to apply a coating of processing solution to the emulsion only of said printing sheets and vacuum pumping and means for maintaining a flow of processing solution through said chamber only when a printing sheet is covering said slot.

4. Photographic processing apparatus according to claim 3 and print drying means adjacent to the conveyor apron in a position to dry the print after it has been completely processed.

5. Photographic processing apparatus according to claim 3 and wherein the means for maintaining flow of processing solution in said slot like chamber comprises a driven pump and a solution reservoir between said circular plates, a conduit from the intake of the pump to said slot like chamber, a second conduit extending from said slot like chamber to below the surface of the solution in said reservoir, the exhaust port of said pump discharging into said reservoir.

6. A photographic processing apparatus comprising a continuously driven perforated apron conveyor system for manipulating a transparency and a printing sheet during the operating steps of the apparatus, edge guiding means associated with said conveyor apron for accurately guiding and orienting said transparency and printing sheet in register one with the other, vacuum means for holding said sheet in contact with said apron for a portion of its travel after exposure thereof while said transparency is separating therefrom, circular marginal edge gripping means including a driven perforated apron coacting with said conveyor to transport said exposed printing sheet with its emulsion side away from said conveyor apron during its chemical processing steps, a processing solution reservoir, processing solution applying means consisting of at least one applicator unit having a slot like chamber with the open side thereof disposed in the path of the emulsion side of said printing sheet whereby solution in said chamber is applied only to the emulsion of the sheet, a constantly running pump acting to supply solution to said applicator chamber the suction port thereof being connected to one end of said chamber, a conduit connected to the other end of said chamber and extending below the surface of the solution in said reservoir, the exhaust port of said pump discharging into said reservoir whereby when a printing sheet is covering the open side of said applicator chamber solution flows therethrough and when no printing sheet is present no solution flows.

7. Photographic processing apparatus according to claim 6 and wherein the said edge gripping means comprises a pair of narrow large diameter anti-friction bearings having inner and outer races positioned in line with the margin of said apron, tires of resilient non-corrosive material secured to the outer race of said bearings and presenting flat areas and vertical flanges at the outer limit of the flat areas the edges of said conveyor apron and said printing sheet being received between said flanges, the marginal areas of said apron and printing sheet riding upon the narrow flat areas of said tires.

8. Photographic processing apparatus according to claim 6 and wherein the sheet holding vacuum means is positioned to hold and move the sheet until it is positively gripped by said marginal edge gripping means.

9. Photographic processing apparatus according to claim 8 and wherein the said perforated apron has an open flat portion upon which the processed print is received upon completion of its processing, a drying manifold adjacent said flat portion, a centrifugal type air blower, a connection from said blower output to said drying manifold and a connection from the intake of said blower to said sheet holding vacuum means.

References Cited by the Examiner

UNITED STATES PATENTS

2,478,896	8/49	Cobb	95—94
2,492,133	12/49	Cobb	95—94
2,587,350	2/52	Maiwald	95—94
2,665,619	1/54	Tuttle et al.	95—89
2,747,481	5/56	Normann	95—94
2,856,829	10/58	Orlando	95—89
2,895,552	7/59	Pomper et al.	214—6
2,956,494	10/60	Tyler et al.	95—94

FOREIGN PATENTS

828,469	2/60	Great Britain.
888,350	1/62	Great Britain.

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