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[54] PHOTOGRAPHIC FILM AND PAPER PROCESSING
APPARATUS
2 Claims, 9 Drawing Figs.

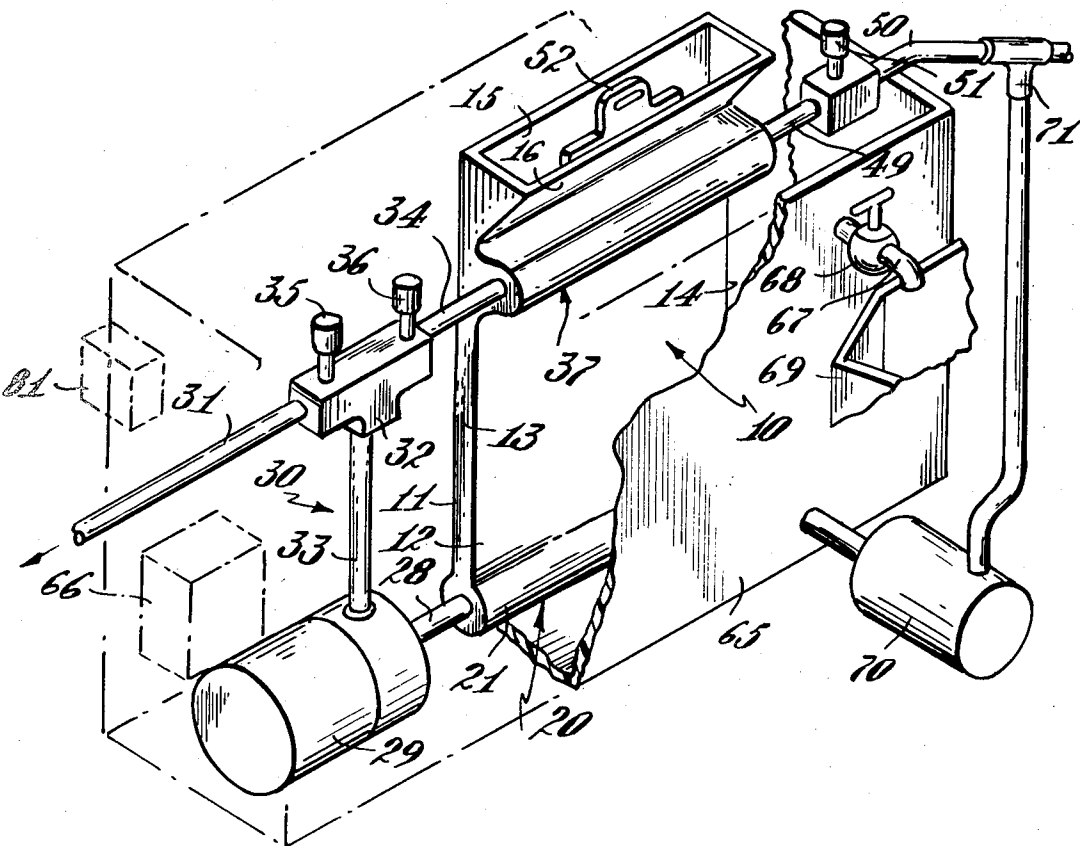
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96, 89

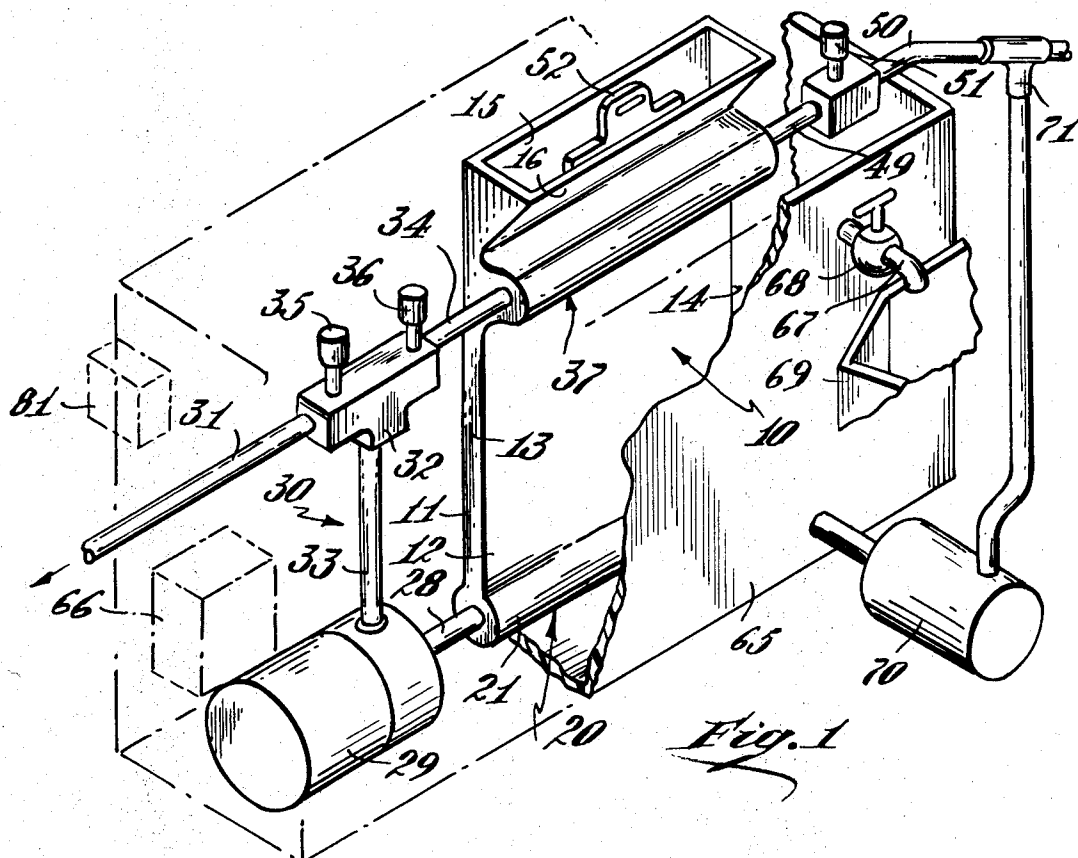
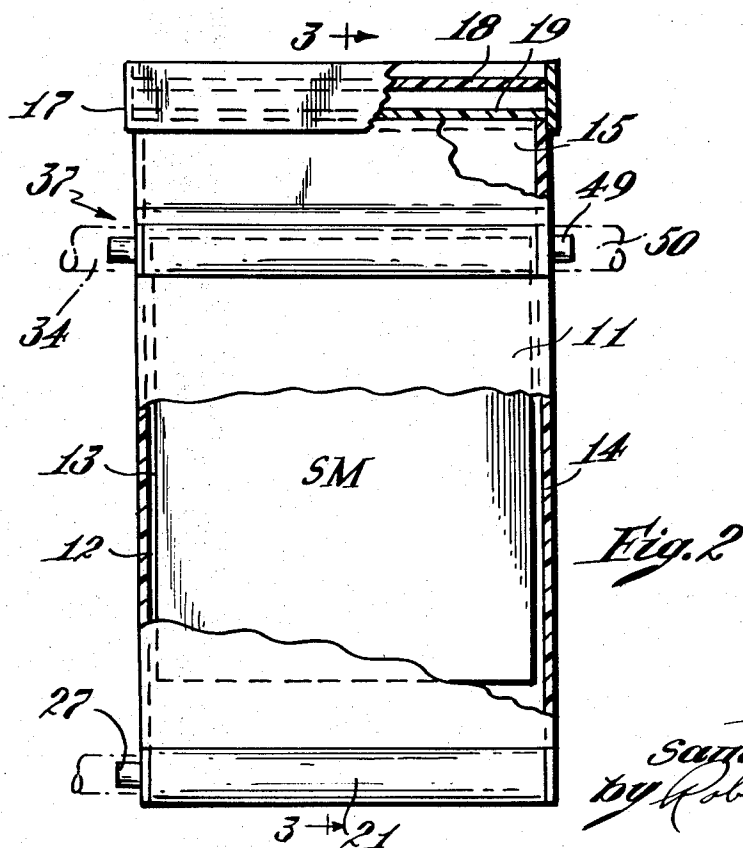
[56] References Cited				
UNITED STATES PATENTS				
1,194,707	8/1916	Bryant	95/90.5	
1,308,710	7/1919	Hamburger	95/96	
2,203,382	6/1940	Davis	95/89(Miscellaneous)UX	
2,327,733	8/1943	Moore	95/98X	

2,332,624	10/1943	Boeckeler	95/97X
2,873,660	2/1959	Land et al.	95/96X
2,930,306	3/1960	Goodman	95/96
3,228,316	1/1966	Benardeau et al.	95/96X
3,343,472	9/1967	Rosenberg	95/94
3,413,904	12/1968	Friedel	95/96X
3,427,949	2/1969	Knight et al.	95/89

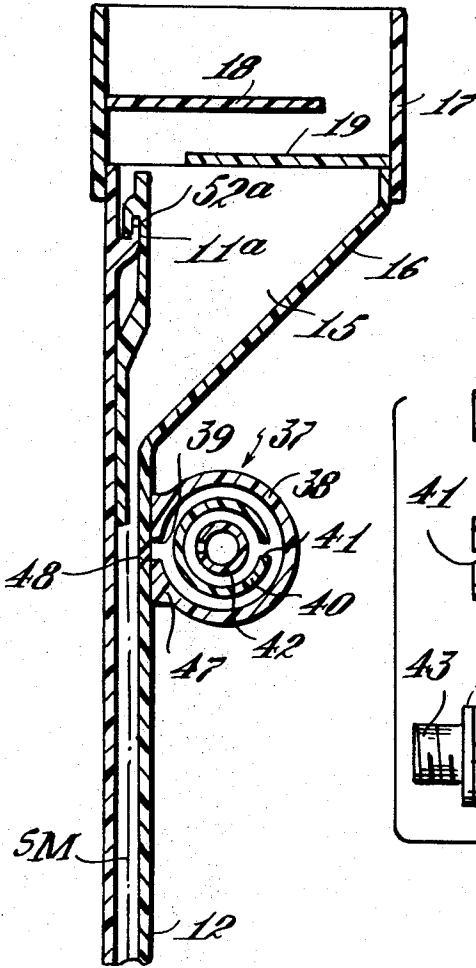
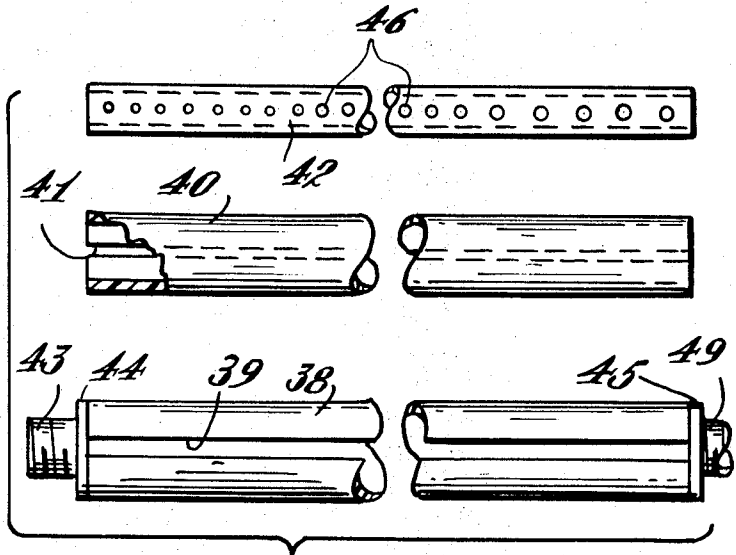
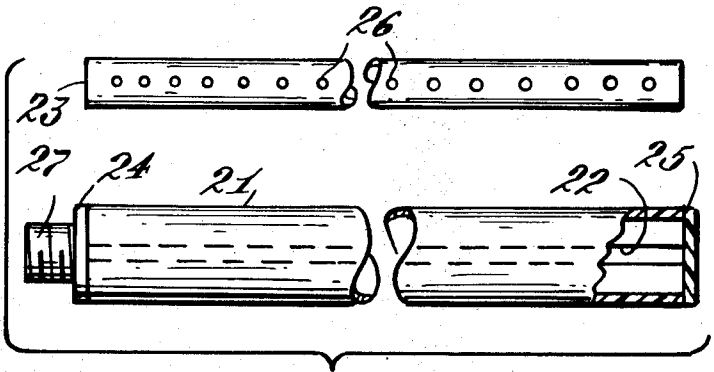
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ABSTRACT: An apparatus and method for processing sensitized photographic film and paper material is described. The sensitized material is immersed and supported within a substantially closed, temperature-controlled fluid system, and chemical processing solutions are recirculated over the surface of said material by manipulation of the system in a simplified, programmed sequence of pulsating and other fluid flowing processing steps, thereby to obtain even, uniform development of and across the entire length and width of the sensitized material.





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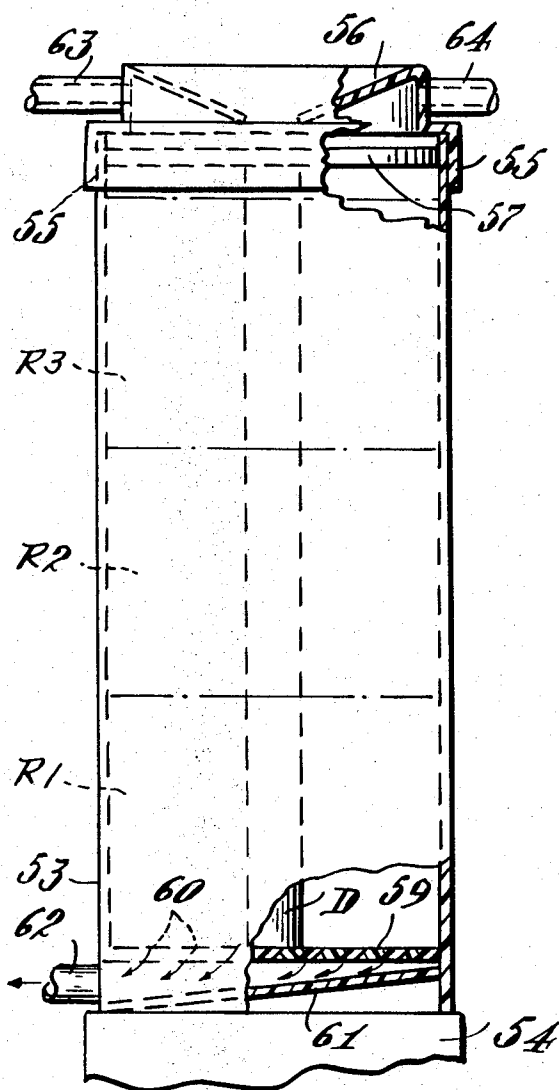


Fig. 6

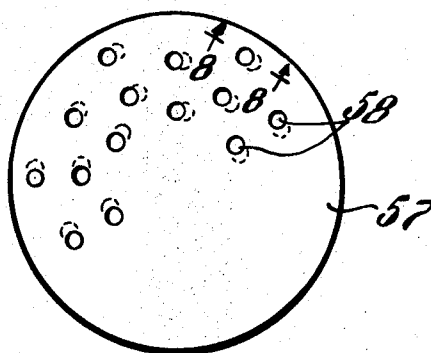


Fig. 7



Fig. 8

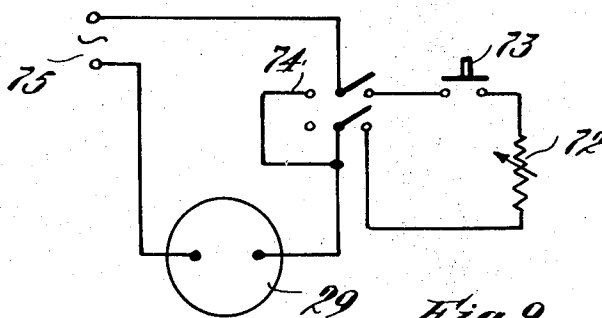


Fig. 9

PHOTOGRAPHIC FILM AND PAPER PROCESSING APPARATUS

SUMMARY OF THE INVENTION

This invention provides a completely self-contained compact apparatus, and a uniquely sensitive, variably controlled procedure, for processing photographic film and paper, in both black and white and color, with extreme accuracy and precision, with utmost ease and simplicity, and with unprecedented economy. The invention processor is adapted to all sizes of photographic film and paper, and enables the developing operation to be carried out under, and as well to be visible under, both darkroom safe light and normal room light condition.

A unique photographic processing apparatus is provided by the invention wherein the photographic chemicals are brought to and circulated over and drawn from the sensitized material while that is held stationary in the material-receiving or jacket portion of a closed fluid system, and wherein the processing fluids are recirculated by system-contained pumping means, having a pulsating capability as desired for solution agitation, and comprising the only moving mechanical part of the entire apparatus.

The invention further provides for varying selective control of the processing procedure with capability of timer control of the pump both for on—off switching and for continuous pulsating operation switching thereof; with capability of speed control of the pump for selective automatic determination thereby of the pressure and rate of flow of the recirculating fluids; and with adaptation of the processor also to selection as between a basic or manual controlled mode, a semiautomatic or remote controlled mode, and a fully automatic or completely preprogrammed mode of carrying out the processing, or, more particularly, the specific number, sequence, and type of steps as desired or required for a given procedure.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be fully understood from this description taken together with the accompanying drawing in which:

FIG. 1 is a perspective view of the invention apparatus, as embodied for processing flat sheet sensitized material;

FIG. 2 is a front elevation of the processing jacket, with its light trap cover in place but partly broken away to show its constructional detail;

FIG. 3 is a vertical section along the line 3-3 of FIG. 2;

FIG. 4 is an exploded view from the rear of the injection sleeve assembly of the apparatus;

FIG. 5 is a like exploded view from the bottom of the ejection sleeve assembly of the apparatus;

FIG. 6 shows another form of the invention apparatus, as embodied for processing rollfilm material;

FIG. 7 is a plan view of the fluid pressure equalizer and diffuser disc of the rollfilm-processing tank assembly of FIG. 6;

FIG. 8 is a vertical section of the diffuser disc taken along the line 8-8 of FIG. 7.

FIG. 9 is a wiring diagram of a circuit for basic manual control of the invention apparatus.

In the FIGS. 1—5 form adapted for processing flat or sheet material the invention apparatus comprises a generally flat rectangular processing jacket 10 having relatively wide vertical sides 11, 12 and relatively narrow vertical ends 13, 14. The processing jacket 10 will be understood to have a length and width to enclose sensitized material SM, FIGS. 2 and 3, of a sheet size, or size range, with which the particular jacket is intended or adapted to be used. More importantly, the processing jacket 10 has short ends, or a narrow depth, as shown, and whereby to contain with the sensitized material a minimum fluid volume, and thus to process the material as efficiently as possible, with use of not more than the necessary amount of solution.

More particularly, with the far greater efficiency of contact of the solution with the emulsion which results from the very thin, say one-sixteenth inch depth or interior cross section of the jacket 10, the procedure times needed for the processing under the invention are found to be considerably reduced.

The jacket sides and ends terminate upwardly in a fluid trough 15 for receiving the processing fluids, and which may be formed by the flaring or inclining of the one side 12 of the jacket as at 16, FIGS. 1 and 3.

Closely fitting over the trough 15 is a cover or light trap pouring spout 17 having overlapping, light-trapping baffles 18, 19, FIG. 3, supported from its opposite sides, and through which fluids may be poured into the trough 15 with all light being prevented by the baffles from reaching the sensitized material undergoing processing.

The lower baffle 19 is seen as inset from the bottom of the cover which thereby defines a jacket-surrounding, surrounding, the light-sealing skirt, when the pouring spout is seated by the said baffle 19 atop the jacket trough 15. The spacing of the upper baffle 18 a light-blocking, fluid-passing distance above the lower baffle 19 is seen similarly to define thereabove, or with the overlying cover wall, a suitable reservoir, into which the fluids may initially be poured.

In accordance with the invention the processing jacket is fitted top and bottom for injection and ejection of fluids recirculated or pumped therethrough, and more particularly for controlling the flow of the fluids, as admitted to and withdrawn from the jacket ends, for uniform pressure dispersion or diffusion across the jacket width, and thereby for travel down the length of the sensitized material with a speed and force which is equal or uniform over or throughout the material width, and whereby the sensitized material is developed uniformly throughout its entire area.

To that end the processing jacket is provided at the bottom with a transverse ejection sleeve assembly 20 comprising an outer tube 21 having a central longitudinal wall section removed to provide a top opening 22, equal to the jacket depth, and at which the outer tube is joined to the jacket side walls 11, 12 for communicating with the jacket interior, as best seen from FIG. 3.

Centered within the outer tube 21 is an inner tube 23 spaced all around from the outer tube, and integrally joined with that to tube-supporting and closing end caps 24, 25, FIG. 5, which may be continuous with the jacket end walls 13, 14 as indicated in FIG. 1.

The inner tube 23 is formed along its length with a series of ports or side openings 26 which are seen from FIG. 5 as oriented to the bottom, or opposite to the outer tube top opening 22.

For discharge or withdrawal of the fluids from the jacket the inner tube is open at one, herein the left, end through the cap 24, at which end opening the ejection sleeve is provided with a suitable outlet fitting or coupling as indicated at 27, FIGS. 2 and 5. In accordance with the invention, and to equalize across the width of the jacket the force of the suction which would otherwise be most strongly felt at its said left end, the inner tube ports 26 are made to increase in size at a pressure compensating rate progressively from that left to the opposite of herein right end of the inner tube 23, as clearly shown in FIG. 5.

The invention apparatus further comprises a recirculating pump 29, FIG. 1, which may be, for illustrative example, a pump of one thirty-fifth minimum horsepower, delivering a minimum of 235 gallons per hour of fluid to a height of 3 feet. The pump is to operate submerged, and therefore is required to be impervious to, or noncorrosive in water and other photographic processing fluids.

The recirculating pump 29 is connected to the ejection sleeve outlet 27 by a vacuum line 28 for subjection of the jacket to fluid discharge or suction pressure as hereinafter described. The submersible pump 29 is arranged and operated also to force the fluids through a pressure line 30 which is coupled to the pump and also to the injection sleeve assembly as

hereinafter described, completing thereby a closed circuit or system for the recycling or recirculating of the processing fluids, FIG. 1.

Provision is also made for delivery of the fluids external to the closed system, through a drain line 31, FIG. 1, which may be directed either to a sink or other convenient waste disposal means, or to a suitable solution recovery means. A simple, economical means of accomplishing this is herein illustrated as a tee or branching connector 32, dividing the pressure line 30 into the segments 33, 34, and also connecting that with discharge line 31. The apparatus is fitted for selective closing and opening of the pressure and drain lines 31, 34, conveniently and as herein by valves or stopcocks 35, 36 located at the connector 32.

The submersible pump 29 recirculates the processing fluids through pressure line 30 to an injection sleeve assembly 37, FIGS. 1—4, which is seen to comprise an outer tube 38 having a longitudinal side opening 39 facing toward the jacket 10, or more particularly abutting the jacket sidewall 12.

The injection sleeve 37 further comprises a concentric intermediate tube 40 having a like longitudinal side opening 41 oriented oppositely to the outer tube opening, or away from the jacket 10. Centered similarly within the intermediate tube is an inner tube 42, to one, herein the left, end of which is joined an inlet fitting or coupling 43, which coupling opens through the left of the end wall caps 44, 45 to which all three tubes 38, 40, 42 are integrally joined, and by which the outer and intermediate tubes are closed at their opposite ends.

The inner tube 42 is provided with a lengthwise series of openings or ports 46 for recycling of the processing fluids within the jacket 10 and across the sensitized face of the photographic material. The point or source of maximum pressure (positive) force is herein again at the left side of the tube 42, and to equalize that pressure across the width of the jacket 10, and therefore across the width also of the sensitized material, the holes 46 are smallest at the left end and range increasingly large to largest at the right end of the tube 42 as shown, FIG. 4, the progression of the holes 46 being similar to that of the holes 26 of the tube 23 as earlier described.

The injection sleeve 37 may be formed at its outer tube 38 with a thickened root 47, for butting the jacket wall 12, and it is aligned at its outer tube opening 39 with a reduced transverse wall opening 48, FIG. 3, inclined downwardly at, say 45°, and dimensioned to form a venturi by which the flow is accelerated, and the pressure thereof increased, and also equalized sufficiently to force the sensitized material being processed against rear jacket wall 11.

Communicating with the other end of inner tube 42 is an inlet 49, FIG. 1, which is coupled with a supply line 50 for connection to a fluid source, as particularly of water. Valve means such as a stopcock 51 are provided for closing the fluid or water supply line 50, as to be described.

While the ejection and injection sleeves have herein been shown and described as having a particular number and arrangement of tubes, tube openings, and inner tube ports with which they are successfully employed in a present embodiment, it will be understood that within the scope of the invention the aforesaid sleeves may be varied in one or another or any combination of said particulars of tube number and tube opening size and distribution, as desired or required to attain the invention object under varying conditions and circumstances of jacket size, fluid pressure, fluid-flow rate and the like.

The particular invention object is the even, uniform development of the entire sensitized material; it may be attained, in conjunction with the pulsating fluid action to be described, at the injection sleeve by the equalizing of the pressure of continuous or the pulsating pressure fluid, and by the diffusing of that over the length and width of the sensitized material to be processed. And it is maintained at the ejection sleeve by the equal force reception or pickup of the equalized dispersion of the continuous or pulsating flow processing agents as dispensed by the injection sleeve.

For manipulating the sensitized material there is provided a processing holder or handle 52, FIGS. 1 and 3, which for rudimentary example may comprise simply a suitably formed strip of plastic to which the photographic material may be removably attached, as by plastic or other suitable adhesive tape. The handle 52 is of a width or transverse extent to prevent any sagging of the material at its ends, and is adapted to be supported, as herein by the interlocking tongues 11a, 52a, from the rear wall 11 of the jacket 10, when the length of the material is less than that which will stand or support it on the tube 23, when the upper margin of the material is positioned, as necessarily, no more than slightly, say one-fourth inch, higher than venturi 48, as shown, FIG. 3.

In the rollfilm processing embodiment of FIGS. 6—8 the processing jacket comprises a cylindrical tank 53 which may be mounted on a suitable base 54 and have a light trap pouring spout and cover 55 fitting tightly over the top of the tank and provided with a centrally opening, cone-shaped pouring reservoir 56.

The tank 53 further comprises a fluid pressure equalizer and diffuser disc 57 which rests on a rod or dowel D on which are stacked the film reels, as herein at R₁, R₂, R₃.

The disc 57 is seen to have at varying radii circumferential patterns of ports 58, outside a solid central area overlying the dowel D and underlying the central opening of pouring spout 56, with all said ports being inclined from the vertical at a fluid diffusing angle and in directions normal to their radii, FIGS. 7 and 8, whereby to diffuse and blend the processing fluids upon their passing therethrough.

At the tank bottom, and corresponding to the ejection sleeve 20 similarly as the disc 57 corresponds to the injection sleeve 37, is a like fluid pressure-distributing disc 59 provided with a pressure-equalizing array of diffuser ports 60, which are all seen as inclined commonly in the same or fluid outlet direction.

The tank 53, further has a bottom wall 61 underlying the disc 59 and inclined at an angle, FIG. 6, as found to equalize the suction pressure on the disc 59 as generated through the discharge outlet 62. At the top the tank 53 has inlets 63, 64 opening through the cover 55 to the disc 57, and fitting the tank similarly as the jacket 10 for solution recycling and for delivery to the tank also of water or other external fluids.

It will be appreciated that the invention apparatus as just described may in its entirety be constructed of plastic materials, as are available in a type which is both inert to photographic chemicals and selectively transparent (clear), opaque, or translucent safelight colored, the latter allowing the entire processing procedure to be visible both under darkroom safelight and under normal room light conditions. The apparatus may also be fabricated wholly or in part of metal, or of other materials as may be suited to or preferred for any use or application.

For a processing procedure exemplary of the invention method, the apparatus is set up by installing the processing jacket 10, 53, the recirculating pump 29, and their interconnecting tubes in a suitable or recycling-apparatus-encompassing water bath tank or jacket 65, FIG. 1, which will be maintained with water filled to a height covering the entire apparatus, but not so as to overflow the trough 15. It will be seen that the desired, accurate control of the temperature of the chemicals within the material processing jacket can easily be maintained through the relatively short processing cycle of the invention, with the volume of water provided by the water bath jacket 65.

The desired, constant, uniform processing temperature control is readily maintained, from one complete operating procedure cycle to the next, by provision of suitable water bath temperature control means, as diagrammatically represented at 66, FIG. 1, which for heating only may comprise a suitable heater.

Further to the apparatus setup, the supply line 50 may be connected to a water source, not shown, but which preferably is regulated at as close to the working temperature as possible.

If such temperature regulated water supply is not available, the water bath jacket 65 may be utilized as the supply, and for that initially filled to an excess, providing thereby a rinsing water volume which in manual operation may be drained, as through a jacket tap 67 positioned at the appropriate height and normally closed by a stopcock 68, into a suitable vessel 69 from which in turn it may be poured into the jacket 10. Or in automatic operation the excess water may be drawn from the tank 65 by a pumping means 70, FIG. 1, delivering to the supply line 50 as through a connection 71.

In commencing the processing procedure the drain stopcock 35 is closed and injection stopcock 36 is open, with water inlet stopcock 51 also closed. A premeasured quantity of developing solution is first poured into fluid trough 15 up to the mouth of the trough. Next recirculating pump 29 is energized in the pulsating mode, initially to displace any air bubbles that may have been trapped in the injection and ejection sleeves, or in the pump connections thereto.

Under darkroom conditions the exposed film or paper is then grasped by the handle 52 and quickly inserted into the processing jacket 10, with the emulsion side facing the injection sleeve 37, and lowered into supported position as shown, FIG. 3.

If a safelight or daylight processing jacket is being utilized the light trap cover 17 can then be placed over the trough 15 as shown, FIG. 3, and the room light turned on.

With the film or paper material SM in position, and the pump 29 energized in the pulsating mode, the initial or developing phase of the procedure is commenced. The length of the developing phase will of course depend upon the material being processed, Agfa color printing paper requiring, for example, approximately 2 minutes at 78° F.

The object of the developing phase as hereinbefore mentioned is to secure even, uniform, development of the entire sensitized material. In accordance with the invention the uniform developing is achieved by a stop-go operation of the pump 29 to pulsate the developing solution within jacket 10 or tank and across the sensitized material, this in combination with the equalizing of the pulsating pressure within the fluid jacket or tank by the combined, coordinated action of the injection-ejection sleeves or diffuser discs respectively. While the sleeves and discs effect a desired homogenizing or intermixing of the fluid pressures within the jacket and tank, the pulsating of the fluids by the aforementioned on-off operation of the pump is found additionally to disperse, diffuse or blend the fluid pressures, as wanted for the desired uniform developing overall of the sensitized material. The pulsating or intermittent pressuring of the developing fluids is observed more particularly to introduce a random pattern of flow through the fluid jacket and over the material being processed, eliminating the possibility of flow lines, and resultant nonuniform pressuring and developing of the material, that may be occasioned by the continuous pumping or pressuring of the fluid through the jacket.

Under the invention the pulsating action, or circulating of the developing fluid in an irregular pattern, may be carried out in different combinations or durations of the on and off portions of the pulsating cycle, as may be differently suited to varying sizes of the material being processed.

Further to the pulsating action, that may be carried out with variations also of the speed of the pump, or force of the solution pulse, independently of or in coordination with the control of the on-off portions of the pulsating cycle.

The off-on or stop-go mode of fluid forcing is observed in the on or go phase to produce a pulse or pressure wave, equalized by the injection-ejection sleeves, which in the jacket 10 accelerates out of the venturi 48, presses the sheet material SM firmly against the jacket rear wall 11, and falls like a curtain down over the emulsion face of the sensitized material, under conditions of pressure and speed as controlled for uniformity over the full area of the material.

The pulsating of the fluids under the invention method, as just described, is to be distinguished in principle and effect

from the agitation of the invention apparatus, wherein might be emulated the manipulation of a cocktail shaker, but by which would be attained not the desired uniform diffusion of, but more likely an unwanted emulsion streaking by the developing chemicals.

Under this invention, then, the two basics of the developing phase are the dispersal of the fluid pressure for even flow without turbulence; and the pulsing of the flow of the solutions through the processing jacket or tank. And in the developing phases the pump 29 may be controlled in speed and on-off sequencing for that force frequency and duration of pulsing which is observed to produce the desired random diffusing, uniform pressuring flow of the developing fluids.

It will be understood that the internal depth of the fluid jacket 10, which has been exaggerated in FIG. 3 for clarity of illustration, is preferably of the smallest dimension that will allow the desired fluid passage over the sensitized surface of material of the maximum wet thickness with which the particular jacket is intended to be used, this minimum jacket depth yielding maximum fluid pressure and also affording maximum economy of fluid or solution use. It is further to be noted that the restriction of the jacket depth (or interior section in the plane of FIG. 3) to a minor fraction of an inch accords that a dimension, and a flow restricting or pressuring, proximate to that of the venturi 48, which in turn restricts the flow from the injection sleeve as earlier described.

It will be recognized still further that every sensitized material has a maximum rate at which it can be developed, under increased pressure and accelerated flow of the fluids thereacross. Under this invention it has been found in fact that at least with the smaller or most common sheet-material sizes the pressure and flow for processing at the maximum rate of some types at least of such smaller size material can be attained under full force operation of the pump 29, in conjunction with the fluid flow pressuring and accelerating by the venturi 48 and restricted depth jacket 10 as just described. That is, with uninterrupted or continuous mode operation of the pump 29, and at sufficient force, which may be at the maximum speed as with bypass switch 74 closed, the pressure and flow of the fluids over the sensitized material is found to be everywhere sufficient for maximum rate processing, such that higher pressures as may exist at one or more points are ineffective to render the developing streaky or otherwise nonuniform, for the reason that such higher pressures are in such instance, in excess of the effective maximum. With such maximum pressure, maximum rate processing of such materials, then the invention apparatus is found capable of uniformly photographic developing by a wholly continuous, and without resort to a pulsating operation of the pumping means. For such operation the basic, manual operation of the apparatus would require for its external controls merely an on-off switch for the pump 29.

Continuing the invention procedure, at the completion of the developing phase, or at, say, 5 seconds prior thereto, injection stopcock 36 is closed, drain stopcock 35 is opened, and the drain line 31 is directed to a suitable vessel, not shown, for the recovery of the developing solution, for quick ejection of which the pump 30 may be switched from the pulsating to its straight full power mode of operation.

With all developing solutions recovered in a few seconds, stopcock 51 is opened and rinse water delivered to the jacket 10 from a supply, or from the water bath jacket 65 as above mentioned, for a wash, which may be, for example, of 30 second duration, and carried out with the drain line 31 shifted from the recovery vessel to a waste sink or the like. The wash under full power surging, as contrasted with the relatively gentle on-off pulsating of the pump 29 yields a speedy and effective purging of the apparatus as well as washing of the photographic material.

During the wash cycle the water level must be above the mouth of the fluid trough 15, or of the light cover 17, but not such as to overflow. Upon completion of the wash phase, the water supply is cut off, as herein by closing the stopcock 51.

The drain stopcock 35 is then closed, and the injection sleeve stopcock 36 is opened, to set up for further recycling of photographic chemicals.

The foregoing procedure is then repeated with the next solution in the processing sequence, with the developing and washing cycles being repeated as often as required by the sensitized material being processed, and with the overall procedure accomplishing normally the developing, fixing and washing of the sensitized or photographic material.

When the entire processing procedure has been completed, all stopcocks 35, 36, 51 are open and the water from the water bath jacket is employed in the manner described, for self-cleaning of the entire closed fluid system of the invention apparatus, this requiring but, say, 30 seconds. In the self-cleaning the water level is maintained high enough to clean the water trough or light trap cover, this admitting of overflowing the water slightly.

Part way through the self-cleaning procedure the injection sleeve stopcock 36 may be closed for a more thorough non-recycling cleaning of the processing jacket 10, the recirculating pump 29 and their tube interconnections. At the end of the 30 second self-cleaning process, the supply of water is shut off, and when all water has been ejected through the drain line 31, the drain stopcock 35 is closed and the injection stopcock 36 is opened once again, readying the apparatus for the commencement of another processing cycle.

In accordance with the invention, the described processing procedure may be carried out under varying degrees of control or automation of the apparatus.

For basic manual operation of the apparatus the valves 35, 36, 51 can be of stopcock construction, or such that their manipulation can be accomplished manually. Referring to FIG. 9, the pump 29 can be controlled as to speed by a fixed (preset) or variable resistor 72, which may be connected in series with a momentary or normally open pushbutton switch 73, which may be mounted as convenient, and by which the described pulsating of the pump 29 may be manually accomplished. A double-pole, double-throw switch 74 may also be provided in the circuit, this to bypass the pulsating on-off of the momentary switch 73, and any speed limiting by the fixed or variable resistor 72, to effect a continuous, full-power action of the pump 29, when energized as by power supply 75.

For semiautomatic control of the processing procedure the stopcock valving can be governed by remote-controlled solenoids, which solenoids may in turn be manually controlled as by toggle switches. Solid state electronic circuit components may be utilized for controlling the submersible, recirculating pump as to speed, as to on-off and pulsating-continuous switching, and also as to duration of operating period. Sequencing control of the processing, as well as of the introduction of the various processing solutions and the

recovery thereof, would be accomplished manually, in this semiautomatic operation of the apparatus, for which the remote-controlled solenoid switches, motor speed controls, pulsating controls, time controls and switching controls are adapted, when the solid state circuitry is utilized, to be housed within a compact and convenient control panel.

I claim:

1. Photographic film and paper-processing apparatus comprising a processing jacket for subjecting sensitized material to treatment by circulating photographic processing fluids, said jacket shaped and formed to receive and support said material for passage of said fluids across the sensitized surface of the material; means on said jacket for injection and ejection of said fluids at the top and bottom of said material, said injection and ejection means arranged and adapted to equalize the pressure of said fluids across the width of said material; pumping means; and fluid conduit means connecting said pumping and injection and ejection means in a closed fluid system in which said material is fully immersed in said jacket and continually processed by said fluids as recirculated therethrough by said pumping means, wherein one of said injection and ejection means comprises a sleeve having concentric inner, intermediate and outer tubes supported and closed at their ends by sleeve end walls through which said fluid conduit means open centrally to the inner of said tubes, said inner tube having longitudinal side passage means opening into the intermediate tube, said intermediate tube opening through an opposite longitudinal side passage means to the outer tube, and said outer tube opening to said jacket opposite to said intermediate-outer tube opening.

2. Photographic film and paper-processing apparatus comprising a processing jacket for subjecting sensitized material to treatment by circulating photographic processing fluids, said jacket shaped and formed to receive and support said material for passage of said fluids across the sensitized surface of the material; means on said jacket for injection and ejection of said fluids at the top and bottom of said material, said injection and ejection means arranged and adapted to equalize the pressure of said fluids across the width of said material; pumping means; and fluid conduit means connecting said pumping and injection and ejection means in a closed fluid system in which said material is fully immersed in said jacket and continually processed by said fluids as recirculated therethrough by said pumping means, wherein one of said injection and ejection means comprises a sleeve having concentric inner and outer tubes supported and closed at their ends by sleeve end walls through which said fluid conduit means open centrally to the inner of said tubes; said inner tube opening through jacket-opposite longitudinal side passage means to the outer tube, and said outer tube opening through jacket-facing longitudinal side passage means to said jacket.

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