United States Patent

[11] 3,613,547

[72] Inventors **James L. Snarr**
Cleveland Hts.;
Robert P. Hunt, South Euclid, both of Ohio

[21] Appl. No. **793,478**
[22] Filed **Jan. 23, 1969**
[45] Patented **Oct. 19, 1971**
[73] Assignee **Picker Corporation**
White Plains, N.Y.

[54] **FILM PROCESSOR**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** ..... **95/96,** 95/89 R, 95/94 R, 95/97
[51] **Int. Cl.** **G03d 3/02**
[50] **Field of Search** 95/89, 90.5, 94, 96, 97, 89; 134/64, 122; 226/118

[56] **References Cited**

UNITED STATES PATENTS

893,103	7/1908	Rubenking	95/98
1,809,830	6/1931	Cobb	95/94 UX
1,900,825	3/1933	Liberman	95/94
1,919,926	7/1933	Bodan	95/94 UX
2,927,503	3/1960	Zollinger	95/94 X
2,938,448	5/1960	Gacki	95/96 X
2,965,013	12/1960	Dorion	95/96 X
3,133,490	5/1969	Buck	95/96
3,149,551	9/1964	Cramer	95/96 X
2,912,915	11/1959	Hiserman	95/94

FOREIGN PATENTS

456,346	5/1968	Switzerland	95/94

Primary Examiner—Samuel S. Matthews
Assistant Examiner—Alan Mathews
Attorney—Watts, Hoffmann, Fisher & Heinke

ABSTRACT: An X-ray film processing machine having a main tank for retaining wash water. Developer and fixer tanks are positioned in spaced relationship in the main tank. Water is circulated around the developer tank to maintain the temperature of the developer at a desired level. The temperature of the developer is sensed to control the temperature of water being added to the main tank. Other water is added to the wash tank as required to maintain wash water at its desired temperature.

The processor has removable film transport mechanisms utilizing belts and rollers in spaced relationship.

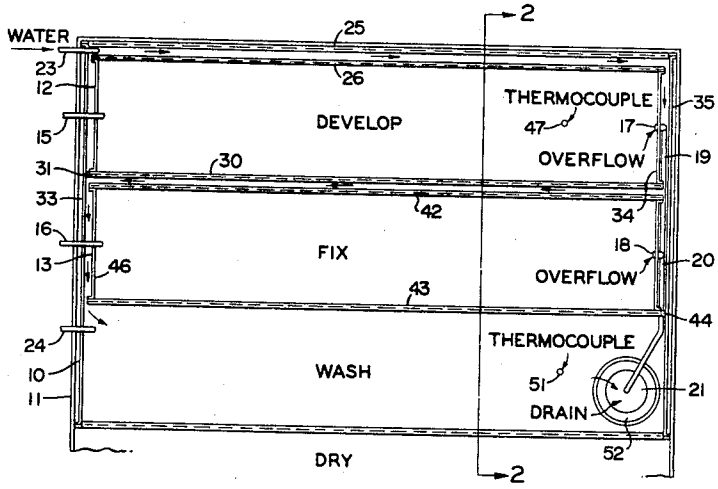
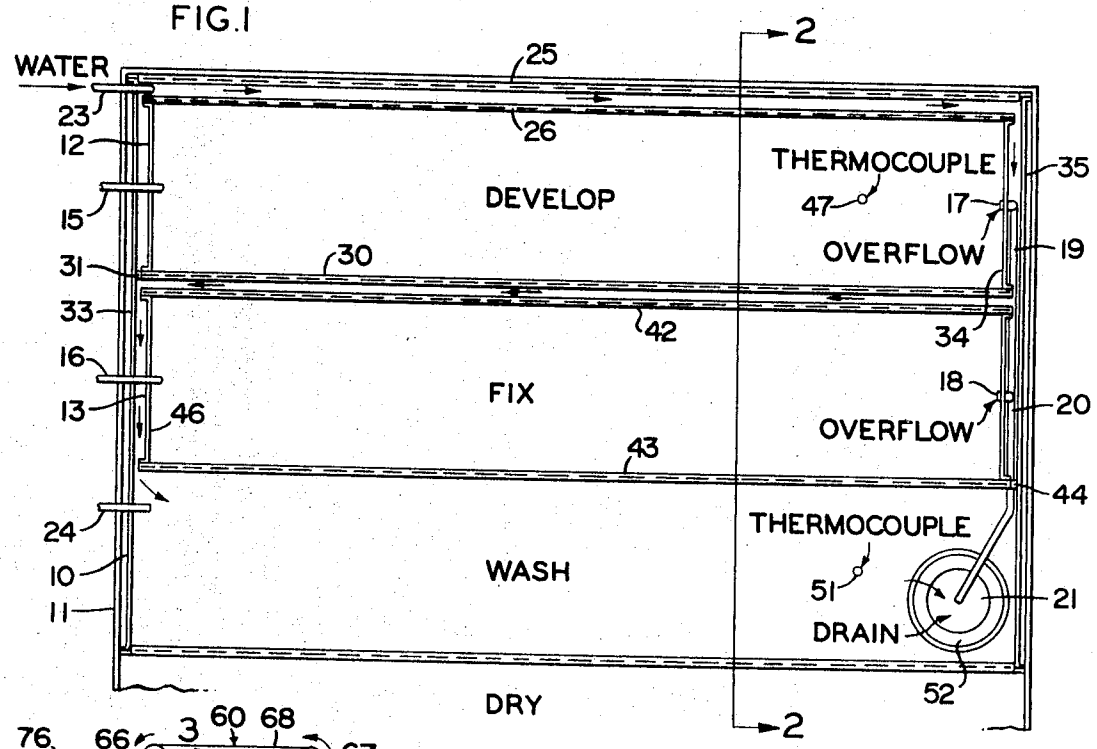


FIG. 1



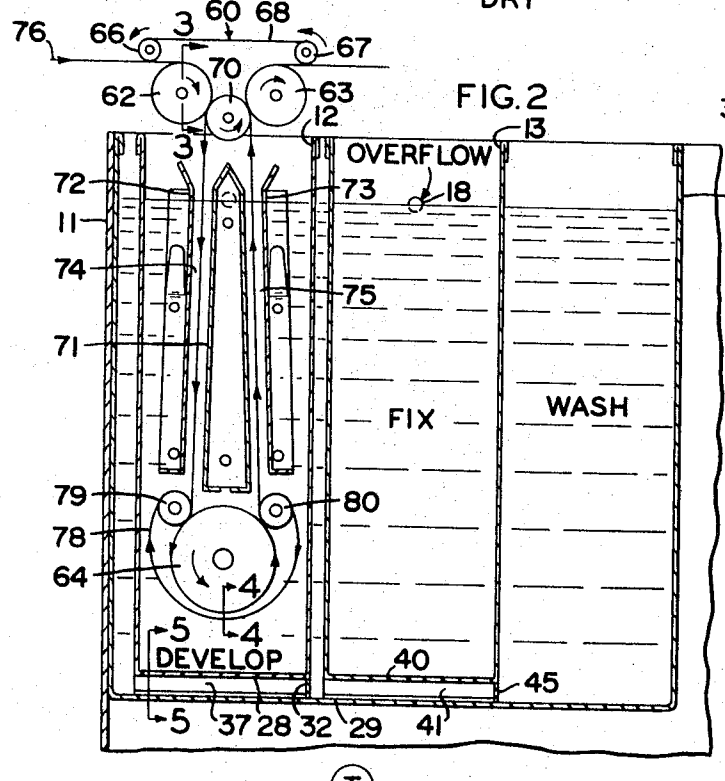


FIG. 2

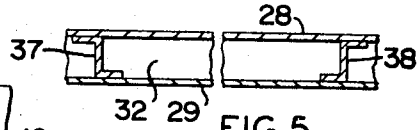


FIG. 5

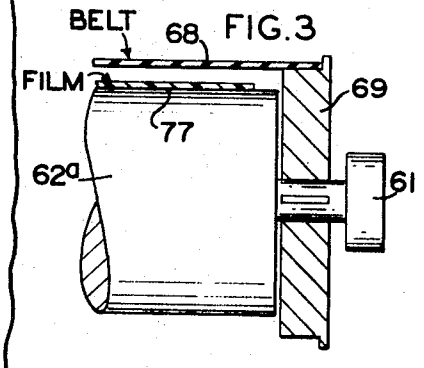


FIG. 3

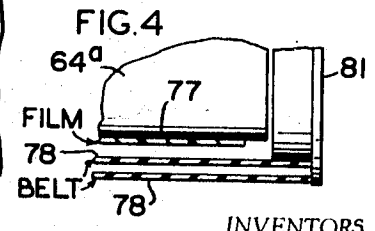


FIG. 4

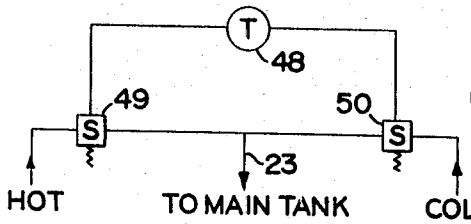


FIG. 6

INVENTORS
JAMES L. SNARR
ROBERT P. HUNT
BY
Watts, Hoffmann, Fisher & Heinke
ATTORNEYS.

FILM PROCESSOR

CROSS REFERENCES TO RELATED PATENTS AND APPLICATION

1. Application Ser. No. 615,260, filed Feb. 10, 1967, by J. L. Snarr as a continuation of Ser. No. 269,999, filed July 23, 1963, now abandoned both applications being entitled "Film processor." The continuing applications now resulted in U.S. Pat. No. 3,418,913, issued Dec. 31, 1968.

2. Copending application Ser. No. 760,868, filed Sept. 19, 1968, by J. L. Snarr under the title "processor." Application Ser. No. 760,868 is division of Ser. No. 615,260.

3. U.S. Letters Pat. No. 3,380,368 issued Apr. 30, 1968 to James L. Snarr under the Title "Film Transport Mechanism."

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to film processors and more particularly to a processor equipped with a novel and improved system for controlling the temperature of processing fluids and to a novel and improved film transport mechanism. The processor is especially adapted for the development of exposed sheets of X-ray film.

2. Description of the Prior Art

In certain medical X-ray techniques, a catheter is inserted in a patient. Various X-ray opaque materials are administered to the patient and a radiographic study is conducted. Since, once the catheter has been removed it is extremely dangerous to reinsert the catheter until several days have elapsed, it is important that the radiologist be certain that the exposed radiographs have produced the requisite information for the diagnosis he wishes to make. To accomplish this, it is desirable to have the radiographs developed while the catheter is still inserted in the patient. Because it is dangerous to maintain the catheter in the patient for excessive lengths of time, it is necessary that the radiographs be developed as quickly as possible.

In modern hospitals, the darkroom is located near X-ray rooms. Often the darkroom and X-ray rooms are connected by built-in film cassette conveyor systems. The purpose of close darkroom location and conveyor systems is to permit expeditious transport of exposed films to the darkroom and return of processed radiographs to the X-ray room.

Immediate access to a darkroom is not, however, the entire answer. It is essential that the radiograph be processed to a developed and dried condition in the shortest possible time. Elevating processing temperatures is a commonly used technique for shortening the time consumed in developing. Typically, developer solutions will be maintained at temperatures on the order of 80° F. to 100° F.

The processing of X-ray film presents other problems which are peculiar to such film. Principal among these are:

1. Both surfaces of a substrate are coated with emulsion while ordinary photographic film has emulsion only on one surface of the substrate; and,
2. In the case of cut film, the processor must cope with an admixture of film sizes, typically varying from film of the order of 5×8 inches in size to 14×17 inches in size.

While the typical X-ray film processor can process most if not all types of film, these listed and other factors peculiar to X-ray film, render the usual general-purpose film processor unsuitable for X-ray film processing.

In a typical X-ray film processor, film transport mechanisms are positioned respectively in developer, fixer, and wash tanks. These mechanisms are of so-called "lift out" construction so that they can easily be moved for cleaning and service. The transport mechanism receives a sheet of film fed to it, feeds it downwardly in its associated tank, around a turnaround mechanism, and thence upwardly to an outlet. At the outlet the film is directed laterally in the above-referenced patent and application, immediately into an adjacent tank.

With X-ray film processors, the apparatus for changing the direction of film feed at the inlet, the turnaround, and the outlet has been somewhat troublesome. For example, it has been

customary to position a cluster of rolls around a large turnaround roll to deflect the film and reverse its downward direction, turning it 180° to an upward direction. These rolls are in intimate contact with both surfaces of the film and to a certain extent tend to "squeegee" the film and inhibit film processing as the film is turned thus somewhat lengthening the processing time. In addition, the turnaround rolls are susceptible to occasional jamming, require service, and unduly complicate a cleaning operation which must be performed from time to time with all film processors.

SUMMARY OF THE INVENTION

In the present processor a main fluid tank is provided. Individual developing and fix tanks are positioned within the main tank to provide develop and fix tanks. A space is provided at one end of the main tank for the wash water. The tanks are configured to provide a serpentine path for water flow when it is introduced to the main tank. Hot water is introduced to the main tank and caused to flow around first the developer and then the fix tank to first heat the developer to the operating level and then maintain it at the desired temperature level during use of the processor. A thermocouple is positioned in the developer to sense the developer temperature and control the temperature of the wash water introduced to the system.

As the water passes around the developer and fix tanks giving off heat to them and warming them, the temperature of the water drops to approximately the desired temperature for the washing operation. Thus, wash water is constantly replenished and circulated when the processor is in use. Another thermocouple is in the wash water to sense the temperature of the wash. Additional water is added to the wash to modulate the temperature of the wash water at a desired level.

Since the developer and fix tanks are disposed within a main tank and surrounded by water, there is hydrostatic pressure against both the inner and the outer surfaces of each wall of these two tanks. With hydrostatic pressure on both surfaces, it is possible to minimize the wall thickness of the tanks. This minimizing of the wall thickness has the apparent advantage of reducing the cost of the processor and the additional advantage of facilitating heat transfer from the supplied hot water to the developer.

With the film transport mechanisms of this invention, sun rollers are provided at the inlet, the turnaround, and the outlet of each transport mechanism. At the top of the transport mechanism a feed belt is reeved over feed belt rollers. The belt defines portions of a film feed path which portions are between the feed belt and the inlet and outlet sun rollers, respectively.

A sheet of film being fed into the transport mechanism passes between this feed belt and the inlet sun roller. The film is then directed downwardly through a chute defined by a pair of plates of the type described and claimed in more detail in the referenced patent 3,380,368 to J. L. Snarr. On leaving the chute, the film passes through a turnaround mechanism. In the turnaround mechanism, a pair of turnaround belt rollers are provided and an endless turnaround belt is supported by them. As film passes between the turnaround belt and the turnaround sun roller, it is turned and passed upwardly through another chute to the outlet sun roller. The film then passes between the feed belt and the outlet sun roller and is deflected outwardly. With this arrangement, scratching, pressure marks, and artifacts are minimized since the belts and rollers are spaced and moving at the speed of the film ad it is deflected. Any danger of the film being scratched or otherwise injured by stationary deflector plates or the like is completely obviated.

Accordingly, the objects of this invention are to provide a film processor equipped with a novel and improved system for maintaining the desired temperatures of the fluids and a novel and improved film transport mechanism.

Other objects and a fuller understanding of the invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the processor of this invention with the film transport mechanisms removed for clarity of illustration;

FIG. 2 is a fragmentary sectional view of the processor as seen from the plane indicated by the line 2—2 of FIG. 1 showing the developer transport mechanism partially inserted in its tank and the fix and wash water transport mechanisms removed;

FIG. 3 is an enlarged, fragmentary, sectional view as seen from the plane indicated by the line 3—3 of FIG. 2 showing the inlet sun roller, the feed belt, and a portion of the film;

FIG. 4 is a fragmentary sectional view of the turnaround sun roller and the turnaround belt as seen from the plane indicated by the line 4—4 of FIG. 2 and on an enlarged scale with respect to FIG. 2;

FIG. 5 is an enlarged, fragmentary sectional view of the base of the wash tank as seen from the plane indicated by the 5—5 of FIG. 2; and,

FIG. 6 is a schematic diagram showing the control of water fed to the main tank for wash and maintaining temperature in the processor.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a top plan view of the processor of this invention. The processor includes a main tank 10 which is mounted in a suitable frame 11. A developer tank 12 and a fix tank 13 are positioned in the main tank. A space is provided in the main tank 10 adjacent the fix tank 13 which is labeled "wash" in FIG. 1.

When the processor is in use, three identical film transport mechanisms are provided and positioned respectively in the develop and fix tanks 12, 13 and in the wash space of the main tank 10. Film is transported in a direction from the top to the bottom of the processor as viewed in FIG. 1 and from left to right as viewed in FIG. 2. When the processor is in use, some of the developer and fix materials are lost as the film passes from the developer to the fix tank and thence through the wash space. Further, the chemical constituents of the developer and fix are gradually depleted as processing progresses. In order to maintain a desired chemical actively in the tanks, replenishment fluid is supplied through developer and fix replenishment lines 15 and 16 respectively.

Replenishment fluids are supplied in excess of the rate at which developer and fix fluids are lost. Developer and fix overflows 17, 18 coact with this excessive replenishment to maintain the levels of the developer and fix fluids at the desired level.

The overflows 17, 18 are connected to overflow conduits 19, 20 respectively. These conduits conduct the overflow fluids to a drain 21.

In order to be sure that the film is thoroughly washed and the developer and fix fluids are thoroughly removed before a film is dried, it is customary to supply fresh water to the wash in a film processor. In the processor of this invention, a main wash water inlet 23 and a control wash water inlet 24 are provided. The purpose of the two wash water inlets 23, 24 is to maintain developer in the tank 12 at a desired elevated level and wash water in the wash space in a desired and somewhat lower temperature range.

Water from the main inlet 23 is directed into a space between the inlet end walls 25, 26 of the main and developer tanks 10, 12, respectively. The construction of the main and developer tanks 10, 12 is such that as water enters from the main wash water inlet 23 it must traverse the path indicated by the arrows of FIG. 1 in order to pass ultimately into the wash space. The water can enter a space between bottoms 28, 29 of the developer and main tanks 12, 10 but is prevented from passing to the right as seen in FIG. 2.

Outlet end wall 30 of the developer tank 12 is constructed to confine the fluid flow along he desired path. The construction of the outlet end wall 30 which achieves this confined fluid flow includes a vertical baffle 31 and a base baffle 32. The vertical baffle 31 abuts a fluid supply sidewall 33 of the main tank 10. The vertical baffle 31 prevents the flow of wash water between the developer tank 12 and the fluid supply sidewall 33. Similarly, the base baffle 32 abuts the bottom 29 of the main tank 10 to prevent fluid from passing under the developer tank 12 to the right as seen in FIG. 2. Thus, the flow of fluid from the inlet 23 is along the space between the inlet end walls 25, 26 the length of developer tank 12, and then through a space defined by drive sidewalls 34, 35 of the developer and wash tanks 12, 10, respectively.

The developer tank is maintained in spaced relationship with bottom 29 of the tank 10 to minimize heat transfer the ambient atmosphere to the developer through the bottom 29. Thus, waters in the space between the tank bottoms 28, 29 contribute to the maintenance of the developer at the desired temperature. This spacing of the bottoms 28, 29 is achieved through the vertical baffle 32 and a pair of feet 37, 38. The feet 37, 38 are somewhat Z-shaped in cross section as is best seen in FIG. 5. The feet are imperforate and extend the width of the developer tank, as is seen in FIG. 2. The feet are secured to the vertical baffle 32 to stiffen and reinforce it.

The fix tank 13 similarly has a bottom 40 which is in spaced relationship with the main tank bottom 29. A pair of feet 41 are provided to maintain the spacing of the fix and main tank bottoms 40, 29. The feet 41 are identical to the feet 37, 38. Accordingly, only one is shown in FIG. 2.

The developer tank 13 has an outlet end wall 43. This outlet end wall includes vertical and base baffles 44, 45. The vertical baffle 44 abuts the drive sidewall 35 of the main tank 10 to prevent flow of wash water between the vertical baffle 44 and the wall 35. The overflow conduits 19, 20 pass through apertures in the vertical baffle 44. The spaces between the overflow conduits 19, 20 and their respective apertures are sealed or substantially sealed so that wash water flow is prevented or inhibited through these apertures.

The base baffle 45 abuts the man tank bottom 29 to prevent flow of water under the developer tank into the wash space. Thus, wash water flow is confined between the developer tank outlet end wall 30 and the fix tank inlet end wall 42 so that it must flow the length of the developer tank, from right to left, as seen in FIG. 1. Water flow then passes between a main tank sidewall 33 and a fluid supply sidewall 46 of the fix tank 13 into the wash space.

The temperature of the water supplied through the main wash water inlet 23 is controlled to maintain the temperature of the developer at a desired level. The typical temperature level for the developer is from 80° F. to 100° F. With the temperature control system of this invention, the temperature of the developer can be maintained at a desired temperature level plus or minus 1° Fahrenheit.

To achieve this temperature control of the developer, a thermocouple 47 is positioned in the developer tank, FIG. 1. This thermocouple is connected to a thermostatic control 48. A suitable commercially available thermostat is Robertshaw Controls Company type B-20. The thermostat 48 is connected to hot and cold solenoid valves 49, 50. One or the other of these valves is opened according to the temperature requirements of the developer. Thus, in the disclosed arrangement, either hot or cold water is supplied to the main water inlet 23 according to the temperature of the developer sensed by the thermocouple 47.

In the absence of a means to stabilize wash water temperature, the temperature variations of the water supplied by the inlet 23 vary the temperature of the water in the wash space excessively. Accordingly, further water is supplied to the wash space through the control inlet 24.

The temperature of water passed through the control inlet 24 is controlled in a manner identical to that shown in FIG. 6 and it will not be shown or described in detail. Thermocouple 51 acts similarly to thermocouple 45 to control the supply of either hot or cold water through the replenishment conduit 24 to maintain the wash water at the desired level of 80° F., plus or minus 5°.

A drain standpipe is shown at **52**. The standpipe **52** is a removable, vertically disposed tube. The standpipe **52** is effective to maintain the level of wash water at the desired level approximately equal to the level of the developer and fix solutions.

Referring now to FIGS. **2–4**, a film transport mechanism is shown generally at **60**. As shown, the transport mechanism is partially, but not fully, positioned in the developer tank **12**. Since the developer fix and wash transport mechanisms are identical, only the developer transport mechanism **60** is shown, it being understood that, in normal operation, identical transport mechanisms are positioned in the fix tank and in the wash space, respectively.

The coupling of the transport mechanism is accomplished through a drive pinion **61**, FIG. **3**. The drive pinion rests on, and is gravity-biased into engagement with, a drive train. For clarity of illustration, the drive train is not shown. The drive train may be that described in the above-referenced patents.

The film transport mechanism **60** has inlet, outlet, and turnaround sun roller assemblies **62, 63, 64**, respectively. A pair of feed idler rollers **66, 67** are provided. A feed belt **68** is reeved around these idler rollers. As viewed in FIG. **2**, the feed belt **68** extends to the right from the idler roller **66**. One reach of the belt is trained over a pair of sun roller idlers **69**, one of which is visible in FIG. **3**. The feed belt passes downwardly from the inlet sun roller assembly **62** and around a lower feed belt idler roller **70**. The belt then passes from the lower roller upwardly and around a pair of idlers of the sun roller assembly **63** and thence around the other feed idler **67**.

A central guide **71** is provided. Pivotable plates **72, 73** are mounted on the transport mechanism to provide inlet and outlet chutes **74, 75**, respectively. As the film is fed inwardly along a path identified by an arrow **76** in FIG. **2**, it passes through the space between the feed belt **68** and inlet sun roller **62*a***. This is depicted in FIG. **3** where the film bears the legend **77**. The film passes around the sun roller **62*a*** and is thence directed downwardly through the chute **64** to a turnaround mechanism.

The turnaround mechanism includes the turnaround sun roller assembly **64**. A turnaround belt **78** is reeved over a pair of turnaround idler rollers **79, 80** and a pair of sun roller assembly idlers, one of which is shown at **81** in FIG. **4**.

As indicated in FIG. **4**, the film **77** passes through the space between the turnaround belt **78** and turnaround roller **64*a*** of the turnaround sun roller assembly **64**. The film is then directed upwardly through the chute **75** and thence between the outlet belt **68** and the outlet sun roller assembly **63** directly to the turnaround mechanism of the fix tank.

In prior film transport mechanisms, it has been customary with the turnaround and often with the transfer mechanisms for transferring film from one transport mechanism to another, to utilize a cluster of small rollers around a large roll. These mechanisms squeeze and squeegee the film. If the rollers are marked or marred or have deposits on them, they mark the film, causing artifacts, scratches and the like.

This film marking problem is completely obviated with the present constructions because the belts are maintained in spaced relationship with the sun rollers so that squeezing of the film is eliminated.

It should be understood that the turnaround mechanism is positioned sufficiently close to the outlet sun rollers **63** that film of the minimum size processed by the machine will be picked up by the outlet sun roller and the feed belt **68** as it is leaving the turnaround mechanism. Where shorter film lengths are to be handled, intermediate rollers may be required to assure full transport of the film from the turnaround mechanism to the outlet.

As indicated previously, the film transport mechanism **60** is shown in a slightly elevated position for clarity in the drawings. Its normal operating position is lower, such that the inlet and outlet sun rollers **62, 63** are at least partially immersed in the developer fluid to keep them wet for the purposes described in greater detail in the referenced copending application Ser. No. 760,868 filed Sept. 19, 1968, by J. L. Snarr, under the title, "processor."

Although the invention has been described in its preferred form with a certain degree of particularity it is understood that the present disclosure of the preferred form has been made only by way of example, and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

We claim:

1. In a film processor the improved tank construction comprising:

a. a main tank having inlet and outlet ends and fluid supply and drive sides;

b. a developer tank mounted in said main tank, the developer tank having an inlet end and fluid supply and drive sides in spaced relationship with the main tank inlet end, and the fluid supply and drive sides of the main tank respectively;

c. the developer tank having feet maintaining the bottom of the developer tank in spaced relationship with the bottom of the main tank;

d. the developer tank having an outlet sidewall including portions projecting past the developer tank fluid supply sidewall and bottom into engagement with the main tank to provide fluid diverting baffles extending vertically upwardly from the bottom of the tank to the bottom of the developer and between the fluid supply sidewalls;

e. a fix tank having inlet and outlet end walls, fluid supply and drive sidewalls and a bottom, the fix tank bottom and sidewalls being in spaced relationship with the bottom and corresponding sidewalls of the main tank;

f. the fix tank inlet end wall being spaced from the developer outlet end wall;

g. the fix tank outlet end wall being in spaced relationship with the main tank outlet end wall to define a wash space therebetween;

h. the fix tank outlet end wall projecting past its drive side and bottom respectively into engagement with the main tank bottom and sidewall, thereby defining water-diverting baffles;

i. the fix tank including feet maintaining the bottom of the developer tank in spaced relationship with the bottom of the main tank; and,

j. film transport mechanisms positioned in the developer and fix tanks and in the wash space, respectively.

2. The processor of claim **1** additionally including:

a first fluid inlet positioned to admit fluid to said main tank adjacent said developer tank;

a second fluid inlet positioned to admit fluid to said main tank within said wash space;

first temperature-responsive means positioned to sense obviated temperature within said developer tank and to control the flow of fluid entering said main tank from said first fluid inlet to maintain a first predetermined fluid temperature within said developer tank; and,

second temperature-responsive means positioned to sense the temperature within said wash space and to control the flow of fluid entering said main tank from said second fluid inlet to maintain a second predetermined temperature within said wash space.

3. In a film processor:

a main tank having one end thereof provided as a wash space;

a developer tank positioned within said main tank and in spaced-apart relation thereto adjacent to the end opposite the wash space end thereof;

a fix tank positioned within said main tank between said wash space and said developer tank and in spaced-apart relation to each of said tanks;

a first fluid inlet positioned to admit fluid to said main tank near said opposite end thereof;

a second fluid inlet positioned to admit fluid to said main tank adjacent said wash space end thereof;

fluid flow direction means establishing a first path of flow such that fluid entering said main tank from said first inlet flows around said developer tank and thereafter to said wash space, and a second path of flow whereby fluid entering said main tank from said second inlet mixes in said wash space with fluid from said first inlet;

first temperature-responsive means positioned to sense the fluid temperature within said developer tank and being adapted to control the flow of fluid entering said main tank from said first fluid inlet to maintain a predetermined fluid temperature within said developer tank;

second temperature-responsive means positioned to sense the fluid temperature within said wash space to control the flow of fluid entering said main tank from said second fluid inlet to maintain a second predetermined fluid temperature within said wash space; and,

said first temperature-responsive means being preset to maintain the fluid in said developer tank at a higher temperature than is maintained by said second temperature-responsive means in said wash space, whereby fluid entering from said first inlet serves to heat the fluid in said developer tank before flowing into said wash space.

4. The processor of claim 3 wherein said fluid flow direction means includes discharge means communicating with said wash space whereby fluid from said first and second inlets flows along said flow paths, mixes in said wash space, and discharges therefrom through said discharge means.

5. The processor of claim 3 wherein said fluid flow direction means includes baffle means associated with said developer tank to direct the flow of fluid around said developer tank before entering said wash space.

6. The processor of claim 3 wherein said fluid flow direction means includes baffle means associated with said fix tank to direct the flow of fluid from said first inlet around said fix tank before entering said wash space.

7 The processor of claim 6 wherein said fluid flow direction means also includes baffle means associated with said developer tank to direct the flow of fluid from said first inlet around said developer tank before flowing around said fix tank.

8. The processor of claim 7 wherein:

said first temperature-responsive means comprises a first thermocouple connected to a first thermostatically controlled valve adapted to control the flow of fluid to said first inlet; and,

said second temperature-responsive means comprises a second thermocouple connected to a second thermostatically controlled valve adapted to control the flow of fluid to said second inlet.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,613,547 Dated October 19, 1971

Inventor(s) James L. Snarr and Robert P. Hunt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, paragraph 1, line 4, delete "applications" substitute -- application has --.

Col. 1, paragraph 2, line 2, delete "processor" substitute -- Processor --.

Col. 2, line 66, delete "ad" substitute -- as --.

Col. 3, line 73, before "desired" delete "he" substitute -- the --.

Col. 4, line 37, delete "man" substitute -- main --.

Col. 6, line 2 "processor" should be -- Processor --.

Claim 1, paragraph (i) line 2, "developer" should be -- fix --.

Claim 2, lines 6, 7, delete "obviated" substitute -- the --.

Signed and sealed this 11th day of April 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334