

[54] **PHOTOGRAPHIC PROCESSOR FOR LARGE FORMAT FILM UNITS**

[75] Inventor: **Duncan C. Sorli**, Chelmsford, Mass.

[73] Assignee: **Polaroid Corporation**, Cambridge, Mass.

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Primary Examiner—Fred L. Braun

Attorney, Agent, or Firm—John S. Vale

[52] U.S. Cl. 354/312, 354/84, 354/301, 354/307

[51] Int. Cl. G03d 9/02

[58] Field of Search 95/13, 89 R, 89 L, 94 R, 95/89 G, 93; 354/83, 84, 86, 301, 303, 307, 310, 311, 312, 339

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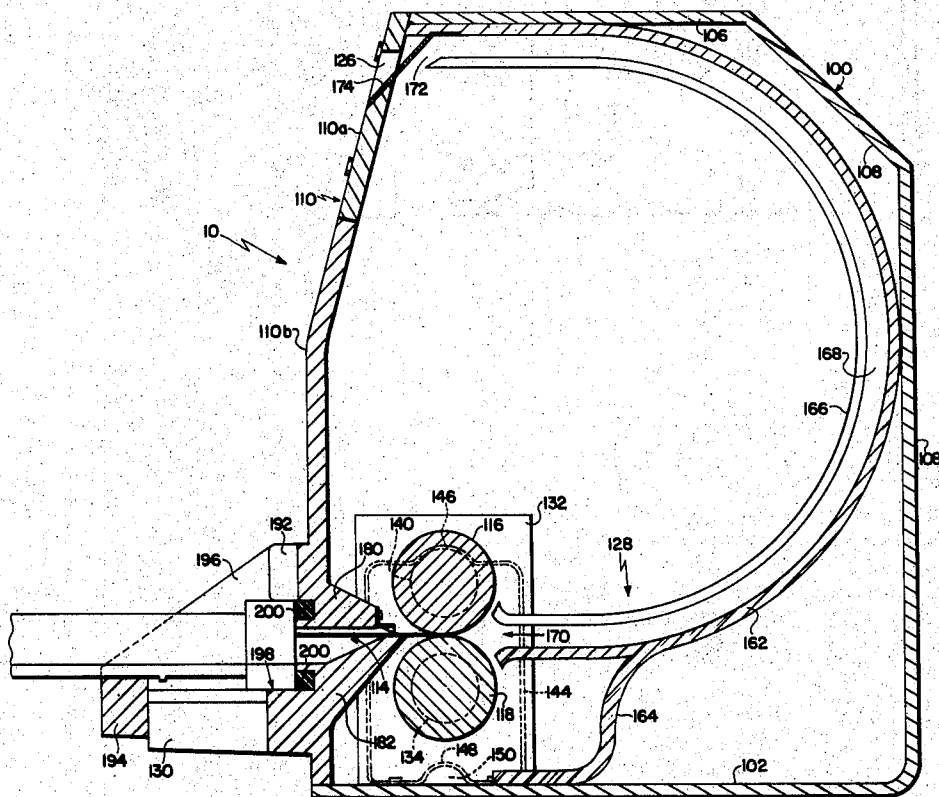
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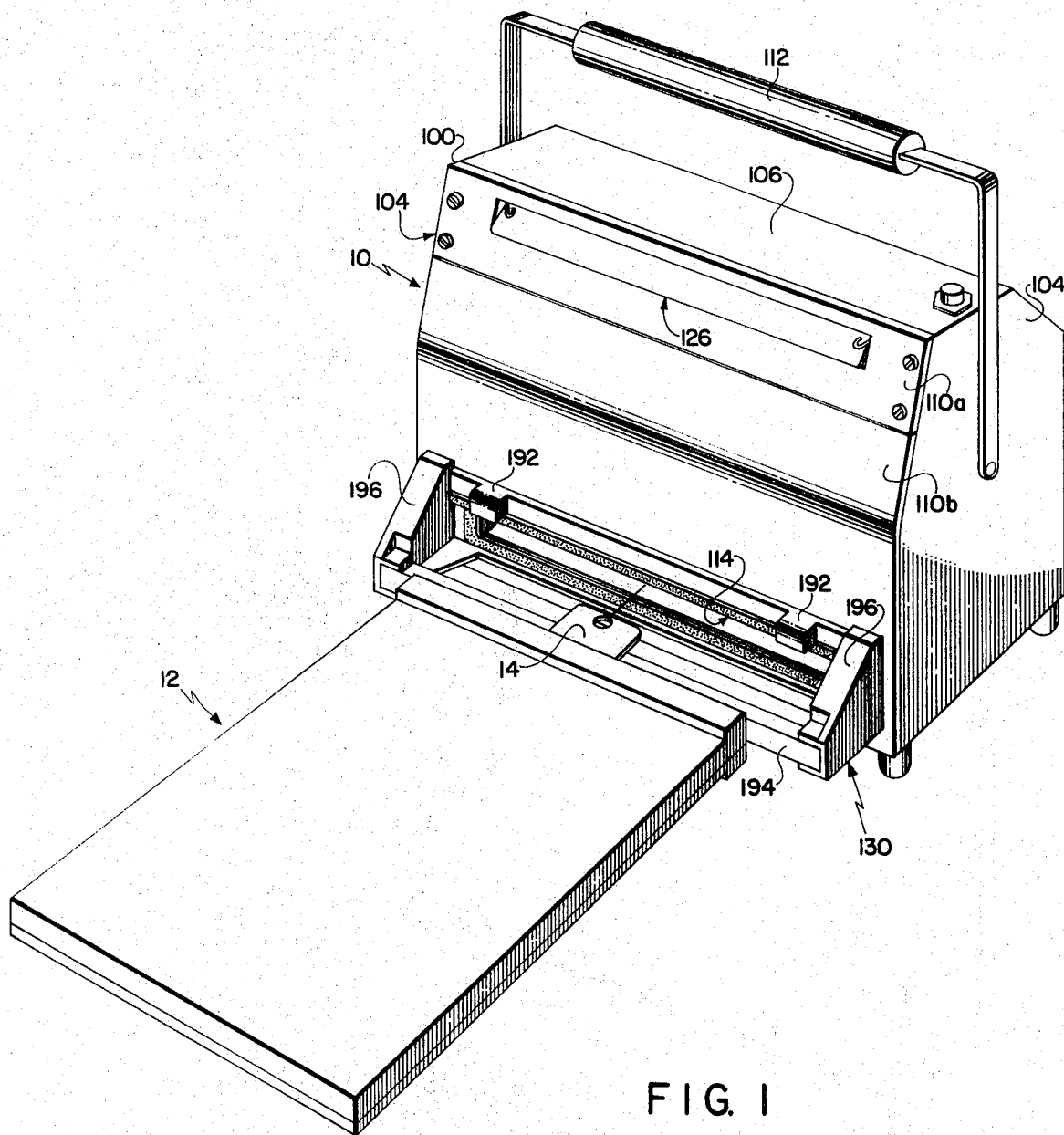
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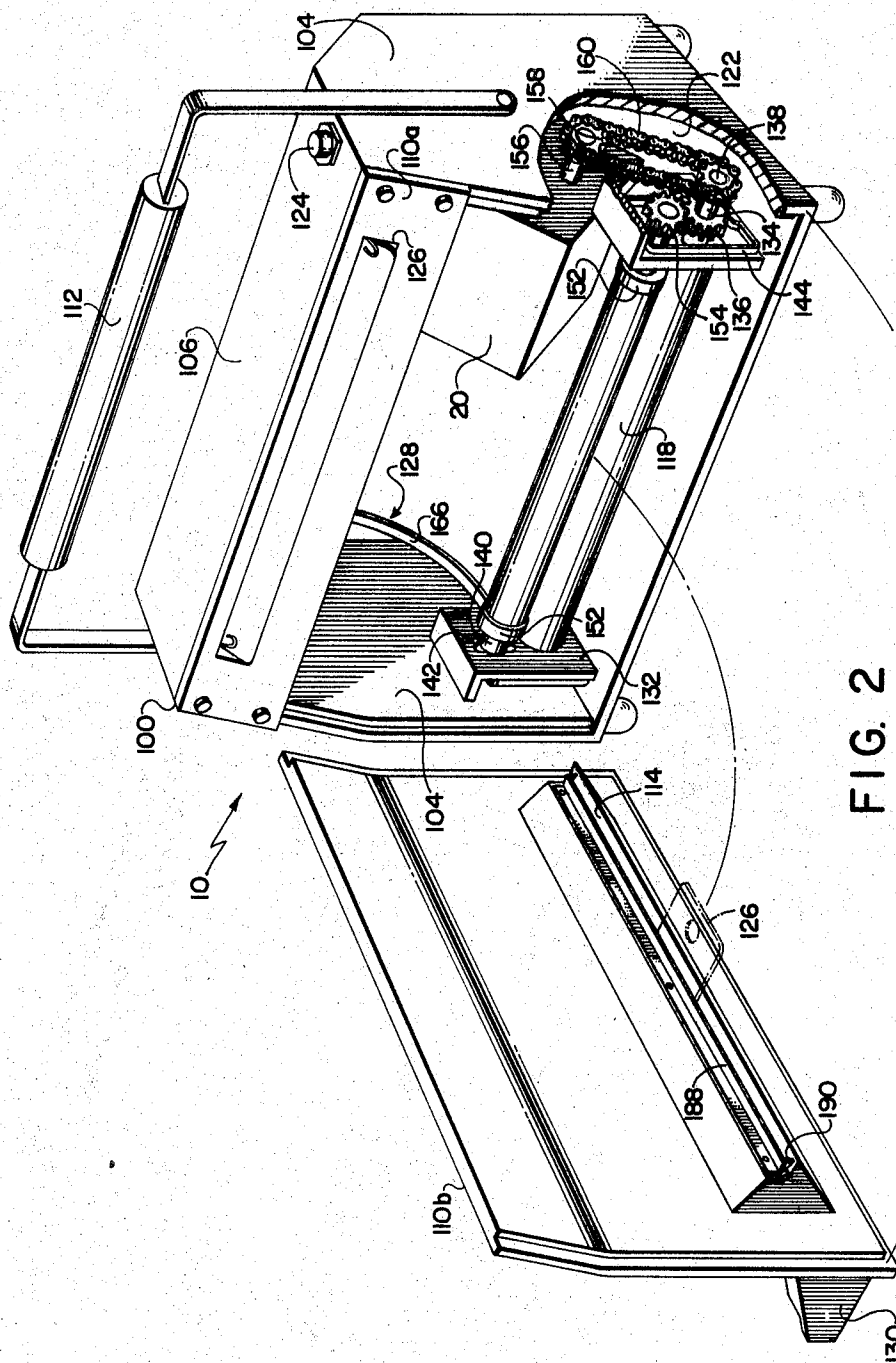
[57] **ABSTRACT**

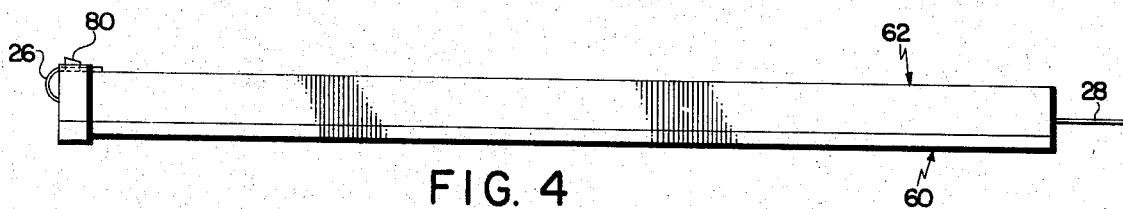
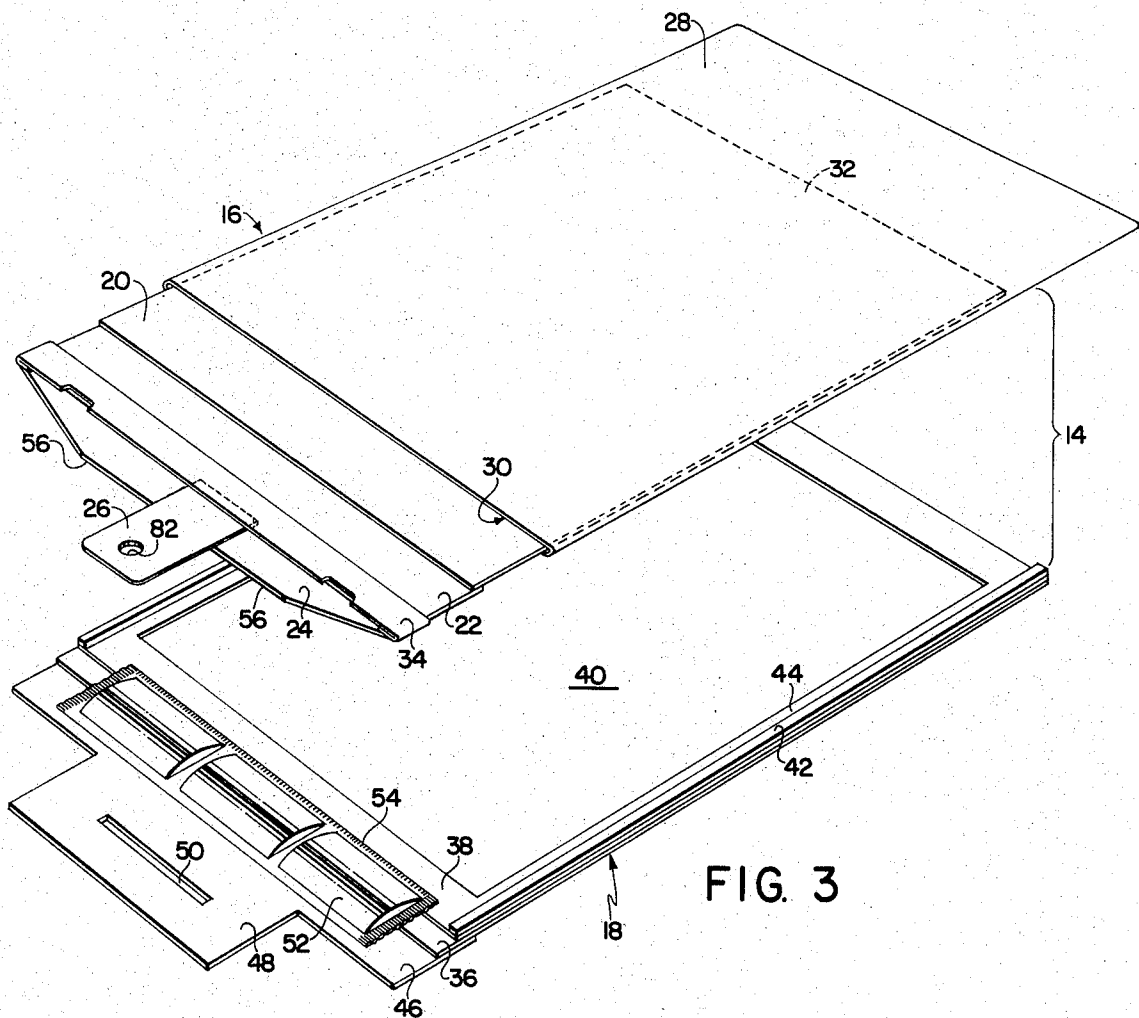
A processor for extracting a large format film unit from a cassette and causing a fluid processing composition to be uniformly distributed between predetermined layers of the film unit. The processor includes a housing having film entry and withdrawal slots therein. A guide member guides the film unit through the housing such that a tab on the film unit extends through the withdrawal slot to give the user a visual indication that fluid distribution has been completed.

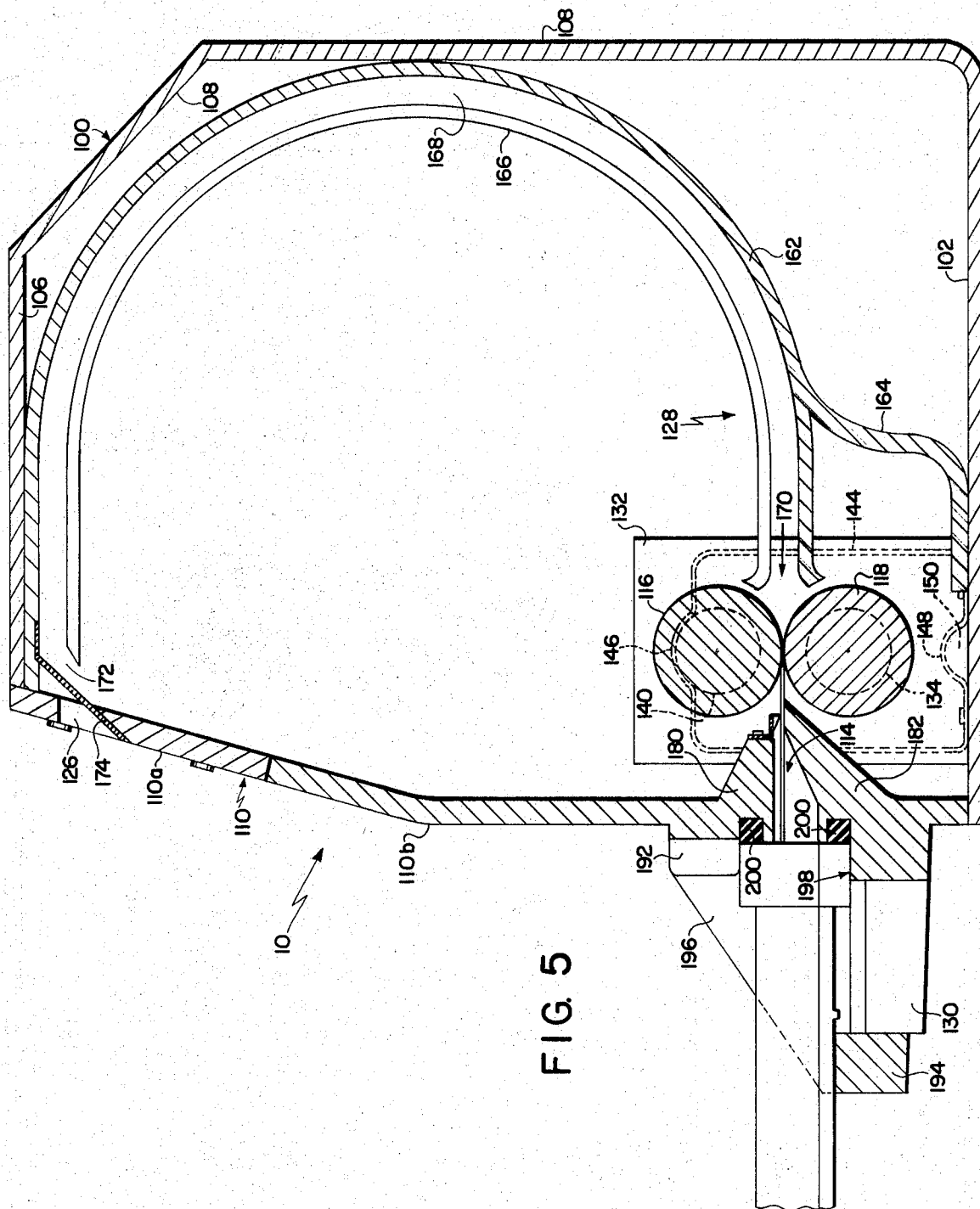
8 Claims, 7 Drawing Figures

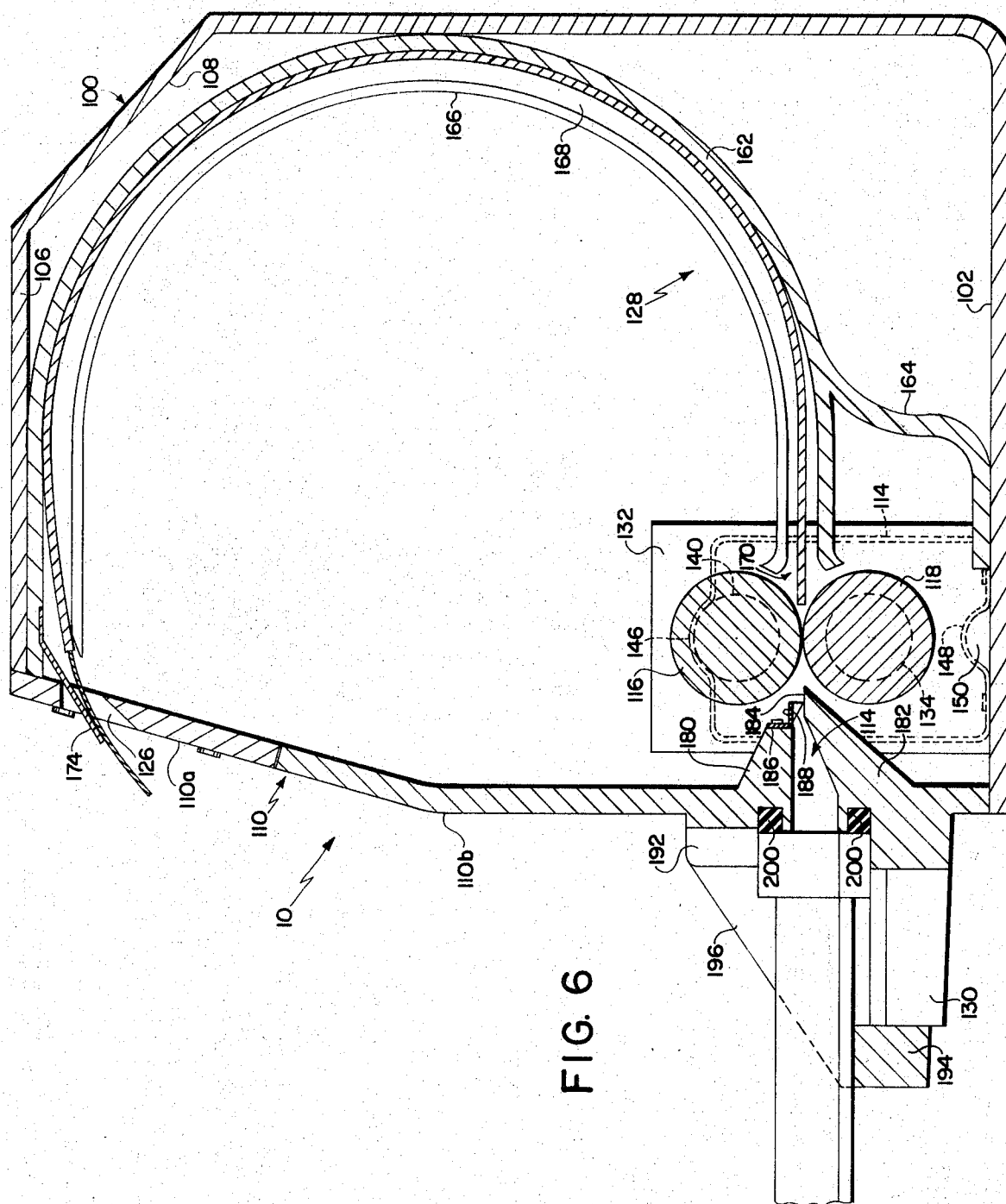


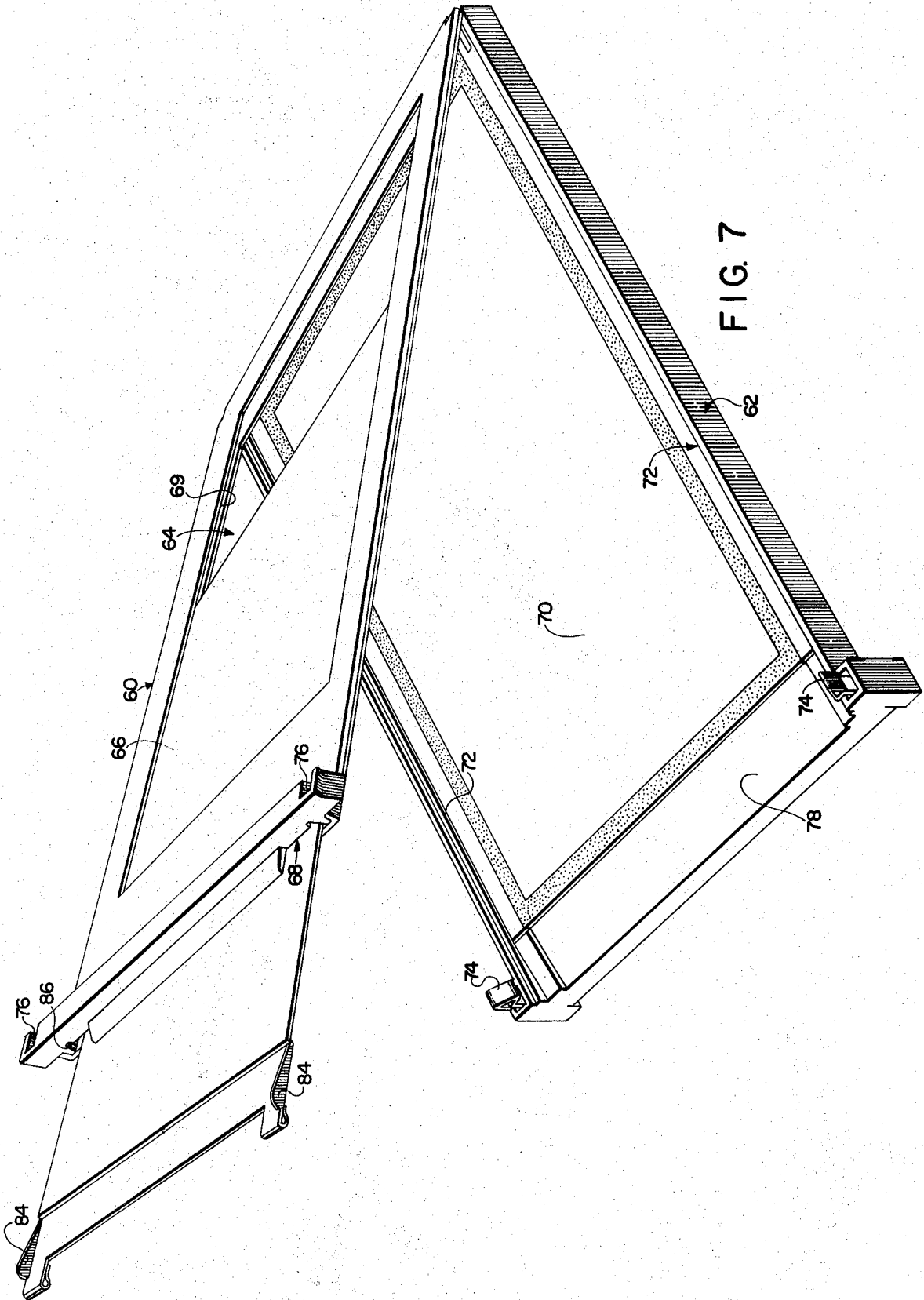












PHOTOGRAPHIC PROCESSOR FOR LARGE FORMAT FILM UNITS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field of photography and, more particularly, to a processor for processing large format film units of the self-developing type.

2. Description of the Prior Art

Large format, i.e., 8×10 or 10×12 inch film units of the self-developing type are commonly used in the medical field to provide instant radiographs or X-rays. Other applications include industrial, advertising, and portrait photography.

The film units are generally loaded into a light-tight cassette and exposed in conventional view cameras or X-ray apparatus.

After exposure, the cassette is moved to a processor which extracts the film from the cassette and distributes a fluid processing composition between predetermined layers of the film unit to initiate a well known diffusion transfer process.

In their most common form, each film unit includes a photosensitive element comprising an opaque or translucent support sheet having one or more photosensitive layers thereon and an image-receiving element comprising an opaque or translucent support sheet having one or more image-receiving layers thereon and a rupturable container of fluid processing composition coupled to the leading end of the support sheet.

The two sheets may be coupled together at their respective leading ends by a leader such that the two elements may be extracted simultaneously from the cassette in super-position with the photosensitive and image-receiving layers in face-to-face relation to one another.

The leader is generally fed between pressure applying members in the processor, e.g., a pair of juxtaposed rollers, which serve to apply a compressive pressure across the width of the film unit for rupturing the container and distributing the fluid between the photosensitive and image-receiving layers as the film unit is advanced relative to the pressure applying member.

After a suitable imbibition period, the two sheets may be separated to reveal a positive image on the image-receiving sheet.

At least two types of large format film processors are disclosed in the prior art. The first type (See U.S. Pat. No. 2,638,828) includes a lighttight box having a platform therein for receiving a film cassette, a pair of pressure rollers at one end of the platform for frictionally engaging the film unit to extract it from the cassette and apply the compressive pressure to effect fluid distribution, a slot adjacent to the rollers, and an auxiliary receiving chamber mounted on the exterior of the box in communication with the slot for receiving the processed film unit.

There are several drawbacks to this type of processor. First, it is relatively large compared to the size of the film unit because of the need for the auxiliary receiving chamber which extends outwardly from the main housing. Secondly, the film unit is completely enclosed during processing and the user cannot tell exactly when the fluid distribution has been completed so

he may begin to time the imbibition period. Also, loading the cassette into the processor and removing the processed film unit is time consuming because the user must manually open and close a cover on the top of the box in preparation to manipulate the film unit.

A second type of large format film processor is disclosed in U.S. Pat. No. 3,364,834. It consists of a vertically standing rectangular frame having a top slot for receiving the leading end of a film cassette. Below the slot is a pair of pressure applying rollers each having a flexible sheet of material coiled therearound. The two sheets are joined together at one end such that they operate to form a lighttight expansible imbibition chamber as the rollers are rotated to cause the sheets to uncoil therefrom. The rollers are adapted to be manually or motor driven to frictionally engage the film leader and extract the film unit from the cassette while applying the compressive pressure and advancing the film unit into the expanding chamber below the rollers.

One major disadvantage of this type of processor is that in order to remove the film unit from the expanded chamber, the film must be retracted back through the rollers as they are rotated in a reverse direction. This is a time consuming operation and it severely limits the number of film units which may be processed during a given time period.

In another embodiment where the chamber may be opened at the bottom to remove the film unit, the processing time is still excessive because the rollers must be reversed to retract the chamber before the next film unit may be processed.

SUMMARY OF THE INVENTION

The present invention provides a compact and easy to use processor for extracting a large format film unit from a cassette and causing a fluid processing composition to be uniformly distributed between predetermined layers of the film unit.

The processor features a compact housing having a film entry slot and an offset and film withdrawal slot (preferably on the same side of the housing as the entry slot).

A pair of pressure applying members, preferably motor driven rollers, are positioned within the housing near the entry slot for frictionally engaging a film unit leading end tab which protrudes from a cassette. In response to rotatably driving the roller, the film unit is advanced from the cassette and between the rollers to effect the distribution of the fluid processing composition.

As the film exits from the rollers it is guided, by guide members within the housing, along a curved path of travel to the withdrawal slot. The guide members define a path length such that a portion of the leader extends through the withdrawal slot when the film unit has completely passed between the rollers. This serves as a visual indication to the user that the fluid distribution has been completed and that he should begin to time the imbibition period.

As noted earlier, the withdrawal slot is preferably on the same side of the housing as the entry slot. Accordingly, the leader appears in a location where the user may easily grasp it and remove the film unit from the housing by pulling the leader towards himself.

The processor preferably is also equipped with a novel fluid control mechanism associated with the film entry slot. As the superposed film elements are drawn

into the rollers, a pair of flanges positioned over the entry slot on the inside of the housing apply a compressive pressure to the lateral margins of the two sheets to insure that the fluid will be contained therebetween during the spreading or distribution mode of operation.

The processor may also be provided with a cassette support member positioned on the exterior of the housing for supporting the leading end of a film holding cassette in operative relation with the entry slot. The support member is simple in construction and allows cassettes to be quickly and accurately attached to and detached from the housing.

In operation, the user attached a cassette to the processor housing, feeds the leader or tab of the film unit and presses a motor start button. The rollers frictionally engage, extract, and process the film unit and the tab appears at the withdrawal slot. The user waits until the imbibition interval is complete, pulls the film unit through the withdrawal slot and separates the two sheets.

There are no housing covers to open and close. There are no expansible imbibition chambers to retract. The user simply has to couple the next cassette to the processor housing and press the start button to process the next film unit.

Therefore, it is a feature and object of the present invention to provide a compact and easy to use processor for large format self-developing film units.

It is another feature and object of the invention to provide a processor which includes a housing having offset film entry and withdrawal slots, processing means including pressure applying means and film advance means within the housing, and guide means for receiving the film unit from the processing means and guiding it to the withdrawal slot.

It is another feature and object to provide a processor which includes a housing having entry and withdrawal slots therein, processing means for extracting a film unit from a cassette through the entry slot, means for supporting a cassette on the housing, and guide means for defining a curved path of travel for the film unit within the housing such that it is located in a convenient position to be removed from the housing through the withdrawal slot.

It is yet another feature and object to provide such processor which is equipped with fluid control members associated with the entry slot for applying a compressive pressure to the lateral margins of a film unit passing therethrough to insure that a processing fluid being distributed between predetermined layers of the film unit does not escape along the lateral margins of the film unit.

It is still another feature and object of the present invention to provide a system for distributing a fluid processing composition between predetermined layers of a film unit wherein the system includes a processor, a film unit, and a film holding cassette.

It is yet another feature and object of the invention to provide a large format film processor which is uniquely configured to provide the user with a signal, preferably a visual signal, indicating that fluid distribution within a film unit has been completed.

Other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

The invention accordingly comprises the apparatus and system possessing the construction, combination of

elements, and arrangement of parts which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a large format film processor, film holding cassette, and self-developing film unit comprising the processing system of the instant invention;

FIG. 2 is a perspective view of the processor of FIG. 1 with the front panel removed to show details of the interior construction;

FIG. 3 is a perspective view of a large format, self-developing film unit which is especially well suited to be processed in the processor shown in FIGS. 1 and 2;

FIG. 4 is an elevational view of the film holding cassette that is adapted for use with the processor of FIGS. 1 and 2;

FIG. 5 is an elevational view, partly in section, of the processor showing a film holding cassette positioned in operative relation with a film entry slot in the processor;

FIG. 6 is an elevational view, partly in section, of the processor showing a processed film unit protruding from a withdrawal slot in the processor housing; and

FIG. 7 is a perspective view of the film holding cassette of FIGS. 1 and 4 shown in its open position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The components forming a unique system for processing a large format self-developing film unit are shown in FIG. 1 of the drawings. They include a film unit processor 10, a film holding cassette 12, and a self-developing film unit 14 (shown positioned in cassette 12).

A more detailed view of film unit 14 is shown in FIG. 3 of the drawings. In its preferred form, it comprises a first film element 16, commonly referred to as the photosensitive element or negative sheet, and a second element 18 which may be called an image-receiving element or positive sheet.

The photosensitive element 16 includes a generally rectangular support sheet 20 having one or more photosensitive layers coated on one side thereof. Sheet 20 is preferably formed of a conventional paper or plastic film base material which may be opaque or slightly translucent. Attached across the leading end of sheet 20 is a paper or plastic leader 22 for facilitating manipulation of sheet 18 during cassette loading and subsequent processing operations. Leader 22 is preferably configured to include a tapered portion 24 (for stiffening the leading end of the film element 14) which terminates in a generally rectangular, centrally disposed, and forwardly extending tab 26, the functions of which will be described hereinafter.

In order to protect the photosensitive layer on sheet 20 from exposure to visible light before film element 16 is loaded in holding cassette 12, element 16 is preferably provided with a removable opaque paper or plastic envelope 28. Envelope 28 is sealed along three edges

and includes an opening 30 along the fourth edge through which the trailing end 32 of sheet 20 may be inserted. The opening 30 is light sealed by an opaque overskirt 34 on leader 22 into which the leading end of the envelope 28 is adapted to be inserted. Once film element 14 is loaded into a lighttight cassette 12, envelope 28 may be withdrawn from the trailing end 32 of sheet 20.

The second film unit element 18 preferably comprises a generally rectangular, opaque (or slightly translucent), paper or plastic support sheet 36 having one or more image-receiving layers coated on one side thereof. A strippable rectangular mask 38 is releasably secured around the marginal edges of the coated surface and serves to define the bounds of a generally rectangular, central image-forming area 40. In a preferred embodiment, a pair of slightly raised spacers or rails 42 are provided on the lateral margins 44 of mask 38 for establishing a predetermined gap between the photosensitive and image-receiving layers, when sheets 20 and 36 are superposed, to control the thickness of the layer of processing fluid distributed therebetween.

Attached to, and extending across the leading end of sheet 36, is a paper or plastic leader 46 which terminates in a forwardly extending, centrally disposed, sheet manipulation tab 48 having a centrally disposed elongated slot 50 therein.

In this embodiment, film element 18 also includes a rupturable container 52 of a fluid processing composition. Container 52 is preferably formed of a rectangular blank of vapor and liquid impermeable material which is folded over on itself and sealed along three edges to form a cavity for holding the processing fluid. The container is secured to leader 46 such that a relatively weak longitudinal seal 54 faces the image forming area 40 of sheet 36.

As will be described in detail hereinafter, the photosensitive element 16 is loaded into cassette 12 after which the opaque envelope 28 is removed from sheet 20. The cassette is then mounted on a view camera or X-ray apparatus and the photosensitive layer or emulsion is exposed to form a latent image therein. The image-receiving element 18 is then inserted into the cassette 12 in overlying relation to element 16 such that the photosensitive and image-receiving layers are in face-to-face relation.

The leading ends of elements 16 and 18 are coupled together by folding tab 48 back on itself such that slot 50 is at the leading edge of the folded tab 48. The tab 26, on film element 16, is then inserted through slot 50 until the planar forward edge 56 of leader portion 24 abuts against the crease in the folded tab 48 on either side of slot 50.

Tab 26 is fed into processor 10 where pressure applying members (to be described later) frictionally engage tab 26 and draw the two superposed elements 16 and 18 from cassette 12 and into the processor 10.

The pressure applying members compress the walls of the container 52 and induce a hydraulic pressure in the fluid which causes the longitudinal seal 54 to rupture thereby dispensing the fluid in a mass along the leading edge of the image forming area 40.

As the superposed elements 16 and 18 are further advanced between the pressure applying members, the mass of liquid is advanced along a wave front which travels from the leading to the trailing end of the image forming area 40. Accordingly, the fluid is distributed

between and in contact with the photosensitive and image-receiving layers to initiate the well known diffusion transfer process. As noted earlier, the side rails or spacers 42 on mask 38 serve to regulate the thickness of the fluid layer between sheets 20 and 36. In a preferred embodiment, the trailing end margin 57 of mask 38 is provided with a liquid trap (not shown) for collecting any excess fluid which may extend beyond the trailing end of the image forming area 40.

Once the fluid has been distributed, the user begins to time a predetermined imbibition period, typically 15 seconds for black and white film and one minute for color, after which the photosensitive and image-receiving elements may be separated to view the positive image on sheet 36.

At this point, it may be well to point out that the chemical composition of film unit 14 has been described in somewhat general terms and that it may be configured to produce either black and white or full color positive images. For a more detailed description of the chemical composition of suitable photosensitive and image-receiving layers and compatible processing fluids, reference may be had to U.S. Pat. No. 2,983,606, issued to H. G. Rogers on May 9, 1961, and U.S. Pat. Nos. 2,698,236, 2,698,237 and 2,698,245, issued to E. H. Land on Dec. 28, 1954.

The film holding cassette 12 which is especially well suited for use with processor 10 and film unit 14 is best shown in FIGS. 4 and 7.

The cassette is formed by two generally rectangular plate-like members 60 and 62 which are hinged together near the lateral corners of their respective trailing ends for movement between the open or film loading position of FIG. 7 and the closed position of FIG. 4 wherein members 60 and 62 cooperate to form a lighttight enclosure for film element 16.

Cassette member 60 is formed of any suitable opaque material, i.e., metal or plastic, and is configured as a rectangular frame which defines a rectangular exposure aperture 64 therein. The exposure aperture 64 is adapted to be blocked and unblocked by means of a plate-like dark slide 66 which is adapted to be inserted into member 60 through an elongated opening 68 at its leading end. Communicating with opening 68 is a pair of guide slots 69 disposed along the lateral edges of exposure aperture 64 for guiding the edges of dark slide 66 as it slides between its blocking and unblocking position.

Cassette member 62 includes a generally planar bottom wall 70 having a pair of upstanding flanges 72 along its lateral edges. It will be noted cassette member 60 is configured to be thicker in the center (to accommodate dark slide 66) than out at its lateral edges. This thicker center portion extends down between flanges 72 when the cassette is closed such that lateral edges rest on top of flanges 72 to create a labyrinth-type of light seal therebetween.

In order to releasably secure the cassette members 60 and 62 in the closed position, member 62 is provided with a pair of spring biased latching members 74 near its leading end which are adapted to engage appropriate detents 76 formed in the leading end of cassette member 60.

The film element 16 is placed on the bottom wall 70 of cassette member 62 with its envelope enclosed photosensitive coated side facing the exposure aperture 64

and its leading end tab 26 extending beyond the leading end of member 62.

It will be noted that the bottom wall 70 includes a generally rectangular depression 78 at its leading end to accommodate the relatively thick envelope sealing overskirt 34.

The cassette is then closed and latched. The forwardly extending film tab 26 is folded around the leading end of member 62 and is releasably coupled to the underside of bottom wall 70 by a projection 80 integrally formed therewith which is adapted to extend through a hole 82 in tab 26 (See FIG. 4).

The opening at the leading end of the cassette 12, between member 60 and 62, may be light sealed by a strip of resilient material, for example foam rubber, secured across the leading end of the underside of member 60. With the leading end of film unit 16 secured to the cassette, the opaque envelope 28 may be withdrawn from sheet 20 through a light baffled opening (not shown) at the trailing end of the cassette between the hinges connecting members 60 and 62.

Cassette 12 then may be mounted on a camera or X-ray apparatus to expose the photosensitive emulsion through exposure aperture 64. One skilled in the art will appreciate that in the case of X-ray applications, the dark slide 66 may be made of a suitable material which is transparent to X-rays such that it may remain in its blocking position during exposure.

It will be noted that dark slide 66 is provided with a pair of upturned flanges 84 near its leading end lateral edges which are adapted to slide into a pair of slots 86 in the leading end of cassette member 60 when the dark slide 66 is in its fully inserted or blocking position. The function of flanges 84 are to engage and pivot upwardly a resilient light sealing member (not shown) which normally depends from the upper edge of the elongated opening 68 towards the bottom edge thereof.

Subsequent to the exposure of the film element 16, and with the light seal retracted by flanges 84, the second film element 18 may be inserted through opening 68, on top of dark slide 66, with its image-receiving layer facing downwardly towards the photosensitive layer of film element 16 on the opposite side of dark slide 66.

With both elements 16 and 18 held in the closed cassette 12, tab 26 on element 16 may be removed from its engagement with projection 80 and inserted through the slot 50 in tab 48 on film element 18 to couple the leading ends of the elements together as described earlier.

Accordingly, the film elements 16 and 18 may be extracted from cassette 12 simultaneously and thereby brought into face-to-face contact by pulling tab 26 outwardly from the leading end of the cassette.

Processor 10, as best shown in FIGS. 1, 2, 5, and 6, includes a box-like housing 100 which may be formed of any suitable opaque material, e.g., sheet metal or plastic. The housing 100 is formed by a bottom wall 102, a pair of side walls 104, a top wall 106, a rear wall 108, and a front wall 110 which is preferably constructed to include an upper section 110a fixedly secured to the leading edges of side walls 104 and top wall 106, and a lower section 110b which is releasably secured to the leading edges of side walls 104 and bottom wall 102 such that it may be easily removed to provide access to the interior of housing 100.

Housing 100 is relatively small when compared to the prior art processors and may easily be moved from place to place. To enhance the portability of the processor, a carrying handle 112, pivotally coupled to side walls 104, may be provided.

The construction of processor 10 is quite simple. It includes film entry slot 114 in lower front wall section 110b, a pair of pressure applying rollers 116 and 118 positioned behind entry slot 114 for applying a compressive pressure to a film unit 14; a roller drive assembly comprising an electrical motor 120, a chain drive system 122, and a motor start/stop switch 124; an offset film exit or withdrawal slot 126 in front wall section 110a above the entry slot 114; and a curved film guide member 128 for guiding a film unit from the exit side of rollers 116 and 118 to the withdrawal slot 126. The processor also includes a cassette support member 130 mounted on the exterior of front wall section 110b for supporting a cassette such that its leading end is in alignment with film entry slot 114.

The rollers 116 and 118 are rotatably mounted in juxtaposition between a pair of L-shaped mounting blocks 132 which may be secured to bottom wall 102 and side walls 104.

Rollers 116 and 118 are preferably formed of a suitable metal, e.g., stainless steel and dimensioned such that their central film engaging portion measure approximately $\frac{3}{4}$ to 1 inch in diameter.

The lower roller 118 includes a pair of narrow diameter end extensions 134 which extend through suitable roller bearings (not shown) fixedly mounted in mounting blades 132. Mounted on the right end extension 134 (as viewed in FIG. 2) between block 132 and side wall 104 are a pair of gears 136 and 138.

The upper roller 116 also includes narrow end extensions 140 which extend through roller bearings (not shown) which are preferably slidably mounted in elongated openings 142 in mounting blocks 132 (See FIG. 2). This arrangement permits roller 116 to move towards and away from roller 118 in a vertical plane.

Roller 116 is biased downwardly towards roller 118 by means of a pair of generally rectangular spring elements 144 which may be secured to bottom wall 102. Each spring element includes an upper curved section 146 which receives the roller end extension 140 and a lower curved section 148 for receiving a complimentary curved projection 150 on bottom wall 102. By shaping spring element 144 in this manner, the downward biasing force on roller 116 is concentrated in a vertical direction such that it passes through the axis of rotation of rollers 116 and 118.

The upper roller 116 is mounted for vertical movement relative to roller 118 to vary the gap or spacing therebetween during the film processing cycle to accommodate the relatively thick container 52 of processing fluid at the leading end of the film unit 14. More importantly, however, is the fact that this type of structure provides a simple method for varying the compressive pressure along the length of the film unit as will be described in detail hereinafter.

For reasons to be explained later, it is desirable to maintain a minimum gap between the rollers 116 and 118. This may be accomplished by providing raised collars 152 near the ends of roller 116 inboard of mounting blocks 132. In a preferred embodiment the minimum spacing may approximate .0015 inches.

Roller 116 is provided with a drive gear 154 mounted on the right hand end extension 140 which is adapted to mesh with drive gear 136 on roller 118. It will be noted that the teeth of both gears 136 and 154 are cut sufficiently deep to permit limited vertical movement of roller 116 without having these gears become disengaged.

The roller drive assembly includes an A.C. motor 120 which may be fixedly mounted on the interior surface of the right hand housing side wall 104 by a suitable mounting bracket (not shown). The motor drive shaft 156 has a drive gear 158 coupled to its end which is preferably coupled to gear 138 on roller 118 by a closed loop drive chain 160.

One skilled in the art will appreciate that the drive chain 160 is but one of many methods of transmitting power from motor 120 to roller 118 and it will be understood that it is within the scope of the present invention to utilize other drive train components such as a series of interconnected gears.

As best shown in FIG. 2, motor 120 is adapted to be driven in a clockwise direction (looking at the end of drive shaft 156 from right hand wall 104 in FIG. 2) in response to actuating start/stop switch 124. Gear 158 drives chain 160 in a clockwise direction causing roller 118 to also be rotated in a clockwise direction. Gear 136 on roller 118 drives gear 154 on roller 116 causing roller 116 to be rotated in a counterclockwise direction such that a film unit inserted into the bite of the rollers from the entry slot 114 will pass between the rollers and be advanced into the housing 100.

Positioned on the exit side of rollers 116 and 118 is a curved guide member 128 for receiving a film unit 14 from rollers 116 and 118 and guiding it to the exit slot 126.

In its preferred embodiment guide member 128 may be formed, in part, by a first curved section 162 which extends across the width of housing 100 between side-walls 104. Section 162 may be formed of sheet metal or plastic and may be supported in the position shown in FIGS. 5 and 6 by fixedly securing its upper end to the interior surfaces of top wall 106 and securing an integrally formed support bracket 164 depending from its lower end to bottom wall 102 by any suitable means such as adhesive bonding, welding, etc.

Guide member 128 also includes a pair of curved sections 166 which extend inwardly, approximately one inch, from the housing side walls 104 and are spaced from section 164 to define a pair of curved channels 168 therebetween for receiving the lateral edges of a film unit 14.

As best shown in FIGS. 5 and 6 the entrance openings 170 of channels 168 are adjacent to and in alignment with the bite between rollers 116 and 118. The exit ends 172 of channels 168 are preferably enclosed by a resilient, opaque, exit door 174 which is attached to the interior surface of top wall 106 at one end and has its opposite free end resting on a beveled surface at the bottom of the film exit slot 126. The exit door 174 serves to light seal slot 126 and the open exit ends 172 of channels 168 and is normally biased to the position shown in FIG. 5 in closing relation to slot 126.

As best shown in FIGS. 5 and 6 the film entry slot 114 in the lower front wall section 110b is generally defined by a pair of inwardly extending upper and lower projections 180 and 182.

The lower projection 182 is preferably provided with a planar, horizontal, bearing surface 184 which is disposed in a plane that is located just slightly below a horizontal plane containing the bite between rollers 116 and 118. This surface 184 serves as a means for supporting and guiding the film unit 14 as it is advanced from the cassette 12 into the bite of the rotating pressure applying rollers.

It will be noted that surface 184 extends beyond (to the right as viewed in FIG. 5) the trailing end 186 of the upper projection 180. Mounted on the trailing end 186 of projection 180 is a pressure applying member 188 for selectively applying a second compressive pressure to the lateral margin of the film unit 14 forward (to the left as viewed in FIG. 5) of the rollers 116 and 118. The function of member 188 is to hold the lateral edges of the superposed film elements together to prevent fluid leakage along the lateral margins. In effect, member 188 serves as a means for controlling the lateral distribution of fluid processing composition between the superposed photosensitive and image receiving elements.

As best shown in FIG. 2, pressure applying member 188 comprises an elongated resilient metal strip which is fastened by any suitable means to the trailing edge of projection 180 such that it is substantially parallel to and in spaced overlying relation to the bearing surface 184 on projection 184. The lateral ends 190 of member 188 depend downwardly towards bearing surface 184 to define a small gap (narrower than the thickness of a film unit 14) therebetween.

As a film unit 14 is advanced through film entry slot 114, the ends 190 are deflected upwardly and apply a downward force on the lateral margins of the film unit 14 and selectively compress the margins against the fixed bearing surface 184.

As best shown in FIGS. 1, 5, and 6, the cassette support member 130 is mounted on the exterior surface of front wall section 110b. It comprises a pair of laterally spaced upper projections 192 for bearing against the top surface of the cassette 12 and a generally horizontal bar 194, supported forwardly of projections 192 by triangular support plates 196, for supporting the underside of the leading end of cassette 12.

Support member 130 also includes a second support surface 198 located directly under projections 192 and disposed in a horizontal plane for receiving and supporting the underside of the leading end of cassette 12.

With the upper and lower leading ends of cassette 12 positioned between projections 192 and bearing surface 198, horizontal bar 194 is able to support the full weight of cassette 12 in cantilever fashion.

In an alternative embodiment of processor 10, a cassette support structure similar to support 130 may be integrally formed with the horizontal portion of carrying handle 112. When the processor is in use, the handle would be pivoted to a position in front of wall 110 to locate the cassette support in alignment with film entry slot 114.

As best shown in FIG. 5, the opening in front wall section 110b leading to slot 114 may be provided with a resilient rubber gasket or O ring seal 200 which is adapted to bear against the leading edge of cassette 12 when the cassette is fully inserted into support member 130 for light sealing the interface between cassette 12 and processor 10.

In the operation of the film processing system, the photosensitive film element 16 is loaded into cassette 12 which is then mounted in an appropriate camera or other photographic apparatus. Subsequent to exposure of element 16, the cassette is removed from the camera or apparatus and the image receiving element 18 is slipped into the cassette in overlying relation to the dark slide 66. The tab 26 on film element 16 is inserted through the slot 50 in the leader attached to film element 18 thereby interconnecting elements 16 and 18 for simultaneous withdrawal from cassette 12.

The cassette 12 is inserted, leading end first, into the processor cassette support member 130. The tab 26 is inserted through film entry slot 114 and is guided by surface 184 and the flat medial portion of pressure applying member 188 into the bite between rollers 116 and 118.

It will be noted that the length of tab 26 protruding from the end of cassette 12 preferably exceeds the distance from the cassette to the bite of the rollers 116 and 118. This causes tab 26 to assume a curved or "S" shaped configuration when its leading edge is in the bite. Such a configuration is desirable in that it creates a certain amount of resiliency in the tab that tends to urge it forwardly into the bite of the roller to insure positive frictional engagement of the tab by the rollers as they begin to rotate.

As noted earlier, the rollers are pre-gapped by collars 152 on roller 116 and are initially spaced .0015 of an inch. The thickness of the tab is preferably .006 or .007 of an inch to insure positive frictional engagement sufficient to overcome the frictional forces holding the film unit 14 in cassette 12.

Motor 120 is energized by depressing the start/stop button 124 and the rollers 116 and 118 are driven in a direction to advance the film unit 14 therebetween. As the relatively thick fluid container 52 passes between the rollers, the upper roller 116 is forced upwardly and moves vertically in mounting blocks against the downward bias of spring thereby maximizing the compressive pressure on container 52.

The compressive force on the container creates an increased hydraulic pressure in the fluid which causes the relatively weak longitudinal seal 54 to rupture. The fluid is dispensed, in a mass, across the leading end margin of the rectangular mask 38 on the image-receiving sheet 36. As the film unit is progressively advanced between the rollers 116 and 118, roller 116 moves downwardly thereby reducing the compressive pressure and the fluid is progressively distributed in a thin uniform layer between and in contact with the superposed photosensitive and image-receiving layers to initiate the diffusion transfer process.

During the spreading or fluid distribution operation, the thickness or depth of the fluid layer is controlled by either the thickness of the mask 38 or alternatively by the combined thickness of the mask 38 and the side rails 42 if rails 42 are employed on the particular film unit being processed. As noted earlier, the lateral edges of the film unit 14 are compressed by the ends 190 of control member 188 in cooperation with bearing surface 184. The pre-gap of the rollers also insures that the fluid will flow over and not under the mask 38 to maintain a white border around the image forming area 40.

As best shown in FIGS. 4 and 5, the film unit exits from between rollers 116 and 118 and enters the channels 168 of the curved guide member 128.

Guide member 128 defines a generally circular path of travel from the film unit to the offset withdrawal slot.

The terms "offset withdrawal slot" and "offset exit slot" are used in this application to refer to the spacial relationship between the entry slot 114 and the exit slot 126, and denotes a slot that is normal to a plane other than a horizontal plane passing through the entry slot 114 and the bite between the rollers 116 and 118.

In the preferred embodiment shown in FIGS. 4 and 5 the withdrawal slot 126 is positioned above and parallel to the entry slot 114 in housing wall 110 such that the film travels along a curved path and the change in its direction of travel, from entry to exit, is approximately 180 degrees.

This configuration is particularly convenient for the user. He may stand in front of the processor facing wall 110 and move the film cassette away from himself to insert it into support member 130. After processing, the film unit is adapted to be pulled out of housing 100 through slot 126 in a direction towards the user.

In another embodiment, the withdrawal slot may be located in the top housing wall 106 such that its direction of travel, from entry to exit, would change by approximately 90 degrees.

In addition to providing convenience for the user, the employment of an offset exit slot provides the additional advantage for reducing the dimensions of the processor housing since the processed film unit is stored therein in a curved configuration. Accordingly, the dimension from the exit side of the roller to the rear wall 108 of the housing may be significantly shorter than the length of the film unit.

It will be noted, that the length of the guide member 128 is directly related to the length of the film unit 14.

As best shown in FIG. 6, when the trailing end of the film unit has been disengaged from the rollers, the tab 26 at the leading end of the film unit has displaced the withdrawal slot cover 174 and extends outwardly from slot 126, while the main portion of the film units (sheets 20 and 36) remains in the lighttight environment of the housing.

As the fluid distribution phase is completed, the tab projects through the slot 124 and provides a visual signal to the user that 1) he may release the start/stop button 124 to de-energize motor 120 and 2) the distribution phase is finished and he should begin timing the imbibition period.

At the conclusion of the imbibition period (typically 15 seconds for black and white and 1 minute for color film) the film unit 14 may be grasped by the protruding tab 15 and pulled through the withdrawal slot 124. The photosensitive element 16 is separated from the image-receiving element to reveal the positive image formed thereon.

While the instant processing system has been directed to processing a film unit comprising separate photosensitive and image-receiving elements which are adapted to be superposed after exposure of the photosensitive element, it will be understood that the processor 10 and cassette 12 may be used for processing other types of film units.

For example, U.S. Pat. No. 3,415,644, issued to E. H. Land on Dec. 10, 1968, describes a film unit having a photosensitive element and an integral, transparent, image-receiving element through which the photosensitive element may be exposed. Utilizing this type of film structure would eliminate the need for the interlocking tab construction and it may be used by simply providing a single pull tab at the leading end of the film unit.

Since certain changes may be made in the above apparatus and system without departing from the scope of the invention herein involved, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A processor for providing a lighttight environment for a film unit including photosensitive and image-receiving layers and for distributing a fluid processing composition between predetermined layers of the film unit, such a film unit being of the type including a film unit tab extending forwardly of a leading end of the film unit, said processor comprising:

a housing having a lighttight chamber therein and film entry and withdrawal slots on one side of said housing through which such a film unit may be respectively inserted into and withdrawn from said lighttight chamber;

processing means in said lighttight chamber for effecting the distribution of the fluid between the predetermined layers of such a film unit inserted, leading end first, into said lighttight chamber through said film entry slot and for advancing the film unit within said lighttight chamber; and

guide means for guiding the film unit as it is advanced within said lighttight chamber from said processing means to said withdrawal slot, said guide means including a curved member defining a curved path of travel for the film unit of a predetermined length, said predetermined length being at least equal to the length of the film unit but less than the combined length of the film unit and the film unit tab extending forwardly of the leading end of the film unit, to cause at least a portion of the film unit tab to extend through said withdrawal slot, while the photosensitive and image-receiving layers of the film unit remain in the lighttight environment of said chamber, to give the user a visual signal that the fluid has been completely distributed and an imbibition period following distribution has started,

wherein said guide means supports such a film unit in the lighttight environment of said chamber during the imbibition period.

2. A processor as defined in claim 1 further including a cover over said withdrawal slot which is adapted to be displaced by said tab to permit said tab to extend through said slot to provide the user with the visual signal.

3. A processor as defined in claim 1 wherein said processing means include pressure applying means mounted within said housing near said film entry slot for applying a compressive pressure to a film unit to effect the distribution of the fluid between the predetermined layers of the film unit.

4. A processor as defined in claim 1 further including means associated with said film entry slot for selec-

tively and progressively applying a compressive pressure along lateral margins of a film unit as the film unit is advanced through said film entry slot to prevent leakage of the fluid from the lateral edges of the film unit.

5. A processor as defined in claim 1 further including means for supporting a cassette in alignment with said film entry slot such that a film unit held in such a cassette may be extracted from the cassette and be fed into the processor through said film entry slot.

6. A system for distributing a fluid processing composition between predetermined layers of a film unit, said system comprising:

a film unit comprising a plurality of layers including photosensitive and image-receiving layers, a rupturable container holding a fluid processing composition adapted to be distributed between a predetermined pair of said layers, and a film unit manipulation tab extending forwardly of a leading end of said film unit;

a lighttight cassette for holding said film unit, said cassette including a light sealed opening at one end thereof through which said tab may protrude and through which said film unit may be withdrawn from said cassette by pulling on said tab; and

a processor including:

a housing having a lighttight chamber therein and film entry and withdrawal slots on one side of said housing through which said film unit may be respectively inserted into and withdrawn from said lighttight chamber;

means on said housing for receiving and supporting said cassette with said opening at said one end of said cassette facing and in alignment with said film entry slot;

processing means within said lighttight chamber adjacent said film entry slot for engaging said film unit tab and withdrawing said film unit from said cassette and advancing said film unit into and within said lighttight chamber, said processing means also including pressure applying means for progressively applying a compressive pressure to said film unit to rupture said container and distribute said fluid between said predetermined layers; and

guide means for guiding said film unit as it is advanced within said lighttight chamber from said processing means to said withdrawal slot, said guide means including a curved member defining a curved path of travel for said film unit of a predetermined length, said predetermined length being at least equal to the length of said film unit but less than the combined length of said film unit and said film unit tab extending forwardly of the leading end of said film unit, to cause at least a portion of said film unit tab to extend through said withdrawal slot, while said photosensitive and image-receiving layers of the film unit remain in the lighttight environment of said chamber, to give the user a visual signal that said fluid has been completely distributed and an imbibition period following distribution has started,

wherein said guide means supports said film unit in the lighttight environment of said chamber during the imbibition period.

7. The system of claim 6 wherein said film unit includes a first sheet having said photosensitive layer thereon and said tab attached to one end of said first

15

sheet and a second sheet having said image-receiving layer thereon and leader means attached to one end of said second sheet, said leader means having an opening therein through which said tab is adapted to be inserted to interconnect the ends of said first and second sheets so that they may be extracted from said cassette, simultaneously, by pulling on said tab.

16

8. The system of claim 7 wherein said cassette is configured to initially hold said first sheet and includes means for receiving and supporting said second sheet in overlying relation to said first sheet subsequent to the exposure of the photosensitive layer on said first sheet.

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