

[54] **SYSTEM FOR PROCESSING A STRIP OF PHOTOGRAPHIC MATERIAL**

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Related U.S. Application Data

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[52] U.S. Cl. **222/541, 222/107, 222/207**

[51] Int. Cl. **B65d 47/10**

[58] Field of Search **95/13 R, 89 R; 222/107, 207, 541**

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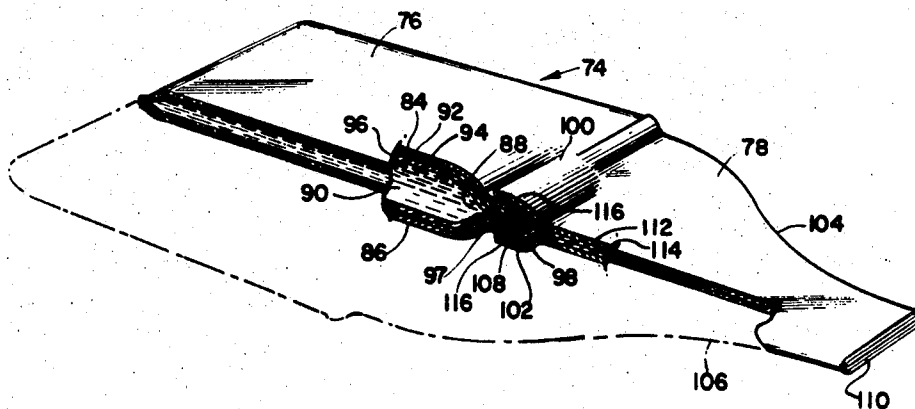
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[57] **ABSTRACT**

A motion picture film processing system employing an applicator having an orifice through which processing fluid may be expressed onto a strip of exposed film as the film is drawn across the face thereof. Processing fluid is initially stored in a collapsible container having a weakened portion adapted to rupture when a predetermined compressive force is applied to the container. An expandable chamber having a restricted exit orifice communicating with the applicator also has an entrance port connected to the weakened portion of the collapsible container. Positioned in operable relationship to the expandable chamber is a force applying member adapted to exert a pressure on the fluid after it has been received into that chamber to cause the fluid to be fed from the expandable chamber to the applicator. This system can advantageously be employed in a compact multipurpose film handling cassette adapted to be mounted in both a camera and a projector.

9 Claims, 7 Drawing Figures



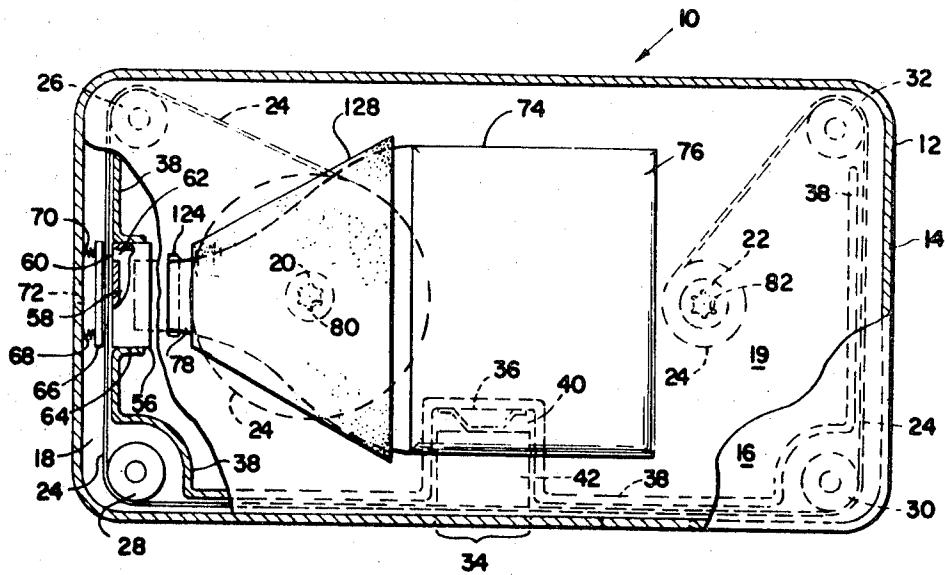


FIG. 1

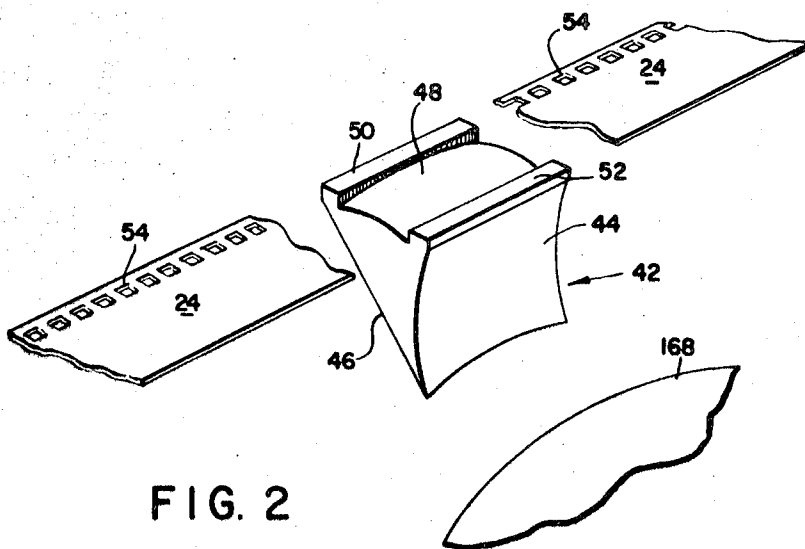


FIG. 2

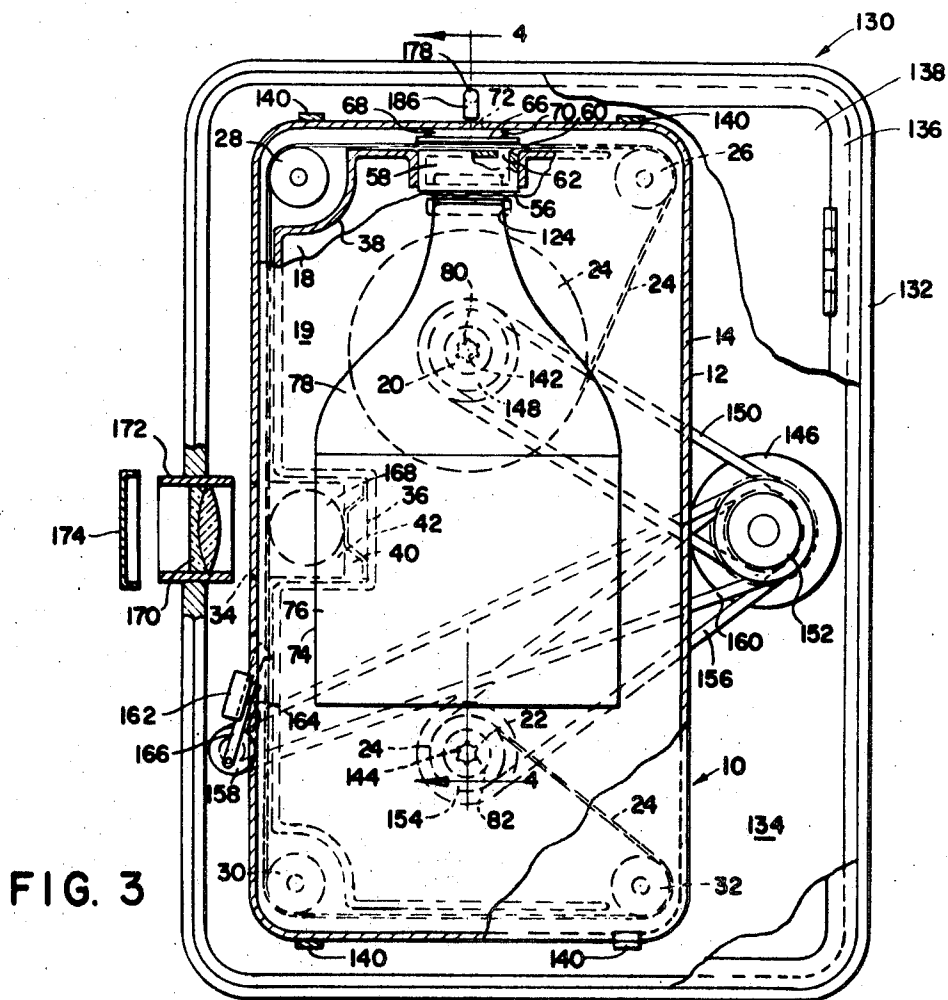


FIG. 3

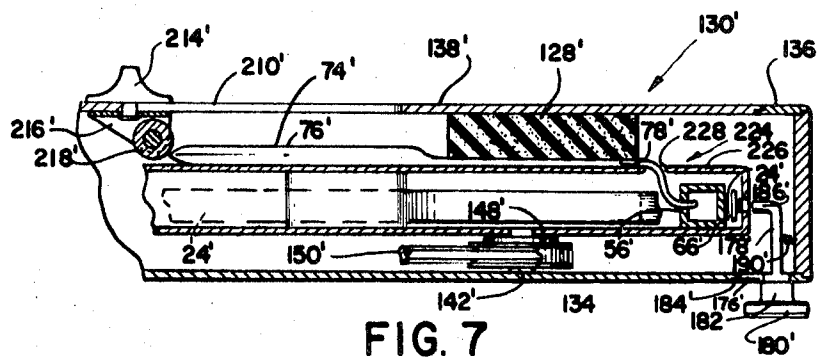


FIG. 7

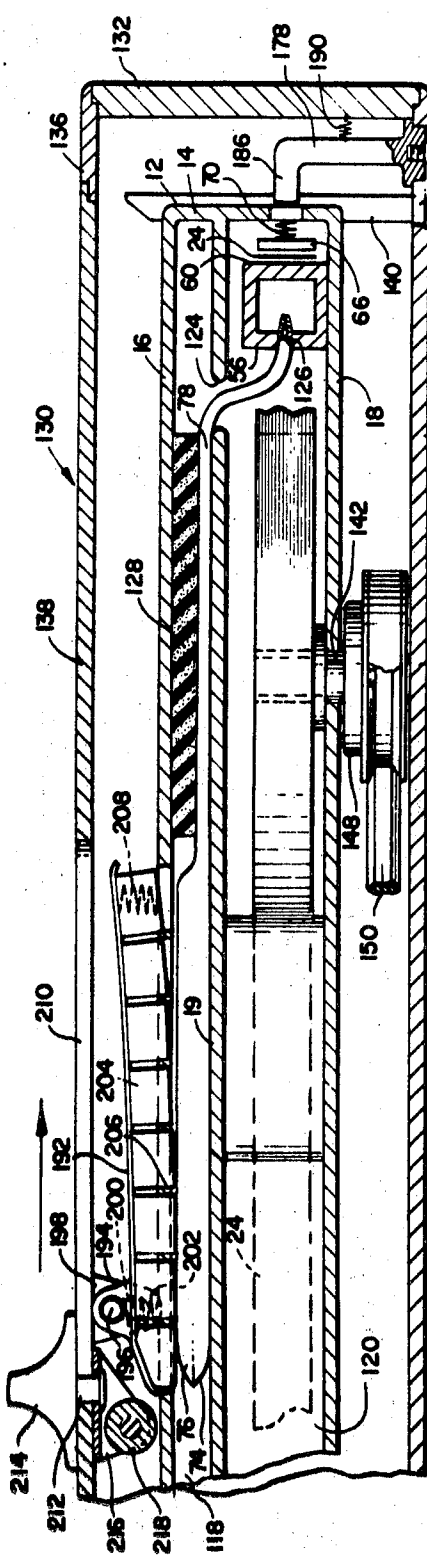


FIG. 4

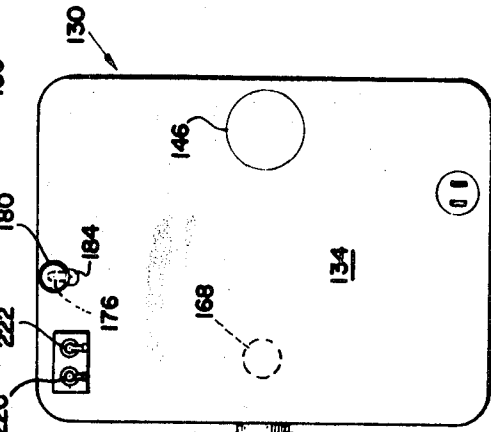


FIG. 6

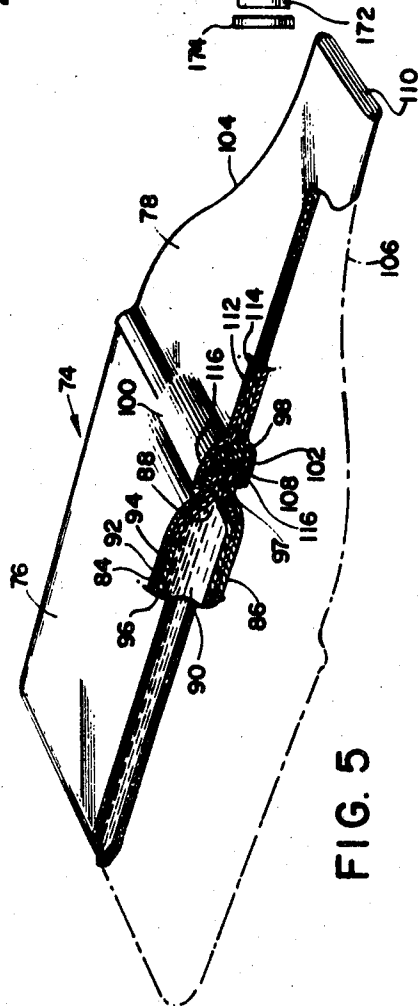


FIG. 5

SYSTEM FOR PROCESSING A STRIP OF PHOTOGRAPHIC MATERIAL

This is a division of copending application Ser. No. 788,897 filed Jan. 3, 1969, now U.S. Pat. No. 3,644,024.

BACKGROUND OF THE INVENTION

1. Field of Invention

This invention relates to photography and, more particularly, to an improved system and method for initially storing processing fluid and subsequently applying a uniform coating of the fluid to an exposed strip of photographic material.

2. Description of the Prior Art

Traditionally, after motion picture film has been exposed in a camera, the operator mails the reel of exposed film to a processing laboratory. At the laboratory the film is removed from the reel and subjected to a series of operations in order to develop visible images from the latent images recorded on the exposed film. The fully developed film is then rewound onto a reel at the laboratory and returned to the user.

The extended delay normally incurred between the time the exposed film is mailed to the laboratory and returned ready for viewing has proved to be a significant inconvenience to the user and a source of great annoyance.

The field of still photography is no longer hampered by extensive periods of delay associated with the processing of exposed film. The impact on the public of the one-step photographic process employing diffusion transfer techniques is a matter of record and generally well known. The home still photographer can now enjoy the fruits of his efforts in a matter of seconds. This important convenience has been available to the amateur still photographer for many years.

Most recently, important technological advances have made it possible for the home photographer interested in motion pictures to enjoy the same convenience. Radically different motion picture systems have now been developed which permit the photographer himself to quickly and easily process and project a strip of motion picture film shortly after the pictures have been taken. Exemplary of such new and unique systems are those described in copending applications Ser. No. 755,901 of Edwin H. Land filed Aug. 28, 1968, now issued as U.S. Pat. No. 3,615,127 on Oct. 26, 1971; Ser. No. 761,771 of Rogers B. Downey filed Sept. 23, 1968, now U.S. Pat. No. 3,597,062; Ser. No. 776,481 of Rogers B. Downey filed Nov. 18, 1968, now U.S. Pat. No. 3,537,784, and Ser. No. 772,789 of Vaito K. Eloranta and Benjamin C. Ruggles filed Nov. 1, 1968, now issued as U. S. Pat. No. 3,623,417 on Nov. 30, 1971; all of which applications are assigned to the assignee of the present invention. Most of the systems described in the aforementioned copending applications most advantageously employ a cassette from which the film need not be removed during exposure, processing and projection operations.

In commercial and industrial operations such rapid motion picture processing systems are not only an improvement as a matter of convenience, but have other important effects as well. For instance, motion picture newsreel programs can be presented on television to the viewing public shortly after events of interest have occurred and been photographed.

In some of these new systems the processing fluid is initially stored in an applicator; while in others the processing fluid is initially stored in a frangible container from which it is later released into a reservoir of the cassette to facilitate the processing operation. Considerable funds and effort are currently being expended to further improve and refine various features of these systems in order to reduce their cost, to further simplify the task of the operator, to improve their reliability, and to improve the quality of the final product. The present invention is directed to an improved system and method, for initially storing and then applying processing fluid to a strip of exposed motion picture film, capable of being operated by the photographer himself and which are particularly well adapted for use in a compact multipurpose film handling cassette.

One of the objects of this invention therefore is to provide an improved system for applying a processing fluid to a strip of exposed photographic sheet material.

Another primary object of this invention is to provide an improved method for applying a processing fluid to a strip of exposed photographic sheet material.

A further object of this invention is to provide a system for initially storing processing fluid and then subsequently feeding the fluid to an applicator in operative relationship to a strip of exposed photographic material.

An additional object of this invention is to provide a unique processing fluid storage and applicator system for use in treating a strip of exposed photographic material.

Still another object of this invention is to provide a compact motion picture film handling cassette which can be utilized in both a camera and a projector and which contains an improved system for treating a strip of exposed film with processing fluid.

Also, an object of this invention is to provide a compact multipurpose motion picture film handling cassette employing an improved system for initially storing and subsequently applying processing fluid to a strip of exposed motion picture film.

A still further object of this invention is to provide a compact motion picture film handling cassette from which the film need not be removed during exposure, processing and projection operations and which contains a novel system for initially storing processing fluid and then subsequently feeding the processing fluid to an applicator positioned in operative relationship to a strip of exposed motion picture film.

An additional object of this invention is to provide an improved device useful in initially storing processing fluid and then applying the fluid to a strip of exposed photographic material.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features that are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof will best be understood from the following description of the preferred embodiments when read in connection with the accompanying drawings wherein like numbers have been employed in the different figures to denote the same parts and wherein:

FIG. 1 is a cut away plan view of a compact multipurpose motion picture film handling cassette embodying features of this invention;

FIG. 2 is a diagrammatic perspective view, partially cut away, illustrating the light reflecting element and film strip employed in the cassette illustrated in FIG. 1 and also illustrating the operative relationship between the light reflecting element and the light source of a projector;

FIG. 3 is a diagrammatic front elevation view, partially cut away, illustrating a projector in which the cassette of FIG. 1 is mounted;

FIG. 4 is a view illustrating the operative relationship between a roller mechanism of the projector and the cassette's processing fluid storage and applicator system taken along line 4—4 of FIG. 3;

FIG. 5 is a perspective view, partially in section, illustrating various details of the processing fluid storage and feeding system employed in the cassette of FIG. 1;

FIG. 6 is a diagrammatic rear elevation view of the projector illustrated in FIG. 3; and

FIG. 7 is a partial side elevation sectional view illustrating an alternate embodiment of the compact multipurpose motion picture film handling cassette of this invention in which the processing fluid's storage container and applicator feeding system is mounted externally of the cassette's housing.

SUMMARY OF THE INVENTION

The preferred embodiment of this invention briefly comprises a collapsible container provided with a weakened edge portion and in which processing fluid is initially stored. This container may take the form of a relatively flat rectangular pod having a relative weak seal formed along one of its edges. An expandable fluid receiving chamber provided with a restricted orifice and which may have the configuration of a flattened funnel has its entrance port connected to the weakened portion of the container. The restricted exit orifice of the fluid receiving chamber is connected to an applicator, which in the preferred embodiment comprises an orifice having a doctor blade therewith.

Means are provided for drawing the strip of exposed photographic material progressively across the face of the applicator adjacent its doctor blade. Additionally, a pressure applying member which may take the form of a foam-like element is positioned in operative relationship to the expandable funnel.

A compressible force is progressively applied along the length of the collapsible container towards its weakened edge portion to initially rupture the container along that edge and to force the processing fluid out of the container and into the expandable fluid receiving chamber. The processing fluid enters the receiving chamber through its entrance port causing that chamber to expand thereby compressing the foam-like element. Pressure, thereafter exerted against the expandable fluid-receiving chamber by the foam-like element, causes the fluid retained therein to be continually urged through the restricted exit orifice into the applicator and towards the doctor blade. As the unexposed film strip is progressively passed across the doctor blade, it draws processing fluid from the applicator to form a uniform coating of processing fluid along its entire length.

Most advantageously, this unique processing fluid storage and applicator system may be incorporated into

a compact multipurpose motion picture film handling cassette. Such a cassette may include coplanar supply and take-up reels to which respective ends of a strip of photosensitive motion picture film are affixed. Substantially the entire length of photographic film strip is initially coiled around the supply reel and, in reaching the take-up reel, passes through a processing station and an exposure and projection station. The applicator is positioned in the processing station and the exposure and projection station includes a film gate behind which a light reflecting element is positioned with the film strip disposed between the film gate and the reflecting element. The assembly comprising the collapsible pod, in which the processing fluid is initially stored, and the expandable fluid-receiving chamber with its associated foam-like element are mounted internally of the cassette housing. The expandable fluid receiving chamber communicates with the applicator through its restricted exit orifice.

This cassette is adapted to first be mounted in a camera for exposure operations. During this process, the photosensitive film strip is drawn across the film gate onto the take-up reel. After the picture taking process has been completed, the cassette is removed from the camera and mounted in a specially configured projector. A pressure applying assembly is mounted within the projector and may include a series of displaceable projections in alignment with a series of apertures provided through the cassette adjacent the collapsible container. The pressure applying members are sequentially pressed against the collapsible container to first rupture its weakened portion and to then cause the processing fluid to be expelled therethrough into the expandable fluid receiving chamber. As the fluid enters the fluid receiving chamber, that chamber expands against the force of the foam-like element to receive the fluid and to urge a portion of it into the applicator. Drive means of the projector engage the cassette's supply reel to return the exposed film strip from the take-up reel to the supply reel. During this operation, the exposed film strip passes across the doctor blade and draws processing fluid from the applicator to form a uniform coating of the fluid along its entire exposed surface.

The processed film strip may then be returned across the cassette's film gate in front of the light reflecting element to the take-up reel for projection operations.

DESCRIPTION OF THE PREFERRED EMBODIMENT

An illustrated preferred embodiment of this invention makes use of a film structure, which comprises both a photosensitive negative emulsion and an image-receiving layer to which a positive image may be transferred by diffusion during development without necessitating the subsequent removal of the emulsion containing its developed negative image, and a compatible processing fluid. This highly desirable type of film structure is made possible by a developed negative image having low covering power.

In typical silver transfer reversal processes for the projection of black-and-white images, a silver halide developer and a silver halide solvent are applied in an aqueous alkaline solution to a photoexposed silver halide stratum or emulsion where they develop exposed silver halide to silver and react with unexposed silver halide to form a soluble silver complex. This complex, in order to form a positive print, is transferred and re-

duced to silver on a silver-receptive stratum upon which the silver halide stratum has been superposed. It has generally been the practice, in the completion of this process, to separate the silver-receptive and silver halide strata in order to render the positive print visible.

However, as indicated above, the positive print may be rendered visible without separation of the silver halide and silver receptive strata. For example, the silver receptive stratum may be so constituted as to provide an unusually vigorous silver precipitating environment which causes the silver deposited upon it, in comparison with silver developed in the silver halide stratum, to possess very high covering power, i.e., opacity for a given mass of reduced silver. If the silver halide is in such a concentration as to give rise only when fully developed to a predetermined low maximum density, and if the silver complex is reduced to silver in a vigorous silver precipitating environment, the resulting negative and positive prints in super-position provide a composite print that presents a good image for projection purposes as long as they are contained on a transparent support. Since the silver halide stratum and the silver receptive stratum need not be separated, an overall simplification of the silver transfer-reversal process is achieved.

A composite film assembly of this type as well as processing compositions for producing a fully developed black-and-white image without the necessity of removing the developed negative image after processing are shown in prior U. S. Pat. No. 2,891,885 of Edwin H. Land which issued on Nov. 25, 1958. Other composite film assemblies capable of producing developed full-color images without the necessity of removing the developed emulsion are shown in prior U. S. patents of Edwin H. Land Nos. 2,726,154 issued Dec. 6, 1955 and 2,944,894 issued July 12, 1960. All of these prior patents are assigned to the assignee of the present invention.

However, it should be noted that the present invention is not directed to the chemistry by which images are developed in the photosensitive emulsion and transferred to an image receiving stratum. While illustrated preferred embodiments of the invention employ a film structure not requiring the removal of the negative emulsion after development and a compatible processing fluid, the invention itself is also applicable for use with other types of film structures and processing fluids.

The drawings illustrate preferred arrangements wherein the novel and highly advantageous processing fluid storage and applicator system of the invention has been uniquely incorporated into a compact multipurpose film handling cassette.

Referring now to FIG. 1 of the drawings, a motion picture film handling cassette 10 is shown, the housing 12 of which is constituted by a frame member 14 disposed between and connected to a pair of cover plates 16 and 18. The interior of the cassette 10 is divided into two sections by a partition 19. Coplanarly oriented within the housing 12 between the cover plate 18 and the partition 19 and rotatably mounted from the cover plate 18 are a supply reel 20 and a take-up reel 22. Respective ends of a strip 24 of motion picture film are permanently affixed to the supply reel 20 and the take-up reel 22. Substantially the entire length of film strip 24 in unexposed condition is initially coiled on the sup-

ply reel 20 and sequentially passes around idlers 26, 28 30 and 32 in reaching the take-up reel 22. In traveling between the idlers 28 and 30, the film strip 24 traverses a film gate 34 provided in the frame member 14. The cover plate 18 includes an opening 36 adjacent the film gate 34. Mounted between the partition 19 and the cover plate 18 is a light sealing plate 38 which extends adjacent the frame member 14 from a position in the vicinity of the idler 26, around idlers 28 and 30 to within the vicinity of idler 32. This light sealing plate 38 is configured to seat along the edge of the opening 36 in the cover plate 18 thereby cooperating with the cover plate 18 and the partition 19 to define a recess 40 within the cassette 10 sealed in a lighttight manner from the section within the cassette in which the reels 20 and 22 are positioned.

Mounted by any suitable means within the recess 40 is a light reflecting element 42. In the system illustrated in the drawings, this light reflecting element is prismatic in nature, as may be seen in FIG. 2, and includes a concave light receiving transparent face 44 and a flat reflecting surface 46 which reflects light received into the element through the concave face 44 outwardly through a convex transparent face 48 onto that portion of the film strip 24 disposed across the film gate 34. The light reflecting element 42 also includes a pair of parallel bearing surfaces 50 and 52 disposed on the opposite sides of its convex transparent face 48 and on which the film strip 24 is supported as it traverses the film gate 34. A prismatic element of this type suitable for use in connection with the present invention is described in copending application Ser. No. 767,609 of Herbert A. Bing filed Oct. 15, 1968 now abandoned in favor of continuation application Ser. No. 118,963 filed on Feb. 25, 1971 and assigned to the assignee of the present invention. As may be seen in this FIG. 2 of the drawings, the film strip 24 includes sprocket holes 54 as is conventional.

Returning now to FIG. 1, an applicator 56, including a fluid receiving area 58 and an orifice having a doctor blade 60 associated therewith 62, is mounted in an aperture 64 of the light sealing plate 38 intermediate of the idlers 26 and 28 and of the cover plate 18 and the partition 19. A support plate 66 is spring mounted from the frame member 14 in juxtaposition to the doctor blade 60. Springs 68 and 70 continually bias the support plate 66 towards the frame member 14 and away from the film strip 24 disposed between the support plate and the doctor plate 60. The cassette's frame member 14 is provided with an aperture 72 through which an externally mounted pin may be introduced into the cassette 10 so as to bear against the support plate 66 and to urge it away from the frame member 14 into contact with the film strip 24 whereby the film strip may be seated against the applicator 56 to overlie its doctor blade 60.

Positioned internally of the cassette's housing 12 between the cover plate 16 and the partition 19 is a relatively flat processing fluid storage and applicator feeding device 74 which includes a collapsible fluid container or pod 76 connected to an expandable fluid receiving chamber 78 that in turn communicates with the applicator 56. The nature of this processing fluid storage and applicator feeding device 74 and the manner by which it is incorporated into the cassette housing 12 will be described in further detail in connection with the discussion of FIGS. 4 and 5 of the drawings.

Supply reel 20 and take-up reel 22 include fluted recesses 80 and 82, respectively. In this manner these reels 20 and 22 are adapted to receive externally mounted drive shafts to facilitate selective reversible transport of the film strip 24 therebetween. Thus, the film gate 34 is adapted to serve as an exposure station during a first pass of the photosensitive film strip 24 thereacross and as a projection station during subsequent operations in which the film strip, in a developed condition, is advanced from the supply reel 20 to the take-up reel 22.

Idler 28, around which the film strip passes on its way from the supply reel 20 to the film gate 34, may, if desired, be mounted on a movable post spring biased towards the corner which it occupies in the cassette housing 12 and capable of being moved resiliently inward away from that corner. Concurrently, idler 30 may be designed in accordance with current practice to provide a snubbing action during exposure and projection operations. This represents one way to minimize strain exerted on the film strip 24 by the conventional intermittent film advancement structure engaging the sprocket holes 54 of the film during these operations. Also, idler 30 may be spring biased toward the corner which it occupies in the cassette housing 12 and capable of being moved resiliently inward away from that corner.

The processing fluid storage and applicator feeding device 74 is illustrated in greater detail in FIG. 5 of the drawings. As shown therein the collapsible container or pod 76 comprises two opposed walls 84 and 86 bonded together in the vicinity of their peripheral edge surfaces to form a cavity 88 containing processing fluid 90 suitable for developing the film strip 24 after it has been exposed to image carrying light rays. The walls 84 and 86 may be formed of any suitable material which is flexible and deformable so as to transmit a hydraulic pressure to the processing fluid 90 within the cavity 88 responsive to an externally mounted force applying member being pressed against one of their exterior surfaces. It is desirable that these walls 84 and 86 be substantially impervious to the processing fluid 90 and inert to attack by the fluid 90. Typically they may consist of an outer layer 92 of pouch or glassine paper, and intermediate layer 94 of lead foil and an inner liner 96 of polyvinylchloride material. Under proper pressure and temperature conditions, the polyvinylchloride liners 96 may be bonded together to effect the sealing of the fluid filled cavity 88. It is important that a seal 97 along the margin section 98 of the collapsible container 76 be substantially weaker than the seal along the other marginal sections thereof. As shown in the drawing, the outer walls 84 and 86 extend a short distance beyond the seal 97.

The expandable fluid receiving chamber 78 also comprises two opposing walls 100 and 102. In this case the walls 100 and 102 are joined together along symmetrically tapered marginal sections 104 and 106. Thus, the receiving chamber 78 includes a relatively large entrance port 108 and a restricted exit orifice 110. It is necessary that the walls 100 and 102 be formed of a material adapted to permit them to separate to form a cavity therebetween so that the processing fluid 90 initially stored in the container 76 may subsequently be accommodated within the chamber 78. Similar to the walls 84 and 86 of the container 76, these walls 100 and 102 must be both impervious and inert

with respect to the processing fluid 90. For example, they may be formed of an outer layer 112 of pouch or glassine paper bonded to an inner layer 114 of polyethylene material. The polyethylene inner layers 114 may be bonded together to form the necessary seals along the symmetrically tapered marginal sections 104 and 106. Preferably the entrance port 108 of the chamber 78 is configured to receive the sections of the container walls 84 and 86 which extend slightly beyond the seal 97 of the container 76. This arrangement permits the fluid receiving chamber 78 to be connected to the collapsible container 76 by a seal 116 between the polyethylene inner layer of the walls 100 and 102 and the paper outer layer 92 of the walls 84 and 86. It will thus be appreciated that when an exteriorly mounted force applying member is pressed against the exterior surface of the collapsible fluid container 76 with sufficient force, the seal 97 of that container will rupture to permit the processing fluid 90 to be expelled therefrom into the fluid receiving chamber 78 which will then expand to accommodate the fluid.

Referring now to FIG. 4, it will be seen that the cassette 10 is in effect divided into the two aforementioned sections by the partition 19, i.e., a first section 118 and a second section 120. As previously indicated, the supply reel 20, the take-up reel 22, the film strip 24 and the applicator 60 are mounted within the second section. The collapsible fluid container or pod 76 is mounted in the cassette's first section 118 and, while a major portion of the expandable fluid receiving chamber 78 is also mounted in this first section of the cassette 10, it extends into the cassette's second section 120 through an aperture 124 of the partition 19 and enters into the applicator 56 through an aperture 126 thereof. A resiliently compressible member 128 is positioned within the cassette's first section 118 between the cover plate 18 and the expandable fluid receiving chamber 78. This resiliently compressible member 128 may, for example, be formed of a foam material. It compresses to permit fluid 90 expelled from collapsible container 76 to be received into the expandable chamber 78 and, thereafter, exerts a pressure on the fluid within the chamber 78 urging the fluid retained therein toward the exit orifice 110 and into the applicator 56.

As indicated, the cassette 10 is initially furnished with substantially all of the film strip 24 in a photosensitive condition coiled on the supply reel 20. For exposure purposes the cassette 10 is mounted in an appropriate camera (not shown) with the drive means of the camera engaging the recess 82 of the take-up reel 22. In this use, light rays from the scene being photographed are focused by the camera lens through the camera shutter and the film gate 34 onto the photosensitive film strip 24 in its passage from the supply reel 20 to the take-up reel 22. During this exposure sequence, the processing fluid 90 is retained within the collapsible container 76 and the springs 68 and 70 restrain the support plate 66 out of contact with the film strip 24, thereby rendering the applicator 56 inoperative. As the film strip 24 is drawn onto the take-up reel 22 by power supplied thereto by the camera, it is simultaneously advanced past the film gate 34 in incremental steps by a typical claw mechanism or the like of the camera cooperating with the sprocket holes 54 provided in the film strip 24. In traversing the film gate 34 the film strip 24 is supported on the bearing surfaces 52 and 50 of the light reflecting element 42. In the embodiment illus-

trated, the photosensitive surface of the film strip 24 faces inwardly of the cassette housing 12 such that exposure of the emulsion is effected through the transparent film base.

While the exposed film strip 24 may be processed with the cassette 10 mounted in the camera or when it is mounted in a special processing apparatus, it is preferably processed while the cassette is mounted in a special projector 130 diagrammatically illustrated in FIG. 3 of the drawings. Basically, the housing of this projector 130 consists of a frame member 132 enclosed by a rear panel 134 and a front panel 136. Hinged to, and forming part of, the front panel 136 is a door 138. The multipurpose compact cassette 10 is adapted to be received into the projector 130 through its door 138 and retained therein by spring clamps 140 extending from the projector's rear panel 134. When so mounted in the projector 130, drive shafts 142 and 144, rotatably mounted from the rear panel 134, respectively engage the recess 80 of the supply reel 20 and the recess 82 of the take-up reel 22. Drive shaft 142 may be connected to the projector's motor 146 through a slip clutch 148, a belt 150 and a multiple clutching mechanism 152. In turn, the drive shaft 144 may be connected to the projector's motor 146 through a slip clutch 154, a belt 156 and the multiple clutching mechanism 152. In this manner the projector's motor 146 can be alternately employed to drive the take-up reel 22 and the supply reel 20 to selectively effect reversible transport of the film strip 24 within the cassette housing 12 between the take-up reel and the supply reel.

Also, the projector 130 includes means for advancing the film strip 24 across the film gate 34 represented by a mechanism comprising a wheel 158 rotatably mounted from the rear panel 134 and connected to the motor 146 through a belt 160 and the multiple clutching mechanism 152. Supported within the projector 130 between a guide post 162 and a spring 164 is a claw member 166, one end of which is eccentrically mounted to the wheel 158 and the other end of which is adapted to extend into the cassette 10 and engage the sprocket holes 54 of the film strip 24. As the wheel 158 is rotated about its axis, the claw member 166 intermittently engages the sprocket holes 54 to draw the film strip 24 in incremental steps across the film gate 34.

Still referring to FIG. 3, the projector 130 includes a light source 168 and a lens 170, the latter of which elements is in registry with a flanged opening 172 provided in the frame member 132. Snuggly seated on this flanged opening 172 is a dust cap 174. When the cassette 10 is mounted in the projector 130, its light reflecting element 42 is positioned immediately in front of the light source 168 and also in alignment with the lens 170. Consequently, light entering the element 42 from the light source 168 is redirected by the flat reflecting surface 46 of that element outwardly of the cassette 10 through the film strip 24 and the film gate 34 onto the lens 170. In this manner, visible images recorded on the film strip 24 can be projected onto a screen (not shown) appropriately positioned in front of the flanged opening 172 as the film is drawn across the film gate 34 by the claw member 166.

The rear panel 134 of the projector 130 is provided with a slot 176 (See FIGS. 4 and 6) adapted to have a pin 178 slidably mounted therethrough. On the end of this pin 178 extending exteriorly of the projector's rear panel 134 there is provided a hand knob 180 which in-

cludes a reduced stem portion 182 adapted to seat in a recess 184 of the projector's rear panel, which recess communicates with the slot 176. The other end of the pin 178, i.e., the end positioned internally of the projector 130, includes a projection 186 extending in a direction parallel to the projector's rear panel 134 and disposed in registry with the aperture 72 of the cassette 10. Mounted on the pin 178 is a spring 188 which continually urges the pin and its attached hand knob 180 inwardly of the projector 130. Additionally, a spring 190 connected to the pin 178 continually urges the pin along the slot 176 in a right hand direction as viewed in FIG. 4. Thus the operator may displace the hand knob 180 along the slot 176 against the force of the spring 190 to bring the projection 186 into contact with the cassette's support plate 66 and to cause the support plate to be displaced inwardly of the cassette 10 until it contacts the film strip 24 and seats the film strip against the face of applicator 56. When the film strip 24 is seated against the face of the doctor blade 60, the reduced stem portion 182 of the button 180 enters the recess 184 under the force of spring 188 to lock the pin 178 in position with respect to the projector's rear panel 134. The hand knob 180 may later be withdrawn from the recess 184 by the operator at which time the spring 190 will cause the pin 178 to be returned to its original position along the slot 176 and, simultaneously, the springs 68 and 70 will draw the support plate 66 out of contact with the film strip 24.

Referring now to FIG. 4, it will be seen that a flexible plate 192 is mounted from the inner face of the projector's door 138 in a position disposed adjacent the cassette's collapsible fluid container 76 when the cassette 10 is mounted in the projector 130 and the projector's door is closed. In this connection, the flexible plate 192 is provided with a bracket 194 adjacent one end thereof that is connected by a pair of pins 196 to a bracket 198 which extends inwardly of the projector 130 from its door 138. The pins 196 are actually seated in slots 200 of the bracket 198 and are connected to springs 202 which urge the pins 196 and the flexible plate 192 connected thereto along the slots towards the projector's door 138. A pair of springs 208, connected to the flexible plate 192 in the vicinity of its other end, restrain this end of the flexible plate 192 in the position shown in FIG. 4 while at the same time permitting this end of that plate to be displaced a greater distance from the door 138 towards the cassette 10. The flexible plate 192 may be formed of any suitable material such as a light gauge steel and has a plurality of tooth-like members 204, which may also be formed, for example, of steel, connected thereto. These tooth-like members 204 are disposed along the flexible plate 192 so as to be in alignment with a plurality of apertures 206 provided through the cover plate 16 of the cassette 10.

The door 138 of the projector 130 is also provided with an elongated slot 210 through which a pin 212 is slidably mounted. Connected to the end of the pin 212 extending exteriorly of the projector's door 138 is a button 214, while the other end of this pin is affixed to a bracket 216 to which a roller 218 is rotatably connected. This roller 218 is in alignment with the flexible plate 192. Consequently, as the operator draws the button 214 along the elongated slot 210 in a right handed direction as shown in FIG. 4, the roller 218 will ride along the flexible plate 192 to sequentially cause the tooth-like members 204 to enter the cassette 10

through apertures 206 and to come into contact with the collapsible container 76. It will therefore be appreciated that during this process the seal 97 of the container 76 will first rupture and then the processing fluid 90 within the cavity 88 will be expelled from the container into the expandable fluid receiving chamber 78. The resiliently compressible member 128 is compressed, as the fluid 90 enters the fluid receiving chamber 78, permitting that chamber to expand as it is filled with the fluid. Thereafter this resiliently compressible member 128 exerts a pressure on the fluid within the chamber 78 causing the fluid to be fed therefrom through its restricted exit orifice 110 into the applicator 56.

Toggle switches 220 and 222 mounted on the outside of the projector's rear panel 134 (see FIG. 6), in cooperation with the hand knob 180 and the button 214, control the operation of the described system in a manner to be set forth hereinafter.

OPERATION OF THE PREFERRED EMBODIMENT

To summarize the operation of the preferred embodiment of this invention, the cassette 10, with its film strip 24 in an unexposed condition and substantially entirely coiled on the supply reel 20 and with its processing fluid 90 retained within the cavity 88 of the collapsible container 76, is adapted to be quick mounted in a camera (not shown). The camera includes a drive shaft which engages the recess 82 of the take-up reel 22 and which can be selectively energized by the camera's motor to advance the film strip 24 from the supply reel 20 onto the take-up reel 22. During this process a claw mechanism of the camera engages the sprocket holes 54 of the film strip 24 to draw the film strip in incremental steps across the film gate 34 for exposure purposes. In this manner, the operator can selectively record images on the photosensitive film strip 24 as it traverses the film gate 34. During the picture taking operation, the film strip 24 is supported across the film gate 34 on the bearing surfaces 50 and 52 of the light reflecting element 42. After the film strip 24 has been completely exposed, the cassette 10 can be quickly removed from the camera and replaced, when desired, by an identical cassette containing unexposed film.

After exposure, the cassette 10 is mounted in the spring clamps 140 of the projector 130. At this time the hand knob 180 and the button 214 are in their positions shown in FIG. 4. The projector's drive shafts 142 and 144 are engaged with the cassette's supply reel 20 and take-up reel 22, respectively.

The operator may now move the hand knob 180 along the slot 176 until it seats in the recess 184 thus causing the film strip disposed across the applicator 56 to be slidably engaged between the cassette's support plate 66 and doctor blade 60. By sliding the button 214 along the slot 210, the operator can rupture the collapsible container 76 to cause the processing fluid 90 initially stored therein to be expelled therefrom into the expandable fluid receiving chamber 78. The force exerted by the resiliently compressible member 128 against the fluid filled chamber 78 urges the fluid 90 now positioned therein through the chamber's restricted exit orifice 110 into the applicator 56 and thus into contact with the section of film strip 24 seated against the applicator adjacent the doctor blade 60.

By then turning the toggle switch 220 to its "on" position, the motor 146 is energized and the clutch 148

and the multiple clutching mechanism 152 of the motor are engaged to connect the supply reel 20 to the motor whereby the exposed film strip 24 is returned to the supply reel from the take-up reel 22.

As the film strip 24 returns to the supply reel 20 it is drawn progressively across the doctor blade 60. During this sequence, the film strip 24 draws processing fluid 90 across the doctor blade 60 and the fluid thereby removed from the applicator 56 is continually replenished with additional fluid from the collapsible chamber 78 responsive to the hydraulic pressure established within the chamber by the force exerted thereon by the resiliently compressible member 128. In this manner the entire length of exposed film strip 24 is provided with a uniform coating of processing fluid 90. Conventional means automatically return the toggle switch 220 to its "off" position when the film strip 24 is substantially completely coiled on the supply reel 20.

At this time, the operator should render the applicator 56 inoperative by withdrawing the hand knob 180 from the recess 184 and permitting the force of the spring 190 to slide the pin 178 along the slot 176 away from the cassette 10. As a result of this action, the film strip will return to its original position between idlers 26 and 28, i.e., out of contact with the applicator 56. The operator may also now return the button 214 to its original position along the slot 210 to permit the tooth-like members 204 to be withdrawn from the cassette 10.

After sufficient time has been allowed for the processing fluid 90 to develop visible images on the film strip 24, the toggle switch 222 should be thrown to its "on" position. This switch 222 energizes both the projector's motor 146 and the light source 168 and, further, engages the multiple clutching mechanism 152 and the slip clutch 154 to supply power to both the wheel 158 and the take-up reel 22. As the processed film strip 24 is once again returned from the supply reel 20 to the take-up reel 22, it is engaged by the claw member 166 which draws it in incremental steps across the light reflecting element 42, whereby the visible images recorded thereon are projected through the lens 170 onto the aforementioned screen. Conventional means automatically return the toggle switch 222 to its "off" position after the developed film strip 24 is substantially entirely coiled around the take-up reel 22.

Toggle switch 220 may again be employed to rewind the developed film strip 24 onto the supply reel 20 after the projection operation has been completed. Thereafter, the cassette 10 may be removed from the projector 130 for storage.

Editing of the developed film strip 24 can easily be effected. It is only necessary to draw a loop of the film strip 24 from the film gate 34 and to remove sections therefrom or to splice therein as desired.

DESCRIPTION OF AN ALTERNATE EMBODIMENT

An alternate embodiment of this invention in which a processing fluid storage and applicator feeding device is substantially entirely mounted exteriorly of the cassette housing is illustrated in FIG. 7 of the drawings. The same numerals primed are employed in that figure to denote parts of that embodiment which remain substantially unchanged from the embodiment illustrated in the other figures of the drawings.

Referring now to FIG. 7, a compact multipurpose film handling cassette 224 is shown mounted in spring clamps 140' of a projector 130'. The cassette 224 includes a take-up reel (not shown) and a coplanar supply reel 20' to which respective ends of a strip of motion picture film 24' are connected. The processing fluid storage and applicator feeding device 74', comprising a collapsible fluid container or pod 76' and an expandable fluid receiving chamber 78', is removably adhered to the outer face of a cover plate 226 of the cassette 224. This fluid receiving chamber 78' includes an entrance port 108' connected to an edge 98' of the collapsible container 76' so as to receive the processing fluid 90' initially stored therein as it is expelled therefrom through a weakened seal provided adjacent that edge thereof. The bonded edges of the fluid receiving chamber 78' taper to form a restricted exit orifice 110' connected to an applicator 56' mounted internally of the cassette 224'. In this respect a section of the chamber 78' adjacent its exit orifice 110' enters the cassette 224 through an aperture 228 provided in the cover plate 226.

Mounted from the inside face of the projector's door 138', so as to be positioned against the expandable fluid receiving chamber 78' when the cassette 224 is positioned within the projector 130', is a resiliently compressible member 128'.

A button 214', mounted for slidable motion along an elongated slot 210' provided in the projector's door 138', may be manipulated along that slot to draw a roller 218' along the length of the collapsible container 76'. As the roller progresses along the container 76', it causes the weakened seal along edge 98' of that member to rupture and the processing fluid 90' initially stored therein to be expelled therefrom into the expandable fluid receiving chamber 78'. This chamber 78' expands to accommodate the processing fluid and, in this expanding process, compresses the member 128'. Thereafter the resilient member 128' exerts a force on the fluid within the chamber 78' causing the fluid to be fed through its orifice 110' into the applicator 56'.

After the processing operation has been completed the processing fluid storage and applicator feeding device 74' may be removed from the cassette housing 12' for disposal.

Those familiar with the motion picture arts will readily appreciate the novel and highly unique advantages of this invention. An inexpensive and efficient processing fluid storage and applicator system and method are provided which facilitate the application of a uniform coating of processing fluid to a strip of exposed photographic material. This unique system and method are particularly well adapted for use in connection with compact multipurpose motion picture film handling cassettes to greatly simplify the task of the photographer and to permit him to quickly develop his own pictures.

The term "projector" is used herein in a comprehensive sense, i.e., to broadly refer to systems wherein the visible image recorded on a sheet of material is reimaged for viewing purposes and is not restricted to only those systems in which the recorded visible image is projected onto a screen of one type or another.

This invention may be practiced or embodied in still other ways without departing from the spirit or essential character thereof. For instance, while in the illus-

trated preferred embodiments, the support plate 66 is displaced to bring the film strip 24 into contact with the applicator 56, the applicator 56 may alternately be displaceably mounted within the cassette 10 in order to be selectively seated against the film strip. Also, means other than those described and illustrated herein for rupturing the container 76 will readily suggest themselves to those skilled in the art. Additionally, the resiliently compressible member 128 can be replaced by other force applying devices such as, for example, a roller adapted to be drawn across the length of the chamber 78. The preferred embodiments described herein are therefore illustrative and not restrictive, the scope of the invention being indicated by the appended claims and all variations which come within the meaning of the claims are intended to be embraced therein.

I claim:

1. In apparatus for processing a strip of photographic sheet material after said material has been exposed to image carrying light rays to record latent images thereon, a system comprising:

a collapsible container in which a supply of processing fluid suitable to develop visible images on said sheet material from said latent images recorded thereon is initially stored, said container having a weakened portion adapted to rupture when said fluid stored therein is subjected to a predetermined pressure responsive to a force applying member being pressed against said container; and

an expandable fluid receiving chamber configured upon expansion to accommodate substantially the entire supply of said fluid, said chamber having an entrance port of substantially the same size and configuration as said weakened portion of said container and a comparatively smaller exit port defining a restricted exit orifice through which said fluid may be expressed onto said strip of material, said entrance port being connected to said weakened portion of said container whereby, when said force applying member is pressed against said container, said weakened portion ruptures and said container collapses to cause said fluid to be expelled therefrom into said receiving chamber which expands to accommodate said fluid and from which said chamber said fluid may be subsequently fed by application thereto of a suitable hydraulic pressure.

2. The system of claim 1 wherein said fluid receiving chamber is shaped as a funnel.

3. The system of claim 1 wherein said container is substantially flat when said processing is retained therein and said chamber is shaped as a flattened funnel.

4. A device useful for initially storing and subsequently applying processing fluid to a strip of exposed photographic sheet material, comprising:

a container having a pair of opposed walls joined together to provide a liquid-containing cavity, said cavity holding a supply of processing fluid capable of developing visible images on a strip of photographic sheet material after such material has been exposed to image carrying light rays to record latent images thereon, at least one of said container walls being flexible and deformable for transmitting pressure applied to the exterior of said container directly to said fluid retained therein, said container walls being connected together along one marginal section thereof adjacent said cavity

by a weakened bond whereby said container will rupture along said weakened bond and such fluid will be expelled from said container through said ruptured section in response to hydraulic pressure developed within said cavity when pressure is applied to the exterior of said container;

a fluid receiving chamber configured upon expansion to accommodate substantially the entire supply of said processing fluid, said chamber having a pair of opposed walls disposed in contact with each other connected together along marginal portions thereof to form an entrance port of substantially the same size as said weakened bond of said container and a comparatively smaller exit port forming a restricted exit orifice through which said fluid may be expressed onto said strip of exposed photographic material, said chamber connected to said container so that fluid expelled from said container through said ruptured section will be received into said chamber through said entrance port, at least one of said walls of said chamber being flexible and deformable whereby, as such fluid is expelled from said container, said chamber will expand to accommodate such fluid and such that pressure applied to the exterior of said chamber may be transmitted directly to such fluid so that the latter can subsequently be fed from said chamber through said restricted orifice to such applicator in response to hydraulic pressure developed within said chamber when pressure is applied to the exterior thereof.

5. The device of claim 4 wherein said opposed walls of said container are rectangularly shaped and said opposed walls of said chamber taper symmetrically from said entrance port to form said restricted exit orifice.

6. The device of claim 5 wherein said opposed walls of said container are bonded together adjacent the edges thereof and said weakened bond comprises the bond along one said edge.

7. The device of claim 4 wherein said fluid filled container and said chamber are substantially flat.

8. In apparatus for processing a strip of photographic sheet material after said material has been exposed to image carrying light rays to record latent images thereon, a system comprising:

a collapsible container defining a cavity adapted to hold a body of fluid, said container having a weakened portion;

a body of processing fluid, suitable to develop visible images on said sheet material from said latent images recorded thereon, positioned within said cavity whereby said weakened portion of said container will rupture and said fluid will be expelled from said container through said ruptured portion in response to hydraulic pressure developed in said fluid as pressure is applied to the exterior of said container; and

an expandable fluid receiving chamber configured upon expansion to accommodate substantially the entire amount of said body of fluid, said chamber

having an entrance port of substantially the same size and configuration as said weakened portion of said container and a restricted exit orifice through which said fluid may be expressed onto said strip of material, said entrance port being connected to said weakened portion of said container whereby, as said fluid is expelled from said container, said chamber expands to accommodate said fluid and said fluid within said chamber may be subsequently fed through said restricted exit orifice by application thereto of a suitable hydraulic pressure.

9. A device for attachment to an applicator having an orifice therein, and useful for initially storing and subsequently applying processing fluid through such applicator orifice to a strip of exposed photographic sheet material, comprising:

a disposable container having a pair of opposed walls joined together to provide a liquid-containing cavity, said cavity holding a processing fluid capable of developing visible images on a strip of photographic sheet material after said material has been exposed to image carrying light rays to record latent images thereon, at least one of said walls being flexible and deformable for transmitting pressure applied to the exterior of said container directly to said fluid retained therein, said walls being connected together along one marginal section thereof adjacent said cavity by a weakened bond whereby said container will rupture along said weakened bond and said fluid be expelled from said container through said ruptured section in response to hydraulic pressure developed in said fluid when pressure is applied to the exterior of said container;

a fluid receiving chamber having a pair of opposed walls disposed in contact with each other connected together along marginal portions thereof to form an entrance port of substantially the same size as said weakened bond of said container and a restricted exit orifice adapted to be connected to such applicator through which said fluid may be expressed onto said strip of exposed photographic material, said chamber connected to said container so that fluid expelled from said container through said ruptured section will be received into said chamber through said entrance port, at least one of said walls of said chamber being flexible and deformable whereby, as said fluid is expelled from said container, said chamber will expand to accommodate said fluid and said fluid can subsequently be fed from said chamber through said restricted orifice to said applicator by application thereto of a suitable hydraulic pressure, said opposed walls of said container and said chamber comprise an outer layer of paper and an inner layer of polymeric material and wherein said inner layer of said chamber walls adjacent said entrance port are bonded to said outer layer of said container walls adjacent said weakened bond.

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