United States Patent [19]

Lehmann

[11] **3,795,351**

[45] **Mar. 5, 1974**

[54] **APPARATUS FOR DISPENSING A METERED AMOUNT OF FLUID**

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

[22] Filed: **June 5, 1972**

[21] Appl. No.: **259,388**

Related U.S. Application Data

[62] Division of Ser. No. 103,986, Jan. 5, 1971, Pat. No. 3,685,412.

[52] **U.S. Cl.** **222/209,** 222/336, 222/405, 401/184, 118/266

[51] **Int. Cl.** **B65d 37/00**

[58] **Field of Search** ... 222/207, 209, 205, 213, 187, 222/269, 338, 335, 336, 318, 405; 401/196, 183, 184, 185, 264; 95/94 R; 118/266, 264, 401

[56] **References Cited**

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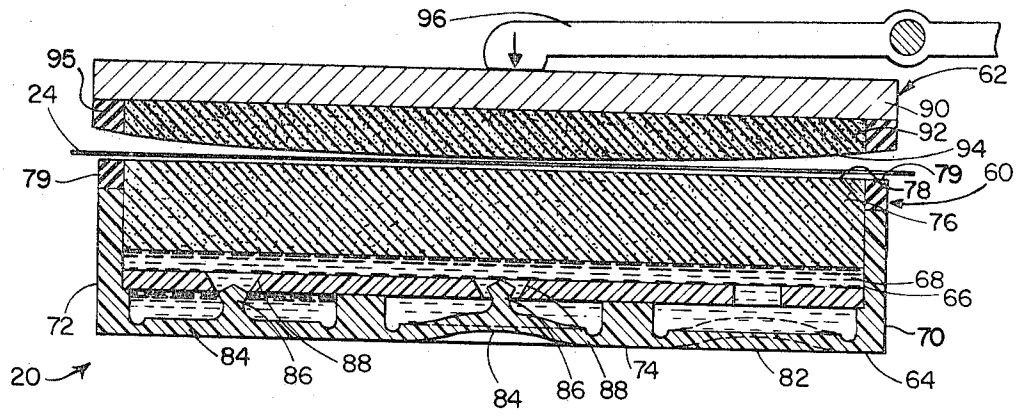
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Primary Examiner—Stanley H. Tollberg
Assistant Examiner—James M. Slattery

[57] **ABSTRACT**

Dispenser apparatus including a container configured for retaining a source of liquid and having a plurality of deformable wall portions which may be selectively activated by an external force so as to reduce the volume of the container and thereby provide repetitive application of a given pressure to the retained source of liquid for dispensing of the liquid from the container. Preferably, a plurality of the wall portions are configured for irreversible deformation so as to permit successively reduced volume in accordance with their actuation and at least one is configured for reversible deformation and is biased to return to its original position upon removal of the actuating force thereby returning any excess of the dispensed liquid to within the container.

12 Claims, 10 Drawing Figures



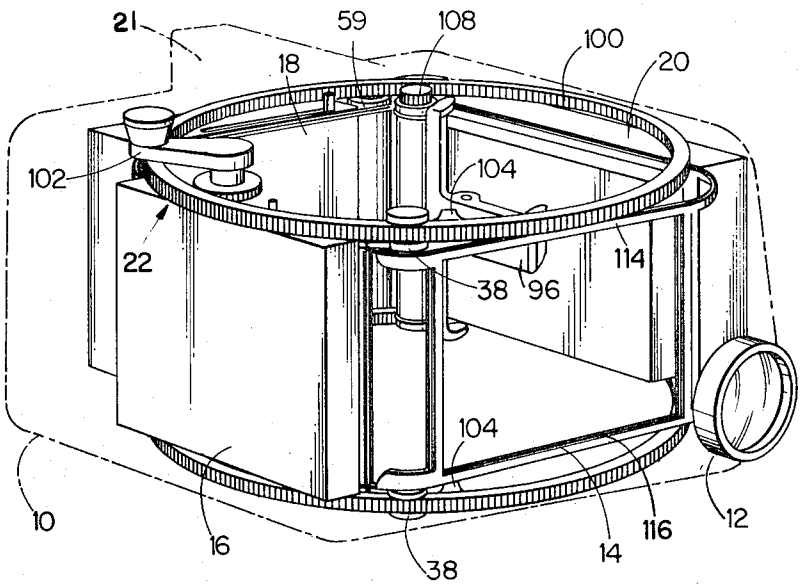

21
59
108
100
20
18
102
104
22
114
38
96
104
10
16
38
14
116
12

Fig. 1.

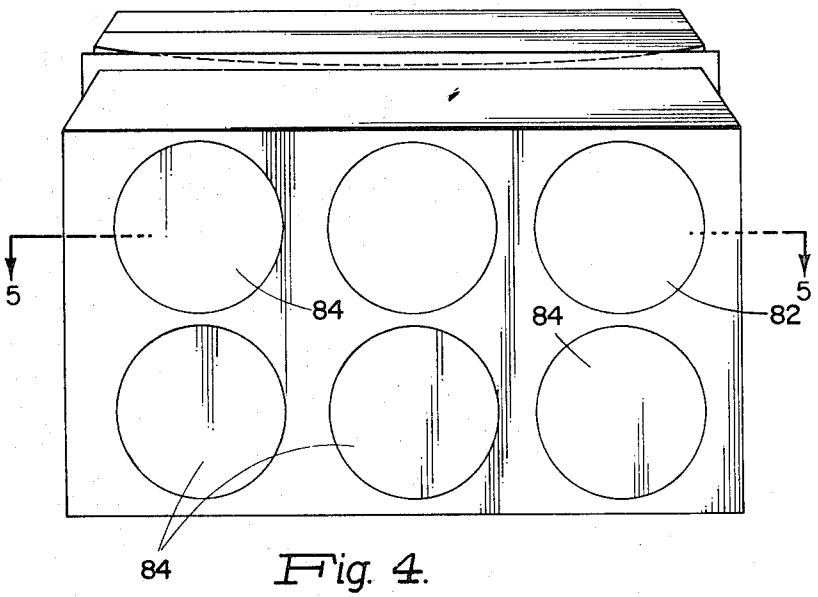

5
84
84
82
5
84

Fig. 4.

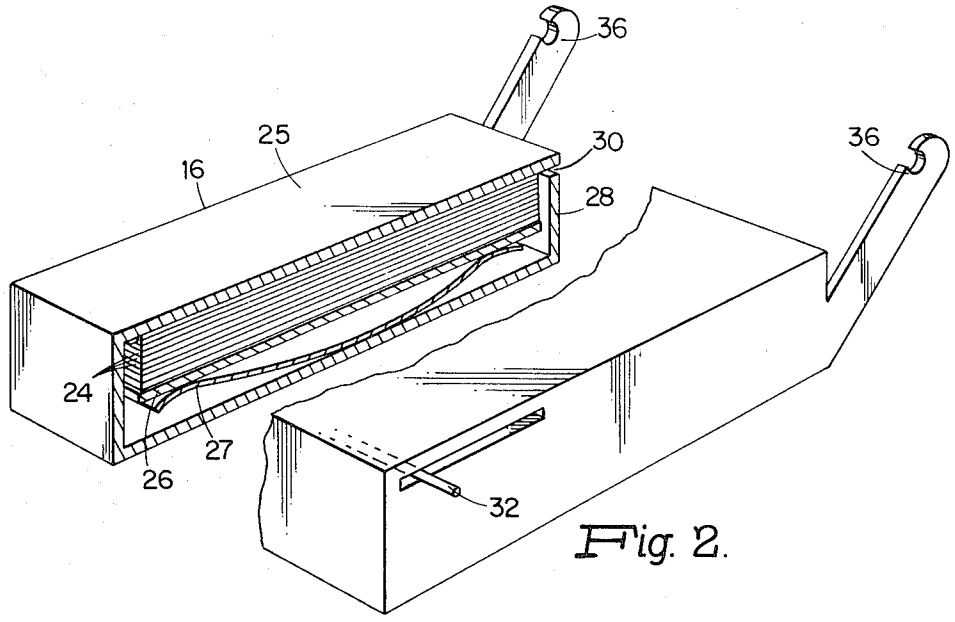


Fig. 2.

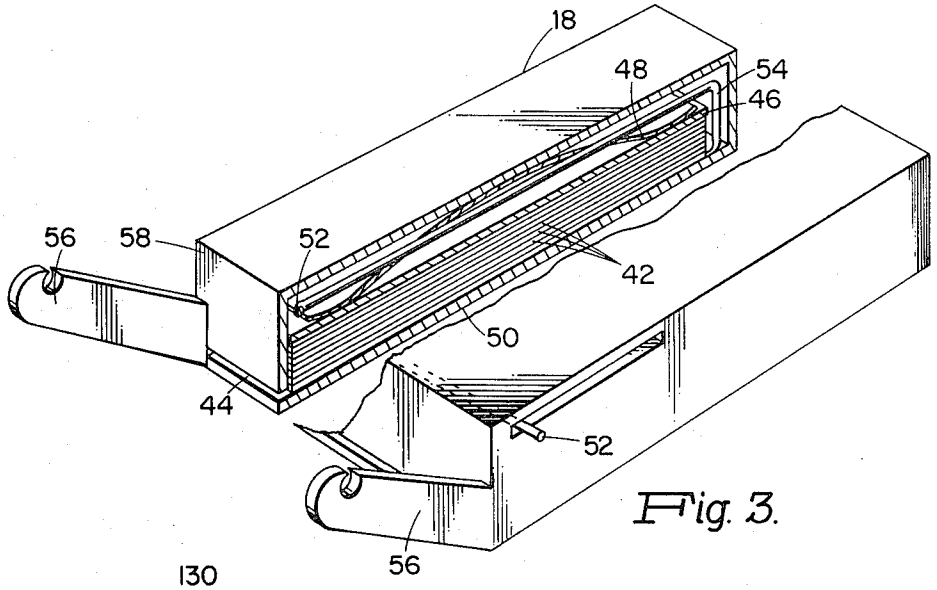


Fig. 3.

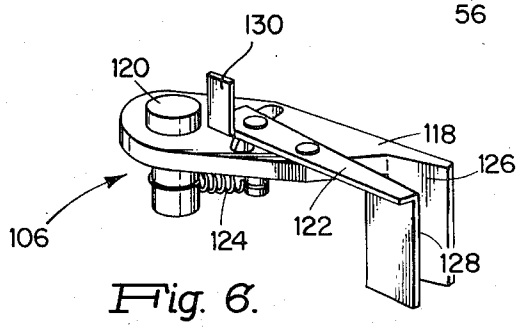


Fig. 6.

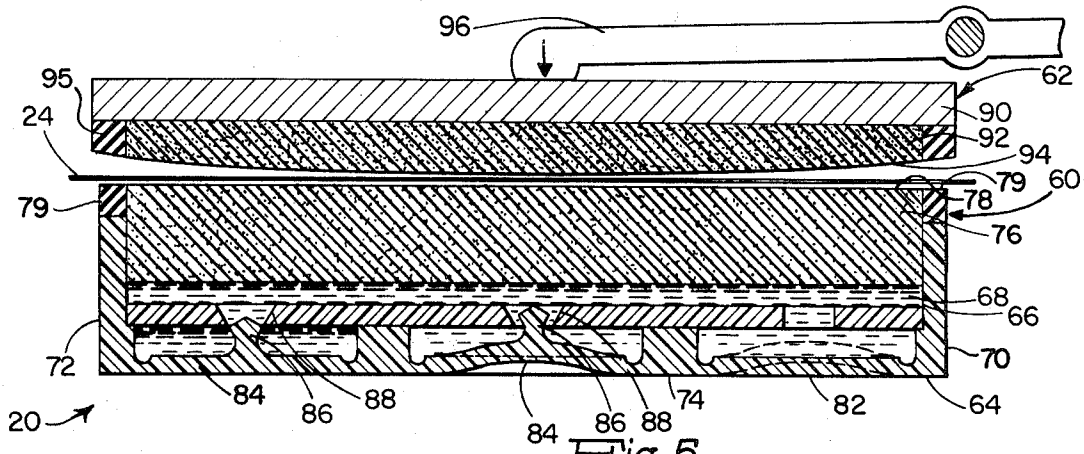


Fig. 5.

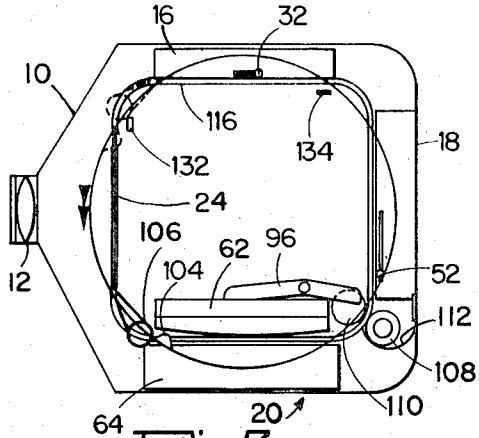


Fig. 7.

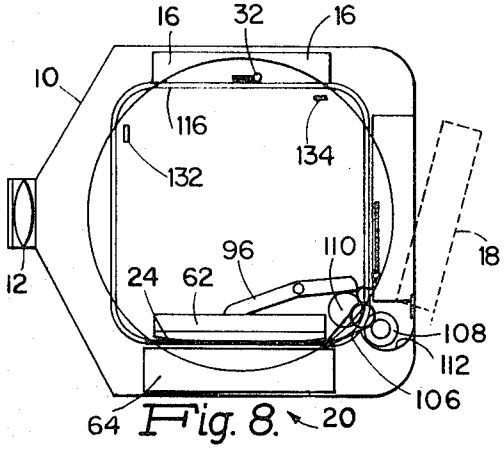


Fig. 8.

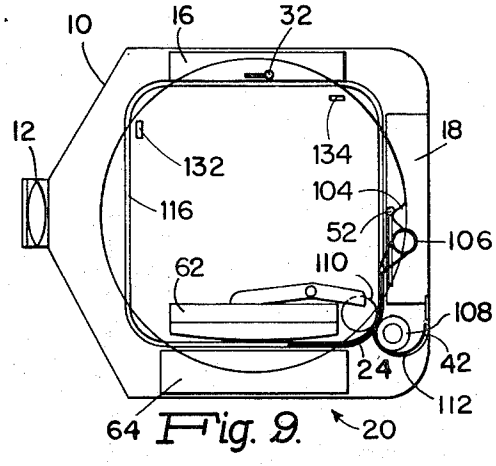


Fig. 9.

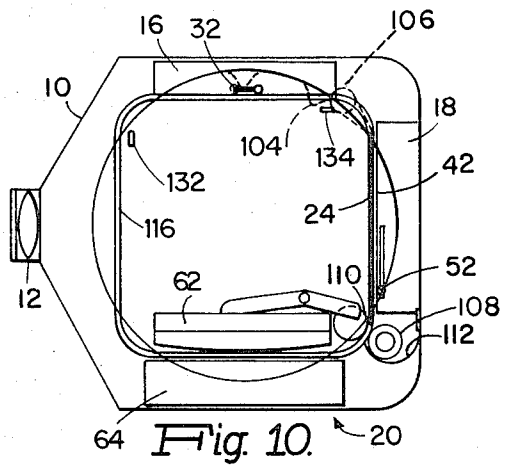


Fig. 10.

APPARATUS FOR DISPENSING A METERED AMOUNT OF FLUID

RELATED APPLICATIONS

This application is a division of application Ser. No. 103,986, filed Jan. 5, 1971, now U.S. Pat. No. 3,685,412.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to dispenser apparatus and more particularly to an improved dispenser adapted for repetitively dispensing processing fluid to photographic material.

2. Description of the Prior Art

In modern technology, it is often desirable to simply and efficiently apply processing liquids during a particular operation. For instance, as noted in the parent application following exposure of photographic material, it is usually necessary to subject it to a suitable processing liquid for a prescribed imbibition period. Generally, it is important to minimize the amount of processing liquid employed and to dispense the latter with a minimum of entrapped gas. Since the processing liquid employed is generally corrosive it must be suitably confined so as to protect both the apparatus and the operator. Moreover, application of the processing liquid in portable apparatus with which the present invention is particularly concerned, further compounds the difficulties of storing and applying the liquid since this often requires the application of predetermined quantities of the liquid, uniformly and at relatively high rates, and the necessity for so doing in apparatus that may be operated manually and presents the problem of precluding spillage.

Accordingly, it is an important object of this invention to provide improved apparatus for dispensing fluid.

Another object of the invention is to provide apparatus for repetitively dispensing a predetermined quantity of processing liquid.

A further object of the invention is to provide an applicator for efficiently dispensing a predetermined amount of gas-free processing liquid uniformly over sheet-like material.

A still further object of the invention is to provide apparatus for rapidly applying processing liquid to photographic material.

SUMMARY OF THE INVENTION

Broadly, the apparatus comprises a container of predetermined volume configured for retaining a liquid and includes means configured for successively decreasing the container volume and egress means for permitting dispensing of the liquid in accordance with such reduction of volume. Preferably, the egress means comprises porous filter material which, within a given range of pressure differential, is liquid permeable and gas impermeable such that gas-free processing liquid may be substantially uniformly dispensed over the filter surface in accordance with operation of the volume decreasing means.

In the illustrated embodiment, the dispenser is employed in a camera structure for applying processing liquid to a photosensitized sheet of photographic film and is configured to dispense to the film a prescribed amount of processing liquid from a source thereof and, following an appropriate imbibition period, to return any excess liquid to the source. In this arrangement, the container includes a plurality of deformable wall portions, each adapted to reduce the container volume and thereby increase the source pressure by a prescribed amount in accordance with inward displacement of the wall portions responsive to application of an external force. One of the discrete portions is adapted for reversible deformation for repetitive dispensing of the liquid from the container upon application of the external force and return of any excess liquid upon removal of such force. The remainder of the deformable portions are adapted for irreversible displacement so as to maintain a substantially constant source pressure intermediate repeated applications of the liquid. In this embodiment, the container body is constructed of material which, while capable of providing a substantially rigid container of fixed volume is sufficiently elastic to permit displacement of thin wall portions. Each of the discrete wall portions are substantially rigid portions of the same wall thickness as the body of the container which are coupled to the latter by a thin wall portion so as to provide a diaphramlike member. Additionally, the elasticity of the thin wall section surrounding each portion tends to bias each portion to its original position. This is utilized in regard to the one reversible portion but circumvented in the case of the irreversible portions which include means for automatically latching them in their depressed position.

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 embodiment 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 diagrammatic view in perspective of a photographic camera embodying the invention;

FIG. 2 is a diagrammatic view partially in section illustrating one film magazine employed in the camera of FIG. 1;

FIG. 3 is a diagrammatic view partially in section showing another film magazine employed in the camera of FIG. 1;

FIG. 4 is a diagrammatic view in perspective illustrating the processing station of the camera;

FIG. 5 is a view in section of the processing station taken along line 5—5 of FIG. 4;

FIG. 6 is a diagrammatic view in perspective of another operative element of the camera; and

FIGS. 7, 8, 9 and 10 are diagrammatic plan views of the interior of the camera and illustrating its operation.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of this invention is illustrated as a camera including apparatus facilitating application of a compatible processing liquid to a photosensitive image-recording sheet following its exposure and superposition of this sheet with an image-receiving

sheet for formation of a visible image in the latter by a diffusion-transfer process. The apparatus and process of the invention while applicable to photography in general, is specially adapted to produce photgraphic transfer prints such as those described in U.S. Pat. No. 2,983,606 issued May 9, 1961 to Howard G. Rogers and utilizing integral multilayer image-recording sheets incorporating dye developers such as are disclosed in U.S. Pat. No. 3,345,163 issued Oct. 3, 1967 to Edwin H. Land et al., and to photographic film processing as described in U.S. Pat. No. 3,485,628 issued Dec. 23, 1969 to Edwin H. Land. As indicated in the latter patent, the multicolor image-recording sheet is first photoexposed to form a latent image, then permeated with an aqueous alkaline processing liquid, and finally, superposed with an image-recording sheet so as to produce a visible image therein.

As shown in FIG. 1, the apparatus provides a camera having a housing 10 providing a substantially light-tight structure including a conventional lens and shutter assembly 12 at the front thereof adapted to expose a photosensitive sheet presented at an exposure aperture 14. Releasably mounted at the left and rear sides of the housing 10 are film magazines 16 and 18 which supply the photographic sheets utilized in the camera. At the right side of the housing is a processing station 20, and the interior of the housing includes a transport mechanism 22 providing means for transport of sequential image-recording sheets 24 from magazine 16 to aperture 14, processing station 20 and to a rear section 21 of the camera where each is superimposed with a suitable image-receiving sheet 42 from magazine 18, as later explained in detail.

As shown in FIG. 2 magazine 16 provides means for storing and dispensing image-recording sheets 24. The sheets 24 are disposed within magazine 16 in a stacked relation and urged towards the upper face 25 of the magazine 16 by a pressure plate 26 in cooperation with a spring member 27 such that the uppermost sheet of the stack is positioned in alignment with an exit aperture 30 of the leading edge 28 of the magazine. A sheet engaging member 32 extends from the magazine 16 and is adapted for displacement towards the leading edge 28 for lateral ejection of the foremost sheet through aperture 30. Advantageously, sheet engaging member 32 may be spring biased by any conventional means (not shown) in a direction away from aperture 30 so as to provide automatic return to the engaging position following film ejection. Integral with the magazine 16 and extending from its leading edge 28 are a pair of extended arms 36 configured for releasable mounting of the magazine to the housing 10. Hence, arms 36 are designed to releasably engage post 38 of the housing 10 to permit pivotal movement of the magazine 16 to a closed position as shown in FIG. 1 where it is retained by any conventional locking means (not shown). In this position, edge 28 of the magazine adjoins the exposure aperture 14 within the housing 10.

Magazine 18 which is mounted at the rear of the camera, provides means for storing and dispensing of the image-recording sheets 24 in accordance with operation of the apparatus and, as shown in FIG. 2, contains a plurality of the image-recording sheets in a stacked relation with the lowermost of these sheets laterally aligned with an exit aperture 44. A pressure plate 46 in cooperation with a spring 48 urges the film stack towards the lowermost face 50, as shown in this figure. Slideably mounted within magazine 18 is a film engaging member 52 which includes a flexible tongue 54 adapted to drive each successive film sheet in a direction opposite to the displacement of the engaging member, or that is, to move the lowermost film sheet through aperture 44 as the engaging member is displaced in a direction away from this aperture. This is accomplished by any conventional means such as by confining tongue 54 within a track or channel (not shown) so as to force it to bend back on itself. The unit is completed by integral mounting arms 56 which extend from the leading edge 58 of the magazine for releasable pivotal mounting to housing 10, for example, by engagement with post 59 of the housing as shown in FIG. 1. A conventional latch (not shown) is employed to releasably secure the magazine 18 in a closed position with its exit aperture 44 located adjacent the feed rolls of the camera for dispensing of each image-recording sheet 42 thereto, as later explained in detail.

Processing station 20, as shown in FIGS. 4 and 5, includes a demountable applicator unit 60 which is configured for releasable mounting to housing 10 in an adjoining relationship to a film support member 62. The applicator unit 60 is made up of a box-like housing 64 which is closed at its open end by an applicator body 76. This forms a narrow cavity or internal chamber 66 of predetermined volume between the rear wall 74 and body 76 for containing a source of processing liquid 68.

Preferably, applicator body 76 is a substantially inflexible member of porous material which facilitates delivery of gas-free liquid from source 68 to the exterior surface 78 of the body. Hence, the body 76 provides egress means for permitting dispensing of the liquid 68 from the chamber 66 to the exterior of the housing 64. The exterior surface 78 is of slightly greater area or dimension than that of exposure aperture 14 whereby all of the photoexposed area of each film sheet may be disposed in contact with the applicator surface at a given time.

The body 76 is of so called membrane filter material, that is, microporous material having a sponge-like structure of small interconnected pores which provide, a relatively high bubble pressure in the processing liquid, and hence, in cooperation with the surface tension of the liquid, preclude passage of gas up to relatively high pressure. Substantially coplanar with the applicator surface 78 is a sealing member of perimetric gasket 79 of 40 durometer rubber or the like which provides a rectangular surface enclosure and is intended to engage the perimetric margin of the film sheet 24 exteriorly of its photosensitive area.

Suitable membrane materials are glass, ceramic, carbon or plastic such as nylon or polyvinylchloride or other materials which are chemically inactive with the processing liquid and have a sufficiently small pore size, for example, ½ micron to 10 microns diameter such that once contacted with the liquid it will pass the same while excluding passage of gas upon application of a low pressure differential to the body. That is, the applicator body is of a substance having sufficiently small pore size, which once contacted by the liquid, is liquid permeable but substantially gas impermeable at relatively low pressures. Inasmuch as the applicator body 76 precludes gas passage and includes a multiplicity of interlocking pores, it uniformly disperses liquid to its exterior surface 78. Stated otherwise, although the source of liquid may not provide uniform contact with

the underside of the body **76**, for example, due to entrained gas in the source, the liquid tends to be carried uniformly throughout the body and produces a uniform distribution on the body surface **78**. Hence, the applicator body **76** provides means for dispensing fluid from source **68** to the body surface **78** and for providing a substantially uniform distribution of liquid thereat.

It will be appreciated that the unique nature of the applicator provides rapid lateral flow of gas-free liquid to the photosensitive sheet, and simultaneously subjects all the photosensitive surface to the processing solution. Advantageously, the unit provides a slight excess of liquid during imbibition, then removes any remaining excess and returns it to the source. Hence, the arrangement not only minimizes the amount of source needed but also removes excess liquid from the photographic sheet prior to its withdrawal from the applicator unit. This is in contrast to capillary applicators which fail to provide gas-free wetting of the film sheet, fail to remove excess liquid following imbibition and additionally do not provide external control over the liquid flow. Stated otherwise, in capillary devices the fluid flow is caused by absorption into the film of the liquid which can result in non-uniform or incomplete wetting whereas, in the present case, liquid flow is controlled by the applied pressure differential.

In the rear wall **74** of container **64**, means are provided for varying the pressure on source **68** and for thereby providing a suitable pressure differential between the source and the exterior surface **78** of the applicator body. These means include a plurality of movable members **82** and **84** formed by discrete deformable portions of the rear wall **74**, each of which are adapted to reduce the volume of the chamber and increase the interior pressure by a specific amount and thereby increase the source pressure accordingly. In this embodiment, the members **82** and **84** are portions of the rear wall **74** which are joined thereto by thin wall material to provide diaphragmlike areas which may be depressed, from their location coplanar with the rear wall, into chamber **66** to reduce the volume and increase the internal pressure of the latter. One member **82** is adapted for reversible operation for providing reversible pressure variations and is preferably, elastically coupled to the rear wall. For example, the container is constructed of material having some elasticity such that the deformable portion tends to return to its original location. In operation, member **82** is depressed to dispense liquid from the source **68** and then released to return excess liquid to the source. In contrast to member **82**, members **84** are adapted for irreversible operation, and include an interior latch **86** for locking each in its depressed location responsive to engagement of the latch with recess **88**. The latter members are designed for non-repetitive operation and function to bring the chamber back up to the original pressure following each operation of member **82**. Hence, each of the deformable members **84** compensates for the reduction in source volume (or source pressure) resulting from the absorption of liquid in each processed film sheet.

In a specific example, which is given for purposes of illustration and not intended to be limiting, a 4×5 inch sheet of photosensitive material of the type disclosed in the aforementioned U.S. Pat. No. 2,983,606 was processed in the described processing station which contained an aqueous, alkaline solution having a low viscosity substantially that of water and containing:

	Percent
Potassium hydroxide	10.0
N-benzyl-α-picolinium bromide	2.0
Benzotriazole	3.5
Zinc nitrate	0.5

The applicator unit was constructed with an acrylic container body having an internal volume of approximately 1.5 cubic inches and a membrane filter wall of slightly greater than 3×4 inches in length and width. The membrane filter, which was three-sixteenth inch thick, acrylonitrile polyvinylchloride copolymer reinforced with nylon, with a mean pore size of 1.2 microns and a porosity of approximately 70 percent, formed the front of the container; and the rear of the container, included several 1 inch diameter movable wall portions of rubber material. All but one of the movable members included an internal latch.

A film support member **62** made up of support plate **90** covered by an arcuate surface layer **92** of urethane foam having a density of 10 pounds per cubic foot was employed. Both the applicator filter surface **78** and the support plate layer **92** were perimetrically bordered by sealing margins **79** and **95**, respectively of rubber having a durometer reading of about **40**. The chamber of the container was filled with the above solution which permeated the filter applicator and wetted its exterior surface.

After exposure, the photosensitized surface of the sheet was positioned over the applicator surface and progressively pressed into contact with it by forcing the film support member against the rear of the photographic material. Then, the non-latching deformable portion was depressed to a depth of approximately 0.050 inch which increased the source pressure to about 5 psi and dispensed about 1 cc. of gas-free liquid to the photosensitive surface.

The depressed portion was held in its activated position for about 8 sec., then released to return excess fluid to the source. Immediately following this, the photographic sheet was removed from the applicator surface and pressed into superposition with an image-receiving sheet for formation of a visible image therein.

Thereafter, one of the self-latching deformable areas was depressed and locked in its depressed condition by its internal latch. This compensated for the reduced source volume and returned the source pressure to approximately its original value. A second photographic sheet was then exposed and the above steps repeated to produce its recorded image.

Applicator unit **60** is releasably mounted on the camera housing **10** by any conventional latching means (not shown) with its applicator surface **78** disposed in juxtaposition with film support member **62** which during camera operation, as later explained in detail, is selectively driven by lever **96** towards applicator unit **60** to press the film sheet against surface **78** in accordance with operation of the camera. To insure complete wetted contact of the film sheet with the applicator surface **78**, the support member **62** includes means for removing air from between the interposed sheet and the applicator surface. Thus, the member **62** includes a support plate **90** which carries a resilient surface layer **92** of compressible material such as urethane foam of 10 pounds per cubic foot density or the like having a curved exterior surface **94** which tapers from a raised

or extended central portion towards the margins such that as the support plate is moved towards the applicator **60**, to press the image-receiving sheet **24** into contact therewith, contact between the sheet and applicator surface **78** initially is a small restricted area which is progressively enlarged towards the edges of the structure so as to drive air towards the sheet margin and from between the sheet and applicator surface. Thus it will be recognized that the unit wipes air or gas from the applicator surface as the sheet is deposited and then precludes gas conduction during dispensing.

Carried at the perimeter of the plate **90** in juxtaposition with gasket **79** is a second perimetric gasket **95** of resiliently deformable material such as elastomer, for example, 40 durometer butyl rubber or the like. Gaskets **79** and **95**, which are of resilient deformable material and cooperate to seal the margins of sheet **24** to the applicator **60**, should be less compressible than the surface layer **92** so that during operation of the unit, the margins remain sealed while film sheet **24** is deflected slightly away from the applicator surface **78** responsive to the liquid pressure.

As previously indicated, the support member **62** and the applicator **60** are mounted at the side of the camera housing **10**, as shown in FIG. **1**, adjoining exposure aperture **14** such that film sheets may be disposed within the processing station following their exposure. The support member **62** is permanently mounted in the housing for movement towards the exterior surface thereof while applicator unit **60** is releasably mounted in the exterior wall of the housing with its applicator surface **78** in juxtaposition with film engaging surface **92** of the support member.

As shown in FIG. **1**, film transport system **22** includes a ring gear **100** which is mounted for rotation about the vertical axis of the camera in accordance with operation of hand crank **102**. Extending from ring gear **100** and interiorly thereof is a lever of lug member **104** which is adapted for operation of the components of the camera during rotation of the ring gear. Also depending from ring gear **100** is a film engaging or film gripping member **106** which is shown in detail in FIG. **6**. As shown in the latter figure, the gripping member **106** includes a pair of coupled lever members **118** and **122** adapted for engaging a film sheet between their sheet-engaging surfaces **126** and **128** in accordance with actuation of arm **130**. In this embodiment, the gripping member **106** is biased to a normally closed position by spring **124**, and is pivotally mounted on shaft **120** beneath ring gear **100** in position for engagement of the film sheets during camera operation. In this regard, the gripping member **106** is spaced slightly to the right of lug **104**, or that is, leads lug **104** in a counterclockwise direction looking down on the camera.

Included within the interior of the camera is a pair of upper and lower channels or track **114** and **116** within which the film sheet is moved during camera operation. Additionally, a pair of feed rolls **108** and **110** are rotably mounted at the rear of the housing **10** and adapted to superpose the film sheets after imbibition. The feed rolls **108** and **110** are coupled to the gear ring **100** by conventional means (not shown) and rotated therewith.

In the operation of the camera, as shown in FIGS. **7–10**, the ring gear **100** is initially positioned with lug **104** located clockwise of film engaging member **32** of magazine **16** when the camera is viewed from the top. as the hand crank **102** is rotated to move the ring gear **100** in a counterclockwise direction lug **104** engages the member **32**, drives it towards the front of the camera and ejects an image-recording sheet **24** from the magazine **16** into the channels **114** and **116** and within the film engaging surfaces **126** and **128** of gripping member **106**. The latter are held in an open position at this time in accordance with engagement of the gripping member against a release lug or trip lug **132** which is fixedly mounted to the left of aperture **14**. Continued rotation of the gear ring **100** closes gripping member **106** and draws the image recording sheet **24** into position at exposure aperture **14** where a conventional shutter release (not shown) is activated to photoexpose the photosensitive surface of the sheet. At this time gear ring **100** has been rotated to the position shown in FIG. **7** wherein actuating lug **104** and gripping member **106** are positioned at the trailing edge of aperture **14**. Further rotation of gear ring **104** then draws the film sheet **24** into position within processing station **20** and automatically actuates lever member **96** which moves member **62** into engagement with the sheet **24** and presses its photosensitive surface against the applicator body **76**. The operator of the camera then presses the dispensing member **82** at the rear of container **64** to inject liquid through applicator **76** to the photosensitive surface. That is, deformation or the depressing of portion **82** increases source pressure and applies a positive pressure differential between source **68** and surface **78**.

In this embodiment, the imbibition time is controlled by the length of time the operator holds the deformable portion in its depressed condition. Hence, after a proper interval of, for example, 8 seconds the operator releases member **82** which elastically tends to return to its original position. This reduces source pressure and withdraws excess fluid from the vicinity of the film sheet **24**. The ring gear **100** is then further rotated to release lever member **96**, open the processing station **20** and draw film sheet **24** between feed rolls **108** and **110**.

As the film sheet **24** enters the feed rolls **108** and **110**, it is superposed within an image-receiving sheet, dispensed from magazine **18** in accordance with actuation of its film engaging member **52** by contact with lug **104**. Hence, as lug **104** passes across magazine **18** it strikes film engaging member **52** and drives it along with the moving ring gear **100**, as shown in FIG. **9**. Consequently film engaging member **52** dispenses an image-receiving sheet **42** in a clockwise direction, that is, toward the processing station **20** where a baffle plate **112** forces it around roll **108** into engagement with image-recording sheet **24** and between the feed roll in superposition therewith. The operation is completed as shown in FIG. **10**, when gripper member **106** reaches a position adjoining the trailing edge of magazine **18** where it engages a second release lug or trip lug **134**. Magazine **18** is then pivoted to an open position for removal of the superposed sheets. At this stage of the operation, lug **104** is back to its initial position in readiness for engagement with film engaging member **32** for dispensing of a second image-recording sheet **24**.

For subsequent exposures, the unit is operated in substantially the same manner, with however, the additional activation of one of the irreversible portions **84**. Hence, since a small amount of liquid is imbibed by each film sheet during the processing and applicator body **78** will not admit air to the chamber, release of

portion 82 withdraws excess liquid from the applicator surface 78, but results in reduced pressure on source 68 due to the fluid loss. Consequently, one of the irreversible portions 84 is activated following each application of processing liquid (or just prior to subsequent application) to the film sheet so as to return the source pressure to its original value whereby reversible portion 82 will again be ready for dispensing a prescribed amount of liquid to the next successive sheet. Hence, the irreversible portions are activated to return the source pressure to its original value. Consequently, only portion 82 is depressed for processing of the initial film sheet whereas portions 84 and 82 are activated in that order for processing of subsequent film sheets. It should be understood that since the irreversible portions 84 only compensate for the imbibition loss, they need not provide as great a pressure change as that of portion 82, and hence, may be of smaller area, etc.

Many other variations and different embodiments are possible within the scope of these teachings. For instance, in some applications it may be desirable to utilize a conventional pump or other means for varying the reservoir pressure so as to provide proper pressure differential across the applicator body. Moreover, various mechanisms for transporting the film sheet into position with the applicator member will be suitable and different arrangements for removing air from between the film sheet and the applicator surface may be employed. For example, the raised surface portion of the pressure member may be located along one edge rather than in the center, or the pressure member may be a substantially planar surface which is initially contacted against a given edge of the film sheet and then progessively pressed into contact with the remainder of the sheet so as to drive air towards the opposite edge. Additionally, although the applicator body is illustrated as an integral body of filter material, it could of course be a laminated unit having a supporting perforated substrate or supporting base of large pore material which allows liquid and gas to pass to a thin surface membrane (for example, 140 microns thick) of filter material. In this case, the substrate provides essentially a supporting function while the filter membrane controls the exclusion of gas. Advantageously, the use of a composite body allows efficient operation with a smaller source since only a small amount of liquid is stored in the thin memberane.

Since these and other variations of the invention and its modes of utilization may be made within the scope of the present teachings, the preferred embodiment described herein is 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.

What is claimed is:

1. An apparatus for repetitively dispensing predetermined amounts of liquid from a source of fluid, said apparatus comprising a housing defining a substantially closed chamber of predetermined volume configured for receiving such source of fluid, said housing including egress means configured for permitting passage of such liquid between said chamber and the exterior of said housing for dispensing fluid therefrom while precluding entrance of gaseous fluid thereto, and said housing including a plurality of displaceable wall portions adapted to vary said predetermined volume of said chamber in accordance with displacement of each of said portions responsive to application of an external force thereto, said wall portions being in communication with said chamber and configured for independent displacement between a first position defining an initial volume of said chamber and a second position defining a reduced volume of said chamber thereby providing increased pressure on such fluid within said chamber in accordance with displacement from said first to said second position, at least one of said displaceable portions being configured for reversible displacement between said first and second positions for dispensing liquid from said chamber responsive to displacement of said one portion from said first to said second position and for subsequently returning any excess of such liquid to said chamber responsive to displacement of said one portion from said second to said first position, and another of said portions being configured for irreversible displacement from said first to said second position for maintaining the pressure within said container approximately constant intermediate with dispensing such liquid therefrom responsive to operation of said one portion.

2. An apparatus for repetitively dispensing predetermined amounts of fluid from a source contained therein, said apparatus comprising a substantially rigid housing defining a substantially closed chamber of predetermined volume configured for receiving such source of fluid, said housing including egress means configured for permitting passage of such fluid between said chamber and the exterior of said housing for dispensing fluid therefrom, and said housing including a plurality of displaceable wall portions adapted to vary said predetermined volume of said chamber in accordance with displacement of each of said portions responsive to application of an external force thereto, said wall portions being in communication with said chamber and configured for independent displacement between a first position defining an initial volume of said chamber and a second position defining a reduced volume of said chamber thereby providing increased pressure on such fluid within said chamber in accordance with displacement from said first to said second position so as to dispense an appropriate amount of such fluid through said egress means, at least one of said displaceable wall portions being elastically coupled to said housing such that, upon removal of an external force configured for displacement of said one portion from its said first to its said second position, said one portion tends to automatically return to its original location and thereby tends to return the reduced volume of said container to its volume just prior to actuation of said one portion, at least another of said portions is elastically coupled to said body, said another portion including means configured for latching said another portion in its said second position following its displacement thereto.

3. An apparatus for repetitively dispensing predetermined amounts of liquid from a source of fluid, said appartus comprising a housing defining a substantially closed chamber of predetermined volume configured for receiving such source of fluid, said housing including egress means configured for premitting passage of such fluid between said chamber and the exterior of said housing for dispensing fluid therefrom, said egress means including a porous filter medium which in cooperation with the surface tension of such liquid permits

passage of the latter while precluding passage of gaseous fluid within a given range of pressure differential, and said housing including a plurality of displaceable wall portions adapted to vary said predetermined volume of said chamber in accordance with displacement of each of said portions responsive to application of an external force thereto, said wall portions being in communication with said chamber and configured for independent displacement between a first position defining an initial volume of said chamber and a second position defining a reduced volume of said chamber thereby providing increased pressure on such fluid within said chamber in accordance with displacement from said first to said second position, at least one of said displaceable portions being configured for reducing said container volume by a predetermined amount so as to increase the internal pressure within said chamber and to produce a pressure on the interior of said filter medium which in cooperation with the exterior pressure thereof produces a pressure differential across said medium which is within said given range of pressure differential so as to thereby dispense an appropriate amount of such liquid.

4. The apparatus of claim **3** wherein said one of said portions is configured for reversible displacement so as to repetitively apply a pressure differential across said filter material for repetitively dispensing such liquid therethrough responsive to repetitive actuation of said one portion.

5. The apparatus of claim **4** wherein including means for latching another of said displaceable portions in said second position so as to irreversibly reduce the volume of said chamber whereby said another portion may be displaced to its said second position and latched therein following actuation of said one portion so as to return the internal pressure of said chamber to approximately the initial pressure existing just prior to said actuation of said one portion so as to compensate for the reduced amount of liquid in said chamber.

6. The apparatus of claim **5** wherein said first portion is biased to its said first position and said latching means includes an arm member affixed to and extending inwardly from said another portion and means located within said housing for cooperating with said arm member when said another portion is displaced to its said second position so as to retain it therein.

7. An apparatus for repetitively dispensing predetermined amounts of liquid from a source of fluid, said apparatus comprising:

a housing defining a substantially closed chamber of predetermined volume configured for receiving such source of fluid, said housing including egress means for permitting passage of such fluid between said chamber and the exterior of said housing, said egress means including means configured for permitting passage of liquid while precluding passage of gaseous fluids, and means for selectively reducing said predetermined volume of said container in discrete incremental steps so as to repetitively dispense an amount of such fluid through said egress means, said volume reducing means includes means operative to repetitively reduce the volume of said chamber by a predetermined amount so as to dispense liquid therefrom and then to tend to return said volume to its initial state so as to return any unused portions of such dispensed liquid to said chamber and means operative to irreversibly reduce the volume of said chamber to compensate for used portions of such dispensed liquid.

8. The apparatus of claim **7** wherein said housing includes a substantial planar wall portion forming a wall of said chamber and said volume reducing means includes a plurality of discrete portions of said housing wall which are configured for independent displacement from a first position defining said predetermined volume to a second position which reduces said volume responsive to application of an external force to said wall portions.

9. The apparatus of claim **8** wherein said wall portions are initially substantially coplanar with said housing wall when they are located in said first position and are configured for diplacement inwardly along an axis substantially perpendicular to said wall.

10. The apparatus of claim **8** wherein at least said one wall portion is biased to its said first position and configured to automatically return thereto from its said second position responsive to removal of such external force and thereby tends to return the volume of said container to its volume just prior to actuation of said one portion.

11. An apparatus for repetitively dispensing predetermined amounts of liquid from a source thereof, said apparatus comprising:

a housing defining a substantially closed chamber of predetermined volume configured for receiving such source of liquid and retaining it at an initial pressure;

egress means located on said housing and configured for passage of liquid between said chamber and the exterior of said housing and substantially precluding passage of gaseous fluid therebetween at least when a given range of pressure is maintained in said chamber;

first means for reversibly varying the volume of said chamber so as to first decrease said chamber volume and thereby increase the pressure on such source so as to dispense liquid therefrom through said egress means and then subsequently return said chamber volume to its initial state existing just prior to decreasing said volume and thereby decrease the pressure on such source so as to return any unused portion of such liquid to said chamber; and

second means for irreversibly reducing said chamber volume by a discrete amount following operation of said first means so as to substantially compensate for the reduced volume of said source within such chamber and thereby return the pressure of said chamber to approximately said initial pressure whereby said first means may be again operated to dispense said amount of such liquid and return unused portions thereof.

12. The apparatus of claim **11** wherein said first means and said second means include a plurality of discrete wall portions of said housing which are in communication with said chamber and configured for displacement between a first position defining said predetermined volume of said chamber and a second position defining a reduced volume of said chamber.

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