Dec. 7, 1965 A. M. GLASS 3,221,942

COLLAPSIBLE FLUID CONTAINER

Filed July 25, 1963

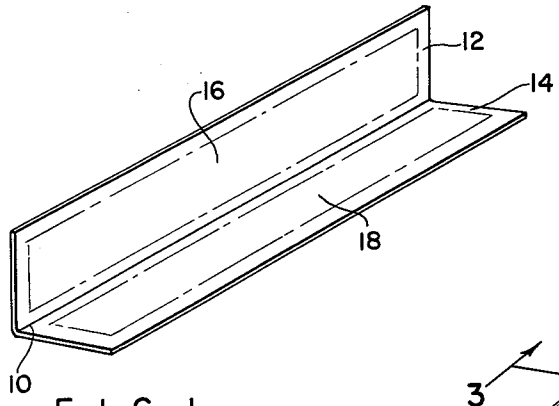


FIG. 1

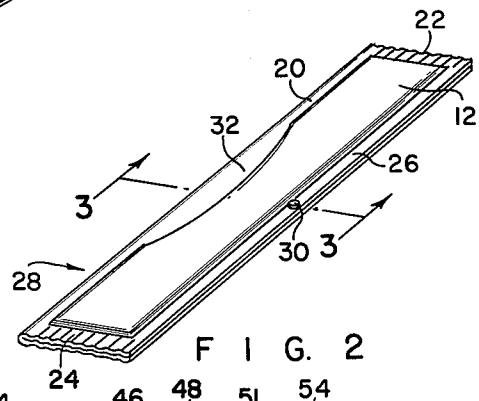


FIG. 2

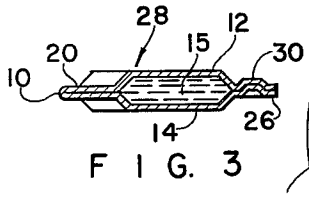


FIG. 3

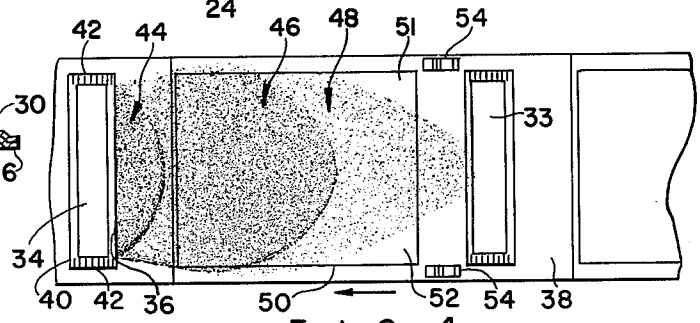


FIG. 4

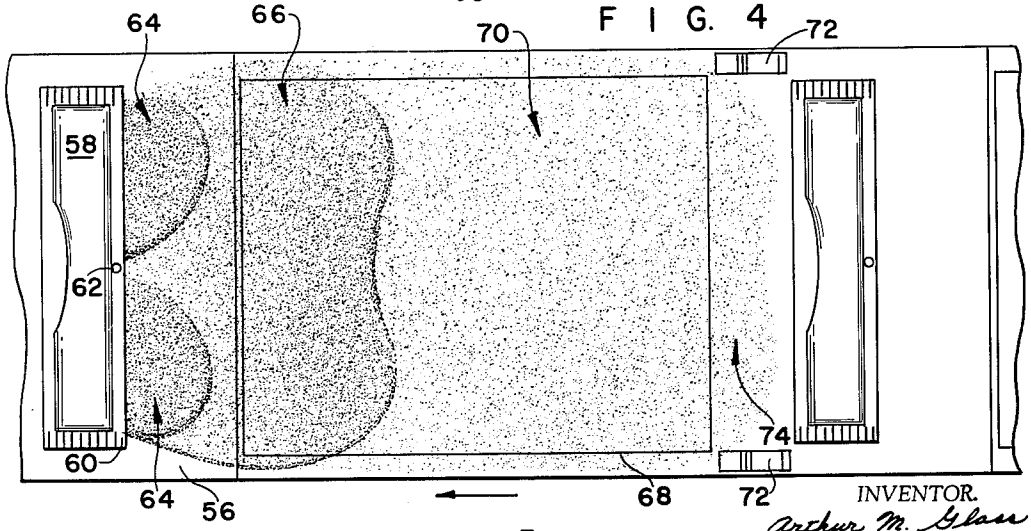


FIG. 5

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COLLAPSIBLE FLUID CONTAINER

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This invention relates to fluid containers and more particularly to containers adapted to contain a fluid composition suitable, for example, for use in a process of forming photographic images.

A principal object of the present invention is to provide a novel container for releasably carrying a liquid suitable for forming a photographic image in conjunction with associated materials.

A further object is to provide a fluid-carrying container having pliable walls and an edge portion adapted to rupture upon the application of a compressive force to said walls whereby the fluid is released in a desired manner and direction.

Another object is to provide a container having a single, continuous, fluid-carrying cavity and means for releasing the fluid, upon application of force to the container, in a plurality of liquid masses.

A still further object is to provide a collapsible container releasably enclosing a liquid, said container being suitable for positioning between sheet materials comprising a photosensitive film and a second sheet whereby, upon drawing said sheet materials between pressure-applying members the fluid is released from the container and spread between the sheets, the frontal portion of the fluid mass being advanced relative to the sheets in an approximately straight line perpendicular to the direction of travel.

Still another object is to provide a collapsible container having a single fluid-carrying cavity and a sealed edge portion adapted to rupture only in predetermined areas upon the application of force on the container.

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

The invention accordingly comprises the product possessing the features, properties and the relation of components which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

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

FIGURE 1 is a perspective view of a sheet of material partly fabricated for use according to the present invention;

FIG. 2 is a perspective view of a fluid container constructed according to the present invention;

FIG. 3 is a side, sectional view on the line 3—3 of FIG. 2;

FIG. 4 is a plan view of a previously-known container, showing a typical distribution of the fluid contents thereof between two sheets upon drawing the latter through a pair of pressure-applying members;

FIG. 5 is a plan view as in FIG. 4, showing a typical distribution of the contents of a container constructed according to the present invention.

Photographic products of the type herein disclosed generally include a pliable material which may readily be formed, by appropriate apparatus, into rupturable containers carrying a processing composition. The product is intended primarily for use in a photographic process which includes developing a latent image formed by exposure to actinic radiation of a photosensitive sheet by distributing the processing composition carried by the

product between the photosensitive sheet and another sheet. The photosensitive sheet preferably comprises a stratum of photosensitive material disposed upon a suitable base or support, the material being adapted to attain a developable latent image by proper exposure. The photosensitive material may comprise, for instance, an emulsion of silver halide in a colloid stratum wherein the colloid may be a natural colloid on a synthetic material, many examples of both being well known in the art. Instead of a silver halide emulsion one may employ, for example, other heavy metal salts capable of forming developable latent images upon exposure to actinic radiation, as well as ferric salts such as the ferricyanides, certain diazonium compounds and bichromates.

The other sheet may merely aid in the distribution of a processing composition, but is preferably adapted to serve as a support for an image-receiving layer in which may be produced a visible print of an image recorded by the photosensitive material.

The processing composition, in the preferred form, when spread in a relatively uniform, thin layer between the photosensitive sheet and other sheet, preferably effectuates a transfer of image-forming substances such as occurs in a silver halide diffusion-transfer reversal process, by which the latent image in the photosensitive sheet is developed and a positive print is produced in an image-receiving layer between the sheets. Where the photosensitive material is a silver halide and the receiving layer is a silver-receptive stratum, the processing composition may comprise an aqueous solution of a silver halide developer such as hydroquinone, a silver halide solvent such as sodium thiosulphate and an alkali such as sodium hydroxide.

Means are provided for maintaining the photosensitive and other sheets in superposed relation after treatment with the fluid processing composition for a predetermined processing period during which the exposed silver halide of a photosensitive sheet is reduced to silver and the unreduced silver halide forms a water-soluble complex silver salt which diffuses through the layer of composition, and upon being reduced to silver forms a visible print on an image-receiving layer. Examples of suitable photographic materials in conjunction with which products of the type disclosed herein are useful are described in greater detail in U.S. Patents Nos. 2,543,181 issued February 27, 1951; 2,661,293 issued December 1, 1953; 2,647,049 issued July 28, 1953; 2,614,926 issued October 21, 1952 and 2,662,822 issued December 15, 1953, all to Edwin H. Land, and 2,774,668 issued December 18, 1956, to Howard G. Rogers.

It is, of course, to be understood that the product of the present invention is not limited to use with any particular species of photosensitive or other sheets, nor limited to the examples of materials set forth herein.

Referring now to the drawings, a form of photographic product comprehended by the invention is illustrated, said product being formed, for example, from a strip of continuous material, medially folded at **10** to form walls **12** and **14**. Marginal portions of walls **12** and **14** are secured together, as by adhesively sealing the opposing faces, to form a cavity **15** (FIG. 3). This cavity is preferably formed from portions of both walls, as indicated at **16** and **18** in FIGURE 1. During or after the introduction of a processing composition of the type previously described into cavity **15** the marginal portions of the product are sealed at leading edge **20**, ends **22** and **24**, and trailing edge **26** to form the container, denoted generally by reference numeral **28**, having a single, fluid-filled cavity **15**.

Suitable materials from which container **28** may be formed include metal foil coated, at least on surfaces **16** and **18**, with a material substantially imprevious to the fluid processing composition which is enclosed. A preferred method of securing together the marginal por-

tions of container **28** is to provide a heat and/or pressure sensitive coating on the facing surface and applying the required heat and/or pressure to the marginal portions in appropriate sequence with introduction of the processing composition into the cavity to form the liquid-filled container.

In order to release the contents of the container in a predetermined direction upon the application of a force sufficient to rupture at least one of the seals, the marginal portions of trailing edge **26** are secured together by a relatively weaker bond than that existing between the bonded marginal surface portions at leading edge **20** and ends **22** and **24**. That is, upon application of a compressive stress to container walls **12** and **14**, as, for example, by passing a pair of superposed sheets with container **28** disposed therebetween through pressure rollers, the bond or seal at trailing edge **26** will rupture substantially along the entire length thereof to release the fluid contents of the container through the opening thus formed. Specific examples of materials suitable for use as the walls of container **28**, as well as coating materials for the internal surfaces thereof, both to provide isolation of the fluid contents from the internal container surfaces and for bonding together the marginal portions thereof, may be found in U.S. Patents Nos. 2,634,886 issued April 14, 1953 to Edwin H. Land; 2,653,732 issued September 29, 1953 to Edwin H. Land; 2,750,075 issued June 12, 1956 to Edwin H. Land and Otto E. Wolff, and 2,903,829 issued September 15, 1959 to Otto E. Wolff. The said patent 2,634,886 includes a specific disclosure of suitable methods and means for differentially sealing the various marginal portions of the container so that the fluid contents will be released in a predetermined direction upon application of compressive force. The said Patent 2,903,829 discloses an example of suitable apparatus for introducing the fluid into the container and sealing the marginal portions thereof.

An additional seal, in the area of container **28** denoted by reference numeral **30**, is effected by appropriate means such as the application of additional heat and pressure in this area. It will be noted that in the illustrated embodiment trailing edge **26** is indented or crimped in area **30**, as may be expected by the application of additional pressure to a deformable material. The bonding force between the opposing surfaces of walls **12** and **14** is strong enough in area **30** so that, upon application of compressive force to container **28** in the normal manner of use thereof, the seal at trailing edge **26** does not rupture in area **30**. Thus, the fluid is released from container **28** on each side of area **30**, the initial discharge therefore being in the nature of two separate masses. Area **30** is preferably centrally located with respect to trailing edge **26**. Also, the seal at leading edge **20** may be widened near the center, if desired, as indicated at **32**. This has the effect of constricting the cross-sectional area of cavity **15** near the center, whereby the processing fluid is not so highly concentrated at this point with resulting desirable effects which will be pointed out hereinafter.

Turning now to FIG. 4, there is shown a portion of an assembly which includes a plurality of fluid-carrying containers **33** and **34** which do not embody the present invention. The seal or bond at trailing edge **36** of container **34** is intended to rupture substantially simultaneously along its entire length when sheet **38** and another sheet (removed for purposes of illustration) are drawn between a pair of pressure-applying members in superposed relation with container **34** disposed therebetween. The sheets are moved between the pressure-applying members in the direction indicated by the arrow in FIG. 4. Thus, as the film assembly is drawn between the members, container **34** is progressively compressed, beginning at its leading edge **40**, thereby generating a hydraulic pressure in the enclosed processing fluid. This pressure builds up until it is sufficient to rupture the longitudinal seal along the container's trailing edge **36**.

The nonrupturing seals at ends **42** of container **34** tend to retard the rupturing of the end portions of the longitudinal seal. The seals at ends **42** also constrict the end portions of the cavity within the container, the greater portion of the processing fluid thereby being in the central portion of the cavity. The pressure generated in the processing fluid is not uniform but varies from point to point, being greatest in the region of the greatest amount of fluid. This combination of both a relatively larger amount of fluid and, as a consequence thereof, a greater hydraulic pressure at the center portion of the container increases any tendency the longitudinal seal may have to rupture initially at the center of trailing edge **36**. Thus, substantially more processing fluid may be dispensed at the center of the superposed sheets than near their lateral edges.

Although there is some tendency for the excess fluid which is dispensed at the center of the sheets to be spread outwardly, an appreciable amount remains at the center as the sheets are advanced between the pressure-applying members. This results in an uneven thickness of fluid between the sheets, possible incomplete coverage by the fluid of the predetermined area to be processed, and a large amount of excess fluid at the center after this portion of the processing area has already been covered. This undesirable condition is illustrated in FIG. 4 by the various shaded areas which indicate the nonuniform initial discharge and subsequent distribution in a film unit which does not embody the present invention. Heavily shaded area **44** represents the limits of the distribution of the processing fluid just after its discharge from container **34**. With an initial fluid discharge such as this, as the superposed sheets continue to be advanced between the pressure-applying members, the fluid is advanced relative to and between the sheets along a generally curved or tongue-shaped front. Medium shaded area **46** indicates the limits of the fluid distribution at roughly the midpoint of the spread, and lightly shaded area **48** shows the distribution at the end. Rectangular area **50** represents the predetermined area of sheet **38** which it is desired to process by spreading thereover a layer of the processing fluid. There is always the possiblity that corners **51** and **52** of area **50** will not be covered with a spread such as that of FIG. 4.

An amount of processing fluid in excess of that actually required to cover area **50** may be provided within the collapsible container in order to insure that all areas are covered in spite of the fact that the greatest concentration of fluid is at the center. For this reason, means may be provided to force the presure-applying members apart by a greater amount, thus allowing the excess fluid to collect in a thicker layer between the sheets, after area **50** has been covered by a complete layer of the desired thickness. One such means comprises a pair of spacer members **54**, typically comprising paperboard, hard rubber or plastic blocks, adhered to the lateral edges of sheet **38**. The excess processing fluid, rather than being further advanced, is collected between the superposed sheets. The required length of the collecting area, which may be essentially the distance from the end of processed area **50** to container **33**, is dependent both on the amount and distribution of the excess fluid. It is apparent from the outer limits of lightly-shaded area **48**, indicating the final distribution of the fluid, that the tongue-shaped distribution, which uses only the central portion of the collecting area, could result in some of the excess fluid being advanced beyond the end of the collecting area.

Thus, it is evident that the use of conventional containers, such as those of FIG. 4, may produce the undesirable results of incomplete coverage of the area to be processed and/or incomplete trapping of the excess fluid in the area provided for this purpose. The novel container structure of the present invention is designed to overcome these deficiencies by providing a fluid distribution which is more evenly concentrated across the super-

posed sheets, and which is advanced with respect to the sheets along a front which is more nearly linear, at least at the end of the spread. A typical distribution from a container embodying the present invention is shown in FIG. 5. A single sheet **56** of the film unit is shown, it being understood that a second sheet is superposed therewith during distribution of the processing fluid. Container **58**, similar in all essential respects to the container of FIGS. 1–3, is disposed between the two superposed sheets as the latter are drawn between appropriate pressure-applying members. As previously noted, the longitudinal seal at trailing edge **60** is designated to rupture as container **58** passes between the pressure-applying members in the direction indicated by the arrow. Area **62** remains sealed, as explained above, when the longitudinal seal ruptures, thus having the effect of initially releasing the fluid in two separate masses. Heavily shaded area **64** indicates the initial distribution of the fluid just after release thereof from container **58**. As the superposed sheets continue to be advanced through the pressure-applying members, the fluid is advanced relative to the sheets as indicated by medium shaded area **66**. That is, the two fluid masses which are released in side-by-side relationship tend to flow together at the center so that all of processing area **68** of sheet **56** is covered. However, instead of having a tongue-shaped distribution at the center of the sheets, as in FIG. 4, the fluid is advanced along a front which, at the intermediate stage shown by medium shaded area **66**, is curved inward (i.e., away from the relative direction of travel of the fluid) at the center. As the fluid continues to be advanced relative to the sheets the amount of inward curve along the fluid front becomes less pronounced since some of the fluid from both of the separate masses initially released flows into this area, whereas only the fluid from each distinct mass is available to be distributed in the other areas. Consequently, the final distribution is that indicated by lightly shaded area **70**, which is seen to have a front extending laterally across sheet **56** in a relatively straight line. Spacer elements **72** are provided, as in the previous embodiment, to force apart the pressure-applying members and allow the excess fluid to collect between the sheets in area **74**.

The intended purpose of the fluid distribution is thus better accomplished through the use of the container of the present invention than by conventional containers, such as those of FIG. 4, previously used for the same purpose. Specifically, the distribution of fluid from a rupturable container between a pair of superposed sheets, resulting from passing the latter through pressure-applying members, is more uniform when the fluid is dispensed from the container of the present invention. That is, the final limit of the fluid distribution is more nearly parallel to the limiting edge of the area which is processed by the fluid, which edge runs laterally across the sheets. Thus, there is less likelihood of an incomplete coverage of the processing area by the fluid and also less likelihood that the excess fluid will fail to be collected in the area between the sheets provided for this purpose. The container of the present invention has been found to be especially advantageous when the processing fluid used is of relatively high viscosity and in instances where it is necessary to supply a relatively large amount of such fluid.

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

What is claimed is:

1. A collapsible, fluid-carrying container of the type used in photographic processes wherein said container is positioned between a pair of sheet materials which are advanced in superposed relation between pressure-applying members to effect release of said fluid and spreading thereof in a uniformly thin layer between said sheets to effect photographic processing of at least one of said sheets, said container comprising:

(a) a pair of substantially rectangular, opposed wall members;

(b) means securing together marginal portions of all four sides of said wall members to form a single, enclosed cavity;

(c) a viscous fluid contained within said cavity;

(d) at least one of said wall members being flexible and deformable whereby a hydraulic pressure is exerted by said fluid upon application of a compressive force upon advancement of said container between said pressure-applying members to said container; and

(e) three of said four sides and a centrally disposed portion of the fourth side being secured together in said marginal portions by a stronger bond than that securing said fourth side in other than said centrally disposed portion, whereby said fluid is released upon application of said force to said container from said fourth side on each side of said centrally disposed portion.

2. The invention according to claim **1** wherein said centrally disposed portion is relatively small with regard to the total area of said marginal portions along said fourth side.

3. A collapsible container releasably carrying a fluid-processing agent for use in a photographic process wherein said fluid is released from said container and spread in a relatively thin layer between a pair of superposed sheets to effect photographic processing of at least one of said sheets, said container comprising:

(a) a pair of substantially rectangular, juxtaposed wall members;

(b) sealing means securing together the opposing faces of marginal portions of said wall members to form a single, completely enclosed cavity;

(c) a viscous photographic processing fluid releasably contained within said cavity;

(d) at least one of said wall members being flexible and deformable whereby a hydraulic pressure is exerted by said fluid upon application of a compressive force to said container;

(e) said marginal portions being secured along the two short sides and a first long side of said rectangular wall members by a first adhesive force;

(f) said marginal portions being secured along the second long side by a second adhesive force in a centrally disposed portion and by a third adhesive force in other portions; and

(g) said third adhesive force being less than said first and second adhesive forces whereby, upon application of said compressive force to said container, said marginal portions become unsecured along said second long side in the area thereof secured by said third adhesive force, said fluid thereby being released from said container along said second long side on each side of said centrally disposed portion.

4. The invention according to claim **3** wherein said centrally disposed portion is relatively small with regard to the total area of said marginal portions along said second long side.

5. The invention according to claim **4** wherein said marginal portions along said first long side are secured together in a wider band at the center than at the ends of said first long side, whereby the cross-sectional area of said cavity is greater at each end of said container than at the center thereof.

6. In a composite photographic product for use in a self-developing camera and including a pair of flexible sheet materials adapted to be drawn in superposition between a pair of pressure-applying members of said camera, a collapsible, fluid-carrying container adapted to be posi-

tioned between said sheets and to release said fluid upon application of a compressive force by said pressure-applying members, said container comprising:

(a) a pair of elongated, substantially rectangular wall members arranged in superposed relation;

(b) said wall members being of substantially equal dimensions and having marginal edge portions secured together around the entire periphery thereof, whereby the inner, opposed surfaces of said wall members define a single, completely enclosed cavity;

(c) a fluid processing composition substantially filling said cavity;

(d) at least one of said wall members being flexible and deformable, whereby pressure applied to the exterior of said container by said pressure-applying members is transmitted to said fluid, which in turn exerts a hydraulic pressure tending to cause said marginal edge portions to come unsecured;

(e) means for securing the marginal edge portion along the trailing edge of said container, with respect to the direction of advancement thereof, by a weaker seal than the marginal edge portions along the other three sides; and

(f) means for securing a central portion of said trailing edge by a seal stronger than said weaker seal, whereby said container becomes unsealed along said trailing edge in the areas secured by said weaker seal and remains secured in said central portion in response to application of said hydraulic pressure, thus releasing said fluid between said sheets in two separate fluid masses from said single cavity.

7. The invention according to claim 6 wherein said central portion is small relative to the total area of said marginal edge portion along said trailing edge.

References Cited by the Examiner

UNITED STATES PATENTS

2,634,886	4/1953	Land	222—107
2,663,461	12/1953	Brown	222—94 X
2,702,146	2/1955	Land	222—107
2,750,075	6/1956	Land et al.	222—94
2,990,101	6/1961	Mead et al.	222—541
3,030,207	4/1962	Land	96—29
3,072,248	1/1963	Bishop	206—56

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