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E. H. LAND
LIQUID-CARRYING CONTAINERS

3,152,515

Filed Feb. 4, 1959

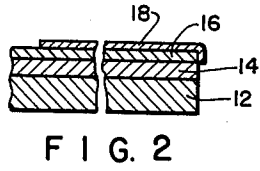
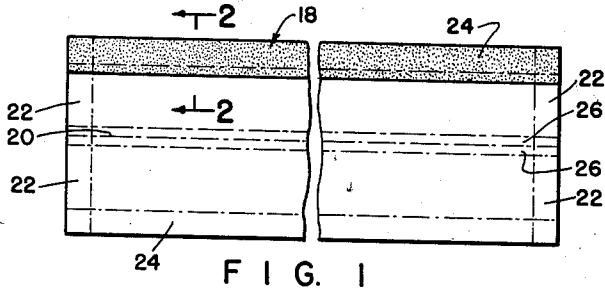


FIG. 1

FIG. 2

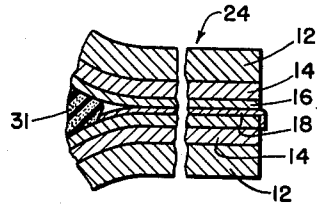
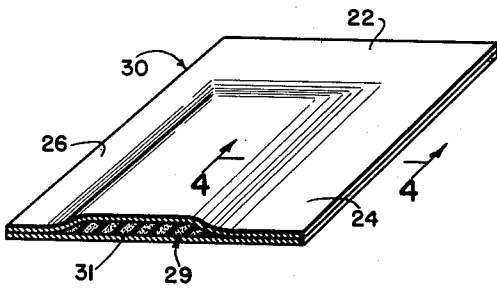


FIG. 3

FIG. 4

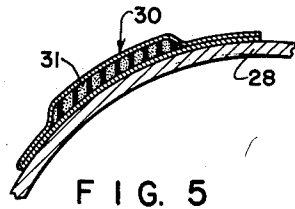
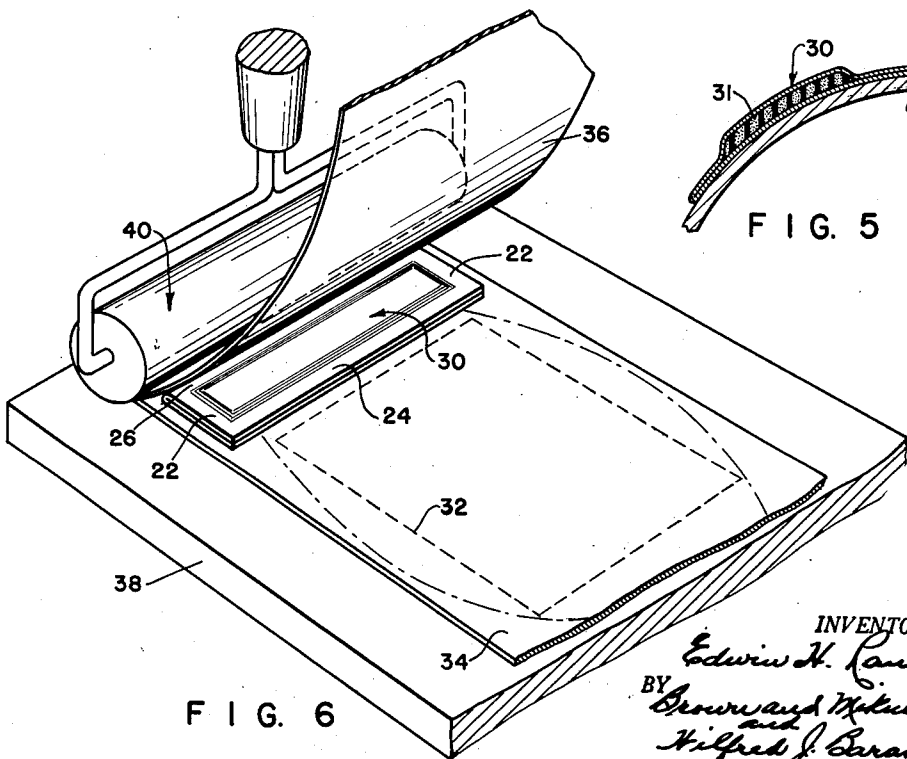


FIG. 6

FIG. 5

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LIQUID-CARRYING CONTAINERS

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This invention relates to liquid-carrying containers and more particularly to single use, disposable containers adapted to contain a liquid composition suitable, for example, for use in a process of forming positive photographic prints.

The present invention contemplates an improvement over liquid-carrying containers of the type disclosed, for example, in U.S. Patent No. 2,612,451 for Photographic Product, Including a Container and Means for Rupturing Said Container, U.S. Patent No. 2,634,886 for Collapsible Fluid Container and U.S. Patent No. 2,653,732 for Single Use Container Having a Sealed Passage Adapted To Be Unsealed Upon Application of Stress. In the containers described in the above patents, there is provided a single, elongated cavity or compartment for releasably containing a liquid. When the container, having a sealed liquid-releasing passage comprising marginal portions of the container walls bonded together in face-to-face relation, is subjected to compression, the liquid is released from the container through the ruptured marginal wall portions said is adapted for forming, in conjunction with associated materials, a positive photographic print. It has been found that when such containers are incorporated into rolls of photographic film and the rolls are stored in an edgewise fashion, with the container, which is positioned transversely of the photographic papers forming part of the film roll, standing on end, in a manner of speaking, there is a tendency for the liquid to concentrate adjacent the lower end of the cavity, and if a film comprising such a container is utilized without giving the liquid, which is usually quite viscous, an opportunity to redistribute itself, it is possible that the liquid, when released, will not uniformly cover the desired image area. Moreover, the liquid within the container cavity has heretofore been suitably thickened to give the same at least a predetermined minimum viscosity. This was necessary to insure an equalization of the hydraulic peeling pressure transmitted by the container contents to the sealed passages prior to rupture of the latter so that a more uniform and complete peeling apart of the marginal walls which constitute the sealed passages could be obtained with a corresponding uniform release and distribution of the liquid contents. Thus, in order to insure a uniform peeling apart of the sealed passages upon application of a squeezing force to the walls of the container, a quite viscous liquid is employed, which because of its viscosity, requires sufficient time for its redistribution should it concentrate or flow to one end of the cavity during standing or storage.

It is accordingly an object of the present invention to provide a single use, disposable, liquid-carrying container so constructed that its contents may be directly and uniformly spread therefrom in a thin layer so as to fully cover an appreciably large area and which is not subject to the above-mentioned disadvantages.

Another object of the invention is to provide a container having a cavity substantially filled with a suitable liquid absorbent material for holding the liquid contents of the container.

A further object is to provide a liquid-carrying container of the above type having pliable walls and differential sealing means adjacent the cavity or chamber, whereby the liquid may be directionally released when the container is subject to compression.

Still another object of the invention is to provide a liquid-carrying container of the above type which is suitable for attachment to a material adapted either to carry or to otherwise serve in the formation of a positive photographic print.

A still further object is to provide a container of the above type releasably holding a liquid, said container being formed from pliable and deformable materials and being suitable for positioning between sheet materials comprising a photosensitive film and a material for carrying a positive photographic print whereby said liquid may be released between said sheet materials and serve to form said print when the container is subjected to compression.

Still another object is to provide a collapsible container of the above type releasably carrying a predetermined quantity of a liquid suitable for release to an adjacent photographically exposed film whereby a positive print of the subject image of said film may be formed.

Still another object is to provide a collapsible container of the above type releasably carrying a liquid suitable for processing a photographically exposed photosensitive film, for transporting an image-forming component to a material for carrying a positive print of the subject image of said film, and for forming said positive print.

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

The invention accordingly comprises the products 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 plan view, with parts broken away, of a blank from which one embodiment of the novel container of the present invention may be formed;

FIG. 2 is a fragmentary, sectional view taken substantially along the line 2—2 of FIG. 1;

FIG. 3 is a sectional, perspective view of a portion of the container structure of the present invention in its filled and sealed condition;

FIG. 4 is a section, taken substantially along line 4—4 of FIG. 3, showing the details of the sealed liquid-releasing passage of the container;

FIG. 5 is a sectional view, showing the container mounted in a suitable base, of a curvature which the container may readily assume without rupture; and

FIG. 6 is a somewhat diagrammatic, perspective view, with parts broken away, illustrating an application of the container of the present invention.

By employing a container with a cavity which is substantially filled or occupied with a suitable absorbent material for retaining or holding the liquid contents of the container, there will be no tendency for the liquid to flow to one end of the cavity should the container be stored in an edgewise fashion. Moreover, liquid composition of much lower viscosities than heretofore employed can now be used if desired. The use of adsorbent material within the cavity of the container provides even after long storage a more uniform release and distribution of the liquid.

In one preferred embodiment of the invention the container is elongated, having a length at least twice its width, and is relatively flat, having a depth which is but a fraction of its width. The container is deformable in its filled and sealed condition so that it may be curved if necessary, in the direction of its width, for example about a radius equal to its width without danger of rupturing its seal. The container comprises at least one cavity or chamber which is substantially filled with a suitable ab-

sorbent material for holding the preferred liquid. The liquid held by said absorbent material within the cavity of the container is adapted to be spread directly from said container in a thin layer over an area substantially as wide as the length of the cavity, the cavity having a sealed, liquid-releasing passage extending the length of said cavity.

The absorbent material employed as a thin sheet or pad within the cavity is preferably of a pliable, relatively porous nature capable of absorbing and retaining the liquid employed and capable of readily giving up or discharging the liquid therein upon compression. Sponge-like material are particularly suitable for use within the container cavity. The liquid contents of the container held by the absorbent material can be of the viscous types heretofore mentioned and well known in the art or of a much less viscous nature.

The container is fluid-tight and substantially water-vapor impervious so that its contents may be kept intact for long periods of time, and the structure thereof is such that the contents of the container can be squeezed and distributed therefrom with the same care and uniformity at any time during the several months which follow the forming, filling and sealing of the container. As a result the container can be stored for relatively long periods of time prior to use.

The container is preferably formed with a single, essentially rectangular blank folded medially. It may also be formed from two essentially rectangular blanks secured together at their marginal edges. It is so simply constructed that the blank or blanks from which the same is formed may be cut without waste from a single continuous strip of sheet material permitting the material of the container walls to be processed, and the container to be filled, sealed and severed as part of one continuous operation.

Referring to FIG. 1 there is shown a blank 10 from which one embodiment of the novel container of the present invention may be formed, said blank, as shown, being substantially rectangular in shape and having a length equal to the container length, and a width approximately twice the width of the finished, filled container. The blank is preferably formed of a composite, deformable sheet material comprising a plurality of layers or plies (FIG. 2).

An outer layer 12 serves as a backing or support and is preferably formed of a thin, relatively inexpensive, tough material which may be a plastic but is preferably a paper, such as kraft paper. Applied to the surface of layer 12 is a thin film or sheet of a relatively vapor-impervious material, such as a metal foil 14, and there is coated on the surface of said foil 14 a further layer 16 of a suitable plastic which can be adhered to itself by the application of heat and/or pressure. Layer 16 is preferably liquid-impervious in order to provide a protective coating for the metal foil 14 thereby preventing the contents of the container from reaching the foil to corrode or otherwise deteriorate the same. Coatings 14 and 16 are relatively thin, being only sufficiently thick to be continuous.

Adjacent one long edge of the blank 10 there is provided a strip 18 of a suitable thermoplastic material which has a lesser affinity for the plastic of layer 16 than the latter plastic has for itself. Coating 18 is applied in such a way that it extends to the very edge of the blank along the entire length of the blank, precautions being taken to insure this condition even to the extent of having the material of said strip 18 coated over the edge as shown in FIG. 2.

The container 30 (FIG. 3) is formed by folding the blank along a substantially medial line 20 extending the length of the container, and then securing together the faces of the marginal portions 22 along the short edges of the container and the facing marginal surfaces 24 along the long edge of the container. These several marginal

portions are secured together by the application of heat and/or pressure and, in addition, it is preferable to adhesively secure together a narrow strip 26 of the container walls adjacent the fold line 20. This provides a thin leading edge for the container over which a suitable pressure-applying device, such as a pressure roll or a doctor blade, may be readily advanced to compress the container walls and effect the release of the container contents.

The seal along the long edge of the container is effected between the inner coating material 16 and the material of strip 18 which, as hereinbefore indicated, is a material which has a lesser affinity for the plastic of layer 16 than that plastic has for itself. Since short edge portions 22 are secured together by a bond formed by direct contact between the inner coating layers 16, the latter bond is substantially stronger than the seal along the long edge.

Within the cavity 29 of container 30 there is positioned, before complete sealing of the container, at least one, thin pliable, relatively porous sheet of absorbent material 31 for holding or containing within its porous structure all or essentially all of a predetermined amount of liquid to be carried by said container. Natural and synthetic spongy materials, e.g. sponges, fibrous or cellulosic-containing materials such as absorbent papers, e.g. blotters, cotton and the like, employed in the form of a thin sheet or pad are suitable for use in the present invention. Natural and synthetic porous, pliable sheets or pads of fibrous materials capable of absorbing and retaining the liquid employed, and readily giving up or discharging the liquid therein upon compression, can be used within container 30. The specific absorbent material employed in any particular instance should be such that it will not decompose, dissolve or otherwise lose its desired properties while in contact with the liquid or reagents within the container and absorbed thereby.

This structure assures a unidirectional release of the contents of the container upon the application of a compressive squeezing force to the walls thereof. To make certain that a uniform peeling or separation of the marginal portions along the long edge of the container is obtained when the container is subjected to a liquid-releasing force, the strip 18 not only extends to the very edge of the blank but is also substantially wider than the width of the seal 24 and extends within the liquid-carrying cavity of the container as shown in FIG. 4. A further precaution against the hazard of an uneven seal consists in displacing the long edge of the blank containing a strip 18 just beyond the long edge of the blank (FIG. 4) which is adhered thereto. As a result, strip 18 projects beyond both long edges of the bond 24.

In the formation of the container, the desired quantity of liquid can be previously absorbed by a sheet of absorbent material such as a sponge and this liquid-containing sheet positioned within the container prior to sealing of the walls thereof. Alternately, the sheet alone can be placed within the container and the liquid introduced as the container walls are being sealed together. For example, in this latter embodiment the long edges of the container blank after insertion of the absorbent material may be sealed together before the blank is severed from the stock of material from which it is formed. During the sealing together of the long edges, the desired quantity of liquid content for the container is introduced between the folded walls of the blank and thereafter the short edges are sealed together and the finished container is severed from the remainder of the sheet stock. The sealing is preferably effected by the application of heat and/or pressure, and a uniform heat and/or pressure may be applied to all of the marginal portions being sealed together in view of the difference between the adhesive properties of the strip 18 and those of the material of inner coating 16.

It is to be expressly understood that a greater strength differential between the short edge seals 22 and the rupturable long edge seal 24 may be obtained by subjecting

the short edge seals to a greater heat and/or pressure during sealing than is used in forming said long edge seal. Similarly, it is possible, although less preferred, to use the same thermoplastic bonding materials for each of the seals 22 and 24 and to obtain the differential sealing effect by controlling the heat and/or pressure used in obtaining the seal, the heat and/or pressure applied to the short edge seals being substantially greater than the heat and/or pressure applied to the long edge seal.

The walls of container 30 in one preferred form comprise a construction in which base 12 is a kraft paper, layer 14 is a silver or lead foil, and coating 16 is a thermoplastic such as polyethylene, polyvinyl chloride or a polyvinyl acetal, for example, polyvinyl butyral, polyvinyl acetal or polyvinyl formal. Coating 16 may also be a polyester, for example a polyalkylene terephthalate such as polyethylene terephthalate sold under the DuPont trade name of "Mylar." It is to be understood that the composition of plastic layer 16 may include suitable plasticizers and other materials which render the coating formed from the plastic composition more suitable for its purpose. For example, a composition comprising 60% to 72% by weight of polyvinyl butyral, 10% to 23% by weight of nitrocellulose, and approximately 5% by weight of dibutyl sebacate is particularly satisfactory as inner coating 16. When layer 16 is of the foregoing composition, strip 18 may consist of ethyl cellulose or of a mixture of ethyl cellulose and paraffin, the mixture comprising at least 50% by weight of ethyl cellulose.

The container structure described above is particularly suited for carrying aqueous alkaline solutions of photographic developing agents useful in the production of black and white or color positive images. For example, in the transfer reversal processes for the production of black and white positive prints, the aqueous alkaline solution in addition to a silver halide developer also contains a silver halide solvent or transfer reagent such as sodium thiosulfate. When a liquid composition of the latter type is employed and is spread uniformly between the photosensitive layer and another sheet, which may be the image-receiving layer, the developer in the liquid develops the latent image in the photosensitive layer and the silver halide solvent forms soluble image-forming complexes with undeveloped silver halide. These complexes are transferred from the photosensitive layer to the image-receiving layer to provide a visible image.

As hereinbefore pointed out, the liquid employed can be of the quite viscous types well known in the art as shown in the earlier mentioned patents, or of a much less viscous nature. The container contents heretofore employed have had a minimum viscosity on the order of at least 1000 centipoises at a temperature of 24° C. This viscosity may be obtained by dissolving in the liquid a suitable high molecular weight polymer which will not decompose or otherwise lose its thickening properties due to reaction with the liquid or the reagents therein. For example, where the liquid composition in the container has water as its solvent, suitable plastics for increasing the viscosity of the liquid composition are the water-soluble cellulosic plastics such as hydroxyethyl cellulose and sodium carboxymethyl cellulose.

It is possible that the liquid in the container and held by the absorbent material may comprise only water. The other elements necessary for photographic processing may be positioned in solid form upon one or more of the layers of the film unit with which the container is to be used. In some other cases it is desirable to include portions of the active ingredients in the liquid and to place other portions thereof in one or more of the layers of the film unit. Moreover, the liquid may also include only materials useful in developing, or developing and fixing, a latent negative image without the production of a positive image.

As a result of the foregoing structure the container in its filled and sealed condition is relatively deformable, and it becomes possible to mount the container on a suitable

base 28 (FIG. 5) of a sheet material such as paper and to wind the paper with the container mounted thereon into a roll having a radius as small as the width of the container. In this way, it becomes possible to package a plurality of the containers in relatively compact and conveniently accessible form.

The use of the novel container structure of the invention is illustrated in FIG. 6 wherein the container contents are applied to an area 32 of a sheet material 34 for adhering said area to a corresponding area of a second sheet material 36. The container 30 is located adjacent to area 32 with long seal 24 thereof contiguous to said area, and with said container between sheet materials 34 and 36. This arrangement of elements may be positioned on a plate 38, and a hand-operated squeegee roller 40 may be advanced over the assembly, beginning its travel at long edge 26 of the container. The downward pressure applied by roller 40 will determine the thickness of the film that is obtained when the contents of the container are squeezed from the container. During the early stage of the advance of the roller from the leading edge 26 widthwise of the container there is created a hydraulic pressure in the container contents which is uniformly distributed along the entire length of seal 24. Continued advancement of roller 40 increases this pressure to the point where the seal is ruptured, the rupturer uniformly peeling apart the walls of seal 24 to provide a discharge passage for the container contents equal to the length of seal 24 between seals 22. The contents may thereafter be spread in a desired thickness over the area 32 by continued movement of said roller 40, the construction of the container insuring an immediate spread wide enough to cover said area 32.

It is to be understood that the container 30 may be adhesively or otherwise secured to the sheet 34 over which its contents are to be spread, the latter providing a spreading area adjacent the mouth or lip 24 of the container, which area is of width at least as great as said dispensing lip is long, and is of a length many times the width of said container. Sheet 34 may merely serve as a liquid-spreading layer for effecting a uniform distribution of the liquid content of the container for processing an area of another element superposed on said sheet.

In the embodiment of FIG. 6, sheet 34 is illustrated as including an image-receiving area 32 and sheet 36 as a photosensitive layer, the container 30 being secured to sheet 34. It should be understood, however, that it may be desirable, and in certain instances preferable, to have the container 30 secured to sheet 36 rather than to sheet 34, and such a modification, while not illustrated in the drawings, is considered to fall within the scope of the present invention.

Containers embodying the principles of the present invention are adapted for use in connection with self-developing X-ray film assemblies of the type described and claimed in U.S. Patent No. 2,740,714. Moreover, such containers are adapted for use in film pack units such as illustrated in U.S. Patent No. 2,495,111 and 2,837,987, in containers provided with a plurality or multiplicity of liquid-carrying chambers such as described in U.S. Patent No. 2,750,075, and in round containers or pods of the type disclosed in U.S. Patent 2,687,478. In containers of the latter type the liquid-releasing passage is substantially coextensive with the circumference of the container.

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 photographic product comprising a rupturable container holding a relatively porous, compressible pad of a liquid-absorbent material and a processing liquid, said liquid comprising at least one substance from the

class consisting of silver halide solvents and silver halide developers, a sheet support upon which said container is mounted and secured, said sheet support providing a spreading surface having a liquid-receiving area adjacent said container onto which said liquid is spreadable directly from said pad and said container, said liquid-receiving area being greater than the area covered by said container, said container being relatively flat and comprising means, including walls, defining a cavity, said cavity having therein said pad and said processing liquid, a sealed liquid-releasing passage along one edge of said container at least coextensive in length with said cavity and through which passage said processing liquid is released upon the application of pressure to said rupturable container, said passage comprising longitudinal marginal portions of the container walls bonded together in face-to-face relation by a continuous film of adhesive material interlaid between the bonded marginal portions, said sealed passage being the weakest liquid-retaining portion of said container, the walls of the container having an inner coating of a resin, said resin having a different affinity for itself than for said film of adhesive material.

2. The photographic product of claim 1, wherein said pad comprises a sponge-like material.

3. The photographic product of claim 1, wherein said pad comprises a cellulosic material.

4. The photographic product of claim 1, wherein said liquid has a viscosity of at least one thousand centipoises at 24° C.

5. The photographic product of claim 1, wherein said resin comprises a polyvinyl acetal.

6. The photographic product of claim 1, wherein said resin comprises polyvinyl chloride.

7. The photographic product of claim 1, wherein said resin comprises polyethylene.

8. The photographic product of claim 1, wherein said resin comprises polyethylene terephthalate.

9. A photographic product comprising a rupturable container holding a relatively porous, compressible pad of a liquid-absorbent material and a processing liquid, said liquid comprising at least one substance from the class consisting of silver halide solvents and silver halide developers, a sheet support upon which said container is mounted and secured, said sheet support providing a spreading surface having a liquid-receiving area adjacent said container onto which said liquid is spreadable directly from said pad and said container, said liquid-receiving area being greater than the area covered by said container, said container being relatively flat and comprising means, including walls, defining a cavity, said cavity having therein said pad and said processing liquid, said container having a sealed liquid-releasing passage along one edge thereof at least coextensive in length with said cavity, said passage comprising longitudinal marginal portions of the container walls bonded together in face-to-face relation by a bond of substantially uniform strength, said sealed passage being the weakest liquid-retaining portion of said container, marginal portions of said container walls along two other edges of said container at opposite

ends of said liquid-releasing passage being adhesively secured together in face-to-face relation, the seals at said two other ends being appreciably stronger than the seal at said passage and extending transversely of and connecting with the seal at said passage so that when the walls of the container are squeezed together in the direction of said passage, the seal at said passage ruptures and the seals at said two other edges prevent the discharge of liquid except through said passage.

10. A photographic product comprising a first layer, a second layer and a rupturable container, said second layer being superposable on said first layer with said rupturable container being positioned between said first and second layers when said first and second layers are superposed, said first layer comprising a photosensitive material, said rupturable container defining a cavity having therein a relatively porous, compressible pad of a liquid-absorbent material and a liquid composition for processing said photosensitive material, said container having a predetermined portion which, when ruptured, is adapted to permit release of said liquid composition from said cavity for spreading between said first layer and said second layer, said container being secured to one of said layers, which layer provides a spreading surface having a liquid-receiving area adjacent said container onto which said liquid is spreadable directly from said pad and said container, said liquid-receiving area being greater than the area covered by said container, said container being relatively flat and comprising means, including walls, defining a cavity, said cavity having therein said pad and said processing liquid, a sealed liquid-releasing passage along one edge of said container at least coextensive in length with said cavity and through which passage said liquid is released upon the application of pressure to said rupturable container, said passage comprising longitudinal marginal portions of the container walls bonded together in face-to-face relation by a continuous film of adhesive material interlaid between the bonded marginal portions, said sealed passage being the weakest liquid-retaining portion of said container, the walls of the container having an inner coating of a resin, said resin having a different affinity for itself than for said film of adhesive material.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,152,515

October 13, 1964

Edwin H. Land

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 29, for "said" read -- and --; column 2, line 60, for "adsorbent" read -- absorbent --; column 4, line 20, after "thin" insert a comma; line 48, after "containing" strike out -- a --; column 6, line 26, for "rupturer" read -- rupture --; line 38, after "of" insert -- a --.

Signed and sealed this 13th day of April 1965.

(SEAL)

Attest:

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Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents