June 12, 1956 E. H. LAND ET AL 2,750,075

COLLAPSIBLE LIQUID-CARRYING CONTAINER

Filed April 9, 1953 2 Sheets-Sheet 1

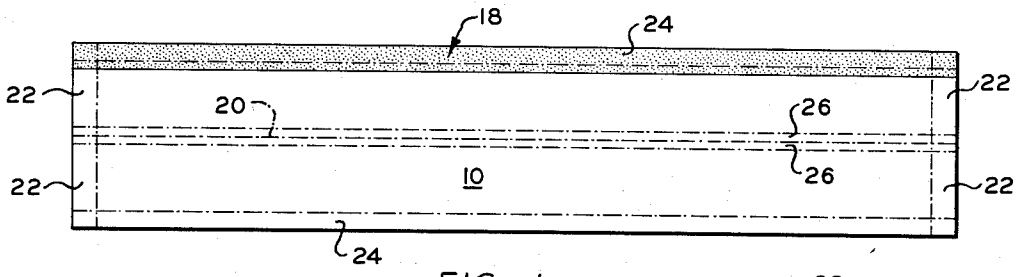

FIG. 1

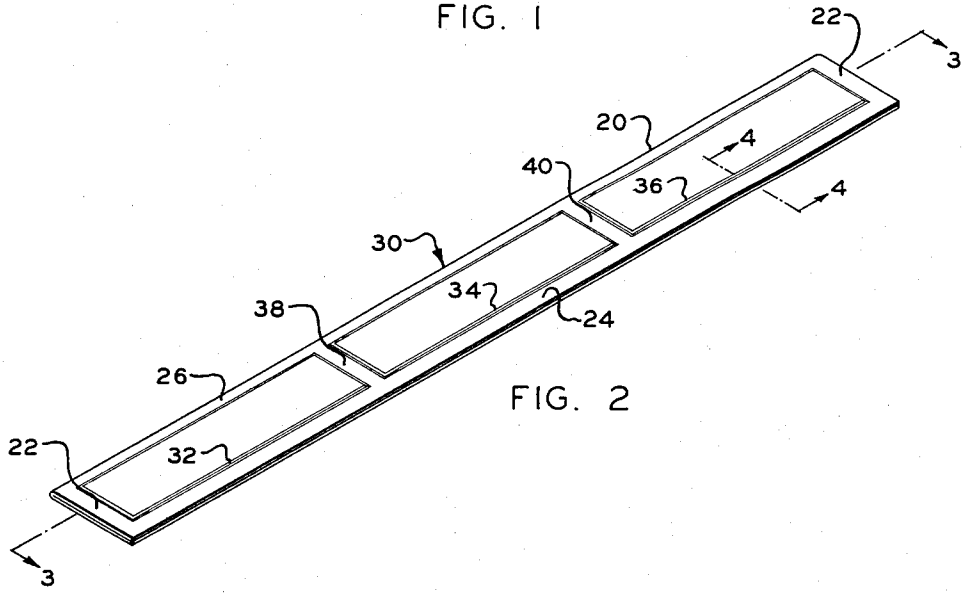

FIG. 2

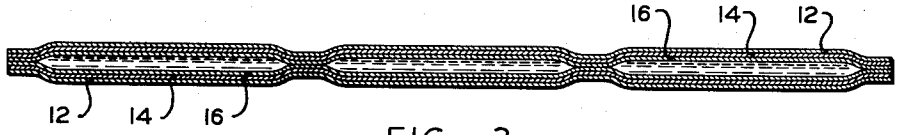

FIG. 3

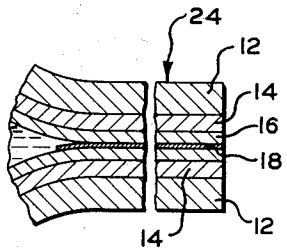

FIG. 4

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COLLAPSIBLE LIQUID-CARRYING CONTAINER

Filed April 9, 1953 2 Sheets-Sheet 2

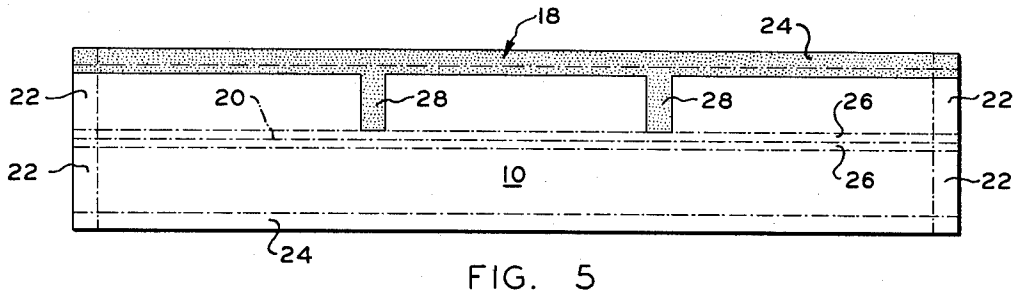

FIG. 5

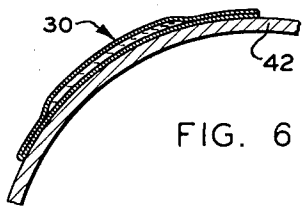

FIG. 6

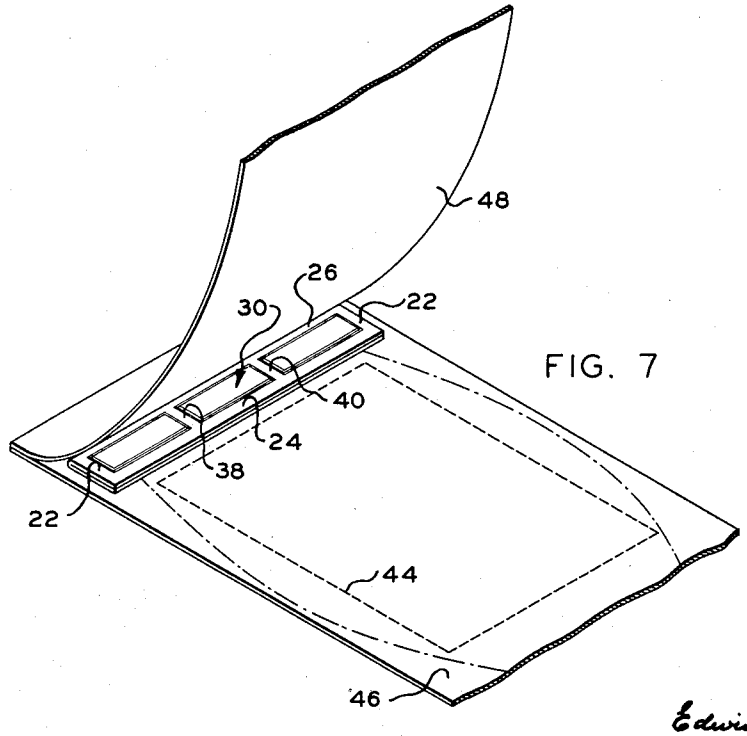

FIG. 7

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COLLAPSIBLE LIQUID-CARRYING CONTAINER

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Application April 9, 1953, Serial No. 347,684

5 Claims. (Cl. 222—94)

This invention relates to liquid-carrying containers and more particularly to single-use, disposable, liquid-carrying containers.

The present invention contemplates an improvement over liquid-carrying containers of the type disclosed, for example, in the copending applications of Edwin H. Land, Serial No. 652,612, filed March 7, 1946, for Collapsible Fluid Containers (now Patent No. 2,634,886), and Serial No. 74,791, filed February 5, 1949, for Single Use Container Having a Sealed Passage Adapted to Be Unsealed Upon Application of Stress (now Patent No. 2,653,732). In the containers described in the said copending applications, there is provided a single, elongated cavity or compartment for releasably containing a liquid which, when the container is subjected to compression, is released from the container and 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 more than likely that the liquid, when released, will not uniformly cover the desired image area.

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 spread therefrom in a thin layer so as to fully cover an area which is substantially as wide as the container is long and many times the width of the container and which is not subject to the disadvantages of a container having but a single liquid-containing chamber.

Another object of the invention is to provide a container having a plurality of liquid-containing cavities or chambers spaced lengthwise of the container.

A further object is to provide a liquid-carrying container having pliable walls and differential sealing means adjacent the liquid-containing cavities or chambers, whereby the liquid may be directionally released when the container is subjected to compression.

Still another object of the invention is to provide such a liquid-carrying container 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 such a container releasably holding a viscous 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.

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 drawings, wherein:

Figure 1 is a plan view of a blank from which one embodiment of the novel container of the present invention may be formed;

Fig. 2 is a perspective view of the container structure of the invention in its filled and sealed condition;

Fig. 3 is an exaggerated, longitudinal, sectional view, in elevation and taken along the line 3—3 of Fig. 2, of the liquid-carrying container of the invention;

Fig. 4 is a sectional view, taken along the line 4—4 of Fig. 2, showing the details of the sealed liquid-releasing passage of the container;

Fig. 5 is a plan view of a blank from which another embodiment of the container may be formed;

Fig. 6 is a sectional view showing the container mounted on a suitable base of a curvature which the container may readily assume without rupture; and

Fig. 7 is a somewhat diagrammatic perspective view illustrating an application of the container of the present invention.

The novel liquid-carrying container of the invention 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 in the direction of its width, for example about a radius equal to its width, without danger of rupturing its seal. It comprises a plurality of separate, liquid-containing chambers spaced lengthwise of said container, the outer boundaries of each of said chambers being defined by marginal and transverse seals whose width is but a fraction of the length of one of said chambers. The liquid held by said container is adapted to be spread directly from said container in a thin layer over an area substantially as wide as the overall length of said container, each said chamber having a sealed liquid-releasing passage extending lengthwise of said chamber along a common edge of said container, the seals defining said passages being as weak as any of the other seals which define the liquid-containing chambers.

The contents of the container are preferably of a viscosity exceeding a predetermined minimum viscosity and, in this viscous condition, cooperate with the container structure and the sealed passages to insure a uniform peeling apart of the walls of the sealed passages upon application of a squeezing force to the walls of the container. This force is applied to the entire length of the container as by a doctor blade, roll applicator or a pair of pressure rolls, and progresses widthwise of said container in the direction of the sealed passages. By equipping the container with a plurality of fairly wide, flat, liquid-containing cavities, and by suitably thickening the contents to give the same at least a predetermined minimum viscosity, the squeezing together of the container walls, particularly during the initial stages of the pressure application, insures an equalization of the hydraulic peeling pressure transmitted by the container contents to the sealed passages prior to rupture of the latter. The further squeezing together of the container walls during the progressive application of the liquid-releasing force produces a uniform and complete peeling apart of the marginal walls which constitute the sealed passages.

The width of each of the transverse intermediate and end seals is but a fraction of the length of one of said chambers, said seals being sufficiently narrow so that the liquid, when released from the chambers, is adapted to be spread in a thin continuous layer over an area substantially as wide as the overall length of said container.

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 ease 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 from a single, substantially rectangular blank folded medially. It may also be formed from two substanitally 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 (Figs. 3 and 4).

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 a surface of layer **12** is a thin film or sheet **14** of a relatively vapor-impervious material, such as a metal foil, and there is coated on the surface of said sheet **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 sheet or film **14**, thereby preventing the contents of the container from contacting sheet **14** 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.

The container **30** (Fig. 2) 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 end marginal portions **22** along the short edges of the container, the faces of marginal surfaces **24** along the long edge of the container, and the faces of the intermediate transverse portions **38** and **40**, thereby providing a plurality of liquid-containing chambers, for example chambers **32**, **34** and **36**. These several marginal and intermediate 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 the facing surfaces of short edge portions **22** and of intermediate portions **38** and **40** 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.

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 long edge of the blank but also extends within the liquid-containing cavities or chambers of the container, as shown in Fig. 4.

In the formation of the container, the contents may be introduced as the container walls are being sealed together. For example, the long edges of the container blank 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 is introduced between the folded walls of the blank and thereafter the short edges and the intermediate portions 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 and intermediate 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 intermediate seals **38** and **40**, on the one hand, and the rupturable long edge seal **24**, on the other, may be obtained by subjecting the short edge seals and the intermediate 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**, **24**, **38** and **40** and to obtain the differential sealing effect by controlling the heat and/or pressure used in obtaining the various bonds, the heat and/or pressure applied to the short edge seals **22** and the intermediate seals **38** and **40** being substantially greater than the heat and/or pressure applied to the long edge seal **24**.

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 material such as a polyvinyl acetal, for example polyvinyl butyral, polyvinyl acetal or polyvinyl formal. 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 one-half-second 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.

As hereinbefore pointed out, the container contents have a predetermined minimum viscosity and are thickened, if necessary, to impart thereto this predetermined viscosity which cooperates with the seal and structure of the container to give a uniform and complete opening of the long seal **24** during use of the container and thereby

insure a spread of liquid directly from the container over an area as wide as the overall length of the container. This minimum viscosity should be of the order of at least 100 centipoises at a temperature of 24° C. Such a viscosity provides adequate allowance for such variations in viscosity as may take place when the container is used in an environment where the temperatures are much higher than 24° C. The range of temperatures for which the operation of the container is intended is the range of ambient temperatures which would be encountered in various locations under varied climatic conditions, i. e., temperatures not exceeding 45° C.

The desired viscosity may be obtained in the liquid contents of the container 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.

In Fig. 5 there is illustrated a modification of the container blank heretofore described. The blank of Fig. 5 is identical with that of Fig. 1 except that the areas identified by the reference numeral **28** have been coated with the same or similar thermoplastic material as is used for the strip **18**, i. e., a material which has a lesser affinity for the plastic of layer **16** than the latter plastic has for itself, thereby providing a container which is identical in every respect with the container of Fig. 2 except that in the modified container the facing surfaces which are bonded together to form the intermediate seals **38** and **40** will separate from each other, under compression, just as easily as does the longitudinal seal **24**. Thus, as the compressive force is progressively applied to the container walls in the direction of the longitudinal seal **24**, the intermediate seals **38** and **40** are ruptured, allowing the liquid from chambers **32**, **34** and **36** to merge as they approach the outer edge of the longitudinal seal **24**, thereby assuring a spread of the liquid over the entire area to be covered thereby.

As a result of the foregoing structure the container in its filled and sealed condition is relatively deformable, and it becomes possible to mount it on a suitable base **42** (Fig. 6) 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, such, for example, as in the film sold commercially under the name "Polaroid Land Film."

The use of the novel container structure of the invention is illustrated in Fig. 7 wherein the container contents are applied, by means for example of a pair of pressure rollers of the type forming part of the apparatus described and claimed in Patent No. 2,455,111, issued November 30, 1948, to Joseph F. Carbone and Murry N. Fairbank, to an area **44** of a sheet material **46** for adhering said area to a corresponding area of a second sheet material **48**. The container **30** is located adjacent to area **44** with the long seal **24** thereof contiguous to said area, and with said container between sheet materials **46** and **48**. The assembly of elements is advanced through the pressure rollers with the container end going first. During the early stage of the advance through the rollers from the leading edge **26** of the container widthwise of the container, there is created a hydraulic pressure in the container contents. Continued advancement of the assembly through the rollers increases this pressure to the point where at least the portions of seal **24** contiguous to chambers **32**, **34** and **36** are ruptured, the rupture peeling apart the walls of seal **24** to provide discharge passages for the container contents. The contents may thereafter be spread

in a desired thickness over the area **44** by continued movement of the assembly through the rollers, the construction of the container insuring an immediate spread wide enough to cover said area **44**.

It is to be understood that the container **30** may be adhesively or otherwise secured to the sheet **46** over which its contents are to be spread, sheet **46** providing a spreading area adjacent the rupturable seal **24** of the container, which area is of a width at least as great as said seal **24** is long and is of a length many times the width of said container.

In the embodiment of Fig. 7, sheet **46** is illustrated as an image-receiving layer and sheet **48** as a photosensitive layer, the container **30** being secured to image-receiving layer **46**. It should be understood, however, that it may be desirable, and in certain instances preferable, to have the container **30** secured to sheet **48** rather than to sheet **46**, 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 particularly adapted for use in connection with self-developing X-ray film assemblies of the type described and claimed in the copending application of Albert J. Bachelder and William J. McCune, Jr., Serial No. 232,284, filed June 19, 1951, for Photographic Film Assembly.

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 drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. An elongated liquid-carrying container comprising a pair of opposed walls having an inner coating of a plastic and being closed at their ends and sides and sealed together at transverse intermediate regions to provide a plurality of separate liquid-containing chambers spaced lengthwise of said container, one of the side closures comprising opposed portions of the container walls which are bonded together in face-to-face relation by an adhesive material interlaid between the plastic-coated inner surfaces of said portions, said plastic having a greater affinity for itself than for said adhesive material, each end closure comprising a direct bond between the plastic-coated inner surfaces of said walls, each chamber being closed by part of the side closures of the container, at least said one side closure being weaker than the end closures whereby it is adapted to be opened by compression applied to the container to provide passages communicating with said chambers, the seals at said transverse intermediate regions extending between the inner edges of the side closures and being sufficiently narrow so that the liquid, when released from said chambers through said passages, is adapted to emerge in a thin continuous layer substantially over the overall length of said container.

2. An elongated liquid-carrying container comprising a pair of opposed walls having an inner coating of a plastic and being closed at their ends and sides and sealed together at transverse intermediate regions to provide a plurality of separate liquid-containing chambers spaced lengthwise of said container, one of the side closures comprising opposed portions of the container walls which are bonded together in face-to-face relation by an adhesive material interlaid between the plastic-coated inner surfaces of said portions, said plastic having a greater affinity for itself than for said adhesive material, each end closure comprising a direct bond between the plastic-coated inner surfaces of said walls, each chamber being closed by part of the side closures of the container, at least said one side closure being weaker than the end closures whereby it is adapted to be opened by compression applied to the container to provide passages communicating with said chambers, said end closures and

the seals at said transverse intermediate regions extending between the inner edges of the side closures and being sufficiently narrow so that the liquid, when released from said chambers through said passages, is adapted to emerge in a thin continuous layer substantially over the overall length of said container.

3. An elongated liquid-carrying container comprising a pair of opposed walls having an inner coating of a plastic and being closed at their ends and sides and sealed together at transverse intermediate regions to provide a plurality of separate liquid-containing chambers lengthwise of said container, one of the side closures comprising opposed portions of the container walls which are bonded together in face-to-face relation by an adhesive material interlaid between the plastic-coated inner surfaces of said portions, said plastic having a greater affinity for itself than for said adhesive material, each end closure comprising a direct bond between the plastic-coated inner surfaces of said walls, each chamber being closed by part of the side closures of the container, said one side closure being weaker than said end closures and the seals at said intermediate regions whereby said one end closure is adapted to be opened by compression applied to the container to provide passages communicating with said chambers, the seals at said transverse intermediate regions extending between the inner edges of the side closures and being sufficiently narrow so that the liquid, when released from said chambers through said passages, is adapted to emerge in a thin continuous layer substantially over the overall length of said container.

4. An elongated liquid-carrying container comprising a pair of opposed walls having an inner coating of a plastic and being closed at their ends and sides and sealed together at transverse intermediate regions to provide a plurality of separate liquid-containing chambers spaced lengthwise of said container, one of the side closures comprising opposed portions of the container walls which are bonded together in face-to-face relation by an adhesive material interlaid between the plastic-coated inner surfaces of said portions, said plastic having a greater affinity for itself than for said adhesive material, each end closure comprising a direct bond between the plastic-coated inner surfaces of said walls, each chamber being closed by part of the side closures of the container, said one side closure and the seals at said intermediate regions being weaker than the end closures whereby said one side closure and the seals at said intermediate regions are adapted to be opened by compression applied to the container to provide passages communicating with said chambers, the seals at said transverse intermediate regions extending between the inner edges of the side closures and being sufficiently narrow so that the liquid, when released from said chambers through said passages, is adapted to emerge in a thin continuous layer substantially over the overall length of said container.

5. A container as defined in claim 1 wherein the walls are folded longitudinally whereby one side of each chamber is constituted by said fold.

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