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2,618,409

LIQUID CONTAINER COMPRISING A FLEXIBLE ENVELOPE

Filed Sept. 7, 1949

2 SHEETS—SHEET 1

Fig. 1.

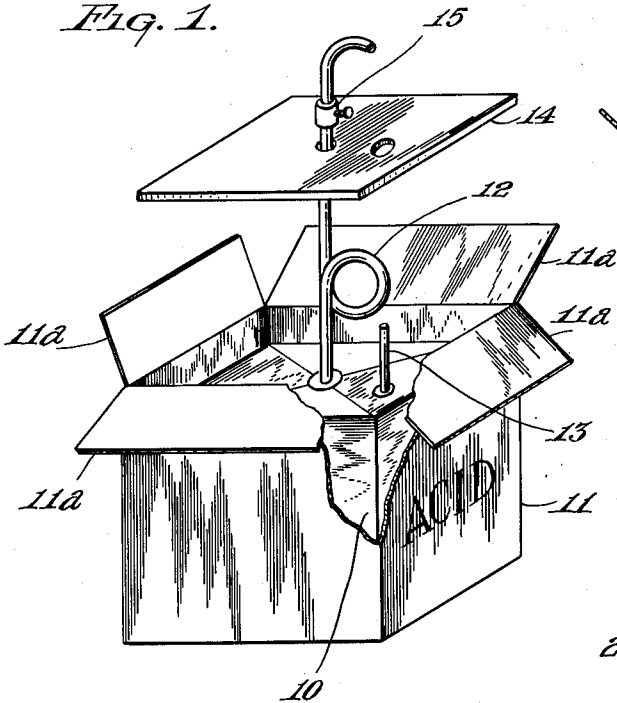


Fig. 2.

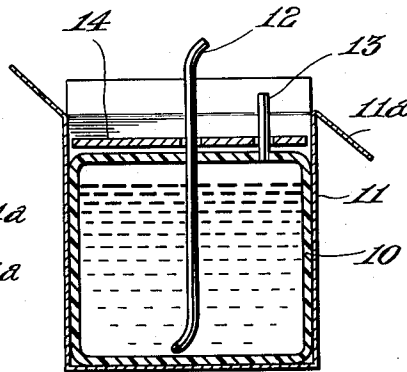


Fig. 3.

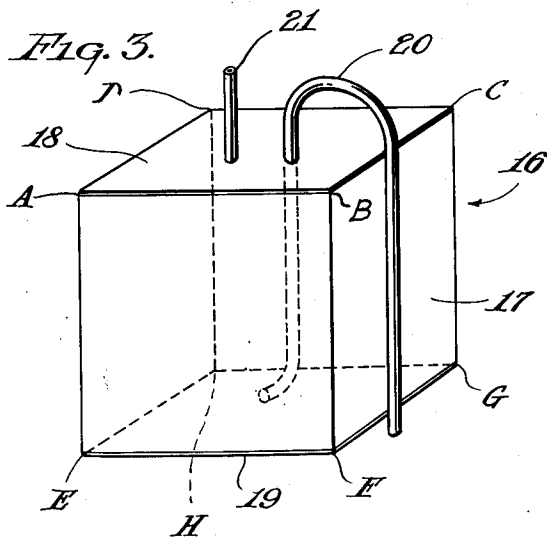
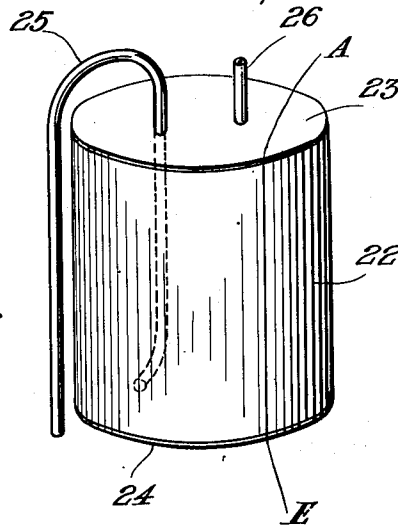


Fig. 4.



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2 SHEETS—SHEET 2

Fig. 5.

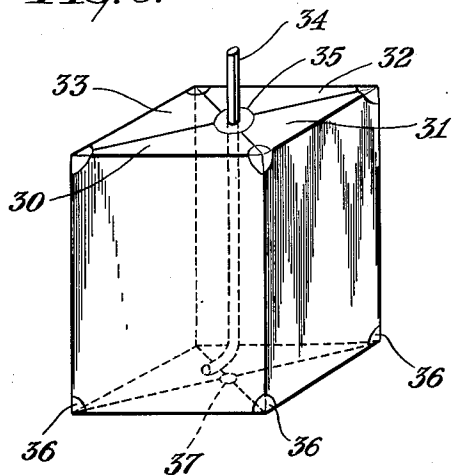


Fig. 6.

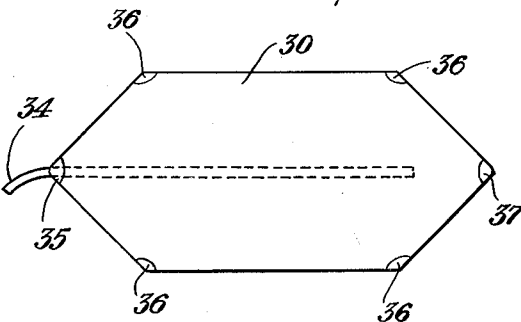
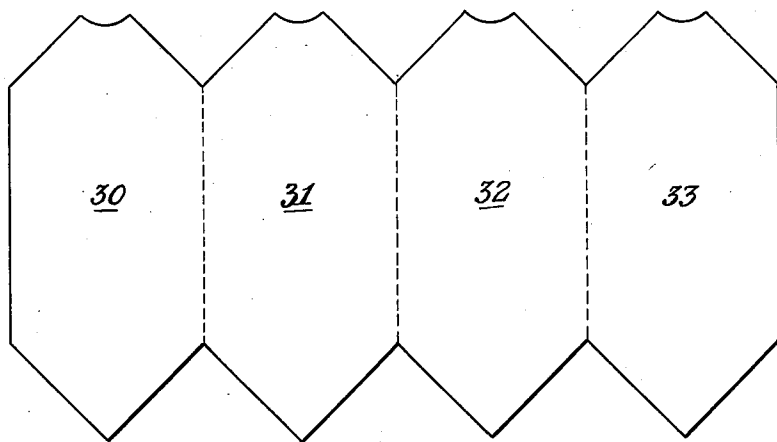


Fig. 7.



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FLEXIBLE ENVELOPESidney Eisenberger, Long Island City, and
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6 Claims. (Cl. 222-103)

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The present invention relates generally to liquid containers, and more particularly to flexible containers or bags fabricated of plastic material and suitable for the shipping, storing and dispensing of liquid chemicals and food products, as for example, oils, flavoring syrups, inks, greases and acids.

Corrosive liquids, such as acids of caustics, are normally carried in carboys constituted by large glass bottles enclosed in a box, or in drums formed of acid-resistant metal. Conventional liquid containers formed of glass or metal are disadvantageous in many respects both from the standpoint of cost and operating efficiency. To begin with, they are relatively heavy and expensive. Moreover, rigid metal or glass containers, when empty, occupy as much space as when filled, so that in transport the same space must be allotted in returning the emptied containers as is required for the delivery of the filled containers. In the case of glass containers, by reason of their fragility, exceptional care must be exercised in handling to avoid breakage. Difficulties are also experienced with rigid containers in dispensing the liquid contained therein.

With a view to overcoming the above mentioned drawbacks in existing liquid containers, it is the primary object of the present invention to provide a flexible plastic liquid container of sturdy but inexpensive construction which may be easily handled, whereby shipping, handling, and storage costs are reduced.

More particularly, it is an object of this invention to provide a container comprising a flexible plastic envelope which may be easily and rapidly filled or emptied. It is also an object of this invention to provide a flexible container which is resistant to impact, thereby minimizing the hazards and costs of breakage encountered with glass containers.

Yet another object of this invention is to provide a flexible plastic container which permits sterilization of its contents and protects its contents from contamination. It is a further object of this invention to provide a flexible container which when not in use may be collapsed into a flat form, whereby the space then occupied by the container is considerably less than the space taken by the filled container.

Broadly stated, a container in accordance with the invention is constituted by an enclosed flexible plastic bag or envelope incorporating a flexible siphon tube extending therein and sealed thereto. The liquid is discharged from the envelope by applying pressure thereto to actuate the

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siphon. In a preferred embodiment of the invention, a vent tube is also provided which is sealed to the envelope for the entrance and exit of air, and the envelope is housed within a rigid protective box including a floating cover to facilitate compression of the envelope.

For a better understanding of the invention as well as other objects and further features thereof, reference is made to the following detailed description to be read in conjunction with the accompanying drawing wherein like elements in the figures are identified by like reference numerals.

In the drawing:

Fig. 1 is a perspective view of a preferred embodiment of a liquid container in accordance with the principles of the invention,

Fig. 2 is a sectional view of the container shown in Fig. 1,

Fig. 3 is a perspective view of another preferred embodiment of the invention,

Fig. 4 is a perspective view of still another embodiment of the invention,

Fig. 5 illustrates in perspective a collapsible liquid envelope in accordance with the invention, Fig. 6 shows in plan view the envelope of Fig. 5 as it appears when collapsed, and

Fig. 7 illustrates the pattern of the plastic material forming the envelope of Fig. 5.

Referring now to the drawing and in particular to Figures 1 and 2, there is shown a liquid container comprising an enclosed flexible bag or envelope, 10, housed within a rigid protective case 11. Envelope 10 is of rectangular cross-section and preferably is formed of a flexible plastic material such as one drawn from the class of vinyl resin plastics. For the purpose of filling envelope 10 with liquid or drawing liquid therefrom, a siphon tube 12 is provided which extends downwardly into the envelope through an opening in the upper wall thereof, the siphon being hermetically sealed to the envelope. The portion of siphon tube 12 within the envelope extends to the bottom wall thereof, and the length of tube 12 without the envelope is such that the end of the tube may be positioned below the envelope so that it may be completely emptied. To allow for passage of air into and out of envelope 10, a vent tube 13 is provided which projects from the top wall of the envelope and communicates with the interior thereof, the vent tube also being hermetically sealed to the envelope.

Case 11 may be made of any inexpensive material, such as cardboard, fiberboard or plywood, a corrugated carton being shown having top

cover flaps 11a. The carton is constructed so that it may be folded and collapsed when not in use, thereby effecting a further economy in space when the container is stored. To facilitate reuse of the carton, the top and bottom flaps thereof may be provided with cooperating locking clasps whereby the carton may be readily erected or collapsed.

Also supplied is a siphon actuator in the form of a rectangular floating cover 14 of rigid material and so dimensioned that it is movable longitudinally within case 11, the floating cover bearing against the top wall of envelope 10. For purposes of illustration, in Fig. 1 the cover 14 is shown suspended above the case. The height of case 11 exceeds that of envelope 10, thereby defining a space between floating cover 14 and the flaps of the case. This space furnishes room for expansion should the contents of the container increase in volume due to such factors as a rise in temperature. Siphon tube 12 and vent tube 13 are led through suitable apertures in floating cover 14 and when case 11 is closed they are coiled up on the space between the floating cover and the flaps 11a.

Vent tube 13 and siphon tube 12 may be opened and closed by any suitable clamping or faucet device, of which screw clamps or spring actuated pinch clamps are the simplest examples and generally quite satisfactory. In Fig. 1, by way of example, a removable screw clamp 15 is fitted about siphon tube 12. Cast or moulded plastic faucets and bungs may also be used as they may be sealed to the plastic tubing by simple techniques. In many instances, therefore, it is possible to fabricate the flexible envelope, the siphon vent tubes and the faucets therefor from the same type of plastic which is selected for its resistance to the liquid to be packaged.

When filling the container, siphon tube 12 is coupled to the line delivering the liquid to be packaged, both vent tube 13 and siphon tube 12 are opened and the liquid is then fed into the envelope. To withdraw liquid from the container, the siphon tube is first opened and pressure is applied to floating cover 14 until the siphon begins functioning; whereupon vent tube 13 is opened and the siphon tube continues to discharge liquid until the container is empty or until the siphon flow is arrested. The siphon flow may be stopped at any point by closing the clamp therefor, or by raising the end of the siphon tube above the level of the liquid in the container, at which point it will not further discharge liquid until again actuated by pressure applied to floating cover 14.

If preferred, the vent tube may be omitted from the container, in which case envelope 10 must be completely deflated before filling to exhaust the air therein. In discharging liquid in the absence of a vent tube, pressure must be maintained on cover 14 to empty the container, or otherwise the floating cover must be suitably weighted to insure the collapse of the flexible container as it empties. It is however expedient to incorporate the vent tube in the container as it reduces the amount of manipulation entailed during filling and emptying.

If it is desired to pasteurize or sterilize the liquid contents of the envelope by heat, a suitable porous plug, such as cotton is placed in the mouth of the vent tube, or the vent tube may be eliminated entirely. After opening the vent and siphon tubes, the envelope and its contents may be subjected to the desired heat treatment. The length of the flexible siphon tube ensures pro-

tection of the liquid contents against subsequent bacterial contamination.

As is evident from the foregoing, the container, in accordance with the invention, is more economical to manufacture, lighter in weight, and may be handled and stacked more easily than glass jars, carboys, or metallic drums. It can be emptied without difficulty and when emptied, can be folded up and stored in a small space for return and repeated reuse.

While there has been illustrated a flexible plastic envelope having a uniform rectangular cross section, it is to be understood that the envelope and the rigid casing therefor may be designed to assume any desired configuration. The envelope may be prismatic, cylindrical or in truncated conical form, if desired, with the rigid case being given a corresponding form. The plastic envelope may be manufactured by any known fabrication technique.

A preferred embodiment of an envelope 16 having a parallelepiped shape is shown in Fig. 3, the side walls of the envelope being defined by sealing the extremities of a single, elongated, rectangular plastic sheet along lines AE to form a sleeve 17. The open ends of sleeve 17 are enclosed by rectangular pieces 18 and 19 of similar material which serve respectively as the top and bottom walls of the envelope. Piece 18 is sealed to one end of sleeve 17 along lines AB, BC, CD and DA, while piece 19 is sealed to the other end of the sleeve along line EF, FG, GH and HE. A siphon tube 20 and a vent tube 21 are sealed to the top piece 18 before it is affixed to sleeve 17.

Alternatively, sleeves may be cut from extruded plastic tubing in which case the seal along line AE is eliminated. If it is desired to minimize the tendency of the unsealed vertical edges of the sleeve to round off when the container is filled, or if the pattern is too large for the available sheeting, individual pieces may be used for each vertical wall of the envelope. In this case, the sleeve in Fig. 3 would then be made by sealing along the lines AE, BF, CG, and DH. The corners of the envelope may be reinforced by suitable corner patches of plastic material.

As shown in Fig. 4, the same rectangular sheet which in Fig. 3 forms the rectangular sleeve may also be employed to form a cylindrical sleeve by sealing together the extremities of the sheet along lines AE. The open ends of the cylindrical sleeve 22 thus formed are enclosed by circular pieces 23 and 24 of flexible plastic material which serve respectively as the top and bottom walls of the cylindrical envelope. Flexible siphon and vent tubes 25 and 26 are pre-attached and sealed to the top wall 23 before it is sealed to sleeve 22. The cylindrical envelope may readily be modified to assume a barrel-like shape by rounding off the extremities of the rectangular sheet forming the sleeve and sealing along the resulting arc. This design is advantageous in envelopes having a large liquid capacity.

Referring now to Figs. 5, 6 and 7 there is shown an embodiment of a collapsible flexible envelope which when full assumes a parallelepiped shape and hence may be fitted neatly into a rigid carton of the type shown in Fig. 1. When the envelope is empty and folded, it assumes a flat hexagonal shape, as shown in Fig. 6, so that large quantities of such liquid envelopes may be tightly stacked in a relatively small space when not in use.

The envelope is fabricated from a single, generally rectangular sheet of plastic material which, as shown by the pattern in Fig. 7, is correspond-

ingly serrated along both sides to define when folded four hexagonal panels 30, 31, 32 and 33. The extremities of the sheet are sealed together to provide a sleeve having a rectangular cross section, and the upper and lower triangular sections of panels 30 to 33 are folded inwardly into abutting relationship to enclose the ends of the sleeve, the contiguous edges of the triangular section being sealed together to complete the enclosure.

To afford an opening for the flexible siphon tube 34, the upper triangular sections are arcuately notched, whereby a circular aperture is created in the top wall of the envelope. Siphon tube 34 passes through and is sealed to an annular disc 35 of flexible material which encloses the aperture in the top wall of the envelope, the periphery of the disc being sealed to the wall.

To reinforce the corners of the envelope, plastic patches 36 are attached thereto, and an additional circular patch 37 is attached centrally to the bottom wall of the envelope to strengthen this wall. This envelope may be filled with liquid or discharged in the same manner described in connection with Fig. 1 in the absence of a vent tube. Obviously, if desired, the aperture in the top wall of the envelope may be enlarged to accommodate a vent tube as well as a siphon tube.

In the manufacture of the flexible envelope of the type disclosed hereinabove, sealing may be effected by any conventional process known in the art. These include the use of hot sealing bars, impulse heating, high-frequency dielectric heating, solvents and pressure, and adhesive. Pinch seals and lap seals may both be used. The type of seal and the method of sealing selected depends on a number of factors of which the type of plastic sheeting to be used is often the most important.

Whenever possible, the use of plastic sheeting based on polyvinyl chloride or polyvinyl acetate, or copolymers thereof is preferred. These include compositions plasticized with esters such as those manufactured by the Bakelite corporation and sold under the trade-mark "Vinylite," and compositions plasticized with synthetic rubber such as those sold by the B. F. Goodrich Chemical Co. under the trade-mark "Geon Polyblends." These materials are relatively low in cost, are easily fabricated, have excellent physical properties (i. e., flexibility, tensile strength, impact resistance, etc.), produce strong and reliable seals, are resistant to a wide variety of chemicals, and may be used in contact with diverse types of food products.

Polyethylene sheeting is comparable in cost of the polyvinyl plastics and is more resistant to chemical action. Its physical properties are inferior but adequate. Fluorinated plastics and silicone plastics exhibit even greater chemical resistance but are limited in their usefulness by their relatively high cost.

Polyamides, such as those sold by E. I. du Pont de Nemours Inc. under the name of "nylon" have superior tensile strength and are easily fabricated. Their high softening points recommend their use in cases where it is desired to effect heat sterilization. Rubber hydrochloride, chlorinated rubbers and other types of sheeting may also be used.

It is also important to note that the interior of the flexible plastic envelope may be coated or lined with a substance which will resist a particular liquid. The material may also be laminated, or a double bag may be used, the composi-

tion of the inner bag being resistant to the liquid contained therein. For example, polyvinyl alcohol sheeting has satisfactory properties as a packaging medium for oils and greases but is subject to the hazard of being water soluble. However, this drawback can be obviated by placing the polyvinyl alcohol bag within another flexible bag which is unaffected by water.

While there have been shown what at present are considered preferred embodiments of the invention, it will be evident that many changes and modifications may be made therein without departing from the essential nature of the invention. It is intended therefore in the annexed claims to cover all such changes and modifications as fall within the true spirit of the invention.

What is claimed is:

1. A package comprising a liquid container including an enclosed envelope formed of flexible plastic material, said envelope containing a liquid, a siphon tube formed of flexible plastic material, said tube extending into said envelope and being sealed hermetically thereto, the material of said envelope and said tube being resistant to the liquid to be contained and a rigid casing housing said envelope and including a floating cover movable longitudinally therein for enabling the application of pressure to said envelope whereby a momentary pressure exerted on said cover forces liquid into said siphon and causes said siphon automatically to discharge said liquid.

2. A package comprising a liquid container including an enclosed envelope formed of flexible plastic material and having a rectangular cross section, said envelope containing a liquid, a siphon tube formed of flexible plastic material, said tube extending into said envelope through the top wall thereof and being sealed hermetically thereto, the material of said envelope and said tube being resistant to the liquid to be contained, and a rigid box of rectangular shape housing said envelope and including a floating cover bearing against the top wall of said envelope and movable longitudinally within said box, said cover having an opening therein through which the portion of said tube without said envelope is extended, whereby a momentary pressure exerted on said floating cover forces liquid into said siphon and causes said siphon automatically to discharge said liquid.

3. A package as set forth in claim 2 wherein the height of said box exceeds the height of said envelope to allow for volume expansion.

4. A package comprising a liquid container including an enclosed envelope formed of flexible plastic material and having a rectangular cross section and top and bottom walls, a liquid contained in said envelope, a siphon tube formed of the same material extending into said envelope through the top wall thereof and being sealed thereto, the portion of said siphon tube within the envelope extending to the bottom wall, a vent tube formed of the same material projecting from the top wall of said envelope and communicating with the interior of said envelope, said material being resistant to the liquid to be contained, and a rigid box of rectangular shape housing said envelope and including a floating cover bearing against the top wall of said envelope and movable longitudinally within said box, said cover having openings therein through which said tubes are led, the

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height of said box exceeding the height of said envelope to allow for volume expansion whereby a pressure exerted on said cover forces liquid into said siphon tube and causes said siphon to discharge said liquid.

5. A package as set forth in claim 4 further including clamping devices coupled to the respective tubes.

6. A package, as set forth in claim 4, wherein the end of the portion of said siphon tube which extends to the bottom wall of said envelope is disposed to one side of said envelope.

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