United States Patent [19]

Jensen

[11] **3,805,855**

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[54] **PACKAGE FOR TRANSPORTING LIQUIDS**

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[52] **U.S. Cl.**..... **141/114,** 136/162, 136/181, 206/47 A

[51] **Int. Cl.**..... **B65b 3/04**

[58] **Field of Search**..... 141/1, 9, 100, 105, 106, 141/114, 313, 366, 392; 136/162, 181; 206/46 FC, 47 A, DIG. 30; 220/9 F

[56] **References Cited**

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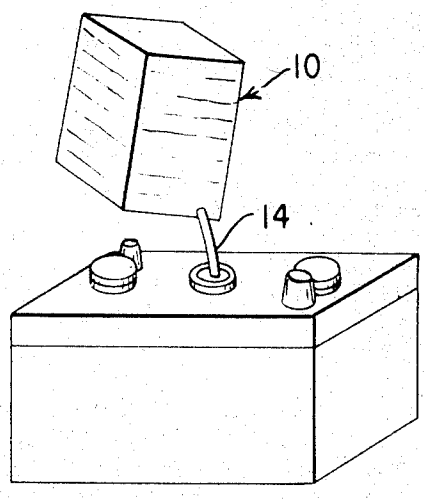
[57] **ABSTRACT**

A method and apparatus is disclosed for transporting and storing concentrated liquids such as battery acid which must be diluted before usage. An absorbent body of open-celled material is impregnated with the concentrated liquid, and placed inside a heat-resistant plastic container. The plastic container has expandable side-walls and a filling and pouring orifice on its top wall. At the site of use, the plastic body is expanded to about 4 times its original volume, and filled with water. After mixing, the diluted liquid is ready to be poured from the plastic container.

3 Claims, 4 Drawing Figures



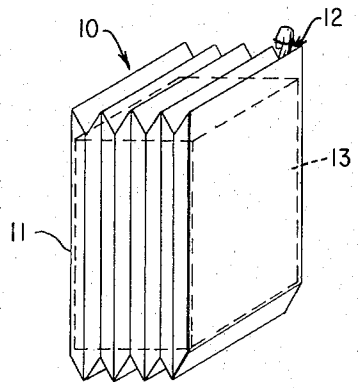


Fig. 1

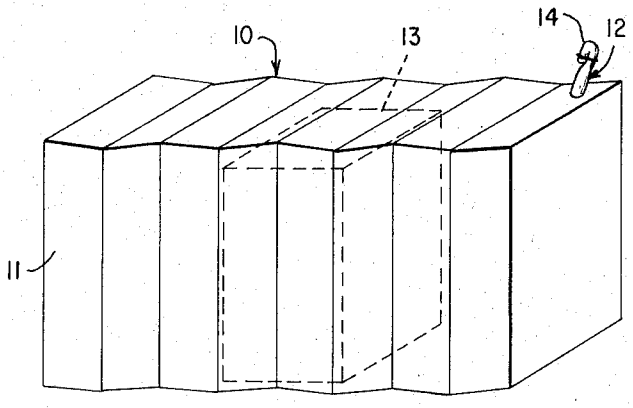


Fig. 2

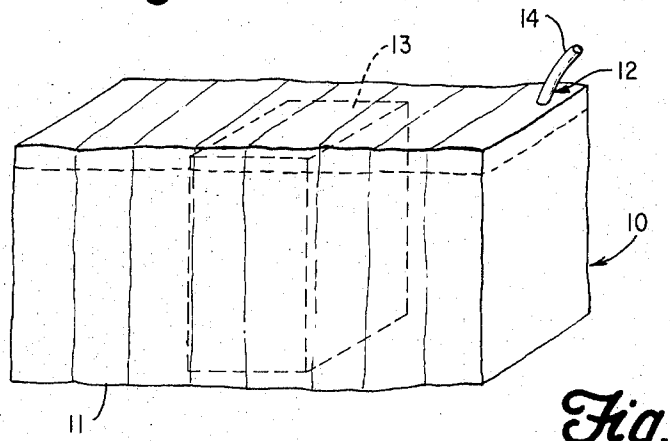


Fig. 3

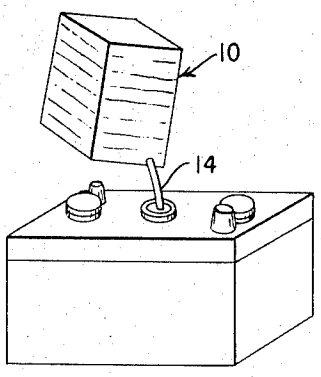


Fig. 4

PACKAGE FOR TRANSPORTING LIQUIDS

BACKGROUND OF THE INVENTION

This invention relates to transporting and storing concentrated liquids. More particularly it relates to transporting and storing concentrated acids which are required to be diluted within a narrow range of specific gravity prior to usage.

Conventional electrical storage batteries require the addition of a battery electrolyte, such as sulfuric acid, having a specific gravity range of from 1.255 to 1.265. The battery acid can be shipped in either a concentrated or dilute form. If shipped in a concentrated form, the battery installer or user must dilute the acid to the correct required concentration. This is often a problem where retail facilities and personnel are not well equipped or trained to handle battery acid. When the acid must be shipped to foreign countries, additional problems are created, such as printing instructions in foreign languages. In addition, the installer or user may not be capable of reading and understanding instructions, and may not have any simple tools or equipment readily available. Ihe acid is shipped in a dilute form ready for usage, the shipper is paying additional money for transporting water. This expense may prohibitive when the shipment is intended for remote areas.

One approach used in the prior art has been to inactivate or immobilze the concentrated sulfuric acid by combining it with a gel-forming or granular-forming agent, such as finely-divided silicon-dioxide, so that, when water is added to the battery at the point of sale, the immobilized acid is released from the gel or granular material to thus activate the battery. In this type of installation, the time required for the battery to become active, after the addition of water, is longer than desirable because the water must diffuse into and the electrolyte must diffuse from the mass of immobilized acid, and also the residual material, such as the silicon-dioxide, can circulate throughout the cells to possibly interfere with the battery action.

Another approach is suggested by commonly assigned U.S. Pat. No. 3,591,422 in which a specially designed battery containing a block of absorbent foam is used to contain the concentrated acid to which water is later added at the site of use. This approach has been successful but requires a specially designed battery construction. The present invention provides a system for use with existant conventional storage batteries.

SUMMARY OF THE INVENTION

The instant invention provides a convenient method of transporting and storing concentrated liquids, especially battery acid. An open-celled body is impregnated with the liquid and placed in a heat-resistant plastic container. The plastic container has expandable side-walls and a filling and pouring orifice on its top wall. The plastic container is expanded, for example, to about 4 times its original volume, and filled with water. After allowing adequate time for mixing, the diluted liquid is ready to be poured from the container.

It is, therefore, a primary object of the present invention to provide an improved method and apparatus for transporting and storing concentrated liquids.

Another object of the present invention is to provide a method for shipping concentrated liquids which requires a minimum of printed instructions and requires

no measuring instruments or other tools at the site of use.

Other objects and advantages of the invention will become apparent to those skilled in the art from the following drawings and detailed description.

BRIEF DESCRTION OF THE DRAWINGS

FIG. 1 is a perspective view of an expandable volume apparatus containing an impregnated open-cell body, ready for shipping;

FIG. 2 is a perspective view of the expandable volume apparatus of FIG. 1 expanded prior to filling with water;

FIG. 3 is a perspective view of the expanded volume apparatus of FIG. 2 filled with water; and

FIG. 4 is a perspective view showing the expanded volume apparatus being used to fill a conventional dry-charge battery with battery electrolyte.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1 shows an expandable volume container **10.** The container **10** is preferably made of a heat-resistant plastic material with accordion-type expandable side-walls **11** and a filling and pouring orifice **12.** Inside the container **10** is a block of open-celled material **13.** The block **13** should be an open-celled foamed or granular material capable of absorbing a concentrated volume of liquid. The block **13** is impregnated with the concentrated liquid which is to be transported or stored. Open-celled as used herein, means that the material should have communicating voids so that it will function as a sponge to absorb and retain the concentrated liquid. The materials described in the aforementioned U.S. Pat. No. 3,591,422 are suitable materials.

When it is desired to use the container **10** for transporting battery acid, for example, material **13** should have an absorbency sufficient that upon filling the container **10** with water, the diluted electrolyte has a specific gravity range from 1.255 to 1.265. Necessarily, the material must be resistant to the corrosive action of the battery acid. In general, it has been found that open-celled foamed blocks of phenolic resins, polyvinyl chloride, polyethylene, polypropylene, and silicon derivatives may be used for this purpose.

If the container **10** is used for transporting concentrated battery acid, addition of water to the container **10** will cause an increase in the water temperature as a result of the heat of chemical reaction. Because of this heat of reaction, the expandable plastic container **10** should b constructed of a plastic material that is sufficiently resistant to he to prevent softening, stretching or bursting. A pstic material such as polytetrafluoroethylene is suitably heat-resistanand flexible for use in the present invention and others will be apparent to those skilled in the art.

The absorbent block of metal **13** will retain a substantial amount of the heat of chemicl raction generated upon mixing of the acid in water. It is preferable that the block **13** be positioned such as in the middle of the container **10** as shown in FIG. **3.** This allows adquate circulation of the water throughout the container **10.** Circulation of the wat-acidolution will eliminate excessive heating of the container side-walls, and maintain the localized heating effect within acceptable limits. After an adequate amount of mixing time, the di-

luted acid is ready to be poured into a conventional dry-charge battery as shown in FIG. 4.

Although it s only necessary to supply a single closable filling and pouring orifice 12, a preferred embodiment is shown in FIGS. 2, 3 and 4. By molding or attaching a flexible tube 14 to the orifice 12, filling of the container 10, and subsequent pouring ofhe diluted acis conveniently accomplished.

It will be apparent to one skilled in the art that the instant invention will be useful in numerous applications wherein it is desired to transport or store a concentrated liquid which must be diluted prior to usage. Variou othe advantages and modifications of the above described preferred embodiment will be apparent to those skilled in the art and may be made without departing from the spirit and scope of thappended claims.

I claim:

1. A package for transporting a liquid concentrate comprising an open-celled block of absorbent foam material placed within a closed liquid tight envelope, said envelope comprising a liquid impervious flexible skin having a collapsed and an expanded condition, which envelope, when collapsed, defines an interior envelope space having a volume substantially equal to that of said foam block and which, when expanded, defines an increased interior space volume having a predetermined ratio to the collapsed volume, and means for adding further liquid to the interior of said envelope when expanded whereby, when said foam block is initialy saturated with a liquid concentrate, said envelope may be expanded and filled with further liquid to dilute said liquid concentrate by an amount equal to said predetermined ratio.

2. The package of claim 1 wherein said foam block is positioned centrally within said expanded envelope when said envelope is expanded.

3. The package of claim 1 wherein said flexible envelope includes side walls having accordian-type pleats which, when extended, expand said envelope in one dimension away from opposed faces of said foam block such that said foam block remains centrally positioned within said expanded envelope.

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