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[54] FLEXIBLE CONTAINER
4 Claims, 2 Drawing Figs.

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117/161

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B44d 1/16

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138 8(F), 161(UID), 94, 68; 150/0.5; 161/231, 253,
255

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UNITED STATES PATENTS

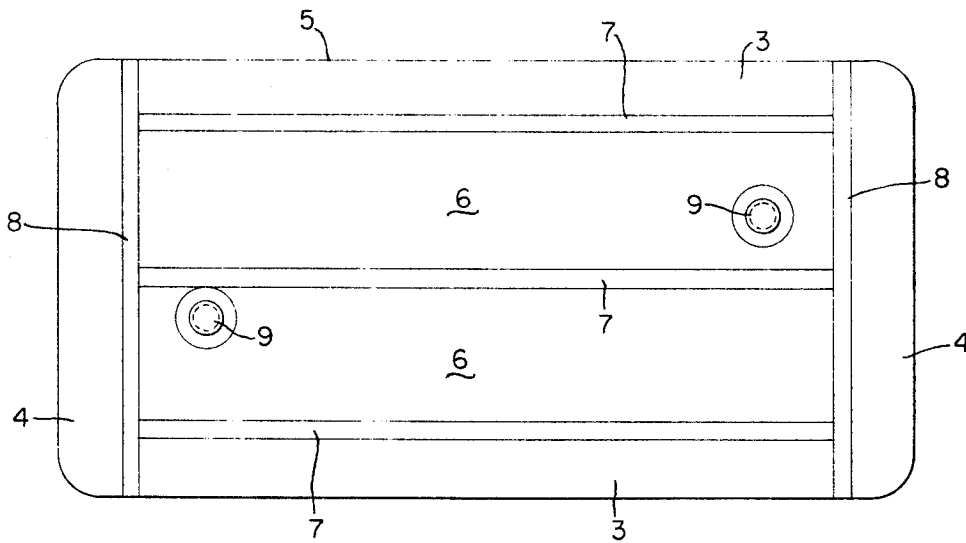
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ABSTRACT: A flexible container for phosphoric acid of less than 75 percent strength or similar acids having a polyester fabric body portion and at least one fitting for access to the inside of the container, said fabric of the body portion having each of its sides covered with a cured chlorobutyl rubber composition.



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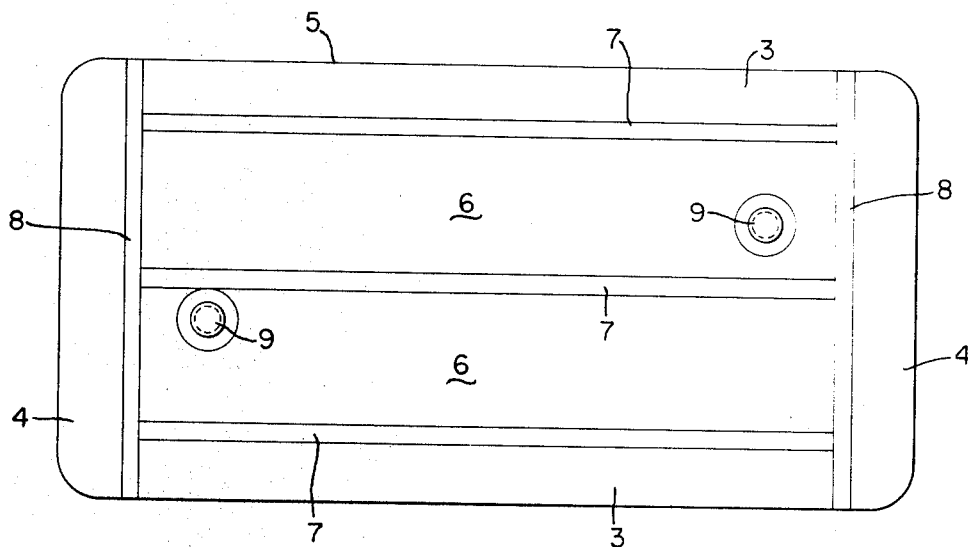


FIG. 1

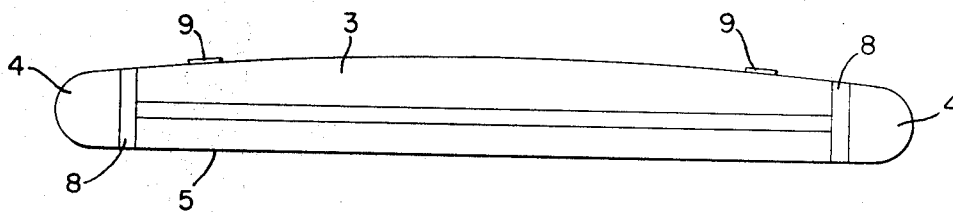


FIG. 2

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FLEXIBLE CONTAINER

This invention relates to a flexible container for phosphoric acid of less than about 75 percent strength and to the method of making said container.

Although elastomeric fabric containers have been made heretofore, these elastomeric coated fabric containers were unsuitable for handling weak to relatively strong phosphoric acid as the phosphoric acid tended to degrade the elastomer and also to destroy the fabric.

Therefore, an object of this invention is to provide a method of preparing a flexible container which is suitable for use in storage of phosphoric acid of less than about 75 percent strength.

This object and other advantages of this invention may be obtained by coating a polyester fabric with a chlorobutyl rubber composition to give a coating of a chlorobutyl rubber composition on both faces of the polyester fabric. Then this chlorobutyl rubber composition coated polyester fabric is cut into suitable pieces and cemented together to form a body portion of the flexible container with the body portion containing access openings for fittings to permit access to the inside of the container. Once the body portion of the container has been formed by cementing the seams, the fabric container is placed in a suitable curing means such as a hot air or steam oven and cured by heating to obtain a flexible container to which fittings may be attached that are suitable for use in storing phosphoric acid of less 75 percent in strength.

Exemplification of this invention is further illustrated by reference to the drawings where FIG. 1 is a plan view of a container for phosphoric acid and FIG. 2 is an end elevational view of said container.

Referring specifically to FIG. 1, the numeral 3 designates a container having its body portion 5 formed by cementing several strips 6 of a polyester fabric together along seams 7 to form a tube which has had its ends capped by cementing the end caps 4 to the body portion to form seams 8. Access to the container is obtained by the access fittings 9 which are of phosphoric acid resistant material, preferably stainless steel or acid resistant polyvinyl chloride.

In a representative construction a polyethylene terephthalate type 9 ounce square woven 450 pounds per square inch fabric, of suitable widths such as 25, 50 and/or 74 inches is dipped or subjected to a spreading operation to give the fabric a tie gum coating. This tie gum coating is preferably a mixture on a weight basis of 100 parts brominated poly-2,3-dichlorobutadiene-1,3, a phosgenated product (6.67 parts) of the product obtained by acid rearrangement of the reaction product of aniline and formaldehyde, as described in U.S. Pat. No. 2,683,730 and 50 parts of toluene. The amount of toluene or related solvent should be adjusted to permit the tie gum coating to be readily applied by spreading, dipping, etc.

After the tie gum coating is applied to the polyester fabric, each side of the fabric is given a coating of a chlorobutyl rubber composition by subjecting the fabric to a spreading or calendering operation to build the coating up to a thickness of about 10 to 200 mils and preferably 40 to 100 mils.

The chlorobutyl rubber composition comprises a chlorobutyl rubber, fillers, compounding agents or curatives alone or together with up to about 50 percent of butyl rubber. If the chlorobutyl rubber composition is used to coat the fabric in a spreader, it is dissolved in sufficient rubber solvent, for instance naphtha or hexane to permit it to be spread; usually about 5 to 50 percent of solvent is used. The term butyl rubber is used in the usual sense to designate the isobutylene copolymer of a conjugated diene such as isoprene where the diene content is less than 5 percent and preferably less than about 3 percent. The term chlorobutyl rubber is likewise used in its usual sense to designate the chlorinated copolymer of isobutylene and a diene such as isoprene where the chlorine enters the alkylic position relative to the double bond. Thus this rubber is curable with conventional sulfur cure systems and with crosslinking with zinc oxide, amines and phenols.

Then the coated fabric is cut into appropriate lengths for the size container desired and the pieces of fabric cemented together to give a body portion having seams as shown in FIGS. 1 and 2. The seams can be sewn and then the cement is applied between the overlapping fabric pieces which are pressed together to form a flat seam. Although lap seams can be used, it is preferred to use butt seams with a strip about 4 to 6 inches wide cemented over the butt seam on both the inside and outside seam face. The preferred cement is a chlorobutyl rubber or a mixture of chlorobutyl rubber and less than about 75 percent butyl rubber dissolved in a suitable solvent such as hexane, naphtha or other rubber solvents. The amount of solvent can vary over wide ranges but, in general, it is preferred to have about 5 to 20 percent solids by weight.

Once the body portion is formed, the end caps are cut from the fabric, and cemented to the body portion to form seams 8 to thereby close the container. These seams 8 can be either lap or butt seams.

A suitable representative chlorobutyl rubber composition for calendering or spread coating the fabric is shown by the following recipe, on a weight basis:

Ingredients:	Parts
Chlorobutyl rubber.....	80
Butyl Rubber.....	20
Magnesia.....	2
Zinc Oxide.....	3
Tetra Methyl thiuram disulfide.....	1
Benzothiozyl disulfide.....	2
Stearic acid.....	1
Amberol ST-137-X resin.....	5
Tert-butyl phenol.....	1
Process oil.....	5
Tributoxy ethyl phosphate.....	2
Carbon black, high abrasion furnace.....	50

If this recipe is to be used for spread coating, it would be dispersed in a suitable rubber solvent such as toluene.

The container after it has been formed by cementing the polyester fabric strips together is then cured by placing the container in a steam autoclave or hot air oven for 3 to 10 hours at 320°F. and higher. A 2,000 gallon container prepared in this manner has held phosphoric acid of 75 percent strength for 11 months without any leaks or other signs of deterioration.

Any of the polyester fabrics may be used, but some preferred polyesters are those available under the trade names of Dacron and Terylene. In general, the polyesters are the condensation product of ethylene glycol, propylene glycol, butylene glycol or their mixtures or 1,4 cyclohexane dimethanol with dicarboxylic acids of 2 to 10 carbon atoms or their anhydrides such as adipic acid, phthalic acid, terephthalic and isophthalic acid and mixtures of said acids or anhydrides.

Although the preferred tie gums contain a halogenated polydichlorobutadiene containing from about 10 to 45 percent halogen, satisfactory adhesion of the chlorobutyl rubber composition can be achieved by treating the polyester fabric with an organic triisocyanate or higher; for instance methane triphenyl isocyanate or the product produced according to the teachings of U.S. Pat. No. 2,683,730 but the resistance to the stronger phosphoric acid is not as good.

Although this invention has been exemplified by testing the container with phosphoric acid, it should be appreciated that the container is useful with other liquids and acids of a similar type, for example dilute hydrochloric acid, acetic acid or hydrofluosilicic acid.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in this art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

We claim:

1. A flexible container suitable for storage of phosphoric acid of 75 percent strength for eleven (11) months composed of a polyester fabric body portion and at least one fitting for access to the inside of the container, said fabric of the body portion having a coating of a cured chlorobutyl rubber composition on each of its sides.

2. The container of claim 1 wherein the polyester fabric is covered with a tie coat of an organic triisocyanate to bond the

chlorobutyl rubber composition to the fabric.

3. The container of claim 1 wherein the polyester fabric is covered with a tie coat of an organic triisocyanate and a brominated polybutadiene to bond the chlorobutyl rubber composition to the fabric.

4. The container of claim 1 wherein the chlorobutyl rubber composition consists essentially of chlorobutyl rubber.

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