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GAS RETAINING FABRICS AND METHOD OF
PREPARING THE SAME

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This invention relates to gas retaining fabrics and a method of rendering such fabrics flexible and impermeable to fluids. The gas retaining fabric hereinafter described is particularly adapted for use in the gas cells of airships, although it is to be understood that it is applicable to other devices wherein a gas retaining or flexible fabric is desired.

An object of my invention is to provide a fabric that shall be impermeable to inflating gases, light in weight, flexible, and not subject to rapid deterioration because of weathering or other natural agencies.

Another object of my invention is to provide a coating material that may be readily and inexpensively applied to a fabric for making the same suitable for use as a gas cell material.

Materials that have heretofore been prepared for the construction of gas cells have included gold-beaters' skin, which is difficult and expensive to procure and to apply; rubber and various lacquers and varnishes, which either do not offer sufficient resistance to diffusion of the inflating gases, or are not sufficiently flexible to withstand severe flexing without cracking or checking.

The invention hereinafter described, which is intended to overcome the disadvantages of the fabrics heretofore employed, arises from the discovery that a film of polyvinyl alcohol is highly impermeable to hydrogen and in addition possesses a remarkable degree of flexibility and toughness.

In carrying out my invention an aqueous solution containing polyvinyl alcohol, obtained by hydrolysis of a low viscosity polyvinyl ester, such as polyvinyl acetate, is spread, brushed or sprayed upon a fabric, preferably a light, closely woven material, in a plurality of coatings. The fabric thus coated offers a very high resistance to the diffusion of inflating gases, one fabric thus prepared having a total weight of coating of 1.8 ounces per square yard, indicating a permeability of one-tenth of a liter of hydrogen per square meter of surface within a period of twenty-four hours.

In carrying out my invention the spreading mixture may contain a plasticizer, such as glycerol, and a substance capable of combining with the polyvinyl alcohol to render it insoluble in water, such as formaldehyde. Or the aqueous solution of polyvinyl alcohol may be mixed with rubber latex previous to application. The raw fabric may be replaced by a fabric previously coated with rubber or other suitable proofing material.

The coated fabric may be protected from mois-

ture by means of a coating of varnish or other suitable proofing applied to its surface.

The proportions of the various ingredients employed in the material may be varied within relatively wide limits without departing from the spirit of the invention. The following are examples of formulas which have been found to be satisfactory:

Example I

Polyvinyl alcohol	30 grams
Glycerol	7.5 do.
Formaldehyde (40% aqueous solution)	4 cc.
Water	600 cc.

Example II

Polyvinyl alcohol	40 grams
Rubber latex (containing 30% solid matter)	200 do.
Glycerol	5 do.
Formaldehyde (40% aqueous solution)	4 cc.
Water	400 cc.

The solutions can be applied to a light weight, closely woven fabric by means of a spreading machine in a plurality of coatings. Each coat is allowed to dry before applying subsequent coats. The coated fabric may be force dried by heating at about 110° C. in a strong current of air. The fabric thus coated is light, flexible and remarkably impermeable to hydrogen.

I also provide a modified form of my improved coating in which the reaction product of polyvinyl and butyl aldehyde is the basis. In preparing this coating, I dissolve one-hundred and fifty grams of polyvinyl alcohol in 1800 grams of water which has been heated to 70° C. Fifteen cubic centimeters of 36 percent hydrochloric acid are added and the solution stirred vigorously, the temperature being maintained at 65° to 75° C. To this solution are added 96 grams of normal butyl aldehyde and the stirring is continued until the reaction product is precipitated as a rubbery mass. This mass is removed and comminuted in cold water in an internal mixer, the water being replaced several times until the washed product is free from acid. The product is pressed or centrifuged to remove excess water. The product, which may contain from 50% to 60% water, is then dispersed in 95% ethyl alcohol to form a viscous solution containing about 16% by weight of solid matter upon evaporation. To prepare a suitable spreading mixture 25 grams of glycerol are added to 470 grams of the above solution and the mixture thoroughly stirred. The resulting coating can be applied to a fabric in a plurality

of coats, each coat being allowed to dry before the application of successive coats.

I desire it to be understood that various changes, including the varying of quantities and the percentages used, may be made within the scope of my invention. Thus, the reaction product of polyvinyl alcohol and butyl aldehyde and/or any aldehyde capable of rendering the coating insoluble in water may be dispersed in solvents other than alcohol, such as isopropyl alcohol, dioxan, methyl ether of ethylene glycol, ethyl ether of ethylene glycol, and similar solvents. Likewise, ethylene glycol, polyglycols and polyglycerols may be employed as softening agents in place of, or in addition to, glycerol.

From the foregoing description it will be apparent that I have provided a new composition of matter to be utilized in the construction of gas cell fabrics for lighter-than-air craft. It is obvious that the examples enumerated serve merely as illustrations and that various modifications may be embodied therein without departing from the spirit of the invention or from the scope of the appended claims.

The invention herein described may be manu-

factured and used by or for the Government of the United States of America for governmental purposes, without the payment of any royalties thereon.

What I claim is:

1. A fabric capable of use in making gas cells, coated with a composition containing polyvinyl alcohol of a character and in sufficient quantity to render the fabric impermeable to hydrogen.

2. A fabric capable of use in making gas cells, coated with a composition comprising a reaction product of polyvinyl alcohol, said reaction product containing polyvinyl alcohol of a character and in sufficient quantity to render the fabric impermeable to hydrogen.

3. A fabric coating comprising substantially 30 grams polyvinyl alcohol, 7.5 grams glycerol, 4 cc. formaldehyde of a 40 percent aqueous solution, and 600 cc. water.

4. A fabric coating comprising substantially 40 grams polyvinyl alcohol, 200 grams of rubber latex containing 30 percent solid matter, 5 grams glycerol, 4 cc. formaldehyde of 40 percent aqueous solution, and 400 cc. water.

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