Aug. 1, 1944. R. L. SEBASTIAN ET AL 2,354,707

PROTECTIVE FABRIC

Filed June 28, 1933



Fig. 1



Fig. 2



Fig. 3



Fig. 4

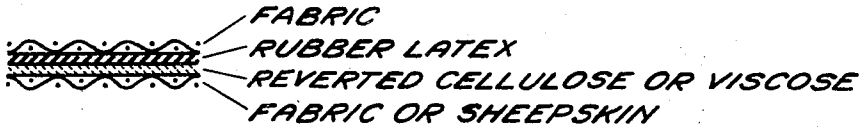


Fig. 5

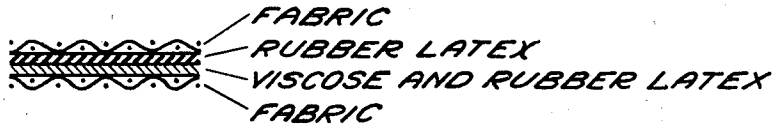


Fig. 6

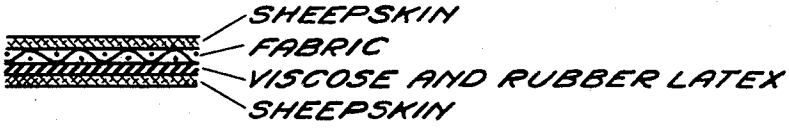


Fig. 7

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UNITED STATES PATENT OFFICE

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PROTECTIVE FABRIC

Robert L. Sebastian, New York, N. Y., and Herbert A. Scruton, Baltimore, Md., assignors to United States of America, as represented by the Secretary of War, and his successors in office, in trust

Application June 28, 1933, Serial No. 678,088

1 Claim. (Cl. 154—50)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to a material treated to render it impervious to injurious gases, and more particularly to a treated flexible fabric suitable for capes, gloves, leggings, hoods, gas mask facepieces, and similar articles of protective clothing.

It is well known that modern warfare involves the use of various gases which injure the skin of those coming in contact therewith or injure the lungs if breathed. Attempts have been made to provide protective clothing and masks to protect persons exposed to these gases, either by excluding the gases or by changing their character to render them non-injurious.

One object of this invention is to provide a fabric suitable for use in various articles of clothing which is impermeable to injurious gases.

Another object of this invention is to provide a protective fabric light in weight and sufficiently flexible for use in various articles of clothing and which is impermeable to injurious gases.

Another object of this invention is to provide a fabric which is light in weight and sufficiently durable and flexible for use in various articles of clothing and is highly resistant to the passage of mustard and similar gases.

Another object of this invention is to provide a fabric which is rendered impermeable to various injurious gases by having a reverted cellulose coating thereon.

A further object of this invention is to provide a flexible fabric suitable for articles of clothing comprising one or more plies of fabric coated to make the same impermeable to various gases and combined with other coatings to protect the impermeable coating from wear and from moisture.

A further object of this invention is to provide a flexible fabric made impermeable to various gases by coating with viscose or viscose-rubber latex compounds either plain or plasticized.

These and various other objects of this invention will be apparent from the following description and appended claims, it being understood that the several necessary substances and compounds employed in carrying out the steps involved in the necessary procedure may be widely varied without departing from the spirit of the invention or the scope of the appended claims.

The present invention relates briefly to the coating of a flexible material such as fabric to render the same impervious to mustard or other injurious gases, the coating being suitably protected against wear and moisture, and to the assembly of one or more of such coated fabrics with other flexible materials.

Figures 1 to 7 show enlarged sections of various forms of the invention, with legends indicating the material.

One specific embodiment of this invention is made as follows: A relatively light and flexible fabric such as 2-ounce cotton cloth is lightly proofed on one side with rubber and then a thin film containing viscose and rubber latex plasticized with glycerine is attached to the rubberized side by means of an intermediate film of gelatin. The cloth thus treated effectively repels the passage of injurious gases, and particularly mustard gas.

If the fabric thus made is to be used as a garment, it is generally desirable to protect the viscose and rubber latex coating from abrasion, wear, and moisture. This may be done in various ways, such as applying a thin coating of varnish or other protective coating over the viscose rubber latex film or by the assembly of the treated cloth with other fabrics treated or untreated, the assembled cloth having the viscose rubber latex protected.

The cloth treated as above described is useful in many applications for protection against gases but is not practicable for some articles of clothing such as gas mask facepieces due to its light weight. However, in increasing the weight it is also necessary to protect the viscose-latex film from mechanical injury and moisture, the latter being necessary in order to maintain the glycerine content of the film which is essential for flexibility. One embodiment of a cloth meeting the above requirements is made as follows: Cotton cloth is treated with viscose-latex as above and then adhering the same to rubberized cotton cloth with the viscose-latex film in the center. With these two fabrics plied together, the resultant cloth has increased weight, the gas resistant viscose-latex is fully protected from mechanical wear and abrasion and is protected from moisture on both sides by the rubber, and the cloth is of a weight suitable for gas mask facepieces and other articles of clothing and retains its flexibility and gas-resistance for an indefinite period.

For some uses the plied cloth above described is too heavy. Therefore a further embodiment of this invention comprises a film of viscose or viscose-latex plasticized with glycerine applied directly to the cotton cloth. The cloth so treated is lighter in weight, more simple to manufacture, with reduced cost, and retains the viscose or vis-

cose-latex as the gas resisting medium. This light weight cloth may be used alone or plied with other flexible materials.

The above examples are given as the more specific embodiments of this invention, but the invention is not limited thereto. Many other gas resistant films may be used as hereinafter described. A viscose film without the rubber latex may be applied directly to a cloth. Furthermore, the elastic, gas-tight cellulose film obtained by the precipitation of a viscose solution with ammonium salts and known as Cellophane may be used, preferably plied with other flexible materials or otherwise protected.

A reverted cellulose may be applied directly to a relatively light fabric such as cotton cloth and used as a gas-resistant medium, particularly in applications where the film of reverted cellulose will not be subjected to excessive wear or abrasion. In some intsances it may be desirable to coat the reverted cellulose with a flexible coating of varnish or other proofing agent.

If the ultimate use requires greater flexibility the reverted cellulose may be plasticized with glycerine or other plasticizer and applied directly to the cloth. This film may be protected if desired with a film of varnish or other proofing agent.

A film of reverted cellulose and rubber latex may also be applied to the cloth directly, and if desirable this film may be protected by a varnish or other film. It will generally be found preferable to use a plasticizer such as glycerine with the reverted cellulose and rubber latex, and the varnish or other film may be used with this coating.

The various coatings above described may be directly applied to the cloth with satisfactory results. However, if there is danger of moisture passing through the cloth and reaching the gas resistant layer, it will be preferable to first apply a light coating of rubber to the cloth. Then the coating of reverted cellulose, reverted cellulose plasticized, reverted cellulose-rubber-latex, or reverted cellulose-rubber-latex plasticized may be applied to the rubber film. These films may then be protected by a varnish or other proofing coat if desirable.

Generally, satisfactory results are obtained by applying the gas-resistant film or coating directly to the cloth or to the rubber coating thereon. However, in some instances it may be desirable to more securely fix the gas-resistant coating to the cloth or to the rubber coating. For this purpose a gelatine or glue adhesive may be applied to the cloth or to the rubber coating if such is used and the gas-resistant reverted cellulose either plain or plasticized or combined with rubber latex applied to the adhesive. The gas-resistant film may or may not be protected by varnish or other proofing agent depending upon the ultimate use of the cloth.

In the specific examples herein described, the reverted cellulose protective coating has been described as being applied over the rubber coating on the fabric. However, in some instances it may be desirable to apply the rubber coating on one side of the fabric and the protective coating of reverted cellulose on the opposite side, since the rubber coating is used to protect the cellulose coating from moisture.

In the various gas-resistant coatings above described, generally more satisfactory results will be obtained with those coatings having a plasticizing agent therewith.

This invention further contemplates the assembly of the cloth rendered impermeable to injurious gases by the above methods with other flexible protective mediums. For example a fabric having a viscose or viscose-latex coating may be plied with two layers of sheepskin previously coated with a cellulose nitrate composition, the gas impermeable cloth being placed between the two layers of sheepskin. This assembly is suitably stitched or otherwise secured together, the stitches and seams being made gas tight by a sprayed-on cellulose nitrate composition.

In making up protective materials for articles of clothing, it will be understood that various combinations of fabrics either coated or uncoated may be plied together. If greater resistance to gas penetration is desired than is obtainable by one coating of reverted cellulose, two or more fabrics so coated may be plied together. Preferably these materials should be so arranged that the protective coatings are within the interior of the final material. Furthermore, it is within the scope of this invention to apply a plurality of protective coatings to one fabric, either on the same side or on opposite sides thereof.

The various coatings herein described render the cloth impermeable to the so-called warfare gases. These gas-resistant coatings are preferably protected by a protective coating such as varnish or are placed between layers of protective materials such as rubber, treated cloth, leather, sheepskin or the like to protect the gas-resistant coatings from the action of water and mechanical injury. The cloth resulting from this plying of materials is highly resistant to the passage of gases, and has the necessary weight, flexibility, and durability to enable it to be successfully used for protective clothing such as gas mask facepieces. The resistance to gas penetration of these plied fabrics is many times greater than the sum of the resistance values of the constituent single layers.

Although this invention has been described in connection with the coating of a fabric, it will be understood that any material may be coated, such as leather, sheepskin, or the like, and in the appended claims the word fabric is intended to include any such material.

In the foregoing description and accompanying claim, the terms vesicant, vesicant gases, injurious gases, mustard, and mustard gas, are intended to include gases, vapors and liquids. The term mustard or mustard gas designates the vesicant compound bis (beta-chlorethyl) sulphide which may be in the gaseous, vapor or liquid state.

While in the foregoing description the preferred embodiments of this invention have been described, it is to be understood that the invention is not confined to the precise steps or ingredients set forth herein by way of illustration, as it is apparent that many changes and variations may be made therein by those skilled in the art without departing from the spirit of the invention or exceeding the scope of the appended claim.

We claim:

A flexible material resistant to attack by or penetration by liquid or vaporous vesicants or other chemical warfare agents and suitable for making articles of protective clothing comprising a fabric having a coating of viscose thereon, said coated fabric being positioned between treated layers of sheepskin.

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