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UNITED STATES PATENT OFFICE.

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WATERPROOF FABRIC.

SPECIFICATION forming part of Letters Patent No. 742,212, dated October 27, 1903.

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To all whom it may concern:

Be it known that I, ARMAND MÜLLER-JACOBS, a citizen of the Republic of Switzerland, residing at Richmond Hill, in the town of Jamaica, county of Kings, and State of New York, have invented certain new and useful Improvements in Waterproof Fabrics, of which the following is a specification.

This invention relates to the process and resulting product of waterproofing fabrics, more especially textile fabrics, by means of an insoluble soap in which is occluded a fixed gas in an extremely fine state of division.

It has heretofore been proposed to precipitate an insoluble soap upon the fibers of a textile fabric in order to render the same waterproof; but this process has not been attended with practical success. The fabric so treated is rendered only partially resistant to water and cannot be regarded as thoroughly waterproof. I have discovered, however, that if during the process of precipitating an insoluble soap upon the fibers of a textile fabric a gas, such as carbonic dioxid, is liberated in the midst of the chemical reagents whose mutual reaction results in the precipitation of an insoluble soap upon the constituent fibers of the fabric, simultaneously with those reactions such carbonic dioxid in a state of infinitesimal division becomes fixed in the resulting precipitate and is held occluded therein in such manner as greatly to increase the water-repellant capabilities of the textile fabric so treated.

The following mode of procedure as applied to cloth, for instance, will serve as an example of the process which I have found to produce the best practical results: I prepare the first bath with which the cloth is to be impregnated by adding to one hundred parts of water ten parts of stearic acid, one and one-half parts of sodium hydrate, and two parts of sodium bicarbonate. The mixture is boiled to complete solution, and then five hundred parts of water are added thereto.

The second bath consists of a solution of aluminium chlorid having a specific gravity indicated by 7° to 10° of Baumé's hydrometer and containing, in addition, from three to five parts of acetic acid standing at 10° Baumé.

The cloth to be treated is passed through the first bath maintained at a temperature not below 180° Fahrenheit in such manner as to become thoroughly saturated therewith, and then the excess of liquid is expressed therefrom by running it between squeezing-rollers, as in the well-known apparatus used for ordinary wet operations of the dye-house. The cloth is next passed through the second bath at ordinary temperature in such manner as to bring about within and upon the constituent fibers of the cloth the chemical and physical changes due to the reaction between the ingredients of the first bath still retained therein and the ingredients of the second bath brought in contact therewith.

Care should be taken to keep the second bath always in an acid state. As soon as it tends to become neutral more acetic acid should be added. When the cloth passes from the second bath, it should have the excess of liquid squeezed out of it, and should thereupon be thoroughly washed out in running water. After that it is dried and may be calendered.

In the reactions of the ingredients of the second bath upon the ingredients of the first bath with which the cloth has been saturated there are precipitated in and upon the textile fibers the two insoluble compounds, aluminium stearate and aluminium hydrate, while carbonic dioxid is liberated, and a part of this gas in a finely-divided and discrete state is distributed through the insoluble compound and occluded or permanently fixed therein. Ordinary cotton cloth thus treated is so completely impervious to water that when bulged or folded in such manner as to form a bowl-shaped depression or pocket it will hold water therein for days without letting a drop escape through its meshes and without becoming moist upon its under side.

In the first bath potassium stearate may be substituted for sodium stearate and potassium bicarbonate may be substituted for sodium bicarbonate; but I prefer the sodium compound. So, likewise, may palmitic

acid or oleic acid be substituted for stearic acid, but with inferior results.

In the second bath aluminium sulfate may be substituted for aluminium chlorid and so may other soluble salts of aluminium—such as the nitrate or acetate, for instance. In like manner the soluble salts of certain other metals which are capable of forming insoluble metallic soaps in combination with the fat acids may be substituted for the soluble aluminium salts of the second bath, but not with so good practical results. Thus I find that magnesium salts answer fairly well; but calcium, barium, or strontium salts are decidedly inferior. The insoluble aluminium compounds formed by the reactions hereinabove indicated appear to absorb or occlude a greater quantity of carbonic dioxid than the substituted analogous magnesium, calcium, &c., compounds.

I claim—

1. The herein-described process of waterproofing fabrics, which consists in impregnating the fabric with a solution of soluble soap and alkaline bicarbonate, and then in passing the same through an acid solution of a metallic salt whose metal, when combined with a fat acid, will form an insoluble soap.

2. The herein-described process of waterproofing fabrics, which consists in impregnating the fabric with a solution of soluble soap and alkaline bicarbonate, and then in passing the same through an acid solution of a soluble aluminium compound.

3. The herein-described process of waterproofing fabrics, which consists in impregnating the fabric with a solution of sodium stearate and sodium bicarbonate, and then in passing the same through a solution of aluminium chlorid and acetic acid.

4. A waterproof fabric consisting of fibrous material in and upon the constituent fibers of which has been chemically precipitated an insoluble metallic soap occluding a finely-divided, discrete and distributed gas.

5. A waterproof fabric consisting of fibrous material, in and upon the constituent fibers, of which has been chemically precipitated an insoluble aluminium soap occluding carbonic dioxid in a finely-divided, discrete and distributed state.

6. A waterproof fabric consisting of fibrous material, in and upon the constituent fibers, of which has been chemically precipitated an insoluble aluminium soap and aluminium hydrate occluding carbonic dioxid in a finely-divided, discrete and distributed state.

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Witnesses:
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