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MECHANICAL FABRIC

Carlton C. Gordon, Elsmere, N. Y., assignor to Albany Felt Company, Albany, N. Y., a corporation of New York

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My invention relates to fabrics which are used in connection with or form parts of machines for the manufacture or treatment of other fabrics and which, in such use, are usually subjected to both moisture and heat. Papermakers' felts and blankets, and palmer and sanforizing blankets are examples of the class of fabrics to which my invention relates, and are referred to herein as mechanical fabrics.

In the manufacture of paper, for example, the wet web of fiber is dried by carrying it around steam heated cylinders with the surface of which it is held in contact by a felt belt coextensive therewith.

In the sanforizing process of mechanically shrinking fabrics a felt blanket is used to hold the moist fabric in contact with the surface of a heated cylinder in order to dry it. Similarly, the finishing of silk fabrics on palmer machines involves evaporating moisture from the silk by running it about a heated cylinder with which it is held in contact by a blanket.

In all these processes, and in similar ones, the felt or blanket employed is a heavy fabric which consists, at least in part, of wool, and which is subjected to moisture and high temperature for long periods in the manner described above.

One of the functions of the felt or blanket is, of course, to absorb and pass on the moisture evaporated from the underlying fabric, and for this reason it has always been considered essential that the felt or blanket be highly absorbent in order to facilitate the drying of the fabric. Paradoxical as it may seem, my investigations have clearly demonstrated that a mechanical fabric which has been treated to make it water repellent drys the underlying fabric more rapidly and has a very much longer useful life than an untreated fabric.

In am aware, of course, that the treatment of fabrics to be used for wearing apparel, tents, umbrellas, etc., by various processes in order to make them water repellent and to prevent the passage of moisture therethrough has heretofore been proposed, but my proposal so to treat mechanical fabrics, which have generally been understood to function in part, at least, as blotters, in order to improve their "blotting" action and to facilitate the passage of moisture therethrough is quite radical and believed to be entirely novel.

In general, a sanforizing blanket begins to scorch on the surface which is in contact with the main and the blanket-drying cylinders. The heat from the cylinders and the moisture from the cloth being treated combine to make the surface fibers brittle so that they gradually break off thus making the blanket thinner. Sometimes this wear causes the blanket to become so thin as to destroy its shrinking function or even to pull apart.

While excessive dry heat alone will injure a woolen blanket, heat and moisture combined are much more damaging. Because of this, many mills have prolonged blanket life by increasing the steam pressure, at least on the blanket-drying cylinder, so that the blanket runs dryer although hotter. Other mills have prolonged the blanket life by merely running it at a slower rate so that again the blanket runs drier but hotter.

When the moisture is driven from the cloth that is being treated it passes to the wool blanket where some of it condenses and some passes through as vapor. Both of these things are always happening at the same time and the extent of each is determined largely by the quantity of water to be evaporated as well as the moisture content and temperature of the blanket.

My experiments have definitely indicated that a dry blanket is much more porous than one which is wet. This difference in porosity is very marked as will be apparent from a comparison of the following porosity indices in which a larger number indicates a closer fabric—

Percent moisture in blanket:	Porosity reading
10	28
20	34
30	44
40	60
50	81

From the foregoing it will be clear that as the moisture content of the blanket increases its porosity to the passage of air and water vapor is greatly reduced.

My investigations have also shown that when a blanket has been treated to make it water repellent its porosity is greater than a similar but untreated blanket which contains the same amount of moisture. For example, two blankets both containing 70% of water had porosity indices of 81 and 109 for the treated and untreated blankets, respectively; and with a 90% moisture content the same blankets had relative porosities of 100 and 114.

While it would seem that the logical way to improve these felts or blankets would be to make them absorbent so that they would more quickly absorb the water from the fabric that is being

dried, actual experiments indicate that by making the fabric water repellent the blanket remains more open to the passage of air and water vapor. The moisture vapor condensed in the treated blanket on its passage therethrough seems to accumulate on the surface of the fibers instead of being absorbed by them. Both of these conditions facilitate the dissipation of water and, as a result, the blanket runs effectively drier and therefore is less injured by the heat and moisture.

Mechanical fabrics may be made water repellent by a variety of methods such, for example, as by impregnating the fabric and thus coating the fibers with insoluble metal soaps such as those of aluminum, iron, calcium, magnesium, lead, zinc, etc., which may be used alone or in combination with an organic wax such as carnauba, candelilla, montan, beeswax, paraffin or ozocerite. A number of proprietary compositions comprising metal soaps and waxes in the form of an emulsion, such as that sold under the trade name of "Aridex," and which is recommended for the treatment of fabrics in order to make them water repellent may conveniently be used to increase the porosity of a mechanical fabric.

After the felt or blanket has received its final wash it preferably is prepared for further treatment by making it slightly acid. This may be done by mixing about 1 lb. of commercial acetic acid per 100 lbs. of fabric with a small quantity of water in the bottom of the washer, running the fabric in this solution for about 5 minutes and then giving it a brief rinse. This is done because many of the water repellent materials are more stable in a very slightly acid solution. If an emulsified solution of metal soap and wax such, for example, as Aridex is employed, which contains about 20% of solid material, about 11½ lbs. of the soap-wax composition may be used per 100 lbs. of fabric. The water repellent material is mixed with only enough water in the washer to saturate the fabric thoroughly and uniformly.

I find that a final solution containing from about ½% to 2% of solids is quite effective. Solutions containing larger quantities of solids may be used but since little or no extra protection is given their use is not recommended for economic reasons. Furthermore, I prefer to use solutions containing solids in percentages of about the above order because it is possible, if the percentage of solids is substantially increased, to reduce instead of increase the effective porosity of the fabric by filling it with solid material. After running in this solution for from 5 to 10 minutes the fabric may be taken out without any rinse, extracted, dried and finished by the usual processes.

After the blanket has been extracted in a centrifuge, it usually contains about one-half of its own weight in water. Thus, if there is 2% of solids in the treating solution there will be about 1% of solids in the finished fabric.

The time of running the blanket in the solutions is not critical and it is only necessary that the fabric be thoroughly and uniformly soaked.

As distinguished from the treatment of fabrics with metal soaps and waxes in order to make them waterproof, it should be borne in mind that my treatment contemplates impregnating or coating the individual fibers only while maintaining the interstices of the fabrics about the fibers substantially free of water-proofing or water-repellent material so that air and water vapor may pass freely therethrough.

Therefore, by the term "mechanical fabric" as used above and in the appended claims I mean to include only those fabrics which are used in the mechanical arts and which must be pervious rather than impervious to hot water and hot water vapor. My invention is not concerned with waterproofing fabrics in the sense in which that term is ordinarily understood and no claim is made to fabrics, or to the treatment of fabrics for use in wearing apparel or in any other field where imperviousness to water is a desirable characteristic.

What I claim is:

1. The method of prolonging the life and increasing the porosity to the passage of water and water vapor of a mechanical fabric which in normal use is subjected to comparatively high temperatures in the presence of moisture which comprises treating the fabric by immersion in a liquid which, when dry, will form a water-insoluble and water-repellent coating on the fibers of said fabric, subjecting said fabric to a centrifuging action while saturated with said liquid to remove the excess thereof from the interstices of said fabric about and between said fibers, and thereafter drying said fabric.

2. The method of prolonging the life and increasing the porosity to the passage of water and water vapor of a mechanical fabric which in normal use is subjected to comparatively high temperatures in the presence of moisture which comprises treating the fabric by immersion in an emulsion of a metal soap and wax to effect a coating of the fibers of said fabric therewith, subjecting said fabric, while saturated with said emulsion, to a centrifuging action to remove the excess of said emulsion from the interstices of said fabric about and between said fibers, and thereafter drying said fabric.

3. The method of prolonging the life and increasing the porosity to the passage of water and water vapor of a mechanical fabric which in normal use is subjected to comparatively high temperatures in the presence of moisture which comprises saturating said fabric with water containing a metal soap, removing from said fabric about one half of the water absorbed thereby before any substantial evaporation thereof has taken place, and thereafter drying said fabric by evaporating the balance of the water therein, whereby to deposit a water-repellent coating on the fibers thereof.

4. The method of prolonging the life and increasing the porosity to the passage of water and water vapor of a mechanical fabric which in normal use is subjected to comparatively high temperatures in the presence of moisture which comprises saturating said fabric with water containing a metal soap and an organic wax, removing from said fabric about one-half of the saturating liquid before any substantial evaporation thereof has taken place, and thereafter drying said fabric by evaporation of the moisture therein to effect the deposit on the fibers thereof of a water-repelent coating of insoluble soap and wax.

CARLTON C. GORDON.