Fig. 1.

Fig. 2.

Inventor:
Hans R. Haertel.

by
[Signature]
My invention relates to flexible sheet material resistant to water shrinking, and to methods of making the same, the material being applicable for use for the tops of automobiles and for other purposes where it is subjected to alternate wetting and drying.

The invention will be best understood from the following description of one example of the improved product and of one example of the practice of the method of making it, while the scope of the invention will be more particularly pointed out in the appended claims.

In the drawing:

Fig. 1 is a plan of a fragment of the improved product on a much enlarged scale; and Fig. 2 is a section on the line 2—2 of Fig. 1.

As illustrated, the improved product comprises closely adjacent textile sheets 1 and 3 united by a strongly adhering, thin layer 5 of cured rubber compound, the textile sheets having the warp threads 7 and weft threads 9, these threads, particularly the warp threads, being deeply embedded in the rubber layer so as to be locked thereto, but without the rubber compound extending through the meshes 11 of the textile, which if it did would give the outer surface of the sheets a highly objectionable appearance and "feel".

It will thus be observed that the improved material at each side has the characteristics of the original textile sheets, and that the latter are subject to alternate wetting and drying when exposed to the weather, although the material itself is waterproof in the sense that the rubber layer will prevent water being conducted from one side of the material to the other.

The standard test for water shrinking in this art consists in sponging the material and drying it at room temperature three times in twenty-four hours, and noting the shrinkage. When the textile sheets are, for example, "teal cloth", a mackintosh cloth commonly employed for tops of automobiles, and the material is fabricated according to prior processes, in some cases the water shrinking may be as much as 6%, although it is highly desirable that a material with no shrinkage be employed, and any shrinkage is highly objectionable in the sense that if allowance is made for shrinkage in fabricating the automobile top an unsightly appearance is produced, and if no allowance is made for shrinkage, the latter, when it occurs, causes distortion of the top, and, in extreme cases of shrinkage, breakage of the bows of the top framework.

According to the present invention a product is produced in which water shrinking is practically eliminated, thus avoiding the objections to the product prepared according to prior methods.

This improved product is characterized by the employment of a layer of rubber compound to which the textile sheets strongly adhere, the rubber layer being incompressible when the textile sheets are subjected to water shrinking, thus avoiding water shrinking of the product.

As an example of the practice of the improved method of fabricating the product, the rubber layer may be applied to one side of each sheet by use of hot calender rolls, the consistency of the rubber and the pressure being coordinated to force the threads of the textile into the rubber layer to a greater extent than has been former practice, but without causing the rubber to extend through the meshes of the textile. After the rubber is applied to the two sheets they may be "doubled", that is to say, their rubberized sides may be placed in contact and the sheets pressed together, as by passing them between rolls, to cause their rubber surfaces to adhere. After the doubling operation the sheets may be cured. After curing, the material may be tentered for correcting slight inequalities in the width of the material and to bring the threads into parallel relation. While being tentered the material may be subjected to shrinkage by exposing it to the action of water and heat, as for example exposing it to a spray of wet steam or a spray of water and steam. Any suitable form of tentering machine may be employed for performing the tentering operation. As these machines, as well as the calendering machine hereinbefore mentioned, are well understood by those skilled in the art, it is believed unnecessary to describe them.

It has been found that the material so prepared effectively resists water shrinking, the shrinkage in many cases being practically nothing, and in all cases exceedingly small as compared to that which occurs when material prepared according to prior methods is subjected to water shrinking. Applicant's explanation of this property of the improved product is that the individual threads of the textile sheets, particularly the warp threads, are strongly locked to the rubber layer at a multitude of closely adjacent points so as to prevent slippage between the rubber layer and the textile sheets, with the result that when the material is subjected to shrinkage by application of moisture and heat the rubber is put under compression in planes parallel to the planes of the textile sheets, and that this compression is of a degree sufficient to resist any
further shrinkage when the material is subjected to water shrinking, the latter causing the exertion of relatively small forces on the rubber as compared to the shrinkage which occurred when the material was subjected to water and heat. This is borne out by the fact that if the material is not subjected to the action of water and heat for shrinking it will shrink when subjected to water shrinking, also by the fact that if the material is applied by the usual "calendering" or "spreader" process, or if rubber compound of low tensile strength is employed, the material will water shrink.

The rubber compound employed may be given a high tensile strength in any convenient way within the skill of the art, as by use of a large amount and volume of rubber, which volume may be secured by the use of heavy fillers such as barium sulphate, lithopone, etc., instead of large proportions of whiting as commonly employed in rubber compounds, and conveniently the compound should contain a small amount of waxes, such as Montan wax, to prevent sticking of the compound, due to its high rubber content, to the rolls of the calendering machine, and also conveniently should contain a small amount of grease, such as zinc stearate, for bringing the sulphur and accelerator into contact with the rubber, and conveniently a small amount of resinous material such as ester gum, cumarone resin, indene resin, etc., for making the material soft when hot to facilitate it entering the interstices between the threads of the textile.

As a specific example of a suitable rubber compound, but without limitation thereto, 7 ounces per square yard of the compound listed below may be applied to each textile sheet, the pressure of the calendar rolls being about 25% greater than that ordinarily employed so as to force the compound about half way through the interstices of the fabrics, so that textile sheets having a thickness of about .016 inch results in a finished doubled material of about .041 inch thick:

<table>
<thead>
<tr>
<th>Material</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure rubber milled with accelerator and anti-oxidant</td>
<td>10</td>
</tr>
<tr>
<td>Pure rubber</td>
<td>30</td>
</tr>
<tr>
<td>Reclaimed rubber</td>
<td>40</td>
</tr>
<tr>
<td>Montan wax</td>
<td>2.8</td>
</tr>
<tr>
<td>Zinc oxide (activator)</td>
<td>6</td>
</tr>
</tbody>
</table>

Lithopone (mixture of zinc sulphide and barium sulphate constituting an opaque heavy filler) | 10 |
Whiting                          | 26    |
Zinc stearate                    | 15    |
Magnesium oxide (acid neutralizer)| .5    |
Sulphur (vulcanizing agent)      | .94   |
Cumar (mixture of cumarone and indene resins) | 2     |

As a satisfactory textile for the above described product, but without limitation thereto, applicant has used a plain weave "teal cloth" weighing 5.4 lbs. per square yard having 52 two-ply yarn warp threads per inch and 38 single-yarn weft threads per inch. After fabrication of the product as above described, the material, if desired, may be treated to render it somewhat water repellent, as for example, treating it with a metal soap such as aluminium palminate, without materially changing its appearance or feel. It will be understood that the invention is applicable for use with other forms of cloth than the one above mentioned, and that those skilled in the art may employ various compositions of rubber compound for securing the desired results. It will therefore be understood that within the scope of the invention wide deviations may be made from the embodiment thereof hereinafter described without departing from the spirit of the invention.

1. Flexible material comprising two closely adjacent, exposed textile sheets which are characterized by the property of water shrinking and are joined by a strongly adhering, interposed layer of rubber compound of high tensile strength under initial compression in planes parallel to said sheets to resist water shrinking of the material.

2. Flexible material comprising two closely adjacent, textile sheets which are characterized by the property of water shrinking, said sheets joined by a layer of rubber compound of high tensile strength under initial compression in planes parallel to said sheets to resist water shrinking of the material, the threads of said sheets being embedded in said compound for a material part of their thickness without said compound extending through the meshes of said sheets.

HANS RICHARD HAERTEL.