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METHOD OF PRODUCING SURGICAL BANDAGES
WITH IMPROVED ELASTIC PROPERTIES
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Fig. 1.

Fig. 2.

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METHOD OF PRODUCING SURGICAL BANDAGES WITH IMPROVED ELASTIC PROPERTIES

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1 Claim. (Cl. 28—76)

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This application is made under the act of March 3, 1883, as amended by the act of April 30, 1928, and the invention herein described, if patented, may be manufactured and used by or for the Government of the United States of America, for governmental purposes without the payment to me of any royalty thereon.

This invention relates to an improved cotton fabric for use as a surgical bandage. The conventional surgical bandage is made from bleached gauze, cotton of the class commonly designated as cheese cloth, finished in a very elastic and unstretchable form, and used in strips, pads, etc. Bandages made from this material are frequently very difficult to fit and to keep in position on various parts of the body.

There are also in common use elastic bandages (1) which depend upon rubber placed within specially woven fabric to effect recovery of length after deformation of shape, and (2) which depend entirely upon special weaves and are constructed in part, from highly twisted yarns such as are used in crepe, which impart the elastic behavior. Elastic bandages of both of these types are commonly used for support where the self-tightening effect due to this elastic behavior is the main requirement. These bandages are usually elastic only in the lengthwise direction.

My new bandage fabric can be made in the absorbent gauze type, but is an improved form embodying the addition of elasticity by a new method of manufacture, this elastic effect being exerted not only in the direction of length but also across the fabric. This causes bandages made from this fabric to be self-fitting over irregular surfaces, self-tightening if applied with a slight stretch, and very flexible and elastic. These qualities allow much more freedom of motion than usual to bandaged parts of the body without the bandages becoming loose. The method of manufacture also makes the fabric non-slipping which is another great added advantage.

The new type of bandage can also be made from heavier goods, when its properties will be more like those of commercial elastic bandages such as described above. In no form of this new bandage does it utilize rubber or yarns of such high twist as in crepe constructions.

Cotton gauze for making the new form of bandage with the new properties described above is prepared by shrinking a suitable open weave fabric by means of a swelling agent for cellulose, removing the swelling agent, and then drying with a minimum of tension. Most of the shrinkage is retained in the form of added crimp and kinkiness in the warp and filling yarns in the cloth. Hereafter the combined crimp and kinkiness will be generally called or referred to as the crimp in the piece goods have elastic properties which they impart to the fabric making it, in effect, elastic.

Heavier bandage fabrics of similar weight to the commercial elastic bandages described above can also be made from an open fabric of suitable weight.

The result of the treatment is clearly shown in the accompanying drawing. Figure 1 illustrates a piece of cheese cloth in the form in which it is woven. Figure 2 shows the same cloth after treating as described, and shows especially the crimp and kinkiness in the yarns. While these drawings are only diagrammatic, they are faithful reproductions from enlarged photographs of areas of these fabrics. The increased closeness of the threads is a visual measure of the shrinkage and a rough indication of the elastic properties.

It can be easily seen that the fabric portrayed in Figure 2 can be stretched if enough tension is applied to straighten the crimp. There will be enough elastic effect in the cotton to cause the crimp to re-enter the yarn upon release of the tension and to return the cloth to nearly its shrunken size. The crimp also causes the rough surface which makes the bandage non-slipping.

Thus Figure 2 shows the changes in the cloth which impart the new and useful properties to my new bandage fabrics.

As a specific and convenient example, a stretchable and elastic bandage fabric can be made from a cotton cheese cloth of 28 warp threads and 24 filling threads per inch. This cloth in rope form or open width is dropped loosely into a solution of sodium hydroxide of such concentration, for example 20 or 25%, as will cause rapid swelling of the cotton fibers and shrinking of the cloth. The cloth may be previously wet so that the sodium hydroxide will penetrate and act upon it quickly or the sodium hydroxide solution may contain a wetting agent to help wet the cotton and promote rapid action.

After the shrinking is complete the excess sodium hydroxide is removed, usually by careful squeezing, the residual alkali thoroughly washed out, and the cloth dried. Care is necessary to avoid tension on the goods either in width or length which may tend to pull out the shrinkage, or stretch the cloth beyond its dimensions in the wet shrunken state.

A fabric was prepared in this way from a cheese
cloth of 28 x 24 thread count, containing yarns of numbers 28 and 37 on the cotton system and of 20 and 26 twists per inch, in warp and filling respectively, with full preservation of the shrinkage. When tested by stretching to given percentages and releasing to recover elastically, the results shown in the table were obtained:

<table>
<thead>
<tr>
<th>Direction in fabric</th>
<th>Total shrinkage in process</th>
<th>Test data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage stretched</td>
<td>Percentage recovered</td>
</tr>
<tr>
<td>Length</td>
<td>Per cent</td>
<td>10</td>
</tr>
<tr>
<td>Width</td>
<td>36</td>
<td>10</td>
</tr>
</tbody>
</table>

The treated fabric had a thread count of 45 x 37 which corresponds closely with the shrinkages shown in the second column above.

In the example given above only those steps in the manufacture of an absorbent type bandage fabric have been indicated which are necessary to produce a fabric having the described surface and elastic properties. It is to be understood that the cloth can be acidified and washed to remove alkali, or kier boiled and bleached to make it absorbent, at any selected time in the process without substantially changing the nature of my new treatment. It is also to be understood that the shrinking treatment can be varied greatly in detail without departing from the spirit of my invention. It is only necessary that a large amount of shrinkage, not necessarily the maximum that might be attained, shall be put into the goods and retained completely through subsequent processings, or to a sufficient degree to impart the properties which have been described. It is not necessary that the amounts of stretchability be equal in the two directions in the piece, nor the amounts of elastic recovery. Hence it is to be understood that the example given above is not in any sense a limitation and it is clear that various modifications and changes in the method of treatment and in the product may be employed without departing from the spirit and scope of the invention.

It is possible to produce a great range of effects represented by different weights and types of fabric and different degrees of stretchability and elastic recovery. Each fabric can be designed to meet requirements which may be imposed. The twist in the yarns will control to a certain extent the maximum amount of shrinkage that can be reached. The size of the yarns and the number of threads per inch in the goods will affect the shrinkage somewhat but will control particularly the weight and closeness of structure of the resulting fabric. Finally, some of the shrinkage can be taken out by suitable tension during finishing if necessary to meet requirements of predetermined dimensions and elastic effects.

The method of producing this new bandage does not interfere with the absorbency of properly bleached goods but tends to increase it owing to residual swelling left in the cotton. The bandage will also be more absorbent than ordinary surgical gauze because of its improved texture.

Other proposals have been made to utilize the shrinking effects of caustic alkalis on cotton fabrics but not with the present object in view. For example, cotton fabrics have been shrunk in a somewhat similar way to obtain closeness of texture or wool-like characteristics which are in no way related to my new bandage fabric. The necessary elastic properties would be lacking in such closely woven fabrics where the closeness is increased by shrinking.

Having thus described my invention, I claim:

A method of producing an elastic and roughened surgical bandage comprising treating an open weave cotton fabric with a solution of sodium hydroxide of about from 20 to 25% concentration without applying tension to the fabric, whereby the fabric shrinks in all directions imparting to the individual yarns of the fabric many small spring-like crimps lying between adjacent yarns running in the direction normal thereto, removing the sodium hydroxide, and drying the fabric while in the non-tensioned state.

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