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TREATED FABRIC AND METHOD OF MAKING

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Fig. 1

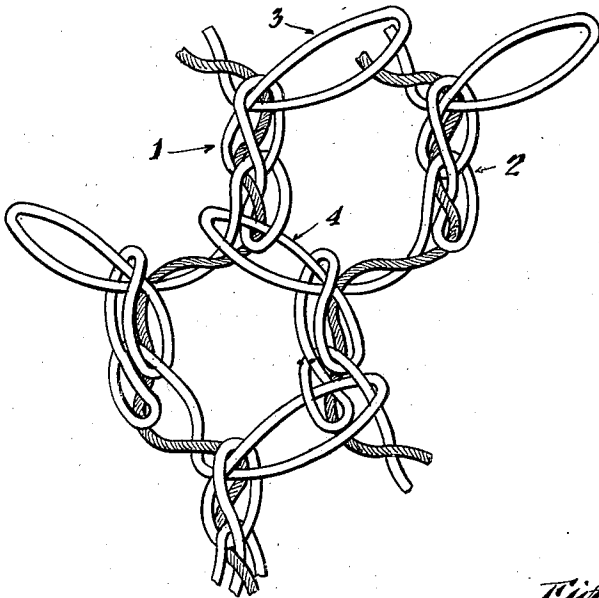


Fig. 3

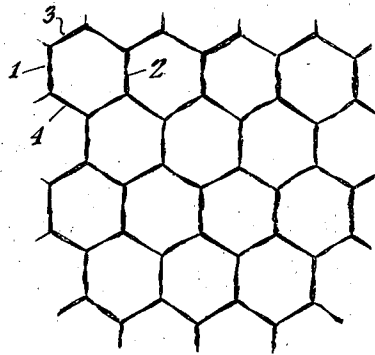
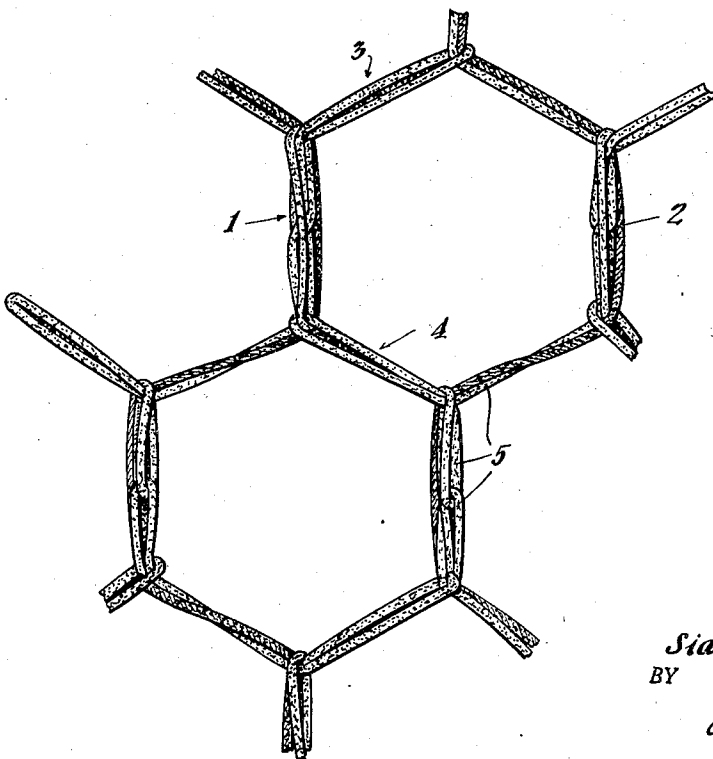


Fig. 2



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TREATED FABRIC AND METHOD OF MAKING

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3 Claims. (Cl. 28-80)

This invention relates to a fabric and the method of making it and particularly to a fabric of substantially permanently established width and shape of mesh.

Because of the especially important results obtained by the use of Rashel knitted fabric as the textile to be treated, the invention will be first illustrated by description in connection with the use of such fabric.

The Rashel knitted fabric used is illustrated by the material made in accordance with U. S. Patent 2,205,581, issued one June 25, 1940, to Aaron S. Staff, and entitled Knitted fabric.

In this fabric there are a plurality of series of warp threads. The threads of one series are held to an adjacent series by means of loops in one of the threads. Because of the particular construction, the resulting fabric when tented shows a generally hexagonal shape of the meshes. But the fabric when knitted in regular manner comes from the machine in more or less collapsed form, so that the series of yarns referred to lie close together. The desired hexagonal mesh and width of the fabric are not preserved.

The present invention provides a strengthened Rashel knitted fabric which has a permanently established width and shape of mesh that are not altered appreciably by repeated laundering.

Briefly stated, the invention comprises the method of and the product resulting from applying a film of cellulosic material to fabric of the type of Rashel knit, so that the applied film bridges over and closes the spaces between the narrowed loops which tie the several series of warp threads together, without closing the meshes in the knitted fabric.

In this way, the normally loose, easily slipping loops are converted to trusses of permanently established stiffness and strength, with no free space left inside the loops for slipping of warp threads within the loop and with no possibility of the loops returning to generally circular form and thus drawing nearer two adjacent series of warp threads. At the same time there is preserved the desired elasticity or yieldability of the fabric and there is established the desired shape of mesh and width of the goods.

In the preferred embodiment the invention comprises the application to the selected fabric of a solution of cellulose in alkaline sodium zincate solution or a solution of an alkali stable cellulose ether in sodium hydroxide solution, the cellulose or the cellulose ether so applied being precipitated in manner that is usual for forming films of cellulose or its ether from alkaline solutions and

the fabric and applied cellulosic material being washed and dried. It is necessary for the present results that the fabric be tented or pulled out to width at some time when in contact with the precipitated cellulose, as during the precipitation itself or during the final drying step in the finishing of the fabric. Thus the fabric is advantageously tented before application of the cellulosic solution and kept tented during the subsequent precipitation of cellulose and, for best results, also during the subsequent washing and drying steps.

Proceeding in this manner, I obtain with Rashel knitted fabric a product that possesses the desired features of preservation of the hexagonal mesh and full width and also increased strength. Furthermore, the desired appearance of the finished fabric is retained, the cellulose film so applied preserving the natural luster and appearance of the threads.

The invention will be illustrated by description in connection with the attached drawing to which reference is made.

Fig. 1 is a face view of Rashel knitted fabric in normal condition based upon a figure of the said Patent No. 2,205,581.

Fig. 2 is a similar view of the same fabric after it has been stretched to elongate the loops which hold together adjacent series of warp threads and the remaining spaces within the narrowed loops have been filled by cellulosic material.

Fig. 3 is a view similar to Fig. 2 but showing a somewhat larger piece of the treated fabric.

All of the figures are exaggerated in dimensions as compared to the fabric normally used and the exaggeration is greater in the case of Figs. 1 and 2 than Fig. 3.

In general, the fabric consists of a plurality of series 1 and 2 of spaced warp threads, the threads from each series being provided with loops 3 or 4 which extend from one series into an adjacent series and are interlaced in the latter series, so as to limit movement of two series of warp threads in direction away from each other.

These loops are substantially closed, that is, the return side of the loop enters its series of threads at approximately the same position as that at which the loop first issues from that series. As a result of this substantially closed looping of the thread, the loop when stretched or elongated comes to consist of two generally parallel sides that lie in close proximity to each other. When the coating 5 is applied over the narrowed loops, the coating bridges the space between the two sides of each loop and fills the space, so that each

loop is converted to a strengthened truss element having in it no space in which warp yarns may slip towards those of another series so as to deform the fabric.

Since this bracing structure in loops 3 and 4 is integral with the coating of the remainder of the threads, the loops not only keep their extended form as sides of the generally hexagonal meshes in the finished fabric but also hold the warp threads apart, at established spacings. This causes setting of the meshes in the finished dried product.

In general the method of making the improved fabric of the present invention comprises applying to the knitted fabric a cellulosic coating such as one of cellulose or cellulose ether; washing, tentering, and drying the product. The tentering may be effected at various stages as described above and as illustrated in the specific examples given later herein.

Cellulose dissolved in aqueous alkali metal zincate solution is preferred as the solution for applying the cellulosic material. Except as noted specifically herein the cellulose-zincate solution may be made, applied to the fabric, and the cellulose precipitated on the fabric as described in my copending application Serial No. 423,163, filed December 16, 1941, and entitled Textile material and method of making.

A solution of cellulose in cuprammonium, cellulose in quaternary ammonium compounds, cellulose ether in alkali solution, or cellulose xanthate solution may be used as a substitute for the cellulose-zincate. Such alternative solutions are made and applied and the cellulosic material precipitated upon the fabric in accordance with conventional practice in applying such solutions to fabrics. Thus, cellulose ether is applied in solution in aqueous sodium hydroxide solution and precipitated with dilute acid. Washing and drying of the fabric with applied cellulosic material are effected in any convenient manner.

Tentering is necessary. This pulling out to width and elongation of the loops 3 and 4 are effected on a usual type of tentering machine.

As the material of the fabric used, there is preferred rayon or cotton. Wool or silk may be used, provided the time of contact with the alkaline cellulosic material is very short, say about 20 to 60 seconds or less and the alkali is properly neutralized, as by precipitation with dilute sulfuric acid solution, to avoid substantial deteriorating effect of alkali upon the protein fibers.

As the cellulose ether which is used, there may be employed any one of the common solutions of cellulose ethers that are satisfactory for coating fabrics as, for example, a solution in aqueous sodium hydroxide of water insoluble, alkali soluble and alkali stable ethyl ether, methyl ether, and hydroxy ethyl ether of cellulose.

The cellulose coating of the present invention is preferably applied to the fabric directly after it is fabricated, or after fabrication and washing in case the fabric requires cleaning by washing. The subsequent operations including bleaching, dyeing, and the necessary handling are thus performed upon the material that is already strengthened by the cellulose application. With the Raschel knitted fabrics, this early strengthening is particularly important because they are normally weak and flimsy and easily distorted or torn, especially while wet. The present process gives a strengthening and protection of the fabric from the time of its first formation (or washing) through the entire processing in a textile

mill. In a typical commercial run, the production of second quality fabric, due largely to slipping of rayon threads, was reduced from a normal of 20% to 2% with the use of a cellulose coating applied in alkali metal zincate solution as described herein.

Suitably the fabric after being coated, washed and dried, is given a second treatment of the same kind. The double coating effected with tentering in each instance ensures closing the spaces within the elongated loops with cellulosic material and producing a satisfactory finished product.

The invention will be further illustrated by description in connection with the following specific examples.

Example 1

A Raschel fabric of the described structure and consisting of viscose rayon is padded through a cellulose-sodium-zincate solution made as described in Patent 2,322,427, issued to me on June 22, 1943, and entitled Cellulose product. The solution used in this example was made from approximately 5% sulfite wood pulp, 8% caustic, 2.9% zinc oxide, and water to make 100%. Temperature of treatment of the fabric is room temperature. After padding, the fabric is passed into a bath of 5% sulfuric acid and allowed to remain until the alkali is thoroughly neutralized. The fabric and adhering precipitated cellulose is then rinsed thoroughly, passed through soda ash or ammonia to remove remaining acid, and then rinsed again. The fabric is then pulled out and dried on a tenter frame so that the loops 3 and 4 are fully elongated. The fabric made by this treatment will show an increase in strength, will have a certain amount of stiffness, and on being wet with water or soap will not revert to its original shape, that is, the hexagonal meshes will remain substantially the same.

Example 2

Same as Example 1, but the fabric used is one made of cotton, nylon, acetate rayon, silk or wool. When the fabric is made of silk, wool, nylon, or other material dissolved or weakened by alkali, the treatment with the alkaline sodium zincate solution of cellulose should be very brief and should be followed immediately by the acid treatment to neutralize alkalinity. Otherwise the procedure is as described under Example 1.

Example 3

Fabrics of Examples 1 and 2 are pulled out so that the mesh has the hexagonal shape. The fabric is then passed through the cellulose and zincate solution while the fabric is in this tented condition, then immediately into the acid. The fabric is then washed as above but may be dried without further tentering since the hexagonal shape was preserved by the setting with acid.

Example 4

Raschel knitted cotton fabric is padded through the cellulose-zincate solution and is then tented to width, to form the elongated loops and hexagonal meshes. It is then dried on a tenter in this position. After drying the fabric is neutralized in acid, washed, etc. By this method the hexagonal shape of the meshes is preserved and the fabric may be finally dried either with or without framing. This method is not generally applicable to fibers other than cotton unless the time of first drying is very rapid.

Example 5

The procedure of any of the above examples is followed except that there is used in place of cellulose an alkali soluble and alkali stable cellulose ether dissolved in caustic soda solution. As an example, a solution containing 6% of hydroxyethyl cellulose dissolved in an 8% sodium hydroxide solution and having a viscosity of 1000 centipoises is applied to the Rashel fabric, the ether precipitated with an excess of dilute acid, and the product is washed with water, an antacid (usually a dilute solution of sodium carbonate), and then again with water, and dried, the product being tentered during drying or an earlier stage of the treatment.

Because of the special effect of closing and strengthening the loops in Rashel knitted fabric without closing the meshes, the invention is particularly applicable to such fabric. Some of the present results are obtained when the method is applied to other types of fabrics including conventional knitted or woven fabrics, provided the coated fabric is tentered at the time the cellulosic material is precipitated on the fabric or during a subsequent step. Thus, it is possible to treat a common kind of knitted or woven mesh curtain to establish the dimensions of it so that a curtain or other article made of the tested fabric may be laundered without particular care to establish the size of the curtain during the laundering and subsequent drying operation.

It will be understood also that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

More particularly, it will be understood that potassium or other alkali metal may be substituted for sodium in the zincate and also in the sodium hydroxide solutions referred to herein. The sodium compounds have been used in the description, as the cheapest as well as satisfactory representatives of the alkali metal compounds.

What I claim is:

1. An article of manufacture comprising a knitted fabric having spaced series of warp threads and substantially closed loops extending from one of said series and interlaced with the threads of an adjacent series, so as to limit movement away from each other of the series of warp threads, the loops being in elongated condition so that the two sides of each loop are in close proximity to each other, and a cellulosic film bridging the space within the elongated loops, holding together the two sides of the loops, restricting movement of warp threads within the loops under ordinary conditions of use and laundering and serving to set the shape of meshes in and approximate width of the fabric but not closing the meshes in the fabric.

2. The article described in claim 1, the cellulosic material of the said film being cellulose.

3. The article described in claim 1, the cellulosic material of the said film being an alkali stable cellulose ether.

4. The method of making the article described in claim 1 which comprises applying a cellulosic coating over threads of the fabric and drying the thus coated fabric, the fabric being tentered during at least one stage of the treatment described.

5. The method of making a coated knitted fabric which comprises applying an alkaline solution of a cellulosic material to a knitted fabric having spaced series of warp threads and substantially closed loops extending from one of said series and interlaced with the threads of an adjacent series, so as to limit movement away from each other of the series of warp threads, the loops being in elongated condition so that the two sides of each loop are in close proximity to each other, acidifying the thus treated fabric to cause precipitation of the cellulosic material on the fabric, and washing and drying the resulting product, the fabric being tentered at some stage in the operation beginning with the precipitation of the cellulosic material.

6. The method of making a coated knitted fabric which comprises applying a solution of cellulose in alkaline sodium zincate solution to a knitted fabric having spaced series of warp threads and substantially closed loops extending from one of said series and interlaced with the threads of an adjacent series, so as to limit movement away from each other of the series of warp threads, the loops being in elongated condition so that the two sides of each loop are in close proximity to each other, precipitating cellulose from the applied solution upon the fabric, and washing and drying the product, the fabric being tentered at some stage in the operation beginning with the precipitation of the cellulose.

7. The method of making a coated knitted fabric which comprises applying a solution of a water insoluble, alkali soluble and alkali stable cellulose ether in sodium hydroxide solution to a knitted fabric having spaced series of warp threads and substantially closed loops extending from one of said series and interlaced with the threads of an adjacent series, so as to limit movement away from each other of the series of warp threads, the loops being in elongated condition so that the two sides of each loop are in close proximity to each other, precipitating the cellulose ether from the applied solution upon the fabric, and washing and drying the product, the fabric being tentered at some stage in the operation beginning with the precipitation of the cellulose ether.

8. The method of making a coated knitted fabric which comprises applying a solution of cellulose in alkaline sodium zincate solution to a knitted fabric having spaced series of warp threads and substantially closed loops extending from one of said series and interlaced with the threads of an adjacent series, so as to limit movement away from each other of the series of warp threads, the loops being in elongated condition so that the two sides of each loop are in close proximity to each other, precipitating cellulose from the applied solution upon the fabric, and washing and drying the product, the fabric being tentered during the drying operation.

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