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2,177,586

FABRIC AND PROCESS FOR MAKING THE SAME

Filed Sept. 21, 1938

2 Sheets-Sheet 1

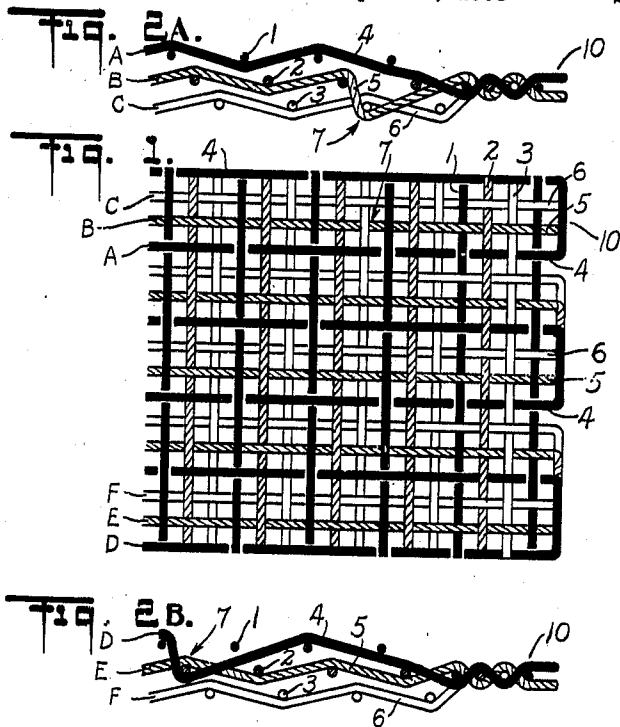


Fig. 3.

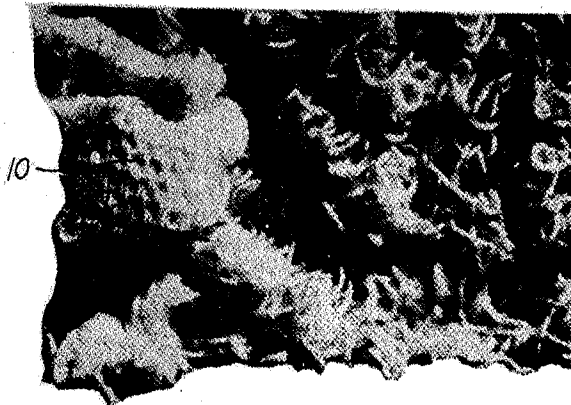


Fig. 4.



Fig. 4A.



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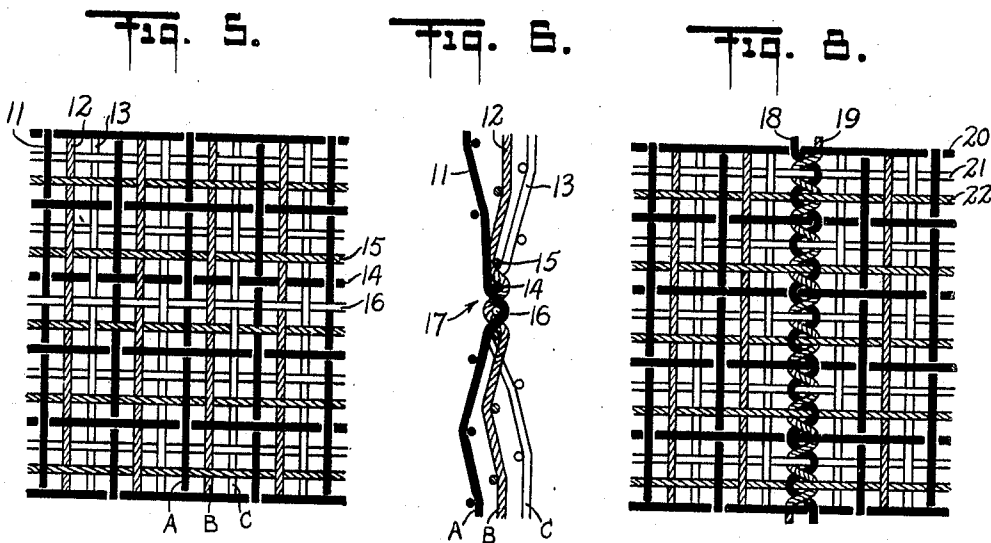
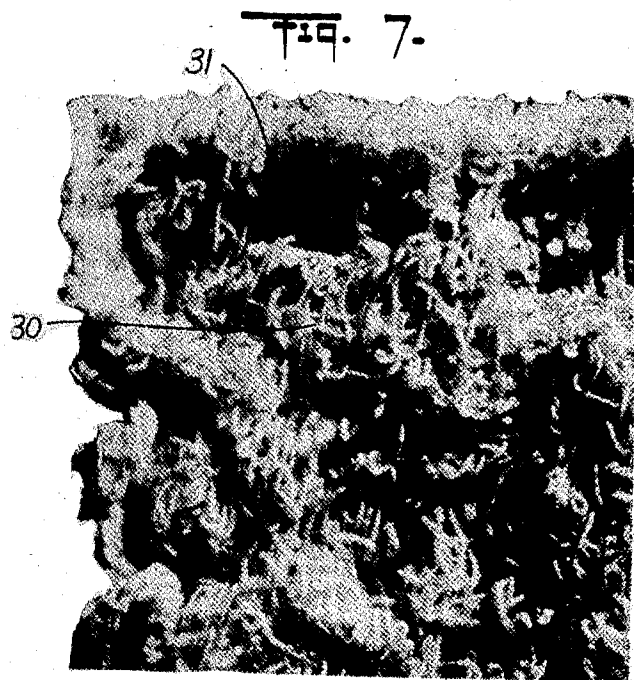
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FABRIC AND PROCESS FOR MAKING THE SAME

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2 Sheets-Sheet 2



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FABRIC AND PROCESS FOR MAKING THE SAME

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Application September 21, 1938, Serial No. 230,910

6 Claims. (Cl. 139—408)

This invention pertains to a novel fabric and to a process for making the same, and more particularly to a fabric having a relatively large bulk (i. e., occupying a relatively large space) per unit weight of the fabric, and to a process for manufacturing such a fabric.

It is often desirable to have a fabric in which the bulk is large for the actual body of the material, i. e., the number of threads per inch making up the fabric. Such cloth has many uses, such, for example, as for bandages, surgical dressings (where absorbent materials are needed); for curtains where non-transparent material is needed which will not interfere with air circulation and which is capable of easy draping; for summer wear such as in beach robes, lounging robes, etc.; and also for blankets for covering purposes and many other uses.

One of the objects of the invention is to provide an improved cloth having relatively large bulk for the actual body of the material.

Another object is to provide an improved process for manufacturing such cloth.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings, which show views of several modifications of cloth embodying the inventions and which show the cloth in various stages of manufacture,

Figure 1 is a diagrammatic view of a multi-ply fabric at one stage in the process of manufacture;

Figure 2A is a composite cross-section thereof taken on lines A, B and C to show the weft threads of the top, intermediate and bottom plies, respectively;

Figure 2B is another composite cross-section thereof taken on lines D, E and F showing weft threads of the plies in the same order as shown in Figure 2A;

Figure 3 is a magnified plan view taken from a photograph of a fabric embodying the invention and made in accordance with the process embodying the invention and showing the cloth of Figure 1 at a later stage in the process of manufacture;

Figure 4 is a magnified sectional view taken from a photograph of the material shown in Figure 3;

Figure 4A is an enlarged diagrammatic view of a cross-section of the cloth shown in Figure 3;

Figure 5 is a diagrammatic view of another multi-ply fabric at the same stage in the process of manufacture as shown in Figure 1 but woven differently from that shown in Figure 1;

Figure 6 is a composite cross-section of the fabric shown in Figure 4 taken on lines A, B and C of the warp threads of the top, intermediate and bottom plies respectively;

Figure 7 is a magnified plan view taken from a photograph of a fabric embodying the invention, the fabric being the same as that shown in Figure 5 but after further processing; and

Figure 8 is a diagrammatic view of another fabric in the same stage of the process as that shown in Figure 1.

Corresponding reference characters refer to corresponding parts throughout the several views of the drawings.

Referring to Figure 1, the cloth there shown is what is commonly known as multi-ply cloth, i. e., it is woven in such a way that a plurality of plies are formed, the plies having common selvages 10, and each of the plies being tied together, as by warp tie-ins in the well-known manner. This construction is shown in Figures 2A and 2B wherein there are three sets of warp threads, 1, 2 and 3, representing respectively the warp of the top, middle and bottom plies. The weft or filler threads of the respective top, intermediate and bottom plies are shown at 4, 5 and 6, respectively. In the present embodiment this cloth is preferably woven in such manner that the tie-ins are made at regularly spaced points as indicated at 7 in Figures 2A and 2B so that in subsequent processing the various plies are held together and support one another.

The fabric shown is a plain weave construction and is such that each ply has a relatively large open mesh structure. Thus, each ply may be formed of threads of from numbers 20 to 60 English or higher, and, for example, a construction of 12 x 8 threads per inch. The yarn used may have a normal twist in contradistinction to a hard twist. For example yarn having a twist of 4 to 4.5 D may be used, although higher or lower twists may be used where desired. Thus the open mesh in each ply has a width much greater than the diameter of the threads.

This construction gives each ply a coarse and loose character and the cloth in this stage has relatively little body or bulk, and little solidity. Although the plies are interlaced by the warp threads, the construction is so loose the various plies may slide slightly with respect to each other. This renders the fabric capable of responding to a subsequent contracting step in the manufacturing process because the construction is such that the warp and filler threads are not tied to each other, but on the contrary each warp may easily move crosswise of associated weft strands, and vice versa, to permit the warp and weft threads to independently contract by looping at random.

The next step in the process of forming my new fabric is to treat the fabric just described to produce a relatively large so-called "contracting" of the warp and filler threads, the contracting being produced in such a way that each warp and filler

thread "contracts" independently of the other warp and filler threads, so that they all curl or loop in different directions and out of the plane of their respective plies to form a fabric that looks and feels somewhat like terry cloth.

Thus by the term contracting, as referred to herein, is meant that action which causes the threads to assume looped or curled conditions which are natural to the threads when exposed to some medium that thoroughly wets the threads such, for example, as hot soapy water, while the threads are in an untensioned state.

In this kind of contracting each length of warp between the adjacent filler threads is free to leave the plane of the particular ply in which the warp lies and to loop or tend to loop, as shown in Figures 3 and 4. The same action or shrinking applies to the weft strands. The loose mesh construction of the several plies permits this kind of contracting because of the relatively long lengths of the strand between the two adjacent cross strands under which the strand passes as compared with the thread or strand diameters. Thus, although the contracting effectively brings closer together the crossing points of the strands in each ply, it may not close up the fabric because of the looped and/or crinkled nature of the threads between the crossing points and because as to each ply the crossing points may still be relatively far apart, i. e., the effective meshes may still be relatively large although covered by the random positions of the loops and crinkles of the warp and filler threads.

Referring to Figures 4 and 4A, the loops and crinkles of the warp and filler threads of one ply extending into and contacting the loops and crinkles of the warp and filler threads of adjacent plies serve to give the fabric thus formed greater solidity than that existing in the fabric as shown in Figure 1.

Thus this contracting converts the transparent non-bulky and non-solid fabric shown in Figure 1 into a fabric which has a greatly increased bulk or thickness, as shown in Figures 3 and 4. The resulting fabric also has an appreciable bulk for the relatively light body of the fabric. Further, the fabric is soft and relatively solid. In this way cloth having these highly desirable characteristics or properties is formed inexpensively because of the small amount of bulk and because the loose construction of the various plies makes possible obtaining such contracting as described with only normally twisted thread and without the need of threads having a higher twist.

One satisfactory method of producing such contracting of the fabric as is desired is by the known method of agitating the cloth in a hot water bath containing among other ingredients soap. This may be carried out in a closed container partially filled with the hot soapy water, the container being mounted for agitation on suitable shaking apparatus or rotary motion which causes the cloth to slap against the sides of the container under the weight of the cloth. Due to the kind of loose construction of the fabric, as above described, the warp and weft threads, even though having only normal twist, contract at will to loop as shown in Figures 3, 4 and 4A, and in so contracting produce the above described bulky fabric. Such treatment causes a resultant overall contraction of the cloth, as shown in Figure 1, of at least 30%.

After the cloth has been thus treated it is dried in such a manner as not to remove the contracting produced by the above described process.

With reference to the construction of the fabric discussed in Figure 1, the number of threads per inch in each ply may be reduced, but as they are reduced it may be desirable to increase the number of plies to maintain about the same body or total number of threads per inch in the cloth. Or if it is desired to further increase the bulk of the finished cloth and at the same time to increase the number of threads per inch of the cloth, the number of plies may be increased without increasing the number of threads per inch in each ply.

And contrariwise, if desired, the body of the fabric may be increased by increasing the number of threads per inch in each of the plies of the fabric as shown, but the amount that the threads per inch can be increased is limited by the open mesh construction required in the contracting operation to permit the warp and weft threads to assume their loose looped or kinked positions. If the mesh construction is made too close the warp and weft strands instead of contracting, as described, simply shrink slightly in straight paths, being held in the plane of the fabric by the weave construction. Thus the construction of threads per inch with respect to the diameter or count of the thread cannot be changed to the point of preventing the formation of the loose loops of the strands as above described.

Further, the weave may be varied in the several plies; thus, for example, it may not be necessary to use as many filler threads in the intermediate plies as in the outer plies to reduce the cost of manufacture, or use more warp threads to increase the bulk and give greater production of the loom. The weave may thus be varied so long as it is not of such a character as to prevent the random looping of the threads as above described. Further, the weave may be varied when desired to float the warp threads on either side of an intermediate ply, the warp threads being tied in as shown in Figure 5.

Referring to Figure 5, there is shown another embodiment of the invention in which the multi-ply cloth is woven in a different manner. In this modification the three sets of warp, 11, 12 and 13, are repeatedly tied in only at spaced intervals by the weft threads 14, 15 and 16, to form what might be called intermediate selvages generally indicated at 17. With this construction the cloth has more solidity and the warp threads are held in a more nearly aligned position during the subsequent contracting operation.

When this fabric is subjected to the contracting action, as above described, the resulting cloth has a ribbed appearance, as shown in Figure 7, the raised parts of the ribs being indicated at 30 and the valleys at 31. The ribbed appearance may be varied as desired by varying the spacing or width of the selvages.

Referring to Figure 8 there is shown another modification of a multi-ply fabric which may be contracted as described. In this fabric the various plies are tied together by leno warp threads 18, 19 which tie in along spaced paths some or all of the filler threads 20, 21, 22. These leno threads may be used to control the amount of contracting as above described. Thus, leno threads having a high twist may be used to aid in causing greater contraction, or medium twist leno threads may be used to limit the natural contraction; and leno threads having a sub-normal twist may be used to still further limit the natural contraction. Furthermore, these leno threads may be used when desired in the selvage

formed during weaving between portions of the fabric to prevent undesired crinkling of the selvage during the contracting of the body of the fabric.

5 Fabric such as shown in Figure 8, when subjected to the contracting action above described results in a cloth which also has a ribbed appearance such as that shown in Figure 7, and the ribbed appearance may be varied by varying 10 the application of the leno threads and the twist of the leno threads used.

Cloth embodying the invention and made in accordance with the process is particularly adapted for bandages and for surgical absorption pads. The highly porous nature of the cloth 15 makes it permeable. The looseness of the thread construction plus the fact that it has had the hot soap and water treatment as well as treatments which result in the extraction of foreign materials, such as sizing, as well as materials 20 naturally contained in the fibres (which materials it is desirable to remove for the production of nearly pure fibre) and the fact that the cloth is made from yarns of normal twist, renders the threads highly absorbent and soft. Hard twists 25 result in wiry cloth.

As various embodiments might be made of this invention, and as various changes might be made in the construction herein described, all without departing from the scope of the invention, 30 it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

35 I claim:

1. As an article of manufacture, a fabric having a large bulk per unit of weight, comprising at least three plies having common selvages, formed from cotton thread having a normal twist of from about 4 to 4.5 and from threads 40 of numbers from 20 to 60, the construction of each ply being approximately 12 x 8 threads per inch, and the plies being interwoven only at spaced intervals with respect to each other and individual threads of the respective plies being 45 independently looped out of the planes of the plies in a random manner and intermingled with looped threads of adjacent plies to give the cloth a bulky solid expansive characteristic.

50 2. As an article of manufacture, a cloth having a large bulk per unit of weight, said cloth comprising a plurality of plies having common selvages and being interwoven at spaced intervals only and woven principally from light cotton warp and weft threads, said warp threads 55 being of substantially equal length and said weft threads being of substantially equal length, and the arrangement of the warp and weft threads in each ply being of open mesh weave and being characterized by individual random looping of 60 the threads out of the planes of the respective plies caused by the threads tending to assume a naturally less twisted condition while wetted and untensioned, and the construction of said plies being so loose as to permit and facilitate 65 said looping produced by said wetting treatment.

70 3. As an article of manufacture, a cloth having a large bulk per unit of weight, said cloth comprising a plurality of plies having common selvages and being interwoven only at spaced intervals and woven principally from light cotton warp and weft threads of normal twist, said warp threads being of substantially the same

length, and the arrangement of the warp and weft threads in each ply being of open mesh weave and being characterized by individual random looping of the threads out of the planes of the respective plies to form a solid bulky cloth, and the construction of said plies being so loose (in the neighborhood of 12 x 8 threads per inch) as to permit said individual looping of the threads.

4. As an article of manufacture, a fabric 10 formed from a grey cloth woven principally from light cotton warp and weft threads of about normal twist and comprising a plurality of plies having common selvages and being interwoven only at spaced intervals, and the warp threads 15 thereof being of substantially equal length and each of the plies being of a plain open mesh weave and having a loose construction such that individual threads thereof may be looped out of the planes of the plies by contracting the grey cloth by the application of hot soapy water while in an untensioned condition; said fabric being 20 characterized by the fact that the warp and weft threads of the plies are so looped, some of them extending from the planes of their respective plies into the planes of the other plies and intermingling with the looped threads thereof and some of which, in addition to those extending into and intermingling with the looped threads 25 of adjacent plies, are looped over threads of adjacent plies, so as positively to tie the plies together.

5. The process for manufacturing a cloth having relatively large bulk in comparison with its body, comprising weaving a plurality of plies from 35 cotton yarn having a twist of from 4 to 4.5 and from numbers which may vary from 20 to 60, the plies each being woven in a plain weave and each ply having a grey cloth construction of approximately 12 x 8 threads per inch, the plies 40 having common selvages and being interwoven only at spaced intervals with respect to each other, subsequently subjecting the cloth thus formed to a hot soapy water bath to contract the fabric by causing the individual threads of the respective plies to independently loop out of 45 the planes of the respective plies and to intermingle with the threads of the adjacent plies to increase the bulk and solidity of the cloth, and subsequently drying the cloth thus contracted in such manner as to leave the loops in the threads in the final product.

6. A process of manufacturing a cloth having a large bulk per unit of weight which comprises the steps of weaving a plurality of plies from 55 light cotton warp and weft threads of about normal twist, said plies having common selvages and being interwoven only at spaced intervals and the warp threads thereof being of substantially the same length, each ply having a grey cloth construction of open mesh weave and sufficiently loose that in a subsequent contracting operation the individual threads thereof may loop out of the plane of each ply, subsequently 60 subjecting the cloth to a water treatment while untensioned to wet the threads thereof to release their natural tendency to loop to cause them individually to loop out of the planes of the respective plies and contract the fabric, and subsequently drying the cloth in such manner as to 70 leave the loops in the threads in the final product.

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