Aug. 20, 1940. F. B. VOEGELI 2,211,841

FABRIC AND METHOD OF MAKING SAME

Filed Jan. 5, 1939 2 Sheets-Sheet 1

Fig. 1.

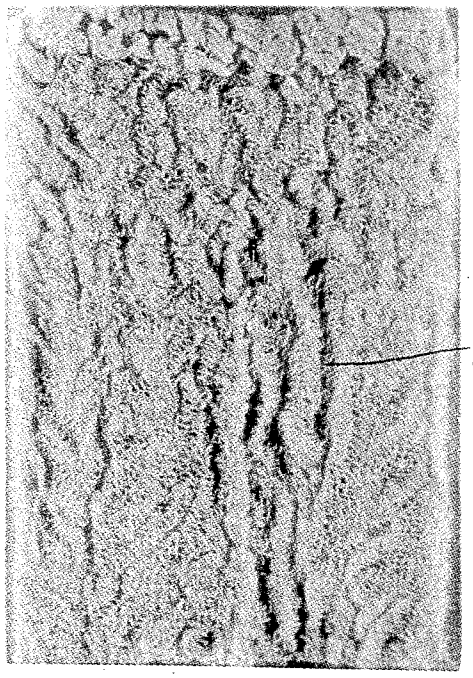


Fig. 2.

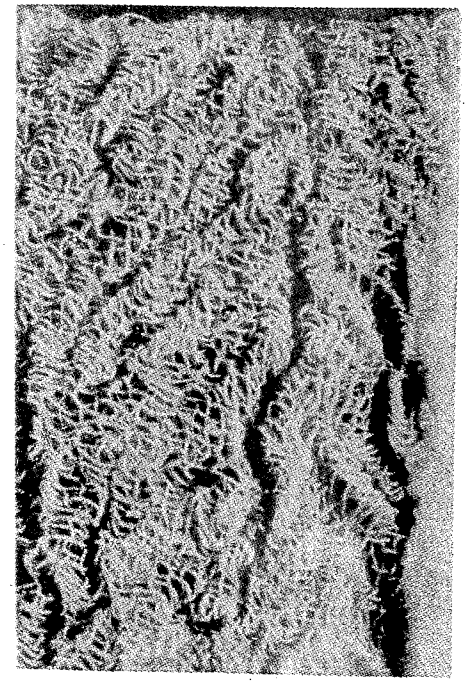
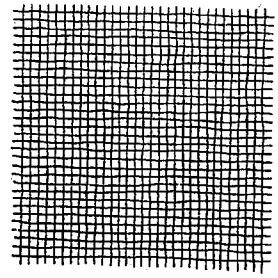


Fig. 3.



Fig. 4.



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Fig. 5.

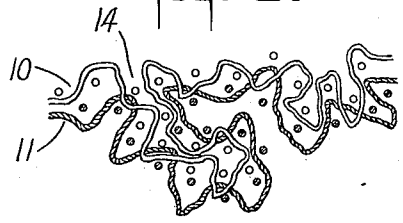


Fig. 6.

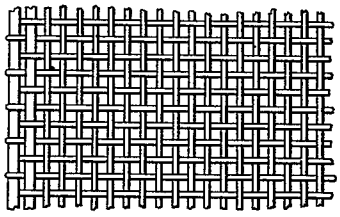


Fig. 6A.

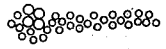


Fig. 7.

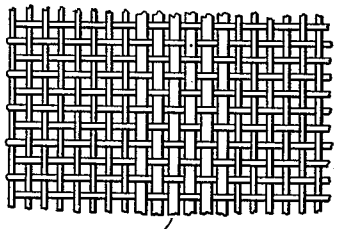


Fig. 7A.

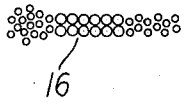


Fig. 8.

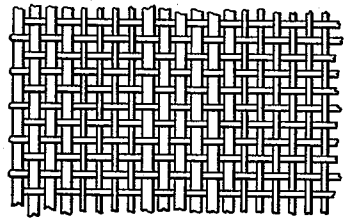
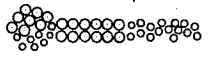


Fig. 8A.



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2,211,841

FABRIC AND METHOD OF MAKING SAME

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Application January 5, 1939, Serial No. 249,366

8 Claims. (Cl. 154—2)

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

One fabric having a relatively large bulk per unit of weight is described in Secrist Patent 2,081,370 and may be made by first forming a fabric of a "loose" construction and subsequently contracting the fabric to cause the threads comprising the fabric to loop at random out of the plane of the fabric so that the resulting fabric is of relatively bulky, soft, pliable construction. However, the flimsy nature of the fabric before the contracting operation makes it difficult and relatively uneconomical to process it. Further, even the finished cloth is without body and strength and even though it may be folded upon itself or doubled with another layer to give it more body, such procedure is relatively unsatisfactory inasmuch as the various layers are not joined together and care must be taken in their use to keep them from separating.

It is an object of the present invention to provide a new type of such cloth wherein several layers of loosely constructed cloth are combined and processed simultaneously to form a single fabric having a construction which is relatively bulky and yet soft and pliable.

Another object is to provide a novel process for economically manufacturing such cloth.

In the drawings:

Figure 1 is a plan view made from a photograph of a fabric embodying the invention;

Figure 2 is an enlarged view made from a photograph of a section of Figure 1 showing the loops of individual threads and the folds of the fabric;

Figure 3 is an enlarged view made from a photograph of a cross-section of the fabric shown in Figure 1;

Figure 4 is a diagrammatic view showing the weave of the cloth forming each ply of the fabric of Figure 1;

Figure 5 is a diagrammatic cross-sectional view showing the folding or kinking of the fabric of Figure 1;

Figure 6 is a diagrammatic view showing one type of selvedge that can be used in each of the plies making up the finished fabric;

Figure 6A is a diagrammatic cross-sectional view of the fabric of Figure 6 combined in two layers and after having been subjected to the contracting operation;

Figure 7 is a diagrammatic view showing another type of selvedge that can be used in each of the plies making up the finished fabric;

Figure 7A is a diagrammatic cross-sectional view of the fabric of Figure 7 combined in two layers, and after having been subjected to the contracting operation;

Figure 8 is a diagrammatic view showing another type of selvedge that can be used in each of the plies making up the finished fabric; and

Figure 8A is a diagrammatic cross-sectional view of the fabric of Figure 8 combined in two layers, and after having been subjected to the contracting operation.

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

Referring to Figures 1, 2 and 3, the cloth there shown comprises two plies 10 and 11, each ply being formed from a fabric which has a "loose" construction and which have been simultaneously treated while in contact with each other so that the individual weft and warp threads making up the plies are looped out of the plane of their respective plies so as to extend into and interengage with similar loops of threads of the adjacent plies. Further, the treatment is such as to produce random folds in the plies as indicated at 14. With this construction the plies form effectively a single fabric, which fabric by reason of its structural nature, is bulky and soft and retains its multi-layer character in use.

Referring to Figure 4, the cloth above described may be made up from any number of a plurality of plies (two in the present embodiment). Each ply is preferably of a plain or drill construction, or any other suitable weave that permits free random looping of the weft and warp threads. Furthermore, the thread construction is preferably loose. By this term I mean that the warp and weft threads are sufficiently spaced from each other so that in a subsequent contracting operation to be described, the warp and weft threads may loop at random out of the planes of the cloth that they form. I have found that such loose constructions may vary from 12 x 8 threads per inch up to, for example, 36 x 32 threads per inch. The yarn numbers may vary from #20 to #60 (or higher) English, and the twists of the thread may be only normal, it being understood, however, that higher twists may be used if desired, although the use of higher twists of course increases the cost of the cloth.

Fabric plies, thus formed, are next laminated while in their "gray" condition and preferably with the warp threads still containing starch siz-

ing customarily applied to warp threads. This may be accomplished by passing the plies one on top of the other between rubber rollers and simultaneously wetting the plies so that the sizing, being moistened, becomes sticky and holds together the individual plies. The plies thus stuck or held together act as a single fabric in the subsequent operations.

Under conditions where less than the usual sizing has been used in the warp threads, it may be desirable to increase the body adhesion between the adjacent plies by slightly roughing up the threads of each ply as by passing the individual plies over sand rolls of known type or by calendering or chasing the plies and then wetting them before the above-described rolling operation.

After the plies have thus been rolled together to form a unit fabric, the fabric is put into rope form as by passing it through a pot eye. In the present embodiment the contracting is carried out in a batch operation and consequently the next step is to cut the fabric in its rope form. The length of each piece is proportioned to the capacity of the laundry washer, or dolly, used for carrying out the next step of the process. The length of the pieces may vary anywhere from 60 to 200 yards, and each piece is formed into a bundle which is securely but loosely tied.

The fabric pieces are next put in a rotary laundry washer, or dolly, containing, among other ingredients, hot soapy water. This laundry washer, or dolly, is partially filled with the hot soapy water and is so constructed that it causes the fabric therein to slope or fall against the sides of the container under the weight of the cloth. During this operation the so-called contracting takes pplace. During this contracting the warp and filler threads loop independently of each other and of other warp and filler threads so that all the threads curl and 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. During this process, the cloth folds or kinks at random as shown at 14 in Figures 1 and 5.

This kind of contracting is produced by causing each free length of warp between the adjacent filler threads to loop so as to leave the plane of the particular ply in which the warp lies. The looping is probably caused by the natural tendency of the threads to untwist while in a wet loose condition and the construction of the cloth is such as to permit such untwisting action to take place. The same action takes place in the weft strands. In addition, in spots or areas the resulting contracting produces folds in the cloth.

The loose mesh construction of the several piles permits this type of contracting because of the relatively long length of the strands between adjacent cross-strands. Thus, although this contracting effectively brings closer together the crossing points of the strands in each ply, it does not close up the fabric in the sense that a duck fabric is closed because of the looped and/or crinkled nature of the threads between the crossing points, and because as to each ply the crossing points are still relatively far apart, i. e., the effective meshes are still relatively large although covered by the random formation of the loops of the warp and filler threads.

The length of time that the cloth is thus tumbled is arbitrary, but as a general rule the longer the tumbling the greater the amount of contracting.

The hot soapy water may now be drawn off from the washer and the cloth while in the washer may be rinsed with cooler water, after which operation the sizing or starch may be removed from the warp threads by the well-known enzym or acid treatments. This step takes a relatively short time and after the fabric is again rinsed it is preferably bleached by introducing a bleaching bath into the washer which bath has a caustic soda base. During the bleaching the presence of the caustic may produce still further contracting. After the bleaching operation the fabric may be again rinsed and if it is to be used for the purposes demanding chemical purity it may be treated in the known ways to remove all chemical impurities.

The cloth is then taken from the washer, laid on racks to allow the water to drip or drain out of the cloth. It is then placed in a centrifuge to remove most of the excess moisture. This step leaves the fabric damp. Each fabric piece now comprising two layers secured together by the contracting operation is opened by hand and is preferably dried on a pin frame in such manner that the cloth is not over-stretched so that when dried the folds and the loops of the threads remain in the cloth as shown in Figures 1, 2 and 5.

Referring to Figures 6, 7 and 8 there is shown different types of selvedges which may be advantageously used in making up cloth embodying the invention. In Figure 6 the selvedge shown is an ordinary plain selvedge. This selvedge will tend to roll during contracting process as shown in Figure 6A.

In Figure 7 a ply is shown woven with a tape selvedge as indicated at 16 about an inch in from the regular selvedge. During the shrinking operation the regular selvedge will roll up to the point of the tape selvedge, as shown in Figure 7A, thus providing a firmer bond between the plies making up the final fabric. The tape selvedge controls the amount of such rolling up.

In Figure 8 a ply is shown which has a very narrow tape selvedge at the end and a wider tape selvedge spaced inwardly about an inch from the outer selvedge. During the contracting operation the narrow tape selvedge will roll up tightly to the wider tape selvedge as shown in Figure 8A.

Further, by providing the selvedges as shown in Figures 7 and 8, the wide selvedge in such instances may serve as bands to which the pins of the drying frame are attached.

Such fabric as shown in Figure 1 may be formed not only of cotton, but also of other fiber materials.

I claim:

1. As an article of manufacture, a multi-ply fabric having a bulky open-meshed structure, and comprising a plurality of fabric plies each ply being formed from grey cloth having a loose construction such that in a subsequent contracting operation individual threads between cross threads may loop out of the plane of the ply, and the adjacent plies being caught together by said individual threads of the respective plies looping out of the planes of the plies in a random manner and intermingling and interlocking with similarly looped threads of adjacent plies and by random folds formed in the fabric by the said contracting operation.

2. As an article of manufacture, a multi-ply fabric having a bulky open-meshed structure, and comprising a plurality of plies each ply be-

ing formed from a grey cloth having a construction of not less than 12 x 8 and not more than 36 x 32 threads per inch and formed of threads having normal twist and such that in a subsequent contracting operation individual threads between cross threads may loop out of the plane of the ply, and the adjacent plies being caught together by said individual threads of the respective plies looping out of the planes of the plies in a random manner and intermingling and interlocking with similarly looped threads of adjacent plies and by random folds formed in the fabric by the looping of the threads of the respective plies.

3. As an article of manufacture, a multi-ply fabric having a bulky open-meshed structure, and comprising a plurality of plies, each ply being formed from a grey cloth having a construction of not less than 12 x 8 and not more than 36 x 32 threads per inch and formed of threads having normal twist and such that in a subsequent contracting treatment individual threads between cross threads may loop out of the plane of the ply, and each ply in the grey cloth having a selvedge of tape formation spaced inwardly from the extreme selvedge of the ply, and the adjacent plies being caught together by the individual threads of the respective plies looping out of the planes of the plies in a random manner and intermingling and interlocking with similarly looped threads of adjacent plies and by random folds formed in the fabric during said contracting treatment, and by the rolling of the selvedges beyond the tape selvedges.

4. As an article of manufacture, a multi-ply fabric having a bulky open-meshed structure, and comprising a plurality of plies, each ply being formed from a grey cloth having a loose construction of not less than 12 x 8 and not more than 36 x 32 threads per inch and formed of threads having normal twist and such that in a subsequent contracting treatment individual threads between cross threads may loop out of the plane of the ply, and the selvedge of each ply in the grey cloth having a narrow tape formation at the extreme selvedge and a wider formation spaced inwardly from the first tape formation, and the adjacent plies being caught together by the individual threads of the respective plies looping out of the planes of the plies in a random manner and intermingling and interlocking with similarly looped threads of adjacent plies, by random folds formed in the fabric during the contracting treatment, and by the rolling together of the narrower tape formation selvedges.

5. The process of manufacturing a multi-ply fabric which comprises rolling together a plurality of plies of grey cloth each ply having a loose construction such that in a subsequent contracting treatment individual threads thereof may loop out of the plane of the ply, submitting the fabric thus formed while in an untensioned condition to a contracting operation to cause individual threads of each ply to loop out of the plane of the ply and intermingle and interlock with similarly looped threads of adjacent plies and to cause random folds to occur in the fabric, and drying the fabric thus formed without removing the looping and folds.

6. The process of manufacturing a multi-ply fabric which comprises simultaneously moistening and rolling together a plurality of plies of grey cloth each ply having a loose construction such that in a subsequent contracting treatment individual threads thereof may loop out of the plane of the ply, subjecting the fabric thus formed to a contracting operation to cause the individual threads of each ply to loop out of the plane of the ply and intermingle and interlock with similarly looped threads of adjacent plies and to cause random fold formations to occur in the fabric, removing sizing from the cloth, and drying the fabric thus formed without removing the random loop and fold formations.

7. The process of manufacturing a multi-ply fabric which comprises individually treating plies of grey cloth having a loose construction such that in a subsequent contracting treatment individual threads may loop out of the plane of the ply to present a fluffed-up surface, rolling together the plies thus fluffed-up to hold the plies together for a subsequent operation, subjecting the fabric thus formed to a contracting operation to cause said individual threads of each ply to loop out of the plane of the ply and to cause random folds to occur in the fabric, and drying the fabric thus formed without removing the loops or the folds.

8. The process of manufacturing a multi-ply fabric which comprises simultaneously moistening and rolling together a plurality of plies in their grey cloth condition, each ply having a loose construction such that in a subsequent contracting treatment individual threads may loop out of the plane of the ply, subjecting the fabric thus formed while in a loose condition to the action of hot soapy water to contract the fabric to cause the individual threads of each ply to loop out of the plane of the ply and intermingle and interlock with similarly looped threads of adjacent plies, removing sizing from the cloth, subjecting the fabric thus shrunk to the bleaching action of a bleaching solution having a caustic soda base, and drying the fabric thus formed without removing the loops or the folds.

FREDERICK B. VOEGELI.

CERTIFICATE OF CORRECTION.

Patent No. 2,211,841. August 20, 1940.

FREDERICK B. VOEGELI.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 11, before and after the word "contracting" insert quotation marks; page 2, second column, line 16, strike out "che" before "purposes"; line 35, before "contracting" insert --the--; line 39, for "shrinking" read --contracting--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of September, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)