Patented Dec. 12, 1939

2,182,882

UNITED STATES PATENT OFFICE

2,182,882

PROCESS OF MAKING MULTI-PLY WOVEN FABRICS

Thomas Lewis Shepherd, London, England

No Drawing. Original application February 28, 1936, Serial No. 66,310. Divided and this application September 8, 1936, Serial No. 99,857. In Great Britain June 27, 1934

5 Claims. (Cl. 154—2)

This application is a division of my application No. 66,310, filed February 28, 1936.

This invention relates to the manufacture of fabrics for use more particularly in the making of collars, cuffs, shirts, table-cloths, napkins, millinery and the like.

The object of the invention to be hereinafter described is to provide a multi-ply fabric which will be permanently stiff when dry, whereby any necessity for the continual starching operation when the fabric or article made therefrom has to be washed and laundered is eliminated.

The present invention consists in a process of making multi-ply fabrics adapted for the manufacture of collars, cuffs, shirts, table-cloths, napkins, millinery and the like, comprising immersing the plies of fabric in a cuprammonium solution of cellulose which, if desired, may have a solvent action on the fabric, pressing the plies thus treated together, and treating the multi-ply fabric obtained in a coagulating bath so that the cellulose is precipitated and becomes intimately associated with the fibres of the fabric, thus securely uniting the plies together and enabling the fabric obtained or articles made therefrom to withstand laundering or cleaning operations without losing the properties imparted to them by such treatment whereby starching or sizing of the fabrics or articles is rendered unnecessary.

In carrying the invention into effect, the material may be given any desired degree of stiffness and it can afterwards be washed and ironed, if necessary, in the usual manner. Whereas previously a washed fabric is in a condition of limpness after drying, by the process according to the invention the fabric regains on drying its original stiffness, thus eliminating any necessity for a starching or stiffening operation during the process of laundering. Likewise the material made by the process according to the invention may be subjected to any normal cleaning process, such for example as "dry cleaning" and on drying the original stiffness will be regained. Moreover, the permanently stiffened material will be capable of absorbing a dye, in the same way as a normal fabric and take any desired colour.

In carrying the invention into effect a cuprammonium solution containing cellulose, is made to any desired strength. Each of the plies of the fabric treated are passed through a bath containing this solution and the saturated or partly saturated material is then treated in a squeezing device which serves both to increase the penetration of the solution into the fibres and also removes any excess solution.

The plies are then pressed together for example by passing through such a pressure device, usually a mangle or a wringer, and the multi-ply fabric obtained is passed into a coagulating bath which causes the cellulose to be directly precipitated intimately into and onto the fabric. The material is then treated to remove undesired chemicals or solvents and is finally ironed. The stiffness thus imparted to the fabric is permanent and such a characteristic will not be removed by any subsequent washing or laundering operation. The multi-ply fabric obtained can be washed, bleached, dry cleaned, dyed, cut, sewn and ironed in exactly the same way as an unstiffened fabric or garment. The absorbent qualities are in no way impaired whilst the strength and resistance to abrasion and dirt are considerably enhanced.

By this means there is incorporated into the fabric a dressing which permits the article to be washed as usual and when ironed to assume just the degree of stiffening required, this being predetermined by the amount of solution originally incorporated into the material. The same degree of stiffness will thus always be imparted to the material no matter how many times it be washed and ironed, for the starched finish is constantly revived by the latter operation. Moreover by a suitable choice or adaptation of the solution used, the final appearance of the article may be dull or lustrous.

The particular dressing or substance employed for the purpose acts therefore as a kind of permanent starch or dressing which will constantly give the effect desired and which being insoluble will not wash out with successive washings.

The plies constituting the fabric are passed through the cuprammonium solution of cellulose at varying speeds say 30 to 40 yards per minute; the solution is pressed well into the material and the excess removed by scrapers or squeezing rollers suitably adjusted. On leaving the rollers by which the plies are pressed together the multi-ply fabric is treated in a coagulating bath and the undesirable by-products removed by washing, acidification, or the like. The material is then dried, calendered, or ironed in the usual way. Bleaching and/or dyeing may be carried out prior or subsequent to the treatment and no finishing is necessary.

The solution of cellulose may be of such a nature that it will not attack the fibres or it may be of such a nature as to still be capable of dissolving further cellulose, i. e. it contains an ex-

cess of cellulose solvent so that it will attack the fibres of the fabric being treated but only very superficially owing to the short period of contact and the fact that the dissolving power of the cellulose solution is not great. Thus only the exterior surface of the cloth will undergo any change. This together with a certain percentage of added cellulose will be firmly fixed or adhered to the body of the material thus imparting a smooth fibreless appearance instead of a fibrous one. The absence of loose fibres renders the article more impervious to dirt and abrasion.

An example for the preparation of such a cuprammonium solution of cellulose which may be employed in the process is given as follows:

60 grammes of copper sulphate are dissolved in 300 cc. of water and this may be heated if necessary. When cold, there is added to the cold solution 40 cc. of a 50 per cent. caustic soda or potash solution and this causes a precipitation of the copper hydroxide and then there is obtained a suspension of copper hydroxide in aqueous solution. 30 grammes of cellulose are suspended in 3000 cc. water and this suspension is added with constant stirring to the above mixture. The solid matter is then separated after allowing the whole to stand for several hours. The separated solid matter is then dissolved in 250 cc. of strong ammonia, the solution being preferably effected below 0° C.

The coagulating bath is a 10 per cent. solution of caustic soda or potash. The fabric is then immersed in a bath of water and then passed into a bath of 5 to 10 per cent. strength sulphuric acid and the operation is then concluded by immersing and washing the fabric for several hours in water.

A final coating may be applied to the multiply fabric consisting of cellulose acetate or nitrocellulose and the like, either by brushing, spraying or otherwise and the material subsequently dried in air, an inert gas, heat or otherwise. The final coating may be of a desired colour and layers of paper, blotting paper, cellulose wadding may be applied between the plies of the material, in order to give body to the material.

The permanent stiffening finish to the material as above described will become soft when washing the fabric and that will facilitate its handling for the purpose of cleaning, but it will resume its original stiffness on drying and ironing.

When such a fabric is cut or divided, it will be left with an edge which will not fray and such a characteristic may be further increased by applying to the edge a coating of for example a solution of cellulose acetate which seals the cut edges of the multi-ply fabric.

By such a process a material (such as a knitted fabric) hitherto considered as being unsuitable to such a stiffening or loading effected, can by this process be utilised in this way. An improved fabric is thus produced such as a knitted fabric and which may therefore be used for collars, fronts, cuffs and other wearing apparel or fabrics where such a stiffening or loading is desired.

In the finished material it will be found that the original outer fibres have been welded together more or less firmly, not because they have been dissolved but owing to the fact that the cellulose precipitated from the cellulose solution has filled or partially filled the cavities or interstices between the individual fibres and threads, thus acting as a welding agent.

The cloths or garments made by this process show a noticeable increase in strength and improvement in washing qualities whilst the appearance undergoes a notable modification; for instance if the plies are of cotton the fabric obtained assumes a linen-like appearance so that it is possible by this process to obtain a kind of "artificial linen".

The effects obtained by this process can be regulated in different manners so as to create a whole series of finishes. For example the quantity of cellulose absorbed by the cloth can be varied by the type of cloth treated; the nature of the cellulose solution is also of importance, for example the cellulose content of such solution and its viscosity, on which latter depends amongst other things the speed with which the solution penetrates the cloths and fibres. Moreover the action of the solution on the surface of the cloth will be increased by employing a solution containing a greater excess of solvent than by employing a solution containing a less excess of solvent and also by stronger bleaching of the cloth or garment. Further it will be evident that the speed with which the cloth is drawn through the cellulose solution, the method of removal by scraping or squeezing the excess of solution, as well as the temperature at which the process is carried out, play an important role in determining the final character of the cloth.

The qualities of the cloths produced by the present process are permanent and will not be removed by washing, boiling, bleaching, or similar treatment in contradistinction to those of starched or other "finished" cloths which are quickly removed when subjected to such treatments.

The solution of cellulose can if desired be coagulated by means of a bath of an alkaline hydroxide of mercerising strength in which the cloth is maintained under tension with the result that a mercerising effect is obtained on the final product.

In the case of coagulation by sulphuric acid the latter may be of sufficient strength as to cause the cloths to be parchmentised at the same time.

Again an interlining consisting of blotting or other paper, a nappe of fibres or any kind of filling of vegetable origin may be inserted between the fabrics and the whole treated substantially as already described above, the whole being welded into one homogeneous mass practically inseparable by normal usage.

In carrying out the process two similar or different outer cloths may be used to produce double-faced fabrics, suitable for reversible collars, cuffs and the like.

In carrying out the process instead of treating the separate plies of the fabric as already described the fabric may be treated in a continuous length and may be pleated, turned over, or otherwise doubled, the treatment applied firmly welding the folded portions together. It will be understood that the multi-ply fabric may comprise two or more than two plies.

Again a separate band, tape or insertion may be fixed on the surface or across the edges of the fabric or garment made therefrom for decorative or finishing purposes by the use of the solutions mentioned.

As an instance of the use of the fabric made according to this invention one might mention the manufacture of semi-stiff or stiff collars stamped out of the material and finished without seams, thus eliminating the cutting out and the sewing together of the various pieces.

Finally the finished article may be immersed in a bath containing a suitable varnish such as a solution of cellulose acetate or this may be applied to either or both sides and edges by a brush or other means. In this way not only are the edges sealed but a permanent lustrous finish is imparted to the article.

The above described system may be applied to collars of the kind having equal sized flaps or tabs, whereby such collars are reversible.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Process of making multi-ply woven fabric adapted for the manufacture of collars, cuffs, shirts, tablecloths, napkins and millinery, comprising immersing the plies of the said fabric in a preformed cuprammonium solution of cellulose, pressing the plies thus treated together, and treating the multi-ply woven fabric obtained in a coagulating bath to precipitate the dissolved cellulose which becomes intimately associated with the fibres of the woven fabric, and unites the plies together.

2. The process as claimed in claim 1 in which the coagulating solution employed is an alkali metal hydroxide of mercerising strength.

3. The process as claimed in claim 1 in which the coagulating solution employed is sulphuric acid of parchmentising strength.

4. The process as claimed in claim 1 in which a final coating of cellulosic varnish is applied to the multi-ply woven fabric and articles made therefrom to impart a lustrous finish thereto.

5. The process as claimed in claim 1 in which the edges of the multi-ply woven fabric and articles made therefrom are coated with a cellulosic varnish to act as an additional seal to the edges.

THOMAS LEWIS SHEPHERD.