

UNITED STATES PATENT OFFICE

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LACE MAKING

No Drawing.

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My invention relates more particularly to improvements in lace making but various features thereof will be found useful in various other fields. The main object of the invention is to provide improvements whereby a foundation or ground fabric may be formed for the lace, embroidery or other element which may be easily removed therefrom and with a minimum loss of time and expense. Further and more specific objects, features and advantages will more clearly appear from the detail description below.

It has been common in the manufacture of lace to provide a ground fabric or foundation such as "chemicalized buckram or crinoline" or a sized cotton fabric treated with sulphuric acid, and the lace is then stitched or formed on this ground fabric and after the lace has been so made the ground fabric is removed therefrom by heating the composite fabric whereupon the ground fabric carbonizes and disintegrates so that the remains thereof may be separated from the lace. This method of removal of the foundation fabric is however, attended with certain disadvantages. There is a serious risk of destroying or injuring the lace by reason of the generation of acid vapors, produced in the heat necessary to carbonize. This is especially the case when chlorides generating hydrochloric acid on heating are used in etching the ground. For this reason a "bland" reagent in the removal of the solubilized or temporary fibre is most desirable and by this I mean a reagent without harmful action on the permanent fibre. By the term "solubilized" I mean to indicate cellulose treated to make it readily soluble in a reagent or reagents which do not readily dissolve cotton or other cellulose textile fibers in their normal state. For the cheaper grades of goods, paper has been employed as a foundation, the paper being removed by digestion with water which takes a long time. This method is also unsatisfactory because of the tensile weakness of paper permitting the needles to cut across it here and there as the lace is being formed thereon and so producing unsatisfactory work. Other forms of foundations have been

suggested but have been found to be so expensive that they have been little used.

According to my invention in its preferred form, I provide a ground or foundation fabric of cellulosic fiber such as cotton and treat the same so that it is rendered relatively soluble with respect to ordinary cotton fabric and then after stitching or forming the lace, embroidery or the like on the foundation fabric, which serves as a support for the lace, embroidery or the like, while the same is being formed, I dissolve away the treated foundation fabric by soaking the same in or passing the same through a solution of a solvent of the treated fabric which is not a solvent of the untreated lace, embroidery, etc., whereby the foundation fabric is easily, quickly and cheaply removed and the lace, embroidery etc. freed therefrom. By this method I am able to use as a foundation fabric, one of cotton or cellulosic fiber which is relatively cheap and yet which has ample tensile strength for the work in question. While the foundation fabric of cellulosic fiber may be rendered soluble in various ways, I prefer to do this by using cotton cloth and passing the same through a mixture of sulphuric and nitric acids made by taking 1000 parts by volume of concentrated sulphuric acid of commerce and combining it with 600 parts by volume of strong commercial nitric acid so that the actual amount of H_2SO_4 is about 60% and the actual HNO_3 is about 20%. These acids are carefully and slowly mixed while cooling or chilling and stirring and after they are thoroughly mixed and the temperature thereof is reduced to about 60° Fahrenheit, the fabric is introduced therein. This nitrates the cotton forming nitro cellulose thereof, but the fabric still retains its fibrous condition and its strength is not materially weakened. Care must be taken that the acids are not too strong so as to materially weaken the tensile strength of the fabric. Therefore, for any particular fabric it is preferable to make preliminary trials with small pieces of the fabric which are dropped in the mixed acids for about ten minutes and then well washed in cold water and then in hot water and the strength thereof then com-

pared with the original fabric. If it is found that the strength of the fabric is materially weakened, more water should be added to the acids. I find that about 18% of water in the mixture will in many cases be sufficient and result in an acid mixture which will change the cotton fabric into a true nitro cellulose fabric. I prefer to use a mixture of acids which is as strong as possible in the beginning so that the bath will run longer without refortifying, but the bath should not be so strong as to materially weaken the fiber. After the fabric has remained in the acid solution for about ten minutes or until the desired modification has been obtained, it is withdrawn from the bath and immediately drenched with a large volume of cold water and given a prolonged washing to remove the acid. It may then be passed through a very dilute solution of carbonate of soda containing about 1/50% of Na_2CO_3 and then dried. The fabric thus prepared is inflammable but it can be rendered substantially flame-proof by treatment with zinc chloride; or the fabric after being taken from the acid bath and washed with cold water may be rendered substantially free from residual acid and at the same time rendered substantially flame-proof by passing the same through a 20% solution of zinc chloride containing a little zinc carbonate in suspension. From this bath the fabric may then be removed and dried. To be more certain of the removal of the acid and flame-proof quality of the fabric, it may again be put through the zinc chloride and zinc carbonate bath if desired. A little glycerine, say amounting to about 5% of the zinc chloride bath, may be added to the bath to promote a softer feel of the finished treated fabric and this also seems to promote solubility of the fabric later.

The fabric may then be used as a ground or foundation on which to stitch or form the lace, embroidery, etc. and after the latter is completed, the ground fabric may be readily dissolved by placing the combination or multiple fabric composed of the lace, embroidery, etc. and foundation, in a 10% caustic soda solution and slightly warming it. The ground fabric should dissolve away rapidly leaving the lace, embroidery or the like free therefrom. By a complex fabric I mean a mixed fabric of variable constituents but in one plane, for example; double weave, poplin a mixture of linen and silk, cotton shirting with silk stripes, etc. By a multiple fabric I mean a series of fabrics, in more than one plane for example:—a man's collar, containing a face, a lining and a back.

Instead of treating the cotton fabric to form nitrate of cellulose, it may be treated with suitable chemicals to form a fabric or fibers of other cellulose derivatives such as acetate

or cellulose, hydro-cellulose, and other solvents may be used in place of the caustic alkali. For example, the nitrated fabric may be dissolved and detached from the lace, embroidery, etc. by using acetone as a solvent or by using a mixture of ether and alcohol or other organic solvents in which case the dissolved fabric instead of forming a product which would go to waste, results in a solution suitable for making lacquers, a collodion, an enamel or waterproofing composition. A slight amount of such solution remaining in the fabric and dried therein is often advantageous. If the ground fabric be treated to form acetate of cellulose thereof, it may likewise be dissolved in either caustic soda or organic solvents to form useful by-products as above explained.

Other vegetable fabrics such as fabrics of linen, jute, ramine, etc. may likewise be hydrolyzed or otherwise rendered relatively soluble and used as the base fabric and even certain grades of paper may be treated with acids or other chemicals to secure a degree of hydrolyzation or solubility which brings about a very little weakening of the tensile strength thereof and yet good solubility in caustic liquors or other solvents. The ground fabric may likewise be rendered relatively soluble by a complex chemical action thereon as for example by producing a fabric, the fibers of which are relatively soluble by reason of being partially hydrolyzed and partially esterified either at one and the same time or serially and either by a complex and dual action in one bath of chemical or a series of single actions in sequence. Thus an ephemeral fabric may be formed in various ways which is readily and easily soluble as compared with the lace or other element stitched or formed thereon whereby after the latter has been formed the former may be easily and quickly removed therefrom by solution.

It will be seen further that I have provided a foundation or reinforcing element for fabrics of various kinds which is easily removed from the finished goods when desired by the simple method of solution and without injury to the remaining permanent fabric or elements thereof and at the same time my invention in its preferred form provides in the resulting solution a useful by-product capable of various uses. The fabric may be made of materials modified and solubilized before spinning or weaving or it may consist of a web or felted sheet that is not produced by textile operations.

Therefore, while I have described my improvements in great detail and with respect to certain forms and modifications thereof, I do not desire to be limited to such details, forms or modifications since many other modifications and changes may be made and the invention embodied in widely different

forms without departing from the spirit and scope thereof in its broader aspects. Hence I desire to cover all of the forms and features coming within the language or scope of any one or more of the appended claims.

By the term "fabric" I mean such a fabric as is sometimes designated by the term textile fabric, i. e. not a wire fabric nor a felt and not broadly something fabricated, but a sheet-like article made up of strand-like bodies such as yarns or threads by interlacing such strand-like bodies by methods such as weaving, or knitting. By "natural" I mean as formed by or occurring in nature, and I do not include artificial strands of material such as artificial silk under this term.

What I claim as new and desire to secure by Letters Patent, is:

1. The method of making lace or the like which consists in nitrating a fabric of cellulosic fiber without materially weakening the fabric, forming the lace on the said fabric and then dissolving the said fabric to free the lace therefrom.

2. The method of making lace or the like which consists in forming a fabric of nitrated cellulose fiber, forming the lace thereon as a foundation and dissolving the said fabric with a solvent of nitrated cellulose to free the lace therefrom.

3. The method which consists in forming a fabric of nitrated cellulosic fiber, forming another fabric thereon and dissolving the first to free the second therefrom.

4. The method of making lace or the like which consists in treating cotton fabric to change the cellulose thereof into a cellulose derivative soluble in a reagent harmless to cotton without materially decreasing the strength of the fabric, forming lace of cellulosic material on the treated fabric as a foundation and then dissolving the treated fabric to free the lace therefrom.

5. The method which consists in forming a fabric on a foundation of solubilized cellulose fabric and then dissolving the latter with a solvent of the latter and not of the former to free the former from the latter.

6. The method which consists in treating a fabric of cellulosic material to render the cellulose thereof soluble in a reagent that does not dissolve normal cellulose, forming another fabric thereon and dissolving the first fabric to free the second therefrom.

7. The method which consists in treating a fabric of cellulosic fiber to render it soluble in an organic solvent without materially decreasing its strength, forming another fabric thereon, and dissolving the former away from the latter with an organic solvent.

8. The method which consists in forming one fabric on another, the fibers of said fabrics being of common origin, the fibers of the latter being pretreated to render them rela-

tively soluble, and then dissolving the latter to free the former therefrom.

9. As a step in lace manufacture, freeing a lace or the like of relatively insoluble material from a backing of solubilized cellulosic material by the use of a reagent that dissolves the backing readily.

10. The method of making a fabric backing for embroidery and the like which comprises treating a fabric of cellulosic fibers to render it soluble in a reagent harmless to normal cellulose while preserving the form and useful tensile strength of the fabric.

11. The method of making a fabric backing for embroidery which comprises subjecting a cotton fabric to the action of nitrating chemicals to nitrate the fibers of the fabric substantially completely and thus render it soluble in reagents harmless to normal cellulose while preserving the form of the fabric and its useful tensile strength.

12. The method of making a soluble embroidery backing which consists in nitrating a cotton fabric to render the same soluble in a reagent harmless to normal cellulose while preserving the form and useful tensile strength of the fabric, and treating the solubilized fabric with a reagent to render the same more fire resisting.

13. The method of making a soluble embroidery backing which consists in nitrating a cotton fabric to render the same soluble in a reagent harmless to normal cellulose while preserving the form and useful tensile strength of the fabric, and treating the solubilized fabric with a softening agent and with a reagent to render the same more fire resisting.

14. The method of making a fabric backing for embroidery and the like which comprises treating a fabric of cellulosic fibers to render it soluble in a reagent harmless to normal cellulose while preserving the form and useful tensile strength of the fabric, and treating the solubilized fabric with a reagent to render the same more fire resisting.

15. The method of making a fabric backing for embroidery and the like which comprises treating a fabric of cellulosic fibers to render it soluble in a reagent harmless to normal cellulose while preserving the form and useful tensile strength of the fabric, and treating the solubilized fabric with a softening agent and with a reagent to render the same more fire resisting.

16. A foundation fabric for embroidery consisting essentially of cellulosic fiber solubilized to attack by a reagent harmless to normal cellulose.

17. A foundation fabric for embroidery consisting essentially of cellulosic fiber solubilized to attack by a reagent harmless to normal cellulose, said fabric containing a fire resisting agent.

18. A foundation fabric for embroidery

consisting essentially of cellulosic fiber solubilized to attack by a reagent harmless to normal cellulose, said fabric containing a fire resisting agent and a softening agent.

5 19. A foundation fabric for lace-making consisting essentially of solubilized natural cellulose fibers said fabric retaining useful tensile strength.

20. A foundation fabric for lace, embroidery and the like consisting essentially of esterified cellulose and retaining its useful tensile strength.

21. The combination of a foundation fabric and a lace fabric attached thereto, the lace
15 being of normal cellulosic material and the foundation being of solubilized cellulose.

22. The combination of a foundation fabric and a lace fabric attached thereto, the lace
20 being made of thread of normal cellulosic material and the foundation being of nitrated cellulose.

23. The combination of a foundation fabric of solubilized cellulose and a fabric of lace or the like attached thereto.

25 In testimony whereof I have signed my name to this specification.

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