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STENCIL BLANK AND PROCESS OF MANUFACTURING THE SAME.

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This invention has for one of several of its objects the manufacture of stencil blanks suitable for use in connection with the reproduction of written, typewritten or printed matter as maps, engravings or stenciled work, and for the preparation of such stencil blanks more suitable than those heretofore found upon the market as will be more specifically set forth herein, and to the production of stencil blanks superior in that they are tough, elastic, substantially water-insoluble and grease-repellent, sufficiently hygroscopic, of high tensile strength and hence great durability, and which may be manipulated with the minimum of labor and maximum of dependable results at a satisfactory cost of manufacture compatible with the long wearing qualities of the same.

A further object is the provision of a stencil blank free from the disadvantages of the present wax stencils or the so-called indestructible stencils which require to be kept moistened during use, and which will not crack, craze, peel or blister under normal usage, and which in its use, unites simplicity and efficiency to a degree not attainable in the stencils of present day manufacture.

My improved stencil blank, consists of a base material preferably cellulose or cellulosic in its nature, upon which is poured or otherwise caused to be deposited a solution containing organic esters of cellulose and ethers of cellulose dissolved separately or together in appropriate solvents or solvent combinations, the volatile portion being then allowed to evaporate spontaneously or otherwise, thus resulting in the formation of a tough, flexible, water-insoluble, fat-, wax-, and grease-repellent surface, admirably adapted for stencil work or the reproduction of written, typewritten or printed matter.

More specifically, my improved stencil sheet consists of a base or blank, preferably of cellulose or cellulosic material suitable for the purpose such as a sheet of paper of appropriate thickness and tensile strength, upon which base there is applied mechanically or by hand, in a unitary or plurality of coatings, by brushings, impregnating, immersing or otherwise in order to obtain partial or substantially entire saturation of the base, a cellulose ester and a cellulose ether in solution admixed with solvents and non-solvents, and to which may be added fats, oils, resins and other products in order to impart certain desirable properties to the finished preparation.

I have experimented with a large number of base materials with which I have obtained satisfactory results for specific purposes in connection with stencil blank production, but I prefer to employ a thin, tough paper, such a suitable paper being known in the trade as Japanese paper, yoshino paper, rice paper and by other names. Other forms of cellulose or cellulosic materials in sheet form have been used by me with satisfactory results for some purposes, and it is not to be understood that the base material as above suggested is to be construed as the limitation of my invention for said base material, for I may use any cellulosic material suitable for the purposes desired without departing from the essence and spirit of my invention.

This base material may be used as received from the manufacturer, or a portion of the moisture may be removed, or it may otherwise be treated prior to coating, as desired. The cellulosic base may be loaded or treated with inorganic or organic fillers or both before application thereto of my mixed cellulose ester and cellulose ether composition, if so desired, or the porosity of the base may be augmented or inhibited by other means before the coating material is applied thereto.

The liquid impregnating or coating composition preferably consists of a cellulose ester dissolved in the appropriate solvent, combination of solvents, combination of solvents and non-solvents, or other solvent combination, using for this purpose, solvents, non-solvents, diluents, high boilers and plastifiers now well known, and this is preferably mixed with a cellulose ether also dissolved in an appropriate solvent, combination of solvents and non-solvents, or other solvent combination, using for this purpose, solvents, non-solvents, diluents, high boilers and plastifiers now well known. I have obtained satisfactory results in the employment in solution of those organic cellulose esters, known as the cellulose acetates and of the cellulose ethers known as the ethyl celluloses, either alone or in admixture one with the other.

As an example of an organic cellulose ester found suitable by me to be used in conjunction with the cellulose ethers, while I have obtained satisfactory results by the use of cellulose formates, cellulose propionates, cellulose butyrates, etc., I prefer to employ the cellulose esters of acetic acid known commercially as the cellulose acetates. And of those cellulose acetates, I have up to the present obtained most satisfactory results by employing that form of cellulose acetate of commerce which has been partially hydrated after esterification to that point represented by solubility in acetone, although other forms of acetated cellulose may be used by a modification of the components of the fluid portion of the mixture, as is well known to those skilled in the art of cellulose ester manipulation. The acetone-soluble cellulose acetates, however, are readily obtainable in commerce and when properly prepared are admirably suited for the purpose of stencil blank manufacture by my improved process.

By cellulose ethers, I mean it to be understood as those bodies in which a portion of the replaceable hydroxyl of the cellulose aggregate has been replaced by alcohol radicals or alkyls, forming alkyl-celluloses. While I have obtained satisfactory results in some instances using the methylated or methylcelluloses and the benzoylated or benzylcelluloses, I prefer to employ the ethylated celluloses or ethylcelluloses in conjunction with the organic cellulose esters in my improved process of stencil blank manufacture, and of the ethylcellulose, I have up to the present time obtained most satisfactory results by the employment of an ethylated cellulose in which the ethyl content most nearly approaches the pentaethylcelluloses, these being soluble in acetone.

In the preparation of the solution of cellulose ester and cellulose ether which is applied to the cellulosic base. I take the acetone-soluble or partially hydrated cellulose acetate of commerce, removing therefrom if desired, a small proportion of moisture contained therein by a gentle drying process, and then dissolving the same in acetone or other appropriate solvent or solvent combination, either at normal or elevated temperature and by hand stirring or mechanical agitation, continuing the same until substantially all of the acetated cellulose has passed into solution in the solvent-containing liquid. I then take the cellulose ether and manipulate it in a somewhat similar manner, finally mixing the dissolved cellulose ester and cellulose ether together to a homogeneously appearing solution. The ratio of ether to ester may vary within comparatively wide limits depending upon the effect desired, but in general the ratio is between 25% to 50% of one to the other by weight. To this gelatinous appearing solution may be added various proportions of oils as castor, olive, rape, lard, or other vegetable or animal oil, or oils; petroleum oils as spindle machine, cylinder or other hydrocarbon oils; waxes as beeswax, carnauba wax, Montan wax, and the like; resins as shellac, mastic, elemi, sandaras, copal or kauri; the addition of the above oils, waxes and resins, being in proportions relatively smaller than the percentage of cellulose compound employed, said oils, waxes and resins being added in variable amounts relative to the proportion of cellulose compound in order to obtain specific and advantageous results in the manufacture of stencil blanks or sheets by my improved process.

As an example merely illustrative of one method of carrying my invention into effect, I may dissolve 700 grams acetone-soluble acetated cellulose in 6 liters of acetone of high commercial purity and strength, and after the acetated cellulose has apparently all passed into solution in the acetone, this may be mixed with 300 grams ethylated cellulose previously dissolved in 4 liters of acetone. 30 grams of castor oil being then added and 2 liters of commercial benzol, or I may mix the above amounts of cellulose ether and ester together in the dry state, and dissolve them at one and the same operation in 10 liters of acetone as above described. I have found it advantageous in the preparation of this stencil blank solution to add also 10 to 50 grams of cellulose compound plastifier such as acetated glycerol for imparting a softening effect. For some purposes I may replace a portion of all of the castor oil by other oil, by resin or wax or resin and wax, in order to obtain specific results, and depending upon the nature and proportions of the components in the mixture. The variation in viscosity and solubility of the acetated and etherified cellulose; the strength, relative purity and dissolving power of the solvents; the nature and amount of non-solvent or diluent portion present in the formula; the degree of partial hydration of the acetated cellulose employed; the physical characteristics of the etherified cellulose used; the nature of the cellulosic base upon which the mixture is placed; and the season of the year and conditions as of heat, cold or moisture, will require corresponding adjustments in the above illustrative type formula, as will be readily understood by those skilled in the art to which this appertains, and therefore it is to be understood that wide variation in components and their relative proportions may be made by me in the employment of an organic cellulose ester in conjunction with an etherified cellulose in stencil blank formation, without departing from the basic principles of my improved invention.

In coating, impregnating or otherwise ap-

plying the cellulose ester and ether solution to the cellulosic base, I may coat one side of the base, or both sides, either by hand as by brushing, or by immersion, or by a doctor blade or other form of coating apparatus. I may coat the base in sheets or in rolls, at normal or elevated temperature, the speed of coating dependent upon the nature and proportion of liquids and solids in the coating composition, the speed and depth of coating of the base, and the removal of the volatile portion from the coated base at normal or elevated temperatures.

After the base has been coated with a sufficient amount of cellulose ester and cellulose ether composition, the volatile portion is allowed to dissipate in any suitable manner until it is substantially all removed, when the sheets (after, perhaps trimming) are then ready for sale.

I am aware that heretofore acetone has been used as a solvent of the cellulose acetates; and also of the ethylated celluloses that benzol and other non-solvents have been used as diluents; for cellulose esters and ethers; that castor oil and other vegetable oils have been employed in conjunction with cellulose compounds for specific purposes; that acetated glycerol has been described in connection with cellulose acetate. But I disclaim the broad use of acetone as a cellulose acetate or cellulose ether solvent; of benzol as a diluent therein; of the use of castor oil or other oil in conjunction with a mixture of cellulose acetate and cellulose ethers alone; of the employment of acetated glycerol with acetated cellulose without admixture of other components, but what I do claim and desire to secure by Letters Patent for an improved stencil blank is:—

1. A method of making a stencil sheet, said method comprising forming a solution containing a cellulose ester and a cellulose ether; applying the mixture to paper to form a coating; and drying the paper.

2. A method of making a stencil sheet, said method comprising forming a solution containing a cellulose ester and a cellulose ether; adding oil and wax; applying the mixture to paper to form a coating; and drying the paper.

3. A method of making a stencil sheet, said method comprising forming a solution containing cellulose acetate and pentaethyl cellulose; applying the mixture to paper to form a coating; and drying the paper.

4. A method of making a stencil sheet, said method comprising adding acetated cellulose to a solvent; adding a solution containing ethylated cellulose; applying the mixture to paper to form a coating; and drying the paper.

5. A method of making a stencil sheet, said method comprising adding acetated cellulose to a solvent; adding a solution containing ethylated cellulose; adding acetated glycerol; applying the mixture to stencil paper to form a coating; and drying the paper.

6. A method of making a stencil sheet, said method comprising forming a coating substance by dissolving acetone-soluble acetated cellulose in acetone free of metallic oxide and of high commercial purity and strength; and after the acetated cellulose has apparently passed into solution adding ethylated cellulose previously dissolved in acetone; adding castor oil and commercial benzol; and adding acetated glycerol; applying the coating substance to stencil paper; and substantially evaporating the volatile portions of said substance.

7. A method of making a stencil sheet, said method comprising forming a coating substance by dissolving 700 grams of acetone-soluble acetated cellulose in 6 liters of acetone free of metallic oxide and of high commercial purity and strength; and after the acetated cellulose has apparently passed into solution adding 300 grams of ethylated cellulose previously dissolved in 4 liters of acetone; adding 30 grams of castor oil and 2 liters of commercial benzol; and adding 10 grams of acetated glycerol; applying the coating substance to yoshino paper; and substantially evaporating the volatile portions of said substance.

8. A method of making a coating substance for stencil sheets, said method comprising forming a solution containing a cellulose ester and a cellulose ether.

9. A method of making a stencil-sheet coating-substance, said method comprising adding acetated cellulose to a solvent; adding a solution containing ethylated cellulose; and adding acetated glycerol.

10. A method of making a coating substance for stencil sheets, said method comprising forming a solution containing a cellulose ester and a cellulose ether; and adding oil, fat, resin and wax to form a coating mixture.

11. A method of making a coating substance for stencil sheets, said method comprising adding cellulose acetate to a solvent; and adding a solution containing ethyl cellulose; and adding acetated glycerol.

12. A method of making a coating substance for stencil sheets, said method comprising dissolving acetone-soluble acetated cellulose in acetone free of metallic oxide and of high commercial strength; and after the acetated cellulose has apparently passed into solution adding ethylated cellulose previously dissolved acetone; adding fat, resin, wax oil and commercial benzol; and adding acetated glycerol.

13. A method of making a coating substance for stencil sheets, said method comprising dissolving 700 grams of acetone-soluble acetated cellulose in 6 liters of ace-

tone free of metallic oxide and of high commercial purity and strength; and after the acetated cellulose has apparently passed into solution adding 300 grams of ethylated cellulose previously dissolved in 4 liters of acetone; adding 30 grams of castor oil and 2 liters of commercial benzol; and adding 10 grams of acetated glycerol.

14. A stencil sheet comprising a sheet of paper having thereon a coating containing a cellulose ester and a cellulose ether.

15. A stencil sheet comprising a sheet of paper having thereon a coating containing an organic cellulose ester and a cellulose ether.

16. A stencil sheet comprising a sheet of paper having thereon a coating containing a cellulose ester and a cellulose ether free of metallic oxide.

17. A stencil sheet comprising a sheet of paper having thereon a coating containing a cellulose ester, a cellulose ether and resin.

In testimony whereof I affix my signature.

PRESTON ROBERTS SMITH.