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STENCIL SHEET.

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To all whom it may concern:

Be it known that I, JOHN DOUGLASS GRANGE, citizen of the United States, residing at Brookfield, in the county of Cook and State of Illinois, have invented new and useful Improvements in Stencil Sheets, of which the following is a full, clear, concise, and exact description.

This invention relates to improvement in stencil sheets of the so-called "dry type" which comprise a sheet of fibrous material impregnated with a substance which is impervious to ink, the stencil being formed by expressing the impregnating substance to expose the fibrous sheet, thus permitting the passage of the ink through the exposed portions of the sheet. Another type of stencil sheet known as the "wet type" is made by impregnating a thin lace-like paper such as Japanese Yoshino paper with a protein such as gelatine which has been hardened with alum. Before the sheet is cut to form a stencil it is moistened for a period sufficient to almost rot the base sheet so that a stencil cutting instrument perforates the base sheet, the ink passing through the perforations instead of through the base sheet itself as in the case of the dry stencil. Both of these types of stencils are well known and a type of dry stencil which has been used rather extensively is made by coating Yoshino paper with a compound consisting essentially of gelatine coagulated with a chronic agent such as potassium di-chromate. In making a stencil of this sort in order to coagulate the gelatine the impregnating sheet must be exposed to light as the coagulating action of potassium di-chromate is dependent upon a light reaction which consumes considerable time. In order to expose stencils made in accordance with this process so that their entire surface is acted upon by light requires a large amount of floor space when they are manufactured in any quantity.

It is an object of the invention to provide a "dry type" of stencil and a method of manufacturing such a stencil which is economical, rapid, and utilizes a minimum of apparatus and equipment.

In carrying out my invention, I use as an impregnating compound for the fibrous sheet, a solution of gelatin, sugar, glycerine, acetic acid, a coloring material, and water which are thoroughly mixed so that the ingredients are completely dissolved. A solution of an aluminum salt and water is prepared, the salt being dissolved in the water, and this solution added to the mixture above described. The resulting mixture is then filtered by any suitable means. The fibrous sheets to be impregnated, which are preferably of an open, lace-like material such as Japanese Yoshino paper, are then taken one at a time and drawn across the surface of the impregnating solution held within a suitable container. Each sheet is then suspended to dry. As the drying action takes place, the aluminum salt causes a hardening of the impregnating compound, so that the resulting stencil sheet is to a considerable extent insoluble in water and will not soften under the influence of moisture to an extent that will affect its satisfactory use.

The impregnating mixture which I have found to be the best contains ingredients in the following proportions:

	Parts by weight.
Gelatin	12.6
Glycerine	14
Acetic acid	5.5
Sugar	5.7
Acid dye	1.2
Aluminum sulphate	.3
Water	60.7

The proportions of the above ingredients may be varied within reasonable limits and produce a satisfactory stencil, except that the aluminum sulphate or other aluminum salt, such as ammonium or potassium alum, should be in an amount not less than .22 of a part nor more than .6 of a part. If less than .22 of a part of the aluminum salt is employed, I find that the impregnating compound will not be hard enough to resist the heat of summer sufficiently to permit its successful use at this season. On the other hand, if more than .6 of a part of the aluminum salt is employed, I find that the impregnating solution forms a coating having a porous and cellular like structure which will produce unsatisfactory stencil sheets, since they permit the passage of ink through portions of the coating where it is not desired. I attribute the success I have had with stencils impregnated with

the compound above described, to a large extent, to my discovery of the limits within which the amount of aluminum salt must be maintained. If potassium alum or ammonium alum are maintained within the limits above given satisfactory stencils may be made using either of these materials, but I have found after long experiments that aluminum sulphate produces the better stencil. The aluminum sulphate is more desirable in that it produces a harder and tougher coating, which at the same time is not brittle.

The acetic acid in the composition serves to retard the hardening action of the aluminum salt on the gelatine until the acetic acid is volatilized as the stencil sheet drys. Were the acetic acid not present it would be impossible to keep the compound sufficiently fluid to impregnate the stencil sheets as they are subjected to it. The acetic acid is especially necessary where an aluminum salt is used as the hardening agent, since its hardening action is not dependent on light (as is the coagulating action of potassium di-chromate) but will act immediately to harden the gelatine unless retarded.

The glycerine is a tempering agent. The stencil sheet after being impregnated with the compound is kept in a flexible condition by the glycerine which retains enough moisture to keep the sheet from becoming brittle.

Sheets made using my formula have a deep color, preferably blue or green, which throws into great contrast the stencil sheet and its light colored backing which may be viewed through the expressed portions of the stencil sheet thus facilitating the preparation and proofreading of the sheet. The coloring material utilized may be of any suitable type. I find it preferable, however, to use an acid dye or some other material which will form a lake with the aluminum salt, so that upon moistening the stencil sheet preparatory to making the stencil, the coloring material will not run.

By employing aluminum sulphate or other aluminum salts as the hardening agent, it is unnecessary to subject the stencil to light while drying, so that as a consequence the impregnated stencils may be stacked closely together, as for instance, on suitable wooden frames which may be placed in suitable drying chambers. In this way a large number of stencils may be dried within a small compass and the drying operation rapidly achieved; whereas if a chromic coagulating agent is utilized, it is necessary to separate the stencils sufficiently to permit their surfaces to come into contact with the light to secure the requisite coagulation. As a consequence, in the manufacture of stencils using a chromic coagulating agent, it has been found necessary to utilize large enclosures having great expanses of glass in order to produce stencil sheets on a large scale.

Where stencils are made in accordance with my invention, the moisture content and temperature of the air in which the impregnated sheets are dried are the factors controlling the speed at which the stencil sheets may be made. Where I have impregnated the tissue sheets with my compound and dried them in an enclosure maintained at approximately 95° Fahrenheit, I have been able to make stencil sheets ready for use within from one to two hours. However, with the use of an enclosed drying chamber having suitable humidity controlled equipment and means for providing proper circulation of the humidified and heated air, the time necessary to produce stencils in accordance with my invention may undoubtedly be materially reduced.

On the other hand, where stencils are made using a protein coagulated with a chromic coagulating agent, since light is the factor controlling the coagulation of the impregnating substance, stencils cannot be made in less than six hours, and under unfavorable light conditions may require 12 hours to complete their fabrication.

What is claimed is:

1. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound including a protein, an aluminum salt, an agent to retard the hardening effect of the aluminum salt, a suitable tempering agent, a coloring material and water.

2. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound including a protein, aluminum sulphate, an agent to retard the hardening effect of the aluminum sulphate, a suitable tempering agent, a coloring material and water.

3. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound including a protein, a single aluminum salt, an agent to retard the hardening effect of the aluminum salt, a tempering agent, a coloring material and water.

4. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of a protein, a single aluminum salt, a volatile agent to retard the hardening effect of the aluminum salt, a suitable tempering agent, a coloring material and water.

5. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of a protein, an aluminum salt, acetic acid, a tempering agent, a coloring material and water.

6. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of gelatin, acetic acid, a single aluminum salt, a tempering agent, a coloring material and water.

7. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of a protein, an aluminum salt, an agent to retard the hardening effect of the aluminum salt, a tempering agent, a coloring material and water, the aluminum salt being in the ratio of not less than 1.75 parts by weight to 100 parts by weight of protein.

8. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of a protein, an aluminum salt, an agent to retard the hardening effect of the aluminum salt, a tempering agent, a coloring material and water, the aluminum salt being in the ratio of not more than 4.75 parts by weight to 100 parts by weight of protein.

9. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting essentially of a protein, an aluminum salt, an agent to retard the hardening effect of the aluminum salt, a tempering agent, a coloring material and water, the aluminum salt being in the ratio of not less than 1.75 parts nor more than 4.75 parts by weight to 100 parts by weight of protein.

10. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting of a protein, aluminum sulphate in the ratio of 100 parts of protein to not less than 1.75 parts nor more than 4.75 parts by weight of the aluminum sulphate, an agent to retard the hardening effect of the aluminum sulphate, a suitable tempering agent, a coloring material and water.

11. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting of sugar, acetic acid, glycerine, gelatine, aluminum sulphate, and water.

12. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting of sugar about 5.7 parts, acetic acid about 5.5 parts, glycerine 14 parts, gelatine about 12.6 parts, water about 60.7 parts, and aluminum salts not less than .22 of a part nor more than .6 of a part.

13. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting of gelatine about 12.6 parts, sugar about 5.7 parts, acetic acid about 5.5 parts, glycerine about 14 parts, coloring material about 1.2 parts, and aluminum salts not less than .22 of a part nor more than .6 of a part.

14. A stencil blank capable of being stencilized, comprising a sheet of fibrous material impregnated with a compound consisting of sugar about 5.7 parts, acetic acid about 5.5 parts, glycerine about 14 parts, gelatine about 12.6 parts, water about 60.7 parts, coloring material about 1.2 parts, and aluminum sulphate not less than .22 of a part nor more than .6 of a part.

In witness whereof, I hereunto subscribe my name this 16th day of November A. D., 1922.

JOHN DOUGLASS GRANGE.