April 18, 1933. S. A. NEIDICH ET AL 1,904,289

METHOD OF MANUFACTURING ARTICLES FROM CELLULOID AND THE LIKE

Filed March 13, 1929

FIG. I.

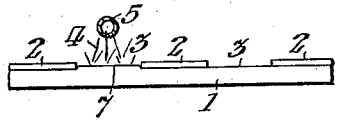


FIG. II.



FIG. III.

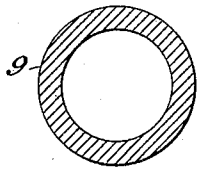


FIG. IV.

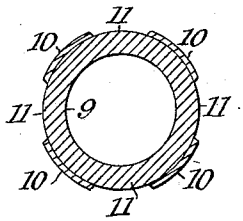


FIG. V.

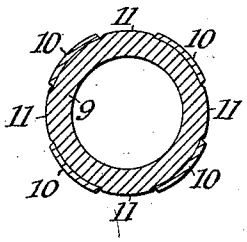


FIG. VI.

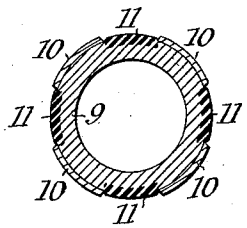
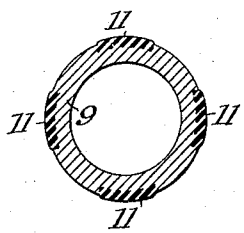


FIG. VII.



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UNITED STATES PATENT OFFICE

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METHOD OF MANUFACTURING ARTICLES FROM CELLULOID AND THE LIKE

Application filed March 13, 1929. Serial No. 346,786.

Our invention relates to methods for facilitating the dyeing of products of cellulose, such as celluloid, cellulose nitrate, cellulose acetate, and similar materials, and particularly to simulate with cheap material primarily of uniform texture and color, the mosaic effects heretofore attainable only by more costly methods and means.

In accordance with the ordinary methods of manufacture of such products for commerce, they are primarily molded in slabs 5″ × 21″ × 51″; commercial sheets of such materials being shaved from such slabs, of any desired thickness, and trimmed to 20″ × 50″.

If such commercial slabs or sheets are to present a mosaic appearance, they are formed of an aggregate of initially separate pieces of different colors or textures, of celluloid or the like, which are joined by compressing the aggregate while the material is softened with any suitable solvent. For instance, acetone is a suitable solvent for celluloid and cellulose nitrate, and ethyl acetate, or a mixture of alcohol and ether, are suitable solvents for cellulose acetate.

Perhaps the principal use of such mosaic materials is in the manufacture of tubular bodies and caps for fountain pens, pencils and the like. It is the usual practice to form such tubes, of mosaic appearance, by cutting the conglomerate slabs above contemplated into bars, turning the outer surface thereof to cylindrical form, and boring such bars in coaxial relation with their outer surfaces. It is obvious that such a complicated method of manufacture is extremely costly. For instance, such mosaic material, in its primary form, costs approximately five times as much as the ordinary material of uniform color or texture, and fountain pens including holders and caps of the turned and bored type cost from $7.50 to $10.00 each, retail.

It is characteristic of our invention that celluloid or the like, of uniform color or texture, or both, made by the least costly method and means known to the prior art, are caused to present the desired mosaic appearance by dyeing the material either in the form of the commercial plane sheets above contemplated or after the material is reduced to cylindrical, tubular, or other form by any suitable method or means.

As hereinafter described, an essential feature of our invention is a treatment of the area to be dyed, before or in the actual dyeing operation, and by subjecting it to the action of a cellulose nitrate solvent having a high boiling point and low volatility; for instance, derivatives of ethylene glycol, such as ethylene glycol monoethyl ether acetate, or ethylene glycol mono ethyl ether, or diethylene glycol mono butyl ether, etc.

Our invention includes the various novel features of structure, arrangement, and method of procedure hereinafter more definitely specified.

In said drawing; Fig. I is an edge view of a piece of plane cheap celluloid or the like, having regions in spaced relation upon one face thereof, masked by dye resisting material.

Fig. II is a view indicating the piece of material shown in Fig. I, but after it has been subjected to the dyeing operation and the dye resisting material removed therefrom.

Fig. III is a cross sectional view of a cylindrical tube of celluloid or the like.

Fig. IV is a view similar to Fig. III, but showing regions of the outer surface of the tube masked with dye resisting material.

Fig. V is a view similar to Figs. III and IV, but showing the condition of the tube after the unmasked areas thereof have been subjected to the action of the solvent, preparatory to the dyeing operation.

Fig. VI is a view similar to Fig. V but showing the unmasked regions of the tube dyed.

Fig. VII is a view similar to Fig. VI but showing the finished tube with the masking material removed.

Referring to Fig. I; the sheet 1, of celluloid or the like, is masked by material 2 which is dye resistant, for instance, paraffin, which may be applied to the material 1 in any convenient manner and by any convenient means; for instance, by spraying it

thru a perforated pattern sheet laid upon the surface of the material to be dyed. The areas 3 of said sheet 1 which are left exposed, to be dyed, between the masked portions of the sheet aforesaid, are then subjected to the action of a solvent 4 of the character above contemplated. Such solvent may be applied in any convenient way, by any convenient means; for instance, it may be sprayed upon the exposed surfaces thru an air brush nozzle 5. However, such preliminary treatment of the material 1 may be effected by brushing the solvent thereon or by dipping the sheet face downward in a bath of the solvent. As indicated at 7 in Fig. I, the effect of the absorption of such a solvent by celluloid or the like, is a slight expansion of the treated areas, producing a cameo effect.

Such preliminary treatment of the material to be dyed has the effect of rendering it permeable by dyes which are ordinarily classed as non-penetrating, with respect to celluloid and the like, for instance, dyes which are mixed with water or water and alcohol. Such treatment not only permits the use of less costly dyes than are ordinarily required, but accelerates the operation of dyeing so that it is effected in much less time than heretofore.

The dye stuff may be applied to the exposed areas 3 of said sheet 1 in any convenient way by any suitable means. For instance, the dye may be sprayed with an air brush such as indicated at 5 in Fig. I. After the dyeing operation is completed, the masking material 2 may be removed, conveniently by warming it; leaving the sheet 1 with its regions 3 dyed, as indicated in Fig. II and with the desired mosaic effect.

Referring to Fig. III; the cylindrical tube 9 of celluloid or the like may be formed by turning and boring a piece of the solid slab above contemplated or by a tubular molding operation or by rolling a thin sheet moistened with solvent. Such tube 9 may be masked with dye resisting material 10, as indicated in Fig. IV, leaving regions 11 thereof exposed for the dyeing operation. The tube thus masked may then be treated with the solvent material in any manner above contemplated and with the effect that the regions 11 thereof absorb such solvent material and project as indicated in Fig. V.

The tube 9 thus rendered abnormally susceptible for the dyeing operation may be dyed with any suitable dye stuff, conveniently dyes of the cheap normally non-penetrating class above contemplated, applied in any suitable way and with the effect of dyeing the regions 11, as indicated in Fig. VI.

Thereupon, the masking material 10 may be removed from the tube 9. leaving the latter in the dyed and embossed form shown in Fig. VII.

Celluloid and the like have such affinity for cellulose nitrate solvents that if such a tube as 9 be instantaneously dipped in and removed from a bath of the pure (low volatile high boiling) solvent and the tube be allowed to rest for a few minutes while the solvent thus picked up is absorbed; the dye may be caused to penetrate thru the entire thickness of the tube. However, for the manufacture of pen tubes above contemplated, it is unnecessary to dye the material to such depth and a very considerable saving in solvent and in dye stuff, and in the time required for treatment, may be effected by diluting the solvent. For instance, ethylene glycol mono ethyl ether acetate and similar derivatives of ethylene glycol may be diluted with water. However, we prefer to employ a more volatile diluent, such as carbon tetrachloride, or light hydrocarbons. Altho gasoline and naphtha may be used in lieu of carbon tetrachloride as diluents of cellulose nitrate solvents; carbon tetrachloride is preferable because it is not inflammable like the hydrocarbons aforesaid.

For example, a solvent composition for softening celluloid and the like may be composed of twenty per cent., of ethylene glycol mono ethyl ether acetate or other derivative of ethylene glycol, adapted for solvent purposes, mixed with eighty per cent., of carbon tetrachloride. Pen tubes of, say, one thirty-second of an inch thickness may be penetrated by such a solvent, by instantaneously dipping them into and removing them from such a bath, allowing them to rest thereafter, for, say, ten minutes to permit thorough penetration of the solvent, before dyeing them.

It may be observed that such treatment of, say, ten minutes' duration, is as efficacious in the preparation of the material for dyeing as immersion in a bath of twenty percent., acetone and eighty percent., carbon tetrachloride, for a period of forty-eight hours, and has the further advantage that, whereas, celluloid or the like treated with acetone to soften it, rehardens in a few minutes and, therefore, any operation of dyeing it must be hastened for accomplishment within such a brief period; on the contrary, the softening effect of our present invention is prolonged, by reason of the low volatility of the cellulose nitrate solvents, so that ample time is afforded for any desired operation of dyeing, without undue haste.

Therefore, it is possible to simultaneously treat a large quantity of articles at a single operation, say, sufficient for a supply for dyeing during eight hours thereafter; whereas, the effect of any of the prior methods and means herein contemplated is so evanescent that only such small quantities of articles may be treated with the solvent at one time as can be quickly dyed thereafter, with consequent loss of time and use of apparatus in

repetition of the solvent treating operations at short intervals.

Moreover, it is possible to subject the celluloid or the like to the action of solvents of the character aforesaid during the dyeing operation and without the preliminary treatment aforesaid, by dissolving the dye stuff in the solvent solution and applying a mixture of dye stuff and solvent directly to the surface to be dyed. The effect of such application is that the solvent penetrates the celluloid and the like and the dye stuff follows it to a depth determined by the percentage of solvent present.

Furthermore, altho articles softened and dyed in accordance with our invention may be permitted to harden spontaneously by slow evaporation of the low volatile solvents employed; such hardening may be facilitated by immersing the dyed articles in a diluent of the solvent capable of taking up the latter from the dyed article. For instance, the dyed articles may be submerged in a bath of carbon tetrachloride to extract the solvent therefrom and be thus, as it were, "case hardened."

Therefore, we do not desire to limit ourselves to the precise details of the method and means herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of our invention, as defined in the appended claim.

We claim:

The method of forming an article of cellulosic material presenting a mosaic pattern at its outer surface, which consists in selecting a piece of said material of a uniform color desired for some elements of the mosaic pattern; masking, with a coating insoluble in any solvent of said material, selected areas in spaced relation on said surface which are to remain of that color; subjecting the unmasked areas of said surface to the action of a solvent of said material, having a high boiling point and low volatility; and subjecting unmasked areas in spaced relation on said surface to the action of a dye to which said material is normally resistant, but is rendered quickly permeable by the action of said solvent; wherein the solvent is mixed with carbon tetrachloride.

In testimony whereof, we have hereunto signed our names at Burlington, New Jersey, this 31st day of January, 1929.

SAMUEL A. NEIDICH.
WILLIAM MENDEL.