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MANUFACTURE OF SHAPED TEXTILE MATERIALS

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This invention relates to the manufacture of shaped textile articles, and relates more particularly to the manufacture of shaped articles of wearing apparel from textile materials made of or containing a thermoplastic derivative of cellulose.

An important object of this invention is the provision of a novel process for the manufacture of shaped articles of wearing apparel, such as hats, caps, and the like, from fabrics, ribbons or braids of textile materials made of or containing a thermoplastic derivative of cellulose.

Another object of this invention is to provide a process for the manufacture of shaped articles of wearing apparel from ribbons or braids of textile materials made of or containing thermoplastic derivatives of cellulose, without resorting to the normal practice of using size or lacquer.

A further object of this invention is to provide a process for the manufacture of artificial straw hats from braids prepared from filaments or fibers made of or containing cellulose acetate.

Other objects and advantages of this invention will appear from the following detailed description.

In prior practices, certain hat bodies were made from ribbons or braids of textile materials by first making a button of the ribbon or braid, which button forms the tip of the hat body, then winding the ribbon or braid spirally around said button and sewing together the contiguous edges. In order that the ribbon or braid be readily handled by the operative during the sewing operation, the ribbon or braid was stiffened by the application thereto of a suitable size such as starch, for example. Certain other hat bodies were made from fabric webs by drawing the same over suitable forms. After the hat body was formed a lacquer was applied thereto and dried. The lacquered hat body was then placed in a suitable mold and shaped into the form of a hat under the action of heat and pressure, the lacquer imparting to the hat the desired stiffness.

We have found that hats can be formed more simply and expeditiously, without the necessity of using size or lacquer, by employing fabrics, ribbons or braids of plasticized textile materials, made of or containing a thermoplastic derivative of cellulose, to make the hat bodies and then shaping such hat bodies into the form of hat desired with the aid of heat and pressure. Under the influence of heat, the thermoplastic derivative of cellulose textile materials soften sufficiently to assume the shape of the forming device and upon cooling stiffen into such shape.

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The hats so formed retain their shape substantially permanently and do not lose their shape when exposed to moisture such as rain, or water when washed.

In accordance with our invention, the thermoplastic derivative of cellulose textile materials, either before or after they are woven, knitted, netted or braided in fabrics, ribbons or braids, are plasticized with a suitable plasticizer for the thermoplastic derivative of cellulose. The thermoplastic derivative of cellulose textile material may be plasticized in any suitable manner. Thus, the plasticizer may be incorporated in the materials by the addition of the plasticizer to the solution of the thermoplastic derivative of cellulose from which the filaments to be processed into fabrics, ribbons or braids are spun, or by applying the plasticizer to the formed filaments, fabrics, ribbons or braids, in the presence of a swelling agent for the thermoplastic derivative of cellulose, by dipping, hand dipping in the case of filaments, ribbons and braids, the same in a solution of the plasticizer in a volative solvent therefor, or by running the same through the plasticizer solution. The solvent for the plasticizer should preferably be a volatile liquid, such as ethyl alcohol or isopropyl alcohol, which acts as a swelling agent for the particular thermoplastic cellulose derivative so as to cause the plasticizer to penetrate into the filament and be retained therein when the solvent evaporates. We have found that highly desirable results are obtained by applying the plasticizers to the formed materials from a solution of the plasticizer in isopropyl alcohol and then immediately drying the same at controlled temperatures, preferably by subjecting the materials to the action of temperatures on the order of 180° to 220° F. for a period of from 1 to 10 minutes.

The amount of plasticizer that may be employed in the solution depends largely on its plastifying properties, on the derivative of cellulose being treated and upon the degree of pliability desired from the plasticized product. We have found that solutions of plasticizers containing from 10 to 35%, and preferably from 20 to 30%, based on the weight of the product, give excellent results for the purpose of the present invention. Any suitable plasticizer of relatively high boiling point which will supply sufficient stiffness to the fabric, ribbon or braid so that it may be more easily handled may be employed in accordance with our invention. However, the plasticizers should be such which will not only give stiffness to the fabric, ribbon or braid, which

stiffness should be substantially retained after the plasticizer is removed therefrom but the plasticizers employed should also be readily removable from the textile materials. Thus, we may employ plasticizers such as ethylene glycol, diethylene glycol, triethylene glycol, glycerol, monoacetin, diacetin, ethyl oxybutyrate and formal glycerol which may be removed readily from the filaments by a scouring with water. We prefer to employ plasticizers which are removable by the use of benzol, carbon tetrachloride, trichlorethylene, or other organic solvent namely such plasticizers as tricresyl phosphate, triphenyl phosphate, para toluene sulphonamide, dibutyl tartrate, triethyl citrate and dimethoxy ethyl phthalate. We have found that optimum results, with respect to stiffening the fabric, ribbon or braid to the desired degree, is obtained by the use of dimethoxy ethyl phthalate, particularly dissolved in isopropyl alcohol.

The solvent preferably is one that readily dissolves the plasticizer employed, yet has little or no softening action on the thermoplastic derivative of cellulose and effect materials, such as pigments, filling materials, dyes or lakes, if effect materials are employed. Mixtures of two or more plasticizers may be employed, but when using mixtures of plasticizers, it is preferred that the solvent or solvent mixture used is capable of removing all of the plasticizers employed in the mixture.

The shaping of the hat body formed of the fabric, ribbon or braid is effected under such conditions of temperature that the thermoplastic derivative of cellulose textile materials are softened but not fused under the prevailing conditions. The temperature of treatment will vary not only with the nature of the particular thermoplastic derivative of cellulose present in the textile material of the fabric, ribbon or braid, but also with the prevailing conditions, such as the amount of water or steam present, if water is employed. However, we prefer not to employ water or steam. Thus, if the hat body made of fabric, ribbons or braids containing acetone-soluble cellulose acetate is shaped between or on forming devices in the absence of water or steam, the temperature of such devices should preferably be above 125° C. while the upper temperature limit should be below 180° C. in order to avoid fusing of the cellulose acetate filaments. We have found, however, that by shaping the hat body made of fabrics, ribbons or braids of acetone-soluble cellulose acetate on metal forms which have at least one layer of felt or other suitable fabric or cloth covering the metal surfaces, fusing of the textile materials is substantially avoided.

In carrying out the shaping operation, any suitable devices and expedients may be employed. For instance, the flat textile material may be placed between the male and female members of mold-like devices of desired shape, either or both of which may be heated internally or externally by ordinary steam, superheated steam, steam under pressure, electrical resistance, flames and the like. Such devices may be provided with means, such as perforations or jets, to supply steam to the textile material in order to facilitate the shaping of the same. Or, the flat textile material may be placed over a heated form and drawn over or pressed upon such form under suitably applied tension until the desired shape is imparted. However, in shaping the hat bodies made in accordance with this invention into the form of a hat, we prefer to employ a shaping mechanism in which a hollow form of composite material made of vulcanized duck and rubber is adapted to receive the hat body. The top of this form is of the configuration to which it is desired to shape the crown of the hat. While the top of this form is hard, the wall is flexible. This form comprises the male member of a mold and cooperates with a female member of aluminum which is heated. The mold is provided with aluminum flanges for shaping the brim. A soft rubber bag is provided for entering the hollow male member. The rubber bag has supplied thereto water under pressure, which pressure may be up to 200 pounds per square inch. The pressure of the water in the bag causes the expansion of the flexible wall of male member and also forces the top of the male member downwards. A hat body in such a mold would be forced against the wall and bottom of the female member thus shaping it to the mold design.

Any suitable thermoplastic derivative of cellulose may be employed in accordance with the present invention, particularly organic derivatives of cellulose, such as organic esters of cellulose and cellulose ethers. Examples of organic esters of cellulose are cellulose acetate, cellulose propionate, cellulose butyrate, while examples of cellulose ethers are methyl cellulose, ethyl cellulose and benzyl cellulose. The fabrics, ribbons or braids may consist of one or a mixture of thermoplastic derivative of cellulose textile materials, or they may contain in addition to the thermoplastic derivative of cellulose, other textile materials such as cotton, silk, regenerated cellulose, etc.

By way of describing my invention still further and not with the intention of limiting its scope thereby, the following specific example is given:

Example

The braid prepared from yarns having a basis of an acetone-soluble cellulose acetate is dipped in a solution of 30% dimethoxy ethyl phthalate in isopropyl alcohol. The treated braid is passed between rollers with sufficient pressure to give approximately 100% expression. The braid is then dried from 1 to 5 minutes in a hot air oven at a temperature of about 220° F. The braid is then dipped in ethyl ether to extract the dimethoxy ethyl phthalate and dried in the air.

The braid, plasticized and extracted, is now in a slightly stiff condition and, thus, more conveniently handled during the sewing operation in forming the hat body. The hat body is formed by first twisting the braid spirally beginning at one end, i. e. forming the button. After the button is formed, the twisting or winding is continued spirally around the button to form the top or crown of the hat, stitching of the contiguous convolutions of the hat is effected substantially simultaneously with the guiding of the braid around the button. After the crown of the hat body is formed the winding and sewing continues to form the brim thereof.

After the hat body is formed from the plasticized and extracted braid, it is molded to shape by the action of heat and pressure. After molding, the hat has the appearance of being made from straw.

Where the braid employed is woven from spun yarns having a basis of an organic derivative of cellulose, such as cellulose acetate, the resulting hat has the appearance of a cloth hat rather than a straw hat.

For certain types of hats, the crowns and brims

are formed separately and stitched together before the molding operation.

Where the braid employed is stiff enough by virtue of its construction, the hat body is first formed without the use of any stiffening agent or plasticizer, the hat body then plasticized and extracted, and finally subjected to the molding operation.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of our invention.

Having described our invention, what we desire to secure by Letters Patent is:

1. The method of producing shaped articles from formed textile materials containing a thermoplastic organic derivative of cellulose, which comprises treating said formed textile materials with a solution of a plasticizer for the organic derivative of cellulose in a volatile solvent for the plasticizer, drying the plasticized textile materials, extracting the plasticizer from the textile materials, and then processing the extracted materials to shape.

2. The method of producing shaped articles from formed textile materials containing a thermoplastic organic derivative of cellulose, which comprises treating said formed textile materials with a 5 to 35% solution of a plasticizer in a volatile solvent therefor, having a swelling action on the organic derivative of cellulose, drying the plasticized textile materials, extracting the plasticizer from the textile materials, and then processing the extracted materials to shape.

3. The method of producing shaped articles from formed textile materials containing a thermoplastic organic derivative of cellulose, which comprises treating said formed textile materials with a 5 to 35% solution of a plasticizer in a volatile solvent therefor, having a swelling action on the thermoplastic organic derivative of cellulose, drying the plasticized textile materials, treating the plasticized textile materials with an extractant to remove said plasticizer, drying the extracted textile materials and then processing said extracted and dried textile materials to shape.

4. The method of producing hats from braid containing a thermoplastic organic derivative of cellulose, which comprises treating said braid with a solution of a plasticizer for the thermoplastic organic derivative of cellulose in a volatile solvent therefor, having a swelling action on the thermoplastic organic derivative of cellulose, drying the plasticized braid, extracting the plasticizer from the braid, forming a hat body from said braid, and then molding said hat body into the shape of a hat.

5. The method of producing hats from braid containing a thermoplastic organic derivative of cellulose, which comprises treating said braid with a 5 to 35% solution of a plasticizer in a volatile solvent therefor, having a swelling action on the thermoplastic organic derivative of cellulose, drying the plasticized braid, extracting the plasticizer from the braid, forming a hat body from said braid, and then molding said hat body into the shape of a hat.

6. The method of producing hats from braid containing a thermoplastic organic derivative of cellulose, which comprises treating said braid with a 5 to 35% solution of a plasticizer in a volatile solvent therefor, having a swelling action on the thermoplastic organic derivative of cellulose, drying the plasticized braid, treating the plasticized braid with an extractant to remove said plasticizer, drying the extracted braids, forming a hat body from said braid, and then molding said hat body into the shape of a hat.

7. The method of producing shaped articles from formed textile materials containing cellulose acetate, which comprises treating said formed textile materials with a 5 to 35% solution of a plasticizer in a volatile solvent therefor, having a swelling action on the cellulose acetate, drying the plasticized textile materials, treating the plasticized textile materials with an extractant to remove said plasticizer, drying the extracted textile materials and then processing said extracted and dried textile materials to shape.

8. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a solution of dimethoxy ethyl phthalate in a volatile solvent therefor having a swelling action on said cellulose acetate, drying said treated braid, extracting said dimethoxy ethyl phthalate from said braid, forming a hat body from said extracted braid, and then molding said hat body into the shape of a hat.

9. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a solution of dimethoxy ethyl phthalate in isopropyl alcohol, drying said treated braid, extracting said dimethoxy ethyl phthalate from said braid, forming a hat body from said extracted braid, and then molding said hat body into the shape of a hat.

10. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, drying said treated braid, extracting said dimethoxy ethyl phthalate from said braid, forming a hat body from said extracted braid, and then molding said hat body into the shape of a hat.

11. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, drying said treated braid at an elevated temperature, extracting said dimethoxy ethyl phthalate from said braid, forming a hat body from said extracted braid, and then molding said hat body into the shape of a hat.

12. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, drying said treated braid at a temperature of 180 to 220° F. for 1 to 5 minutes, extracting said dimethoxy ethyl phthalate from said braid, forming a hat body from said extracted braid, and then molding said hat body into the shape of a hat.

13. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, drying said treated braid at a temperature of 180 to 220° F. for 1 to 5 minutes, treating the plasticized braid with ethyl ether to remove the dimethoxy ethyl phthalate, forming a hat body from the extracted braid, and then molding said body into the shape of a hat.

14. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol,

drying said treated braid at a temperature of 180 to 220° F. for 1 to 5 minutes, treating the plasticized braid with ethyl ether to remove the dimethoxy ethyl phthalate, air drying the extracted braid, forming a hat body from the extracted braid, and then molding said body into the shape of a hat.

15. The method of producing hats from braid containing cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, pressing out substantially all of the said solution from said braid, drying said treated braid to a temperature of 180 to 220° F. for 1 to 5 minutes, treating the plasticized braid with ethyl ether to remove the dimethoxy ethyl phthalate, air drying the extracted braid, forming a hat body from the extracted braid, and then molding said body into the shape of a hat.

16. The method of producing hats from braid made of or containing spun yarns having a basis of cellulose acetate, which comprises treating said braid with a 20 to 30% solution of dimethoxy ethyl phthalate in isopropyl alcohol, pressing out substantially all of the said solution from said braid, drying said treated braid at a temperature of 180 to 220° F. for 1 to 5 minutes, treating the plasticized braid with ethyl ether to remove the dimethoxy ethyl phthalate, air drying the extracted braid, forming a hat body from the extracted braid, and then molding said body into the shape of a hat.

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