

UNITED STATES PATENT OFFICE

2,372,664

DEPILATORY ARTICLE OF WEARING APPAREL

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No Drawing. Application December 24, 1942,
Serial No. 470,116

5 Claims. (Cl. 2-239)

This invention relates to wearing apparel, and particularly to articles of clothing which come in direct contact with the wearer's skin.

The object of the present invention is to incorporate in the fabric of a skin-contacting article of wearing apparel an inorganic abrasive substance which, in the normal course of wearing of the article, will remove from and prevent further undesirable hair growth on the wearer's skin, maintaining the skin relatively free of such growth, at all times, under a rubbing action created by relative movement occurring between the skin and the depilatory article of apparel, as a result of normal activity of the wearer.

The present invention is especially desirable in the case of women's sheer hosiery, for keeping the limbs free of unsightly hair, without the use of messy and time-consuming depilatories currently employed for the purpose. The present invention enables the wearer to procure the depilatory function automatically and painlessly, without spending time or effort, and without giving the subject any consideration whatsoever.

The present invention is applicable to all types and styles of hosiery formed of any of the yarns usually employed in the manufacture of hosiery, and which are normally composed of animal or vegetable fibres, synthetic fibres or filaments, or suitable combination or mixture thereof.

Preferably the invention is applied to fabrics of the artificial silk type, including the synthetics known as rayon and nylon; and is also particularly adaptable to cotton fabrics.

According to the principles of the present invention, the abrasive substance is preferably incorporated in the article subsequent to its fabrication, at any time up to or during the finishing thereof, or just prior to final drying, in the case of hosiery, particularly.

However, it is within the realm of the present invention to incorporate the abrasive material in the yarn after its formation and prior to its being knit or woven into a garment directly, or prior to the formation of the yarn into piece goods from which such garments may be made.

In the case of synthetic yarns, it is possible to incorporate the abrasive in the solution from which the synthetic filaments are made, prior to the solution being extruded as a filament.

Neither of the above methods, however, is considered to be particularly desirable, because of the erosive effect of the abrasive on the guides, needles, etc. of the spinning, winding, and knitting machines, etc., or on the openings of the extruding dies or spinnerets through and from which the solution is forced under pressure into a solidifying bath.

The present invention is characterized by imparting depilatory properties to fabrics of various kinds, particularly the artificial silks, supra. This

is accomplished by effecting substantially permanent adhesion of the abrasive to and effecting protrusion of the abrasive from the outer surfaces of the yarn filaments or fibre, said abrasive being formed of any one of a number of minerals or chemical compounds which possess satisfactory abrasive characteristics.

Preferably, those inorganic substances may be used which are relatively free from impurities, and which are substantially non-reactive towards the particular yarn employed, or towards the agents or chemicals present in or employed for preparing said yarn or fabric. It is preferable to employ inorganic substances which readily disperse in the finishing or sizing solutions used in the manufacture of the yarn or fabric.

In general, use is contemplated of such inorganic substances as mica, fibrous talc, emery, corundum, carborundum, garnet, infusorial earths, pumice, silica and pigment substances. Previously calcined pigments, and particularly those calcined at relatively high temperatures (in excess of 1000 C.) and preferably higher than the calcination temperatures normally employed in usual pigment manufacturing operations, are especially adapted for use in the invention and hence are preferred. So-called "hard" calcining of the pigment induces sintering and aggregate formation and develops a harder type of abrasive material.

Among the useful types of pigment substances which may be mentioned are zinc sulfide, lithopone, zinc oxide, or other well-known forms of white pigments, as well as inorganic pigment extenders, which may be used alone or in conjunction with a prime pigment. Examples of useful extenders include barium sulfate (barytes), calcium sulfate, carbonates or silicates, etc.

To insure sufficient abrading qualities, without unduly filling, weighting or weakening the yarn or fabric, I prefer to utilize an abrasive which has a hardness rating of at least 3 (on a scale wherein talc=1 and diamond=10) and a particle size value of substantially 1 micron in diameter and generally, at the most, not more than a few micron diameters. Thus, it will be seen that the particles are so fine as to be invisible to the naked eye, consequently no unusual appearance is presented to the observer, and no unusual "feel" is felt by the wearer.

Materials of lesser hardness and smaller particle size may be used, if desired, provided the quantity thereof is increased even though some sacrifice is experienced in other properties of the yarn or fabric being treated.

One preferred mode of incorporating the abrasive in hosiery or other fabric comprises applying said abrasive in conjunction with a conventionally applied permanent finish, such as a urea-formaldehyde or alkyd resin. For example,

a sufficient but relatively small amount of previously calcined pigment, such as zinc sulfide, may be mixed with a water-soluble resin monomer, the mixing operation being conducted until such time as substantially uniform dispersion of the pigment throughout the resin solution is obtained. Impregnation of the fabric with the coating material or abrasive-containing finish is then effected, this being accomplished in such manner as will effect complete penetration of the fabric with the mixture. The treated fabric is then squeezed between suitable rollers, in order to more completely impregnate the mixture into the fiber and remove excess resin accumulated between the threads. Thereafter, the treated fabric is dried and cured for a relatively short period of time (say, 3 or 4 minutes) at an elevated temperature of, for example 250° F., and not in excess of about 300 F., to convert the resin into an insoluble polymer. The fabric is then washed to remove any unpolymerized resin which may be present.

Approximately 1 quart of water per pound of resin will in most instances form a satisfactory solution and a small amount, say, an ounce, of hydrochloric acid will aid in stabilization and in removing impurities which might otherwise hinder penetration of the fiber.

While various quantities of resin may be used, a sufficient amount thereof should be in solution as will insure complete penetration of the yarn fiber. As stated, the amount of pigment abrasive to be used is relatively small, but preferably should at least equal $\frac{1}{2}$ pound per pound of resin in solution, with optimum results accruing when the amount of pigment utilized is in excess of a pound-for-pound basis.

The application of an abrasive to rayon or nylon hosiery is obviously not limited to a resin finishing operation. Thus, the abrasive may be incorporated in the proofing process whereby the pigment or other depilatory-functioning substance may first be uniformly dispersed in a 3%-5% solution of paraffin wax. After thorough impregnation of the fabric with the mixture, the surplus solution is squeezed off and the solvent allowed to evaporate at room or elevated temperatures.

According to one embodiment of the invention wherein the fabric yarn itself is impregnated with the abrasive, comprises depositing an insoluble, inorganic salt, such as barium sulfate, in the fiber by reason of a chemical displacement reaction. Thus, one may first place the artificial silk fabric or yarn in a solution of barium hydroxide (using approximately a minimum of 1 pound of barium hydrate per 10 gallons of water) maintained at substantially room temperature. Shortly thereafter (say, after a period of half-hour has elapsed), the fabric under treatment is hydroextracted and then treated in a second bath which contains a sufficient concentration of a soluble, preferably an alkali sulfate solution, more specifically approximately $1\frac{1}{4}$ pounds of sodium sulfate per 10 gallons of water, also maintained at substantially room temperature. Small quantities of sulfonated oil may be added to both solutions as a softener in order to insure the treated goods having an improved "hand." In the ensuing reaction, the barium sulfate is precipitated by the action of barium hydroxide

upon a neutral salt of sulphuric acid, in this case sodium sulfate. Thus, the barium sulfate is precipitated into the yarn fibre of the fabric, the treated fabric being then rinsed and dried. Since the barium sulfate is formed within and impregnates the yarn or fiber, the hosiery or other fabric manufactured therefrom will be capable of withstanding repeated washings without undesirably reducing its abrasive content.

Although the invention has been described in its preferred adaptation as incorporating an abrasive substance in rayon or nylon fabrics, it will be readily apparent to those skilled in the art that the abrasive treatment is equally applicable to other types of yarn and either before or after the usual knitting, weaving or spinning operations.

When an article of apparel, such as hosiery, is manufactured from a yarn or fiber which has been treated in accordance with my invention and said article is subsequently worn by the individual, it will be found that the relatively small rubbing action set up by movement of a limb on which the hosiery is worn will exert an abrading action over the contacting skin surface to wear away and completely remove protruding hair growth.

It will be clear from the foregoing disclosure that the abrasive substance may be intimately associated with an article of wearing apparel by introducing the abrasive material into the solution from which synthetic filaments are formed and which subsequently form components of the fabric of which the article is composed; or by impregnating or coating the component yarns of the fabric with an abrasive containing solution; or by applying the abrasive containing solution to the completed fabric or garment as an after-finishing or final finishing operation, within the scope of the present invention.

I claim:

1. A form-enclosing snug fitting article of wearing apparel having a substantially smooth non-irritating abrasive depilatory surface adapted for direct contact with a wearer's skin.

2. A form-enclosing snug fitting article of wearing apparel composed of textile fabric embodying a substantially smooth non-irritating yarn component having a depilatory surface formed of an abrasive substance intimately associated therewith and adapted for direct contact with a wearer's skin.

3. A form-enclosing snug fitting article of wearing apparel composed of textile fabric embodying a substantially smooth non-irritating yarn component having a depilatory surface formed of an abrasive substance constituting an integral part of said yarn and adapted for direct contact with a wearer's skin.

4. A form-enclosing snug fitting article of wearing apparel composed of textile fabric having a substantially smooth non-irritating depilatory surface consisting of a post-fabrication coating containing an abrasive substance adapted for direct contact with a wearer's skin.

5. A stocking having a substantially smooth non-irritating depilatory surface formed of a minute grain abrasive substance intimately associated therewith and adapted for direct contact with a wearer's skin.

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