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TEXTILE FINISHING

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This invention relates to the treatment of textile fabrics in the piece, and more particularly, to the finishing of cellulosic fabrics, that is—rayon, sometimes called regenerated cellulose, and especially to fabrics made up of or containing a substantial portion of continuous filament rayon as distinguished from fabrics made solely from spun rayon, and fabrics having a substantial portion of spun rayon therein.

One purpose and object of the present invention is to impart a glass-like appearance to filament rayon fabrics.

A further object is the production of textile finishes for filament rayon fabrics which thereby acquire certain so-called non-iron or no-iron properties; that is to say, it is a purpose and object of the invention to produce fabrics and finish the same, which will not require any ironing after laundering.

Further objects of the present invention are to provide textile finishes for filament rayon fabrics, or fabrics containing a substantial proportion of filament rayon, which will be characterized by having a residual shrinkage of not substantially more than 1½% in both warp and filling, even after repeated laundering or washing.

A still further object is a method of treating fabrics which will not result in any substantial diminution of tensile strength by reason of the finishing process. A further object is a process for imparting special properties and effects to filament rayon woven or knitted fabrics which will be characterized by an adequate, or more than adequate, resistance to abrasion.

Another object is a method and means of applying a new type of finish to fabrics of the character referred to above, which will be thereby rendered wholly or substantially resistant to household bleaching.

A still further object is to produce a permanent finish in filament rayon fabrics, that is to say, a finish which will withstand repeated washing of the fabric.

Other and further objects will appear hereinafter.

According to the present invention, it has been found that by applying a large amount of a low polymer urea formaldehyde resin impregnating solution to a bright viscose rayon woven or knitted fabric of 300 denier or more, and incorporating in the impregnating solution a metallic catalyst, namely, zinc nitrate, in an amount substantially in excess of the theoretical amount required to obtain fully substituted tertiary nitrogen, and subsequently washing the finished or treated goods to remove free formaldehyde and excess catalyst, a fabric thus impregnated exhibits the properties above specified and differs from conventional fabrics of like character in its ability to be laundered, dried, and returned to service without any need of ironing, and its further ability to retain this characteristic after an indefinite number of launderings; such fabric being further characterized in that although the finished goods will retain chlorine after chlorine bleaching, they are not subsequently weakened or discolored on exposure to light or heat.

Apparently, the properties above described are obtainable by the application of such finish or impregnating agents only with respect to knitted or woven goods of bright filament rayon (viscose rayon) having a denier of 300 or larger, although the weave of such fabric may be

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of any style, such as leno, basket, novelty, or jacquered weave.

Further, according to the present invention, the goods are first scoured by any conventional method or means, and dried on dry cans or tenter frame so as to retain 3% to 6% moisture, which is to say, the goods must not be bone dry.

Enough resin for a single day's run must be made fresh and used within a 24 hour period. The resin is made up as follows:

Dissolve 120 lbs. of urea in 480 lbs. of 37% formaldehyde. Adjust the pH to 8.2 with sodium dicarbonate. Raise the temperature to 100° F. and allow the reaction to proceed for one hour. Temperature will rise to 120° F. to 125° F. Cool with ice; dissolve 30 lbs. of zinc nitrate in the mix; add 40 lbs. of Meltone RH softener (Crown Chemical Co.), and adjust the volume to 100 gallons. pH should now be 6.0 to 6.3.

The prepared goods are run through this solution in a conventional two-bowl pad with a pressure of 15 tons. They are then pre-dried on four drying cans at 160° F. They then go into a 90 foot tenter frame with temperatures of 305° F. at the entering end, and 325° F. at the discharge end. The entire process is run at 45 y.p.m.

The goods are finally washed in .25% Na₂CO₃ and .05% synthetic detergent at 160° F. for 10 minutes, rinsed and dried.

The product or fabric finish thus obtained may be used for a variety of end purposes such as curtains, draperies, bedspreads, slipcovers, or wearing apparel, and is characterized by the fact that it requires no ironing after laundering, and will drip dry; that it has adequate tensile strength and resistance to abrasion for the end use selected; that it is not damaged or discolored by chlorine bleaching, or any residual chlorine which may be left in the goods after laundering; that it has a residual shrinkage of not more than 1½% either warpwise or fillingwise, even after repeated laundering; and such fabric retains all of these characteristics even after 10 or more launderings.

As heretofore indicated, the special effects or properties obtained by means of the finish above described can only be obtained on or in knitted or woven fabrics constituted of bright viscose rayon of 300 denier or larger. In applying the resin or impregnating agent to fabrics of that character, care must be taken that the resin is a low polymer resin alkaline precondensate, and after making up the same, the resin should be used within 24 hours after its manufacture. Use of the term "low polymer" is intended to indicate a resin which is theoretically 100% monomeric, but in practice it has been found to be something less than that, to wit, approximately 95% monomeric and 5% polymeric. It is also important that the precondensate resin or urea formaldehyde solution should be alkaline in nature, and not an acid solution. By adjusting the pH to 8.2 with sodium bicarbonate the alkalinity of the solution is assured. The reason for using the resin finishing solution within a period of about 24 hours after its manufacture is because if it is kept much longer than that, undue polymerization will result; and if the resin, thus further polymerized, is subsequently applied to the cloth, the fabric will be unduly tenderized or otherwise damaged.

In practice it has been found that the amount or concentration of the urea formaldehyde resin in the treating or finishing solution should be substantially about 21% by weight of the treating or finishing solution. If the urea formaldehyde concentration is substantially less than 21% by weight, the desired properties and improvements in the fabric are not obtained. If substantially more than 21% by weight urea formaldehyde concentration is

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employed in the finishing solution, the fabric is damaged. Thus it may be said that a by weight urea formaldehyde concentration of about 21% of the impregnating or treating solution is of rather critical importance.

With respect to the catalyst employed in the present impregnating solution, it has been found that there is no substitute for the metallic catalyst above specified, namely, zinc nitrate, and it has been further found that this specific catalyst should be incorporated in the treating solution in an amount within the range of from about 3% to about 5% by weight of the treating solution. The preferred and desired quantity of concentration of the catalyst is 4% by weight of the treating solution.

A typical resin impregnating solution formulation is as follows:

	Lbs.
Urea	120
Formaldehyde (177 lbs. of 37% aqueous formaldehyde solution)	480
Sodium bicarbonate	0.33
Zinc nitrate	30
Softener—Meltone RH (Crown Chemical Co.) ..	70
Water (to adjust volume to 100 gallons)	130
	830.33

While a variety of softeners may be used as additives to the formulation, such softeners must be non-chlorine retentive. It is also to be mentioned that the goods should be dried before finishing, to the point where they retain not substantially more or less than from about 3% to 6% moisture. In any event they should not be bone dry. After finishing, the goods should be washed to remove excess unreacted formaldehyde and catalyst.

Thus, in carrying out the present invention, a specific fabric, that is, woven or knitted bright viscose filament rayon of at least 300 denier, is given a special resin finish by applying thereto, in the manner described above, a finishing composition comprising about 21% by weight concentration of low polymer urea formaldehyde resin in the form of an alkaline precondensate and metallic catalyst, namely, zinc nitrate, in an amount of concentration within the range of from about 3% to about 5%, and preferably in a concentration of 4% by weight of the treating solution; and following the application of the treating solution to such fabric the goods are cured, washed, rinsed, and dried. As a result of this treatment there is imparted to such fabric a special finish whereby

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the fabric achieves a glass-like appearance, which is to say, it visually appears to be a heavy fabric with a glossy finish, in these respects resembling fabrics made from fiberglass. Such fabric, thus treated, will drip dry and does not require any ironing after laundering. It is further characterized by resistance to abrasion, resistance to bleaching, absence of substantial residual shrinkage, and permanency of finish.

In the light of the foregoing, the following is claimed:

1. Bright viscose rayon fabric of at least 300 denier impregnated with a resin treating solution comprising about 21% by weight of urea formaldehyde low polymer resin and zinc nitrate as a catalyst in a concentration of from about 3% to about 5% by weight of the treating solution.

2. Low polymer urea formaldehyde finishing composition for 300 denier bright viscose rayon woven and knitted fabrics comprising an alkaline precondensate including urea formaldehyde in a concentration of about substantially 21% by weight of the treating composition, and a metallic catalyst, namely, zinc nitrate, in a concentration of from about 3% to about 5% of the treating composition.

3. Method of applying a permanent finish comprising a glass-like appearance to bright viscose rayon woven and knitted fabrics having a denier of at least 300, which comprises the steps of running such fabrics through a treating solution comprising about 21% by weight concentration of urea formaldehyde, and from about 3% to about 5% by weight concentration of zinc nitrate, squeezing the goods thus treated to remove excess treating solution, and subsequently drying the treated goods at a temperature of about 160° F. and passing the dried goods through a tenter frame heated to temperatures within about 305° F. to 325° F. at a speed of about 45 yards per minute, and finally washing the treated, dried, and tented goods at about 160° F. for about 10 minutes.

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