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METHOD OF PREPARING NONPYROGENIC MEDICAL ABSORBENT WADDING

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This invention relates to medical absorbent wadding. More particularly, it relates to a method of producing medical absorbent wadding from viscose rayon waste and to the product resulting therefrom.

Considerable viscose rayon waste is obtained in the production of viscose yarn and viscose staple. Likewise, considerable waste is obtained during the production of twisted yarns either from continuous filaments or staple rayon. Waste is also obtained during the weaving or knitting of viscose rayon yarns (either the continuous filament type or spun staple rayon type) into fabrics. During the conversion of the fabrics into various articles wherein the fabric is cut, there is also considerable waste in the form of cuttings. The waste resulting from operations utilizing twisted yarns or fabrics is known as "hard waste," and the waste obtained in operations wherein the viscose rayon is in the form of untwisted filament or staple fiber is known as "soft waste."

Viscose rayon is produced by extruding a cellulose xanthate solution into a coagulating and regenerating bath whereby some of the sulfur formed during the conversion of the xanthate into regenerated cellulose is retained in and on the filaments. In the usual processes, the yarn is subjected to a desulfuring operation and, preferably also, a bleaching operation.

Many attempts have been made to produce medical absorbent wadding from viscose rayon. However, these attempts were unsuccessful for the reason that the product contained pyrogenic substances, were not fluffy, and, in many cases, disintegrated into a powder during storage.

An object of this invention is to provide medical absorbent wadding from viscose rayon.

Another object of this invention is to provide medical absorbent wadding made of viscose rayon waste and which wadding will not induce fever when used on open wounds.

An additional object of this invention is to provide medical absorbent wadding made of viscose rayon waste and which will not disintegrate into a powder during storage.

A further object of this invention is to provide a method of preparing medical absorbent wadding consisting essentially of waste viscose rayon.

Other and additional objects of the invention will become apparent hereinafter.

The objects of the invention are accomplished, in general, by subjecting rayon waste to a series of treatments wherein any pyrogenic substance, and particularly sulfur, is removed to an extent that the product is no longer pyrogenic, and thereafter converting the treated fibers into a wadding which is neutral and capable of being

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sterilized. The waste, and especially if it is hard waste, is subjected to a picking operation wherein the fibers are opened up without any substantial breaking up of the fibers. The opened up fibers are subjected to desulfurizing and bleaching operations to remove the sulfur. Since the waste is generally in a dry state, prior to the desulfurizing operation the waste is preferably subjected to a boil-off wherein the fibers are caused to assume a gel state so that the subsequent treatments can be more effectively carried out. All of the chemical operations are carried out under conditions and with concentrations of the reagents as will not deleteriously degrade the fibers.

The details and manner of practicing the invention will become apparent by reference to the following specific example, it being understood that this example is merely an illustrative embodiment of the invention and that the scope of the invention is not restricted thereto:

Example

Dry rayon waste is subjected to a picking operation wherein the fibers are opened up without breaking thereof, and the picked raw waste is subjected to the following treatments, the quantities and concentrations hereinafter set forth being for each 100 kilograms of the picked raw waste:

(a) First boil-off.—The dry picked fibers are introduced in a closed kier and subjected to a boil-off for 3 hours, at a temperature of 95° C. and under a pressure of 2.5 kgs. per square centimeter, with the following solution which is circulated by means of a centrifugal pump through a system including the kier:

Water	liters	3500
Caustic soda (92%–95% pure sodium hydroxide)	kilograms	15
Sodium carbonate (Solvay)	do	10
Castile soap (72%)	do	5

At the end of this boil-off, the material is rinsed with water at a temperature of 50° C.

(b) Second boil-off.—The material resulting from step (a) is subjected to a second boil-off for 2 hours (under the same conditions of temperature and pressure as those of the first boil-off), with the following solution:

Water	liters	3500
Caustic soda (92%–95% pure sodium hydroxide)	kilograms	12
Sodium carbonate (Solvay)	do	10
Castile soap (72%)	do	6

At the end of this second boil-off, the material is rinsed with water at a temperature of 50° C.

(c) *Desulfurization.*—In a kier employed for the boil-off operations as above disclosed, the boiled-off fibers are subjected to a circulating solution at a temperature of 60°–80° C. and consisting of 2500 ls. of water and 15 kgs. of sodium sulfide for 30 to 35 minutes, the circulation being effected by a centrifugal pump. At the end of the treatment, the solution is separated from the fibers, which are then rinsed with slightly acidulated water at a temperature of 50° C.

(d) *Bleaching.*—The material is removed to an open kettle where, after it has been rinsed first with water at room temperature, it is treated with a circulating bath consisting of a 3° Bé. aqueous solution of sodium hypochlorite for a period of about 3 hours, whereby the material is uniformly impregnated, after which the solution is removed and the material is rinsed with water for 15 minutes.

(e) *Dechlorination.*—The material resulting from step (d) is treated with a circulating solution consisting of 3000 ls. of water and 12 ls. of commercial hydrochloric acid for 35 to 40 minutes, after which the solution is removed and the material rinsed with cold water.

(f) *Soaking.*—The material is next put into a vat equipped with stirring forks and valve-controlled inlets and outlets. When this vat is filled, there is added a solution consisting of 2 kgs. of sodium sulfite per 1000 ls. of water, and the material is permitted to soak therein for 15 minutes, after which the outlet valves are opened and the solution drained. Then the water valves are opened and the material washed 20 minutes in continuously running water.

(g) *Wash.*—The vat containing the material from step (f) is filled with water and the stirring apparatus is operated, whereby the material is stirred in all directions in continuously renewed water until the wash water is free of sulfur and compounds containing the same. This treatment takes about 1 hour.

(h) The product is then treated with a bluing, such as methylene blue, to enhance its whiteness.

The product is then appropriately dried, as by centrifuging, and the dried material is converted into an unwoven lap of appropriate size, as by carding. The lap can be formed into sheets or rolls of appropriate size and packaged.

The method of this invention is equally applicable to the treatment of hard or soft viscose rayon waste or, indeed, to dry viscose rayon yarn or fibers as normally produced. When hard viscose rayon waste is utilized, the latter is subjected to the picking operation set forth in the specific example. The picking operation need not be utilized with soft viscose rayon waste, but even with such waste better results are obtained when the picking operation is utilized therewith.

The invention is not restricted to the specific concentrations, temperature and pressure conditions set forth in the example. In general, the temperature and pressure conditions as well as the concentration of the solutions employed in the respective steps are such as not to deleteriously degrade the viscose rayon fibers. The temperature of the boil-off and the desulfuring as well as the washing therebetween should not exceed 95° C. This is important since it has been found that when the boil-off and the desulfuring operations are carried out at temperatures above 95° C., the product is unsatisfactory in that it is degraded. The bleaching step can be effectively

carried out under room temperature, and accordingly this temperature is preferred therefor.

As shown by the example, the boil-off is preferably performed in two operations, the second boil-off being carried out with a solution in which the alkali content is less than that of the first boil-off. It has been found that carrying out the boil-off in two stages, as set forth in the example, is more effective than carrying out the boil-off in a single operation. When the boil-off is carried out in a single step, the fibers are attacked, with the result that a product which is not as satisfactory as that obtained with a double boil-off results.

Instead of carrying out the boil-off and desulfuring treatment separately, as disclosed in the example, the boil-off and the desulfuring treatment can be combined. A suitable solution for carrying out the combined operation of boil-off and desulfuring comprises an aqueous solution containing 5 grams per liter of anhydrous sodium hydroxide and from 0.2% to 0.5% sodium sulfide. Such a solution is employed at 95° C. If desired, in place of the sodium sulfide, trisodium phosphate in a concentration of 1 gram per liter can be used. Optionally, a wetting agent, such as a sulfate of a higher alcohol, can also be incorporated in the baths which simultaneously boil-off and desulfur.

The product of the method can be rendered cracky by soaking it in an aqueous solution containing 1 gram of lactic acid per liter.

In carrying out the process, when the fibers are to be separated from the solution this can be obtained in various manners and preferably by centrifuging. Likewise, the whiteness of the product can be enhanced by the treatment with any appropriate bluing dye which has no pyrogenic reaction.

The product of this invention is absorbent wadding which can be sterilized and, either in the sterilized or unsterilized condition, will not disintegrate even when kept for prolonged periods of time. Due to the chemical operations to which the rayon waste has been subjected, the product will not induce any pyrogenic reaction when used as a medical absorbent wadding on open wounds in place of or as a substitute for medical absorbent cotton.

Since it is obvious that many changes and modifications can be made in the above-described details without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

I claim:

1. A method of preparing non-pyrogenic medical absorbent wadding which comprises picking open the fibers of viscose rayon waste, subjecting the picked fibers to a two-stage alkaline boil-off in caustic soda solution, the first stage containing a higher concentration of caustic soda than the second stage, desulfuring said fibers by treatment with a sodium sulphide solution, bleaching said desulfured rayon fibers, washing the resulting fibers while continuously stirring in all directions until the wash water is free of sulfur and sulfur-containing compounds, drying said fibers, and converting them to an unwoven lap.

2. A method of preparing non-pyrogenic medical absorbent wadding which comprises picking open the fibers of viscose rayon waste, subjecting the picked fibers to a two-stage alkaline boil-off in caustic soda solution, the first stage containing a higher concentration of caustic soda than

the second stage, desulfuring said fibers by treatment in a sodium sulphide solution, bleaching said desulfured rayon fibers by treatment with sodium hypochlorite, soaking said fibers in a dilute aqueous solution of sodium sulfite, washing the resulting fibers while continuously stirring in all directions until the wash water is free of sulfur and sulfur-containing compounds, drying said fibers, and converting them to an unwoven lap.

3. A method of preparing non-pyrogenic medical absorbent wadding which comprises picking dry viscose rayon, boiling off the dry opened up viscose rayon fibers in a two-stage boiling-off operation, the first stage comprising subjecting the fibers for 3 hours at a temperature not in excess of 95° C. with the following solution:

Water	liters	3500
Caustic soda (92%–95% pure sodium hydroxide)	kilograms	15
Sodium carbonate (Solvay)	do	10
Castile soap (72%)	do	5

the second stage of the boil-off being performed under the same conditions as the first boil-off except that it is performed for 2 hours with the following solution:

Water	liters	3500
Caustic soda (92%–95% pure sodium hydroxide)	kilograms	12
Sodium carbonate (Solvay)	do	10
Castile soap (72%)	do	6

subjecting the boiled-off fibers to a solution at 60°–80° C. and consisting of an aqueous solution containing 0.6% sodium sulfide, bleaching the desulfured fibers with a 3° Bé. aqueous solution of sodium hypochlorite, subjecting the bleached material to an anti-chlor, soaking the resulting material in an aqueous solution containing 0.2% sodium sulfite, removing said sodium sulfite solution, washing the resulting material while being continuously stirred in all directions with continuously renewed material until the wash water is free of sulfur and compounds containing the same, drying the material, and converting it into an unwoven lap.

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