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2,362,572

ELECTRICAL PROCESS OF PRODUCING VILLOUS OR PUBESCENT SYNTHETIC YARN

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FIG. 1.

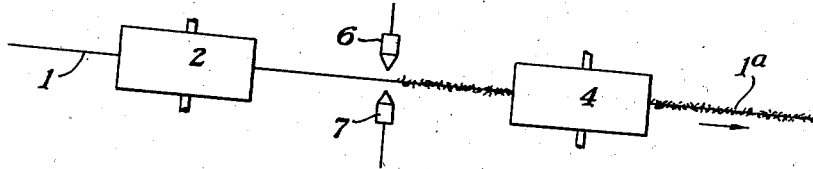


FIG. 2.

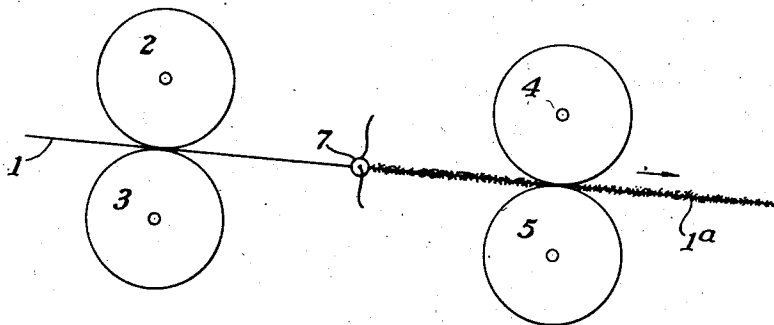


FIG. 3.

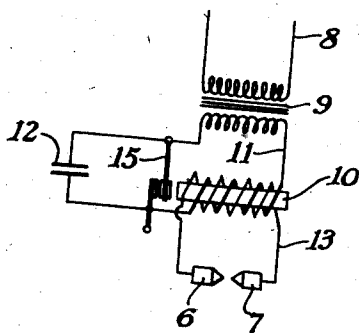
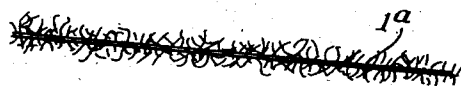


FIG. 4.



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ELECTRICAL PROCESS OF PRODUCING VILLOUS OR PUBESCENT SYNTHETIC YARN

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2 Claims. (Cl. 28—72)

This invention relates to the production of synthetic yarns and more particularly to the production of cellulose acetate and other synthetic yarns having a villous or pubescent character and otherwise closely simulating spun yarn in its physical characteristics.

As is well known, numerous processes have been proposed for the manufacture of synthetic staple fiber yarns from continuous filaments. Without exception, such processes have involved, either the cutting of the filament material into the desired staple lengths by means of knives, abrading devices or equivalent means, or have involved stretch-breaking. In the latter method the individual filaments of a strand are broken, either at random or at more or less predetermined points or segments as the yarn progresses through a stretch-breaking device. When staple fiber yarns are produced by cutting staple lengths from continuous filament material, a considerable number of operations must be performed on the resulting staple fiber material before it can be employed in a textile process, such operations including opening, picking, carding, drafting, drawing, combing, gilling, reducing, roving and spinning to produce the final spun yarn. Not only do such processes require the use of a great deal of complicated machinery which is expensive to operate and maintain, but many of these operations are extremely injurious to the fiber material and reduce its effectiveness for the intended use. While other methods for obtaining a true or simulated spun yarn, such as the various modifications of the so-called Perlok process, have eliminated most of the operations just referred to, nevertheless they do have the disadvantage that the filaments are unavoidably subjected to a certain amount of stretching which inevitably reduces the ultimate "stretch" or ability to be stretched which the material would otherwise possess. Even in those processes in which the filaments are actually cut, as by a rough stone or other abrasive material, certain very distinct disadvantages are encountered. For example, the control of an abrading surface, such as the surface of a roughened stone ring over which the yarn passes, to keep it uniform and prevent its wearing slick is extremely difficult in mill operation. Furthermore, even in such an abrading operation, the yarn is subjected to a relatively severe amount of tension or stretching as it passes over the abrading surface.

The present invention has as an object to provide a process for converting a strand of continuous filament synthetic yarn, such as a yarn

composed of cellulose acetate or other cellulose derivative material, to a condition in which it simulates natural spun yarn, without the disadvantages inherent in the prior art procedures referred to above. A further object is to provide a process for producing a villous or pubescent type of cellulose acetate or other cellulose derivative yarn which, not only avoids the complicated procedures involved in converting continuous filament yarns to spun yarn by the mechanical cutting method, but also results in the production of a product in which the staple fibers or segments of the villous or pubescent product have not been caused to deteriorate by undue stretching. A still further object is to provide a method of producing a simulated spun yarn by a cutting method which is simple to operate and easily controlled. Other objects will appear hereinafter.

These objects are accomplished by the following invention which, in its broader aspects, involves passing a strand of cellulose acetate or other synthetic filaments under very light tension between the electrodes of a high potential circuit at a sufficient speed to enable at least the outer filaments to be cut without, however, completely severing the strand.

In the following examples and description, I have set forth several of the preferred embodiments of my invention, but they are included merely for purposes of illustration and not as a limitation thereof.

In the drawing:

Fig. 1 is a diagrammatic plan view of one form of apparatus which may be employed in the carrying out of the invention.

Fig. 2 is an elevational view of the apparatus shown in Fig. 1.

Fig. 3 is a wiring diagram of an electrical circuit which may be employed to actuate the electrical cutting means of Figs. 1 and 2.

Fig. 4 is an illustration in greatly exaggerated proportions, of a segment of villous or pubescent yarn which has been produced in accordance with the invention.

My invention may be readily understood by reference to the drawing. In Figs. 1 and 2, the numeral 1 designates a strand containing a plurality of cellulose acetate rayon filaments. This strand is carried between a set of feed rolls 2 and 3 in contact one with another and rotatively mounted and driven by means not shown, which may, if desired, be covered with any appropriate material to facilitate gripping of the yarn and passing it on to the delivery rolls.

Numerals 4 and 5 designate the delivery rolls which are positioned so as to be in contact with one another and rotatively mounted and driven, by means not shown, similarly to feed rolls 2 and 3. Such rolls may also, if desired, be covered with any appropriate material which will facilitate gripping of the yarn.

Positioned at an intermediate point between the feed and delivery rolls and in close proximity to the strand of yarn passing therebetween, are electrodes 6 and 7 which are the terminals of a high voltage circuit to be more particularly described below. The arc formed between the electrodes when current is supplied thereto severs the outer filaments and causes the ends to stand out and impart to the yarn a fuzzy or villous appearance, as illustrated by the segment 1a of filament of Figs. 1 and 2, which has already passed between the electrodes.

The two sets of rolls are preferably operated at the same linear speed so that the strand of yarn is fed between the electrodes under little or substantially no tension. While I prefer to employ two sets of rolls, a tension gate and one set of rolls might be employed with substantially the same results as are obtained with two sets of rolls.

The linear speed of the yarn, the voltage of the current supplied to the electrodes and the amount of twist applied to the yarn may be controlled and regulated to give the desired results. Lower speeds, higher potential currents and higher tension on the yarn produce a greater number of breaks and thereby increase the fuzzy or villous condition of the yarn. In general, I have found that the tension on the yarn should not be more than 1 to 100 grams, the voltage should not be more than from 8,000 to 50,000 and the amount of twist should be from 5 to 50 turns per inch in order to give optimum results.

In Fig. 3, there is illustrated one type of electrical circuit for obtaining the desired arc, the high potential being supplied by passing the current from a 110-volt line 8 through the transformer 9 where it is reduced to 6 volts. The low voltage current passes through induction coil 10 where the voltage is raised to approximately 20,000 volts. Numeral 11 designates the primary 6 volt circuit which may be provided with condenser 12, while 13 is the 20,000-volt secondary circuit which supplies electrodes 6 and 7. 15 is the vibrating arm which operates to build up and collapse the electrical field.

As will be apparent from the above discussion many modifications of the process may be made within the scope of my invention. For example, although I have found it convenient to illustrate my invention by reference to the arc severing of continuous filament cellulose acetate yarns, yarns composed of other cellulose derivative ma-

terials, such as cellulose propionate, cellulose acetate propionate, cellulose acetate butyrate, the cellulose ethers, viscose and various other synthetic materials may be employed with equal facility.

The particular voltage of the high potential support may be varied in accordance with the type and denier of yarn being processed and the results desired in the finished product.

Instead of employing a single type of yarn material a multi-filament strand may be made up by blending a number of different synthetic filaments and then passing the blended material through the arc processing step. Not only may filaments composed of different yarn material be employed, but I may also blend different deniers of yarn of the same or different synthetic material.

In other instances I may prepare a plurality of separate strands and process them separately in the electric arc to produce a villous or pubescent type yarn and then combine the separate strands into a single large strand. By combining filaments of different synthetic materials and different deniers, an almost unlimited number of effects may be obtained. A variegated appearance may be given to the ultimate strand by combining filaments of different colors or containing different effect materials.

One of the outstanding advantages of the arc severing method of producing a pubescent or simulated spun yarn is that a much greater degree of uniformity of cutting or severing may be obtained than is possible with the stretch-breaking methods heretofore described in the prior art, with the result that the finished product has a more uniformly fuzzy or villous appearance than was heretofore possible.

It will thus be seen that I have provided a simple, effective and highly efficient process for the production of villous or simulated spun yarns which avoids most of the difficulties heretofore encountered in the production of such products.

What I claim is:

1. The process of producing a synthetic pubescent yarn closely simulating spun yarn which comprises cutting a strand of preformed synthetic continuous filaments into staple fibers by passing the strand through the arc formed between two electrodes supplied with a high potential electric current.

2. The process of producing a synthetic pubescent yarn closely simulating spun yarn which comprises cutting a strand of cellulose acetate continuous filaments into staple fibers by passing the strand through the arc formed between two electrodes supplied with an electric current having a potential of approximately 20,000 volts.

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