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J. S. FONDA ET AL
ARTIFICIAL THREAD TREATMENT

2,098,620

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FIG. 1.

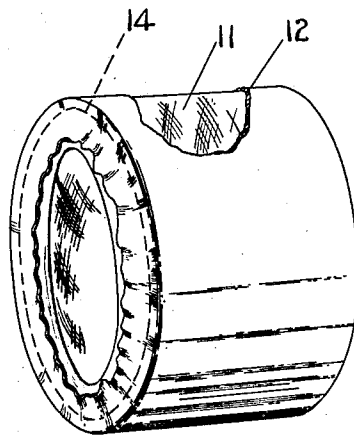
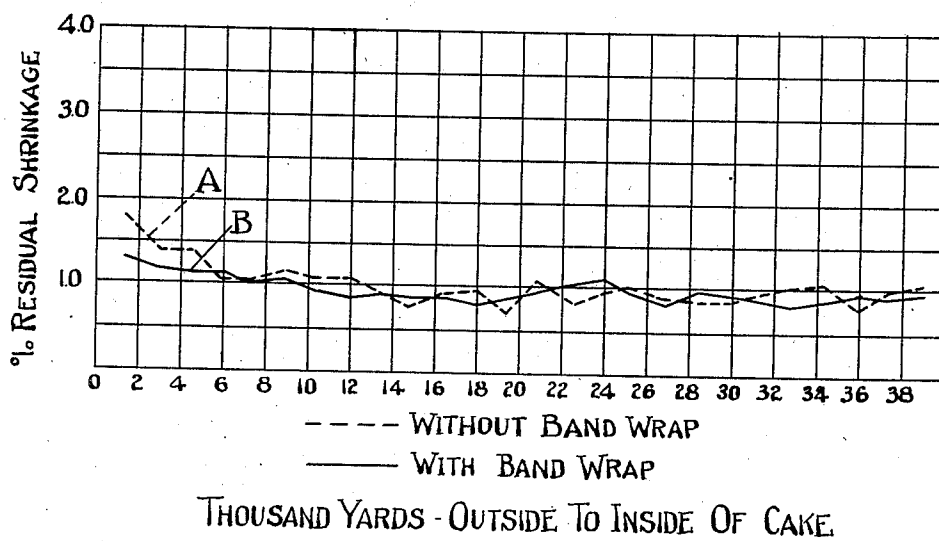


FIG. 2.



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ARTIFICIAL THREAD TREATMENT

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Application December 24, 1935, Serial No. 56,058

4 Claims. (Cl. 34—24)

The present invention relates to the production of artificial threads and filaments, and more particularly it relates to the production of artificial threads and filaments having uniform shrinkage characteristics.

In the production of artificial threads or filaments by the centrifugal bucket process the thread cakes, after their removal from the centrifugal spinning bucket, are processed by subjecting them to various liquid treatments. For example, the cakes may be subjected to successive washing, desulfuring, washing, bleaching and washing treatments, after which if desired, they may be treated with a suitable finishing composition. The purified cakes are then usually centrifugally wrung for a period of time to remove the major portion of adherent liquid prior to the subsequent drying thereof.

The production of artificial threads and filaments by the bobbin process often involves a similar purification procedure. The threads spun on the bobbins may be rewound with twisting into a yarn package which is sufficiently soft and pervious to permit uniform purification by liquid purification treatments in the manner described in patent application, Serial No. 570,474, filed October 22, 1931, by Charles Chatin. The thread may, for example, be rewound from the spinning bobbin on to a cylindrical or slightly tapered take-up bobbin, from which it may be removed as a cake for purification treatments which are carried out substantially in the manner above set forth in the purification treatment of bucket cakes. After the purification, or if desired, after purification and treatment with a suitable finish, the package is subjected to a drying procedure in which hot air is circulated through and over the surface of the cake.

It is well recognized today that packages or cakes of artificial threads cannot be subjected to a drying procedure in their open, uncovered state without producing a dried thread or yarn having very objectionable differences in shrinkage between the outer and inner sections of the cake, unless the drying is exceedingly slow.

Numerous efforts have been made to eliminate this objectionable difference in the shrinkage of the yarn between the external and interior sections thereof by covering the exterior peripheral surface of the cake and thereby cause the major part of the drying to be conducted from the inside towards the outside of the cake. These prior attempts have somewhat improved the shrinkage characteristics of the resulting yarn, nevertheless, they have not entirely eliminated the same.

It is therefore an object of the present invention to provide means for protecting the cake in such a manner that in the drying thereof the resulting dried thread will have substantially uniform shrinkage characteristics.

It is another object of this invention to provide means for protecting the external peripheral surface as well as portions of the end surfaces of the cake during the drying thereof so as to produce a yarn having uniform shrinkage characteristics.

It is a further object of the present invention to provide a method for drying the cakes of artificial silk, previously submitted to liquid purification treatments, in which the resulting dried thread will have substantially uniform shrinkage characteristics.

Other objects of the invention will appear hereinafter.

The objects of the invention may be achieved, in general, by placing a moisture impermeable elastic dam or wrapper about a firm but unsupported cake of yarn in such a manner that the external periphery and the outer edges of the ends of the cake will be covered thereby, prior to their subjection to drying in a manner as will be described hereinafter.

The details of the applicants' invention will be more clearly apparent by reference to the following detailed description, taken in connection with the accompanying illustration of one specific embodiment thereof, and in which:

Figure 1 is a perspective view, partially broken away, showing a yarn cake or package about which is placed a rubber dam in accordance with the present invention;

Figure 2 is a graphic illustration, showing the uniformity of shrinkage of thread resulting from an improvement in the drying of yarn cakes or packages when carried out in accordance with the present invention.

Referring to Figure 1 of the drawing, reference numeral 11 designates a hollow, cylindrical or conical yarn package or cake unsupported by an insert of any description which is desired to be dried. Securely positioned about the package or cake 11 is a rubber dam 12, which is composed of a flexible material having a sufficiently smaller diameter than the cake so that when positioned on a cake, the same will cover the outer peripheral portions of the ends to the extent of about $\frac{1}{4}$ inch, or more, as indicated by the dotted line 14.

The rubber dam or band is preferably made of a resilient, highly elastic, air cured, sheet rubber, having a thickness of about 0.010 inch to 0.012 inch. The dam or band is preferably constructed as a cylindrical member and is made at least 1 inch longer than the cake it is designed to cover, and is preferably about 5% to 10% smaller in circumference than the moist cake prior to its subjection to drying. The dam is constructed of such materials and of such a size as to have sufficient tension to extend over the ends of the cake, but insufficient tension to crush the same. The rubber dam or wrapper is made at least 1 inch longer than the cake it is to cover

to insure its proper application about the cakes without the consumption of undue time during the procedure, and to properly protect the corners of the cakes and to prevent them from drying too rapidly as well as the external peripheral surface of the cakes.

In order to secure uniform shrinkage characteristics in the resulting thread or filaments, the rubber dam 12 must be sufficiently smaller in circumference than the cakes and sufficiently elastic to securely grip and cover the outer surfaces of the ends of the cakes, as indicated by numeral 14, to the extent of $\frac{1}{4}$ inch, or more. In cake or package wrappers as known heretofore, for example, the wrapper disclosed in U. S. Patent No. 1,999,585 to J. Bruggeman, failed to eliminate the production of undesirable shrinkage characteristics in dried yarn, by reason of the fact that the outer portions of the ends of the cakes were not adequately protected. When the ends of the cakes are inadequately protected, the yarn in the outer windings of the cakes will dry against inner windings of the cakes and thereby prevent the natural unrestricted shrinkage thereof. The yarn, upon subsequent wetting, will shrink unevenly due to the fact that the outer layers of the cake of yarn have dried under tension, and therefore, make such yarns unsatisfactory for the production of certain textile materials. When the ends are protected in accordance with the present invention the thread will first dry on the inside of the cake. The inner windings of the cake are free to shrink in an unrestricted manner. Therefore, as the cake dries from the inside to the outside the succeeding windings are free to shrink in an unrestricted manner due to the prior shrinking of the dried preceding windings. When the cakes, covered in accordance with the present invention, have dried through the outer windings the rubber dam will be sufficiently loosened due to shrinkage of the cake as to be easily removable therefrom.

The effectiveness of the rubber dam or band is illustrated in the accompanying curve in which the dotted line designated by reference letter "A" illustrates the residual shrinkage properties of the yarn which has been dried as hereinafter described without the use of the rubber dam or band of the present invention and "B" illustrates the residual or potential shrinkage properties of the yarn which has been dried under similar conditions while being protected with a rubber dam constructed in accordance with the present invention. The decrease in the residual shrinkage shown at the left-hand portion of the curve B when compared with the curve A is sufficient to eliminate the herring bone in warp fabrics caused by the greater spread in residual shrinkage in yarns as represented by the upturn of curve A. It is apparent that only the outside 5,000 yards or so is affected. The actual drying procedure to which the wrapped cakes are subjected is preferably similar to that described in copending application, Serial No. 38,441, filed August 29, 1935, to Bradshaw, Fonda and Filson, which discloses, with reference to 100 denier-40 filament yarn somewhat the following procedure:

The total drying period which is approximately 92 hours is divided into five portions in which the drying temperature is maintained at approximately 130° F. throughout the entire dry-

ing cycle. In the first 18.4 hours the relative humidity is kept at about 64%; in the next 18.4 hours it is maintained at about 56%; in the next 18.4 hours it is maintained at about 48%; in the fourth 18.4 hour period it is maintained at about 35%; and in the last 18.4 hours it is uncontrolled, dropping to about 15-20%.

The "residual" or "potential" shrinkage referred to throughout the specification is the shrinkage in length obtained in a thread by subjecting the same, for a period of ten minutes to an aqueous solution containing 1.35% NaOH at a temperature of about 95° C., washing and drying the same at a temperature of 55° C. without opposition or restriction to shrinkage.

It will be obvious that various changes and modifications may be made in the above description without departing from the nature and spirit of the invention, and it is therefore to be understood that the invention is not to be limited thereto except as set forth in the appended claims.

We claim:

1. A covering for protecting artificial thread packages during the drying thereof comprising a cylindrical, moisture impermeable elastic band which is longer than said package and has a circumference which in its unstretched state is from 5% to 10% smaller than the circumference of the package to be dried.

2. A covering for protecting artificial thread packages during the drying thereof comprising a cylindrical, moisture impermeable elastic band having a circumference which in its unstretched state is from 5% to 10% smaller and at least one inch longer than the circumference and length respectively of the package to be dried.

3. In a method for drying cakes and packages of artificial thread which are unsupported on the internal surface thereof, the steps comprising covering the outer circumferential surface and at least the outer periphery of the ends of said cakes and packages with a moisture impermeable elastic tubular member by stretching the same thereover, said tubular member having a circumference which in its unstretched state is sufficiently smaller than the circumference of said package that it will be maintained in contact with the entire outer surface of said package during the entire drying operation, and which has a length greater than said package, and drying said covered package from the internal surface thereof.

4. In a method for drying cakes and packages of artificial thread which are unsupported on the internal surface thereof, the steps comprising covering the outer circumferential surface and at least the outer one-quarter inch periphery of the ends of said cakes and packages with a moisture impermeable elastic tubular member by stretching the same thereover, said tubular member having a circumference which in its unstretched state is from 5% to 10% smaller than the circumference of said package so that it will be maintained in contact with the entire outer surface of said package during the entire drying operation, and which has such a length that it overhangs said package at least one-half inch on each end, and drying said covered package from the internal surface thereof.

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