March 17, 1964 W. D. SMITH 3,124,924

SYSTEM AND APPARATUS FOR MAKING ELASTIC YARN

Filed Nov. 14, 1962

FIG. 1.

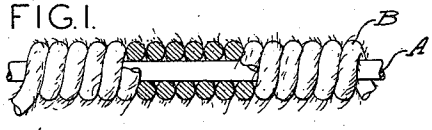


FIG. 2.

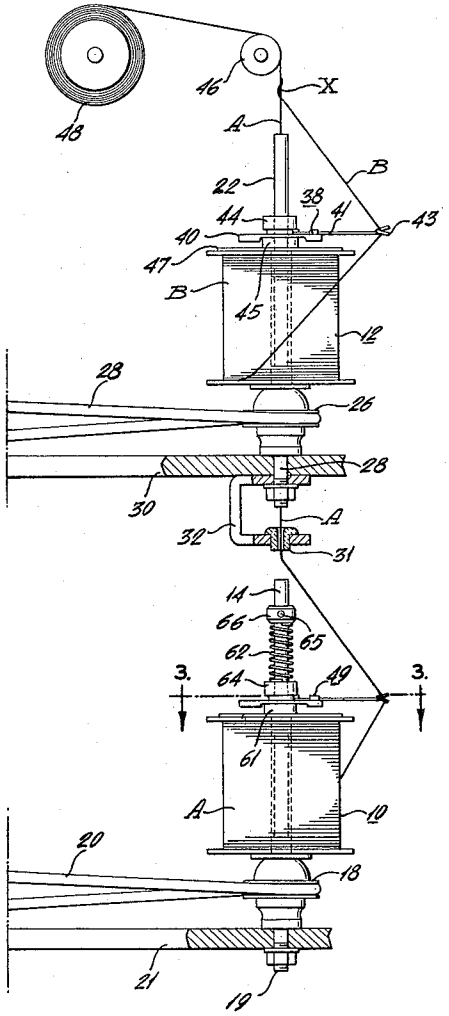


FIG. 3.

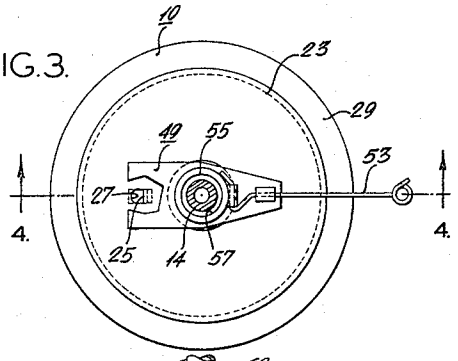


FIG. 4.

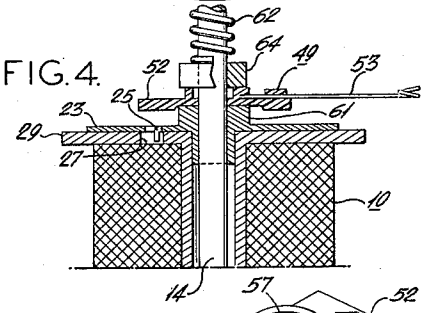


FIG. 5.

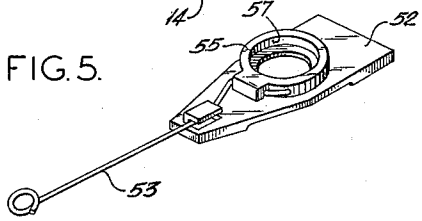


FIG. 6.

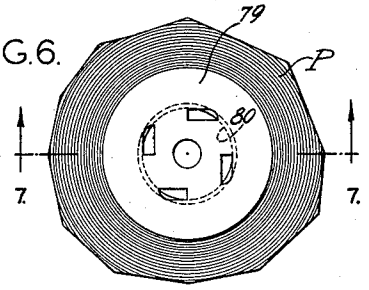
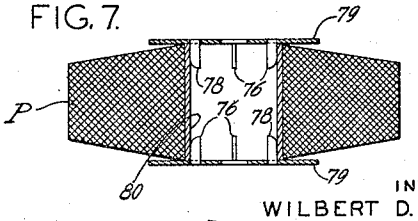


FIG. 7.



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SYSTEM AND APPARATUS FOR MAKING ELASTIC YARN

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The present invention relates to a system and apparatus for making elastic yarn.

The present invention relates to an improvement in yarn making apparatus of the type shown, for example, in my co-pending application, entitled "Elastic Yarn and Method of Making Same," Serial No. 181,020, filed March 20, 1962. As shown therein, the apparatus includes upper and lower rotatable spools, the lower spool having wound thereon an elastic core filament and the upper spool having wound thereon an inelastic cover thread. The elastic core filament is drawn from its spool and advanced through a hollow spindle on which the upper spool is mounted to a point above the spool where the cover thread is helically wrapped around the core filament. It is noted that as the core filament is withdrawn from the bottom spool, the core filament is stretched and in the case of a Spandex yarn, is stretched and set due to air resistance which produces a ballooning in the core filament. One of the factors determining the percent stretch in the finished yarn, is the amount the elastic core filament is stretched and/or set as a result of the above described ballooning. Another characteristic of the finished yarn affected by the ballooning of the elastic core filament is the ratio of core filament to cover thread content in a given unit of finished yarn.

Even though satisfactory elastic yarns may be produced on my prior apparatus, it has been found that when the apparatus is set to provide a finished yarn having a predetermined percent stretch, there are slight variations in the percent stretch in various sections of a run of the finished yarn and also that the ratio of core filament to cover thread content in the finished yarn varies slightly in sections of the yarn. Accordingly when the yarn is woven into a fabric, the fabric is not of the highest quality because of slight variations in percent stretch in the yarn and also the slight variations in the ratio of core filament to cover thread content. This non-uniformity in percent stretch and ratio of the elastic core filament to cover thread content in finished yarn is attributable to variations in the amount that the core filament is stretched and/or set when it is unwound from its spool. In this regard it is noted that the core filament does not tend to unwind smoothly but has a tendency to ripple due to turbulent, changing air currents in the region of the spool which is rotating at high speeds whereby the core filament is not stretched and/or set uniformly. Additionally it has been found that the amount the core filament is stretched changes as the amount of filament on the spool decreases.

In other prior apparatus of the above type the core filament is unwound from its spool by means of a flyer which is rotatably mounted on the spindle mounting the filament spool and which is seated against a flange of the filament spool by means of a weighted collar. However, the collar tends to bob up and down on the spindle when the filament spool is rotating at high speeds whereby the drag on the flyer varies. This bobbing action produces variations in the amount the yarn stretches and/or sets which result in non-uniformity in the percent stretch in the finished yarn and also non-uniformity in the ratio of filament to cover thread content in the finished yarn. Moreover, changes in drag on the flyer

often cause filament breakage necessitating frequent shut downs to rethread the machine.

In accordance with the present invention an improved apparatus is provided for making a balanced yarn characterized by a uniform percent stretch and a uniform ratio of core filament to cover thread content throughout the finished yarn. In accordance with the present invention, this is accomplished by providing an adjustable biasing means urging the flyer against the filament spool to provide a controllable, predetermined uniform drag between the flyer and the spool. By this arrangement the elastic core filament is stretched and/or set uniformly as it is unwound from its spool by the flyer to provide a uniform percent stretch in the finished yarn and a uniform ratio of core filament to cover thread content. It is noted that by the present arrangement the drag between the flyer and spool is uniform irrespective of the amount of filament on the spool thereby minimizing the danger of breakage and shut down. Thus the productivity of the apparatus is increased.

With the foregoing in mind, an object of the present invention is to provide an improved system and apparatus for making a balanced elastic yarn wherein all of the yarn produced is characterized by a uniform percent stretch and a uniform ratio of elastic core filament to cover thread content.

Another object of the present invention is to provide an improved yarn making apparatus characterized by novel features of construction and arrangement whereby the elastic core filament is unwound from the spool in a manner minimizing the chance of breakage and therefore increasing the productivity by eliminating "down time" necessitated by breakage of the yarn.

A further object of the present invention is to provide an improved apparatus for making balanced elastic yarn which is of comparatively simplified construction and may be manufactured economically.

These and other objects of the present invention and the various features and details thereof are set forth more fully hereinafter with reference to the accompanying drawings, in which:

FIG. 1 shows a section of elastic yarn made on the apparatus of the present invention;

FIG. 2 illustrates diagrammatically yarn making apparatus in accordance with the present invention;

FIG. 3 is an enlarged sectional view taken on line 3—3 of FIG. 2;

FIG. 4 is an enlarged fragmentary sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is an enlarged perspective view of the flyer assembly;

FIG. 6 is a plan view of a conventional package having end discs whereby the package may be accommodated on the yarn making apparatus of the present invention; and

FIG. 7 is a sectional view taken on line 7—7 of FIG. 6.

In accordance with the system of the present invention, an elastic core filament A is advanced along a predetermined path to a wrapping station and means is provided along said path for stretching the core filament in a predetermined controlled uniform manner. At the wrapping station, at least one inelastic cover thread B is helically wrapped around the stretched elastic core filament A to provide an elastic yarn of the type shown in FIG. 1. The amount of stretch imparted to the core filament is selectively adjustable so that, in accordance with the present invention, the percent stretch of the finished yarn may be controlled accurately and all of the yarn of a given run is characterized by a uniform percent stretch and a uniform ratio of core filament to cover thread content.

Referring now to the drawing and particularly to FIG. 2 thereof, there is illustrated apparatus in accordance with the present invention for making a balanced elastic yarn having uniform stretch characteristics and a uniform ratio of core filament to cover thread content. As illustrated the apparatus includes a pair of rotatable spools 10 and 12 having wound thereon the elastic core filament A and the inelastic cover thread B respectively. The spool 10 is mounted for rotation on a vertically disposed tubular spindle 14 mounted at one end in a whirl or pulley 18 which is journalled on a stub shaft 19 secured to a rigid support 21 and which is driven by a belt 20 connected to a suitable drive means. The spindle 14 carries a disc 23 spaced axially from the free end of the spindle 14, the disc 23 having a depending lug 25 engageable in an opening 27 in the upper flange 29 of the spool to establish a driving connection between the spindle and spool. The spool 12 is mounted for rotation on a hollow spindle 22 which is rotated by suitable drive means similar to that of spool 10 including a whirl or pulley 26 journalled on a shaft 28 mounted in a rigid support 30 and a belt 28 connecting the whirl 26 to suitable drive means. The spools 10 and 12 are rotated in a direction counter to the direction of wrap of the core filament and thread on their respective spools, that is, the spool 10 is rotated in a clockwise direction and the spool 12 is rotated in a counterclockwise direction as viewed from the top of the apparatus.

In the operation of the apparatus, the core filament A is withdrawn from its spool and passes through a guide bushing 31 mounted in a C-shaped bracket 32 depending from the support 30, then up through the spindle 22 to a point X where the cover thread B is helically wrapped around the core filament A to produce the finished yarn. The cover thread B is withdrawn from its spool and wrapped around the core filament A at the point X by means of a flyer assembly 38 consisting of a holder 40 which is rotatably mounted on the spindle 22, an arm 41 projecting from the holder 40 and an eye 43 at the outer end of the arm through which the cover thread is guided. The holder 40 is pressed against the hub 45 of a disc 47 mounted on the spindle 22 by a weighted collar 44. The finished yarn is wrapped around a feed roll 46 rotated at a predetermined rate to advance the yarn through the apparatus to a take up package 48.

In accordance with the present invention, means is provided for withdrawing the core filament from its spool in a manner to continuously impart a predetermined uniform stretch and/or set to the filament whereby the finished yarn is characterized by a predetermined uniform percent stretch and a predetermined uniform ratio or filament to cover thread content. To this end the core filament A is unwound from its spool 10 by means of a flyer assembly 49 including a holder 52 rotatably mounted on the spindle 14, an arm 53 projecting from the holder terminating in a loop or eye at its outer end through which the filament is guided. As illustrated in FIG. 5, the holder 52 which is preferably made of plastic, is of generally rectangular shape and has an annular flange 55 which surrounds an opening 57 therein and projects upwardly from one face of the holder. The holder 52 is pressed against the axial end face of a hub 61 projecting axially from the disc 23 by means of a coil spring 62 encircling the spindle 14 and which acts on a collar 64. The force exerted by the spring 62 on the collar 64 is adjustable selectively by means of an adjusting collar 66 which is movable axially on the spindle 14 and which may be secured in a predetermined position to load the spring 62 by means of a set screw 65. Accordingly by this arrangement, the holder 52 of the flyer assembly is frictionally held between the collar 64 and the hub 61 and is accordingly rotated in the same direction as the spool 12. However, as the yarn is advanced through the apparatus by rotation of feed roll 46, there is a relative rotation between the flyer 49 and the spool 10 whereby the core filament A is unwound from the spool 10 and stretched a predetermined controlled amount. The relative rotation of the flyer 49 and the spool 10, or drag may be controlled selectively by adjusting the biasing force of the spring 62. However, for a given setting of the spring 62, the relative rotation of the flyer 49 and the spool 10 or drag is constant and therefore a uniform stretch is imparted to the core filament. This stretch may be increased or decreased selectively by increasing or decreasing the biasing force of the spring 62 by adjusting the adjusting collar 66.

The core filament and thread are usually wound on packages P as shown in FIG. 7 and then transferred to the spools 10 and 12 respectively, which, as illustrated, have a core of comparatively small cross section. There is illustrated in FIGS. 6 and 7 end plates for the conventional package P whereby the package may be used directly on the yarn making apparatus. As illustrated, each of the end plates has a plurality, in the present instance, four lugs 76 arranged in a circular array which may be formed therein by a punching operation. Each of the lugs 76 has a rounded outer edge 78 to facilitate insertion into the core 80 of the package P as shown in FIG. 7. The plates are held in place at opposite axial ends of the core 80 by frictional engagement of the lugs 76 and the inner wall of the core 80.

While a particular embodiment of the present invention has been illustrated and described herein, it is not intended to limit the invention and changes and modifications may be made therein within the scope of the following claims.

I claim:

1. In apparatus for making elastic yarn by wrapping an inelastic cover thread about an elastic core filament, a spool having an elastic core filament thereon, means for rotating said spool in a predetermined direction, a flyer assembly for withdrawing the elastic core filament from the spool, biasing means acting on the flyer assembly operable to effect a predetermined uniform relative rotation between the flyer and spool whereby the core filament is continuously withdrawn from its spool and stretched a predetermined uniform amount, means for helically wrapping at least one inelastic cover thread around the stretched core filament and means for selectively adjusting the biasing means to vary the relative rotation between the flyer assembly and spool.

2. Apparatus as claimed in claim 1 wherein said biasing means comprises a coil spring surrounding said spindle having one end adjacent said holder and said means for adjusting the bias of said spring comprises an adjusting collar on said spindle adapted to engage opposite end of said spring which is movable axially of the spindle and which may be secured thereto to provide a predetermined preload in the spring.

3. In apparatus for making elastic yarn by wrapping an inelastic cover thread about an elastic core filament, a spindle, a spool having an elastic core filament wound thereon mounted on said spindle for rotation therewith, means for rotating said spindle in a predetermined direction, a flyer assembly including a holder rotatably mounted on said spindle and an arm projecting from the holder which terminates in an eye through which the core filament is guided, biasing means urging said holder against an end flange of said spool to effect a predetermined uniform relative rotation between the flyer assembly and spool whereby a uniform stretch is imparted to the core filament as it is withdrawn from the spool, means for helically wrapping at least one inelastic cover thread around the stretched core filament and means for selectively adjusting the biasing means to vary the relative rotation between the flyer assembly and spool.

4. In apparatus for making an elastic yarn, a first spindle, a first spool having the elastic core filament wound thereon mounted on said first spindle for rotation therewith, means for rotating said first spindle in a

direction opposite to the direction of wrap of the cover thread, a hollow second spindle, a second spool having the inelastic cover thread wound thereon, mounted on said second spool for rotation therewith, means for rotating said second spool in a direction opposite to the direction of wrap of the cover thread, feed roll means for advancing said core filament through said hollow second spindle, means for withdrawing and stretching said core filament including a flyer assembly having a holder rotatably mounted on said first spindle, an arm projecting from said holder terminating in a flyer through which the elastic core filament is guided and biasing means acting on said holder to provide a constant relative rotation between said flyer assembly and said first spool to withdraw said core filament therefrom and stretch it a predetermined

uniform amount and means for withdrawing said cover thread from said second spool and helically wrapping it around the stretched core filament and means for selectively adjusting the biasing means to vary the relative rotation between the flyer assembly and said first spool.

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