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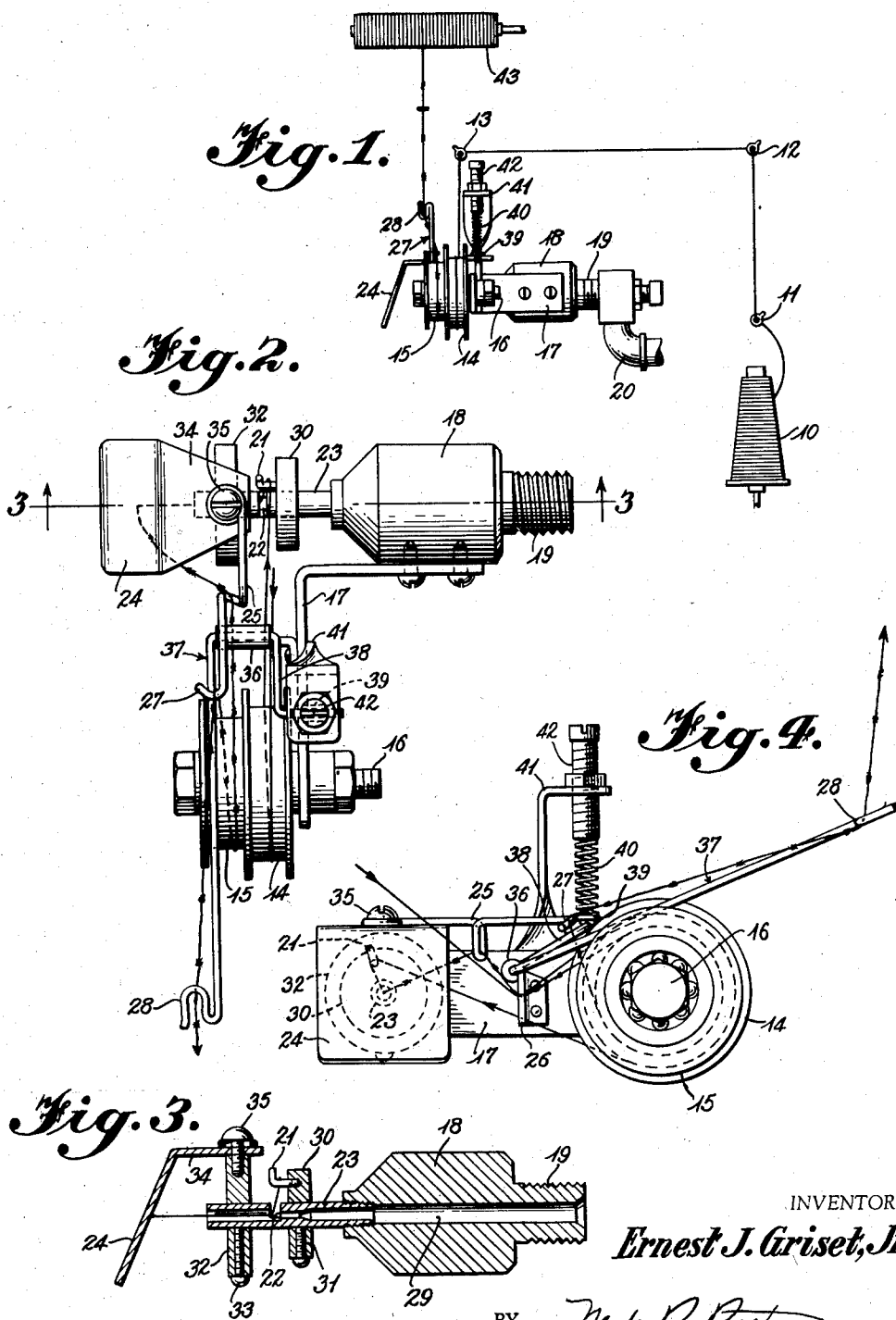
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BULKING YARN

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2 Sheets-Sheet 1



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2,874,445

BULKING YARN

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Application October 4, 1954, Serial No. 460,166

11 Claims. (Cl. 28—1)

This invention relates to the production of continuous filament yarn characterized by the presence of curls, fluffiness, and, if desired, localized areas of increased denier. This application is a continuation-in-part of commonly owned application Serial Number 410,918, filed February 17, 1954.

In the application above-identified there is disclosed and claimed a method and apparatus for bulking continuous filament yarn. The disclosed apparatus includes a two step pulley for controlling the delivery of the yarn to the gas stream and the withdrawal of the yarn therefrom. By using a two step sheave or pulley, accurate control over the input and output tension ratio is maintained and a product of excellent appearance is produced. After bulking, the customary practice was, heretofore, to collect the bulked yarn on a take-up mechanism such as a winding machine or a coping machine. It is desirable that the take-up mechanism collect the yarn under reasonably uniform conditions.

In commercial production of bulked yarn it was found that the product, although of good appearance, did not have absolute interpackage uniformity. In other words, the packages produced on different machines and on different runs of the same machine were not completely uniform. It was believed that this lack of interpackage uniformity was due to minor tension variations within the narrowest range of tension variation possible to impose with the controls on the take-up machine. Tests were made and it was confirmed that the tension control mechanisms of an ordinary winding machine are not accurate enough to maintain absolute interpackage uniformity with yarns bulked according to the method and apparatus disclosed in application Serial No. 410,918.

In an attempt to overcome the difficulty, different types of collecting mechanisms were employed and, with an elaborate speed control, it was found that excellent interpackage uniformity could be achieved. On the other hand, the mechanisms tried were sensitive, delicate to adjust, expensive to install and would not permit the use of existing capitalization in take-up machines.

It is an object of this invention to overcome these difficulties and to provide a tension control mechanism for maintaining a high degree of uniformity between the bulking apparatus and the collecting cone of a take-up machine whereby high interpackage uniformity can be achieved with economical use of existing take-up machine equipment.

A further object is to provide a novel tension member. It is proposed according to the present invention to feel continuously the tension of the yarn running between the bulking mechanism and the take-up and to impress the slightest deviation from a predetermined normal tension on to the two step sheave system to maintain a constant tension difference between the bulking apparatus and the collecting package.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed

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description of a preferred embodiment thereof in conjunction with the annexed drawings wherein:

Figure 1 is a schematic view in elevation showing a supply package, the bulking mechanism of the present invention and the package of a take-up machine;

Figure 2 is a top plan view of the bulking mechanism of the present invention;

Figure 3 is a view in vertical section taken along the line 3—3 of Figure 2;

Figure 4 is an end view of the apparatus of Figure 2;

Figure 5 is a perspective view of a modified type of bulking mechanism according to the present invention;

Figure 6 is a side view of the adjustable baffle associated with the assembly of Figure 5; and

Figure 7 is a top plan view of the baffle of Figure 6.

Referring now in greater detail to the drawings, the numeral 10 designates a supply package containing yarn to be bulked. This yarn is led through guides 11, 12 and 13 to and around a large sheave or pulley 14 of a two step coaxial pulley system including also a small sheave or pulley 15. The pulleys 14 and 15 are fixed together but mounted for free rotation on a shaft 16 which is supported from a bracket 17, which is, in turn, fastened to a fitting 18. The fitting 18 has a threaded end 19 which is connected to coupling 20.

The yarn leaving the underside of the large pulley or sheave 14 runs to and over a guide 21 into a notch 22 in conduit 23 to be acted upon by a stream of air under pressure supplied from coupling 20. After leaving the conduit 23, the yarn is subjected to the influence of air impinging against a baffle plate 24 and is then led over a guide 25, under the guide 26, around the sheave 15, over a guide 27 and to a feeler arm 28 of the improvement of the present invention.

If reference is made to Figure 3, it will be seen that the fitting 18 has a hollow central bore at 29 which feeds air to the tube 23. Tube 23 is threaded at one end and is received in a complementary threaded portion of the fitting 18 in order to be physically supported by the part 18. The guide 21 extends from an annular body 30 which is slidable along and around the tube 23 to adjust the position of the guide. The body 30 is held in adjusted position by a set screw 31. An annulus 32, similar to but larger than the annulus 30, is also mounted on the tube 23 but on the outer side of the groove 22 from the annulus 30. The annulus 32 is held in the desired position of adjustment by a set screw 33 and it supports the baffle 24 from its integral top portion 34 by a screw 35. It can now be seen that the guide 21 and the baffle 24 are both capable of adjustment to produce the desired relationship of the parts in order to produce a desired ornamental effect in the thread. The apparatus thus far described, although differing in certain constructional details, is basically quite similar to that shown in application Serial No. 410,918. The pulleys 14 and 15 are identical in construction and in mounting to the arrangement shown in Figure 14 of application Serial No. 410,918. In other words, both pulleys are locked together for unitary movement but are free to rotate on the shaft 16. They are driven from and by the yarn.

The screw 35 which holds the baffle 24 also supports the single length of wire which defines both of thread guides 25 and 27. The shape of these guides can best be appreciated by concurrent reference to Figures 3 and 4. Thread guide 26 extends and is supported from the bracket 17. As a part of the subassembly which includes guide 26 there is a barrel 36 which acts as a bearing for the tension control guide of the present invention. The tension control guide is formed from a single length of wire and is designated generally by the numeral 37. It is bent at one end to define the feeler arm 28. From

the feeler arm it extends straight, see Figure 4, to the barrel 36. There it is bent at right angles and a length of it extends through the barrel. On the other side of the barrel 36 a shorter length of the guide bearing reference numeral 38 extends radially outwardly from the barrel, across the rim of the sheave 14 and into a socket 39. The socket 39 is fastened on the end of a spring 40 which acts in compression to urge it downwardly. The spring 40 is supported from a bracket 41 which in turn is supported from the bracket 17. A screw arrangement 42 with a lock nut adjusts and locks the predetermined thrust sought to be imposed by the spring 40.

It can now be seen that the arm 38 of the tension control element 37 bears upon the rim of the pulley 14 with a pressure that is dependent upon the load of the spring 40 and the tension of the thread running under the feeler arm 28. If the tension running under the feeler arm 28 is very high, there is a tendency to lift the arm to rotate it counter-clockwise as viewed in Figure 4 and hence to lift arm 38 off the rim of the pulley 14 against the thrust of the spring 40. All this tends to reduce the drag imposed by the system including the pulleys 14 and 15. On the other hand, if the tension encountered by the feeler arm 28 is very low, the arm 28 tends to move clockwise under the bias of spring 40 which puts its load on the arm 38. The full braking effect of the arm 38 is thus imposed on the rim of the pulley 14.

It will be noted that because pulleys 14 and 15 run together at the same R. P. M., but with different peripheral speeds, they will control the relation between the speed of delivery of yarn to the notch 21 and the speed of withdrawal of the yarn from the baffle 24 quite independently of the tension between the sheave 15 and the take-up cone 43. If the peripheral speed of the take-up machine tends to vary for any reason, the action of the control 37 compensates therefor.

In Figures 5, 6 and 7, there is shown a commercial model of machine according to the present invention. The basic supporting structure is a block 44, which is drilled at one end to receive a tube 45 which functions as a jet tube. This tube is fed by a tube 46 from an air or gas source not shown. An annulus 47 surrounds the tube 45 and corresponds in structure and in function to the annulus 30 of the preceding figures. The annulus 47 supports a thread guide 48 thereon. The tube 45 is notched at 49. An annulus 50, somewhat corresponding to the annulus 32, surrounds the tube 45 and supports a baffle assembly 51, a thread guide wire 52, while defining a thread guiding eye 53. The baffle 51 is different from the baffle 24 in that it comprises mutually hinged leaves 54 and 55, the leaves having overlapping ears which are connected by a screw very much in the way an eyeglass frame is pivoted to the ear-piece. The screws, one of which is shown at 56 in Figure 5, can be tightened to lock the plate 55 in a desired angular position, see Figure 6. The eye at 53 avoids the necessity for the guide shown at 25 in the preceding figures. A stud 57 projects from the side of the block 44 and it has depending from it radial pins which define thread guides 58 and 59. The wire 52 defines thread guides 60 and 61. The sheave assembly is exactly like the one shown in Figures 1 to 4, inclusive, except that it is mounted directly from the block 44 for free rotation. The larger sheave is designated by numeral 62 in Figure 5 and the smaller by numeral 63. The brake mechanism of the embodiment of Figures 5, 6 and 7 is a wire 64 pivoted at 65 in a bracket 66 held from the block 44. The wire 64 is springy and it is so mounted that when its sensing portion at 67 is lifted its braking portion at 68 has the tension somewhat relieved whereby to reduce the braking effect on the sheave assembly.

In operation the function of the apparatus of Figures 5, 6 and 7 is identical to that described in conjunction with Figures 1 to 4, inclusive. Yarn 68 comes into the system from the left of Figure 5, passes through guide 58,

over and around sheave 62, again through guide 58, then over guide 48 and into the notch 49. After being ejected from the tube 45, it is subjected to the action of air impinging against baffle plate 55 and then comes through eyelet 53, guide 60, and guide 59. It then wraps once around the sheave 63 and goes on to guide 61 and passes to the sensing guide 67.

It will be apparent that annular body 30 in Figure 3, or the corresponding annulus 47 in the commercial embodiment of the invention shown in Figure 5, may be rotated about the tubes 23 and 45, respectively, to guide the yarn into the notch at different angles. In Figure 3, if the annular body 30 is rotated so that guide 21 delivers the yarn into the notch 22 from the side opposite that from which the yarn is withdrawn from baffle 24, it will be found that nubs are produced. On the other hand, if guides 21 and 25 are on the same side of tube 23 so that the yarn is introduced into the notch on the same side of tube 23 from which it is withdrawn from the baffle 24, the yarn will be rendered more bulky, curly, and fluffy, but will not have nubs produced therein. Similarly the annular member 30 may be rotated so that the guide 21 delivers the yarn from above and this rotatable adjustment may be used to vary the number of nubs produced. The annular member 47 in Figure 5 acts in an identical manner.

It is to be understood that the present invention is not limited to the precise embodiments described above. The principles herein disclosed are applicable to other types of apparatus for producing bulky type yarns. For example, in a system for producing bulky yarns wherein a positively driven feed roll is used to supply the yarn to a jet device, a single freely rotatable roller equipped with a brake member as herein disclosed may be interposed between the jet and the collection means. Such an assembly would have the advantage that only one positively driven feed roll would be required, i. e., the roll supplying yarn to the jet. There would be no positively driven roll between the jet and the collection package. Instead there would be disposed in this location the relatively inexpensive pulley and brake mechanism described above. Other uses for this tension member will occur to those skilled in the art.

It is to be understood that the invention is limited only by the appended claims.

What is claimed is:

1. Apparatus for controlling tension comprising in combination a first rotatable roller, means for supporting said roller, a second rotatable roller different in diameter from said first roller and mounted for rotation at the same number of revolutions per unit of time as said first roller, and brake means for one of said rollers responsive to variations in tension on a running thread passing into contact with the surface of each of said rollers.

2. Apparatus for bulky yarn comprising in combination a gas jet, means to positively feed a multifilament yarn to said jet, means to collect bulked yarn issuing from said jet in package form, and a member disposed between said collection means and said jet for controlling said feed means responsive to the tension on the bulked yarn between the collection means and the jet.

3. In apparatus for bulking yarn including a gas jet and means including yarn contacting surfaces operable to feed yarn to and withdraw yarn from said jet, the improvement that comprises means to collect the bulked yarn, and means responsive to tension variations between said withdrawing means and said collecting means to improve resistance on said withdrawing means varying inversely with tension whereby to maintain constant yarn tension.

4. In apparatus for bulking yarn including a gas jet and means including yarn contacting surfaces operable at a constant speed difference to feed yarn to and withdraw yarn from said jet, the improvement that comprises means to collect the bulked yarn under tension which is

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maintained substantially constant, and means responsive to minor tension variations between said withdrawing means and said collecting means to impose resistance on said withdrawing means varying inversely with tension whereby to maintain constant yarn tension with high accuracy.

5. In apparatus for bulking yarn including a gas jet and a two step yarn driven sheave to feed yarn to and withdraw yarn from said jet at a constant speed difference, the improvement that comprises means to collect the bulked yarn under substantially constant tension, spring loaded braking means acting on said sheave, and means responsive to the tension of the yarn running between the withdrawal surface of said sheave and said collecting means to vary the load imposed on the braking means by the spring.

6. In apparatus for bulking yarn including a gas jet and a two step yarn driven sheave to feed yarn to and withdraw yarn from said jet at a constant speed difference, the improvement that comprises means to collect the bulked yarn under substantially constant tension, spring loaded braking means frictionally bearing on said sheave, and means responsive to the tension of the yarn running between the withdrawal surface of said sheave and said collecting means to vary the load imposed on the braking means by the spring and hence the frictional drag on the sheave.

7. In apparatus for bulking yarn including a gas jet and a two step yarn driven sheave to feed yarn to and withdraw yarn from said jet at a constant speed difference the improvement that comprises means to collect the bulked yarn under substantially constant tension, a lever centrally pivoted and having two projecting arms, adjustable spring means to bias one of said arms into frictional contact with a portion of the surface of the sheave, the other of said arms lying in the yarn path between said sheave and said collecting means in a position to bias said one arm away from said sheave in response to increases in tension.

8. The method of bulking yarn that comprises the steps of positively feeding yarn to an air jet, withdrawing

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the yarn from the jet by means of a freely rotatable thread driven roller, collecting the yarn in orderly form on a collection package, and controlling the speed of said roller by means responsive to the tension of the yarn running between the jet and the collection package.

9. The method of bulking yarn that comprises feeding yarn to and withdrawing yarn from an air jet at a constant speed difference and collecting the resulting bulked yarn in package form under substantially constant tension by varying the rate at which the yarn is fed to and withdrawn from the air jet.

10. The method of bulking yarn that comprises feeding yarn to and withdrawing yarn from a gas jet at a substantially constant speed difference, withdrawing the yarn to a point of collection and controlling the tension between the withdrawal point and the point of collection by varying resistance to withdrawal.

11. In an apparatus for bulking yarn including a gas jet and means to feed yarn to said jet, the improvement that comprises means to collect the bulked yarn in package form, a freely rotatable yarn driven pulley to withdraw yarn from said jet, a brake for said pulley and means responsive to variations in tension on the running yarn for controlling said brake, said last means being disposed between said pulley and said collection means.

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CERTIFICATE OF CORRECTION

Patent No. 2,874,445

February 24, 1959

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, line 42, for "narowest" read -- narrowest --; column 4, line 55, for "bulky" read -- bulking --; line 68, for "improve" read -- impose --.

Signed and sealed this 22nd day of September 1959.

(SEAL)

Attest:

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