

June 23, 1964

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3,137,912

APPARATUS FOR PRODUCING INTERMITTENT EDGE-CRIMPED YARN

Filed Jan. 9, 1961

2 Sheets-Sheet 1

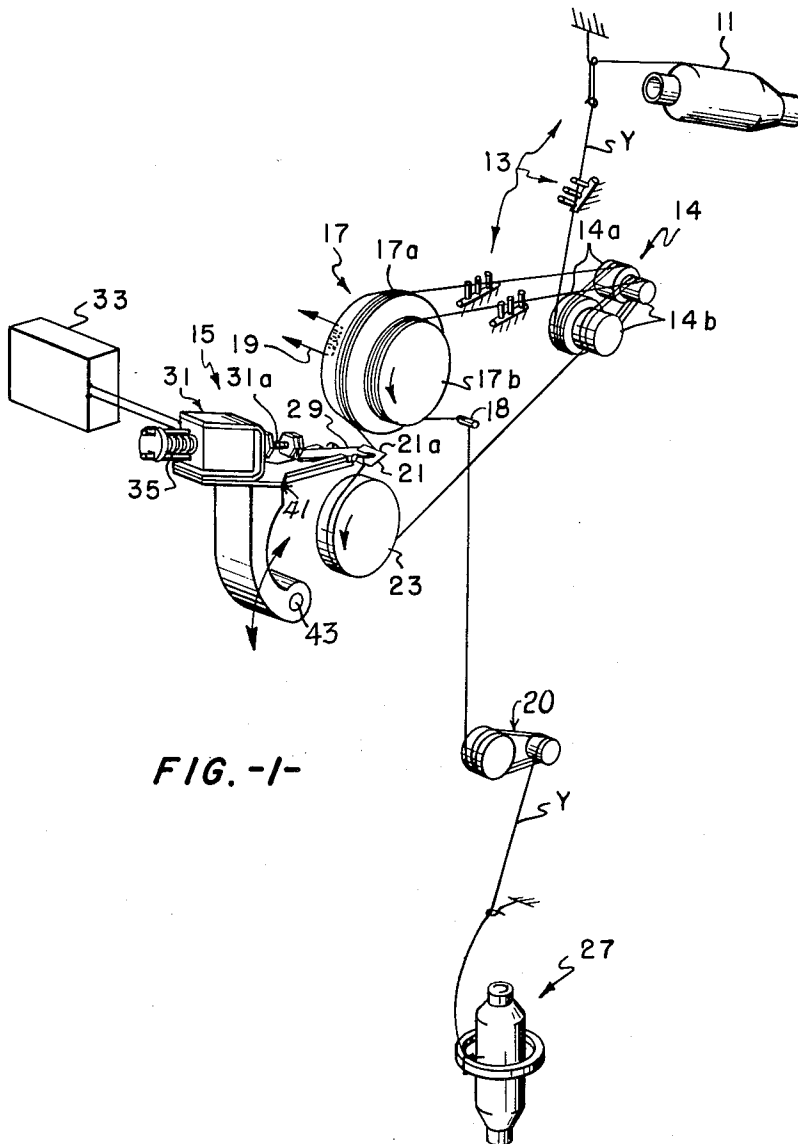


FIG. -1-

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2 Sheets-Sheet 2

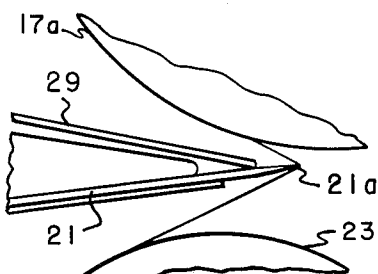


FIG.-5-

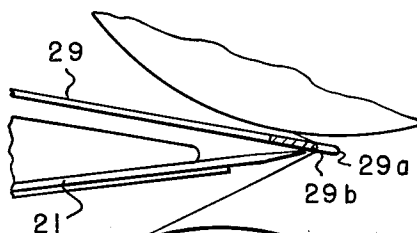


FIG.-6-

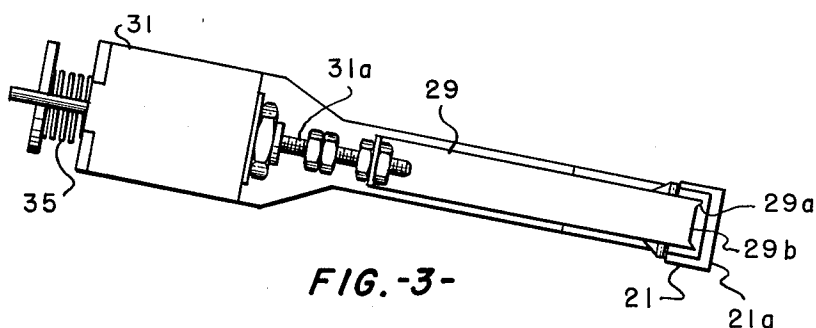


FIG.-3-

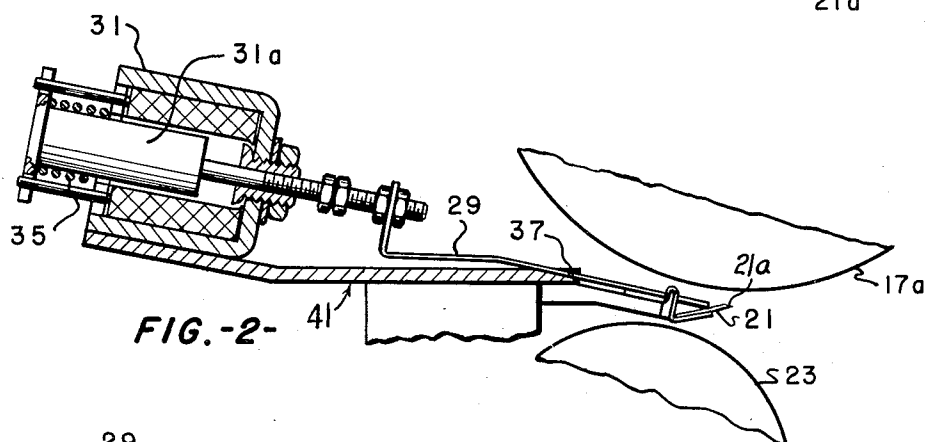


FIG.-2-

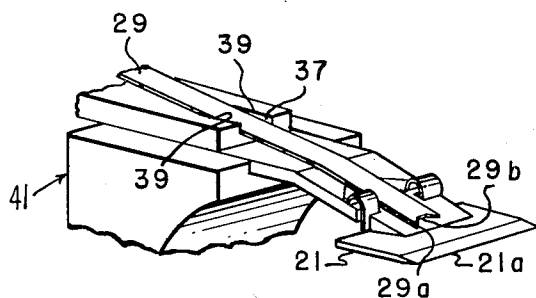


FIG.-4-

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APPARATUS FOR PRODUCING INTERMITTENT EDGE-CRIMPED YARN

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This invention relates to a novel method and apparatus for producing intermittently elasticized stretch and bulked yarn, and more particularly to an improved method and apparatus for producing intermittently elasticized stretch and bulked edge-crimped yarn.

The advantages of elasticizing and bulking thermoplastic yarn, particularly by edge crimping of the yarn, are now well known and established in the textile arts. Such elasticizing and bulking has conventionally been effected in a continuous manner to produce a continuously elasticized or bulked yarn product. In a copending application of Bolinger and Pittman, Serial Number 834,517, filed August 18, 1959, now U.S. Patent No. 3,047,932, there is disclosed a novel method and apparatus for producing intermittently elasticized and/or bulked yarn. A major feature of this invention is the provision of an improved apparatus for the production of fully developed intermittently elasticized and/or bulked yarn in one continuous process. Such yarn product will thus include alternately elasticized and/or bulked segments and substantially unelasticized and/or bulked segments, and may be employed in the production of various fabrics to produce various design effects.

Still other features and advantages will become apparent to one skilled in the art from a reading of the following detailed description of a preferred embodiment constructed according to the invention, wherein

FIGURE 1 is an overall schematic view in perspective of an apparatus according to the present invention, the apparatus being shown in elasticizing and bulking position.

FIGURE 2 is an enlarged side view in partial section of the elasticizing and bulking arrangement of FIGURE 1, showing the apparatus in elasticizing and bulking position.

FIGURE 3 is a plan view of the blade holding and yarn removing section of the apparatus.

FIGURE 4 is an enlarged fragmentary view in perspective of the blade holding and yarn removing section of the apparatus.

FIGURES 5 and 6 are schematic side views showing the blade and yarn removing parts of the apparatus in the elasticizing and bulking position and in the non-elasticizing and bulking position, respectively.

Referring now in detail to the figures of the drawing, a yarn Y of thermoplastic material, and having any desired number of filaments, is fed from a suitable supply indicated at 11 through suitable guide means, illustrated schematically at 13, over the larger diameter portion 14a of feed roll assembly 14, to an intermittent elasticizing and bulking arrangement, generally indicated at 15. The elasticizing and bulking arrangement 15 takes the form of a suitably rotatably driven grooved heater roll 17, which may be heated in any suitable manner such as by an electrical resistance element 19 as schematically illustrated, about which heater roll the yarn passes, preferably in one or more wraps, and a member 21 having a relatively sharp edge 21a (e.g. .001-.002" radius), such as a razor blade, spaced from the yarn heater. The blade 21, heater roll 17, and a subsequent suitably driven yarn engaging roll 23 are so arranged with respect to each other as to form a sharp angular bend in the yarn as it proceeds over the edge 21a of the blade 21, the yarn thus having both a relatively small patent crimp and a relatively large

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latent crimp formed therein by this passage over and from the blade or such other sharp edged element.

This intermittent latent crimp is subsequently developed according to the invention in a continuous operation by subsequent passage of the yarn back over a smaller diameter portion 17b of the heater roll 17 and smaller diameter portions 14b of feed roll assembly 14, the smaller diameter being employed to permit a desired shrinkage of the yarn during the passage of the yarn between the initial heating portion 17a of the heater roll and the secondary heating or developing portion 17b thereof. The secondary heating or developing portion 17b may preferably be smaller than the initial heating portion by a ratio approximately proportional to the average length, number, and duration of the incrementally spaced edge-crimped segments which have passed in contact with the edge-crimping blade edge 21a. The texturized yarn is then subsequently fed along a desired path over a guide pin 18 and about feed rolls 20 to a suitable yarn takeup arrangement generally indicated at 27.

The continuous post-development of the incrementally spaced latent crimp in the overfed multifilament thermoplastic yarn causes a considerable bulking in the incremental segments which have passed in contact with the edge-crimping blade edge 21a, while the incremental segments of the yarn which have passed by the blade edge 21a without contact therewith remain substantially straight and unchanged with substantially no bulk. This bulking effect is more pronounced in yarns having a relatively large number of filaments.

As the yarn proceeds through the elasticizing and bulking arrangement 15 it is periodically moved into and out of latent elasticizing and bulking position. To this end the yarn is moved away from and into contact with the sharp edge of the blade through the medium of an arm 29 suitably connected to the reciprocable armature 31a of a solenoid 31 carried on a support bracket generally indicated at 41, which solenoid is intermittently actuated by a suitable intermittent electrical signal generator generally indicated at 33. The solenoid 31 may be connected for movement of the arm 29 in either direction, and a return spring 35 may suitably be employed for returning the armature 31a and arm 29 to the opposite end of their throw. In the illustrated embodiment the solenoid 31 when actuated moves the arm 29 to remove the yarn Y away from contact with the sharp edge 21a of the blade 21, and the return spring 35 returns the armature 31a and arm 29 to normal retracted quiescent position. While any desired signal generator may be employed for effecting electrical signals to actuate the solenoid, it is preferable in most cases that the signal generator give a random signal output, although in some instances a particular pattern output may be highly desirable in order to give a specific fabric pattern effect.

In the illustrated embodiment the reciprocated arm 29 is formed of spring steel which is preferably slightly bent downwardly and toward the blade surface to provide a resilient bias toward its seated position, and is formed at its outer end with a pair of spaced apart yarn confining fingers 29a, or alternatively with a widthwise concave end surface, in order to laterally confine the yarn and prevent it from sliding off the edge of the yarn remover arm 29 as a result of being removed from the blade edge 21a by the reciprocating movement of the arm. The outer yarn-engaging edge 29b of the arm has a substantially and materially larger radius of curvature (e.g. .030-.060" or more) than that of the crimping edge 21a, in order that this yarn engaging end surface 29b of the yarn remover arm will effect substantially no edge crimping of the yarn. While it will normally be preferred to effect substantially no crimping of the yarn during the period of its removal from the sharp edge 21a of the blade 21 by

the reciprocable arm 29 it may in some instances be desirable to effect merely a lesser degree of crimping during the passage of yarn over the yarn-engaging edge surface 29b of the reciprocable arm, as by employing a ratio of radius of curvature of edge 29b relative to edge 21a of, for example, 1.5-2 to 1, thus yielding a further and different yarn patterning effect when the resulting yarn is incorporated in a fabric.

In order to maintain the yarn removal edge 29b substantially parallel to the edge 29a, and also to aid in effecting the desired intermittent reciprocable motion of the arm 29, the support bracket 41 for the blade 21 is preferably provided with a slot 37 having guide shoulders 39 on either side thereof over at least a portion of the arm length in order to provide for smooth laterally stable movement of the arm 29 during removal from and replacement of the yarn onto the blade edge 21a. Also, as an aid to yarn threadup, the support bracket 41 may, if desired, be suitably swingably mounted about a pivot axis 43, as on a pin or rod or other suitable member, not shown, such swingable mounting construction being illustrated and described in more detail in the prior co-pending application Serial Number 652,153 of Cyril G. Evans, now U.S. Patent No. 3,028,654.

While a specific embodiment has been shown and described by way of illustration, it will become apparent to one skilled in the art from the teachings set forth therein that various embodiments, modifications, and improvements may be made without departing from the scope and spirit of the invention. It is therefore to be understood that this invention is not to be limited by the particular illustrative embodiment shown and described herein but only by the scope of the appended claims.

That which we claim is:

1. Edge crimping yarn processing apparatus comprising intermittent latent crimping means, latent crimp developing means, and means of progressing a running length of yarn under tension successively and sequentially into operative contact with said intermittent latent crimping means and into operative contact with said latent crimp developing means; said intermittent latent crimping means including two different yarn engaging members mounted for linear movement of the points of yarn contact one in relation with the other, said points of contact lying in substantially the same vertical plane as the yarn and selectively engageable with a side thereof, one of said yarn engaging members having a sharp crimping edge effective of imparting latent crimp effecting stresses to the yarn when in contact therewith, and the other of said yarn engaging members having a relatively less sharp yarn-engaging edge and less capable of imparting latent crimp effecting stresses to the yarn and means for reciprocating one member in a straight path relative to the other.

2. Apparatus according to claim 1 wherein said other of said members has opposed lateral-movement-restraining surfaces formed thereon adjacent said yarn engaging edge in order to prevent slipping of the yarn off said other member edge during engagement therewith.

3. Edge-crimping yarn processing apparatus comprising intermittent latent crimping means, latent crimp developing means, and means of progressing running lengths of yarn under tension into operative contact with said latent crimp developing means; said intermittent latent crimping means including two different yarn engaging members having points of contact lying in substantially the same vertical plane as the yarn and selectively engageable with a side thereof, one of said yarn engaging members having a sharp crimping edge effective of imparting latent crimp effecting stresses to the yarn when in

contact therewith, and the other of said yarn engaging members having a relatively less sharp yarn-engaging edge and less capable of imparting latent crimp effecting stresses to the yarn, said intermittent latent crimping means also including parallel guide means for maintaining the general parallelism of said edges at the point of yarn contact therewith, and means for reciprocating one of said members relative to the other of said members and in a direction perpendicular to said edges at the point of yarn contact therewith.

4. Apparatus according to claim 3 wherein said means for reciprocating comprises a solenoid, and intermittent signal generating means operatively connected in controlling relation to said solenoid.

5. Apparatus according to claim 1 wherein said intermittent latent crimping means comprises yarn heating means for heating said yarn as it is progressed, and means for intermittently stressing said yarn differentially across its cross section at spaced intervals along its progressing length, said latent crimp developing means comprising yarn heating means arranged in subsequent flow relation to said means for intermittently and differentially stressing said yarn.

6. Apparatus according to claim 5 wherein said two yarn heating means comprise two heater roll surfaces one of which heater roll surface is disposed in preceding flow relation to said means for intermittently and differentially stressing the yarn and the other of which heater roll surfaces is disposed in subsequent flow relation to said means for intermittently and differentially stressing the yarn, and means for rotating said heater roll surfaces each at a different linear velocity, said one roll surface being rotated faster than said other roll surface by an amount which is an approximate function of the average length, number, and duration of the intermittent differential stresses imparted to the yarn by said means for intermittently and differentially stressing the yarn.

7. Apparatus according to claim 6 wherein said two heater roll surfaces are concentric and formed on a single heater roll, said one heater roll surface having a larger effective diameter than said other heater roll surface.

8. Edge-crimping yarn processing apparatus comprising intermittent latent crimping means and means of progressing running lengths of yarn under tension into operative contact with said intermittent latent crimping means; said intermittent latent crimping means including two different yarn engaging members mounted for linear movement of the points of yarn contact one in relation with the other said points of contact lying in substantially the same vertical plane as the yarn and selectively engageable with a side thereof, one of said yarn engaging members having a sharp crimping edge effective of imparting latent crimp effecting stresses to the yarn when in contact therewith, and the other of said yarn engaging members having a relatively less sharp yarn-engaging edge and less capable of imparting latent crimp effecting stresses to the yarn and means for reciprocating one member in a straight path relative to the other.

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