July 30, 1968 E. E. NEFF 3,394,538

SPUN YARN

Filed Jan. 14, 1966

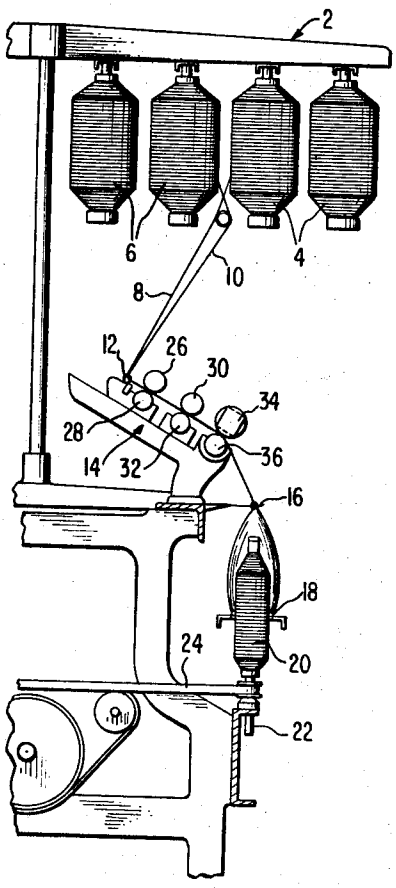


FIG.1

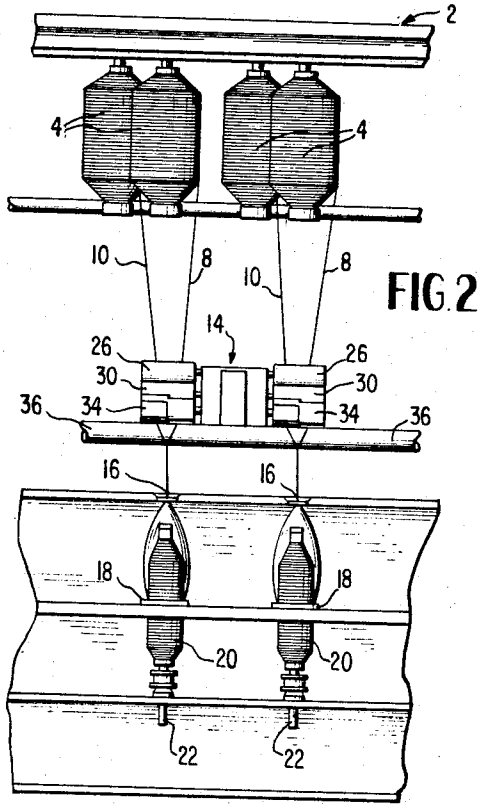


FIG.2

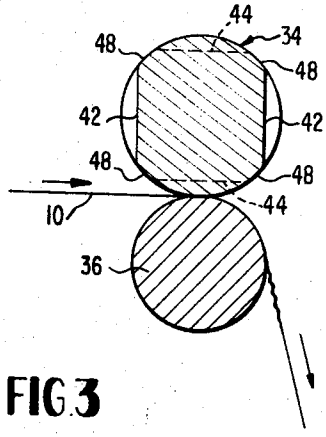


FIG.3

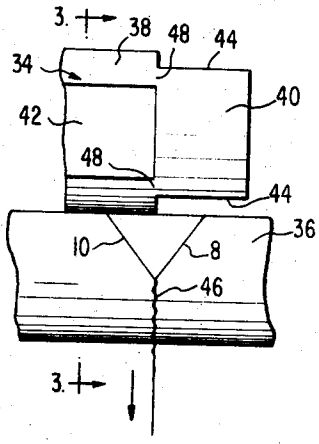


FIG.4

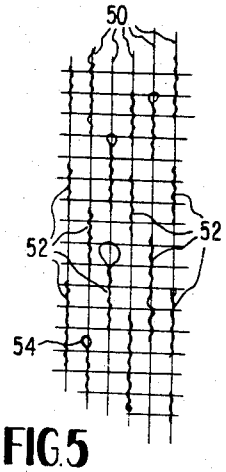


FIG.5

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SPUN YARN

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ABSTRACT OF THE DISCLOSURE

A method and apparatus for spinning novelty yarn by feeding a plurality of staple fiber rovings separately through drafting means including a pair of front rolls, the front rolls alternately nipping and releasing at least one of the rovings so as to vary both the drafting action on such roving and the relative rates of delivery of the roving into the twisting zone thereby producing a thick and thin novelty yarn.

This invention relates to a novel spun yarn having random thick and thin sections along its length and a method and apparatus for producing such yarn.

Yarns having thick and thin sections have long been known to the art. When incorporated into fabrics, as by weaving, such yarns provide interesting texture effects, enhancing the appearance and feel of the fabrics and increasing their suitability for certain end uses. For example, many garment fabrics and drapery fabrics embody such yarns.

One known type of thick-and-thin yarn is produced customarily by combining two already spun yarns on a novelty twister in such a way that thick sections are formed periodically by wrapping one of the yarns loosely about the other. An example of an early disclosure dealing with such a technique is the United States Patent Number 386,623 granted on July 24, 1888.

For some applications a degree of irregularity in the thick-and-thin yarn sections is highly desirable. When yarns having regularly spaced, uniform thick sections are woven into fabric, the fabric usually will have a line or rowed pattern effect that detracts from the overall appearance.

An object of this invention is to provide a novelty yarn having thick and thin sections of irregular lengths and thicknesses. Another object of this invention is to provide a method and apparatus for economically producing a novelty yarn directly from rovings on a conventional textile machine with only slight modifications to the structure of the machine.

These objects are accomplished in accordance with a preferred embodiment of the invention by alternately drafting and releasing separate rovings as they are being spun together. Preferably, the spinning is carried out in a conventional worsted ring spinning frame that includes drafting rolls and means for twisting the rovings together as they emerge from the drafting rolls. In the apparatus of this invention, one of the rolls in the last pair of drafting rolls, the top front roll, is provided with axially spaced roll sections each of which separately engages one of the rovings. The sections of the modified top front roll have recesses in their cylindrical surfaces and the recesses in one section are offset angularly from corresponding recesses in the other roll section. The rovings are spun together under tension after passing between the front rolls.

The configuration of the top front roll is such that, during rotation of the roll, each of the rovings is alternately pressed against the bottom front roll and released from driving engagement with such roll. When a roving is being pressed against the bottom front roll, both

the rate of delivery of the roving to the twisting means and the degree of draft imparted to the roving are determined by the surface speed of the bottom front roll. However, when a roving is disposed between the bottom front roll and a recessed portion of the top front roll, the fibers thereof need not move at the surface speed of the bottom front roll, so that neither rate of delivery to the twister head nor degree of draft is a direct function of bottom front roll speed.

As two rovings pass together through the apparatus a number of different effects are produced. At one moment both of the rovings may be pressed against the bottom front roll. At other moments one or the other of the rovings may be opposite recessed portions of the top roll. When one roving is being pressed against the bottom front roll and the other is not, differential drafting occurs along with a wrapping and looping of the one roving about the other due to their different rates of delivery to the twisting head. These various effects interact in an unpredictable way and the end result is a yarn having thick and thin sections that are "random" in the sense of being unpredictable as to length and bulk.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:

FIGURE 1 is a side elevational view of a worsted spinning frame incorporating the apparatus of the invention;

FIGURE 2 is a front elevational view of the spinning frame;

FIGURE 3 is an enlarged vertical cross sectional view of the front rolls of the spinning frame along the line 3—3 in FIGURE 4;

FIGURE 4 is a front elevational view of the front rolls; and

FIGURE 5 is a schematic view of a fabric having a plurality of yarns in accordance with this invention woven therein.

Referring to FIGURES 1 and 2, a conventional worsted ring spinning frame includes a creel **2** in which are mounted supply packages **4** and **6** that are wound with rovings **8** and **10** of staple fibers. Rovings from the bobbins **4** and **6** pass through separate guides indicated at **12** and into drafting means **14**. The rovings emerging from the rolls of the drafting means **14** pass through a yarn guide **16** and then to the ring traveller **18** of the spinning head. The twisted yarn is wound on a bobbin **20** mounted on a spindle **22** rotated by a motor driven tape or belt **24**. As shown in FIGURE 2, the rovings **8** and **10** follow separate paths through the set of drafting rolls and are twisted together by the rotating ring traveller **18**. The bobbin **20** applies tension to the yarn between the bobbin and the last pair of rolls in the set of rolls **14**. There are two complete spinning units shown in FIGURE 2. Actually, many units are mounted side-by-side on a common frame.

The drafting means **14** includes a first pair of rolls, commonly called back rolls **26** and **28**, intermediate or middle rolls **30** and **32**, and front rolls **34** and **36**. The lower roll of each pair is positively driven and the top roll of each pair is pressed against the corresponding lower roll so that it moves at the same surface speed. The front rolls **34** and **36** move at a surface speed greater than that of the back rolls **26** and **28** to provide for a drafting action on the rovings as the rovings move through the roll set.

In accordance with this invention, the front top roll **34** is generally cylindrical, but is divided into roll sections **38** and **40**. The roll section **38** has a pair of recesses **42** on opposite sides of the roll section. The other roll section **40** has a pair of oppositely facing recesses **44**. The pairs of recesses **42** and **44** are angularly offset from one another, as shown in FIGURE 3. Preferably,

they are offset approximately 90°. Roving **10** passes under the roll section **38**, as shown in FIGURE 4, and the other roving **8** passes under the roll section **40**. The ring traveller **18** causes the rovings **8** and **10** to be twisted together as they emerge from between the front rolls **34** and **36**.

The roving **8** is not engaged by the top front roll **34** when the roll is in the position shown in FIGURE 4. However, at the same time, the other roving **10** is nipped between the top front roll and the bottom front roll. The ring traveller **18** and the bobbin **20** apply tension to the doubled yarn, but since the roving **8**, which is twisted into the yarn, is temporarily released from engagement with the top front drafting roll, it is not fed toward the twisting head as rapidly as the other roving **10**. The twisting action of the ring **18**, therefore, causes the roving **10** to wrap around the roving **8**, as shown at **46** in FIGURE 4. Because of the relatively large difference in the rates of delivery of the two rovings, a loose wrapping of the roving **10** occurs and in the relaxed yarn, loops of the wrapping **10** protrude from the main body of the yarn in a boucle effect.

The top and bottom front rolls are continuously rotating and after the top roll **34** has rotated approximately 45° from the position shown in FIGURE 4, the cylindrical portion of the roll section **40** engages the roving **8** and then the other roving **10** is released as the recess **42** moves opposite the roll **36**. When this occurs, the roving **8** is wrapped around the roving **10**. Thus, successive thick sections in the yarn are formed by alternately wrapping one roving and then the other. The top roll recesses are not angularly contiguous, but there are zones **48** where both roll sections have full diameter cylindrical surface portions. When the zones **48** are in engagement with the rovings, they are both subjected to the same drafting forces and both are fed to the twister at the same rate.

Although the recesses **42** and **44** release the respective rovings **8** and **10** at regular intervals, the lengths and weights of the thick sections **46** and their positions along the length of the twisted yarn are not uniform. The thick sections are formed randomly along the length of the yarn. This surprising result apparently stems from the interaction of the varying twist and draft effects which occur as the front top roll sections nip and release the rovings.

In FIGURE 5, several yarns **50**, produced in accordance with this invention, are shown schematically as woven as the filling in a fabric. The lengths of the thick sections **52** are widely variable and the distances between them are irregular. The thick sections also vary in bulk. Many of them appear as loosely twisted or wrapped structures, having discernible protruding loop portions **54**.

As an additional feature of this invention, rovings of different colors might be used to produce alternately colored thick sections in the yarn. Since the surface fibers of the thick sections alternate between one roving and the other along the yarn, successive thick sections would be of different colors. The same effect could be achieved by using different fibers in the rovings and cross-dyeing the fibers after the yarn is spun. Also, different fibers could be used to produce alternate thick sections having different characteristics.

While this invention has been illustrated and described in one embodiment, it is recognized that variations and changes may be made therein without departing from the invention as set forth in the claims.

What is claimed is:

1. In a method of spinning yarn in which a plurality of staple fiber rovings are fed separately through drafting means including a pair of front rolls and in which twisting forces are applied to the rovings as they leave said front rolls to twist the rovings together into a yarn, the improvement which comprises alternately nipping and releasing at least one of the rovings as it passes said front rolls so as to vary both the drafting action on such roving and the relative rates of delivery of said rovings into the zone of application of the twisting forces to produce a novelty yarn random thick and thin sections along its length.

2. A method according to claim **1** in which two rovings are alternately nipped and released as they pass the front rolls, and in which the nipping of one of the rovings is out of phase with the nipping of the other of the rovings.

3. In a spinning frame means including a pair of front rolls for drafting rovings, twisting means for receiving a pair of rovings from said front rolls and applying twist thereto to form a composite yarn one of said front rolls having axially spaced roll sections, means for guiding rovings individually between said front rolls with one of said rovings engaging a first roll section and another of said rovings engaging a second roll section, means for separating said roll sections from engagement with said rovings for periodic intervals alternating between said first and second roll sections said separating means including recesses in the circumferences of said roll sections, said recesses being angularly offset from each other and extending over less than 90° of arc on the surface of the respective first and second roll sections whereby yarns having irregular thick sections are formed.

4. Apparatus according to claim **3** wherein said periodic intervals are of substantially equal duration.

5. Apparatus according to claim **3** wherein each of said roll sections has a pair of recesses on opposite sides thereof, said recesses in one roll section being offset substantially 90° from the recesses in the other roll section.

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