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YARN HANDLING

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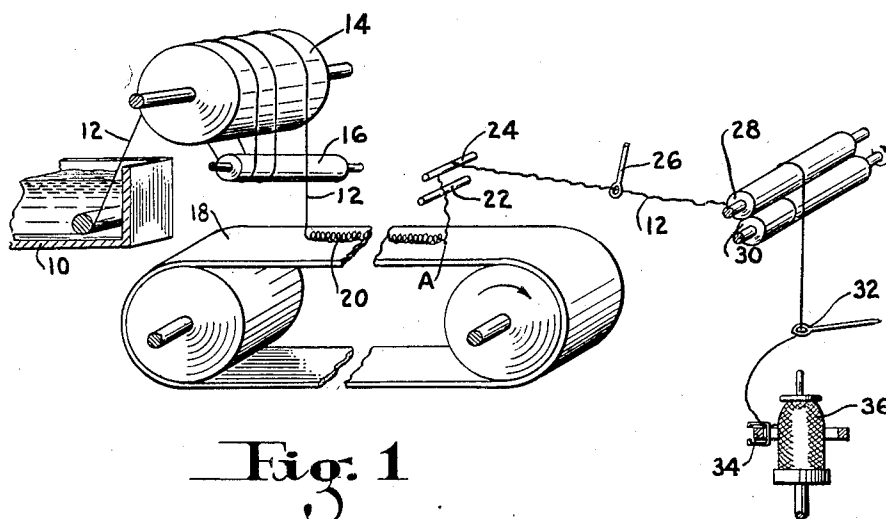


Fig. 1

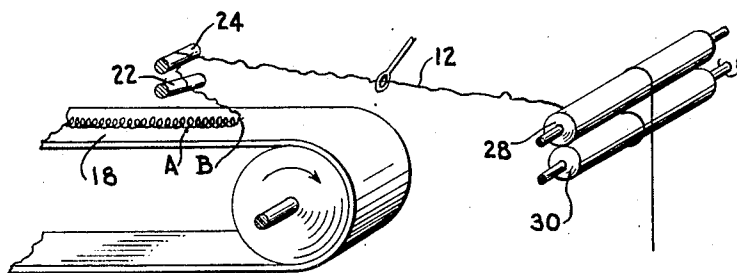


Fig. 2

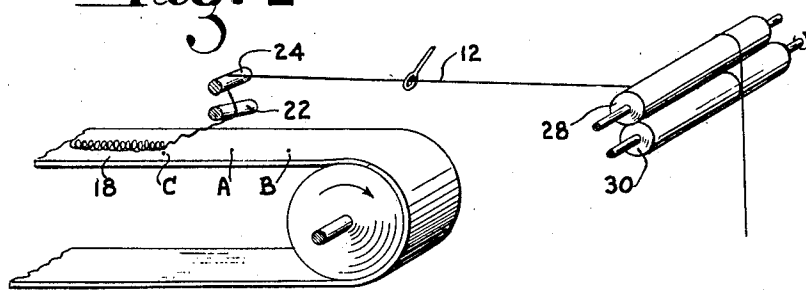


Fig. 3

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YARN HANDLING

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6 Claims. (Cl. 28—71.5)

This invention relates to the removal of a yarn from a moving conveyor. It relates particularly to an improved method and apparatus for controlling and maintaining constant the speed of yarn removal and the point along the conveyor from which the yarn is removed.

It has been proposed, heretofore, to collect a freshly spun yarn on a moving conveyor such as a belt or the like. In such previously proposed processes, the yarn is permitted to fall on to a slowly moving belt on which it accumulates in the form of small overlapping ringlets. Since the yarn is collected, free from all tension, and is purified and dried on the conveyor, it will have a crinkly form; that is, the yarn instead of being straight will be composed of small undulations due to uneven stresses during the drying thereof. Such a process is disclosed, for example, in British Patent No. 379,880. In such a process the yarn collected on the moving conveyor belt must be removed from the belt and wound on to a usable package. Difficulty has been experienced in removing the yarn from the belt in a continuous uniform manner. It is particularly desirable to continuously remove such a yarn at a constant and uniform speed. Preferably, this speed is substantially the same as the speed of collection on the opposite end of the belt. Inasmuch as the yarn may dry with slight periodic variations in the degree of crinkle, and since the drying of such a yarn may involve slight variations in the degree of shrinking of the yarn, it is difficult to continuously remove the yarn at a given point from the forward end of the conveyor. If the yarn is removed at a speed which is too low, it will overrun the end of the belt, while if it is removed at a speed which is too high, it will be removed from the belt too quickly, possibly before the drying is completed.

Particular difficulty is experienced in removing the yarns from a movable conveyor when two or more such yarns are spun in side-by-side arrangement on to a single belt conveyor. The fact that such yarns may possess different absolute spinning speeds and may shrink or elongate during processing to different dry lengths, requires the take-up means for each yarn to be provided with its own individual driving mechanism. The further fact that the spinning speed and shrinkage or elongation of a given yarn may vary during the time it is being wound on to a single package makes it very difficult, if not almost impossible, to correlate in a satisfactory

manner the take-up speed and yarn speed by means of a geared mechanism.

It is an object of the present invention to provide a suitable method and apparatus for controlling the speed of removal of a crinkly yarn which has been spun free of tension on to a movable conveyor means.

It is another object of this invention to provide a suitable method and apparatus for continuously removing a crinkly yarn from a given point on the forward end of a movable conveyor on which the yarn is positioned.

Other objects of the invention will appear hereinafter.

The present invention will be more clearly understood by reference to the following detailed description when taken in connection with the accompanying illustration, in which:

Figure 1 is a perspective view showing an apparatus constructed in accordance with the present invention for continuously removing a crinkly yarn from a point spaced a given distance from the forward end of a movable conveyor.

Figure 2 is a partial perspective view showing the manner in which the apparatus operates to enhance the speed of removal of the yarn.

Figure 3 is a partial perspective view showing the manner in which the apparatus operates to slow down the speed of removal of a yarn from the apparatus of the present invention.

The present invention is based primarily on the fact that a yarn which is spun in the wet state and collected free of all tension, except that imposed by the weight of the yarn, on a slowly moving conveyor, and processed and dried on said conveyor will exhibit a crinkled form. If the yarn is drawn from the conveyor with the crinkle unremoved from the yarn, it will be removed at a considerably faster rate than if the yarn is first tensioned to remove the crinkle therefrom. The crinkle can be removed from the yarn collected in the manner above described by application of a relatively small tension, such as will be exerted by a snubbing tension device of the washboard type wherein the yarn is led in a sinuous path about fixed rods.

This invention uses this tension requirement as a means of obtaining a uniform take-up speed so as to maintain a constant point of yarn take-off from the belt. According to the principles of this invention, a suitable tensioning device is so mounted along the forward end of the conveyor belt that it will remove a portion, but only a portion, of the crinkle from the yarn when the yarn is being removed from the belt

at the desired point spaced a given distance from the forward end of the belt. When the yarn is being removed from the belt at a point in advance of said desired point, the tension device will exert less tension on the yarn and remove less of the crinkle therefrom, thus increasing the take-off speed of the yarn and moving the point of yarn take-off backwards along the belt. When the yarn is being removed from the belt at a point to the rear of the desired point, the tension device will exert a greater tension on the yarn and thus remove a greater amount of crinkle from the yarn. This straightening of the yarn will effectively decrease the speed of yarn removal and will advance the point of yarn take-off along the length of the belt.

Referring to the drawing, reference numeral 10 designates a liquid container from which the yarn 12 is removed by means of yarn forwarding roller 14 and displacement roller 16. The yarn is forwarded from rollers 14 and 16 on to a slowly moving conveyor belt 18. The yarn collects on the conveyor belt 18 without any tension placed on the yarn except that imposed by the weight of the wet yarn. The yarn 12 collects on the movable conveyor in the form of overlapping ringlets 20. The yarn on the conveyor belt may be processed with liquid processing solutions and dried in the form in which it is collected on the belt.

It is desired that the yarn be continuously removed from the belt at approximately the point A spaced from the forward end of the belt. For this purpose, a pair of fixed yarn tensioning rods 22 and 24 is positioned in spaced relationship to each other above the point A of the belt. The yarn is drawn from the belt under rod 22 and over rod 24, then through the thread guide 26 by means of yarn forwarding rollers 28 and 30. The yarn may then be passed from the forwarding rollers 28 and 30 through a yarn guide 32 and twisted by means of a downtwisting apparatus 34, and wound on the pirn 36. The ballooning of the yarn caused by the downtwisting apparatus is sufficient to remove all crinkle from the yarn as it passes from the forwarding rollers 28 and 30 to the pirn 36.

The yarn forwarding rollers 28 and 30 are nip rollers and they draw the yarn across the two yarn tensioning rods 22 and 24 and, depending upon the degree of tension imparted to the yarn by the rods, at least partially, remove the crinkle from the yarn. This crinkle is removed due to the snubbing tension imposed on the yarn as it passes across tensioning rods 22 and 24. As long as the yarn passes from the belt at a given point A from the forward end of the belt, only a part of the crinkle will be removed from the yarn. The speed of the forwarding rollers 28 and 30 is so adjusted that the yarn with said given degree of crinkle-removal will continue to leave the belt at the point A spaced from the forward end of the belt.

If for some reason the yarn accumulates on the belt to a point in advance of said given point A, that is, for example, to the point B, the yarn forwarding rollers 28 and 30 will draw the yarn from the belt with the yarn only contacting one of the yarn tensioning rods, that is, yarn tensioning rod 24. Under these circumstances, the snubbing tension imposed on the yarn will be considerably less than when the yarn contacts both snubbing tensioning rods and a smaller degree of crinkle will be thereby removed from

the yarn. Under these circumstances, the quantity of yarn per unit of time withdrawn from the belt by the forwarding rollers 28 and 30 will be considerably greater than in the case above described where the yarn leaves the belt at point A and contacts both yarn tensioning rods 22 and 24. The greater speed of yarn removal will cause the yarn to be picked up faster from the belt until the point of removal recedes to point A on the belt, after which the yarn tension will be sufficient to eliminate a greater degree of crinkle from the yarn and thereby automatically slow down the speed of yarn removal from the belt.

In the event that the yarn is removed from the belt faster than anticipated and the point of yarn removal from the belt falls behind the given point A, for example, to the point C shown in Figure 3, the yarn will have a greater snubbing contact with snubbing tensioning rods 22 and 24 and thereby will remove substantially all of the crinkle from the yarn being removed from the belt. Under these circumstances, the speed of removal of the yarn from the belt will be considerably lower than in the above two described situations and thereby permit the yarn to accumulate on the belt until it reaches point A after which the tension on the yarn will be sufficiently lessened to retain a slight degree of crinkle in the yarn and thereby continue to remove the yarn from the belt at point A from the forward end of the belt. As above stated, the yarn forwarding rollers 28 and 30 must be driven at such a speed that a slight degree of tension on the yarn whereby the yarn retains a slight degree of crinkle will determine the removal of the yarn from the belt at a substantially constant point (point A) from the end of the belt.

As mentioned above, it is preferred that the upper nip roll possess a smooth hardened surface while the lower nip roll possesses a cork or other soft, resilient surface. Such an arrangement aids importantly in preventing abrasion of the crinkled yarn passing about the nip rolls, especially when the yarn is to be subsequently twisted. However, this arrangement is not essential to the invention; if desired, the more conventional nip roll arrangement, wherein the upper roll possesses a soft surface and the lower roll a hardened surface, can be employed.

The present invention is not limited to the controlling of the speed of a yarn by the removal of a varying amount of crinkle from a yarn. In the case of a wet yarn substantially all the crinkle is removed from the yarn at all times regardless of the point from which the yarn is removed from the belt. A wet yarn, however, readily responds to tension variations to impart variations in stretch or elongation to the yarn. The present invention is therefore clearly applicable to regulate the removal of a wet yarn from a given point on a belt conveyor. The amount of elongation imparted to the yarn will determine the speed of yarn removal and thereby determine the point of removal of the yarn from the belt. In other words, as in the case of the variable removal of the crinkle of a yarn, the effective length of the yarn is varied to control the effective speed of removal of the yarn.

The present invention makes it possible to control the speed of yarn removal from a slowly moving conveyor on which the yarn is collected. By controlling the speed of yarn removal, the yarn can be continuously removed from a point

on the conveyor spaced at a given distance from the forward end of the conveyor.

Since it is obvious that many changes and modifications can be made in the above-described method and apparatus without departing from the nature and spirit of the invention, it is to be understood that the invention is not to be limited except as set forth in the appended claims.

I claim:

1. The method of removing a crinkled yarn resting freely on a movable conveyor which comprises drawing the yarn from the forward end of said conveyor, tensioning said yarn to remove at least a portion of crinkle from the yarn, and varying the degree of tension on the yarn to vary the degree of crinkle removal and control the rate of yarn removal.

2. The method of removing a crinkled yarn resting freely on a movable conveyor which comprises drawing the yarn from the forward end of said conveyor, tensioning said yarn to remove at least a portion of crinkle from the yarn, decreasing said tension on the yarn to decrease the removal of crinkle when the point of yarn removal is positioned on said conveyor beyond a given point, and increasing said tension on the yarn to increase the removal of crinkle when the point of yarn removal is positioned in back of said given point, the degree of tension and removal of crinkle determining the rate of yarn removal.

3. An apparatus for removing a yarn resting on a movable conveyor, yarn forwarding rolls adapted to draw the yarn from said conveyor, yarn snubbing elements positioned to snub the yarn passing from said conveyor to said rolls, said snubbing elements positioned above a given point on said conveyor and arranged to decrease the

snubbing action on the yarn when it moves beyond said given point and to increase the snubbing action when it moves back of said given point.

4. An apparatus for removing a yarn resting on a movable conveyor, yarn forwarding rolls adapted to draw the yarn from said conveyor, yarn snubbing elements positioned to snub the yarn passing from said conveyor to said rolls, said snubbing elements vertically spaced from each other above a given point on said conveyor, said rolls arranged to draw the yarn over said snubbing elements to decrease the snubbing action on the yarn when it moves beyond said given point and to increase the snubbing action when it moves back of said given point.

5. An apparatus for removing a yarn resting on a movable conveyor, yarn forwarding rolls adapted to draw the yarn from said conveyor, yarn snubbing elements positioned to snub the yarn passing from said conveyor to said rolls, said snubbing elements comprising horizontal pins vertically spaced from each other above a given point on said conveyor, said rolls arranged to draw the yarn over said pins to decrease the snubbing action on the yarn when it moves beyond said given point and to increase the snubbing action when it moves back of said given point.

6. The method of removing an elongatable yarn resting freely on a movable conveyor which comprises drawing the yarn from the forward end of said conveyor, tensioning said yarn so as to elongate said yarn, and varying the degree of tension on the yarn to vary the effective length of said yarn and thereby control the rate of yarn removal.

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