Oct. 9, 1951 E. J. ABBOTT 2,570,184

CUTTING TOW

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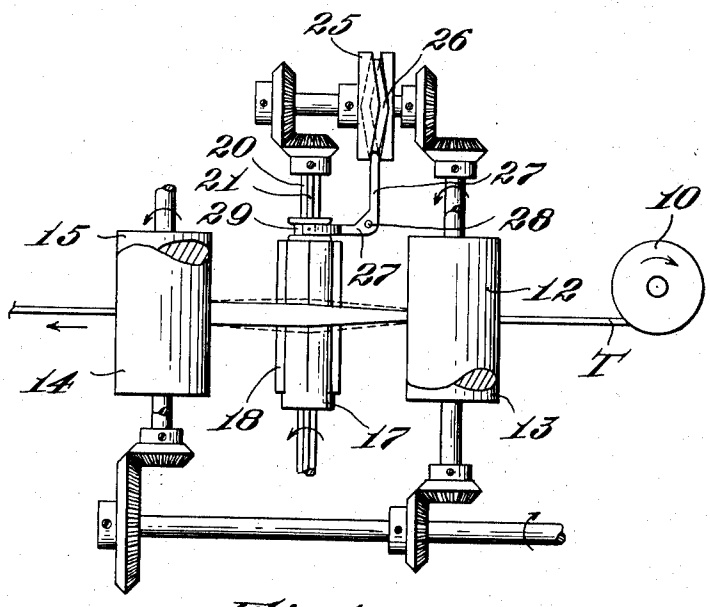


Fig. 1

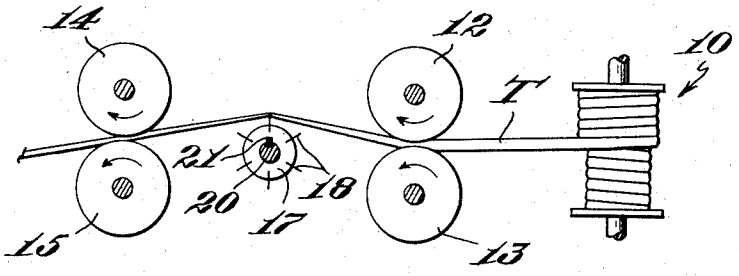


Fig. 2

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2,570,184

CUTTING TOW

Edward J. Abbott, deceased, late of Wilton, N. H., by Samuel L. Abbott, executor, Wilton, N. H., assignor, by mesne assignments, to Abbott Worsted Mills, Incorporated, Wilton, N. H., a corporation of New Hampshire

Application May 3, 1949, Serial No. 91,084

2 Claims. (Cl. 19—1)

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This invention relates to converting fibers of a tow of continuous fibers into staple length fibers, particularly in the preparation of spun yarn in which all of the fibers are converted into staple lengths and the resulting material can be spun in the manner of natural textile fibers either alone or together with natural fibers.

The invention is an improvement upon United States Patent No. 2,323,300 which discloses tensioning a group of continuous fibers to force the fibers against a cutting edge, causing them to be severed individually, and drafting the group of severed fibers.

The invention aims to improve the cutting action upon the individual fibers, minimizing any longitudinal dragging of the fibers over the cutting means, while providing a sliding cutting action of the cutting edges transversely across the fibers.

The invention further aims to facilitate the handling of a group of fibers in the form of tow, that is, a rope-like or cord-like bundle which usually however has little or no twist, and to act upon such tow to sever each of its considerable number of fibers into approximately regular staple lengths. In thus handling a tow, the improved procedure and apparatus of this invention is adapted to spread the fibers of the tow laterally, facilitating the effective contact of the cutting means with each of the numerous fibers, while also, as indicated above, minimizing any longitudinal dragging of the fibers over the cutting means.

Other advantages and objects of the invention will be apparent from its specification and its drawings in which the invention is explained by way of example.

In the drawings,

Fig. 1 is a plan view of apparatus for converting fibers of a tow into staple length fibers, according to the present invention, and

Fig. 2 is a side elevation of the apparatus, largely diagrammatic.

In the drawings a spool or other supply of the tow T to be treated is indicated at 10. It will be understood that this tow may be of any desired continuous filament material such as viscose, acetate rayon or the like and of any desired weight, for instance, around 10 grains per yard in the finer weights that are comparable to the roving usually fed to a spinning machine, or around 200 grains per yard in the heavier weights that are comparable to a sliver of worsted top. The tow is of rope-like or cord-like form but

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usually has little if any twist and consists of a considerable number of individual filaments usually representing the products of a considerable number of spinnerets.

From the spool or other supply 10 the tow T is drawn forward into a draft zone defined by a nipping pair of rear draft rolls 12, 13 and a nipping pair of forward draft rolls 14, 15. As indicated in Fig. 1, suitable bevel gearing diagrammatically shown therein is provided to drive the front rolls 14, 15 at a substantially greater speed than the rear rolls 12, 13, for instance twice as fast, providing a draft of 2. The distance between the front and rear rolls should be set to exceed somewhat the length into which it is desired to sever the fibers.

A rotary knife-holding element 17 is located within the draft zone and carries a plurality of radially disposed blades 18 each terminating in a sharp outer cutting edge, for example, six of such blades as shown in Fig. 2, or some other suitable number, such that the tow T will be continuously or substantially continuously in contact with at least one of these blades.

As indicated in Fig. 2, the rotary element 17 and its blades 18 are arranged and disposed with relation to the line of draft of the tow so that the tow is continuously deflected slightly above the straight line between nips of rolls 12, 13 and 14, 15, the tow thus bearing against a knife edge.

The rotary element 17 and its knife blades 18 are continuously rotated so that the knife blades in contact with the tow travel at substantially the same speed as the tow, that is, at the surface speed of the rear rolls 12, 13, suitable bevel gear drive connections being provided as diagrammatically shown in Fig. 1, including a shaft 20 onto which the rotary element 17 is connected by a spline connection 21.

The spline connection 21 permits the rotary element 17 to be reciprocated back and forth along its shaft 20, that is transversely of the tow. Any suitable driving connections may be provided so to reciprocate the rotary element, for instance as shown in Fig. 1, a cam 25 continuously rotating with the driving connections between the rotary element 17 and the rear roll 13 and provided with a cam groove 26 adapted to oscillate a bell crank 27 which is pivoted at 28 and engages a grooved collar 29 on the rotary element 17.

In operation, as the tow proceeds forwardly and contacts the knife blades 18 these blades move at the same forward surface speed as the tow, and longitudinal dragging of the tow over the blades

is avoided, each cutting of a filament occurring at substantially a single point on the filament. Simultaneously the knife blades reciprocate transversely of the direction of progress of the tow, providing a sliding cutting action.

The draft between the front rolls and rear rolls progressively tightens the individual continuous filaments, progressively increasing the force with which the individual filaments are drawn against a knife edge, thus causing severing of each individual filament as such filament becomes sufficiently tensioned and is pressed sufficiently firmly against a reciprocating knife blade. Each filament is severed sufficiently frequently to produce staple lengths thereof, and severance of the several filaments takes place successively, although not in precisely regular sequence, in such manner as to stagger or distribute the ends of the staple lengths relatively evenly throughout the resulting strand, and leaving no continuous or uncut filaments. The trailing portion of a filament ahead of the cutting knife blade, when such filament becomes severed, is thereupon free to be drawn forward at the faster speed of the front rolls 14, 15. The leading end of the filament from which this staple length has been severed is then carried forward, along with the other filaments, but without substantial tension until it is received by the front rolls 14, 15. Any leading end of a filament that may tend to drop down from the point of cutting is nevertheless carried forward in contact with the other filaments by the action of the rotary blades 18 which are continually rising up from in rear of cutting position and moving forwardly with the filaments.

It will be noted that the reciprocation of the rotary knife blades not only gives a transversely sliding cutting stroke of the knife blade for severing each filament, but also serves to shift the filaments of the tow back and forth with a lateral movement diagrammatically indicated in dotted lines in Fig. 1, such lateral movement of the tow being somewhat less than that of the series of knife blades. The lateral shifting of the tow spreads the tow laterally and thins the tow at the knife blades. Such spreading and thinning of the tow increases the number of individual filaments that are momentarily in contact with a knife blade and increases the certainty and ease with which individual tensioned filaments are drawn down past other filaments and into effective cutting contact with a blade. This action thus particularly facilitates cutting those filaments which are not initially in a position for immediate contact with a knife blade, as in the case of filaments initially lying buried within the body of the tow. Thus each individual filament of the initially rope-like or cord-like tow is enabled to draw into effective cutting contact with one of the blades.

The relatively rapid forward movement of those staple length filaments that are controlled by the faster-moving front rolls 14, 15 results in drafting the strand. After passing the front rolls the drafted strand of cut fibers may be subjected to any suitable after treatment, for instance, further drafting, the reception of twist, and winding up. Thus the illustrated apparatus may constitute the drafting portion of such machine as a roving frame or spinning frame having suitable twisting and winding mechanism. When the apparatus constitutes the drafting portion of a spinning frame, the weight of the tow T will be selected so that after its draft received in this apparatus the strand will twist into yarn of the desired count.

What is claimed is:

1. Apparatus for converting fibers of a tow of continuous filaments into staple-length fibers, comprising means for subjecting the tow to a draft, a rotary element including a plurality of knife blades extending transversely of the line of draft of the tow, said rotary element and its knife blades being arranged and disposed with relation to the tow so that the tow bears against and is deflected by said knife blades, means for causing said knife blades to rotate at a surface speed approximately the same as the forward surface speed of the tow in contact therewith, and means for simultaneously reciprocating said knife blades transversely of the tow, so as to sever the sufficiently strongly tensioned filaments with a sliding and cutting action while minimizing longitudinal drag of the filaments over the blades.

2. Apparatus for converting fibers of a tow of continuous filaments into staple-length fibers, comprising means for subjecting the tow to a draft, a rotary element including a plurality of knife blades extending transversely of the line of draft of the tow, said rotary element and its knife blades being arranged and disposed with relation to the tow so that the tow bears against and is deflected by said knife blades, means for causing said knife blades to rotate at a surface speed approximately the same as the forward surface speed of the tow in contact therewith, and means for simultaneously reciprocating said knife blades transversely of the tow, the machine being constructed and arranged to permit shifting of the tow back and forth laterally and spreading of the filaments thereof at the knife blades under the influence of the knife blades, the reciprocation of the knife blades being greater than such shifting of the tow.

SAMUEL L. ABBOTT,
Executor of the Will of Edward J. Abbott, Deceased.

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The following references are of record in the file of this patent:

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