Aug. 26, 1941. W. F. BIRD 2,254,058

PREPARATION OF STAPLE FIBER FOR SPINNING

Filed March 25, 1939 2 Sheets-Sheet 1

FIG. I.

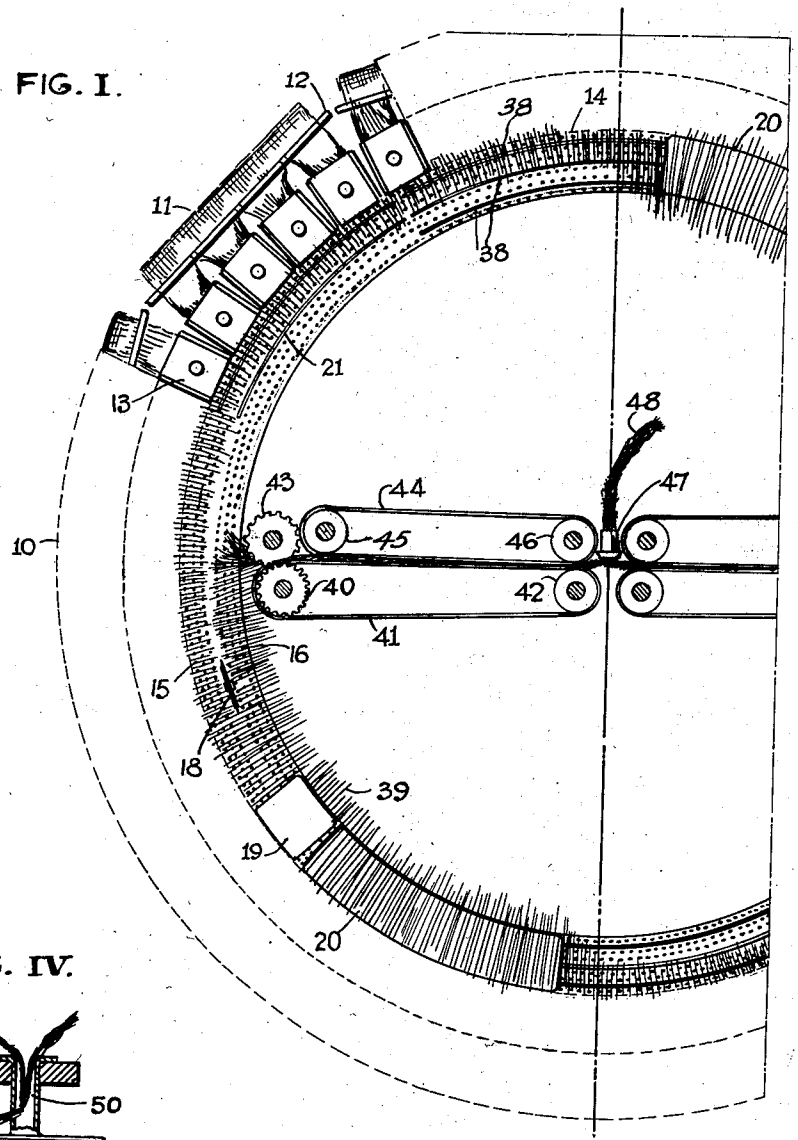
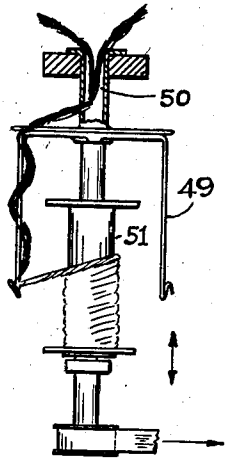


FIG. IV.



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FIG. II.

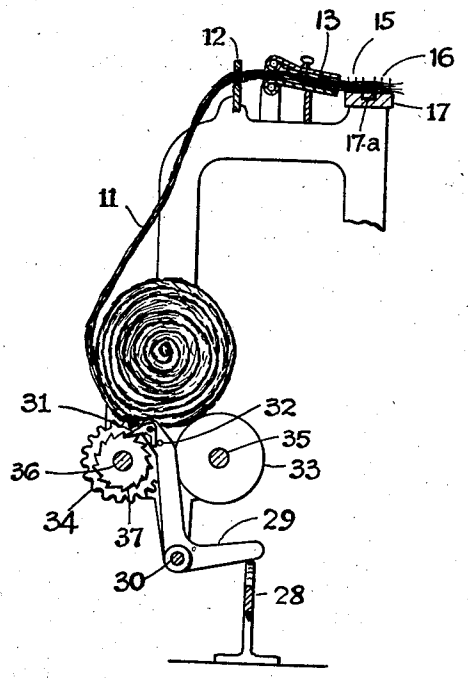
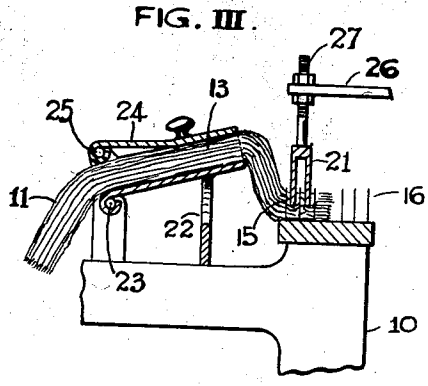


FIG. III.



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UNITED STATES PATENT OFFICE

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PREPARATION OF STAPLE FIBERS FOR SPINNING

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Application March 25, 1939, Serial No. 264,170

17 Claims. (Cl. 57—2)

This invention relates to a method of and apparatus for the production of staple fibers from continuous filaments such as silk, rayon and casein wool. It has particular reference to forming staple fibers of any desired length and delivering them in continuous form from a single apparatus. The concept of the invention comprises the production of a sliver in a form suitable for necessary subsequent operations preparatory to the final spinning of yarns or threads all of one fiber or blends of different fibers. The invention may be carried out by new apparatus or by modifying present textile equipment.

The production of staple fiber from continuous filaments has been carried out in several ways; for example, it is known to cut the filaments at regular intervals and then to make this cut staple into a so-called spun yarn by subjecting it to substantially the steps involved in crimping, carding and the like. These operations are relatively expensive, and in the case of carding result in breaking of many of the fibers and irregularity of the ultimate product.

It is further known to pass continuous filaments successively through two pairs of breaking rollers, the second pair of which is rotated at a higher peripheral speed so as to stretch the filaments beyond their breaking points. The fibrous material so produced is then twisted continuously with its breaking operation into the final yarn by means of a flier or like spinning unit. This second method produces staple fiber of various lengths and introduces difficulties of control of the fibers broken by the pairs of breaking rollers. Relatively few filaments can simultaneously be reduced to staple fiber by a single mechanism using this method.

Continuous filaments are sometimes drawn from spinnerettes having thousands of orifices. I may combine these continuous filaments in stock batts of a size comparable to those used in the combing of card stock on the worsted system when made up for combing on a Noble comb.

My concept of invention includes within its scope the positioning of uncarded staple fibers on a retaining means, such as a comb, in any convenient manner and progressively drawing off the staple in overlapping fiber lengths.

More specifically this invention includes a method and an apparatus for producing staple fibers in continuous form by feeding a relatively large mass of continuous filaments to a holding means and forming staple fibers while the ends of the continuous filaments are retained in the holding means, and then progressively drawing the staple fibers from the holding means, the rate of drawing off being such that each fiber length overlaps with other fiber lengths as the drawing off progresses. To perform this function I provide a relative transverse motion between the holding or retaining means and the drawing off means. The holding means may be circular and comprise a series of pin circles. The stock may be dabbed into these circles so that the ends of the stock lay transversely thereof and overhang the inner periphery. When the stock is introduced into the pin circles at a desired fiber length the drawing off may be done by rotating the pin circle so that the projecting ends of the fibers will engage a drawing off device as the pins rotate with their base. Cut staple may be introduced into the pin circles manually. A false twist or a twisting device may be positioned forwardly of the drawing off device to form a sliver or roving. A steam system as on present day combs may be employed.

An object of the present invention is to provide fibers, which have been produced from continuous filaments, in continuous form.

Another object of the invention is to provide staple fibers in continuous form without passing the fibers through the steps of crimping or carding.

Another object of the present invention is to provide a sliver of artificial staple fiber so that it may be conveniently handled in subsequent operations, including blending with other fibers.

Another object of this invention is to provide a combined feeding, cutting and comb assembly for the production of staple fiber in rope form.

These and other objects of invention will be manifest from a consideration of the following description and accompanying drawings, in which:

Figure I is a top plan view of an apparatus on which my invention may be practiced.

Figure II is a side elevation showing a slack provider, a stock guide, a stock box and a comb retaining means.

Figure III is a detailed view of the feeding means.

Figure IV denotes a flier for putting twists in the drawn off stock after it reaches the drawing off means.

Referring first to Figure I, a rotatable portion, generally depicted as 10, carries a number of batts 11 of continuous filaments, which are divided into sections which pass through holes in guide plate 12 and then through open end feed boxes 13, the stock, guide plates and boxes com-

pletely encompassing the periphery of the comb circles 14, which comprise groups of pin circles 15 and 16. Between said groups and acting against a resilient track portion 17A of the base 17 is a rotatable or other cutter 18 for severing the ends of the continuous filaments as the portion 10 rotates. The cutter may be driven from a suitable source of power and may be in any convenient design.

Dabber brush 19 is positioned adjacent the inwardly and downwardly inclined smooth plate 20, and both the brush and the plate are above the rotating pin circles 15 and 16. The dabber brush during operation is rapidly reciprocated vertically and its function is to force the ends of stock down into the pin circles as the said ends laterally pass from the fixed plate 20.

It is to be understood that the cutter 18, dabber brush 19 and plate 20 do not rotate with the stock 11, guide plate 12, boxes 13 and pin circles 15 and 16, all of which latter are comprised in rotatable portion 10. The rapid reciprocation of the dabber brush permits long life of the brush and minimizes the effect of the pins moving transversely therethrough. If desired, a shear cutter may be driven from the dabber brush.

Bifurcated knife 21, Figures I and III, together with the boxes 13 and cam 22, constitute feeding means. Stock 11 is somewhat crowded in its passage through the boxes and will not slip back. The boxes 13 ride on cam 22 and are pivoted as at 23. The top 24 of the boxes is pivoted at 25 and acts as a weight on the filaments to hold them somewhat firmly so that they cannot slip backward unless the lid is open. The knife 21 is mounted on a fixed portion 26 of the machine and has a convenient adjustment at 27. As the stock rotates it passes under this fixed knife 21 and cam 22 raises the boxes 13 to take up the slack between the box and the stock batt 11.

Prior to the lifting of the boxes 13 a slack producing means, Figure II insures sufficient slack to avoid feeding against a drag occasioned by the weight of the batt. This is accomplished by providing a fixed cam 28 which actuates bell crank lever 29 pivoted at 30, and on one end of which is a pivoted weighted ratchet engaging pawl 31 and pawl stop 32.

The stock batt 11 rests on rotatable smooth roller 33 and corrugated roller 34 on shafts 35 and 36 respectively. Integral with the corrugated roller 34 is a ratchet 37 advanced as required by cam 28 through pawl 31.

Referring again to Figure I, fixed cams 38 positioned between rows of pins in the outer circle 15 lift the ends of stock from the pins and permit them to slide on smooth plate 20 so that they overhang the innermost portion of the pin circles. After leaving the smooth inclined plate, the ends are again dabbed into the pin circles by the dabber brush, as hereinbefore described, where they are positioned for cutting into staple fibers. The protruding ends are designated 39. It will be seen that the forward ends of these fibers will overhang their supports substantially equally and that substantially all of the fibers will be drawn off.

As the comb rotates it passes a suitably driven fixed take up device which engages the overhanging ends of the fibers and progressively draws them off against the drag of the pins to a point where they are combined by a false twist device with the portion drawn off from the duplicate mechanism on the other side of the apparatus.

The take up mechanism comprises a driven fluted roller 40 rotating in conjunction with a leather apron 41. Apron 41 passes about smooth roller 42. A fluted roller 43 cooperates with the fluted roller 40 and the apron 41 to form a nip and to pass the stock between apron 44 which is looped about the rollers 45 and 46 and the apron 41. The aprons 41 and 44 deliver the stock to a false twist device or trumpet 47 to form it into a sliver 48.

A spinning unit such as the flier 49 may be used in conjunction with the false twist device or in lieu thereof, depending on the particular characteristics of the stock being handled. If, for example, the stock be casein wool it can be handled in a manner equivalent to present methods for producing slivers on conventional combs. It is not essential to the present concept that the stock from both sides of the machine be combined and twist may be put into the stock as it leaves the drawing off aprons on one side.

In the illustrated embodiment, the flier 49 combines the drawn off stock from both drawing off means. The stock first passes through a condensing means 50 before being twisted and wound on the bobbin 51, which is driven in any convenient manner.

It will be seen that the above described apparatus and process provides a sliver of cut staple fiber from continuous filaments in regular and uninjured form, that the individual fibers will not be stuck together and that by care being exercised in introducing the ends of the continuous filaments through the combs a sliver of extreme evenness will be produced. This evenness of the sliver will result in a reduction in the number of subsequent finishing steps and an improvement in the regularity in the case of blending.

It is well known that according to the worsted method the large number of gillings and drawings are made primarily with the view of obtaining an evenness in the final product. It is of course understood that the term "continuous filaments" as used herein does not mean continuous or endless in the sense of a closed circle, but on the other hand in the present disclosure it is intended to define the filaments in the form in which they leave the spinning bath, as in the production of rayon. It is further to be understood that this invention contemplates the use of any convenient slack producing or feeding apparatus, and that the feeding apparatus may be such as to compensate for the decrease in diameter of the supply batt.

Operation

At the beginning of a run the stock rests on the corrugated and smooth rollers and passes up through the guide plates and boxes to overhang the inner periphery of the pin circle. Considering the smooth plate as a starting point, the ends of the filaments as they leave this plate are dabbed under the pins which retain them so that the fibers pass in the path of the cutter. The cut fibers positioned in the inner group of pin circles are drawn off as they pass the take off device and the ends of the continuous filaments are retained by the pin circles of the outer group. The ends of the continuous filaments retained in the outer group of pin circles pass under the knife and the boxes are elevated. The elevation of the boxes takes up slack which exists between the boxes and the bulk of stock resting on the rollers. If the slack is insufficient,

the knife and boxes will draw from the stock until a sufficient advance has been made to produce the desired length cut staple.

After the feeding step, the ends of the continuous filaments are cammed out of the pin circles on to the smooth plate where they can slip inwardly and downwardly so that the ends will again overhang the inner periphery of the retaining means. The operation is then repeated.

Having described my invention in a preferred embodiment, and intending only to be limited by the scope of the following, I claim:

1. An apparatus for the production of staple fiber in continuous form comprising means for feeding continuous filaments, cutting means for reducing the end portions of the continuous filaments to staple fiber, a drawing off device, a retaining means comprising a plurality of pins, said retaining means and drawing off device being relatively transversely movable during operation, whereby the staple fiber will be drawn from its retaining means substantially progressively.

2. In an apparatus as set forth in claim 1, characterized in that the cutting means is positioned intermediate the position of some of the pins.

3. In an apparatus according to claim 1, characterized in that a slack provider is auxiliary to the feeding means.

4. In an apparatus as set forth in claim 1, characterized in that the feeding means comprises a stationary knife, feed box and cam for the feed box.

5. In an apparatus as set forth in claim 1, characterized by a slack provider means auxiliary to the feeding means and that the feeding means comprises a fixed feed knife, a pivoted stock box and a cam for elevating the stock box about its pivot.

6. In an apparatus for preparing staple fiber for spinning, feeding means, holding means for the staple fiber, a cutting means between the front of the holding means and the feeding means, a drawing off mechanism and means for moving the holding means relatively to and transversely of the drawing off means, said holding means comprising a plurality of pins which combs the fibers as they are drawn off.

7. An apparatus for the production of staple fibers in rope-like form comprising means for feeding continuous filaments, means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device having a nip, retaining means in which the staple fibers lie substantially side by side with protruding ends and approach the nip of the drawing off means substantially laterally; and means for relatively moving the retaining means past the nip of the drawing off device, whereby the staple fibers will be engaged by the nip and all of the fibers will be drawn from their retaining means substantially progressively.

8. In the combination set forth in claim 7, further characterized in the provision of a condensing means for the drawn off fibers.

9. In the combination set forth in claim 7, further characterized in the provision of a twisting device for the drawn off fibers.

10. An apparatus for the production of staple fibers in continuous or rope-like form comprising means for feeding continuous filaments, cutting means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device having a nip, retaining means in which the staple fibers lie substantially side by side with protruding ends and approach the nip of the drawing off means substantially laterally; and means for relatively moving the retaining means past the nip of the drawing off device, whereby the staple fibers will be engaged by the nip and all of the fibers will be drawn from their retaining means substantially progressively.

11. An apparatus for the production of staple fibers in continuous form comprising means for feeding continuous filaments, cutting means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device having a nip, an annular retaining means in which the staple fibers lie substantially side by side with protruding ends and approach the nip of the drawing off means substantially laterally; and means for relatively rotating said annular retaining means past the nip of the drawing off device, whereby the staple fibers will be engaged by the nip and all of the fibers will be drawn from their retaining means substantially progressively.

12. An apparatus for the production of staple fibers in continuous form from large masses of continuous filaments comprising means for feeding the mass of continuous filaments, an annular retaining means, cutting means positioned outwardly of the inside of the annular retaining means to cut the end portions of the continuous filaments so as to form staple fibers, a drawing off device, said drawing off device being relatively movable to the annular retaining means across its periphery during operation, whereby the staple fibers will be drawn from their retaining means substantially progressively.

13. In the combination set forth in claim 1, further characterized in that the retaining means is annular and that the pins are positioned so that the staple fibers may be retained in a side by side position about the retaining means.

14. In an apparatus for preparing staple fiber for spinning, feeding means, drag producing holding means for the staple fiber, a cutting means between the front of the holding means and the feeding means, a drawing off mechanism and means for moving the holding means and the fibers relatively to and substantially laterally of the drawing off means as the fibers approach the drawing off device in the horizontal plane of the staple fibers.

15. In a method for the production of staple fiber in continuous form from stock that has not been carded, the steps which consist in positioning uncarded staple fibers of substantially equal length side by side so that the forward ends of the fibers are in substantial alignment with each other, providing a retaining drag for the uncarded staple fibers, moving the positioned fibers substantially sidewise, progressively drawing off substantially all of the retained fibers longitudinally as they are moved and approach the drawing off point substantially sidewise, the rate of drawing off being such that each staple fiber length overlaps with other staple fiber lengths, whereby a continuous sliver is formed.

16. In a method for the production of staple fiber in continuous form from stock that has not been carded, the steps which consist in feeding continuous filaments side by side, cutting the ends of the continuous filaments, providing a retaining drag on the cut ends of the continuous filaments, moving the cut ends substantially sidewise, progressively drawing off substantially all of the retained cut ends longitudinally as they

are moved and approach the drawing off point substantially sidewise, the rate of drawing off being such that each cut end length overlaps with other cut end lengths, whereby a continuous sliver of staple fibers will be formed.

17. In a method for the production of staple fibers in continuous form from stock that has not been carded, the steps which consist in feeding continuous filaments side by side in a circular path, cutting the ends of the continuous filaments to form staple fibers, providing a retaining drag for the staple fibers and the adjacent ends of the continuous filaments, moving the staple fibers substantially sidewise and progressively drawing off all of the retained staple fibers longitudinally as they are moved and approach the drawing off point substantially sidewise, the rate of drawing off being such that each staple fiber length overlaps with other staple fiber lengths and then releasing the ends of continuous filaments.

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