

Aug. 26, 1941.

W. F. BIRD

2,254,059

PREPARATION OF STAPLE FIBERS

Filed May 15, 1941

2 Sheets-Sheet 1

FIG. I.

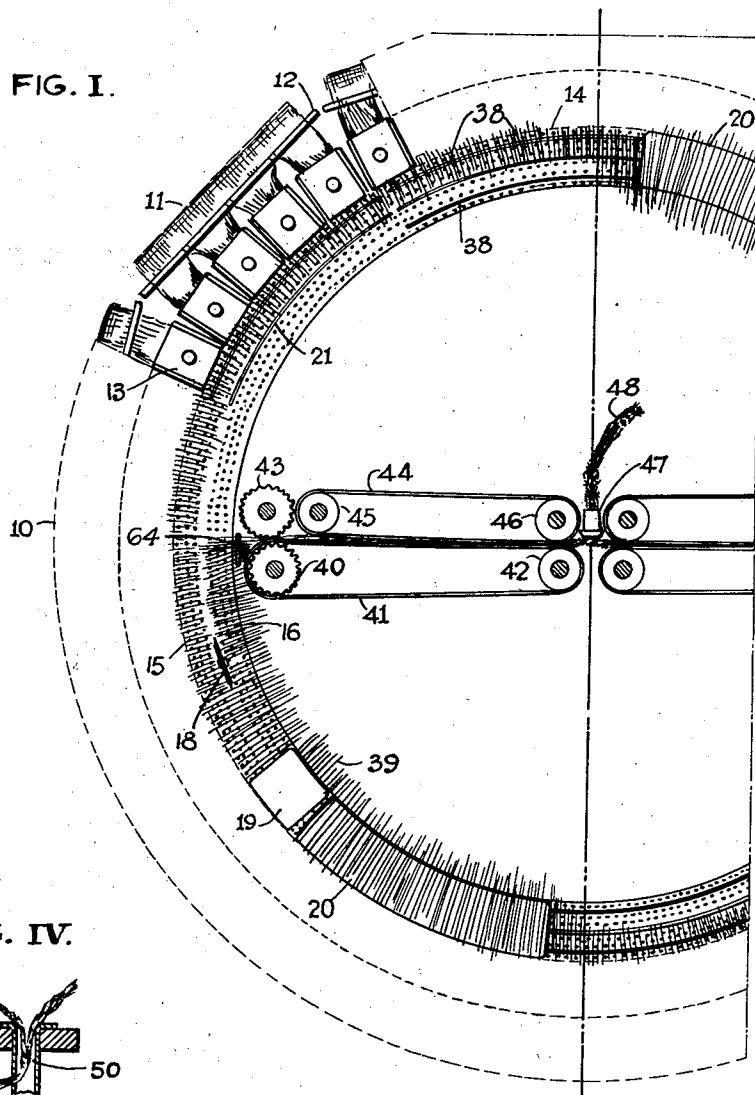
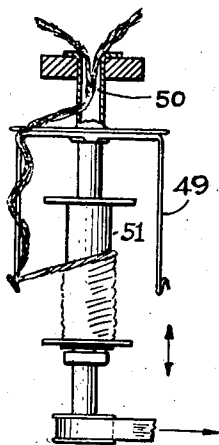


FIG. IV.



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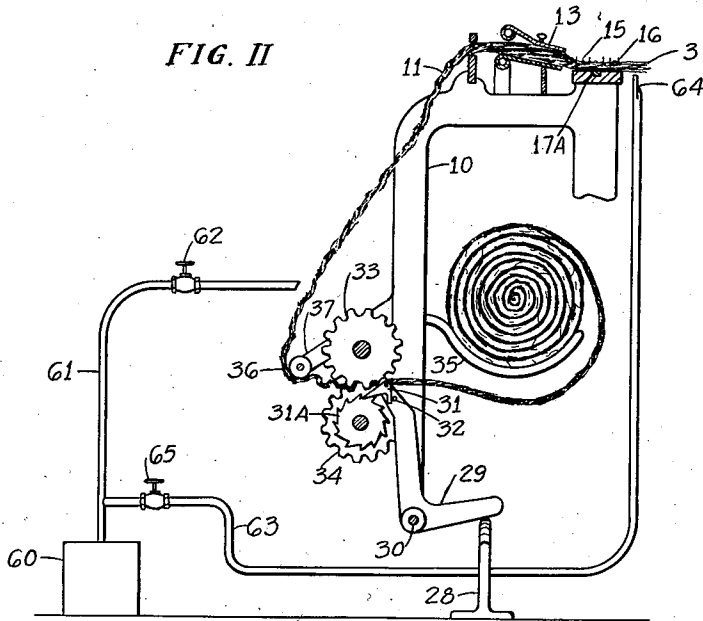
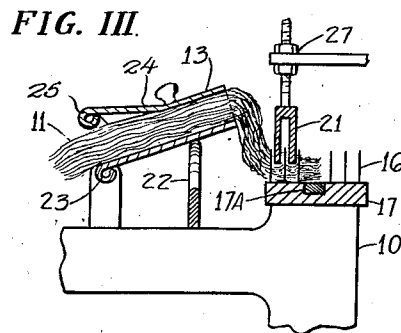
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2 Sheets-Sheet 2



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2,254,059

PREPARATION OF STAPLE FIBERS

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Application May 15, 1941, Serial No. 393,560

9 Claims. (Cl. 19—1)

This invention relates to a method of and apparatus for the production of staple fiber in sliver form from continuous filaments and is a continuation in part of my copending application Serial No. 264,170, filed March 25, 1939.

According to the present concept, provision is made to effect a separation of the continuous filaments from each other so as to avoid drawing off bunches or groups of fibers after the cutting operation, as will sometimes occur because of the natural cohesiveness of the filaments or as a result of a treatment to which they have been subjected prior to being reduced to staple fiber.

I propose to accomplish my objects by crimping the filaments and then agitating the crimped stock so as to disalign the crimps and to break up bunches which may have formed prior to or during crimping. The agitator, which I have illustrated as a pneumatic device, separates and disaligns the crimped filaments and causes them to be more readily engaged by the drawing off device. The crimping of the filaments gives them an irregularity which breaks up groups, and thus fibers which tend to stand upwardly near the drawing off means may support the other fibers so that all are engaged more readily. The pneumatic agitator or air beater directs an air blast which improves the operation. A mechanical beater or separator obviously could be substituted to perform this last function.

An object of this invention is to crimp continuous filaments prior to reducing them to slivers of staple fibers.

Another object is to continuously feed, crimp, separate and reduce continuous filaments to slivers of staple fibers on a single machine.

Another object of this invention is to agitate continuous crimped filaments, to separate them and to disalign the crimps in them prior to reducing the filaments to slivers of staple fibers.

These and other objects of invention will be manifest from a consideration of the following description, claims and 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 and crimper, a stock guide, fiber separator, a stock box and a comb retaining means.

Figure III is a detailed view of the top feeding means.

Figure IV denotes a flyer for putting twist 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, said batts being 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 completely 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 top 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 top feeding against a drag or pull occasioned by the crimp rollers. This is accomplished by providing a fixed cam 28 which actuates bell crank lever 29 pivoted at 30 and at one end of which is a pivoted weighted ratchet engaging pawl 31 and pawl stop 32. This pawl 31 and ratchet 31A drives the crimping rollers 33 and 34.

The stock batts 11 rest on a support 35 and, as indicated in Figure II, the stock passes through crimping rollers 33 and 34 and around a guide 36 supported by bracket 37, which is connected to the rotating frame 10. The cam 28 and crimp rollers 33 and 34, which are actuated thereby, constitute a bottom feeding means and provide slack for the top feeding means.

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 fiber. The protruding ends are designated 39.

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. The slack filaments between the top and bottom feeding means are subjected to agitation by a pneumatic device connected to a source of compressed air 60. The pipe 61, through which air flow is regulated by valve 62, is directed on the filaments as the frame 10 rotates. This air current will agitate the fibers to separate them and disalign the crimps in the separate filaments. It is to be understood that the crimping and disalignment of crimps in the filaments may be done on separate mechanism and the treated stock reduced to staple on the machine, which is the subject matter of my application Serial No. 264,170.

When very fine or soft fibers are being reduced to staple, some difficulty may be experienced in causing the ends of the cut staple to engage the drawing off device. To overcome this difficulty, another pipe 63, partially flattened at its end 64, conducts air, the flow of which is regulated by valve 65, to a point near the drawing off device. A small air current will be sufficient to support the fibers for engagement with the drawing off device as the frame 10 rotates. 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. The forward ends of the cut fibers will overhang their support substantially equally and substantially all of the fibers will be drawn off. Breakage, of course, may occasion a relatively small loss.

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 automatically compensates with a decrease in diameter of the supply batt as the crimping means is operated at a regular intermittent rate, and hence the bottom feeding is independent of the size of the batt.

Operation

At the beginning of a run the stock batt rests on the support 35 which is fixed to the rotating frame 10 and the stock passes through the crimping rollers around the guide 36 and 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 from the path of the cutter. The cut crimped fibers are irregularly disposed to each other and are positioned in the inner group of pin circles. These 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 15. 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 bottom feeding means or crimping rollers.

After the feeding step the ends of the continuous filaments are cammed out of the pin circles on to the smooth plate 20 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 fibers in continuous form, comprising means for feeding continuous filaments, crimping means, cutting means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device, and retaining means comprising a plurality of pins, said retaining means and

drawing off device being relatively transversely movable during operation, whereby the staple fibers will be drawn from their retaining means substantially progressively.

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

3. An apparatus for the production of staple fibers in rope-like form, comprising means for feeding continuous filaments, crimping means, 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 substantially all of the fibers will be drawn from their retaining means substantially progressively.

4. An apparatus for the production of staple fibers in continuous form, comprising means for feeding continuous filaments, crimping means, cutting means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device having a nip, 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 substantially all of the fibers will be drawn from their retaining means substantially progressively.

5. An apparatus for the production of staple fibers in continuous form, comprising means for feeding continuous filaments, crimping means, fiber separating means, cutting means for reducing the end portions of the continuous filaments to staple fibers, a drawing off device hav-

ing a nip, 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 substantially all of the fibers will be drawn from their retaining means substantially progressively.

6. In an apparatus as described in claim 5, characterized in that a pneumatic means is provided for supporting the ends of the fibers which protrude beyond the annular retaining means.

7. 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, crimping the continuous filaments, cutting the ends of the said filaments, providing a retaining drag on the cut ends of the 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.

8. 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, crimping the said continuous filaments, cutting the ends of the 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 substantially 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.

9. In a method for the production of staple fibers as described in claim 8, further characterized in that the crimped fibers are agitated after crimping.

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