

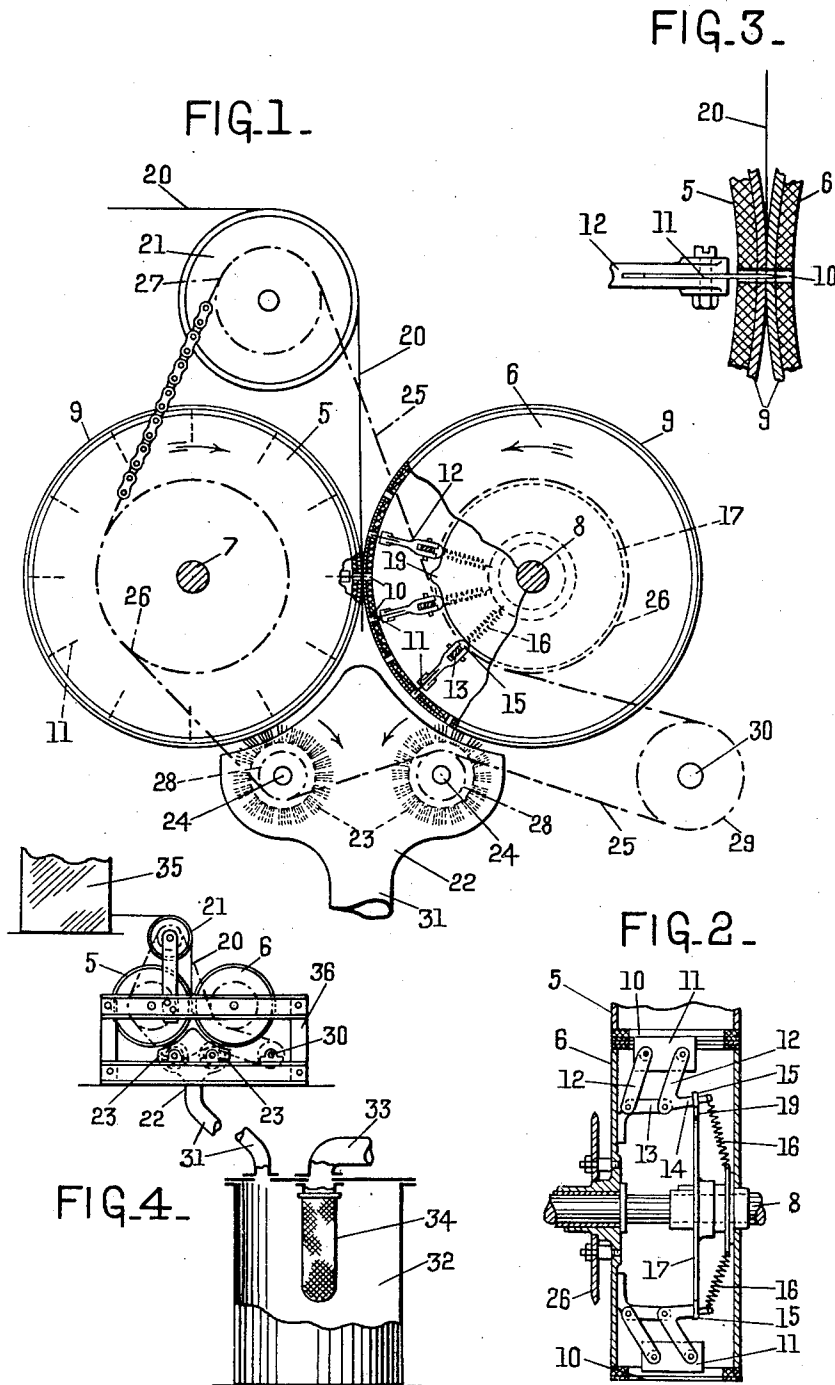
Aug. 6, 1935.

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2,010,078

PRODUCTION OF STAPLE FIBERS

Filed April 14, 1932



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UNITED STATES PATENT OFFICE

2,010,078

PRODUCTION OF STAPLE FIBERS

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Application April 14, 1932, Serial No. 605,218
In Great Britain June 4, 1931

13 Claims. (Cl. 164—68)

This invention relates to textile operations, and in particular the cutting of filamentary or thread-like materials, especially such materials as are intended to be transformed into staple fiber for the preparation of spun yarns.

The principal object of the invention is to devise a method and apparatus for cutting continuously fed filaments or like materials (hereafter referred to as "filaments") and especially such filaments when fed at a high or very high rate, necessitating a correspondingly high or very high frequency of cutting, particularly when short staple lengths are required. Another object of the invention is to enable artificial filaments to be cut into staple fibers continuously with their production.

According to the invention staple fibers are produced by cutting continuously fed filaments while gripping the filaments on both sides of the point of cutting. Apparatus for this purpose comprises a cutting blade which is adapted to be moved across the path of the filaments to be severed, and means for holding the filaments on both sides of the blade during cutting. The cutting blade is preferably arranged to be drawn across the path of the tautened filaments so that cutting takes place with a slicing motion, ensuring clean and certain severance of the filaments.

In order to ensure continuous feeding of the filaments to the cutting apparatus, a condition which is important for the securing of uniform lengths of fibers, the apparatus is preferably devised so that tension is applied to the free end of the filaments after severance of staple lengths from the end of the filaments. Thus the filaments may be drawn to the cutting point by nip rollers, a cutting blade being so arranged that it severs the filaments at or about the centre point of the nip of the rollers. Conveniently a resilient coating is applied to one or both of the rollers so that the nip of the rollers covers an area and does not take place along a line only. Provided cutting takes place within the width of this area, the filaments are held by the contact between the rollers on both sides of the line of cut, and severance of the free end of the filaments to form a staple length does not release the filaments behind the line of cut, but enables tension to be continuously maintained on the filaments.

Conveniently the cutting blade is caused to rotate with one of the rollers, cam or other means being provided to actuate the blade as it arrives at the nip of the rollers for the purpose explained

above. The blade thus operates once for each revolution of the roller. The length of staple cut depends upon the rate at which the filaments are fed to the nip, and this rate in turn depends upon the diameter of the contacting rollers.

For the cutting of short or comparatively short lengths of staple fiber it is preferred to employ a number of cutting blades which operate in turn as they reach the nip of the rollers, and the provision of a plurality of such cutting blades enables for any particular length of staple fiber a larger diameter of roller to be employed, with consequent reduction in the angular velocity necessary. Further, each of the two contacting rollers may be provided with cutting means; for example, the two rollers may each have the same number of cutting blades, with the blades of one roller operating in alternation with those of the other.

In order to provide for the slicing action of the cutting blades, the cutting edge not only moves radially or substantially so across the path of the filaments, but also moves sideways over the filaments. These motions may be effected by separate cam or other means, or the blades may be so formed or so mounted that a single operating means suffices to give both motions. In the latter case, the operating means may act positively in either direction, but preferably act in the cutting direction, return of the knife being effected by spring or like means. The operating means may conveniently be adapted to cause a rapid cutting motion of the knife, the return motion being slower if desired.

It is preferred to provide a slot in the one roller to be entered by a blade of the other roller when the blade is actuated to sever the filaments, so that the blade makes a cutting movement which passes beyond the path of the filaments.

The cutting blades may be of such width as to be able to cut a considerable number of filaments on each cutting movement, and the lengths of the drums are made sufficient to accommodate side by side any desired number of filaments or threads of filaments to be simultaneously cut.

Feeding of the filaments to the nip of the rolls from packages or other suitable sources of supply is preferably effected by means of a feed-roller arranged some little distance from the nip of the rolls and driven at the desired feeding speed. For the purpose of ensuring tautness of the filaments, the cutting rollers may be driven at a speed slightly in excess of the feed-roller speed.

When the apparatus is employed for cutting artificial filaments continuously with their pro-

duction, e. g. cellulose acetate or other cellulose derivative filaments produced by the dry or evaporative method, the above mentioned feed-roller may be employed in replacement of the usual feed-roller used on spinning machines, or, on the other hand, the filaments may be led from the feed-roller of the spinning machine to the feed-roller arranged near the cutting rollers.

For the cutting of a large number of filaments simultaneously guide means may be arranged to conduct filaments to the cutting apparatus from any desired number of packages, or from any desired number of spinning cells, in the case of cutting continuously with production of the filaments.

Means may be provided to remove the fibers from the vicinity of the rollers after cutting, and if desired a pair of brushes or combs may be so arranged as to brush from the face of the rollers any fibers which adhere thereto.

A form of apparatus according to the invention will now be described in greater detail with reference to the accompanying drawing, but it is to be understood that the following description is given by way of example only and is not in any way limitative:—

Fig. 1 is an end view partly in section of a cutting device;

Fig. 2 is a part sectional view of one of the rollers of the device;

Fig. 3 shows a detail to an enlarged scale; and

Fig. 4 shows in diagrammatic form the cutting device arranged in conjunction with a dry spinning machine.

Referring to Fig. 1, a pair of rollers 5, 6 are mounted on parallel shafts 7, 8 so that their faces, which are covered with a rubber sheet 9, are pressed together at the point of contact between the rollers. Each roller surface is formed with a number of equally spaced slots 10, the rubber sheet 9 being similarly slotted, and adjacent to alternate slots in each roller is arranged a movable knife blade 11 carried by links 12 from brackets 13 within the roller so as to be capable of swinging through the slots. One of the links 12 is connected to a lever 14 provided with a follower roller 15 and pressed by means of a spring 16 into contact with a cam 17 secured to the fixed shaft 8 on which the roller rotates.

At a point opposite the nip of the rollers the cam 17 is formed with a projection 19 so that as the knives are carried over the projection by the rotation of the roller, they are passed through the slot 10 in the roller and enter corresponding slots in the other roller. At the same time the mounting of the knives is such that their outward movement is accompanied by a sweeping movement lengthwise of the slot.

Filaments to be cut are shown at 20, these being fed at an appropriate speed by means of a feed roller 21. The end of the filaments is nipped between the rubber covering of the rollers 5, 6 so that the filaments are held taut across the opposed openings of the slots 10 at the nip of the rollers. The slicing action of the knives 11 operating at this point thus severs the filaments cleanly. At the same time the end of the filaments is still held by the rollers after severance of the staple lengths, and forward feeding of the filaments proceeds continuously and positively. The length of fiber cut from the filaments equals the distance between adjacent slots in the rollers.

The severed fibers fall into a chute 22, any fibers adhering to the filaments being removed by the revolving brushes 23 mounted on shafts 24.

The rollers 5, 6 and the feed roller 21 and brushes 23 are driven by a chain 25 passing over sprockets 26, 27, 28 on the shafts carrying these members and over a sprocket 29 on the driving shaft 30.

The fibers are drawn from the chute 22 by a conduit 31 leading to a chamber 32 to which suction is applied through a pipe 33. A bag 34 on the inlet to the pipe 33 causes the fibers to be retained in the chamber 32.

The peripheral speed of the feed roller 21 is the same as that of the rollers 5, 6 or very slightly less, so that the filaments 20 are held taut at the cutting position. The peripheral speed of the brushes 23 is greater than that of the rollers 5, 6 to ensure proper brushing of the rollers, and further, the surfaces of the brushes move in the opposite direction to those of the rollers for the same purpose.

When the apparatus is employed for cutting 20 filaments continuously with their production as shown in Fig. 4, which shows filaments proceeding from a dry-spinning machine 35, the feed roller 21 may be used to determine the rate of filament production from the machine, being suitably geared in the usual manner with the pump driving mechanism of the machine. The frame 36 carrying the cutting device may be disposed in any convenient manner with respect to the spinning machine, and may if desired be incorporated in the support for the machine.

What I claim and desire to secure by Letters Patent is:—

1. Method of severing a moving continuous filament in forming staple fiber therefrom, which comprises feeding the filament forward between, and in continuous contact with, moving surfaces, gripping the filament between said moving surfaces immediately adjacent the point of severance and on each side thereof, and while it is gripped cutting the filament at the point of severance by passing a knife edge through said filament in a direction forming an acute angle with the knife edge.

2. Method according to claim 1, in which said passage of the knife through said filament is concurrent with the production of the latter.

3. Method according to claim 1, in which said passage of the knife through said filament simultaneously severs, at the same point, a plurality of other filaments each conducted thereto from a convenient source of supply.

4. Apparatus for severing a moving continuous filament, comprising, in combination, a pair of moving surfaces adapted to continuously feed the filament forward and to grip the filament immediately adjacent the point of severance and on each side thereof, a cutting blade, and actuating means for passing the cutting blades while the filament is gripped, in a direction forming an acute angle with its cutting edge, through and beyond said filament at the point of severance.

5. Apparatus for severing a moving continuous filament comprising, in combination, gripping means in continuous contact with the free end of the moving filament and adapted to grip said filament over part of its length, a cutting blade, driving means for imparting a rotary motion both to said gripping means and to said cutting blade, and actuating means for moving said blade, in a direction forming an acute angle with its cutting edge, through and beyond said filament at a point in the gripped length thereof.

6. Apparatus for cutting a moving continuous filament into staple fibers comprising, in combi-

nation, a pair of nipping rollers in continuous contact with the free end of the moving filament and adapted to continuously feed forward said filament, at least one of said rollers having a resilient deformable surface, driving means for positively rotating said rollers in opposite directions at equal peripheral speeds, a cutting blade housed in one of said rollers and movable to project through an axially directed slot in the periphery thereof, and actuating means operative when said slot is within the area of contact of said rollers to move said blade outwardly through said slot in a direction forming an acute angle with its cutting edge.

7. Apparatus for cutting a moving continuous filament into staple fibers comprising, in combination, a pair of nipping rollers in continuous contact with the free end of the moving filament and adapted to continuously feed forward said filament, at least one of said rollers having a resilient deformable surface, driving means for positively rotating said rollers in opposite directions at equal peripheral speeds, a cutting blade housed in one of said rollers and movable to project through an axially directed slot in the periphery thereof, and actuating means operative when said slot is within the area of contact of said rollers to move said blade outwardly through said slot in a direction forming an acute angle with its cutting edge, a recess in the other of said rollers being so positioned as to accommodate the projected portion of said blade.

8. Apparatus according to claim 6, which comprises a plurality of cutting blades and means to actuate said blades in succession.

9. Apparatus according to claim 6 in which each of said nipping rollers contains at least one cutting blade and actuating means therefor.

10. Apparatus for cutting moving continuous filaments into staple fibers comprising, in combination, at least one supply of continuous filament in package form, a pair of nipping rollers in continuous contact with the free end of said filament and adapted to continuously draw said filament from each supply, at least one of said rollers having a resilient deformable surface, driving means for positively rotating said rollers

in opposite directions at equal peripheral speeds, a cutting blade housed in one of said rollers and movable to project through an axially directed slot in the periphery thereof, and actuating means operative when said slot is within the area of contact of said rollers to move said blade outwardly through said slot in a direction forming an acute angle with its cutting edge.

11. Apparatus for the manufacture of artificial staple fibers comprising, in combination, spinning apparatus for the production of at least one continuous artificial filament, a pair of nipping rollers in continuous contact with the free end of said filament and adapted to continuously draw each filament from said spinning apparatus, at least one of said rollers having a resilient deformable surface, driving means for positively rotating said rollers in opposite directions at equal peripheral speeds, a cutting blade housed in one of said rollers and movable to project through an axially directed slot in the periphery thereof, and actuating means operative when said slot is within the area of contact of said rollers to move said blade outwardly through said slot in a direction forming an acute angle with its cutting edge.

12. Apparatus for cutting a continuous filament into staple fibers comprising, in combination, a pair of nipping rollers in continuous contact with the free end of said filament and adapted to continuously feed forward said filament, at least one of said rollers having a resilient deformable surface, driving means for positively rotating said rollers in opposite directions at equal peripheral speeds, a cutting blade housed in one of said rollers and movable to project through an axially directed slot in the periphery thereof, actuating means operative when said slot is within the area of contact of said rollers to move said blade outwardly through said slot in a direction forming an acute angle with its cutting edge and means for producing and directing a current of fluid to remove the cut fibers from the apparatus.

13. Apparatus according to claim 6, which comprises means for dislodging the cut fibers from the vicinity of the cutting blade.

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