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C. J. WESTIN

2,221,065

FIBER CUTTER

Filed July 16, 1938

2 Sheets-Sheet 1

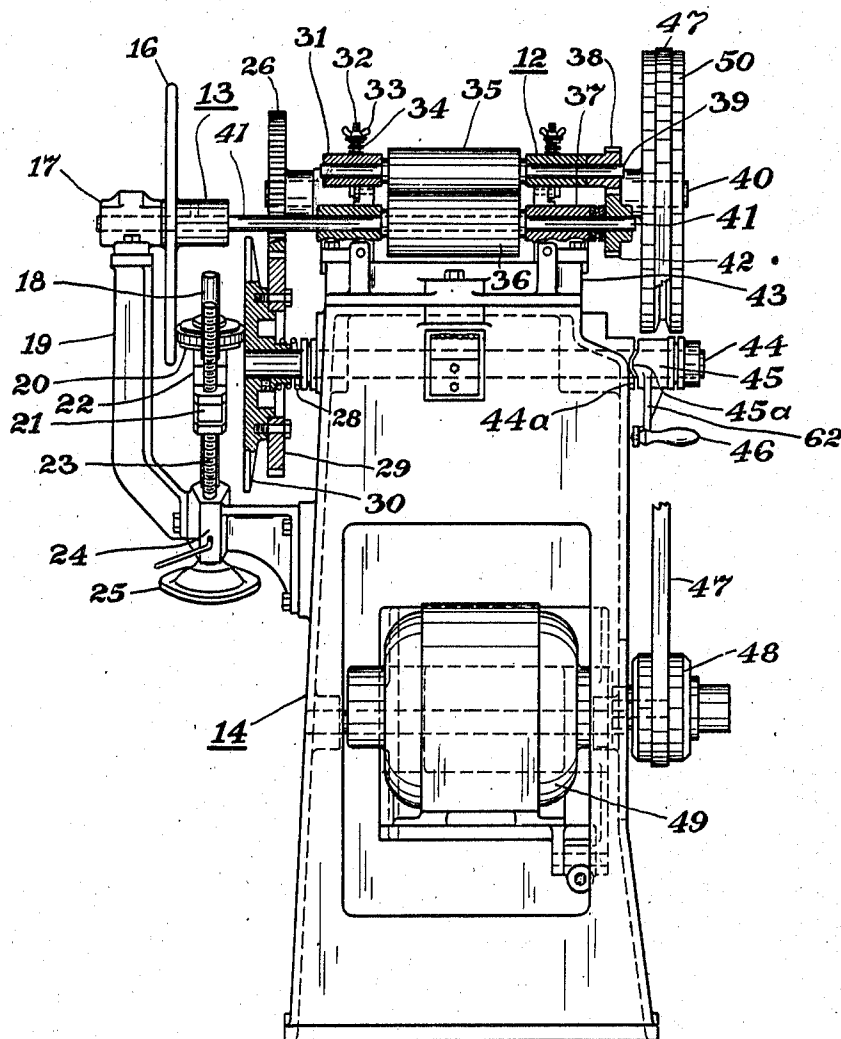


Fig. 1.

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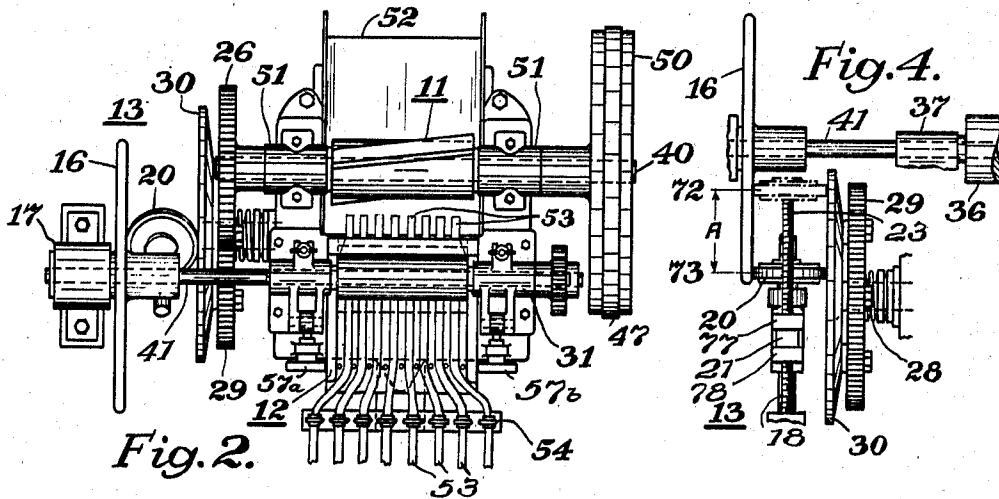
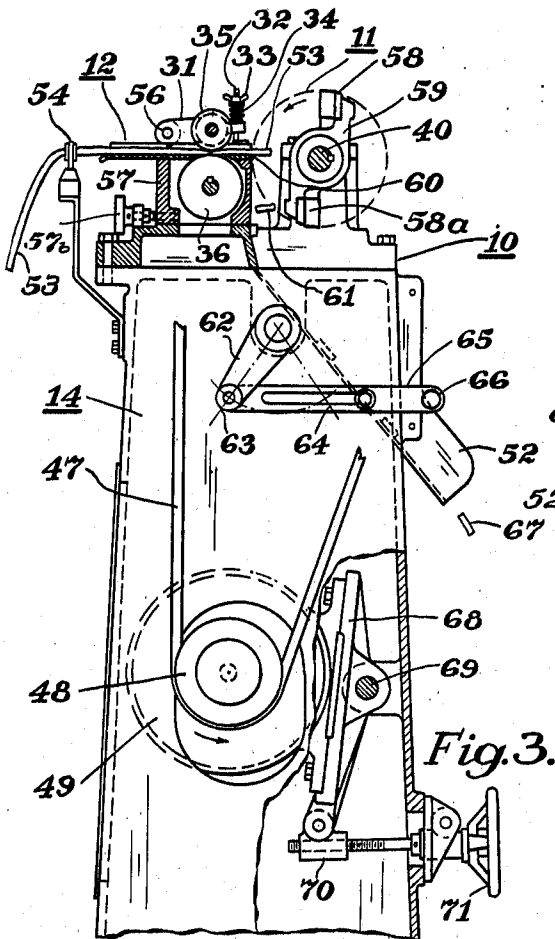
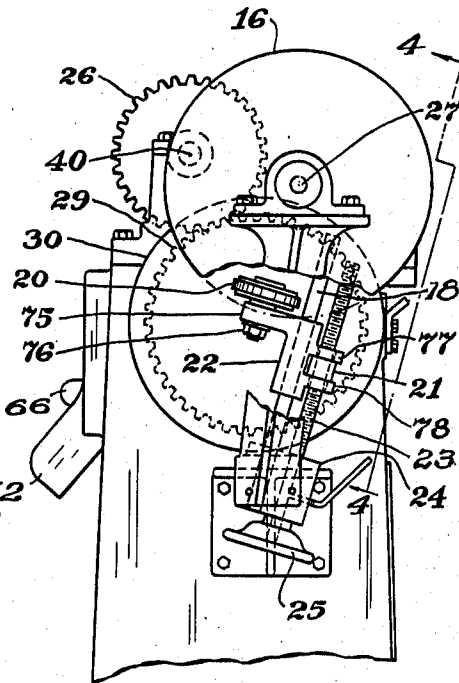
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' 2 Sheets-Sheet 2



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FIBER CUTTER

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In Great Britain July 6, 1938

6 Claims. (Cl. 164—68)

This invention relates to fiber cutters and particularly to cutting machines of the rotary cutter type used for cutting cotton sliver, wool staple, etc., into any desired length within the range of the machine.

In the manufacture of yarns many combinations or mixtures of fibers are used and the raw material may be selected from a variety of available kinds such as wools, cotton, silk, rayon, etc., depending on the product desired. For successful carding and spinning the various materials going into the mix ought to be of approximately the same fiber length. Nature, however, does not supply constant staple of wools in exactly the same length every season and the locality and breed of sheep has a decided influence on the kind of wools available. In the use of available raw material adjustments, therefore, must be made when preparing the various staples which must be done by cutting to suitable length. The better grades of cotton staple usually come in lengths varying from $1\frac{1}{8}$ " to $1\frac{1}{4}$ " and the wool or other material such as silk and rayon to be mixed with it, must be prepared by cutting to approximately that length. The cotton staple, however, may come in lengths of $1\frac{1}{2}$ " or even considerably longer, and the cutter used in preparing the mix should, therefore, be conveniently adjustable to take care of any possible variation. A conveniently adjustable rotary cutter is also very desirable and useful in many other lines of manufacture of novelty goods such as imitation suede material used for clothing, shoes, etc. These manufacturers cut the cotton sliver or rayon into very short lengths varying from a few thousandths up to $\frac{1}{2}$ ".

Heretofore, as far as I know, adjustment of the feed for different length of cuts required a new set of change gears or the combination of several sets of change gears, ratchets and pawls, in order to come somewhere near to the desired length. In some machines a series of sprockets with chains in varying lengths are in use, but all of these devices are unsatisfactory where a number of varying lengths must be taken care of. In some cutters now in use, the feeding is set by steps through the use of a ratchet and pawl mechanism and in order to increase the sensitivity or, in other words, obtain adjustments in small steps, pawls in multiples are used, but even at that, the adjustment is not always satisfactory and to set the steps accurately is extremely difficult. Another difficulty with the step-by-step feed arrangement is the jerky action which interferes with the accuracy of the machine. It

also seriously affects the speed at which the cutter may be run, and, therefore, holds down the production below that desired for a machine of this type.

Through my invention all of the above difficulties have been overcome and a simple, conveniently adjustable and very efficient rotary cutter is provided. The operation is continuous so that the cutter may be operated at maximum production efficiency. The feed, of course, is continuous and adjustable by infinitely small steps within a definite range. It consists of the usual rotating cutter-head, with one or more cutting edges acting to shear the material fed against the edge of a cooperating dead knife, the feeding of the material being accomplished by a set of rolls yieldably pressed towards each other and continuously rotating at a suitable speed, the rate of speed being conveniently adjustable by means of a friction drive unit incorporated in the transmission supplying the driving power. The invention also includes other new and novel features which will be apparent from the appended drawings, specification and claims.

Referring to the drawings:

Figure 1 represents a front elevation of the machine with portions of the feed mechanism in sections;

Figure 2 represents a top view;

Figure 3 represents a side elevation, partly in sections and with parts broken away;

Figure 4 is a fragmentary view taken on line 4—4 of Figure 5 showing the details of the friction drive for the feeding mechanism, and

Figure 5 is a side elevation showing the friction drive unit with parts broken away.

In the embodiment selected to illustrate the principles of my invention as shown in the drawings, a rotary cutting head is shown at 11 mounted on a frame 10 in bearings 51 so as to rotate and cut any stock 53 which may be fed forward by the feed-frame 12 during the time intervening between the contact of the knives. Frame 10 is supported on the upper end of base 14. The feed rolls 35 and 36 of feed-frame 12 move the fiber stock forward at a uniform continuous rate of speed, the rotary movement being imparted to the feed rolls by the adjustable friction drive unit 13, the length of stock 51 cut off depending on the rate of speed at which the feed rolls move the stock forward. If a slow speed is imparted to the feed rolls the pieces of stock 51 cut off will be comparatively short while if the speed of the feed rolls is high the stock cut would be several times that of the slow speed. A slight change

in the location of friction wheel 20, as is shown in Figure 4, will affect the length depending on which way the wheel is moved. At the position indicated as 73 the minimum length of stock would be fed while if the wheel is moved to position 72, the maximum length of stock would feed in over the knife to be cut.

The rotary cutter may consist of a rotating head 59, carrying one or more knives 58 and 58a. The rotating head 59 is mounted on shaft 40, journaled in bearings 51 on frame 10 and rotated by means of a flywheel 50 mounted on shaft 40 and receiving power through belt 47 from a pulley 48 on prime mover 49. A gear 26 is mounted on the other end of shaft 40 and this transmits rotary motion to gear 29 (Figures 1 and 2). To gear 29 is attached a drive disk 30 and these two elements may be fastened as a unit to shaft 44 extending through bearings provided in base 14 (Figure 1). The feed-frame 12 which carries the dead or fixed blade 60 consists of a housing 57 (Figure 3) mounted for sliding movement on frame 10 in such a way that it may be adjusted with relation to its distance to cutter-head 11 by means of a pair of screws 57a and 57b. By this adjustment of the housing 57, proper shearing action is obtained between the rotary cutter blades 58-58a and the dead blade 60 carried by housing 57. Two feed rollers 35 and 36 are mounted on the feed housing 57, the lower 36 having bearings provided for it in the housing at 37, and the upper roll 35 is mounted on housing 57 in yieldable bearings 31. The shaft 41 on which roller 36 is mounted extends through on both sides, having gear 42 attached to it on one side which transmits a rotary motion to the gear 38 and through it to shaft 39 on which the upper feed roller 35 is mounted, as is best seen in Figure 1. Feed roller 35, however, with its shaft 39, is supported in bearings 31, each of which is provided on one side with an arm fulcrumed at 56 and on the other side with two lugs embracing opposite sides of threaded pin 32 and extending in under a spring 34 (Figure 3) which is pressed down against the lugs by means of the nut 33 carried by pin 32. Feed roller 35 through this arrangement can adjust itself to the thickness of stock moving between the two rolls and the tension on the stock is, therefore, maintained uniform regardless of thickness. The prime mover may be of any suitable type and may be mounted in any convenient place; for example, I have shown an electric motor 49 mounted within the base 14 of the machine on a plate 68 fulcrumed at 69 and provided with belt tension adjustment through a screw and nut 70 adjustable in and out by means of handwheel 71, Figure 3.

In Figures 2 and 3, a plurality of strands 53 are shown feeding through the rolls, each one being guided by an eyelet 54 or in any other convenient manner. The rotary motion of disk 30 is transmitted through the pressure exerted by it on friction disk 20 pressing it against the driven disk 16 which is attached to the lower roller shaft 41. The left end of shaft 41 (Fig. 1) is journaled in bearing 17 carried by bracket 19 secured to base 14. Shaft 44 (Figure 1) on which drive disk 30 is mounted is so arranged that it can slide endwise, and a spring 28 surrounding shaft 44 is arranged to continually press the drive disk 30 against the friction wheel 20 unless restrained by means hereinafter described. As mentioned above, the position of friction disk 20 with relation to the driving disk 30 and the driven one 16, determines the length of stock fed through to

the cutter. In the drawings, I have shown one convenient way of adjusting the position of friction wheel 20 but other ways embodying the principles herein described could readily be used. As a matter of illustration, wheel 20 (Figure 5) is free to rotate on a pin rigidly fastened by means of nut 76 onto the arm 75 of thimble 22 which is mounted for sliding movement on a rod 18 secured in bracket 24. On the opposite side, two lugs 77 and 78 extend out from the thimble and screw 23 passes through holes formed in these lugs with sufficient clearance to permit limited swinging of thimble 22 about rod 18. Confined between these lugs is a nut 21, engaging screw 23 which is free to rotate in bracket 24 but held from endwise movement. On the screw 23 is attached a hand-wheel 25 by means of which the screw can be turned so as to move the thimble 22, and with it friction disk 20, to either of the positions shown in Figure 4 or to any intermediate position that may be desired. It is evident from the construction indicated that the friction wheel 20 will be free to move between the two disks contacting it and thus adjust itself to any position imposed upon it by the spring 28 pressing drive disk 30 against 20 and, of course, as nothing restrains the arm 75, the wheel 20 is pressed against disk 16 and by means of the contact friction thus produced by spring 28 between the three drive members, the power of rotating the feed roll is transmitted from the cutter-head shaft 40 to lower feed roller 36.

The operation of the machine is as follows:

Strands of material to be cut into staple are threaded through the eyelets 54 and in between the feed rollers 35 and 36. Suitable tension is applied by means of spring 34 to furnish the necessary traction for a uniform and steady feeding through of the stock 53. With the cutter head rotating the stock will feed in over the dead knife 60 and the movement across the dead knife continues until knife 58 on the cutter head 59 contacts and shears off pieces of the strands as is indicated at 61 or 67, the sheared off pieces dropping down and out through the chute 52. It will be evident from a study of the conditions in Figure 3 that the stock 53 presented over the dead knife 60 can be varied in length by increasing the speed of rotation, or decreasing the speed of rotation as the case might be, of the two feed rollers in relation to the speed of the cutter-head 59. The faster the rollers rotate the longer will be the piece of stock fed in between the time that the knife 58 and 58a contact and shear it off. The speed of the two feed rollers are, as explained above, controlled by the position of friction disk 20 and the relationship between the speeds of the two members concerned, that is, the rotating cutter head 59 and the two feed rolls can, therefore, conveniently be adjusted to any desired speed, thereby producing any desired length of staple within the range of the machine.

The cutter head 59 may be driven directly from a prime mover as indicated and it is always desirable to permit the cutter head to rotate continuously even though at times it is preferred to discontinue the feeding of the stock. Convenient means for the discontinuing or uncoupling of the feeding or the rotation of the feed rollers is provided through the action of the hand operated cam 45 (Figure 1) on shaft 44. In the driving position lever 62 would present the cam 45 as shown on Figure 1 and corresponding position of lever 62 would be as indicated at 63 in Figure 3. By pulling out on handle 66 attached to the

link 65, lever 62 would take the position indicated at 64 with the cam faces 45a contacting the high points of cam 44a. The result of this cam action is to move shaft 44 endwise, pulling disk 30 away from friction wheel 20 and thus relieving the pressure imposed by spring 28 and eliminating all the friction necessary for transmitting the rotary motion. With all frictional pressure eliminated disk 16 will stop and thus the movement of the stock is also stopped for permitting examinations or necessary changes in the arrangement of the strands 53.

What I claim is:

1. In a cutting machine, the combination of 15
a base, a rotary cutter journaled upon said base and cooperating with a fixed blade mounted upon said base, a pair of feed rolls for feeding a strand of fibrous material to said fixed blade, a rotary disk driven in fixed speed relation with 20
said rotary cutter, a second disk mounted on the shaft of one of said feed rolls and arranged in overlapping relation with the first disk, means for driving said second disk from the first disk including a friction wheel mounted between said 25
disks and arranged for movement radially of said disks, one of said disks being mounted for axial movement, and means for shifting said movable disk axially thereof to interrupt the transmission of power to said feed rolls.

2. In a cutting machine, the combination of a 30
base, a rotary cutter journaled upon said base and cooperating with a fixed blade mounted upon said base, a pair of feed rolls for feeding a strand of fibrous material to said fixed blade, a rotary disk driven in fixed speed relation with 35
said rotary cutter, a second disk mounted on the shaft of one of said feed rolls, said disks being arranged in overlapping relation, a friction wheel mounted between said disks for driving the second disk from the first disk, means for shifting 40
said friction wheel along a line joining the axes of said disks, one of said disks being mounted for axial movement, spring means for urging said movable disk into contact with said friction wheel and for maintaining said friction wheel in contact with the other disk, and means for at will 45
shifting said movable disk against the action of said spring means to interrupt the transmission of power between said disks.

3. In combination, a power shaft having a disk 50
mounted thereon, a driven shaft having a disk mounted thereon and arranged in overlapping relation with the disk on the power shaft, a friction wheel interposed between said disks for driving the driven shaft from the power shaft, one 55
of said disks being mounted for axial movement, spring means urging said movable disk into con-

tact with said friction wheel and for maintaining said friction wheel in contact with the other disk, and means for at will shifting said movable disk against the action of said spring means for interrupting the transmission of power between 5
said power shaft and said driven shaft.

4. In combination, a power shaft mounted for axial movement and having a disk mounted thereon, a driven shaft arranged parallel with 10
said power shaft and having a disk mounted thereon and arranged in overlapping relation with the disk on the power shaft, a friction wheel interposed between said disks for transmitting power between said shafts, mounting means for 15
said friction wheel including means for shifting said wheel along a line joining the axes of said shafts and permitting free movement of said wheel axially of said shafts, spring means for 20
urging said power shaft axially thereof to maintain constant pressure on said friction wheel between said disks, and means for at will shifting said power shaft against the action of said spring means to interrupt the transmission of power between 25
said shafts.

5. In a cutting machine, the combination of a 25
base, a rotary cutter mounted on a fixed axis on said base, a stationary blade cooperating with said rotary cutter and carried by a frame slidably supported on said base, means for adjusting said frame with respect to said rotary cutter to 30
secure shearing operation between said rotary cutter and said stationary blade, means for feeding a strand of fibrous material to said stationary blade including a feed roller carried by said slidable frame, means for continuously rotating said 35
rotary cutter, and a variable speed transmission interposed between said rotary cutter and said roller for driving said roller at a predetermined speed relation with respect to said cutter.

6. In a cutting machine, the combination of 40
a base, a rotary cutter journaled upon said base and cooperating with a fixed blade mounted upon said base, a pair of feed rolls for feeding a strand of fibrous material to said fixed blade, a rotary 45
disk driven in fixed speed relation with said rotary cutter, a second disk mounted on the shaft of one of said feed rolls, said disks being arranged in overlapping relation so the periphery of one disk is adjacent the center of the other disks, a friction wheel mounted between said disks for 50
driving the second disk from the first disk, and means for shifting said friction wheel along a line joining the axes of said disks whereby the driving ratio between said disks is continuously and smoothly varied. 55

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