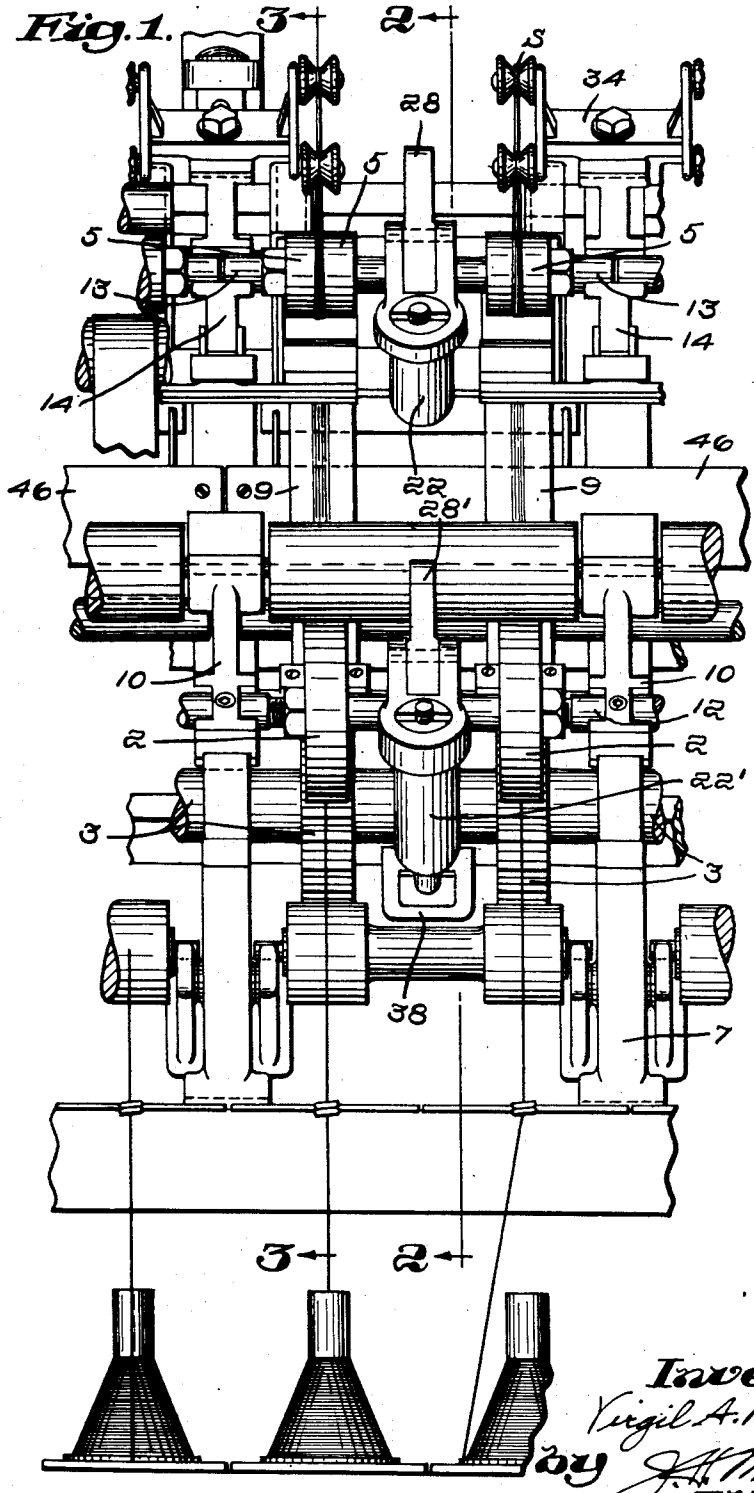
June 2, 1953 V. A. BURNHAM 2,640,228

MECHANISM FOR DRAFTING RAYON TOW

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Fig. 1.



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Fig. 5.

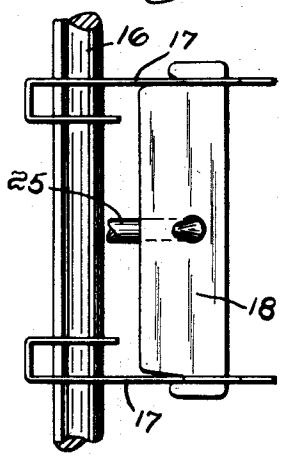


Fig. 2.

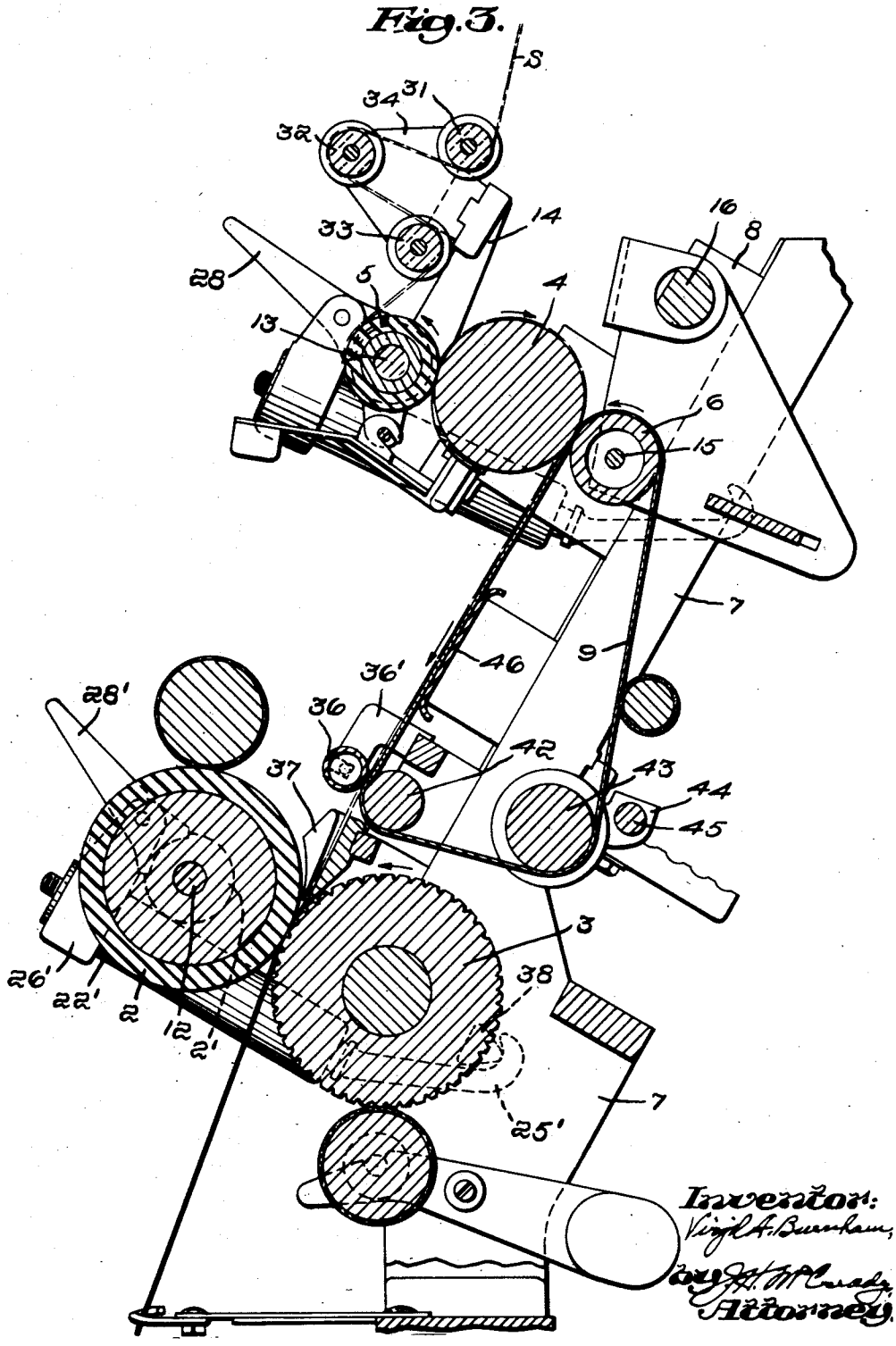
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MECHANISM FOR DRAFTING RAYON TOW

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Fig. 3.



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MECHANISM FOR DRAFTING RAYON TOW

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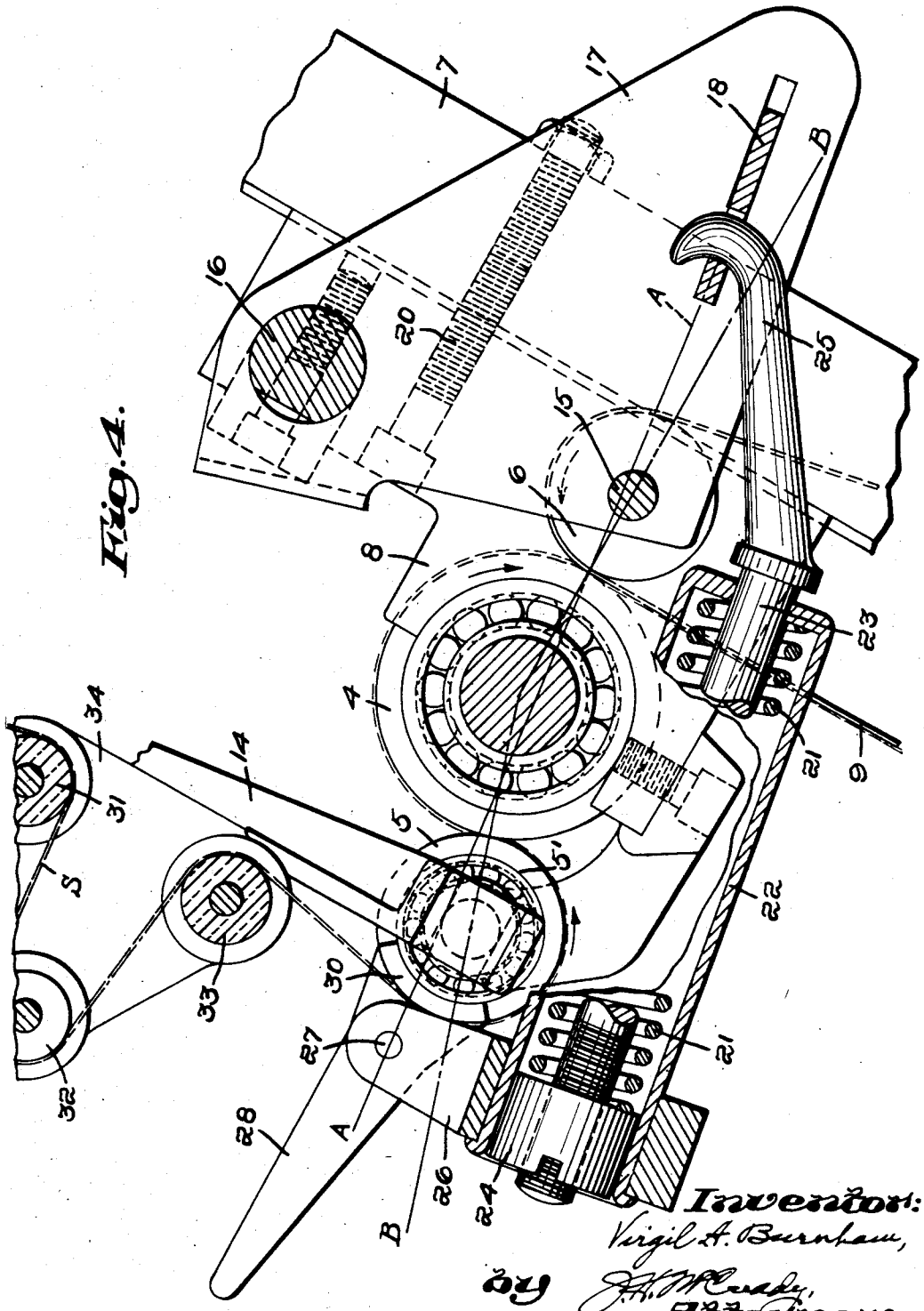


Fig. 4.

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MECHANISM FOR DRAFTING RAYON TOW

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Application May 6, 1947, Serial No. 746,183

12 Claims. (Cl. 19—0.35)

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As is well understood by those familiar with the commercial methods of producing thread or yarn from artificial fibers of various kinds (hereinafter referred to generically as rayon), it has been a common practice to cut up the rayon tow into short lengths of, say, in the neighborhood of an inch and a half, in order to make it possible to use this material in cotton mill machinery. That is, the tow is originally produced in the form of a composite strand containing several thousand individual continuous fibers of very fine gauge and the cutting operation reduces these continuous lengths to those comparable to cotton so that it can be handled in the cotton working machinery with which mills customarily are equipped.

In order to avoid some of the expense involved in the foregoing process, it has also been proposed to run a tow of the character just described, through a drafting mechanism so constructed as to break the strands while they are being fed from a holding set of rolls to delivery rolls, thus eliminating the necessity for a separate chopping step and combining it with a drafting operation. In practice the resultant product subsequently is fed to spinning instrumentalities which twist it into a yarn.

The latter process yields certain advantages but the machinery provided for practicing this method has not proved entirely satisfactory. It is important to the production of good yarn by this method to provide a very positive holding action at the rear rolls of the drafting mechanism and an equally positive feeding action at the front rolls. Without either one of these two positive factors, the resulting product will vary to such a degree that it is unsatisfactory. And it has been particularly difficult to produce a positive holding action at the rear rolls with anything except a very cumbersome mechanism.

The present invention is especially concerned with the foregoing considerations, and it aims to improve tow drafting mechanisms of the character above described with a view to curing the defects above referred to.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying drawings, and the novel features will be particularly pointed out in the appended claims.

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In the drawings,

Fig. 1 is a front elevation of a portion of the drafting mechanism of a spinning frame embodying this invention;

Fig. 2 is a vertical, sectional view on the line 2—2, Fig. 1;

Fig. 3 is a similar view taken substantially on the plane of the path of travel of a strand through the drafting mechanism, this plane being indicated at 3—3 in Fig. 1;

Fig. 4 is a side elevation, partly in section, showing the rear set of rolls and the supporting and weighting mechanism for them on a larger scale; and

Fig. 5 is a top view showing certain details of the weighting mechanism for one of the rolls of the rear set.

Referring first to Figs. 1 and 2, the drafting mechanism there shown comprises a front or delivery set of rolls including a top roll 2 and a lower roll 3, and a rear or holding set of rolls including a middle roll 4 and two rolls 5 and 6 mounted at opposite sides of it. Each of the front rolls and the rear rolls 5 and 6 includes two bosses so that a single set of rolls feeds two strands simultaneously to the spindles cooperating with the respective series of bosses. The lower front roll 3 and the rear middle roll 4 are positively driven by a mechanism similar to those used in the orthodox drafting mechanisms of spinning frames to drive the lower front and rear rolls of said mechanisms, and they are supported in much the same manner in a series of roll stands 7, as best shown in Figs. 2 and 3. These stands are spaced apart by suitable intervals, the reduced sections of the lower roll 3, between certain of its bosses, resting in U-shaped bearing portions provided in the roll stands. The rear roll 4 is similarly supported.

In Figs. 2, 3 and 4, bearing blocks for the middle rear roll are shown at 8, and they are mounted on ribbed upper surfaces of the roll stand 7 for adjustment toward and from the front roll. They are secured in their adjusted positions by bolts passing through the respective blocks 8, as in the orthodox roll stand construction for spinning frames. One of these bolts is shown at 20 in Fig. 4.

The front top roll 2 and the rear roll 5 are solid rolls fast on arbors 12 and 13, respectively,

the former being supported in cap bars 10, Fig. 1, while the latter is similarly supported in cap bars 14. Some of the cap bars are mounted directly on the bearing blocks 8, as shown in Fig. 4, and those between roll stands are supported on a bar or rail 16, Fig. 2, which is bolted securely to the roll stands and runs the entire length of the frame. The rear roll 6 is mounted on ball bearings supported on a stationary or "dead" spindle 15, Figs. 2, 3 and 4. Its opposite ends are supported in two plate-like brackets 17, suspended on the bar 16, so that they can have a slight swinging movement toward and from the middle roll. The other rolls 6 are similarly supported and the individual brackets of each pair are slotted to receive the opposite ends of a spreader plate 18, as best shown in Fig. 5, this arrangement being utilized in weighting each roll 6.

As above indicated, an important problem in a mechanism of this type is to produce a positive feeding action at the front rolls and a positive holding action at the rear rolls. The latter has proved to be even a more difficult problem than the former. It is partly for the purpose of solving this problem that the peculiar arrangement of rear rolls shown in the drawings has been provided. Also, for this purpose a weighting mechanism is combined with it in a unique manner, the entire combination producing the results desired.

As best shown in Figs. 3 and 4, the weighting mechanism includes a spring 21, housed in a tube or holder 22 in which a plunger 23 is mounted to slide. At one end this plunger has a head 24 threaded on to it, while its opposite end is curved and hooks through a hole in the spreader 18, this hole being located at a point midway between the brackets 17—17, Fig. 5. Rigidly secured to the upper end portion of the tube 22 and forming part of the holder is an arm 26 extending at right angles to the tube and carrying a pivot pin 27 on which another arm 28 is fulcrumed. The latter carries a shoe 30 provided with an arcuate face which rests on the outer race of a ball bearing 5', smaller in diameter than the roll 5 and mounted on the spindle 13 between the two bosses of this roll.

It will be evident from an inspection of Fig. 4 that because the spring 21 is of the compression type with one end bearing against the bottom of the tube 22 and the other against the head 24, it exerts a strong pressure directed along the line A—A, Fig. 4, connecting the plate 18 with the axis of the pivot 27, which pressure tends to squeeze all three of the rolls 4, 5 and 6 together.

Considering a single strand S, Figs. 3 and 4, to be drafted by these rolls, it is led from a spool, or other source of supply, around three stationary grooved guides 31, 32 and 33, all mounted on a bracket 34 which is bolted to the cap bar 14, and it passes from the last mentioned guide, in a counter-clockwise direction, around one of the bosses of the top roll 5 for approximately 180°, then in a clockwise direction around the middle roll 4 to the apron 9, which runs over the roll 6. Thence it runs under a slip roll 36, Fig. 3, through a trumpet 37 to the bite of the delivery rolls 2 and 3 from which it is guided to the ring or other spinning instrumentality. Thus it makes a long wrap around both rolls 5 and 4 and runs through two bites, one between the rolls just named and the other between the middle roll 4 and the apron 9 supported by the lateral roll 6. This arrangement, plus the pressure applied at the bites just mentioned, provides a very strong, non-slipping grip of the rolls on the strands.

It should be observed that when the rear rolls are in their running positions, as shown in Fig. 4, the axis of the top roll 5 is below the pressure line A—A. This fact prevents any tendency of the spring pressure to swing the arm 28 in a counter-clockwise direction which might release the contact of the shoe with its bearing 5', and throw the weighting mechanism out of its operative position. Because the brackets 17 can swing somewhat to move the roll 6 toward and from the middle roll 4, and the mounting of the roll 5 in the cap bar 14 permits a similar movement of the latter roll, those conditions necessary to enable the parts to function as above described are provided. At the same time the weight can be relieved quickly by swinging the arm 28 in a counter-clockwise direction, thus unlocking the rolls and permitting the weighting unit to be removed, if desired for any reason.

In replacing the weighting mechanism, the arm 28 is swung in a clockwise direction, Fig. 4, while the shoe is in contact with the outer race of the ball bearing 5' which is mounted on the spindle 13 between the rolls 5—5, said swinging movement continuing until the axis of said spindle or shaft 13 passes the pressure line A—A, Fig. 4. Up to this time the force applied to the lever must be increased, but after this dead center position is passed, the spring 21 then tends to tip the lever 28 clockwise into its final position, where the bearing 5' strikes the tube 22. In other words, the spring 21, at this time, tends to crowd the roll 5 toward the tube and that action is stopped by the engagement of the bearing 5' with the tube.

It should also be noted that the longitudinal stress on the strand as it passes from the pretensioning means to the feed rolls 4 and 6 tends to increase the pressure on the strand at the bites between the rolls 4 and 5, and the rolls 4 and 6, since the force exerted by the strand upon the roll 5 in a generally upward and backward direction tends to increase the distance from the axis of roll 5 to the spreader plate 18 because of the offset relationship of the axis of roll 4 from the line A—A. This increase in distance increases the compression of the spring 21. As the compression of spring 21 is increased it tends to hold rolls 5 and 6 more firmly against roll 4.

The spreader 18 distributes the pressure of the weighting mechanism substantially equally on the two brackets 17 with which it is associated, and thus equalizes the pressure of the two bosses of each roll 6 on both strands running in contact with them.

As best shown in Figs. 2 and 3, the weighting unit above described is duplicated at the lower rolls to weight them, and the corresponding parts are designated by the same, but primed, numerals. The hook 25' engages a lug 38 which forms a part of a small bracket 61, bolted to one of the cross-bars 40, while the pressure applying arm 28' acts on the surface of a ball bearing roll 2' mounted on the shaft 12. Thus this mechanism serves to load the top roll 2 with sufficient pressure to make the front rolls grip the strand firmly.

The apron 9 is driven by the power operated roll 4 at the area where the apron is pinched between this roll and the guide roll 6. It is guided over a stationary bar 42 and is tensioned by the usual take-up roll 43, controlled by a pair of links 44 which are separately pivoted at 45. It will be observed that the driving contact of the roll with

the apron is applied to the outer surface of the apron, as distinguished from the usual driving arrangement in mechanisms in which aprons are employed.

Because the roll spacing is excessive, as compared to that of the common forms of spinning frames, running from, say, six inches to thirteen inches or thereabouts, a stationary intermediate plate **46**, Figs. 1 and 3, is provided to support the central portion of the apron against vibration that might be troublesome.

When the mechanism is in operation the forward rolls may be running at a surface speed 10 to 40 times that of the rear rolls, these speeds, of course, varying with the production and draft desired. In any event, it is made such that the tow is placed under a tensile strain sufficient to break the individual continuous fibers of which it is composed. This breaking operation proceeds progressively as the fibers are fed from the rear to the front rolls, and it may be seen taking place along approximately the entire length of the tow between the two sets of rolls. Drafting of the tow occurs simultaneously. Some splaying or dispersion of the ends of the fibers occurs at the points of rupture and the slip rolls **36** supported in the brackets **36'**, Fig. 2, cooperate with the apron in exerting a control of these fiber ends. A further control of this splaying action is afforded by the trumpet **37**, this member preferably being slotted axially at its upper side to facilitate threading up.

This machine has proved, in actual mill use, that it accomplishes the objects of this invention, as above set forth, in an entirely satisfactory manner. The front set of rolls positively feeds the fibers, exerting the heavy pull on them necessary to break and draft them, while the rear rolls hold the tow positively against the pull of the front rolls. In some measure the accomplishment of these objects is facilitated by the preliminary tension applied to the tow by its passage over and around the three guides **31**, **32** and **33**, and the operation of both sets of rolls also is improved by covering the top rolls **2** and **5** and the middle roll **4** with a material, such as synthetic rubber, which gives them a moderate degree of yield or resiliency. Mainly, however, the success of the machine is due to the rear roll arrangement and the weighting mechanism used with it.

While I have herein shown and described a preferred embodiment of my invention, it will be evident that the invention is susceptible of embodiment in other forms without department from the spirit or scope thereof.

Having thus described my invention, what I desire to claim as new is:

1. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a surface speed sufficiently higher than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a positively driven middle roll and two additional rolls at opposite sides of it frictionally driven therefrom, the axis of said middle roll being offset from the plane passing through the axes of the other two rolls associated with it in a direction opposite to the direction of travel of said strand away from the middle roll, means supporting said additional rolls for movement toward and from said middle roll, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, and a weighting mechanism forcing all three of the rear rolls together.

2. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a surface speed sufficiently higher than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a middle roll and two additional rolls at opposite sides of it, means supporting said additional rolls for movement toward and from said middle roll, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around a first one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, said means including stationary guide means arranged to guide said strand in a path around the stationary surfaces of said guide means to snub it and thereby apply a tension to the strand prior to its contact with the first additional roll of said rear set, and a weighting mechanism forcing all three of the rear rolls together.

3. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a surface speed sufficiently higher than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a positively driven middle roll and two additional rolls at opposite sides of it frictionally driven therefrom, means supporting said middle roll for rotation around a fixed axis, means supporting said additional rolls for rotation around axes parallel to that of said middle roll but movable toward and from the middle roll, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, and a weighting mechanism forcing all three of the rear rolls together.

4. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart for feeding and drafting a composite strand of textile fibers, one of said sets of rolls comprising a middle roll and two additional rolls at opposite sides of it, and weighting mechanism straddling said one set of rolls comprising a spring, a holder in which said spring is supported, a plunger slidable in said holder, a hook connected with said plunger and arranged to engage a machine part having a fixed relationship to one of said rolls, a member carried by said holder and having an offset relationship to the holder, a part carried by the member for engaging another member having a rolling relationship to another of said rolls, said hook and the latter part being arranged to apply pressure to said rolls to force them toward each other, and the holder being offset laterally with reference to said rolls and extending at approximately right angles to them.

5. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart for feeding and drafting a composite strand of textile fibers, one of said sets of rolls comprising a middle roll and two additional rolls

at opposite sides of it, and weighting mechanism straddling said one set of rolls comprising a spring, a holder in which said spring is supported, a plunger slidable in said holder, a hook connected with said plunger and arranged to engage a machine part having a fixed relationship to one of said rolls, a member carried by said holder and having an offset relationship to the holder, an arm pivoted on said member and provided with an arcuate face to engage a cylindrical surface of one of said rolls, said holder extending at right angles to said rolls, said hook and the pivotal axis of said arm being so offset laterally from said holder that the line of pressure exerted by said spring through said hook and said arm passes through said rolls at one side of the plane connecting their axes and the relation of said arm to the roll surface which it engages tends to crowd one of said rolls and the holder together.

6. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a higher surface speed than the rear set, whereby said strand is drafted, one of said sets of rolls including one roll revolving on a substantially fixed axis and a second roll supported for rotation on an axis movable toward and from said fixed axis, said second roll being supported on two brackets mounted on the machine frame for movement toward and from its companion roll, a spreader engaging both of said brackets and a spring weighting mechanism, said spring weighting mechanism being connected with said spreader to operate through it to force said second roll against its companion roll.

7. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a surface speed sufficiently higher than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a middle roll and two additional rolls at opposite sides of it, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, each of said rolls including two bosses spaced apart to engage independent substantially parallel strands, in combination with means supporting one of said additional rolls and comprising two brackets mounted on the machine frame for movement about a horizontal axis toward and from the middle roll, a spreader engaging both of said brackets, and a weighting mechanism connected with said spreader midway between the brackets, whereby it operates through them to force the roll supported on them into contact with said middle roll.

8. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a sufficiently higher surface speed than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a positively driven middle roll and two additional rolls at opposite sides of it frictionally driven therefrom, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then a wrap of at least 180 degrees around said middle roll so that it provides two bites through which the strand runs, an apron running over the other of said additional rolls and nipped between said additional roll and said middle roll and conveying the strand being drafted to a point adjacent to the bite of said front rolls, and a spring weighting mechanism forcing the rear set of three rolls together.

9. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a sufficiently higher surface speed than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a middle roll and two additional rolls at opposite sides of it, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, an apron running over the other of said additional rolls and conveying the strand being drafted to a point adjacent to the bite of said front rolls, and means supporting the central part of said apron in substantially the plane passing through the bites of the front rolls and the rear rolls which engage the apron, and a spring weighting mechanism forcing all three of the rear rolls together.

10. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a sufficiently higher surface speed than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a middle roll and two additional rolls at opposite sides of it, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, an apron running over the other of said additional rolls and conveying the strand being drafted to a point adjacent to the bite of said front rolls, additional means cooperating with said additional roll to support and guide said apron, whereby it underlies the strand of broken fibers until they reach the delivery end of the latter, and a trumpet through which the drafted strand passes from the apron to the bite of the front rolls.

11. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers from one set to the other, the front set of rolls running at a sufficiently higher surface speed than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a power driven roll and an idle guide roll directly below said power driven roll, an underlying and conveying apron running over said guide roll and pinched between it and said power driven roll whereby the apron is driven by the contact of the latter roll with the outer surface of the apron, additional means between the two sets of rolls for guiding and tensioning said apron, and means for weighting both sets of said rolls.

12. In a textile drafting mechanism, the combination of front and rear sets of rolls spaced apart to feed a composite strand of textile fibers

from one set to the other, the front set of rolls running at a sufficiently higher surface speed than that of the rear set to break the individual fibers and to draft the strand as so modified, said rear set of rolls comprising a power driven roll and two additional rolls at opposite sides of it, means for guiding said strand to said rear set of rolls in such a manner that it makes a partial wrap around one of said additional rolls and then around said middle roll so that it provides two bites through which the strand runs, an apron running around the other of said additional rolls and driven by said middle roll, and additional means cooperating with the latter of said additional rolls to support and guide said apron so that it conveys the strand being drafted to a point adjacent to the bite of said front rolls, the driving contact of said middle roll with said apron being exerted on the outer surface of said apron.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,883,384	Lohrke et al.	Oct. 18, 1932
2,067,062	Oswald	Jan. 5, 1937
2,074,556	Pilz	Mar. 23, 1937
2,139,016	Harris	Dec. 6, 1938
2,153,118	Harris	Apr. 4, 1939
2,221,023	Guenther	Nov. 12, 1940
2,315,936	Cobb	Apr. 6, 1943
2,322,711	Gwaltney et al.	June 22, 1943
2,419,320	Lohrke	Apr. 22, 1947
2,430,611	Gwaltney et al.	Nov. 11, 1947

FOREIGN PATENTS

Number	Country	Date
11,676	Great Britain	of 1847
254,567	Great Britain	July 8, 1926