

Sept. 21, 1954

J. R. ANDREWS, JR., ET AL

2,689,382

VERTICAL APRON DRAFTER

Filed March 19, 1949

5 Sheets-Sheet 1

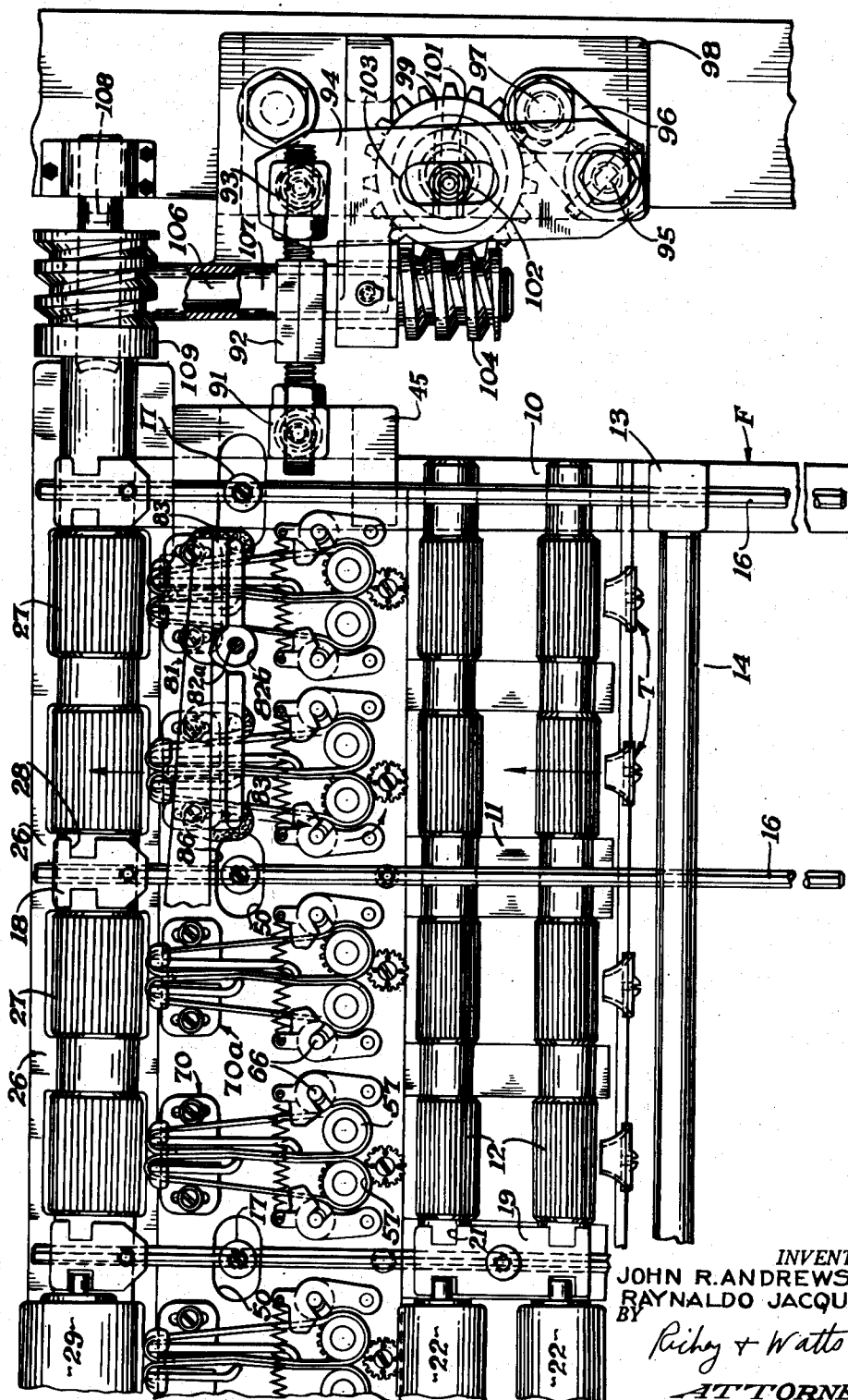


Fig. 1

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5 Sheets-Sheet 3

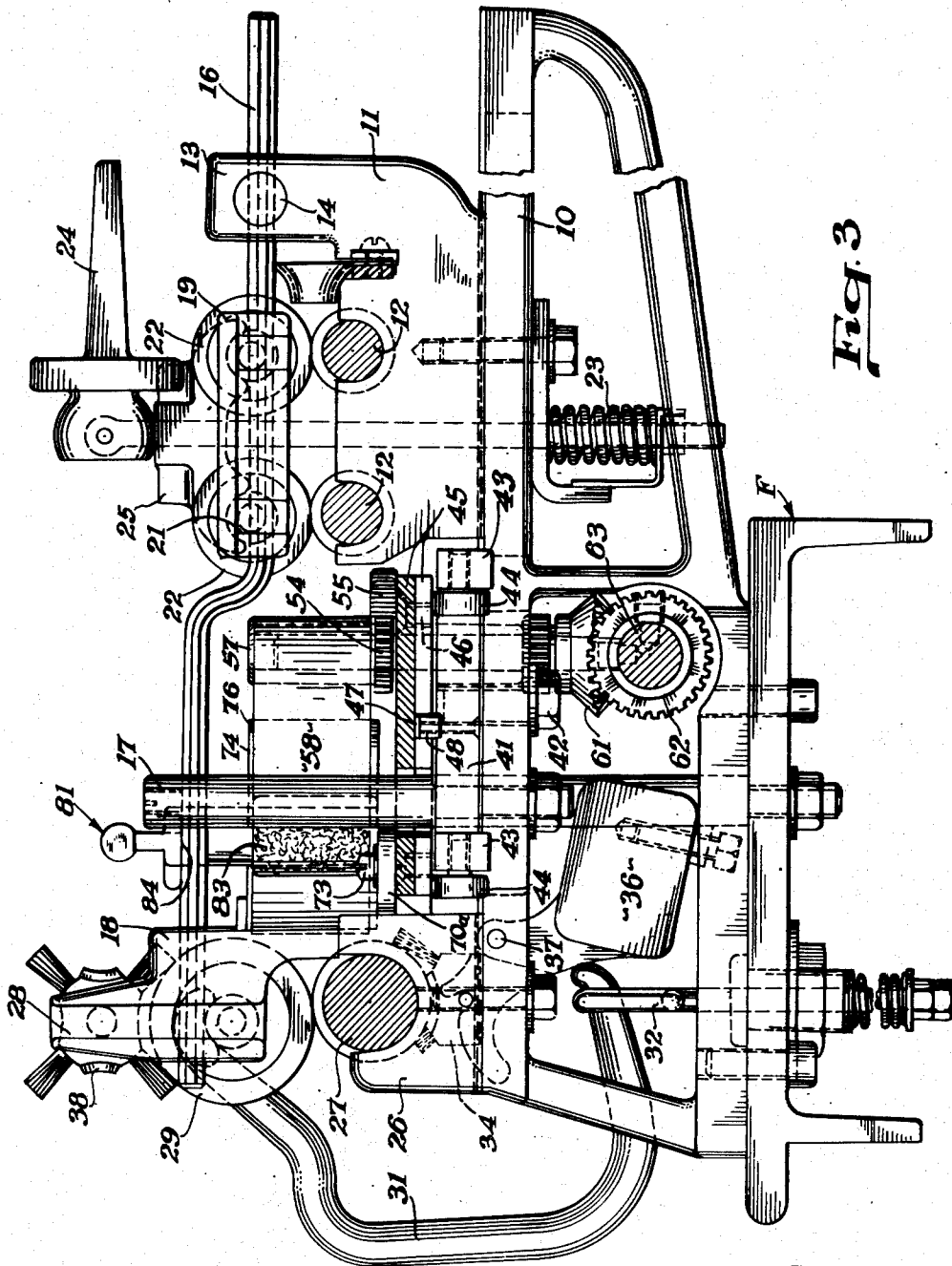


Fig. 3

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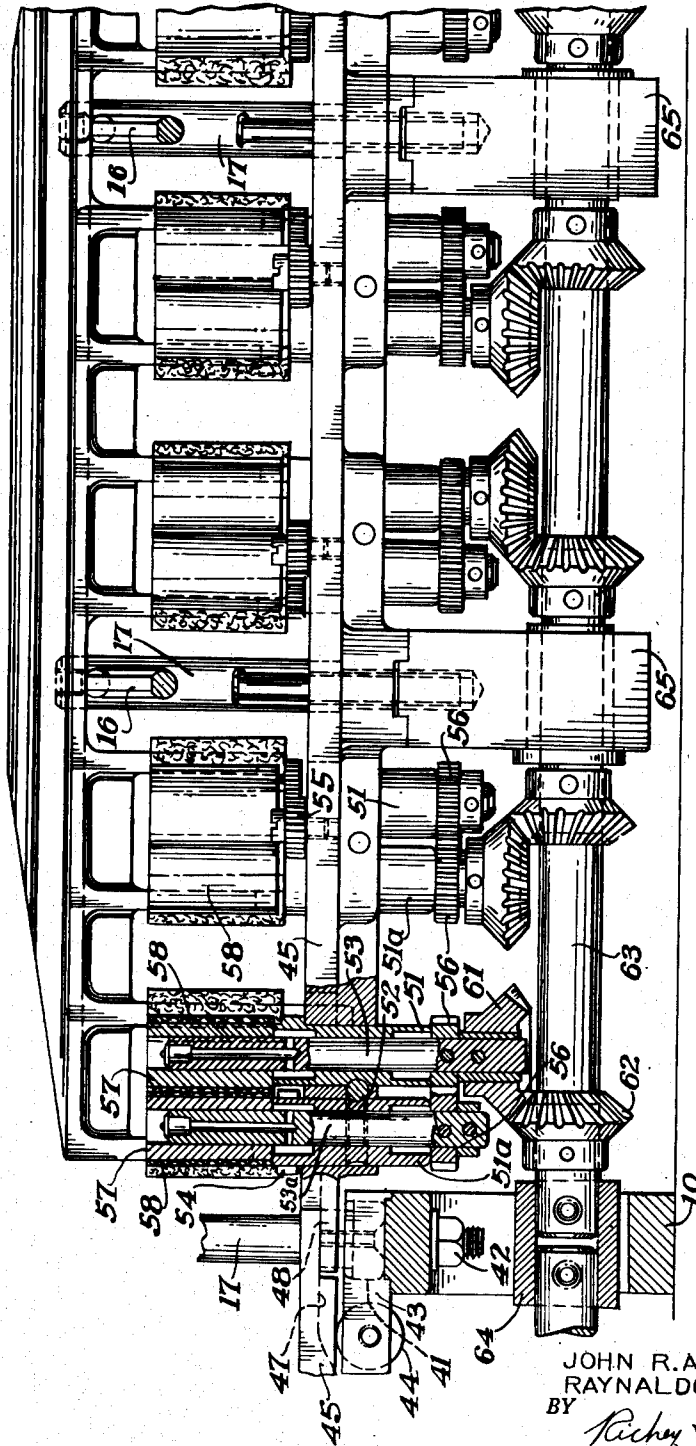


Fig. 4

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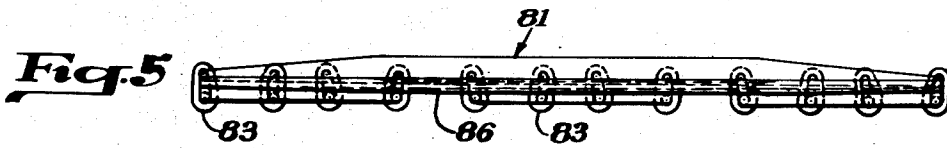
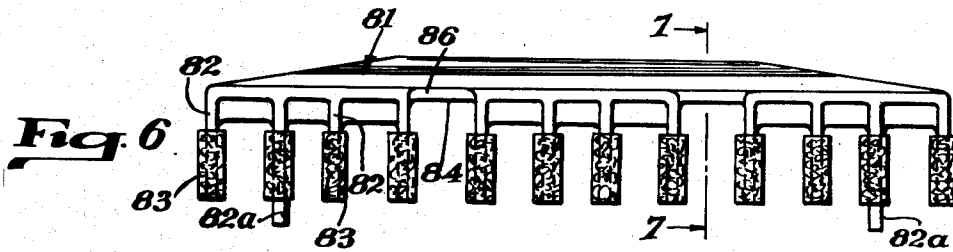
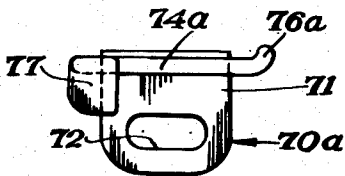
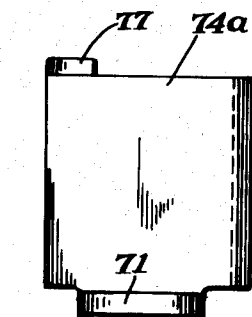
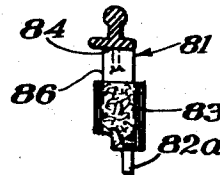
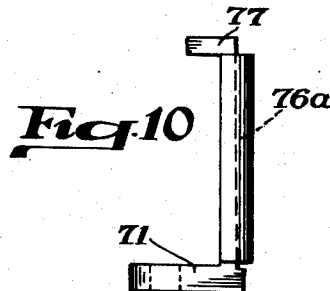
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UNITED STATES PATENT OFFICE

2,689,382

VERTICAL APRON DRAFTER

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16 Claims. (Cl. 19—131)

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This invention relates to apparatus for drafting or elongating strands of fibrous material in order to form yarn. More particularly, this invention relates to apparatus of the nature described wherein the strand or fiber supporting function during drafting is performed by endless belts or aprons.

It is a principal object of the invention to permit the employment of draft ratios higher than those usually attainable with prior devices while improving and compacting the strand in two planes in order to improve the distribution of the fibers and the uniformity of section of the strand. Briefly, this is accomplished by mounting the apron devices between parallel feed and drafting rolls and arranging the apron devices so that they function in a plane perpendicular to that of the rolls. With this arrangement the rolls compact the strand in one plane and the aprons in a plane perpendicular thereto which so improves the composition and distribution of the fibers in the strand that relatively high drafting ratios can be tolerated while maintaining evenness and avoiding excessive fly waste. Another advantage of this arrangement is that any fibers at the outside edges of the strand that tend to flare away from the body of the strand between the horizontal feed rolls and the vertical aprons are readily gripped by the apron and compacted laterally together. The strand then leaves the aprons compacted in a vertical plane and is then immediately compacted horizontally by the front drafting rolls. This compacting of the strand into a more or less small rectangular cross section at the nip of the drafting roll effectively prevents fibers separating from the strand at this point and allows the twist which is inserted in the drafted strand beyond the drafting rolls, to run back into the nip of the rolls, preventing lapping and greatly reducing fly waste, while improving the strength, uniformity and breakage of the drafted strand.

Another object of the invention resides in simplifying the service and replacement of the aprons and associated parts, facilitating adjustment of apron tension and spacing and providing for observation of the passage of fibers through the aprons and across the gap between the rolls and the aprons. This is accomplished by mounting the apron spindles and guides in cantilever fashion so that the outer ends thereof are unsupported and unincumbered by brackets and the like. Thus, the apron and associated parts are readily removed, replaced, and adjusted and all the parts are in full view during the process.

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Another object resides in distributing the wear on the rubber drafting rolls without danger of breaking the strand. This is accomplished by mounting the aprons on a slide that is reciprocated parallel to the rolls whereupon the aprons gently move the strand from side to side and distribute the wear on the rolls without danger of strand breakage.

Another object resides in facilitating the adjustment of spacing between opposed aprons, tension on the aprons, and the snubbing action thereof. In the preferred embodiment of the invention the adjustment of the spacing of the aprons at their entrance is accomplished by mounting one of each pair of spindles in an eccentric bushing. The adjustment of the spacing at the other end of the snubbing action is provided by a pair of guide members which include rearwardly extending fingers. The guide members are mounted for universal motion so that both the tension of the aprons and the disposition of the fingers against them may be varied whereby the tension and the snubbing action is readily adjusted.

The manner whereby the aforesaid objects and advantages may be attained will be understood from the following description of a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a plan view of one segment of the drafting apparatus;

Fig. 2 is an enlarged fragmentary view showing a pair of apron assemblies;

Fig. 3 is a side elevation of the apparatus;

Fig. 4 is a fragmentary end elevation thereof;

Figs. 5 to 7 are views of a preferred form of clearing comb; and,

Figs. 8 to 10 show a preferred form of belt guide and finger snubbing device.

As seen most clearly in Fig. 3, the frame F includes a base or support member which mounts a plurality of elongated bracket members 10 which act as a roll stand. At the entrance side of the apertures trunnion blocks 11 are provided for the ratch and back feed rolls 12 which rest in suitable recesses in the usual manner, it being understood that mounting details of the various rolls form no part of the invention and may follow conventional practice known to those skilled in the art. Each bearing member 11 may include an upward extension 13 which supports a crossbar 14 which bar positions a plurality of longitudinal guide bars 16. These guide bars may also be supported by a plurality of posts 17 bolted to the frame structure, and at their other ends the

guide bars 16 are received in a plurality of brackets 18 keyed by the framework. At the entrance side of the machine roll pressure bearings 19 are mounted upon bars 16 and in the usual manner include grooves 21 for locating the upper rubber-covered rolls 22. It is desirable to provide spring pressure between the rolls, which may be accomplished by a spring-pressed rod 23 pivoted to a cam member 24 that presses downwardly upon a back roll pressure bar 25.

The drafting roll structure includes a front roll bar 26 fixed to the framework with suitable fasteners which may mount in the usual manner lower metal drafting rolls 27. Grooves 28 in member 18 receive the trunnions of the upper rubber-covered drafting rolls 29. The pressure between the drafting rolls is applied by means of a saddle 31 which hooks over the bearings between the rolls and is spring-pressed by saddle hook members 32, it being understood that the exact construction of the roll and pressure assembly is not critical to the present invention.

In accordance with preferred practice, brush cleaners are provided for the drafting rolls. The cleaners 34 for the lower rolls are urged upwardly by counterweight 36, the cleaner assembly being pivoted to the assembly as at 37. The cleaners 38 for the upper rolls act by force of gravity and are guided by pins extending into slots 28 formed in members 18.

In accordance with the invention, the aprons are mounted on a slide member that is reciprocated parallel to the axes of the rolls, to distribute the wear on the rolls caused by passage of the yarn therethrough. Although the exact constructional details of this portion of the apparatus are not critical to the invention, in the preferred form the apparatus includes (as best seen in Figs. 3 and 4) bracket members 41 bolted to the cross rails 10 as by bolts 42 and including the laterally extending ears 43 which carry rollers 44. The apron support means comprises a slide made up of elongated members 45, the ends of which are rabbeted and bolted together by means of screws 46. In order to guide the slide, suitable means such as a slot 47 is milled therein and a key 48 fastened to member 41 may be provided. The slide is apertured as at 50 (Fig. 1) to clear posts 17 as the slide reciprocates.

The mounting of the aprons and drive spindles is best seen in Fig. 4 wherein one assembly is sectioned. Extending through apertures in the slide 45 is a pair of bushings 51 and 51a which may be pinned in place by means of the pin 52. Rotatable in the bushings are the spindles which include shafts 53 and 53a respectively. Shaft 53a is eccentric in its bushing and the groove in the bushing receiving pin 52 is a circumferential groove. Thus, when bushing 51a is rotated as by means of a gear 54 formed thereon, spindle 53a is moved toward and away from the other spindle. In order to facilitate adjustment of the eccentric bushing which provides readily operative and precise control of apron spacing at the entrance end, a small pinion 55 is meshed with the bushing gear 54 and retained by a clamp screw. When the screw is loosened, suitable wrench means may be employed to rotate pinion 55 and adjust the apron spacing. The shafts 53 and 53a are geared together for reverse rotation by means of pinions 56 pinned to the shafts. The spindles include drums 57 splined or pressed thereon which drive the endless apron 58. The spindles are rotated by means of bevel gear 61 pinned to spindle 53 and meshing with another bevel gear 62 pinned to the

main apron drive shaft 63. Sections may be assembled by coupling the shafts as at 64 and intermediate sections of the shaft are guided by brackets 65 depending from the slide 45.

Tensioned idler means are provided to maintain a resilient tension on the aprons as best seen in Fig. 2. These include idlers 66 mounted in pivoted brackets 67 which are urged together to tension the apron belts by means of spring 68. Novel guide means and snubbing means 70 and 70a are provided for the exit end of the aprons. The right-hand member seen in Fig. 2 includes a mounting flange 71 slotted as at 72 to receive a clamping screw 73 that fits loosely in the slot. Extending upwardly and rearwardly from the base 71 is a snubbing arm or finger 74 having a curved nose 76 that engages the inside of the forwardly-traveling reach of the associated apron. An upper flange 77 is formed on the guide to prevent the belt from climbing up off the guide. The other guide member is similar to that just described except that it is a mirror image thereof and the finger 74a is shorter so that its nose 76a engages the belt forwardly of the nose 76. The slide may be used as a pivot point for the members 70 and 70a during adjustment of the snubbing action as well as adjustment of the bolt tension when screws 73 are loosened. Proper adjustment of the arms 74 and 74a is readily made to provide the desired soft snubbing action on the strands or fibers as they pass between the aprons to provide for high drafting ratios without slippage of the strands or parting thereof.

It is a feature of the invention that readily replaceable, effective apron clearer means are provided. In the preferred form, the clearer includes a plurality of comb-like members 81 having depending teeth or tines 82 over which are slipped felt cleaner pads 83. It will be understood that the term "felt," as employed in the specification and claims, includes any soft friction material suitable to provide the proper clearing action. At spaced intervals the clearer is notched vertically as at 84 to permit it to ride upon the bars 16 as best seen in Fig. 3, and the clearer is relieved in a horizontal plane as at 86 to clear the post 17 during deciprocation of the slide as best seen in Fig. 1.

The clearer bars are provided with a floating mounting which is a feature of the invention. They are located generally by means of extensions 82a of certain of the teeth or tines which extend into apertures 82b formed in the slide as shown in Fig. 1 and generally locate the combs. It will be noted in Fig. 1 that the outer or return reaches of the aprons are increasingly spaced in their direction of travel. Due to the floating action of the clearer bars, the felt pads are accordingly carried rearwardly by frictional force between them and the aprons, which simultaneously wedges them against the aprons and results in an extremely effective clearing action.

Suitable means are provided for reciprocating the aprons between the rolls in order to distribute the wear over the roll surfaces. As seen in Fig. 1, an ear 91 is attached to one end of the slide 45 and has extending therefrom an adjustable turnbuckle link 92, the other end of which is attached to a block 93 pivotally mounted on a slide shifting lever 94. Lever 94 is pivoted at its other end 95 to a compensating link 96 pivoted in turn to the frame structure as at 97. Link 96 permits block 93 on lever 94 to partake of straight line motion. In order to oscillate lever 94, gear member 99 is pivoted to the frame structure as at

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98 and has formed therein a transverse slot 101. Adjustably mounted and clamped at any place along the slot is a roller 102 which rides in a notch 103 formed in lever 94. Gear 99 is rotated by worm 104 mounted on shaft 106 supported in a housing structure 107. A worm wheel 108 is keyed to the other end of shaft 106 and is disposed beneath worm 109 keyed to the lower drafting roll shaft. When worm 109 is rotated it will be readily seen that the slide and aprons are reciprocated between the rolls.

The means for turning the ratch and feed rolls, the apron spindles, and the drafting rolls may comprise suitable gearing which forms no part of the invention and is well known in the art. Since shaft 63 which drives the aprons is mounted on and reciprocates with the slide 45 the gearing that turns shaft 63 must permit reciprocation thereof. Any mechanism known in the machine art may be provided for this purpose. For example, the driven end of shaft 63 may be square or splined for sliding in its driving gear, a flexible shaft may be used, or any sliding connection selected from the large number of such joints known to all mechanics. The exact drive mechanism forms no part of the present invention. Preferably the gearing is such that the aprons have a higher linear speed than that of rolls 12, and the drafting rolls have a considerably higher speed than that of the aprons. Due to the two-plane compacting action effected by the apparatus, the drafting rolls may be geared to provide relatively high drafting ratios, ratios of 10-1 being readily attainable, and with certain yarns ratios of 14-1 being possible.

It can be seen that not only may the clearer bars be quickly lifted clear for inspection and replacement of the parts, but since the apron supports are mounted in cantilever fashion vertically between the rolls, passage of the yarn may be observed. Also, with this construction adjustment of the devices may be readily performed, and the apron belts may be readily changed. Since the aprons are reciprocated between the rolls and since they provide a soft holding or supporting action on the yarn, the reciprocation does not tend to part or tear the yarn as wear is distributed over the rolls. The neutral position of the slide may be readily adjusted by means of turnbuckle 92 and trumpets T are slidably mounted on bars so that they may be centered about the neutral position, whereby substantially the entire roll surfaces may be utilized before the roll becomes too worn for service. Thus, the various elements described all cooperate to provide and permit higher drafting ratios, the yarn is of more uniform cross-sectional density, and replacement and adjustment of the parts is simple, rapid and easily and precisely accomplished.

Although a preferred embodiment of the invention has been described in detail, it will be understood that the scope of the invention is not limited to the aforesaid embodiment, but is determined by the appended claims.

What is claimed is:

1. Apparatus for drafting strands of fiber comprising feed rolls and drafting rolls, said rolls having spaced parallel axes disposed in a common plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around said pairs of drive and guide means to support the strands of

fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means for supporting the apron drive spindle and guide means, and means for moving the said support means in the direction parallel to the axes of the rolls.

2. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means comprising an elongated plate for supporting the apron drive spindle and guide means, bearing means for permitting the support plate to move transversely across the frame in the direction of the rolls, and drive means supported by the frame and connected to the plate for reciprocating the aprons along the length of the rolls.

3. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, transversely movable, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, clearing means for said belts, said clearing means comprising a comb-like member having a back and depending tines, clearing pads on said tines and arranged to engage the outer return sides of said belts, said clearing means having a floating mounting whereby friction between the belts and clearing pads positions said clearing means, and support means for the said clearing means comprising a member fixed to said strand supporting means, the comb member resting thereon and above the aprons to permit the comb member to move transversely with the apron belts.

4. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, clearing means for said belts, said clearing means comprising a comb-like member having a back and depending tines, clearing pads on said tines and arranged to engage the outer return sides of said belts, said clearing means having a floating mounting comprising fore and aft frame members extending between the rolls and supporting the clearing member, the clearing member ex-

tending transversely across the frame and sliding upon the fore and aft members whereby friction between the belts and clearing pads positions said clearing means

5. Apparatus for drafting strands of fiber comprising feed rolls and drafting rolls, said rolls having spaced parallel axes disposed in a common plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted perpendicular to the plane of said rolls, an eccentric bushing surrounding one of said spindles, means to rotate said bushing to move said one spindle toward and away from the other spindle, and endless apron belts passing around said pairs of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls.

6. An apron assembly for supporting strands of fiber during a drafting operation comprising a support, a pair of drive spindles, means rotatably mounting said spindles in said support, the mounting means for one of said spindles including an eccentric bushing surrounding said one spindle and rotatable in said support, means for turning said eccentric bushing whereby said one spindle is moved toward and away from the other spindle, apron guide means for each spindle spaced therefrom along the line of strand travel, aprons around said spindles and guide means, and means to rotate said spindles.

7. An apron assembly for supporting strands of fiber during a drafting operation comprising a support, a pair of drive spindles rotatably mounted in said support, an apron guide member spaced forwardly from each spindle in the direction of fiber travel, a belt snubbing finger extending rearwardly from each guide member with one of said fingers being longer than the other, an endless belt around said spindle, guide member, and finger, each apron guide member including a base mounting flange, a slot in said flange, and screw means extending through said slot to mount said guide member for limited universal motion relative to said spindles.

8. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, and clearing means for said belts, said clearing means comprising a comb-like member having a back and depending tines, clearing pads on said tines and arranged to engage the outer return reaches of pairs of said belts, said spindles and guide means being arranged so that the spacing between pairs of return belt reaches increases in a direction opposite to the direction of feed, the tines of said clearing means being spaced on either side of said belts, and said clearing means having a floating mounting whereby friction between the belts and clearing pads wedges said pads against the belts.

9. Apparatus for drafting strands of fiber

comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, guide bars mounted above said supporting means and extending generally parallel to the direction of strand travel, and belt clearing means comprising a comb-like member having a back and spaced, depending felt-covered tines, said back resting on said bars with said felt-covered tines engaging the return reaches of said belts, the said bars supporting the clearing member vertically above the apron belts and the said clearing member being adapted to slide across the bars and to move with the apron belts.

10. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, a slide mounted for motion parallel to said rolls, means to traverse said slide, a plurality of opposed strand supporting means on said slide between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, spaced apertures in said slide between said strand supporting means, posts extending upwardly from said frame means and through said slide apertures there being clearance to permit slide traverse, bars supported by said posts, apron clearing means comprising a comb-like member having a back portion slidably supported on said bars and depending felt-covered tines in engagement with said belts, said apron drive spindle and guide means extending upwardly from said frame means in cantilever fashion whereby removal of said clearing means, replacement of said belts, and adjustments of said drive and guide means is facilitated.

11. For use with an apron-type strand drafting apparatus, an apron clearing unit comprising a comb-like member having a back and spaced depending tines, and felt clearing pads extending along the length of said tines and adapted to bear against the surface of an apron belt moving between and parallel to the tines.

12. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls on said frame means, said rolls having spaced parallel axes disposed in a common plane, slide means mounted on said frame means for reciprocatory motion parallel to said roll axes, apron-type strand supporting means mounted on said slide means between said feed and drafting rolls, and means to reciprocate said slide means, said apron-type strand-supporting means running about axes perpendicular to that of said rolls at all times.

13. Apparatus for drafting strands of fiber comprising frame means, including fore and aft

and transverse members feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means mounted on said frame means and supporting said apron spindle and guide means and movable in the plane of the drafting rolls, means for reciprocating said support means relative to said frame and said draft rolls, and a clearer bar for the said apron belts comprising a transverse member having depending tines and clearing pads mounted on the tines, the transverse member of the clearer bar sliding upon the fore and aft frame members for transverse motion with the reciprocation of the support means.

14. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means between said feed and drafting rolls, said strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means mounted on said frame means and supporting said apron spindle and guide means and movable in the plane of the drafting rolls, and means for reciprocating said support means relative to said frame and said drafting rolls.

15. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by the said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands

of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means comprising an elongated plate for supporting the apron drive spindle and guide means upon the frame, bearing means for permitting the support plate to move transversely across the frame in the direction of the rolls, means for reciprocating said support plate relative to said frame, shafts for the apron drive spindles extending through the support plate, and means mounted on the underside of the support plate and reciprocable therewith for driving the spindle shafts.

16. Apparatus for drafting strands of fiber comprising frame means, feed rolls and drafting rolls supported by the said frame means, said rolls having spaced parallel axes disposed in a common horizontal plane, opposed strand supporting means comprising opposed pairs of apron drive spindle and apron guide means mounted generally perpendicular to the plane of said rolls, endless apron belts passing around each pair of drive and guide means to support the strands of fiber and compact them in a direction perpendicular to the direction of compacting effected by said rolls, means comprising an elongated plate for supporting the apron drive spindle and guide means upon the frame, bearing means for permitting the support plate to move transversely across the frame in the direction of the rolls, means for reciprocating said support plate relative to said frame, shafts for the apron drive spindles extending through the support plate, means mounted on the underside of the support plate and reciprocable therewith for driving the spindle shafts, one of each pair of said spindle shafts extending through an eccentric bushing mounted upon said plate, and means for rotating said bushing to adjust the lateral spacing of the pairs of spindle shafts.

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