Aug. 28, 1956 A. A. SPISAK ET AL 2,760,237

VACUUM DRAFT CONTROL SYSTEM FOR VARIABLE SPINNING

Filed March 9, 1953 3 Sheets-Sheet 1

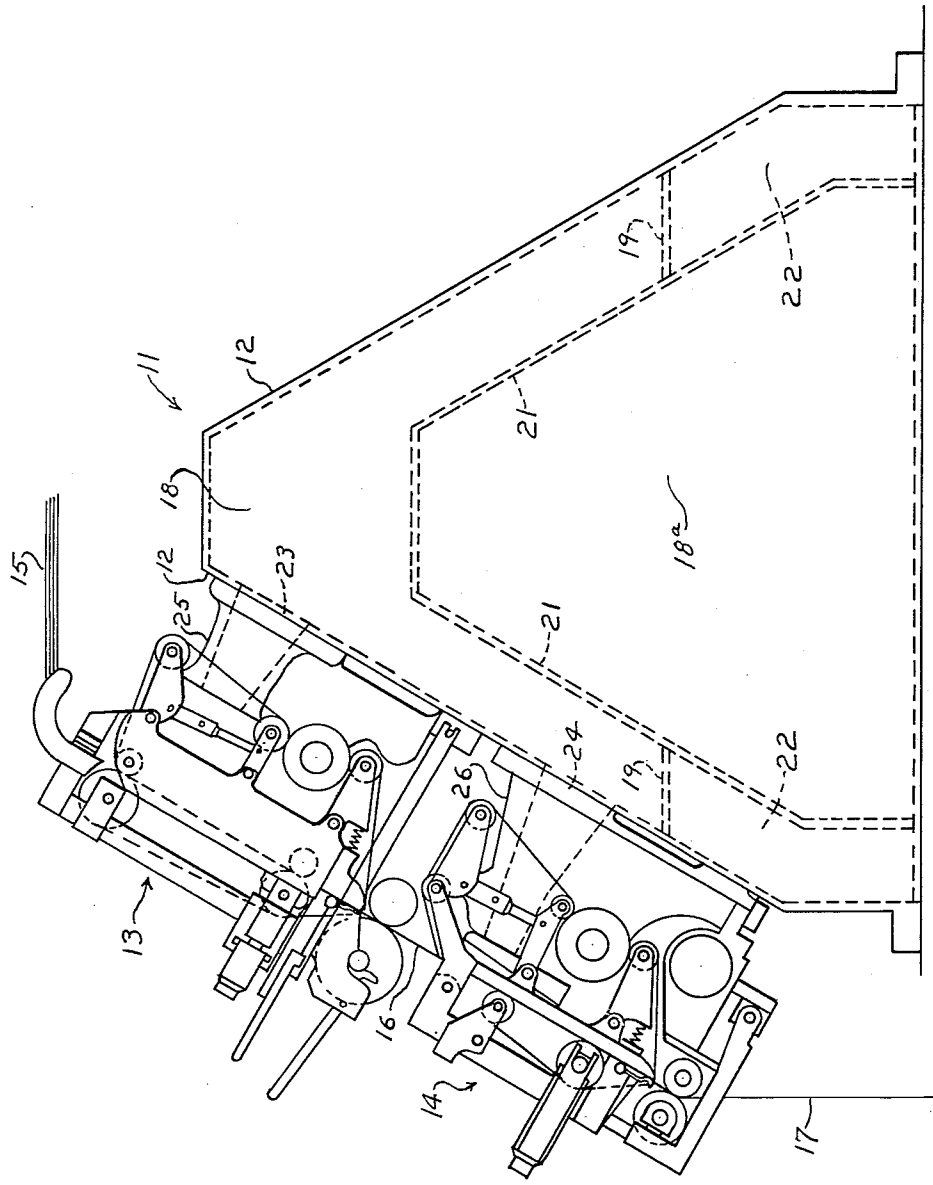


FIG. 1

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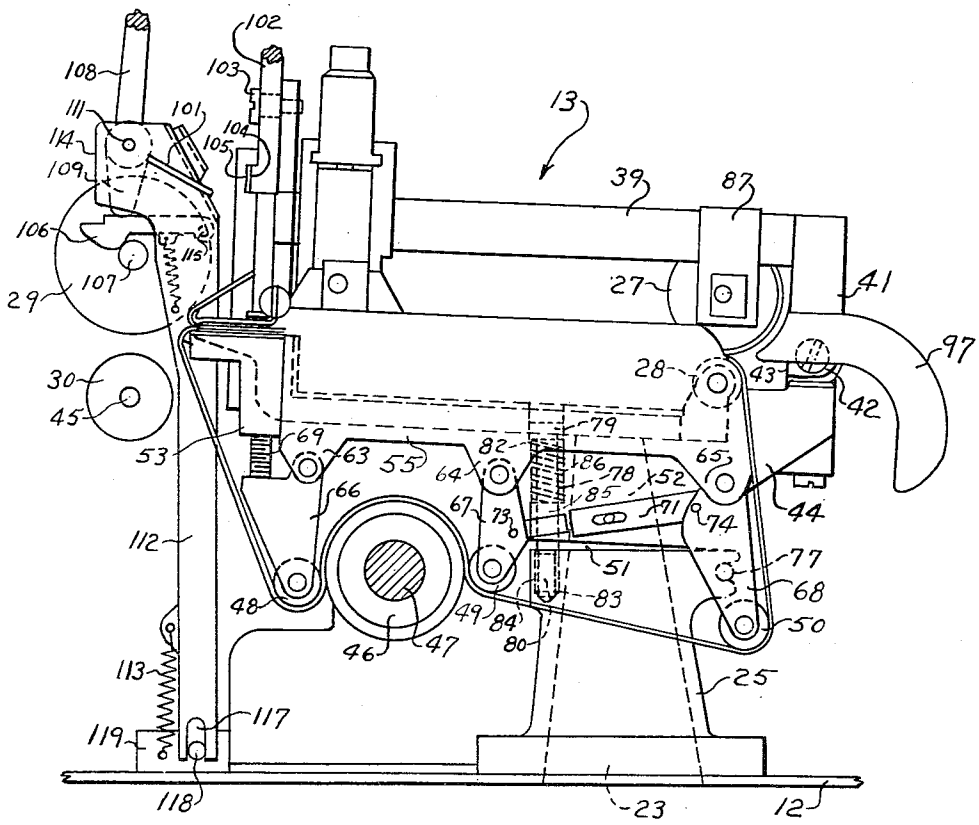


FIG. 2

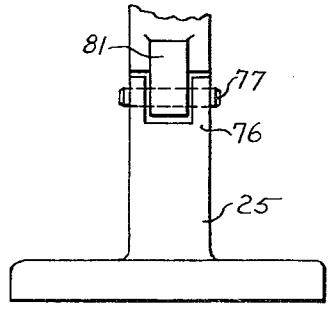


FIG. 6

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VACUUM DRAFT CONTROL SYSTEM FOR VARIABLE SPINNING

Filed March 9, 1953 3 Sheets-Sheet 3

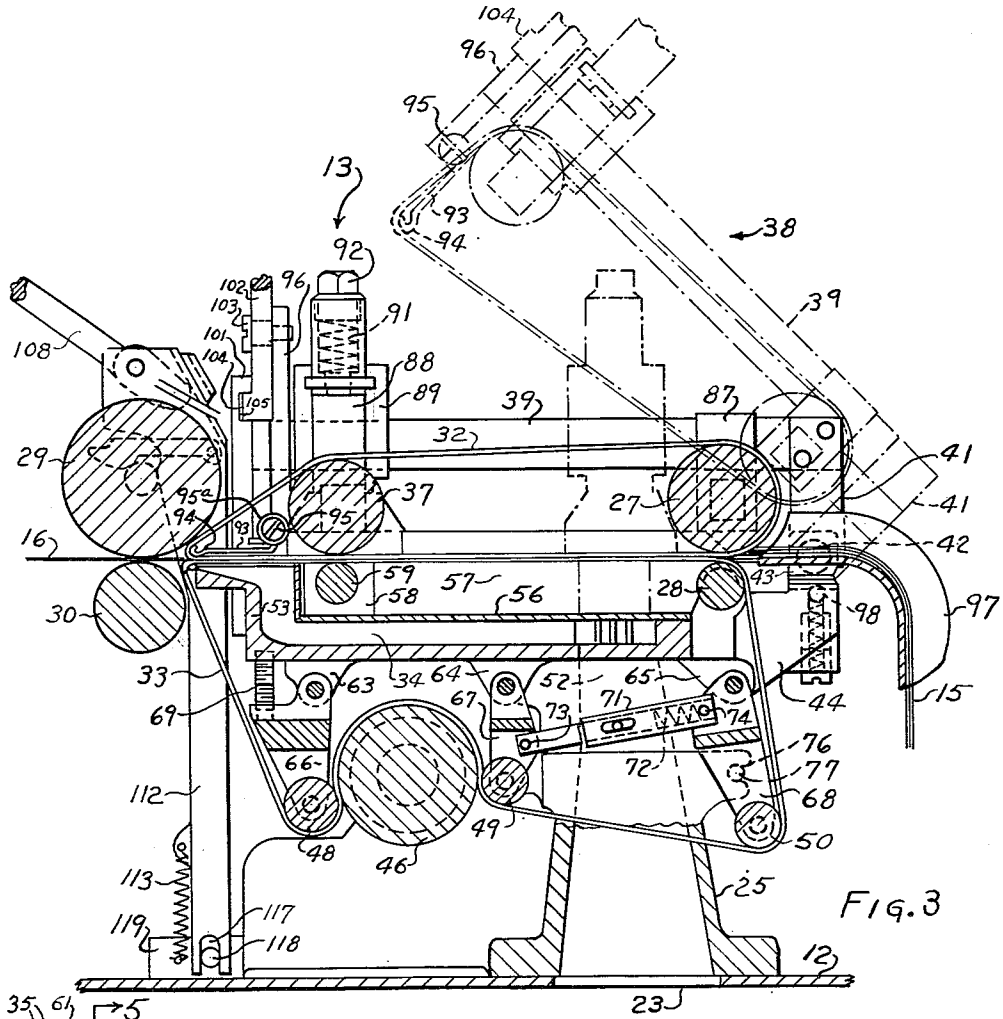


FIG. 3

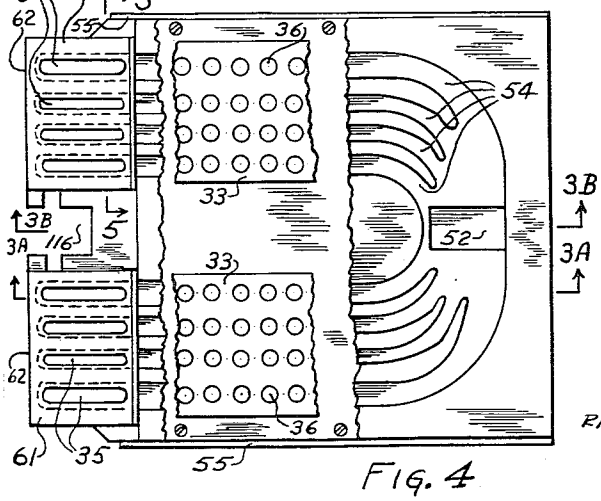


FIG. 4

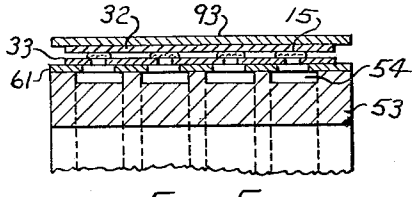


FIG. 5

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2,760,237

VACUUM DRAFT CONTROL SYSTEM FOR VARIABLE SPINNING

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Application March 9, 1953, Serial No. 341,252

4 Claims. (Cl. 19—131)

The present invention relates to fiber drafting and concerns particularly the drafting of strands of fibers preparatory to spinning and other operations for preparation of textile yarns and threads. The invention may be practiced with any type of fiber strands, such as tops, slivers, rovings, slubbings, and the like in bundles or aggregates, all of which for convenience are referred to as fiber strands or slivers.

An object of the invention is to achieve improved control of the fibers in the strand during drafting and to achieve effective control of various kinds of fibers natural or synthetic, or blends thereof in the case of natural fibers whether of animal or vegetable source, and in the case of synthetic fibers whether smooth or crimped. Moreover, it is an object to accomplish such fiber control for various fiber lengths as well as for strands composed of a mixture of fibers of different lengths.

A further object of the invention is to provide an improved draft control unit, readily adjustable for different fiber lengths, and easily opened and closed for insertion of fiber strands.

Still another object of the invention is to obtain a high degree of reduction in each drafting stage and to produce very fine yarns with relatively few drafting stages.

It is also an object to avoid difficulty with breaking of fibers in the strand and to produce drawn slivers of a high degree of uniformity of weight and thickness.

Other and further objects, features and advantages will become apparent as the description proceeds.

In carrying out the invention in accordance with a preferred form thereof, a plurality of drafting units are mounted upon sloping sides of a suction header for supplying a large number of spinning heads simultaneously. Two drafting zones are provided for each sliver and improved draft control is provided in each. In the first drafting zone a plurality of slivers are drafted simultaneously to be combined and further drafted as a single strand in the second zone. In the first zone a multiple-slot trumpet guide is provided for supplying the slivers to the ratch. Ratch rolls and draft rolls are provided. For accomplishing effective draft control, upper and lower belts or aprons are provided for contacting and enveloping the strands. Each apron passes around one of the ratch rolls and is guided directly into the nip of the draft rolls. Moreover, an apron nip pressure roll is provided for increasing control over the fibers of the strands. An adjustable mounting is provided for the pressure roll to accommodate in the same apparatus different strands which may differ in average maximum lengths of fiber.

For retaining full fiber control into the very nip of the draft rolls, the lower apron is so constructed as to be air pervious and a suction box is provided for applying vacuum to the under surface of the portion of the lower apron at the exit end of the drafting ratch.

In order to permit the draft control apparatus to be opened and closed readily when slivers are to be inserted,

or a change in set-up is to be made or the like, a pivotally-mounted frame-work is provided which supports the upper ratch roll, apron nip pressure roll, apron nip guide, and upper apron. This frame-work, and likewise the upper draft rolls, are provided with quick-release latches.

A better understanding of the invention will be provided by the following detailed description considered in conjunction with the accompanying drawings in which:

Fig. 1 is an end elevation of vacuum draft control apparatus for variable spinning;

Fig. 2 is a view of the first zone draft control unit corresponding to Fig. 1 but showing the unit tilted to a horizontal base;

Fig. 3 is a view corresponding to Fig. 2 but partially in section represented as cut by a vertical broken plane, showing also in broken lines the upper apron and mounting swung up into open position, and showing in broken lines an alternative extreme portion of the pressure-roll mounting; the cutting planes for sectional representation are indicated at 3A and 3B in Fig. 4, the plane 3B being taken through the hollow pedestal;

Fig. 4 is a plan view of the suction box with the plate along which lower apron moves, partially broken away to expose air channels to slots for separate slivers and fragmentarily showing lower, air-pervious aprons;

Fig. 5 is a cross-section cut by a plane 5—5 indicated in Fig. 4, and

Fig. 6 is a fragmentary end view showing a pivoting mounting for the unit of Fig. 2.

Like reference characters are utilized throughout the drawings to designate like parts.

In the embodiment of the invention illustrated there is a suction header 11 which may extend the length of the spinning room, having sloping sides 12 for carrying a plurality of drafting units 13 and 14 mounted side by side. Since in the view of Fig. 1 the drafting line is seen from one end, only one first-zone drafting unit 13, and one second zone drafting unit 14 are visible. Drafting units are shown on only one side to simplify the drawing, but it will be understood they may be mounted on both sides if desired. As shown, the first-zone drafting unit 13 is arranged to receive a plurality of slivers 15 and to reduce these to much lighter strands 16. The second-zone unit 14 is arranged to receive the strands 16, combine them into a single strand and reduce the combined strand further to a fine yarn 17, suitable for supplying to one of a conventional long bank of spinning heads (not shown).

The suction header 11 is fabricated of sheet metal or the like to form a suction duct 18, roughly of inverted V-shape in cross-section. Horizontal sheets 19, joined to the outer walls 12 and inner walls 21 serve to form an enclosed space constituting the suction duct 18, and to isolate this space from chambers 22. A suitable suction fan or pump (not shown) is connected to the suction duct 18*a* at the far end with respect to the view presented by Fig. 1, in order that all of the drafting units of the bank may be supplied with suction. Suitable means are provided for avoiding a pressure drop along the length of the duct as described in the copending application of Andrew A. Spisak Serial No. 337,545, filed February 18, 1953. Openings 23 and 24 are provided in the side walls 12 of the suction header to cooperate with hollow pedestals 25 and 26 for supporting the drafting units 13 and 14, respectively, and through which suction connections to drafting control elements are made.

The first-zone drafting unit 13 is illustrated to a larger scale and more in detail in Figs. 2 and 3. To effect drafting of the strand, the unit 13 includes upper and lower feed rolls 27 and 28, respectively, and upper and lower draft rolls 29 and 30, respectively. To control the fibers

during drafting, a combination of three features is employed, apron control, vacuum control and roll pressure control. To this end upper and lower aprons or belts **32** and **33** are provided. A suction box **34** is provided having air-inlet slots **35**, shown in Fig. 4, under the portion of the lower apron **33** near the draft roll nip; and the lower apron **33** is made air-pervious, preferably with rows of perforations **36** aligned with the slots **35**. In addition an apron nip pressure roll **37** is provided, which is arranged for adjustment of its position along the sliver **15**. As indicated by the fragmentary view of Fig. 4, a twin unit construction may be employed with duplicate sets of rolls, aprons and the like mounted on either side of a common pedestal **25**.

To facilitate threading sliver between the aprons and the draft rolls when starting the apparatus or for other reasons, the draft control units are made openable. This is accomplished by mounting the upper apron and rolls upon a pivoted framework **38**, comprising a longitudinal bar **39**, a vertical post **41**, and a pivot bolt **42**, secured in a clevis **43** carried by a bracket **44**, forming a part of the mounting assembly for the lower apron and the suction box. The lifted or open position is indicated by dashed lines in Fig. 3, the full lines showing the parts in closed or operating position.

For further improvement in operating efficiency in connection with making adjustments and replacing the lower apron when necessary, the lower apron and suction box mounting assembly is also made movable, being removably secured to the hollow pedestal **25**.

The lower draft roll **30** is secured to a drive shaft **45** which is common to all the drafting units of the bank for directly driving the lower draft roll. The upper drive roll **29**, of greater diameter is indirectly driven by the friction transmitted from the lower roll **30** through the sliver **16**.

The lower apron **33** is provided with a driving roll **46** secured to a drive shaft **47** which is common to all the apron drive rolls of the bank. Idler rolls **48**, **49** and **50** are provided to keep the belt **33** taut and give the drive roll **46** enough contact with the belt **33**. The lower feed roll **28** is driven through the belt **33** by the apron drive roll **46**. All other rolls are individually driven as a result of force transmitted frictionally from one of the drive rolls through the aprons or the slivers or both.

The lower assembly of the draft control unit comprises the hollow pedestal **25** and the suction box **34**. The suction box **34** has a depending throat portion **52**, adapted to fit against the upper end of the pedestal **25** and form a connection with the interior thereof, the suction box **34** being removably secured to the pedestal **25**. The suction box **34** comprises a casting **53** with a plurality of ducts **54** formed therein leading to the slots **35** and communicating with the throat portion **52**. Side plates **55** are secured to the casting **53** on either side thereof as shown in Fig. 2. The casting **34** is recessed to receive a sheet metal member **56** forming a well **57** adapted to receive adjustably positioned journal boxes **58** for mounting a lower pressure roll **59**. At the exit end, slotted plates **61** are mounted on the casting **53** to provide a smooth surface along which the apron **33** may slide. The slots **35** are formed in the plates **61**. The forward edges **62** of the plates **61** are formed into lips serving as front guides for lower aprons **33**.

Ears **63**, **64** and **65** are formed in the side plates **55** for pivotally supporting arms **66**, **67** and **68**, carrying the idler rolls **48**, **49** and **50** respectively. An adjusting screw **69** is provided for causing the arms **66** to hold the roll **48** and the lower apron **33** in close proximity to the apron drive roll **46**. A telescoping strut member **71** is also provided, containing a compression spring **72** for resiliently extending the member. The strut **71** is pivoted at the ends by means of pivot pins **73** and **74** to the arms **67** and **68** for resiliently holding these arms apart to maintain the lower belt **33** taut and press the roll **49**

and the apron **33** around and against the drive roll **46**. As shown, the pivot pin **73** is located at a greater distance from the supporting pivot of the arm **67** than the pivot pin **74** from the support of the arm **68**. Consequently, the spring strut **71** exerts the greater leverage upon the arm **67**.

Means are provided for relieving the suction and the drive to the lower apron by pivoting the suction box assembly **34** in the event of fibers wrapping around the draft roll **30**. To this end a projecting notch **76** is formed on the pedestal **25**, and a pivot pin **77** is fixed on an arm **81** (shown in Fig. 6) depending from the casting **53**, forming a part of the suction box assembly **34**, for pivotally supporting the draft unit in the notch **76**.

For yieldably securing the suction box assembly **34** to the hollow pedestal **25**, a machine screw **78** is provided having a head **79** and a threaded tip **80** as shown in Fig. 2. A counterbored opening **82** in the cover wall of the casting **53** is provided to receive the head **79** and a tapped hole **83** is provided in a nose portion **84** of the hollow pedestal **25**. An abutment **85** is provided at the front of the throat portion **52** of the suction box **34**, for providing a bearing surface for a compression spring **86** surrounding the screw **78** and fitting under its head **79** whereby the spring **86** normally urges the suction box assembly **34** and throat portion **52** downwardly to close the joint **51** with the hollow pedestal **25** for maintaining suction.

If there should be an unusual uneveness of the fibers or for other reasons a great mass or bunch of fibers reaches the draft rolls **29** and **30** pressure is produced which is great enough to lift the suction box assembly **34** against the force of the springs **86** and **113**. The suction box assembly **34** and the holddown subassembly for the upper draft roll **29** including the member **112** are interconnected so that bodily movement of the holddown subassembly away from the suction header wall **12** is imparted to the suction box assembly **34**. Thereupon the assembly pivots around the pin **77** from the position shown in full lines in Fig. 3 to that shown in Fig. 2, separating the structure from the hollow pedestal **25** so as to form an opening **51** relieving the suction. As the assembly rises, pivoting around the pin **77**, members **66** and **67** carrying the idler rollers **48** and **49** also rise loosening the apron **33**, discontinuing the effect of the drive roll **46** thereon and thus relieving the lower apron drive. The assembly including the machine screw **78** and spring **86**, thus provides for a small angle of movement of the drafting unit around the pivot pin **77**.

The pivoted framework **38** for the upper apron and rolls carries bearing brackets **87** in which the upper ratch roll **27** is mounted, and bearing brackets **88** in which the pressure roll **37** is mounted. The bearing brackets **88** are secured to a carriage **89** which is adjustably secured to the longitudinal bars **39**. As indicated in Fig. 3 the carriage **89** is slidable along the bars **39** and may be secured in any position thereon from that shown in full lines to that shown in dashed lines in Fig. 3.

A spring mounting is utilized, including compression springs **91** for yieldably pressing the roll **37** against the portion of the upper apron **32** contacting the sliver **15**. For adjusting spring pressure, adjusting screws **92** may be provided.

For the purpose of guiding the upper apron **32** into the nip of the draft rolls **29** and **30** a pivoted sheet metal guide member **93** is provided having a curved lip **94** around which the apron **32** slides. The guide **93** is secured to pivot pins **95** journaled in the side frame bars **39** and is urged into contact with the upper apron **32** by means of a rat-trap spring **95***a*, for forming an auxiliary nip.

Multiple trumpet guides **97** are provided having suitable slots for receiving the slivers **15** and feeding them between the portions of the aprons **32** and **33** aligned with

the apertures **36** in the lower apron **33** and slots **35** in the plate **61**. A spring-pressed ball detent **98** may be provided for releasably holding the upper apron framework **38** in the raised position.

For securely fastening the framework **38** downward in the operating position shown in full lines in Figs. 1, 2 and 3, a latch mechanism is provided. The latch mechanism comprises a center post **101** secured to the twin-unit suction box **34** between apron units, and a latch lever **102** pivoted to the post **96** by a screw **103**. The latch lever **102** is provided with an offset or nose **104** fitting a slot **105** in the post **101**. The post **96** is fixed to the bar **39** carried by the upper framework **38**.

In order that the draft rolls **29** may be held down with adequate pressure, but the pressure may be relieved quickly in case of necessity for shutting down a section of the spinning frame, a quick release hold-down mechanism is provided. This takes the form of pivoted roll hold downs **106** adapted to bear against stub shafts **107** of the upper draft rolls **29**, the stub shafts being adapted to ride between the edges of members **106** and **112**. For yieldably pressing the members **106** downward, a lever **108** is provided, having nose portions **109** adapted to bear down on the hold downs **106**, pivoted by pins **111** at the upper end of a vertical member **112** held down yieldably by a tension spring **113**. The member **112** is formed with a head **114** receiving the pivot pins **111** and also receiving pivot pins **115** for the hold downs **106**. The central portion of the member **112** is in the form of a rectangular post fitting a rectangular notch **116** as shown in Fig. 4 formed in the suction box casting **53**. That portion of the member **112** beneath said central portion thereof is wider than the slot **116** so that when the member **112** is moved outwardly away from the wall **12** of the suction header and against the action of the spring **113** it carries the assembly **34** from the position shown in Fig. 3 to the position shown in Fig. 2.

At the lower end of the member **112** a slot **117** is provided cooperating with a guide pin **118** in a block **119** secured to the base of the pedestal **25**.

As the previously mentioned bunching of the fibers or cascading of the fibers takes place and the fiber builds up between draft rolls **29** and **30**, in case of abnormal operation, a force is produced which is great enough to overcome the force of the spring **113** and lift the upper draft roll **29** with its assembly attached to the arm **112** in an upward direction, thereby taking the draft roll **29** out of contact with the draft roll **30** as shown in Fig. 2, in addition to breaking the vacuum at the opening **51**.

For normal operation, the framework **38** for the upper apron **32** is held down with the latch **102** engaging the slot **105** and the draft roll hold down lever **108** is in the vertical position shown in Fig. 3 in full lines. Rotative power applied through the drive shaft **45** causes the draft rolls **29** and **30** to draw the sliver **15** out while the fibers therein are controlled and confined by the suction applied from the slots **35** through the apertures **36** in the lower belt **33**, and the fibers are compacted by the pressure of the roll **37**.

The interfrictional grip between fibers produced by the suction cooperating with the upper and lower aprons causes only those fibers to be pulled out during drafting which are actually nipped by the draft rolls **29** and **30**. The forward movement of the remaining fibers is controlled by the surface speed of the apron **33**. The second stage unit **14** shown in Fig. 1 operates in a similar manner to attenuate the slivers **16** further after combining them into a single strand to form the sliver **17**.

If it is desired to draft slivers having longer fibers the pressure roll mountings **89** and **58** are moved from the position shown in full lines in Fig. 3, toward the position shown in dashed lines in Fig. 3 after releasing the latch lever **102** to permit the framework **38** to take the position shown in dashed lines in Fig. 3. For releasing the upper draft roll **29** to permit inserting the end of a new batch of fibers the hold down lever **108** is moved to the position shown in Fig. 3.

Lifting the suction box **34** from the hollow pedestal **25** releases the tension on the lower apron **33** permitting examination or replacement thereof. When the suction box **34** is replaced the adjusting screws **69** and spring **72** and rolls **48** and **49** wrap the apron around the apron drive roll **46**, enabling the roll **46** to control the linear surface speed of the apron **33** so as to maintain it at a fixed value less than that of the draft roll **30**.

While the invention has been described as embodied in concrete form and as operating in a specific manner in accordance with the provisions of the patent statutes, it should be understood that the invention is not limited thereto, since various modifications will suggest themselves to those skilled in the art without departing from the scope of the invention.

What is claimed is:

1. A draft control apparatus for textile fibers comprising in combination with a suction header having an opening therein, a hollow pedestal mounted to close said opening in said header and a draft control unit pivotally secured to said hollow pedestal, adapted to pivot between first and second positions toward and away from the pedestal, and having a suction opening therein adapted to fit a corresponding opening in the hollow pedestal and close the opening with the draft control unit in its first position against the pedestal and to relieve the suction with the draft control unit in its second position, a suction box having a suction passageway connected to the opening in said pivoted draft control unit, said suction box having a surface plate with longitudinally extending openings leading from said suction passageway, an air pervious apron with means for causing it to move longitudinally along said suction box openings over said surface plate and means cooperating with said apron for holding slivers against said apron.

2. Apparatus as in claim 1 wherein the last mentioned means comprise a second apron with means for supporting it along the first apron for sliver feed therebetween.

3. A draft control unit for association with a pair of drafting rolls for strands of textile fibers, said unit comprising in combination a suction box, pressure roll means, strand-contacting apron means with supporting means for passing said apron means longitudinally of itself under said pressure roll means, and along said suction box and toward said drafting rolls, said apron means having an air pervious zone toward said suction box, the portion of said suction box between said pressure roll means and the drafting rolls having longitudinally extending openings registering with said apron air pervious zone, whereby the fibers of the strand being drafted are compacted and maintained in interfrictional engagement as they approach the drafting rolls, said pressure roll means comprising a strand-compressing pressure roll mounted above the strand-contacting apron means more distant from the drafting rolls than said suction box openings, said suction box being recessed to receive a reaction pressure roll mounted below said strand-contacting apron means positioned to receive the force of said strand-compressing roll.

4. A draft control unit for association with a pair of drafting rolls for strands of textile fibers, said unit comprising in combination a suction box, pressure roll means, strand-contacting apron means with supporting means for passing said apron means longitudinally of itself under said pressure roll means, and along said suction box and toward said drafting rolls, said apron means having an air pervious zone toward said suction box, the portion of said suction box between said pressure roll means and the drafting rolls having longitudinally extending openings registering with said apron air pervious zone, whereby the fibers of the strand being drafted are compacted and maintained in interfrictional engagement as they approach the drafting rolls, said pressure roll means com-

prising a strand-compressing pressure roll mounted above the strand-contacting apron means more distant from the drafting rolls than said suction box openings, said suction box being recessed to receive a reaction pressure roll mounted below said strand-contacting apron means positioned to receive the force of said strand-compressing roll, and longitudinally adjustable supporting means for said pressure rolls to adapt the apparatus to different maximum lengths of fibers in strands to be drafted.

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