Feb. 21, 1967 P. B. WEST ET AL 3,304,584

DRAFTING MECHANISM

Filed Oct. 7, 1964 2 Sheets-Sheet 1

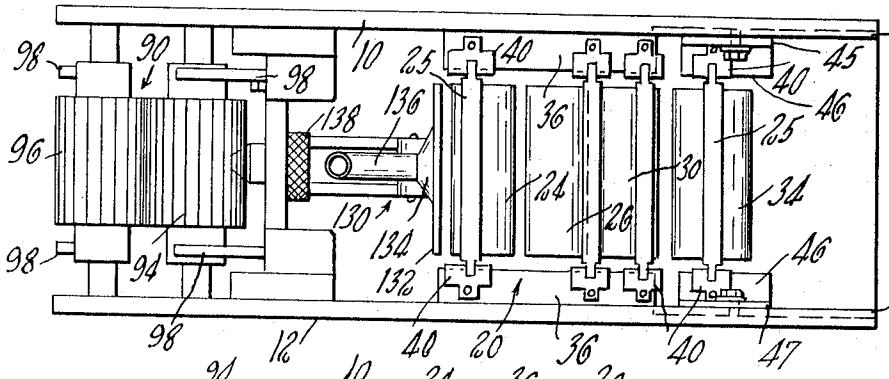

Fig. 1.

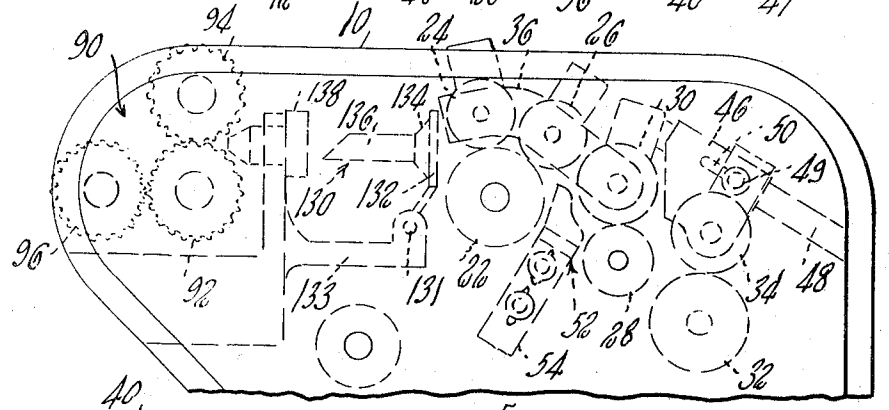

Fig. 2.

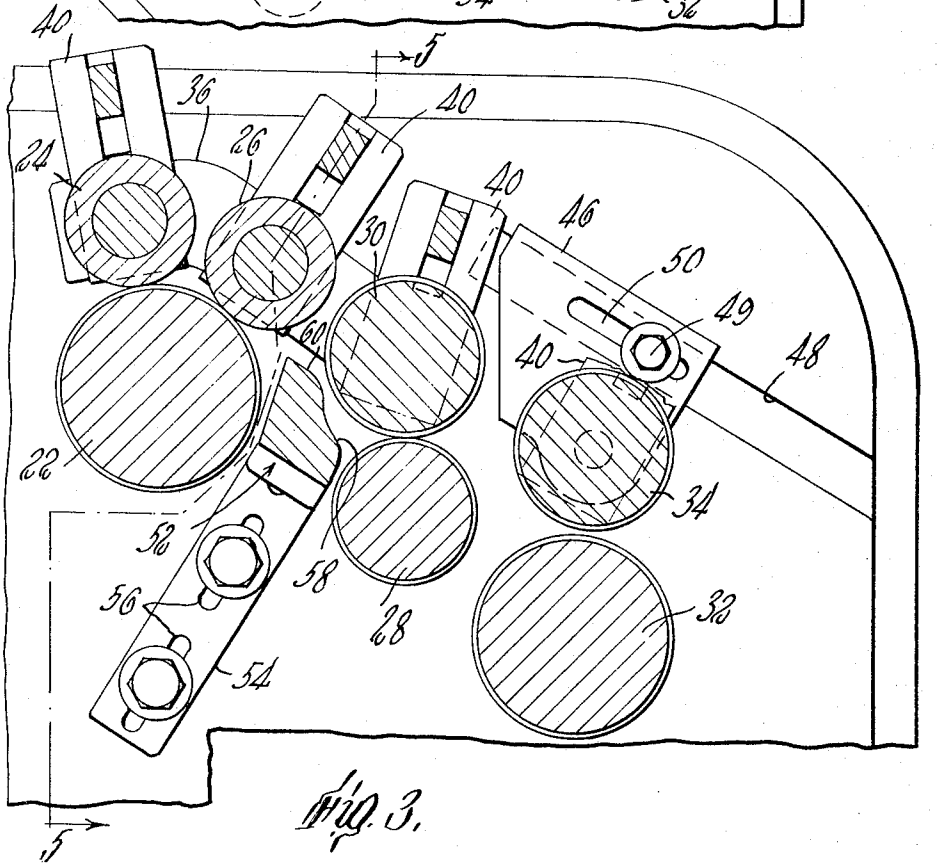

Fig. 3.

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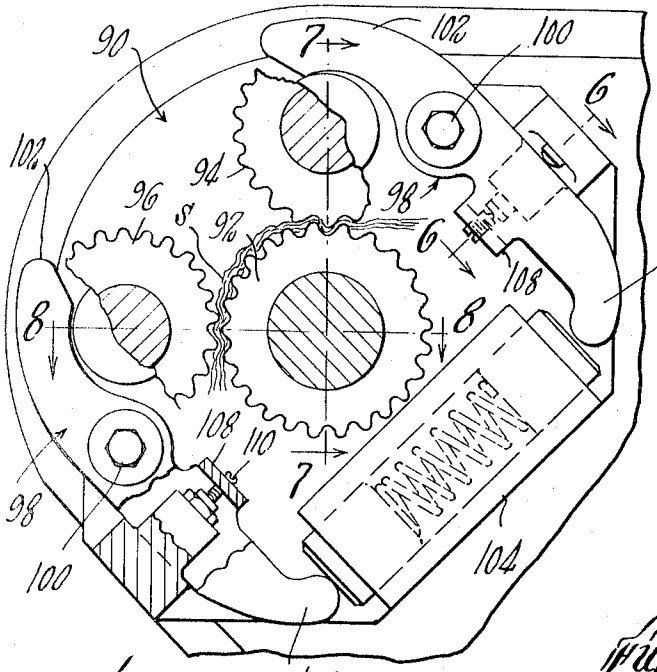

Fig. 4.

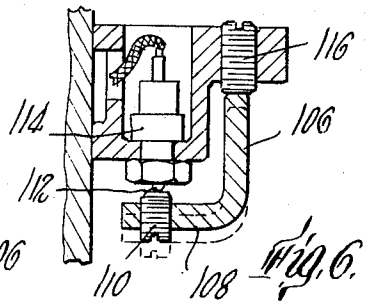

Fig. 6.

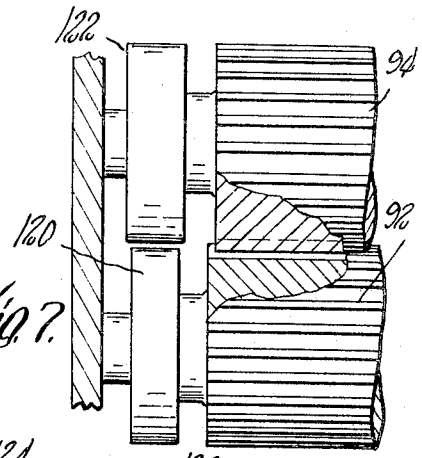

Fig. 7.

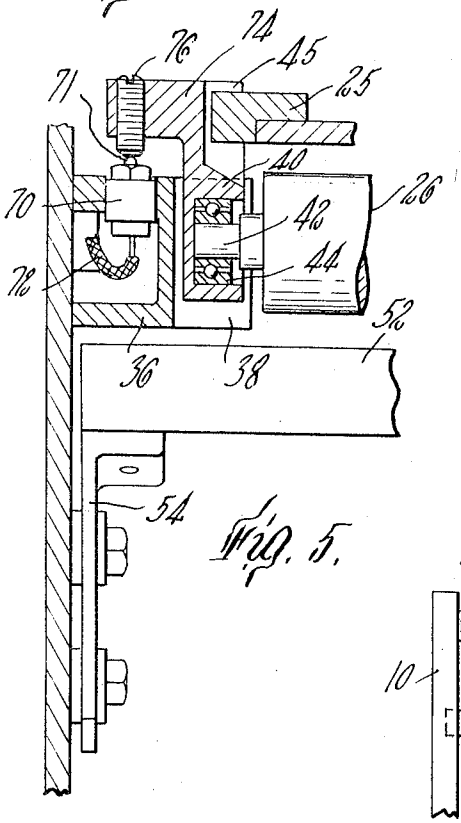

Fig. 5.

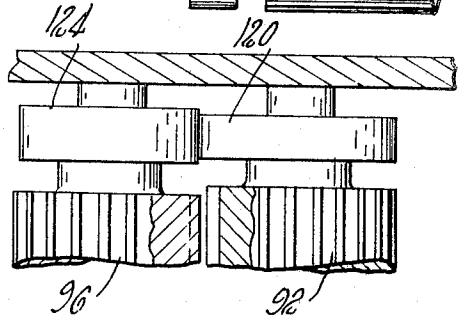

Fig. 8.

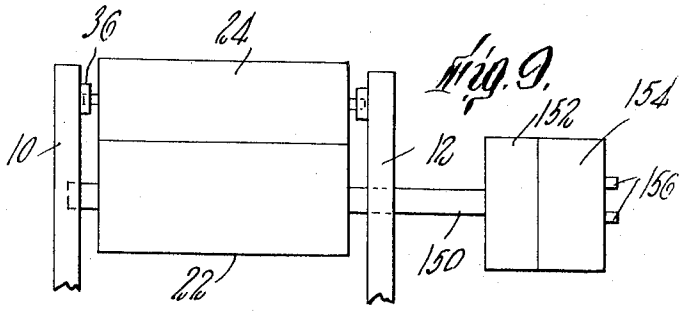

Fig. 9.

United States Patent Office

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DRAFTING MECHANISM

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4 Claims. (Cl. 19—261)

This invention relates to a textile machine including a drafting element for use in processing slivers, rovings and the like and more particularly to a drafting element employing a simple, easily adjusted arrangement for suitably controlling a wide range of staple lengths of fibers during their passage through the same.

A common objection to prior art mechanisms of this type resides in the fact that such mechanisms in order to properly control the sliver during its passage through the drafting zone included rather complicated arrangements including aprons, additional rolls, and various other devices in order to obtain such control. Additionally, such drafting mechanisms had little versatility in that they were adapted to accommodate a rather limited range of staple lengths. These objections are of considerable importance due to the greatly increased operating speeds and required versatility in todays textile machinery.

Other problems encountered in the textile industry as a result of greatly increased operating speeds include difficulties in changing the direction of travel of material being processed, as for example, in changing from a substantially horizontal path of movement upon delivery from the drafting mechanism to a substantially vertical path for the conventional operation of coiling the material into a can.

Further probelms resulting from operation at such high speeds are encountered whenever a drafting mechanism is employed in conjunction with a multiple carding unit including a plurality of carding machines for drafting the slivers delivered from such cards such as the arrangement more fully disclosed in corresponding U.S. patent application S.N. 278,727 filed May 7, 1963 by V. A. Burnham. These difficulties are encountered primarily whenever piecing-up of the slivers in the drafting mechanism is required after the unit is slowed down or stopped upon detection of a lap-up or after doffing of a full can. In either of these situations the carding machines continue to deliver a sliver due to the inertia of the machine after the drafting element has been stopped, thereby inserting excessive slack in the sliver between the cards and the drafting element.

Another problem common to drafting elements disclosed in prior art devices has to do with the electrically actuated stop motions employed therein. Generally, such stop motions are comprised of a pair of contact points, one of which is fixed to and moves with the top rolls and the other contact point is fixed to the frame of the machine. Thus, upon a predetermined movement of the top roll the contact points become engaged thereby actuating the stop motion. Arrangements of this type include certain undesirable features, foremost of which is that such stop motions may accumulate fly and various other kinds of foreign matter which tend to make it difficult and sometimes impossible for the stop motion to function properly. Further, the amount of movement of the top roll in such prior art devices is generally restricted by the aforementioned contact arrangement creating potential damage to some part of the mechanism.

Accordingly, the present invention deals particularly with the foregoing considerations and it aims to overcome the same by providing a drafting mechanism which may be operated at speeds upwards of 2000 feet per minute including a non-rotatable fiber control bar in contact with the material during its passage through the drafting zone, which control bar may be adjusted to support and deflect the material a desired amount inducing a "drag" on the same thereby assisting in control of the fibers. Additionally, the present invention provides a novel adjustment of the drafting mechanism which is quick and simple whereby a wide range of staple lengths may be accommodated.

Additionally, it is an object of the invention to provide a novel calender roll arrangement for changing the direction of travel of a sliver moving at high speeds.

Further, it is an object of the invention to provide an auxiliary means for driving the drafting mechanism when used in conjunction with a multiple carding unit in order that the drafting mechanism may be driven independently of the cards so as to assist in piecing up and/or removal of excessive slack in the incoming slivers.

Still further, it is an object of the present invention to provide a novel stop motion wherein both contact points are completely enclosed in the frame of the machine and are therefore immune to foreign matter with the top roll serving only to actuate the same.

A still further object is the provision of a novel stop motion means wherein the movement of the top roll is not restricted by the construction of the stop motion.

Other objects and advantages of the invention will become apparent as the following description of the invention progresses, in conjunction with the drawings, wherein:

FIGURE 1 is a top plan view of the mechanism incorporating the invention;

FIGURE 2 is a side elevation of the mechanism;

FIGURE 3 is a cross-sectional side elevation of the drafting mechanism of the invention;

FIGURE 4 is a side elevation, partly in cross-section, of the novel calender roll arrangement of the invention with some parts broken away for clear illustration;

FIGURE 5 is a cross-section taken along the lines 5—5 of FIGURE 3;

FIGURE 6 is a cross-section taken along the line 6—6 of FIGURE 4;

FIGURE 7 is a cross-section taken along the line 7—7 of FIGURE 4;

FIGURE 8 is a cross-section taken along the line 8—8 of FIGURE 4;

FIGURE 9 is a schematic illustration of the novel auxiliary driving means for the drafting mechanism.

Referring now to the drawings and especially to FIGURES 1 and 2, the construction there shown includes side frame members 10 and 12 between which is supported the drafting mechanism of the present invention indicated generally at 20 as well as the novel calender roll arrangement indicated generally at 90. As more clearly shown in FIGURE 3, the drafting mechanism 20 includes a front bottom roll 22, a first top roll 24 and a second top roll 26, whose operation will be more fully explained below, co-

operating with said bottom roll, an intermediate bottom roll **28** and a cooperating top roll **30**, a rear bottom roll **32** and a top roll **34** cooperating therewith. The bottom rolls **22, 28, 32** are rotatably mounted in suitable bearings in side frames **10** and **12** and are driven in a conventional manner by suitable gearing which forms no part of the instant invention and is not shown.

Referring more specifically to the top rolls and their mountings, front guide members **36** fixedly mounted on said side frames are provided with slots **38** (FIGURE 5) for guiding the guide blocks **40** in which arbors **42** are rotatably mounted as by roller bearings **44**, the front and intermediate top rolls **24, 26, 30** being precisely located by the slots **38**. It will be noted that the top rolls **24** and **26** are guided by said slots in a plane extending through the axis of the cooperating bottom roll and that the intermediate top roll **30** is guided by its respective slot in a plane located forwardly of the axis of its cooperating bottom roll **28** for a purpose to be set forth hereafter. Back top roll **34** is mounted in a similar manner in back guide member **46**, which is adjustably mounted by means of a screw **49** and adjusting slot **50** in the recess **48** on the side frames **10** and **12**. As best illustrated in FIGURE 1, the back back guide member **46** includes a portion **47** which extends into and is guided along said recess **48** during adjustment of the same. The guide blocks **40** on the ends of the rolls are freely slidable in their associated slots whereby each roll will readily move downwardly into contact with its respective bottom roll. Conventional roll clearers **25** may be employed in conjunction with the rolls of the drafting mechanism, which clearers are removably mounted in recesses **45** in guide blocks **40**. It is preferred that magnetic attractive forces be employed to provide suitable weighting for the top rolls, however, it will be obvious to those skilled in the art that any conventional means for weighting such rolls may be employed.

As pointed out earlier, the axis of the top roll **30** is positioned somewhat forwardly along the path followed by the material than the axis of its cooperating bottom roll **28** thereby requiring the material to extend around and be controlled by a segment of the top roll **30**. Such control of the material in the drafting zone is highly desirable and in order to facilitate this, a non-rotatable control bar indicated generally at **52** is also provided which extends into the path of movement of the material from the underside thereof and provides important additional control. The bar may be adjusted to a desired position toward and away from the top roll **30** in order to adjust the gap therebetween as by adjustment slots **56** located in supporting legs **54** thereby varying the degree of control exerted by said bar. The illustrated configuration of the control bar **52** has been found to provide best results, believed to be due primarily to the concave portion **58**, which provides a continuously decreasing spacing between the bar and the top roll, assisting in piecing-up of the material at this point. The upper rounded or convex portion **60** of the bar provides a gentle snubbing control of the material at high operating speeds.

It is preferred that the rolls be of the fluted type as disclosed in U.S. application S.N. 373,793 filed June 9, 1964, of common assignee with the present application although any conventional drafting rolls may be employed as desired.

Operation of drafting element

The drafting mechanism described above is highly versatile in that it is adapted to process a wide range of staple length materials from short fibers in the neighborhood of ¾ inch to those in excess of 2½ inches. The drafting mechanism, as illustrated, is suitable for processing materials having a staple length up to and including 2 inches.

In order to accommodate materials having a staple length over 2 inches, only a single roll need be adjusted, that being the top rear roll **34** which is moved away from the intermediate rolls a desired distance thereby adjusting the nip point of these rolls around the periphery of the bottom roll, thus increasing the distance between the nip points of the intermediate and back roll pairs. Also, top roll **26** is entirely removed to increase the distance between nip points of the front and intermediate rolls and minor adjustment of the control bar setting is made in order to maintain proper control in the front draft zone. Thus it can be seen that by making three simple changes, the drafting mechanism can be adapted to accommodate staple lengths of over 2 inches.

An important feature of the present drafting element resides in the fact that the axes of rotation of each of the bottom rolls are permanently fixed, therefore, the meshing relationship of the driving gears is never disturbed.

The supporting and guiding apparatus **36** at each end of the top rolls of the drafting mechanism includes the novel electrically operated stop motion for detecting a lap-up of the material around either roll of each roll pair. The construction of the stop motion in each instance is identical, therefore, it will be necessary to describe only one such arrangement. Thus, as seen in FIGURE 5, a switch mechanism **70** having a spring actuated plunger **71** and suitable electrical connections **72** is mounted in the top roll guide **36**. An actuator **74** integral with guide block **40** and projecting substantially laterally therefrom over the plunger **71** is provided for relatively free up and down movement with the guide block **40** for actuation of the plunger **71**. An adjustable set screw **76** extends from the actuator **74** into contact with the plunger for holding the same depressed a predetermined amount during normal operation of said drafting mechanism. Thus, it will be seen that in the event of a lap-up on one of the rolls the top roll as well as its associated guide block **40** and actuator **74** will be continuously raised thereby permitting upward movement of the plunger **71** until the stop motion has been actuated. The preferred arrangement for actuation of the stop motion is in the form of a normally open circuit with the same being energized by the movement of plunger **71** at the predetermined time, although an opposite arrangement wherein a normally energized circuit is employed and is broken to actuate the stop motion would function equally as well.

Because of the very high operating speed of the drafting mechanism disclosed herein, it is of the utmost importance that such a stop motion be reliable and it will become readily apparent that the present stop-motion provides such reliability since the electrical contacts in the switch **70** are entirely enclosed within the top roll guide **36** and are therefore not susceptible to interference from trash and other foreign matter. Further, due to the location of the contacts below the movable components associated with the top rolls, it will also become apparent that such movement of these rolls is not restricted in any way by the stop motion.

Referring now to FIGURES 1, 2, and 4 wherein the novel calender roll arrangement of the invention is indicated generally at **90** and includes a fluted driving calender roll **92** rotatably journaled in the side frame members **10** and **12** and driven in synchronization with the front rolls of the drafting mechanism **20** in a conventional manner by suitable gearing, not shown. Meshing with and positioned substantially verticaly above driving roll **92** is a first freely rotatable fluted calender roll **94**. A second freely rotatable fluted calender roll **96** is mounted in a substantially horizontal plane alongside said driving roll **92** and is in meshing engagement therewith, each of the freely rotatable rolls **94, 96** being driven solely through the meshing relationship with the flutes of the driving roll **92** and by engagement with the materials processed therebetween. Rolls **94, 96** are retained in meshing engagement with driving roll **92** by means of weighting arms indicated generally at **98** which are pivotally

mounted at 100, one end portion 102 of said weighting arms engaging said rolls 94, 96 and a spring weighting cylinder 104 is interposed between and urges outwardly the opposite end portion 106 of the weighting arm, thereby resiliently biasing the rolls 94, 96 inwardly toward the driving roll 92 for meshing engagement therewith.

A stop motion which is similar to that described earlier is provided for the calender roll arrangement, which stop motion is illustrated more clearly in FIGURE 6 wherein the end portion 106 of the weighting arm is illustrated as being provided with a laterally off-set actuating portion 108 including an adjustable screw 110 for operating the plunger 112 of the enclosed switch mechanism 114. Outward movement of the outwardly urged end portion 106 of the weighting arm may be controlled as by adjustment of the set screw 116. Such adjustment of weighting arm 98 by the set screw 116 serves the dual function of protecting the switch 114 and facilitating easy insertion of rolls 94, 96.

In the event of a lap-up around the calender rolls, at least one of the rolls 94, 96 will be moved outwardly from driving roll 92 against the bias of weighting arm 98 thus moving the end portion 106 of the weighting arm inwardly as shown in phantom lines (FIGURE 6) permitting the switch mechanism 114 to operate whereby the stop motion is actuated. It will be obvious that actuation of the stop motion in either the drafting mechanism or the calender roll mechanism will render the entire machine inoperative.

It is of considerable importance, in view of the high operational speed of the machine, that the calender rolls 94, 96 mesh propery with the driving roll 92. It has been found that where the degree of meshing of the respective rolls varies greatly, either too much tension would be applied to the stocks between the successive nips of rolls 92, 94 and 92, 96 thus causing undesirable drafting, or alternatively, too little tension would be applied thus creating slack and permitting billowing between the rolls. Thus in order to assist in controlling the meshing of the first and second calender rolls 94, 96, spacing collars or discs are employed as illustrated in FIGURES 7 and 8 wherein the driving roll 92 is provided with a spacing collar 120 for cooperation with a similar collar 122 on the first calender roll 94 (FIGURE 7). The purpose of this pair of collars is to prevent harmful bottoming of the rolls in the event of a depletion of stock while the rolls are in operation. Thus, during normal operation the rolls 92, 94 and their respective collars are spaced from each other according to the thickness of the stock being processed which will usually be approximately .025 inch for a 45 to 60 grain silver. The second calender roll 96 as seen in FIGURE 8 is provided with a spacing collar 124 whose dimensions are determined by the mean spacing of the first calender roll 94 and driving roll 92, which is shown to be approximately .025 inch in the example referred to above, during normal operation of the machine plus an additional distance of approximately .008 inch to .012 inch thus providing a total spacing of approximately .035 inch between the rolls 92, 96. It is important that the spacing of the second calender roll 96 be such that the same will ride on the spacing collars 120, 124 in order to control the depth of meshing of rolls 92, 96 which in turn serves to control the effective diameter of said rolls in a manner well understood in the art, thereby effectively regulating the tension between successive nips of the calender rolls during operation and it has been found the .035 inch spacing for a 45 to 60 grain sliver, as for example, will function in essentially this manner.

The spacing collar 124 may be changed as desired upon a change in the stock being processed so as to maintain the proper tension in the stock during passage through the calendering arrangement 90.

Suitable web control means for controlling the web delivered by the front rolls 22, 24 are provided at 130 in FIGURES 1 and 2, said means including a flat gathering plate 132 extending along the length of said rolls, a frusto conical portion 134 centrally located thereof and a tubular portion 136 extending from said frusto conical portion to a point adjacent the receiving end of a trumpet 138 for conducting the material into said trumpet. The web control means 130 is pivotally mounted as at 131 on a stationary frame 133 of the machine and may be pivoted away from the rolls 22, 24 in order to facilitate access to said rolls. If desired, a stop mechanism similar to those described earlier may be incorporated adjacent to said pivot 131 to give a signal if the web control means becomes clogged and is pivoted during operation of the drafting element.

Turning now to FIGURE 9, illustrating schematically the novel auxiliary driving arrangement of my invention, there is shown therein the front bottom roll 22 of the drafting mechanism which, as pointed out earlier, is driven by suitable conventional gearing operatively connected to a prime mover, not illustrated, and a cooperating top roll 24, which rolls are rotatably supported in the manner more fully described in conjunction with the earlier detailed explanation of the drafting mechanism. The bottom roll 22 further includes a shaft 150 extending through the side frame 12 carrying a suitable overrunning clutch 152 and auxiliary motor 154 having start and stop switches 156 for driving the drafting and calendering mechanisms slowly. Whenever the primary driving means has been de-energized, means (not shown) are provided for disengaging the primary drive to the drafting mechanism thus insuring that only the drafting and calendering mechanisms are driven by the auxiliary driving motor 154.

Therefore it will be seen that we have provided a novel auxiliary driving arrangement which will greatly assist the operator in piecing up through the drafting mechanism subsequent to a lap-up or other disruption in the fibers being processed. The present arrangement is especially useful in conjunction with drafting mechanisms being employed to draft the combined slivers issuing directly from a group of carding machines. In such an arrangement, it is not uncommon for excessive amounts of slack to accumulate betwen the output of the cards and the drafting mechanism since the cards continue to deliver sliver after the drafting mechanism has been stopped because of the inertia of the carding machines. The present auxiliary driving arrangement permits the further processing of the slivers in this instance so as to eliminate such slack before again starting the primary driving means. It will be obvious that manually operated or other suitable means may be employed in operating the auxiliary drive.

While we have herein shown and described preferred embodiments of our invention, it is understood that other constructions and configurations, obvious to those having skill in the art, are incorporated within the spirit of the invention as defined in the following claims.

We claim:

1. A textile machine having fiber processing instrumentalities including a calender roll mechanism comprising,
   - a fluted driving roll,
   - a first freely rotatable fluted driven roll mounted substantially in a vertical plane above said driving roll and intermeshing therewith,
   - a second freely rotatable fluted driven roll mounted substantially in a horizontal plane alongside said driving roll and intermeshing therewith,
   - weighting means urging said driven rolls into meshing engagement with said driving roll,
   - and means for controlling the depth of meshing of said driven rolls with said driving roll, the depth of meshing of said first driven roll being greater than that of said second driven roll.

2. A textile machine as set forth in claim 1, wherein said depth control means includes spacing collars positioned on said rolls adjacent the ends thereof.

3. A textile machine as set forth in claim **1**, wherein said weighting means includes spring means for resiliently urging said driven rolls into intermeshing relationship with said driving roll.

4. A textile machine as set forth in claim **2**, wherein said calender roll mechanism further includes means for sensing an undesirable accumulation of fibers between said rolls and means responsive to said sensing means for stopping said machine.

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