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CARDING MACHINE SLIVER AND LAP STOP MOTION APPARATUS

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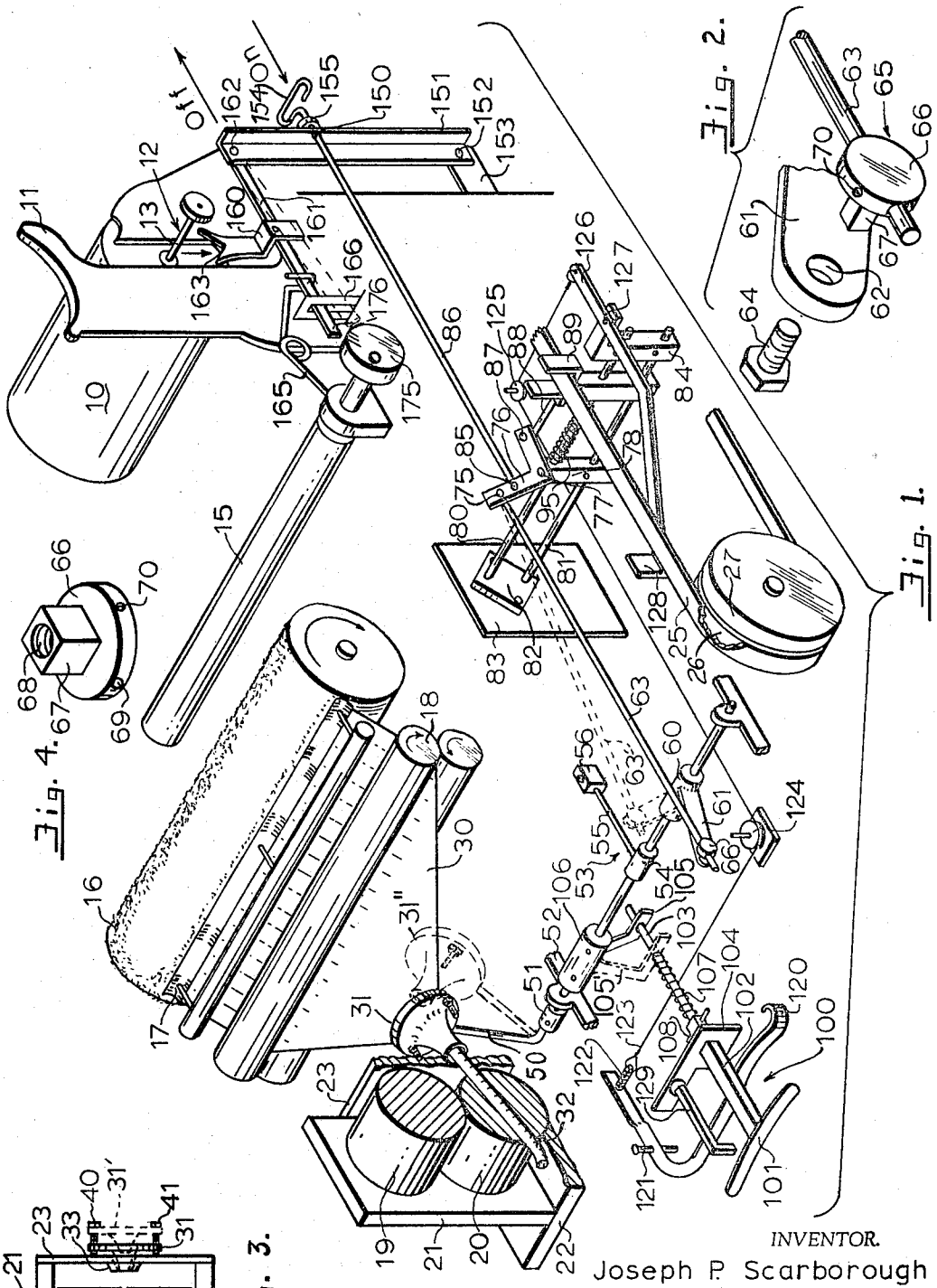

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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CARDING MACHINE SLIVER AND LAP STOP MOTION APPARATUS

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The present invention relates to textile carding machines and specifically to an apparatus for stopping the carding process upon certain defects or a breakage occurring in the web or sliver or upon the lap running out.

In the operation of conventional carding machines such as the Model H made by the Whitin Machine Works of Whitinsville, Massachusetts, on which the present description is based, it is known that if the web or sliver breaks or if it becomes bunchy, too heavy, or too light or if foreign matter gets intermingled with the web or sliver, it is desirable to stop the carding process and clear the defect whatever it might be in order to minimize the amount of defective sliver coming out of the calender rolls. Another reason for stopping the carding process develops when the lap runs down to about one-half to one and one-half yards from the lap end. This is because the tail end of the lap usually contains oil and sometimes foreign matter and is frequently of a different weight and evenness from that found in the bulk of the lap. Therefore, it is desirable when the tail end of the lap is reached to stop the carding process, remove the tail end of the lap in process and start a new lap. Aside from other considerations it is known that there is a real risk of damaging the card elements if the last yard or so of the tail end of the lap is allowed to go through the lap feed roll. One other aspect of card protection that should be mentioned is the fact that when the web or sliver breaks before the lap has run out it is desirable to restore the web and sliver flow through the calender rolls without disturbing the lap. However, when the lap runs out, it is deemed best practice to break the web and sliver and start a new flow of web and sliver at the same time a new lap is started to insure that the lap end does not become sliver work product.

Prior art apparatus for protecting the web and sliver flow has usually taken the form of a pivoted trumpet through which the web flows and which is designed to fall and cause the drive belt to shift to an idle pulley whenever a defect occurs in the web. Other forms of sliver protection have been employed however the pivoted trumpet concept is probably the most widely employed type. The conventional pivoted trumpet devices nevertheless have certain shortcomings in that the operator usually has to use one of his hands for holding the trumpet in place while it is being threaded after clearing a defect whereas the preferable device would be one that leaves both hands free for manipulating the web into the trumpet entrance. Conventional trumpet type sliver protectors lack means for shifting the belt independent of the mean connected to the trumpet which means that the web must be broken when the belt is shifted. It is also known that some sliver protectors of the pivoted trumpet type interfere with operation of the doffer knock-off lever and in some cases even prevent use of the doffer knock-off lever. Recognition should also be made of the difficulty of getting a fine sensitivity in those types of trumpet protectors which employ different size trumpet inserts as a means of getting a fine adjustment in sensitivity.

So far as lap run out protection apparatus is concerned some attempts are shown in the prior art including a form of pneumatic control. In any event there has been no widespread acceptance of any form of lap run out protection. More specifically the conventional lap run out apparatus does not connect lap run out and sliver protection such that when the lap runs out the web is also made to part and the trumpet to fall.

With the foregoing in mind a general object of the invention is to provide an improved protection apparatus for carding machines to prevent card damage and production losses.

Another object is to provide an improved sliver protection apparatus of the pivoted trumpet type.

Another object is to provide an improved lap run out protection apparatus.

Another object is to provide an apparatus which combines protection against web and sliver defects and lap run out.

Another object is to provide an improved sliver protection apparatus which can be made extremely sensitive to those types of web and sliver defects normally encountered in the carding process.

Another object is to provide an improved sliver protection apparatus of the pivoted trumpet type which incorporates means for shifting the drive belt without disturbing the trumpet position.

Another object is to provide a combined web and sliver defect and lap run out protection apparatus in which lap run out effects a stoppage of the lap and a breakage of the sliver.

The above and other objects will become apparent as the description proceeds and in the drawings, in which:

FIGURE 1 is an isometric skeleton view of some of the principal elements of a carding machine and showing an embodiment of the invention arranged with these elements.

FIGURE 2 is an enlarged isometric view of one of the linkage connection employed in the invention.

FIGURE 3 is a partial plan view of the calender roll area illustrating how the trumpet is adjusted.

FIGURE 4 is an isometric view of a rod connecting member.

The invention is described in reference to the previously mentioned Type H, Whitin carding machine though it can be applied to carding machines of other manufacturers. The invention employs a typical trumpet through which the web passes and which is delicately balanced on a pivoted lever mechanism connected to a belt shifter. When the trumpet encounters a defect such as a bunch area in the web or a web or sliver weight outside of the range to which the trumpet has been adjusted, the trumpet falls and effects a shifting of the drive belt which stops the lap feed roll, the lap roll, the doffer, the calender rolls and the coiler rolls. To this extent the invention is broadly conventional and no claim is made to the same except as to the later described and claimed improvements thereon.

Departing from the conventional pivoted trumpet apparatus, the invention provides a separate linkage to the belt shifter which can be operated with the knee and which can be employed to shift the belt without disturbing the trumpet so that other machine adjustments can be made without having to interrupt the web and sliver flow through the trumpet. The pivoted trumpet apparatus of the invention also departs from conventional apparatus of the same type in that a very high degree of sensitivity and delicate balance is obtained by providing means for adjusting the distance between the face of the trumpet and the center line of the calender rolls, this adjustment being provided to supplement the conventional adjustment which depends on shifting a weight incorporated in the pivoting linkage.

Another significant departure is found in the provision for lap run out protection. In this regard, the invention

recognizes that the position of the lap pin bears a direct relation to the amount of lap remaining. A lever actuating means is provided which is operated by the lap pin striking the actuating means and which results in effecting an operation of the belt shifter and in a preferred form also effects an operation of the sliver pivoted trumpet apparatus.

Referring in more detail to the drawings in which like numerals indicate like parts throughout the various figures, in FIGURE 1 the reference numeral **10** designates a roll of lap material in process, the number **11** designates one of the members conventionally provided for supporting a spare lap, not shown, and the number **12** designates the conventional lap pin having an extension portion **13** that extends beyond the end of the lap **10** and which is utilized as later described.

The lap feed roll is represented at **15**, the doffer cylinder at **16**, the comb at **17**, the crushing rolls at **18**, the upper calender roll at **19**, the lower calender roll at **20**, the calender roll stand at **21**, the calender roll stand support at **22** and the calender roll condenser plate at **23**. While not shown, it will of course be understood that the feed roll **15**, the doffer cylinder **16**, the comb **17** which has a vibrating action, the crushing rolls **18** and the calender rolls **19**, **20** are all provided with the conventional drive apparatus such that their respective functions are coordinated with the functions of other conventional parts such as the card cylinder, flats, lap roll and the like which are not shown but which are well understood in the art. That is, the description and drawings are not intended to represent a complete carding machine but rather only those elements with which the invention is primarily concerned and sufficient to teach the invention in one embodiment to those skilled in the art. To complete this portion of the description the drive belt **25** is arranged to be shifted between a drive pulley **26** and idle pulley **27** and may be driven by an individual or line belt drive, neither being shown.

As has been previously mentioned, the invention is concerned with both sliver defect and lap run out protection and the description will now refer particularly to the sliver protection. In this regard, the web represented at **30** is arranged to pass through a conventional hollow, truncated, horizontally oriented cone shaped trumpet member **31**. On leaving the trumpet **31**, the sliver is pulled through the calender rolls **19**, **20** and emerges as sliver **32** which is directed to the coiler apparatus, not shown. The condenser plate **23** is suitably arranged as at the indented portion **33** (FIGURE 3) to receive the trumpet **31** such that the trumpet exit, when the trumpet is operative, can be placed proximate the calender roll entrance. With respect to fine balancing of the trumpet, the invention makes provision for the adjusting screws **40**, **41** which are threadably mounted in the trumpet **31** and which allow the face of the trumpet to be moved with respect to the center line of the calender rolls as represented by the solid line operative position of trumpet **31** in FIGURE 3 compared to the inoperative dotted line position **31'**. Thus for fine adjustments of trumpet **31**, adjusting screws **40**, **41** can be moved in and out and thereby regulate the distance between the trumpet face and the center line of the calender rolls.

Continuing the description of the sliver protection apparatus, the trumpet **31** is pivoted on a bent rod member **50** which passes through a spacer **51** secured to rod **50** and is supported in a fixed frame bearing member represented at **52**. Secured to rod **50** is a cantilevered weight structure **53** and which includes a sleeve **54** secured to rod **50**, a rod **55** secured to sleeve **54** and a weight **56** adjustably secured to rod **55**. A rough balancing can thus be obtained for trumpet **31** by shifting weight **56** on rod **55** with a fine adjustment being obtained with previously mentioned adjusting screws **40**, **41**.

Rod **50** mounts a further sleeve member **60** which has an integral lever portion **61** containing a hole **62**. Lever **61** is connected to an additional rod member **63** which operates the belt shifter as later explained. It is particularly important that the conection between rod **63** and lever **61** have a minimum of friction and to accomplish this a preferred connector construction is represented in FIGURES 2 and 4. In particular, an externally threaded bolt **64** is arranged to be threaded into a female member **65**. Member **65** has a cylindrical hub portion **66** and integral therewith a square stem portion **67** having internal threads **68** adapted to mate with the threads of bolt **64**. The hub portion **66** has a hole **69** in which rod **63** is positioned as shown in the drawings and once positioned is suitably secured as by the set screw **70**. The advantage of this form of connection is that only the four edges of the stem **67** contact the interior surface of hole **62** and thus lint and other foreign matter which inevitably collects in this particular area of the machine during the carding operation is unlikely to substantially increase the friction at the connection.

Rod **63** is pivotally connected at **75** to an L-shaped member **76** which in turn is pivotally supported at **77** on a post member **78**. Post **78** is positioned on a pair of horizontally disposed fixed rods **80**, **81** which are supported at one end by a pair of fixed plate members **82**, **83** secured to the machine frame, not shown, and are supported at the opposite end on a fixed post member **84** secured by suitable means not shown to the main machine frame. Member **76** has a further pivotal connection at **85** to a rod **86** which is operated by the lap run out mechanism later described and also has a pivotal connection at **87** to a rod **88** which actuates the forked belt shifter member **89**. Belt shift **89** is slidably mounted on the two rods **80**, **81** such that it can be moved laterally to effect a shifting of the drive belt **25** from the drive pulley **26** to the idle pulley **27**. When moved toward the drive pulley **26**, shifter **89** tends to compress a coil spring **95** which is loosely mounted on rod **80**, and whose purpose is discussed later in the description.

From the description thus far, it will be seen that a positive connection is made between the trumpet **31** and the belt shifter **89** such that the position of trumpet **31** can be used to control the position of belt shift **89**. With the weight **56** and the screws **40**, **41** properly adjusted an extremely sensitive sliver protection system is established. Of special interest is the fact that when trumpet **31** is positioned for operation, the lever **61** and rod **63** are brought down to the solid line position shown in FIGURE 1 against the tension of spring **95** such that rod **63** is substantially resting on sleeve **60** and exerting almost zero moment of force on rod **50**. A very slight movement of trumpet **31** however as might arise by a change in web or sliver weight or by a bunched web attempting to go through trumpet **31**, will disturb this equilibrium and allow lever **61** to move up which puts a moment on rod **50** that is amplified by the tension in spring **95**. This then tends to cause a rapid movement of belt shifter **89**.

Once the web and sliver is broken, trumpet **31** has nothing to support it and will remain in the tripped position indicated in dotted lines **31''** and rod **63** will remain in the dotted line position **63'**. In order to restart the carding process it is of course necessary to put the trumpet back into its normal operating position and start the web and sliver back through the trumpet. This is an operation which at the least requires expert and experienced hands since it is difficult to use one hand to hold the web and form it into a pointed end for feeding into the trumpet to form the sliver and use the other hand to hold the trumpet in position. The invention provides a unique system for assisting in this operation in providing a separate trumpet position holding mechanism which can be operated by the operator's knee to hold the trumpet in position thus leaving both the operator's hands free to manipulate the web and sliver. This mechanism includes a T-shaped bar **100** which has a horizontally disposed

member **101** adapted to be engaged by the operator's knee and which is integral with a somewhat square shaped rod **102** that has a round rod integral extension **103**. That is, member **101**, rod **102** and rod **103** form the integral structure **100** with the rod portion **102** being mounted to slide in a fixed plate member **104** suitably secured to the machine frame. Rod **103** passes through, in a free slidable relation, an L-shaped member **105** which is made integral with a sleeve member **106** secured to rod **50**. Member **105** slides on rod **103** and assumes the dotted line position **105'** when trumpet **31** is at position **31''**. A coil spring **107** surrounds rod **103** between member **105** and plate **104** and a pin **108** fixed in rod **102** limits the outward travel of the overall T-shaped rod **100**. In operation, it will be seen that the operator can use his knee to press in on member **101** and thus hold trumpet **31** in position and at the same time hold belt shifter **89** in position to hold belt **25** engaged with drive pulley **26** which leaves both hands free to restart the sliver **32** through the calender rolls **19, 20**.

Another practical need for a completely satisfactory sliver protection apparatus is recognized by the provision in the invention for means to shift the drive belt **25** independent of the trumpet operated belt shifting means. For example if the operator wants to pick out foreign matter out of the web before it reaches the trumpet it should be possible for him to do so without having to break the web itself. This feature is not provided by conventional apparatus in which the belt can be shifted only by the trumpet operated shifter. Referring further to FIGURE 1, there is provided a bent lever **120** which pivots on a suitable fixed pin **121** and which connects through a bolt **122** to a cable **123** entrained around pulleys **124** and **125**. Cable **123** is in turn connected to a suitably bent lever **126** which pivots on a pin **127** and which has a belt engaging portion **128**. It will be seen that when lever **120** is pushed in by the hand or knee, lever **126** is pivoted in a manner to cause belt **25** to shift to the idle pulley **27** but without disturbing the web or sliver. The travel of lever **120** is limited by a suitable stop member **129** that is secured to plate **104**.

The description thus far has dealt with the linkage by which the fall of the trumpet causes the drive belt to shift, the linkage by which the operator can use his knee to hold the trumpet in operating position and the linkage by which the operator can shift the drive belt without disturbing the drive belt shifter linked to the trumpet. The description next turns to the lap run out protection means. For this purpose, rod **86** passes loosely through a hole at **150** provided in a vertically positioned angle member **151** which is pivoted at **152** on plate member **153** fixedly secured to the machine frame. In order that rod **86** can be operated manually for purposes later described, the end which extends through angle member **151** is bent in the form of a handle as shown at **154** and a suitable washed **155** is loosely mounted on rod **86** adjacent handle **154**.

A bent plate member **160** is secured to a pawl member **161** which is pivoted at **162** on angle member **151**. Member **160** is provided with a V-shaped notched portion **163** and is so arranged with respect to the conventional extension portion **13** of lap pin **12** that as the lap **10** is depleted the extension portion **13** will gradually move down and engage the notched portion **163** of member **160**. Two means are provided to give pawl **161** a positive inoperative position which means include a spring **165** secured at one end to the frame by suitable means, not shown, the other end of the spring **165** being in engagement with pawl **161** such that spring **165** always tends to lift pawl **161** with the travel of pawl **161** being limited by an inverted U-shaped member **166** fixedly secured to the frame by means not shown. As lap **10** becomes depleted it will be seen that the extension portion **13** will gradually move down, will engage the notched portion **163** of member **160** and will cause pawl **161** to move down against the tension of spring **165**.

As lap **10** becomes depleted and pawl **161** moves down, the end **176** of pawl **161** engages a cam **175** which is mounted on the end of the feed roll **15** and which rotates with the feed roll **15**. Therefore, as lap **10** becomes depleted cam **175** effectively "feels" the position of pawl **161** on each revolution of feed roll **15** and whenever member **161** is moved down sufficiently by reason of lap **10** being depleted, cam **175** will cause pawl **161** to move outward or rearwardly. As member **161** moves outward, angle member **151** will bear against the handle portion of rod **86** and will cause rod **86** to rotate member **76**. As member **76** is moved, all of the linkage associated with trumpet **31** and belt shifter **89** is moved which causes trumpet **31** to start falling and the drive belt **25** to be shifted. Since any small shaft in the trumpet **31** position causes trumpet **31** to fall, the belt shifting will be completed by reason of trumpet **31** falling to its inoperative position **31''**. That is, a depletion of lap **10** causes trumpet **31** to move as if it had encountered a sliver defect and consequently the linkage between cam **175** and trumpet **31** once established need give trumpet **31** only a relatively small movement to accomplish a shifting of belt **25**. From an operating viewpoint, it should also be noted that if the operator is near the lap he can stop the carding process simply by pulling on handle **154**. That is, the lap run out linkage inherently provides a means to shift the drive belt from the lap end of the machine.

As has already been explained, it is desirable when the lap runs out to restart the web and sliver since the lap trailing end usually has oil and various foreign matter not conducive to making satisfactory sliver. Thus, by breaking the web and sliver when the lap runs out the operator is automatically reminded of the need to and in fact is required to clear the old web and sliver. It is possible of course to use the lap run out mechanism with enough throw to shift the shifter **89** whatever amount is required. It is also recognized that many of the invention's advantages might be realized by using one belt shifting linkage connected to the lap run out mechanism and another belt shifting mechanism linkage connected to the trumpet sliver protection mechanism such as the independently operating mechanism connected to lever **126**.

Having described the invention, what is claimed is:

1. In a textile carding machine for conversion of fibrous material from lap to sliver form and having drive and idle pulleys, a drive belt, a shifter for shifting said belt between said pulleys, a trumpet arranged to receive and condense a web into a sliver, first linkage means pivotally mounting said trumpet and connecting said trumpet and shifter to automatically effect said shifting upon said trumpet encountering certain predetermined sliver defects, a driven lap feed roll, a lap pin mounting a lap and movable downwardly as said lap is depleted, the improvement comprising, in combination, a cam mounted on one end of said feed roll and rotatable therewith and second linkage means connected to said belt shifter and arranged to be actuated by said lap pin establishing an operative relation between said second linkage means and said cam upon said lap pin reaching some predetermined low position to also automatically effect said shifting when the lap depletion corresponds to said position.

2. In a textile carding machine for conversion of fibrous material from lap to sliver form and having drive and idle pulleys, a drive belt, a shifter for shifting said belt between said pulleys, a trumpet arranged to receive and condense a web into a sliver, first linkage means pivotally mounting said trumpet and connecting said trumpet and shifter to automatically effect said shifting upon said trumpet encountering certain predetermined sliver defects, a driven lap feed roll, a lap pin mounting a lap and movable downwardly as said lap is

depleted, the improvement comprising, in combination, a cam mounted on one end of said feed roll and rotatable therewith, a follower arm normally positioned out of contact with said cam and so arranged that said lap pin brings it into operative relation with said cam upon said lap pin reaching some predetermined low position, and second linkage means connecting said arm to said shifter to also automatically effect said shifting when the lap depletion corresponds to said position.

3. In a textile carding machine as claimed in claim 2 wherein said second linkage means connecting said arm to said shifter includes a handle equipped connecting member located proximate said lap and arranged for a manual shifting operation independent of said automatic shifting thereby enabling said shifter to be manually shifted from the lap end of said machine and independent of lap depletion.

4. In a textile carding machine for conversion of fibrous material from lap to sliver form and having drive and idle pulleys, a drive belt, a shifter for shifting said belt between said pulleys, a trumpet arranged to receive and condense a web into a sliver, first linkage means pivotally mounting said trumpet and connecting said trumpet and shifter to automatically effect said shifting upon said trumpet encountering certain predetermined sliver defects, a lap pin mounting a lap and movable downwardly as said lap is depleted, the improvement comprising, in combination, second linkage means connected to said first linkage means and arranged to be actuated by said lap pin at some predetermined low position thereof sufficient to trip said trumpet and cause said trumpet to fall and to automatically effect said shifting when the lap depletion corresponds to said position.

5. In a textile carding machine for conversion of fibrous material from lap to sliver form, in combination, drive and idle pulleys, a drive belt, first and second independently operable belt shifters for shifting said belt between said pulleys, a trumpet arranged to receive and condense a web into a sliver, first linkage means pivotally mounting said trumpet and connecting said trumpet and first shifter to automatically effect said shifting upon said trumpet encountering certain predetermined sliver defects, calender rolls, a condenser plate proximate said rolls, adjustable screw means mounted in said trumpet and engageable with said plate thereby enabling the position of said trumpet to be finely adjusted with respect to said rolls, bar means connected to said first linkage means and adapted to be engaged by the operator's knee for holding said trumpet in its operative position, a manually operable lever mounted proximate and operable independent of said bar means, second linkage means connecting said second shifter and said lever thereby enabling manual shifting of said belt without disturbing the position of said trumpet, a driven lap feed roll, a cam mounted on one end of said feed roll and rotatable therewith, a lap pin mounting a lap and movable downwardly as said lap is depleted, a follower arm normally positioned out of contact with said cam and so arranged that said lap pin brings it into operative relation with said cam upon said lap pin reaching some predetermined low position, and third linkage means connecting said arm to said first shifter to automatically effect said shifting when the lap depletion corresponds to said position.

6. In a textile carding machine for conversion of fibrous material from lap to sliver form and having drive and idle pulleys, a drive belt, a shifter for shifting said belt between said pulleys, a lap feed roll, a lap pin mounting a lap and movable downwardly as said lap is depleted, the improvement comprising, in combination, a cam mounted on one end of said feed roll and rotatable therewith, a follower arm normally positioned out of contact with said cam and so arranged that said lap pin brings it into operative relation with said cam upon said lap pin reaching some predetermined low position, and means connecting said arm to said shifter to automatically effect said shifting when the lap depletion corresponds to said position.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,276,080 October 4, 1966

Joseph P. Scarborough

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 35, for "connection" read -- connections --; column 4, lines 32 and 42, for "shift", each occurrence, read -- shifter --; column 5, line 56, for "washed" read -- washer --; column 6, line 17, for "shaft" read -- shift --.

Signed and sealed this 29th day of August 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents