

[54] APPARATUS FOR FORMING A SLIVER FROM A FIBER WEB PRODUCED IN A CARD

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[63] Continuation-in-part of Ser. No. 95,619, Dec. 7, 1970, abandoned.

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[51] Int. Cl. D01h 15/46

[58] Field of Search..... 19/150, 106 R

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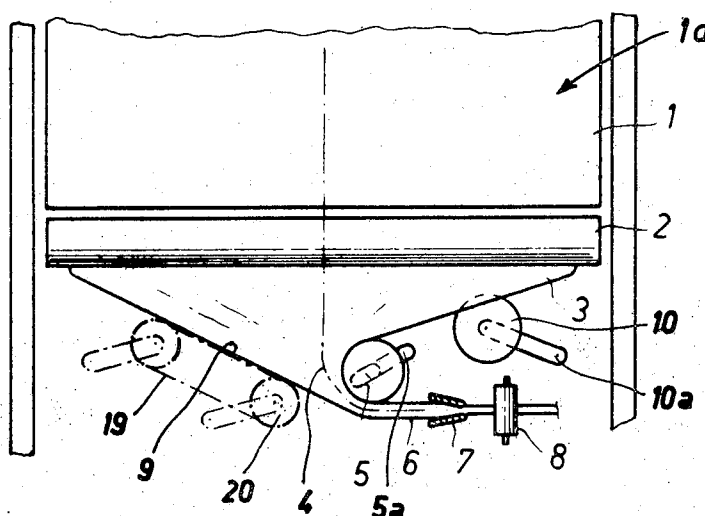
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[57]

ABSTRACT

A method of forming a sliver from a fiber web produced in a card which comprises the steps of subjecting the formed web immediately after it is withdrawn to a precondensing action or preliminary condensation by laterally collecting the web towards the middle thereof, and subsequently condensing such web into a sliver by means of a known type of condensing device to essentially complete the formation. The invention also pertains to apparatus for forming a sliver in accordance with the aforesaid inventive method wherein a sliver condensing device is arranged after a web take-off device of the card, and between the web take-off device and the sliver condensing device there is provided movable precondensing means in the form of at least one substantially cylindrical-type roller or having at least one substantially cylindrical circumferential precondensing surface disposed in a plane which is in substantially perpendicular relationship with respect to the plane in which the web moves for forming a precondensed strand of fibers by laterally collecting the fiber web.

1 Claim, 9 Drawing Figures



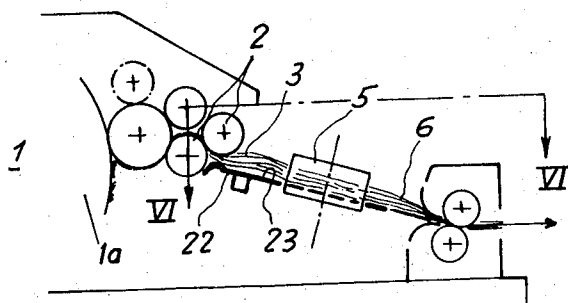


Fig. 5

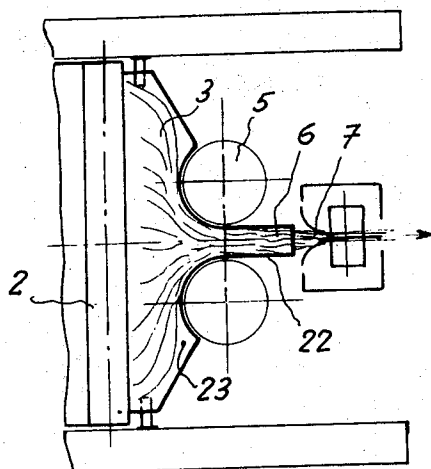


Fig. 6

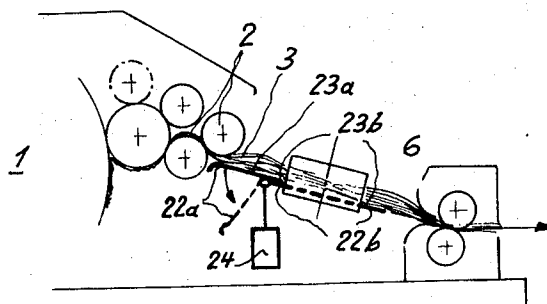


Fig. 7

APPARATUS FOR FORMING A SLIVER FROM A FIBER WEB PRODUCED IN A CARD

CROSS-REFERENCE TO RELATED CASE

This application is a continuation-in-part application of my commonly assigned U.S. application, Ser. No. 95,619, filed Dec. 7, 1970, now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved method of forming a sliver from a fiber web produced in a card and also pertains to a new and improved apparatus for the implementation of the aforesaid method.

The formation of a sliver from a fiber web produced in a card is known as such to the art. Previously, such was undertaken by directly condensing the produced fiber web in a suitable condensing device arranged after the web take-off device, for instance, at a so-called sliver funnel condenser or calender condenser.

However, in cards of the prior art heretofore known and equipped with a condensing device at the delivery arrangement, the delivery speed or through-put speed, respectively, of the web between the web take-off device or a delivery roll arrangement on one side and the condensing device on the other side should not exceed, as experience has shown, a certain maximum speed, otherwise the selvages of the web at higher speeds tend to form fringes or the web itself is torn, thus causing disturbances in operation and impairing product quality.

Now in order to somewhat alleviate the danger of the above-discussed fringe formation or tearing of the web, proposals have already been advanced towards arranging one or two easily rotatably mounted guide or support rolls possessing conical surfaces along the normal path of travel of the endangered web selvages. Owing to this measure, the formation of fringes or the tearing of the web selvages was reduced within the range of the heretofore conventional upper limits of the throughput speeds, but, however, no or at least no appreciable increase of the throughput speed or the card productivity was achieved. One such type prior art system is disclosed in U.S. Pat. No. 2,326,331, granted Aug. 10, 1943, and listing as the inventor Thomas Chantler.

SUMMARY OF THE INVENTION

Accordingly, there is still present a real need in the art of forming a sliver from a fiber web produced in a card which is not associated with the aforementioned drawbacks of the prior art manufacturing techniques and there is also prevailing a similar need for effective equipment to manufacture such slivers without the existing drawbacks experienced with state-of-the-art equipment. Therefore, a primary objective of the present invention is to provide an improved method of, and apparatus for, forming a sliver from a fiber web produced in a card, which is not associated with the aforementioned drawbacks of the prior art equipment and manufacturing techniques, and therefore effectively, economically and reliably fulfills the existing need of the art.

In keeping with the aforementioned general objective of the present invention, it is a primary object thereof to ensure for maximum increase in productivity of a card

through the utilization of a fiber web condenser arranged after the fiber web take-off device of the card and to further ensure for disturbance-free operation of the equipment.

The just-mentioned objective of the invention can be realized through the activity of laterally collecting and precondensing or partially compacting the fiber web produced in the card substantially over its entire width immediately after such web has been taken-off or delivered from the card, and then subsequently condensing the web in a condenser of known construction.

Now drafting arrangements, particularly drafting arrangements of draw frames, are known to the art where the web which is delivered is taken-off via a funnel-shaped delivery duct. This duct performs some collecting action upon the web. However, with such type funnels, the card web would be torn.

On the other hand, such precondensing action or preliminary compaction can be effectively achieved at a card equipped with a sliver condenser arranged after the web take-off device if, according to the teachings of the present invention, there is provided between the web take-off device and a conventional sliver condensing device a precondensing or precompacting apparatus which, as contemplated by the invention, is equipped with movable precondensing means disposed to form a precondensed strand of fibers by laterally collecting the fiber web.

Apart from the foregoing objects of the invention, a further objective thereof is directed at facilitating the "threading" of the fiber web into the precondensing elements, and if fringes start forming at the fiber web selvages, to avoid further tearing of the web and to guide those fringes which may have formed back into the fiber body or fiber web structure.

It is here also to be remarked that the prior art is equally familiar with an arrangement of guiding elements possessing relatively steep sliding surfaces, such as guide plates, funnels, and the like, at the web output side of the card, for the purpose of guiding the delivered fiber web into the sliver funnel. Yet, if the sliding surfaces are not inclined sufficiently, that is, if they are not steep enough, then these state-of-the-art arrangements can cause local bunching-up and tearing of the fiber due to local variations in the adhesion properties, thus adversely affecting the uniformity of the thus-produced sliver.

Therefore, with this deficiency of the prior art in mind, a further object of the invention is to eliminate these above-noted disadvantages.

According to the invention, this can be effectively achieved by arranging a support element at the output side of the card, which support element possesses a fiber web-support area extending at least substantially across the full width of the precondensing zone.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic top view of the delivery end region of a card equipped with a first embodiment of inventive apparatus for the practice of the inventive method;

FIG. 2 is a schematic top plan view, similar to a certain extent to the showing of FIG. 1, and depicting an alternative embodiment of the present invention;

FIGS. 3a, 3b and 3c are respective schematic views of various shapes for the cross-section of the precondensing members which can be used in the apparatus arrangements of FIGS. 1, 2 and 4;

FIG. 4 is a view similar to FIG. 2, but depicting a further embodiment of inventive apparatus;

FIG. 5 is an elevational side view of an advantageous structural embodiment of the present invention;

FIG. 6 is a top plan view of the embodiment depicted in FIG. 5 viewed substantially along the line VI—VI thereof; and

FIG. 7 is a side view of a further modified arrangement of inventive apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the exemplary embodiments of apparatus depicted hereinafter throughout the various figures, it will be understood that the various embodiments of the invention have been shown, by way of example, located at the delivery side or end 1 of the doffer role or arrangement 1a of a card equipped, for instance, with a pair of web take-off rolls 2 for a fiber web 3.

Referring now more specifically to the embodiment of equipment depicted in FIG. 1, it will be seen that such comprises a web take-off device 2, for instance formed by roll means, arranged at the delivery side or end 1 of a card. Further, at a short distance from such roll means 2 and the lengthwise extending web take-off or delivery axis 4, which at this location coincides with the longitudinal axis or longitudinal centerline of the card, there is provided a freely or easily rotatable roller member 5 possessing a substantially cylindrical surface, i.e., a substantially cylindrical circumferential precondensing surface. Roller member 5 is not driven, rather is freely rotatable and dragged by the web 3 and serves as a movable precondensing element or member for the web 3 in order to transform same into a precondensed or partially compacted strand of fibers 6. Furthermore, this roll or roller member 5 is advantageously adjustably positionable by means of any suitable adjustment mechanism, such as a guide slot arrangement as indicated at location 5a. After the precondensed or precompact strand of fibers 6 is sharply deflected about the cylindrical roll or roller member 5 forming a defined angle at least to one side at almost a right angle with respect to the longitudinal axis of the card to provide a relatively high degree of precondensing action over a relatively short distance, the final condensing operation occurs in a funnel member 7 and a pair of calender rolls 8. Due to the sharp deflection of the web to one side, as just discussed, the web is gathered together or collected and precondensed into the strand of fibers 6. In order to counteract any possible tendency of fringe formation or tearing of the web selvage 9 opposite the delivery side, it is possible to arrange at such side a conventional guide and support roll 10 possessing, for example, a conical surface as discussed at the outset of this disclosure with respect to the prior art. The guide and support roll 10, which, as shown, is arranged along the selvage of the web is displaceably mounted in a schematically illustrated guideslot type adjustment mechanism 10a so that its position may be varied or adjusted in accordance with the web path. In

comparison to the other embodiments of the invention which will be described hereinafter, the arrangement of FIG. 1 under consideration will be understood to constitute a very simple construction, and additionally possesses the further advantage of exhibiting an extremely short length of the equipment, thus providing a saving in floor space.

FIG. 2 illustrates a further embodiment of the invention wherein the sliver delivery axis 11 of the equipment coincides with the longitudinal axis of the card, which for convenience in illustration has not here been shown, but reference may be had to the delivery side or end 1 of the card of FIG. 1. In this modified version, two non-driven rolls or roller members 14 possessing substantially cylindrical circumferential precondensing surfaces are supported such that they are easily rotatable and arranged to both sides of the web take-off axis 11 at a short distance from the web take-off device 12 for the web 13, as clearly shown. These rolls 14 are provided for the purpose of laterally gathering together or collecting and precondensing the web over substantially its entire width, and additionally, are mounted at the schematically indicated adjustment mechanism 14a in a manner so that they are adjustable in all directions and preferably mutually with respect to one another. The desired partial compaction or partial densification of the web 3 over its entire width can be achieved by means of substantially cylindrical rolls or roller members 5 (FIG. 1) or 14 (FIG. 2) disposed at a relatively close distance from the center line of the fiber flow and as closely as possible near the take-off device at the web delivery end of the carding engine, as shown. Within certain limits, it is possible to select the spacing or distance between the rolls 14 and the web take-off device so as to be as small as desired, but for purposes of easier operation such distance is chosen just large enough that the web 13 can be easily manually guided about the rolls 14 during the drawing-in or threading operation. Consequently, both lateral edges or selvages of the web 13 in particular are deflected through a comparatively acute angle towards the lengthwise take-off axis 11 immediately after leaving the web take-off device 12, the web 13 thus being subjected to the aforementioned collecting and precondensing or precompact action. At this time, its volume is still many times greater than the volume of the sliver 16 resulting after final fiber compaction or condensation. To ensure for optimum collecting and precondensing of the web 13 into a strand of fibers 15 under as many conditions as possible, it is desirable, as mentioned above, that the rolls 14 be adjustable in their position in all directions. Furthermore, as mentioned heretofore, to prevent any possible tendency of fringe formation or tearing of the web selvages, particularly in the case of cards possessing a very large working width, it may be advantageous to provide along each of the edges or selvages of the web an adjustably positionable guide and support roll 17 having a conical surface, and the adjustment of which can be readily realized by the provision of any suitable and therefore merely schematically illustrated adjustment mechanism 17a.

The position of the precondensing rolls 14 indicated in phantom lines in FIG. 2 and the path of the selvage of the web 13 corresponding to this position of the rolls 14 represents that position of such rolls 14 where they just still exert an influence upon the web, and thus rep-

resents the minimum permissible preconditioning action.

In FIGS. 3a, 3b and 3c, respectively, there are shown different cross-sectional configurations of preconditioning roll surfaces deviating somewhat from a cylindrical shape (but which may be still considered to be encompassed by the expression "cylindrical" roller or equivalent terminology) and which configurations are suitable for the preconditioning rolls 5, 14 discussed above. It will be observed that the cylindrical-type roller 5 or 14 of FIG. 3c has a somewhat concave outer surface.

Turning now to FIG. 4, there is represented therein a still further embodiment of the inventive equipment where instead of using preconditioning rolls, there is this time provided a preconditioning member 19 in the form of a belt arranged at each side of the web. Each belt is located at two easily or freely rotatable support rolls 20 which are not driven, yet which may be positionally adjusted with the aid of any suitable adjusting mechanism indicated by reference character 20a. When working with especially large webs, it is possible to provide an additional guide and support roll 21 for each preconditioning member 19, this guide roll 21 likewise being suitably adjusted, as indicated by the adjustment mechanism 21a. Hence, the web 18 and each preconditioning belt 19 can assume the configuration or contour indicated by phantom lines in FIG. 4.

At this location it is mentioned that in connection with the alternative embodiments of inventive apparatus as depicted in FIGS. 1 and 4, respectively, it would be possible to conceive of an arrangement employing the features of both these embodiments. Thus, more specifically, it would be possible to provide at one side of the respective take-off axis 4 and 11 a cylindrical-type preconditioning roll 5 or 14 of the type shown in FIGS. 1 or 2, and at the other side of such axis a belt rotatably supported on the rolls according to the arrangement of FIG. 4 just discussed and shown in phantom lines in FIG. 1 at the left thereof. This modification is therefore equally contemplated by the teachings of the present invention and can be readily realized.

Continuing, and referring now to FIG. 5, it will be seen that at the output or delivery side 1 of the card, there is arranged a support element 22 in close proximity to and below the delivered fiber web 3. This support element or member 22, on the one hand, extends into close proximity to the pair of web take-off rolls 2 and, on the other hand, extends at least substantially across the full width of the preconditioning zone, as best recognized by referring to FIG. 6. Furthermore, the width of the support element 22 and its support area 23 may decrease in the delivery or output direction in accordance with the lateral condensation of the fiber web 3 which increases from the pair of take-off rolls 2 in the direction of and to the pair of preconditioning rolls 5.

Additionally, it is of importance that the support element 22 be arranged in such manner that its upper side or surface, functioning as the actual supporting area 23 for the fiber web, merges into the zone of action or operable zone of the preconditioning elements 5 immediately above the lower edge of such preconditioning elements, as best recognized by referring to FIG. 5. Furthermore, it has been found useful to extend the support element 22 and its supporting surface 23 in the sliver delivery or take-off direction further than the actual operable zone of the preconditioning elements 5, and under certain circumstances, into close vicinity to

the sliver condensing funnel arrangement 7, as particularly clearly depicted in FIG. 6. The manner of attachment of the support element 22 to the card frame can be realized in any suitable manner. Any impurities or other foreign contaminants possibly carried by the web can spill off over the edges of the support element 22.

Now, in accordance with a modification of the invention, this support element 22 together with its support surface 23 for the fiber web 3 can be divided in the sliver delivery or output direction, as best shown by referring to the arrangement of FIG. 7, into at least two sections or parts 22a and 22b. These support sections 22a and 22b possess the respective support surface portions 23a and 23b which preferably extend across the full width of the preconditioning zone, a gap, which has not been particularly referenced in the drawing, being formed between the two support sections and through which impurities and other foreign contaminants possibly carried by the web, such as seed particles, are dropped. It is advantageous if at least one of both support sections 22a, 22b, preferably however the support element section 22a arranged towards the web take-off device, be hingedly connected in any suitable manner, for instance as indicated by the hinge joint 22d, to for instance the card frame or the support element section 22b so that the support element section 22a is tiltably or pivotally arranged to remove impurities possibly entrained by the web. Moreover, for periodically pivoting this hingedly connected support section 22a automatically, it is possible, for instance, to provide an actuating or control device controlled by a suitable timer, all as schematically shown by reference character 24.

As has been quite surprisingly found, this arrangement brings about a further advantage in terms of a noticeable or appreciable improvement of the preconditioning action, and therefore, and in contrast to cards which are not equipped with a preconditioning device, has proven to be advantageous even if the fiber web support surface is arranged substantially horizontally since the fiber web is condensed, even though slightly, when it contacts the support element 22 at the web take-off side owing to the slight frictional resistance prevailing at the web support surface.

While for convenience in illustration the arrangement of the support element 22 has been shown and described in FIG. 7 in conjunction with a preconditioning device in the form of a pair of rolls 5, it should of course also be readily understood and recognized that this modified version of the equipment can be equally utilized in conjunction with other embodiments of preconditioning devices as heretofore described.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims. ACCORDINGLY,

What is claimed is:

1. An apparatus for forming a sliver from a fiber web produced at a card possessing a web delivery side, comprising a web take-off device arranged at the web delivery side of the card and a sliver condensing device arranged after said web take-off device and extending to both sides of the longitudinal centerline of the card, movable substantially cylindrical preconditioning means

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for forming a precondensed strand of fibers by laterally collecting and partially compacting the fiber web substantially across its entire width, said substantially cylindrical precondensing means being located in a precondensing zone for the web and disposed between said web take-off device and said sliver condensing device and in close proximity to the longitudinal axis of the card, a support element provided with a support surface for the fiber web located at the web delivery side of the card, said take-off device comprising a pair of web take-off rolls, said support element extending from said pair of web take-off rolls at least substantially across the full width of the precondensing zone be-

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tween said take-off device and said precondensing means, said precondensing means being effective at an operable zone and said support element together with its support surface merges into said operable zone of said precondensing means immediately above a lower edge of said precondensing means, said support element together with its support surface being divided into at least two support sections in the direction of travel of the web, means for pivotably mounting at least one of said support sections, and actuating means for periodically automatically tilting the pivotably mounted support section of the support element.

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