United States Patent

[11] 3,628,219

[72] Inventors Minoru Nakamura
Amagasaki-shi;
Megumi Minamibata, Takarazuka-shi;
Munetika Terao, Itami-shi; Sueo
Kawabata, Nara-shi; Masateru Nishimura,
Ichinomiya-shi; Toshio Kato, Gifu-shi;
Kazuo Yamada, Haguri-gun, all of Japan

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[73] Assignees Osaka Kiko Kabushiki Kaisha
Osaka, ;
Chuwa Wool Industry Co., Ltd.
Ichinomiya-shi, Japan

[32] Priorities Dec. 13, 1968
[33] Japan
[31] 43/91728;
Dec. 26, 1968, Japan, No. 43/96222

[54] METHOD AND APPARATUS FOR FORMING A COMBED SLIVER

4 Claims, 31 Drawing Figs.

[52] U.S. Cl. 19/231, 19/215
[51] Int. Cl. D01g 19/18
[50] Field of Search 19/115, 215, 225–233, 150

[56] References Cited

FOREIGN PATENTS

124,101	4/1878	France	19/215
937,538	9/1963	Great Britain	19/215

OTHER REFERENCES

Saco-Lowell Bulletin, April 1962, pp. 32–34

Primary Examiner—Dorsey Newton
Attorneys—Robert E. Burns and Emmanuel J. Lobato

ABSTRACT: A method and apparatus for forming a combed sliver having a preferable arrangement of component fibers so as to produce drafted sliver having uniform thickness of sliver. In the sliver-forming step according to the present invention, each component tuft of fleece delivered from a detaching roller of a comber is provided with shear of fiber end arrangement so that leading ends of individual fibers of the component tuft are substantially arranged with uniform density with respect to an axis of sliver. The sliver-forming apparatus according to the present invention is provided with means for producing shear of fiber end arrangement so as to create uniform distribution of fiber ends in the sliver and provided with an auxiliary means for effecting positive movement of fibers during the silver-forming operation.

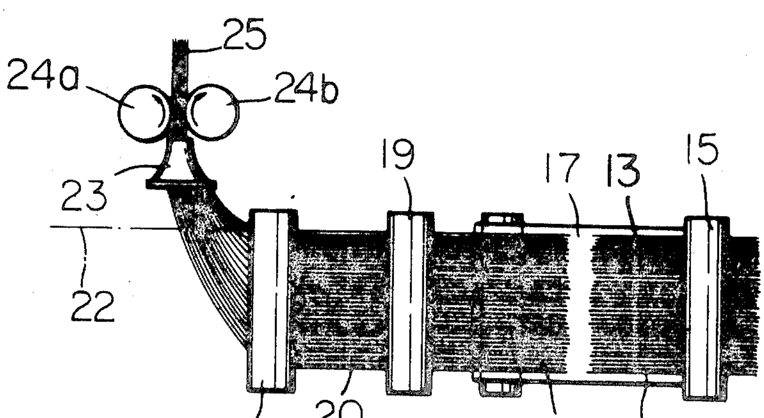


Fig. 1A

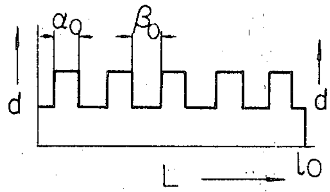


Fig. 1B

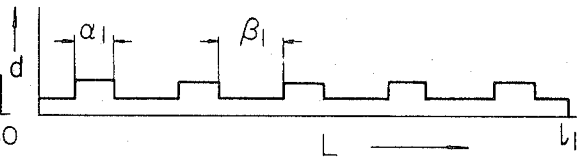


Fig. 1C

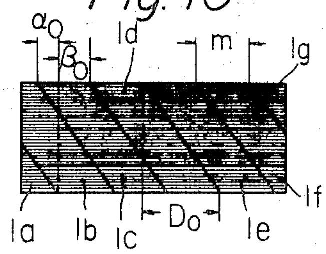


Fig. 1D

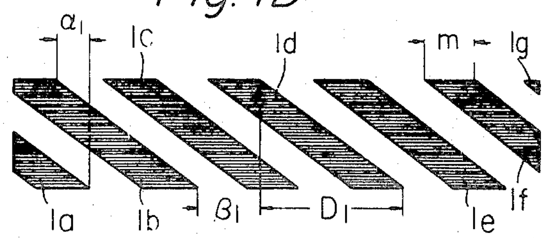


Fig. 1E

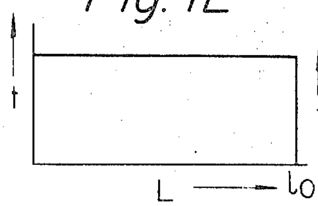
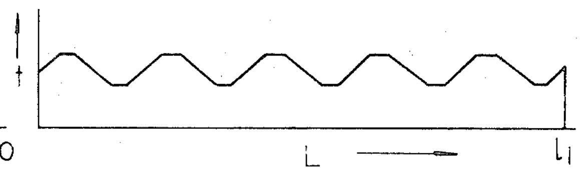


Fig. 1F



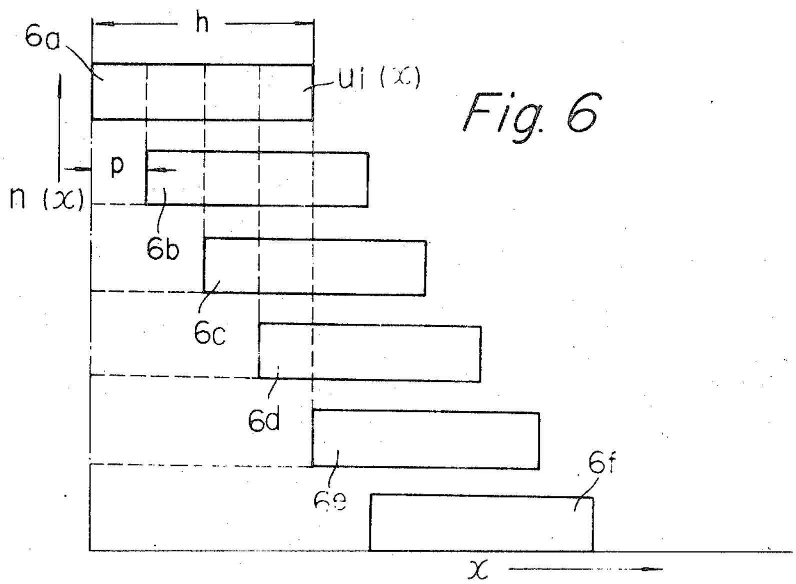


Fig. 6

Fig. 2A

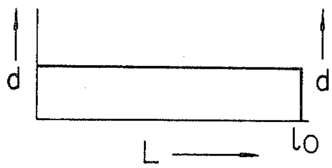


Fig. 2B

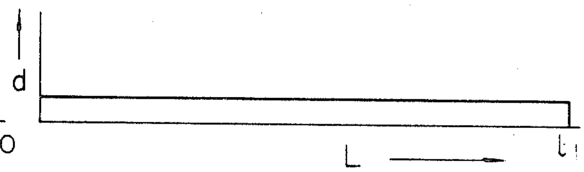


Fig. 2C

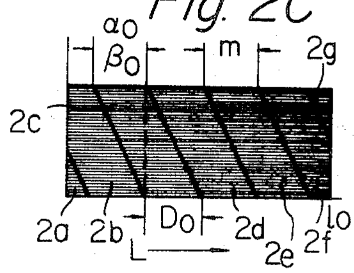


Fig. 2D

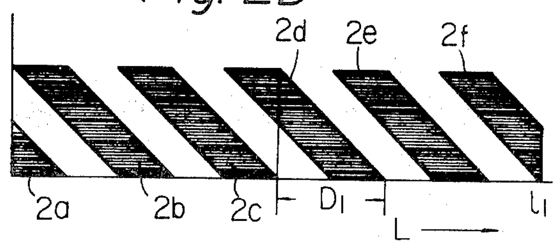


Fig. 2E

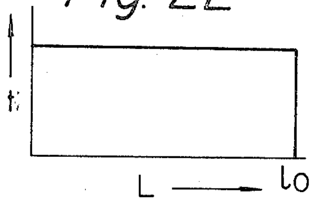


Fig. 2F

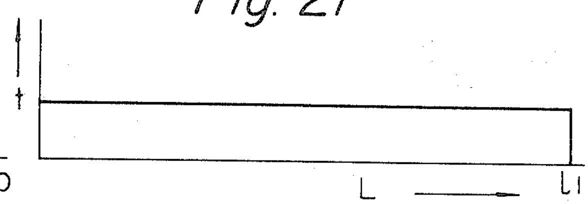


Fig. 7

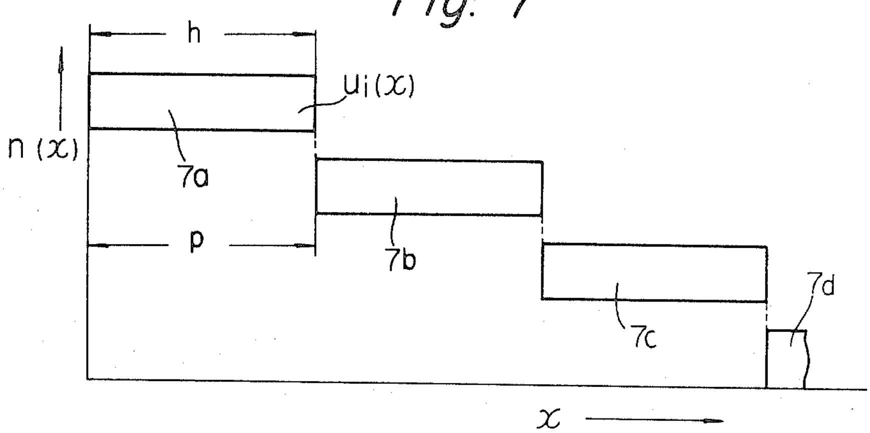


Fig. 3A

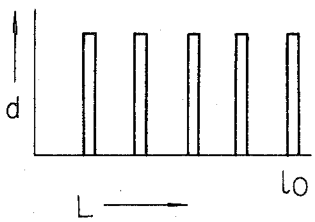


Fig. 3B

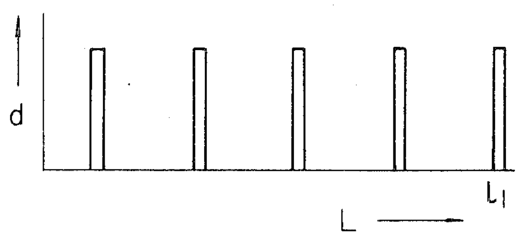


Fig. 3C

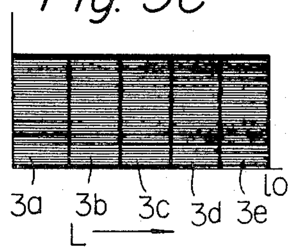


Fig. 3D

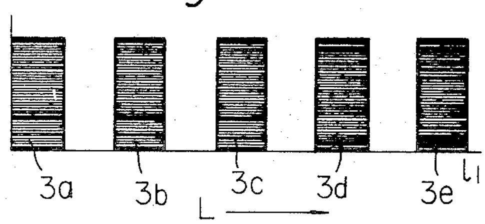


Fig. 3E

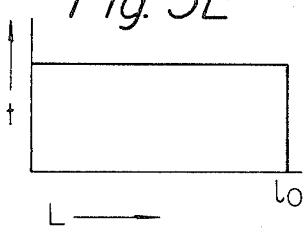


Fig. 3F

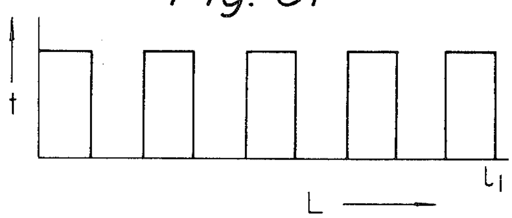
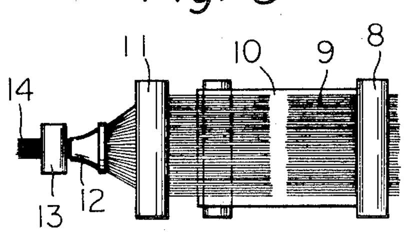
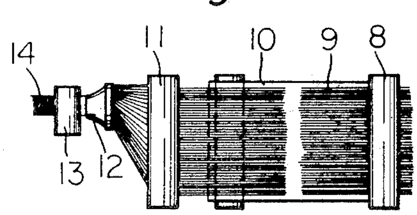


Fig. 8



(PRIOR ART)

Fig. 9



(PRIOR ART)

Fig. 4A

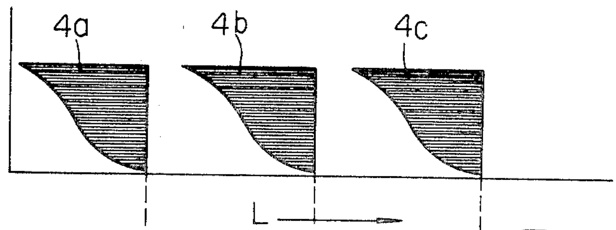


Fig. 4B

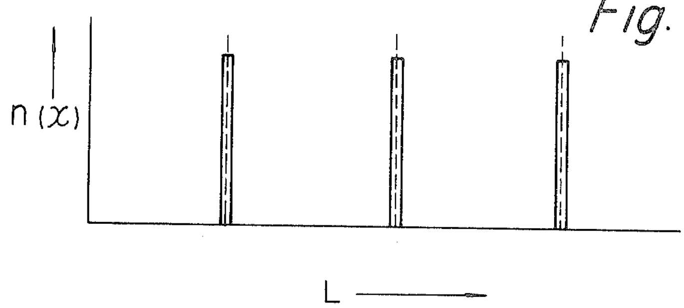


Fig. 5A

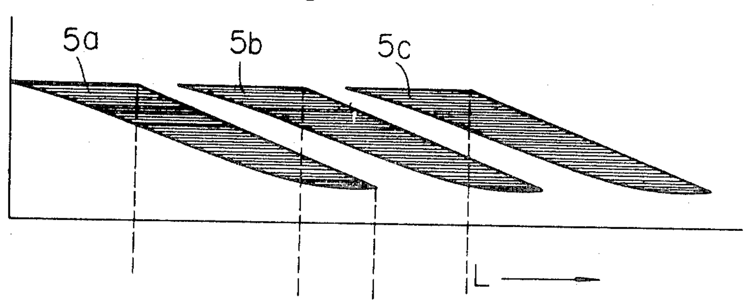


Fig. 5B

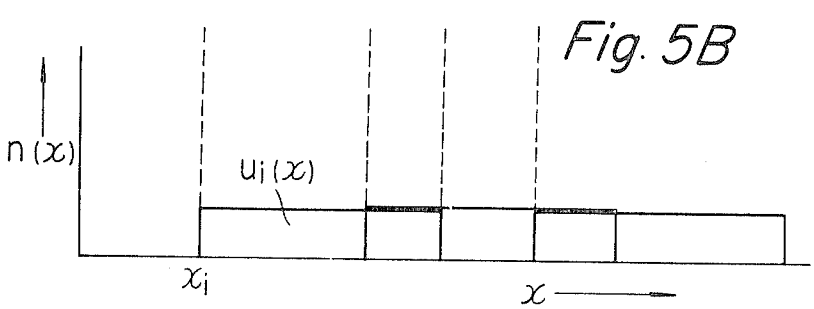


Fig. 10A
(PRIOR ART)

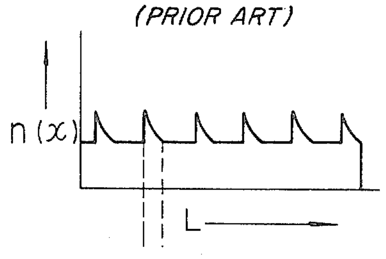


Fig. 11A
(PRIOR ART)

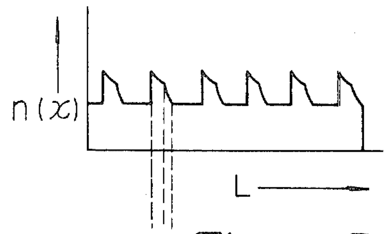


Fig. 10B
(PRIOR ART)

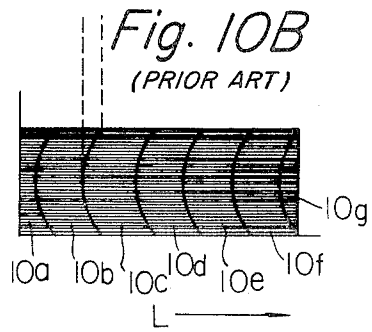


Fig. 11B
(PRIOR ART)

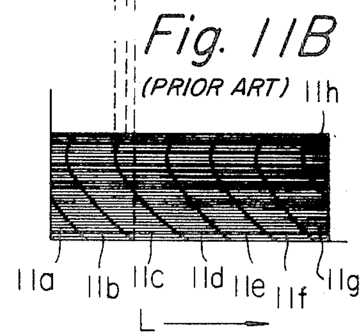
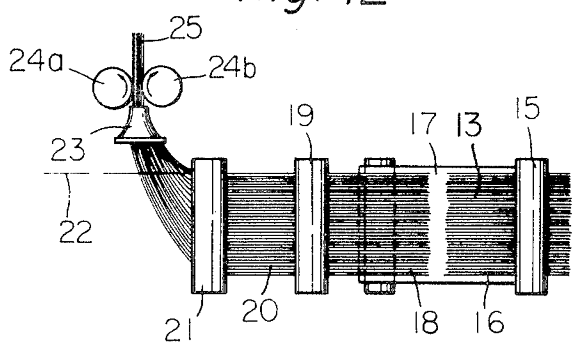


Fig. 12



METHOD AND APPARATUS FOR FORMING A COMBED SLIVER

The present invention relates to a method and apparatus for forming a combed sliver, more particularly relates to an improved method and apparatus for forming a combed sliver having a preferable arrangement of component fibers so that a uniform draft operation can be carried out in successive draft operations. In an ideal sliver, distribution of fiber end density along the sliver axis is uniform. Such a condition of the component fibers in a sliver is represented by the mentioned expression of "preferable arrangement of component fibers." If a sliver having a preferable arrangement of component fibers is subjected to a draft operation, a drafted sliver having uniform thickness and uniform arrangement of the component fibers can be produced.

Generally, weight per unit length of a sliver, or number of fibers in a cross section of a sliver or its corresponding measure is used as a measure to express an evenness of a sliver. However, even if the above-mentioned measure of a sliver is satisfied in view of sliver uniformity and the mentioned sliver is subjected to an ideal draft operation, it is doubtful that a drafted sliver having uniform thickness will be produced. The term "ideal draft operation" herein used means that moving speeds of individual fibers of a sliver is instantaneously changed from a feed speed to a delivery speed at a fixed point in a drafting field of a draft element.

By our experimental study, it is understood that, even if an ideal draft operation is applied to a sliver having uniform thickness but having irregular distribution of fiber end density along the sliver axis, an apparent irregularity in the thickness of the drafted sliver can be observed. It is no exaggeration to say that the mentioned irregularity in the thickness of the drafted sliver is inevitably produced by the ideal draft operation. Therefore, it may be understood that the most substantial factor making the sliver thickness irregular is the irregular distribution of fiber end density along the sliver axis. The present invention was developed by utilizing the above-mentioned basic principles.

Therefore, the principal object of the present invention is to provide a method and apparatus for forming a combed sliver having a uniform distribution of fiber end density along the entire length of the sliver.

Other objects and features of the invention will appear more fully from the following description and the accompanying drawings and will be particularly pointed out in the claims.

FIGS. 1A–1F, FIGS. 2A–2F and FIGS. 3A–3F are comparative diagrams of sliver geometry showing a distribution of fiber end density along a sliver axis and fiber arrangement in the sliver and thickness of sliver before and after an ideal draft operation respectively, wherein the sliver is composed of fibers having an equal staple length,

FIGS. 4A and 4B, FIGS. 5A and 5B are the similar comparative diagrams to the preceding figures, except the sliver is composed of fibers having unequal staple length,

FIGS. 6 and 7 are explanatory diagrams showing a distribution of fiber end density of a sliver produced by an apparatus according to the present invention,

FIGS. 8 and 9 are schematic plan view of a sliver-forming apparatus utilized for a conventional comber,

FIGS. 10A and 10B, FIGS. 11A and 11B are explanatory drawings of the sliver geometry showing distribution of the fiber end density and the fiber arrangement in the slivers produced by the sliver forming apparatus shown in FIGS. 8 and 9, respectively,

FIG. 12 is a schematic plan view of an embodiment of the sliver forming apparatus according to the present invention.

Before illustrating the present invention in detail, a basic idea of analyzing the construction of a sliver before and after an ideal drafting operation is hereinafter explained. In the following analysis, two basic assumptions are made. First, all fibers in a sliver are regarded as straight and arranged in a parallel condition so that any fiber is completely specified by the position of its right-hand end and its fiber length. Secondly, it is assumed that at any point of the sliver there are fibers of all lengths present in the proportion given by the frequency length curve. The mentioned analysis is referred to hereinafter as "sliver geometry." In our assumption of the sliver geometry, a tuft, which is made by dividing the sliver into components of fiber groups, contains fibers of all lengths distributed according to the frequency length curve of sliver and the sliver is represented uniquely as a succession of identical tufts following each other at very small equal intervals.

In FIGS. 1A–1F, FIGS. 2A–2F and, FIGS. 3A–3F, a sliver composed of fibers having an equal fiber length is considered. In these drawings, a fiber end density, fiber arrangement and thickness of the drafted and undrafted slivers are compared respectively, wherein conditions of the undrafted sliver are shown in the left-hand portion and conditions of the drafted sliver are shown in the right-hand portion of FIGS. 1, 2, and 3.

Referring to FIGS. 1A–F, first, an undrafted sliver represented in the left-hand portion of FIG. 1 is composed of a plurality of identical tufts 1*b*, 1*c*, 1*d*, 1*e*, 1*f*, and fractions of the tufts 1*a* and 1*g* are considered. It is noted that tufts of the undrafted sliver 1*a*, 1*b*, 1*c*, 1*d*, 1*e*, 1*f* are arranged in a slightly overlapping condition as shown in FIG. 1C. In the following illustration, the distance of this overlapping measured along the longitudinal axis of the sliver is referred to hereinafter as "overlapping shear" and total shear of each tuft is referred to as "shear of tuft." Let the overlapping shear and the shear of tuft of the undrafted sliver by α_o and D_o, respectively, while β_o is a distance between a leading point of a tuft and an end point of the second tuft ahead. When the above-mentioned undrafted sliver is drafted at a draft ratio l_1/l_o by an ideal drafting operation, the overlapping shear α_o, shear of tuft D_o and the distance β_o are enlarged as shown in FIG. 1C. These enlarged factors are designated as α_1, D_1 and β_1, respectively, and can be calculated by the following algebraic calculation, that is, $\alpha_1=\alpha_o(l_1/l_o)$, $D_1=D_o(l_1/l_o)$ and $\beta_1=\beta_o(l_1/l_o)$. As the fiber length *m* is constant in both the drafted and undrafted conditions, a constant intervened space must be considered at a position between the adjacent tufts of the drafted sliver.

Distributions of the fiber end density along the sliver axis of the undrafted sliver and the drafted sliver are represented by diagrams of fiber end density respectively shown in FIGS. 1A and 1B, wherein the ordinate represents the fiber end density (*d*) while the abscissa represents the length of sliver (L). As it is clearly shown, the diagrams of the fiber end density of the undrafted sliver and the drafted sliver are composed of a plurality of square waves repeated successively, because the tufts 1*a*, 1*b*, 1*c*, 1*d*, 1*e*, 1*f*, and 1*g* of undrafted sliver and the drafted sliver are arranged in a slightly overlapped conditions as shown in FIGS. 1C and 1D. The frequency of the mentioned square waves corresponds to the overlapped arrangement of the tufts shown in FIGS. 1C and 1D. The arrangement of the square waves after the draft operation is shown in FIG. 1D, however the magnitude of the fiber end density *d* of the drafted sliver is reduced by l_1/l_o times that of the undrafted sliver, while the overlapping shear α_1 and distance β_1 of the drafted sliver are enlarged by l_1/l_o times those of the undrafted sliver, respectively. On the other hand, with respect to the number of fibers in a cross section, in spite of having a uniform number of fibers in any cross section of the undrafted sliver as shown in FIG. 1C, the number of fibers varies along the sliver axis by the draft operation as also shown in FIG. 1D. In other words, even though the undrafted sliver has a uniform thickness, the drafted sliver has an irregular thickness as shown in FIGS. 1E and 1F wherein *t* represents "thickness of sliver."

Referring to FIGS. 2A, 2C, and 2E, the undrafted sliver having an ideal distribution of fiber end density is composed of a plurality of tufts 2*b*, 2*c*, 2*d*, 2*e*, 2*f*, and fractions of the tufts 2*a* and 2*g*, arranged in a similar way to the undrafted sliver shown in the left-hand portion of FIG. 1. However, in this case, the overlapping shear α_o and the shear of tuft D_o are respectively equal to the fiber length *m*, and an absolute distance β_o between a leading point of a tuft and an end point of a second tuft ahead is also equal to the length *m*. This particular construction of the sliver is a characteristic feature of an ideal sliver having the mentioned ideal distribution of fiber end density. A distance of the fiber end density of this ideal sliver before the drafting operation is shown in FIG. 2A and the variation of thickness of this undrafted sliver is represented in FIG. 2E. When the undrafted ideal sliver is drafted at a draft ratio l_1/l_o by an ideal draft operation, the tufts 2*a*, 2*b*, 2*c*, 2*d*, 2*e*, 2*f*, and 2*g* are subjected to a shearing action of the draft operation, and their relative arrangements are changed as shown in FIG. 2D, that is, the overlapping shear and the shear of tuft are enlarged by the drafting operation in such a condition that the overlapping shear α_1, shear of tuft D_1, the distance β_1, between a leading point of a tuft and an end point of a second tuft ahead of the drafted sliver are equal to $\alpha_o(l_1/l_o)$, $D_o(l_1/l_o)$, $\beta_o(l_1/l_o)$ respectively. It may be noted that the fiber end density diagram of FIG. 2A is simply enlarged in its length from l_o to l_1 and the magnitude of the uniform fiber end density d_o is reduced to d_1 which corresponds to $d_o(l_o/l_1)$ as shown in FIG. 2B, further, the thickness t_o of the undrafted sliver is reduced to t_1 which corresponds to $t_o(l_o/l_1)$ as shown in FIG. 2F.

If an undrafted sliver is composed of a plurality of tufts 3*a*, 3*b*, 3*c*, 3*d*, and 3*e* arranged in a condition without any overlapped portion as shown in FIG. 3C and the undrafted sliver is drafted at a draft ratio (l_1/l_o) by an ideal drafting operation, these tufts are separated from each other, in other words, it is impossible to produce a continuous drafted sliver. Supposing these tufts are arranged in a range l_1 with an equal intervened space between adjacent tufts as shown in FIG. 3D, the diagram of the fiber end density and the thickness diagram of the drafted sliver can be represented as shown in FIGS. 3B and 3F, respectively.

As it is clearly shown in the above-mentioned analysis of sliver geometry, in spite of the thickness of the undrafted slivers shown being uniform, if the distribution of the fiber end density along the sliver axis varies as shown in FIG. 1A or FIG. 3A, it is impossible to produce a drafted sliver having a uniform thickness, as shown in FIG. 1F or FIG. 3F, respectively. The only method for producing a drafted sliver having a uniform thickness is to prepare an undrafted sliver having a uniform distribution of fiber end density as shown in FIG. 2A, as a material sliver.

As a sliver delivered from a detaching roller of a comber has an analogous construction to the sliver shown in FIG. 3C, in other words, the sliver is composed of a plurality of identical tufts arranged with a little overlapping, this arrangement of tufts is rather similar to that of the undrafted slivers shown in FIG. 3C. Even though the overlapping of the tufts might be enlarged by a conventional sliver-forming apparatus so as to reform construction of the combed sliver, it has been possible only to produce a reformed sliver having an analogous construction to that of the sliver shown in FIG. 1. Therefore, it is well known that it is required to apply a successive doubling operation or operations of the conventional combed sliver for improving the distinct irregularity of thickness of the drafted combed sliver.

The basic idea of the present invention is based upon the result of the mentioned sliver geometry, in other words, the ideal construction shown in FIG. 2C must be satisfied for producing a drafted combed sliver having a uniform thickness.

Actually, the combed sliver is composed of fibers having various staple lengths. Therefore, the basic theory of the above-mentioned sliver geometry must be modified. In FIGS. 4B and 5B, sliver axes are represented by x coordinates, the ordinates represent the fiber end density $n(x)$. The fiber end density $n(x)$ is expressed by an estimated value of the number of fiber ends contained in a sliver of unit length.

According to the result obtained by the above-mentioned analysis, if the value of $n(x)$ is fixed at a constant n_o, an additional irregularity of thickness of a drafted sliver can be satisfactorily prevented. Further, when $Y(w)$ represents a spectro density of $n(x)$, where $w=2\pi/P$, P represents a wave length; the expression "$Y(w)=0$" means that there is no irregularity of the thickness of sliver.

Let the fiber end density of the tufts which are delivered successively from the detaching roller of the comber be considered as a drawing of the sliver geometry as shown in FIG. 4B and a plurality of tufts 4*a*, 4*b*, and 4*c* are arranged successively with an equal intervened space between the adjacent tufts which corresponds to P, and further, each tuft is represented by its staple diagram shown in FIG. 4A. The leading ends of the fibers in each staple diagram can be considered so arranged on a line perpendicular to the x-axis if the leading ends of each fiber tuft delivered periodically from the detaching roller is arranged on a line perpendicular to the sliver axis. The above-mentioned intervened space corresponds to an interval of the adjacent nipping operation of the comber. As it is clearly shown in the case if FIGS. 3A–3F, of the sliver composed of the above-mentioned tufts shown in FIGS. 4A and 4B is subjected to an ideal draft operation, a remarkably irregular sliver having a periodical variation in thickness is produced and it is impossible to produce a continuous sliver. However, if the arrangement of the leading ends of fibers in the tuft is changed so as to have a certain shear, for example, the leading ends in the tufts are arranged with a shear h as shown in FIG. 5A, the distribution function $n(x)$ of the fiber end density is changed as shown in FIG. 5B. Let an ordinate of a rectangular wave starting from a point x_1 on the abscissa be designated as $u_i(x)$, $n(x)$ and $Y(w)$ are represented by the following equations;

$$n(x)=d\sum_{i=-\infty}^{\infty}u_i(x)$$

$$Y(w)=\frac{2d}{\pi hw^2}(1-\cos hW)(1+2Re\sum_{t=1}^{\infty}\{e^{-jwp}\}^t)$$

$$=\frac{4d^2}{h^2w^2}(1-\cos hW)\delta\left(W-\frac{2n}{p}\pi\right)$$

$$=\frac{2d^2}{n^2\pi}\text{Sin}^2\left(\frac{n\pi h}{p}\right)\quad(n=1,2,\ldots)$$

where

$\delta(x)$ is a delta function,

d is a value of $n(x)$ of the rectangular wave. As it is clear by the above-mentioned equation, the spectro density of $n(x)$ is shown by a discrete spectrogram. Consequently, in the following condition; $h/p=m$, $m=1, 2, \ldots$, in other words when the value of the shear h is set as an integral times of the intervened space p,

$\sin^2(nabh/p)=0$, therefore

$Y(w)=0$.

The above-mentioned condition ($Y(w)=0$) means that there is no chance of causing variation of $n(x)$ so that the production of a sliver having the irregular thickness can be prevented. In the above-mentioned illustration, $n(x)$ is a sum of values of the ordinates $u_i(x)$ of a group of the rectangular waves overlapping each other which correspond to the adjacent tufts overlapping each other, wherein each tuft is provided with a shear h.

In FIGS. 6 and 7, relations between the rectangular waves and fiber end density $n(x)$ in cases of $h/p=4$, and $h/p=1$, are shown, respectively. In these drawings, the arrangement of the rectangular waves 6*a*, 6*b*, 6*c*, 6*d*, 6*e*, and 6*f*, 7*a*, 7*b*, 7*c*, and 7*d* etc. are shown in spreading-out conditions, respectively. As shown in the analysis in FIGS. 6 and 7, the fiber end density is always constant, that is, $n(x)$ is $4u_i(x)$ in the case of FIG. 6 and $n(x)$ is $u_1(x)$ in the case of FIG. 7.

When a combed sliver is drafted by an ideal draft operation, the variation of thickness of a drafted sliver can be remarkably improved by means of applying the above-mentioned results of our sliver geometry, that is

$$n(S)\int_0^{\infty}p(l)e^{-sl}dl=n_b(S)$$

where $p(l)$ represents a function of a staple diagram, $n(S)$ is a laplace transformation of $n(x)$, $n_b(x)$ represents a function of the rear end density of fibers, $n_b(S)$ is a laplace transformation of $n_b(x)$. The function $n_b(x)$ may be considered as a function of the leading-end density of fibers when a combed sliver reserved in a can is subjected to an ideal draft operation. As it is clear in the above-mentioned equation, when the value of $n(S)$ is smaller, $n_b(S)$ is also smaller.

By applying the above-mentioned conclusion of the sliver geometry, the arrangements of the fiber end in the tufts successively delivered from the detaching roller of the comber are provided with a suitable shear so as to produce uniform distribution of the fiber end density along the sliver axis and the preferable combed sliver can be produced, in other words, when the arrangements of the fiber end density in the tufts successively delivered from the detaching roller are provided with a suitable shear so that the value of shear of tuft is set as an integral number of times of the nipping interval, an ideal combed sliver can be produced. In the above-mentioned illustration, the nipping interval corresponds to a difference between distances of forward driving and backward driving of a nip roller of a comber. Consequently, when a sliver produced by a method according to the present invention wherein the above-mentioned theory is applied, it is subjected to the following drafting operation, and a very uniform sliver can be produced.

Generally, in a conventional combing operation such as shown in FIG. 8, a fleece 9 delivered from a detaching roller 8 is collected into a sliver 14 by a trumpet 12 and delivered from a delivery roller 13 after being conveyed by an apron 10 and a roller 11. The trumpet 12 is disposed at a certain position with respect to the passage of the fleece 9. As it is well known, the fiber ends of each tuft delivered from the detaching roller 8 of the comber is arranged on a line being parallel to the axis of the detaching roller 8 and the fleece composed of these tufts in accumulated by the above-mentioned trumpet 12 so that the fiber arrangement of the sliver 14 can be represented as shown in FIG. 10B, therefore the diagram of the fiber end density along the sliver axis can be represented by a diagram shown in FIG. 10A. In case the trumpet 12 is disposed at a biased position so as to provide the distribution of the fiber ends of combed sliver with a certain shear, as shown in FIG. 9, the diagram of the fiber end density along the sliver axis and the fiber arrangement in the sliver 14 are shown in FIGS. 11A and 11B.

As already discussed in the sliver models in FIGS. 1–3, these combed slivers 14 have an irregular distribution of fiber end density and therefore it is impossible to produce a sliver having uniform thickness even though an ideal draft operation is applied.

In the present invention, a particular attempt to reform the fiber arrangement in the combed fleece is made so that a sliver having the above-mentioned ideal construction is produced. A typical embodiment of the apparatus according to the invention is shown in FIG. 12. A fleece 13 is delivered from movable detaching rollers 15 (only the upper one being visible in FIG. 12) in such a way that its leading end portion is superimposed with a rearward end portion of the ahead fleece by the intermittent operation of the detaching roller 15. The intermittent operation of the movable detaching rollers 15 lay the tufts of combed fleece in overlapping relationship onto a comber apron 17 so that a continuous fleece 18 is conveyed by the comber apron 17 and delivered from a delivery roller 19 which is alternately rotating toward a leading direction of a combed fleece 18 and its reverse direction. The fleece 18 delivered from the delivery roller 19 is conveyed to a pair of feed rollers 21 which is disposed at an extended position of the passage of the fleece 18 without any bias. The rollers 21 are rotating continuously toward the leading direction of the fleece 18. The width of the feed roller 21 is equal to that of the delivery roller 19. A pair of collecting rollers 24a and 24b are disposed at an outside position biased from an elongated line 22 which coincides with an edge line 20 of the continuous fleece 18 delivered from the delivery roller 16 as shown in FIG. 12. Before the collecting roller 24a and 24b, a trumpet 23 for collecting the fleece 18 is disposed. The fleece 18 delivered from the delivery roller 19 is carried to the trumpet 23 and collected in a sliver shape, after passing through the pair of feed rollers 21. The sliver 25 thus produced is used for material sliver of the successive process. In the above-mentioned embodiment, the fleece 18 delivered from the delivery roller 19 is delivered from the feed roller 21, and the arrangement of the fiber ends in the fleece 18 is provided with a shear while carrying from the feed rollers 21 to the collecting rollers 24a and 24b. The magnitude of the above-mentioned shear is varied in accordance with the position of the collecting rollers 24a, 24b. Let K_1, K_2 be distances between a nip point (K_2 being larger in distance between a nip point of the collecting rollers 24a, 24b and the feed rollers 21) of the collecting roller 24a, 24b and both edges of the fleece 18 at the nip point of the feed rollers 21 respectively, the magnitude of the above-mentioned shear is substantially decided by difference between K_1 and K_2. Therefore, it is necessary to fix the above-mentioned shear by means of selecting the distances K_1, K_2 so as to satisfy the condition which is previously given in the illustration of the method according to the present invention. By means of providing the combed sliver with the ideal fiber arrangement as shown in the model of ideal sliver represented in FIG. 2C, a product having a uniform thickness can be produced in the successive draft operation. Further, the feed roller 21 and the collecting rollers 24a and 24b are continuously rotating during the combing operation of the comber, the above-mentioned preferable combed sliver can be continuously produced without any troubles such as distortion or tearing of the fleece 18, in spite of the intermittent combing action effected by the alternate rotations of the delivery roller 19.

By our experimental test, the collecting rollers 24a, 24b may be disposed at a position on the line 22 with restricted condition of mentioned distance K_1 is larger than the maximum staple length of the combed fleece 18 (but $K_2>K_1$) so that the same result as the above-mentioned embodiment can be obtained. This setting position of the collecting rollers is a borderline to attain the purpose of the present invention.

While the invention has been described in conjunction with certain embodiments thereof it is to be understood that various modifications and changes may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. In a method for producing a combed sliver from a continuous fleece delivered from detaching rollers of a comber, an improvement comprising: taking up a continuous fleece delivered from said detaching rollers without substantially changing the width thereof by means of a pair of rotating nip rollers, and condensing said fleece delivered from said nip rollers at a position biased outwardly from an extended edge line of said fleece being carried to said nip rollers to effect shear of the fiber end arrangement in each component tuft during formation of said combed sliver in a particular condition that said fiber ends of each component tuft are arranged uniformly in an inclined cross-sectional plane of said sliver with respect to said sliver axis and the amount of said shear is approximately equal to an integral number of times the nip distance of said carried fleece from said detaching roller, whereby a combed sliver having a uniform density of said fiber end along the entire length thereof is produced.

2. An apparatus for producing condensed sliver in a combing machine comprising: advancing means including a pair of rotationally driven feed rollers for advancing a combed fleece composed of numerous overlapped tufts of fibers along a longitudinal axis; condensing means for receiving the combed fleece from said feed rollers and condensing same into a condensed sliver; means locating said condensing means at a position biased outwardly from an extended edge line of said fleece delivered from said feed rollers to effect shear of the fiber end arrangement in each component tuft formation of said combed sliver in an inclined cross-sectional plane of said sliver with respect to said sliver, and the value of said shear

being approximately equal to a whole number multiple of the nip distance of said combing machine, whereby a combed sliver having a uniform density of fiber ends along the entire length thereof is produced.

3. An apparatus according to claim 2; wherein said condensing means comprises a tapered, open-ended guide member through which the combed sliver travels, said guide member having a divergent end facing said longitudinal axis receptive of the combed sliver and a convergent end through which the condensed sliver exits.

4. An apparatus according to claim 3; wherein said feed rollers extend perpendicular to said longitudinal axis.

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