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METHOD OF AND APPARATUS FOR PARALLELIZING AND BLENDING TEXTILE FIBERS

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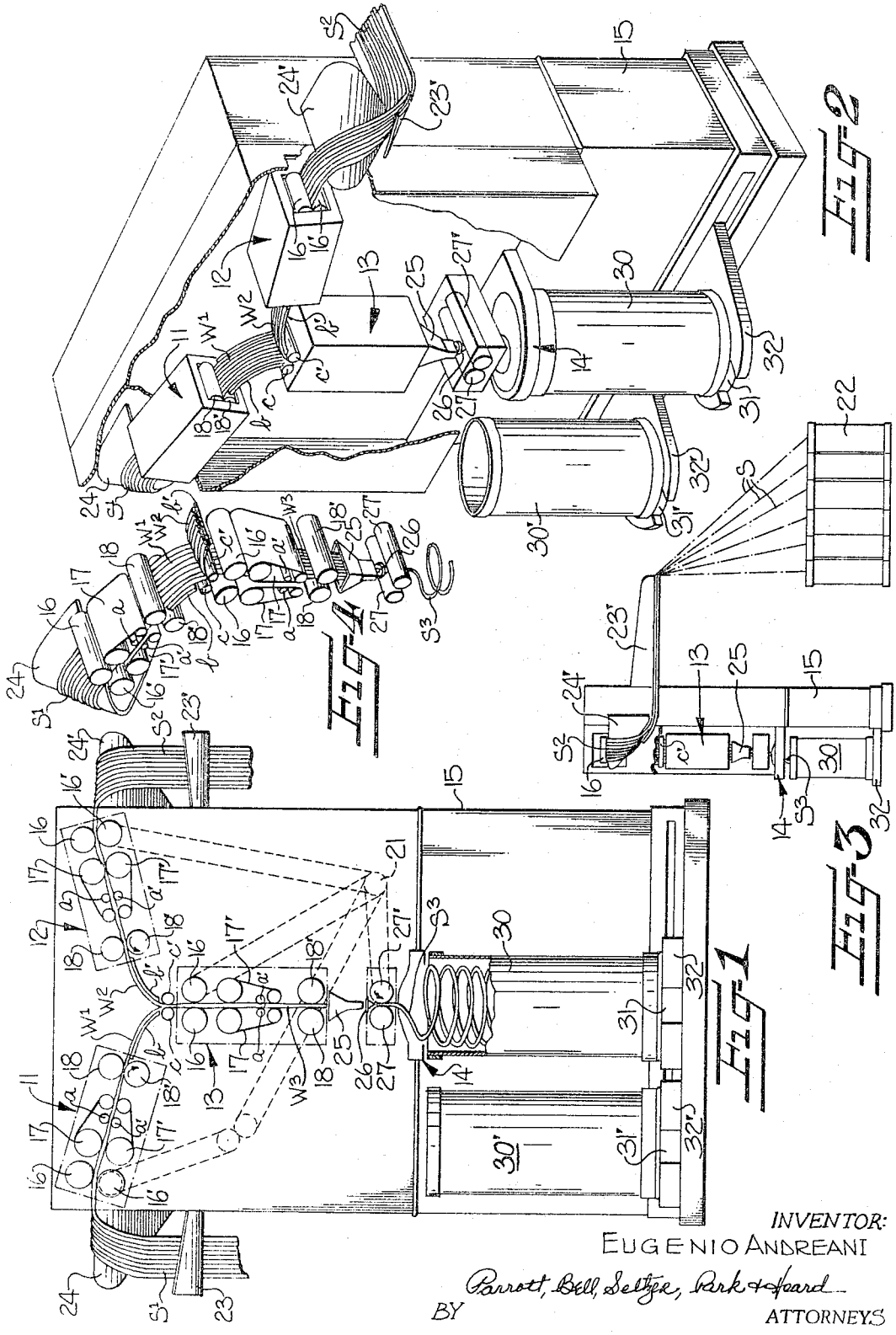


FIG. 1

FIG. 2

FIG. 3

FIG. 4

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METHOD OF AND APPARATUS FOR PARALLELIZING AND BLENDING TEXTILE FIBERS

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This invention relates to a method of and apparatus for drafting wool, cotton and/or man-made textile fibers in sliver form to obtain, with a small amount of drafting, a degree of blending, parallelization and straightening of fibers heretofore unobtainable to my knowledge.

The term "sliver" as used herein means a loose, soft, untwisted strand, rope or tow of wool, cotton and/or man-made textile fibers such as are delivered from cards, drawing frames, and the like and is not to be confused with rovings, yarns or other twisted strands such as are delivered from fly frames, spinning frames, twisters or other machines which process fibers subsequent to the final processing of the fibers in the production of sliver.

In the normal processes employed heretofore for parallelizing and straightening the fibers of the slivers, a single or multiple drafting system has been used which delivered the slivers through condensing organs to sliver cans. Such systems, depending upon the most convenient number, are coupled, alined or otherwise disposed to form a series of drawing frames which draft a number of slivers in single or multiple doublings to obtain a single sliver. This sliver so obtained is ready to be processed on a roving frame, spinning frame, twister frame and/or similar machines. Such prior drafting systems have required different drawing frames making different drawing frame passages; i.e., the several slivers drafted on each drawing frame were condensed into a single sliver which was doubled with other slivers in subsequent drafting and, depending upon the ultimate size of sliver desired, the resultant sliver was, in each instance, about the same as or above or below the weight per unit length of each sliver fed into the corresponding drawing frame. In other words, in many instances the draft was substantially equal to the number of slivers fed to each drawing frame. As is generally known, the greater the draft imparted to some textile fibers the more the strength thereof is reduced and, thus, the lower the quality of the sliver.

In order to obtain slivers of good quality from slivers coming directly from carding machines, it is an object of this invention to provide an apparatus and method for drafting textile fibers in which two groups of slivers are passed and drafted through separate primary drafting zones; i.e., one drafting zone for each group of slivers, with the groups of slivers each issuing from the respective drafting zones in web form, and wherein the two webs are united into a single composite web, preferably by arranging them in sandwiching or superposed relationship, and the fibers of the composite web are blended and further parallelized and straightened by passing the single web through a final or secondary drafting zone. Thereafter, the composite web is condensed into a sliver and coiled into a can for subsequent processing. All three drafting zones are embraced in a single drawing frame.

It is to be noted that this method effects an initial or primary drafting, parallelizing and straightening of the fibers in each of the two groups of slivers and a final or secondary drafting, blending, parallelizing and straightening of the fibers of the composite web formed by doubling the initially drafted webs, so that the total draft to which the resulting sliver has been subjected may be divided between the primary and secondary drafting zones.

In processing two groups of twelve slivers each through respective separate primary drafting zones and then doubling the resulting webs and drafting the composite web thus formed through a secondary drafting zone, a maximum required draft of 24 may be obtained by applying, for example, to the slivers a draft of 6 at each of the primary drafting zones, and applying a draft of 4 to the composite web at the final drafting zone so the fibers actually are subjected to a total draft of 10 (6+4) with only two successive passages of the fibers through corresponding drafting zones.

To obtain a sliver by conventional processes of a quality comparing favorably with that produced according to my method, it has been necessary heretofore to subject the same types of fibers to at least four drawing passages, wherein generally a draft substantially equal to the number of slivers being fed was employed at each drafting zone. Thus, the prior art system would require four separate drawing frames and, if 12 slivers were fed to each drawing frame, it follows that a total draft of about 48 will have been imparted to the fibers from the time they entered the first drawing frame to the time they were formed into a single sliver at the fourth drawing frame. Even then the fibers will not have been blended as homogeneously as they are according to my method, it being well known that two fibrous superposed webs become interblended much more efficiently during drafting than several parallel slivers.

Further, while my improved system would require a minimum of only 25 coiler cans in processing 24 slivers (24 cans at the creel and one can at the coiler), the comparable prior art method required a minimum of 85 coiler cans (12 cans at each creel, 12 cans for successively receiving slivers from each of the first three drawing frames and one can for receiving the sliver from the fourth drawing frame).

In the drawing frame of the present invention, no piecing up of slivers normally is required from the time the card slivers enter the primary drafting zones until they are coiled as a single sliver into the coiler can. Conversely since each drafting zone of the prior art system forms each group of slivers into a single sliver, the slivers from twelve cans, for example, must be joined to the trailing ends of slivers entering each successive drawing frame thereafter. Such joining or piecing up of the slivers is deleterious to the slivers, it is time-consuming and requires considerable space for the creels in back of each of the four drawing frames.

It is another object of this invention to provide a drawing frame including two opposed primary drafting zones and a substantially vertical secondary drafting zone spaced below the delivery rolls of the primary drafting zones, with means for guiding two fibrous webs from the primary zones into juxtaposed relationship and to the secondary drafting zone and wherein the total draft to be imparted to the slivers being fed to the primary zones in producing a single sliver delivered from the secondary zone is predeterminedly distributed among all the drafting zones in an expeditious manner according to the character of the fibers and the size or weight per unit length of the resulting sliver.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which

FIGURE 1 is a schematic front elevation of a preferred embodiment of my improved drawing frame;

FIGURE 2 is a perspective view of the drawing frame with parts broken away for purposes of clarity with individual, optional, enclosures enclosing the drafting zones;

FIGURE 3 is a right-hand side elevation of the drawing frame with parts broken away; and

FIGURE 4 is a fragmentary perspective view of one of the primary drafting zones and the secondary drafting zone.

Referring more particularly to the drawing, the new and novel drawing frame for carrying out the method of the present invention comprises a pair of substantially opposed primary drafting zones or deliveries **11**, **12**, a substantially vertically disposed secondary drafting zone or delivery **13** and a coiler head **14**, all of which are suitably mounted on the front portion of a frame or cabinet **15**. Each delivery **11**, **12**, **13**, may be of known construction. However, since the method of this invention is improved by applying a slip-draft to the fibers, it is preferred that each delivery is of the type disclosed in the pending application of Gianfranco Andreani, Ser. No. 385,689, filed July 28, 1964, and entitled, Double Apron Drafting System for Drawing Frames.

Each delivery comprises a pair of feed rolls **16**, **16'**, a pair of intermediate rolls or double aprons **17**, **17'**, which are arranged for the parallelization and control of the fibers, and a pair of delivery or draft rolls **18**, **18'**. One of the rolls of each pair is positively driven by suitable drive means within cabinet **15** and including a motor **21**. The other roll or apron of each pair is rotated by contact with the fibers passing between the rolls and aprons.

In order to impart a slip-draft to the fibers in their passage through the drafting zones **11**, **12**, **13** and thereby provide for effective control and blending of the fibers, the proximal runs of each pair of aprons **17** are engaged by a pair of control rollers *a*, *a'*, which lightly press together corresponding portions of the belt runs and the fibers therebetween.

Textile slivers S directly from carding machines, are drawn from cans **22**, representing a creel, and are separated into two sliver groups S^1, S^2, each of which generally would include from four to sixteen slivers and which pass over suitable guides **23**, **23'**, and then pass upwardly and partially around respective deflectors **24**, **24'**, which are so curved as to effect a smooth or gradual transition of the path of the slivers from a forward movement to a lateral movement. The sliver groups S^1, S^2, then enter the respective primary deliveries **11**, **12**, so each sliver group is drafted independently of the other to blend, parallelize and straighten the fibers thereof. As is usual the effective surface speeds of the rolls **16**, **16'**; **17**, **17'**; **18**, **18'**, of each delivery **11**, **12**, **13**, increase progressively in that order according to the amount of draft to be imparted to the corresponding fibers passing therethrough.

The sliver groups S^1, S^2, issue from the primary deliveries **11**, **12**, in the form of respective broad, flat, soft primary webs W^1, W^2, of fibers. The primary deliveries may be suitably supported in horizontal positions on frame **15** but preferably are positioned at slight angles along converging planes, as shown in FIGURE 1, to assist in guiding primary webs W^1, W^2, into juxtaposed relationship so they are united as they converge over a pair of arcuate guide plates *b*, *b'*, and are drawn and compressed between a pair of intermediate calender rolls *c*, *c'*, to the second delivery **13**, in the form of a composite secondary web W^3. Either or both of the intermediate calender rolls *c*, *c'*, may be suitably driven from motor **21** at about the same effective surface speed as, or slightly above the effective surface speed of, draft rolls **18**, **18'**, of primary dliveries **11**, **12**. The nips of the rolls of secondary delivery **13** preferably are on a vertical plane about halfway between the primary deliveries **11**, **12**.

It is important to note that the fibers do not issue as slivers from each primary delivery **11**, **12** but, instead, they are in the form of webs so that when doubled and passed through the secondary delivery **13**, they are blended uniformly and to an extent which cannot be obtained when drafting parallel slivers under similar conditions. Also, although two primary deliveries or drafting zones are employed, each sliver group S^1, S^2, is subjected to only one drafting passage so that all the fibers are subjected only to two drafting passages in order to reduce the two sliver groups to a single sliver.

The composite web W^3, emerges from the lower end of secondary delivery **13** as a broad, flat web of efficiently blended, highly parallelized and straightened fibers which are condensed through a web condenser **25**, of flattened funnel-like form. From the web condenser the fibers are pulled through a sliver condenser or trumpet **26** of appropriate size by a pair of final calender rolls **27**, **27'**, one of which is driven by suitable connections with motor **21**.

Calender rolls **27**, **27'** direct the final sliver S^3, to the rotating coiler head or tube gear **14** which functions, in a well-known manner, to coil sliver S^3, into a coiler can **30** rotating upon a rotary turntable **31**. Coiler head **14** and turntable **31** may be driven from motor **21**. In this instance, turntable **31** is shown mounted on a shiftable support **32** which is shifted automatically, by suitable mechanism within cabinet **15**, upon can **30** being filled with sliver.

A coiler can **30'**, turntable **31'** and support **32'** may be provided adjacent support **32**. Support **32'** shifts turntable **31'** and can **30** with support **32** to position can **30'** beneath coiler head **14** as can **30** is shifted away from beneath coiler head **14**, and vice versa, upon successive cans being filled with sliver. Since the means for shifting the supports **32**, **32'** forms no part of the present invention, further details and description thereof is deemed unnecessary.

It is thus seen that I have provided a novel drawing frame including three drafting zones so arranged as to obtain sliver of good quality by drafting initially two independent groups of slivers or doublings and then uniting the webs formed of the two sliver groups and drafting them as a composite web which is condensed thereafter into a final sliver. Such arrangement provides for multiple parallelization, blending and straightening of the fibers with a minimum of handlings and a minimum of attenuation of the fibers which reduces the breaking of fibers and thereby increases the strength of the slivers and products made therefrom as compared to the strength of similar slivers processed in a conventional manner.

The present invention also permits higher carding machine production as slivers of greater weight per unit length can be readily reduced to final high quality sliver of substantially lesser weight with only two drafting passages of the slivers on a single drawing frame. Usually the size of each sliver coming from a carding machine is about the same size as the final sliver to be obtained by doubling and drafting a plurality of card slivers. As an example of how this invention lends itself to higher carding machine production and assuming that the desired weight of the final sliver S^3 is to be 50 grains per yard, the slivers from the carding machine may weigh 70 grains per yard. Now, if twelve 70-grain slivers are fed to each primary delivery **11**, **12**, a draft of 6 may be imparted thereto in forming the webs W^1, W^2. Thus, each web W^1, W^2 would weigh about 140 grains per yard and the resulting composite web W^3 would weigh 280 grains per yard before drafting the same. The composite web then need be drafted further only 5.6:1 to obtain a 50-grain sliver therefrom. Thus, it follows that the final sliver, which is of good quality, has only been subjected to a total draft of 11.6.

The method of this invention not only applies to the processing of like fibers such as cotton, but also is applicable to the blending of two or more different types of fibers. It has been found that, in instances in which about 50% of the slivers were synthetic and 50% of the slivers were cotton, for example, they were blended so homogeneously that it was extremely difficult to distinguish the cotton fibers from the synthetic fibers. In the conventional method of drafting described heretofore, on the other hand, the fibers in the core of the slivers are not worked as effectively as in the present method, so that the cotton fibers of a similar textile sliver were easily distinguished from the synthetic fibers. It is apparent that this

method also is applicable to the blending of fibers of different colors.

In the drawing and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A drawing frame for forming a sliver by drafting two groups of textile slivers and uniformly blending the same, said drawing frame comprising

(a) first and second primary drafting means defining substantially horizontal drafting zones for drafting the two groups of slivers and delivering the same as thin flat webs, said first and second drafting means having the delivery ends thereof disposed in opposed relation,

(b) means convergingly extending from points immediately adjacent the delivery ends of said primary drafting means to a termination point therebetween for supporting and convergingly guiding the webs during their travel from said primary drafting means with opposite side edges of each web being maintained generally parallel,

(c) secondary drafting means defining a substantially vertical drafting zone having an entry end disposed immediately beneath said point of termination of said web supporting and guiding means and extending below said primary drafting means for receiving and blendingly drafting the webs as a composite web,

(d) a pair of rotatable calender rolls disposed between said point of termination of said web supporting and guiding means and said secondary drafting means for forming said webs into a composite web and for directing the composite web to said secondary drafting means, and

(e) means disposed below said secondary drafting means for condensing the drafted web into a sliver and for coiling the sliver in a can.

2. A drawing frame according to claim 1, wherein said web supporting and guiding means comprises a pair of curved plates convergingly extending downwardly from the delivery ends of said first and second drafting means.

3. A drawing frame according to claim 1, wherein said web supporting and guiding means are of substantially the same effective length and direct the webs in downwardly converging relation with their corresponding side edges in substantially common vertical planes to guide the webs toward juxtaposed relation with their corresponding side edges in alignment, and said secondary drafting means is centrally disposed between said primary drafting means whereby the paths of travel of the webs from said primary drafting means to said secondary drafting means are of substantially the same length to facilitate uniform blending of the webs together.

4. A drawing frame for forming a sliver by drafting two groups of textile slivers and uniformly blending the same, said drawing frame comprising

(a) first and second primary drafting means defining substantially horizontal drafting zones for drafting the two groups of slivers and delivering the same as thin flat webs, said first and second drafting means having the delivery ends thereof disposed in opposed relation,

(b) secondary drafting means defining a substantially vertical drafting zone extending below said primary drafting means for receiving and blendingly drafting the webs as a composite web, said secondary drafting means including means for imparting a slip draft to the composite web for enhanced blending of the fibers in the drafted web,

(c) a pair of rotatable calender rolls disposed between said primary and secondary drafting means for forming said webs into a composite web and for directing the composite web to said secondary drafting means, and

(d) means disposed below said secondary drafting means for condensing the drafted web into a sliver and for coiling the sliver in a can.

5. A drawing frame according to claim 4, wherein said first and second primary drafting means also include means for imparting a slip-draft to the webs during the drafting thereof.

6. A drawing frame according to claim 5, wherein each of said primary and secondary drafting means comprises front and rear pairs of cooperating drafting rolls and an intermediate pair of aprons disposed between said front and rear pairs of drafting rolls and operatively associated therewith for imparting a slip-draft to the fibers passing therethrough.

7. A method of draftingly blending groups of slivers comprising

(a) feeding first and second respective groups of slivers through first and second primary drafting units arranged in horizontal opposing relation while drafting the groups of slivers and delivering the same as corresponding first and second webs,

(b) directing the webs generally downwardly from the drafting units in converging paths of travel to a point therebetween into juxtaposed substantially aligned relation to form a composite web therefrom,

(c) initially blending together the composite web components by calendering the composite web,

(d) downwardly directing the calendered composite web in a generally vertical path of travel through a secondary drafting unit while blendingly drafting the composite web, and

(e) condensing the thus drafted composite web into a sliver and coiling the sliver in a can.

8. A method according to claim 7, including guidingly supporting the first and second webs substantially throughout their paths of travel from the primary drafting units to the secondary drafting unit to facilitate the continuous passage of the webs from the primary drafting units to the secondary drafting unit.

9. A method according to claim 7, including imparting a slip-draft to the composite web as the same is being drafted in the secondary drafting unit to provide enhanced blending of the fibers in the web.

10. A method according to claim 9, including imparting a slip-draft to the groups of slivers as the same are being drafted in the primary drafting units.

11. A method according to claim 7, wherein the first and second webs are directed into juxtaposed substantially aligned relation along paths of travel of substantially the same length while maintaining their corresponding side edges in substantially common vertical planes to facilitate blending of the webs together.

12. A drawing frame for forming a sliver by drafting two groups of textile slivers and uniformly blending the same, said drawing frame comprising

(a) first and second primary drafting means defining substantially horizontal drafting zones for drafting the two groups of slivers and delivering the same as thin flat webs, said first and second drafting means having the delivery ends thereof disposed in opposed relation,

(b) means convergingly extending from points immediately adjacent the delivery ends of said primary drafting means to a termination point therebetween for supporting and convergingly guiding the webs during their travel from said primary drafting means with opposite side edges of each web being maintained generally parallel,

(c) secondary drafting means defining a substantially vertical drafting zone having an entry end disposed immediately beneath said point of termination of said web supporting and guiding means and extending

below said primary drafting means for receiving and blendingly drafting the webs as a composite web,

(d) each of said primary and secondary drafting means comprising front and rear pairs of cooperating drafting rolls and an intermediate pair of aprons disposed between said front and rear pairs of drafting rolls and operatively associated therewith for imparting a slip-draft to the fibers passing therethrough, and

(e) means disposed below said secondary drafting means for condensing the drafted web into a sliver and for coiling the sliver in a can.

13. A drawing frame for forming a sliver by drafting two groups of textile slivers and uniformly blending the same, said drawing frame comprising

(a) first and second primary drafting means defining substantially horizontal drafting zones for drafting the two groups of slivers and delivering the same as thin flat webs, said first and second drafting means having the delivery ends thereof disposed in opposed relation,

(b) secondary drafting means defining a substantially vertical drafting zone extending below said primary

drafting means for receiving and blendingly drafting the webs as a composite web,

(c) said primary and said secondary drafting means each being independent of each other and being alike, and

(d) means disposed below said secondary drafting means for condensing the drafted web into a sliver and for coiling the sliver in a can.

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