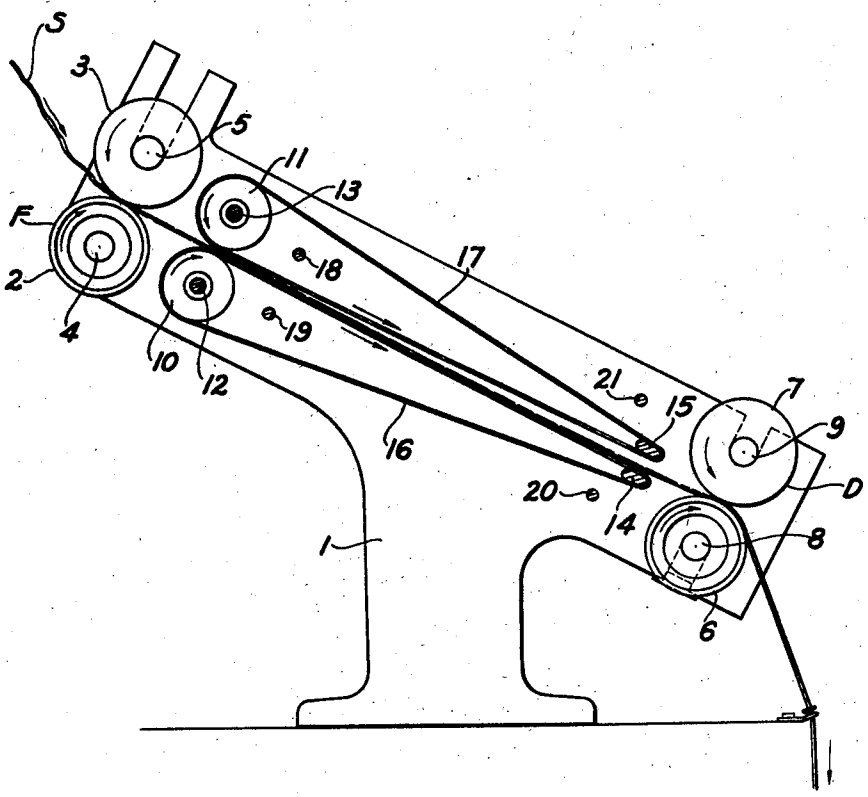
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YARN DRAFTING PROCESS

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YARN DRAFTING PROCESS

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1 Claim. (Cl. 19—131)

This invention relates to the drafting of yarn slivers or rovings, and more particularly, to an improved method of and mechanism for the drafting of slivers containing staple fibers of widely varying length.

As is well known, before a staple fiber yarn composed of either synthetic or natural fibers can be converted into a yarn or thread suitable for weaving and similar textile operations, it must be so treated that the individual fibers are closely matted or interlocked and twisted to give the material the required degree of tensile strength. In practice, a sliver or roving of relatively loosely associated staple fibers of considerable bulk or thickness is subjected to a drafting operation in which the sliver or roving is pulled out or, as it is said, "drafted" and subsequently twisted.

One method of drafting is to run the material between two sets of contacting rolls, one of which operates at a higher peripheral velocity than the preceding set, whereby the staple fibers are pulled out longitudinally with respect to one another in such manner that the diameter of the sliver is reduced and the material subsequently or simultaneously twisted. In one of the forms of carrying out this method known as the Casablancas system two substantially parallel endless belts are employed between the first set of rolls, usually known as the feed rolls and the second set of rolls, known as the delivery rolls. Each of these endless belts is carried over a roll and the two rolls are so positioned that the belts come in contact with one another at that point and pinch the yarn material between them.

The usual practice in drafting a sliver with this mechanism is to feed the sliver through the feed rolls, then between the pinch of the contacting belts and finally between the delivery rolls. The drafting action, that is the pulling out of the sliver in this system, takes place exclusively between the delivery rolls and the point where the belts contact and pinch the sliver.

It is also well known that natural fibers, such as wool and cotton vary in length and that it is rather difficult to produce a uniform yarn from a sliver containing staples of widely varying length, particularly if the material contains a relatively large proportion of short staples. In recent years, the production of staple fiber yarns from synthetic materials, such as viscose, and cellulose organic derivatives such as cellulose acetate, has come into vogue. While it is a relatively simple matter to obtain uniformity of staple length by simply cutting the filaments to the desired lengths, such material still has to be subjected to various operations such as opening, carding, drawing, spinning and the like and these operations tend to give the yarn a non-uniformity of staple length. Such processes also have the disadvantage that they are discontinuous. More recently, a continuous process of obtaining staple fiber yarns by stretch breaking a continuous filament yarn has been proposed. One of the pioneer processes of this type is that covered by the Lohrke Patent 1,883,384. Both the stretch breaking process and the above-mentioned processing steps of the prior art, when applied to such synthetic staples invariably gives a yarn of widely varying staple length which is difficult to draft on the textile machinery now employed for this purpose. It is common knowledge in the textile art that the longer the staple, the stronger the yarn and that yarns composed of staples of relatively uniform length will possess greater strength than yarns composed of fibers of varying length. In order to reduce the number of short staples, it is necessary to subject a non-uniform yarn to a combing process.

Under ordinary circumstances and with the use of known textile machinery, it is impossible to obtain a yarn from material containing fibers whose length vary from ½ to 15 inches. If, for example, it is attempted to spin a yarn containing such widely varying staple lengths, it will be found to be very uneven, full of slubs and bunches and having a very low breaking strength. When such uneven yarn is twisted into a finished yarn, the twist will be concentrated at the thinnest places, causing the yarn to be weak at those points.

This invention has as its principal object to provide a process whereby a natural or synthetic yarn sliver composed of staple fibers of varying length may be converted into a strong spun yarn. A further object is to provide a process for the drafting of a sliver of natural or synthetic staple fibers of varying staple length in such manner as to eliminate the necessity of combing or carding operations and to produce a strong, dense, even, spun yarn. A still further object is to provide textile drafting machinery for the production of such yarn. A specific object of the invention is to produce a strong, even yarn without the use of a comber or any device that would remove short staples from the yarn and to produce a yarn that can be easily processed, although it may contain staple lengths from ½ to 15 inches or longer. Other objects will appear hereinafter.

These objects are accomplished by the following invention, which, in its broader aspects, comprises the discovery that a strong, dense, uniform, spun yarn may be produced from a sliver or roving composed of fibers of widely varying staple length, if, during the drafting operation, the sliver is subjected to a treatment which, not only serves to support the short fibers and keeps them parallel during this operation, but also serves to actually force them into the body of the sliver as the drafting proceeds. More specifically, my invention is distinguished from the above-mentioned prior art drafting processes by virtue of the fact that the sliver in my process is not drafted between the feed rolls and the pinch of the belt rolls, as in the prior art, but between the feed rolls and the delivery rolls. According to my invention, the belts of the drafting device are spaced slightly apart, do not pinch the yarn and perform, not a drafting function, but (1) support the shorter fibers and (2) since they are operating at a greater surface speed than the feed rolls, but at the same speed as the delivery rolls, serve to push the shorter fibers into the roving. These features of my invention will be more readily understood by reference to the accompanying drawing and the following detailed description.

The single figure of the drawing is a diagrammatic elevational view in partial section of a conventional type of spinning frame which has been modified in accordance with my invention and illustrating the manner in which a yarn composed of fibers of varying staple length is treated in accordance therewith.

My invention will be more readily understood by reference to the drawing in which the numeral 1 designates the frame of a standard drawing frame commonly employed in the textile industry to draft a sliver of staple fibers in the production of spun yarn. This spinning frame comprises two sets of rolls F and D which may be conveniently referred to as the feed rolls and the delivery rolls, respectively. The feed rolls comprise bottom roll 2 and top roll 3, mounted, respectively, on shafts 4 and 5 which in turn are mounted in appropriate bearings, not shown, secured to the drawing frame. The bottom roll 2 has a fluted metal surface and drives the top roll 3 which latter has a cork or leather surface.

The roll 3 is so positioned with respect to roll 2 that a yarn sliver S may pass between the rolls. Any suitable tensioning device may be employed for regulating tension between these rolls. The distance between the centers of the shafts of the two rolls may be adjusted in known manner to provide for the drafting of slivers of varying bulk or thickness.

Similarly, the delivery rolls D comprise the bottom roll 6 and the top roll 7, mounted in the drawing frame on shafts 8 and 9, as in a manner similar to that employed for feed rolls F. Roll 6 is a fluted metal roll which drives leather or cork-covered roll D. As in the case of delivery rolls F, provision may be made for adjusting the tension and distance between centers of rolls 6 and 7.

As shown, the drawing frame is also provided with a third set of rolls composed of rolls 10 and 11 mounted adjacent to delivery rolls F on shafts 12 and 13, respectively. The numerals 14 and 15 designate guide bars positioned adjacent to the delivery rolls D. The rolls 10 and 11 are provided with leather or felt belts 16 and 17, these belts being disposed loosely around the respective rolls and around the guide bars 14 and 15, as shown. The numerals 18, 19, 20, and 21 indicate rods for holding the opposite frame plates (not shown) in position and for securing together a plurality of drafting units. As is well known in the art, these spinning frames are composed of a relatively large number of such drafting units which operate simultaneously from a common source of power. Inasmuch as the general construction of these spinning frames and the power drive is well known, and since these details have no particular bearing upon the instant invention, no discussion or illustration thereof is given.

Each of rolls 10 and 11 is driven in the direction indicated by the respective arrows by an appropriate source of power, not shown. In accordance with the invention, the rolls 10 and 11 are spaced apart at such a distance that there is no contact between the two belts 16 and 17. Furthermore, in operation there is no pinching of the sliver between these rolls and their respective belts and therefore no draft takes place at this point.

The operation of the device will be apparent from a consideration of the drawing. The sliver S containing fibers of widely varying staple length, say anywhere from ½ inch to 15 inches, is fed between the bite of rolls 2 and 3 from which it is conveyed between the belts 16 and 17 to the bite of rolls 6 and 7 and thence to an appropriate twisting device, not shown. In accordance with the invention, the surface speed of rolls 6 and 7 is greater than the surface speed of rolls 2 and 3, thus providing for drafting and reducing the sliver. The particular ratio of speeds of the two sets of rolls will of course depend upon the amount of draft desired and various other factors well known to those skilled in the art of textile spinning. It should be noted at this point that in the drafting of a sliver of natural or synthetic fibers of widely varying staple length, extreme difficulty is encountered unless provision is made for maintaining the continuity of the sliver and for combing out the shorter staples. In accordance with present practice, it is necessary to carry such a sliver containing varying staple lengths through a number of relatively expensive combing operations.

In operating in accordance with my invention, the actual draft takes place between the feed rolls and the delivery rolls. The belts 16 and 17 driven by rolls 10 and 11 as shown, serve to support the sliver as it passes from the feed rolls to the delivery rolls. It is to be particularly noted that the surface speed of the rolls 10 and 11 and therefore the surface speed of the belts 16 and 17 is maintained the same as the surface speed of the delivery rolls D and that the sliver is not pinched between the rolls 10 and 11 since there is no contact between them or their respective belts as previously pointed out. In other words, no drafting of the sliver takes place between the feed rolls F and the belt rolls 10 and 11. The function of the belts 16 and 17 is two-fold, namely, to support the sliver during drafting and to provide a means of condensing the sliver by keeping the short fibers in a line which is substantially parallel to the length of the sliver and of pushing such short fibers into the body of the sliver as it is drafted.

At this point, it should be particularly pointed out that my process, while in general similar to one form of the well-known Casablancas system of long draft spinning, is nevertheless specifically

distinguished therefrom by the fact that no drafting of the sliver takes place between the feed rolls and the belt rolls 10 and 11, but exclusively between the feed rolls and the delivery rolls, the belts 16 and 17, while supporting the sliver, also performing an entirely different function than in the Casablancas system.

While I find it desirable to employ two belts, such as 16 and 17 of the drawing, I may employ a single belt. In this case, it is preferable to use the belt in the lower position, that is, carried around roll 10 and guide bar 14. The surface speed of the belt is, as previously described, the same as the surface speed of the rolls 6 and 7.

From the above, it will be seen that I have provided a method and means for the conversion of slivers or rovings of natural or synthetic staple fibers containing fibers ranging from very short lengths to relatively long lengths into strong, even, dense spun yarn. By providing a method in which the shorter staples are condensed into the main body of the yarn undergoing drafting, I have made possible the elimination of weak spots and bunches in the yarn. My method and improved mechanism also provides the important advantage of permitting the sliver or roving to be supported and condensed during the principal drafting step itself, a feature which is totally absent from the prior art practice.

It should also be noted that an outstanding advantage of my invention is the fact that it is particularly adaptable to the drafting of slivers or rovings of stretch-broken fibers produced in processes such as the stretch-breaking process above referred to. Its particular value in this case is because of the fact that rovings of stretch-broken fibers contain staple lengths, ranging all the way from very short lengths to quite long lengths and it has been found that it is practically impossible to draft a sliver or roving of this type satisfactorily by the prior art practice. By employing the above-described mechanism and procedure, on the other hand, one may draft such rovings with complete success.

What I claim is:

The process of drafting a sliver containing textile staple fibers ranging from very short to relatively long lengths to produce a strong, even, spun yarn, which comprises subjecting the sliver to draft between feed rolls and delivery rolls spaced apart at a distance greater than the length of the longest fiber and supporting the sliver for a major portion of its run between said feed and delivery rolls on a conveyor, and running the delivery rolls and the conveyor at substantially the same rate and faster than the feed rolls whereby the draft on the sliver takes place between the feed and delivery rolls, and whereby the conveyor travels faster than the sliver it is supporting so that the conveyor tends to compact particularly the shorter fibers into the sliver in a parallel relationship to the length of the sliver.

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