

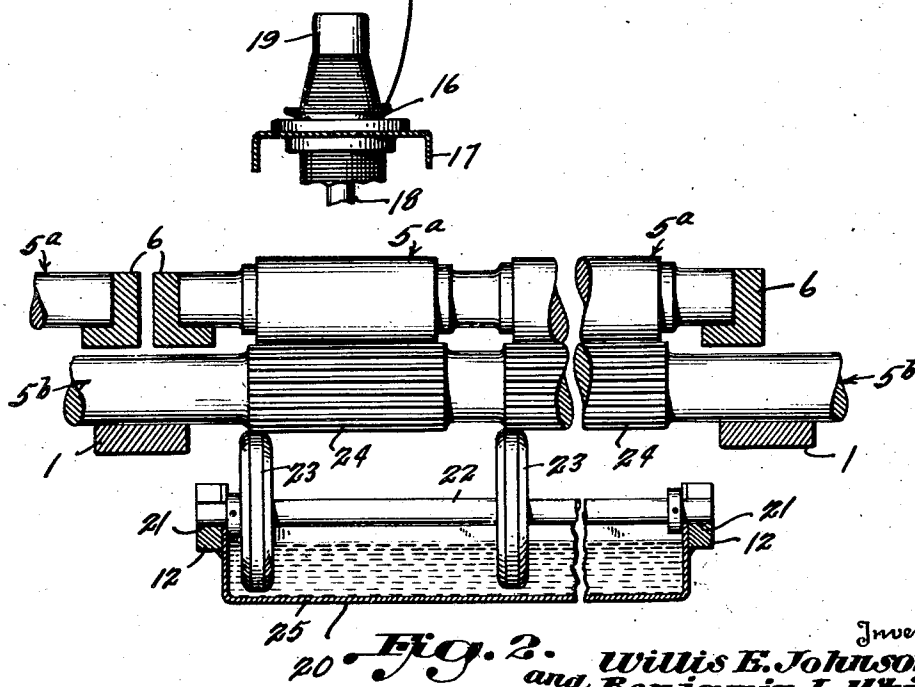
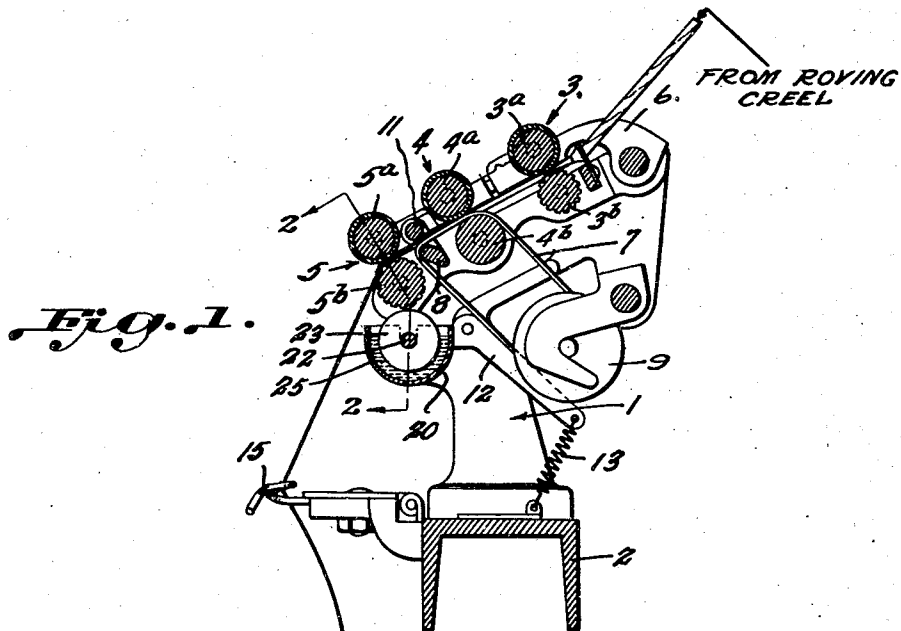
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SPINNING OF COTTON YARN

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SPINNING OF COTTON YARN

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1

This invention relates to the spinning of cotton yarns, and more particularly to a method and apparatus for wet spinning of cotton fibers to produce a yarn of increased strength and improved appearance.

Yarn may be defined as a twisted strand of fibers which has received its final attenuation and is produced today almost exclusively by ring spinning. A great variety of yarns are spun, each having its own characteristics of strength, flexibility, etc., depending upon the purpose for which the yarn is to be used. In the production of all yarns, however, three major factors are considered, usually in the following order: First, strength which is required in all yarns; second, the appearance of the yarn; and third, the efficiency of the spinning operation.

It is well known that the strength of the yarn is not dependent so much upon the strength of the cotton fibers but primarily upon the amount and degree of interengagement of these fibers in the yarn. Cotton fibers have a natural cohesive quality which is a factor in the ability of these fibers to spin. Because of this cohesive quality, obviously the greater the amount of surface engagement between two adjoining fibers the greater the force necessary to draw them apart. This is clearly shown by the fact that a stronger yarn is produced from the long staple cotton than one produced from a shorter staple cotton of equal fiber strength.

Long staple cotton, however, is expensive and therefore not used in the manufacture of yarns except for special purposes and to obtain yarn of maximum strength from the shorter staple lengths care is taken to first arrange all of the fibers parallel to one another and twist them together in this condition.

While the drawing rolls of a ring spinning frame straighten and arrange the fibers parallel to each other in the drawn strand, and this condition maintains as long as the fibers are gripped by the drawing rolls, the machine does not provide for controlling the fibers after they have left the front drawing rolls and before they are twisted into the yarn. As a result many of the fiber ends and often appreciable portions of their length are not laid into the twist but protrude outwardly from the yarn and thereby preclude obtaining the potential strength of the yarn.

Besides reducing the potential strength of the yarn, failure of the fiber ends to be laid into the twist also detracts from the appearance of the yarn. While appearance is of secondary importance in yarns for some purposes, a good

2

appearance is always desirable and is of great importance in yarns such as are used in the production of high quality threads and many types of fabrics which must present a smooth lustrous surface.

The strength of the yarn, particularly the strength of the strand being twisted into the yarn, is also a material factor in the efficiency of the spinning operation. Breaks in the strand almost invariably occur just forward of the front drawing roll before the fibers are sufficiently twisted into the strand to give it strength. When a break occurs it is necessary for the operator to join together the broken ends before the spinning operation can be continued. This not only decreases the output of the machine per unit time but also increases the labor necessary to operate the machine. Under normal operating conditions it is customary to allow from 5% to 10% in calculating the efficiency of a spinning frame because of the stops necessary to the broken ends. Also when a break occurs, the roving continues to be drawn through the rolls and waste accumulates until the operator is able to repair the broken end.

Then too, lack of control of the fibers from the time when they are released from the nip of the drawing rolls until they are twisted into the yarn produces an abundance of lint and fly which accumulates in and about the machine and which must be periodically removed. This likewise serves to lower the operating efficiency of the spinning frame.

It has been proposed to overcome the above defects of cotton spinning by spinning the yarn with the fibers in a wetted condition to increase the cohesion between fibers to maintain their aligned relationship while being twisted into the yarn. The advantages to be gained by wet spinning have been long recognized but the means heretofore suggested for wetting the fibers have been defective especially in connection with modern spinning machinery. Such a system is shown in Patent 18,461 to Lister and Warburton who propose first passing the roving through a water bath prior to processing in the spinning frame. The defect of such a system, however, is readily apparent if the principle involved in drawing and the action of the drawing rolls is considered.

Drawing rolls, by means of which a roving is reduced to the required size for the yarn, are arranged in pairs—usually three—operating at successively increasing surface speeds from the back to the front rolls. The roving is passed

between these sets of rolls, a slowly revolving set gripping and feeding the fibers to a faster moving set which grip the more advanced fibers and draw them away from those still gripped by the slower moving rolls. In this way the original fiber mass of the roving is drawn out into a new strand of reduced diameter. In the more modern form of standard draft system, where the middle rolls are unweighted or light weighted, and in long draft systems which provide a draft zone considerably in excess of the fiber length, free relative movement of the fibers must be allowed to prevent breaking or bunching which would produce a non-uniform strand. It can therefore readily be seen that if the roving were drawn wet, as proposed, the strong cohesion between fibers would inhibit the necessary uniform slip and the desired uniform arrangement of fibers could not result.

It is therefore one of the principal objects of this invention to provide a system of spinning which will not only produce a yarn of improved appearance, but will produce a yarn of increased strength without the sacrifice of flexibility and by increasing the strength of the yarn to thereby increase the efficiency of the spinning operation.

Another object of this invention is to provide an improved method of spinning cotton yarn in a ring spinning frame whereby the roving is drawn in a dry condition and the twist imparted to the drawn strand while the strand is wet.

Yet another object of the invention is to provide a method and apparatus for spinning cotton yarns in which substantially the entire length of all of the fibers composing the yarn are twisted thereto.

A further object of the invention is to provide a method and apparatus for the wet spinning of cotton yarns in a ring spinning frame in which moisture is applied to the strand of fibers as it passes between the front drawing rolls of the frame.

A still further object of this invention is to provide a method of spinning cotton yarns in a ring spinning frame which materially increases the strength of the drawn strand and thereby increases the operating efficiency of the spinning machine.

Another object of the invention is to provide a cotton yarn in which the full length fibers composing the same are entirely twisted into the yarn to thereby increase the strength and improve the appearance of the yarn.

A still further object of the invention is to provide a system of wet spinning of cotton yarn which will overcome the defects of prior practice and which may be readily and economically adapted with little change to the various types of existing spinning frames.

To accomplish these and other important objects and advantages the invention consists in the procedural steps and the parts and combinations hereinafter set forth.

In the accompanying drawing which is referred to in the following specification and is employed to illustrate one means for carrying the invention into practical effect:

Figure 1 is a sectional view of a portion of a ring spinning frame with apparatus associated therewith applying moisture to a drawn strand of cotton fibers in accordance with this invention; and

Figure 2 is a sectional view, partly broken away, taken along the line 2-2 of Figure 1.

Referring now more particularly to the draw-

ing, there is shown one means for carrying the invention into practical effect. In Figure 1 there is somewhat diagrammatically illustrated a long draft frame which is supported on the roll beam 1 of a ring spinning frame. The drawing frame comprises essentially a roll stand 2 which supports three sets of drawing rolls, namely back rolls 3, middle rolls 4 and front rolls 5. The lower rolls 3b, 4b, and 5b are journaled in the stand proper while the cooperating upper rolls 3a, 4a and 5a are journaled in, and held in contact with the bottom rolls by means of a cap bar 6. The bottom rolls are geared together by gears (not shown) having a ratio to impart to the rolls successively increasing surface speeds from the back to the front rolls.

Carried over the middle lower roll 4b is a transport apron 7 which passes forwardly over a nose bar 8 positioned immediately behind the front bottom roll 5b, thence downwardly and rearwardly over an idle sheave 9 carried by pivoted supporting arms 10. This apron 7 is driven by the middle rolls and serves to transport the fibers from the middle to the front rolls, the fibers being controlled by the loose nip between the apron and a small control roll 11, carried by a special cap bar, between the middle and front upper rolls.

The upper rolls are smooth surfaced, usually being covered with leather or a suitable composition material having sufficient friction property to provide the necessary grip for the fibers. The lower back and front rolls 3b and 5b are longitudinally fluted. In the standard frame an additional nap-covered scavenger roll is journaled in the forward end of arms 12, pivoted to the stand 2 in a manner to contact the bottom front roll 5b, contact being maintained by spring 13 tensioned between the rear ends of the arms 12 and the stand 2. The purpose of this scavenger roll is to take up the broken end of a strand when a break occurs.

The roving is brought downwardly from the roving creel (not shown) and passed through a throat 14 secured to the roll stand just behind the back rolls 3 and aligned with the nip of these rolls. From the throat 14 the end of the roving is fed between the drawing rolls. As the roving is fed forwardly by a slow moving set of rolls to a faster moving set, the fibers will be drawn out longitudinally to one another, straightened and arranged into a smaller strand in the form of a ribbon of parallel fibers having very little tensile strength. This strand is led through a thread guide 15, supported by the roll beam 1. From the guide, the strand is led through the traveler of the spinning ring 16 which is mounted on the ring rail 17 of the machine and thence to a bobbin 18 mounted on, and for rotation with, a spindle 19. The spindle rotates rapidly about an axis aligned directly below the eye of the guide 15 and imparts a rotation to one end of the fiber strand while the opposite end is held against rotation by the grip of the front drawing rolls 5a and 5b. Thus a twist is imparted to the strand which progresses up the strand from the ring to the rolls 5a and 5b and spirally intertwines the fibers and strengthens the yarn. At the same time the yarn is wound on the bobbin.

As above set forth, the fibers will be arranged in parallelism by the drawing operation and will maintain this condition while controlled by the drawing rolls. From the time that they emerge from the front rolls, however, until they are twisted into the yarn they are uncontrolled and because of air currents, static conditions which

5

are present around all operating machines, and other reasons, the fiber ends will tend to fly away from the strand as they emerge from the nip of the front rolls. To overcome this condition we propose to moisten the fibers at the back nip of the front rolls 5a and 5b to obtain an increased coherence between the fibers and assure their complete interengagement while being twisted into the yarn and yet in no way interfere with the normal drawing operation.

One means for carrying the invention into effect is shown in the drawing and comprises a semi-cylindrical trough-shaped tank 20 which is preferably secured between the arms 12 which normally support the scavenger roll of the drawing frame.

Extending longitudinally of the tank 20 and journaled in the scavenger roll bearings 21 is a shaft 22 which carries a plurality of disc-like rollers 23, one for each boss 24 of the lower front rolls 5b. As in the case of the scavenger roll, the springs 13 will urge the rollers 23 into contact with and be rotated by the front bottom rolls 5b. Preferably the rollers 23 are positioned on their shaft to engage the front rolls adjacent one end of the bosses 24 and are designed with a narrow peripheral surface to give a small surface contact with the roll. While the scavenger roll supporting arms 12 provide a convenient support for the tank 20 and journals for the roller shaft 21, other suitable points of attachment may be employed.

Within the tank 20 is a body of liquid 25 which will be carried up by the revolving rollers dipping therinto, and transferred onto the bosses 24 of the rolls 5b. The liquid will be deposited onto the ends of the roll bosses and will spread in a substantially thin film over the surface, aided by the flutings of the roll. As the drawn cotton strand passes over the moistened roll, and since the strand passes between the rolls in a thin ribbon, all of the fibers will become moistened.

It has been found advantageous in many wet treatments of cotton threads and fabrics to employ a solution of a wetting agent as the wetting liquid and it is within the concept of this invention to use, as the liquid 25, an aqueous solution of a suitable wetting agent to aid spreading the liquid evenly over the roll bosses and fibers and to effect a better penetration of the drawn strand. The concentration of the solution will of course depend upon the condition of the cotton and the wetting agent used, and may vary from about .5% to as high as a 3% concentration.

It is highly important that the cotton fibers be thoroughly and completely moistened to attain the desired result, but it is equally important that the yarn as wound on the bobbin not contain an excess of water which might cause the yarn to mildew during storage. By this invention an optimum wetting is obtained and it has been found that the whirling action of the yarn balloon, between the thread guide and spindle, will dry the yarn to just a slightly damp condition—approximately the condition desired for "setting" the twist into the yarn.

In the above connection newly spun yarns tend to untwist, snarl and kink when tension on them is released. This condition sometimes is objectionable and may result in defects during the subsequent operations. In some instances yarn is subjected to a "rest period" to set the twist requiring special equipment which is expensive to operate and maintain. Furthermore, the process is time-consuming. By means of this inven-

6

tion, however, such difficulties and treatments are done away with and thereby a material saving is effected both in production costs and time.

From the above it will be seen that not only will a stronger yarn and a better appearing yarn be produced by the present methods, but subsequent operations will be made more simple. This invention actually produces a greater yardage per unit weight of roving by virtue of the fact that the whole fiber length is actually utilized to impart strength to the yarn and therefore, less fibers are needed to produce a given strength.

The precise procedural steps of the process herein described and the parts and combinations of the apparatus shown and described for carrying the process into practical effect are disclosed by way of illustration only of a preferred embodiment of the invention and it must be understood that various changes may be made therein by those skilled in the art, without departing from the spirit of the invention or from the scope of the appended claims.

We claim:

1. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, wetting the drawn strand at the end of the drawing but prior to twisting, and then twisting the wetted strand to form the yarn.

2. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, wetting the drawn strand with an aqueous solution of a wetting agent at the end of the drawing but prior to twisting, and then twisting the wetted strand to form the yarn.

3. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, wetting the drawn strand with an aqueous solution containing from .5% to 3% of a wetting agent at the end of the drawing but prior to twisting, and then twisting the wetted strand to form the yarn.

4. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, wetting the drawn strand with a 2% solution of a wetting agent at the end of the drawing but prior to twisting, and then twisting the wetted strand to form the yarn.

5. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, passing the drawn strand at the end of the drawing but prior to twisting in contact with a wetted surface, and then twisting the strand to form the yarn.

6. A method of spinning cotton yarns comprising drawing a roving strand to reduce the same to required yarn size, applying an aqueous solution of a wetting agent to a surface, passing the drawn strand at the end of the drawing but prior to twisting over the wetted surface, and then twisting the strand to form the yarn.

7. A method of spinning cotton yarns comprising arranging cotton fibers into a strand thereof wherein the fibers lie parallel one with the other, applying moisture to the fibers to effect cohesion therebetween and the end of the drawing but prior to twisting, and then imparting a twist to the strand of cohering fibers to form a yarn whereby substantially the entire lengths of said fibers are laid into the twist of the yarn.

8. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, a reservoir containing a liquid, and means for transferring liquid from the reservoir to the front drawing rolls

for wetting the strand as said strand passes between the front drawing rolls.

9. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, and means for transferring liquid from the reservoir to one of the pair of front drawing rolls for wetting the strand as said strand passes between the front drawing rolls.

10. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, one roll of said pairs being fluted, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, and means for transferring liquid from the reservoir to the fluted roll of the front pair of drawing rolls for wetting the strand as said strand passes between the front drawing rolls.

11. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, and a roller member partially immersed in said liquid, said roller member being adapted to peripherally engage the lower of the front pair of drawing rolls for transferring liquid from the reservoir to said roll to thereby wet the strand passing between said front pair of drawing rolls.

12. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, a roller member partially immersed in said liquid, said roller member being adapted to peripherally engage the lower of the front pair of drawing rolls for transferring liquid from the reservoir to said roll to thereby wet the strand passing between said front pair of drawing rolls, and resilient means urging the roller member into engagement with the said lower roll.

13. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing roving to a required size strand of fibers prior to spinning the same into yarn, one roll of said pairs being fluted, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, a rotatable disc member partially immersed in the liquid and peripherally engaging the fluted roll of the front pair of drawing rolls for transferring liquid from the reservoir to the fluted roll to thereby wet the strand as said strand passes between the front pair of drawing rolls.

14. In a spinning frame having a plurality of pairs of drawing rolls for progressively reducing

roving to a required size strand of fibers prior to spinning the same into yarn, one roll of said pairs being fluted, a reservoir containing a liquid positioned adjacent the front pair of drawing rolls, a rotatable disc member partially immersed in the liquid and peripherally engaging the fluted roll of the front pair of drawing rolls adjacent one end thereof for transferring liquid from the reservoir to the fluted roll to thereby wet the strand as said strand passes between the front pair of drawing rolls.

15. A method of spinning cotton yarns in a ring spinning frame comprising applying a liquid to the front drawing rolls of said frame whereby a drawn strand will become wetted during passage between said rolls, and twisting the strand into yarn while in the wetted condition.

16. A method of spinning cotton yarns in a ring spinning frame comprising continuously transferring liquid in small quantities from a source thereof to the lower front drawing roll of said frame whereby a drawn strand will become wetted during passage between said rolls, and twisting the strand into yarn while in the wetted condition.

17. A method of spinning cotton yarns in a ring spinning frame comprising applying an aqueous solution of a wetting agent to the front drawing rolls of said frame whereby a drawn strand will become wetted during passage between said rolls, and twisting the strand into yarn while in the wetted condition.

18. In a method of spinning cotton yarns which comprises drawing a cotton roving to reduce the same to required yarn size in the form of a ribbon of parallel fibers and then twisting ribbon to form the yarn, the step of wetting the ribbon at the end of the drawing but prior to twisting.

19. A method of spinning yarns comprising drawing a roving strand to reduce the same to required yarn size, wetting the drawn strand at the end of the drawing but prior to twisting, and then twisting the wetted strand to form the yarn.

20. A method of spinning yarns comprising arranging fibers into a strand thereof wherein the fibers lie parallel one with the other, applying moisture to the fibers to effect cohesion therebetween at the end of the drawing but prior to twisting, and then imparting a twist to the strand of cohering fibers to form a yarn whereby substantially the entire lengths of said fibers are laid into the twist of the yarn.

21. A method of spinning yarns in a ring spinning frame comprising applying a liquid to the front drawing rolls of said frame whereby a drawn strand will become wetted during passage between said rolls, and twisting the strand into yarn while in the wetted condition.

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