July 3, 1962 E. FEHRER 3,041,817

YARN MAKING PROCESS

Filed Oct. 28, 1958

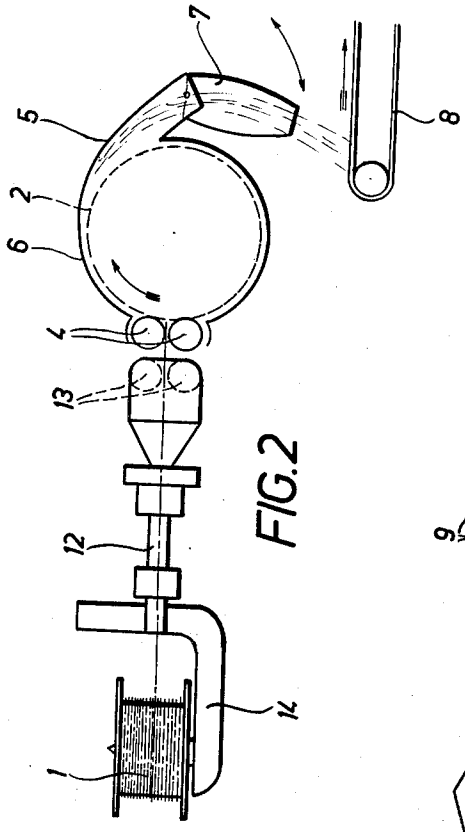


FIG.2

FIG.1

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United States Patent Office

3,041,817
Patented July 3, 1962

3,041,817

YARN MAKING PROCESS

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Filed Oct. 28, 1958, Ser. No. 770,104
Claims priority, application Austria Nov. 9, 1957
6 Claims. (Cl. 57—156)

The spinning of thin yarns, about 1 mm. to 6 mm. in diameter which serve as starting material for making carpets, mats, ropes, cords or the like, from coco fiber, sisal fiber, or other hard fibers having a short fiber length and similar textile properties had previously to be performed by hand. Machine spinning was not possible because the specific properties of the material prevented the formation of a sufficiently thin and narrow fiber web of sufficient uniformity and internal coherence which would be fed to the spinning machine.

Whereas known feeding devices for spinning machines automatically withdraw the material from a container and, with the aid of a measuring or weighing device, ensure that equal quantities of material are uniformly distributed on a conveyor belt for forming the web, the web supplied by such feeding devices can be spun only to coarse yarns of relatively large diameter, approximately 10 mm., so that the desired aim is not achieved. To modify the dimensions of the known feeding devices to provide a relatively thin yarn at the end of the operation is impractical because the modification would require an extremely sensitive measuring and weighing device and the machine would be uneconomical owing to an insufficient output rate. It is obvious that the usually permissible tolerance of +0.5% in the uniformity of the web and yarn can be maintained much more easily in the case of larger weights than where small units are to be measured. The individual fibers are very light in weight, and an air draft may be sufficient to cause substantial weighing errors which lead to a non-uniform web and yarn of varying thickness.

It is not possible to form a roving from the loose material which roving may be stored on spools or in cans prior to drawing, as is the general practice in spinning mills, even when processing certain hard fibers having a larger staple length than those with which this invention is concerned. The brittleness, short staple length and low adherence of the individual coco fibers preclude the formation of a transferable, unspun roving and a subsequent drawing operation.

It is also impractical to divide a web of uniform width (sliver) formed by a carding engine or the like into several individual strips and to feed each strip to a spinning station. The bond between the individual fibers within the sliver is insufficient to prevent disintegration of the strips when the sliver is divided.

The process according to the invention enables the mechanical manufacture of thin yarns from coco fibers or the like which were previously capable of being spun into fine yarns by hand only.

In the process according to the invention, a coarse spun yarn is fed by feed rollers to a carding drum and is disintegrated into individual fibers by the carding drum rotating at high speed. The fibers are scattered by an oscillating chute on a conveyor and are thus caused to form a fiber web, which is conveyed at a speed which is higher than the feeding speed of the coarse yarn.

The fiber web is then spun to form the end product and is wound up. The coarse yarn can readily be produced on a machine. If the aforementioned known feeding device is used together with the spinning machine the spun yarn may have a thickness of, e.g., 10 mm. and good uniformity. When this coarse yarn is carded and the carded fibers are discharged onto a conveyor belt leading

to a spinning station, a fiber web will be obtained which is much narrower and thinner than the web formed before the first spinning because the lateral scattering of a carding drum supplied with a yarn is very small and a stretching of the material is obtained because the speed of the conveyor belt succeeding the carding drum is higher than the speed at which the material is fed to the carding drum. The fiber web now formed may be further reduced in width and thickness by a conventional drafting mechanism. It has a high uniformity because the disintegrating zone of the carding drum is continuously fed a yarn having little variation in thickness and, as a result, continuously discharges material at a uniform rate. Thus, the thickness of the end product is only a fraction of the thickness of the initial yarn so that the desired goal is fully achieved.

Another advantage of the process according to the invention is the large output which can be achieved. The amount of coarse yarn produced by one spinning machine is sufficient for feeding coarse yarn to a plurality of subsequently arranged secondary twisters producing the final yarn. The operating expense and first cost of the secondary twisters are relatively small. An attempt to spin directly yarns having the desired small diameter would not only involve the difficulties described, but would also require a complicated and expensive machine having only a low output rate. One machine for spinning a coarse yarn cooperating with a plurality of simple machines for spinning the thin final yarns has an output rate determined by the rate of spinning the coarse yarn.

The machine for manufacturing the coarse yarn operates entirely independently of the subsequently arranged installation for spinning the fine yarn. For instance, when it is desired for manufacturing reasons, the machine for spinning the coarse yarn may be used to spin a relatively large number of drums of coarse yarn. The full drums of coarse yarn may subsequently be supplied to the installation for spinning fine yarn, where the coarse yarn is processed to form fine yarn.

For coco fibers and other hard and short fibers having similar textile properties the spun yarn is the only form in which the fibers can be held together whereas it is impossible, e.g., to subject a non-spun web of such fibers to operations such as feeding, winding or the like which are quite suitable for other, longer fiber material.

According to another feature of the invention, two or more coarse yarns are simultaneously carded and disintegrated into their constituent fibers by means of a single carding drum, whereby the uniformity of the single web formed on the conveyor belt of the carding drum and of the subsequently spun final yarn is further improved. Variations in the diameter of the coarse yarn within certain limits must always be expected. The combination of two or more yarns tends to balance these small differences in thickness, and the carding drum is supplied with material at a practically constant rate. It is obvious that the velocity of the conveyor belt must be increased in proportion if more material is fed to the carding drum. Coarse yarns consisting of different materials or of materials having different properties, e.g., of different fiber lengths, may be combined and may be carded together to produce an otherwise unachievable intimate mixture of the component materials and to enable a utilization of previously useless waste products for further processing.

It has been found that the spun coarse yarn can readily be fed to the carding drum and can be untwisted by the same without actual untwisting operation. In special cases it may be preferred first to untwist the yarn immediately before entering the carding drum and to feed it to the carding drum in an untwisted condition. Both operations are continuously performed.

Two illustrative embodiments of apparatus for carrying

out the process according to the invention are diagrammatically shown in the drawing.

FIG. 1 is a diagrammatic view showing in side elevation an installation for carrying out the process according to the invention. In this installation several coarse yarns are fed without untwisting directly and simultaneously to a carding drum.

FIG. 2 is another diagrammatic side elevation showing an installation for carrying out a modification of the method, wherein the coarse yarn is untwisted just before the carding drum.

With reference to FIG. 1, coarse yarns coming from a machine for spinning coarse yarn (not shown) are wound up on a drum **1** and are fed to the machine for spinning fine yarn shown in FIG. 1. Several drums of coarse yarn are mounted in front of the machine at the same time. These coarse yarns are jointly and simultaneously fed through a collecting eye **3** to a pair of feed rollers **4**. This pair of feed rollers **4** feeds the yarns to a carding drum **2** rotating at high speed to disintegrate the coarse yarn into individual fibers. The ejection opening **5** of the casing **6** of the carding drum **2** is adjoined by a pivoted tubular chute **7**. The individual fibers are thrown off the drum **2** and by the oscillating pivoted feed chute **7** are uniformly scattered onto an underlying conveyor belt **8** moving at a speed which is higher than that at which the coarse yarns are fed to the feed rollers. On this conveyor belt **8** the scattered fibers form a fiber web, which is received by a drafting unit **9**, which serves to stretch and align the fibers in the fiber web. Having passed through the drafting unit **9**, the fiber web is spun to form a fine yarn by means of a known spinning machine. **10** denotes a twisting arm and **11** a drum for winding up the final yarn.

According to FIG. 2 a rotary guide tube **12** is mounted before the carding drum **2**. A pair of rollers **13** provided at one end of this tube is slightly spaced from the pair of feed rollers **4** whereas a holder **14** for the roving drum **1** is affixed to the other end of the tube. The coarse yarn which has been withdrawn from the drum **1** by the pair of feed rollers **4** is untwisted with the aid of the rotating pair of rollers **13**, and the resulting fiber web is fed to the carding drum **2**. The means succeeding the carding drum correspond to those of FIG. 1.

I claim:

1. A process of making yarn from coco fibers or like relatively hard and short fibers, which comprises

(*a*) spinning said fibers into a relatively coarse yarn at least 10 millimeters in diameter;

(*b*) continuously feeding said yarn at a predetermined speed to a disintegrating zone;

(*c*) continuously disintegrating said yarn in said zone into the constituent fibers;

(*d*) continuously forming said constituent fibers into a web;

(*e*) continuously withdrawing said web from said zone at a speed greater than said predetermined speed; and

(*f*) continuously twisting said web into a relatively fine yarn having a diameter of less than 6 millimeters.

2. A process as set forth in claim 1, wherein said coarse yarn is untwisted while being fed to said disintegrating zone.

3. A process as set forth in claim 1, wherein said fibers are coco fibers.

4. A process as set forth in claim 1, wherein said fibers are sisal fibers.

5. A process of making yarn from coco fibers or like relatively hard and short fibers, which comprises

(*a*) spinning said fibers into a plurality of relatively coarse yarns each having a diameter of at least 10 millimeters;

(*b*) simultaneously and continuously feeding said yarns to a disintegrating zone at respective predetermined speeds;

(*c*) continuously disintegrating said yarns in said zone into the constituent fibers thereof;

(*d*) continuously forming said constituent fibers into a common web;

(*e*) continuously withdrawing said web from said zone at a speed greater than the combined predetermined speeds of said yarns; and

(*f*) continuously twisting said web into a relatively fine yarn having a diameter of less than six millimeters.

6. A process as set forth in claim 5, wherein said predetermined speeds of said coarse yarns are substantially equal.

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