

Aug. 29, 1944.

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PROCESS FOR THE MANUFACTURE OF STRONGLY CURLED,
WOOL-LIKE TWISTED YARNS OF ENDLESS THREADS
Filed April 27, 1943

2,356,887

Fig. 3.

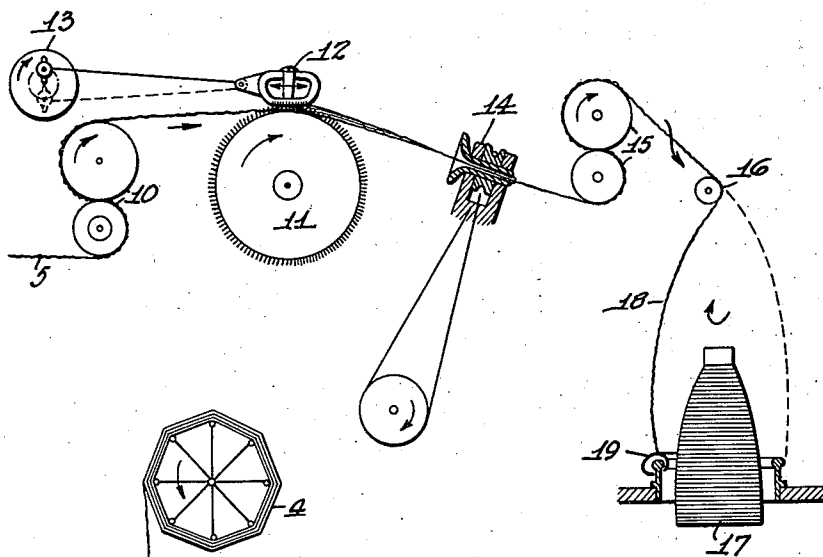


Fig. 2.

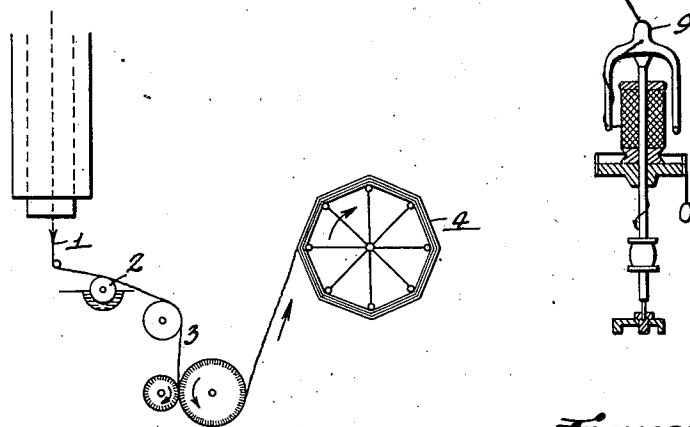


Fig. 1.

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2,356,887

PROCESS FOR THE MANUFACTURE OF
STRONGLY CURLED, WOOLLIKE TWISTED
YARNS OF ENDLESS THREADS

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Application April 27, 1943, Serial No. 484,760
In Switzerland May 9, 1942

9 Claims. (Cl. 57—157)

Many attempts have been made in order to obtain in a very simple and cheap way a wool-like, completely twisted yarn from endless spun artificial fibres.

The oldest process which is carried out by cutting freshly spun endless fibre bundles, of curling, drying and the like and of subsequently spinning the artificial fibre tufts according to the wool or cotton spinning process is outmoded. Today shorter and simpler processes, such as for instance the process applying the so-called spinning band or spinning roving, are used, but all of these processes possess the common feature that the endless single filaments must be cut or broken in a certain manner and then be drawn and twisted in order to thus obtain the exterior character of a wool or cotton yarn.

It has now been found that it is possible to produce a wool-like, highly voluminous yarn without carrying out the multiple, hitherto partly difficult and expensive individual operations of cutting, recombining and compressing the fibres.

The present invention consists in that the individual filaments and the crimping arcs of a preferably flat fibre bundle of chemically as well as mechanically curled endless threads, which bundle shows approximately the same titre as the final product (final yarn), are displaced longitudinally and transversely in such a manner relatively to one another and in the various planes, that the fibre bundle is greatly loosened, causing thereby the volume of the so-obtained entangled structure to become at least 15 times, preferably 30 to 40 times, greater (than the unloosened flat fibre bundle) and in that the fibre structure loosened in this way is thereafter converted into the desired wool-like yarn of curled endless threads by slightly rounding and twisting it without applying any drawing and stretching operation. The yarn so-obtained is characterized by excellent properties, such as for instance by a big volume and a remarkable power of maintaining heat, moreover by a high twisting, elasticity and strength. Thus the present process differs from the known art, wherein the bands, rovings and yarns consist of staggered individual filaments (staples). The latter structures possess especially in form of bands and roves only a low strength, but the same are capable of being drafted and may suitably be diminished with respect to the titre by means of drawing operations. Only by the last twist movement (twisting) do these articles get the desired strength.

On the other hand, the yarns obtainable according to the present invention cannot be stretched, that is to say that it is impossible to stretch them by horizontally displacing the individual filaments with regard to one another, as the yarns consist of endless threads. Therefore, further working-up (attenuation) of the yarns by means of an apparatus, for example by means of a drawing device or a spinning machine is impossible. However, the yarns obtainable according to the invention which may be single or manifold twisted are especially suitable as hand working yarns, but they may also be directed to manually or automatically executed knitting, braiding, weaving and crochet operations.

According to the present invention many working steps are excluded which hitherto have been absolutely necessary, so that there results not only a considerable decrease of the costs for the final product, but also a substantial improvement of the textile properties of such yarns. Thus, yarns having no cut or broken individual filaments show the strength of a smooth artificial yarn, i. e. the complete substance strength of all the fibres. Besides, the elongation of such yarns is very considerable and consists of the full curliness elongation and of the specific elongation of the smooth individual filaments. Therefore, the elongation is much higher than that of the usually stapled yarns or of smooth artificial yarns. It must be pointed out that the volume of the new yarns constitutes the maximum of that disclosed hitherto. The strong equal curliness of each single fibre will thus fully come to effect in the yarn. Besides, it is not necessary to twist the yarns to a considerable extent in order to obtain a sufficient tensile strength. The threads in these yarns do not seem to have a definite length as for instance 3 to 12 cm., but to be endless long continuous and cohering threads. For this reason these yarns are highly elastic. The filaments are disposed in the yarn in entangled manner like spiral springs and operate on tension and subsequent relieving with their full elasticity in the direction of the longitudinal axis of the filaments.

In spite of the considerable loosening the yarn shows a good interconnection transversely to the longitudinal axis inasmuch as the threads overlap each other, the longitudinal cohesion being still better, as the same is completely maintained by the continuous endless long filaments. Due to the loosened threads a very voluminous textile structure is obtained which is very light like down and which can subsequently be slightly rounded

and, by a slight tension, be more or less strongly twisted, e. g. on a fly or ring spindle or on a cap spinning device. It is of importance that all these operations are carried out without draft or drawing, so that the almost ideal uniformity of the titre (such as in the case of unstapled artificial fibres) is exactly maintained and that a completely uniform thick, roundish, very voluminous yarn is obtained which is free from nops and cut portions and possesses an excellent covering power and also a considerable power of maintaining heat.

When, on loosening the curled bands or on intentionally staggering the filaments and crimping arcs, some of the filaments are broken, the properties of the new yarn are not damaged; contrarily this may be of advantage, as on twisting the broken little fibres will laterally project from the yarn structure and, therefore, increase the wool character of the yarn. Of course, it is also possible to intentionally increase the number of the broken fibres in order to produce a delusive appearance of a stapled yarn.

The present process is especially suitable for working-up endless artificial silk threads. In this case, just such a heavy endless fibre bundle will be produced at the delivery place for the artificial fibres, e. g. during the dry spinning process, as corresponds approximately to the titre of the desired final yarn, whereupon the curling operation is directly or subsequently carried out. Preferably, the fibre bundle or several fibre bundles are spread out in form of a flat band and the curling is simultaneously carried out so that the curliness will be as complete and equal as possible. The curled band may then directly or after having passed a winding apparatus, e. g. spools and the like or so-called spinning pots, be subjected to the loosening treatment.

According to the invention it is also possible to treat threads of natural silk in the described manner after having curled the same in a suitable manner in order to produce yarns sufficient for maximum requirements with respect to the capacity of maintaining heat. Likewise, after a suitable curling operation, natural fibre yarns may also be worked-up according to this invention.

In order that the invention may be more fully understood, there will now be explained by way of example only, and with the aid of the accompanying drawing, a preferred manner of working.

Figures 1 and 2 illustrate diagrammatically the invention.

Figure 3 is a diagrammatic showing of loosening apparatus.

According to Fig. 1 one or several newly spun fibre bundles coming from the spinning apparatus are delivered at 1 (dry spinning process). At 2 the fibre bundle or bundles are conducted over humid rolls and treated at 3 with curling rolls of a known type, whereupon they are wound on or reeled at 4 on a reel, spool or the like. As shown in Fig. 2 the hank 4 thus reeled or wound is again unwound. The curled thread band 5 is then treated in the loosening apparatus 6 in such a manner that its volume becomes at least 15 times greater and that all of the filaments and crimping arcs are alternately staggered as far as possible. For this purpose it will be advantageous to use the apparatus shown in Fig. 3 and described below. Then, the loosened downy structure is slightly rounded as illustrated at 9, and is subsequently led to a spindle, for in-

stance to a spindle which gives the required twisting to the yarn so that it may then be wound on bobbins, reels or the like. After this procedure the yarn can, if desired, be subjected to a single or manifold twisting and to any further textile operation.

For loosening purposes the flat curled thread bands can be treated for example between two cams or brackets covered with velvet, leather or plush. During this procedure, for instance, the lower bracket will substantially cause an advancing movement of the bands, while the upper bracket will preferably make a circular, semi-circular or elliptical movement. A loosening apparatus is described for example in Fig. 3. The curled thread band 5 is supplied to the main apparatus by means of feed rollers 10 with a determined speed. From these feed rollers the curled band 5 is led to the drum 11 being a roller covered with velvet, plush or card wire band or the like. The surface speed of the feed rollers is substantially higher than that of the drum. The latter is arranged somewhat higher than the feed rollers, so that in every case the curled band running therethrough must rest upon the tips of the drum.

The substantial operation of disentangling takes place, when the curled band passes the tips of the drum. For the loosening of the crimping arcs lying initially in a synchronous order a comb 12 is moved very rapidly across the fibre material, i. e. across the drum. The said comb is moved by a rapidly running cam and a connecting rod 13; the speed of the cam as well as the stroke are adjustable. Due to these adjusting possibilities the loosening degree of the curled band can be controlled in the desired manner.

A further apparatus (not shown) makes it possible to adjust the comb 12 in an exactly determined distance with regard to the drum 11, that is to say to cause the tips of both the comb and drum to mesh into each other. For the comb it is of importance that the tips thereof are directed in the sense of the general thread movement. The tips of the drum can be directed radially or in the sense of the general thread movement or also in the opposite manner.

When the article leaves the main working zone all of the crimping arcs are displaced into each other and loosened in such a manner that the thread material shows a great resemblance with so-called card sliver, i. e. it has the form of a downy soft flat band. In order to give the thread band a more roundish form, it is passed through a spinning tube 14 which produces a so-called false twist. Thereafter the thread band is introduced between a couple of calender rollers 15 having a substantially higher surface speed than the drum 11. The surface speeds of the feed rollers 10 and of the calender rollers 15 are approximately the same so that the degree of curliness of the thread band will be maintained. After having passed through the calender rollers 15 and the guiding roller 16, which latter is mounted above the centre of the spindle, the thread is wound on the spool 17. Finally the thread 18 obtains the correct twist, whereupon there will result the finished single yarn.

Generally the thread material has a speed of for example 4 to 20 m. per minute. The twists per m./thread amount on the average to 100 so that the number of revolutions of the spindle is about 400 to 2000 per minute. The twists per metre substantially influence the character of the yarn. Moreover, according to the choice of the

card wire bands or the kind of plush or velvet provided on the drum and on the comb and to the adjustment of these latter elements with regard to each other, the fibrous properties of the finished yarn can be influenced. Therefore, it is possible to produce according to the invention a nearly fibreless, smooth yarn or a slightly strong to downy yarn, as this is the case for the production of wool yarn.

Furthermore, the loosened thread bands may be delustered or dyed in a known manner; these treatments can be carried out in the spinning machine (spinning mass) or on the reel after the curling or loosening operation, but possibly also in the finished yarn or tissue.

What I claim is:

1. A process for the manufacture of strongly curled, wool-like twisted yarns of endless threads which comprises displacing the individual filaments and the crimping arcs of a fibre bundle consisting of curled endless threads and having approximately the same titre as the final product, longitudinally and transversely in such a manner relatively to one another and in the various planes, that the mass of fibres is strongly loosened and assumes a volume at least 15 times larger, and then converting the resultant loosened fibre mass into the desired wool-like yarn of curled endless threads by slightly rounding and twisting it without applying any drawing and stretching operation.

2. A process according to claim 1, in which the volume of the fibre mass is increased 30-40 times by way of loosening.

3. A process according to claim 1, in which the thread bundles consist of curled artificial silk threads.

4. Process according to claim 1, in which the thread bundles consist of curled natural silk.

5. Process according to claim 1, in which the thread bundles consist of curled natural fibrous yarn.

6. Process according to claim 1, in which the curling is effected on a spreaded band consisting of one or more thread bundles and in which the curled band is subjected either directly or after winding to the loosening treatment and to twisting.

7. Process according to claim 1, in which the obtained yarn is so twisted that it can be used as a hand working yarn or for a weaving, knitting, braiding, crochet operation or the like.

8. Process according to claim 1, in which the individual threads are purposely broken to produce a partially stapled yarn having laterally projecting fibres.

9. The products obtained according to the process of claim 1.

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