Nov. 10, 1931. P. SPINDLER 1,830,771

PROCESS FOR TREATING FRESHLY SPUN THREADS OF ARTIFICIAL SILK

Filed March 28, 1929

FIG. 1.

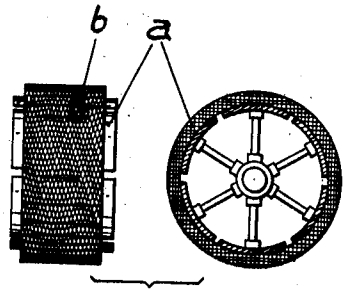


FIG. 2.

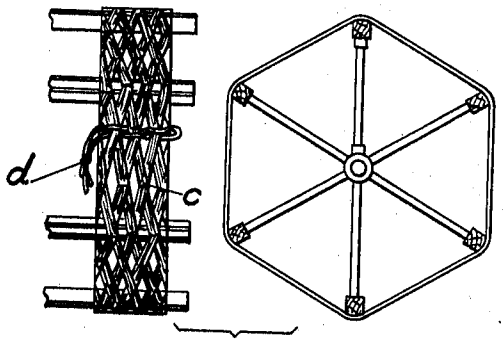


FIG. 3.

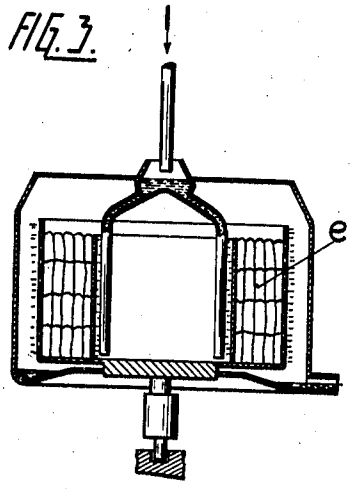


FIG. 4.

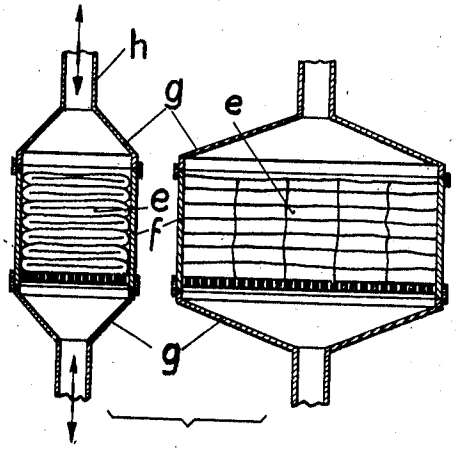
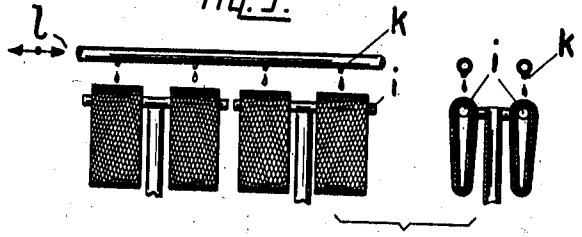


FIG. 5.



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UNITED STATES PATENT OFFICE

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PROCESS FOR TREATING FRESHLY SPUN THREADS OF ARTIFICIAL SILK

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There are two distinctive types of processes for producing artificial silk. In the one the threads issuing from the spinning bath are twisted at the time of reeling, for example by allowing them to run into a spinning centrifuge. In the other the newly spun silk is wound on revolving rollers or reels without twisting in the spinning machine. At the end of a certain time, the rollers or reels carrying the silk are taken out of the spinning machine and, in conjunction with the silk thereon, subjected to washing and drying.

In such cases in order not to impede or render impossible the penetration of the artificial silk material by liquids, only a relatively thin layer of threads can be wound on the rollers. Moreover methods of this kind take up a considerable amount of time and require very large quantities of treating liquids, because the liquids penetrate only very slowly through the entire winding or because as the result of the contact not being uniform over all parts of the winding the washing or treatment must, on account of these parts, be considerably prolonged. This results in a very great waste of liquid. Owing to the long duration of the process an enormous outlay on rollers is necessary and represents a considerable proportion of the capital invested in an artificial silk factory. Finally the question of roller material presents serious difficulties since there are only a few materials which are not attacked by the various liquids—some acid, some alkaline—required for the treatment and on the other hand the few materials which are suitable, from the chemical standpoint, are impracticable in other respects, either because they are too heavy, too brittle or offer insufficient resistance to the pressure set up by the contraction of the silk in drying. A further drawback of this method consists in that, in the drying of the threads on the rollers, the inner and outer turns of the winding contract differently since the inner turns encounter resistance on the part of the roller whereas the outer turns in consequence of the thinning of the inner turns have ample room to contract. The result of this is that irregular stresses are set up in the artificial silk; moreover the silk often becomes frayed (exhibits protruding ends) through the tearing of individual fibrils in consequence of the excessive stressing of the iner turns on the roller, and, in addition, the turns of the winding easily become intermingled so that many breakages occur in unwinding and result in inferior quality (many protruding ends and knots) and increased cost of production.

In spinning on to reels attempts have already been made—on account of the said difficulties which mainly arise in this case also—to detach the fresh hanks of artificial silk from the spinning reel and then treat it with liquids. In such case it is necessary to tie the hank together crosswise at several points with suitable yarn material (skeining) otherwise the hank gets into such disorder as to render unwinding difficult, if not impossible. In order to allow of this skeining the artificial silk is wound in such a manner on the reel in spinning as to leave gaps in the winding through which the skeining threads are interwoven.

The threads are easily damaged in skeining the hanks especially in the wet state. Moreover, during the treatment of the skeined hanks with liquids when in the loose state the open hank turns often undergo displacement to form stranded groups of threads thus causing a tangling and relative displacement of the crossings of the threads, whereby further damage, breakages and knots again ensue rendering the threads difficult or impossible to unwind; and there is a considerable amount of waste and outlay for labour. The cost of labour for the skeining also plays a considerable part in the manufacture.

The present invention relates to an improvement in the further treatment of such freshly spun threads of artificial silk which are wound as "single" on rollers and the like. It consists in that the freshly spun threads coming from the spinning bath are wound, without twisting, by the quick-traverse method (preferably in a thick layer) but compactly and free from gaps, taking the resulting hanks of yarn from the reeling ap-

paratus without skeining and treating them in this condition with the requisite liquids.

The drawings illustrate several devices suitable for carrying out the new method.

Fig. 1 is a new type of reel in front and side elevation with the artificial silk wound thereon in accordance with the new method. For comparison, Fig. 2 shows the old known reels and the existing method of winding the artificial silk.

Fig. 3 shows a centrifuge in which the artificial silk spun according to the new method is treated with liquids.

Fig. 4 shows in front and side elevation, a trough for the same purpose, with inlet and outlet.

Finally Fig. 5 shows in front and side elevation a number of artificial silk cheeses spun in accordance with the new method, being irrigated with liquids from above.

In the spinning process the artificial silk is wound according to the invention either on rollers or preferably on reels of roller type of not over-large dimensions and with particularly broad supporting surfaces (*a*, Fig. 1) in quick-traverse but compactly disposed turns. To make this clear Fig. 2 represents an ordinary reel plus the usual method of winding the threads, gaps *c* being intentionally left between the threads for intertwining the skein threads *d*. The winding by the new method may take place on single reels or rollers or several threads separated by intermediate spaces may be wound on correspondingly longer rollers or reels. Suitable pervious backings (felt, fabric, wire gauze and the like) may be applied to the rollers or reels and taken off with the hanks of yarn wound thereon. The rollers or reels are so arranged, in known manner, that the hanks can easily be taken off, for example by reducing the peripheral dimensions of the roller and the like. For the purposes of treatment with the necessary liquids the hanks are taken off the rollers or reels without being tied in skeins. Owing to their compact winding they offer considerable resistance to displacement and damage of the threads. A special advantage of the new method, in contrast to the existing practice, is that a very thick layer can be formed in winding. This is specially advantageous since the resistance of the hank is thereby greatly increased. The thicker layer of threads assures increased length between knots and therefore fewer interruptions in the spinning process because the reeling appliances require to be less frequently interchanged. This implies a substantial increase in output.

These resistant hanks obtained by the new method can now be treated with the requisite liquids in various ways without prejudice to the unwinding.

According to Fig. 3 the hanks *e* are laid flat in one or more layers in a centrifuge and preferably with the lateral surfaces against the wall in order to obviate the risk of the windings becoming displaced during the centrifuging process. The various liquids are then successively admitted into the centrifuge and brought into contact with the hanks which are preferably shielded from the direct impact of the liquids by a suitable covering. The centrifugal force impels the liquid through the artificial silk and in a very short time perfect treatment throughout the whole of the material results. After shutting off the supply of the final liquid the centrifuge is preferably kept running for some time longer for drainage purposes, whereupon the cheeses are taken out and dried.

In order to obtain a better utilization of the centrifuge the rotary bowl of the same may be made interchangeable. The rotary bowl is charged outwards and is then put into the unmoved centrifuge casing. It is also advantageous to divide said bowl into a number of separate compartments. The treatment with the various liquids may also be distributed among several centrifuges each of which is used for only one, or only part, of the liquids in question. In such case the contents of one centrifuge must always be transferred (preferably with the bowl or compartment) to the next in succession. Following this treatment the silk may be dyed or treated with other appropriate liquids in the same working operation.

According to Fig. 4 the hanks *e* are first laid flat in one or more layers in or on suitable tablets containers, baskets or boxes with perforated or grooved bottoms or perforated walls and flushed with the various liquids in succession. This flushing can be effected by irrigation or by means of pressure or aspiration. Where pressure or suction is employed—which particularly accelerates the result—the vessel containing the hanks is closed by a tight-fitting cover *g* connected to pressure or vacuum pipes *h*. The charged container is afterwards drained preferably in a centrifuge, (Fig. 3), and in the manner described with reference thereto.

Another method of applying liquid treatment to the hanks spun by the new method is shown in Fig. 5. The individual hanks are suspended on rods *i* in suitable frames and irrigated. Several hanks may suitably be suspended in superimposition so that one and the same quantity of liquid flows through several hanks in succession. The irrigation is preferably performed by admitting the liquid through a single nozzle *k* or only a small number of nozzles moved slowly to and fro above the hanks after the manner indicated by the arrow *l*. This gives perfectly uniform irrigation and also an improved effect of the washing liquid inasmuch as the reciprocating movement produces an inter-

mittent wetting which leaves the liquid time to sink down into the layers of thread so that on the return of the jet or drop the liquid finds the material of the hank in a less saturated condition in consequence of which the fresh liquid is better able to penetrate more completely through same, whereas in the case of continuous irrigation the irrigation liquid accumulates especially in the layers on the supports and replacement is impeded. In this manner a considerable saving is effected in the liquids employed as also in respect of the time consumed and the cost of labour. When the treatment is completed the hanks may be drained, for example in a centrifuge. This, however, is not essential and the hanks may be dried directly by transferring the frames to the drying apparatus.

It has been found that the hanks which have been spun and treated in the above described manner can be unwound when placed on suitable unwinding appliances (drums, winding crowns, plates or the like), with surprising facility, speed and almost without any trouble, in either a lateral or radially inward direction. Any desired further process may also advantageously be combined with the unwinding operation, e. g., a twisting process.

What I claim is:

1. The method of treating threads of artificial silk fresh from the spinning bath which comprises reeling thread without twisting in closely-set and quick-traverse turns free from gaps in a layer or hank, removing said hank from the reel and subjecting said hank immediately to after-treatment with a liquid.

2. The method of treating freshly spun threads of artificial silk coming from the spinning bath which comprises reeling the threads without twisting on collapsible reels in close-set, quick-traverse turns free from gaps in a compact layer or hank, removing the hank from the reeling appliance and afterwards subjecting the hank to treatment with a liquid.

In testimony whereof I affix my signature.

PAUL SPINDLER.