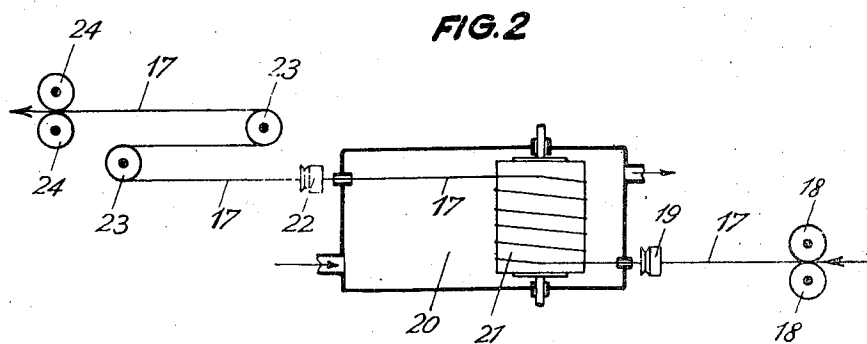
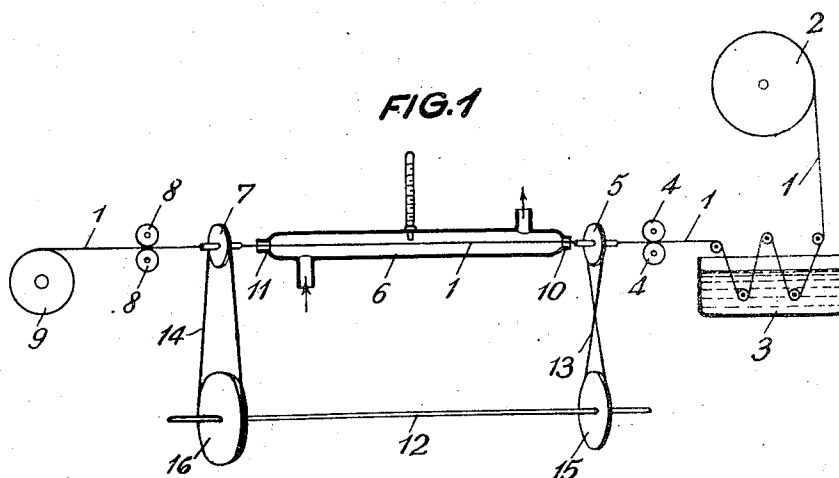


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PROCESS AND APPARATUS FOR PRODUCING WOOLLIKE
FILAMENTS OF CELLULOSE HYDRATE RAYON
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PROCESS AND APPARATUS FOR PRODUCING
WOOLLIKE FILAMENTS OF CELLULOSE
HYDRATE RAYON

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The present invention relates to a further development of the process and the apparatus described in the Swiss Patent No. 233,148.

In the Swiss patent specification No. 233,148 an apparatus for producing wool-like rayon filaments has been disclosed which comprises a filament pay-out tackle, an impregnating device, a filament feed gear, a drying tube or duct, a positively driven false-twister, a second filament feed gear, and a reel rigging. Some parts thereof are specially altered. The twister, for example, may be constructed in the manner of a ball bearing and comprise an inner rotating portion for the purpose of twisting the filament, and an outer stationary portion. The said inner portion may be rotated, for example, by means of a cord drive. The operation of this known apparatus is such that a finished rayon filament, preferably of the viscose or copper type, is drawn off the pay-out tackle by the first feed gear, and conducted through the impregnating device charged with a suitable impregnating liquid. The filament then passes through the drying tube, wherein it is given a false twist by the subsequent twister on one hand, and is dried and fixed in twist on the other hand, is continuously drawn forward by the second feed gear, while the twist is undone, and delivered to the reel rigging. Drying the twisted and, in particular, suitably pre-impregnated filament then will furnish a yarn structure of wool-like appearance, stable frizzling and great filling capacity.

The results attained by means of the known apparatus for producing wool-like frizzle rayon are not quite satisfactory, for, among other reasons, the operating speed is relatively limited, and since at times there appear certain irregularities in the form of fluctuations of the frizzling intensity in the yarns obtained, the cause of which has not been recognised heretofore.

I have succeeded now in speeding up the operation and in perfecting the twisting by applying two false-twisters, one ahead of and one after the drying tube, rotating in opposite directions.

From such knowledge there resulted an improved process, comprising transferring the wet pre-impregnated filament from a first twister on to a second twister for false twist and which rotates in the opposite directions, twisting same, and drying it over this distance without bringing any substantial sliding friction to act thereon between the two twisters.

As has been recognised, the sliding friction tends to push back the false twist on the fila-

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ment passing by. Since sliding friction always acts more or less irregularly, the pushing back of the twist also takes place irregularly, and the deformation is fixed in this irregular form immediately thereafter. There are many causes for the appearance of sliding friction between the two twisters, the suppression and prevention of which constitute the main object of the present invention, amongst which may be mentioned:

The passage openings, for example, through the drying devices may be too narrow; the twisters may be too big or, further, the filament may describe too large a cone surface due to the great distance between the passage aperture of the filament in the rotating portion and the centre, thus rubbing on the passage aperture of the drying device; or the same drawback may arise because of putting the twister too close to the passage aperture of the drying device; or, what is more likely, the two twisters and the inlet and outlet openings for the filament in the drying device are not accurately aligned, so that the filament readily rubs on the walls of the said apertures.

Preliminary impregnation may take place, in a manner known per se, simply by means of water or aqueous solutions. The swelled and soft filament then accommodates itself free of stress into the twisted shape after having passed through the first twister, and shows a still greater tendency of remaining in the twisted shape after drying. For pre-impregnating purposes, such solutions may be used at still greater advantage which contain products of precondensation or pre-polymerisation or constituents thereof, and which are capable, upon drying, of forming insoluble products of condensation or polymerisation which assist in fixing the filament in the crimped form, such as, for example, urea-formaldehyde condensation products.

An apparatus suited for carrying out the process will be described hereinafter with reference to the drawing and the run of the filament.

In the drawing:

Fig. 1 is a diagrammatic view of the device according to the invention.

Fig. 2 is a diagrammatic view of a second embodiment of the apparatus according to the invention.

The filament 1, having been paid out from the supply means 2 and having passed through the impregnating device 3 and the first filament feed gear 4, is drawn into a first positively driven twister 5. The filament then passes through the drying tube 6 into the second twister 7, which

latter rotates in a sense opposite to that of the twister 5, and is drawn forward by the feed gear 8 to be finally wound upon the winder 9. The twisters 5, 6 and the inlet and outlet apertures 10, 11 for the filament in the drying tube 6 are accurately aligned and so disposed as to prevent any substantial friction of the filament between the said twisters.

By disposing two twisters at the points indicated and by the said axial alignment of inlet and outlet and twister centres, the following advantages are attained: the false twist need not be applied inside of the drying device, and the said twist is kept uniform on the entire passage through the drying device and may adjust itself, and the twist cannot be pushed back irregularly and in an uncontrolled way and manner, since there are no points of friction. It has been found that this improvement is very favourable not only for the intensity but also for the uniformity of the frizzling to be attained.

Between the two twisters a kind of summation of the twist effect is taking place.

It has been found advantageous in certain cases to let the two twisters rotate at different speeds, in particularly to have the second twister run at a higher speed than the first. In the latter case, the twist after passing the second twister, snaps back very lively, which materially favours the filling effect.

The two twisters, according to the present invention, may be driven by cords 13, 14 from a common drive shaft 12. By suitably selecting the drive discs 15, 16 or the twisters themselves, the speed of the latter may be fixed relatively to each other, i. e. both twisters may be made to rotate at the same speed, or one faster than the other.

Working with doubled composite filaments to be separated again, which then possess a high total titre of 500, 750, 1000 and much more denier, the drying is accomplished even at a still lower speed, and even longer drying tubes are required.

I have succeeded now in surmounting the said difficulties, which particularly pertain to yarns of high titre, by recognising that one is not bound to the use of a drying tube or duct when continuously drying a filament twisted intermediate of two twisters rotating in different directions, but also may use, without materially impairing the frizzling effect, rotating drying devices between the two twisters, wherein the filament is supported by transport elements at the speed of the drawn-off filament and without any substantial sliding friction. It thus has been made possible to use filament-transport gears capable of accommodating a length of filament of many metres within small space.

For this purpose drying devices comprising continuously operating filament-transport gears have proved satisfactory; such as stagger reels of the kind disclosed in the German patent specifications 236,584, 239,822 and 415,479, but also crossed-roller pairs, or fluted-roller pairs, over which the filament is moved in helical windings when moving the elements, or finally systems of loose rollers driven solely by the filament itself. The heating of these rotating filament-transport systems and of the filament rolling thereon may take place in any suitable way and manner insofar as the filament is not damaged thereby. It has proved suitable to enclose the filament-transport elements in appropriate casings provided with the suitable inlets and outlets for the filament and the heating medium respectively. The

latter may consist of hot air, hot gases or steam. These drying devices are of the kind disclosed in my co-pending application Ser. No. 645,942 for predrying the yet non-twisted filament.

The new matter disclosed by the present invention essentially consists in using and adapting the indicated heated and rotating or rotatable filament-transport gears as drying devices for the twisted filament intermediate of the two twisters rotating in opposite sense.

On one hand, an extended drying time may thus be provided or, additionally, a long drying distance be accommodated within a narrow space, and on the other hand the twisting and frizzling yet be combined therewith.

There arises the necessity, in many cases, of reserving filament sections of quite some length, for developing and uncurling the false twist between the two twisters, for the long filament section to be twisted; i. e. filament has to be made available for the purpose set forth, ahead of the first and back of the second twister respectively. Further prosecuting the pertinent present idea, it has proved advantageous, for the purpose of reducing the overall length of the apparatus, to have the filament run over loop-forming rotating rollers, or over idling rollers driven by the filament itself, between the first fixed point and the first twister on one hand, and particularly between the second fixed point and the second twister on the other hand.

Fig. 2 shows an embodiment of the apparatus according to my present invention. The filament 17 to be frizzled, made of cellulose hydrate rayon, has already been wet impregnated, either on the cone or continuously, before reaching the first fixed point in form of the feed gear 18 which comprises a roller pair. The said filament also could have been produced from a plurality of filaments by doubling, in which case it represents a composite filament. Fig. 2 shows the most important parts, aside from the filament 17 to be dressed and the first feed gear 18 designated as first fixed point, viz. the first positively operating twister 19 for producing false twist, the subsequent heated drying device 20 with the rotating filament-transport rigging 21, the second twister 22 rotating in a sense opposite to that of the first twister, the loop-forming filament-reversing rollers 23, and the second feed gear 24 as second fixed point. Not shown are: the impregnating device, any possible doubling and separating tackles required when working with a composite filament, as well as the pay-out and take-up reel riggings.

The filament-transport gear 21 within the drying device 20 may be adapted in accordance with any of the embodiments described or similar thereto.

What I claim and desire to secure by Letters Patent is:

1. In apparatus for applying a frizzle to cellulose filaments, a filament drying device, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, said rotating means including a common drive shaft and cords engaging the respective twisters, said apparatus being free of any stationary structural parts in position to exert any substantial friction on a filament extending through said twisters and drying device.

2. In apparatus for applying a frizzle to cellulose filaments, a filament drying device including a heated rotating filament transport device capable of accommodating a substantial length of fila-

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ment in a plurality of loops or windings, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, said apparatus being free of any stationary structural parts in position to exert any substantial friction on a filament extending through said twisters and drying device.

3. In apparatus for applying a frizzle to cellulose filaments, a filament drying device including a heated rotating filament transport device capable of accommodating a substantial length of the filament in the form of loops and windings, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, and loop-forming filament-guide rollers disposed after the second of said twisters, said apparatus being free of any stationary structural parts in position to exert any substantial friction on a filament extending through said twisters and drying device.

4. A process of producing wool-like rayon filaments of the cellulose hydrate type, comprising impregnating a filament with a liquid to render the filament soft and drying the filament while being highly twisted by means of two positively operating false-twisting devices one ahead of and one following the drying device, the filament passing between the two twisters being out of contact with any member or part of the drying device.

5. In apparatus for producing wool-like rayon filaments of the cellulose hydrate type, a filament drying device, two positively operating false-twisters one ahead of and one following the drying device, the arrangement being such that the filament between the two twisters is out of contact with any member or part of the drying device.

6. In apparatus for producing wool-like rayon filaments of the cellulose hydrate type, a filament drying device, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, said rotating means including a common drive shaft and cords engaging the respective twisters, the arrangement being such that the filament between the two twisters is out of contact with any member or part of the drying device.

7. In apparatus for producing wool-like rayon

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filaments of the cellulose hydrate type, a filament drying device including a heated rotating filament transport device capable of accommodating a substantial length of filament in a plurality of loops or windings, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, the arrangement being such that the filament between the two twisters is out of contact with any member or part of the drying device.

8. In apparatus producing wool-like rayon filaments of the cellulose hydrate type, a filament drying device including a heated rotating filament transport device capable of accommodating a substantial length of the filament in the form of loops or windings, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, and loop-forming filament-guide rollers disposed after the second of said twisters, the arrangement being such that the filament between the two twisters is out of contact with any member or part of the drying device.

9. In apparatus for producing wool-like rayon filaments of the cellulose hydrate type, a filament drying device including a heated rotating filament transport device capable of accommodating a substantial length of the filament, two positively operating false-twisters one ahead of and one following the drying device, and means for rotating said twisters in opposite directions, and loop-forming filament-guide rollers disposed after the second of said twisters, the arrangement being such that the filament between the two twisters is out of contact with any member or part of the drying device.

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