April 18, 1939. A. J. L. MORITZ 2,155,324

MANUFACTURE OF ARTIFICIAL SILK

Filed April 9, 1937

Fig. 1.

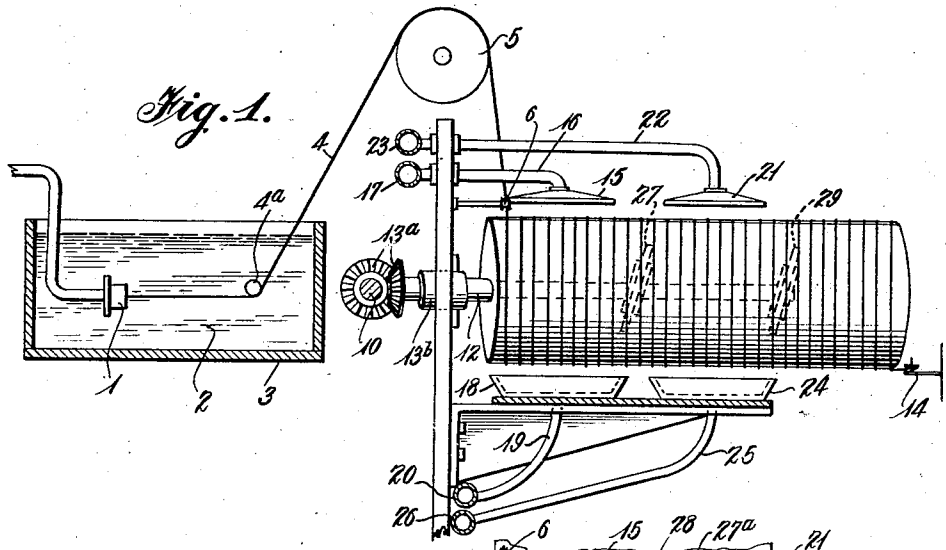


Fig. 2.

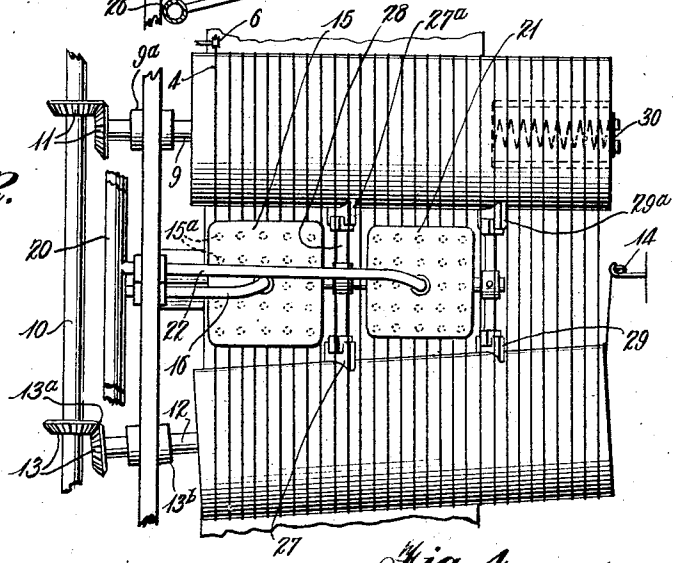


Fig. 3.

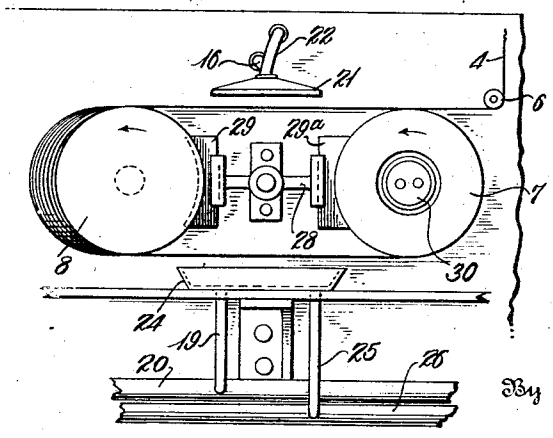
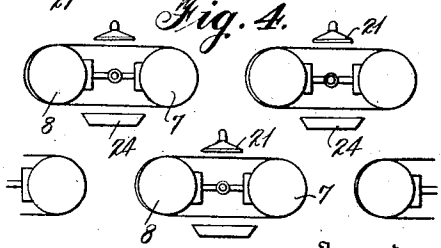


Fig. 4.



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MANUFACTURE OF ARTIFICIAL SILK

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Application April 9, 1937, Serial No. 136,014

4 Claims. (Cl. 18—8)

The present invention is directed to an improvement in an apparatus and method for use in the continuous spinning of filaments of artificial origin. It is particularly concerned with an arrangement of the various elements of the spinning apparatus whereby the filaments may be continuously extruded, precipitated, wet-treated and dried in an improved manner.

In the drawing

Figure 1 is a side elevation of a single unit embodying the invention, the spinning bath being shown in section.

Figure 2 is a plan view of a portion of the device shown in Figure 1.

Figure 3 is an end elevation from the right-hand end of Figure 2.

Figure 4 is a schematic front elevation illustrating the arrangement of a number of the units in a single machine.

The numeral 1 indicates the spinning nozzle which is shown as positioned within the spinning or precipitating bath 2, the latter being confined within a trough 3 which may be individual for that spinning nozzle or it may extend the length of the machine or at least to a number of spinning places. The coagulated filaments forming the thread 4 pass under a guide 4*a*, which may be a fixed guide rod or a positively driven or freely rotating guide rod or roller, and from there to the drawing roller 5. This drawing roller may be a cylinder of glass or other suitable material and is preferably sufficiently long to serve a number of spinning places. After leaving the roller 5, the thread 4 passes to a guide roller 6 and from there around two spaced rollers 7 and 8 rotating in the same direction.

The roller 7 is carried on and driven by a horizontal shaft 9, which is supported in a bearing 9*a* and is rotated by the shaft 10 through the bevel gears 11, 11. The roller 8 is supported and carried on the shaft 12, which is driven by the shaft 10 through the bevel gears 13, 13. The shaft 12 is positioned in the same horizontal plane as the shaft 9 but at a slight angle thereto, such as to cause the thread to advance along the rollers. The shaft 12 or the shaft 9, or both of them, may be adjustable in the horizontal plane, so that the angle of the roller 8 to the roller 7 may be altered to give the desired rate of advancement and allowance for shrinkage of the thread on the rollers. If it be desired, both of these rollers may be adjustable. The teeth of the bevel gears for the adjustable shaft may be slightly curved, as illustrated at 13*a*, to permit the changing of the angle of the shaft 12. The shaft 12 may be adjustably supported in a bearing at 13*a* so that it can swing in an arc concentric with the curve of the gear teeth at 13*a*. The movement of this shaft would be very slight in most instances and it is obvious that other means for driving the shaft so as to allow such adjustment may be provided.

The thread 4 passes many times around the rollers 7 and 8, during which passage it is subjected to wet treating and heat treating, as hereinafter described.

As it leaves the rollers, the thread passes through a guide 14 and from there may be conducted to a suitable collecting means, such as a take-up roller or bobbin or a centrifugal collecting device.

The wet treating means in the embodiment illustrated includes a spray head 15, having a number of outlets 15*a* and being positioned above the upper strands of the thread 4 on the rollers 7 and 8 at a point between the rollers. It may be preferable to extend the spray heads over either or both rollers 7 and 8 and in some cases pairs of spray heads may be employed separately over the rollers so that the liquid is sprayed on the rollers rather than between the same. The treating liquid is supplied to the spray head 15 through the pipe 16 leading from the pipe 17, which may be a common supply pipe for supplying liquid to corresponding spray heads of all of the units of the machine.

The treating liquid supplied to the thread by the spray head 15 will contact the upper strands of the thread and fall through and contact the lower strands of the thread. A tray 18 is provided under the spray head 15 to catch the excess treating liquid that passes through the strands of the thread. A drain 19 conducts the treating liquid to a common receiver pipe 20 from where it may be discharged, or, it may be recirculated for use again, with or without an intermediate purifying operation.

A plurality of means for applying treating liquid to each unit may be provided. In the drawing there is shown a second spray head 21, fed by a line 22 from a common supply pipe 23. Also, similar means may be provided for separately catching and disposing of the second treating liquid, as illustrated at 24, 25 and 26. Additional means for supplying and disposing of other treating liquids, or course, may be provided, if desired.

A certain amount of the treating liquids will be carried by the strands of the thread onto the rollers 7 and 8 and will be advanced with the thread as it advances on the rollers. In order to

prevent the excessive admixture of the liquids on the rollers, wiping means may be provided for wiping the liquids from the rollers. As shown in the drawing, these wiping means are in the form of flexible pads 27 and 27a carried by a fixed support 28. These pads should be of a material that will resist the effect of the treating liquid and the abrasion of the roller. Pads of rubber or cloth-like material are suitable for this use. The wipers 27 and 27a are preferably flexible and held under tension, so that they are always in contact with the rollers. Or, they may be carried on resilient supporting means adapted to maintain them in contact with the rollers. They are preferably positioned at an angle so that the liquid removed by them will flow into the trough 18. Wipers 29 and 29a, similar to wipers 27 and 27a, may be provided for removing the treating liquid, supplied by the spray head 21, from the rollers before reaching the heating zone. Of course, they should be of a material which is resistant to the liquid supplied at 21.

A heating element 30 is shown at the outer end of the roller 7. The heater illustrated is of the electrical resistance wire type positioned within the roller. If desired, a gas burner, applied to the inner or outer surface of the roller, may be used. Also, it is contemplated that a similar heater may be used in or under the roller 8, together with or instead of the heater 30.

In the operation of the device illustrated in the drawing, the spinning solution which may be the usual viscose spinning solution is extruded into the usual precipitating bath for viscose threads. The thread resulting from the bundle of filaments thus formed is drawn by means of the roller 5, the rate of rotation of which roller may be such as to supply the desired stretching of the threads between the roller 5 and the guide 4a. The thread then passes around the guide 6 and to and around the rollers 7 and 8. The rollers 7 and 8 are of the same diameter and rotate at the same speed. In the preferred operation they are rotated at the same peripheral speed as the peripheral speed of the roller 5, so that no stretching takes place between the roller 8 and the roller 5.

The angle of the shaft 12 to the shaft 9 will have been adjusted so that the thread will be progressed at the proper rate toward the outer end of the rollers and so that the shrinkage taking place during the wet treating and drying may be accommodated without exerting undue tension upon the filaments.

As the thread passes under the spray head 15, dilute acid (for example, sulphuric acid of a concentration of about 110–112 grams of 1.84 specific gravity sulphuric acid per liter) may be applied. The excess acid solution will be caught in the tray 18 and may be conducted through a pipe 20 to a settling tank where any sulphur or other suspended matter may be separated. The acid may then be returned for reuse at the spray head 15, with the necessary adjustment in the concentration of the acid solution. The acid solution that is carried to or by the rollers 7 and 8 is removed by the wipers 27 and 27a.

As the thread advances under the second spray head 21, it may be washed with the water, the excess water being caught in the tray 24 and the water that advances with the rollers 7 and 8 being removed by the wipers 29 and 29a.

The outer end of the roller 7 may be heated to a temperature of about 150–190° C., whereby the thread is thoroughly dried before it reaches the end of the roller. It may be then led to the collection device, which may include a roller or bobbin rotating at the same or different peripheral speed from the peripheral speed of the roller 8 or it may be led to some other suitable collection device, such as a centrifugal receiver. If desired, oil or other lubricating material or other treating liquid may be applied to the thread between the rollers 7 and 8 and the collection device.

Although the device has been described particularly in relation to the spinning of viscose silk, it also may be used, with suitable modifications, in the treatment of silk produced by the cuprammonium process or other process for making artificial silk.

As illustrated in Figure 4, a single machine may include a number of units actuated by the same shafts and supplied with liquid from common pipes. In the modification illustrated, the units are positioned in horizontal rows and in staggered relation in order to conserve space. Other arrangements may, of course, be used.

The terms used in describing the invention have been used in their descriptive sense and not as terms of limitation and it is intended that all equivalents thereof be included within the scope of the appended claims.

What I claim is:

1. In the manufacture of artificial silk, a process for the continuous production of rayon thread and the like from cellulosic solutions and the treatment thereof which comprises extruding a cellulosic solution through a spinning nozzle into a precipitating bath to form a thread composed of a number of filaments, withdrawing the thread and passing the same a plurality of times around rollers arranged in substantially the same horizontal plane, causing the thread as it is passed to and around each roller said plurality of times to approach the respective rollers substantially at right angles to their respective axes, thereby to effect the passage of the thread in a horizontal spiral form, spraying a treating liquid between the rollers upon one portion of the spirally arranged thread, spraying another treating liquid between the rollers upon a portion of the spirally arranged thread spaced longitudinally of the rollers from the first mentioned portion, and removing the treating liquid from the respective rollers adjacent each said portion as it is conducted thereto and therealong by the thread, thereby to avoid substantial intermingling of the treating liquids utilized in the respective portions.

2. In the manufacture of artificial silk, a process for the continuous production of rayon thread and the like from cellulosic solutions and the treatment thereof which comprises extruding a cellulosic solution through a spinning nozzle into a precipitating bath to form a thread composed of a number of filaments, withdrawing the thread and passing the same a plurality of times around rollers arranged in substantially the same horizontal plane, causing the thread as it is passed to and around each roller said plurality of times to approach the respective rollers substantially at right angles to their respective axes thereby to effect the passage of the thread in a horizontal spiral form, spraying a treating liquid between the rollers upon one portion of the spirally arranged thread and drying a latter portion of the spirally arranged thread as it passes around the rollers, which latter portion is spaced longitudinally of the rollers from the liquid treated portion.

3. An apparatus for the continuous production of rayon thread and the like which comprises a spinning nozzle positioned within a precipitating medium, means for withdrawing a thread therefrom and advancing the same spirally in a horizontal direction which means comprises spaced driven rollers around which the thread is drawn, said rollers having their axes in substantially the same horizontal plane and at an angle slightly converging toward their outer ends, means for supplying liquid to a portion of the spirally arranged thread passing between the rollers, means for supplying heat to at least one of the rollers, and scrapers positioned between the liquid treating zone and the heating zone for removing liquid from the rollers.

4. An apparatus for the continuous production of rayon thread and the like which comprises a spinning nozzle positioned within a precipitating medium, means for withdrawing a thread therefrom and advancing the same spirally in a horizontal direction which means comprises spaced driven rollers around which the thread is drawn, said rollers having their axes in substantially the same horizontal plane and at an angle slightly converging toward their outer ends, means for spraying an acid solution on one portion of the spirally arranged thread between the rollers, means to receive the excess liquid so supplied, means for scraping said acid solution from the rollers, means for spraying water on another portion of the spirally arranged thread between the rollers, which portion is spaced longitudinally of the rollers from the first mentioned portion, means for scraping water from the rollers, and a drying means beyond said second scrapers.

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