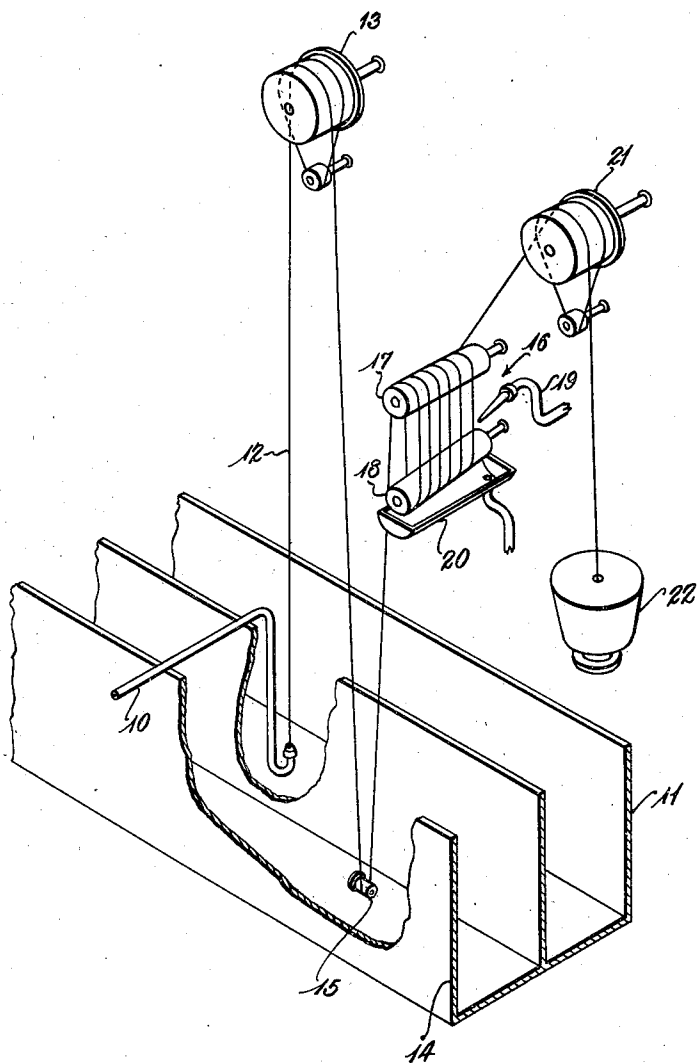


May 9, 1944.

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MANUFACTURE OF RAYON
Filed May 9, 1941

2,348,415



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2,348,415

MANUFACTURE OF RAYON

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Application May 9, 1941, Serial No. 392,763

1 Claim. (Cl. 18—8)

This invention relates to the manufacture of rayon, and is more particularly concerned with a method for the manufacture thereof in which acid-free thread may be directly collected in package form.

Heretofore, the manufacture of rayon has been effected chiefly according to one of two basic processes. The first of these involves the extrusion of thread into a spinning bath and the passage thereof around stretching devices after which succeeding portions thereof are wound in package form. In that form, the package of thread is subjected to after-treatments such as acid-free washing, desulphurizing, bleaching, and drying. The other type of spinning used is the so-called continuous spinning in which the freshly extruded thread is led across a number of thread-storage, thread-advancing devices upon each of which it is subjected to one of the customary after-treatments. Upon completion of all treatments, the thread is wound into a package for twisting and subsequent coning.

In recent years, a third type of spinning has come into existence involving effecting at least some of the after-treatments intermediate spinning and collection in package form and it is to this latter type of spinning that the present invention is primarily directed.

Regardless of the spinning process used in the manufacture of viscose rayon, the bundle of filaments must be extruded into a spinning bath, usually containing sulphuric acid, sodium sulphate, zinc sulphate and magnesium sulphate to bring about coagulation of the viscose and partial regeneration of the xanthate. Coagulation occurs almost instantaneously upon issuance of the filaments from the spinneret. On the other hand, regeneration of the xanthate has been found to be a continuing reaction which occurs for a considerable period of time after the thread has left the spinning bath. As a matter of fact, in the manufacture of viscose rayon, according to either bobbin or pot spinning methods, it has been determined that regeneration continues to occur for a considerable period after the thread has been wound in package form.

In the normal bobbin spinning of rayon, the regeneration time factor is relatively unimportant since the thread is necessarily stored during the winding of the package so that upon completion of the package washing can be undertaken in a short time. In continuous spinning, which necessarily involves an operating plant equipped with a vast number of thread-storage, thread-advancing devices to which the thread may be

successively led for the various after-treatments, the problem is likewise of little importance since the use of two or three reels for setting up and washing immediately subsequent to issuance of the thread from the coagulating bath causes no operating difficulties. On the other hand, a very serious problem is presented in connection with the spinning of acid-free rayon which, in its essence, is but a simple method of after-treating thread in such a way that it may be collected in package form in condition for immediate drying and possibly twisting and coning preparatory to shipment to the consumer. To adopt the use of a plurality of reels, as in continuous spinning, is prohibitive in this type of spinning because of plant arrangement factors, simplicity and low operating cost being of the essence.

There have, however, been several suggestions for the solution of the above problem. One of these involves the passage of thread issuing from the spinning bath directly to a thread-storage device along which it is passed without being subjected to any treatment whatsoever. This temporary storage of the thread retaining acid from the spinning bath permits continued regeneration so that upon delivery from the storage device, the thread may be washed acid-free. This arrangement is inherently unsatisfactory for it renders necessary introduction of a costly time and space consuming process step. Another solution to the problem is suggested in United States Letters Patent No. 1,996,989 to Bernstein in which the patentee suggests the passage of thread from the spinning bath through a second bath consisting of hot water, the function of the second bath being merely to wash the thread. While this is true, it has been determined that such washing is insufficient to entirely remove the acid so that, upon collection of the thread in package form, the package must be washed in the conventional manner to insure removal of the remaining acid.

It is, therefore, an object of this invention to overcome the difficulties heretofore encountered and to provide for the acid-free washing of freshly spun substantially completely regenerated rayon thread immediately following the spinning thereof and prior to collection in package form.

In accordance with the teachings of this invention, it is contemplated that high quality, low cost rayon thread may be produced in a simple discontinuous manner involving the passage of the thread from a spinning bath to a hot, regenerating bath, then directly to a thread-storage, thread-advancing device for washing and there-

after to a collecting device for winding the same into package form in acid-free condition.

A further object of this invention is to effect the production of strong thread in a simple and efficient manner, the thread, as collected, being suitable for all standard uses including use as a rubber reinforcing element without further chemical treatment.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description thereof in conjunction with the annexed drawing wherein the sole figure is a perspective view of a two-bath spinning system intended for operation according to the teachings of the present invention, the apparatus being shown in schematic form.

Referring more particularly to the drawing, it will be seen that the system includes a spinneret 10 disposed in a trough 11, this trough containing the ordinary spinning bath consisting essentially of sulphuric acid, sodium sulphate and zinc sulphate and being at a temperature of about 40° C. Thread 12, issuing from the spinning bath contained in trough 11, is led to a godet 13 and from that godet down into a second trough 14 containing hot water or very dilute acid, the water being between 70° and 100° C., the acid content thereof being not substantially above 1%. (Necessarily some acid will be introduced into the bath in trough 14 by adherence to the thread 12 coming from the acid bath in trough 11.) In the second bath located in trough 14 and functioning to complete the regeneration of the thread, there is disposed a guide roller 15. Thread 12 is led from godet 13 over guide roller 15 which is under the surface of the bath in trough 14 and from there to a washing device 16.

As disclosed, washing device 16 consists of two rollers 17 and 18, the axes of which diverge in the direction of the unsupported end. These rollers are driven and cause the thread 12 to feed from the unsupported toward the supported end in the manner shown in the drawing. The rollers themselves are well known and form no part of the present invention, any type of thread-storage, thread-advancing device being suitable. Adjacent the supported end of the lower roller 18 of the thread-storage, thread-advancing device 16, there is a spray nozzle 19 adapted to spray water therealong for washing purposes. A trough 20 underlies this roller and serves to carry away the washing water after use. The thread after being washed on device 16 is led to a godet 21 and from there to a collecting device which may be either a spinning pot or spinning bobbin. As illustrated, spinning pot 22 is used for collection of the thread in package form.

In operation, thread issuing from spinneret 10 is caused to coagulate in the acid bath in trough 11. The coagulated thread is then led upwardly to godet 13 from thence to guide 15 and thereafter to washing device 16. Regeneration commences immediately upon issuance from the spinneret and is substantially completed by the hot water bath in trough 14 so that a completely formed, fully regenerated thread is stored on device 16. It may be washed, therefore, immediately upon issuance from the second bath without time loss requisite to completion of regeneration.

The thread as it leaves the second bath of

course contains acid. As it then passes along the thread-storage, thread-advancing device from the unsupported toward the supported end thereof, it is first contacted by water which may not be entirely acid-free due to having washed previous coils of thread. As the coil progresses toward the supported end of device 16, however, its acid concentration is gradually reduced until at the last coil it is washed by fresh, entirely acid-free water issuing directly from nozzle 19. Thus, thoroughly washed thread is delivered from device 16 to be passed over godet 19 directly to the spinning pot.

In the manufacture of strong yarn, it has been found desirable to stretch the freshly spun thread prior to the completion of the regeneration. Applying this theory to the present invention, stretching therefore should occur between godet 13 and device 16, as, for example, by driving device 16 in such a way that its take-up speed is in excess of that of godet 13. Of course any known stretching arrangement may be employed.

An example may serve to illustrate more fully the present invention and the advantages inherent therein.

Example I

The first spinning bath is composed of 9% H₂SO₄, 17% Na₂SO₄, 5% MgSO₄ and 1% ZnSO₄, maintained at a temperature of 43° C. The second bath consists of hot water, the acid content of which is not allowed to get substantially above 1%. The freshly spun thread is withdrawn from the spinning bath at approximately 65 meters/minute and after passing through the second hot regenerating bath is taken up on the washing device at approximately 69 meters/minute. The washing device consists of two axially offset rollers on which the thread is temporarily stored in a multiplicity of lateral convolutions (about thirty). During the period that the thread passes through the said convolutions, it is washed acid-free by spraying hot water on the lower roller. The completely washed thread is then drawn from the washing device at 70 meters/minute and finally collected in a wet condition in a centrifugal spinning pot.

What is claimed is:

An apparatus for the manufacture of rayon threads which comprises an acid spinning bath, a spinneret located therein, means for extruding a viscose solution through the spinneret into the bath to form thread that is coagulated and partially regenerated in said bath, a second bath for completing the regeneration of the thread, means for withdrawing the thread from the first bath, a pair of axially offset thread-storage, thread-advancing rollers disposed wholly without the second bath and operated at a take up speed in excess of the delivery speed of the means for withdrawing the thread from the first bath for drawing and stretching the thread through the second bath, said rollers also acting to support the thread in a series of lateral convolutions, means for directing a spray of water in contact with the thread and counter-current to the direction of travel of the said series of convolutions whereby the thread is washed acid-free and the thread containing the least acid initially contacts the water-spray and means for collecting the thread directly after the washing operation.

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