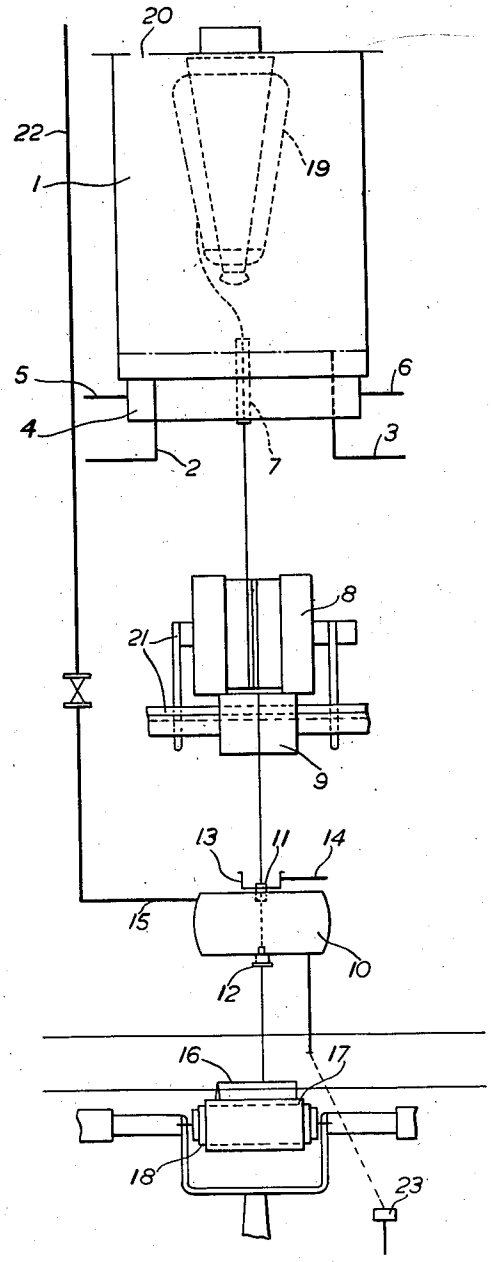
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PRODUCTION OF ARTIFICIAL YARNS, FOILS, AND SIMILAR MATERIALS

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PRODUCTION OF ARTIFICIAL YARNS, FOILS, AND SIMILAR MATERIALS

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4 Claims. (Cl. 28—59)

This invention relates to improvements in the stretching of artificial yarns, foils and similar materials and the application is a divisional application of our application No. 322,948.

British Specifications Nos. 438,584 and 438,585 and U. S. Patents Nos. 2,142,717 and 2,142,722 describe processes for improving the properties of yarns, foils and similar materials having a basis of cellulose esters or ethers by stretching them in the presence of steam during their travel from one point to another.

It has been discovered that improved results, particularly as regards extensibility of the products, may be obtained in processes of the above character if the materials, particularly yarns made of cellulose acetate or other organic derivative of cellulose, are conditioned in wet steam prior to the stretching operation. This conditioning treatment is particularly effective when the stretching operation itself is carried out in steam which is dry or substantially dry. The invention includes not only stretching processes in which the materials are conditioned, but also apparatus for carrying out the processes.

The most satisfactory method of carrying out the conditioning operation is, in general, to effect it while the yarn or other material is in package form and while it is being drawn from the package and proceeding to the stretching vessel, since in this manner as the package is unwound, fresh layers of the material are continually being exposed to the conditioning agent so that uniform conditioning of the materials is facilitated. The conditioning may be assisted by immersing the packages in hot water for a short time, e. g. 5–10 minutes before exposing them to the wet steam. From the conditioning apparatus the materials may pass to a positively-driven feed device and through the stretching chamber in which they are stretched by means of a positively driven stretching-device adapted to draw the materials through the stretching-chamber at a speed greater than that at which they are forwarded by the feed device. In order to moisten the materials thoroughly before they enter the stretching chamber, particularly if the steam employed for stretching is dry or substantially dry, they may pass through a bath of water or in contact with a wick or fabric-covered roller or other device which supplies water to them.

The apparatus according to the invention comprises a container for a package of the material provided with an inlet for wet steam and an outlet for the material in combination with a positively-driven feed device, a substantially closed chamber having an inlet for stretching medium and an inlet and an outlet for the materials and a positively driven stretching-device adapted to draw the materials through the stretching-chamber at a speed greater than that at which they are forwarded by the feed device.

A sectional elevation of an apparatus in accordance with the present invention is shown diagrammatically in the accompanying drawing. The apparatus comprises a container 1 for a package 19 of yarn or other material to be treated. This container is provided with a steam inlet 2, a drain 3, and a cooling chamber 4, which is provided with an inlet 5 and an outlet 6 for cold water. The drain 3 projects into the container so that a layer of condensed steam may be maintained in the container, whilst the steam inlet 2 is so arranged that steam entering the container has to pass through this layer of water. The container has a small hole 20 in order to maintain atmospheric pressure within the container and it is provided with an outlet 7 for the yarns or other materials being treated. This outlet projects above the level of the top of the drain 3 so that the materials passing out of the container do not come into contact with the layer of water.

From the container the materials pass to a feed roller 8 and then over a roller 9 by which the roller 8 is driven. The centre portion of the feed roller is grooved so that the yarns passing round the roller do not come into contact with the driving roller 9. The rollers 8 and 9 are carried on bearings 21 which are capable of being moved so as to separate the rollers.

From the feed roller the materials pass into a stretching chamber 10 which is provided with inlet and outlet orifices 11 and 12. A small cup 13 is provided round the inlet orifice, which is kept filled with water, so that the materials are moistened before they enter the stretching chamber. If the cup is made of a polymerised phenyl-formaldehyde resin or other material of low heat-conductivity the steam issuing from the stretching chamber condenses, and maintains a layer of water in the cup extending up to the level of a drain 14. Steam enters the stretching chamber through a pipe 15. After issuing from the stretching chamber, the yarn passes round a stop motion bar 16 and then on to a cheese 17, which is surface-driven by a roller 18 at a higher peripheral speed than the feed roller. Instead of using a cheese or other package as a stretching-device, a separate positively-driven stretch-

ing-roller may be provided after the stretching chamber and the materials may pass from this roller to a take-up device.

Steam for the container and stretching chambers is taken from a main steam supply through the branch line 22. A steam trap 23 is provided which communicates with the stretching chamber.

An apparatus such as that described above takes up a comparatively small amount of space and a number of units of this construction may be arranged side by side. In this manner a number of yarns may be stretched simultaneously, with the advantage that the breakage of one end or any other cause which interferes with the functioning of one unit does not affect the operation of the remaining units.

Steam may be fed directly to the different units from the main steam supply, but preferably a steam container of fairly large volume is interposed between the steam supply and the units, which assists in maintaining the steam conditions uniform throughout the stretching operation and among the different units. When it is desired to use dry steam, steam traps may be inserted at suitable points along the steam lines and in the stretching chambers in order to remove any condensed water.

In stretching yarns and other articles according to the process of the present invention steam may be used at a temperature of, for example, 110, 120 or 140° C. or more.

The best temperature to employ depends upon the other conditions existing, for example the nature of the materials to be stretched, and particularly upon the degree of stretch which it is desired to effect, the higher the degree of stretch required, the higher, in general, being the steam temperature necessary. Moreover, in general, dry steam appears to require a somewhat higher temperature than wet steam to effect the same degree of stretch. Yarns and similar materials may be stretched, for example, to 150, 170, 200, 500% or even more of their original length and their tenacity may be doubled or trebled or increased to an even greater extent.

The present invention is particularly valuable in the stretching of yarns made of continuous filaments of the ordinary acetone-soluble cellulose acetate, but it is also applicable to other materials having a basis of other cellulose esters and ethers, for example spun yarns having a basis of cellulose acetate and yarns and other materials having a basis of cellulose propionate, cellulose butyrate, cellulose acetate-propionate, cellulose acetate-butyrate, ethyl or benzyl cellulose, ethyl cellulose acetate or oxy-ethyl cellulose acetate.

Having described our invention, what we desire to secure by Letters Patents is:

1. Apparatus for stretching artificial filaments, foils and similar materials which comprises a container for a package of the material provided with an inlet for wet steam and an outlet for the material, a substantially closed stretching chamber having an inlet for stretching medium and an inlet and an outlet for the material, a positively driven feed device adapted to draw the material from the package and forward it to the stretching chamber and a positively driven stretching device adapted to draw the material through the chamber at a speed greater than that at which it is forwarded by the feed device.

2. Apparatus for stretching artificial filaments, foils and similar materials, which comprises a container for a package of the material, said container being provided with an inlet for wet steam, an outlet for the material and an outlet for condensed steam so positioned that a layer of condensed steam covers the bottom of the container and the wet steam inlet introduces steam into the container through the said layer, a substantially closed stretching chamber having an inlet for stretching medium and an inlet and an outlet for the material, a positively driven feed device adapted to draw the material from the package and forward it to the stretching chamber and a positively driven stretching device adapted to draw the material through the chamber at a speed greater than that at which it is forwarded by the feed device.

3. Apparatus for stretching artificial filaments, foils and similar materials, which comprises a container for a package of the material, said container being provided with an inlet for wet steam, with an outlet for the material and with cooling means, a substantially closed stretching chamber having an inlet for stretching medium and an inlet and an outlet for the material, a positively driven feed device adapted to draw the material from the package and forward it to the stretching chamber and a positively driven stretching device adapted to draw the material through the chamber at a speed greater than that at which it is forwarded by the feed device.

4. Apparatus for stretching artificial filaments, foils and similar materials, which comprises a container for a package of the material, a substantially closed stretching chamber having an inlet for stretching medium and an inlet and an outlet for the material, a positively driven feed device adapted to draw the material from the package and forward it to the stretching chamber and a positively driven stretching device adapted to draw the material through the chamber at a speed greater than that at which it is forwarded by the feed device, said container being provided with an inlet for wet steam, with an outlet for the material, with a cooling chamber having an inlet and an outlet for cooling fluid and with an outlet for condensed steam above the bottom of the container, the positions of the wet steam inlet and the condensed steam outlet being such that a layer of condensed steam covers the bottom of the container and the steam inlet introduces steam into the container through the said layer.

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