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EMBODIMENT IN THE PROCESS FOR MANUFACTURING ARTIFICIAL TEXTILE FIBERS FROM ANIMAL CASEIN

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9 Claims. (Cl. 18—54)

The present invention has for its object an embodiment in the process for manufacturing artificial textile fibers from animal casein.

The process according to the invention includes (1) spinning filaments from an alkaline solution of animal casein and coagulating the same in an acid bath (2) collecting the coagulated filaments in a continuous strip or band and passing the same, under tension, through baths containing soluble salts, the hardened filaments being then cut to the desired length and dropped into a bath of formaldehyde, in which salts have been dissolved.

The invention includes also (1) spinning filaments from a solution of animal casein and coagulating the same in acid baths (2) collecting the coagulated filaments in a continuous strip and passing them, under tension, firstly through a bath of sodium chloride and then through a bath of aluminium salts and sodium chloride and optionally formaldehyde, the hardened filaments, being then cut to the desired length and dropped into a bath of formaldehyde, to which aluminium salts and sodium chloride have been added.

A further characteristic of the invention consists in the provision that the filaments, when issued from the coagulating bath are stretched and passed under tension through the successive hardening baths until they are cut to the desired length.

This application is a division of copending previously filed parent application Serial No. 191,000, filed February 17, 1938; said parent application, and therefore the present application, being based upon the earlier filing of corresponding application in Italy on March 2, 1937, which Italian application has subsequently resulted in Italian Patent No. 367,405, granted January 24, 1939.

The invention will be now explained with reference to an example of carrying it into practice.

The casein filament groups or bundles which emerge from the spinning nozzles are conveyed to the top of the spinning machine, thus forming a continuous band (for instance one hundred spinning nozzles having one thousand holes each are equal to a band of one hundred thousand continuous filaments). This band is conveyed, under tension, first through a sodium chloride bath, preferably in opposite direction to remove from the fibers, all or part of the acid and the salts which are carried from the preceding coagulation bath; then the continuous band is conveyed, still under tension, through a preparatory

bath for rendering the delicate filaments insoluble, which bath is composed of sodium chloride and aluminium salts in aqueous solution, either with or without the addition of formaldehyde, and when the filaments are sufficiently washed and subsequently hardened, the band is passed through an automatic cutter, which cuts the filaments to the desired length. The cut filaments, as stated above, must be collected in a bath of sodium chloride or of other salts of alkaline metals or of alkaline earth metals, either with or without the addition of aluminium salts and formaldehyde, but preferably in a bath for rendering them insoluble which is composed of an aqueous solution of sodium chloride, aluminium salts and formaldehyde.

The sodium chloride in the initial immersion bath may be replaced by other soluble salts of alkaline metals or of alkaline earth metals, but, in addition to the increased cost, the resultant product is not so good. Moreover, by the use of a sodium chloride bath, this salt is conveyed by the band into the subsequent bath for rendering the fibers insoluble, which is very useful and indeed almost indispensable.

The first immersion bath, for eliminating the acid and the sodium sulphate or other salts conveyed with the filaments from the coagulating bath, could also be omitted, when the band is immediately immersed in the preparatory bath for rendering the filaments insoluble, composed of aluminium salts and sodium chloride, or even directly into the complete bath for rendering the fibers insoluble composed of formaldehyde, aluminium salts and sodium chloride or of other soluble salts.

The band, which passes through the bath at the same speed as it is spun (60 to 80 metres per minute) may be continuously immersed in the above described baths, but it is also possible to immerse the said band intermittently, for example, at points located one metre apart, making it move upwards and downwards so as to enter the bath merely over a distance of 10 to 15 centimetres only of its travel, with a distance of one metre between successive immersion.

In this passage of the band of filaments through the above described baths it is important that the band be under tension when passing through the baths, so that it cannot shrink by the action of the baths.

It is also important that the temperatures of the baths be suitably determined.

The continuous or the intermittent immersing operation of the band is effected in less than five

minutes (in conformity with the spinning velocity); the filaments are sufficiently hard to prevent adhering together (even when coagulation baths of low concentration are employed). The filaments can be cut to the desired lengths immediately and will only shrink in so far as the best twist is to be obtained. If, however, a greater twist is required, to the detriment of the fineness of the fibers, the passage of the band through the baths may be effected without maintaining it under tension.

By the above described treatment short fibers can also be derived from the casein which are finer than the filaments extruded during spinning. For instance, when the spinning operation is regulated so as to obtain a fiber the count of which is three denier and it is not possible to spin a finer number, the band of filaments should be driven ahead one or more times with a speed which is 50% higher than that of the spinning velocity, and the count which during the spinning was three denier will be reduced to two denier. But when the band is then immediately cut, the filaments will shrink to a point at which the count has returned to three denier; but on the contrary, when the said band is made to pass through the above described baths under tension and at the prescribed temperature the fibers will maintain the count of two denier.

In view of the fact that the price of wool increases as the count increases it will readily be appreciated that it is of considerable importance to be able to obtain a higher count without any increase in cost.

In order to avoid deterioration of the casein filaments when they are freshly coagulated, they should not be rendered insoluble in aqueous solutions which contain more or less high percentages of formaldehyde alone, but other salts such as sodium chloride and aluminium salts should be added to the aqueous solutions of formaldehyde.

The described particulars of the present process for making textile fibers of casein may be modified in various ways without departing from the spirit of the invention.

The invention can also be applied to the manufacture of mixed fibers of casein and cellulose.

The invention also includes the textile fibers of casein obtained by the indicated process.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:

1. In a process for manufacturing artificial textile fibers from an alkaline solution of casein spun into an acid bath, the stage following such coagulation, of grouping the coagulated fibers together as a band, drawing them advancingly from the coagulation bath and passing them continuously under substantial tension produced by stretching to substantially 150% of their normal length, through an aqueous bath containing a salt of an alkali, and finally rendering the filaments insoluble by passing them through a bath containing formaldehyde.

2. A process as in claim 1, wherein an alumi-

num salt is added to at least one bath through which the coagulated filaments are being drawn continuously under tension.

3. In a process for manufacturing artificial textile fibers from an alkaline solution of casein spun into an acid bath, the stage following such coagulation, of grouping the coagulated filaments together as a band, drawing them ahead out of such bath and passing them continuously under tension through an aqueous bath of formaldehyde containing a salt of an alkali.

4. A process as defined in claim 3, wherein one of the baths through which the coagulated filaments are being continuously drawn, contains an aluminum salt.

5. In a process for the manufacture of artificial fibers from casein and following the stage of spinning a multiplicity of filaments from an alkaline solution of the casein and coagulating them in an acid coagulating bath; the after treatment of the delicate coagulated filaments comprising guiding and advancing such coagulated filaments along in a continuous band under stretching tension, and thus conducting them through and hardening them while under such tension in at least one aqueous hardening bath containing an aluminum salt, then cutting such hardened filaments into predetermined lengths, and then subjecting the loose lengths of cut filament to the insolubilizing action of an aqueous formaldehyde bath containing sodium chloride and an aluminum salt.

6. The process of claim 4 wherein the filament band is advanced at a speed substantially higher than the spinning velocity thereby to stretch and attenuate the filaments and reduce the gage, and the tension is maintained through the hardening bath to prevent shrinking and shortening before the reduced gage is fixed.

7. In a process for the manufacture of artificial fibers from casein and following the stage of spinning a multiplicity of filaments from an alkaline solution of the casein and coagulating them in an acid coagulating bath; the after treatment of the delicate coagulated filaments comprising guiding and advancing such coagulated filaments along in a continuous band under stretching tension, and thus conducting them through an initial aqueous bath for washing out residual acid from the coagulation bath, said washing bath containing sodium chloride to restrain swelling of filaments, and then through a hardening bath containing a aluminum salt and sodium chloride in aqueous solution, and thereafter subjecting the washed and hardened filaments to the insolubilizing action of an aqueous formaldehyde solution also containing sodium chloride.

8. The process of claim 6 and wherein the hardening bath contains also a small proportion of formaldehyde, and the insolubilizing bath contains also an aluminum salt.

9. The process of claim 6 and wherein the filaments are cut to length after the hardening step but preceding the completion of the insolubilizing of the filaments.

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