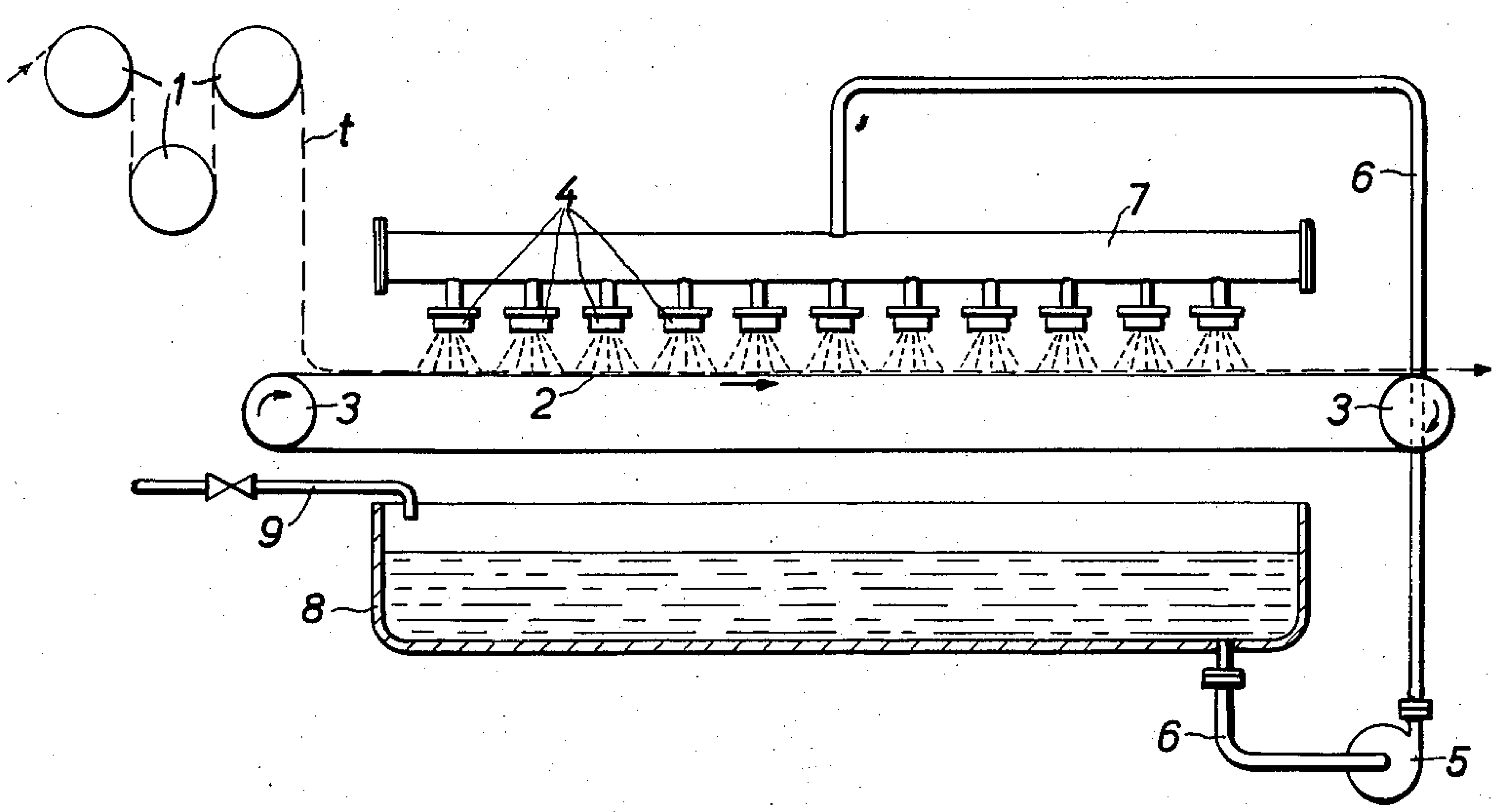
Sept. 20, 1960

MAX-OTTO SCHÜRMANN

AFTERTREATMENT OF TOWS CONSISTING OF CONTINUOUS ARTIFICIAL FILAMENTS

Filed Dec. 13, 1954

2,953,424



INVENTOR.
MAX OTTO SCHÜRMANN
BY
Connolly and Hutz
their ATTORNEYS

United States Patent Office

2,953,424
Patented Sept. 20, 1960

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AFTERTREATMENT OF TOWS CONSISTING OF CONTINUOUS ARTIFICIAL FILAMENTS

Max-Otto Schürmann, Dormagen, Germany, assignor to Farbenfabriken Bayer Aktiengesellschaft, Leverkusen, Germany, a corporation of Germany

Filed Dec. 13, 1954, Ser. No. 474,763

Claims priority, application Germany Feb. 15, 1954

3 Claims. (Cl. 8—151.2)

The invention relates to the chemical processing and washing of tows consisting of continuous artificial filaments.

The continuous production of tows consisting of artificial filaments of regenerated cellulose is in principle similar to the production of rayon yarn by the continuous process. The thickness of the tows is however, much greater than that of the yarn. This greater thickness of the tows renders any wet treatment thereof extremely difficult because it requires a multiple of the time of the wet treatment of yarns.

It is therefore an object of the present invention to provide a process for the aftertreatment of tows consisting of continuous artificial filaments, by which the wet treatment can be performed in a short period of time.

A further object is the provision of a process for the aftertreatment of tows of filaments with the utmost economy in chemicals.

A still further object consists in a process, which avoids the sticking of individual filaments to each other in the tow. Another object resides in the provision of a process by which cuprammonia cellulose filaments can be acidified and freed of copper in a short space of time and without the danger of sticking.

Another object is the provision of an apparatus for continuously aftertreating tows of artificial filaments, which requires little space and is easy to handle.

Still further objects will become apparent as the following specification proceeds.

These objects are accomplished according to the invention by applying the treating liquid to the tow vertically with high speed in fine jets, the tow itself being kept under as small a tension as possible.

In order to counteract the displacement of filaments it is necessary to give the tow a support, for instance by placing it on an endless movable sieve. This sieve should move with a slightly slower speed than the tow which it supports in order to obtain the necessary lack of tension and to allow the tow to shrink unhindered.

Preferably the tow is laid on the horizontally moving sieve and the treating liquids are applied thereto through nozzles or sprays disposed at a small distance thereover. The diameter and speed of the liquid jets must be kept within predetermined limits; jets which are too coarse and strong lead to an undesirable displacement of the filaments while fine jets may lead to a stopping of the fine holes of the nozzles and slow jets fail to produce the optimum effect. The number of holes and their distance from each other should be so selected that the cable is not covered by any substantial amount of liquid. The distance from the sprays of the material to be treated is of importance since it has an influence on the speed of the jets. In selecting the speed and strength of the jets (the first of which is substantially dependent upon the pressure of the liquid in the spray), the thickness of the tow and also that of the individual filaments must be taken into consideration. Thick tows require a more intense treatment than thin ones.

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With a thickness of the tow of from about 30,000 to about 100,000 deniers and an individual denier of 2 to 6, a diameter of the holes of 0.3 to 0.8, preferably 0.5 millimeter, a pressure of the aqueous liquid of between about 0.3 to 1.5, preferably 0.5, atmospheres above normal and a distance of the sprays from the tow of from 5 to 15 centimeters, preferably 10 centimeters, has proved effective. The number of holes amounts to about 100 per square decimeter.

As a support, a sieve band having the greatest possible permeability is employed in order to enable the washing liquid to run unhindered therethrough. Woven sieves or spiral wefts from stainless steel have proved particularly effective.

The single figure of the accompanying drawing shows a diagrammatic cross-sectional view of the apparatus employed. A set of rollers **1** is disposed at the entrance side of the apparatus. A sieve band **2** mounted on rollers **3** is arranged beneath a plurality of sprays or nozzles **4**, which are connected with the pump **5** by the pipe **6** ending in tube **7**. Beneath the movable sieve band there is arranged a tray **8** which collects the liquid coming from the sprays and in which this liquid is mixed with fresh treating liquids from tap **9**.

In operating the apparatus, the tow *t* is introduced by means of the set of rollers **1**, running at a peripheral speed slightly higher than the speed of the sieve band **2**. Thus the tow is laid on the sieve band without any tension. The sprays are then operated by starting the motor of pump **5** whereupon the jets of liquid from the sprays are directed against the tow. The liquid passes through the sieve and is collected in the tray **8**. It is again concentrated from tap **9**.

Apart from the saving of time already mentioned, the process of the invention has the advantage of requiring considerably less room for the apparatus and providing for a more efficient use of the chemicals employed. The invention replaces "washing by dilution" by "washing by displacement." The invention further saves the complicated stirring mechanism which was necessary hitherto in order to keep up a slight tension when tows are washed in long containers. The process is well adapted for hardening freshly spun tows from regenerated cellulose filaments which are apt to adhere to each other. It is especially useful in removing copper from tows freshly spun from cuprammonia cellulose solutions.

The acidifying of the "blue fiber" with dilute sulfuric acid is one of the most complicated steps in cuprammonia fiber production since the fiber here passes through a state in which it has a maximum tendency to stick. While according to hitherto known methods it was difficult to obtain a product free from cohering sections, the present process yields a product which is entirely free of cohesion. The time required for acidifying is about 1/10 of that required according to the known methods. This favorable behavior as regards lack of tendency for sticking makes it possible to reintroduce a higher percentage of used precipitating liquid containing ammonia and copper into the process, which renders the process more economical as regards consumption of chemicals. The precipitating liquid which is reintroduced into the process may be wholly or partly freed of copper by leading it over a cation exchange resin. The process further allows a reduction of the temperature of the spinning bath, a fact which leads to economy in steam consumption. The further washing of the tow after the removal of the copper may be further accelerated by applying the principles of the invention.

The final washing may be carried out in the same step on the same sieve band or after squeezing out the liquid on a separate sieve. The drying of the tow may be effected by applying thereto a vertical stream of heated air of high speed. The advantages of this combined method allow the tow to be continuously processed to the final stages on a very short length of apparatus. A further advantage consists in the complete lack of displacement of individual filaments which would lead to difficulties in the continuous tearing or cutting of the tow into staple. Furthermore it is possible to use the shrinking during acidification and drying to obtain a structural crimp.

I claim:

1. The process of continuously aftertreating a tow consisting of a bundle of filaments of regenerated cellulose and having a thickness of from about 30,000 to about 100,000 deniers with a titer of the individual filaments of from about 2 to about 6 deniers, which process comprises continuously feeding said tow onto a moving endless sieve band and directing thereagainst vertical jets of liquid under a superatmospheric pressure of from about 0.3–1.5 atmospheres gauge through nozzles having a plurality of holes with a diameter of from about 0.3 to 0.8 millimeter, said nozzles being disposed at a distance of 5 to 15 centimeters from said sieve.

2. A process according to claim 1 in which the filaments are spun from a cuprammonia cellulose solution.

3. A process according to claim 2 in which the filaments are freshly spun and still in the alkaline state and liquid is dilute sulfuric acid.

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