United States Patent

[11] 3,608,002

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[31] **F 48039**
Continuation of application Ser. No. 604,450, Dec. 23, 1966, now abandoned.

[54] **PRODUCTION OF SPUN FILAMENTS OF UNIFORM THICKNESS**
1 Claim, 1 Drawing Fig.

[52] **U.S. Cl.** **264/40,** 18/2, 18/8, 264/184, 264/201
[51] **Int. Cl.** **D01d 5/06,** D01d 11/00
[50] **Field of Search** ..... 264/201, 184, 40, 176 F; 18/8 P, 8 K, 8 R, 2, 8 A; 137/2, 8, 9

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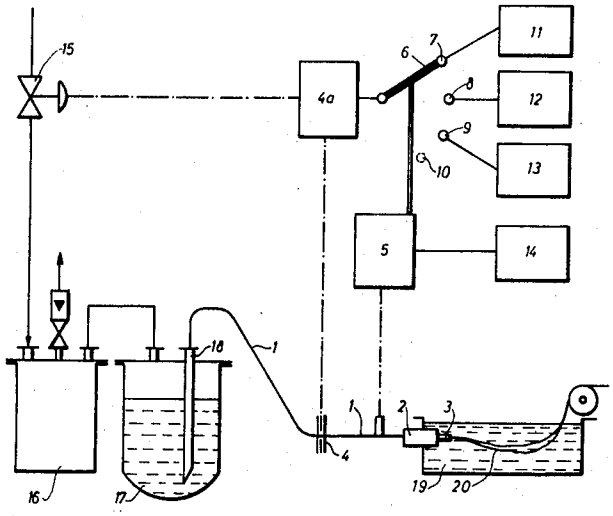
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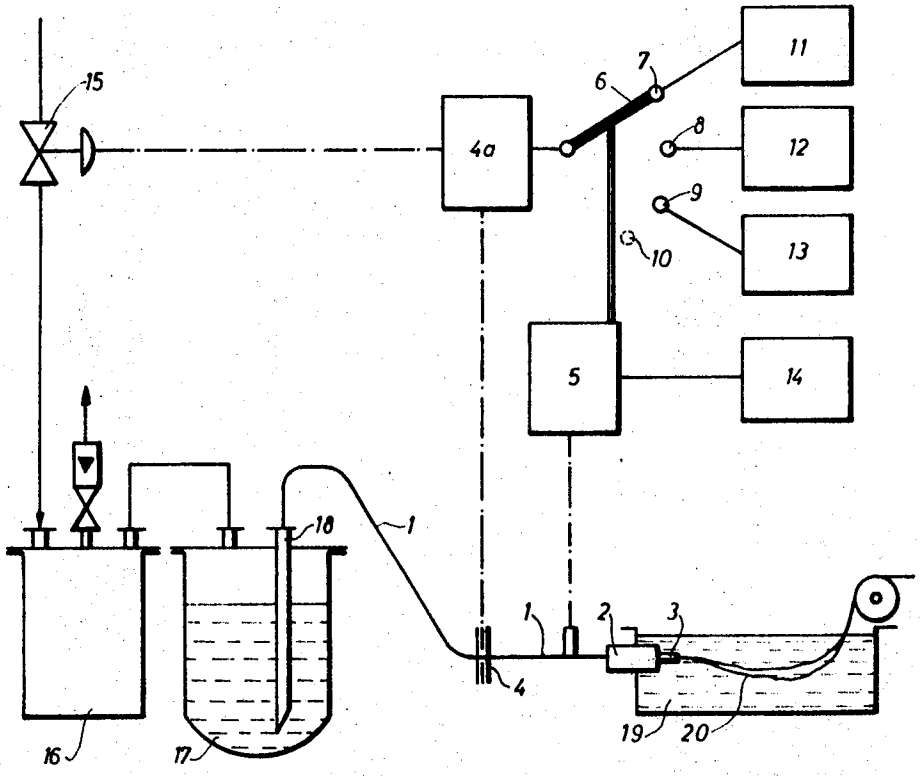
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Primary Examiner—Robert F. White
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ABSTRACT: A process for the spinning of filaments of a substantially uniform thickness. Spinning fluid is forced under pressure from a storage means through conduit means into a spinneret and out spinning nozzles. The pressure of the spinning fluid is controlled according to the value measured by flow measuring means situated in the conduit. Significant pressure variation in the system is measured by measuring the pressure on the spinning fluid feed. The pressure variation measured is translated into switching means preset to operate in relation to the number of spinning nozzles operating. The appropriate preset flow rate controller is utilized depending upon the value measured by the pressure measuring means.





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PRODUCTION OF SPUN FILAMENTS OF UNIFORM THICKNESS

This is a continuation of application Ser. No. 604,450, filled Dec. 23, 1966, and now abandoned.

PRODUCTION OF SPUN FILAMENTS OF UNIFORM THICKNESS

The present invention relates to a process for the production of spun filaments of uniform thickness, in which the solution from which the filaments are to be spun is extruded under pressure through a spinneret comprising a plurality of nozzles. The present invention provides for the spun filaments to be of uniform thickness even in the event of blockage of one or more nozzles of the spinneret and/or changes in viscosity or temperature of the spinning solution due to external factors.

In the process commonly used for the production of spun filaments of a thickness, which is, as fast as possible, uniform the initial pressure in front of the nozzle is kept constant by means of a pressure metering and control device.

Provided that the flow through the nozzles is laminar, the quantity flowing through them, and hence the thickness of the filaments, is proportional to the pressure and inversely proportional to the viscosity (Hagen-Poiseuille's law). The thickness of the filaments is considerably affected by changes in viscosity. In the event of irreversible changes in viscosity due, perhaps, to fluctuations in temperature in the spinning solution, control of the filament thickness by simply keeping the pressure constant is no longer possible.

It has now been found that it is possible to spin filaments of uniform thickness regardless of blockages in the nozzles and external temperature effects if, according to the present invention, a nominal rate of throughflow of solution, which nominal value is adjusted by measurement, is controlled by the pressure change which occurs in front of the spinneret when there is a change in the number of nozzles in operation, this control of the nominal value being effected by a setting means which is adjusted for n or $n-1$ etc. nozzles, and the nominal value, having been changed in this way, is used for governing the rate of flow.

In the event of failure of individual nozzles, the remaining nozzles, therefore, continue to spin the filament at constant thickness. This also applies even when only a single nozzle remains in operation.

The accompanying drawing shows diagrammatically an example of an apparatus for carrying out the process when spinning in a latex solution.

The measuring and control device associated with a spinning plant for natural and synthetic latex spun filaments comprises an electropneumatic arrangement, i.e. all data, except temperatures, are measured and controlled pneumatically. The control apparatuses are electric. The rates of flow of the latex spinning solution forced through pipe **1**, the spinneret **2** and the individual nozzles **3** are measured by means of a measuring aperture **4** and are controlled by means of the control device **4***a* by actuation of the control valve **15** which controls the compressed air supplied to the receiver **16** and storage tank **17** of the latex solution. Care must be taken to ensure that the critical Reynolds number is exceeded at the

prevailing flow through the measuring aperture **4**. For large Reynolds numbers, at which the rate of flow becomes independent of these values, the viscosity forces have a negligible influence on the aperture measurement.

Owing to the air pressure produced above the latex solution in the storage tank **117**, and controlled by means of the control valve **15**, the solution flows through the ascending pipe **18** and the pipe **1** and through the measuring aperture **4** direct to the spinneret **2** and the nozzles **3** from which they are extruded in the form of filaments **20** into a precipitating bath **19**. It is not necessary to provide a control device in the pipe **1** which carries the latex. Owing to changes in viscosity, the pressure in the latex solution will be subjected to measurable fluctuations in the front of the spinneret **2** if the rate of flow is constant. If suitably calibrated nozzles **3** are used, the pressure is a direct measure of the viscosity. In the event of severe disturbances, e.g. blockages of one or more nozzles, the pressure in front of these nozzles rises sharply. A suitable pressure metering and control device **5**, in the simplest case a contact manometer, receives these disturbances and registers them and causes an alarm device **14** to respond, and by way of a selector switch **6** it switches the nominal value of flow rate for n nozzles from the nominal value setting means **11** to the setting means **12** for $n-1$ nozzles or to the setting means **13** for $n-2$ nozzles etc. When the blocked nozzles reopen, the nominal value is switched back to the corresponding value in the same way. A filament thickness of fine tolerance can be guaranteed by this automatic switching of the nominal value to the required value according to the number of operating nozzles.

Example

In a series of experiments extending over a prolonged period, all the variable factors, such as viscosity at the temperature of the latex solution, the number of nozzles, the temperature of precipitating bath and the temperature of spinning nozzles were varied. The level of latex solution in the storage tank **17** had no influence, even when it altered a great deal, on the thickness of the spun filament. The spun latex filament had a mean diameter of 0.600 mm. and a maximum deviation of less than ±0.005 mm., i.e. ±0.83 percent. A tolerance of ±2.5 percent was required. The problem was thus solved by the process described.

What is claimed is:

1. In the process of spinning a plurality of filaments from a corresponding plurality of spinning nozzles in a spinneret, which process comprises feeding liquid-form material to be spun from a reservoir means to said spinneret under pneumatic pressure, and controlling the pneumatic pressure as a function at the rate of flow of liquid-form material to be spun, the improvement which comprises measuring the pressure of said liquid-form material to be spun upstream of said spinning nozzles, automatically determining the number of spinning nozzles operating as a function of such pressure measurements, and automatically adjusting the rate of flow of liquid-form material to be spun to a predetermined and preset value controlled by the number of spinning nozzles then operating.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,608,002 Dated Sept. 21, 1971

Inventor(s) DIETER WÜRSTLIN and HEINZ HORNIG

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 6, "117" should be --17--

Signed and sealed this 28th day of March 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents