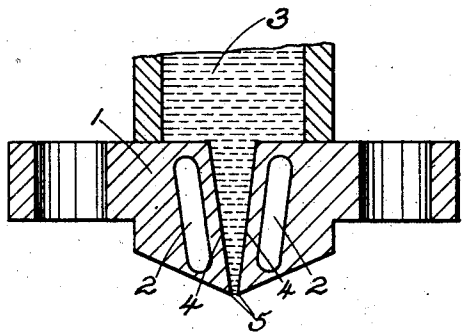
July 27, 1943. A. WUNDERER 2,325,574

MANUFACTURE OF SHEETS OR BANDS FROM HIGHLY VISCOUS CELLULOSE SOLUTIONS

Filed Aug. 26, 1939



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Patented July 27, 1943 2,325,574

UNITED STATES PATENT OFFICE

2,325,574

MANUFACTURE OF SHEETS OR BANDS FROM HIGHLY VISCOUS CELLULOSE SOLUTIONS

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Application August 26, 1939, Serial No. 292,041
In Germany August 29, 1938

1 Claim. (Cl. 18—57)

The present invention relates to the production of foils or bands of regenerated cellulose from highly viscous spinning masses.

The manufacture of sheets of regenerated cellulose from viscose presents no difficulties in respect of the production of a smooth surface, so long as the viscosity of the spinning solution is only so high that a uniform flow is not endangered. It is only necessary to use a spinning device the slot of which has smooth edges to produce in the precipitating bath a coagulated film having a smooth surface.

The position is different when the viscosity of the spinning solution is so high that a flow in the proper sense of the term does not occur. Such highly viscous spinning masses are obtained for example in preparing solutions of cellulose in sulphuric acid, phosphoric acid or zinc chloride solution or other solvents which dissolve cellulose. Such solutions when they have the concentration necessary in making sheets and contain, for instance, five per cent or more of cellulose have a pasty consistency; the viscosity is so high, especially at low temperatures, that the paste can be cut with a knife. If such a solution is extruded from a spinning slot into a precipitating bath the sheet obtained has always on both sides a more or less crimped surface so that its usefulness is generally diminished.

This invention relates to a method by which there may be obtained from a highly viscous solution of cellulose, for instance a pasty solution of cellulose in sulphuric acid, phosphoric acid or the like, sheets, films or bands having smooth surfaces.

The new process is characterized by the fact that the highly viscous spinning mass is heated superficially while it passes through the slot of the employed spinning device, that is to say the part of the spinning mass which is to come into contact with the inner surface of the spinning slot is suitably warmed. In this manner the spinning mass is liquefied at its surface by degradation. The viscosity at the surface of the spinning mass can be lowered to a degree at which the issue from the spinning orifice is faultless and the surface of the extruded sheet is quite smooth and even. Even when the surface is only slightly warmed the surface properties of the foil obtained by treating the extruded spinning mass with a precipitating bath are improved. The best degree of heating, however, must be determined by trial.

It is of importance that the interior of the spinning mass issuing from the spinning slot should not be heated or should be heated to quite a low degree, otherwise there will be too much degradation of the spinning mass, whereby the obtained films would lose too many of their mechanical properties. The interior of the extruded spinning mass remains therefore pasty. This is the meaning of the term "heat superficially."

It is recommended that a cold spinning mass should be supplied to the spinning slot, i. e., a spinning mass the temperature of which is below room temperature. The temperature should preferably not exceed about 10° C.

The heating of the spinning mass at that part which after regeneration of the cellulose becomes the surface of the foil may be achieved by heating uniformly to the required temperature the two edges or lips of the spinning slot. In this manner the outer layers of the spinning mass are warmed to the necessary degree during their passage through the slot. The temperature of the lips depends on the temperature of the spinning mass and the period of time during which the latter is in contact with the heated parts. In general the temperature of the spinning lips should be between 30° and 150° C. When the speed of the spinning is very high, the temperature may also be higher, for instance 200° or 300° C.

The following example illustrates the invention:

A solution of cellulose in sulphuric acid having a temperature between about 0° and 10° C. and containing 7–8 per cent of cellulose, 57–60 per cent of sulphuric acid and the rest water is fed under a pressure of some atmospheres to a spinning device such as that indicated by way of example in the accompanying drawing which is a transverse section through the device. The spinning device 1 has a slot 5, the edges of which are .14 mm. distant from each other. By means of the channels 2 adapted for circulation of hot water the temperature of these lips is raised to about 35–40° C. The length of the path along which the spinning solution 3 flows, namely the heated surfaces 4 of the slot is about 30 mm. The speed of discharge of the spinning solution is about 1 m. per minute. If the speed of spinning is increased the temperature of the lips must be correspondingly raised or the heated surface increased so that the heating of the surface of the spinning solution is maintained at its previous value. When the speed of the spinning is diminished the conditions are reversed. From the spinning slot the solution issues into a precipitating bath of the usual composition, for

instance dilute sulphuric acid or concentrated ammonium sulphate solution, the temperature of which is not too high at best below 10° C. in order that the strength of the sheet produced may not be affected. Under the conditions named there is obtained a film of satisfactory tensile strength and a completely smooth surface. If the temperature of the spinning lips is too high there is the danger that a sheet of poor tensile strength will be produced. When the temperature is too low on the other hand the surface of the sheet is liable to be riffled.

I claim:

A process for producing bands of regenerated cellulose with smooth surfaces which comprises leading to a spinning slot a highly viscous paste of cellulose dissolved in a solvent selected from the class consisting of sulphuric and phosphoric acids, said paste being at a temperature not exceeding 10° C., subjecting the mass adjacent the slot and only at the periphery of the mass to a temperature of from 30 to 300° C. to effect liquefaction of the mass only at the surface thereof and treating the mass passing through said slot with a precipitating bath.

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