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UNITED STATES PATENT OFFICE.

FRANÇOIS GIRARDET, OF ROUSSILLON, FRANCE, ASSIGNOR TO SOCIETE POUR LA FABRICATION DE LA SOIE "RHODIASETA," OF PARIS, FRANCE.

MANUFACTURE OF ARTIFICIAL FILAMENTS.

No Drawing. Application filed May 28, 1925, Serial No. 33,497, and in France March 5, 1925.

The present invention relates to the manufacture of artificial silk and, generally, of all artificial threads, fibres or filaments by the process termed "dry spinning." It is particularly applicable to the spinning of a solution of cellulose acetate and, generally, of an ester, ether, or any cellulose derivative or of a mixture of these products, with or without addition of other compounds, in a solvent or solvent mixture which evaporates in giving birth to the manufactured artificial filaments.

When the artificial filaments so obtained have a section of more or less flattened shape, they have to a more or less pronounced extent a spangled appearance, termed "scintillation." A simple filament, or a thread composed of such filaments, utilized for the manufacture of tissues or other textile articles, gives a surface scattered with bright spots, giving the impression of unequal dyeing, specially in dark shades.

In U. S. A. specification No. 739,972 (Lahouse) it has already been shown that one can effect the form of the sections of elementary filaments by causing the process of evaporation to take place in an atmosphere laden with the volatile solvent or solvents entering into the composition of the collodion. Other inventors have succeeded also in avoiding the scintillating effect by using collodions of especially high concentrations, or, in the case of cellulose acetate, in utilizing specially prepared cellulose acetates.

The present invention has for its object another process permitting, without having recourse to the special spinning conditions mentioned above, to obtain filaments, with a circular section or with rounded or star-shaped outlines, which do not show, or show in a lessened degree, the effect described above, said filaments acquiring at the same time improved serimetric qualities appearance and touch.

In U. S. application No. 720,106 (Prince) it has been shown that, from the point of view of regularity of spinning, it is important to regulate the temperature in the neighbourhood of the spinning dies in a manner independent from the temperature of the remainder of the cell, and the means permitting of an independent regulation have been indicated. Applicant has now found that, owing to this independent regulation of the temperature in the neighbourhood of the spinning dies filaments having a circular section or with rounded or star-shaped outlines can be easily obtained.

However, while the U. S. specification No. 720,106 (Prince) is particularly concerned with the lowering of the temperature in the region of the spinning dies and the advantages resulting therefrom, it has been found that, for the precise purpose which is the object of the present application, the independent regulation of the temperature in the region of the spinning dies must comprise a definite input of heat, variable according to the other conditions affecting the spinning.

According to the present invention, this input of heat to the spinning dies may be obtained by the adjustment of the temperature of the solution spun through the dies, which solution, in this way, itself brings to and beyond the point where it is passed through the orifices a quantity of heat co-operating to the elimination of the solvent or solvents in quantity easily calculated and adjustable, taking place throughout the whole mass of the filament, the internal zone as well as the external layers.

The advantages of this elimination is to impart to the thread, rapidly brought in the whole of its mass to a state of sufficient consistency, a rounded shape.

It is well understood that the input of heat produced, which causes the effect described above can result not only from the regulation of the temperature of the solution led to the spinning orifices (the calories produced in the operation of dissolution of the collodion, particularly, being partly available for utilization) but may be obtained by other means, used jointly or not with the above, it being understood that the input of heat for this precise purpose will be limited to the neighbouring portions of the die or dies, so as to heat the latter and the birth zone of the thread.

The regulation of the temperature at the spinning dies by a definite input of heat is applicable to any type of dry spinning in closed or almost closed cells and may be realized independently for each cell comprising either a spinning die or a group of spinning dies, or simultaneously for a group of cells as important as desired; this regulation being effected by all known means and

for instance by those indicated in the specification left with U. S. application No. 697,029 (Grillet) and No. 720,106 (Prince).

As has been said above, the input of heat to the spinning dies for the precise purpose of forming the object of the present invention is adjusted in a different manner according to the conditions adopted for the spinning, that is, the size of the elementary filament, the stretching to which it is subjected, the diameter, number, respective position and form of the orifices, the spinning speed and pressure, the dimensions and the arrangement of the spinning cell, and the conditions of the gaseous medium in this cell (temperature, rate of flow, and composition of the gaseous medium, location of the inlet or inlets and outlet or outlets of this gaseous medium, etc.). The composition and the properties of the solution to be spun (nature of the selected solvent or solvents, their respective proportions, their point of ebullition, the presence or absence of non-solvent compounds modifying the progress of the evaporation, etc.).

Example.—If, starting with a solution containing 18 to 20% of cellulose acetate in a solvent composed of 85% acetone and 15% ethyl alcohol, for instance, it is desired to produce filaments of a grade of 5 or 6 "deniers," a section with a rounded or star-shaped outline will be obtained by regulating the temperature of the solution at the spinning dies in the neighbourhood of 55 to 75° C., according to the rate of flow of the solution or speed of spinning, the shape of the cell, the composition of the evaporating gaseous medium and the position of the inlet and outlet or inlets and outlets of this gaseous medium.

On the contrary, if, in the same conditions, it is required to produce threads of 2 or 3 "deniers" or less, a substantially lower temperature will be sufficient, for instance, 40° C., 30° C., or less, as the case may be, the thread attaining rapidly in all its mass a suitable consistency.

The present invention, which provides the means for obviating the scintillation of the thread, permits one also to preserve it and bring it to a required degree in order to obtain the special effects to which it may correspond. It is sufficient, according to the selected conditions, to control the temperature of the solution at the spinning dies or of the zone immediately in the vicinity of the dies.

What I claim and desire to secure by Letters Patent is:—

1. A process of manufacturing artificial filaments by dry spinning a solution of a cellulose derivative, which consists in causing the solution to pass under pressure through spinning dies disposed in a closed cell, and producing an inflow of heat into the cell in the region of the dies, thereby to maintain a predetermined temperature in said region independently of the remainder of the cell, whereby filaments having a rounded outline in cross-section and a uniform sheen is produced.

2. A process of manufacturing artificial filaments by dry spinning a solution of a cellulose derivative, which consists in causing said solution to pass under pressure through spinning dies, and maintaining said solution at a predetermined temperature during its passage through the dies and in their immediate region, thereby to produce filaments having a rounded cross-section and uniform sheen.

3. A process of manufacturing artificial filaments by dry spinning a solution of a cellulose derivative, which consists in causing said solution to pass under pressure through spinning dies, and heating said dies thereby to maintain said solution at a predetermined temperature during its passage through the dies and in their immediate region, thereby to produce filaments having a rounded cross-section and uniform sheen.

4. A process of manufacturing artificial filaments by dry spinning a solution of a cellulose derivative, which consists in heating said solution and causing it to pass under pressure through spinning dies, and heating said dies thereby to maintain said solution at a predetermined temperature during its passage through the dies and in their immediate region, thereby to produce filaments having a rounded cross-section and uniform sheen.

In testimony whereof I have signed my name to this specification.

FRANÇOIS GIRARDET.