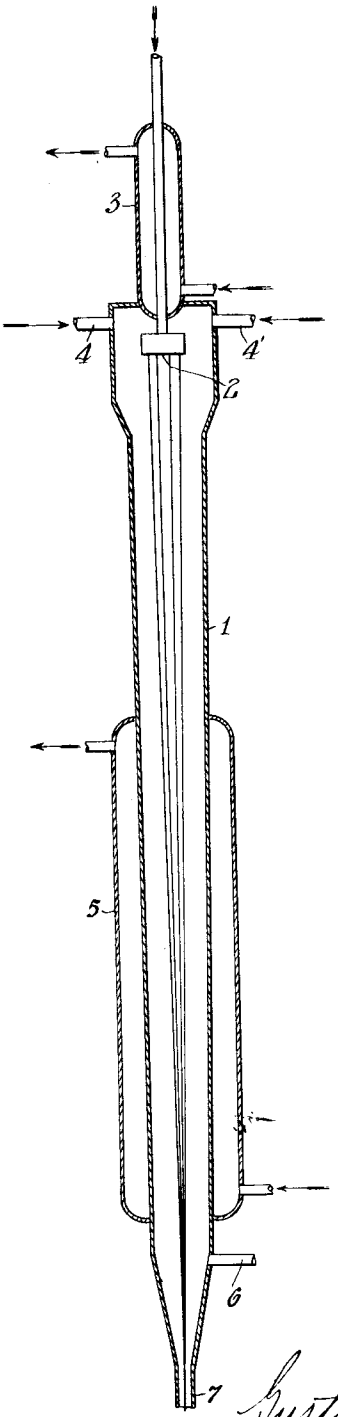
July 18, 1933. G. LECOMTE 1,918,816

PROCESS FOR MANUFACTURING ARTIFICIAL THREADS

Filed Aug. 3, 1928



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Patented July 18, 1933 1,918,816

UNITED STATES PATENT OFFICE

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PROCESS FOR MANUFACTURING ARTIFICIAL THREADS

Application filed August 3, 1928, Serial No. 297,148, and in Great Britain August 10, 1927.

This invention relates to a process of dry spinning cellulose derivatives in a volatile solvent or solvent mixtures wherein the solvent is evaporated and the artificial filament formed. More particularly, it relates to a process of dry spinning a solution of cellulose acetate wherein filaments free from scintillating effects are produced.

In application Serial No. 720,106 there is described a method of dry spinning solutions of cellulose derivatives wherein the temperature is lowered in the vicinity and region of the dies. To obtain this lowering of temperature it is proposed in that application to introduce the whole or a portion only of the drying atmosphere in the region of the dies. The atmosphere so introduced is preferably cold and eventually further cooled in the cell by any suitable cooling arrangement. It also moves in the same direction as the traveling filaments. The complete elimination of the solvents is achieved in a part of the cell opposite to the region of the dies. It is also proposed for the purpose of lowering the temperature in the region of the dies to have recourse to a cooling of the fluid to be spun before it reaches the dies. This method, however, produces generally threads or filaments having scintillating effects.

In Patent No. 1,586,552 it is stated that, in order to obtain filaments which are free from scintillating effects, it is necessary to bring to the dies an amount of heat which varies with the spinning conditions. This may be accomplished in various ways, particularly by heating the solution to be spun.

The object of the present invention is to prepare, by dry spinning of cellulose derivatives in volatile solvents, filaments which are free from scintillating effects, while introducing a cold drying atmosphere near the region of the dies.

Other objects will become apparent from the following description and accompanying drawing in which there is illustrated more or less diagrammatically a spinning cell adapted to carry out the present invention.

To attain the above-mentioned objects, this method comprises the heating of the solution to be spun before being extruded through the dies concurrently with the introduction of cold atmosphere in the region of the dies.

By this process, the advantages resulting from the lowering of the temperature in the birth-zone of the threads—stability of spinning and resisting quality of the filaments—are obtained, and, at the same time, scintillating effects are avoided due to the obtaining of rounded or star-shaped sections instead of flattened ones.

This result is remarkable, for it appears contradictory to realize this simultaneous heating and cooling. This contradiction, however, is only apparent and, as a matter of fact, the heating of the solution to be spun on the one hand and the cooling of the atmosphere surrounding the birth-zone of the filaments on the other hand are two independent operations, the respective advantages of which are effective individually and do not mutually counteract.

In fact, owing to the heating of the collodion, the evaporation of the volatile constituents of the collodion takes place rapidly. This contributes further to the lowering of the temperature in the region of the cell where the solidification of the filaments takes place almost instantaneously.

The effects described in application Serial No. 720,106 are, therefore, obtained by the present process in a particularly marked manner. That is to say, under very good conditions of stability it is possible to spin threads whose elementary filaments are extremely fine (even below 1 denier) and to use speeds of spinning approaching 400 meters per minute and higher. These two effects (pronounced fineness of the filaments and high speed in spinning) are, however, susceptible of being obtained simultaneously.

Means may be provided to heat the cell to affect the final drying of the filaments. This heating may take place only at a certain distance beyond the region of the dies, as is described in the specification of application Serial No. 720,106.

The spinning cell between the dies and the heated part of the cell may be provided with

a cooling device. This cooling device may consist, for instance, in a jacket surrounding the cell and in which a cooled fluid is caused to flow and circulate.

In order to illustrate one modification of the present invention, its application to a cell of a similar type to that described in the specification of application Serial No. 720,106 will now be described as an example, which is merely illustrative and by no means limitative. The fluid to be spun is a solution of cellulose acetate in acetone.

Referring now to the drawing, the reference numeral 1 designates the casing of a cell which is cylindrical in shape. At the upper end of the cell there is disposed a multiple orifice die 2. Surrounding the inlet of the die 2 is a heating arrangement adapted to heat the collodion to be spun before it is extruded by the die. In the present case a jacket 3 through which a heated fluid may circulate is illustrated as the heating means, but any other heating means may be employed. In the cell wall adjacent the die 2 are orifices 4, 4′ through which a cooling atmosphere is admitted to the casing. The atmosphere employed is preferably that of the spinning shed, the temperature of which is regulated to remain at about 20° C. This atmosphere may, however, be derived from any suitable source. Surrounding the cell from a point below the dies downwards (in the case of downward spinning, as shown in the figure), is a jacket 5 in which circulates a heating liquid. This jacket, as in the case of the heater 3, may also be replaced by any other suitable heating means. The walls of the cell and jackets or other heating means are lagged to prevent radiation losses which would raise the temperature of the atmosphere entering the cell. An outlet 6 is provided in the lower portion of the cell whereby the atmosphere may be exhausted, for example, by means of a fan (not shown).

The filaments issue from the cell through the orifice 7 and a small quantity of atmosphere enters the cell through this outlet. This quantity may be, if desired, rendered extremely small in proportion to the rate of flow of the atmosphere entering by the orifices 4, 4′.

Because of the exhaustion of the heated atmosphere laden with solvent vapor through the outlet 6, the portion of the cell beyond said outlet is cool and hence, prior to the exit of the filaments from the cell, they pass through a cool zone. It is to be noted that, when the atmosphere of the shed is drawn into the cell through the orifice 7, it will flow in a direction opposite to the travel of the thread and be exhausted at the outlet 6. Since this cool atmosphere is exhausted at the outlet 6, no substantial intermixing between it and the heated atmosphere in the cell is secured.

It is important that the orifices 4, 4′ be positioned in such a way that the cold atmosphere entering the cell through these orifices, owing to the action of the fan mentioned above, act effectively on the birth-zone of the filaments. They should be placed neither too high, so as not to cool the die carrier unnecessarily, nor too low, as it would not then perform fully the part which it is intended it should play.

If the spinning is carried out with a rather high gaseous circulation, the orifices 4, 4′ may be made of relatively large dimensions and/or increased in number. For example, four orifices of 2 to 3 cms. in diameter may be distributed equidistantly around the periphery of the cell at a height slightly above the birth-zone of the threads. Orifices of even much greater dimensions may be used. For example, orifices having a total area up to 200 cm². may be provided in a cylindrical spinning cell of 6 cm. in diameter and a rate of flow of about 4,000 liters per hour. The gaseous stream will then come in contact with the filaments as soon as they are formed and will continue in contact with them, accompanying them in their travel until the region is reached where the gaseous atmosphere is exhausted.

I do not intend to limit myself to the exact details above described except as set forth in the claims, since it is obvious that modifications may be made without departing from the nature of the invention.

I claim:

1. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies.

2. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere traveling in the same direction as the threads.

3. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere traveling in the same direction as the threads, and heating said atmosphere beyond said dies.

4. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile

solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere being the atmosphere of the spinning shed.

5. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere having a temperature of approximately 20° C.

6. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere being the atmosphere of the spinning shed and traveling in the same direction as the threads.

7. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere being the atmosphere of the spinning shed, and traveling in the same direction as the threads and heating said atmosphere.

8. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere being the atmosphere of the spinning shed and traveling in the same direction as the threads, and heating said atmosphere beyond said dies.

9. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere being subjected to a supplemental cooling within the cell in the vicinity of the dies.

10. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the vicinity of the dies, said atmosphere being subjected to a supplemental cooling in the cell in the vicinity of the dies and traveling in the same direction as the threads, and heating said atmosphere beyond said dies.

11. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose acetate in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold drying atmosphere in the cell in the vicinity of the dies.

12. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose acetate in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the cell in the vicinity of the dies, said atmosphere traveling in the same direction as the threads, and heating said atmosphere beyond said dies.

13. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose acetate in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a cold dry atmosphere in the cell in the vicinity of the dies, said atmosphere being the atmosphere of the spinning shed, and traveling in the same direction as the threads.

14. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose acetate in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, introducing a cold drying atmosphere in the vicinity of the dies, said atmosphere being subjected to a supplemental cooling in the cell in the vicinity of the dies and traveling in the same direction as the threads, and heating said atmosphere beyond said dies.

15. A process of manufacturing artificial threads free from scintillating effects by dry spinning cellulose derivatives in volatile solvents comprising heating the spinning solution prior to being extruded through the dies, extruding the solution, and introducing a relatively large volume of a cold drying atmosphere in the cell in the vicinity of the dies.

16. A dry spinning process of manufacturing artificial thread free from scintillating effects which comprises heating a solution of a cellulose derivative dissolved in volatile solvents, extruding the solution into a cold drying atmosphere, conducting the cold atmosphere and filaments through a heated zone in a cell whereby said atmosphere becomes heated, withdrawing the heated atmosphere ladened with solvent vapor, and passing the filaments through a cool zone

in the cell prior to the exit of the filaments from the cell.

17. A dry spinning process of manufacturing artificial thread free from scintillating effects which comprises heating a solution of a cellulose derivative dissolved in volatile solvents, extruding the solution into a cold drying atmosphere, conducting the cold atmosphere and filaments through a heated zone in a cell whereby said atmosphere becomes heated, withdrawing the heated atmosphere ladened with solvent vapor, and passing the filaments through a zone in the cell in which a cool atmosphere flows in a direction opposite to the travel of the filaments prior to the exit of the filaments from the cell.

18. A dry spinning process of manufacturing artificial thread free from scintillating effects which comprises heating a solution of a cellulose derivative dissolved in volatile solvents, extruding the solution into a cold drying atmosphere, conducting the cold atmosphere and filaments through a heated zone in a cell whereby said atmosphere becomes heated, withdrawing the heated atmosphere ladened with solvent vapor, passing the filaments through a zone in the cell in which a cool atmosphere flows in a direction opposite to the travel of the filaments prior to the exit of the filaments from the cell, and preventing the cool amosphere from mixing with the heated atmosphere in the cell.

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