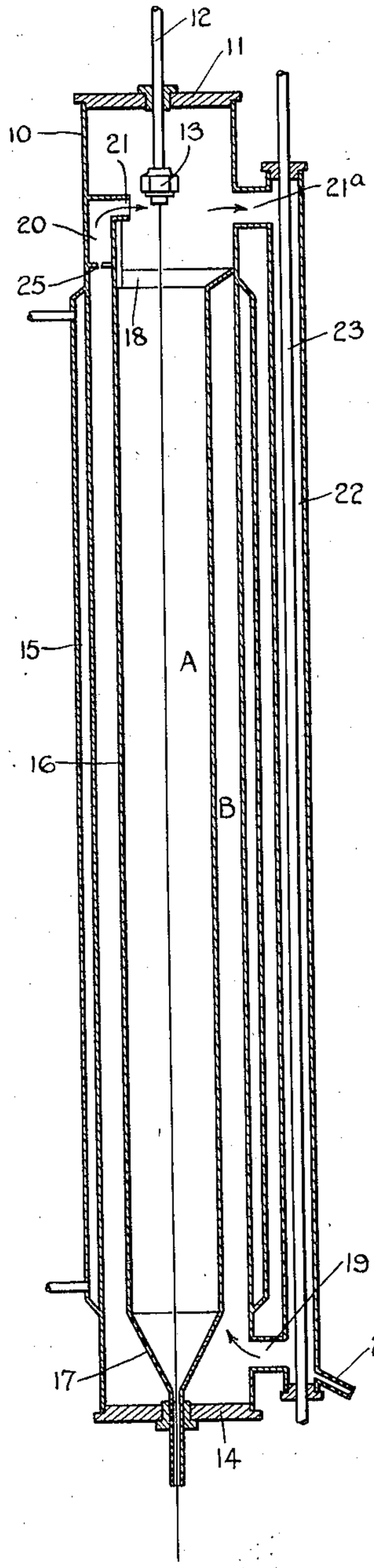
Nov. 26, 1935. E. VIVIANI 2,022,260

DRY SPINNING ARTIFICIAL TEXTILE FIBERS

Filed April 10, 1931



INVENTOR
Ettore Viviani
BY
ATTORNEY

Patented Nov. 26, 1935

2,022,260

UNITED STATES PATENT OFFICE

2,022,260

DRY SPINNING ARTIFICIAL TEXTILE FIBERS

Ettore Viviani, Milan, Italy, assignor to Ruth-Aldo Company, Inc., New York, N. Y., a corporation of New York

Application April 10, 1931, Serial No. 529,017
In Italy April 12, 1930

7 Claims. (Cl. 18—8)

This invention relates to the dry spinning of artificial fibers of the type in which a solution is forced through minute orifices into a closed chamber or spinning cell containing vapor in which the solvent evaporates. Spinning cells for this process are generally constructed in the form of elongated cylinders with the spinnerette near one end and the outlet for the filaments at the other end, the cylinder being substantially closed and provided with means for heating the air therein which receives the evaporating solvent. Cells of this type are customarily used in spinning cellulose acetate filaments.

The contour of the filament is highly important in determining its luster, which has an important bearing on its commercial value. A feature of this invention is the provision of an arrangement for controlling and varying the filament contour, particularly as to cross sectional shape. This is accomplished by providing a current of vapor which impinges laterally on the filaments as they emerge from the spinnerette; and it has been found that by varying the velocity of such current, filaments of varying cross section can be produced. For example, the cross section may vary from a flat shape through an open smooth bulbous cross section and a serrated bulbous form to a round contour by varying the velocity of the vapor current. The use of this controlled transverse current likewise tends in general to change the normally smooth contour of certain types of filament, such as those produced from cellulose acetate to an irregular notched form which tends to reduce the filament luster and produce the much desired delustered effect.

Another feature of the invention involves an arrangement for utilizing this cross current of vapor to produce the desired gentle circulation in the cell between the filament outlet and the zone of action of the cross current. This is in general accomplished by utilizing the current to draw from the body of the cell to the vapor outlet a portion of the vapor contained therein.

Other features of the invention will be apparent from the following description taken in connection with the accompanying drawing, which shows a somewhat diagrammatic vertical section through a spinning cell embodying the invention.

The cell includes a tubular body **10** closed at both ends by upper end plate **11**, through which passes the solution pipe **12** carrying the spinnerette **13**, and lower end plate **14** carrying the outlet tube **15** for the filaments. The vapor used for evaporating the solvent is heated in any desired way, as by a heating jacket **15** surrounding the body **10** through most of its length, through which jacket hot water or other suitable heating fluid may be circulated. The entire cell is preferably insulated in the usual way, the insulation being omitted in the drawing for clearness.

Within the body **10** there is positioned an inner tube **16**, preferably tapered at its lower end and connecting with the bottom part of the body to form a central chamber A substantially closed except at the top. Suitable small openings **17** may however be provided in the lower part of the inner tube **16** to permit the introduction of a certain amount of fresh vapor.

The space between the inner tube **16** and the body **10** constitutes a vertical annular jacket B substantially closed at the bottom by the body **10** and end **14**, and at the top by a closure plate **18**, the latter being located a short distance below the spinnerette **13**. Fresh vapor is introduced at the bottom of jacket B through inlet **19**, and passes out of said jacket through an outlet so arranged that the vapor discharge therefrom will flow transversely across the filaments in a steady stream in the zone adjacent to the spinnerette **13**. A convenient arrangement for this purpose is illustrated, including a riser **20** extending upwardly from the top of the jacket B and preferably along the wall of body **10**, and having a laterally directed outlet or nozzle **21** in line with the filaments and preferably at the level of the extrusion surface of the spinnerette, the arrangement being such that the vapor from jacket B passing up the riser **20** will be directed in the form of a stream through nozzle **21** across the filaments at the moment they emerge from the spinnerette and before they have lost their initial plasticity.

The vapor containing evaporated solvent is withdrawn through outlet **21***a*. This outlet may conveniently be located directly opposite nozzle **21**, an arrangement that not only serves to withdraw promptly the vapor containing the maximum proportion of solvent, but which likewise tends to withdraw a certain amount of vapor from the upper part of chamber A without creating any vigorous currents in the body of the chamber. It should be understood however, that the evacuation of the vapor through outlet **21***a*, preferably located above jacket B, will in any event tend to withdraw some vapor from chamber A.

The withdrawn vapor may be treated in any

desired way as by passing it through a vertical condenser tube **22** connected near its upper end to outlet **21***a* and near its lower end to inlet **19**, tube **22** being chilled in any desired manner as by the central refrigerant pipe **23** through which low temperature brine or other suitable refrigerating medium passes. An outlet **24** for condensed solvent may be located at the bottom of the condenser tube **22**.

The rate of flow of the vapor through nozzle **21** may be controlled to assure the exact velocity across the filaments and a resulting uniformly distorted cross sectional contour. This may be accomplished in various ways, the form illustrated comprising a transverse diaphragm **25** extending across the riser **20** and removably positioned therein, as by frictional engagement with the walls, the diaphragm having a central aperture, the size of which is calculated to produce the desired velocity of the vapor through nozzle **21**. This velocity may be varied by changing diaphragms or the size of the opening therein.

The method of operation in general will be apparent from the above description. The form illustrated is of the closed circuit type in which the fresh vapor through inlet **19** passes upwardly through jacket B, where it is heated through the outer heating jacket **15** and in turn transmits heat to the vapor in central chamber A. The vapor from jacket B then passes upwardly through riser **20** and nozzle **21** and across the filaments adjacent spinnerette **13**. Vapor is withdrawn through outlet **21***a* and is chilled while descending condenser tube **22** thereby condensing a desired proportion of the solvent vapor, which passes off as liquid through outlet **24**, the vapor freed therefrom returning to the cycle through inlet **19**. A portion of this fresh vapor may enter the central chamber A through openings **17**; and a portion of the vapor from said central chamber will pass out from the top thereof through the outlet **21***a*.

The arrangement disclosed provides a quiescent heated central chamber with a minimum of disturbance to the filaments during evaporation of the solvent, and at the same time includes a controlled steady transverse current across the filaments at or adjacent to the point of emergence from the spinnerette.

While the preferred form has been described and illustrated, it will be apparent that substantial variations therein may be made within the scope of the invention as set forth in the claims.

I claim:

1. Method of spinning textile filaments comprising subjecting the filaments immediately after extrusion to a transverse vapor current, and passing the filaments thereafter into a long relatively quiescent column of vapor in which the solvent evaporates.

2. Method of spinning textile filaments comprising treatment of the filaments immediately after extrusion with a transverse current of heated vapor, and thereafter with relatively quiescent vapor of lower temperature in which the solvent evaporates.

3. Apparatus for spinning textile filaments comprising a spinning cell, a spinnerette for extruding filaments therein, a column at least partially surrounding the space through which the filaments pass, means for imparting heat to vapors passing through said column, and means for directing vapors from said column across the filaments.

4. The method of spinning textile filaments comprising passing the filaments after extrusion through a zone of relatively quiescent vapor in which the solvents evaporate, heating said quiescent zone by means of heated vapor, and thereafter passing the heated vapor across the filaments at a point above the relatively quiescent zone.

5. Apparatus for spinning textile filaments comprising a spinning cell having a filament outlet at one end, a spinnerette for extruding filaments at the opposite end of the cell, and a casing in said cell surrounding the filament path and defining an outer chamber and an inner compartment extending to the outlet, said casing having a relatively small opening adjacent the outlet end of the cell whereby communication between said chamber and said compartment is established at that end of the cell.

6. The method of spinning textile filaments which comprises passing the filaments after extrusion through a zone of relatively quiescent vapor which is moving slowly in a direction countercurrent to the direction of movement of the filaments, maintaining a body of vapor around said relatively quiescent body of vapor, heating said surrounding body of vapor, causing said surrounding body of vapor to move rapidly in a direction countercurrent to the direction of movement of the filaments and separate from the relatively quiescent body of slowly moving vapor, and causing vapor from said surrounding body to pass transversely across the filaments, at a place where the filaments are still plastic.

7. The method of spinning textile filaments which comprises passing the filaments after extrusion through a zone of relatively quiescent vapor in which the solvents evaporate, maintaining a body of vapor around said quiescent zone, causing said surrounding body to move in a direction countercurrent to the direction of movement of the filaments, heating at least a portion of the surrounding body of vapor, introducing a portion of the surrounding vapor into the relatively quiescent zone and withdrawing vapor from the surrounding body and the relatively quiescent zone adjacent the place of extrusion.

ETTORE VIVIANI.