

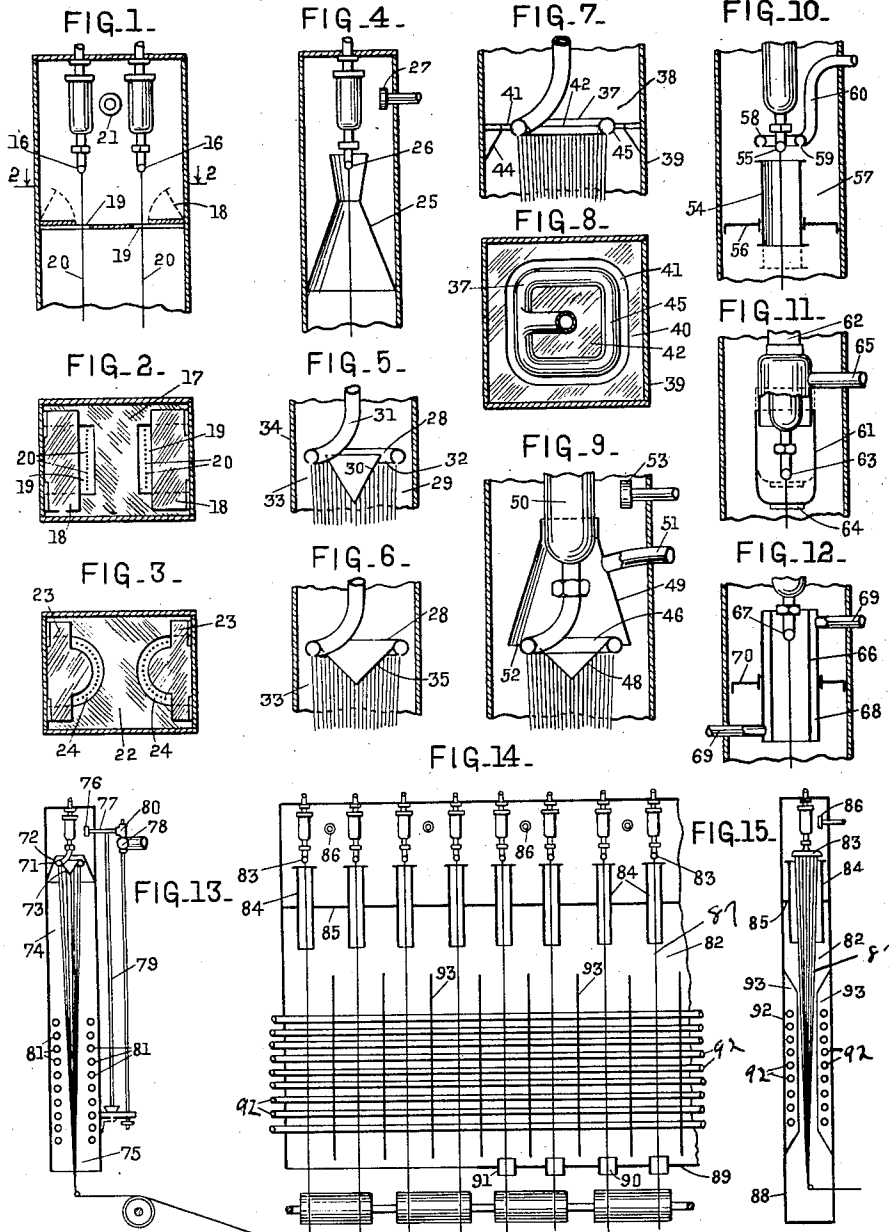
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H. DREYFUS ET AL

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APPARATUS FOR THE PRODUCTION OF ARTIFICIAL FILAMENTS OR THREADS

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APPARATUS FOR THE PRODUCTION OF ARTIFICIAL FILAMENTS OR THREADS

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10 Claims. (Cl. 18—8)

This invention relates to processes and apparatus for the production of artificial silk or like filaments or threads from solutions of cellulose acetate or other organic derivatives of cellulose such as other cellulose esters or cellulose ethers by extruding or spinning the solutions into an evaporative medium such as air, and is an improvement in or modification of the invention described in U. S. Patent No. 1,814,468, July 14, 1931, and also of such invention as improved upon or modified by the invention described in U. S. patent applications S. Nos. 311,213, and 311,214 both filed 8th October 1928. The present application is a continuation in part of application 236,448 filed Nov. 29, 1927 which issued as Patent No. 1,814,468 above noted.

According to U. S. patent application S. No. 236,448 filed 29th November, 1927, a process of spinning artificial silk or like filaments or threads from solutions of cellulose acetate or other cellulose derivative comprises spinning the solutions into closed or substantially closed chambers or cells through which passes an evaporative medium, the chambers or cells being provided with collector devices so that substantially the whole or a definite proportion of the evaporative medium is constrained to pass through the immediate vicinity of the spinning orifice or orifices.

The prior specification includes collector devices which extend across the entire cross-section of the cell or chamber with the exception of an area above, around or below the spinning nozzle or nozzles, and collector devices which do not necessarily extend across the entire cross-section, but are directly connected with the exhaust system for the evaporative medium. The latter form of collector devices may be used in conjunction with the form of collector devices extending across the entire cross-section of the cell or chamber. Examples of collector devices described in the specification are perforated plates, hoods, funnels, cylinders, shields, or the like.

The said specification also describes the use of a special type of draw-off itself adapted to assist in causing the evaporative medium to pass as close as possible to the spinning orifice or orifices. For example, such a draw-off may consist of a pipe of annular or other suitable form connected to the exhaust system and disposed above or round the spinning nozzle, the said pipe having a number of perforations or slits or a continuous slit to act as an outlet for the evaporative medium. This arrangement is especially useful when nozzles of the perforated ring type

are employed though it is not restricted to use with this type of nozzle.

The collector devices according to the prior specification are preferably used in conjunction with outlet pipes for the solvent-laden evaporative medium provided with valves, constructions, or other devices for controlling or regulating the flow therethrough, whether or not flow meters or other devices are used for indicating the volume of flow through the cell as described in U. S. Patent No. 1,541,104, June 9, 1925.

According to U. S. applications S. Nos. 311,213 and 311,214 both of 8th October 1928, the regulation or control over the rate and direction of flow of the evaporative medium afforded by the said collector devices, more particularly when used in conjunction with the flow-controlling devices described in the preceding paragraph, is utilized to enable spinning to be carried out in cells or chambers which are open at the end remote from the spinning nozzle, and also in cells or chambers containing a relatively large number of spinning nozzles, e. g., in metiers which are not partitioned into comparatively small cells.

The present invention has for its object to provide further forms of collector devices for use in the processes and apparatus of the above prior specifications, and particularly to provide collector devices suitable for constraining the evaporative medium to pass through the immediate vicinity of spinning orifices which are arranged in the form of a line. For instance, according to the invention, collector devices may be used in conjunction with nozzles having a rectilinear arrangement of orifices; with nozzles having an arcuate or other curved line of orifices; or with nozzles in which a line of orifices encloses or partially encloses an area through which the evaporative medium can pass, such as in a ring type nozzle, or in a nozzle comprising two or more lines, e. g. straight lines, of orifices forming an enclosed or partially enclosed figure. It is to be understood that a "line" of orifices as above referred to is not limited to include only a single row of orifices, since two or more associated rows may be employed in the nozzles without departing from the general linear arrangement of the orifices.

According to the invention, collector devices are employed having a shape appropriate to the shape of spinning jets comprising a line of extrusion orifices, whether such orifices have a rectilinear or curved arrangement, or whether they wholly or partially enclose an area through which evaporative medium could pass. A special form of

draw-off, preferably, though not necessarily, having a shape appropriate to the shape of the jet, may be employed, itself being adapted to assist in causing the evaporative medium to pass through the immediate vicinity of the spinning orifices. The collector device itself may be directly connected to the exhaust for the evaporative medium. Instead of the whole of the evaporative medium being constrained to pass through the immediate vicinity of the spinning orifices, a definite adjustable proportion may be so constrained.

The height of the collector devices with respect to the nozzles will determine to some extent the exact proportion of the evaporative medium which is brought into the immediate vicinity of the spinning orifices, and some of the devices described above are adapted to be used above or around the nozzles, others below or around the nozzles, while some may be used above, below or around the nozzles. The collector devices may be slidably or otherwise adjustably mounted to permit of ready access to the nozzles.

The draw-off for the evaporative medium is preferably controlled in the manner described in U. S. Patent No. 1,541,104.

Various forms and arrangements of collector devices and nozzles according to the invention will now be described with reference to the accompanying drawing, but it is to be understood that the following description is given by way of example only and is not in any way limitative.

In the drawing:—

Fig. 1 shows a collector device for use in conjunction with straight line nozzles;

Fig. 2 is a section taken on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2, illustrating a modification;

Fig. 4 shows a funnel-shaped collector device for use with a line nozzle;

Figs. 5 and 6 show ring nozzles arranged in a cell having a cross-section not substantially greater than the area occupied by the nozzle;

Fig. 7 shows a ring nozzle arranged in a cell whose cross-section is substantially greater than the area occupied by the nozzle;

Fig. 8 is a plan view with a square shaped "ring" nozzle arranged similarly to the nozzle shown in Fig. 7;

Fig. 9 shows a further arrangement for use with a ring nozzle, in which the draw-off for the evaporative medium is combined with the collector device;

Fig. 10 shows a tubular collector device and a special draw-off each shaped in accordance with the line nozzle with which they are employed;

Fig. 11 shows a combined collector device and draw-off device for use with a line nozzle;

Fig. 12 shows a tubular collector device for use with a line nozzle and provided with heating means;

Fig. 13 is a vertical section of an open bottomed cell employing a ring nozzle and an appropriate collector device;

Figs. 14 and 15 show in section front and side elevations, respectively, of a spinning chamber employing a large number of spinning nozzles of the line type, appropriately shaped collector devices being employed in conjunction with the nozzles, the bottom of Fig. 15, however, being somewhat modified to show an alternative arrangement.

Referring to Figs. 1 and 2, two line nozzles 16 are employed. The collector device comprises an

apertured plate 17 and a pair of movable plates 18. The plates 18 may be swung upwardly as shown in Fig. 1 for convenience in starting up, and then when spinning is commenced may be lowered to the position shown in full lines, leaving apertures 19 through which the filaments 20 pass and by means of which the evaporative medium is constrained to pass through the immediate vicinity of the nozzles 16. The evaporative medium is exhausted from the cell through a draw-off device 21.

In Fig. 3, collector devices are shown suitable for employment with arcuate line nozzles, an apertured plate 22 co-operating with a pair of movable plates 23 to leave apertures 24 shaped in accordance with the form of the nozzle.

In their operative positions, the collector devices shown in Figs. 1, 2, and 3 virtually form a plate having perforations for the passage of the filaments, and if desired, they may be replaced by simple perforated plates.

The above-described form of collector device comprising a plate or plates presenting a rectangular, arcuate, or other perforation or perforations and extending across the entire cross-section of the spinning chamber or cell, with the exception of an area or areas above, around, or below the nozzle or nozzles may be used in conjunction with any form of straight nozzles or curved nozzles not enclosing an area through which evaporative medium could pass.

In Fig. 4, a funnel-shaped collector device 25 is employed to bring the evaporative medium into the immediate vicinity of a line nozzle 26, the medium being exhausted by a draw-off device 27. The device 25 extends across the entire cross-section of the cell with the exception of an area corresponding in shape to that of the nozzle.

In Fig. 5, a ring nozzle 28 is shown having an area not substantially less than that of the cell. A collector device 30 which may be supported in any suitable manner, e. g. from the pipe 31 conveying spinning solution to the ring 28, is arranged inside and fills the area of the ring with the exception of an annular gap 32 in the vicinity of the spinning orifices. The evaporative medium is thus constrained to pass through the gap 32 and through the gap 33 between the ring and the walls 34 of the cell 29. A similar arrangement is shown in Fig. 6, the collector device 35 in the form of a downwardly pointing funnel, however, filling the whole of the ring nozzle 28. The whole of the evaporative medium is thus constrained to pass through the gap 33. The device 35 may be made integral with the ring 28, or may be supported in position in any other suitable manner.

In Fig. 7, a ring nozzle 37 is employed in a cell 38, of such an area that a substantial gap is left between the ring and the walls 39 of the cell. A collector device 44 having an aperture conforming with the shape of the ring 37 but somewhat larger in size is secured in the cell at about the level of the ring 37. A gap 41 is thus left round the ring 37. The interior of the ring may be closed by a plate 42, or by a conical collector device similar to the device 25 shown in Fig. 6. Alternatively, the collector devices inside the ring may leave a gap near the orifices similar to the gap 28 shown in Fig. 5. The funnel shape of the collector device 44 directs the evaporative medium to the gap 41. By an arrangement of collector devices such as that just described, the evaporative medium is constrained to pass

through the area afforded by the gaps either inside or outside the nozzle or both.

In Fig. 8, the plate 40, is shown arranged around a nozzle 45 of somewhat square form, the interior of the nozzle 45 being closed by a plate 42. A similar arrangement may be employed with any form of single "ring" like nozzle 45, or with a plurality of line nozzles arranged in the form of a triangle, square, or other closed or partially closed figure.

Referring to Fig. 9, a ring nozzle 46 which may be provided with a conical collector device 43 similar to the device shown in Fig. 5 or 6, or if desired with a flat plate as shown in Fig. 7 wholly or partially filling the area enclosed by the nozzle, is employed in conjunction with a hood-like collector device 49 carried by and downwardly extending from the filter chamber 50 and connected by a pipe 51 to the draw-off system for the evaporative medium. A gap 52 is left between the mouth of the hood 49 and the outside of the ring 46, and the evaporative medium is constrained to pass through this gap, (and through a further gap inside the ring if the collector device used inside the ring leaves such gap). Instead of the whole of the evaporative medium being taken through the hood 49 and exhausted through the pipe 51, a portion may be allowed to pass outside the hood 49 and exhausted through a draw-off device 53. Either or both of the draw-off devices may be adjusted to determine the proportion of air or other evaporative medium which is to be constrained to pass through the immediate vicinity of the spinning orifices. The solvent-laden medium from each system may be separately treated for solvent recovery, or they may be mixed and treated together for recovery of the solvent. Alternatively, the air or other gas from the space around and above the collector device may be returned to the spinning cell or chamber for re-use, since it contains a much less proportion of solvent vapour than that which has passed through the collector devices.

Fig. 10 shows a collector device in the form of a funnel 54 employed in connection with a line nozzle 55, the cross-section of the funnel 54 corresponding to the shape of the nozzle so that the evaporative medium is constrained to pass close to the nozzle. The funnel 54 is supported by means of a perforated plate 56 extending across a cell 57, the position of the funnel preferably being adjustable. In conjunction with the collector device, a special draw-off is employed comprising a tubular pipe 58 perforated or slotted on its under surface as shown at 59 and shaped to correspond with the form of the nozzle, the evaporative medium being led from the draw-off 58 through a pipe 60 to the exhaust system.

In Fig. 11 the collector device comprises a cylindrical member 61 mounted on the filter chamber 62 supplying spinning solution to a line nozzle 63. The mouth 64 of the member 61 constrains the evaporative medium to pass close to the nozzle 63, the medium being exhausted through a draw-off pipe 65 directly connected to the collector device. The member 61 is preferably adjustable, so that its mouth 64 may be arranged above, below, or around the level of the nozzle 63. When a plurality of draw-off members such as are shown in Figs. 9 and 11 is employed with each cell or chamber, they may, if desired, be joined inside or outside the cell or chamber. It will be understood that such collector devices for use with ring or similar nozzles which are

directly connected to the exhaust for the evaporative medium need not extend over the whole of the area of the chamber or cell surrounding the nozzle.

In Fig. 12, a funnel-like collector device 66 used in connection with a line nozzle 67 is provided with heating means such as an air, steam, or hot water jacket 68 provided with pipes 69 through which the heating fluid is supplied and withdrawn. The funnel 66 is supported by a plate 70 and the evaporative medium is thus constrained to pass through the funnel close to the nozzle 67. The device 66 may also be heated electrically, or fluid circulating pipes, which may be ribbed, may be used.

Fig. 13 shows a ring nozzle 71 provided with a collector device 72 arranged outside the ring, and a collector device 73 wholly or partially filling the inside of the ring, the arrangement being employed in connection with a cell 74 having an open bottom as indicated at 75. The evaporative medium which has been constrained to pass close to the spinning orifices of the ring 71 is drawn off through a valve, constriction, or other device 76 connected by a pipe 77 to a header 78, a flow meter 79 being arranged between the device 76 and a valve 80 which controls the flow of the evaporative medium. The cell 74 may be heated in any suitable way, for example, by means of a bank or banks of pipes 81. The draw-off devices shown in Figs. 9, 10, and 11 may be similarly connected to the exhaust system, and two or more draw-off devices may be connected to each pipe 77.

A spinning chamber 82 containing a comparatively large number of line nozzles 83 is shown in Figs. 14 and 15, a funnel-like collector device 84 being employed in connection with each nozzle. The collector devices are supported by a plate 85 extending across the whole area of the chamber 82 with the exception of the parts occupied by the collector device 84. The evaporative medium is drawn off through a device 86, and is preferably connected to the exhaust system in the manner shown in Fig. 13. The bottom of the chamber 82 may be open as shown on the right-hand side of Fig. 14, the filaments 87 being led through the open bottom, or it may be closed, for example, in the manner shown at 88 in Fig. 15, or by means of a plate 89, orifices 90 being left in the plate 89 for the passage of the filaments 87 as shown on the right-hand side of Fig. 14. If desired the orifices 90 may be fitted with tubes 91 which ensure that air entering the chamber 82 does so in a substantially vertical direction. The air thus heated by pipes 92 may also be guided up the chamber 82 by means of fins 93.

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

1. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of general linear form and having a plurality of spinning orifices disposed in a line, and a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices.

2. Apparatus for the production of artificial filaments, said apparatus comprising a spinning

chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of general linear form and having a plurality of spinning orifices disposed in a straight line, and a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices.

3. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being in the general linear form of a closed curve and having a plurality of spinning orifices disposed in a curve, and a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices.

4. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being in the general linear form of a closed curve and having a plurality of spinning orifices disposed in a curve, and a collector device adapted to fill the space within the closed curve of the nozzle and offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of and outside the closed curve of spinning orifices.

5. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of the general form of a closed curve and having a plurality of spinning orifices disposed in a curve thereon, and means offering a passage for evaporative medium, said passage being so disposed and of such form as to guide the evaporative medium through the immediate vicinity of the line of orifices and through the closed curve of the jet.

6. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of general linear form and having a plurality of spinning orifices disposed in a line, a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices, and a draw-off pipe adapted to assist the evaporative medium to pass through the immediate vicinity of the line of spinning orifices.

7. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of general linear form and having a plurality of spinning orifices disposed in a line, a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices, and a draw-off pipe of a shape appropriate to the linear shape of the nozzle adapted to assist the evaporative medium to pass through the immediate vicinity of the line of orifices.

8. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being of general linear form and having a plurality of spinning orifices disposed in a straight line, a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of the line of spinning orifices, and a draw-off pipe of a shape appropriate to the linear shape of the nozzle adapted to assist the evaporative medium to pass through the immediate vicinity of the line of spinning orifices.

9. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being in the general linear form of a closed curve and having a plurality of spinning orifices disposed in a curve, a collector device offering for evaporative medium a passage of linear cross section corresponding to the form of the spinning nozzle, so that substantially the whole of the evaporative medium passing through said collector device is caused to pass from both sides of the extruded filaments through the immediate vicinity of and outside the closed curve of spinning orifices, and a draw-off pipe of a shape appropriate to the curvi-linear shape of the nozzle adapted to assist the evaporative medium to pass through the immediate vicinity of the line of spinning orifices.

10. Apparatus for the production of artificial filaments, said apparatus comprising a spinning chamber, a spinning nozzle disposed therein for the extrusion of artificial filaments, said nozzle being in the general linear form of a closed curve and having a plurality of spinning orifices disposed in a curve, and a collector device in the form of a draw-off device of a shape appropriate to the curved shape of the nozzle, adapted to limit the passage of the evaporative medium to pass from each side of the filaments through the immediate vicinity of the spinning orifices.

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CERTIFICATE OF CORRECTION.

Patent No. 1,942,540.

January 9, 1934.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, lines 17 and 18, strike out the words and date "application S. No. 236,448 filed 29th November, 1927" and insert instead No. 1,814,468, July 14, 1931; and line 61, for "constructions" read constrictions; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of February, A. D. 1934.

F. M. Hopkins

Acting Commissioner of Patents.

(Seal)