June 13, 1939. J. B. DOVE 2,162,575

MANUFACTURE AND TREATMENT OF THREADS OF ARTIFICIAL FILAMENTS

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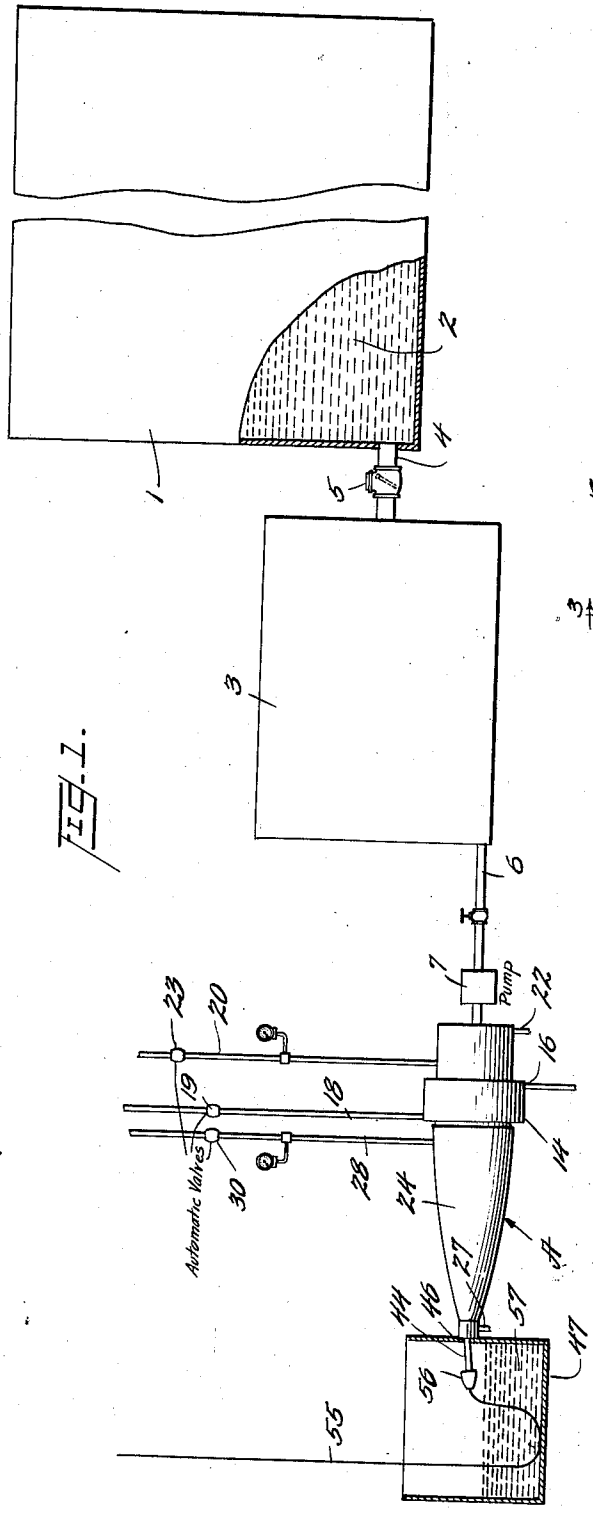



FIG. 1.

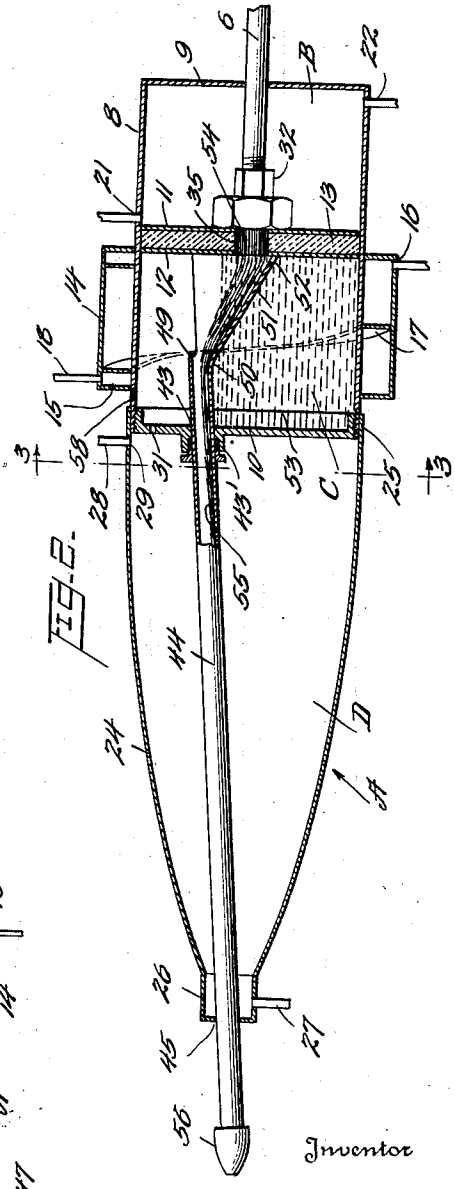


FIG. 2.

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MANUFACTURE AND TREATMENT OF THREADS OF ARTIFICIAL FILAMENTS

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FIG. 7.

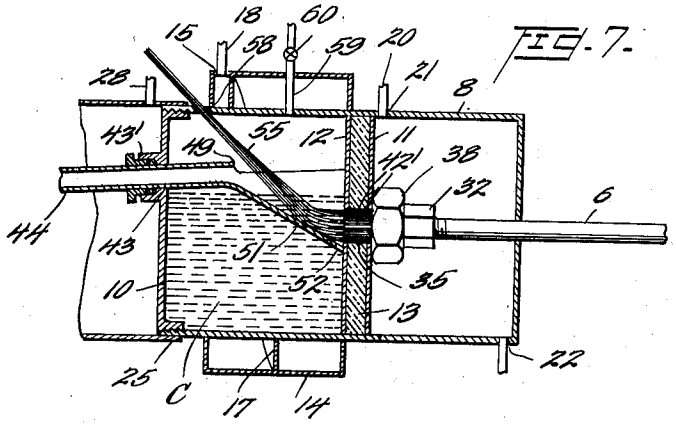



FIG. 3.

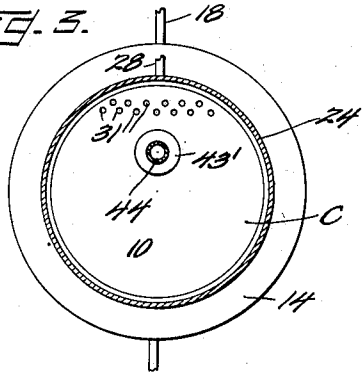



FIG. 5.

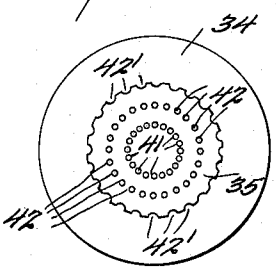



FIG. 6.

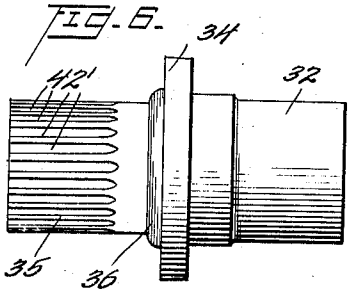
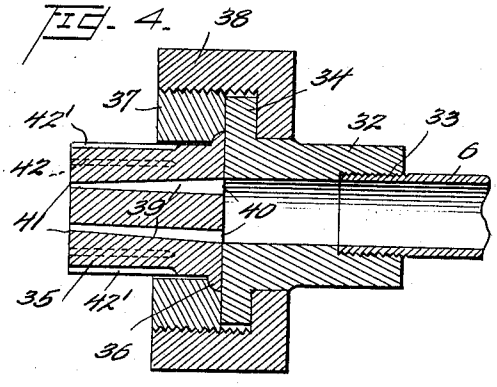



FIG. 4.




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# UNITED STATES PATENT OFFICE

2,162,575

## MANUFACTURE AND TREATMENT OF THREADS OF ARTIFICIAL FILAMENTS

John B. Dove, Atlanta, Ga., assignor of forty-nine per cent to Lee Roy Muse

Application August 12, 1936, Serial No. 95,639

14 Claims. (Cl. 18—8)

This invention relates to the manufacture of filaments, threads, films, or the like, by the extrusion of solutions through spinning jets or other extrusion orifices, whether such filaments, threads, films, or the like are formed by the wet coagulative or dry evaporative methods, and more specifically it is directed to a process and apparatus to be used in conjunction with the subject matter of my pending application entitled "Rayon spinning machine", Serial No. 91,197, filed July 17, 1936, whereby homogeneous products of any desired denier and of unvarying uniformity are produced at less cost from a variety of raw materials such as pine, spruce, cotton linters, and the like, and at a greater spinning rate than heretofore attainable.

One of the fundamental objects of this invention is to remove the limitations heretofore attached to the spinning of low denier filaments and to their drawing rate by thermo-mechanically determining the physical and optical characteristics of the filaments, threads, or the like such as tensile strength, contour, denier and homogeneity as the spinning solution passes through the spinneret, stabilizing these characteristics at the extrusion orifices by oil immersion of the extruding filaments under predetermined temperature conditions and then maintaining the product as thus fixed by temperature control throughout the remaining portion of the process.

Another object of this invention is to provide a method of the character described wherein by varying the temperatures within a pair of temperature chambers jointly encasing a spinneret of the capillary tube type and which is highly responsive to temperature variations, the viscoidal character of the spinning solution may be simultaneously altered with the change in dimensions of the capillary tubes and their outlet orifices, brought about by the expansion and contraction of the spinneret, thus automatically effecting an adjustment between the rate of flow of the spinning solution and the size of the capillary tubes and their extrusion orifices, in accordance with the size of the filaments required.

When the temperature of the viscose solution being spun is elevated above the normal for maximum spinning conditions there is a tendency for a reduction in viscosity to the extent that the surface tension of the jet solution becomes such a predominating factor that the spinning solution leaves the jet orifices in a fluctuating or discontinuous instead of a continuous and uniform stream resulting in unevenness of thread. It is therefore one of the objects of this invention to overcome this defect by extruding into a cold oil bath whereby surface tension of the filaments in the immediate vicinity of the extrusion orifices will be materially lowered.

Another object of this invention is to provide a method and apparatus whereby the filaments, threads or the like after leaving the oil immersion bath are conducted, permeated and encased in a film of oil to the coagulation bath under temperature and air excluding conditions which gradually and uniformly bring the temperature of the filament to that of the coagulation bath without exposure to deteriorating atmospheric influences and the detrimental effects which have been observed when a temperature differential exists between the coagulation bath and that of the entering filaments.

Another object of this invention is to provide a comparatively inexpensive apparatus which may be utilized substantially without change to produce high grade products by either the dry evaporative or wet coagulative method, and to effect a method and apparatus which will enable the production of artificial filaments, threads, films, or the like of any size and at any spinning speed desired.

With these and other objects in view, which will become apparent as the description proceeds, the invention resides in the construction, combination and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which like characters of reference indicate like parts throughout the several figures, of which:

Fig. 1 is a side elevation of the spinning cell and tanks.

Fig. 2 is a longitudinal sectional view of the spinning cell.

Fig. 3 is a cross section on line 3—3 of Fig. 2.

Fig. 4 is a longitudinal section through the spinneret.

Fig. 5 is a face view of spinneret looking towards the right, in Fig. 4, with the coupling removed.

Fig. 6 is a side view of the spinneret with the coupling removed.

Fig. 7 is a fragmentary longtiudinal sectional view similar to Fig. 2, showing the altered direction of the thread for dry spinning.

The instant invention briefly stated consists in directing a suitably prepared spinning solution under the required pressure conditions into and through the capillary tubes of a spinneret, the construction and material of which is such as to render it highly responsive to temperature changes, the spinneret being housed within and located between a pair of adjoining hot and cold temperature chambers, with the end containing the outlet orifices of the capillary device disposed below the level of an oil immersion bath within the cold chamber and its remaining portion lying in the hot temperature chamber, this arrangement permitting control of the size of the capillary tubes and their outlet orifices by expansion and contraction of the spinneret; directing the

extrusion products as they are spun by the spinneret into and upwardly through the oil immersion bath, then altering the course of the filaments as they leave the bath and conducting them along a downwardly inclined path; this reversal releasing the oil entrapped vapors and facilitating the draw of the filaments upwardly through the oil bath; then directing the filaments from the point of reversal to the coagulation bath under temperature controlled and air excluding conditions, and finally directing the filaments into and upwardly through the coagulation bath at the temperature of the latter.

Investigators have been constantly striving to remove the limitations imposed by existing methods on the spinneret, spinning rate of the filaments and their fineness, without in so doing sacrificing the quality of the products formed with respect to uniformity, tensile strength and homogeneity. To this end some have directed their attention to the coagulation bath, while others have sought a solution of the problem in the construction of the spinneret and by thermally treating the spinning solution before it reaches the spinneret, as it passes therethrough, and as it leaves the extrusion orifices. Although these individuals have unquestionably advanced the state of the art the courses thus far taken appear to have limits beyond which it is impossible to go without seriously impairing the resulting products.

The establishment of these facts gave rise to the assumption that the key to the solution of the problem of increased output without consequent deterioration of the product was to be found in the field of mechanical rather than chemical research. Accordingly, the problem was attacked from this angle, and after a systematic study extending over a considerable period the discovery was made that under the predetermined pressure conditions a constant rate of flow could be obtained at the spinning orifices of the spinneret without regard to the size of the extrusion orifices if the latter were caused to expand and contract in accordance with the size of the filaments desired, and if at the same time the resistance to change of shape of the spinning solution were thermally adjusted to meet the changed dimensions of the spinning orifices. It was also found that by extruding the elemental filaments in an oil immersion bath under lowered temperature conditions, filaments that ordinarily would disintegrate under their own weight could be bound by the oil and readily delivered to the coagulation bath. It was further observed that the particles of the filaments extruding from the extrusion orifices into the chilled oil were firmly bound internally and externally due to the permeating and incasing action of the oil and that this association of particles formed at the extrusion orifices could under temperature controlled and atmosphere excluding conditions be maintained throughout the remaining steps of the process. These discoveries when combined in the apparatus forming the subject matter of the instant application produced a soft, velvety-like thread of unusual strength (a six foot length sustaining a five pound weight), fineness and homogeneity at a spinning rate heretofore deemed impossible.

In the illustrated embodiment characterizing this invention there is shown a tank 1 adapted to contain a cellulose spinning solution 2 suitably prepared for either the wet coagulative or dry evaporative process. A comparatively small pressure tank 3 is connected to tank 1 by a pipe 4 in which is mounted a check valve 5. Connected to tank 3 by pipe 5 is a spinning cell A divided into the thermo-control compartments B, C, and D, and mounted in pipe 6 adjacent said cell A is a rotary pump 7 adapted to deliver the spinning solution under a predetermined pressure to the spinning cell A, as will directly more fully appear.

Said cell A comprises a tubular body portion 8 having an end wall 9 for the heating or temperature chamber B and a partition or end wall 10 for the cooling chamber C, and which ends may be threadedly or otherwise connected to said chamber 8 as desired. Welded or suitably attached to the tubular member 8 substantially central of its length are a pair of spaced plates or partition walls 11 and 12 constituting, respectively, the inner end walls of the chambers B and C. The space intermediate said plates is filled with an insulating material such as asbestos 13 in order to maintain the relative thermal conditions of the chambers. Surrounding chamber C is a suitably mounted water jacket 14 formed at its upper side adjacent one edge with a water or other cooling fluid inlet opening 15 and at its lower side and adjacent its opposite edge with a discharge or outlet opening 16. Extending from inlet 15 to outlet 16 is a suitably mounted spiral baffle 17 forming a passageway, so that the cooling fluid entering opening 15 will travel completely around said chamber before reaching the outlet 16 and thoroughly cooling or chilling chamber C, as and for a purpose directly appearing. Lead-in pipe 18 is suitably connected to opening 14 and a source of fluid supply (not shown) and the fluid flow is normally controlled by the automatic control valve 19.

In order to heat chamber B, a lead-in pipe 20 connected to a suitable steam supply or other heating medium and communicating with said chamber as at 21 is adapted to deliver the heating medium to said chamber formed at its lower side with exhaust outlet 22, the temperature in said chamber being normally controlled by automatic valve 23.

A substantially cone-shaped casing 24, forming chamber D, is suitably attached to one end of tubular member 8 as at 25 and terminates at its free end in exhaust hood 26 having a discharge outlet 27 for the air or other cooling fluid admitted to said chamber by pipe 28 suitably connecting with said chamber as at 29 and with a source of fluid supply not shown. The flow of said air under pressure to chamber D is controlled by automatic valve 30 similar to valves 18 and 22, as will be well understood, and at the same time the vapors formed in chamber C are drawn through openings 31 in wall 10 and exhausted through outlet 26, with the air stream passing therefrom, during operation of the device, as will hereinafter more fully appear.

The pipe 6 from pump 7 extends through end 9 within chamber B and has mounted on its free end a spinneret or filament forming die structure E comprising an internally bored connecting portion 32 internally threaded as at 33 to receive the end of pipe 6 and is formed at its opposite end with a lateral flange 34. A filament forming die member 35 constructed from a metal highly sensitive to temperature changes is formed at one end with a flange 36 and is adapted to seatingly engage the flange end of portion 32 in alignment therewith, and mounted on said die member is a nut 37 complementally formed to re-

ceive the flange 36. Mounted on member 32 and embracing flange 34 is a ring nut 38 threadedly engaging nut 37 to securely lock and maintain die member 35 in aligning engagement with member 32. Nut 38 seats against the end member or plate 11 and the die member 35 is adapted to extend through plates 11 and 12 and the insulation 13 with its extrusion face flush with the surface of said plate 12 for communication with chamber C. Said die member 35 is formed with a number of capillary tubes 39 extending therethrough in slightly converging direction from their enlarged inlet ends 40 to their inner ends or extrusion orifices 41. Spaced from said orifices is an annular series of countersunk openings 42, in staggered relation with respect to said openings 41, extending about two-thirds of the way through said member 35, and which latter member is also formed on its exterior surface with a series of circumferentially spaced grooves 42' substantially corresponding in length to the countersunk bores 42, and which construction effects expansion and contraction of die member 35 under the temperature control of chambers B and C, and thereby rendering said die highly responsive to temperature changes, so that by its expansion and contraction the viscosity and denier of the filaments is controlled in accordance with the extrusion speed of the filaments from said die and the size or denier of the desired thread.

Wall 10 which separates chambers C and D is formed with an opening 43 and a packing oil gland structure 43' above and offset with respect to die 35 through which is adapted to extend a thread delivery and gravity pipe 44 which projects through an opening in end 45 of the exhaust hood 26 and through opening 46 into the coagulating bath tank 47 and terminating in nipple 48, as and for a purpose directly more fully appearing.

The opposite end of pipe 44 extends within the combined oil and cooling chamber C, and its upper wall is cut away as at 49 and the lower wall bent downwardly to provide the hump or apex 50 and the downwardly inclined surface 51 terminating at a point 52 spaced from plate 12 just below the edge of the spinneret or die member 35. Said chamber C is adapted to be filled with an oil 53, preferably a vegetable oil, although other oils such as mineral oil may be used under certain conditions. The level of said oil should preferably be maintained at a point above the upper edge of spinneret 35 and below apex 50. This construction is extremely important in view of the fact that chamber B has a temperature range of 70° F. to 109° F., and chamber C a temperature range of 32° F. to 45° F., and as the filaments 54 are convergingly extruded from the orifices 41 within a pressure range of 1–400 pounds per square inch, and although they are subjected to the cooling effect of that portion of the spinneret extending through the cooling plate 12, they are yet in a heated condition and as they are submerged in the oil bath, the oil surfaces of the filaments are congealed entraining particles of water and other substances, and being lighter than oil, said filaments tend to ascend to the top of the oil along the incline 52 to the apex 50, and not only are the individual filaments coated but the thread 55 made up of said filaments is also coated and is directed by gravity from point 59 to the discharge nozzle 56 and into the coagulating solution 57 from whence the thread 55 is directed to the bobbin (not shown) for winding, as will be clear without further description.

It is important to observe that as the filaments 54 pass over the hump or apex 50 not only are they stripped of excess oil but as they pass over this point fissures or weakened surface areas occur in the congealed coating thereby permitting the escape of the entrained vapors, heated particles of water, etc., causing the coating to immediately directly engage the filament surfaces and become sealed, and as they descend the gravity stretch of pipe 44 they are further subjected to temperature control chamber D which is designed to bring their temperature to that of the bath solution 57 so that no temperature differential will occur as the thread passes into said bath, as will hereinafter more fully appear.

In the event it is desired to convert the instant apparatus to the dry evaporative process, this may be accomplished by directing the fibers upwardly through the oil and air in chamber C and thence through the opening 58 formed in the top of the tubular section or casing 8, as clearly shown in Fig. 7 of the drawings. It is evident of course that when the dry process is not used this opening may be closed by a suitable plug. Also, a pipe 59 having a control valve 60 is suitably connected to tubular portion 8 in communication with temperature or evaporating chamber C, by which, in any well known manner, the volatile solvents may be returned from said chamber to the recovery plant. It will thus be seen that by merely changing the temperature prevailing in chamber C for the wet coagulative process, to that essential to the dry evaporative process, a change over from one process to the other may be accomplished without any material structural changes.

With further reference to pipe 44, it will be noted that this pipe is preferably constructed from hard rubber, which has been found especially efficacious, possibly owing to its acid and alkali resistant properties. In connection with the spinneret it is to be understood that the filament forming spinneret or die 35 is readily interchangeable to vary the number of filament orifices and according to the type of thread desired.

While it is thought that the operation of the invention would seem to be clear from the above description, it might be well to further state that when a properly prepared spinning solution is contained in tanks 1 and 3, the operation of pump 7 is controlled to deliver the solution to the spinneret within the spinning cell A at the desired pressure and the temperatures in chambers B, C, and D are maintained relatively constant by suitable valves referred to as automatic. Variations in the operations of these valves and according to predetermined operating requirements, controls the filament forming speed, viscosity, and size or denier of the thread desired. This is readily accomplished by the temperature control, causing expansion and contraction of the capillary tubes and extrusion orifices of the spinneret which latter is highly sensitive to temperature variations.

Further, as the filaments are about to emerge and as they emerge from the extrusion orifices their surface tension is materially lowered, thus preventing their disruption before reaching the oil bath, but no matter how fine such elemental filaments may be, and without regard to the low viscosity of the spinning solution required for very low denier filaments, they will not disinte-

grate at the extrusion orifices, as heretofore has been their tendency. Immediately the filaments are extruded from said orifices they are subjected to a cold oil bath, and this immersion in the oil fixes the association of their particles as determined by the spinneret or die both internally and externally and at the same time further lowers their surface tension.

The said immersion effects the permeation and coating of the filaments with oil and which causes vaporous particles to be entrained therein, and as the filaments are directed out of the bath and up the inclined surface **51**, and as they pass over the hump **50** the outer congealed surface of the oil coating tends to crack or weaken sufficiently to permit the escape of said entrained vapors. This causes the coating to seal the opening and adhere directly to the surfaces of the filaments and effect their bonding together as a thread, and which aids their gavitational travel to the discharge nozzle, since the greater length of pipe **44** from the apex **50** tends to overcome ascent of the inclined surface **51**, thereby effecting take-off of the filaments from the spinneret irrespective of their extrusion speed and preventing ruffing or fluffing of the fiber particles upon their extrusive contact with the oil, as otherwise would be their tendency. Also, according to the temperature control in chamber D above mentioned, by the time they reach discharge nozzle **56** they are of the same temperature as the coagulating solution **57**.

The said oil treatment also produces a lubricating effect, in that, it aids the precipitating action of the coagulation bath without altering the physical characteristics of the thread imparted to it at the extrusion orifices of the spinneret, and thereby imparts to the thread an extremely velvety texture while augmenting its tensile strength. It will further be apparent that the spinneret in forming the filaments, and their treatment during the remaining process, jointly contribute to produce a thread of predetermined and nonvariable denier and of unusual strength, irrespective of the extrusion speed of the filaments, and which denier owing to the particular sensitiveness of the spinneret and the thermal control above described, may be instantly changed as desired without disturbing the thread output rate.

With further reference to the oil contained in chamber B, it is to be understood that under certain operating conditions and in connection with certain types of thread, that other fluids or solutions may be added to the oil or substituted for the latter, as desired.

From the above it will be apparent that I have designed an apparatus for the production of filaments, threads, films and the like by the extrusion of solutions thru spinning jets or other extrusion orifices by the wet coagulative or dry evaporative methods of unusual texture and strength irrespective of the extrusion speed and so thermo-mechanically controlled that the denier may be varied without interruption of the thread output, comprising few parts, simple in construction, versatile in adaptive use, manufacturable at a minimum cost, and efficient for the purposes intended.

Although in practice I have found that the form of my invention illustrated in the accompanying drawings and referred to in the above description as the preferred embodiment is the most efficient and practical; yet realizing the conditions concurrent with the adoption of my invention will necessarily vary, I desire to emphasize that various minor changes in details of construction, proportion and arrangement of parts, may be resorted to within the scope of the appended claims without departing from or sacrificing any of the principles of this invention.

Having thus described my invention, what I desire protected by Letters Patent is as set forth in the following claims:

1. An apparatus for spinning textile filaments from a spinning solution including a spinning cell, a spinneret within the cell, the latter including a plurality of extrusion orifices, thermo-mechanical means in connection with the cell and spinneret for producing filaments of predetermined sizes and shape, said thermo-mechanical means comprising a heating chamber, a cold chamber adapted to contain a fluid such as oil, said spinneret being mounted between said chambers with its extrusion orifices opening into the cold chamber, a controlled refrigerating means in connection with said cold chamber, whereby the filaments are subjected to an oil immersion bath and expansion and contraction of the extrusion orifices is selectively effected by temperature control of the hot and cold chambers, means for directing the filaments through said bath, and means for conducting the spun and oil treated filaments to the exterior of the cell under temperature controlled and atmosphere excluding conditions.

2. An apparatus for spinning artificial filaments, comprising a spinning cell, a spinneret within the cell, and including a series of extrusion orifices, means for directing a spinning solution to and through the extrusion orifices to produce filaments, means formed on the spinneret to increase its response to temperature changes, said means including an annular series of external grooves, means coacting with the spinneret for effecting its expansion and contraction to change the size of its extrusion orifices, said means comprising a heating chamber, a cold chamber insulated from said heating chamber, and a refrigerating means in connection with said cold chamber and means for conducting the filaments from the spinneret to the exterior of the cell under temperature controlled and atmosphere excluding conditions.

3. An apparatus for spinning a textile filament from a spinning solution including hot and cold chambers and a temperature chamber, a spinneret responsive to temperature changes mounted in said hot and cold chambers and having a filament extrusion orifice communicating with said cold chamber, filament conducting means extending within the cold chamber and through the temperature chamber for delivering the filaments therethrough free from atmospheric conditions.

4. An apparatus for spinning textile filaments from a spinning solution including a spinning cell, hot and cold chambers in said cell, a spinneret responsive to temperature changes mounted in said chambers and having filament extruding orifices communicating with the cold chamber, the latter adapted to contain a filament treating substance in intimate contact with said orifices, a conduit having one end connected to the spinneret within the hot chamber and the other end with a source of spinning solution exterior of said chamber, means for heating said spinneret and conduit within said chamber, a refrigerating means in connection with the cold chamber for controlling the temperature of said substance, whereby expansion and contraction

of said orifices is selectively effected, means in connection with said cold chamber for directing the treated filaments from said chamber and to the exterior of the cell free from atmospheric influences, and temperature control means for said filament directing means.

5. An apparatus for spinning textile filaments from a spinning solution including a spinning cell and a coagulating solution containing tank, hot and cold chambers in said cell, a spinneret responsive to temperature changes mounted in said chambers and having filament extruding orifices communicating with the cold chamber, the latter adapted to contain a filament treating substance, means for conducting the treated filaments from said chamber to said coagulating solution free from atmospheric influences, and temperature control means for said filament conducting means, whereby the temperatures of the filaments and the coagulating solution are the same at the time the filaments enter the solution.

6. A method for thermally varying the dimensions of the extrusion orifice of a spinneret consisting in subjecting the inlet end of the spinneret to the action of heat, intimately contacting the extrusion end of the spinneret with a fluid and regulating the temperature of said fluid with a refrigerant to control the effect of said heat application upon the extrusion orifice.

7. A method of thermally varying the dimensions of the extrusion orifice of a spinneret consisting in subjecting the inlet end of the spinneret to the action of heat, intimately contacting the extrusion end of said spinneret with a fluid passing into the spinneret and around the extrusion orifice, and regulating the temperature of said fluid with a suitable refrigerant to control the effect of said heat application upon the extrusion orifice.

8. A method of thermally varying the dimensions of the extrusion orifice of a spinneret and simultaneously changing the viscosity of the spinning solution as it passes to and through said spinneret consisting in surrounding the inlet end of the spinneret with a heating zone, directing the spinning solution through said zone to the inlet end of said spinneret, regulating the temperature of said heating zone in accordance with the degree of heat to be applied to the spinning solution and to the inlet end of the spinneret, intimately contacting the extrusion end of the spinneret with a fluid, and regulating the temperature of said fluid with a circulating refrigerant to control the effect of the action of heat upon the inlet end of said spinneret.

9. A method for thermally varying the dimensions of the extrusion orifices of a spinneret and simultaneously changing the viscosity of the spinning solution as it passes to and through said spinneret consisting in surrounding the inlet end of the spinneret with a heating zone, directing the spinning solution through said zone to the inlet end of said spinneret, regulating the temperature of said heating zone in accordance with the degree of heat to be applied to the spinning solution and to the inlet end of the spinneret, intimately contacting the extrusion end of said spinneret with a fluid passing into the spinneret and around the extrusion orifices and regulating the temperature of said fluid with a circulating refrigerant to control the effect of the action of heat upon the inlet end of said spinneret.

10. An apparatus for spinning textile filaments from a spinning solution including a spinneret having an extrusion orifice, thermo-mechanical means in connection with the spinneret for producing filaments of different sizes, said thermo-mechanical means comprising a heating chamber and a cold chamber insulated from said heating chamber and adapted to contain a fluid, said spinneret having its inlet end in the heating chamber and its extrusion orifice in said cold chamber, a controlled refrigerating means in connection with the cold chamber, whereby the size of said extrusion orifice may be varied, and means for delivering the filament from said cold chamber.

11. An apparatus for spinning textile filaments from a spinning solution including a spinneret having a plurality of extrusion orifices, thermo-mechanical means in connection with the spinneret for producing filaments of different sizes, said thermo-mechanical means comprising a heating chamber, a cold chamber insulated from said heating chamber and adapted to contain a cooling fluid, said spinneret being mounted between said chambers with its extrusion orifices in said cold chamber, a refrigerating means in connection with the cold chamber, whereby the size of the extrusion orifices may be varied, said filaments being subjected as they are extruded to an immersion bath in said cooling fluid, and means for directing the filaments out of said bath and from said cold chamber.

12. An apparatus for spinning a textile filament from a spinning solution including hot and cold chambers insulating material intermediate said chambers, a spinneret responsive to temperature changes mounted in said hot and cold chambers and having a filament extrusion orifice communicating with said cold chamber, said cold chamber adapted to contain a cooling fluid in intimate contact with said orifice, and a controlled refrigerating means in connection with said cold chamber, whereby the size of said orifice may be varied, and means for delivering the filament from said cold chamber.

13. An apparatus for spinning textile filaments from a spinning solution including hot and cold chambers insulated from each other, said cold chamber adapted to contain a cooling fluid, a spinneret responsive to temperature changes mounted in said hot and cold chambers and having filament extrusion orifices communicating with said cold chamber, additional means formed in said spinneret permitting the fluid to pass into the spinneret and around the extrusion orifices, refrigerating means in connection with the cold chamber controlling the temperature of said fluid whereby the dimensions of said orifices are selectively varied, and means for delivering the filaments from said cold chamber.

14. An apparatus for spinning textile filaments from a spinning solution including hot and cold chambers insulated from each other, said cold chamber adapted to contain a fluid, a spinneret responsive to temperature changes mounted in said hot and cold chambers and having filament extrusion orifices communicating with said cold chamber and in intimate contact with said fluid, means for relatively controlling the temperatures in the respective chambers, whereby the dimensions of said orifices are selectively varied, the temperature control of the heating chamber adapted to simultaneously control the viscosity of the solution passing therethrough and through the spinneret, and means for delivering the filaments from said cold chamber.

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