

Nov. 7, 1933.

H. DREYFUS ET AL

1,933.587

PRODUCTION OF ARTIFICIAL FILAMENTS OR THREADS

Filed Nov. 12, 1930

2 Sheets-Sheet 1

FIG. 1

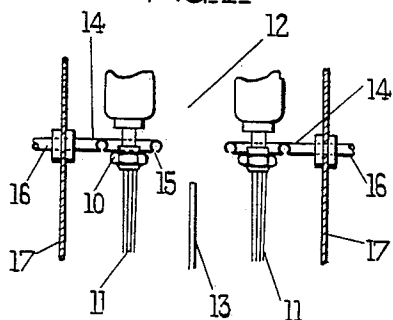


FIG. 2

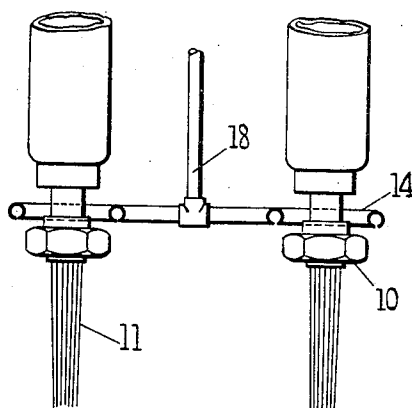


FIG. 3

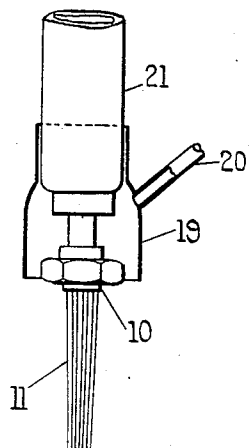
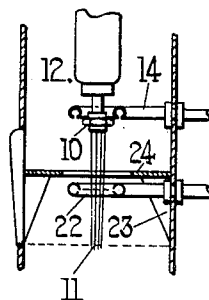


FIG. 4



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2 Sheets-Sheet 2

FIG. 5.

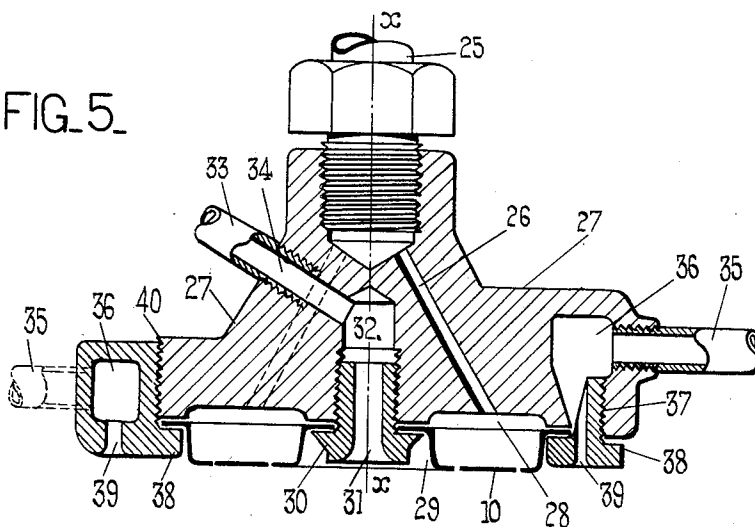


FIG. 6.

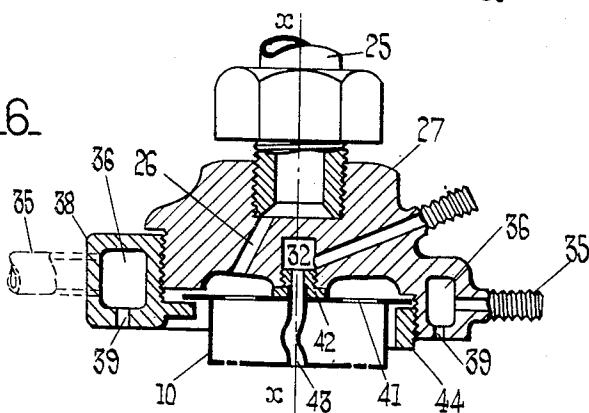
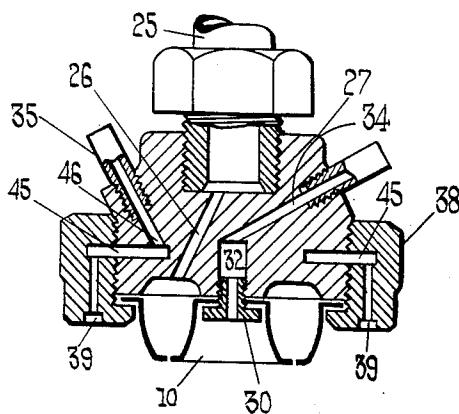


FIG. 7.



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1,933,587

PRODUCTION OF ARTIFICIAL FILAMENTS
OR THREADS

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Application November 12, 1930, Serial No.
495,140, and in Great Britain January 1,
1930

16 Claims. (Cl. 18—8)

This invention relates to processes and appa-
ratus 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 im-
provement in or modification of the invention
described in U. S. application S. No. 236,448,
filed 29th November 1927, and also of such in-
vention as improved upon or modified by the
inventions described in U. S. applications S. Nos.
311,214 filed 8th October 1928, and 405,784 filed
8th November 1929. The present application is
a continuation in part of the aforementioned
applications.

According to prior U. S. application S. No.
236,448, a process of spinning artificial silk or
like filaments or threads from solutions of cellu-
lose acetate or other cellulose derivative com-
prises spinning the solutions into closed or sub-
stantially 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 pro-
portion of the evaporative medium is constrained
to pass through the immediate vicinity of the
spinning orifice or orifices.

The prior specification includes collector de-
vices 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 de-
vices which extend across the entire cross-sec-
tion of the cell or chamber.

Examples of collector devices described in the
specification are perforated plates, hoods, fun-
nels, cylinders, shields, or the like.

The said specification also describes the use of
a special type of draw-off for use in conjunction
with a collector device and itself adapted to as-
sist in causing the evaporative medium to pass
as close as possible to the spinning orifice or ori-
fices. For example, such a draw-off may consist
of a pipe of annular or other suitable form con-
nected to the exhaust system and disposed above
or round the spinning nozzle, the said pipe hav-
ing a number of perforations or slits or a contin-
uous slit to act as an outlet for the evaporative
medium. This arrangement is especially useful

when nozzles of the perforated ring type are em-
ployed 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 evapora-
tive medium provided with valves, constrictions,
or other devices for controlling or regulating the
flow therethrough, whether or not flow meters
or other devices are used for indicating the vol-
ume of flow through the cell as described in prior
U. S. Patent No. 1,541,104.

According to U. S. application S. No. 311,214,
the regulation or control over the rate and direc-
tion of flow of the evaporative medium afforded
by the said collector devices, more particularly
when used in conjunction with the flow-control-
ling devices, described in the preceding para-
graph, 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
cells or chambers containing a relatively large
number of spinning nozzles, i. e., and metiers
which are not partitioned into comparatively
small cells.

U. S. application S. No. 405,784 describes forms
of collector devices for constraining the evapo-
rative medium to pass through the immediate
vicinity of the spinning orifices in spinning noz-
zles comprising a line of such orifices, whether
such nozzles enclose wholly or partially an area
through which evaporative medium could pass
or do not enclose such area. A special type of
draw-off, preferably though not necessarily hav-
ing a shape appropriate to that of the nozzle, may
also be employed in conjunction with these col-
lector devices.

It has now been found according to the inven-
tion that the whole or a definite part of the evap-
orative atmosphere in a spinning cell may be
constrained to pass through the immediate vicini-
ty of the spinning orifices by suitable application
of suction for the withdrawal of the evaporative
atmosphere, e. g. by the mere use of a special
type of draw-off device such as those described
in U. S. applications Nos. 236,448 and 405,784, it
not being essential to provide perforated plates,
hoods or the like devices for constraining the
evaporative atmosphere to pass into the im-
mediate vicinity of the spinning orifices.

The draw-off may consist of any suitably
shaped, perforated or slotted pipe such as is de-
scribed in U. S. applications S. Nos. 236,448 and
405,784, and is arranged around, that is, in about
the same plane as, the spinning nozzle or before

or behind the plane of the nozzle. The form adopted for the draw-off pipe preferably corresponds to the type of nozzle employed; for example when disc or ring type nozzles are used, the draw-off pipe is preferably of annular form, while in the case of line nozzles, a rectangular or oval form of draw-off may be employed.

The draw-off members employed for each nozzle may be connected separately to the exhaust system or may be connected together in groups inside or outside the cell or chamber, each group having a connection with the exhaust system. Thus, two annular draw-off pipes employed in a two-jet cell may be connected to the arms of a T-piece, itself connected to the exhaust pipe of the cell.

It has also been found that the draw-off devices for constraining the evaporative medium to pass through the vicinity of the nozzles can be used in conjunction with devices such as those described in U. S. application S. No. 382,907 filed 2nd August, 1929 for introducing evaporative medium into the spinning cell in the vicinity of the nozzle. The co-operation of the two classes of device, controlling respectively the draw-off of evaporative medium from the cell and the introduction of a further evaporative medium to the vicinity of the spinning nozzle, enables a remarkable control to be effected over the uniformity and character of the filaments or threads produced.

Furthermore, the draw-off device and the device for introducing the additional evaporative medium into the vicinity of the nozzle may be carried by or combined with the nozzle body. For example, the additional evaporative medium may be introduced through the face of the nozzle in a manner similar to that described in British specification No. 30367/29 filed 7th October, 1929 and corresponding U. S. application S. No. 485,410 filed September 30, 1930, whilst the draw-off device comprises a slot or perforation open to the cell and communicating with a suction cavity in the nozzle body.

There may also be employed in conjunction with spinning apparatus having the special type of draw-off device and air-introducing means as described in the two preceding paragraphs, certain of the collector devices described in prior U. S. application S. No. 236,448. For instance, a perforated plate extending across the cell, may be arranged at some distance below the nozzle face, or the filaments may be caused to pass through a funnel, heated or not, which may be carried by a plate extending over the entire cross-section of the cell, with the exception of the area occupied by the funnel, or the funnel may be so supported that the whole of the evaporative medium does not necessarily flow through the funnel.

The accompanying drawings illustrate several forms of apparatus according to the invention, but it is to be understood that the invention is in no way limited to the particular construction shown in the drawings.

Fig. 1 is a vertical section of the upper end of a spinning cell provided with two spinning nozzles and an independent draw-off device associated with each of the nozzles;

Fig. 2 is a part-sectional elevation of two spinning nozzles having separate draw-off devices connected to a common exhaust pipe;

Fig. 3 is a part-section elevation of a modified form of draw-off device;

Fig. 4 is a sectional elevation of a spinning cell containing a spinning nozzle, a draw-off device

for the evaporative medium, a collector device, and means for introducing additional evaporative medium into the cell;

Figs. 5 and 6 show in sectional elevation two forms of nozzle combined with means for introducing additional evaporative medium into the cell and for withdrawing medium from the cell, each side of each of the figures showing slight modifications of the arrangement; and

Fig. 7 is a sectional elevation of a spinning nozzle holder similar to those shown in Figs. 5 and 6 but having a modified construction.

Referring to Fig. 1, two spinning nozzles 10 are employed, the orifices of these nozzles being disposed in one or more circular rings, or otherwise, as may be suitable, in the face of the nozzle, and the filaments 11 proceed from the nozzle 10 down the spinning cell 12 which may be separated into two portions by a dividing wall 13. Around each nozzle is arranged a draw-off device 14 which may have the form of a tubular ring provided with holes or slots 15 facing downwards so that evaporative medium is drawn upwardly, close to the filaments 11 emerging from the nozzle 10, and into the pipe 14, from whence the evaporative medium (usually air) and solvent evaporated from the filaments is led away for recovery of the solvent through the pipe 16 passing through the wall of the cell.

For clearness the ring draw-off device 14 is shown above the nozzle 10 but may surround the nozzle at the level of the nozzle or may be positioned slightly below it, in which case the orifices or slots 15 may be so provided in the device 14 as to be disposed at an angle to the vertical or even horizontal to induce a flow of air close to the filaments.

In Fig. 2, two spinning nozzles 10 are shown provided with devices 14 similar to those in Fig. 1, the two rings 14 being coupled together to a common draw-off pipe 18.

In Fig. 3, a hood-shaped member 19 encircles the nozzle 10, terminating at or about the level of the nozzle, so that there is a narrow annular space between the hood 19 and the nozzle 10. A draw-off pipe 20 is connected to the hood 19 and suction applied thereto causes the air to pass close to the filaments 11, through the annular space and into the hood 19. The hood 19 is carried by the filter candle fitting 21, being shown in the drawings as a push fit thereon, so that the hood may be easily removed to give access to the nozzle 10 or the candle 21.

In Fig. 4, a single spinning nozzle 10 is arranged in the upper end of a spinning cell 12 and, in addition to the draw-off device 14 which draws air through the region of the nozzle, there is provided a tubular ring 22 having a series of perforations or slots 15 similar to those in the draw-off device 14. These slots are directed towards the filaments so that the additional air introduced by the member 22 is caused to pass in close proximity to the filaments. The slots may, as shown in the figure, discharge the air directly inwards, or by providing the slots 15 at an angle to the horizontal and facing upwards may direct the air towards the filaments and towards the draw-off device.

A collector device 23 in the form of a funnel and carried by a perforated plate 24 extending across the cell 12 is adjustably mounted close to the nozzle 10 so as to assist in causing the air to pass through the vicinity of the filaments issuing from the nozzle.

Two constructions of combined air introducing

and draw-off devices associated with a spinning nozzle are shown in Fig. 5, a half section of each device being shown on opposite sides of the centre line $x-x$. The spinning solution is supplied by a pipe 25 to passages 26 in the nozzle body 27 communicating through the cavity 28 with the nozzle 10. The centre portion of the nozzle 10 is provided with a recess 29 which enables it to be secured to the holder 27 by the hollow screwed member 30 having a passage 31 affording an exit for air which is supplied to a passage 32 in the body 27 by a pipe 33 and passage 34. In this manner the air is projected to the inside of the bundle of filaments emerging from the nozzle 10.

On the right-hand side of the figure, a suction pipe 35 is shown communicating with a cavity 36 which is screwed internally at its lower end to receive the screwed nozzle securing cap 38. A slot 39 extending round the whole or part of the circumference of the cap 38 passes through the lower face of the cap 38 and thus places the suction pipe 35 in communication with the air in the cell, so that air is drawn close to the filaments into the slot 39.

On the left hand side of the figure a modified construction is shown, the suction pipe 35 being directly connected to the cavity 36 which in this instance forms part of the cap 38 which screws on to the external thread 40 of the nozzle body 27.

In Fig. 6, the spinning solution is supplied to the nozzle 10 by similar passages 26 through the nozzle body 27. The nozzle, which is in the form of a flanged dish, is secured to the body at its outer edge by the securing cap 38, and there is provided across its flanged portion a perforated plate 41, the nozzle and plate 41 being secured at the centre by a hollow screwed member 42 from which a flexible tube 43 connects the passage 32 in the body 27 with the face of the nozzle 10. Preferably the perforated plate is sweated on to the member 42 so that the nozzle and plate can be secured against the holder by turning the nozzle by hand.

Air is supplied to the flexible tube 43 in the same way as to the passage 31 in Fig. 5, and draw-off devices similar to those in Fig. 5 are carried by the body 27.

In Fig. 7, the spinning solution is supplied to the nozzle 10 by the pipe 25 and passage 26 and air is introduced into the vicinity of the filaments by the passage 34 and the hollow member 30 in a similar manner to that shown in Fig. 5. The nozzle securing cap 38 has in this case a modified construction, both the air introducing and air withdrawing pipes being connected to the body of the holder 27, so that removal of the nozzle can be effected without disturbing the connections to either of these pipes. The cap 38 is provided with a slot 39 which communicates with a recess 45 extending into the cap 38 and the body of the holder 27 and this recess 45 is connected to the draw-off pipe 35 by the passage 46 passing through the body of the holder.

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

1. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, and constraining a definite part of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium.

2. Process for the production of artificial fila-

ments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, constraining a definite part of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium, and introducing additional evaporative medium into the evaporative atmosphere near the vicinity of the point of extrusion of the filaments.

3. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, constraining a definite part of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium, and controlling the rate of withdrawal of evaporative medium.

4. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative downwardly into an evaporative atmosphere, and constraining a definite part of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium.

5. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, and constraining the whole of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium.

6. Process for the production of artificial filaments of cellulose acetate, comprising extruding a spinning solution of cellulose acetate into an evaporative atmosphere, and constraining a definite part of the evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, such constraint being effected solely by means of suction applied to withdraw the evaporative medium.

7. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, introducing additional evaporative medium into said evaporative atmosphere near the vicinity of the point of extrusion of the filaments, and constraining the additional evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments.

8. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, introducing additional evaporative medium into said evaporative atmosphere near the vicinity of the point of extrusion of the filaments, and constraining the additional evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, the constraint being effected solely by means of suction applied to withdraw the evaporative medium.

9. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose deriva-

- tive into an evaporative atmosphere, introducing additional evaporative medium into said evaporative atmosphere near the vicinity of the point of extrusion of the filaments, constraining the additional evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments, and controlling the rate of withdrawal of evaporative medium.
10. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative downwardly into an evaporative atmosphere, introducing additional evaporative medium into said evaporative atmosphere near the vicinity of the point of extrusion of the filaments, and constraining the additional evaporative medium to flow through the immediate vicinity of the point of extrusion of the filaments.
11. Process for the production of artificial filaments of cellulose derivatives, comprising extruding a spinning solution of a cellulose derivative into an evaporative atmosphere, introducing additional evaporative medium into said evaporative atmosphere near the vicinity of the point of extrusion of the filaments, and constraining the whole of the evaporative medium to flow through the vicinity of the point of extrusion of the filaments, the constraint being effected solely by means of suction applied to withdraw the evaporative medium.
12. Apparatus for the production of artificial filaments comprising a spinning chamber, a spinning nozzle disposed therein, a draw-off device so disposed with respect to the nozzle as to be adapted to constrain the evaporative medium by the suction applied by said draw-off device to pass through the immediate vicinity of the spinning orifices, and means for introducing additional evaporative medium into the cell in the vicinity of the spinning nozzle.
13. Apparatus for the production of artificial filaments comprising a spinning chamber, a spinning nozzle disposed therein, a draw-off device carried by said nozzle and having a suction opening outside the nozzle so disposed with respect to the nozzle as to be adapted to constrain the evaporative medium by the suction applied by said draw-off device to pass through the immediate vicinity of the spinning orifices, and a passage within the jet for the introduction of additional evaporative atmosphere through the face of the spinning jet.
14. Apparatus for the production of artificial filaments of cellulose derivatives comprising a spinning chamber, a spinning nozzle disposed therein, a draw-off device adapted to constrain the evaporative medium to flow through the immediate vicinity of the spinning orifices, means for introducing additional evaporative medium into the cell and means adapted to cause said additional evaporative medium to pass through the immediate vicinity of the spinning orifices.
15. Apparatus for the production of artificial filaments of cellulose derivatives comprising a spinning chamber, a spinning nozzle disposed therein, a draw-off device adapted to constrain the evaporative medium to flow through the immediate vicinity of the spinning orifices, means for introducing additional evaporative medium into the cell, and a collector device adapted to cause said additional evaporative medium to pass through the immediate vicinity of the spinning orifices.
16. Apparatus for the production of artificial filaments comprising a spinning chamber and a spinning nozzle disposed therein, a draw-off device carried by said nozzle and having a suction opening outside the nozzle so disposed with respect to the nozzle as to be adapted to constrain the evaporative medium by the suction applied by said draw-off device to pass through the immediate vicinity of the spinning orifices, and a passage within the jet for the introduction of additional evaporative atmosphere through the face of the spinning jet.
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