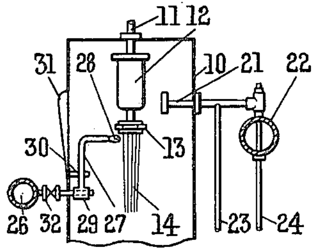
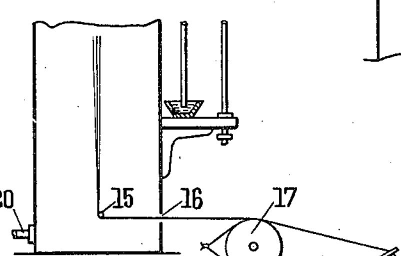
MANUFACTURE OF ARTIFICIAL MATERIALS

Filed Jan. 27, 1933

FIG.1.





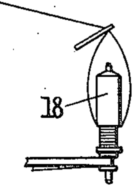


FIG.2.

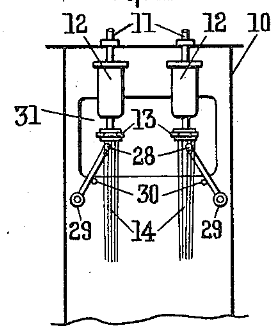


FIG.3.

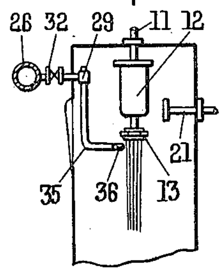


FIG.4.

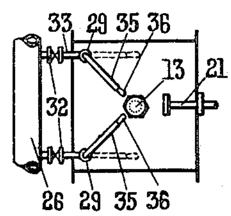


FIG.5.

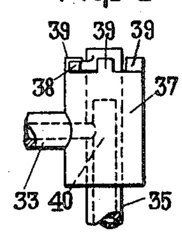
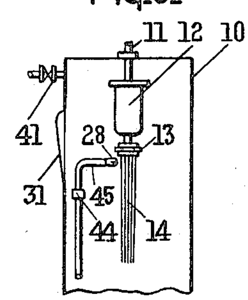


FIG.6.



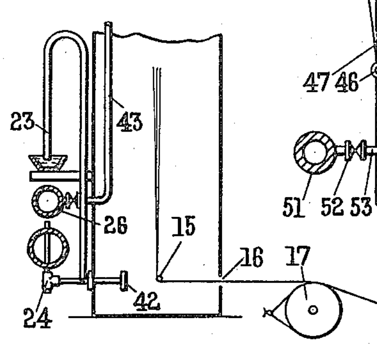


FIG.7.

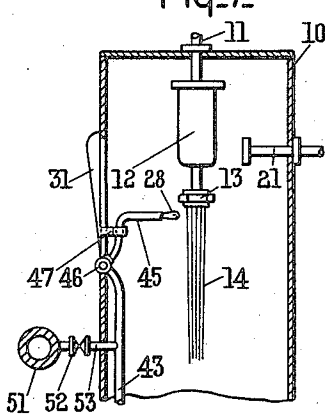
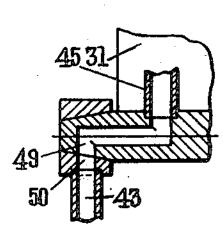


FIG.8.



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2,019,609

MANUFACTURE OF ARTIFICIAL MATERIALS

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Application January 27, 1933, Serial No. 653,804
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4 Claims. (Cl. 18—8)

This invention relates to the production of artificial filaments or the like especially by the dry or evaporative method, for example, the dry spinning of filaments of cellulose acetate or other derivatives of cellulose such as other cellulose esters, e. g. cellulose formate, propionate and butyrate, and cellulose ethers, e. g. ethyl or benzyl cellulose. The invention relates in particular to apparatus for introducing evaporative medium into the immediate vicinity of the filaments issuing from the spinning jet for the purpose of controlling the quality of the filaments and for facilitating the drying thereof.

The object of the present invention is to provide a simple apparatus by means of which the precise position at which the evaporative atmosphere is applied to the filaments and the manner of its presentation, as well as the precise amount of such medium, can be regulated in accordance with the particular requirements of any spinning operation, and especially in accordance with the denier and rate of extrusion of the filaments.

A further object of the invention is to provide an apparatus which will not interfere with the accessibility of the jet for such purposes as cleaning and replacement.

According to the invention a pipe or jet for the application of evaporative medium (hereafter referred to as "air") into the immediate vicinity of the filaments issuing from the spinning jet, is so mounted in the spinning cell that its discharge orifice or orifices lies close to the issuing filaments. The pipe or jet is so mounted that when not required for operation it can be moved away from the jet so as to leave free access thereto. The movable mounting of the pipe or jet is preferably such as not to require breakage of the connection with the supply of air to be introduced, but conveniently the movement may be enabled to cut off the supply of air during the period of inaction of the device.

The supply pipe carrying the pipe is conveniently carried in a corner of the cell or to one side of the cell door so as not to obtrude. The pipe carrying the air jet can then swing in a horizontal plane to a position close against the cell wall to leave the spinning jet quite accessible.

The ability to apply the air close to the filament bundle has several advantages. Thus, it has been found that most effective use can be made of the applied air by having it issue on to the filaments as a blast of comparatively high velocity. By using a relatively small gap between the applying means and the filaments, the applied air need only be supplied at quite a low pressure and yet meet the filaments at high velocity. This is particularly important in facilitating the supply of air to a number of jets simultaneously, since it enables simple and inexpensive air supplying means, such as a rotary fan, to be employed for the purpose.

A further advantage in the arrangement is found in the ability to apply the air to the filaments as a thin blast or stream which increases its evaporative effect and consequently its effect on controlling the characteristics of the filaments. Thus, the jet proper can be made in the form of a wide but thin opening from which the air emerges at high velocity over a width covering a number of filaments, or even the whole of the filaments, which permits a single jet to be used for the whole bundle of filaments issuing from the spinning jet.

The orifice may conveniently be constituted by a burner of the simple slit type used in gas lighting; there may, however, be used a burner of the type in which the flattened stream is produced by causing two streams to impinge on each other.

Any suitable mounting which permits the movement of the air jet to an inoperative position may be employed, a particularly convenient form being one in which the jet is mounted on a supply pipe by a swivel connection serving as a shut-off cock. The mounting may comprise suitable stops or abutments to determine the positions of the jet when in the "on" and/or "off" positions. If desired, means may be employed by which the jet is moved automatically into inoperative position for access to the jet. For example, a pipe carrying the jet may be connected to the cell door so that opening of the door moves the jet. Such an arrangement is particularly useful in avoiding any danger of the jet becoming clogged with spinning solution. If desired, however, the jet may be left to be moved manually either from inside the cell or by means situated outside the cell.

While the flow of air through the jet may be induced by suction employed to withdraw solvent-laden air from the spinning cell, it is generally advisable to supply the air under pressure and, as indicated above, the disposition of the jet close to the filaments enables a low pressure air supply to be utilized to give a high velocity stream. Thus, in the application of the invention to a spinning machine comprising a large number of spinning jets arranged singly or in pairs in separate cells or in larger numbers in bigger spinning compartments, the air jets may be connected

to a header or, if desired, to a series of headers supplied by a pump, fan, pressure vessel or other source of pressure.

The jets are preferably accurately made so as automatically to control the amount of air to be supplied to each jet. Generally in practice each jet of the machine will be required to be supplied with the same quantity of air, in which case similar air jets are employed throughout the machine. Means may, however, be provided to vary the quantity of air delivered. Thus, for example, a valve may be arranged between the supply header and the jet, conveniently being situated for control from outside the spinning cell.

The air may be supplied at any desired temperature. If heated air is required any suitable means may be used to bring it to the desired temperature. Conveniently, this may be effected by causing the pipe connecting the header to the jet to run for some distance through the cell or through or in proximity to the heating means of the cell so that the air becomes heated before its emergence from the jet. By suitable pipe connections and valves this arrangement enables cold, cool, or heated air to be applied at will.

If desired, the applied air may contain gases or vapours such as vapours of the solvent employed in the spinning solution where such are required for the control of the filament characteristics.

The device according to the invention may be employed in connection with any suitable form of dry spinning apparatus and in connection with any desired means for supplying air to or circulating air through the spinning cell. For example, a device or devices may be employed in connection with cells in which a draw-off device is provided at or near the level of the jets to exhaust air from the cell or to produce a current of air through the cell. The air introduced by the device or devices need not, however, be exhausted wholly at such a point, but may be exhausted from some other point or points or partly from one point and partly from another, and may be used whatever the relative movement between the filaments and the evaporative medium. For example, it can be used in downward spinning in which there is a counterflow of evaporative medium or a flow in the same direction as the filaments.

The invention will now be described in greater detail with reference to the accompanying drawing, but it is to be understood that this description is given by way of example only and is in no way limitative.

Figure 1 is a side elevation in section of a spinning cell provided with means according to the invention;

Figure 2 is a front elevation of the interior of the cell shown in Figure 1;

Figure 3 shows a further method of application of the invention;

Figure 4 is an inverted sectional plan view of Figure 3;

Figure 5 is a detail of Figures 3 and 4;

Figures 6 and 7 show further methods of carrying out the invention; and

Figure 8 is a detail of Figure 7.

Referring to Figures 1 and 2, a spinning cell 10 is provided with a supply pipe 11 for spinning solution which is conducted thereby under pressure through a filter candle 12 to a spinning jet 13. The filaments 14 extruded from the spinning jet 13 pass down the cell 10 and turn round a guide 15 near the bottom of the cell, leaving the cell by an aperture 16 on their way to a feed roller 17 feeding them to a cap spinning device 18. Air is allowed to enter the cell through an air inlet 20 and leaves by a draw-off device 21 connected to a header 22, gauge means 23 and control means 24 being provided to adjust the rate of draw-off of air.

Additional air is introduced into the neighbourhood of the filaments 14 issuing from the spinning jet 13 from a header 26 and pipe 27 terminating in a nozzle 28. The nozzle 28 is disposed very close to the filaments and the air leaves it in the form of a thin flat stream which is spread fan-wise against the filaments. The nozzle shown is of the form of a fish tail gas burner, which form is very convenient for the purpose of the present invention.

The pipe 27 swings at the junction 29, its position being determined by means of a stop 30 which brings it accurately into position opposite the bundles of filaments. When desired, however, access may be obtained to the jet 13 through the door 31, the pipes 27 being lifted into inoperative position against the cell wall. The junction 29 is preferably in the form of a cock which shuts off the supply of air as the pipe is swung into inoperative position. In addition a valve 32 is provided to regulate the rate of supply of air, while the pipe 27 is in its operative position. As shown in Fig. 2, the cell 10 contains two spinning nozzles 13, disposed side by side, and air is supplied to each by means of a separate air jet 28.

Figures 3 and 4 show a spinning cell containing a single spinning jet 13. Additional air is fed from a header 26 by means of two separate pipes 35 and jets 36. It will be seen that the junctions 29 in this form of apparatus are such as to permit the pipes 35 to swing about a vertical axis coming to rest as shown in dotted lines against the wall of the cell. The two jets ensure that the entire bundle of filaments is adequately supplied with the additional air injected.

Figure 5 shows the form of the cock 29 illustrated in Figures 3 and 4. The pipe 33 coming from a header 26 leads into the body 37 of the cock, while the pipe 35 passes vertically through the body and is supported by means of lugs 38 resting on the top of the body 37. The extreme positions of rotation of the pipe 35 and the air jet 36 shown in Figures 3 and 4 are controlled by means of lugs 39 on the top of the body 37, which react with the lugs 39 on the pipe 35. Further, rotation of the tube 35 brings the horizontal branch of the passage 40 in the pipe 35 out of engagement with the passage 33 and thereby shuts off the supply of air to the air jet.

In Figure 6 a cell is shown in which the main current of air enters by an inlet 41 and leaves by an outlet 42 provided with control means 23, 24 similar to those described with reference to Figure 1. In this case the main current of air flows in the same direction as the filaments instead of in the opposite direction. The additional air is introduced from the header 26 near the bottom of the cell and passes up the cell through a pipe 43, so that the air contained in the pipe 43 is heated by contact with the main current of warm air within the cell. Near the top of the cell the air passes through a swivel stop cock 44 and tube 45 and out through an air jet 28 of the form previously described. Access to the spinning jet may be obtained through the

door 31 by swinging the tube 45 about the vertical axis of the stop cock 44.

In Figure 7 the air passes up a pipe 43 similar to that described with reference to Figure 6, being supplied from a header (not shown) near the bottom of the cell. In this case however, the tube 43 leads to a stop cock 46 which is integral with the hinge of the cell door 31, the tube 45 leading to the jet 28 being carried on the door 31 by means of a bracket 47. With this arrangement when the door 31 is opened to reach the jet 13 inside the cell, the tube 45 is automatically swung away from the jet 13 and the air current is cut off by means of the cock 46. The cock 46 is shown in Figure 8, which is a section through the planes of the tubes 43 and 45 in Figure 6. It will be seen that, as described with reference to Figure 5, the opening of the door brings the passages 49, 50 out of engagement with one another and so cuts off the supply of air. Means are shown in Figure 8 for supplying solvent or other additional vapours to the air injected into the cell, such vapours being introduced from a header 51 through a valve 52 and pipe 53, the pipe 53 running into a vertical pipe 43 through which the additional evaporative medium is caused to pass.

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

1. Apparatus for the production of artificial filaments by the evaporated method, said apparatus comprising a spinning cell, a spinning jet within said cell for the extrusion of a group of filaments, and means for introducing evaporative medium into said cell, said means having at least one discharge orifice adapted to be moved for operation into a position close to one side of the spinning jet and close to the group of filaments issuing from the spinning jet, and, when not required for operation, to be moved out of said position without disturbing the spinning operation so as to leave free access to the jet.

2. Apparatus for the production of artificial filaments by the evaporative method, comprising a spinning cell, a spinning jet within said cell for the extrusion of a group of filaments, a hinged door in said cell, and at least one pivotally mounted pipe connected to said door and pivoting about the hinge thereof, said pipe having a discharge orifice and being adapted to be swung when the door is closed into a position close to one side of the spinning jet and close to the group of filaments issuing from the spinning jet and when the door is open to be moved out of said position without disturbing the spinning operation so as to leave free access to the jet.

3. Apparatus for the production of artificial filaments by the evaporative method, said apparatus comprising a spinning cell, a spinning jet within said cell for the extrusion of a group of filaments, a hinged door in said cell, the hinge of said door being in the form of a shut-off cock, and at least one pivotally mounted pipe in connection with said cock, said pipe having a discharge orifice and being adapted to be swung when the door is closed into a position close to one side of the spinning jet and close to the group of filaments issuing from the spinning jet and when the door is open to be moved out of said position without disturbing the spinning operation so as to leave free access to the jet and to cut off the supply of air by means of said cock.

4. Apparatus for the production of artificial filaments by the evaporative method, said apparatus comprising a spinning cell, a spinning jet within said cell for the extrusion of a group of filaments, and means for introducing evaporative medium into said cell, said means having a plurality of discharge orifices each adapted to be moved for operation into a position close to one side of the spinning jet and close to the group of filaments issuing from the spinning jet, and, when not required for operation, to be moved out of said position without disturbing the spinning operation so as to leave free access to the jet.

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