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H. TAYLOR

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APPARATUS FOR FORMING FILAMENTS

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Fig. 1.

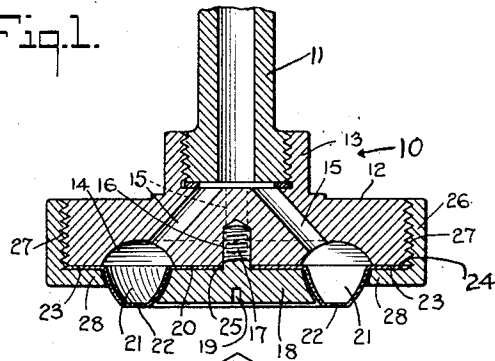


Fig. 2.

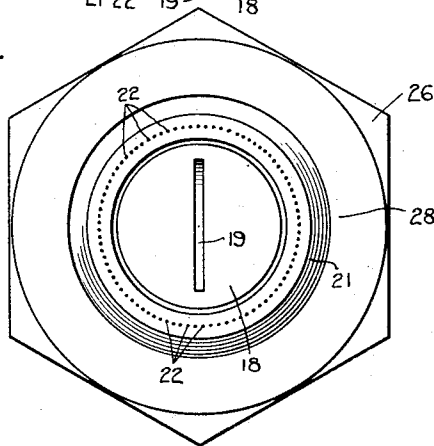
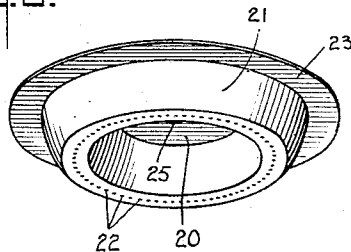


Fig. 3.



INVENTOR
Howard Taylor

BY
J. Seltzer and B. W. Levinson
ATTORNEYS

UNITED STATES PATENT OFFICE

HOWARD TAYLOR, OF CUMBERLAND, MARYLAND, ASSIGNOR TO CELANESE CORPORATION OF AMERICA, A CORPORATION OF DELAWARE

APPARATUS FOR FORMING FILAMENTS

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This invention relates to the manufacture of spinning heads or jets and fittings therefor which are used in the formation of filaments, threads or bristles from solutions of cellulosic materials such as, for example, viscose, cellulose acetate, cellulose nitrate or other cellulose derivatives such as cellulose ethers.

An object of this invention is to provide a spinneret which will permit the simultaneous production of a large number of filaments.

A further object of this invention is to increase the number of outlets in the spinneret which may be served with one pump or denier control.

Another object of this invention is to devise a spinneret or jet which can be subjected to high pressure without the spinneret becoming deformed or distorted.

Still another object of this invention is to devise a construction of the spinning head which will permit easy access to the various parts for cleaning the same and for the replacement of the parts, when the unit contains a very large number of filament forming orifices.

A still further object of this invention is to make it possible to increase the spacing between each hole or outlet, because of the large perforating areas or peripheries now made available, thereby increasing the solvent recovery and drying efficiencies in dry spinning processes and improving the liquor contact and precipitating properties in wet spinning processes.

Other objects and advantages will appear in the following detailed description.

Many types of nozzles and jets have been devised for use in the manufacture of artificial filaments and threads from viscous solutions of cellulose and of its derivatives such as the cellulose esters and ethers. These jets have been found to be objectionable because of their inability to withstand high pressures encountered in forcing the various viscous solutions through the minute orifices in the jet face. After a short period of use these jets are found to be distorted, the distortion resulting in changing the cross sections of the orifices and in the formation of filaments

which vary not only in cross section but also in appearance.

Further, the size of the jets was restricted in ratio to the solution viscosity thus limiting output per unit. Additional difficulties were encountered as the size of the jet orifices was reduced when such reduction was desired in order to produce the smaller or finer deniers, because of the increased back pressure thus created.

It was with the object of overcoming these defects that the present invention was made. Not only have I been able to prevent the distortion of the jet face but I have also made it possible to increase the number of filaments which can be formed from one jet. This I have accomplished by so altering the configuration of the jet that it is better able to withstand the high pressures utilized and by altering the fittings so that a large part of the jet is able to be reinforced to withstand high pressures without in any way interfering with the filament formation. This device also makes it possible, where desirable, to further increase the number of filament forming holes in the jet by simply increasing the diameter of the jet and fitting. The matter of pressure is equally taken care of in large or small units. My invention is equally applicable to the so called wet spinning and dry spinning processes.

In the accompanying drawing, in which like numerals are used to designate like parts throughout the same.

Figure 1 is a vertical sectional view of the assembled spinning jet and its fittings.

Figure 2 is a bottom plan view of the device shown in Figure 1.

Figure 3 is a perspective view of the jet or spinneret.

In the drawing, 10 represents the assembled device as shown in Figure 1, the same being shown attached to the candle, 11 by means of the fitting, 12. The fitting, 12 which comprises the male member of the jet device is formed with a hollow projection, 13 which is internally threaded for attachment to the candle, 11. The lower portion of this member, 12 is formed on its under side with an annular ring or chamber as shown at 14. Into this cham-

ber, 14, the filament forming solution is delivered from the candle through the hollow projection, 13 and the oblique channels, 15. There may be two or more of these channels, the device shown, being provided with four. The bottom of the member, 12 is also formed, at its centre, with a hole, 16 which is internally threaded to receive the threaded projection, 17 of the disc, 18. The disc, 18 is provided on the face opposite the projection, 17 with a slot, 19 to permit its adjustment on the fitting. This disc serves to reinforce the face of the spinning jet to prevent distortion thereof.

In Figure 3 is shown the modified form of jet face, 20. This jet or spinneret is formed with an annular trough or depression, 21 which is adapted to be placed in alignment with the annular chamber, 14 of the member, 12. In the bottom of this annular trough are drilled a series of holes, 22 through which the spinning solution is to be extruded. The spinneret is provided with a central opening, 25 and with a circumferential flange, 23, which flange engages the shoulder, 24 of the fitting, 12 when the device is assembled. 26 designates a coupling member which is internally threaded as at 27. This coupling member is formed with an inwardly extending flange, 28 upon which the flange, 23 of the spinneret is adapted to rest.

The operation of the device is as follows: The spinning solution is fed through the candle 11 and is delivered from the passages 15 into the chamber 21. Due to the pressure under which the spinning solution is fed it is extruded through the minute orifices 22 in the spinneret in the form of fine filaments. These filaments can now be subjected to the action of a heated inert gas to remove the solvent to form artificial filaments or they may be conducted into and through a liquid precipitating and fixing bath when a wet spinning process is employed. The present invention is equally adaptable to the dry and wet spinning processes.

It will be seen from the assembly of the new device that it is quite simple in construction and easily dismantled for cleaning, adjustment or replacement of parts. When assembled suitable washers may be inserted between the flange 23 and the shoulder 24 and/or between the flange 23 and the flange 28 to provide a leakproof connection. The disc 18 is then attached and adjusted in close abutting relationship with the lower side of the jet 20, serving to reinforce the central portion of the jet and to prevent distortion thereof as a result of the pressure utilized in the process. This disc may be of any desired material, but is preferably of metal and should be of such thickness that its lower surface will be in substantially the same plane as the filament forming holes. Where considered necessary or advisable a filter may be

inserted between the jet and the upper portion of the fitting.

As a result of my improved device it is now possible to increase the number of filaments formed from one spinneret thus greatly increasing the output capacity of the filament fibre manufacturing machines, which usually is much greater than the spinneret capacity. Thus for example, a spinneret constructed as hereinbefore set out, capable of producing up to 200 filaments has been used without the slightest distortion of the spinneret, whereas previously a much smaller number of filaments was the maximum which could be obtained with the usual means and solution viscosity. The filaments obtained are uniform in appearance and cross section.

This improvement in the spinning jet has another beneficial result. It makes possible the utilization of extremely fine gauges of metal for spinneret construction. This makes practicable the production of smaller filament forming holes, which in turn produce filaments of finer denier. This is highly desirable since the finer the denier of the filament, the more the latter is analogous to real silk in appearance and hand.

It is to be understood that the description and drawing disclose but one embodiment in my invention. Many possible variations in the respective parts may be made without departing from the spirit of my invention. The term "filament" as used in the claims and specification includes within its scope threads, bristles, etc. even though they be of special cross section.

Having described my invention what I claim and desire to secure by Letters Patent is:

1. In a device for forming filaments the combination of a candle fitting, a spinneret formed with an annular depression, a member for coupling said spinneret and candle fitting and means for reinforcing said spinneret within the annular depression.

2. In a device for forming filaments the combination of a candle fitting, a spinneret formed with an annular depression and a circumferential flange, a member for coupling said spinneret and candle fitting and formed with an inwardly extending flange adapted to contact the flange of the spinneret and means for reinforcing said spinneret within the annular depression.

3. In a device for forming filaments the combination of a candle fitting, a spinneret formed with an annular depression, a member for coupling said spinneret and candle fitting and a metal disc adapted for attachment to the jet fitting for reinforcing the central portion of the spinneret.

4. In a device for forming filaments the combination of a candle fitting, a jet fitting provided on its under side with an annular inverted trough and means of communica-

tion between the central portion of said candle fitting and said trough, a spinneret provided with an annular depression adapted to align with the annular trough of the jet fitting to form an annular chamber, a coupling member and means for reinforcing the spinneret.

5 5. In a device for forming filaments the combination of a candle fitting, a jet fitting provided on its under side with an annular
10 inverted trough and means of communication between the central portion of said candle fitting and said trough, a spinneret provided with a circumferential flange and an
15 annular depression adapted to align with the annular trough of the jet fitting to form an annular chamber, a coupling member formed with an inwardly extending flange adapted to contact the flange of the spinneret and means for reinforcing said spinneret.

20 6. In a device for forming filaments the combination of a candle fitting, a jet fitting provided on its under side with an annular inverted trough and means of communication between the central portion of said candle fitting and said trough, a spinneret provided with a circumferential flange and an
25 annular depression adapted to align with the annular trough of the jet fitting to form an annular chamber, a coupling member
30 formed with an inwardly extending flange adapted to contact the flange of the spinneret, and a metal disc adapted for attachment to the jet fitting for reinforcing the central portion of the spinneret.

35 In testimony whereof, I have hereunto subscribed my name.

HOWARD TAYLOR.

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