May 9, 1961 E. K. BAUER 2,983,282

APPARATUS FOR PRODUCING ARTIFICIAL FILAMENTS

Filed May 12, 1958

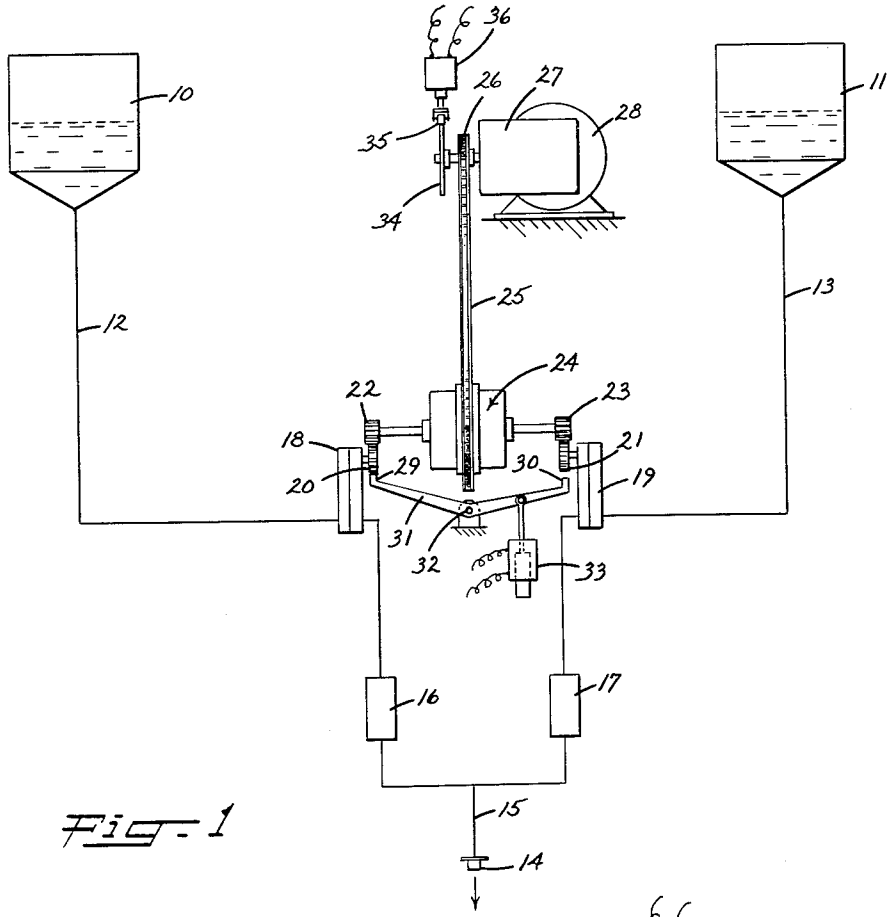


Fig - 1

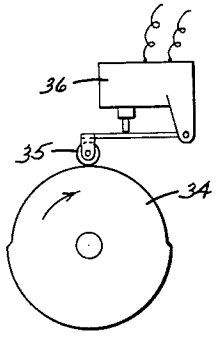


Fig - 2

United States Patent Office 2,983,282 Patented May 9, 1961

2,983,282

APPARATUS FOR PRODUCING ARTIFICIAL FILAMENTS

Ernest K. Bauer, Meadville, Pa., assignor to American Viscose Corporation, Philadelphia, Pa., a corporation of Delaware

Filed May 12, 1958, Ser. No. 734,717

7 Claims. (Cl. 137—567)

The present invention relates to a system or apparatus for producing artificial filaments and more particularly, artificial filaments having alternating segments of differing characteristics such as different colors.

Among the conditions affecting the denier of artificial filaments is the pressure and volume of flow of the spinning solution through the orifices of the spinneret or jet. In the past it has been entirely practicable on a commercial scale to produce constant denier filaments in colors but when an attempt has been made to produce filaments having alternating zones of differing colors or alternating segments differing in some other characteristic, great difficulty has been encountered in maintaining the denier of the filaments constant throughout their length. Part of the difficulty has been caused by the fact that the methods of productiton have generally involved a constant flow of a spinning solution of a particular color or other characteristic and periodically adding to the basic spinning solution a second solution which imparts a different color or characteristic to the material extruded through the spinneret orifices, and during the periods while the second solution is being added there is an increased flow through the orifices with the result that the filaments are characterized by alternating segments of varied cross-section. For example, when spinning filaments of alternating white and red segments, the red segments will generally have a greater cross-sectional area than the white segments because of the addition of the red dye to the normal flow of the white spinning solution. Another difficulty encountered in spinning filaments having alternating segments of differing characteristics has been the inability to provide sharp lines of demarcation between the segments.

It is an object of the present invention to provide an apparatus for spinning constant denier filaments having alternating segments of differing characteristics such as different colors.

It is a further object of the invention to provide an apparatus for spinning filaments of the type referred to wherein by proper manipulation of the apparatus either sharp lines of demarcation may be provided between the alternating segments or a zone may be provided between the alternating segments characterized by a mixture of the components of the alternating segments, that is to say, in the case of different colors there may be a sharp line of demarcation between the colors or there may be a substantial zone between the two colors comprised of a mixture of the two colors.

Other and further objects, features and advantages of the invention will become apparent as a description of a preferred embodiment thereof proceeds.

Referring now to the drawings:

Figure 1 is a diagrammatic showing of the system of the present invention, and

Figure 2 is an elevational view of a device employed for controlling the operation of the two pumps forming a part of the system.

Two differently colored or otherwise differently characterized supplies of spinning solutions or dopes are contained in the tanks **10** and **11** from which they are

pumped respectively through conduits **12** and **13** for extrusion through a common spinneret or jet **14** connected by a relatively short length of pipe **15** to the two conduits. The spinning solutions may be viscose, acetate or any other solutions which may be spun by wet or dry spinning methods to form filaments. The conduits **12** and **13** may contain filters **16** and **17**, respectively, such as ordinarily employed in heretofore known spinning systems.

In the ordinary case, when spinning filaments from a single solution, a positive displacement pump, such as a gear pump, is provided in the line at a point close to the spinneret for supplying spinning solution to the spinneret at a constant rate. In the present instance, a gear pump **18** is provided for pumping the solution through the conduit **12** and a gear pump **19** of the same capacity as the pump **18** is provided in the conduit **13** for pumping the solution through that conduit. The two pumps **18** and **19** are operatively connected through gears **20** and **21**, respectively, with driving pinions **22** and **23** provided on the ends of the two output shafts of a standard differential gear generally indicated at **24**, similar in construction to the ordinary differential found in an automobile. The driving gear of the differential is driven by a sprocket chain **25** from a sprocket wheel **26** provided on the output shaft of a speed reduction unit **27**, the input of which may be driven from any suitable constant speed motor **28**.

As previously mentioned, among the conditions affecting the denier of the filaments formed by extrusion of the spinning solution through the spinneret is the pressure and volume of flow of the spinning solution. Since the present invention contemplates the production of filaments having a constant denier or cross-sectional area throughout their length, means is provided for continuously supplying the spinneret with a constant volume and pressure of spinning solution. Since the two pumps **18** and **19** are driven from a differential gear, when one of said pumps is stopped the other one will be driven at twice the speed at which it would be driven were the two pumps being operated simultaneously. This, of course, is characteristic of a differential gear drive.

In order to stop the two pumps **18** and **19** alternately, positive brake means are provided in the form of teeth **29** and **30** formed on the ends of a common rocker arm **31** pivotally mounted at **32**. The rocker arm **31** may be rocked by means of a solenoid **33**, the armature of which is connected to said rocker arm so that when said solenoid is energized the rocker arm is rocked to engage the tooth **29** with the drive gear **20** and upon de-energization said solenoid rocks the rocker arm in the opposite direction to engage the tooth **30** with the drive gear **21**. In practice, the gears **20** and **21** are driven at a fairly low speed so that it is entirely practicable to provide a positive brake of this type.

If the two pumps **18** and **19** were allowed to operate simultaneously without any braking action upon either of them, equal amounts of the spinning dopes from tanks **10** and **11** would be supplied to the spinneret and in the event that the two dopes were of different colors, the resultant filaments would be formed of a combination of the two colors and these filaments would have a constant denier. By alternately stopping first one pump and then the other, the doubling of the speed of the operating pump assures a constant supply of spinning dope to the spinneret. According to one mode of operating the system of this invention the two pumps are never allowed to operate at the same time, but when one of them is stopped the differential gear immediately delivers its full power to the other pump and thus there will always be a particular quantity of spinning solution supplied to the spin-

neret, the supply consisting alternately of one or the other of the differently characterized spinning solutions. When the stopping of the pumps is abrupt as is the case with a positive type brake, the resultant filaments have a sharp line of demarcation between the differently characterized segments.

In the event that it is desired to produce constant denier filaments having alternating segments of differing characteristics connected by zones wherein the filaments have a mixture of characteristics, a friction brake will be provided instead of the positive brake so that it is possible to stop the pumps gradually instead of abruptly. In this instance the one pump will be speeded up by the differential gear **24** in direct proportion to the slowing down of the other so that during the period while both pumps are operating, some of each of the spinning dopes will be supplied to the spinneret to thus produce between the segments of differing characteristics a zone consisting of a mixture, but nevertheless of the same denier.

In order to automatically produce filaments having alternating segments of the same length, the output shaft of the speed reduction unit **27** carries a cam **34** having one-half of its periphery of a different radius from the other half and this cam cooperates with a follower **35** provided on the operating arm of a micro switch **36** connected in a circuit including the solenoid **33**. The switch **36** may be so arranged as to cause energization of the solenoid either when the follower **35** is on the high or low portion of the periphery of the cam **34** and de-energized when said follower is on the other portion of said cam to thus rock the rocker arm **31** in first one direction and then the other to alternately stop or slow down the pumps **18** and **19**.

Having thus described a preferred embodiment of the invention, what is claimed is:

1. In an apparatus for spinning constant denier filaments having alternating segments of differing characteristics, two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, a differential drive for said pumps, a motor for driving said differential drive, brakes for said pumps, means for alternately operating said brakes, said differential drive speeding up one pump in direct proportion to the slowing down of the other whereby spinning dope will be supplied to the outlet at a constant rate.

2. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for supplying pressure to the spinning dopes, said pumps being of the same capacity, a differential gear drive for said pumps, and means for alternately interrupting the operation of said pumps, said differential drive increasing the speed of the operating pump when the other pump is stopped whereby the total supply of spinning dope to the outlet remains constant.

3. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, said pumps being of the same capacity, a differential gear drive for said pumps, a motor for driving said differential gear, brake means for stopping said pumps alternately, and means operable by said motor for operating said brake means.

4. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics with a substantial zone of diffusion therebetween comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, a differential gear drive for said pumps, a motor for driving said differential gear, brake means for said pumps, a rocker arm for alternately operating said brake means, means to rock said rocker arm in one direction to operate one of said brake means and means to rock said rocker arm in the opposite direction to operate the other brake means.

5. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, said pumps being of the same capacity, a differential gear drive for said pumps, a motor for driving said differential gear, cam means driven by said motor, switch means operated by said cam means, a solenoid in a circuit including said switch means, means operable by said solenoid upon energization thereof due to closing of said switch to stop one of said pumps, and means operable upon de-energization of said solenoid for stopping the other of said pumps, said differential gear drive maintaining a uniform flow of spinning dope to the common outlet.

6. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, said pumps being of the same capacity, a differential gear drive for said pumps, a motor for driving said differential gear, brake means for stopping said pumps, a rocker arm for alternately operating said brake means, a solenoid operable upon energization to rock said rocker arm in one direction to operate one of said brake means and stop one of said pumps and operable upon de-energization to rock said rocker arm in the opposite direction to operate the other brake means and stop the other pump, an electric circuit for said solenoid including a switch, and means operable by said motor for operating said switch.

7. Apparatus for spinning constant denier filaments having alternating segments of differing characteristics comprising two spinning dope supplies of differing characteristics, a conduit leading from each dope supply to a common outlet, a positive displacement pump in each of said conduits for pumping the spinning dopes under pressure through said conduits, said pumps being of the same capacity, a differential gear drive for said pumps, a motor for driving said differential gear, brake means for stopping said pumps, a rocker arm for alternately operating said brake means, a solenoid operable upon energization to rock said rocker arm in one direction to operate one of said brake means and stop one of said pumps and operable upon de-energization to rock said rocker arm in the opposite direction to operate the other brake means and stop the other pump, an electric circuit for said solenoid including a switch, rotary cam means for operating said switch, said cam means being driven by said motor and serving to maintain said switch closed during one-half its revolution and permitting said switch to open during the other half.

References Cited in the file of this patent

UNITED STATES PATENTS

1,985,312	Bryson	Dec. 25, 1934
2,594,064	O'Leary	Apr. 22, 1952
2,692,164	Lockwood	Oct. 19, 1954
2,698,576	Strub	Jan. 4, 1955
2,815,033	Braunlich	Dec. 3, 1957
2,822,574	Lavash	Feb. 11, 1958