Dec. 3, 1957 R. H. BRAUNLICH 2,815,033

ALTERNATE FLOW CONTROL FOR FLUID STREAMS

Filed Feb. 8, 1954

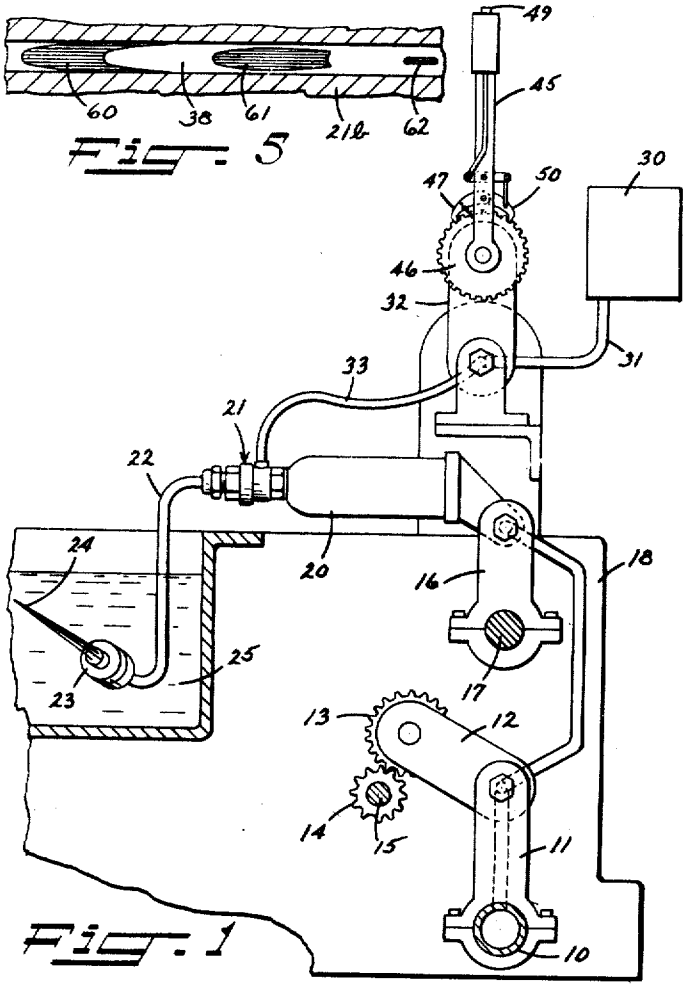


Fig. 1




Fig. 5

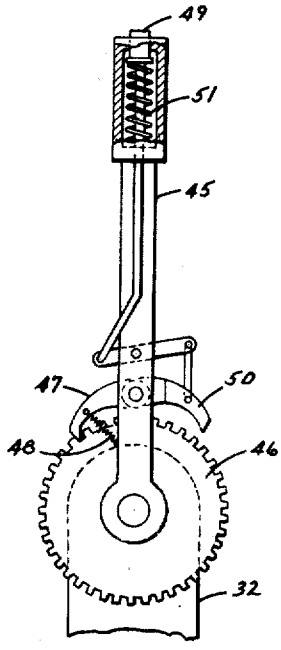


Fig. 2

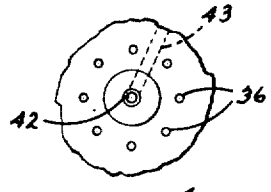


Fig. 4

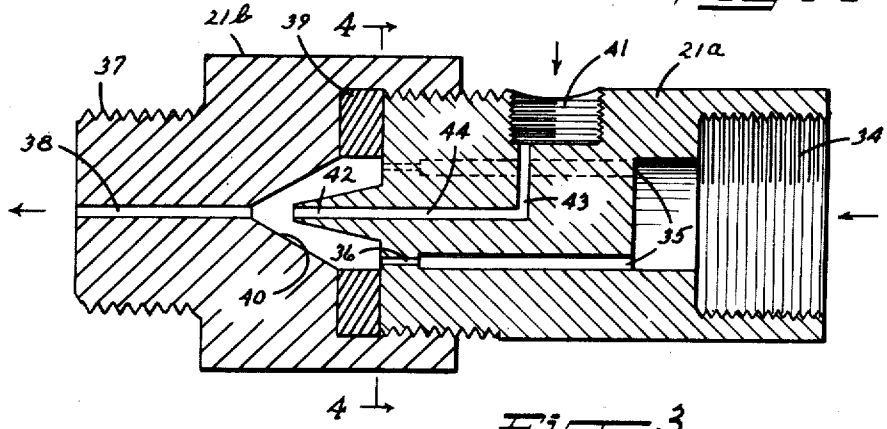


Fig. 3

United States Patent Office 2,815,033
Patented Dec. 3, 1957



2,815,033

# ALTERNATE FLOW CONTROL FOR FLUID STREAMS

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Application February 8, 1954, Serial No. 408,637

4 Claims. (Cl. 137—7)

This invention relates to the spinning of artificial textile fibers and, more particularly, to a novel method and apparatus for providing sharp interfaces between variously colored areas in the spinning solution prior to extrusion through the spinneret.

A serious disadvantage arising in all previously known methods and apparatus for injecting a colored dope or spinning solution into a main spinning solution stream has been the inability to cut off the color solution sharply to avoid a more or less continuous coloring of the main stream. The present invention provides a method and apparatus which controls with great accuracy the precise amount of secondary fluid that is injected into the main stream.

While the present invention will be described in conjunction with the conventional spinning of viscose filaments, it will be understood that it may be used with any other type of synthetic fiber such as, for example, nylon or cellulose acetate.

The primary object of the present invention therefore is to provide an apparatus for injecting a secondary stream of viscose into a primary viscose stream so that the flow of primary viscose may be substantially interrupted by the secondary viscose solution.

A further object of the invention is to provide apparatus for instantaneously cutting off the supply of a secondary viscose stream as injected into a main viscose stream.

A further object of the invention is to provide a method for completely and instantaneously stopping the flow of a secondary viscose stream when combined with a primary stream.

A still further object of the invention is to provide apparatus for substituting one for the other different streams of viscose in a continuously flowing viscose spinning apparatus.

Further objects will be apparent from the specification and drawings in which:

Figure 1 is a transverse sectional view of a viscose spinning machine incorporating the present invention;

Figure 2 is an enlarged fragmentary sectional detail which is a part of the structure of Figure 1;

Figure 3 is an enlarged transverse section of the injection nozzle assembly used in conjunction with the present apparatus;

Figure 4 is a fragmentary detail as seen generally at IV—IV of Figure 3; and

Figure 5 illustrates a variety of results that may be achieved in the viscose stream as it progresses from the injection nozzle to and through the rounder.

The invention comprises essentially the provision of an injection orifice or nozzle which is located in the viscose conduit between the candle filter and the spinneret. Throughout the present specification, the viscose solution which is added to the main stream will be referred to as the secondary viscose which is usually of a different color or composition than the main viscose stream. Strictly speaking, the present apparatus and method do not necessarily deal with an "injection" procedure in the sense that



a small quantity of secondary fluid is substantially continuously injected into a main stream. The present invention contemplates a more or less complete substitution of one viscose stream for the other, thus providing alternate sections or segments in a continuous stream having sharp interfaces between the segments. In order to accomplish the initial complete interruption of the so-called main stream, I provide an aligned injection orifice which is capable of discharging a volume of secondary fluid sufficient to completely fill a metered bore in the main fluid conduit. The shape and relative size of the two conduits together with the shape of the injection chamber enable a complete or partial shutting off of the main viscose stream to be accomplished. When it is desired to reintroduce the primary stream into the rounder or spinneret passage, I not only shut off the supply of the secondary or colored viscose but I positively prevent any additional secondary fluid from passing through the injection nozzle either in the form of seepage or in larger amounts. This is accomplished by a sharp reduction in the pressure on the injection fluid which has the effect of reversing the flow of the fluid in the secondary line between the secondary pump and the nozzle. Such reversal does not have to be more than enough to prevent seepage from the nozzle but, of course, should not be sufficient to withdraw primary viscose back into the secondary conduit or pump.

Referring now to the drawings, the primary stream of viscose is supplied through a conventional conduit or pipe **10** and bracket **11** to pump **12** which is driven by spur gears **13** and **14** from shaft **15**. This apparatus as well as the candle filter bracket **16** and shaft **17** is mounted on the spinning machine frame **18** as is well known in the art. The primary viscose then is pumped through a candle filter **20** from whence it passes through my improved injection nozzle **21**, rounder **22** and spinneret **23**. Filaments **24** are coagulated in the conventional bath **25** in accordance with standard practice. The secondary viscose stream which is ordinarily of a different color than the primary stream is pumped from a reservoir or other supply **30** through conduit **31** by means of a pump **32**. In the present instance, I have shown pump **32** as being manually operated, but it will be understood that a mechanical drive for the secondary pump which provides the desired reciprocating motion may be used. From pump **32**, the secondary stream passes through conduit **33** and thence into the nozzle **21**.

In order to provide a sharp cut-off for the main viscose stream, I introduce the main stream from the candle filter **20** into the nozzle body **21***a* (Figure 3) through the counterbored and tapped opening **34**. The main viscose stream then passes through a plurality of passages **35, 35** which desirably have a reduced bore **36** at the opposite end of the body **21***a*. These passages are, in the preferred form, drilled concentrically around the centerline of the body. The nozzle housing **21***b* connects with the rounder **22** by means of a threaded boss **37** and has a single central passage or conduit **38** through which all the viscose travels to the spinneret **23**. The housing **21***b* is connected to the body **21***a* by means of a threaded connection, and axial adjustment of the position of the body in the housing can be achieved by varying the thickness of the gasket **39** which is compressed between the end of the body **21***a* and a counterbored shoulder in the housing. The upstream end of conduit **38** terminates in a conical chamber **40** which tapers or converges from a diameter slightly greater than the diametric distance between opposite orifices **36, 36** to the diameter of conduit **38**. Thus it will be apparent that the primary stream of fluid, such as viscose, is introduced to chamber **40** through passages **35, 35** and orifices **36** and is discharged from chamber **40** through conduit **38**. The secondary fluid is introduced into the body **21***a* through a tapped passage **41** which

communicates with the secondary injection orifice **42** through suitably drilled passages **43** and **44**. The diameter of orifice **42** is selected in view of the pressure on the secondary stream so that sufficient secondary fluid is injected into the chamber **40** at its apex. In the present instance, I have shown the bore of orifice **42** as being substantially the same diameter as the bore of conduit **38**. However, this relation may be varied depending upon the relative pressures in the primary and secondary streams and the spacing from the tip of orifice **42** to the inner terminus of conduit **38**.

The pump **32** for injecting or supplying the secondary viscose stream is of standard design but is operated so that pressure is periodically applied to the secondary stream and then quickly removed by a reversal of the pump direction. When this pressure sequence is accomplished manually, the pump is driven through lever **45** which has a ratchet and pawl connection with the pump gears. Assuming that a counterclockwise turning of ratchet **46** (Figure 2) applies pressure to the secondary stream, a counterclockwise turning of lever **45** through a predetermined arc drives ratchet wheel **46** through pawl **47** which is spring-loaded at **48**. In order to relieve the injection pressure on the secondary stream, the lever **45** is reversed for all or a part of its forward stroke. By depressing the thumb latch **49** in the handle of the lever, the pawl **50** is raised to disengage the teeth of the ratchet wheel **46**. If the pawl **50** is initially raised and retained in a raised position, no clockwise movement of the ratchet wheel **46** occurs. On the other hand, the ratchet may be completely reversed through its forward arc by releasing the thumb latch **49**, thus permitting the pawl **50** to engage the teeth of the ratchet wheel under urging of spring **51**.

In accordance with the degree or amount of reversal of the pump **32**, it is possible to shut off sharply the flow of secondary viscose through orifice **42**. On the forward or injection stroke of pump **32**, the secondary viscose passes from orifice **42** into chamber **40** and conduit **38**. This continues during the forward or pressure stroke of lever **45** and pump **32**. At the end of the pressure stroke, a reversal of pump **32** immediately draws back the secondary viscose in orifice **42** and passages **43** and **44** together with some of the primary viscose in chamber **40**. The primary fluid then immediately passes into conduit **38** and flow of this fluid is resumed through orifices **36**, **36**. This provides sharp interfaces in the stream of viscose V (Figure 5) which is fed through the rounder **22** and into spinneret **23**. Various types of injection are illustrated in Figure 5 in which the viscose segment **60** completely fills conduit **38** and the remainder of the fluid passage to the spinneret. In this case, however, the friction between the walls of the conduit and the segment of colored or different viscose tends to drag the skin of the segment so that an extremely sharp cut-off will not ordinarily be obtained due to the trailing or stringing out effect which is partially illustrated. If, however, the injection is not sufficiently severe to completely fill conduit **38**, then a colored viscose segment **61** is produced. In this form, there will be limited distortion due to the decreased velocity near the walls of the conduit but a substantially sharp interface is still entirely possible. In the injection of segment **62**, however, maximum sharpness is possible because the injected viscose segment or material remains near the center of the main viscose stream so that the axial velocity throughout the segment is substantially equal. This latter form provides the maximum sharpness of cut-off for the above reason. Furthermore, to enhance the sharpness of the cut-off, it is desirable to place the injection nozzle **21** as near the spinneret **23** as possible, and it will be understood that the nozzle **21** may be located directly in back of the spinneret **23** ahead of the rounder or the rounder as such may be eliminated entirely.

The magnitude of the reversal of pump **32** depends on the various operating conditions and the result desired.



The frequency of the occurrence of the secondary stream segments as well as the main stream segments is, of course, dependent upon the frequency of actuation of pump **32**. It is important to note, however, that regardless of the spacing between the two individual stream segments in the rounder **22** it is possible to provide, for all practical purposes, no mixing of the streams. The secondary viscose stream is in effect chopped into segments of various length and then injected into the main stream to form a final stream of viscose that is extruded through a spinneret. In this way it is possible to achieve much more interesting and novel color effects in the spun yarn. There is an absence of color blending which, with proper spacing, can be made highly effective by way of contrast.

Having thus described my invention, I claim:

1. A method of combining independent liquid streams by intermittently introducing each stream into a common conduit which comprises the steps of applying pressure to a first liquid supply to form a continuous first stream, injecting the first stream through the conduit, applying pressure to a second liquid within a supply line to form a second stream under a greater pressure than the first stream, injecting the second stream through the conduit, said second stream injection momentarily interrupting the passage of the first stream through the conduit, discontinuing the second stream to permit the first stream to resume its passage through the conduit, and reducing the pressure within the supply line for the second stream to withdraw a portion of the first stream within said supply line to prevent seepage of the second stream into the first stream passing through the chamber and conduit.

2. A method of combining independent liquid streams by intermittently introducing each stream into a common conduit which comprises the steps of applying pressure to a first liquid supply to form a continuous first stream, injecting the stream into a chamber leading to the conduit to flood the chamber, further injecting the stream through the conduit, applying pressure to a second liquid within a supply line to form a second stream under a greater pressure than the first stream, injecting the second stream directly through the flooded chamber into the conduit, said second stream injection momentarily interrupting the passage of the first stream through the conduit, continuing the flow of the first stream within the chamber, discontinuing the second stream to permit the first stream to resume its passage through the conduit, and reducing the pressure within the supply line for the second stream to withdraw a portion of the first stream within the supply line to prevent seepage of the second stream into the first stream passing through the chamber and conduit.

3. The method according to claim 2 wherein the first and second streams comprise a clear viscose stream and a colored viscose stream respectively.

4. The method according to claim 2 wherein the first and second streams comprise differently colored viscose streams.


**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 866,112 | Foster | Sept. 17, 1907 |
| 976,148 | Caps | Nov. 22, 1910 |
| 1,613,000 | Widdowson | Jan. 4, 1927 |
| 1,955,825 | Palmer | Apr. 24, 1934 |
| 1,975,153 | Jacquet | Oct. 2, 1934 |
| 2,007,871 | Oldham | July 9, 1935 |
| 2,313,060 | Friedman | Mar. 9, 1943 |
| 2,421,475 | Beeh | June 3, 1947 |
| 2,500,816 | Grid | Mar. 14, 1950 |
| 2,506,415 | Geffroy | May 2, 1950 |
| 2,598,066 | Morse | May 27, 1952 |
| 2,621,596 | Jacuzzi | Dec. 16, 1952 |
| 2,650,168 | Dijk | Aug. 25, 1953 |

FOREIGN PATENTS

| | | |
|---|---|---|
| 517,897 | France | of 1921 |