Aug. 9, 1932. C. D. WALTON ET AL 1,871,100

PROCESS AND APPARATUS FOR MANIPULATING TEXTILE MATERIALS

Filed May 7, 1929 2 Sheets-Sheet 1

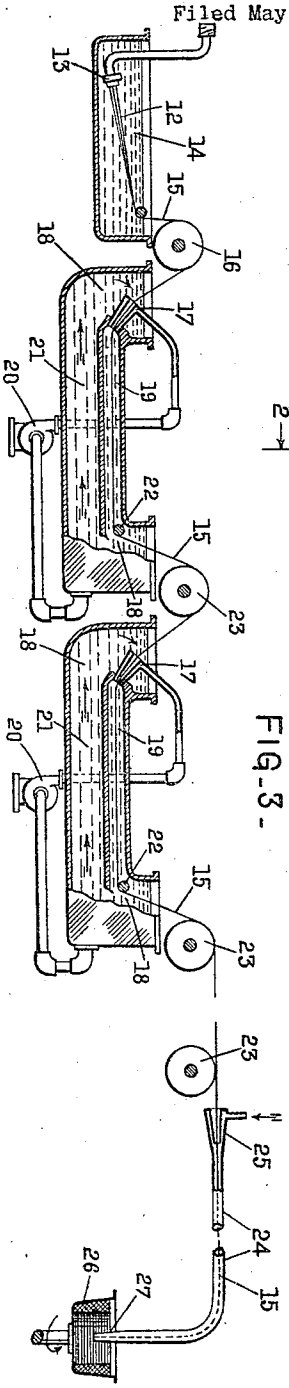


FIG. 3.

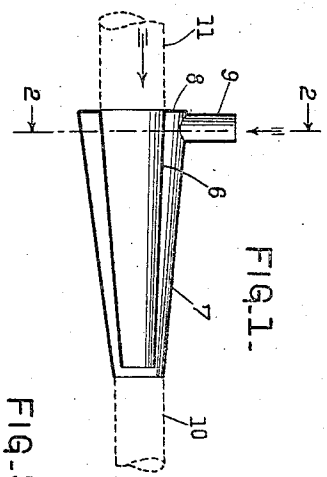


FIG. 1.

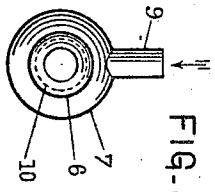


FIG. 2.

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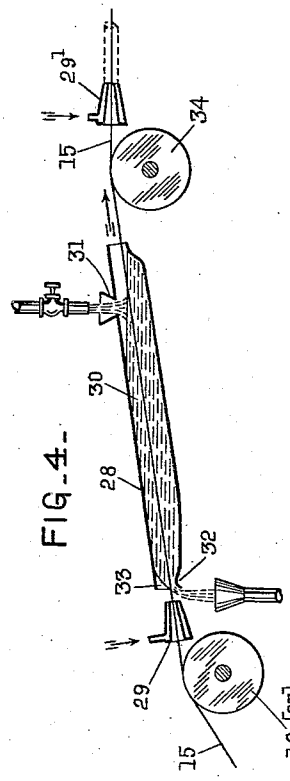


FIG. 4.

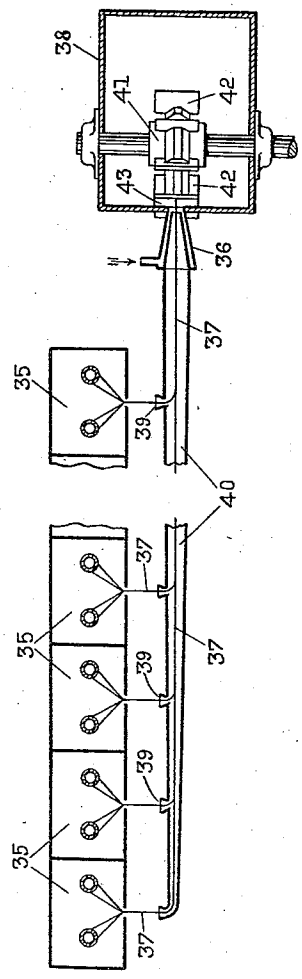


FIG. 5.

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UNITED STATES PATENT OFFICE

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PROCESS AND APPARATUS FOR MANIPULATING TEXTILE MATERIALS

Application filed May 7, 1929, Serial No. 361,090, and in Great Britain May 9, 1928.

This invention relates to processes and apparatus for conveying textile threads, yarns, and filaments and has for its object to overcome the difficulties experienced in many textile operations in transferring threads or the like from one point to another. Guides, rods, driven and idle pulleys, and other devices usually employed are often unsatisfactory in that they subject the threads or the like to excessive friction or tension; or they fail to give the requisite support to the threads, being capable of engagement with them only at intervals along their length; or they limit unnecessarily the form of the path taken by the threads, the threads generally having to proceed in a straight path from one guide or the like to another.

According to our invention, a continuous length of thread, yarn, or filament, or a collection of such lengths, is caused to travel to any desired point by a gaseous or liquid medium which flows with the thread or the like and carries it along with it. The gaseous or liquid flow may be produced by pressure or suction and may be used to convey the threads or the like over long or short distances, carrying it over any desired path.

While the flow of the conveying medium will usually be through a closed pipe or conduit, it may, especially where a liquid medium is employed, be along an open channel or duct. Again, a part of the path may be totally unenclosed, particularly when the thread or the like is to be conveyed over a comparatively short distance.

The threads or the like, (hereinafter referred to as "threads") being carried along with the propelling medium, are given continuous support, and the tension applied by the medium is evenly distributed over the whole length of the thread, instead of being applied at intervals. Long distances can be covered by the thread, especially when the propelling medium is enclosed, the pipes or conduits being designed to allow the medium to flow with as little obstruction as possible between the desired points.

The new system of conveying may be employed for delivering threads to a machine or apparatus for treatment therein, or may be arranged to remove treated threads away from a machine or apparatus, or it may be used to convey them from one machine or apparatus to another. For example, suction may be applied at one end of a conduit to draw in a thread, and the resulting discharge of fluid at the other end of the conduit may be used to deliver the thread. Similarly, a thread may be drawn into a conduit by suction applied at or near the inlet end of the conduit and carried through the conduit to its discharge end by the fluid flow therethrough, or the suction may be applied at an intermediate point along the length of a conduit.

In one form of device embodying this principle, a thread is sucked through a tube or conduit by a fluid steam in a second tube surrounding the inner tube or conduit, the fluid stream discharged from the outer tube serving to eject the thread from the inner tube or conduit. The outlet of the device is arranged as a nozzle to direct the expelled thread to the point desired. Other forms of the device will appear from the subsequent description.

The conveying devices employing a fluid flow according to the invention may be used in conjunction with positive means for conveying threads, this combined arrangement being useful when a definite rate of feed is necessary, or when there is danger of attenuation or shrinkage of the threads or filaments being conveyed.

In addition to serving as a conveying medium, the fluid stream may be utilized for treating the threads simultaneously with their conveyance. Thus washing, drying, or other treatment of the threads may be carried out by the use of suitable fluids. It is also possible, particularly where positive feed means are used in conjunction with the fluid propelling means, to subject the travelling threads to a counterflow of any desired treating fluid, the rate of such counterflow being, of course, adjusted so as not to exert an undue retarding action on the movement of the threads.

An embodiment of the manner in which the invention may be carried out, together with

various applications of the invention, is illustrated in the accompanying drawings, but it is to be understood that the following description is given by way of example only, and is not in any way limitative.

Referring to the drawings:—

Fig. 1 is a longitudinal section of a device for inducing a fluid flow in a conduit along which it is desired to convey a thread;

Fig. 2 is a cross section on the line 2—2 of Fig. 1;

Fig. 3 is a diagrammatic elevational view, principally in section, illustrating the application of the invention to the conveying and treatment of wet-spun artificial threads;

Fig. 4 is an elevational view in section showing the employment of a counterflow treatment of threads which are being conveyed by fluid flow; and

Fig. 5 is a plan view in section illustrating the conveying of dry-spun artificial threads to a cutting machine for the production of staple fibre.

In Figs. 1 and 2, a tube 6, preferably tapered, is arranged inside a tapered tube 7 the annular space between the larger ends of the tubes being closed, as indicated at 8. Fluid is supplied to the outer tube 7 by a pipe 9, and the flow of fluid from the tube 7 past the mouth of the tube 6 induces a flow through the tube 6. A thread being brought under the influence of this induced flow is drawn through the tube 6 and propelled from the mouth of the tube.

The propelling device just described may be used at the inlet end of a conduit 10, the fluid flow through the conduit serving to support and propel the thread along the path of the conduit, or at the outlet end of a conduit 11. It may, however, be used at an intermediate point along the length of a conduit.

Liquids or gases may be used as flow-inducing media, and the fluid which is caused to flow through the tube 6 is preferably the same as that introduced into the tube 7, though, for example, a gas may be used to induce a flow of liquid conveying medium, or vice versa.

The conveying medium may be used for the treatment of the threads conveyed, and Fig. 3 illustrates in diagrammatic form conveying apparatus according to the invention as applied to the treatment of wet-spun artificial threads, e. g. viscose silk.

Filaments 12 extruded from a nozzle 13 into a coagulating bath 14 are associated into a thread 15 and withdrawn from the bath. After passing over a roller 16, which is preferably positively driven so as to deliver the newly-formed filaments at a constant rate, the thread enters a propelling device 17 similar to that described with reference to Figs. 1 and 2, and located in a bath 18. A propelling liquid is supplied to the device 17 and carries the thread 15 into and along a conduit 19. The liquid in the bath 18 may serve to carry out any desired treatment of the thread, such as washing, the length of the conduit 19 being made sufficient to ensure completion of the treatment before the thread is withdrawn from the bath 18. In the arrangement shown, the propelling liquid is constituted by liquid drawn from the bath 18 and circulated to the device 17 by means of a pump 20. A circulation of liquid takes place through a return run 21 of the bath 18, such circulation being set up by the flow induced through the inner tube of the device 17. Any suitable arrangement may be employed for the removal of spent wash liquor and the supply of fresh liquor, preferably as continuous operations. The treatment of the threads in this manner continuously with their production avoids the necessity of submitting them to washing or other treatments after they have been wound.

The washed thread 15 is withdrawn from the bath 18, being passed round a guide 22, and is directed over an idle roller 23 to a second bath 18, through which the thread is conveyed by means of a propelling device 17. Any desired treatment, such, for example, as desulphurizing, may be carried out in the second bath, and further treatments may be applied by the use of additional baths provided with the propelling devices 17.

Finally, the thread may be dried whilst being conveyed to any suitable collecting device, heated air being a convenient medium for conveying and drying. In Fig. 3, the thread 15 on leaving the last of the rollers 23 is drawn into a conveying tube 24 by means of a propelling device 25 to which compressed air (preferably heated) is supplied, and in its passage through the tube 24, the thread is dried. The dried thread is wound or twisted and wound in any suitable manner, for instance, in the spinning box 26 into which it is discharged from the mouth 27 of the tube or conduit 24.

While the thread is being conveyed by means of a fluid stream, it may be subjected to a washing, drying, or other treatment by means of a counterflow of treating medium. Thus the thread may be directed by means of rollers or guides through a trough or conduit through which the treating medium passes. Or it may be passed through a conduit by means of a propelling device such as is illustrated in Figs. 1 and 2 and conveyed thereby to a similar propelling device, which then serves to draw the thread through the conduit. The device which has served to pass the thread through the conduit may then be rendered inoperative and a stream or flow of treating medium is caused to pass through the conduit in a reverse direction to that of the thread. Fig. 4 shows diagrammatically a form of apparatus which may be used for carrying out this

latter arrangement and suitable for use in conjunction with the apparatus shown in Fig. 3.

A thread 15 on leaving any one of the rollers 16 or 23 is introduced into a conduit 28 by means of a propelling device 29, and on emerging from the conduit is conveyed to further treating devices or to a collecting device by means of a propelling device 29^1. As soon as the thread is being drawn through the conduit by the device 29^1, the device 29 is shut off, and wash liquor or other treating fluid 30 is introduced into the conduit 28 through a funnel 31 and flows down the conduit, being discharged over a lip 32, preferably adjustable as to height, at the inlet end 33 of the conduit. An idle or positively driven roller 34, over or around which the thread passes may be interposed between the outlet of the conduit 28 and the device 29.

In a similar manner, a counterflow of gaseous drying medium may be passed through a conduit traversed by the thread.

In Fig. 5, a number of cells 35 of a plant for the dry-spinning of artificial filaments, such as filaments of cellulose acetate, are shown and a propelling device 36 is employed for conveying the filaments or threads of filaments 37 from the cells to a cutting machine 38. The filaments 37 are withdrawn from the cells 35 and enter funnel-shaped openings 39 in a conduit 40. Compressed air is forced through the outer tube of the propelling device and induces a flow of air through the conduit 40, thus drawing the threads which have been introduced through the openings 39 along the conduit and discharging them from the mouth of the device 36.

The cutting machine 38 comprises a cylindrical knife unit 41 having a number of blades 42 co-operating with a fixed blade 43, the threads 37 being discharged by the device 36 over the fixed blade 43 into the path of the moving blades 42. Instead of the device 36 delivering the threads directly to the cutting machine, one or more positively driven rollers may receive the threads from the conduit 40, the threads being delivered to the cutting machine by means, for example, of feeding devices described in U. S. patent application Serial No. 278,884 filed 18th May, 1928.

In the appended claims, the term "thread" is intended to cover also "filaments" or "yarns" which are required to be conveyed and/or treated as continuous lengths.

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

1. Process of conveying a continuous length of thread, comprising conveying the length of thread through a closed conduit by means of a stream of gaseous conveying medium, the stream being induced by suction applied to the conduit.

2. Apparatus for conveying a continuous length of thread, comprising a closed conduit following the path of the thread and suction means for producing a flow of gaseous thread conveying medium through the conduit.

3. Apparatus for conveying a continuous length of thread, comprising a conduit following the path of the thread, suction means for producing a flow of thread conveying fluid along the conduit, and positively driven means for assisting the conveyance of the thread.

4. Apparatus for conveying a continuous length of thread, comprising a closed conduit following the path of the thread, suction means for producing a flow of thread conveying fluid through the conduit, and positively driven means for assisting the conveyance of the thread.

5. Apparatus for conveying a continuous length of thread, comprising a closed conduit following the path of the thread, suction means for producing a flow of gaseous thread conveying medium through the conduit, and positively driven means for assisting the conveyance of the thread.

6. Apparatus for conveying a continuous length of thread, comprising a conduit following the path of the thread and suction means for producing a flow of thread-conveying fluid along said conduit including a plurality of tapered tubes having an annular space therebetween, said space being closed at one end and a fluid supply pipe in the outer tube.

7. Apparatus for conveying a continuous length of thread, comprising a conduit following the path of the thread and suction means for producing a flow of thread-conveying fluid along said conduit including a plurality of concentrically arranged tapered tubes having an annular space therebetween, said space being closed at one end and a fluid supply pipe in the outer tube.

In testimony whereof we have hereunto subscribed our names.

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FREDERICK TROUTON SMALL.