Fig. 2

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Attorney
This invention relates to the liquid treatment of filamentary materials and is more particularly concerned with a manifold in which a moving strand of textile fibres or the like may be alternately subjected to the action of fluid pressure jets and squeeze rolls, the combined action serving to expedite a treatment such as a washing operation. This application is a continuation in part of my co-pending application Serial No. 2,947, filed January 17, 1948.

An object of the invention is to provide an apparatus for subjecting a moving textile strand to a series of fluid-impregnating or flushing operations by pressure jets and to an alternate series of squeeze roll pressures in a structure where the multiple series action may occur in a short yarn traverse.

A further object of the invention is to provide a device of the class described which will pass knots and slubs in a strand without causing breakage and which may be readily threaded.

Another object of the invention is to provide a device of the class described in which a ratio of pressures between treating jets and squeeze rolls may be established and thereafter caused to vary to suit the requirements of treatments by a single fluid control.

A principal feature of the invention is the use of a divided fluid stream to produce a pressure jet and a squeeze roll pressure.

Another feature of the invention is the use of a fluid stream to produce pressure on a strand passing between a pair of squeeze rolls and to reduce the frictional drag of the rolls on a roll housing to a point where traction on the strand will cause the rolls to rotate.

Another feature of the invention is the use of a number of small paired squeeze roll pressures to achieve a total requirement of roll pressure on a strand with the increment of unit pair pressure small enough so that a series of paired rolls may be readily and successively forced apart by the passage of a knot or slub without causing breakage in a strand.

Another feature of the invention is the use of a number of fluid jets and paired squeeze rolls in closely proximate series combination to treat a strand, the resultant multiplicity of differing stresses on the yarn section serving to stimulate a rapidly pulsating flow of fluid particles in the plane of the section which is highly desirable in encouraging a maximum fluid exchange in a strand which in a washing treatment is rapidly traversing a minimum treating zone.

A preferred embodiment of the invention is shown in the accompanying drawings in which like numerals refer to like parts in the several views and in which:

Fig. 1 is a plan view partly in section and with portions broken away of the novel fluid treating structure of the invention; and

Fig. 2 is an end elevation of the same.

Referring to the drawings, there is shown a pan shaped container 10 with interior bosses 12 and having ducts 14 connected by ducts 17 to the supply pipe 19 leading from a source of treating fluid under pressure (not shown). The bosses 12 are recessed, as at 18, to retain mating paired rolls 20, and a series of ports 21 is provided to permit fluid in the ducts 14 to enter the recesses 18 and exert a component of pressure against the rolls which is transmitted by the rolls to a yarn strand 24 passing between them. The strand 24 enters and leaves the container 10 through the slots 25 and is positioned by the guides 26 and external guides (not shown).

Grooves 30 are provided in the recesses 18 leading from the ports 22 around the side of the recesses toward the direction of travel of the strand, said direction being indicated by the arrows at either end of the apparatus. As traction is exerted on the strand from an external source, such as draft rolls 32, the rolls 20 tend to grip the strand and to be drawn against the side of the recess. On this side the flow of liquid through grooves 30 tends to set up a fluid film between each roll and the corresponding side of the recess to reduce materially frictional engagement between the roll and the recess side. Components of pressure from the fluid source are therefore used to press the rolls against the strand and to assist their rotation by reducing roll friction, an important feature of the invention.

In addition to providing a roll pressure and a roll friction reducing film, fluid entering the recesses 18 through the ports 22 and flowing through the grooves 30 is discharged against the strand as jets at points 34 for treating purposes. The squeeze rolls 20 are provided with enough clearance in the recesses 18 to permit free rotation, but this clearance is limited so that, except for minor leakage around the rolls, the majority of the fluid passing through the ports 22 continues through the grooves 30 to create a jet pressure on the strand as described.

Removable cover plates 36 serve to retain the rolls 20 and provide access to the device for cleaning or repairs. Sufficient depth is provided in the recesses 18 so that the rolls may be readily
moved back for threading up the strand into operating position with the fluid shut off and the increment of fluid pressure utilized to produce a mating pressure between the rolls is kept sufficiently low by proper design of the ports and grooves so that the passage of a knot or club in the strand will cause the roll to be struck in series without breakage ensuing. As an example, it is possible to design a device operating from a line pressure of 50 p. s. i. in which a series of jets discharge at a pressure of 40-48 lbs. against a strand. In alternation with mating roll pressures of 5-10 ounces on each individual roll axis and in which traction on the strand is on the order of one pound. If the ports 22 are located to one side of a line passing through the axes of the roll pairs so that the pressure from the jet approaches a tangent, the mating roll pressure will be lessened.

Additional ports 38 are provided by means of which fluid pressure jets may be directed against the strand without reference to the rolls. The purpose of the rolls is to isolate and emphasize the individual jet action so that the strand passes through a series of jets alone the fluid applied by the first jet may cling to the yarn and pass along with the strand to interfere with the action of a second jet, and so forth. Where the jets are alternated with roll pressure the rolls tend to strip off the greater part of the individual jet deposit before the yarn passes to the next jet. In addition the rolls apply a pressure on the section of a more concentrated nature than the jet and which is more suited to reach the moisture in the interior of the fibres. The jet particles tending to encounter the particles of fluid on the outer section of the strand only. By altering the number and the unit cross sectional area of the ports and rolls and their relative disposition any desired combination of roll pressure and jet pressure may be had from a common line pressure and thereafter may be regulated by any common fluid control means.

It is to be understood that balls may be substituted for rollers or that the rollers may have shapes other than cylindrical without departing from the spirit of the invention, also that where it is desired to use a relatively heavy squeeze pressure the rolls may be suspended in slidable or movable bearings and rotated by conventional power means without departing from the spirit and scope of the invention.

Preferably, in order to minimize any possible disrupting effect on the moving thread or filament, the ports 38 and the grooves 30 are disposed to direct mutually opposing balanced streams of fluid, converging on the path of yarn travel.

The sides of the container 10 may be made high enough so that fluid discharged from the ports will be drawn off through a drain 40 before overflow occurs, the slots 26 being closed off against excessive leakage by any conventional means such as staggered baffle plates.

The structure described and shown includes the several features claimed for the invention and is a means by which the several objects of the invention may be attained, and while there has been herein disclosed a preferred embodiment of the invention it will be understood that modifications and changes may be made therein within the spirit and scope of the appended claims.

I claim:
1. In a device for the fluid treatment of a moving strand, a container adapted to provide a bath of treating fluid, means to draw said strand through said bath, a plurality of jets, squeeze rolls and squeeze roll housings all submerged in said bath, said jets and rolls being arranged along the path of strand travel for alternately emitting streams of fluid under pressure against said strand, at least some of said jets being arranged to emit their streams through said squeeze roll housings, the corresponding rolls thereof being disposed in port at least in the courses of said last named streams whereby treating fluid will pass between the peripheries of said rolls and their respective housings on the sides of the direction of strand travel to form a friction reducing film therebetween.

2. In a device for fluid treatment of a moving strand having a fluid treating zone through which the strand passes, said treating zone consisting of a pair of mating rotatable squeeze members and housing thereof, said housing being mounted adjacent said zone, said members being arranged to squeeze the moving strand, at least one of said housings affording a passageway for treating fluid entering said zone, the member housings therein being interspersed in said passageway, and a duct arranged to supply treating fluid under pressure to said zone through said passageway, whereby the squeeze member housed therein will be pressed into yielding engagement with said strand and against its mating member to emitting treating fluid.

3. In a device for the fluid treatment of a moving strand, a fluid confining member provided a fluid treating zone through which said strand is moved, a plurality of jets arranged adjacent said zone along the path of strand travel for emitting streams of fluid under pressure against said strand, and a plurality of rotatable squeeze members loosely held in mountings adjacent said zone in the courses of some of said streams for transverse movement toward and away from said path of strand travel whereby said members will be yieldly pressed against said strand by the pressure of said streams.

4. In a device for the fluid treatment of a moving strand, a fluid confining member providing a fluid treating zone through which said strand is moved, a plurality of jets arranged adjacent said zone along the path of strand travel for emitting streams of fluid under pressure against said strand, a plurality of mating pairs of rotatable squeeze members loosely mounted in mountings adjacent said zone embracing said strand, and in the courses of said streams for transverse movement toward and away from said path of strand travel whereby said members will be yieldly pressed against each other by the fluid pressure of said streams to squeeze said strand and means for moving the strand through said treating zone.

5. In a device for the fluid treatment of a moving strand, a fluid confining member providing a horizontal fluid treating zone through which said strand is moved, a plurality of jets arranged adjacent said zone and aligned along the path of strand travel for emitting streams of fluid under pressure against said strand, and a plurality of mating pairs of squeeze rolls loosely held with their axes vertical in mountings adjacent said zone embracing said path of travel, and held, in
part at least, in the courses of some of said streams for transverse movement toward and away from each other whereby the fluid pressure of said streams provides the mating roll pressure for said rolls.

6. In a device for fluid treatment of a continuous moving strand in which the strand is drawn between and rotates pairs of rotatable squeeze members, a pair of squeeze members adapted to engage the strand and be rotated by the passage thereof, a housing loosely mounting one of said members and permitting the periphery thereof to be urged into frictional engagement with said housing when driven by the movement of said strand, and a conduit for directing a stream of treating fluid between said member and its housing to provide a lubricating film of fluid therebetween.

7. In a device for fluid treatment of a continuous moving strand in which the strand is drawn between and rotates a series of squeeze rolls, squeeze rolls adapted to engage the strand and be rotated by the passage thereof, housings loosely mounting said rolls and permitting the peripheries thereof to be urged into frictional engagement with said housings when driven by the movement of said strand, and conduits for directing streams of treating fluid between said rolls and said housings to provide lubricating films of fluid therebetween.

8. In a device for fluid treatment of a continuous moving strand in which the strand is drawn between and rotates a plurality of squeeze rolls, squeeze rolls adapted to squeeze the strand and be rotated by the passage thereof, a housing loosely mounting one of said rolls and permitting the periphery thereof to be urged into frictional engagement with said housing when driven by the movement of said strand, and a conduit for directing a stream of treating fluid under pressure between said roll and said housing to provide a lubricating film of fluid to reduce the friction therebetween and to press said roll into yielding engagement with another roll.

9. In a device for fluid treatment of a continuous moving strand in which the strand is drawn between and rotates a plurality of squeeze rolls, a series of mating squeeze rolls adapted to engage the strand and be rotated by the passage thereof, housings loosely mounting said rolls and permitting the peripheries thereof to be urged into frictional engagement with said housings when driven by the movement of said strand, and conduits for directing streams of treating fluid under pressure between said rolls and their respective housings to provide lubricating films of fluid to reduce the friction therebetween and to press said rolls into yielding mating engagement.

10. In a device for fluid treatment of a traveling strand, a container adapted to hold a pool of treating fluid through which said strand is passed, squeeze rolls loosely held in housings mounted in said container and rotated by passage of the traveling strand for squeezing the strand, said housings providing passageways around each said roll for the entry of streams of treating fluid, and ducts supplying treating fluid under pressure to said housings, said housings being so arranged as to permit said rolls to be pressed against the strand by the fluid pressure and said streams forming lubricating films between said rolls and their respective housings on the side of the direction of strand travel.

11. In a device for fluid treatment of a traveling strand, a container adapted to hold a pool of treating fluid through which said strand is passed, interior bosses in said container having a series of recesses with their openings adjacent the path of strand travel and having inlet ports, rotatable squeeze members loosely held in said recesses and engaging said strand through said openinws, ducts arranged to supply treating fluid under pressure to said recesses through said inlet ports to press said members into yielding engagement with said strand and to provide lubricating films of fluid between the members and their respective recesses.

12. In a device for fluid treatment of a traveling strand, a fluid confining member providing a closely confined fluid treating zone through which said strand is moved, a plurality of aligned jets submerged in fluid in said zone and arranged longitudinally along the path of travel of said strand to emit opposing streams of fluid against said traveling strand to create a region of relatively heavy fluid pressure therealong, squeeze rolls loosely held in housings mounted in said fluid confining member for squeezing the traveling strand, said housings providing passageways around the rolls held therein for the entry of treating fluid, and ducts supplying treating fluid under pressure to said housings, said housings being so arranged as to permit said rolls to be pressed against the strand by the pressure of the entering fluid.

13. In a device for fluid treatment of a traveling strand, a fluid confining member providing a closely confined fluid treating zone through which said strand is moved, a plurality of aligned jets submerged in fluid in said zone and arranged longitudinally along the path of travel of said strand to emit opposing streams of fluid against said traveling strand to create a region of relatively heavy fluid pressure therealong, squeeze rolls loosely held in housings mounted in said fluid confining member for squeezing the traveling strand, said housings providing passageways around the rolls held therein for the entry of streams of treating fluid, and ducts supplying treating fluid under pressure to said housings, said housings being so arranged as to permit said rolls to be pressed against the strand by the pressure of the entering fluid and said streams forming lubricating films of fluid between said rolls and their respective housings.

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Certificate of Correction

Patent No. 2,538,628

January 16, 1951

PYAM L. PENDLETON

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 38, for the word “provided” read "providing;"

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of February, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.