TEXTILE SCOURING RANGE

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ABSTRACT
A range is provided for use in washing, scouring and otherwise treating running fabric webs, especially those of a fragile nature such as knit goods and the like. The range includes a plurality of separate tanks each furnished with a plurality of rotary impellers for forcing liquid within the tank through the web which is carried along reversing paths through the tanks. Each tank comprises a separate stage which stages are adapted to be interconnected on a selective basis. Nip rolls, speed synchronizing drivers, spreader rolls and overflow chambers are provided between each stage.

5 Claims, 3 Drawing Figures
TEXTILE SCOURING RANGE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to textile machinery and more particularly is directed towards a new and improved range for use in washing, scouring, etc., a running web and especially a web of knit material or the like.

2. Description of the Prior Art

In the manufacture of textile materials it is common practice to thoroughly clean the material to remove oils, resins, dirt and other substances which collect in the web prior to or during the manufacturing process. For example, certain oils are added to fibers as a lubricant during the manufacturing process and these oils must be removed at some stage of the manufacturing process. While the cleaning or scouring of many materials, such as a tightly woven cotton, for example, is relatively simple the problem becomes more difficult when handling light, fragile materials such as knit goods. The knit materials are easily stretched and deformed by tensioning and therefore must be processed without introducing any significant longitudinal or transverse tension therein. While various scouring equipment have been developed heretofore for this purpose, they have been employed primarily as a single washing unit rather than in a range system.

Accordingly, it is an object of the present invention to provide a new and improved textile scouring range. Another object of this invention is to provide a novel textile range having particular use in the scouring of knit materials and the like on a continuous basis.

SUMMARY OF THE INVENTION

This invention features a range for continuously treating a running web, particularly knit materials, comprising a plurality of aligned, spaced tanks each containing a quantity of liquid, overflow compartments disposed between each tank and means provided between each tank for selectively directing the overflow between the tanks either into an adjacent tank or into the overflow compartment. Rotary impeller rolls are mounted in each tank with guide rolls and driven rolls provided to guide the web along reversing paths through the tank. Nip rolls, spray bars and speed synchronizing devices are provided between each stage and a spreader roll and vacuum slot are provided at the end of the range to remove excess liquid.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic sectional view in side elevation of a range made according to the invention.

FIG. 2 is a sectional detail side elevation view of the rotary impellers employed in the range, and

FIG. 3 is a front elevation of a spreader roll employed in the range.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the reference character 10 generally indicates a range for use in treating a running web 12 in a flat tubular or open width form. The apparatus is particularly useful for the washing and/or scouring of knit goods or similar fragile material that is readily subject to distortion by tension.

The range 10 in the illustrated embodiment is comprised of a plurality of tanks 14, 16 and 18 each part of a scouring stage adapted to progressively clean the web 12 which is carried in and out of the tanks in sequence. The tanks are arranged in alignment and spaced apart from one another. Each tank is open at its top and formed with upright side walls 18, 20, 22, 24, 26 and 28 and a bottom wall 30, 32 and 34. Each tank is adapted to contain a quantity of liquid 36 the height of which is controlled by means of liquid level sensing devices adapted to control the flow of liquid pumped into the tank from an outside source (not shown). Such liquid level sensing devices are commercially available. The liquid may be water, detergent, dry cleaning medium, or other chemical depending upon the particular process to be performed on the web.

Each tank is furnished with a set of rolls 40 (A), (B) and (C), the lower rolls being submerged and the upper rolls preferably disposed above the surface of the liquid. The rolls 40 in the preferred embodiment of the invention are made in accordance with U.S. Pat. No. 3,401,541 wherein each submerged roll is provided to substantially float in the liquid to reduce frictional bearing drag. Each driven upper roll is mounted on double bearings with one bearing of each double bearing being driven by means of a variable speed control mechanism so that the bearing drag is reduced substantially to zero. A slight impulsive forward urge is given to each roll while a slight upward and downward tension is given to the web by the zero weight submerged rolls. The rolls 40 (A), (B) and (C) substantially reduce bearing drag and at the same time produce no appreciable tension on the web traveling over these rolls.

In the preferred embodiment of this invention, rotary impellers 42 are mounted in the tank below the liquid surface and between each path of travel of the web as it passes along reversing paths in and out of the bath. The impellers are employed to flush the liquid through the web to insure optimum interaction between the liquid and the web and are made in accordance with U.S. Pat. No. 3,640,101, dated Feb. 8, 1972 entitled "Continuous Open Width Washer".

Briefly, the impellers 42 are comprised of central cores 44 driven by a simple driving system and each provided on its outer surface with spaced longitudinal abutments 46 such as rods or the like whereby the liquid will be pulsed against the open face or flat tubular side of the web as it moves past to enhance the liquid to web contact. The impellers 42 are of a length corresponding at least to the width of the web and arranged in groups on opposite sides of the web so that each section of the web will be subjected to the action of the impellers. Preferably, the abutments 46 are cylindrical in cross-section or at least rounded on their outer portions to eliminate any chance of scoring or otherwise damaging the fabric that might come into direct contact with the impellers.

At the feed side of each tank is a pair of draft rolls 50 and 52 driven by a variable speed motor (not shown) under the control of a speed synchronizing unit 54. This unit includes a dancer roll 56 counterbalanced by a weight 58 on a beam 60. The web is carried between the draft rolls up and over the dancer roll 56 and thence down into the tank. It will be understood that any slack or tension on the web will move the dancer roll 56 up or down accordingly and this in turn will alter the resistance of a rheostat in circuit with the drive.
motor for the draft rolls 50 and 52, increasing or decreasing their speed accordingly.

In any event, the web 12 is carried through the different washing stages in and out of each of the tanks 14, 16 and 18 with a minimum tension thereon, the web being progressively cleaned, scoured, etc., as it proceeds through the stages. Between each stage, there are nip rolls 50' and 52' between tanks 10 and 16 and nip rolls 50'' and 52'' between tanks 16 and 18. A final set of nip rolls 62 and 64 is provided at the discharge end of the range with pressure being applied by means of an air pressure loader 66 engaging the upper nip roll 64.

In order to keep the web 12 in a fully open width condition if it is a single ply or in a flat condition if in tubular form, an opening or spreader roll 68 is provided on the feed side of the nip rolls 50', 52' and 50'', 52''. An additional spreader roll may also be provided at the feed side of the nip rolls 62 and 64 at the discharge end of the range. The spreader roll 68 is best shown in FIG. 3 and is comprised of a generally cylindrical roll body with reduced end portions 70 and 72 for engagement with bearings and drive members such as a gear, motor or the like. The center portion of the spreader roll 68 includes a pair of oppositely threaded sections 74 and 76 which engage the web face and, upon rotation of the spreader roll, tends to remove wrinkles and generally to spread the web into a smooth, flat condition. The spreader roll has a smooth cylindrical center section 78 between the two threaded sections 74 and 76.

In order to enhance the washing action on the web, spray bars 80 and 82 are provided on the discharge sides of the tanks 32 and 34 and serve to direct jets of liquid across the full width of the web as it rises out of the tank. At the discharge end of the range, a suction box 84 formed with a slot opening 86 along its upper face is provided below the web to remove a substantial portion of the liquid from the web prior to being fed between the nip rolls 62 and 64.

It will be noted that the three tanks 14, 16 and 18 are spaced apart from one another to form voids 88 and 90. These voids serve as overflow compartments between adjacent tanks and each is provided with a drain line 92 and 94 connected to a sump, still or the like.

The compartments are adapted to be opened or closed selectively to permit the liquid in the several tanks to flow either from one tank to the other or the overflow from one tank may be collected in an overflow compartment and drained to prevent mingling between liquids in adjacent tanks. The liquid thus can be kept separate or may be mixed depending upon the particular operation to be carried out and the type of liquid used. If the liquids are to be mixed between the adjacent tanks 16 and 18, for example, the drain valve 94 is closed so that the overflow from the tank 18 will first fill up the compartment 90 and then flow back into the tank 16. Overflow connections 96, 98 and 100 are provided at the top of the tanks to drain off excess liquid from the tanks. Also, a drain board 102 is provided below the nip rolls 50' and 52' in a position to direct liquid squeezed from the web by the nip rolls back into the tank 16. Below the set of nip rolls 50' and 52' a drain trough 104 is provided to collect the liquid squeezed by the nip rolls directly above. A drain line 106 connects to the trough and is provided with a valve 108 which may be opened or closed depending upon whether or not the excess liquid from the nip rolls is to be returned to the tank 14 or to be collected in the drain compartment 88.

While the invention has been described with reference to the illustrated embodiment, it will be understood that numerous modifications will appear to those skilled in the art. For example, while the web has been shown as moving along vertically reversing paths in and out of the tanks, the guide rolls can be arranged to carry the web along horizontally reversing paths while below the surface.

Having thus described the invention what I claim and desire to obtain by Letters Patent of the United States is:

1. A range for treating a running web with a scouring liquid or the like, comprising
   a. a plurality of tanks spaced along the path of travel of said web and adapted to contain a quantity of liquid,
   b. an overflow compartment disposed between adjacent tanks to receive excess liquid from said adjacent tanks,
   c. drain means connected to each of said compartments for removing liquid from said compartments,
   d. valve means connected to said drain means for selectively opening and closing said drain means whereby liquid accumulated in said compartments may overflow into an adjacent tank or into said drain means,
   e. a pair of nip rolls mounted above each of said compartments for squeezing liquid from said web passing therebetween,
   f. deflecting means disposed below at least one of said pair of nip rolls for selectively directing liquid from said nip rolls into a compartment or into a tank, and
   g. guide means for guiding said web into and out of said tanks and through said pairs of nip rolls.

2. A range according to claim 1 including a plurality of rotary impellers mounted in each of said tanks below the surface of said liquid, each of said impellers including a power driven rotary core and a plurality of spaced abutments about the periphery thereof, said impellers disposed in transverse relation adjacent the path of travel of said web.

3. A range according to claim 1 including a spreader roll disposed adjacent the feed side of at least one pair of said nip rolls and engaging said web, said roll being formed with helically formed grooves, the grooves at one end having a pitch opposite to the grooves on the other end.

4. A range according to claim 1 including synchronizing drive means engaging said web at spaced points along its path of travel.

5. A range according to claim 1 wherein said deflecting means includes a trough mounted between at least two adjacent tanks at the upper edge thereof and a valve connected to said trough and communicating with said compartment.