

[54] FABRIC TREATMENT APPARATUS

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[22] Filed: Aug. 12, 1974

[21] Appl. No.: 496,876

Related U.S. Application Data

[62] Division of Ser. No. 240,602, April 3, 1972, Pat. No. 3,828,587.

[52] U.S. Cl. 15/307; 34/120; 34/242

[51] Int. Cl.² A47L 5/38

[58] Field of Search 68/5 E, 18 C, 20, 205 R; 34/15, 242, 115, 120, 155; 15/306 R, 306 A, 307; 432/242

[56] References Cited

UNITED STATES PATENTS

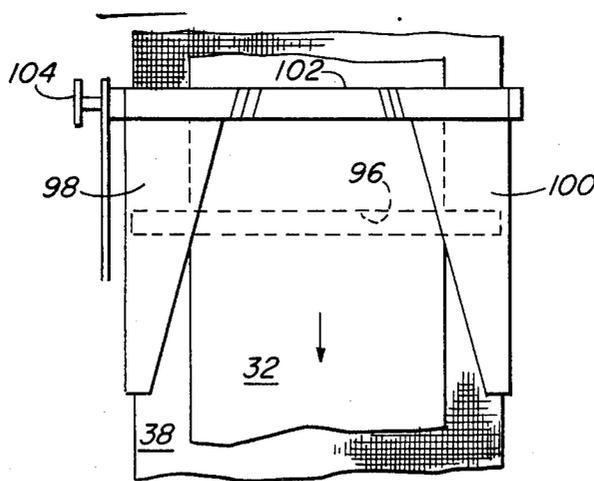
1,789,132	1/1931	Birch	15/307
2,792,587	5/1957	Rose et al.	15/307
3,803,879	4/1974	Holm	68/205 R

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Attorney, Agent, or Firm—Morse, Altman, Oates & Bello

[57] ABSTRACT

A running fabric web is fed in flat tubular or open-width form by means of an openwork conveyor belt below a battery of spray bars which apply a liquid such as a scouring solvent onto the fabric. The spray bars are provided with arcuate baffles which convert a spray discharge into a continuous sheet of liquid which pours onto the web. Excess liquid is then removed by a suction box disposed under the belt. A pair of tapered curtains trails along the top of the belt on either side thereof to cover the suction box slot beyond the edges of the fabric which forces the suction action through the fabric. The curtains are wound on a reefing roller by which the curtains may be selectively extended or retracted according to the width of the fabric being processed. The fabric is then delivered through a drying chamber where the material is dried and the excess solvent is recovered.

3 Claims, 5 Drawing Figures



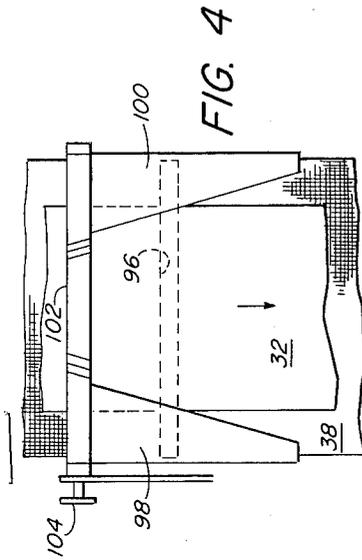


FIG. 4

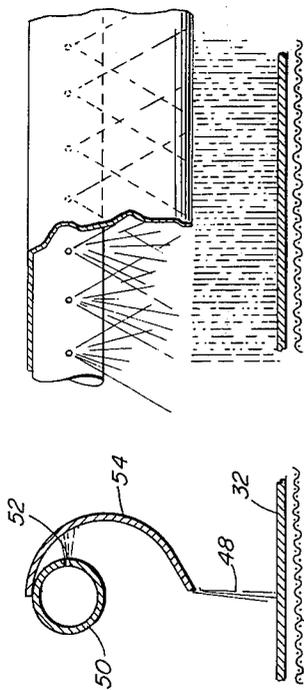


FIG. 2

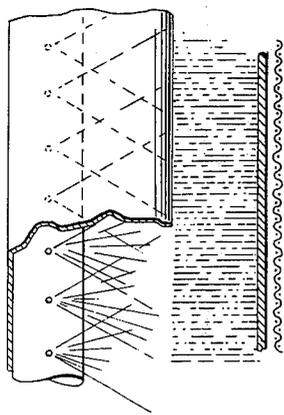


FIG. 3

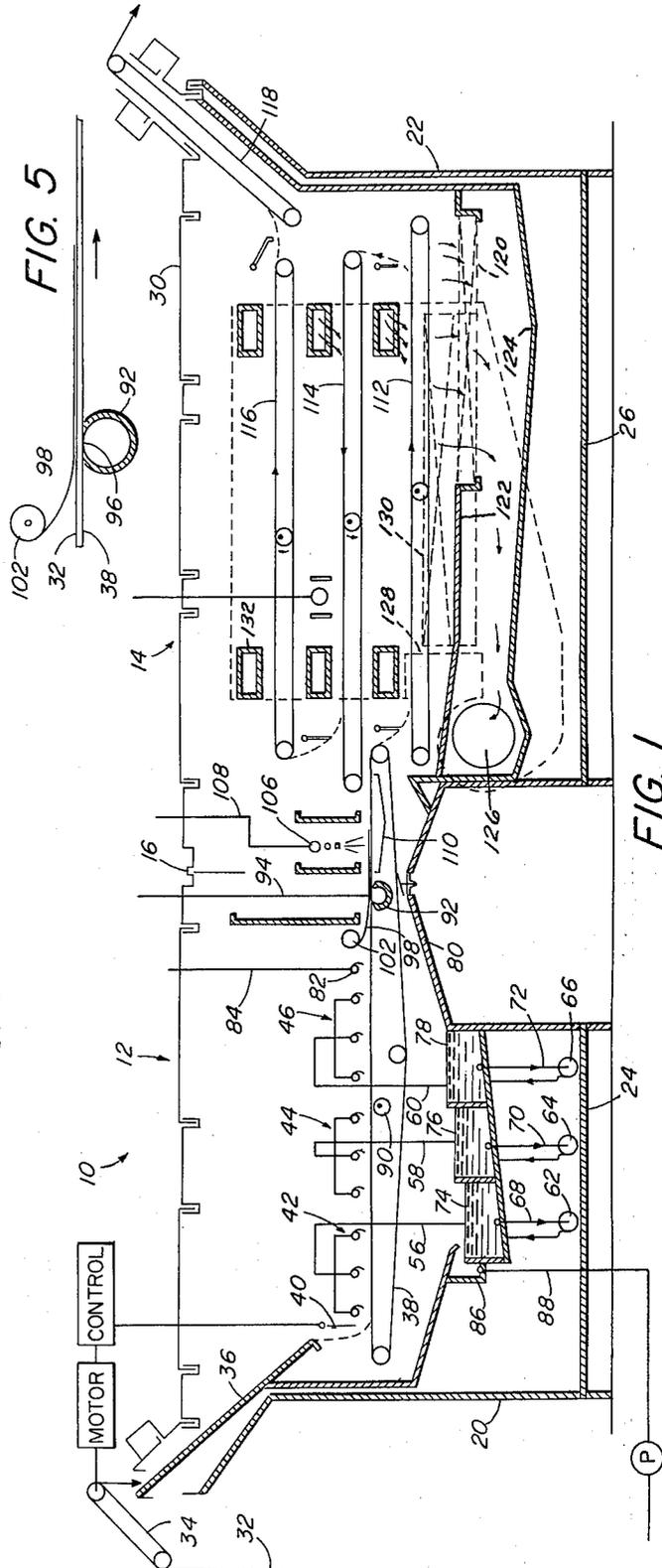


FIG. 1

FIG. 5

FABRIC TREATMENT APPARATUS

This is a division of application Ser. No. 240,602 filed Apr. 3, 1972, now U.S. Pat. No. 3,828,587.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to apparatus for treating a running fabric web and more particularly is directed towards an apparatus for solvent scouring textile webs on a continuous basis.

2. Description of the Prior Art

In the manufacture of various types of textiles such as woven or knit goods, certain impurities accumulate in the web. For example, small amounts of oil are applied to the fabric as a lubricant, particularly in the early stages of fabric production. These oils as well as other impurities must be removed at a later stage to provide a clean and finished product.

In my co-pending application, Ser. No. 207,430, filed Dec. 13, 1971, now U.S. Pat. No. 3,803,879 under the title "Method & Apparatus For Treating Fabric" and assigned to the same assignee as the present application, there is disclosed a method and apparatus particularly useful for solvent scouring flat tubular or open width webs and subsequently drying the web without stretching or otherwise distorting the web. It is an object of the present invention to provide an apparatus for applying a liquid such as a scouring solvent in a continuous liquid sheet form to eliminate streaking on the fabric. A further object of the invention is to provide improvements in suction boxes for removing excess liquid from a running fabric web.

SUMMARY OF THE INVENTION

This invention features an apparatus for treating a flat running fabric with a liquid such as a scouring solvent or the like, comprising an open-work conveyor belt adapted to receive and carry the fabric along its upper reach, a plurality of spray bars disposed above the upper reach of the belt and an arcuate baffle mounted to each spray bar adapted to convert the discharge therefrom into a continuous sheet of liquid for delivery onto the fabric and belt. A suction box located below the upper reach of the conveyor is adapted to remove excess liquid from the fabric. The box is formed with a slot opening across the full width of the belt and a pair of flexible curtains is trailed over the top of the belt one curtain along either side thereof to effectively close the slot of the suction box beyond the width of the fabric. The curtains are tapered and attached to a reefing roller by means of which the curtains may be lengthened or shortened according to the width of the fabric being processed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic sectional view in side elevation of a fabric treatment apparatus made according to the invention,

FIG. 2 is a detailed sectional side view showing a spray bar made according to the invention,

FIG. 3 is a detailed front elevation of the spray bar,

FIG. 4 is a detailed top plan view of the suction box closure mechanism made according to the invention, and,

FIG. 5 is a detailed sectional view in side elevation of the slot closure mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, the reference character 10 generally indicates a fabric treatment apparatus comprised of modular housing sections 12 and 14 detachably connected to one another along a vertical joint 16. In general, the forward section 12 serves as a solvent scouring chamber while the after section 14 serves as a drying chamber. While the apparatus is primarily intended to scour fabrics, obviously, it may be used for various other applications involving the application of liquids to a running web of fabric. The apparatus 10 is mostly enclosed within the housing formed by side walls 18 and 20, end walls 20 and 22, bottom walls 24 and 26 and top walls 28 and 30.

A running web 32, which may be in flat open width form as for woven fabrics or flat tubular form as for knit fabrics, is carried up an inclined conveyor 34 and dropped onto a downwardly inclined chute 36 extending into the first stage 12 and terminating slightly above the upper reach of a horizontally extending conveyor 38. A feeler 40 is located between the discharge of the chute 36 and the start of the conveyor 38 to control the tension on the web 32 as it is delivered onto the conveyor. The feeler is operatively connected to one of the driving rolls for the feed conveyor 34 and serves to control the rate of delivery of the web into the scouring chamber. If the feed is too fast, the web will drape loosely as it comes off the chute, whereas, if the feed is too slow, the web will become tensioned. In any event, the feeler will sense the condition and, through the control unit, take corrective action to prevent tension or slack developing in the web.

Mounted above the upper reach of the conveyor 38 are several groups of spray bars 42, 44 and 46 arranged in spaced parallel relation transversely across the conveyor and positioned to deliver successive continuous sheets 48 of solvent over the web 32 as it is carried underneath. Typically, each set of spray bars may be three in number, each bar comprised of a tube 50 connected to a source of pressurized liquid, such as a scouring solvent, and formed with a plurality of spaced orifices 52 oriented rearwardly or to the right as viewed in FIGS. 1 and 2.

Mounted as by welding or the like to the top of each tube 50 and extending rearwardly and downwardly therefrom is an arcuate baffle 54 having a radius greater than that of the tube 50 and an arc of perhaps 180° whereby the lower edge of the baffle extends forwardly at a point substantially directly below the tube 50 and above the fabric 32. The function of the arcuate baffle is to convert the jet discharges from the several orifices 52 into a continuous sheet 48 of scouring liquid extending the full width of the fabric 32. As shown in FIG. 3, the jets discharged by the orifices 52 strike against the inner face of the baffle 54 and spread out to merge with adjacent discharges and run down the baffle forming into a continuous sheet extending entirely across the belt without any discontinuities. This has the advantage of eliminating streaking in the fabric and provides a highly effective washing action.

Typically, each set of spray tubes 50 are three in number, each set connected by a conduit 56, 58 and 60, respectively, to its own pump 62, 64 and 66, respectively. Each of the pumps is connected by a conduit 68, 70 and 72 to a drain tank or trough 74, 76 and 78, respectively.

The drain troughs 74, 76 and 78 are mounted adjacent to one another in vertically staggered relation with the tank 74 below the level of the tank 76 which, in turn, is below the level of the tank 78. The drains from the spray bars above the conveyor collect in the trough with most of the drains running down an inclined wall 80 into the first trough 78. The wall 80 is located directly below a spray bar 82, similar in construction to the other spray bars, positioned at the end of the sets of spray bars and connected by a conduit 84 to a still from which clean, fresh solvent only will be applied onto the web prior to leaving the scouring chamber. Thus, the trough 78, in conjunction with the pump 66, conduits 70 and 72 and spray bars 46 recirculate relatively clean solvent at this stage since it is closest to the fresh solvent coming from the spray bar 82. The overflow from the trough 78 goes into the middle trough 76 which also receives some drain from its associated spray bars directly over it and which drains includes those impurities washed down by the set of spray bars 42. Thus, the second set of spray bars 44 wash the fabric with solvent that is less clean than the solvent going through the spray bars 46, yet cleaner than that in the first set of spray bars 42. The overflow from the trough 76 is to the trough 74 which is recycled from the first set of spray bars 42 by means of a pump 54. Since the fabric entering the first part of the scouring station receives its first cleaning at the first station, the solvent being circulated will be relatively dirty in comparison with the other stages wherein the solvent becomes increasingly cleaner until it passes the spray bar 82 where a completely clean, fresh solvent is applied and at which point the fabric is fully scoured. The re-cycling of the solvent in this fashion provides a very high capacity of washing action which is extremely effective in keeping to a minimum the total quantity of solvent required despite the high pumping volume. The overflow from the trough 74 is to a collection drain 86 which feeds through a line 88 and is pumped back to the still where the solvent is purified and returned to the scouring station through the line 84. Accessory equipment, such as a storage tank and associated pumps, is provided and connected to the still to compensate the losses due to evaporation, leakage and the like. By re-cycling the solvent in this fashion the cleansing action is multiplied. For example, assuming the pumping capacity from the still is 600 gallons a minute, this washing volume will be multiplied approximately four times by the re-cycling stages, the multiplication factor depending upon the number of re-cycling stages.

The scouring action is further enhanced by vibrating the web as it passes through the scouring station. This may be done by means of an eccentrically rotated roller 90 mounted below the upper reach of the conveyor 38 and adapted to vibrate the belt with the fabric as it moves along. As the fabric is carried by the conveyor 38 out of the scouring chamber, it is carried over a suction box 92 mounted below the upper reach of the conveyor belt and connected by a line 94 to a vacuum pump which discharges the recovered solvent back into the still. In practice, the conveyor belt 38 is in the form of a foraminous screen or mesh material which permits the solvent to pass freely through it.

The suction box 92, as best shown in FIGS. 4 and 5, may be of tubular construction formed with a slot opening 96 along its upper portion and over which slot 96 the conveyor belt 38 moves together with the fabric 32. The slot 96 extends the full width of the conveyor

belt 38 in order to accommodate a variety of web widths that may be carried by the conveyor. Insofar as webs of different widths will be processed by the apparatus, means are provided to close off the ends of the slot not otherwise covered by fabric 32. It will be understood that if a narrow web were to pass over the slot more air would pass through the uncovered ends of the slot than through the fabric and the suction efficiency with respect to the web would be greatly reduced. In order to insure that all of the air passing into the suction box is directed through the fabric 32 a pair of flexible curtains 98 and 100 is provided. The curtains at one end are wrapped about a reefing roller 102 mounted above the belt 38 and controlled by means of a hand wheel 104, or the like, extending from the side of the housing. As best shown in FIG. 4, the outermost edges of the curtains 98 and 100 extend parallel to the edges of the belt 38, while the inner opposing edges are tapered from the narrowest point at the free end of the curtain converging inwardly so that the portion of the curtains about the reefing roller 102 are wider. When the belt 38 is operating, and moving in the direction of the arrows, the narrow ends of the curtains will trail from the reefing roller 102 down onto the conveyor belt and carried to the right, as viewed in FIGS. 1 and 5, over the top of the suction box to cover the outer ends of the slot opening 96. The length of the curtain being trailed out from the reefing roller 102 is controlled by the hand wheel 104 so that only the parts of the slot not covered by the fabric 32 will be covered by the curtains 98 and 100. The curtains should be let out so as to intersect the slot at the edges of the fabric 32 as best shown in FIG. 4. In the event a wider material is being processed, the reefing roller will be rolled up to bring narrower sections of the curtains into position, whereas if a narrower fabric is being processed, more of the slot must be covered and the reefing roller will be let out to bring wider sections of the curtains into position. In practice, the curtains are fabricated from a suitable long wearing material that will not be affected by liquids being used in the process. Various types of materials are available which do not deteriorate in solvents and may be used to advantage.

From the suction box 92 the fabric is carried under another spray bar 106 adapted to deliver a liquid chemical over the width of the fabric. The spray bar is connected by a conduit 108 to an associated pump and storage tanks with excess liquid being recovered by means of a drain board 110. Various types of chemicals may be applied at this station such, for example, a finishing chemical sold under the trademark "Scotch-guard" by the 3M Company.

From the finishing station 106 the web is transported into the drying section 14 comprised of a plurality of conveyor belts 112, 114, and 116, arranged one above the other and more fully disclosed in the above-described co-pending application. The web is carried through the drying chamber along reversely extending paths and is discharged by means of an inclined conveyor 118 up and out of the drying chamber.

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

1. Apparatus for selectively closing the ends of suction slot extending transversely with respect to a longitudinally moving web passing thereover, comprising,
 - a. a reefing roller mounted above said web in advance of said slot and parallel thereto,

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- b. a pair of tapered flexible and substantially imperforate curtains attached at their wider ends to the opposite ends of said roller and having their free ends trailing over opposite ends of said slot,
- c. said curtains having their outer edges parallel to said web and their inner edges converging towards said roller, and,
- d. means for rotating said roller to selectively lengthen or shorten said curtains whereby the ends

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of said slots may be effectively opened and closed according to the width of said web.

2. Apparatus according to claim 1 including a foraminous conveyor belt supporting and carrying said web over said slot, said curtains being trailed along the upper margins of said belt.

3. Apparatus according to claim 2 wherein said reefing roller is disposed above said belt and box and forwardly of said slot.

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