Feb. 14, 1967 R. N. WITT, JR 3,303,676

WET-FINISHING TEXTILE APPARATUS

Filed Jan. 27, 1965 3 Sheets-Sheet 1

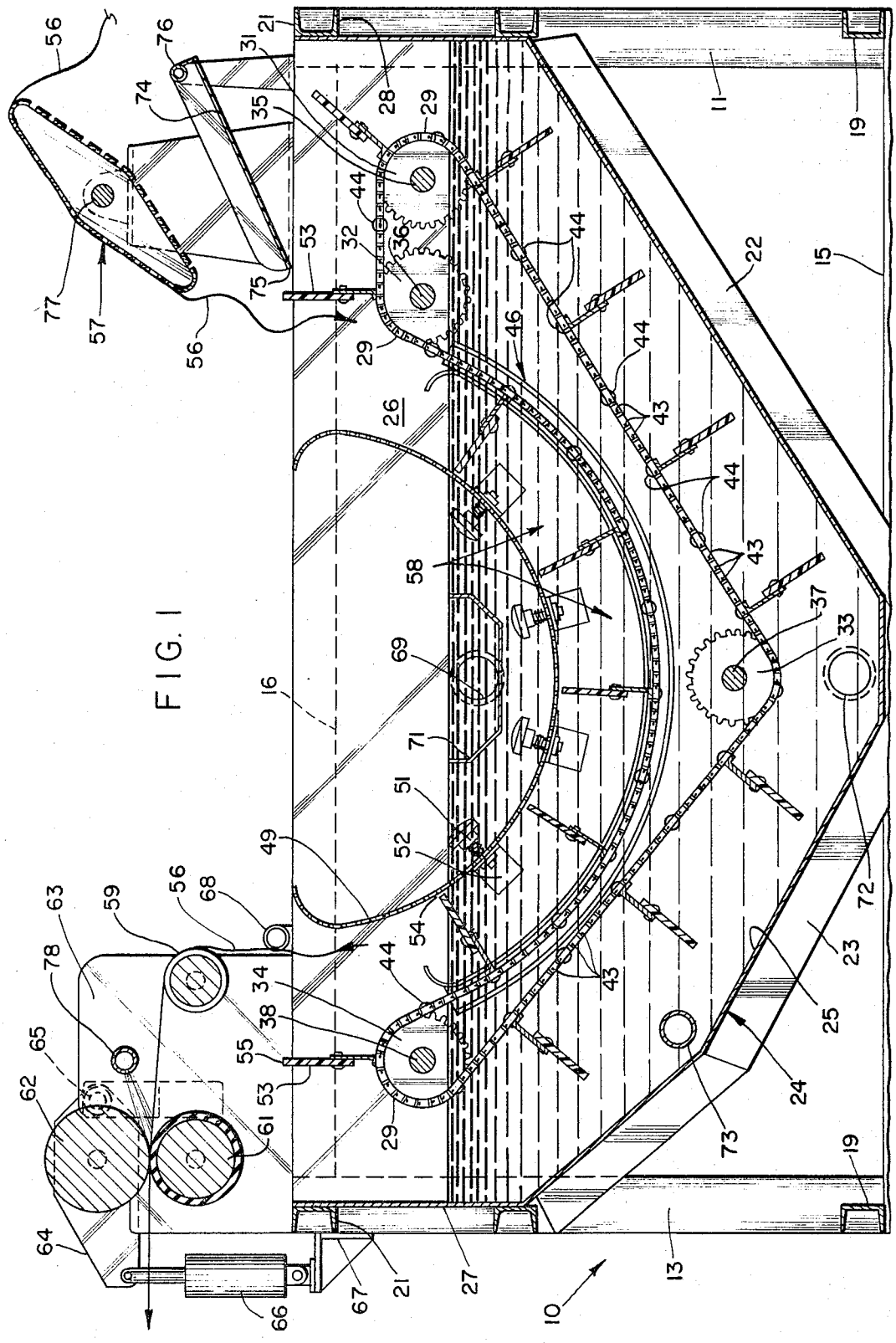

FIG. 1

WET-FINISHING TEXTILE APPARATUS

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3 Sheets-Sheet 2

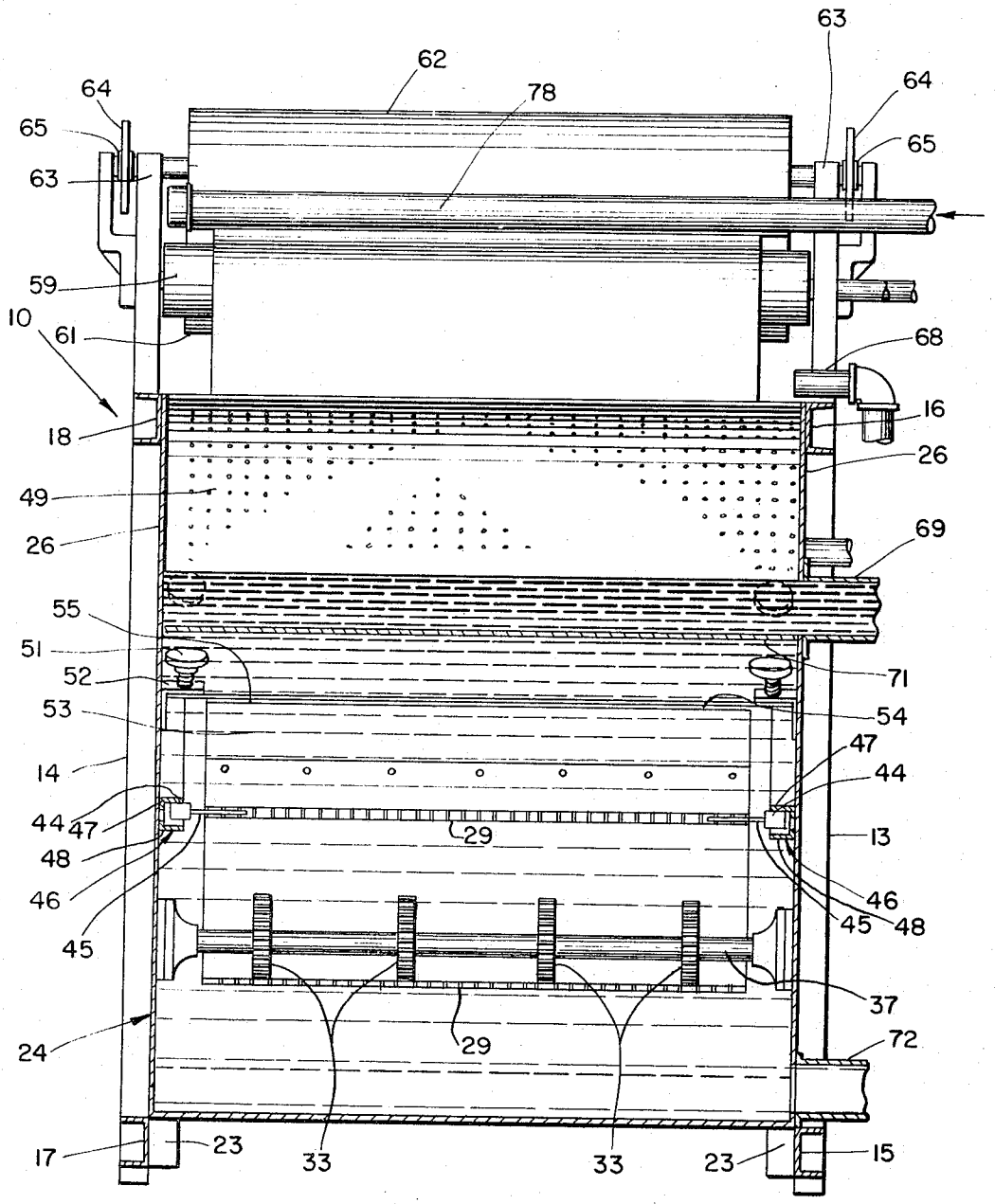

FIG. 2

WET-FINISHING TEXTILE APPARATUS

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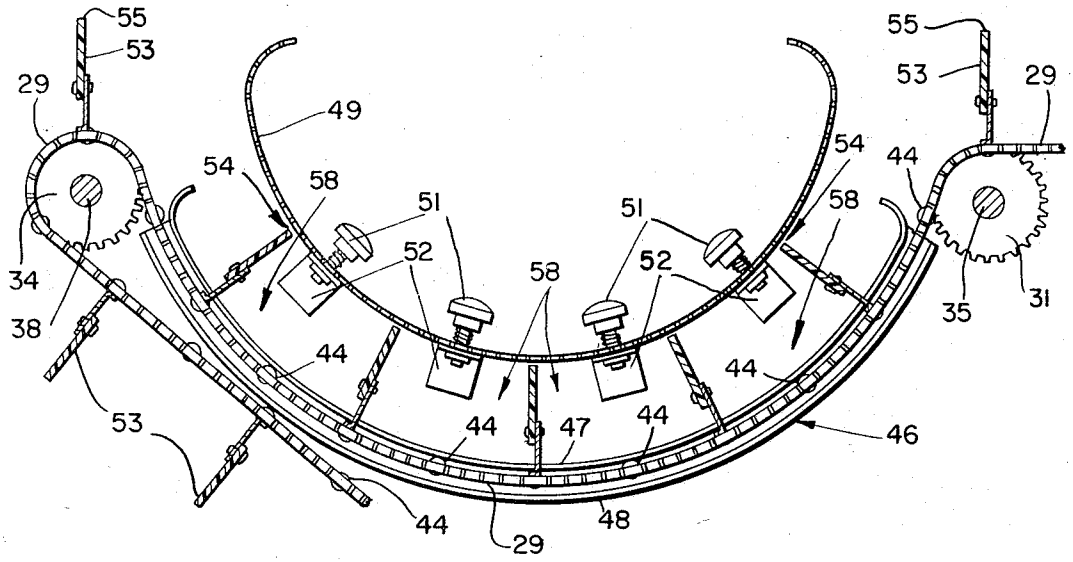

FIG. 3

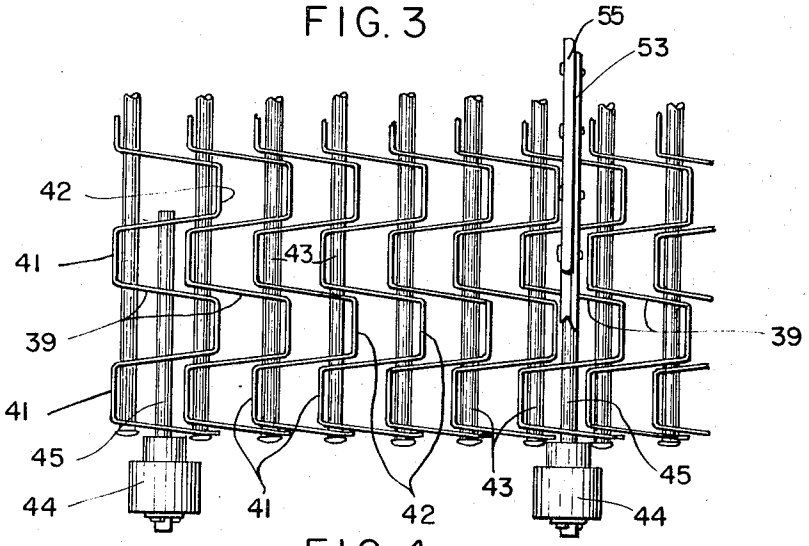

FIG. 4

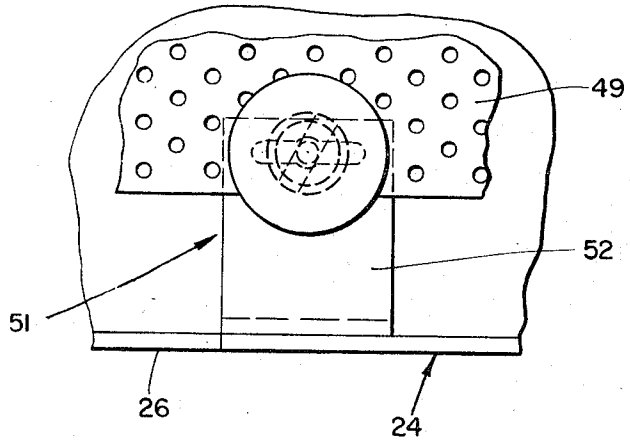

FIG. 5

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WET-FINISHING TEXTILE APPARATUS

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5 Claims. (Cl. 68—148)

This invention relates to textile finishing apparatus, and particularly to a device which permits the open width wet finishing of textiles without applying tension to the web.

As is well known, several substances used as textile fibres exhibit a serious loss of strength when the fibres are wet. If such a weakened textile is pulled through a finishing bath, the weakened condition of the fibre can cause serious distortion of the web. Commonly, the wet finishing of such textiles has been accomplished by the "rope" method, where the entire width of the web, loosely gathered into a rope-like mass, has been run through the bath. Because of the folds and creases which the rope system introduces, penetration of the treating fluid is not always uniform. Although this condition can be corrected in soaping and washing operations by rerunning the piece, it cannot be corrected if a dye be included in the bath, for then the color deposited on the goods may be non-uniform. Consequently, in order to obtain uniform color, or to save the cost, time, and manufacturing space which the reruns demand, it is preferred to treat such textiles in the full open width.

However, as explained above, this is not always possible in conventional apparatus since the pull of the draw rolls may distort or stretch the fabric to an unacceptable extent.

The present invention permits the textile to run through the treating bath in full open width, but at the same time prevents any tension derived from the draw rolls from exerting a pull on the web. As a result, the treatment, whether dyeing, washing, open soaping, etc., is uniform throughout the length and across the entire width of the piece, and no distortion of the web due to pull will result.

The invention may be best understood by reference to the drawings in which

FIG. 1 is a longitudinal section of the treating tank and web transport apparatus,

FIG. 2 is a transverse section of the device taken on its center line,

FIG. 3 is a detail showing the hold-down and guide means used to maintain the path and alignment of the web carrier,

FIG. 4 is a top plan view of a portion of the carrier belt showing its guide rollers, and

FIG. 5 is a top plan view of a single shield hold-down means.

Referring to FIG. 1, the improved apparatus consists of a frame **10**, comprising the vertical beams **11**, **12**, **13**, and **14**. The legs are tied together by longitudinal beams **15**, **16**, **17**, and **18**, and transverse beams **19—19** and **21—21**, while the brace and support beams **22—22** and **23—23**, not only brace the frame, but support the bottom of the tank.

Tank **24** fits with the frame **10**, and comprises an open tank having a hopper bottom wall **25**, side walls **26—26**, and end walls **27** and **28**.

An endless open mesh belt **29**, the outrunning flight of which travels in approximately a parabolic path, is trained over the sprockets **31**, **32**, **33**, and **34**. The sprockets are carried by the axles **35**, **36**, **37**, and **38**. Any of axles **35**, **36**, **37**, and **38** may be driven. The number of sprockets on each axle is determined by the width of the tank, and this in turn is determined by the

open width of the goods which will be run. The return flight of belt **29**, is guided by the sprockets **33—33**. Belt **29** extends almost completely across tank **24**.

The belt **29** can be made of any material which is stable in the treating fluid and which is provided with sufficient interstices to allow the rapid flow of fluid through the belt. However, I prefer a belt formed of thin vertically positioned strips **39—39** of stainless steel which are hinged together near the upper **41**, and the lower **42**, basses of their truncated pyramidal bends by the stainless steel hinge pins **43—43**, as shown in FIG. 4.

At approximately 6-inch intervals along the length of the belt, small rollers **44—44** are mounted on stub axles **45—45**. Axles **45** are welded to the top surface of the metallic strips. The rollers which lie beyond the lateral margins on each side of the belt fit into a trackway **46** (see FIG. 3), which is formed between two angle bars **47** and **48**, bent into essentially a parabolic shape.

Angle bars **47** and **48** are permanently fastened to the side walls **26—26** of the tank **24**. Since one leg of the bars **47** and **48** projects inwardly, they form a guide and hold-down trackway for the rollers, and force the belt to travel in an approximately parabolic path throughout the length of its outward run.

A shield **49** which, save at its exit end, follows the parabolic contour of the inrunning flight of belt **29**, is placed just above the topmost extent of the baffles. Shield **49** is removable and is held in position by the spring-pressed hold-down clamps **51—51**, which fit into the lock in position in the keyhole plates **52—52**, which project inwardly from the side walls **26—26** of the tank **24**. At uniform spaced intervals along the flight of the belt **29**, baffles **53—53**, which extend transversely across the entire width, are attached to the belt **29**. Normally, baffles **53** stand perpendicular to the belt. Baffles **53** can be flexible, e.g., rubber, but preferably are made of semi-rigid plastic, the specific nature of which is dictated by the temperature and by the nature of the treating fluid in the tank.

A small clearance **54** is provided between the shield **49** and the top edge **55** of each baffle **53**, so that fabric draped over the baffle will not rub on shield **49**. Like the belt, shield **49** is foraminous and allows the free passage of treating fluid.

Web **56**, which is unwound from a supply roll or run from a pre-wet tank (not shown), is gathered on an elliptical reel **57**, which, as it turns, drops the successive increments of the web **56** into one of the compartments **58–58**, which are formed between any two baffles **53**. Each increment is dropped into that one compartment which, at the moment, occupies the head end of the machine. Consequently, a fully opened web of any length determined by the size and number of revolutions of the elliptical reel **57**, occupies one compartment and is carried through the machine as that compartment travels from its head end position to the exit.

Other slack feeding arrangements will suggest themselves, e.g., rolls running at higher than take-away speed, but the elliptical reel is preferred.

The web then passes upwardly and out of the tank, first passing over guide roll **59**, which can be a spreader, and then between the squeeze rolls **61** and **62**. The squeeze and guide rolls are supported on the plate extensions **63—63**, which extend upwardly from the longitudinal beams **16** and **17**. The top squeeze roll **62** is journalled between two pivoted plates **64—64**, which may swing about the pivots **65—65**. An adjustable spring or pneumatic type hold-down **66**, extending between a cross member **67**, and the remote end of plates **64—64**, maintains the set pressure.

Fluid which is supplied to the tank **24** enters through the conduit **68**, and is withdrawn through conduit **69**.

This receives the overflow fluid from the trough **71**, the upper margin of which is set at the intended level of water.

Depending on the nature of the treatment, the fluid may either be recirculated by an external pump (not shown) or may be run to the sewer. The tank may be drained through the conduit **72**. Steam spargers **73** are provided for heating the contents of the tank, should this be required.

Usually such machines are run in tandem, or even in sets of three, where the successive treating fluids may be, e.g., open soap, and first- and second-rinse.

It is advantageous to place a full-width tray **74** inclined at a sharp angle toward the compartment beneath the elliptical reel **57**. The tray is best placed when its lower end margin **75** terminates an inch or two behind the axis of sprocket **32**. Part of the treating fluid entering the tank is pumped onto the tray through the conduit **76**, which is drilled along its whole length to supply a flood of fluid to the tray. The flow lifts and carries the fabric folds forward and drops them freely into the compartment beneath.

The speed at which the machine operates is entirely dependent on the nature of the fabric and the specific treatment. Fabrics and treatment conditions are so varied that to meet varied demands a wide range of speed adjustments is essential. This is best accomplished by providing separate, adjustable-speed power sources, one driving the shaft **77** of elliptical reel **57**, and one driving the live axle **35**, which moves belt **29**. The squeeze rolls **61** and **62** are normally driven to produce the same surface speed as that imparted to the web **56** in passing over the elliptical reel **57**. In this manner, the yardage of goods allowed to fall into any one compartment **58**, and the time of travel of that compartment (which, in turn, determines how long the goods shall remain in the treating fluid) can be separately adjusted to the required conditions. A nip spray **78** sprays the open goods just before they enter the nip. Squeeze roll **61** can be driven by interconnection with the elliptical reel power source but also—and advantageously—can be provided with separately adjustable speed control means.

Essentially, therefore, what the machine accomplishes is to drop or rather float fixed increments of the textile piece as a series of overlapping folds of open width textile into the successive compartments which then are led beneath the liquid level in the treating tank. The compartments with their loose load of open-width goods then travel through the tank at a predetermined speed. Since the floor (the belt **29**) and the cover (the shield **49**) of each compartment are foraminous, the rapid circulation of treating fluid which is maintained in the tank effectively washes or dyes each compartment load as it passes from the head end to the exit of the machine. Large-size conduits **68** and **69** which, as explained previously, may be connected in a closed circuit with the fluid circulated by a high-capacity pump (or alternatively may be supplied from an external reservoir, and the waste run to the sewer), maintain the rapid circulation in the tank. The thorough treatment of the goods in each of the successive compartments is assured, but no force pulls or distorts the web.

In the treatment of light-weight fabrics, e.g., synthetic materials, it is desirable to utilize means for preventing the clinging of the wet fabric to the elliptical reel, for

example, by breaker bars mounted on the elliptical reel.

In instances where this apparatus is used as a dyeing bowl, the color is especially even. In all cases, whether they be dyeing or other treatments, the web passes through the machine without pull or distortion. Especially even results have been secured on rayons at web speeds of forty yards per minute and a retention time within the tank of three minutes.

I claim:

1. A tensionless open-width textile finishing machine comprising a tank adapted to hold a treating fluid, a foraminous endless belt having upper and lower flights arranged to move longitudinally of the tank, upstanding baffles attached to said belt at spaced intervals thereby forming a compartment between any two of said baffles, means to maintain a portion of the outrunning flight of said belt beneath the level of fluid in said tank, a foraminous shield overlying the submerged portion of the upper flight of said belt and positioned immediately above the upper edge of said baffles, power driven means to gather successive increments of a textile web into loose open-width folds and to drop such increments successively into successive compartments, and power means to move the belt.

2. A machine as claimed in claim **1** wherein the power-driven means to gather the incremental lengths of textile into loose open-width folds includes an elliptical reel positioned above and adjacent the entrance and of the belt.

3. A machine as claimed in claim **1** wherein auxiliary means including a fluid-flooded inclined tray is provided to direct successive folded increments of the textile web into that compartment of the belt which is then passing beneath the lower end margin of said tray and wherein each successive increment of the web is floated and dropped into the said compartments by the flow of fluid.

4. An open-web textile-finishing machine as claimed in claim **1** wherein the foraminous, endless belt is caused to follow a generally parabolic path, a substantial portion of which path lies below the liquid level in said tank, and wherein the upstanding baffles attached to said belt are formed of a semi-rigid plastic substance and the said means to maintain a portion of the outrunning flight of said belt beneath the level of fluid in the tank comprise trackways fastened to the interior longitudinal walls of said tank.

5. Wet-finishing textile apparatus as claimed in claim **4** including means to maintain a rapid circulation of the bath fluid through said foraminous belt and through said foraminous underlying shield.

References Cited by the Examiner

UNITED STATES PATENTS

1,220,268	3/1917	Payet	68—177 X
1,246,933	11/1917	Payet	68—177 X
1,999,317	4/1935	Brix	68—148
2,663,177	12/1953	Hanhart	68—177

FOREIGN PATENTS

27,560	6/1884	Germany.
850,287	9/1952	Germany.
173,397	1/1922	Great Britain.
500,216	11/1954	Italy.
152,221	4/1932	Switzerland.

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