United States Patent

Gowin

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[54] DYEING APPARATUS FOR CONTINUOUSLY MOVING WEB

[72] Inventor: **Grover Z. Gowin**, Tunnel Hill, Ga.

[73] Assignee: **Gowin-Card, Inc.**, Dalton, Ga.

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[52] **U.S. Cl.**.....**68/205 R**, 68/5 D, 118/301, 118/325

[51] **Int. Cl.**.....**B05c 5/00**, B05c 9/06

[58] **Field of Search**.....68/200, 205 R, 202; 118/325, 118/301

[56] **References Cited**

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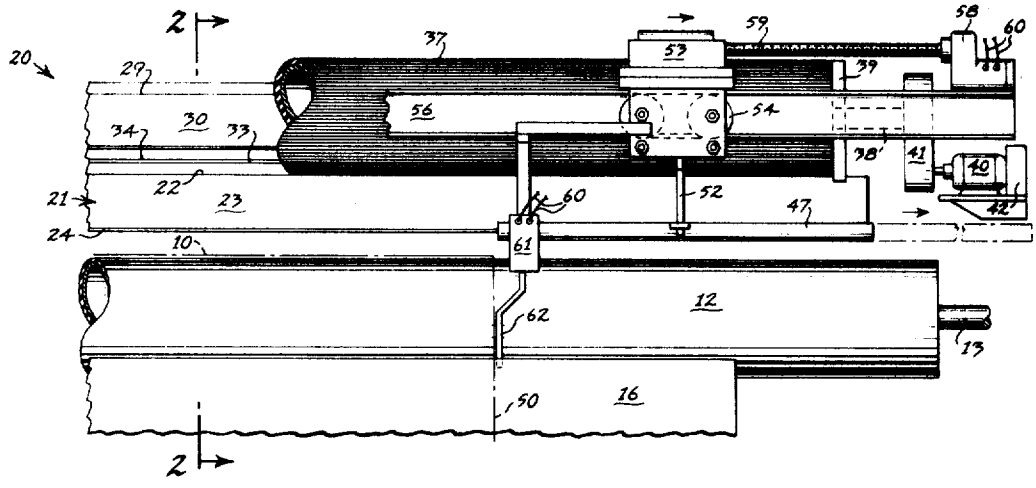
Primary Examiner—William I. Price

Attorney—Harrington A. Lackey

[57] **ABSTRACT**

A spill plate arranged to convey dye liquors upon the surface of a continuously and longitudinally moving web fabric, means feeding dye liquor continuously upon the spill plate, a slotted meter roll engaging the spill plate and driven at a uniform speed to feed uniform streams of dye liquor over the spill plate, guide cups disposed at opposite sides of the spill plate and transversely movable to confine the stream of liquor falling upon the web to a width substantially coinciding with the width of the fabric.

5 Claims, 3 Drawing Figures



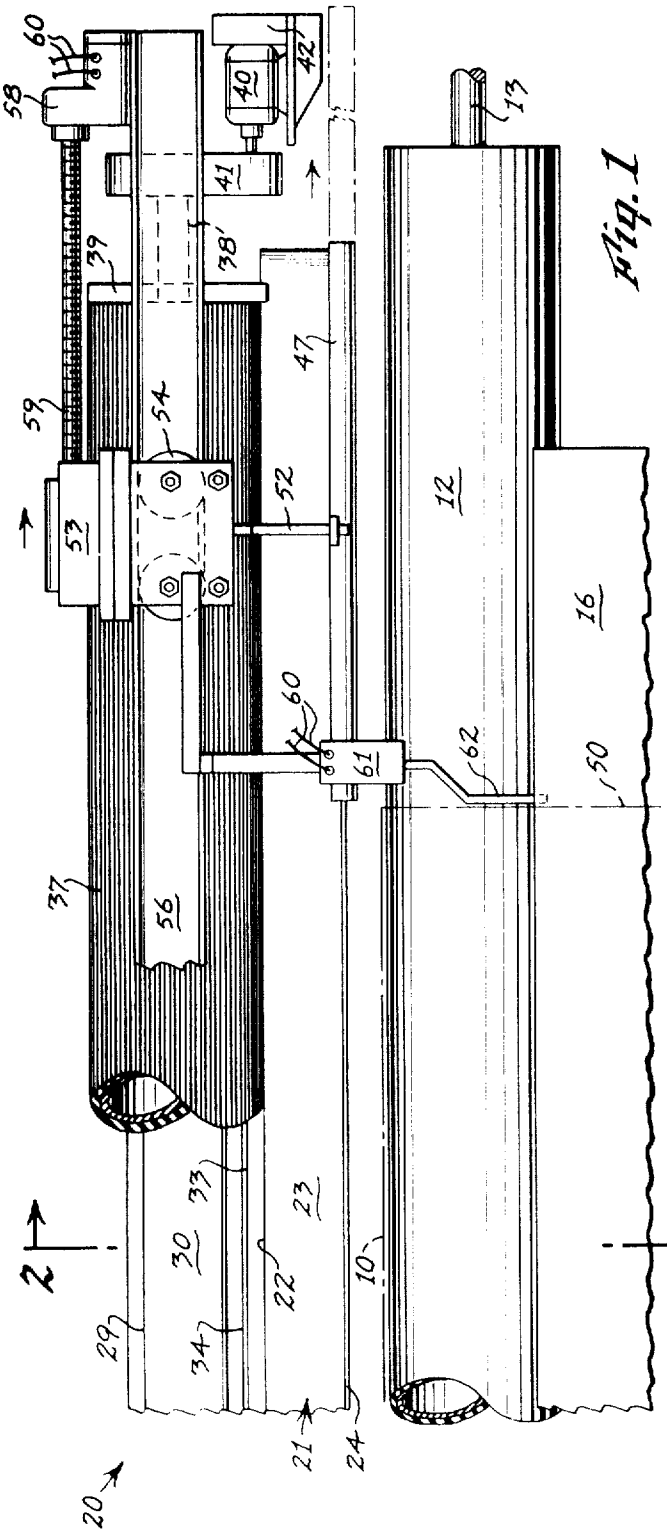


Fig. 1

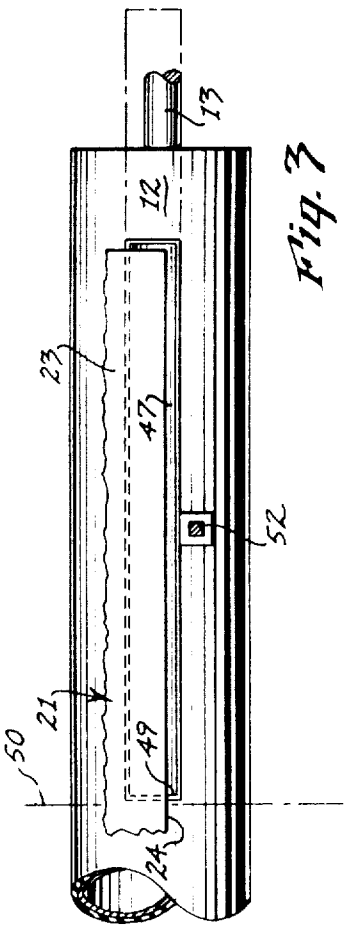


Fig. 3

INVENTOR:
GROVER Z. GOWIN
BY
Harrington A. Lackey
ATTORNEY

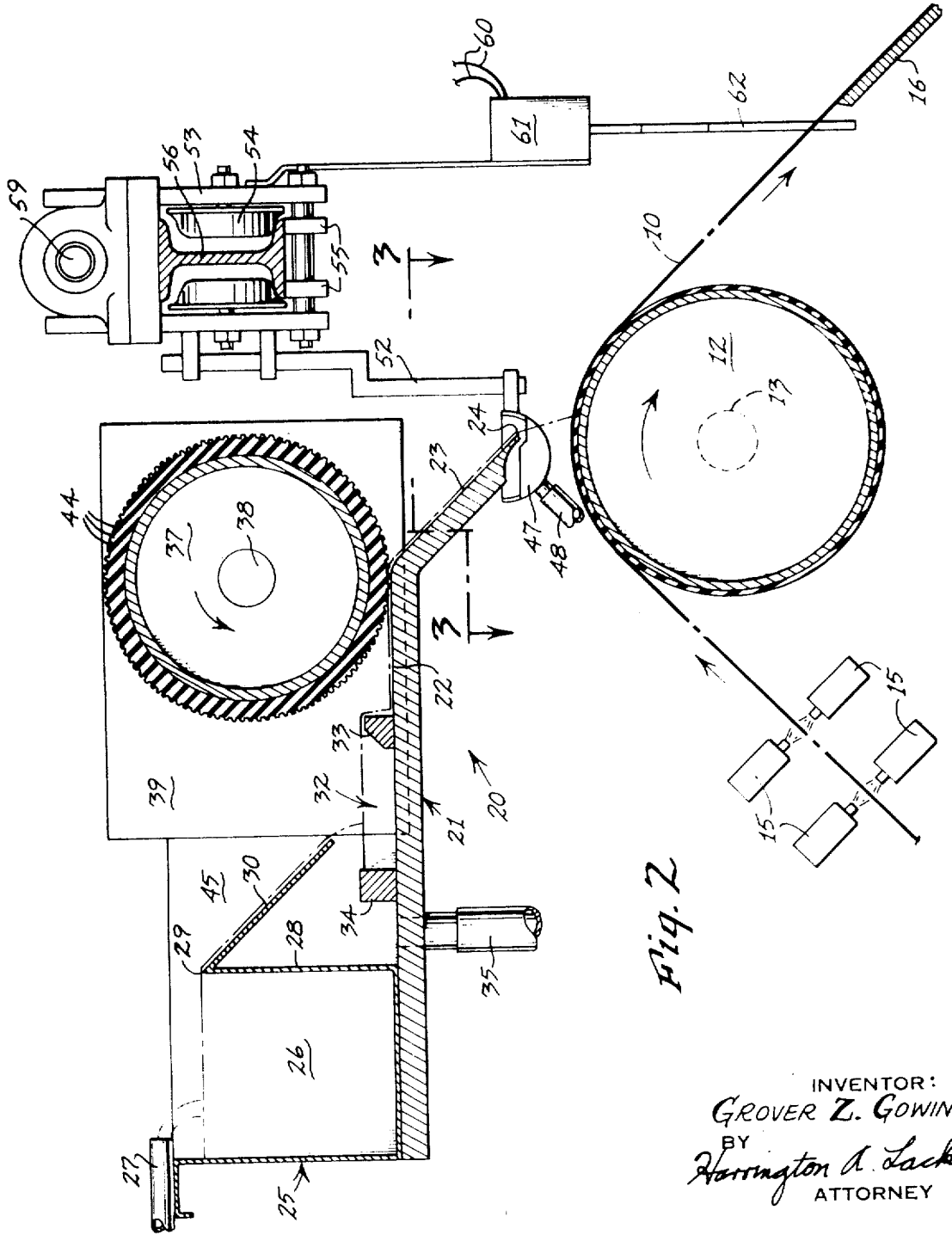


Fig. 2

INVENTOR:
GROVER Z. GOWIN
BY
Harrington A. Lackey
ATTORNEY

DYEING APPARATUS FOR CONTINUOUSLY MOVING WEB

BACKGROUND OF THE INVENTION

This invention relates to a dyeing apparatus for a continuously moving web of fabric, and more particularly to an apparatus for continuously supplying a stream of dye liquor to a moving web of fabric at a uniform rate.

The conventional method of dyeing a textile fabric, such as tufted carpet, in a solid color, is by immersion in a dye bath or vat. In the solid-color dyeing of tufted carpets, the free ends of the carpet are sewn to form a carpet loop around a driven roller with the carpet loop suspended in the dye vat. As the roller is driven, the loop of carpet is circulated in the dye vat for a predetermined period of time. This process is repeated for each individual carpet or piece.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an apparatus for continuously applying dye liquor at a uniform rate to a continuously moving web of fabric, and specifically textile or tufted fabrics. In this manner, the application of the dye liquor is merely another step in the continuous process of finishing the fabric. Furthermore, the dyeing is accomplished without waiting until the web is cut into separate individual lengths, thereby effecting a considerable economy in time and expense.

The apparatus includes a horizontal spillway or spill plate disposed transversely across the moving web of fabric. The dye liquor is continuously supplied through a liquor circulating system, including a supply reservoir and a metering reservoir. A slotted meter roll is rotatably mounted tangent to the spill plate between the metering reservoir and the edge of the spill plate, and is driven at a uniform rate to feed precise amounts of dye liquor in a stream over the edge of the spill plate and upon the web material.

The apparatus further includes overflow cups spaced at opposite side portions of and below the edge of the spill plate and mounted for transverse movement to intercept, and return to the drain or liquor circulating system, liquor from the side portions of the stream. The cups are adapted to be laterally moved to maintain a vertical alignment with the longitudinal edges of the web in order to confine the metered dye liquor stream to the width of the web. The overflow cups may be continuously transversely aligned with the edges of the web by an edge sensing mechanism.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary front elevation of the right-hand portion of the apparatus made in accordance with this invention;

FIG. 2 is an enlarged section taken along the line 2—2 of FIG. 1; and

FIG. 3 is a fragmentary reduced section taken along the line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in more detail, a continuous web of fabric **10** is trained over a pull roll **12** which is rotated in the direction of the arrow by shaft **13** driven by any convenient motor or drive means, not shown. In this manner, the fabric web **10** is continuously moved over and by the pull roll **12** through a plurality of pre-steaming jets **15** and then across a guide plate **16** for subsequent treatment and finishing of the fabric web **10**.

Mounted above the pull roll **12** is a dyeing apparatus **20**. The dyeing apparatus **20** comprises a stationary spill plate **21** having a horizontal flat portion **22** and a forward and downward sloping portion **23** terminating in a front horizontal spill edge **24**, disposed directly above the pull roll **12**.

Supported on the rear end of the spill plate **21** is a supply reservoir **25** containing dye liquor **26**. The dye liquor **26** is

continuously fed into the supply reservoir **25** through an inlet conduit **27** from a dye liquor circulating system, not completely shown, and including a circulating pump, not shown. The front wall **28** of the supply reservoir **25** has a top edge **29** lower than the top edges of the other walls of the reservoir **25** to provide an overflow outlet for the dye liquor. From the overflow outlet **29**, the dye liquor flows over discharge plate **30** sloping downward into a metering reservoir **32**. The metering reservoir **32** includes a front wall or weir **33** having a horizontal transverse top edge or surface, and a rear wall or weir **34** also having a horizontal transverse top edge or surface, but slightly higher than the top surface of the front weir **33**.

Mounted to extend through the flat portion **22** of the spill plate **21** between the front wall **28** of the supply reservoir **25** and the rear weir **34** is a drain conduit **35**, adapted to return surplus dye liquor to the pump, not shown, in the circulating system.

Mounted for rotation in front of the metering reservoir **32** is a meter roll **37**. The meter roll **37** is rotatably driven by shaft **38** journaled in the side walls or ploughs **39** at opposite ends of the meter roll **37**. The shaft **38** is driven in the direction of the arrow, by any conventional means, such as electric motor **40** through any convenient reduction drive or transmission **41** (FIG. 1). The speed, or angular velocity, of the meter roll **37** may be varied by varying the speed of the motor **40** through the speed control mechanism **42** of any conventional construction.

The meter roll shaft **38** is so positioned that the surface of the roll **37** is tangent to the top surface of the spill plate **21**, and specifically the horizontal portion **22**, as best disclosed in FIG. 2. The outer surface of the meter roll **37** is preferably made of hard rubber, including a plurality of circumferentially spaced, elongated, straight slots or grooves **44** of uniform size extending parallel to the axis of the roll **37**.

The walls **45**, forming the side walls of reservoir **25**, also form with the ploughs **39** the side walls of metering reservoir **32**, and define the flow path of dye liquor along the entire length of the horizontal spill plate portion **22**.

Mounted below the spill edge **24** at each side portion thereof, is an elongated overflow cup or trough **47**, only one of which is disclosed in the drawings. Each cup **47** is provided with a drain outlet conduit **48** which is connected to the sump and circulating pump, not shown. As best disclosed in FIG. 3 a portion of the cup **47** extends forwardly of the front edge **24** so that the outboard portion of the stream of dye liquor flowing down the sloping spill plate portion **23** directly above the cup **47**, will be intercepted by the cup **47** before it can descend upon the pull roll **12**. By locating the inner edge **49** of the overflow cup **47** in vertical alignment with the corresponding longitudinal edge **50** of the fabric web **10**, the stream of dye liquor flowing down the sloping spill plate portion **23** will be confined to a width corresponding to the width of the web **10**. Thus only the web will be continuously dyed, without any excess dye liquor being wasted or spilled upon the exposed portions of the pull roll **12**.

Each cup **47** is connected through an upwardly extending arm **52** to a carriage **53** having rollers **54** and **55** engaging a transverse stationary rail beam **56** Mounted at one end of the rail beam **56** is a reversible electric motor **58** adapted to drive a screw shaft **59** threadedly engaging the carriage **53** for reciprocable and reversible movement along the rail beam **56**. Electrically connected through leads **60** to the reversible motor **58** is a sensing mechanism **61** having a feeler or sensing arm or finger **62** adapted to be engaged by the web edge **50**, as best disclosed in FIGS. **1** and **2**.

Thus, as the web **10** is moved longitudinally over and by the pull roll **12**, any outboard movement of the web edge **50** will engage the sensing arm **62** to actuate the sensing mechanism **61** and convey an electric signal to energize the reversible motor **58**. The motor **58** turns the screw shaft **59** in a direction to move the carriage **53** and the cup **47** in an outboard direction to maintain the inner wall **49** of the cup **47** in vertical

alignment with the web edge **50**, regardless of its lateral position. Although not disclosed in the drawings, the web edge **50** on the other side of the web **10** engages a similar sensing arm **62** to actuate mechanism on the other side of the web. Thus the two web sensing mechanism maintain the width of the dye stream flowing over the spill edge **24** the same as the width of the web **10**.

In the operation of the apparatus **20**, the web **10** is continuously being moved longitudinally by the pull roll **12** in the direction of the arrows disclosed in FIG. **2**. The dye liquor **26** is circulated by the pump, not shown, through the inlet **27** to maintain a substantially uniform head in the supply reservoir **25**. A substantially uniform stream of liquor discharges over the overflow outlet **29** and down the discharge plate **30** into the metering reservoir **32**. The metering reservoir **32** discharges a uniform amount of liquor over the front weir **33** by virtue of the difference in height between the front weir **33** and the rear weir **34**. Thus, any surplus dye liquor in excess of the desired uniform amount is discharged over the top of the rear weir **34** and returned to the circulating system through the drain conduit **35**.

Further refinement of the precise amount of dye liquor moved over the spill plate **21** is provided by the uniform angular velocity of the meter roll **37** and the uniform size of the meter slots **44**. The bottom surface of the meter roll **37** engages the surface of the horizontal flat spill plate portion **22** to meter uniform amounts of dye liquor forward upon the sloping spill plate portion **23**. Thus, the amount of dye liquor discharged upon the web **10** from the horizontal spill edge **24** is made uniform with a high degree of precision by virtue of the controlled amount of dye liquor discharged from the supply reservoir **25**, subsequently by the metering reservoir **32**, and finally by the meter roll **37**. The controlled dye stream is simultaneously confined to the width of the fabric web **10** by the sensing mechanism **61** and overflow cups **47**, as previously described.

What is claimed is:

1. An apparatus for dyeing a fabric including:

a. a spill plate having a front horizontal spill edge,

b. means moving a web of fabric longitudinally beneath said spill edge, so that said spill edge extends widthwise of said web,

c. a meter roll having elongated slots of uniform size circumferentially and uniformly spaced in the surface of said meter roll,

d. means mounting said meter roll for rotational movement above said spill plate, so that the surface of said meter roll is tangent to said spill plate to feed uniform amounts of dye liquor between said meter roll and said spill plate toward said spill edge.

2. The invention according to claim **1** further comprising a metering reservoir behind said meter roll, said metering reservoir comprising a front weir having a horizontal transverse top edge and a rear weir having a horizontal transverse top edge spaced above the top edge of said front weir at a predetermined height, and means continuously supplying dye liquor into said metering reservoid so that a uniform stream of dye liquor will flow over said front weir upon said spill plate and toward said meter roll, and any liquor in excess of said uniform stream flows over said rear weir.

3. The invention according to claim **2** in which said dye liquor supplying means comprises a supply reservoir behind said metering reservoir, a fluid outlet for said reservoir spaced above said said rear weir, and a channel communicating with said fluid outlet to convey dye liquor from said supply reservoir to said metering reservoir.

4. The invention according to claim **1** further comprising means driving said meter roll at a uniform speed, and means for changing said speed to vary the flow rate of said dye liquor.

5. The invention according to claim **1** further comprising cup means, means mounting said cup means for transverse movement below said spill edge and in the path of the edge portions of the stream of dye liquor flowing over said edge, electrical motive means operatively connected to said cup means, an electrical sensing element for sensing the longitudinal edge of the web, and means electrically connecting said sensing element to said motive means to actuate said motive means to maintain said cup means in vertical alignment with a corresponding web edge.

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