Jan. 19, 1937. G. HAEBERLIN 2,067,915

APPARATUS FOR THE CONTINUOUS TREATMENT OF TEXTILE FABRICS WITH LIQUIDS

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Fig. 1

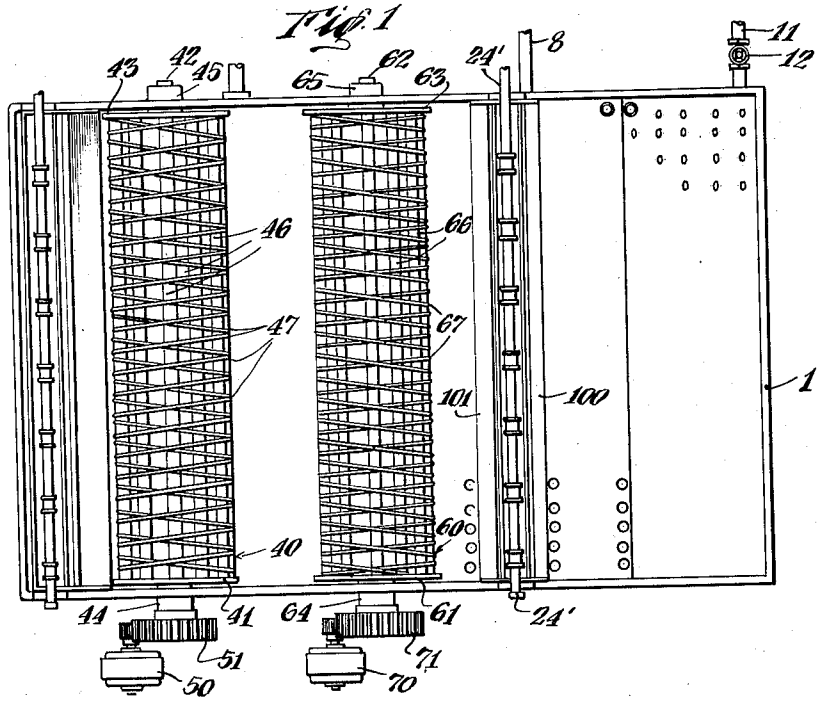
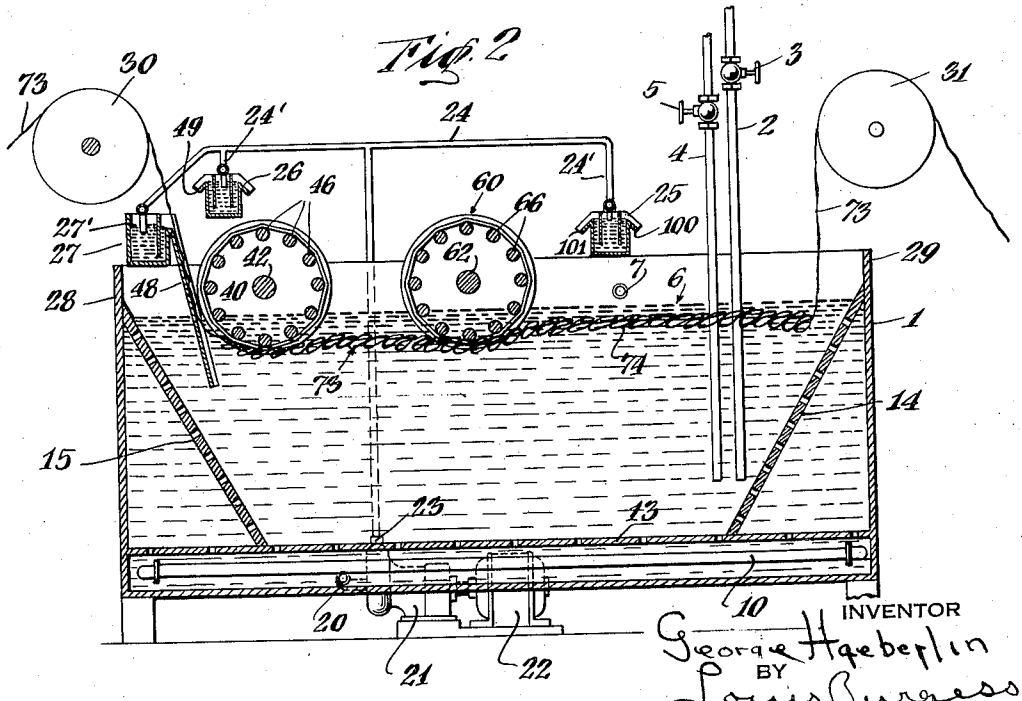


Fig. 2



INVENTOR
George Haeberlin
BY
Louis Burgess
ATTORNEY

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Fig. 3

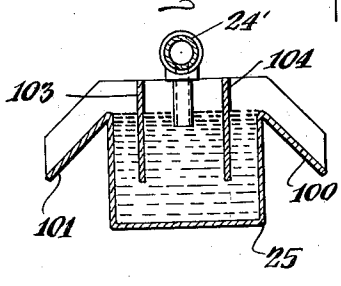


Fig. 4

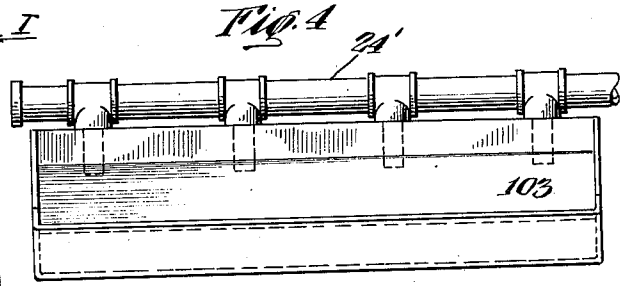


Fig. 5

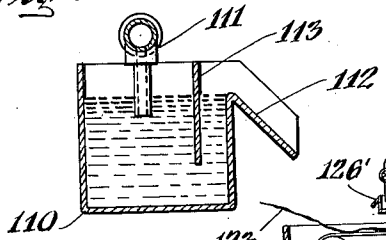


Fig. 6

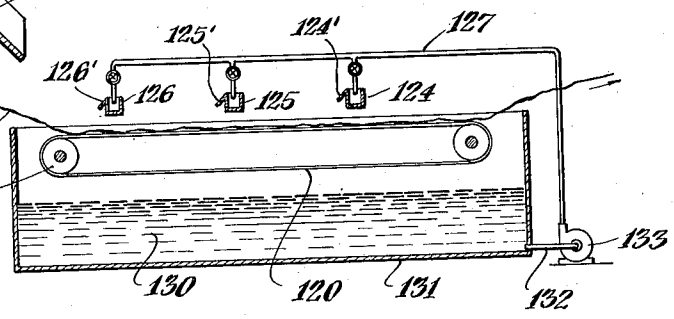
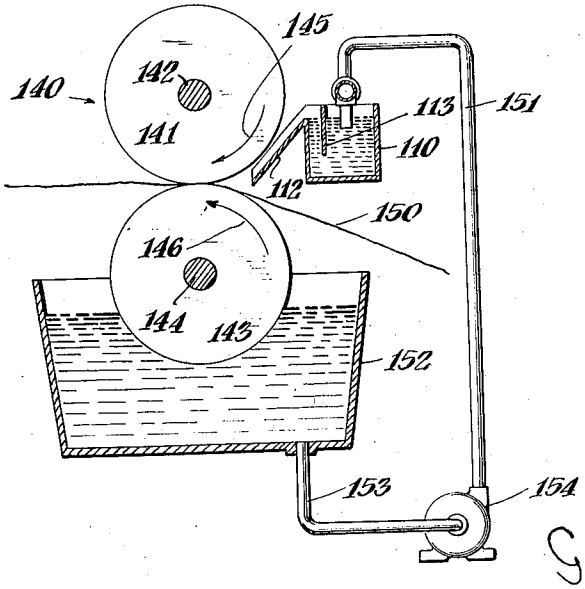


Fig. 7



INVENTOR
George Haeberlin
BY
Louis Burgess
ATTORNEY

Patented Jan. 19, 1937 2,067,915

UNITED STATES PATENT OFFICE

2,067,915

APPARATUS FOR THE CONTINUOUS TREATMENT OF TEXTILE FABRICS WITH LIQUIDS

George Haeberlin, Paterson, N. J., assignor to Textile Dyeing and Printing Co. of America, Inc., a corporation of New Jersey

Application February 6, 1933, Serial No. 655,405

5 Claims. (Cl. 8—19)

The invention is applicable to any of the usual operations in which a moving band of textile fabric is continuously treated with a liquid medium. An example of such use is the treatment of a silk fabric with water and detergent materials for the purpose of removing the gum preparatory to weighting, dyeing, printing, etc. The invention is also applicable to any of the operations in which a fabric is continuously treated with a liquid medium, for example to the various water washes which are incidental to the weighting process.

The invention will be fully understood from the following description read in conjunction with the drawings, in which:

Fig. 1 is a top view of one embodiment of my invention.

Fig. 2 is a vertical section through the construction shown in Fig. 1.

Fig. 3 is a detailed vertical section through a part of the construction shown in Figs. 1 and 2.

Fig. 4 is a longitudinal vertical section through a part of the construction shown in Figs. 1 and 2.

Fig. 5 is a vertical section through one embodiment of my invention.

Fig. 6 is a vertical section through an alternative embodiment of my invention, and

Fig. 7 is a vertical section through a further alternative embodiment of my invention.

Referring to the drawings, 1 designates a tank which may, for example, be composed of steel plate. Pipe 2 controlled by valve 3 is provided for the purpose of introducing cold water to the tank, and pipe 4 controlled by valve 5 is provided for the purpose of introducing hot water to the tank whenever required. It will of course be understood that either or both of these pipes may be utilized for the introduction of any other desired liquid treating medium. A predetermined liquid level 6 is maintained in tank 1 by means of the overflow 7 connected to the pipe 8. The contents in the tank may be heated by means of the steam coil 10 connected to the pipe 11 controlled by the valve 12. A horizontal perforated baffle 13 preferably spans the bottom of the tank, and the perforated baffles 14 and 15 are located adjacent either end of the tank. These insure the gradual mixing of the heated liquid with that which is in direct contact with the fabric. In operation, liquid is continuously withdrawn from adjacent the base of the tank by means of the outlet 20 and connected pump 21 driven by motor 22. This liquid is transferred from the delivery outlet 23 of the pump through the branched pipe 24 to the overflow pans 25, 26 and 27. The pans extend across substantially the entire width of the tank. The sheet of water delivered by any overflow pan is therefore at least as wide as the fabric undergoing treatment. The fabric to be treated is introduced adjacent one end of the tank 1 by means of a feed roller 30; in this way a part of the moving band of textile fabric is continuously introduced adjacent the end 28 of the tank 1. When the treatment of the fabric has been completed and the fabric arrives at the end 29 of the tank, it is lifted therefrom by means of the roller 31 and transferred thereby to the succeeding steps of the process which may comprise drying or treatment with chemical reagents, depending upon the manner in which the fabric is to be finished. In this method of treating textile fabrics, in which the fabric is continuously treated as a moving band by the continuous introduction of a part thereof beneath the surface of a liquid while a subsequent part of the moving band is continuously removed from the liquid, the band of fabric has, insofar as I am aware, been moved through the liquid by means of a roller situated adjacent the delivery end of the tank which operates to draw the fabric through the liquid by placing it under tension. A more or less extended contact between the immersed portion of the band of fabric has been secured in some cases by draping the fabric in festoons over a series of rollers, some of which were located adjacent the upper part of the liquid and some of which were located adjacent the lower part. Such rollers were essentially guide rollers, and the actual work of transferring the band through the liquid was accomplished by tension applied by the roller which finally removes the material from the treating tank.

Superior results are obtained by the employment of the apparatus which I have devised for moving the band of fabric through the liquid. In the case illustrated, this comprises wheel 40, including the disk 41 adjacent one end of the wheel carried by shaft 42 and disk 43 adjacent the other end of the wheel also carried by the shaft 42. Shaft 42 is mounted in suitable bearings 44 and 45. Between the disks 41 and 43 there extend a number of cross-bars 46. The cross-bars are parallel to the axis of the wheel and located on a circle concentric with the wheel. The apron 48 which extends from the lip of the overflow pan 27 delivers the band of fabric to a point adjacent wheel 40. Where the treating liquid consists principally of water, these cross-bars

may conveniently be formed of wood, although other materials have been found to have specific advantage where other treating liquids are employed. Also, where the treating liquid is principally water, I find it of value to wrap around the cross-bars **46** a continuous net **47** formed of diagonally interlacing cords. The wheel **40** is driven by motor **50** through any suitable reducing gear diagrammatically indicated by **51**.

The wheel **60** includes disk **61** adjacent one end thereof connected to shaft **62** and disk **63** adjacent the other end thereof also connected to shaft **62**. The shaft is mounted in suitable bearings **64** and **65**. Between the disks mentioned there extend a number of cross-bars **66** parallel to and concentric with the axis of the wheel and these are likewise surrounded by a net **67** formed of diagonally interlacing cords. The wheel **60** is driven by motor **70** through any suitable gear reduction diagrammatically indicated by **71**. In the operation of my process, the roller **31** is only operated at a sufficient speed to pick up and remove from the tank the end **72** of the moving band of fabric **73**. The roller **31** is at no time operated so rapidly as to place the band **73** of fabric under any substantial tension. The fabric tends, however, to rise to the top of the liquid in tank **1**, and this tendency places the band of fabric in light frictional engagement with the surfaces of the wheels **40** and **60**. The wheels which are driven with the lower surfaces rotating toward the delivery end of the tank operate, therefore, to move the fabric and adjacent liquid in a gentle manner toward the delivery end of the tank. The band **73** of fabric in the tank will form various folds **74** which insure prolonged and efficient contact between the fabric and the treating medium. Where, as is frequently the case, the fabric shrinks while in the treating liquid, the feed roller **30** will of course be operated at a greater speed than the roller **31** in order to compensate for any such shrinkage and to insure that the band of fabric will hang loosely and without tension in the tank **1**. The apparatus described will operate with a minimum of attention and adjustment, and has in practice been found exceptionally efficient.

The drive ratio of the wheels may be varied, and it is at times advisable to drive the wheel **60** at a lower rate of speed than the wheel **40** in order to permit part of the band **73** of fabric to accumulate between the wheels and to thereby adjust the time of contact of the fabric with the liquid.

This application is a continuation-in-part of my prior application Serial No. 650,996, filed January 10, 1933, now abandoned.

Fig. 3 is a detailed vertical section through either of the pans **25** and **26**. By reference to this figure it will be noted that the pan **25** comprises the overflow lips **100** and **101**. In operation, the pan is horizontally disposed and the lips slope outwardly and downwardly with respect to the pan which carries the same. The upper edges of the lips are horizontal. Liquid is continuously supplied to the pan from the branched pipe **24**, and any excess of liquid above that necessary to maintain a constant level overflows over the lips as a continuous sheet.

By reference to Fig. 1, it will be noted that the lips **100** and **101** extend the entire width of the tank and in operation the pan discharges two continuous sheets of water which fall onto the surface **6** of the liquid in tank **1** across the entire width of the fabric **74** which is being moved progressively through the tank. In this case, it will be noted that the sheet of liquid does not penetrate the fabric, but is uniformly distributed with respect to the width of the fabric, and exerts therefore a much more efficient washing action than is possible by means of the so-called pot-eyes heretofore employed. With any apparatus of this character, in which the fabric is propelled through the liquid without placing the same in direction tension, the fabric tends to rise to the surface of the liquid. There are various advantages, both chemical and mechanical, in so moving the fabric through the liquid, but it is also desirable to prevent parts of the fabric from floating on the surface. The parts of the fabric which did float on the surface would not be equally subjected to the action of the liquid. Where, for example, the liquid is applied for the purpose of washing the fabric, the fabric might not be uniformly washed; and where the fabric is subjected to the action of a chemical reagent or of a dye stuff, those parts of the fabric which reach the surface might, for example, be insufficiently weighted or insufficiently dyed. Where, however, pans such as **25** and/or **27** are employed, the continuous sheet of liquid falling onto the surface of the liquid in the tank operates to beat back into the liquid any portion of the fabric which tends to rise, and maintains therefore complete and uniform action of the liquid upon the fabric. It will be noted that the fabric in the tank **1** may form various folds **74** longitudinally, but is nevertheless transversely unfolded and is not treated as a rope. This condition will be comprehended in the claims by the use of the term "transversely rectilinear form".

In one application of my invention the sheet of liquid impinges directly on the fabric and is discharged directly onto the fabric across the entire width of the same. By reference to Fig. 2, it will be noted that the fabric **73** is delivered into the tank **1** by means of the feed roller **30** in the form of a continuous ribbon and transversely in substantially rectilinear form as hereinbefore defined.

In the case now under consideration, the fabric is delivered, as stated, by the feed roller **30** in ribbon form, while the overflow lip **49** carried by the pan **26** delivers a continuous sheet of liquid directly onto the fabric across the entire width of the same, thereby resulting in an exceptionally effective and highly efficient washing action. The ribbon of fabric next passes onto the apron **48** carried by the overflow lip **27'** of the pan **27**. Water is continuously supplied to the pan **27** by means of the pipe **24**, and flows as a continuous sheet over the lip **27'** and down the apron **48**. It will be noted that the apron **48** terminates at a point adjacent the level **6** of the water in tank **1** and preferably at a point slightly below the surface of the same. The effect of the moving sheet of liquid is not only to provide effective washing action, but in addition drives the ribbon of fabric well below the surface **6** of the liquid in the tank **1**.

In Fig. 5 I have illustrated in cross section a form of pan which is similar to **27**, but which does not carry the apron **48** forming an extension of the overflow lip. Referring specifically to Fig. 5, the pan **110** receives liquid from the branched pipe **111**. This pipe corresponds to the pipe **24'** shown in Fig. 4 and need not therefore be more fully described. Any excess of liquid over that necessary to maintain a constant level in the pan

overflow over the lip 112, which lip is horizontally disposed and projects outwardly and downwardly from the pan. Baffle 113 is provided to insure a substantially constant level of liquid in the pan adjacent the overflow lip. This baffle is of the same form as baffles 103 and 104 (Fig. 3) and extends substantially the entire length of the pan.

In Fig. 6 I have illustrated in longitudinal section a stage washer. This comprises the endless conveyor 120 carried by the rolls 121 and 122. The conveyor may either take the form of a continuous net carried by cylindrical rolls, or may, alternatively, take the form of a multiplicity of cross-bars carried by by two or more endless chains, which chains are in turn carried by the wheels 121 and 122. In either event, the conveyor 120 carries the fabric 123 in transversely rectilinear form. The pans 124, 125 and 126 are located above the conveyor 120 and extend across substantially the entire width of the same, and in any event across the entire width of the moving band of fabric 123. Liquid is continuously supplied to the pans from the branched pipe 127. This liquid overflows in continuous sheets over the overflow lips 124', 125' and 126', which sheets fall onto and across the entire width of the moving band of fabric. It will be noted that liquid so falling upon the fabric exerts the maximum penetrative effect, and after passing through the fabric flows through the conveyor 120 back into the body of liquid 130 in tank 131. Liquid from the tank 131 may be continuously withdrawn through educt 132 and recirculated through pipe 127 by means of motor 133. Suitable driving means are, of course, provided for the wheels 121 and 122.

In Fig. 7 I have illustrated in vertical section a further embodiment of my invention. This comprises the two roll quetsch 140, consisting of roller 141 carried by shaft 142, and roller 143 carried by shaft 144. Suitable driving means is, of course, provided to rotate the rollers in the direction indicated by arrows 145 and 146. A moving band of fabric 150 is supplied to the quetsch and passes through the bight of the rollers in transversely rectilinear form. Liquid is continuously supplied to the pan 110 by means of the pipe 151 and overflows as a continuous sheet from the overflow lip 112, which sheet falls onto the sheet 150 across the entire width of the same. Any excess of liquid is squeezed back by the quetsch and flows back into the pan 152 which holds a continuous supply of the same. This liquid may be continuously withdrawn through educt 153 encirculated by means of pump 154. The apparatus illustrated in Fig. 7 constitutes a particularly efficacious means for the rapid and uniform continuous application of finishing and applying oils to textile fabrics, although it is also susceptible of various other advantageous applications.

The foregoing description is for purposes of illustration and not of limitation, and it is my intention that the invention be limited only by the appended claims or their equivalents, wherein I have endeavored to claim broadly all inherent novelty.

I claim:

1. Apparatus for the continuous treatment of a moving band of textile fabric with a liquid comprising a tank, means for introducing liquid to said tank, means for maintaining a predetermined liquid level in said tank, rotary means adapted to propel a moving band of textile fabric tangentially through said tank in transversely rectilinear form by light frictional engagement with the upper surface only of said band of textile fabric the lower part only of said rotary means projecting below the said maintained level, means for continuously introducing part of the said band of textile fabric adjacent one end of said tank, independent of and spaced apart from said rotary means, means for continuously removing part of said moving band of textile fabric adjacent the other end of said tank, independent of and spaced apart from said rotary means, and means for continuously discharging a sheet of liquid onto the upper surface of the liquid in said tank across the entire width of the said fabric.

2. Apparatus for the continuous treatment of a moving band of textile fabric with a liquid comprising a tank, means for introducing liquid to said tank, means for maintaining a predetermined liquid level in said tank, rotary means adapted to propel a moving band of textile fabric tangentially through said tank in transversely rectilinear form by light frictional engagement with the upper surface only of said band of textile fabric the lower part only of said rotary means projecting below the said maintained level, means for continuously introducing part of the said band of textile fabric adjacent one end of said tank, independent of and spaced apart from said rotary means, means for continuously removing part of said moving band of textile fabric adjacent the other end of said tank, independent of and spaced apart from said rotary means, a pan extending horizontally transversely to the direction of movement of said fabric in said tank, and an overflow lip carried by said pan extending outwardly and downwardly therefrom, said lip extending at least the entire width of the said fabric.

3. Apparatus for the continuous treatment of a moving band of textile fabric with a liquid comprising a tank, means for introducing liquid to said tank, means for maintaining a predetermined liquid level in said tank, a plurality of wheels horizontally disposed, the lower edges only of said wheels projecting below the said maintained level, means for continuously introducing part of a moving band of textile fabric adjacent one end of said tank, independent of and spaced apart from said wheels, means for continuously removing part of said moving band of said textile fabric adjacent the other end of said tank, independent of and spaced apart from said wheels, said wheels being adapted to propel said band of fabric tangentially through said tank in transversely rectilinear form by light frictional engagement with the upper surface only of said band of textile fabric, driving means adapted to rotate said wheels with the lower surfaces moving away from the point of introduction, and means for continuously discharging a sheet of liquid onto the surface of the liquid in said tank, said sheet falling parallel to the axes of the said wheels.

4. Apparatus for the continuous treatment of a moving band of textile fabric with a liquid comprising a tank, means for introducing liquid to said tank, means for maintaining a predetermined liquid level in said tank, a plurality of wheels horizontally disposed, the lower edges only of said wheels projecting below the said maintained level, means for continuously introducing part of a moving band of textile fabric adjacent one end of said tank, independent of

and spaced apart from said wheels means for continuously removing part of said moving band of said textile fabric adjacent the other end of said tank, independent of and spaced apart from said wheels, said wheels being adapted to propel said band of fabric tangentially through said tank in transversely rectilinear form by light frictional engagement with the upper surface only of said band of textile fabric, driving means adapted to rotate said wheels with the lower surfaces moving away from the point of introduction, a pan extending horizontally parallel to the axes of the said wheels and an overflow lip carried by said pan extending outwardly and downwardly therefrom, adapted to discharge a sheet of liquid onto the surface of the liquid in said tank, said sheet falling parallel to the axes of the said wheels.

5. Apparatus for the continuous treatment of a moving band of textile fabric with liquid, comprising a tank, means for introducing liquid to said tank, means for maintaining a predetermined liquid level in said tank, a plurality of wheels horizontally disposed, the lower edges only of said wheels projecting below the said maintained level, means for continuously introducing part of a moving band of textile fabric adjacent one end of said tank, independent of and spaced apart from said wheels, means for continuously removing part of said moving band of textile fabric adjacent the other end of said tank, independent of and spaced apart from said wheels, said wheels being adapted to propel said band of fabric tangentially through said tank by light frictional engagement with the upper surface only of said band.

GEORGE HAEBERLIN.