

Sept. 25, 1956

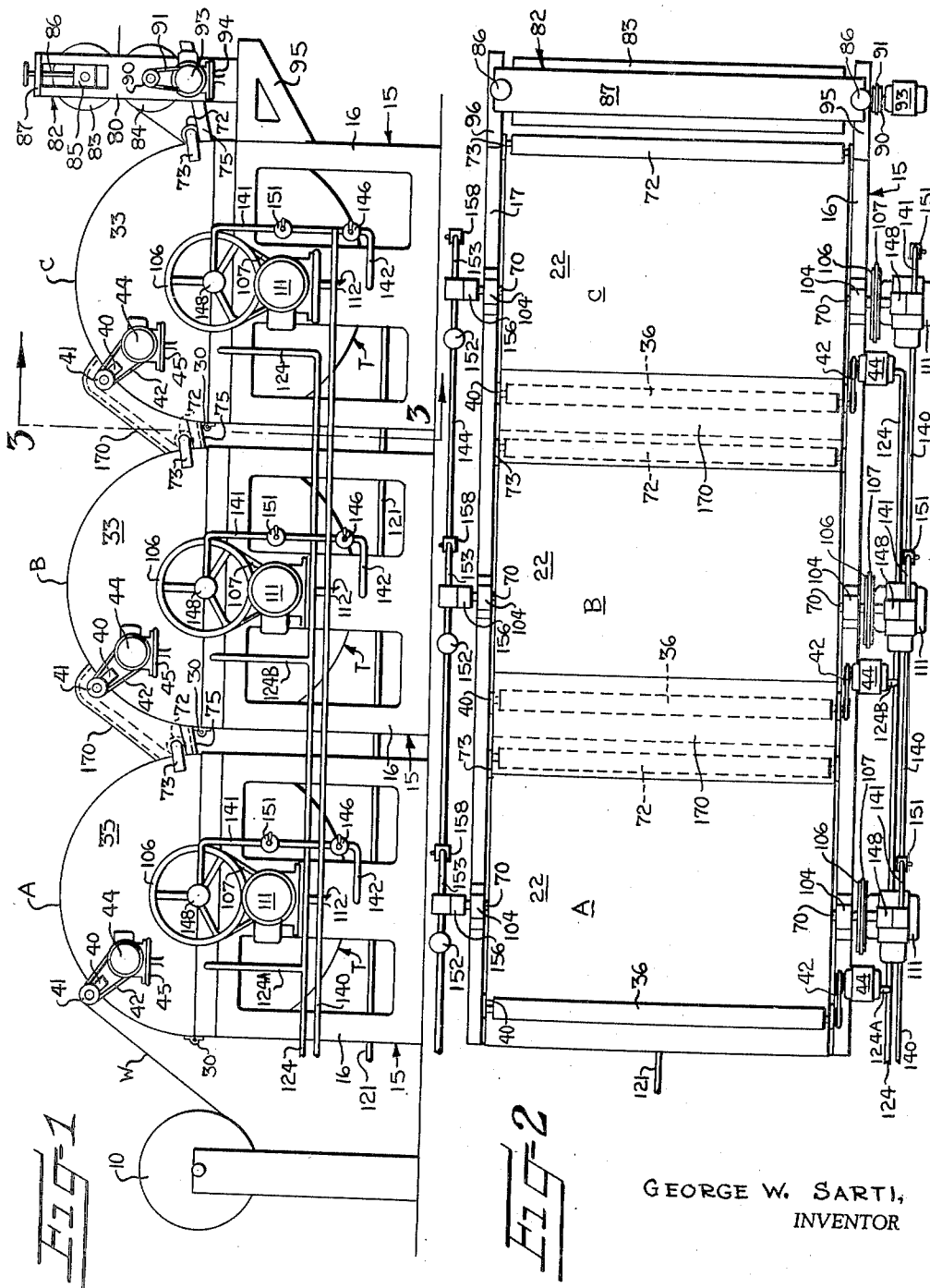
G. W. SARTI

2,764,009

CONTINUOUS WEB TREATING APPARATUS

Filed July 6, 1954

4 Sheets-Sheet 1



GEORGE W. SARTI,
INVENTOR

BY

Eaton + Bell

ATTORNEYS

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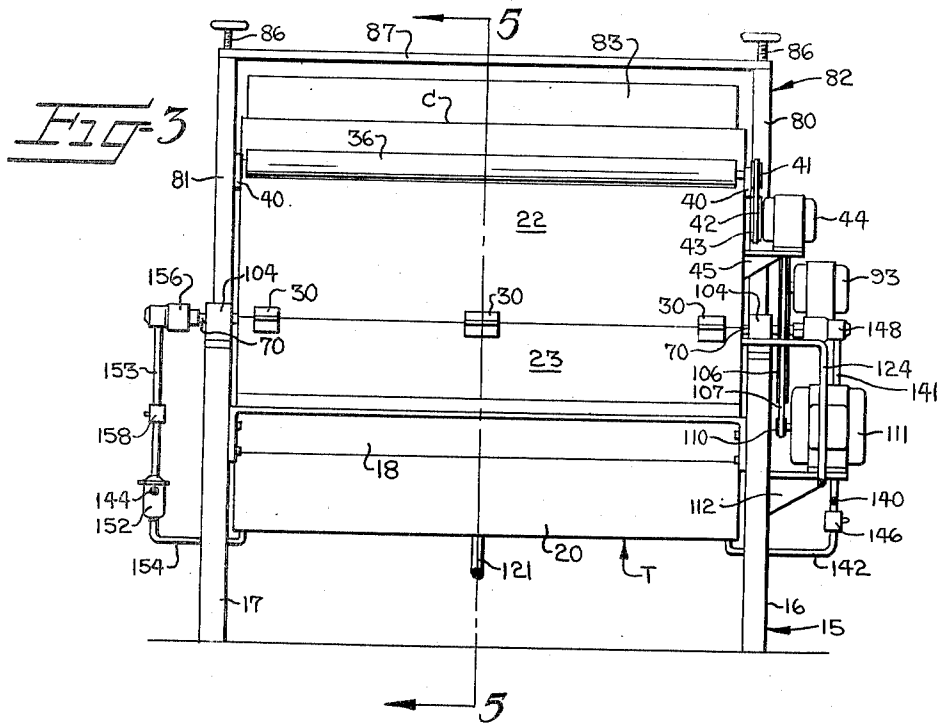
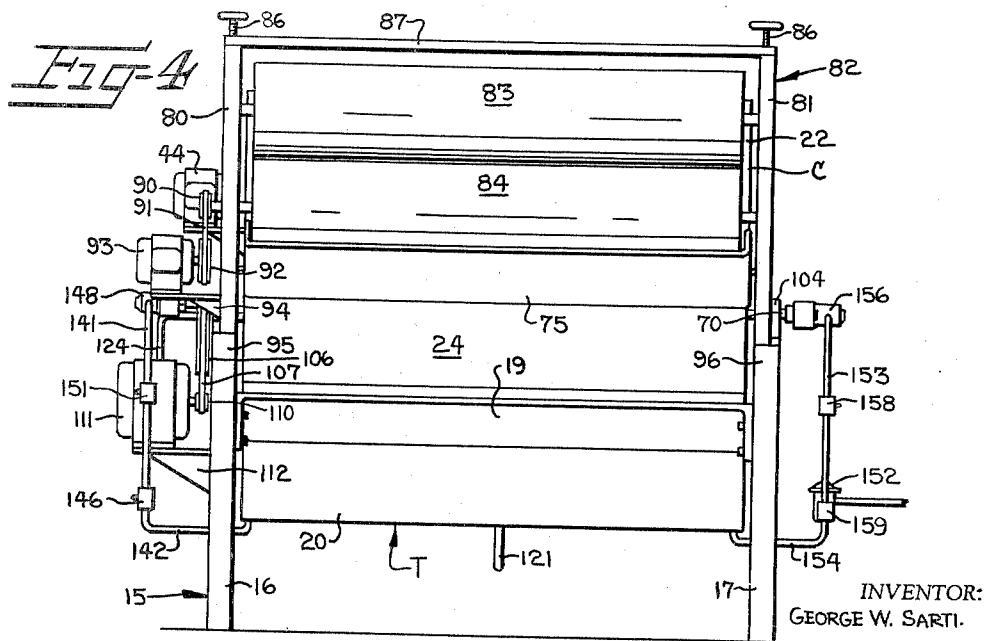
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4 Sheets-Sheet 4

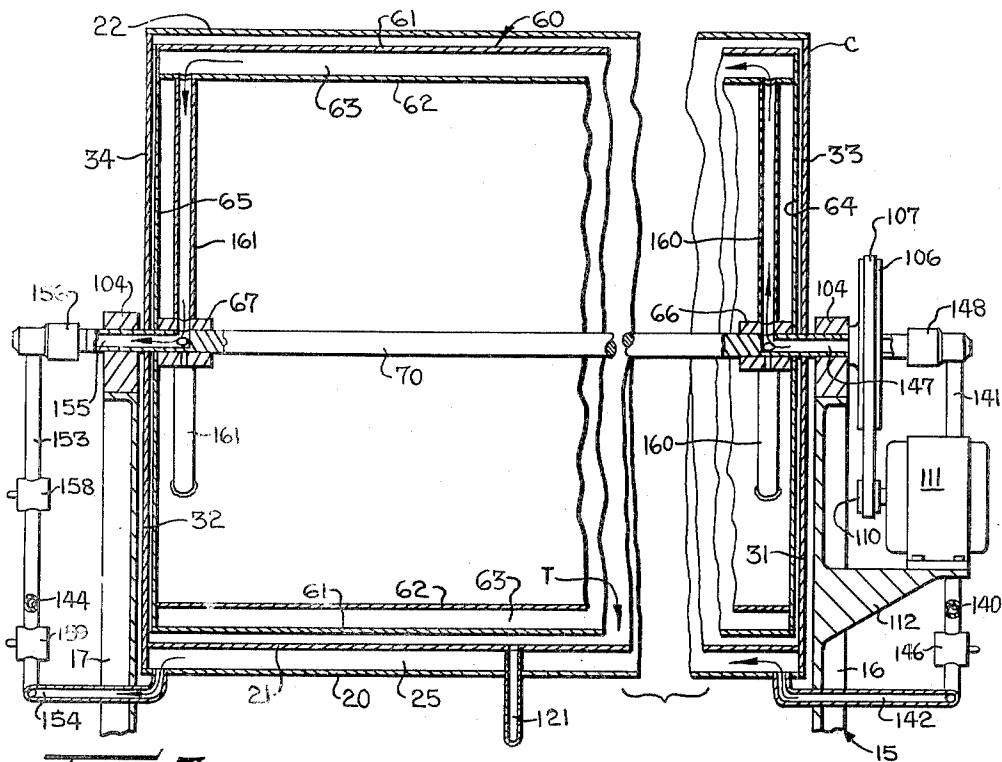


Fig. 7

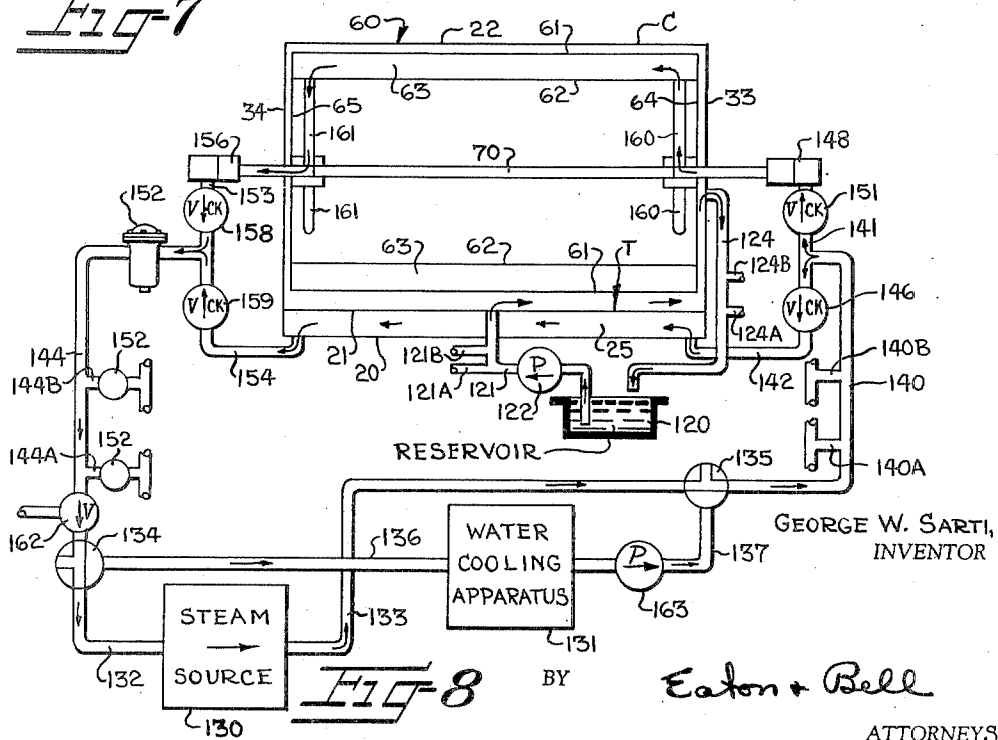


Fig. 8

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2,764,009

CONTINUOUS WEB TREATING APPARATUS

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Application July 6, 1954, Serial No. 441,303

6 Claims. (Cl. 68—15)

This invention relates to an apparatus for the liquid treatment of cloth and other materials in web form, and it is an object of this invention to provide apparatus for dyeing, sizing or otherwise treating a continuous moving web without placing the web under tension as it is passed through the apparatus.

It is another object of this invention to provide means for drawing off web material from a source into a tank in engagement with a periphery of a drum disposed in the tank and subsequently directing the web material out of the tank to a subsequent tank or to a take-up mechanism or squeeze rolls without placing the material under tension as it is advanced through the tank. To this end, separately controlled means are provided for driving the drawing off or feeding means, the drum and the take-up means.

It is another object of this invention to provide an apparatus for the liquid treatment of cloth or other web material embodying means for advancing the cloth through a tank under a minimum of tension or in the relaxed state while using a minimum of treating solution and while maintaining the liquid dyestuff or other treating solution in the tank under predetermined constant temperature.

In order to advance the web material through the tank in a slackened state and to maintain the treating solution under predetermined temperature in said tank, the tank is provided with a circular wall of slightly greater inner diameter than the circular outer periphery of the drum. The distance between the periphery of the drum and the inner surface of the tank wall should be from five to fifteen times the thickness of the fabric or web material or from one-fourth inch to one-and-one-half inches, depending upon the characteristics of the material being processed.

The material is directed into and out of the tank through suitable openings provided in the upper portion or cover of the circular wall of the tank and, due to the close proximity of the periphery of the drum to the inner surface of the circular wall of the tank and the turbulence of the treating solution effected by the rotating drum, the material is carried through the tank, although it does not necessarily have to adhere or snugly engage the periphery of the drum. The limited area between the proximal surfaces of the drum and the wall of the tank also substantially reduces the amount of treating solution required as compared to prior liquid treating equipment.

In order to maintain the liquid dyestuff or other solution at a predetermined temperature as it is used up by the web material passing through the tank, the lower portion of the tank and the circular wall of the drum are each of cellular construction and means are provided to direct heated or cooled water or steam into the cells associated with the tank and the drum, respectively, and this heated or cooled liquid or steam is maintained under a predetermined temperature to thereby maintain the relatively small amount of liquid dyestuff in the tank at a constant temperature.

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Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

5 Figure 1 is a side elevation showing a series of the improved dyeing or treating units with many of the parts being shown somewhat schematically;

Figure 2 is a top plan view of the structure shown in Figure 1, omitting the web and its let-off means and the 10 intervening covers disposed between adjacent units;

Figure 3 is an enlarged elevation looking at the front or ingress end of one of the web treating units, looking substantially along line 3—3 in Figure 1, but omitting the auxiliary or intervening cover disposed between 15 the adjacent units;

Figure 4 is an enlarged view looking at the right-hand end of Figure 1;

Figure 5 is an enlarged longitudinal vertical sectional view through one of the web treating units taken substantially along line 5—5 in Figure 3 and also showing, 20 in cross-section, the squeeze rolls at the discharge end of the series of treating units;

Figure 6 is a schematic view showing the electrical control means for one of the units and the corresponding 25 squeeze rolls;

Figure 7 is a fragmentary vertical sectional view taken substantially along line 7—7 in Figure 5;

Figure 8 is a schematic illustration of the piping for one of the treating units.

30 Referring more specifically to the drawings, the numeral 10 indicates a suitable source of cloth or textile web material and may include a suitable let-off mechanism from which web material W is withdrawn and after which the web material successively passes through 35 the improved apparatus. In this instance, there are shown in Figures 1 and 2, three serially arranged web treating machines or units generally designated at A, B and C, all of which are substantially identical and only the dyeing unit C will be described in detail and like parts associated with each of the units A, B, C will bear the same reference characters. The improved apparatus may be used for any type of liquid treatment of textile materials such as continuous sizing, dyeing, washing, rinsing, etc. Hereinafter, the apparatus will be described 45 as though used for continuous vat dyeing.

Although three dyeing units A, B, C are provided in this instance, it is to be understood that a single dyeing unit or a greater or lesser number of dye units than that illustrated in Figures 1 and 2 may be used, if desired. 50 Each of the dyeing units A, B, C comprises a frame, broadly designated at 15, which includes side frame members 16, 17 to which opposite ends of transverse frame members 18, 19 are suitably secured. The transverse frame members 18, 19 support a segmental or substantially semi-circular chamber wall 20 which, in turn, supports a substantially semi-circular wall 21 of a tank T. The wall 21 may be termed as the lower half of the tank T which is circular in cross-section. The upper half of the circular tank T is in the form of a substantially semi- 60 circular cover 22.

It will be noted in Figure 5 that the front or ingress and rear or egress ends of the curved outer chamber wall member 20 have respective upwardly projecting portions 23 and 24 thereon whose upper edges terminate substantially flush with the opposite upper ends of the wall 21 65 of the tank T to thus form an outer insulating chamber 25 between the wall 20 and the outer surface of the tank wall 21. The chamber 25 is provided for the reception of insulating fluid, in the form of gas or liquid, maintained at the desired temperature, as will be later described. 70

The cover 22 is hinged to the upper edge

of the portion 23 of the wall 20 and the tank wall 21, as at 30. Opposite sides of the tank T are closed by side walls or plates 31, 32 (Figure 7) which also define opposite sides of the chamber 25. The curved cover 22 is also provided with side walls or side plates 33, 34 which normally rest upon the upper edges of the respective side walls 31, 32 of the tank T. The upper front portion of the cover 22 has a transverse web ingress opening 35 therein in which a relatively small driven feed roll 36 is partially disposed. Reduced opposite ends of the driven feed roll 36 are journaled in suitable bearings 40 carried by the side walls 33, 34 of the cover 22.

One reduced end of the feed roll 36 has a pulley 41 fixed thereon which is engaged by an endless belt 42 which also engages a pulley 43 driven by an electric motor 44. The electric motor 44 is suitably supported as by a bracket 45 suitably secured to the corresponding side wall 33 of the cover 22. Although the electric motor 44 may be of the alternating current type, it is shown in Figure 6 as being of the direct current type and one side of the electric motor 44 is grounded, as at 46, and the other side thereof has a wire or conductor 47 leading therefrom to the movable element of rheostat 50.

The stationary element of the rheostat 50 has a conductor 51 leading therefrom to one side of a secondary coil of a suitable transformer 52 whose other side is grounded, as at 53. The primary coil of the transformer 52 has opposite ends of lead wires or conductors 54, 55 connected thereto whose other ends are connected to a plug 56 adapted to be connected to a suitable source of alternating current, not shown.

Mounted for rotation within the circular tank T, defined by the curved wall 21 and the cover 22, is a rotary drum or cylinder indicated at 60 and which comprises spaced outer and inner, relatively thin circular walls 61, 62 which define an inner fluid chamber 63 therebetween for the reception of liquid or gas, as the case may be, and as will be later described. Opposite ends of the drum 60 are closed by side walls or plates 64, 65 (Figure 7) and these plates 64, 65 are fixed to hub members 66, 67 which are, in turn, fixed on a rotary shaft 70.

An extremely important feature of the present invention resides in the fact that the external diameter of the outer wall 61 of drum 60 is only slightly less than the internal diameter defined by the wall 21 of the tank T and the cover 22, say, three-eighths of an inch, since this insures that only a relatively small amount of dye liquor or other treating solution is present within the tank T at a time, and also assists in imparting the movement to the web material W as it is introduced through the ingress opening 35 in the cover 22. By way of comparison, the displacement between the tank wall 21 and the drum wall 61 should be from five to fifteen times the thickness of the web or from one-fourth inch to one-and-one-half inches, depending upon the characteristics of the web.

The relative close proximity of the drum wall 61 to the cover 22 and the tank wall 21 is such that the web material can pass therebetween in a relatively loose or relaxed state, since it is not necessary that the web material than snugly engages the periphery of the rotary drum 60. The periphery of the outer wall 61 of the drum 60 may be smooth, if desired, however, there are instances in which the character of the web material may be such that it may be desirable to knurl or roughen the outer periphery of the outer wall 61 of the drum 60.

The web material W passes downwardly and beneath the drum 60 and then upwardly and passes out of the corresponding dye unit through an egress opening 71 provided in the rear lower portion of the cover 22. It will be observed in Figure 5 that a suitable idler roll 72 serves as a guide for the web material W as it passes upwardly and outwardly through the egress opening 71. It is not necessary that the idler roll 72 be driven and, as a matter of fact, it has been found that the roll 72 may be sta-

tionary without effecting tension in the web material W. In this instance, opposite ends of the roll 72 are suitably journaled in bearings 73 carried by the side walls 33, 34 of the cover 22.

Each of the dyeing units A, B, C has an upwardly and rearwardly inclined chute or trough 75 disposed in alignment with the corresponding egress opening 71 in the corresponding cover 22 for returning the excess solution which falls from the web material W into the corresponding tank T. The intervening inclined troughs 75 between successive dyeing units rest against the covers 22 of the next succeeding dyeing units and the trough 75 associated with the last dyeing unit C (Figure 5) is adjustably secured, as at 76, to a pair of side frame members 80, 81 of a squeeze roll assembly or take-up mechanism broadly designated at 82. Although a squeeze roll assembly 82 is provided only adjacent the egress end of the series, it is to be understood that a similar squeeze roll assembly may be provided adjacent the egress end of each of the dyeing units, if desired.

In this instance, the squeeze roll assembly comprises upper and lower squeeze rolls 83, 84, the upper squeeze roll preferably being rubber covered and the lower squeeze roll preferably being provided with a smooth metallic periphery, preferably being made from stainless steel. Reduced opposite ends of the lower squeeze roll 84 are journaled in the uprights 80, 81 and reduced opposite ends of the upper squeeze rolls 83 are journaled in vertically adjustable bearings or blocks 85 mounted for vertical movement in the upper portions of the uprights 80, 81.

The blocks 85 may be adjusted by any suitable means, such as respective adjustment screws 86 which are threaded through a cross frame member 87 suitably secured to and spanning the distance between the upper ends of the uprights 80, 81. One reduced end of the lower squeeze roll 84 has a pulley 90 fixed thereon which is engaged by an endless belt 91 which also engages a pulley 92 driven by an electric motor 93 (Figure 4). The electric motor 93 is supported on a suitable projection 94 carried by the upright 80. The lower ends of the uprights 80, 81 of the squeeze roll assembly 82 are supported on angle brackets 95, 96 carried by the respective side frame members 16, 17, of the dyeing unit C.

In Figure 6, the electric motor 93 is shown in the form of a direct current type of motor, one side of which is grounded, as at 97, and the other side of which has a conductor 100 leading therefrom to the movable part or element of a rheostat 101. The stationary element or part of the rheostat 101 has a conductor 102 leading therefrom to the wire 51 heretofore described. The rheostat 101 is provided to facilitate minute adjustment of the rate of rotation of the squeeze rolls 83, 84 and the rheostat 50 is provided to provide means for accurately adjusting the rate of rotation of the corresponding feed roll 36.

The structure of the drum 60 and the means for feeding dyestuff or other treating solution and fluid into the interior of the tank T and the chambers 25, 63, respectively, may be identical for each of the dyeing units A, B, C and this structure will now be described with respect to the dyeing unit C. The liquid dyestuff, dye liquor or other treating solution may be circulated through the tank T in any desired manner and the insulating fluid may be circulated through the chambers 25, 63 in any desired manner, suitable means to this end being best shown in Figures 5, 7 and 8.

The shaft 70 of the drum 60 extends outwardly beyond the drum side walls 64, 65, loosely penetrates the walls 33, 34 and walls 31, 32 of the cover 22 and tank T, respectively, and is journaled in bearings 104 carried by the corresponding side frame members 16, 17. One end portion of the shaft 70 has a pulley 106 fixed thereon which is engaged by an endless belt 107 which also en-

gages a pulley 110 driven by an electric motor 111. The electric motor 111 is suitably supported on a bracket 112 carried by the side frame member 16.

The electric motor 111 is also a variable speed motor and is shown in the form of a direct current type of motor in Figure 6, wherein it will be observed that one side of the electric motor 111 is grounded, as at 113, and the other side thereof has a conductor 114 leading therefrom to the movable part of a rheostat 115. The stationary part of the rheostat 115 has a conductor 116 leading therefrom to the conductor 51. Of course, the rheostat 115 is provided to facilitate adjustment of the rate of rotation of the drum 60 relative to the ingress feed roll 36 and the take-up mechanism or the squeeze rolls 83, 84 of the squeeze roll assembly 82.

Referring to Figure 8, the numeral 120 indicates a suitable reservoir for containing a supply of liquid dyestuff or other treating solution and from which the solution is directed into the lower portion of the tank T by means of a pipe or conduit 121 having a suitable pump 122 interposed therein. It will be observed in Figure 5 that the pipe or conduit 121 penetrates the chamber wall 20 and communicates with the interior of the tank T for feeding treating solution into the space between the lower portion of the drum 60 and the walls of the tank T.

The side walls 64, 65 of the drum 60 are spaced closely adjacent the inner surfaces of the side walls 31, 32 of the tank T and, as the dye liquor is fed into the tank T, the level thereof is maintained slightly below the level of the upper edges of the side walls 31, 32 by means of a discharge pipe or conduit 124 which returns the excess solution or dye liquor to the reservoir 120 (Figure 8). It is apparent that the conduits 121, 124 each has suitable branches 121A, 121B thereon for directing the dyestuff into the tank T of the respective dyeing unit A, B. The branches extending from the conduit 121 to the respective dyeing units A, B are indicated at 121A, 121B and the branches extending from the conduit 124 to the respective dyeing units A, B are indicated at 124A, 124B. Of course, a separate reservoir for the dye or other solution may be provided for each web treating unit, if desired.

The circuit shown in Figure 8 is so arranged that either gas or liquid, such as steam or water, may be introduced into the insulating chamber 25 of the tank T and the insulating chamber 63 of the drum 60 of each of the dyeing units A, B, C from common sources indicated schematically at 130, 131. Although the apparatus 131 is illustrated as a water cooling apparatus in Figure 8, it is to be distinctly understood that the apparatus 131 may also be provided for heating water to any desired temperature and the steam source 130 represents any suitable means for providing steam at any desired temperature and pressure, it being well known that the greater the temperature of the steam the greater the pressure thereof.

In Figure 8, the inlet and outlet sides of the steam source 130 have respective pipes or conduits 132, 133 leading therefrom to respective three-way valves 134, 135 and opposite sides of the water conditioning apparatus 131 have pipes or conduits 136, 137 extending therefrom and also being connected to the respective valves 134, 135. Connected to the side of the valve 135 opposite from conduits 133, 137 is a pipe or conduit 140 which has branch pipes 141, 142 connected to its other end and which also has branch pipes 140A, 140B extending therefrom to the respective dyeing units A, B in substantially the same manner as will be presently described with respect to the dyeing unit C. The side of the valve 134 opposite from the conduits 132, 136 has a pipe or conduit 144 leading therefrom which is connected to the dyeing unit C, in a manner to be later described, and the pipe 144 also has branch pipes 144A, 144B leading therefrom to the respective dyeing units A, B and which are connected thereto in the same manner, to be presently

described, in which the pipe or conduit 144 is connected to the dyeing unit C.

The conduit 142 is communicatively connected to the chamber 25 and has a suitable check valve 146 interposed therein. The conduit 141 is connected to the corresponding end of the shaft 70 for communication with a channel or a passageway 147 therein, by means of a rotary connection or joint generally designated at 148. There are many different types of rotary joints which may be used to effect communication between the stationary pipe or conduit 141 and rotating shaft 70, such as is disclosed in the patent to Jacobson No. 2,407,745 of September 17, 1946. Therefore, a detailed illustration and description of the rotary connection 148 is deemed unnecessary. The conduit 141 also has a suitable check valve 151 interposed therein, the check valves 146, 151 being provided for the obvious purpose of preventing reverse flow of the fluid through the conduit 140.

The pipes or conduits 144, 144A, 144B each has a suitable steam trap 152 interposed therein, these steam traps being disposed adjacent the corresponding dyeing units A, B, C. The end of conduit 144 remote from valve 134 has pipes or conduits 153, 154 connected thereto, the pipe or conduit 154 being communicatively connected to the chamber 25 and the pipe 153 being connected to the corresponding end of the shaft 70, for communication with a channel or passageway 155 in shaft 70, by means of a rotary connection or rotary joint 156 which may be of substantially the same construction as the rotary connection or joint 148.

The branch pipes 153, 154 are also provided with respective check valves 158, 159 which prevent the fluid from flowing reversely through the pipes 153, 154 into the chambers 25 and the passageway 155 in shaft 70. Connected to the hubs 66, 67 (Figure 7) for communication with the respective channels 147, 155 in the shaft 70, are a plurality of radially extending pipes or rigid conduits 160, 161, respectively. The outer ends of the pipes 160, 161 are connected to the inner surface of the inner wall of the drum 60 for communication with the chamber 63. The rigid conduits 160, 161 also may serve as braces for the inner wall 62 of the drum 60.

Interposed in pipe or conduit 144 at a point between the valve 144 and the pipe or conduit 144A, is a suitable manually operable valve 162, which may be a three-way valve, and which may be so adjusted as to permit the steam from the chambers 25, 63 to be discharged into the atmosphere, as desired. The valve 162 may also serve to permit the steam to return to the steam source or, when the core of the valve 144 is rotated from the position shown in Figure 8, the fluid in pipe 144 will then return to the water conditioning apparatus 131.

A suitable pump 163 is interposed in pipe or conduit 137 for directing the water under the proper temperature into the pipe 140, when desired. When the cores of the valves 134, 135 occupy the position shown in Figure 8, it is apparent that steam is directed from the source 130, through pipes 133, 140, branch pipes 140B, 140C and through the respective branch pipes 141, 142. Thus, the steam flows through the rotary connection 148 from pipe 141, through the pipe 147 and shaft 70 and through the pipes or rigid conduits 160 into the drum chamber 63. At this time, steam also flows from the branch pipe 142 into the tank chamber 25. This maintains the liquid dyestuff, dye liquor or other solution fed into the tank T from the reservoir 120 under proper operating temperature at all times, although a relatively small amount of solution is present in the tank T at one time in proportion to the amount of fabric or web material passing therethrough.

The steam escapes from the chambers 25, 63 through the pipe 154, on the one hand, and through the rigid conduits or pipes 161, channel 155 in shaft 70, rotary connection 156 and pipe 153, on the other hand. It follows

that the steam may then be discharged through the pipe 144 and valve 162 or returned to the steam source 130 through the pipes 144 and 132. It is apparent, that when the cores of the valves 134, 135 are rotated to the proper position, the water from the apparatus 131 will then be circulated in substantially the same manner as that described with respect to the steam from source 130.

Referring now to Figures 1, 2 and 5, it is apparent that the web material W is drawn from the source 10 by the feed roll 36 associated with the first dyeing unit A, after which the web material W is advanced through the dyeing unit A in the manner heretofore described with respect to the dyeing unit C, the rate of rotation of the drum within the dyeing unit A being such, relative to the rate of rotation of the feed roll 36, as to cause the web material to remain slackened or relatively loose after it passes through the tank T of the first dyeing unit A. Of course, the web material W is withdrawn from the dyeing unit A and fed into the second dyeing unit B by the corresponding roll 36 in the manner heretofore described and the same is also true with respect to the withdrawing of the web material from the second dyeing unit B and feeding the same into the third dyeing unit C, by means of the corresponding feed roll 36 in the manner heretofore described.

Since the web material is saturated with the liquid dyestuff or other solution at the time it passes through each of the dyeing units A, B, it is desirable that the temperature of the web material be maintained constant as it passes from one dyeing unit to the next succeeding dyeing unit. Therefore disposed between the dyeing units A, B, C are respective removable intervening covers or shields 170 which may be identical and the side walls each of which are shaped to rest against the curved surface of the cover 22 and against the upper edges of the side walls of the corresponding troughs 75. The lower front portions of the covers 170 also rest against the lower rear portions or egress portions of the tops of the corresponding covers 22. It is apparent that suitable openings may be provided in the side walls of the intervening covers 170 to accommodate the reduced ends of the rolls 36, 72 and to thereby facilitate ready removal of the intervening covers 170, when desired.

It is thus seen that I have provided an improved continuous web treating or vat dyeing apparatus comprising a closed tank and a rotary drum disposed within the tank and wherein the outer periphery of the rotary drum is disposed in closed proximity to the inner periphery of the circular tank, say, three-eighths of an inch, so the web material may be advanced in a slack state to each of the dyeing units, both by lightly contacting the periphery of the corresponding drums and by the turbulence of the solution disposed between the drums and the tanks as effected by rotation of the drums within the corresponding tanks.

It is to be further noted that I have provided improved means for insulating the walls of the drum and the tank and wherein the insulation is formed of fluid in the form of gas or liquid heated or cooled to the desired temperature in order to maintain the relatively small amount of liquid dyestuff or other solution in the tank T at the proper operating temperature at all times and thereby providing means whereby a substantially greater amount of web material can be treated in proportion to the amount of liquid dyestuff or other solution used, as compared to continuous vat dyeing or other treating processes heretofore employed.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes

of limitation, the scope of the invention being defined in the claims.

I claim:

1. Apparatus for the liquid treatment of textile web material comprising a rotary drum having an outer wall, an inner wall spaced from the outer wall, said inner and outer walls defining a first chamber therebetween, a tank having a curved bottom of an internal radius slightly greater than the external radius of the outer wall of the rotary drum, a chamber wall spaced from the curved bottom of said tank and defining a second chamber beneath the curved bottom of the tank, means to feed a treating solution into the tank, means to effect movement of the web material in a slackened state between the curved bottom of the tank and the outer wall of the rotary drum, and means for circulating fluid at a predetermined temperature through the chambers to thereby maintain the treating solution in the tank at a constant temperature.

2. A structure according to claim 3 having a curved cover for said tank whose inner radius is also slightly greater than the external radius of the outer wall of the rotary drum, said curved cover being provided with circularly spaced ingress and egress openings, said means to effect movement of the web material comprising means for feeding the web material into the egress opening at a predetermined rate of speed, means for driving the rotary drum at a predetermined speed independently of the last-named means to permit the web material to pass between the curved bottom of the tank and the periphery of the drum in a relatively loose state and whereby the web material is advanced through the tank due to the turbulence of the treating solution and the rotation of the drum, means for withdrawing the web material from the tank through the egress opening in said cover at a predetermined rate, and means to control the speed at which the web material is withdrawn through the egress opening in the cover of the tank independently of the means for controlling the speed at which the web material is fed into the ingress opening and independently of the means for driving the rotary drum.

3. Apparatus for the liquid treatment of textile web material comprising an imperforate rotary drum, a tank having a substantially circular wall encircling said drum and being of an internal diameter greater than the external diameter of the rotary drum, means for driving the rotary drum, means for feeding web material into the tank at a predetermined rate, means for withdrawing the web material from the tank at a predetermined rate, means for introducing treating solution into the tank between the circular wall thereof and the periphery of the rotary drum, means for maintaining the exterior surface of the rotary drum and at least a portion of the interior surface of the wall of the tank under predetermined temperature to thereby maintain the treating solution in the tank under predetermined temperature with movement of the web material therethrough, said means for maintaining the external surface of the rotary drum under predetermined temperature comprising an external wall defining the periphery of said rotary drum, an inner substantially circular wall in said drum spaced from the external wall, end walls on said rotary drum, end walls on said tank spaced closely adjacent the end walls on said drum, a shaft loosely penetrating the end walls of the tank and to which the end walls of the drum are secured, means rotatably supporting said shaft, a plurality of circularly spaced radially extending tubular members extending from said shaft and engaging the inner surface of the inner wall of said rotary drum, there being at least one of said radially extending tubular members disposed inwardly of each of the end walls of the rotary drum, said shaft having a longitudinally extending passageway in each end thereof and being open at the corresponding outer end of said shaft, means establishing communication between the passageways in each end of said shaft and the inner ends of the corresponding tubular mem-

bers, means establishing communication between the outer ends of the tubular members and the space defined between the inner and external walls of said rotary drum, means for feeding fluid under predetermined temperature into the passageway at one end of said shaft for circulating the fluid into and through the latter space, and means for channeling the fluid away from the other end of said shaft.

4. Apparatus for continuously treating a textile web material comprising a tank for containing a treating solution having a segmental bottom wall and end walls, a driven watertight rotary drum disposed within said tank and having an outer radius substantially less than that of the inner radius of the bottom wall of said tank, means to feed the web material into the tank, means to withdraw the web material from the tank, means independently controlling the rate of the feeding means, the withdrawing means and the rate of rotation of the drum so the web material remains in a slackened state as it is advanced between the drum and the bottom wall of the tank, means for maintaining the external surface of the rotary drum at predetermined temperature for maintaining constant the temperature of said solution comprising an external wall defining the periphery of said rotary drum, an inner substantially circular wall in said drum spaced from the external wall, end walls on said rotary drum, a shaft penetrating the end walls of the drum and to which the end walls of the drum are secured, means rotatably supporting said shaft, substantially radially extending conduits extending from said shaft and engaging the inner wall of said rotary drum, there being at least one of the said radially extending conduits disposed inwardly of each of the end walls of the rotary drum, said shaft having a passageway in each end thereof and being open at the corresponding outer end of said shaft, means establishing communication between the passageways in each end of said shaft and the inner ends of the corresponding conduits, means establishing communication between the outer ends of the conduits and the space defined between the inner and external walls of said rotary drum, means for feeding fluid under predetermined temperature into the passageway in one end of said shaft for circulating the fluid into and through the chamber, and means for channeling the fluid away from the other end of said shaft.

5. Apparatus for the liquid treatment of textile material comprising a tank for containing a treating solution having a segmental bottom wall and end walls, a driven watertight rotary drum disposed within said tank, said drum comprising an outer circular wall having an

outer radius substantially less than that of the inner radius of the bottom wall of said tank to provide sufficient space between the outer wall of the drum and the bottom of the tank for the passage of textile material therebetween, said drum also comprising an inner circular wall of lesser external diameter than the internal diameter of the outer circular wall to form a chamber between said inner and outer walls, both of said inner and outer walls being imperforate, means to circulate fluid at predetermined temperature into, through and out of the chamber, means to feed said textile material into the tank at a predetermined rate, means for withdrawing the textile material from the tank at a predetermined rate, and means for introducing treating solution into the space between the segmental bottom wall and the outer wall of the rotary drum.

6. Apparatus for the liquid treatment of textile material comprising a tank for containing a treating solution having a substantially circular wall and end walls, a driven watertight rotary drum disposed within said tank, said drum comprising an outer circular wall having an outer radius substantially less than that of the inner radius of the circular wall of said tank to provide sufficient space between the outer wall of the drum and the circular wall of the tank for the passage of textile material therebetween, said drum also comprising an inner circular wall of lesser external diameter than the internal diameter of the outer circular wall to form a chamber between said inner and outer walls, both of said inner and outer walls being imperforate, means to circulate fluid at predetermined temperature into, through and out of the chamber, means to feed said textile material into the tank at a predetermined rate, means for withdrawing said material from the tank at a predetermined rate, and means for introducing treating solution into the space between the circular wall of the tank and the outer wall of the rotary drum.

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