APPARATUS FOR TREATING CLOTH WITH LIQUID

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ABSTRACT

A liquid flow type treating apparatus for treating cloth with liquid in which a staying chamber of treating liquid is provided inside of an axially extending drum shaped vessel, an overflow transfer mechanism and a driving reel are furnished inside of an accommodating cylinder provided in an upper end portion of the vessel, a guide tube connects the overflow transfer mechanism with the staying chamber, and a liquid falling mechanism prevents cloth transferred through the guide tube into the staying chamber from floating up in the staying chamber, so that any unevenness in the cloth is avoided and a uniform treatment of cloth is obtained.

6 Claims, 3 Drawing Figures
APPARATUS FOR TREATING CLOTH WITH LIQUID

BACKGROUND OF THE INVENTION

This invention relates to a LOCO type overflow system cloth treating apparatus for treating textile materials, such as cloth, with liquid and is applicable to all kinds of fabrics, woven and non-woven cloth, rovings, tops, natural or synthetic fabrics, such as cotton, wool, rayon, nylon, etc. These will hereinafter be referred to generally as "cloth." The invention is applicable to various forms of wet treatment such as washing, dyeing, fulling, milling, scouring, or other treatments in which material is contacted with a liquid.

There are many known forms of apparatus for treating cloth such as winch treating apparatus, jigger treating apparatus, beam treating apparatus, and jet dyeing treating apparatus, which are operable in a pressurized condition or in a non-pressurized condition.

When cloth is treated by means of winch treating apparatus, the cloth is stretched strongly in the longitudinal direction only, so that the longitudinal and transverse contractions are different, causing the feel of the cloth to deteriorate, and at the same time the wrinkles are fixed, causing creases in the gray, and the creases produced in the gray could not be removed perfectly in the finishing operation. Such phenomena is notable as the temperature and pressure increase.

In the case where the cloth is to be treated using jigger treating apparatus, no creases are produced in the gray, but the cloth wound up on rolls is compressed excessively, and its feel deteriorates considerably.

When the cloth is treated by means of beam treating apparatus, differences in winding pressure are found at the inner portion and the outer portion of the cloth wound on the beam, causing uneven dyeing, and the so-called "crapping effect" could not be obtained.

In case the cloth is to be treated by means of jet dyeing treating apparatus, since the cloth to be treated is transferred by a high pressure jet stream through a bent tube, the transfer condition is not rational, and the production of creases in gray or wrinkles could not be avoided.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide an apparatus for treating cloth with liquid, by decreasing the tension in the cloth to be treated as much as possible, and preventing creation of creases in the gray which have acute angles and folded forms, so as to obtain a favourable feel with a soft and wool-like touch.

Another object of the present invention is to provide an improved apparatus, wherein the cloths to be treated in the liquid are not exposed to any strong tensile or compressive forces as in the case of the winch treating apparatus or in the jigger treating apparatus.

Still another object of the present invention is to provide an improved apparatus wherein the cloth to be treated is contacted with the liquid for as long as possible, and, at the same time, a large quantity of cloth can be treated in the apparatus.

Still another object of the invention is to provide an improved apparatus in which bubbling at the contacting area between the cloth and the treating liquid is eliminated or reduced substantially.

Still another object of the invention is to provide an improved apparatus which can be operated with a relatively small driving power by avoiding the utilization of a high energy as in the case of the jet treating apparatus.

A further object of the invention is to provide an apparatus in which the material to be treated is formed in a loose endless band or rope-like structure and is continuously circulated through the apparatus. Part of the path of the material through the apparatus may be extended along a confined passage or guide tube through which the treating liquid is caused to flow in the direction of feeding of the material, whereby the material is transferred through the passage in a smoothly elongated but substantially untensioned condition.

Still further object of the invention is to provide an apparatus for the wet treatment of textile material, such as cloth, comprising a treating vessel to contain the treating liquid, means to cause the flow of a stream of the treating liquid through the apparatus, and means for entrain the material in the liquid stream to transport the material.

Preferably, the apparatus includes an elongated and confined transfer passage or a guide tube, and the material and the liquid stream are caused to flow through the passage or guide tube. Preferably, the apparatus also includes a driving reel to feed the material to the passage.

More particularly, the invention is to provide an apparatus having a device for preventing the floating-up of cloth to be treated in a LOCO type overflow system cloth treating apparatus. The LOCO type overflow system cloth treating apparatus is constituted as follows: an accommodating cylinder for a cloth driving mechanism extends vertically at the end portion of a drum-shaped vessel extending longitudinally in axial direction, a liquid reservoir is provided near the communicating portion between the accommodating cylinder and the drum-shaped vessel, a cloth driving reel is provided above the liquid reservoir and inside the accommodating cylinder, a dropping port of a guide tube is provided below the cloth driving reel in the liquid reservoir, and the edge of the dropping port is positioned below the upper edge of the reservoir, the guide tube, one end of which serves as the dropping port, is positioned at the upper portion in the drum-shaped vessel and in axial direction thereof, while the other end is opened at the lower portion of the other end of staying chambers provided in the drum-shaped vessel, and further, a perforated plate is arranged at the end portion of the staying chambers, and one end of a liquid circulating pipe is opened at the lower portion of the space formed between the perforated plate and the end plate portion of the vessel, and the other end of the tube is opened in the liquid reservoir.

The cloth treating apparatus having the above-described construction, operates as follows: the endless rope-shaped cloth stretched over the cloth driving reel and passed into the guide tube and passed around in the drum-shaped vessel, is transferred into the guide tube together with the liquid stream falling into the dropping port of the guide tube from the reservoir, and the cloth is spread in the liquid by means of the liquid stream from the opening of the guide tube which is located at the other end of the staying chamber, and after the cloth was made to float and to move up and down in the
liquid stream in the staying chamber, then the cloth is drawn up. In the cloth treating apparatus using liquid of the LOCO type overflow system, the cloth is caused to stay in the liquid stream in the axially extending drum-shaped vessel for a comparatively long time, so that sufficient time can be allowed for dyeing.

Since the staying time is thus relatively long, the cloth, in a flowing state, consist of two parts; a part immersed in liquid, and a part floating-up from the surface of the liquid. There occurs a difference of adsorption between the parts which are immersed and which are floated up, and this difference produces uneveness in treatment.

Thus, in the present invention, a liquid falling mechanism is provided above the staying chamber inside the vessel, whereby the floating-up of the cloth by the treating solution flowing down from the liquid falling mechanism is prevented and the uneveness of treatment is eliminated.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a longitudinal side sectional elevation of the device according to the present invention. FIG. 2 is a sectional view showing a part along a line II—II in FIG. 1, and FIG. 3 is an enlarged sectional view showing a liquid falling mechanism portion.

**DETAILED DESCRIPTION OF THE INVENTION**

The apparatus according to the present invention will now be described referring to the drawings. The present device has the external appearance of a locomotive boiler, and two chambers are defined longitudinally by dividing the boiler drum with a partition wall. Two guide tubes are arranged corresponding to the two chambers. The axially elongated drum-shaped vessel 1 is closed at one end portion 2 with an end plate 3 and with an openable cover 4 connected with the end plate 3, and at the other end 5 of the vessel 1, with an end plate 6. An accommodating cylinder 8 provided with a cloth driving mechanism 7 there in is provided on the one end portion 2 of the drum-shaped vessel 1. The drum-shaped vessel 1 and the accommodating cylinder 8 are in communication at the connecting portion and the parts are sealed closely together.

In this case, the drum-shaped vessel 1 is installed so that it slopes slightly downwardly toward the one end portion 2.

The cloth driving mechanism 7 which is provided internally of the accommodating cylinder 8, comprises a cloth driving reel 9 rotated by an appropriate driving mechanism (not shown) and an overflow transferring mechanism 10 and the cloth driving reel 9 is disposed perpendicular to the axis of the drum-shaped vessel 1. The overflow transferring mechanism 10 of the cloth 9 is arranged below the cloth driving reel 9, and it includes a liquid reservoir 11 defined at the connecting portion of the drum-shaped vessel 1 and the accommodating cylinder 8. The liquid reservoir 11 contains an open end of a guide tube 14, the upwardly directed edge of the dropping port 13 of the guide tube 14 is located below the upper edge 12 of the liquid reservoir 11, and an opening 19 of a circulating pipe 17 opens into the liquid reserve 11, the lower end 15 of the circulating pipe 17 is open near the end portion 2 of the drum-shaped vessel through a pump 16.

The guide tube 14 passes from the dropping port 13, penetrating the side wall of the liquid reservoir 11, and extending linearly through the upper inside portion of the drum-shaped vessel 1, and is bent near the other end thereof. The linear portion of the guide tubes 14 are formed in a tuck-like configuration having a rectangular section. By selecting the section as a simple polygon such as triangle or square form, forming of twines, twists of wrinkles due to the flow of liquid is prevented, and the transfer of cloth a passing through the guide tube 14 is effected more smoothly. The reason that such a polygonal section can be adopted is that, when the apparatus according to the present invention in operated, the internal and external pressures in the guide tube become equal, and thus sufficient strength is maintained even with the square tube.

Two longitudinally extending staying chambers 24, 24 are defined by a vertical partition wall 19 extending axially in the lower part of the drum-shaped vessel 1, an end wall 20, a perforated bottom plate 21, the gap between this plate 21 and the bottom of the vessel 1 increasing gradually toward the end portion 2, and a perforated bottom plate 22 continuing from the perforated bottom plate 21 and sloping upwardly toward the end portion 2. Another, a perforated defining wall 23 is provided in parallel with the perforated base plate 22.

The operating 15 of the circulating pipe 17 is positioned in the space 25 at the lower portion of the end portion 2 on the bottom of vessel 1. The lower ends of the guide tubes 14, 14 form openings 26, 26 through the end wall 20 corresponding to the staying chambers 24, 24, respectively.

In the drawing, the numeral 27 designates the openable top cover of the accommodating cylinder 8 and serves for charging the discharging of the cloth. The numeral 28 designates a heat exchanger.

A liquid falling mechanism 30 is arranged above described staying chambers 24, 24, and includes troughs 29, 29 which extend in the breadthwise direction of described chambers 24, 24 above the chambers. Both ends of these troughs 29, 29 are closed, their cross sections are substantially V-shaped, and they are suspended from the supply pipes 31, 31, respectively. The supply pipes 31, 31 are positioned above the staying chambers 24, 24 and slightly above and parallel to the troughs 29, 29 so that the supply pipes 31, 31 can supply liquid to the troughs 29, 29. The supply pipes 31, 31 are formed with a large number of discharge holes 32, 32, ... on the lower surface. These supply pipes 31, 31 are connected to a distributing pipe 33, which extends vertically through the roof of the vessel 1, and is connected to the base portion of a branch pipe 34 located outside of the vessel 1. The branch pipe 34 is communicated with the circulating pipe 17.

The upper portion of the reservoir 11 is opened freely.

The present apparatus operates as follows: A required quantity of dyeing liquid is introduced into the staying chamber 24. An endless rope-shaped cloth is put on the driving reel 9 and is passed through the liquid in the staying chamber 24 and through the guide tube 14. Then the dyeing liquid in the staying chamber 24 is supplied through the circulating pipe 17 by the pump 16 to the liquid reservoir 11. The dyeing liquid thus supplied is increased, and the liquid soon overflows the edge of the dropping port 13 of the guide tube 14 and falls thereinto, and at the same time en-
transfers the endless rope-shaped cloth \( a \) into the guide tube 14. A stream is created through the guide tube by a gravitational head difference between the liquid level in the reservoir 11 and that in the vessel 1. The cloth \( a \) transferred with the dyeing liquid flow passes through the linear portion of the guide tube 14, and changes its course at the bent portion, and is discharged through the opening 26 into one of the staying chambers 24. Then the cloth \( a \) is directed into the liquid of the staying chamber 24 from the other end 5 toward the end portion 2, and the cloth \( a \) floats and makes an up-and-down motion longitudinally. Since the cloth \( a \) is kept in the liquid a relatively long time, it is a favorable condition for dyeing, and a sufficient treating time can be secured. Thus in the treatment, the cloth \( a \), joined into an endless configuration, is circulated, in the form of a rope-shaped structure, through a guide tube 14 into a chamber 24, in which the cloth \( a \) is spread, by means of the flowing liquid, into an extended form. It should be noted that the cloth \( a \) thus spread in the liquid in the chamber 24 tends to float in the liquid and passes along a zig-zag course in the up-and-down directions within the treating liquid while it is transferred from one end to the other of the vessel 1 under the action of the flowing liquid. In this case, the circulating liquid branched from the circulating pipe 17 is delivered through a branch pipe 34, distributing pipe 33, and a supply pipes 31, 31 into the troughs 29, 29, through discharge holes 32, and the liquid supplied into the troughs 29, 29 increases in quantity gradually, and overflows from the upper edges of the troughs 29 and falls into the staying chambers 24, where it contacts the cloth \( a \) flowing on the surface of the liquid. Accordingly, when the cloth \( a \) tends to float up on the liquid, it is submerged beneath the liquid by a part of the circulating liquid falling from the trough 29, so that the floating-up of the cloth is prevented.

During this time, the dyeing liquid in the staying chamber 24 flows into the space 25 from a large number of perforations formed in the perforated bottom plate 21, perforated bent plate 22 and perforated defining wall 23, returns into the liquid reservoir 11 from the opening 15 through the circulating pipe 17 and through the opening 18, thus this cycle is repeated and the circulation is continued.

The perforated bottom plate 21 and the perforated bent plate 22 serve to regulate and prevent the twines of cloth \( a \) being swimmingly transferred, and facilitate the drawing up of the cloth \( a \) by the cloth driving reel 9.

Thus, with the LOCO type overflow system cloth treating apparatus according to the present invention, it is possible to prevent the floating-up of the cloth flowing in the liquid stream, so that unevenness in treatment such as that of dyeing can be eliminated, and the finishing state of the cloth can be much improved.

In the embodimental example shown above, the lower portion of the drum shaped vessel is defined into two chambers by means of the partition wall and two guide tubes are provided, so that a large treating capacity of cloth can be obtained. However still larger treating capacity may be obtained when more than three chambers are provided by partition walls and corresponding number of guide tubes are provided. Thus various changes and modifications may freely be effected, and it is of course practicable to use the lower portion of the vessel as a single staying chamber, and to provide a single guide tube 14.

The apparatus according to the present invention is epoch-making as a cloth treating apparatus of the so-called overflow type, the finished state of the cloth is unexcelled as compared to that obtained by any of the conventional means.

What is claimed is:

1. An apparatus for treating cloth with liquid comprising a longitudinally extending horizontally arranged drum-shaped vessel having a first end and an oppositely disposed second end, an accommodating cylinder attached to the upper side of and extending upwardly from said vessel adjacent its first end, the interior of said vessel and of said accommodating cylinder being in communication with one another, a cloth driving reel located within said accommodating cylinder above said vessel, an overflow transfer mechanism positioned within said accommodating cylinder and extending downwardly into said vessel, said overflow transfer mechanism comprising a liquid reservoir having an upper edge within said said accommodating cylinder located below said cloth driving reel, a guide tube located within said vessel and having an inlet dropping port at one end located within said liquid reservoir of said overflow transfer mechanism below the upper edge of said reservoir and said guide tube extending from said transfer mechanism longitudinally through said vessel toward the second end thereof, wall means located within said vessel below the longitudinally extending portion of said guide tube and forming in combination with said vessel a staying chamber open at the top and said chamber extending in the longitudinal direction of said vessel from its second end to adjacent its first end, the opposite end of said guide tube from said inlet dropping port extending downwardly from the longitudinally extending portion and communicating with said staying chamber adjacent the second end of said vessel, said wall means including perforated plates located adjacent the first end of said vessel and defining at least in part the bottom of said staying chamber adjacent the first end of said vessel and the end of said staying chamber adjacent the first end of said vessel, a circulating tube for circulating the liquid used for treating the cloth is connected at one end to a space within said vessel defined between the bottom of said vessel and said perforated plates and extending upwardly therefrom and connected at its opposite end to said liquid reservoir within said overflow transfer mechanism, a device located above the open top of said staying chamber for preventing cloth from floating in said staying chamber comprising at least one trough extending horizontally and transversely of the longitudinal direction of said vessel and located above the open top of said staying chamber, and means for supplying liquid for treating the cloth from said circulating tube to said trough so that a part of the circulating liquid is caused to overflow from said trough and fall into said staying chamber, so that when the liquid in said reservoir rises above said inlet dropping port a flow of the liquid is created through said guide tube by the difference in head between the liquid level in said reservoir and in said staying chamber and the flow of liquid through said guide tube carries the cloth from said cloth driving reel through said inlet dropping port into said guide tube and then through said guide tube into said staying chamber and within said staying chamber the cloth is
spread by the flowing circulating liquid as it moves toward the first end of said vessel and the cloth is prevented from floating up by the downward flow of liquid from said trough and from the end of said staying chamber adjacent the first end of said vessel the cloth returns to said cloth driving reel in said accommodating chamber.

2. An apparatus as claimed in claim 1, wherein the cross-sectional configuration of the longitudinally extending portion of said guide tube is rectangular.

3. An apparatus as claimed in claim 1, wherein the direction of the axis of said cloth driving reel is perpendicular to the longitudinal axis of the vessel.

4. An apparatus as claimed in claim 1, wherein two of said perforated plates are provided inside of said vessel.

5. An apparatus, as set forth in claim 1, wherein a plurality of said staying chambers separated from one another by said wall means extend longitudinally through said vessel.

6. An apparatus, as set forth in claim 1, wherein said means for supplying the liquid used for treating the cloth from said circulating tube to said trough comprises a branch pipe connected to said circulating tube at a point exterior of said vessel and extending therefrom into said vessel, and a horizontally arranged supply pipe connected to said branch pipe and having discharge holes spaced along its length in its lower surface, said supply pipe extending transversely of the longitudinal axis of said vessel and located above said trough for supplying liquid through its discharge holes into said trough. • • • • •