April 10, 1951 J. M. RUGH 2,548,740

APPARATUS FOR DYEING OR OTHERWISE TREATING FIBROUS MATERIALS

Filed April 28, 1948

Fig. 1.

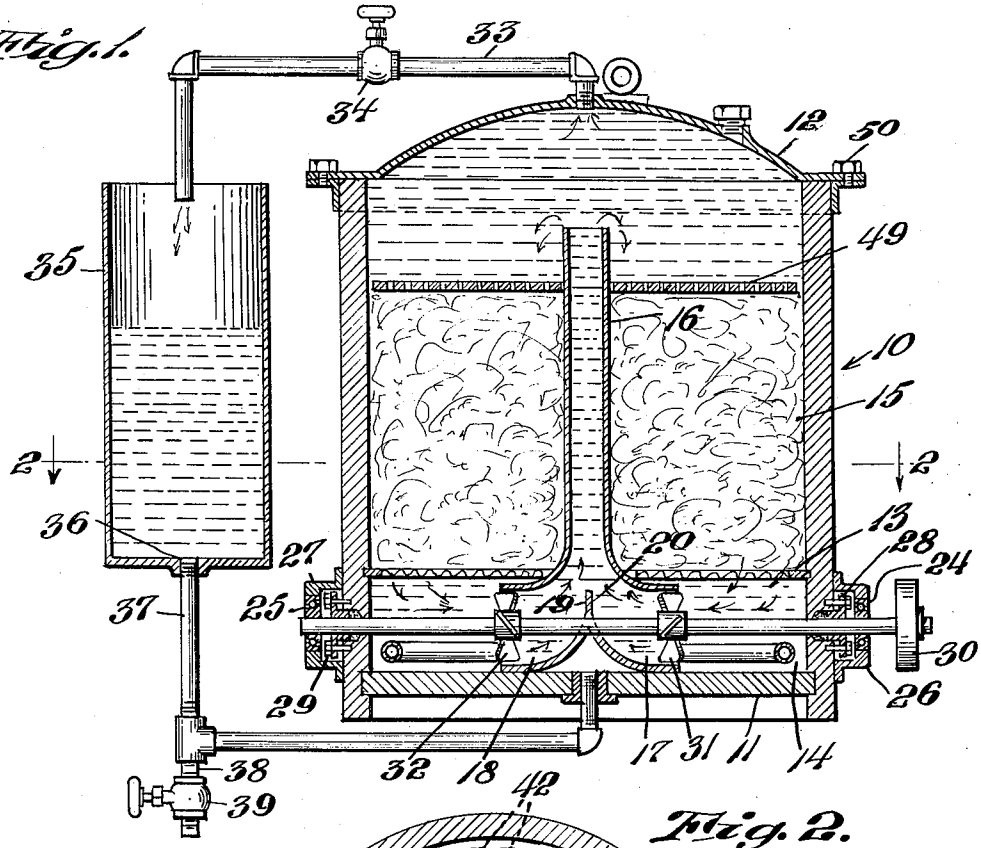

Fig. 2.

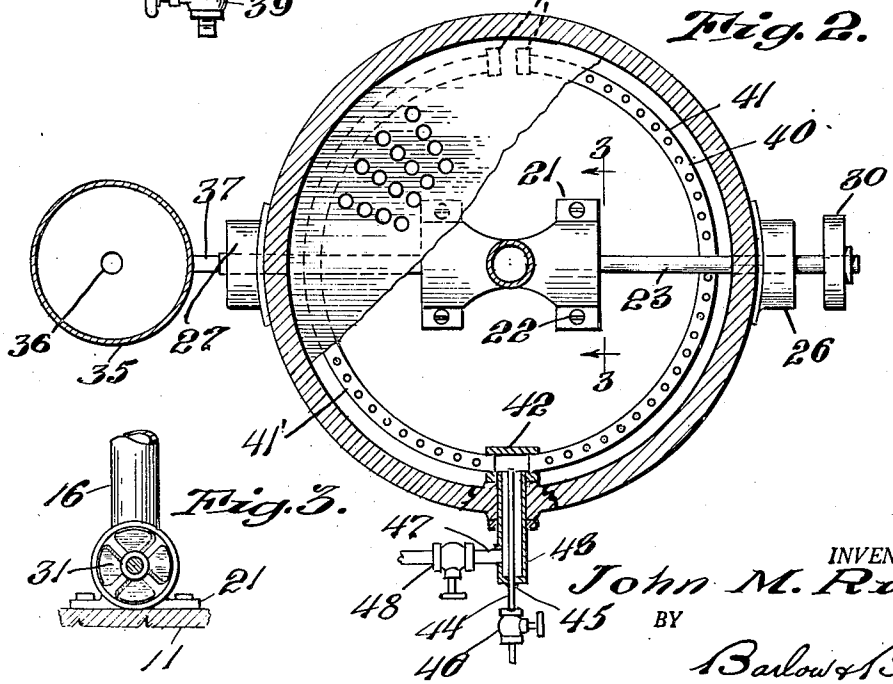

Fig. 3.

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Patented Apr. 10, 1951

2,548,740

UNITED STATES PATENT OFFICE

2,548,740

APPARATUS FOR DYEING OR OTHERWISE TREATING FIBROUS MATERIALS

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Application April 28, 1948, Serial No. 23,696

3 Claims. (Cl. 68—184)

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The invention relates to improvements in an apparatus for dyeing or otherwise treating wool fibers or the like.

In certain prior apparatuses employed for dyeing or otherwise treating wool fibers, the wool is contained in a closed vessel and the treating liquid under pressure is passed through the wool mass and out of the vessel through a centrally positioned outlet to be conducted therefrom to the inlet side of a pump which is usually positioned exteriorly of the vessel. The pressure developed in the upper portion of the vessel above the wool mass is such as to compress and pack the wool mass to such an extent that the liquid does not penetrate and flow evenly throughout the wool mass or wool stock so called.

The general object of the invention is to improve generally on such prior apparatus so as to obtain a better circulation of the treating liquid throughout the wool stock in a manner to create less pressure in the upper portion of the vessel and thus lessen compression of the wool stock so as to permit a more uniform distribution of the liquid therethrough to thereby finish the wool in a more uniform and fluffy state.

A more specific object of the invention is to provide self-contained means within the treating vessel for circulating the liquid therethrough.

Another object of the invention is the provision of an arrangement whereby the liquid circulated through the wool stock will be drawn to the circulating mechanism from opposite sides of the vessel.

Another object of the invention is the provision of a conduit through which a heating medium may be passed to heat the liquid and wool stock and also a cooling medium may be passed to cool the wool stock after treatment thereof.

With these and other objects in view, the invention consists of certain novel features of construction as will be more fully described and particularly pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a central sectional view through a wool stock treating apparatus embodying my invention;

Figure 2 is a sectional view taken substantially along line 2—2 of Figure 1; and

Figure 3 is a view showing the manner of attaching the liquid circulating device to the bottom of the vessel.

In a machine or apparatus of this character, a tub or cylindrical vessel designated generally 10 having a bottom wall 11 and a closure 12 is usually provided for containing the wool stock

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and the treating liquid. In carrying out my invention I provide a perforated plate 13 which is spaced from the bottom wall 11 providing a well 14 and an upper chamber or compartment 15 into which is loaded wool stock to be treated. A vertical central conduit 16 open at the upper end extends from the bottom 11 to a point above the level of the wool stock. The lower end portion of the conduit 16 is provided with opposite branch conduits 17 and 18 having a common wall 19 extending upwardly therebetween a substantial distance so as to provide a baffle 20 for directing liquid entering the conduits 17 and 18 upwardly into the conduit 16. Flanges 21 (see Figures 2 and 3) are provided on the branch conduit for attaching the conduit in place by any suitable means such as screws 22.

A power or drive shaft 23 which extends centrally through the vessel and the conduits 17, 18, is journaled in anti-friction bearings 24 and 25 supported in similar brackets 26 and 27 respectively, which are attached to the outer side of the vessel, while a similar stuffing box 29 seals the shaft at the other end thereof. The shaft 23 may be rotated directly from any convenient power source such as an electric motor, not shown, or the shaft may be provided with a pulley 30 for transmitting power to the shaft. There is attached to the drive shaft 23 to be rotated thereby a right-hand impeller 31 and a left-hand impeller 32. The impeller 31 is positioned within the opening of the conduit 17, while the impeller 32 is similarly positioned in the opening of the conduit 18 whereby upon rotation of these impellers, liquid from the well 14 will be drawn into the branch conduit and through the baffle 20 directed upwardly to pass out of the conduit 16 at the upper end thereof.

In the closure 12 I provide an outlet conduit 33 which may be provided with a manually operable valve 34 so as to control the flow of liquid through the conduit. This conduit extends to discharge into an expansion tank 35 positioned adjacent to the vessel 10. The expansion tank 35 is open at the upper end thereof and has an outlet opening 36 in the bottom wall thereof. A conduit 37 extends from the opening 36 into the well 14 whereby liquid in the expansion tank 35 may flow therefrom into the well 14. The conduit 37 also provides for draining both the vessel 10 and the expansion tank and to this end, a drain conduit 38 is attached to the conduit 37 and is provided with a valve 39 to open or close the conduit 38 which may extend to any desired location or sump.

The liquid for treating the wool stock is usually

heated, and for this purpose, I have provided a header 40 which in the present instance is a form of arcuate perforated pipes 41, 41' each closed at one end by means of caps 42. The header 40 is of a circular form and is positioned in the lower portion of the well 14 and is provided with a fitting 42 attached to the adjacent ends of the pipes 41, 41', a tubular portion 43 extending therefrom outwardly of the vessel 10. This tubular portion 43 opens into the header 40, and a conduit 44 extends through the tubular portion 43 and also opens into the header 40. The conduit 44 and the tubular portion 43 may be secured to each other such as by means of welding as at 45. Steam is introduced from a suitable supply through the conduit 44 to flow through the header 40 and out thereof through the perforations therein to mix with and heat the liquid in a usual well-known manner. A valve 46 is provided for controlling the flow of steam through the conduit 44.

It is desirable that the wool mass after being treated should be cooled before removal thereof so that no sudden change in the temperature of the wool mass will be had. To this end I provide a conduit 47 which is attached to the tubular portion 43 in any approved manner such as by welding. The conduit 47 is provided with a valve 48. Conduit 47 may lead from a cold water supply. When it is desired to cool the wool mass after treatment thereof the valve 46 is operated to close the conduit 44 to the passage of steam therethrough, and the valve 48 is opened to permit cold water under control to flow through and out of the header 40 to intermix with the treating liquid, so as to cool the same and thereby cool the wool mass. By this arrangement the cooling liquid is introduced within the well in a more uniform manner.

In the operation of the apparatus the vessel is filled with a liquid to a level reaching substantially that of line 2—2 of Figure 1. A predetermined amount of wool stock is next loaded into the chamber 15 and packed to the required level such as by wetting the same manually in any convenient manner. A perforated plate 49 of a diameter substantially that of the vessel 10 is positioned to rest upon the wool mass, and the closure 12 is secured in place such as by means of bolts 50 to seal the vessel. The chemical treating substance may be introduced into the expansion tank 35 there to mix with the liquid therein and to flow into the well 14 through the conduit 37. With the valve 46 open to permit the flow of steam through the conduit 44 so as to heat the liquid, the shaft 23 may then be set into motion so as to rotate the impellers 31 and 32 to move or pump the liquid from the well 14 up the conduit 16 onto the wool mass. The liquid will flow downwardly through the wool mass and out through the perforated bottom 13 into the well 14. The flow of liquid through the wool mass will be at a rate less than that pumped up the conduit 16, and the space above the perforated plate 49 will be filled with the liquid which will escape through the conduit 33 into the expansion tank 35. However, the flow of liquid through the conduit 33 into the expansion tank 35 will be controlled by means of the valve 34 such as to permit a pressure in the upper part of the compartment 15 to build up just sufficient, so as to place the liquid under pressure to move downwardly through the wool mass. While I have shown a valve 34 for controlling the flow of liquid through the conduit 33, this flow may also be readily controlled by choosing a conduit of a size to restrict the flow of liquid therethrough so as to provide the desired pressure in the upper portion of the compartment 15.

In providing for the liquid to pass out of the compartment 15 into the well 14 the same is distributed more or less uniformly over the entire bottom wall 13, and in drawing the liquid from either side of the well 14 to be recirculated through the pipe 16, a more uniform distribution of the liquid is had through the wool mass with less pressure required in the upper portion of the compartment 15. Less pressure in the upper portion of the compartment 15 provides less compression or packing of the wool stock whereby the wool stock finishes in a more uniform and fluffy state than in prior apparatuses of this character.

I claim:

1. An apparatus for dyeing or otherwise treating fibrous materials comprising a vessel for containing said materials and the treating liquid, said vessel having a perforated partition spaced from the bottom thereof providing a compartment spaced from the lower portion of the vessel for containing the material to be treated and a sump below said partition, a closure for said vessel, an outlet at the upper portion of said vessel, an expansion chamber, a first conduit from the lower portion of said expansion chamber to the lower portion of said vessel, a second conduit from said outlet to the top of said expansion chamber, means for controlling flow of liquid through said second conduit, a vertical conduit in said vessel extending from the sump through said partition to above the level of the said material in said compartment and having an opening in the lower portion thereof exposed to the liquid in said sump, means including a rotatable impeller positioned in the last said opening for moving the liquid from the sump upwardly through said conduit in a volume greater than may flow through said controlled conduit, whereby to build a pressure in said vessel above the level of said material to force said liquid downwardly through said material, and through said perforated partition to said sump thus bypassing the circulation through the expansion chamber.

2. An apparatus as set forth in claim 1 wherein a heating coil is present in the sump for heating the liquid in the vessel.

3. An apparatus as set forth in claim 1 wherein said vertical conduit has a pair of oppositely directed openings and there is an impeller in each opening for directing the liquid upwardly through the vertical conduit.

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