June 14, 1960 C. P. WALKER 2,940,288

APPARATUS FOR TREATING SHEET OR STRAND MATERIALS WITH LIQUIDS

Filed Nov. 26, 1956 2 Sheets-Sheet 1

FIG. 1

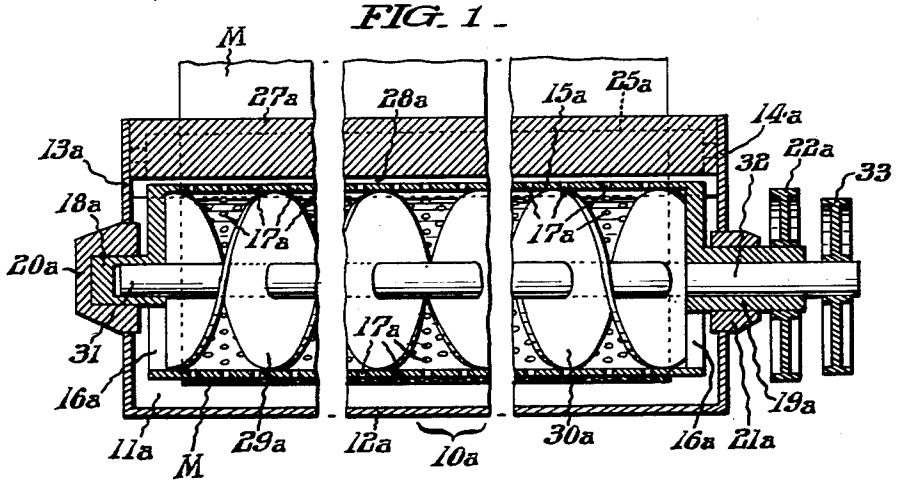

FIG. 2

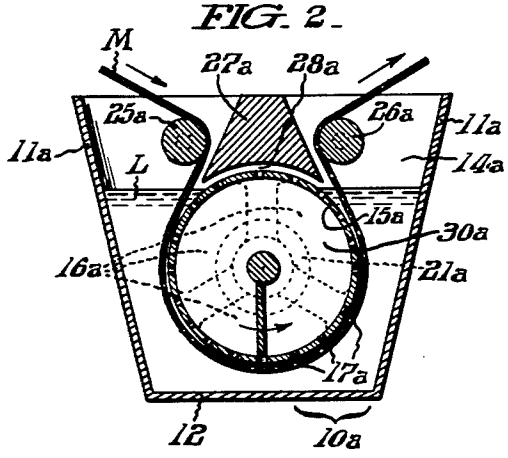

FIG. 3

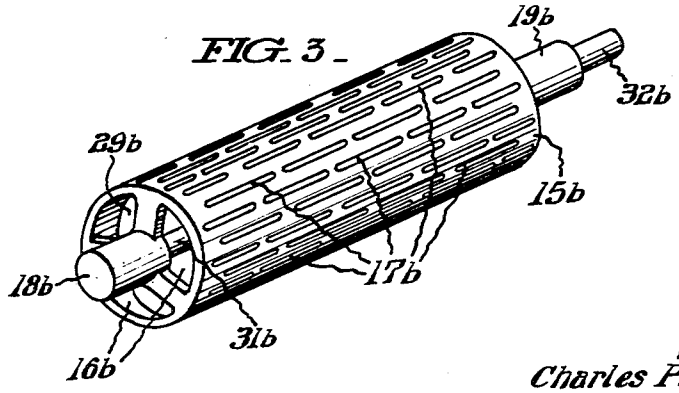

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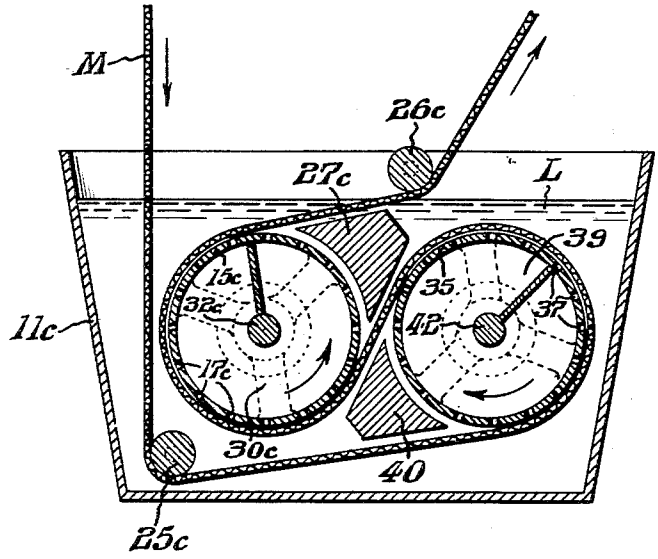
FIG. 4



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APPARATUS FOR TREATING SHEET OR STRAND MATERIALS WITH LIQUIDS

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8 Claims. (Cl. 68—184)

This invention relates to apparatus useful in treating continuous sheet or strand materials, such as textile fabrics, yarns and the like, with dyes, sizing or other liquids, or other liquids for the removal of extraneous matter.

The chief aim of my invention is to provide an apparatus for the above purpose which is simple in construction; which can be relied upon to effect thorough penetration of the materials by the liquids; and which is highly efficient both from the standpoints of output and of power consumption.

How the foregoing objects and advantages are realized in practice will appear from the following detailed description of the attached drawings, wherein:

Fig. 1 is a view, in longitudinal section, of an apparatus for liquid treatment of sheet or strand materials conveniently embodying my invention in one form.

Fig. 2 is a cross section of the apparatus.

Fig. 3 is a perspective view showing a modification of one of the component parts of the apparatus; and

Fig. 4 is a sectional view similar to Fig. 2 showing an alternative embodiment of the invention.

With more specific reference, first more particularly to Figs. 1–3 of these illustrations, the character **10***a* designates a trough for a treating liquid L, said trough having longitudinal side walls **11***a* which converge downwardly, a flat bottom **12***a*, and end walls **13***a* and **14***a*.

Disposed lengthwise within the trough **10***a* and substantially submerged in the liquid L is a horizontally-arranged hollow immersion roll **15***a* which is open at its ends as at **16***a*, and of which the shell is perforated as at **17***a*. At opposite ends, the roll **15***a* is provided with trunnions **18***a* and **19***a* respectively. As shown, the trunnion **18** is rotatively supported in a bearing **20***a* in the end wall **13***a* of the trough **10***a*, and the trunnion **19***a*, extends through and beyond a bearing **21***a* in the other end wall of the trough for connection thereto of a drive wheel or pulley **22***a*.

The continuous material M to be treated is directed into the trough **10***a* over a guide roll **25***a* so as to underpass the immersion roll **15***a* and, upon emerging from the liquid L, is directed over another guide roll **26**. The rolls **25***a* and **26***a* are suitably journaled in the end walls of the trough, and it is to be noted that they are so spaced relative to each other and to the immersion roll **15***a* that the material M is caused to round the greater portion of the cylindrical surface of the latter roll while submerged in the liquid.

Overlying the immersion roll **15***a* in the interval between the guide rolls **25***a* and **26***a* is a baffle in the form of a bar **27***a* which is fixedly supported between the opposite end walls of the trough, and of which the bottom surface is rounded concentrically with the immersion roll **15***a* and is spaced from the surface of the latter by a narrow working clearance **28***a*.

The trunnions **18***a* and **19***a* of the immersion roll **15***a* are hollow for journalling of the opposite ends of the shaft **31** and **32** of a spiral having oppositely pitched end portions **29***a*, **30***a*. As shown, the end **32** of the shaft protrudes beyond the end of the trunnion **19***a* of the immersion roll **15***a* and is there provided with a separate drive wheel or pulley **33**. By reason of the described construction, it will be seen that, as the immersion roll **15***a* is rotated in the direction of the arrow in Fig. 2, treating liquid is drawn into the roll at opposite ends by the oppositely pitched sections **29***a* and **30***a* of the spiral, and expelled by way of the perforations **17***a* to pass through the material M. At the same time, the material is eased slightly away from the surface of the immersion roll **15***a* by the pressure of the liquid which is thus universally distributed to insure thorough penetration and saturation of the material. During the processing, a baffle **27***a* obstructs the perforations in the upper exposed portion of the immersion roll to prevent the impelled liquid from being squirted out of the trough by the action of the spiral. This construction is particularly advantageous when heavy liquids are employed which are thus more thoroughly and effectively agitated for maintenance in homogenous condition. It is to be understood that the immersion roll **15***a* and the spiral are driven independently as indicated by the arrows in Fig. 2. This construction is advantageous over that shown in Figs. 1 and 2 when heavy liquids are employed which are thus more thoroughly and effectively agitated for maintenance in homogenous condition. It is to be understood that in this instance, the immersion roll **15***a* and the spiral are driven independently as indicated by the arrows in Fig. 2.

In Fig. 3, there is shown a modified form of immersion roll **15***b* which, if desired or found to be more advantageous, may be substituted for the immersion roll in either of the two aforedescribed embodiments of the invention. Here, the roll **15***b* has, in its shell, circumferentially and longitudinally spaced horizontal slits **17***b* instead of round perforations, the slits of alternate longitudinal lines being staggered in relation to the slits of the intervening lines.

In the alternate embodiment illustrated in Fig. 4, the trough **11***c* is wider than the trough of the previous embodiment and disposed in it, in parallel relation, are two open-ended hollow immersion rolls **15***c* and **35**. The roll **15***c* is apertured as at **17***c* and provided internally thereof with a spiral **30***c*. The second roll **35** is identical and apertured as at **37** and likewise provided internally with a spiral **39**. In this instance, the material M to be treated is passed down into the liquid L under a submerged guide roll **25***c*, then in succession about the perforated rolls **35** and **15***c* and is finally withdrawn from the trough beneath another guide roll **26***c*. It is to be noted that the guide rolls **25***c* and **26***c* are so located as to predetermine travel of the material substantially about the full circumferences of the rolls **15***c* and **35**. Due to the provision of two perforated immersion rolls and contact of opposite faces of the fabric respectively with said rolls, the treating liquid is forced through the fabric in opposite directions by the action of the spirals **30***c* and **39** with assurance of thorough penetration of the liquid through the fabric. The baffles shown at **27***c* and **40** serve, like the baffle of the previous embodiment, as shields over the exposed surface portions of the rolls **15***c* and **35**. In the apparatus of Fig. 4, the trunnions of both rolls **15***c* and **35** may be solid as in Fig. 3, or one of the trunnions of each may be made hollow as in Fig. 3 for passage of the shafts **32***c* and **42** of the spirals **30***c* and **42** to the exterior and application of driving pulleys to them respectively.

Although in Fig. 4 I have shown but two roll spiral units, I do not consider myself so limited since three or

even more of such units may be utilized if desired or found to be advantageous.

While in accordance with the provisions of the statutes, I have illustrated and described the best forms of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the forms of the apparatus described without departing from the spirit and scope of the invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having thus described my invention, I claim:

1. In apparatus for treating continuous sheet or strand material with a liquid, a container for the liquid; an open-ended perforated hollow immersion roll running at least partly submerged in the liquid in the container; means for rotating the immersion roll; guide means near the surface of said immersion roll and positioned for wrapping the material around part of the outer surface of the immersion roll; circulating means within said immersion roll for moving the liquid from the container into said immersion roll and forcing said liquid outwardly through the perforations of the immersion roll and through the material as the material passes about said roll; and separate drive means connected for driving the circulating means independently of the immersion roll.

2. The apparatus according to claim 1 wherein the circulating means comprises oppositely pitched screws axially arranged within the immersion roll and respectively extending from the center of said roll to opposite ends thereof.

3. The invention according to claim 1 wherein the immersion roll has trunnions rotatively supported in opposite side walls of the trough, one of the trunnions being hollow and extending through the corresponding side wall of the trough; wherein the drive means for the immersion roll comprising a pulley wheel affixed to the protruding end of the hollow trunnion; wherein the circulating means has a shaft extending outwardly through and beyond the hollow trunnion of the immersion roll; and wherein the drive means for the circulating means comprises a pulley wheel affixed to the protruding end of said shaft.

4. The invention according to claim 1 wherein the guide means comprises a pair of auxiliary rolls spaced so as to cause the material to pass about the greater portion of the immersion roll periphery; and wherein a stationary

baffle extends about the peripheral portion of the immersion roll in the interval between said guide means.

5. The invention according to claim 1 wherein the perforations in the immersion roll are in the form of circumferentially spaced longitudinally extending lines of horizontal slits, and wherein the slits of the alternate longitudinal lines are staggered in relation to the slits of the intervening longitudinal lines.

6. The invention according to claim 1 wherein the guide means are auxiliary rolls arranged near the surface of the immersion roll and have their centers spaced at a distance that is less than the outside diameter of the immersion roll.

7. In apparatus for treating continuous sheet or strand material with a liquid, a container for the liquid; a pair of hollow open-ended perforated immersion rolls disposed side by side and substantially parallel to one another in the container and running at least partly submerged in the liquid; means for wrapping the material around part of the surface of one of the immersion rolls and then around part of the surface of the other of the immersion rolls; and circulating means in the respective immersion rolls for forcing the liquid outwardly through the perforations of said rolls to penetrate the material.

8. The apparatus of claim 7, wherein each such circulating means comprises oppositely pitched screw spirals axially within the immersion roll and respectively extending from the center of such roll to opposite ends thereof; wherein means are provided for driving the respective circulating means independently of the respective immersion rolls; and wherein a stationary baffle is provided, extending about the peripheral portion of each immersion roll exposed in the interval between the region of approach and the region of departure of the material to and from such roll.

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