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HOLLOW WOUND PACKAGE HOLDER FOR DYEING APPARATUS

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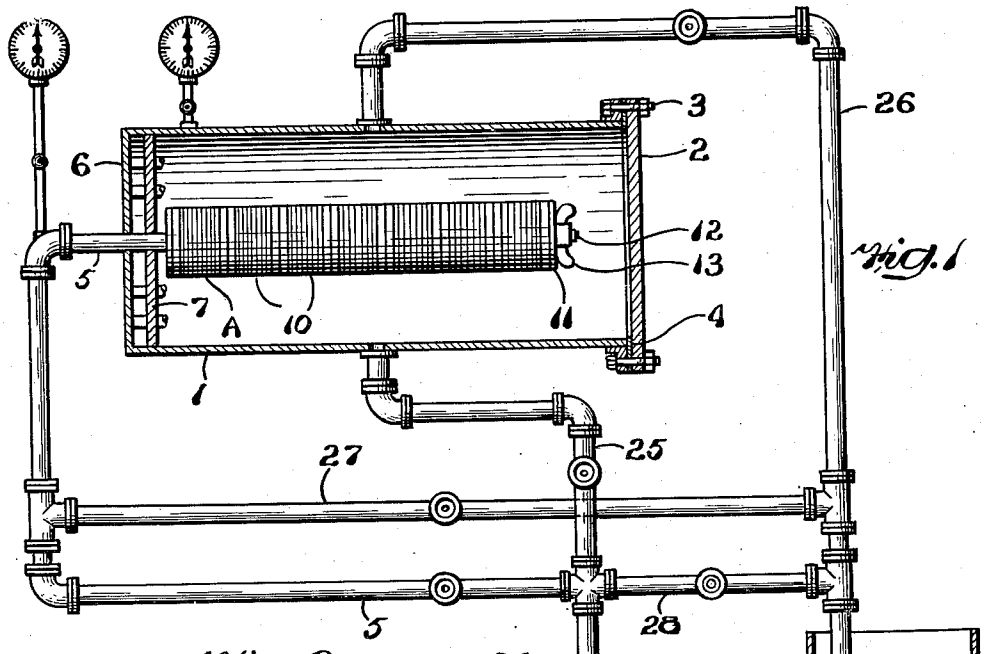


Fig. 1

Fig. 2

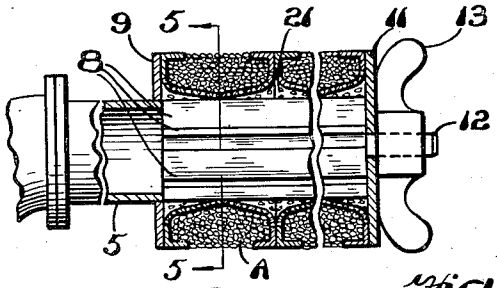
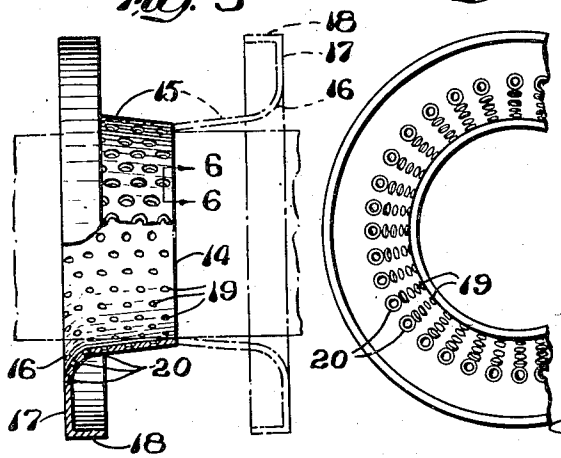


Fig. 3

Fig. 4

Fig. 5



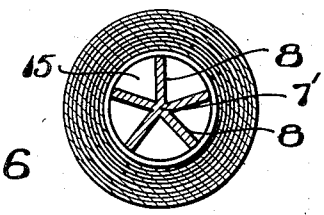


Fig. 6



INVENTOR.
MICHAEL W. RENO &
JAMES E. DOUGHERTY
BY

THEIR ATTORNEY

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HOLLOW WOUND PACKAGE HOLDER FOR DYEING APPARATUS

Michael W. Reno and James E. Dougherty, Philadelphia, Pa.

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3 Claims. (Cl. 68—198)

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Our invention is an improved apparatus for pressure dyeing yarns wound in cakes and it is particularly designed to eliminate the off-shading commonly found in certain portions of such cakes as heretofore dyed.

Our invention is particularly adapted for dyeing filamentary synthetic yarns, such as rayon, while wound in annular cakes, such as come from the spinning pots after precipitation of the yarn. Such a cake is usually supported axially only by a soft knitted tube and forms a cylindrical wall of substantial length and thickness whose ends tend to taper and are of lesser firmness and density and of greater expansibility than the intermediate portion of the cake. When dyes are forced radially through the walls of such cylinders in opposite directions in the usual manner, the yarn sections adjacent to the ends of the cake frequently fail to absorb the dyestuff uniformly with the remainder of the cake, thereby producing off-shade sections of yarn.

Our apparatus overcomes this difficulty by forcing the dyestuff axially or diagonally as well as radially through the cake while the ends thereof are confined or compacted and held against expansion and escape of the dyestuff radially from the end sections is prevented.

In carrying out our invention, the cake is mounted on a frusto-conical spool composed of separable sections each comprising a conical tube having an arcuately flared end and a flange of substantially L-shaped cross section integral therewith and providing the spool with axially extending spaced rims partially overlapping but radially spaced from the tubular portion of the spool. The tubular, arcuate, and, if desired, radial portions of the spool are provided with closely arranged small ports through which the dyeing fluid is jetted into a cake telescoped on the spool.

The end portions of the cake are confined and compacted between the arcuate sections and inturned rim sections of the spool and jets of dye fluid are injected in intersecting directions into these confined portions of the cake and the direct radial escape of dye fluid therefrom is prevented by the inturned rims.

The ports also drain dyeing fluid from the cake when dye fluid is applied exteriorly thereto.

The characteristic features and advantages of our improvements will further appear from the following description and the accompanying drawings in illustration thereof.

In the drawings, Fig. 1 is a somewhat diagrammatic part sectional view of dyeing apparatus embodying our invention; Fig. 2 is an enlarged fragmentary part sectional view of the improved spools embodied in our invention mounted on a supply shaft; Fig. 3 is a further enlarged view of one of the spools, with parts broken away; Fig. 4 is a fragmentary end view of the spool shown in Fig. 3; Fig. 5 is a transverse sectional view on the line 5—5 of Fig. 2; and Fig. 6 is a sectional view of a portion of a spool taken on the line 6—6 of Fig. 3.

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In the embodiment of our invention illustrated in the drawings, a pressure drum 1 has an open end adapted to be sealed by a detachable head 2 which may be connected with the drum by any suitable means, as, for instance, the bolts 3, the joint being sealed by a gasket 4. A pipe 5 is mounted in the fixed head 6 and diaphragm 7 of the drum and supports a shaft 7', Fig. 5, having a plurality of radial webs or spokes 8, the ends of which are welded to the circumference of the pipe 5 adjacent to the flange or disk 9 thereon.

A series of spools 10 are sleeved on the webs 8 of the shaft and may be held against axial movement thereon by a disk 11 sleeved on the threaded stud 12 on the outer end of the shaft 7' and held in place by a thumb nut 13 screwed on said stud 12.

Each spool 10 is composed of a complementary pair of similar members having annular ends abutting along the line 14, Fig. 3, and making a close slip fit adjacent to such line with the quintuplet webs 8 which form triangular channels 15 extending parallel with the axis of the shaft 7 and of the spools 10.

Each of the complementary spool members comprises a frusto-conical tubular shaft section 15 tapering gradually outward from the line of abutment 14 to a head comprising an arcuately flared section 16 from which projects a radial flange 17 having an overturned edge forming a rim 18. The rim 18 is radially spaced from the arcuate section 16 and extends axially toward the line of juncture 14.

The shaft sections 15 and head sections 16 of each spool contain the preferably countersunk apertures 19 and 20, the latter of which may be extended out radially to any desired degree on the flanges 17, but preferably a section of the flange 17 adjacent to the rim 18 is left imperforate so that when the heads of adjacent spools are abutted together on the shaft 7', there is a relatively tight joint formed between the heads adjacent to the peripheries thereof.

The countersunk apertures 19 extend substantially radially to the axis of the spools, whereas

the countersunk apertures 20 extend diagonally to or substantially parallel with such axis so that jets ejected through the several apertures take intersecting directions.

The distance between the complementary flanges 17 of a spool is substantially equal to the axial length of a cake of yarn A when the edges of such cake are in normally compacted condition, and the inner diameter of each rim 18 is substantially equal to the outside diameter of the end of a yarn cake when the strands thereof are in normally compacted condition. Hence when a yarn cake sheathed in its usual stockinet tubular casing is telescoped on the complementary members of a spool and the abutting edges of the latter are brought together, the yarn cake is held in substantially the form in which it was wound in the spinning pot. A series of spools with yarn cakes telescoped thereon are sleeved on the shaft 7' and the juxtaposed edges of the complementary members of each spool and the radial edges of the heads of adjacent spools are clamped tightly together on the shaft between the disks 9 and 11 by tightening up the thumb screw 13. The tapering and arcuate contour of the members of juxtaposed spools form chambers 21 to which or from which dye flows through the channels 15.

Dyeing fluid may be supplied under pressure and in alternation to the interior and exterior of the yarn cakes on the spools 10 in any suitable manner, as, for instance, by a force pump 22 fed from a dye vat 23 and discharging through a conduit 24 to the valved pipe 5 communicating with the channels 15 or discharging through the valved pipe 25 to the pressure tank 1 exteriorly of the spools 10. A valved return pipe 26 connects the top of the pressure drum 1 with the open dye vat 23. The return pipe 26 is also connected with the pipe 5 through the valved by-pass 27 and with the pipe 24 through the valved by-pass 28.

In the practice of our invention, dye is pumped under pressure through the pipes 24 and 25 into the channels 15, the valves of the pipes 25 and 28 being closed and the valve of the return pipe 26 open. The pressure of the dye liquid in the channels 15 forces jets of dye liquid through the apertures 19 and 20 into cakes A in intersecting directions and the end portions of the cakes A are held against distension and confined to substantially the same density as the intermediate portion of the cakes by the flanges 18 which prevent the radial escape of the dye from the ends of the cakes and require it to follow an axial course through the ends of the cakes before it can escape radially from the intermediate portions of said cakes. The effluent from the cakes is discharged from the pressure chamber 1 through the valved return pipe 26 to the vat 23. The return flow is so controlled as to maintain a desired pressure in the tank 1.

When the dye fluid has flowed from the inside to the outside of the cakes A for a desired period, the valves in the pipes 5, 26 and 28 are closed and the valves in the pipes 25 and 27 are opened. Whereupon the pump 22 pumps dye liquid through the pipe 25 into the pressure tank 1 whence it flows through the cakes A reversely to its previous direction of flow and escapes from said cakes through the ports 19 and 20, channels 15, pipes 5, 27 and 26, back to the dye vat 23; the desired pressure in the chamber 1 being controlled by regulating the valve in the pipe 27.

By our improved apparatus we obtain uniform dyeing of the entire yarn cake expeditiously and economically.

Having described our invention, we claim:

1. In dyeing apparatus including a shaft member having webs defining intervening longitudinal fluid channels, the combination of end abutting complemental spool components on said shaft, each such spool embodying a frusto-conical tubular section having a flaring end on its inner tubular surface bounding a fluid channel between them, said flaring end terminating in a substantially radial flange, and said flanges having peripheral portions jointly forming a substantially tight joint for such fluid channel.

2. In pressure dyeing apparatus including a shaft member having radial webs defining longitudinal fluid channels paralleling the axis of said shaft, the combination of a sequential series of axially-aligned opposingly-related pairs of end abutting yarn cake supporting spool-components, each of such components embodying a frusto-conical tubular shaft portion with a head at the major-diameter end, said head end including an arcuately-flared central section and a surrounding radial flange having an angularly-related rim, the minor diameter annular ends of each components being mutually engaged and the arcuately-flared flanged portion of adjacent components bounding a fluid channel between them, while the just mentioned flanged portions form a joint closing-in the said channel, and said frusto-conical shaft portion with the arcuately flared section of each spool component having radially and circumferentially-spaced perforations for the pressure influenced injection of dye fluid into the yarn cake without escape of said dye fluid from the end portions of each cake.

3. The invention of claim 2 wherein the radial flanges and heads of each pair of spool components are of approximately L-shaped cross-section to define the surrounding rim portions, wherein said rim portions are imperforate and inwardly directed, and wherein the component perforations are of countersunk formation, for the purpose specified.

MICHAEL W. RENO.
JAMES E. DOUGHERTY.

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