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APPARATUS FOR TREATING PACKAGED FILAMENTARY MATERIAL WITH LIQUID

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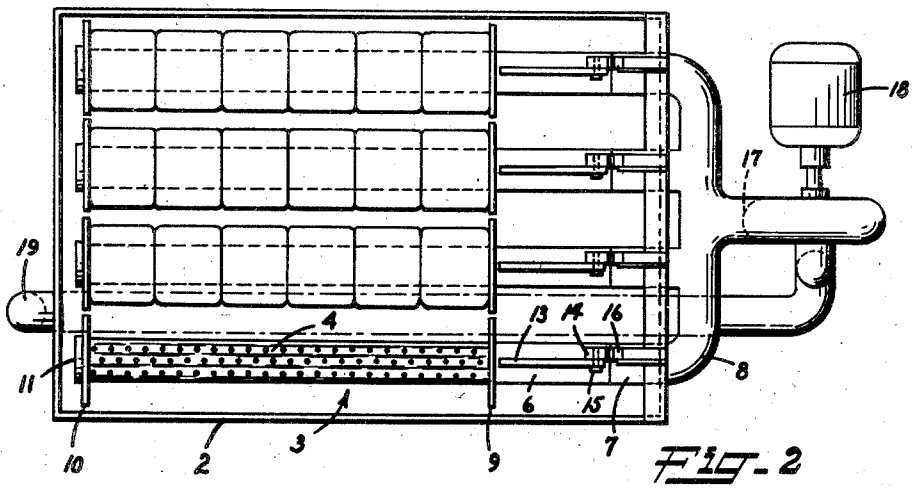


FIG. 2

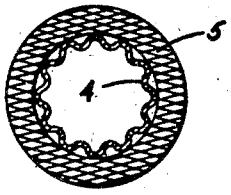


FIG. 3

FIG. 1

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APPARATUS FOR TREATING PACKAGED FILAMENTARY MATERIAL WITH LIQUID

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8 Claims. (Cl. 68—189)

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This invention relates to apparatus for use in treating filamentary material in the form of a wound package with liquid such as dyeing, washing, bleaching, and the like liquids.

The primary object of the invention is to provide apparatus in which wound packages of filamentary material, such as rayon "cakes" or the like are supported in submerged condition in the treating liquid during the entire liquid-treating operation, but which permits free access to the packages at all times without necessitating discharge of the liquor from the vessel containing it. Another object is to maintain the cakes in substantially their original shape during passage of the treating liquid therethrough. Still another object is to permit the passage of the liquid uniformly through all portions of the packages from the inner to the outer surfaces thereof, or vice versa, without undue compression or displacement of the convolutions constituting the packages.

These and other objects of the invention are attained by the provision of an improved apparatus for use in liquid-treating the annular filamentary packages in submerged condition in the liquid, which comprises a vessel for the liquid having associated therewith at least one hollow perforated arm for supporting the packages internally, and through which the liquor may flow from the inner to the outer surface of the packages or vice versa, the arm being swingable relatively of the vessel for alternately submerging the supported packages in the liquid and swinging the supported packages clear of the level of the liquid, and means for maintaining the level of the liquid such that it is above the packages when the latter are supported in the vessel.

In the accompanying drawing, which illustrates a preferred embodiment of the invention,

Figure 1 is a front elevation of apparatus constructed in accordance with the invention;

Figure 2 is a plan view of the apparatus shown in Figure 1, and

Figure 3 is a cross-sectional view taken on line III—III of Figure 1.

Referring to the drawing, there is shown a vessel 2 for the treating liquid and a plurality (four being shown in Figure 2) of arms or rods 3, each of which comprises a hollow perforated portion 4 for supporting the inner faces of cakes 5, and a hollow unperforated extension 6 which is adapted to engage or be disengaged from a socket 6a in the outer end of pipe 7 projecting from the inner surface of an end wall of vessel 2. The pipe communicates with a header 8 for

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introducing treating liquid into the hollow arm or permitting the escape of liquid therefrom as will appear hereinafter. A permanent flange 9 and a removable flange 10 are positioned at opposite ends of hollow perforated portion 4 of arm 3. Removable flange 10 is latched to a cap-like member 11.

A support comprising an upright post-like member 12 and an inclined member 13 is secured to extension 6 and pivotally fixed to a support 14 mounted on the upper rim of vessel 2, by a pivot pin 15. The arm 3 is thus pivotally mounted on a horizontal axis so that when it is swung into vessel 2, all of the packages 5 are submerged in the treating liquid, as shown in solid lines in Figure 1, and when it is swung out of the vessel all of the packages are supported clear of the treating liquid, as shown in dotted lines in Figure 1. A stop 16 is provided on support 12 for retaining the arm in place when it is out of the vessel.

As is apparent from Figure 3, the outer surface of the package supporting portion of arm 3 is fluted. Preferably, the diameter of the outer points of the flutes is somewhat smaller than the inside diameter of cakes 5, so that the inside surface of the cake conforms approximately with the periphery of the fluted arms without the occurrence of excess folds or tension between the peaks of the flutes.

In use, arm 3 is swung into position out of the vessel, the swinging movement being such that extension 6 on the arm is disengaged from socket 6a in pipe 7. A plurality of dry cakes or other annular wound packages of filamentary material are slipped on the arm, the number of cakes placed on each arm being such that when the cakes are submerged in the treating liquid there is sufficient space between the cakes to permit some lateral expansion thereof due to liquid take-up without compressing the cakes together. Removable flange or head 10 is then placed on the arm and secured in place, after which the arm is swung into horizontal position in the vessel. Treating liquid is delivered to the vessel through the action of pump 17 which is driven by motor 18. The treating liquor may be delivered to header 8 through the perforations in the arms, and thence through the filamentary packages supported on the arms from the inner to the outer surfaces thereof. The level of the bath is maintained by the overflow pipe 19. If desired, the procedure may be reversed, the dyeing liquor being delivered directly through the pipe 19 into vessel 2, passing from the vessel

through the cakes, from the outer to the inner surfaces thereof, through the perforations in arms 3 to the interior of the arms, and thence out through header 8.

Preferably, vessel 2 is filled with treating liquor when the freshly loaded arms are swung into horizontal position therein, at the start of the operation, so that the cakes or other wound packages are submerged in the liquid during the entire treating procedure. The pressure under which the treating liquid is forced through the cakes may be varied somewhat, but in general it is preferred to maintain the liquor under a comparatively low pressure of from about 5 to 25 lbs. per square inch, and a large volume of liquid is used, to insure access of the liquid to all portions of the cake while avoiding undue compression of the cakes, distortion of the shape thereof, or displacement of the cake windings, as well as to insure that the level of the bath is at all times above the outer windings of the cakes. When the treating liquid has passed through the cakes and the operation of treating the cakes has been completed, or if for any other reason access to the cakes is necessary, arms 3 may be swung upwardly out of the vessel so that all of the cakes are supported clear of the level of the liquid bath.

Filamentary material which, in the form of wound packages, is treated with liquid in the apparatus of the invention is not subjected to abnormal strain and is more uniformly treated since distribution of the treating liquid through the package is more thorough. Also, since the cakes are submerged in the treating liquid during the entire treating operation, they are at least partially buoyed up by the treating bath and do not tend to be pulled out of shape by the action of gravitational force, such as occurs when packages of filamentary material are supported in a vessel and merely sprayed with treating liquid of any kind.

The apparatus of the invention is especially useful when filamentary material in the form of wound packages is to be dyed. Filamentary material thus dyed is characterized by level dyeing and uniformity of shade throughout, and the dyeing method is simple and practical, and most economical of the dyeing liquor. Further, by virtue of the fact that the supported packages may be readily removed from the dyebath, without disturbing the bath or necessitating discharge of the bath from the dyeing vessel, it is possible to dye packages of material the same color but in shades of varying depth in the same operation. Thus, where packages of light and dark shades are desired, arms on which the packages of lighter shade are supported may be swung out of the bath, while others may be permitted to remain in horizontal position in the bath until the filamentary material supported thereon is dyed a deeper shade, suitable adjustments being made in the concentration of the dyebath as required. It is also possible to dye packages supported on the same arm in different shades by swinging the arms out of the dye-bath when the desired shade is attained, removing some of the packages from the arms, replacing such packages with a blank sleeve of a length corresponding to that of the cake or cakes, and swinging the arm back into horizontal position in the dyebath where it is permitted to remain until the filamentary material has been dyed a shade of the desired depth.

It will be obvious to those skilled in the art that many modifications may be made in the apparatus described and shown herein, which is merely given by way of illustrating the principles of the invention, without departing from the spirit and scope of the invention which is not to be limited except as set forth in the appended claims.

I claim:

1. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one perforated arm the outer surface of which supports a plurality of the packages internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and spaced from the package-supporting portion of the arm, for alternately submerging the supported cakes in the liquid and swinging the supported cakes clear of the liquid, means for holding the perforated arm in stationary position in the vessel and means for maintaining the level of the liquid above the packages in the vessel.

2. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one hollow perforated arm the outer surface of which supports a plurality of the packages internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and spaced from the package-supporting portion of the arm, so that when it is swung into horizontal position in the vessel the supported packages are submerged in the liquid, and when it is swung away from the vessel, the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal position in the vessel and means for maintaining the liquid level above the packages when the packages are supported in the vessel.

3. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one hollow perforated arm having an outer fluted surface for supporting a plurality of cakes internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and spaced from the package-supporting portion of the arm, so that when it is swung into horizontal position in the vessel the packages are submerged in the liquid, and when it is swung away from the vessel the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal position in the vessel and means for maintaining the level of the liquid above the packages when the packages are supported in the vessel.

4. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one hollow, perforated arm the outer surface of which supports a plurality of packages internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and spaced from the package-supporting portion of the arm, so that when it is swung into horizontal position in the vessel the packages are submerged in the liquid, and when it is swung away from the vessel the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal

position in the vessel means for circulating the liquid through the arm and through the packages from one surface to the other thereof, and means for maintaining the liquid level above the packages when the packages are supported in the vessel.

5. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one perforated arm the outer surface of which supports a plurality of packages internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and the upper periphery of the vessel, and spaced from the package-supporting portion of the arm, so that when it is swung into horizontal position in the vessel the packages are submerged in the liquid and when it is swung away from the vessel the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal position in the vessel and means for maintaining the level of the liquid above the packages when the packages are supported in the vessel.

6. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one perforated arm the outer surface of which supports a plurality of packages internally, the arm being so constructed and swingably mounted on a horizontal axis adjacent the upper periphery of the vessel that when it is swung into horizontal position in the vessel the packages are submerged in the liquid and when it is swung away from the vessel the packages are supported clear of the bath, means for holding the perforated arm stationary when it is in horizontal position in the vessel and an overflow for maintaining the level of the liquid above the packages when the packages are supported in the vessel.

7. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one hollow, perforated arm the outer surface of which supports a plurality of packages internally, the arm being so constructed and swingably mounted on a horizontal axis adjacent

the upper periphery of the vessel that when it is swung into horizontal position in the vessel the packages are submerged in the liquid and when it is swung away from the vessel the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal position in the vessel means for circulating the treating liquid through the arm and packages, from one surface to the other of the packages, and means for maintaining the level of the liquid above the packages when the packages are supported in the vessel.

8. Apparatus for use in treating with liquid filamentary material in the form of annular wound packages, in submerged condition in a bath of the liquid, comprising a vessel for the liquid, at least one hollow perforated arm having a fluted outer surface for supporting a plurality of packages internally, the arm being constructed and swingably mounted on a horizontal axis, the axis of swinging being adjacent one end of the arm and the upper periphery of the vessel that when it is swung into horizontal position in the vessel, and spaced from the package-supporting portion of the arm, so the packages are submerged in the liquid, and when it is swung away from the vessel the packages are supported clear of the liquid, means for holding the perforated arm stationary when it is in horizontal position in the vessel and means for maintaining the liquid level above the packages when the packages are supported in the vessel.

JACKSON A. WOODRUFF.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,629,856	Boughton	May 24, 1927
1,709,774	Clarke	Apr. 16, 1929
2,109,893	Abbott	Mar. 1, 1938

FOREIGN PATENTS

Number	Country	Date
8,403	Great Britain	1910
54,484	Switzerland	Feb. 9, 1911
427,913	France	Aug. 17, 1911
469,222	Great Britain	July 21, 1937

Certificate of Correction

Patent No. 2,509,282 May 30, 1950

JACKSON A. WOODRUFF

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 5, lines 33 and 50, strike out "so"; lines 34 and 51, for "adjacent" read , *the axis of swinging being adjacent one end of the arm and*; same column, line 35, and column 6, line 1, after "vessel" and before "that" insert the comma and words , *and spaced from the package-supporting portion of the arm, so*; column 6, lines 24 and 25, strike out ", and spaced from the package-supporting portion of the arm, so" and insert the same after "vessel" in line 22, same column;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of August, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.