

Jan. 19, 1937.

T. McCONNELL

2,068,277

DYEING RAYON IN CAKE FORM

Filed June 20, 1935

2 Sheets-Sheet 1

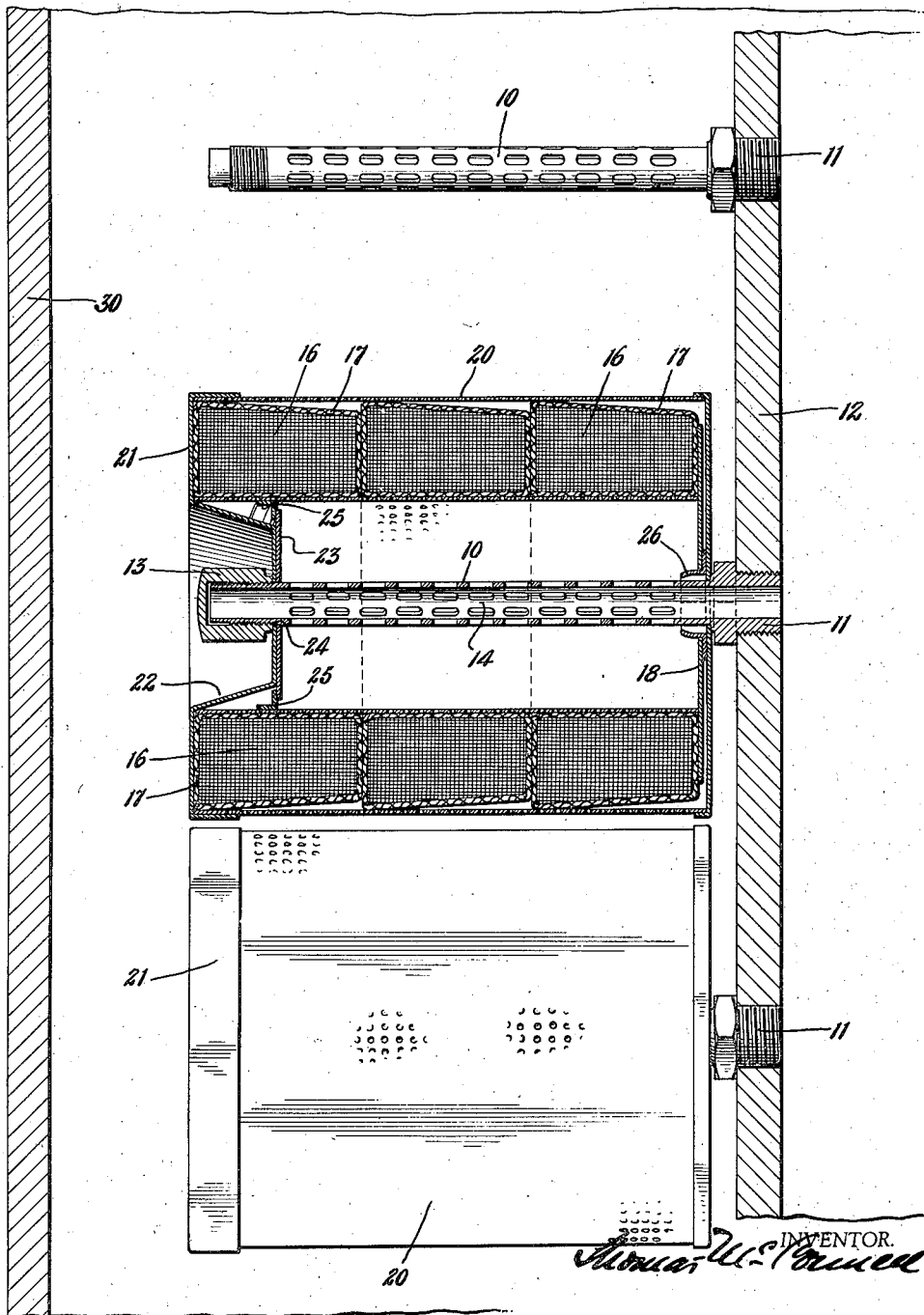


Fig. 1.

INVENTOR.
Thomas W. McConnell

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Fig. 2.

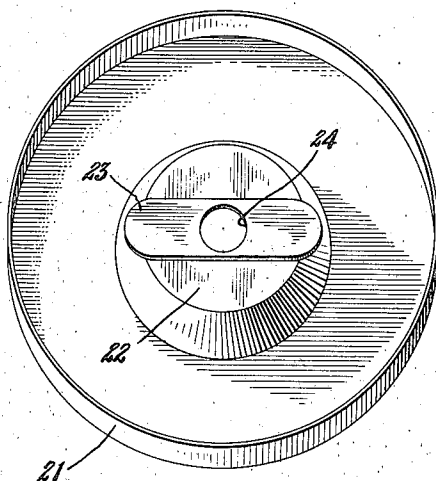
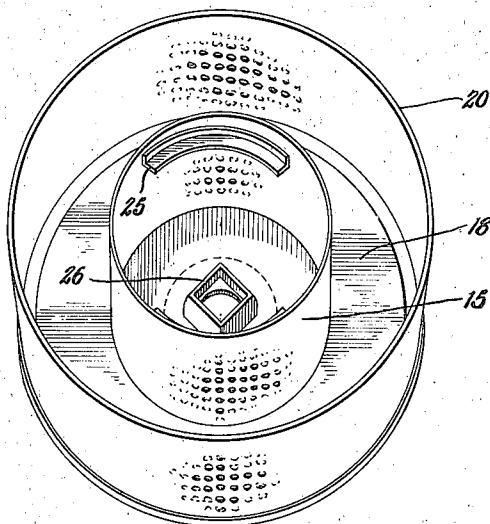


Fig. 3.



Thomas W. McConnell INVENTOR.

UNITED STATES PATENT OFFICE

2,068,277

DYEING RAYON IN CAKE FORM

Thomas McConnell, Northampton, Mass., assign-
or to Hampton Company, Easthampton, Mass.,
a corporation of Massachusetts

Application June 20, 1935, Serial No. 27,574

2 Claims. (Cl. 8-19)

In the usual process of manufacture of rayon from the viscose process by that general series of operations involving "centrifugal", "pot", or "bucket" spinning, the alkaline viscose solution is extruded from spinnerette orifices into an acid coagulation or setting bath, whereby incipient gelatinization ensues by permeation of the filaments by acid, the plastic thread being then taken up by means of guides, passed over a Godet or similar functioning wheel, and thence downwards through a rising and falling funnel into a rapidly revolving centrifugal box or basket, where the filamentous material, comprising filaments coagulated externally but still plastic internally, are thrown against the sides of the revolving centrifugal, thereby building up on the wall thereof a layer of from one to two inches in diameter and three or more inches in height and with hollow interior, and of a weight varying considerably, but usually in the neighborhood of eight ounces dry weight of rayon, thus constituting a cake.

After the completion of coagulation of the filament, it is customary to reel the filaments in skein or hank form, in which condition they are dyed and softened and otherwise finished as desired.

It has heretofore been proposed that, instead of reeling the filaments into skein form and treating them in that condition, the filaments be treated while still in the cake and thus avoid the numerous extra operations and difficulties of handling inherent in skein treatments. The various methods of cake treatment which have been suggested have, however, been subject to disadvantages which became more marked as the treatment of the cake proceeded and which have been particularly serious in dyeing. While initially the cake is to some extent self-supporting it becomes light and fluffy after it has been desulphurized, bleached, and dried, so that by the time it is ready for dyeing it is soft, very easily compressed even under its own weight, and readily injured. Furthermore, it is particularly important in the dyeing operation that all parts of the cake receive equal treatment, for if one part of the cake has more dye flowing through it than other parts those parts receiving the most dye will take on a deeper color and the resulting yarn will be uneven in its coloration.

In accordance with the present invention these difficulties are avoided and the percentage of defects in the yarn is materially reduced as compared either with skein treatment or any previously proposed cake treatment. Briefly

stated, the invention consists in wrapping each cake in a pervious fabric wrapper and then placing a plurality of wrapped cakes end to end and supporting them both externally and internally in a perforated cylindrical carrier through which the treating liquid or dyeing liquor may be passed either inwardly or outwardly in a radial direction and which is formed so as to closely embrace the ends of the assembly of cakes to prevent by-passing of liquid. By holding the cakes so supported in a horizontal position in a bath of liquid during the radial passage of the liquid there is no tendency for the soft cake to condense due to the weight of the saturated yarn, and no by-passing at the ends can occur. Furthermore, since the radial thickness of the cake is small relative to its other dimensions, the cake is supported in the best possible way to avoid any tendency toward distortion and towards disarrangement of the filaments out of which the cake is formed.

One method of exemplifying my invention in a simple, novel, efficient and improved manner is disclosed by the following description when taken in connection with the accompanying drawings in which:

Fig. 1 is a fragmentary vertical section of an apparatus for dyeing rayon in which the rayon-carrying drum is shown in part with some of its perforated pins and cake cages or baskets in section and elevation.

Fig. 2 is a plan perspective of the cover for the cage which is one end of the spool.

Fig. 3 is a plan perspective of the rayon cage or basket with the inner cake-carrying spool in place, but without the rayon cakes thereon.

Referring to the drawings, a hollow perforated support spindle 10, has one end 11 threaded into the wall 12 of a dyeing apparatus of the Obermaier or similar type of dyeing machine. This is a standard form of apparatus in which a plurality of horizontal spindles extend radially outwardly from a central cylinder with its axis vertical. A part of the wall of such a cylinder is shown at 12 in the drawings. In use this cylinder is then lowered into a cylindrical tank with its axis vertical, one wall of which is shown at 30 in the drawings, the top of the tank is covered, the tank filled with liquid, and by a pumping arrangement the liquid is circulated between the interior of the tank and the interior of the cylinder through the hollow spindles which are closed at their ends so that any liquid passing through them must also pass through the cakes. In the standard commercial apparatus provision is made

for causing the liquid to flow either outwardly or inwardly through the spindles. This apparatus has been used for some time in dyeing thread masses unsupported except by the perforated spool on which they are wound, but as far as I am aware has never been adaptable for use in the dyeing of rayon cakes. I will now proceed with the description of the particular devices which I have developed to permit rayon cakes to be treated by this standard apparatus. The outer, free end of 10 is threaded to receive a cage- or basket-retaining cap 13, perhaps containing thereon a rubber gasket for tighter fitting, which cap also serves to close the outer end of the dye conduit 14 in the pin.

A rayon cake-carrying cylinder or spool 15, having a perforated barrel, is provided of such diameter as readily to pass through the central hole in the rayon cake 16, including its wrapping 20 17 (shown diagrammatically). As illustrated, the cylinder 15 is adapted to receive three rayon cakes of the general dimensions specified, but the length and diameter of the cylinder may be varied within wide limits from that herein shown according to the dimensions of the individual cake and the number of cakes it is desired to encase in a single basket. It will be noted from Fig. 1 that the cakes 16 are placed end to end upon the cylinder 15 so that no space is left between them through which liquid may pass.

A bottom flange 18 on cylinder 15, holds the plurality of cakes 16 thereon, while the operator places it within a cage or basket 20, having perforated cylindrical walls, but the bottom wall or portion next to the dyeing cylindrical wall 12, is solid except for a central aperture whereby it is supported at its inner end on pin 10 when placed thereon.

A flanged cover 21 is provided to close the outer end of basket 20, spool 15, and also serves as an outer bearing for the assembly on 10.

The central portion of cover 21 is depressed as at 22, so as to project slightly within the spool 15, and has mounted thereon a lock strap 23. Hole 24 in the strap and cover allows the latter to be placed over the outer end of pin 10, thereby forming the support for the outer end of basket 20 and spool 15.

The outer ends of the lock strap 23 co-operate with a pair of diametrically disposed, segmental, inwardly projecting ledges 25, which are secured to the inner wall of spool 15 in such manner so as to form part of a helix. Thus, as cover 21 is turned, the lock strap 23 feeds under ledges 25, and the helical arrangement of the latter serves to draw the cover tightly into place and keep it so. These ledges also serve as finger grips by which the spool 15 can be removed from the basket 20 or other container without the necessity of grasping the cakes which are mounted on the spool.

A squared boss 26 on the bottom of basket 20 co-operates with a square hole in flange 18 of spool 15, to prevent rotation of spool and contents while cover is being locked thereon.

A plurality of rayon cakes 16, enclosed in their porous wrappers 17, are slipped over the spool 15 while the latter is removed from the basket and is standing on its header 18. The first wrapped cake fits snugly against the header 18, and the remaining cakes abut each other end to end. When the length of the spool has been supplied with cakes—that length being so chosen that the desired number of cakes will just go into it—the spool with the cakes thereon is lowered, with

header 18 still at the bottom, into the basket 20. The cover 21 is next applied and locked in place, this cover fitting snugly against the end of the uppermost cake. The cakes are now supported and protected on all sides and can be transported and handled without possibility of injury, and are ready to be applied to the treating or dyeing apparatus.

It is of course generally preferable to treat a large number of spools at once, but the method followed is just as applicable to a single unit. In either event the baskets with the cakes within them are held in a horizontal position in a bath of dye liquor or other treating liquid and the liquid passed outwardly or inwardly through the basket. It will be seen by reference to the basket shown on the middle spindle in Fig. 1 that the cakes are supported against sagging and that they are without any tendency to shift axially of the basket. There is thus no chance for the cakes to move apart or away from one or the other of the end headers of the basket so that the liquid might find a way past the cakes rather than going through them. In the preferred form the baskets are mounted on the usual spindles of the commercial Obermaier type machines, being held in position by the cap 13 as described above.

A desirable reversal flow of dye liquor from main casing 30, through baskets 20, through rayon cake wrapper 17, if such be used, through rayon cakes 16, etc., into drum 12, may be accomplished by reversal of pressure or partial vacuum or both applied to the dyeing machine, as accomplished by suitable valve arrangement, or pump reversal or other desired means.

In fact, in operation, it is found useful to reverse the dye liquor circulation periodically for more even penetration of dye liquor in rayon and to obtain more uniform dyeing results. In a dyeing operation consuming, say, one and one-half hours' total duration, reversal of flow of dye solution at about 15 minute intervals has been found especially satisfactory when proceeding according to my invention. The manipulation of solutions will also depend somewhat upon the nature of the dyestuffs employed, whether direct, basic, developed, sulfur or oxidizing dyestuffs, and also upon the denier of the rayon to be dyed, and hence the number of filatures in a filament. In some rayons there are as many as 2000 filatures per individual filament.

In a two-bath or poly-bath dyestuff dyeing operation, by means of valve and pump adjustments, more than one kind of solution may be circulated through the rayon cake in manner as heretofore indicated.

In general, the number of cakes which it is advisable to encase in an individual basket, is also dependent upon the space between the circumference of the inner shell of the dyeing apparatus to which the individual baskets are attached through the support pin 10, and the circumference of the non-perforated shell of the outside of the dyeing apparatus.

What I claim is:—

1. A method of dyeing rayon which has been spun, treated, and dehydrated in cake form, which comprises assembling end to end a plurality of rayon cakes wrapped individually in a pervious fabric, the dehydrated rayon cakes being of such soft and fluffy consistency as to be substantially incapable of self-support when wet, enclosing the assemblage of cakes on all sides with a substantially rigid support pervious to liquid

interiorly and exteriorly of the cakes and substantially impervious to liquid at the ends of the cake assemblage, supporting the enclosed cakes in a bath of liquor with their common axes sufficiently horizontal to protect the soft cakes against collapsing pressure from their own weight or from the weight of cakes above them and thus shifting away from the impervious ends of the support so as to provide a by-pass for the dyeing liquor, and passing dyeing liquor under pressure through the cakes between their inner and outer peripheries.

2. A method of dyeing rayon which has been spun, treated, and dehydrated in cake form, which comprises assembling end to end a plurality of rayon cakes wrapped individually in a pervious fabric, the dehydrated rayon cakes being of such soft and fluffy consistency as to be substantially incapable of self-support when wet, enclosing the assemblage of cakes on all sides with a substantially rigid support pervious to liquid interiorly and exteriorly of the cakes and

substantially impervious to liquid at the ends of the cake assemblage, supporting the enclosed cakes in a bath of liquor with their common axes sufficiently horizontal to protect the soft cakes against collapsing pressure from their own weight or from the weight of cakes above them and thus shifting away from the impervious ends of the support so as to provide a by-pass for the dyeing liquor, and passing dyeing liquor under pressure through the cakes between their inner and outer peripheries first in one direction and then in the other, the cakes being packed within the support with sufficient looseness to permit them to move slightly with the direction of application of pressure, away from the support on the side from which the pressure is exerted, thereby causing sufficient shifting of the yarn body of the cakes to prevent the dyeing liquor following the same channels through the yarn body in one direction that it followed in the other direction.

THOMAS McCONNELL.