May 24, 1927. 1,630,197

D. A. McKENZIE

METHOD FOR USE IN THE MANUFACTURE OF ARTIFICIAL SILKS

Filed Dec. 28, 1923 3 Sheets-Sheet 1

Fig. 1.

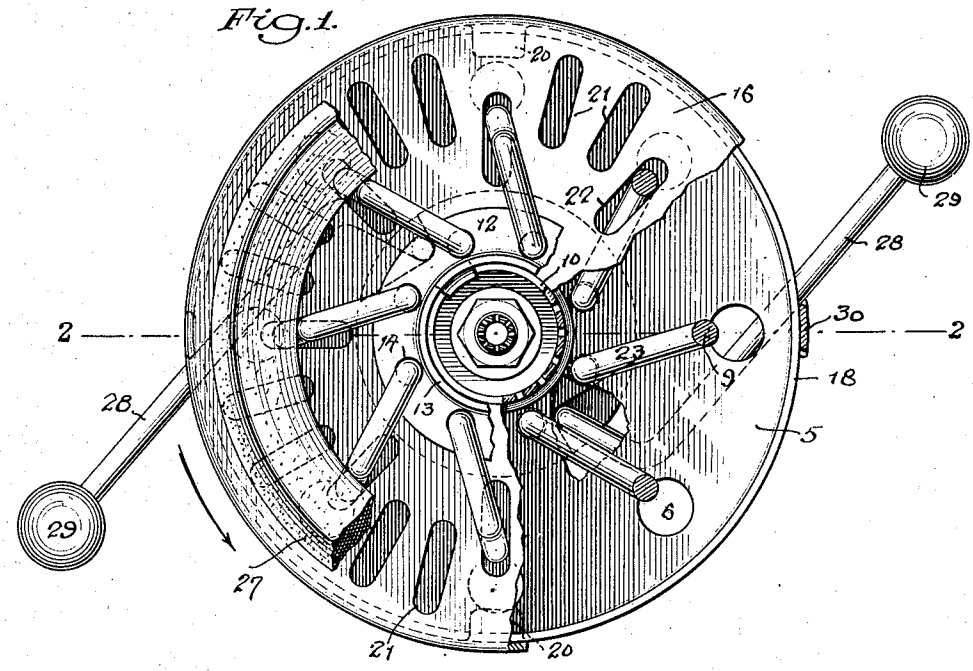

Fig. 2.

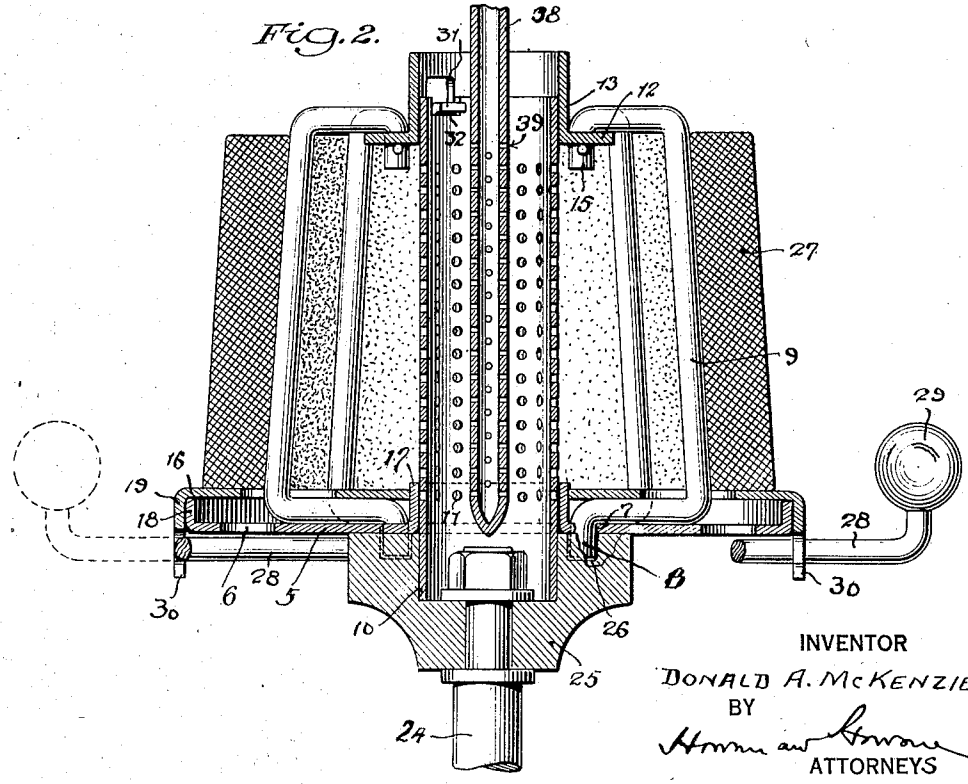

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Fig. 3.

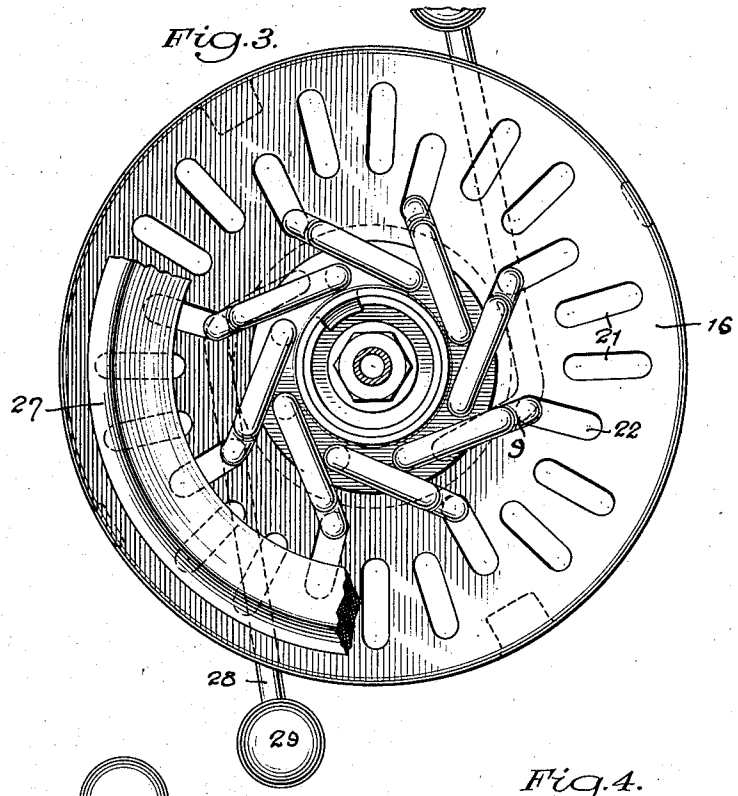

Fig. 4.

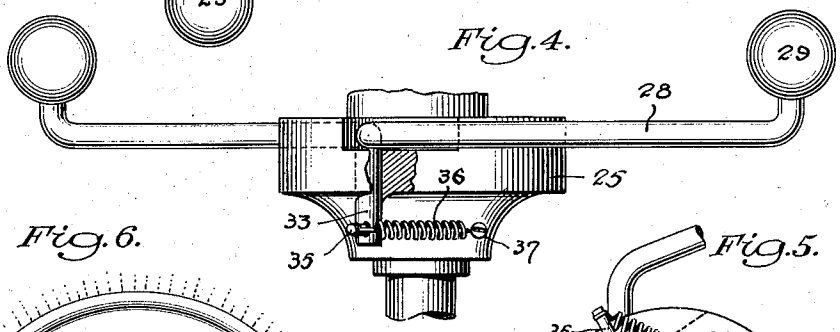

Fig. 6.

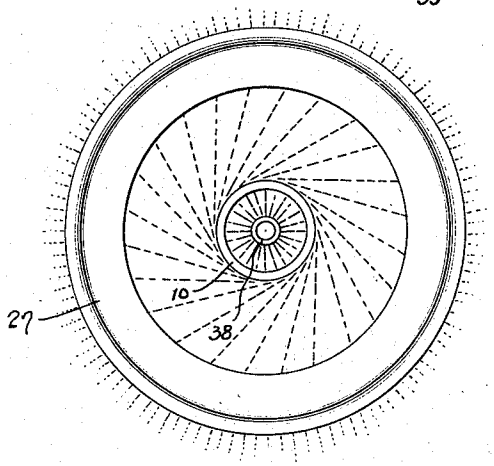

Fig. 5.

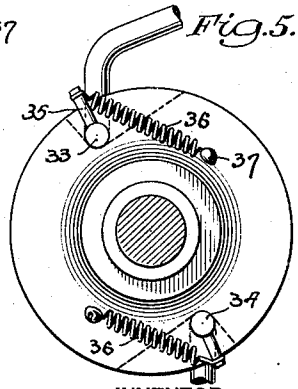

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Fig. 7.

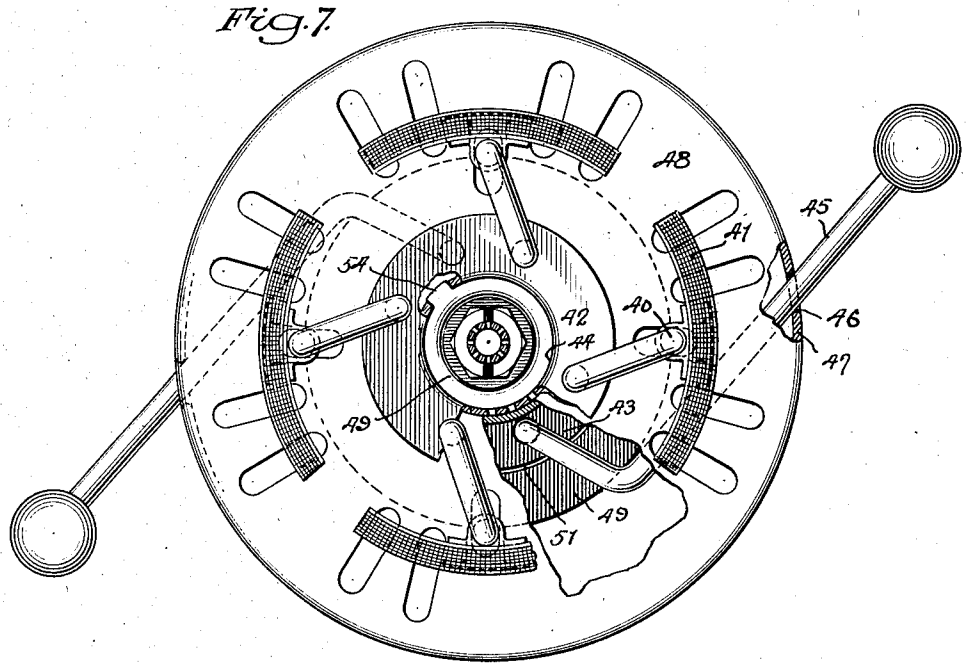
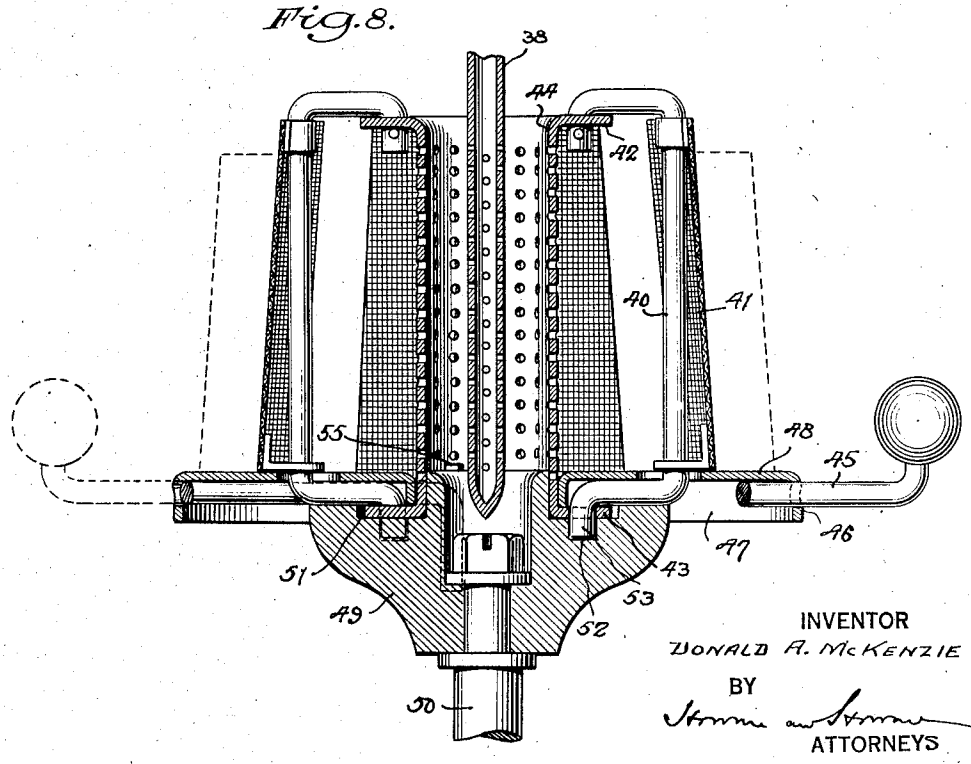


Fig. 8.



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Patented May 24, 1927. 1,630,197

UNITED STATES PATENT OFFICE.

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METHOD FOR USE IN THE MANUFACTURE OF ARTIFICIAL SILKS.

Application filed December 28, 1923. Serial No. 683,213.

My invention relates to a method for use in the manufacture of artificial silks. The object of my invention is to simplify and facilitate the washing and subsequent operations upon the fiber after it leaves the spinning box.

In the manufacture of artificial silk and the like, it is the customary practice to lead the thread from the setting bath, over guide rollers or godets to a rapidly rotating spinning box, within which the thread is twisted, and coiled or built up into what is commonly known in the art as a "fiber cake". Apparatus for this purpose is illustrated in the Clayton Patents Nos. 1,406,153; 1,417,455 and 1,417,456. The thread carries with it into the spinning box acid from the setting bath, which must be removed. As a preliminary to the washing and subsequent treatment of the thread, it has been common practice to reel the fiber from the cake into skeins on a machine of the general type illustrated in the patent to Clayton No. 1,435,805.

Under the best conditions, however, artificial silk thread is delicate and fragile during the early steps in the process of manufacture, and breakage or other injury is frequent during these steps.

My invention eliminates the danger of injury incident to skeining and other delicate handling operations, by maintaining the fiber cake intact, and facilitating the handling thereof during the washing and at least some of the subsequent manufacturing steps. To this end my invention contemplates the doffing of the fiber cake from the spinning box upon a suitable carrier, on which it remains during the setting up period, and by which it is carried during the washing and such subsequent steps as may be desirable. The washing step is preferably carried out by spraying the wash water or the like against the inner periphery of the cake, the latter being rotated at sufficient speed to cause the wash liquid to permeate and be discharged from the fiber cake by centrifugal force.

When the fiber cake has been thus washed, it may be rotated or whizzed for a brief period to remove the free moisture by centrifugal force from the interior of the cake. It is then lifted on its carrier from the washing rotor and transferred, still on its carrier, to the drying chamber or stove, where it is subjected to the drying step while the fiber is still in the cake form.

In its washed and dried condition the fiber now possesses considerably greater mechanical strength, and may be handled without great danger of injury. If desired, it may now be skeined, and subjected, in skein form, to the usual further treatments which are common in this art. My invention, however, contemplates the carrying out of at least some of these further steps while the fiber cake is still maintained in its original condition.

A simple and appropriate carrier upon which the fiber cake may be doffed from the spinning box, and by which it may be supported during its treatment in cake form, is illustrated in the accompanying drawings, in which—

Fig. 1 is a broken plan of a fiber cake and a cooperating washing appliance;

Fig. 2 is a section on the line 2—2, Fig. 1;

Fig. 3 is a plan view of the apparatus shown in Fig. 1, but with the parts in different position;

Fig. 4 is a broken side elevation of the rotor alone;

Fig. 5 is an inverted broken plan thereof;

Fig. 6 is a diagrammatic plan view illustrating the operation of the washer;

Fig. 7 is a broken plan of a modified construction; and

Fig. 8 is a vertical section therethrough.

In the form illustrated in Figs. 1–5, the carrier comprises a base plate 5 apertured at 6 for ventilation and lightness, and at 7 to afford a bearing for the offset lower ends 8 of the centering and gripping bars 9. At its center the plate 5 is apertured to pass over a rotary tubular standard 10 perforated at appropriate points 11, the perforations preferably being rather small. Fitting over the upper end of the standard 10 is a second bearing plate 12, the offset collar 13 of which snugly fits the standard. The plate 12 is appropriately pierced at 14 (Fig. 1) in register with the apertures 7 in plate 5 to receive the upper offset ends 15 of the bars 9.

Overlying the base plate 5 is a bar shifting disk 16 centrally apertured to snugly fit the base plate collar 17, and resting at its

outer periphery upon the marginal flange 18 of the base plate which is embraced by the down-turned marginal flange 19 of the disk 16. The latter is held in swivelling relation to the base plate 5 by lugs 20 offset from the flange 19 and extending beneath the base plate. The bar shifting disk 16 is slotted at 21 for ventilation and lightness, and also at 22 to accommodate the bars 9 which pass therethrough, the lower offset reaches 23 of the bars lying between the base plate 5 and the shifting disk 16. It is obvious that if the base plate 5 be held stationary, the rotation of the disk 16 with relation thereto will cause the bars 9 to swing inwardly or outwardly on their axes 8—15, and to play inwardly or outwardly in the slots 22 in the shifting disk, 16, depending upon the direction of rotation of the latter.

To cooperate with the carrier and to cause the same to bodily rotate during the washing or other step of treatment, I provide a vertical rotary spindle 24, having at its upper end a rigid hub 25, in the upper supporting face of which pockets 26 are formed for the reception of the offset lower ends 8 of the gripping bars 9. When the carrier is positioned upon the hub, the ends 8 of the bars 9 form in effect clutch studs, through which the driving connection between the hub 25 and the cake carrier is effected. The tubular standard 10 over which the carrier plates pass, is fast with the hub and rotates therewith and with the carrier.

In order to locate the gripping bars 9 in proper position for the reception of the fiber cake when the latter is doffed from the spinning box to the carrier, the disk 16 is rotated with respect to the base plate 5 to cause the bars 9 to swing inwardly toward the axis of the carrier. The fiber cake, diagrammatically indicated at 27, is then doffed upon the disk 16 and the latter rotated with respect to the base plate 5, thus causing the bars 9 to move outward into engagement with the inner periphery of the fiber cake. The direction of the rotation of the disk 16 with reference to the base plate 5 to cause the outward swing of the bars on their crank arms, is the same as that which it takes as a result of its inertia and that of its supported mass during the drive of the spindle 24. This direction of rotation may be readily assured by so limiting the radial length of the slot 22 that the bars 9 are prevented from swinging over-center. Consequently, when the spindle is rotated, both inertia and centrifugal action combine to swing the gripping bars 9 outwardly against the inner periphery of the fiber cake. The latter is thus firmly gripped and caused to rotate with the carrier.

Inasmuch as the weight of the fiber cake may not be absolutely uniformly distributed around its axis, or since the axis of the cake when positioned on the carrier may not be precisely coincident with the axis of the spindle, stresses may be set up when the carrier is rotated, which tend to collapse the cage and thus reduce the grip of the bars on the fiber cake, with resultant slippage of the latter. To prevent this possibility, it is advisable to provide masses, the centrifugal effort of which is so exerted as to overcome these unbalanced stresses. This may be accomplished in many ways. It may be attained, for example, by means of the bell crank arms 28 pivoted on the hub 25 and provided at their free ends with weights 29. Lugs 30 project downward from the flange 19 of the disk 16 into the path of the arms 28, and are so located that the thrust of the arms against them, under the action of centrifugal force, is in a direction to rotate the disk 16 in the direction to expand the cage and cause the gripping arms 9 to move outward against the inner wall of the cake.

Since the arms 28 are carried by the hub 25, some means must be provided to so locate the carrier with respect to the hub 25 that the lugs 30 are properly positioned for engagement by the centrifugal arms 28. For this purpose one or more lugs 31 may be struck inward from the collar 13 to enter notches 32 in the upper margin of the rotor standard 10.

Furthermore, since the centrifugal arms 28 must be swung inward in order to insure their proper position with respect to the lugs 30 on the disk when the cage is placed on the rotor in collapsed condition (Fig. 3), some means are preferably provided to draw the arms 28 automatically inward toward the hub 25. In the construction shown the bearing ends 33 and 34 of the centrifugal arms are passed downward through the hub 25, each provided at its lower end with a pin 35 which is engaged by one end of a light spring 36 anchored to the hub at its other end 37. The effort of the spring 36 is sufficient to swing the arms inward toward the hub, but has no appreciable effect upon the effort of the arms under the action of centrifugal force.

The wash liquid may be applied in any suitable way to the inner periphery of the fiber cake. I have illustrated an independent supply pipe 38 which is passed down into the standard 10, and is provided with a series of lateral apertures 39 through which the wash water is discharged against the inner face of the rotating standard 10. It passes through the apertures 11 in the latter and is dispersed in the form of a fine spray against the inner face of the fiber cake. The direction of the jets is indicated in the diagram, Fig. 6. As will be noted, the liquid emerges in a radial spray from the central feed pipe 38 and impinges against the inner wall of the rotary standard 10. Passing

through the holes 11 in the latter, the liquid is discharged in a whirling mist-like spray which bodily rotates in the same direction as the fiber cake 27 against the inner face of which the spray impinges. By reason of the fact that the spray is whirling in the same direction as the fiber cake, a violent impingement of the jets against the fiber of the cake is prevented. On the contrary, the spray beats lightly against the inner periphery of the cake, without injury to the fibers. Permeating the cake, the liquid is thrown off radially in all directions. It is customary to pass the spindles 24 up through the bottom of a box, or side by side in a trough, (where a group of washers operates at the same time) and thus confine the liquid, which is discharged by an overflow or drainage outlet. The acid carried into the fiber cake from the setting bath is taken up by the wash water which permeates the cake by centrifugal force, and is discharged with the water from the trough or box (not shown).

When the washing operation is completed the supply of wash water is cut off from the jet tube 38, and the rotation of the spindle 24 continued for a brief period in order to throw off the wash water contained in the cake. The spindle is then halted, the jet tube 38 removed, and the carrier bodily lifted from the driving hub 25 of the spindle and transferred with the washed fiber cake to the drying chamber or other apparatus for this purpose.

After drying or "stoving", the carrier, with the fiber cake still undisturbed thereon, may be transferred to the skeining machine. I prefer, however, to still maintain the fiber cake undisturbed on the carrier and to subject it to such further chemical action as may be appropriate, for example desulphiding and dyeing, by again placing the carrier upon a driving spindle, and applying the treating liquids to the inner periphery of the cake, through which they pass by centrifugal action incident to its rotation.

As an example of a modified form of construction for the carrier, I have shown in Figs. 7 and 8 a type in which the gripping bars 40 are fewer in number than in the construction first described, each of the bars, however, carrying a segmental screen 41 adapted to lie against the inner periphery of the fiber cake. In this construction the upper and lower plates are dispensed with and are substituted by upper and lower flanges 42 and 43 at opposite ends of the rotary tube 44 which forms a portion of the carrier. The flanges 42 and 43 are suitably apertured in register to receive the upper and lower offset ends of the bars 40 which swing therein. The lower flange 43 is also apertured to accommodate the offset ends of the rods 45 which project through apertures 46 in the down-turned flange 47 on the shifting disk 48. The rods 45 thus also form portion of the carrier in this construction.

The hub 49 at the head of the spindle 50 is provided with an annular channel 51, in which the lower flange 43 of the tube 44 is accommodated, while the pockets 52 into which the stud ends 53 of the bars 40 project, extend downward from the bottom of the channel 51. The entry of the stud ends 53 of the bars 40 and rods 45 into their appropriate pockets 52 in the bottom of the channel 51, may be readily assured by means of a locating boss 54 on the hub 49 which takes into a corresponding notch 55 at the lower end of the tube 44.

In both of the constructions, the rods 45 afford ready means for shifting the gripping bars 40 of the cage outward into engagement with the inner face of the fiber cake, after the carrier has been positioned on the spindle. For this purpose it is merely necessary to grasp the weights at the ends of the rods and pull them outward, the engagement of the rods with the flange of the shifting disk serving to rotate the latter with respect to the hub 49. In the construction shown in Figs. 7 and 8, in which the rods 45 pass through holes 46 in the flange 47 of the shifting disk, the rods may be also used to collapse the cage by shifting the gripping bars 40 inward. It is necessary merely to push the rods inward to cause them to rotate the disk in the opposite direction and thus swing the gripping bars inward.

In the construction shown in Figs. 1–5, the carrier may be handled readily by means of the collar 13, the apertures in which, formed by striking-in of the lugs 31, afford finger holds. A similar flange may be provided at the upper end of the tube 44 (Figs. 7 and 8) if desired—but there is in this construction ample finger room between adjacent bars of the cage.

It will of course be understood that various other modifications, readily occurring to those skilled in the art, both in the details of the steps of the method and in the structural features of the carrier apparatus, may be made without departing from what I claim as my invention.

I claim—

1. In the manufacture of artificial silk, the step of applying liquid to a rotating fiber cake simultaneously throughout the length of the cake axis to cause the liquid to pass through the cake by centrifugal force.

2. In the manufacture of artificial silk, the step of applying liquid in spray form to the inner face of a rotating fiber cake to cause the liquid to pass through the cake by centrifugal force.

3. In the manufacture of artificial silk, the step of applying liquid in the form of a

whirling spray to a rotating fiber cake to cause the liquid to pass through the cake by centrifugal force.

4. In the manufacture of artificial silk, the step of rotating a fiber cake and simultaneously applying thereto a liquid spray whirling in the same direction to cause the liquid to pass through the cake by centrifugal force.

5. In the manufacture of artificial silk, the steps of doffing a spun fiber cake upon a carrier engaging the cake at its inner periphery causing the carrier to rotate and supplying liquid by centrifugal action to the inner peripheral face of the cake during its rotation.

6. In the manufacture of artificial silk, the step of supplying liquid in divided form to the inner peripheral face of a fiber cake throughout the axial dimensions thereof and simultaneously rotating the cake to cause the liquid to permeate the same by centrifugal force.

7. In the manufacture of artificial silk, the steps of supplying liquid simultaneously in all directions to the inner peripheral face of a fiber cake during the rotation of the latter, to cause the liquid to permeate the cake, by centrifugal force, cutting off the supply of liquid and continuing the rotation of the cake to discharge the free liquid from the interior of the cake through its outer periphery by centrifugal force.

8. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the cake upon a carrier and subjecting the cake while so mounted to successive treatments by liquid applied to the inner face of the cake and caused to penetrate the same by centrifugal force.

9. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the fiber cake upon a carrier, and subjecting the cake on said carrier to washing and drying steps in sequence, the washing liquor being applied to the inner face of the cake during its rotation, and caused to pass therethrough by centrifugal force, and the drying step being effected by the halt of the liquid step during the continued rotation of the cake.

10. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the fiber cake upon a carrier, causing liquid to pass through said cake by centrifugal force, removing free liquid from the interior of the cake by centrifugal force, and thereafter drying the cake while quiescent.

11. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the fiber cake upon a carrier, and subjecting the cake on said carrier to washing and drying steps, and subsequently winding the fiber from said cake.

12. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the fiber cake upon a carrier, permitting the setting-up action to take place while the cake is on the carrier, transferring the carrier to a washer and washing the fiber cake while on said carrier.

13. In the manufacture of artificial silk, the steps of forming a fiber cake, mounting the fiber cake upon a carrier, permitting the setting-up action to take place while the cake is on the carrier, transferring the carrier to a washer and washing the fiber cake while on said carrier and during the rotation of the carrier.

14. In the manufacture of artificial silk, the step of rotating a centrally open mass of fiber, supplying liquid to the inner peripheral surface of the mass during rotation of the latter to cause the liquid to pass through the mass by centrifugal force, and preventing injurious abrasion of said surface by the liquid.

15. In the manufacture of artificial silk, the step of rotating a centrally open fiber mass unconfined at its outer periphery, supplying liquid to the central opening of the mass during rotation of the latter to cause the liquid to pass through the mass and be freely discharged from its unconfined outer periphery by centrifugal force, and preventing injurious abrasion of the fiber by the liquid.

16. In the manufacture of artificial silk, the step of spraying liquid against a surrounding mass of fiber during rotation of the latter to cause the sprayed liquid to pass through the mass and be discharged from its outer periphery by centrifugal force.

17. In the manufacture of artificial silk, the step of dispersing liquid by centrifugal force in a spray against the inner peripheral surface of a surrounding mass of fiber while the latter is rotating at a speed sufficient to cause the impinging spray to pass therethrough and be discharged from the outer periphery thereof by centrifugal force.

18. In the manufacture of artificial silk, the step of rotating an annular mass of fiber, and dispersing a stream of liquid in spray form against the inner periphery of the rotating fiber mass.

19. In the manufacture of artificial silk, the steps of surrounding a stationary spray device by an annular mass of fiber, simultaneously rotating the spray device and fiber mass, and feeding liquid to the spray device to cause the dispersal of the liquid in the form of a spray against the inner periphery of the surrounding mass of fiber and causing the sprayed liquid to pass through the fiber mass by centrifugal force.

20. In the manufacture of artificial silk, the steps of placing an annular mass of fiber upon a collapsible carrier, mounting the carrier upon a rotatable spray device, rotating

said spray device and carrier and feeding liquid to the spray device while the latter is rotating to cause the impingement of the liquid in spray form against the inner periphery of the fiber mass and its passage therethrough by centrifugal force.

21. In the manufacture of artificial silk, the steps of placing an annular mass of fiber upon a collapsible carrier, mounting the carrier upon a rotatable spray device, rotating said spray device and carrier and feeding liquid to the spray device while the latter is rotating to cause the impingement of the liquid in spray form against the inner periphery of the fiber mass and its passage therethrough by centrifugal force, halting the spray device, removing the carrier therefrom and permitting shrinkage of the fiber incident to drying while on said collapsible carrier.

22. In the manufacture of artificial silk, the step of rotating a collapsible carrier having thereon an annular mass of fiber, supplying liquid to the inner periphery of the mass during its rotation to cause the liquid to pass through the mass by centrifugal force, halting the carrier and permitting the fiber mass to shrink incident to drying while on said collapsible carrier.

In testimony whereof I have signed my name to this specification.

DONALD A. McKENZIE.