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J. P. LAIRD ET AL

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APPARATUS FOR TREATING ARTIFICIAL FIBERS

Filed June 5, 1935

3 Sheets-Sheet 1

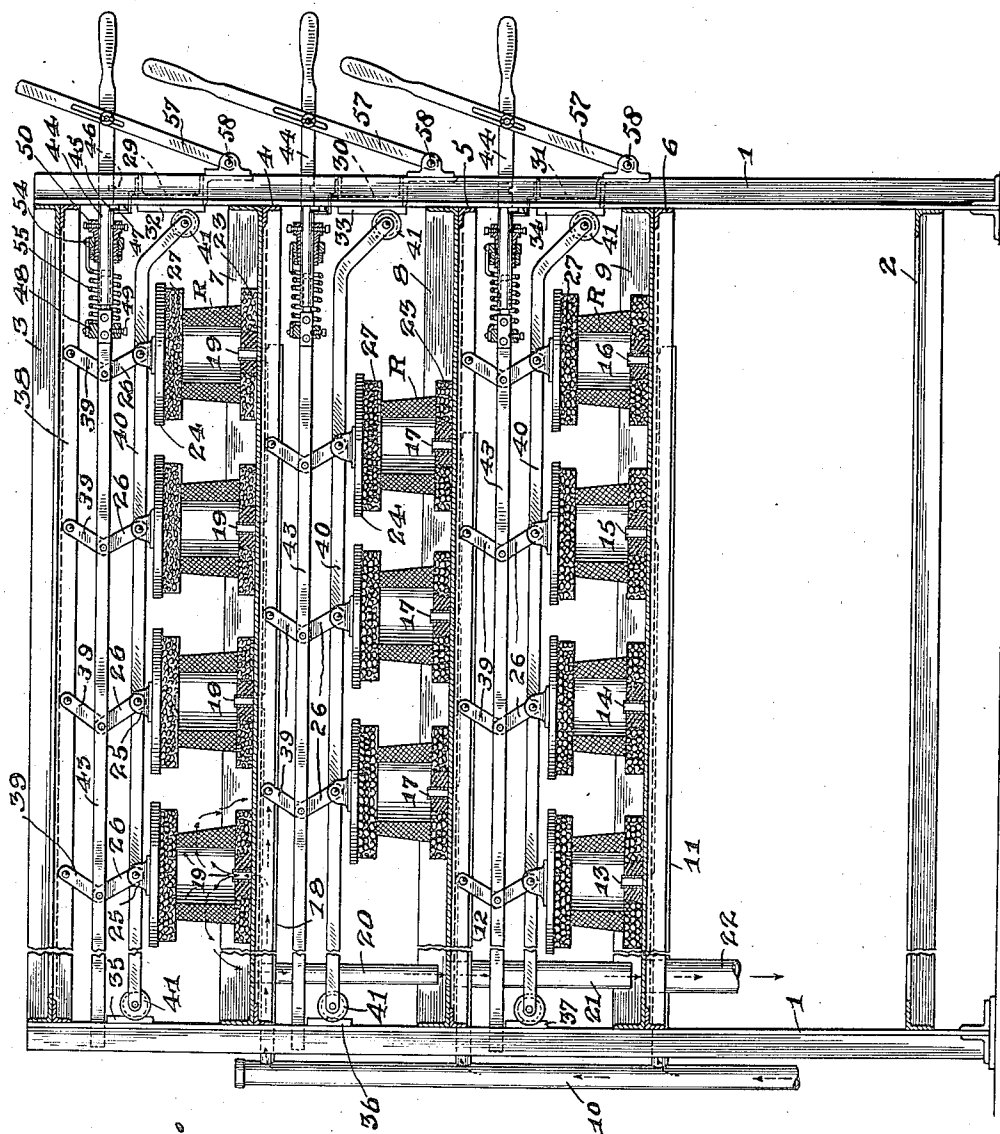


Fig. 1.

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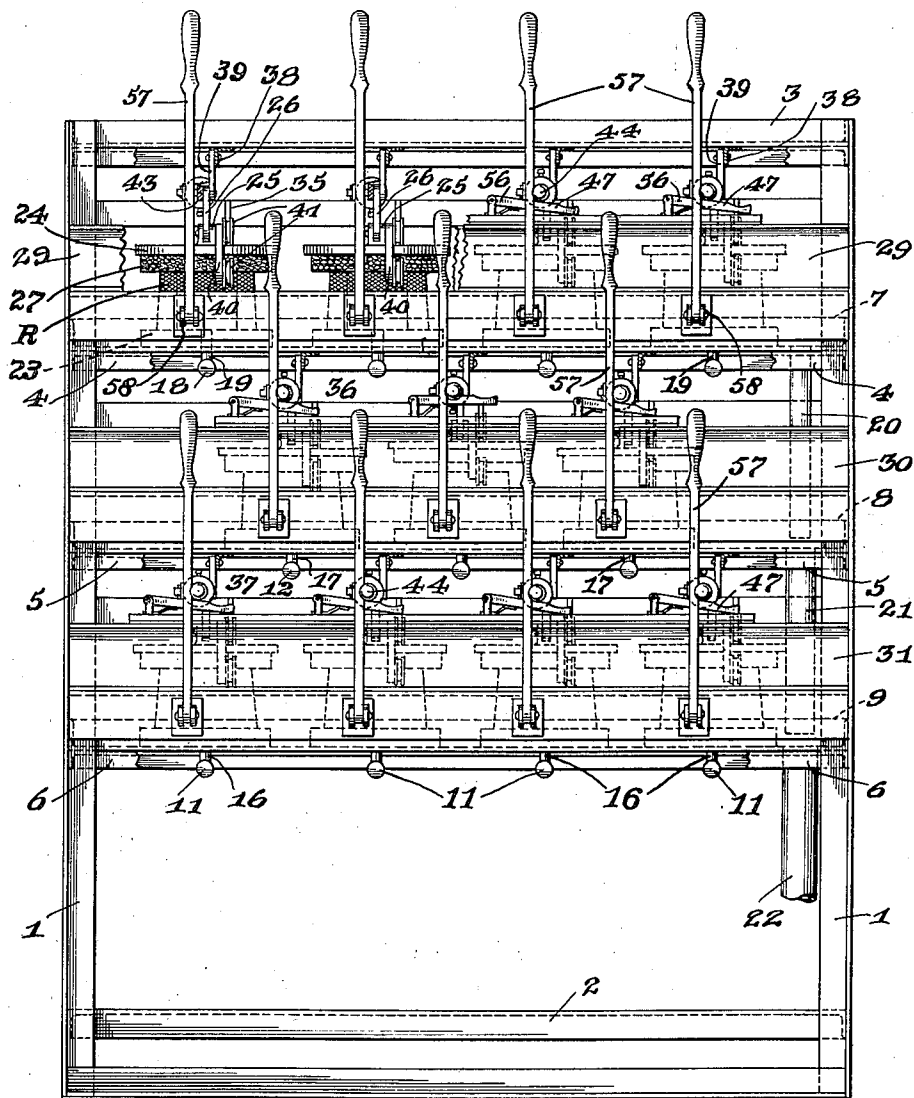
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3 Sheets-Sheet 2

Fig. 2.



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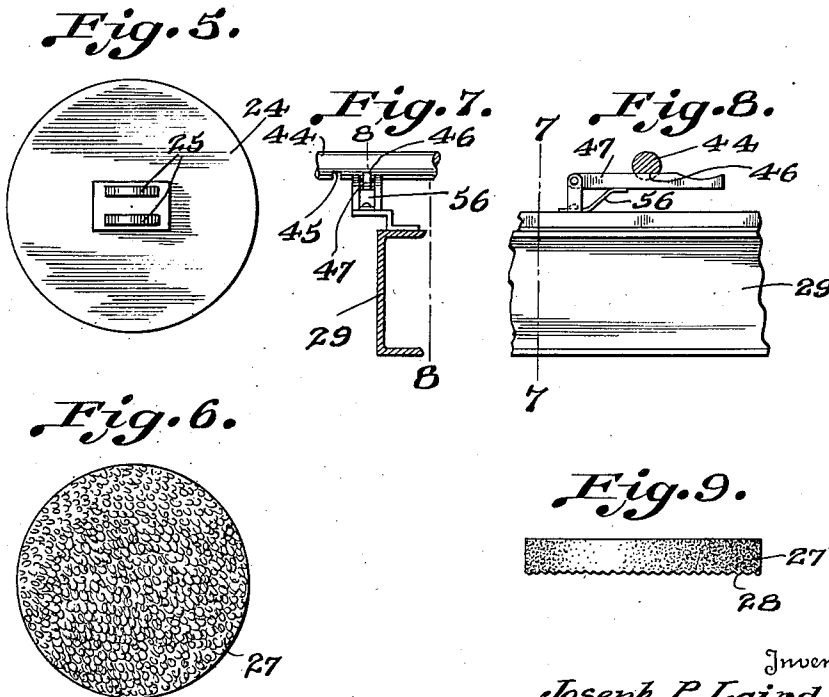
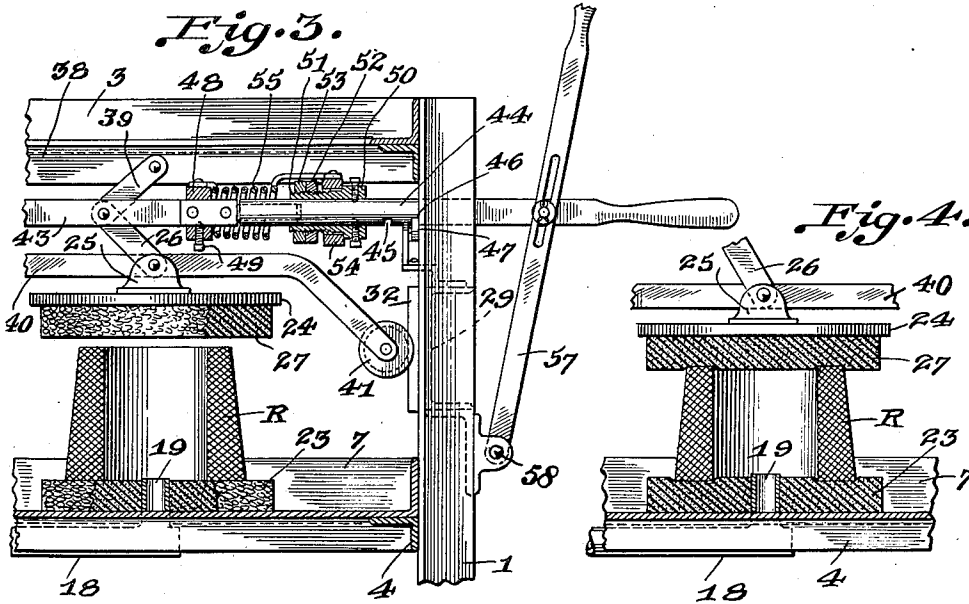
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3 Sheets-Sheet 3



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APPARATUS FOR TREATING ARTIFICIAL FIBERS

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Application June 5, 1935, Serial No. 25,190

6 Claims. (Cl. 28—58)

Our invention relates to new and useful improvements in a method of and apparatus for treating artificial fibers.

Generally, the apparatus consists of a frame in which there is provided a plurality of troughs in tier relation, while imposed in the troughs are a plurality of fixed sponge rubber pads centered about inlet nipples. Also mounted for vertical movement above these first-mentioned pads are further sponge rubber pads or discs. Between the respective upper and lower soft sponge rubber discs are to be clamped the artificial fibers in the form of a "cake", by which is meant a package of rayon thread in the well-known hollow cake form as it comes from the spin pot.

Mechanical means are also provided to cooperate with the respective upper soft or sponge rubber pads, so that if the cakes elongate to a point that might impair the efficiency of the compressed rubber pads, further elongation of the cake is made possible by a link arrangement held under spring tension. In other words, it is desirable throughout the entire treatment of the cake to permit an elongation of the same, due to the water pressure within the cake, and by providing soft or sponge rubber pads, together with a tension means, a water-tight seal is always provided and, at the same time, elongation is permitted without any danger of impairment to the compressible soft or sponge rubber pads or to the rayon cake.

Generally speaking, the method consists of individually clamping a series or rows of artificial fibers or rayon cakes between two soft or sponge rubber pads of about 1½" in thickness, the upper of the respective pads also being capable of a slight vertical movement, though under tension at all times. Then, while the cakes are all individually clamped between their respective soft rubber pads, water under pressure, anywhere from four to eight pounds, is forced through the cakes. The cakes are thus allowed to expand longitudinally between their respective soft rubber pads, and as the upper pads are held under spring tension this tension will partly relieve the pressure on the pads so that there will be no danger of the cake being deformed or the threads at the end of the cake damaged and, at the same time, the pads will be relieved of a pressure that might otherwise impair their efficiency.

Also, by having the soft spongy rubber overhanging the opposite ends of the cakes, it is possible to thoroughly wash the cakes throughout their length or, in other words, also thoroughly wash the shoulders without in any way dis-

turbing the layers of thread, which is not possible if the cakes are clamped between two relatively hard surfaces. At the same time, a tight seal is at all times present between the pads and the cake to thus prevent any water from passing around the ends of the cake rather than passing therethrough.

It will be understood that when we speak of washing the cakes, it includes the complete treatment; that is, the washing, bleaching, desulphurizing, etc., and we have even found that a dye may be passed through the cakes so that the threads may obtain an even and permanent coloring.

More specifically, a principal object of the invention is to provide an apparatus consisting of a plurality of troughs or pans arranged in tier formation, the said troughs being provided with a sponge or soft rubber means for sealing the upper and lower ends of the cakes, inlet pipes extending through the lower respective soft rubber sealing means and tension means connected with the upper soft rubber means (which may be finely adjusted) so that the cakes may be subjected to an internal water pressure of from four to eight pounds. The sponge rubber and the tension means allow the cakes to elongate longitudinally but always holding the sponge rubber means in sealed relation with the cakes so that the water or acid will have to pass through the same and not leak around the ends of said cakes.

Still another object of the invention is to provide an apparatus for treating rayon fiber wherein a plurality of soft rubber sealing means are linked to a horizontal rod, so that as the cakes elongate past the compression point of sponge rubber, between which the cakes are inserted, further elongation is made possible through the link connection with the horizontal rod which, in turn, is held under tension by a spring to thus permit the fullest possible elongation of the cake during treatment and, at the same time, preventing the leakage of any water from around the ends of the cakes.

Still another object of the invention is to provide an apparatus for treating artificial fiber cakes wherein the cakes are placed, preferably, between two sponge rubber pads, so that there is a tight fit between the ends of the cake and the pads immediately on the placing of the cakes between the pads, the pads thus allowing for the expansion of the cakes longitudinally until such time as the rubber is fully compressed, after which the cakes may still be free to expand, due

to the spring tension arrangement, about to be described.

Still another object of the invention is to provide an apparatus wherein a plurality of cakes of rayon are set in rows or series and in tier formation, wherein each cake is to be individually treated and individually subjected to a clamping action between two soft rubber pads and wherein a number of these pads are connected with individual pull rods or arms, so that a number of the cakes can be clamped into position by the operator with the movement of a single rod.

Still another object of the invention is to so arrange this rod as to permit of a varying tension being put on the rod and which tension may be adjusted at will and to also provide a stop on the rod, so that when the soft rubber pads are clamped about the upper edges of the respective cakes there is no possibility of the operator forcing the rod too far forwardly and exerting an unwanted pressure on the cakes which, due to their formation, might be easily deformed or distorted.

With these and other objects in view, the invention consists in certain new and novel features and combination of parts, as will be hereinafter more fully explained and pointed out in the claims.

Referring now to the drawings showing a preferred embodiment,

Fig. 1 is a side elevation of our apparatus for the treatment of artificial fiber cakes (washing, bleaching, desulphurizing, and again washing), showing the same in position, part of the rubber pads being shown in elevation and part in section to more clearly show the inlets for the water to the respective cakes;

Fig. 2 is an end view of the apparatus, parts being broken away for the sake of clearness, the trip rod on the central lever of the second stack being shown in inoperative position;

Fig. 3 is an enlarged fragmentary view of the clamping and sealing means for one of the cakes, partly in elevation and partly in section, the sealing means being in its raised position;

Fig. 4 is an enlarged fragmentary sectional view of a cake in its sealed position;

Fig. 5 is a top plan view of the sealing plate;

Fig. 6 is a bottom plan view showing the sponge rubber which is secured to the plate;

Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 8;

Fig. 8 is a fragmentary sectional view of the latch taken on the line 8—8 of Fig. 7;

Fig. 9 shows a slightly modified form of seal or pad, this being a soft rubber plate with a rough sandy finish on its under surface rather than a sponge rubber construction.

Referring now to the drawings showing a preferred embodiment, and for the moment to Figs. 1 and 2, there is shown an apparatus for the treatment of rayon cakes in the form of a skeleton frame, consisting of the angle iron uprights 1, the lower cross brace 2 near the bottom of the stand, and the upper cross piece 3, while other angle irons 4, 5, and 6 may be seen, respectively, looking from the top to the bottom of the framework.

Mounted on the framework and extending from front to rear may be seen the troughs or pans 7, 8, and 9, and it is to be understood that although we have shown these in three layers or tiers, the framework might be built much higher, so that any number of troughs or pans and the mechanism, about to be described, could be installed.

In these troughs, which are arranged in tier formation, will be treated the rayon cakes and, as may be seen from the drawings, these cakes will be arranged in rows, so that each row may be subjected to a certain determined clamping pressure, the arrangement being such that all of the cakes in one row will be clamped in position by the movement of one lever, later to be described.

It is to be understood that any desired number of rows may be used and that the apparatus can be made up in a plurality of sections.

Viewing Fig. 1 for the moment, there may also be seen a pipe manifold 10, which may be placed anywhere on the framework, while leading from this manifold 10 for the lower trough 9 may be seen an inlet pipe 11, from which extend the nipples 13, 14, 15, and 16 in certain spaced relation to each other and about which will be placed the respective rayon cakes, as will be shortly described. In the same manner, there is another inlet pipe 12 extending beneath the trough 8 having the nipples 17, and in a like manner there is a third inlet pipe 18 connected with the upper trough 7 to supply the various cakes through the nipples 19.

From Fig. 2, it will be understood that a plurality of manifolds 10 and inlet pipes 11, 12, and 18 are provided for the various rows of rayon cakes.

Leading from the trough 7 may be seen a relatively small outlet pipe 20, which discharges into the trough 8. Also, leading from the trough 8 is an outlet pipe 21 directly under the outlet pipe 20 which, in turn, discharges into the trough 9. In a like manner, there is an outlet pipe 22 from the trough 9, which is positioned directly beneath the aforementioned outlet pipe 21, so that all of the troughs can be continuously discharging.

So far as the specification has proceeded, it will be seen that there is a plurality of troughs or pans with means for furnishing a washing medium to the troughs and also an outlet extending from the troughs.

It is desirable to provide a sealing means at the top of the cake of a similar easily compressible nature to the bottom pads and, at the same time, have these upper sealing means operate in a vertical direction rather than any horizontal movement, as it is to be remembered that a rayon cake en masse is fairly rigid but still any horizontal movement of a sealing member might tend to destroy or distort the upper strands of the cake from their true spun position.

Furthermore, it is very desirable to allow for expansion longitudinally of the cake throughout its entire treatment and, at the same time, tightly seal the ends of the cake, so that the water under about four to eight pounds pressure may pass through the cake to thus thoroughly wash the same. As is well known, these cakes have to be washed, bleached, desulphurized, and then again washed before they are dyed. It will also be understood that the effect of the washing operation upon the cake is to expand the cake longitudinally or, as might be stated, axially elongated, but not enlarged laterally.

By forcing the water centrally and outwardly of the cake, it will swell longitudinally, as is well known, and by allowing the cake to expand longitudinally during its whole treatment but, at the same time, sealing the ends, the cake may be efficiently and evenly washed, bleached, and even dyed throughout its entire length. In other

words, in addition to the water wash, cakes may be quickly subjected to a sulphide wash and then a chlorine bleach, an acid wash, or any other treatment which it is desired to apply to these cakes. As heretofore mentioned, it is also possible to dye the cake in the same machine and to obtain an even and permanent coloring.

Besides allowing for the expansion of the cake longitudinally, as heretofore has been done, it is very desirable to have a soft, easily compressible substance to seal both the upper and lower ends of the cake, as if the cake is placed in contact at its opposite ends with a relatively hard material it has been proved by tests that the threads on the extreme upper and lower sides are not properly washed. In other words, the shoulders of the cakes are not washed and cleaned and bleached in the proper manner and in keeping with the rest of the cake. However, by using a spongy surface, such as the sponge rubber, which comes directly in contact with the top and bottom of the cake, the liquor or wash is allowed to completely envelop the threads on the extreme upper and lower sides and the cake will be washed or bleached or desulphurized, depending on the liquor used, evenly and properly throughout its entire length.

Referring now for the moment to Figs. 4, 5, and 6, there will be seen a hard rubber plate 24, on the upper surface of which may be formed the ears 25 to which will be fastened a link 26. This plate 24, although preferably made of hard rubber, may be made of metal or any other desirable material, while cemented to its under surface, as may be seen in Fig. 4, is a pad 27 of sponge rubber, preferably of about 1½" in thickness. As shown in the modification in Fig. 9, we might substitute a pad of soft rubber 27', which may be corrugated on its under surface 28, but we have found in actual practice that the sponge rubber pads are preferable, although we do not wish to be limited to sponge rubber, as any spongy element or composition may work with good results.

The pad 27, as will be noticed, is slightly larger in diameter than the diameter of the cake R, and likewise the lower pad 23 of sponge rubber is about the same size as the pad 27. The pad 23, however, is held against movement while the pad 27 with its plate 24 are capable of a vertical movement.

It is desirable to be able to treat a number of the cakes at the one time, and we have devised a means whereby a number of cakes may be simultaneously but individually treated and wherein the compression applied to the several cakes will be uniform.

Heretofore, certain apparatus for washing rayon cakes has been used wherein the cakes have been stacked one above the other and subjected to a compression to form a sealing means, but when the cakes are thus stacked we have found that the several cakes are all subjected to unequal pressures and some cakes are washed more thoroughly than others. With our arrangement shown, each cake is individually held under compression, and when we say compression, we mean sufficiently clamped against leakage of the water from within the cake. Thus, each cake will receive its individual treatment and none of the cakes will be subjected to more weight and pressure than others which, of course, would prevent the same from being washed as free of the acids as others.

Referring now to Figs. 2 and 3, there will be

seen extending across the front of the uprights 1, channels 29, 30, and 31, to which are secured the tracks 32, 33, and 34, respectively. In a like manner are tracks 35, 36, and 37 secured to the rear uprights.

As a description of the sealing means of one tier is similar to the sealing means of the other tiers, just one will be described.

Still referring to Fig. 2, there will be seen above the troughs 7 an angle iron 38, to which are pivoted the respective links 39. These links 39 are secured at their lower ends to a pull rod 43, and from this pull rod extend the other respective links 26, heretofore mentioned with respect to the description in Fig. 4. The lower ends of these links 26 fit within the respective ears 25 of the plates 24 to which, it will be remembered, are cemented the sponge rubber pads 27. The forward end of the rod 43 is telescoped within the handle 44, as may be more clearly seen in Fig. 3. This handle 44 is provided with two notches 45 and 46 to engage a latch 47 detailed in Figs. 7 and 8.

Also extending horizontally in a plane parallel with the pull rod is what we term a balance bar 40, on the opposite ends of which are the rollers 41, which bear against the aforementioned tracks 32 and 35. This bar is connected to the respective links 26 and passes adjacent the ears 25 of the plates that carry the soft rubber pads and prohibit the said plates and their pads from any horizontal movement.

Fitted on the end of the rod 43 may also be seen a collar 48, which is held in position by a set-screw 49, and likewise there may be seen a bushing 50 mounted on the handle portion 44, which bushing 50 may also be set in position. A part of the bushing is screw-threaded, as at 51, so that a nut 52 and a lock nut 53 may be threaded thereon, and there is a further collar 54 extending beyond the nuts, which is free to move on the bushing 50. Extending between this collar 54 and the collar 48 is the spring 55 with its ends fastened to the respective collars.

A latch member 47 is shown, which may be spring-pressed by the small spring 56. Slottedly connected to the handle portion 44 of the pull rod 43 is the further lever 57 which is pivotally retained, as at 58, to the main frame.

Now supposing for the moment that it is desired to insert the respective cakes of rayon to be treated, the position of the draw rod and handle and the respective sponge rubber pads will be that shown in Fig. 3. That is, the little finger latch 47 will be engaged in the rear notch 46 and the toggle links will be in the position as also shown in Fig. 3, the spring will be in its normal position, and the plates 24 with their sponge rubber pads will be in their raised position.

After the respective cakes have been placed on their respective lower sponge rubber pads 23, the finger latch 47 will be depressed and the lever 57 pulled outwardly or toward the operator until the small notch 45 registers with the finger latch 47. The lever 57 while moving outwardly will move the pull rod 43 to straighten the respective toggle links 39 and 26, lower the plates 24, and force the sponge rubber pads 27 about the upper edge of the respective cakes, as may be seen in the several views. This movement also of the pull rod 43 will put the spring under a slight tension. It will now be seen that all of the cakes associated with this pull rod 43 and its cooperating parts will be subjected to the same clamping

pressure, which is sufficient to seal the ends of the respective cakes.

By providing the lock nuts 52 and 53 on the bushing 50, just the desired amount of tension on the spring may be secured. Thus, the cakes R may expand longitudinally until such times as the rubber pads have reached their natural limit of compression, and if the cakes then have a tendency to further expand longitudinally they can do so individually and collectively by forcing the sponge rubber pads and their holders upwardly and, in turn, open the links and also move the pull rod rearwardly (to the left, Fig. 1), the force being taken up by the expansion of the heretofore mentioned spring.

Also, by having the little spring-pressed finger latches, as shown, there is no danger of the operator pulling on the lever 57 with too much force, because as soon as the finger registers with the latch 45, it will snap in place, thus assuring just the right amount of pressure to each individual cake.

After the cakes have been placed in position, valves (not shown) will be operated to supply water from four to eight pounds pressure to the manifold 10 and the water, in turn, will be delivered centrally of the cakes and will pass through the weave of the cakes as the cakes expand longitudinally. The maximum fluid pressure to be applied to each cake should be from four to eight pounds, although we have successfully washed and treated the cake at four pounds pressure.

We have also found that whereas the usual time required to wash these cakes was anywhere up to twenty-five hours on a shower wash, we have reduced the time of washing, desulphurizing, and rewashing to a total of sixty-one minutes.

As the water or other liquid used passes through the cakes, it will run into the respective troughs and out through the outlet pipes 20, 21, and 22 to a desired discharge pipe. After the cakes of rayon have been treated, the respective levers 57 will be released by operating the finger latch 47 and the lever 57 pressed forwardly to thus shorten the links and, in turn, raise the respective upper covers with their sponge rubber pads, following which the rayon cakes may be carefully removed and others inserted for their treatment. When the lever 57 is pushed forwardly, the finger latch 47 will snap in the kerf 46 to thus hold the various sponge rubber pads in their uppermost position.

As heretofore mentioned, the above-described mechanism is repeated in the three layers shown and in the separate rows extending the depth of the apparatus.

From the foregoing, it will be seen that each cake is subjected to a like clamping and sealing pressure, regardless of its position in the apparatus, and that the respective upper sealing pads are movable and controlled as one unit, so that the pressure will be uniform. Also, the treatment begins immediately after the cakes have been sealed or clamped in position. As the liquor penetrates each individual cake from the small outlet in the tray over which the cake is set, there is a gradual longitudinal expansion of the cake, which is permitted by the use of the sponge rubber pads and the tension arrangement heretofore mentioned.

Furthermore, by providing the forward notch in the draw rods, there is no possibility of the operator exerting too much or too little pressure on the cakes, which would cause an unsatisfactory treatment of the cakes.

Again, by providing the spring arrangement in conjunction with the soft or sponge rubber pads, it prevents a compression of the rubber to a degree which might impair its efficiency.

We have found that by using these sponge rubber pads, the shoulders of the cakes may be washed as well as the remainder of the cakes, and there is no possibility of the same being distorted, as may be the case due to irregularities in the size of the cake and irregularities in the closeness in which the cake is wound.

Finally, the sponge rubber pads or spongy composition pads readily absorb the greater part of the expansion of the cake, but should there be further expansion it is taken care of by the spring on the draw rods, so that the cake retains its original firm shape, thus permitting the subsequent mechanical treatments to be more readily accomplished, such as winding into cones, skeins, or directly on cops or bobbins, or whatever form of package the user desires.

It will be understood that we have illustrated only one section of the apparatus, but any multiples may be used, depending upon the available floor space and the number of rayon cakes to be treated. Also, it is to be understood that although we have found that sponge rubber or soft rubber clamping pads are extremely efficient, still any similar soft, easily compressible material or composition might be used with good effects.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. An apparatus for treating a non-stacked hollow tapered cake of artificial fiber during fluid treatment, including two sponge rubber pads, means for supporting the pads, a link and spring means for holding the cake in its clamped position between the pads but permitting the same to elongate past the compression limit of the pads, the cake being unconfined except at its opposite ends.

2. An apparatus for treating a hollow cake of rayon during fluid treatment, including two sponge rubber pads, means for supporting the upper pad, means for supporting the lower pad, means for holding the cake in a clamped position between the pads, said means including a rod and links connected thereto, a handle connected to said rod, an interposed spring means between the handle and rod whereby a spring tension may be exerted on the rod and to said upper rubber pad, and means for limiting the movement of the rod in its opposite directions.

3. An apparatus for washing a multiplicity of rayon cakes, including troughs arranged in tiers, each of said troughs provided with fluid inlets, soft supporting means for the rayon cakes, further soft pads located, respectively, above the first-mentioned pads and indirectly connected to each other through a draw rod and link mechanism, a handle connected to said draw rod, tension means between the handle and said rod whereby the upper pads may be raised and lowered in a vertical direction and may be held in a lowered position under tension, and means for locking the said rod under tension whereby the cakes in said trough may elongate past the efficient compressibility of the above-mentioned soft pads.

4. A machine for treating artificial fiber in cake form, including a trough provided with an outlet, a plurality of yieldable supports in the trough provided with fluid inlets, a pull rod provided with links, carrier plates connected with

the pull rod, yieldable pads secured to said plates, means for operating the draw rod under tension to compress the cakes between the respective supports and soft pads, latch means for limiting the forward movement of the draw rod, and
5 means for regulating the tension means on the draw rod whereby the cakes are allowed to expand under pressure past the efficient compressibility of the said soft pads.

10 5. An apparatus for treating rayon cakes under fluid pressure, including relatively soft compressible means for clamping the opposite ends of the cake to form a fluid-tight seal, regulatable tension means associated with the compressible

means whereby the cake may expand longitudinally during its entire treatment, and further means for limiting the initial clamping action on the cakes.

6. A washing and clamping means for rayon cakes, including an upper and a lower sponge rubber pad, compressible and tension means
5 connected with one of the pads, the other of said pads provided with a fluid inlet, and means for limiting the amount of pressure on the upper
10 of said pads.

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