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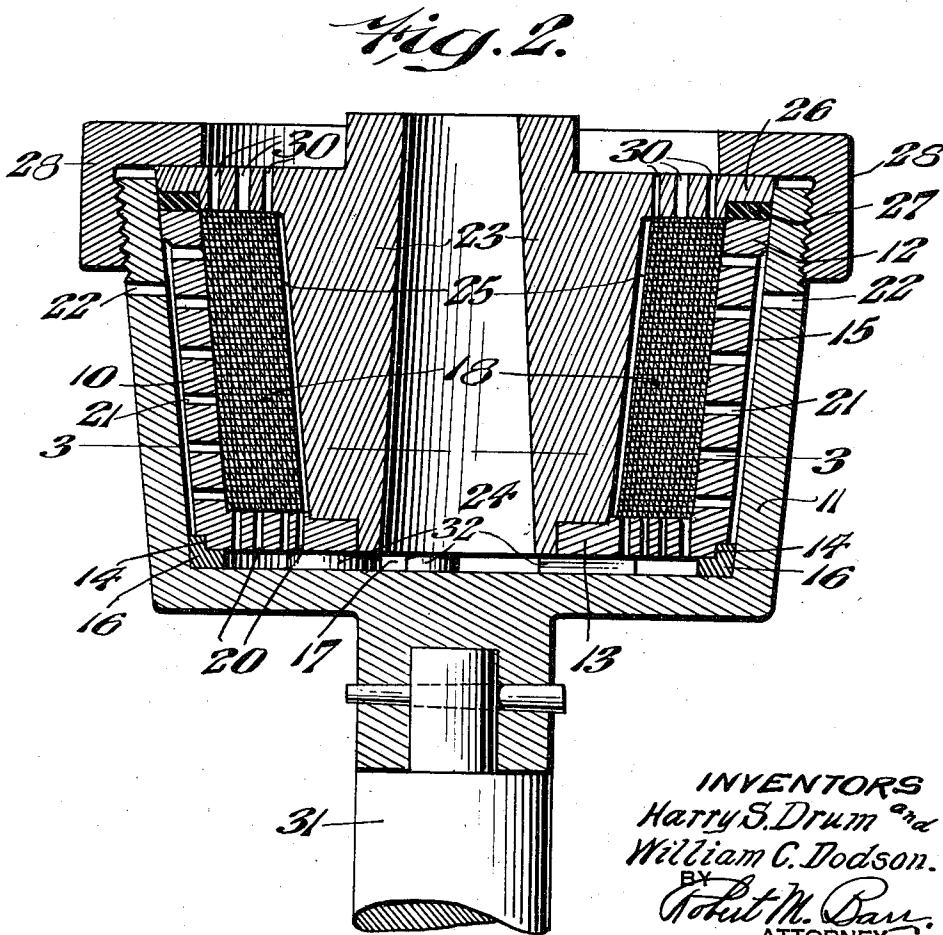
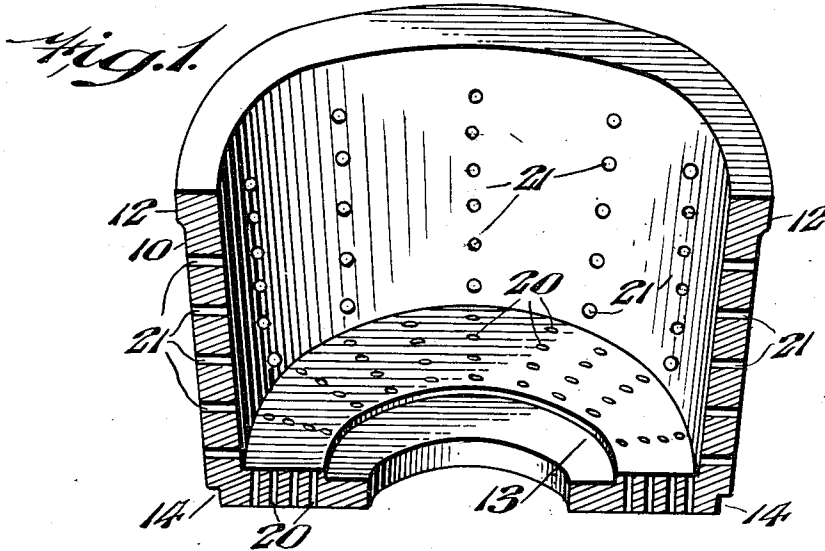
H. S. DRUM ET AL

2,017,691

METHOD OF PROCESSING FIBER CAKES

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3 Sheets-Sheet 1



INVENTORS
Harry S. Drum and
William C. Dodson.
BY
Robert M. Barr.
ATTORNEY

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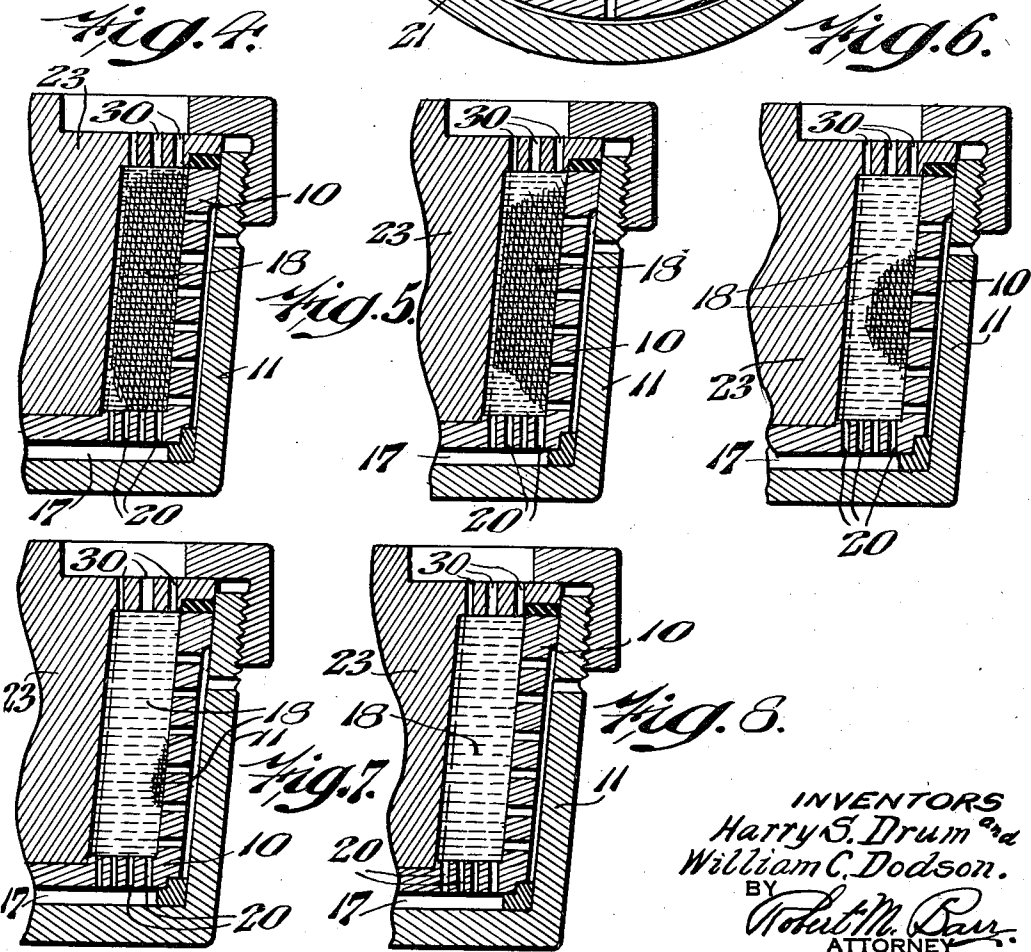
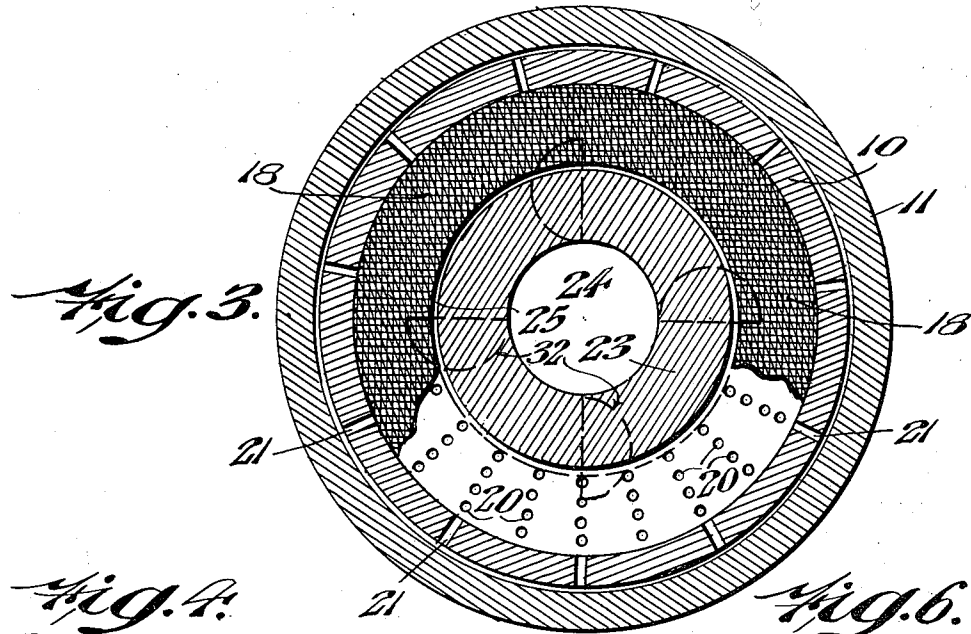
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William C. Dodson.
BY
Robert M. Barr
ATTORNEY

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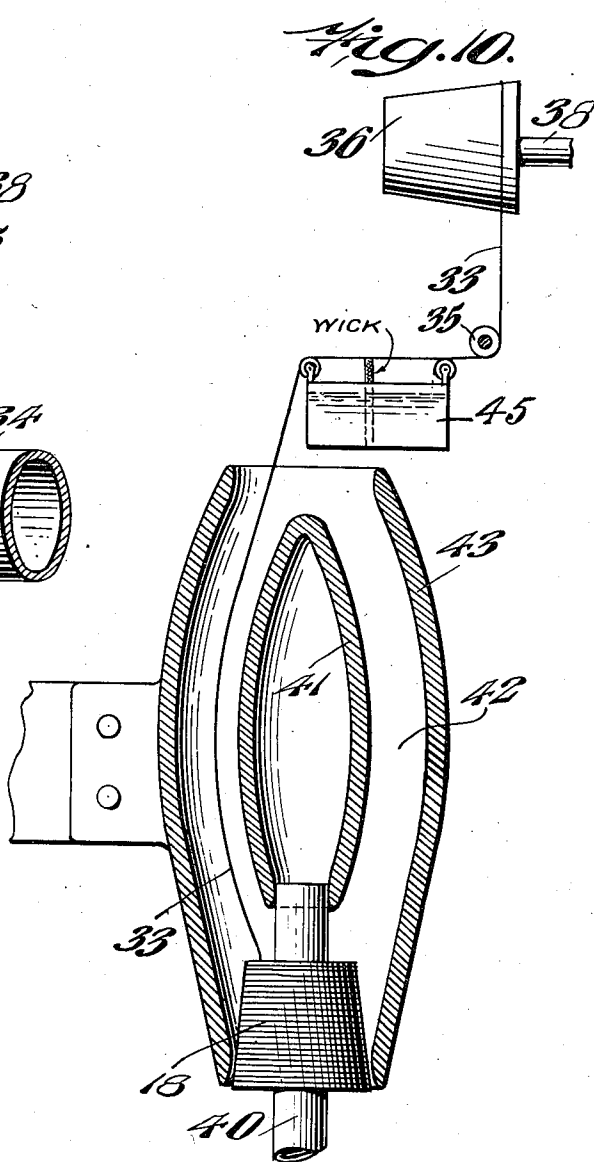
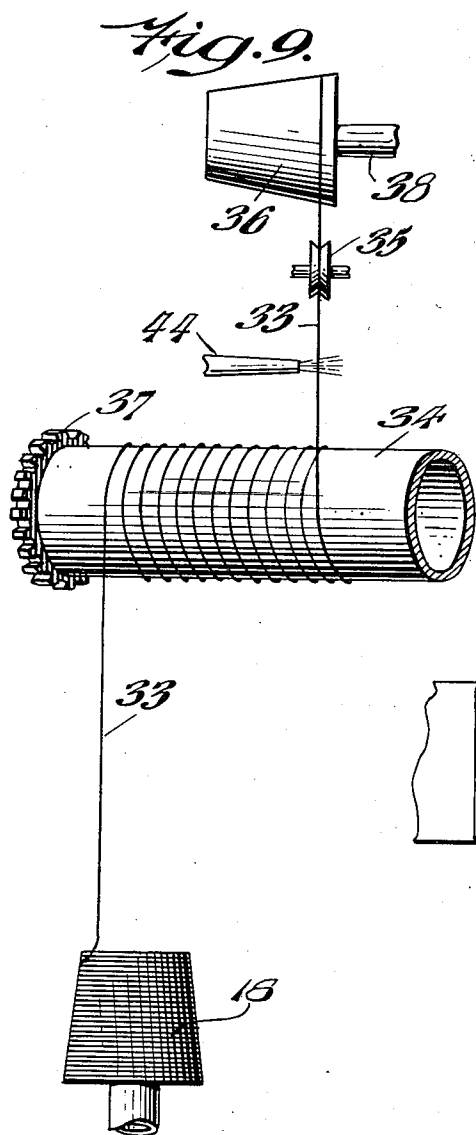
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METHOD OF PROCESSING FIBER CAKES

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3 Sheets-Sheet 3



INVENTORS:
Harry S. Drum and
William C. Dodson.
BY
Robert M. Barr,
ATTORNEY.

UNITED STATES PATENT OFFICE

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METHOD OF PROCESSING FIBER CAKES

Harry S. Drum, Abington, and William C. Dodson, Meadowbrook, Pa., assignors to Smith, Drum and Company, Philadelphia, Pa., a corporation of Pennsylvania

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6 Claims. (Cl. 18—54)

The present invention relates to a method of processing fiber cakes, such as are preformed by the spinning and setting of artificial silk threads or filaments.

5 These fiber cakes as received for processing are quite densely packed and therefore present a natural barrier to the passage of liquid. Heretofore liquid propelled by centrifugal force has been generally employed in the succeeding washing and treating steps to overcome this barrier and properly saturate and flush the cake. Such prior methods of necessity require an inordinate amount of time and this time loss factor is one of the main drawbacks in the present day processing of fiber cakes. Furthermore to permit free discharge of the treating or washing liquid from the outer face of the cake it is and has been the practice to carry out the processing steps without any wall or other bounding surface about this outer face. While this omission tends to relieve the radially discharging liquid from back pressure it at once introduces another disadvantageous feature, namely allowing the cake to respond to variation of its center of gravity so that its shape, more often than otherwise, becomes that of an ellipse. The consequent dense packing of threads at one location with more open packing at another results in non-uniformity of thread treatment.

30 Some of the objects of the present invention are to provide an improved method for processing fiber cakes; to provide a method of processing fiber cakes wherein the time heretofore required to effectively carry out the washing and treating steps is materially reduced and with a better product than heretofore; to provide a method of processing fiber cakes wherein uniformity of treatment is assured for each step; to provide a fiber cake treatment wherein it is impossible for the cake to become deformed; to provide a fiber cake treatment wherein one face of the cake is subjected to liquid flowing lengthwise thereof; to provide a method of fiber cake treatment wherein the processing liquid or liquids is caused to travel in a path as the component of an endwise and crosswise flow; to provide a method in the processing of synthetic silk or the like which includes a drying and coning operation as a continuous step direct from the fiber cake; to provide means for conditioning the threads after the drying step; and to provide other improvements as will hereinafter appear.

50 In the accompanying drawings Fig. 1 represents a sectional perspective of one form of cup used in forming the fiber cake; Fig. 2 represents a

sectional elevation of the cup with its contained cake located in a treating bucket or receptacle including the associated parts; Fig. 3 represents a section on line 3—3 of Fig. 2; Figs. 4 to 8 inclusive represent detailed sections showing different stages in the liquid treatment of the cake; Fig. 9 represents one form of apparatus for carrying out the drying step of the processing operation; and Fig. 10 represents another form of drying apparatus by which this step of the method can be carried out.

Referring to the drawings one form of apparatus using the method of the present invention consists of a cup 10 of generally truncate form and of a shape and size designed to be received within a bucket or receptacle 11 of the type usually employed in the processing of such fiber cakes as this invention relates to.

As here shown, the cup 10 is provided with a flanged rim 12 and has an annular bottom 13 provided with a stepped rim 14 so that when the cup is located within the receptacle 11, the rim 12 will abut the receptacle 11 and form an annular passage 15. The stepped rim 14 is arranged to seat upon a stepped ring 16 located within the receptacle 11 and of such a thickness as to provide a chamber 17 between the juxtaposed bottoms of the two articles.

In order to introduce washing or treating liquid against an end of a preformed cake 18, the bottom 13 of the cup 10 is provided with radial rows of passages 20 which are circumferentially arranged to the best advantage for carrying out the purpose. Also the side wall of the cup 10 is formed with through channels 21 which are radially disposed with respect to the axis of the cup and open against the cake 18 at one end and into the passage 15 at the other end. It will be noted that excess liquid discharged into the passage 15 can find an exit by way of radially disposed holes 22 through the wall of the receptacle 11.

For the purpose of introducing treating or washing liquid into the chamber 17 a core member 23 is provided having an axial bore 24 there- through which serves as a conduit for incoming liquid to be delivered to the chamber 17. The core 23 is preferably shaped to conform generally to the opening in the cake 18 but is of less diameter so that when the core is in its operative position within the cake it will form therewith an annular space 25. The entering end of the core member 23 as here shown is stepped to fit the opening in the bottom 13 of the cup in order to seal the joint so that the incoming

liquid is directed to the passages 20. Also the opposite end of the core 23 is provided with a flange 26 of a diameter corresponding substantially to that of the rim of the cup 10 so that in effect this flange becomes a cover seated upon the otherwise exposed end of the cake 18. Preferably, a packing ring 27 is introduced between the cup 10 and the aforesaid flange 26 to seal the joint therebetween. An annular clamping ring 28 has threaded engagement with the rim of the receptacle 11 and serves to hold the core 23 and other associated parts in proper operative relation. This clamping ring 28 has an internal diameter of sufficient size to uncover rows of passages 30 which are formed circumferentially about the flange 26 and in such a position that the inner ends thereof are juxtaposed with respect to the top end face of the cake 18.

In carrying out the method of the present invention by the preferred form of apparatus above described, the cup 10 is attached to a rotatable table or other device driven from any suitable source of power and when so fixed and located thereon the fiber filament leaving the godet wheel is spun therein in the well known manner while the filament is given an axial traverse motion. When the cake is of the desired or standard size the spinning operation is discontinued and the cup 10 with its contained cake is removed to undergo the setting operation. When this is completed the cake is ready for the processing operations and the cup with its contained cake is then placed within the bucket or receptacle 11 being made fast therein by means of the clamping ring 23. The treating or washing liquid is now delivered to the bore 24 and flows there-through into the chamber 17 to rise therefrom by way of the passages 20 against the bottom of the cake 18.

From Fig. 4 it will be seen that the initial travel of the liquid is inwardly across the lower circumferential inner edge of the cake, this being the line of least resistance, and thence upwardly in the passage 15 in contact with the inner face of the cake until it reaches the cover flange 26 where it is deflected outwardly again following the line of least resistance to the passages 30. This flow across the inner face of the cake quickly leaches the exposed face of the cake because whatever substance is removed by the washing operation is carried upwardly into the passage instead of being forced through the body of the cake so that it is now possible to carry out each processing step in much less time than heretofore as well as more efficiently. While the liquid is being caused to flow endwise through the cake the receptacle 10, which is attached to a suitable rotating shaft 31, is being rotated at a predetermined speed to subject the column of liquid to a centrifugal action. The effect of this dual force can be followed from Figs. 4 to 8 inclusive wherein Fig. 4 represents the path of the liquid after one minutes' treatment; Fig. 5 after two minutes' treatment; Fig. 6 after four minutes' treatment; Fig. 7 after five minutes' treatment; and Fig. 8 after eight minutes' treatment. It will thus be evident that there is a continuous or progressive endwise flow of the liquid through the cake from its bottom face to its top face and during such travel centrifugal action causes the flowing column to be deflected outwardly, but still upwardly, toward the wall of the cup 10. The general effect is to progressively wash or treat vertical areas of the cake, these areas being successively treated as the liquid moves outwardly.

It should be noted that preferably the receptacle 11 has its bottom provided with a plurality of impellor vanes 32, which are located between the outlet of the bore 24 and the inlet to the passages 20. These vanes 32 are so shaped as to increase the velocity of the incoming liquid by projecting it outward towards the passages 20. The result of this is to materially reduce the number of revolutions of the receptacle from that necessary to use with a receptacle without vanes.

As another step in the method the present invention embodies the winding off of the yarn from the fiber cake, subjecting it to a drying operation while moving and winding it directly upon a cone. One form of apparatus for carrying out this step of the method is shown in Fig. 9 wherein the thread 33 is led to and wrapped around a tubular heater pipe 34 and continues therefrom to preferably pass over a guide pulley 35 to a cone 36 upon which the thread is finally wound. The pipe 34 is preferably provided with a gear 37 driven from any suitable source of power and at the predetermined rate to expose the thread to the heat of the pipe 34 only for the proper length of time. Any suitable heating medium is supplied to the pipe 34 as will be understood. The cone 36 is mounted upon a driven shaft 38 the speed of which is correlated to the feed of the thread 33 to, around, and from the pipe 34.

In Fig. 10 another modification of the coning and drying step is shown wherein the cake 18 is mounted upon a core in the form of a heating medium supply pipe 40, which pipe terminates in an elongated tubular member 41 in which the heating medium circulates to radiate heat into the annular channel 42 which is formed by the circumposed casing 43. This casing 43 is open at opposite ends and the thread 33 is delivered at its upper end to pass over pulley 35 to the winding cone 36 which is driven by the shaft 38 as previously explained. In this construction the member 41 and its supply pipe 40 form an axis about which the thread rotates as it is drawn off in the coning operation and is thereby effectually dried.

In order to insure the thread being wound on the cone in a proper state for coning and use, and more particularly to overcome the effects of too drastic drying, it is preferable to provide between the drying means and the cone some form of moistener conditioning apparatus. In Fig. 9 one form of such apparatus is shown as a spray nozzle 44 by means of which a mist is sprayed upon the thread during its travel from the drier to the cone upon which it is wound. In Fig. 10 a type of conditioning apparatus is illustrated wherein the thread is caused to travel in wiping contact with the wick of a moistening trough 45 containing water or other moistening liquid.

It will thus be apparent that by the present method a fiber cake is subjected to processing steps while submerged and exposed to centrifugal force. Also as a step in the processing the treating or washing liquid is subjected to pressure substantially at right angles to the direction of the centrifugal force while at the same time the exposed faces of the cake are confined so that the fibers thereof are not disturbed by the liquid. Furthermore this latter step prevents distortion of the cake during treatment.

With the step of drying the thread as it leaves the fiber cake and during the same operation winding it upon the cone, a complete series of

steps has been devised for carrying out the processing of silk fibers or artificial silk from the initial thread formation to the complete built up cone. It will be evident by providing for drying the thread during its travel from the fiber cake to the coner that the usual loss of time of drying it in skein form is eliminated.

Having thus described our invention, we claim:

1. The method of processing fiber cakes which consists in causing a body of liquid to flow across the inner face of a fiber cake, and subjecting said flowing body to centrifugal force.

2. The method of processing fiber cakes which consists in causing a body of liquid to flow across the inner face of a fiber cake, subjecting said flowing body to centrifugal force, and confining the outer face of said cake against outward displacement by the centrifugal force.

3. The method of processing fiber cakes which consists in causing a body of liquid to flow across the inner face of a fiber cake, subjecting said flowing body to centrifugal force, confining the

outer face of said cake against outward displacement by the centrifugal force, and relieving the back pressure of said liquid along said outer face.

4. The method of processing fiber cakes which consists in subjecting a fiber cake to an endwise liquid flow travelling first across the inner face, and causing said travelling liquid to progressively penetrate the cake in the direction of its thickness by rotation of the cake.

5. The method of processing fiber cakes which consists in submerging a fiber cake in a processing liquid, subjecting the liquid to centrifugal force, and simultaneously subjecting the liquid to pressure substantially at right angles to the direction of said centrifugal force.

6. The method of processing fiber cakes which consists in submerging a fiber cake in a processing liquid and subjecting said liquid to an endwise pressure flow and crosswise centrifugal force.

HARRY S. DRUM.

WILLIAM C. DODSON.