

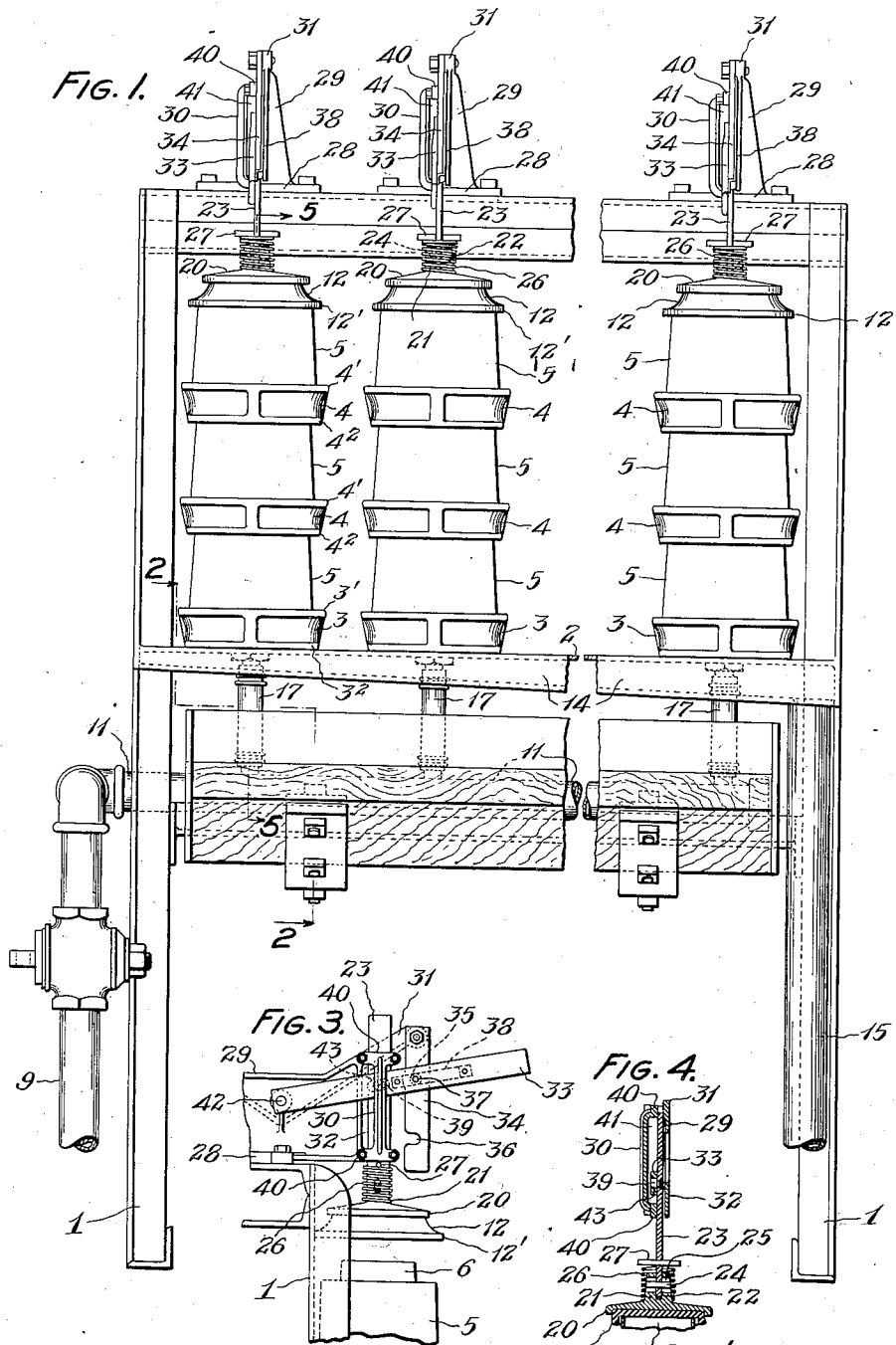
Aug. 13, 1935.

C. A. HUTTINGER

2,011,485

APPARATUS FOR TREATING FINE FILAMENTOUS THREAD IN PACKAGE FORM

Original Filed April 9, 1930 3 Sheets-Sheet 1



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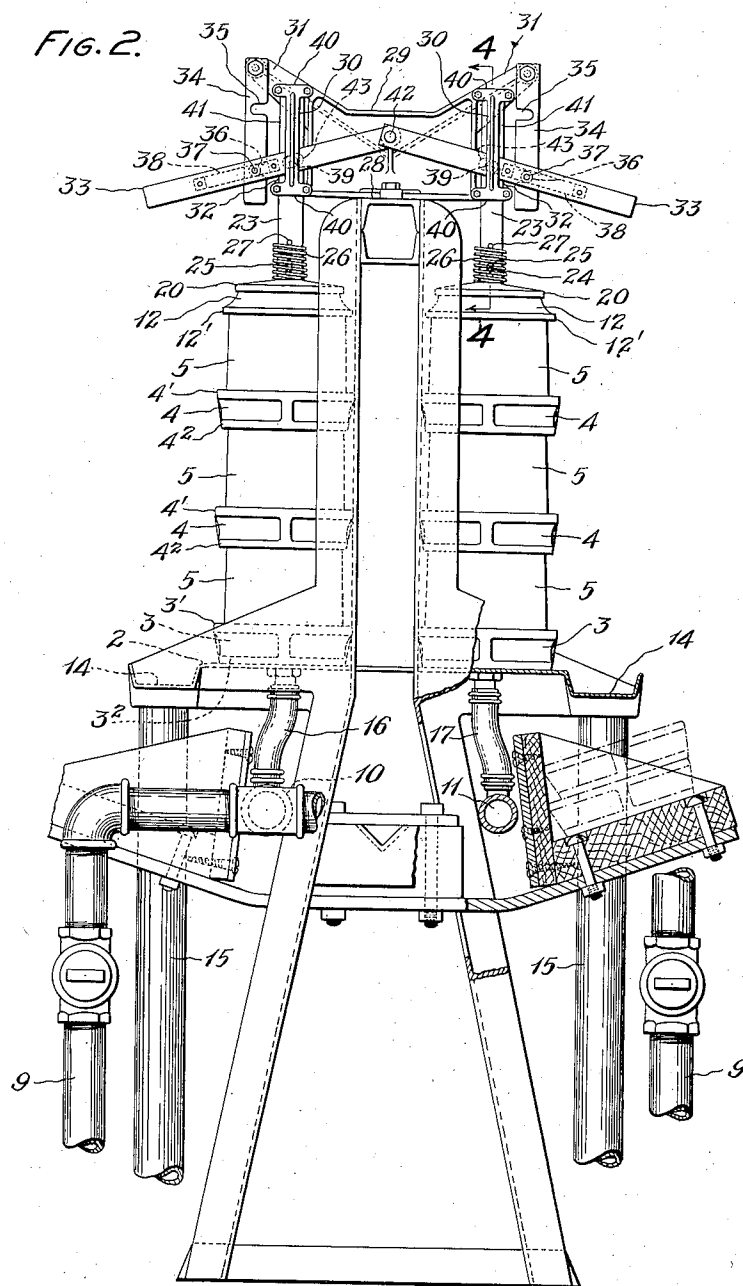
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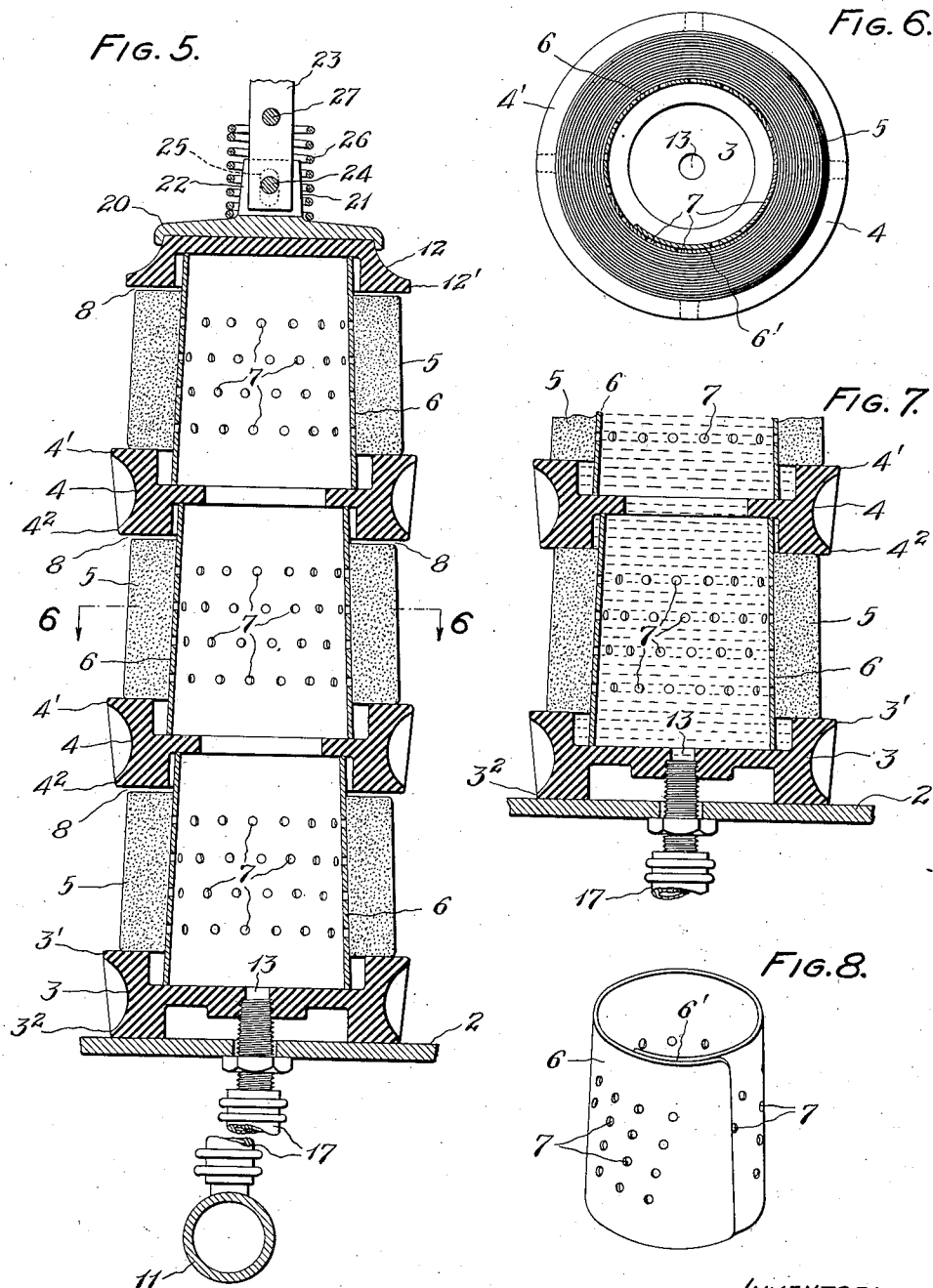
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UNITED STATES PATENT OFFICE

2,011,485

APPARATUS FOR TREATING FINE FILAMENTOUS THREAD IN PACKAGE FORM

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Original application April 9, 1930, Serial No.
442,874. Divided and this application January
10, 1933, Serial No. 651,035. In France May 3,
1930.

14 Claims. (Cl. 18—8)

This application is a division of application
Serial No. 442,874, filed by me April 9, 1930, which
in turn is a continuation in part of application
Serial No. 360,354, filed by me May 4, 1929, which
latter application resulted in Letters Patent No.
1,859,037, granted May 17, 1932, relating to im-
provements in Methods of treating fine fila-
mentous thread in package form.

My present invention, hereinafter described and
claimed, particularly relates to apparatus for car-
rying out the processes described and claimed
in my Letters Patent No. 1,859,037 and my ap-
plication Serial No. 442,874 referred to above.
Briefly, these processes relate to washing or other
treatments of fine filamentous thread, while the
thread is in a tender state and in package form.
The treatments are effected with water or other
fluids, and particularly with water or other fluids
under pressure, and specifically provide for a limited
expansion of the thread during the initial
stages of the washing or other treatment. The
apparatus whereby this limited expansion is at-
tained and the washing or other operation is
effected constitutes the subject matter of the present
application. More particularly, my invention
comprises apparatus for mounting cakes of rayon
thread so as to provide a limited expansion space
whereby a part only of the expansion is permitted
which the cakes tend to make during the treat-
ment of the rayon thread following the forma-
tion of the cakes, for example, during the wash-
ing of the cakes with water. For purposes of
illustration I shall describe my invention in this
specification, and illustrate it in the accompany-
ing drawings referred to therein, as embodied
in an apparatus intended for a washing treat-
ment of a thread package. In this illustrative
form of my invention, the essential parts of the
apparatus are perforated shell members, for sup-
porting the individual cakes and for guiding the
flow of water thereto, and spacers for support-
ing the shell members and the cakes and for
providing the limited expansion space referred to
above. This, however, is but one of the forms of
apparatus in which my invention may be em-
bodied.

In the annexed drawings:

Figure 1 is a broken front elevation of an im-
proved washing rack in which is embodied ap-
paratus exemplifying my invention, several cakes
mounted for washing treatment being shown on
the rack;

Figure 2 is a end elevation of the apparatus
shown in Figure 1, a portion of the view being

in vertical section and taken in the planes indi-
cated by the line 2—2, Figure 1;

Figure 3 is a view of a portion of the parts
shown in Figure 2, this Figure 3 particularly
showing certain clamping mechanism in its re-
leased position; whereas, this clamping mecha-
nism is shown in Figure 2 in locked position;

Figure 4 is a fragmentary longitudinal verti-
cal section, taken in the plane indicated by the
line 4—4, Figure 2;

Figure 5 is a transverse vertical section, upon
an enlarged scale, through a battery of cakes
assembled in washing position, the showing in
this view illustrating the condition of the cakes
before the wash water is turned on, and the sec-
tion being taken in the plane indicated by the
line 5—5, Figure 1;

Figure 6 is a horizontal section, taken in the
plane indicated by the line 6—6, Figure 5;

Figure 7 is a section similar to a portion of the
parts shown in Figure 5 but illustrating the con-
dition of the cakes after the wash water has been
turned on and the cakes are being subjected to
the pressure thereof; and

Figure 8 is a perspective of a certain cake core
or shell upon which the cake is mounted dur-
ing the washing operation, the view showing the
split formation of the shell.

Referring to the annexed drawings in which
the same parts are indicated by the same several
numbers in the different views, the frame 1 of a
wash rack is provided with a horizontal platform
2 upon which are mounted two longitudinal series
of bases 3 or foundations for vertical bat-
teries of regenerated cellulose cakes which are
to be washed, one of these series of bases 3, in the
form of apparatus illustrated, being arranged
along each longitudinal edge of the platform 2.
Disposed above each of the bases 3, and in spaced
relation through the medium of intermediately-
disposed inclined shell members or cores 6, are
a plurality of spacers or abutments 4, plainly
shown in Figure 5; and upon the top of the top-
most shell member 6 is positioned a cap mem-
ber 12. Preferably, the shells 6 are longitudinally
split and have overlapping portions, as illustrated
by the number 6' in Figure 8, and hence are col-
lapsible or expansible. The inclination of the
outer peripheral surface of the core 6 corresponds
with the bevel of the inner peripheral face of the
usual cake, as plainly shown in Figure 5. The
base 3 and abutments 4 are formed with upper
annular flanges 3' and 4', respectively, and lower
annular flanges 3" and 4", respectively, and the
cap 12 is formed with a lower flange 12'. One of

the cakes 5 surrounds each core 6 and is disposed between adjacent flanges 4' and 4² of adjacent spacer members 4, or between the latter and the adjacent base member 3 or cap member 12. The spacing of the members 3, 4 and 12 is such that adjacent flanges are disposed somewhat further apart than the depth of the cake 5 so as to provide a slight space 8, plainly shown in Figure 5, between the top of the cake 5 and the lower flange of the adjacently upper member. A fit of the core 6 within the cake 5 within a quarter of an inch of the latter is ample for satisfactory operation. In assembling the cake 5 upon the cores 6, a cloth, such as a knit fabric, can first be drawn through the cake and the metal core or shell 6 then compressed and drawn through the cloth, thus mounting the cakes 5 without disturbing the fibers thereof.

The wash water is obtained from any suitable source and fed under pressure through the inlet 9 whence it is conducted through conduit sections 10 and 11 to the two longitudinal series of cake batteries. For this purpose, the webs of the base members 3 are formed with holes 13 there-through, with which communicate the pipe sections 16 and 17, which results in the water being forced into the interior of the cores 6, the walls of the latter being provided with a multiplicity of perforations 7 whereby the water is forced outwardly and transversely through the several cakes 5 and drips downwardly from the outer peripheral faces thereof into the troughs 14 whence it is conducted off through the drains 15.

I shall now explain the operation of this apparatus by describing what happens during the washing operation and the effect upon the thread package. In order to do this, I shall assume a certain composition of the viscose solution, without intending thereby to limit myself to such composition. The composition is assumed merely for the purpose of making plain what are the benefits of the washing operation carried out on my improved apparatus. The viscose solution, for instance, comprises eight (8) per cent cellulose, an aggregate of approximately two or three (2 or 3) per cent of various sulphur compounds, and caustic soda of substantially six or seven (6 or 7) per cent, the balance of the viscose being water. When this viscose is being set up into the regenerated cellulose thread in the precipitating bath, the acid of the bath attacks the caustic soda-cellulose combination, which results in precipitating the cellulose in gel formation, during which operation the cellulose loses about three-fourths ($\frac{3}{4}$) of its water. This regenerated cellulose-water combination is collected by centrifugal spinning in a pot into the initial cake package, being wound and twisted by the same operation. Immediately the cake commences to shrink due to its steady loss of moisture content. The natural tendency of the regenerated cellulose threads is to become thinner after being collected, even during the washing operation, due to the gradual loss of the moisture content contained between the twisted filaments of the thread. The action of the wash water upon the inherent water in the gel cake is to drag out or pull from the cake substantially one-fourth ($\frac{1}{4}$) of this inherent water. The natural shrinking of the thread and the positive removal of water during the washing operation result in a porousness which assists in uniform washing. However, the effect of the washing operation upon the whole cake is to induce some longitudinal or axial elongation but no lateral enlargement. This longitudinal elongation

is permitted to an extent determined by the depth of the space 8. This longitudinal elongation will be completed in a period of time governed by the pressure of the wash water and flow-speed thereof, and the compactness of the cake and the closeness of the registry of the resilient core 6 therein, and other conditions. Ordinarily if the wash water flow is carefully regulated and other conditions are favorable, this elongation will be completed by the time the wash water rises to the level of the space 8.

The space 8 which I provide between the top of the cake 5 and the adjacently upper spacing member 4 is sufficient to provide relief for passage of the wash water, during the initial stages of washing, if the resistance to the transverse passage of the wash water between the adjacent filaments of the thread is such as to cause the wash water to rise within the core 6 to the level of the space 8 before the cake 5 has expanded longitudinally an amount sufficient to fill the space 8. In this event the wash water flows downwardly over the exterior surface of the cake and in thus wetting the same induces quick longitudinal expansion which promotes the increasing porosity of the cake and permits efficient transverse washing passage of the water through the cake.

The longitudinal swelling of the cakes 5, during the initial washing, causes the cakes to fill the upper spaces 8 so that the cakes 5 are then confined between the upper and lower faces respectively of the adjacent spacing members. At the time these spaces 8 are thus filled by the cakes 5, the latter have become so porous as to permit free and uniform washing. Thus, by the treatment, the cake is permitted first to elongate longitudinally sufficiently to fill the slight space 8 and then is restrained from further elongation, the wash water having during the elongating period a medium through which to filter consisting in part of the space 8 and in part of the cake body, this filtering medium changing to the cake body only after the elongation of the cake has filled the space 8. Thus, the space 8 somewhat alleviates, during the elongating period, the pressure which, if there was not provided such a space 8, would tend to be built up by the resistance which the cake body offers during such period to the passage of the wash water there-through. The close confinement of the end faces of the cakes 5 by the engaging portions of the spacers 4 or the base members 3 or the caps 12 prevents the wash water from passing along the said end faces of the cakes 5 and hence obviates any distortion of the cakes and adds to the uniformity of the treatment. There also is effected a smoothing out of any distortion of the cakes 5 as may have occurred during the previous handling of the cakes.

The proper depth of the space 8 is governed by the number of twisted filaments that make up the regenerated thread. Apparently, this number of filaments governs the depth of the space 8 in approximately a direct ratio. For instance, a cake of 30-filament threads requires substantially one-half ($\frac{1}{2}$) the depth of space 8 as a cake of the same denier threads but in which the latter are comprised of 60 filaments.

Without limiting myself to a space 8 of such a depth, I have found that such a space of one-eighth ($\frac{1}{8}$) inch depth gives very satisfactory results when washing a thread cake of three and one-half ($3\frac{1}{2}$) inches in depth and containing approximately eight (8) ounces of dry rayon and consisting of 44-filament 300 denier thread.

The rapidity with which satisfactory treating operations can be effected by my improved process is of great material importance. For instance, I find that with cold water as satisfactory a washing can be effected in one and one-half (1½) hours as is effected by other present methods, with which I am acquainted, in twelve (12) or more hours. Also, I have ascertained that wash water of substantially 180° F. will accomplish as satisfactory a washing in fifteen (15) minutes as is effected by cold water in one and one-half (1½) hours. Wash water of temperatures intermediate the temperature of cold water and 180° F. affects the time necessary for satisfactory washing to somewhat proportionate degrees. In some of the operations, the washing with hot water of substantially 180° F. promotes a double action, such as simultaneously washing and desulphurizing. Temperature control is an important consideration in such compound actions.

Another very great advantage resides in the fact that my improved method is a radial treatment of the initial package. This is particularly true, if the thread has been collected in twisted formation. This advantage is that my method does not disturb the twist of the thread. When a skein or a hank is washed, or some other non-initial package which cannot be treated by wash water applied radially, the water running downwardly over the skein washes the twist down and results in a non-uniform twist and the formation of open areas and snarled portions in the skein. By my method, the wash water is uniformly applied in a radial direction between the adjacent filaments of the twisted thread and there is no non-uniform pressure applied between any two filaments or applied to any local area between two adjacent filaments which would result in a disturbing of a twist or the creation of a non-uniform twist.

I will now describe by reference to the accompanying drawings certain mechanism for effecting the clamping of the several vertical batteries of members heretofore described. A clamping head 20 adapted closely to fit over the top of the cap member 12 is formed with an upper boss 21 having a vertical recess 22 within which is contained the bottom end of a link 23. This link 23 is secured in said recess 22 through the medium of a pin 24 mounted in the link 23 and passing through a vertically elongated slot 25 formed in the boss 21. Normally the pin 24 is held in its lowermost position in the slot 25 through the medium of a coil spring 26 confined between the top of the clamping member 20 and a pin 27 secured in the link 23, as plainly shown in Figures 4 and 5. The spring 26, pin 24 and elongated slot 25 furnish shock-absorbing means during the clamping of the head 20 down upon the cap member 21. The clamping member 20 is locked down upon and released from the cap member 12 by manually-operated means that will now be described.

Secured to the upper part of the rack frame 1 is a centrally aligned series of base members 28 of a series of transverse brackets 29 which are symmetrical about their centers so as to serve alike for the oppositely-disposed batteries of cakes 5 upon the two sides of the frame 1. The bracket 29 is formed with outer vertical strap members 30 longitudinally of which the upper ends of the links 23 play, these links being pivotally secured adjacent the members 30 to, and intermediate the ends of, operating handles 33 by means of pins 39, said handles 33 being also adapted to make two connections to vertically-disposed

locking levers 34 by means of pins 37. These latter connections are effected by means of a pair of vertically-spaced recesses 35 and 36 formed in the lever 34, whereby the pin 37 secured in the handle 33 can be locked in either of the recesses 35 and 36, as plainly shown in Figures 2 and 3, the recess 35 being used for the released or unclamped position of the clamping member 20, and the recess 36 for the clamped position. Upper and lower end members 40 of the strap member 30 are secured to two diagonally extended legs 31 and 32 of the bracket 29, as plainly shown in Figures 2 and 4, and the top of the locking lever 34 is pivotally secured to the extended end of the upper member 31. The pin 39 plays in an elongated recess 43 formed in the handle member 33 and to this handle member is secured a strap member 38 within which the locking lever 34 has a limited amount of movement. During the up and down movement of the operating handle 33 to effect the clamping and unclamping operation, the pin 39 plays in a longitudinal vertical recess 41 formed in the strap member 30. The inner ends of the two oppositely disposed operating handles 33 for the corresponding batteries are pivotally mounted upon the same pin 42 secured in the body of the bracket 29.

It is evident from the foregoing description that the battery of cakes and spacing members and base members and cap members can be assembled, when the clamping members are in the position shown in Figure 3 and that after being so assembled, the locking lever 34 can be pulled rearwardly within the strap 38 to release the pin 37 from the notch 35 and then the handle 33 pulled down until the pin 37 intersects the notch 36, the locking lever 34 automatically taking such locking position or being forced concurrently and manually into such locking position.

My apparatus is intended for use in treating rayon threads in their initial package form. No special reeling or winding of the fibers is necessary other than that which is incident to the collecting of the thread in the desired form of initial package. These initial packages may then be subjected to the desired processing and finishing operations, without first skeining or otherwise reorganizing the fibers into packages of a different nature, my apparatus should not be confused with apparatus designed for treatments of rayon material which is not in the initial package but has been specially reeled or rewound for such special treatments, such as apparatus designed for special well-known processes of dyeing for which a special winding of the material is necessary before it is subjected to the dyeing process.

What I claim is:

1. Apparatus for fluid-treating fine filamentous thread gathered into an initial package which tends to elongate longitudinally during the treatment of the thread, comprising means for supporting the package which permit longitudinal elongation thereof in a predetermined amount but to an extent less than it tends to make under the treatment, and means for distributing the treating fluid to the package.
2. Apparatus for fluid-treating fine filamentous thread gathered into an initial tubular package which tends to elongate longitudinally during the treatment of the thread, comprising means for supporting the package, which means include a perforated tubular shell for distributing the treating fluid to the package, said supporting means permitting longitudinal elongation

tion of the package in a predetermined amount but to an extent less than the package tends to make under the treatment.

3. Apparatus for fluid-treating fine filamentous thread gathered into an initial tubular package which tends to elongate longitudinally during the treatment of the thread, comprising means for supporting the package, which means include a resiliently expansible tubular shell for distributing the treating fluid to the package, said supporting means permitting longitudinal elongation of the package in a predetermined amount but to an extent less than the package tends to make under the treatment.

4. The apparatus set forth in claim 3 characterized in that said tubular shell is perforated.

5. Apparatus for fluid-treating fine filamentous thread wound into an initial tubular package which tends to elongate longitudinally during the treatment of the thread, comprising an element for radially supporting the package and two spacers for the ends of the package, the ends of said element abutting said spacers and spacing the latter a distance apart somewhat more than the length of the package before the treatment but less than the length which the package would attain during the treatment if it should be permitted to expand unrestrainedly, and means for distributing the treating fluid to the package.

6. The apparatus set forth in claim 5, characterized in that said element is tubular and perforated whereby it is adapted to serve as a conduit for the treating fluid and to direct the treating fluid transversely of the package.

7. The apparatus set forth in claim 5, characterized in that said element is a resiliently and radially expansible tube and is perforated to direct the treating fluid radially of the package.

8. Apparatus for fluid-treating fine filamentous thread wound into initial tubular packages which tend to elongate longitudinally during the treatment of the thread, comprising perforated tubular elements for radially supporting the packages and annular spacers for the adjacent ends of contiguous packages, the ends of said tubular elements abutting said spacers and spacing adjacent spacers a distance apart somewhat more than the length of the package before the treatment but less than the length which the package would attain during treatment if it should be permitted to expand unrestrainedly, said tubular elements and annular spacers being aligned to serve as a conduit for the treating fluid.

9. The apparatus set forth in claim 8, in combination with clamping means for said tubular elements and annular spacers.

10. The apparatus set forth in claim 8, characterized in that said tubular elements have longitudinally split overlapping walls, whereby said elements are expansible.

11. Apparatus for fluid-treating fine filamentous rayon thread collected into a cake, comprising a perforated tubular cake core, a rigid abutment for one end of said core and for one end of the cake, a second rigid abutment for the other end of the core, said abutments being spaced apart a distance predeterminedly greater than the length of the cake before treatment but less than the length which the cake would attain during treatment if it should be permitted to elongate longitudinally unrestrainedly, and means for supplying treating fluid to the core.

12. Apparatus for fluid-treating fine filamentous rayon threads collected into cakes, comprising means for mounting a battery of cakes in vertically spaced relation and including tubular means radially contacting the inner faces of the cakes and spacers mounted between the contiguous ends of adjacent cakes, adjacent spacers being spaced a distance apart somewhat more than the length of the cake before the treatment but less than the cake would attain during the treatment if it should be permitted to elongate longitudinally unrestrainedly, and means for rigidly clamping said mounting means in an axial direction.

13. Apparatus for fluid-treating fine filamentous rayon threads collected into cakes, comprising means for mounting a battery of cakes in vertically spaced relation and including a perforated resilient tubular core for each cake extended beyond the ends of the latter and spacers mounted between the contiguous ends of adjacent cores, adjacent spacers being spaced a distance apart somewhat more than the length of the cake before the treatment but less than the length which the cake would attain during the treatment if it should be permitted to elongate longitudinally unrestrainedly, and means for rigidly clamping said mounting means in an axial direction.

14. The apparatus set forth in claim 13, in combination with means for passing a treating fluid into the core interiors and transversely through the cakes.

CHARLES A. HUTTINGER.