

Feb. 10, 1942.

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2,272,233

METHOD OF PROCESSING THREAD OR THE LIKE

Filed May 3, 1938

3 Sheets-Sheet 1

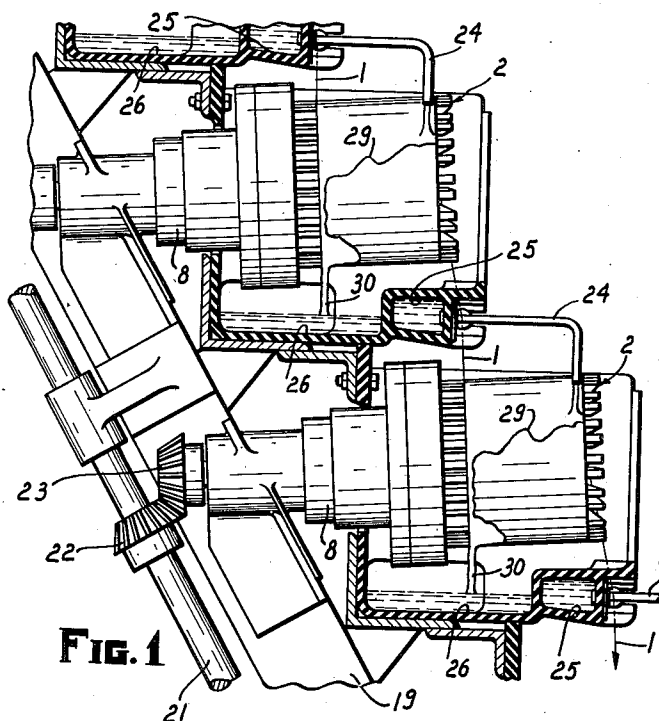


FIG. 1

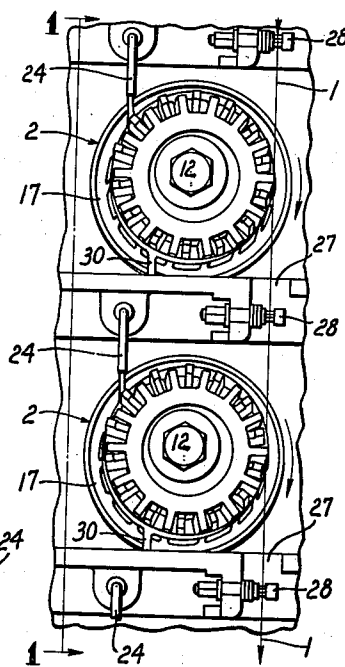


FIG. 2

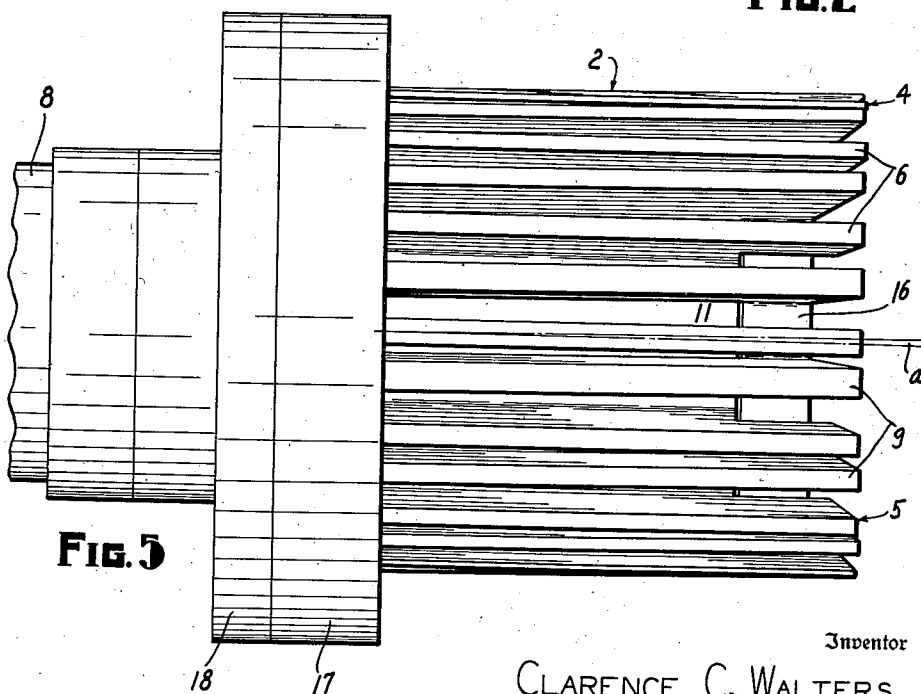


FIG. 3

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3 Sheets-Sheet 2

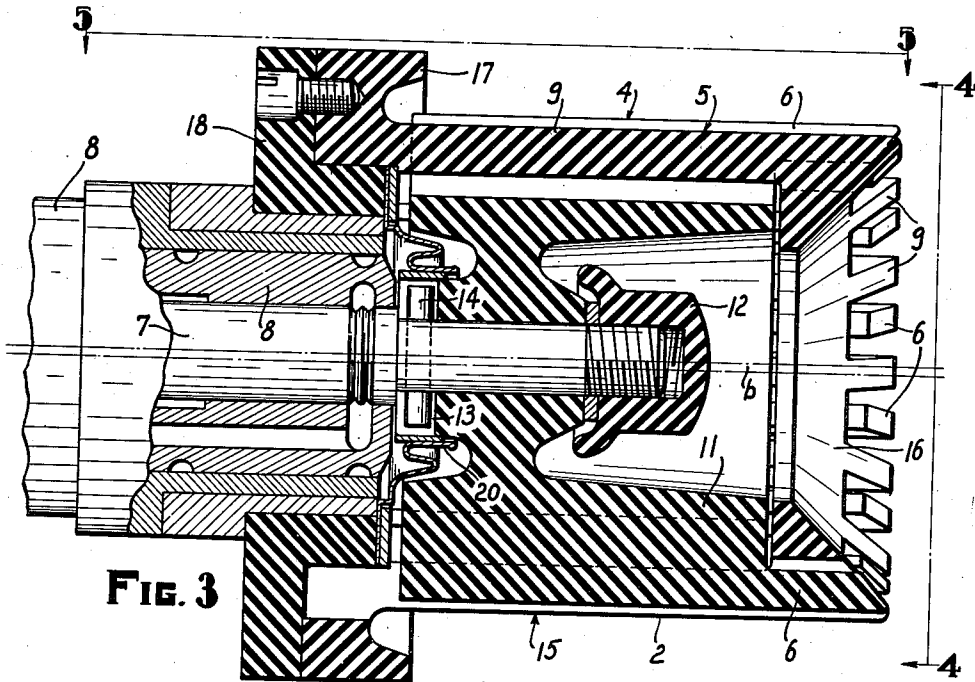


FIG. 3

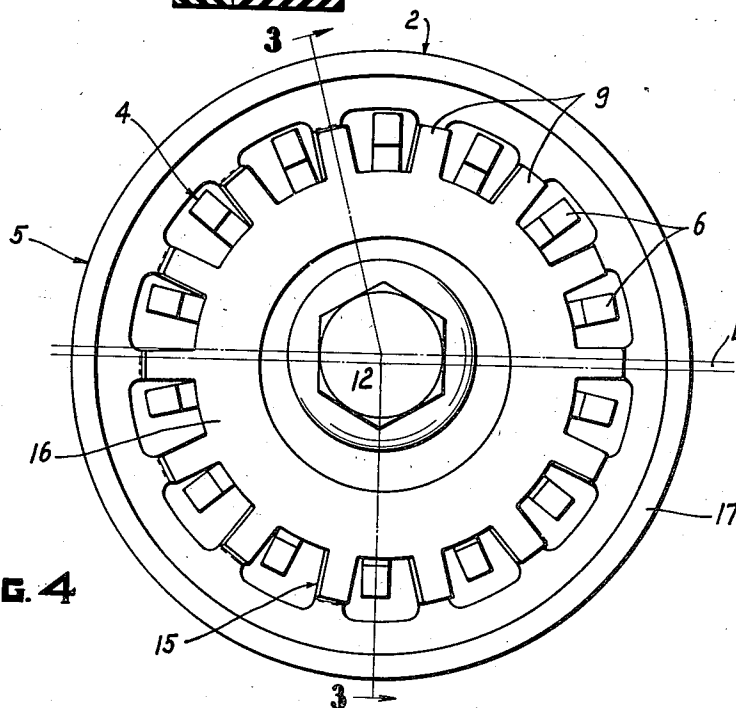


FIG. 4

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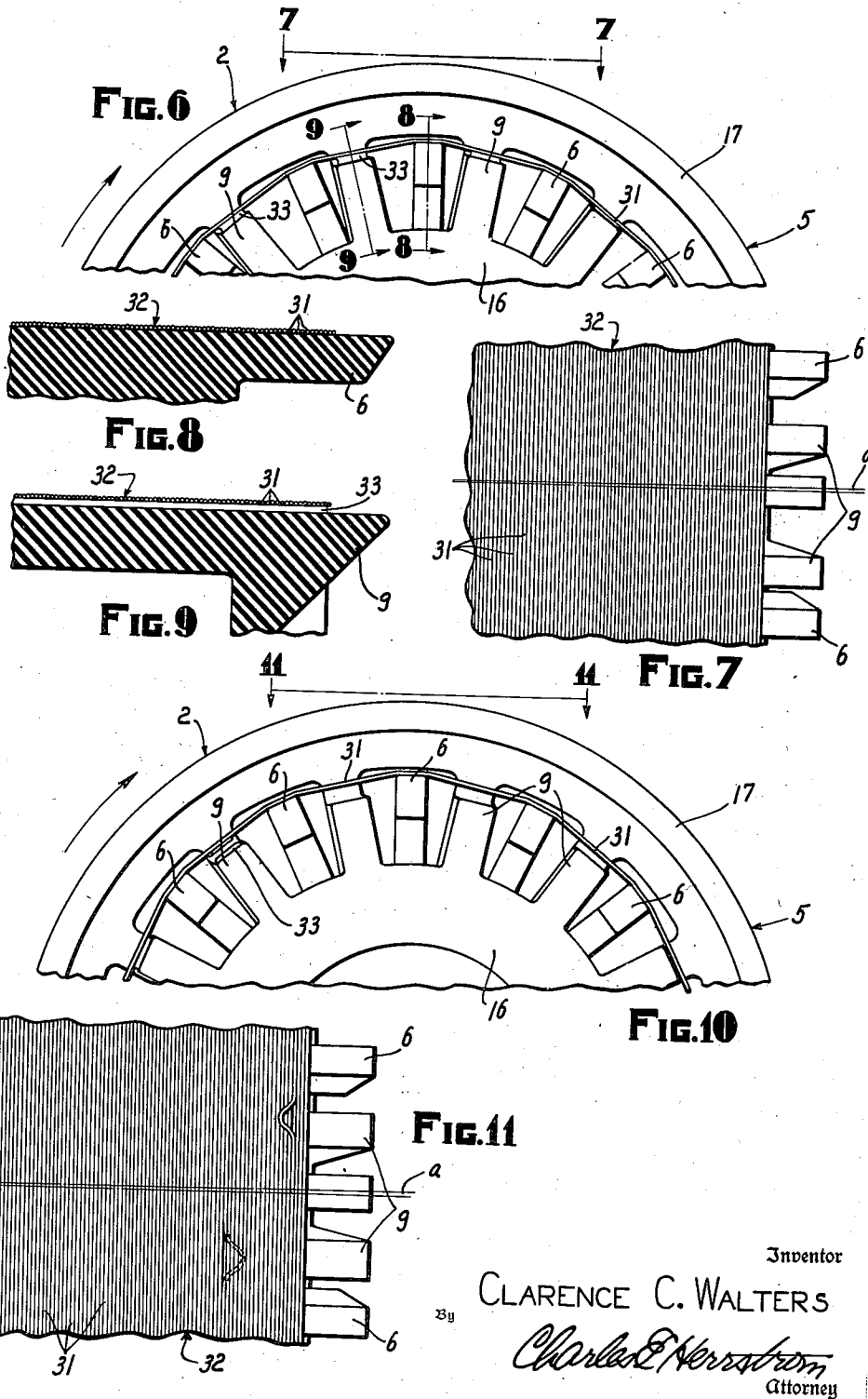
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METHOD OF PROCESSING THREAD OR THE LIKE

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3 Sheets-Sheet 3



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2,272,233

METHOD OF PROCESSING THREAD OR THE LIKE

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Application May 3, 1938, Serial No. 205,863

6 Claims. (Cl. 18—54)

This invention relates to the processing of thread or the like. More particularly, it relates to the liquid processing of thread or the like, such as multiple filament artificial silk thread, while it is continuously but temporarily stored on a thread-advancing reel made up of two interdigitating sets of bar members which cooperate to advance the thread or the like lengthwise of the reel in a plurality of generally helical turns. For convenience, the invention will be described in connection with the processing of multiple filament viscose artificial silk thread on apparatus generally similar to the apparatus shown, described and claimed in copending application Serial No. 7,114, filed February 18, 1935, by Walter F. Knebusch and Alden H. Burkholder (Patent No. 2,225,642).

In the drawings, Figure 1 represents a side sectional elevation on line I—I of Figure 2 of a portion of an apparatus for processing multiple filament viscose artificial silk thread which includes a plurality of thread-advancing reels capable of operating according to the principles of the present invention. Figure 2 is a front elevation of a portion of the apparatus shown in Figure 1. Figure 3 is a sectional elevation from line 3—3 of Figure 4 of a thread-advancing reel capable of operating according to the present invention. Figure 4 is an end elevation of said reel from line 4—4 of Figure 3. Figure 5 is an elevation of the reel from line 5—5 of Figure 3 showing in particular the inclined relation of the sets of bar members forming the thread-bearing periphery of the reel.

Figure 6 is an elevation of a portion of the end of the reel corresponding in general to the upper portion of Figure 4 but on a larger scale, showing the conditions obtaining when the reel is operating according to the invention. Figure 7 is a plan of a portion of the reel of Figure 6, from line 7—7 of Figure 6. Figure 8 is a sectional elevation from line 8—8 of Figure 6 showing in cross section the filaments of the thread in the arrangement which they tend to take when actually supported by a bar member of a reel operating under such conditions. Figure 9 is a similar sectional elevation from line 9—9 of Figure 6 showing the relation which the filaments bear to a retracted bar member of a reel operating according to the present invention. Figure 10 is an elevation on the same scale as Figure 6 of a portion of a reel which does not operate according to the present invention showing the thread as disposed on said reel under such con-

ditions. Figure 11 is a plan of a portion of the reel from line 11—11 of Figure 10.

In the drawings, like reference characters refer to like parts throughout.

In the illustrated apparatus, as is apparent from Figures 1 and 2 of the drawings, thread 1 from a suitable source is passed in sequence to each of a plurality of thread-advancing reels 2 on each of which the thread is subjected to processing treatment. The illustrated apparatus is similar to that of the above-mentioned prior application in that the apparatus as a whole comprises a plurality of parallel descending series of thread-advancing reels each of which series serves to process a single thread. Corresponding thread-advancing reels of such adjacent series may be disposed in corresponding positions longitudinally of the machine, whereby advantages are provided in the construction of the apparatus.

Thread-advancing reels employed in the practice of the invention may conveniently take the form of the reel shown, which operates on the same thread-advancing principle as the reel shown, claimed and described in copending application Serial No. 652,089 of Walter F. Knebusch (Patent No. 2,210,914). The illustrated reel is, however, of cantilever form; that is, it is supported and driven from one end only, having its other end free and unobstructed. It operates to advance the thread toward the free end of the reel in a large number of closely spaced, generally helical turns. Numerous benefits are provided by the cantilever construction of the reel, among them ease of starting the thread on the reel, advantages in transferring the thread to the succeeding device, etc.

Moreover, because of the cantilever construction of the reels, they can be disposed as shown in Figure 1 in stepped relation with the free or discharge end of each preceding reel in opposite relation to the supported or receiving end of the succeeding reel. Great advantages are provided by such arrangement, among them being the fact that the reels are readily accessible for operating purposes, as for starting the thread on the reels, for inspection and maintenance, etc. Further, it is not necessary that the thread bend sharply in passing from a preceding reel to a succeeding reel, as a result of which are avoided the stresses which would otherwise be induced by sharp bending of the thread. Such stresses would tend to injure the thread, which is very delicate, particularly when incompletely processed.

The operation and construction of the illustrated reel will be explained in connection with Figures 3 to 5, inclusive.

As shown in these figures, each reel is made up of two rigid, generally cylindrical reel members 4 and 5 each of which comprises a plurality of spaced, longitudinally extending bar members. The bar members of each reel member are disposed alternately with those of the other reel member. Thus reel member 4, which, inasmuch as it is concentrically mounted on a drive shaft 7 journaled in a frame member 8, may be termed the concentric member, has its periphery formed of a plurality of spaced longitudinally extending bar members 6. The other reel member 5, which may be termed the eccentric member, has a generally cylindrical periphery formed of a plurality of spaced longitudinally extending bar members 9 alternately disposed to the bar members 6 of reel member 4. Said reel member 5 is mounted for rotation about an axis suitably displaced from that of reel member 4, being preferably offset laterally from and inclined to that of reel member 4.

Concentric member 4 may be formed as shown with the bar members 6 mounted on the periphery of a cylindrical body 11, in which case great rigidity is obtained. While said reel member 4 may be mounted on and driven from drive shaft 7 by any one of various means, in the illustrated reel embodiment the generally cylindrical body 11 is concentrically mounted on a reduced portion of the drive shaft 7, being held against a shoulder on said drive shaft by a cap-nut 12 threaded on the end of the drive shaft 7. The body 11 is provided with a slot 13 at the rear end thereof, in which slot are disposed the projecting ends of a pin 14 passing diametrically through said drive shaft, whereby the reel member 4 is caused to rotate with drive shaft 7.

In the illustrated embodiment, the eccentric reel member 5 is formed of a rigid cage-like member 15 having at the unsupported end of the reel an internal annular rib 16 which serves to reinforce the bar members 9. At its other end it has an external annular rib 17 which serves to reinforce the bar members 6. Rib 17 also serves as means by which the cage-like member 15 is mounted on an annular member 18 journaled on frame member 8 for rotation about an axis disposed in the desired offset and inclined relation to that of the drive shaft 7. In the illustrated apparatus, the frame member 8 for each reel is mounted on the inclined beam 19 forming part of the frame of the apparatus as a whole.

The reel members may be made of some material resistant to the action of the processing liquids, while suitable sealing means, such as a bellows shaped rubber diaphragm 20, may be provided to seal the bearing means against entrance of processing liquid.

Rotation of the reel drive shaft 7 causes concentric member 4 fixed thereto to rotate, whereupon contact of the bar members 6 of concentric member 4 with the bar members 9 of eccentric member 5 causes said eccentric member to rotate at the same angular speed. During such rotation, the offset relation of the generally cylindrical reel members 4 and 5 causes the thread in each turn to be transferred from the bar members of one reel member to those of the other reel member. Simultaneously, the inclined relation of the reel members causes the thread to advance in a plurality of generally helical turns

lengthwise of the reel. The magnitude of the inclination between the axes of the reel members, indicated by the angle α in Figure 5, determines the pitch of the helical turns of thread; that is, the greater the angle α , the greater is the amount that each thread turn advances during a revolution of the reel.

The reels may be driven by any suitable means; for instance, as shown in Figure 1, from a drive shaft 21, a gear 22 mounted on said drive shaft meshing with a gear 23 mounted on each driven reel drive shaft 7.

In the illustrated embodiment of the invention, processing liquid is applied to the thread stored on each reel from a tube 24 which is supplied with processing liquid from a conduit 25 extending longitudinally of the machine. The processing liquid is collected in a suitable collecting trough 26 extending beneath the reel, which trough may likewise serve a plurality of corresponding reels in a horizontal series. Each trough collects the liquid leaving the reels above it and also, by means of the reagent supply conduit 25 formed integrally therewith, supplies processing liquid to the reels below it. Each of said troughs, moreover, is formed with a recessed portion 27 through which the thread passes from the reel above the trough to the succeeding reel, a suitable guide 28 being provided, if desired, to guide the thread onto the succeeding reel.

It has been found, despite the fact the thread turns are supported by the bar members only at spaced points, that it is possible under certain conditions to obtain a continuous film or sheet of processing liquid over the thread turns on the reel.

If such a film of processing liquid is to be formed and maintained, it is necessary that the thread turns be relatively closely spaced. The thread turns should be close enough together, in fact, to permit the processing liquid adhering to the adjacent thread turns to form a film therebetween due to the surface tension of such liquid. If the thread turns are too widely spaced, particularly with respect to the size of the thread, the distance between adjacent thread turns is too great to allow the film of processing liquid to be formed and maintained. Rather, under such circumstances the liquid adhering to the thread tends to cause the filaments in the thread turns to coalesce into separate bundles of small cross sectional area.

When the film of processing liquid is thus formed, the filaments of the thread turns contained in said film spread out into a thin layer which extends entirely around the reel. The layer may be one or more filaments thick, depending upon the spacing of the thread turns and on the number of filaments in the thread. In either case, the filaments thus contained in the film of processing liquid are so spread out that adjacent turns of thread are practically indistinguishable from each other. The fact that such a film of processing liquid is formed, and that the filaments of the thread are spread out in said film, provides numerous advantages.

As previously explained, in the case of the illustrated reel the space between the thread turns or, in other words, the amount each thread turn is advanced during one revolution of the reel, is determined by the angle of inclination between the reel members, which angle is indicated at α in Figure 5. With such a reel, very accurate control over the spacing of the thread

turns can be obtained and the thread turns can be very closely spaced. This follows from the fact that the principle of operation of the reel makes possible the elimination of all lost motion between the thread-advancing elements, the thread turns being advanced only by the rotation of rigid reel members about inclined axes and by no other moving parts.

With a reel of given diameter, the speed of rotation of the reel plays an important part in the formation and maintenance of said film. The speed of rotation of the reel should be high enough to cause the development of sufficient centrifugal force to maintain said film; that is, the speed of rotation should not be so low that the processing liquid applied to the thread on the reel merely drops off the thread while at the upper portion of the reel and thus does not form the film. On the other hand, the speed of rotation of the reel should not be so high that the centrifugal force developed is great enough to throw off sufficient processing liquid from the thread to prevent the formation of the film or to break it if it does form. Between these two limits the speed of the reel may be varied to a considerable extent and the film of processing liquid still be obtained.

The manner in which the processing liquid is applied to the thread on the reel also affects the formation and maintenance of the film of processing liquid. When the processing liquid is applied as illustrated in Figures 1 and 2, very satisfactory results are obtained. As shown in said figures, the processing liquid is applied to the thread on the reel in a single stream from the reagent tube 24, said stream being caused to impinge substantially tangentially on the thread on the reel at a point near the free end of the reel, preferably against the direction of rotation thereof.

In the apparatus of Figures 1 and 2, the reel is inclined from the horizontal, the end at which the thread leaves the reel being higher than the end at which the thread starts on the reel. Because the reel is inclined, a very effective countercurrent flow of processing liquid is provided, since the processing liquid is applied to the elevated end of the reel and travels in the film toward the lower end of the reel. This makes for very efficient processing of the thread, since the thread which has just started on the reel is subjected to processing liquid which has previously been used to treat other portions of the thread, while the thread approaching the point at which it is to leave the reel is subjected to the fresh processing liquid.

The inclination of the reel, as in the embodiment illustrated in Figures 1 and 2, promotes the formation and maintenance of film of processing liquid. A comparatively thick layer 29 of processing liquid is formed along one side of the reel, extending from the point of application of the liquid toward the lower end of the reel. The processing liquid forming said layer 29 tends to drop downward on the periphery of the reel, but said layer is maintained because the thread on the reel is moving as shown by the arrows. The formation of this layer 29 of liquid, which may extend along the entire length of the thread winding on the reel, is advantageous because it acts as a source of supply for the film of processing liquid which extends entirely around the reel and thus makes it possible for said film to extend entirely along the length of the thread winding on the reel.

In the inclined reels of Figures 1 and 2, when the processing liquid reaches the extreme limit of the layer of thread adjacent the supported end of the reel; i. e., the end on which the thread starts, it can travel no farther. The reason for this state of affairs resides in the fact that the spaced bar members extending beyond the end of the layer of thread cannot in and of themselves maintain the film. Therefore, the processing liquid leaves the reel at the lower end of the thread layer, either in a more or less continuous stream of liquid 30 or in drops or masses of liquid, being collected in the trough 26. Relatively little liquid is thrown off the reel, since in general the liquid passes off the reel in a stream or collects in large masses which drop off the reel in the manner described.

The amount of inclination of the reel from the horizontal, however, also influences the successful formation and maintenance of the film of processing liquid on the thread turns. If the amount of inclination is too great, the liquid tends to travel toward the lower end of the reel too rapidly to permit the formation and maintenance of the above-described film of processing liquid on the thread turns. If the amount of inclination is too small, the processing liquid will not travel entirely toward the lower end of the reel and hence a film will be obtained only over a limited portion of the reel.

The formation of such a film of processing liquid, which forms no part of the present invention but is described, illustrated and claimed in copending application Serial No. 205,678, provides numerous advantages. Because the filaments of the thread are spread out into a thin layer on the reel, they may be efficiently and thoroughly subjected to processing medium, and therefore thread of a very high quality may be produced. Moreover, the thread may be thus effectively and thoroughly processed with a much smaller amount of processing liquid than would otherwise be required because most, if not all, of the processing liquid applied to the thread is brought into actual contact with it. This results in reduced consumption of processing liquid and savings in the cost of construction of the apparatus because of the reduced size of the conduits, etc., which carry the processing liquid.

In general, in a reel of the type to the employment of which the invention is directed, the thread is supported as the reel rotates by certain of the bar members of each of the two interdigitating sets of bar members. In effect, as the reel rotates, the bar members of each set are projected beyond and retracted within the periphery defined by the bar members of the other set. When the bar members of either set project beyond the periphery defined by the bar members of the other set, the projecting set supports the thread. During such time, in cooperation with such of the bar members of the other set as also carry the thread, they effect advancement of the thread in the necessary large number of closely spaced, generally helical turns.

According to the present invention, the reel is so constructed that the retracted bar members are withdrawn within the periphery defined by the other set of bar members only sufficiently to permit the thread-advancing function of the reel to occur.

This will be understood from a consideration of Figures 6 to 9, inclusive. In the conditions illustrated in these figures and particularly in Figure 6, the portion of the reel which is shown

is one in which the bar members 6 of reel member 4 are employed in carrying the thread. The bar members 9 of the other reel member 5 are retracted within the periphery defined by said bar members 6. The portion of the reel illustrated in Figures 6 to 9, inclusive, shows the extreme retracted position reached by the bar members 9 when withdrawn, Figure 6 corresponding to the upper portion of Figure 4.

As shown in Figure 7, representing an elevation of a portion of the thread-bearing periphery of the reel corresponding in general to the portion seen from line 7—7 of Figure 6, when the continuous film of processing liquid forms around the thread-bearing periphery of the reel, the filaments 31 of the thread turns tend to spread out in a thin layer 32 in such manner that adjacent turns are practically indistinguishable. This is illustrated in Figure 8, which shows the filaments 31 of the thread turns disposed in a layer 32 on a bar member 6 supporting the thread, and in Figure 9, which shows the layer of filaments disposed above a retracted bar member 9 which is not at the moment supporting the thread. The filaments shown in Figures 6 to 9, inclusive, as also in Figures 10 and 11, are exaggerated with respect to the size of the reel members for the purpose of clearness in illustration.

As shown in Figures 6 and 9, as the bar members which are not at the moment employed in carrying the thread are retracted within the periphery defined by the bar members which are engaged in carrying the thread, a secondary film 33 of processing liquid forms between the layer 32 of thread and each of the retracted bar members. As appears from Figure 9, when the above-described continuous film of processing liquid extends for substantially the full length of the thread windings on the reel, this secondary film 33 extends lengthwise of each retracted bar member for substantially the entire length of the thread windings in the layer 32. According to the present invention, the reel is so constructed that the retracted bar members are not withdrawn sufficiently, even when retracted by the maximum amount, to result in a rupture of this secondary film 33.

The retracted bar members are, however, withdrawn a sufficient amount to permit the thread-advancing function of the reel to take place. Thus in the reel illustrated as operating according to the invention, the retracted bar members are withdrawn an amount just sufficient to permit the bar members carrying the thread to support it without subjecting it to the thread-advancing or guiding influence of the retracted bar members, so that the inclined relation of the sets of bar members can cause advance of the thread in the intended manner. In the illustrated reel, the amount which the bar members of each set are retracted within the bar members of the other set is determined by the amount of offset, indicated at *b* in Figures 3 and 4, between the planes in which the respective axes of the two sets of bar members of the two reel members are disposed.

Figures 10 and 11 illustrate the conditions which occur with a reel which does not operate according to the present invention, but which is so constructed that the retracted bar members are withdrawn within the thread-supporting bar members to such an extent that the film is ruptured. As shown in Figure 10, the bar members 9 which are not carrying the thread are retracted

by such an amount within the periphery defined by the bar members 6 that the film 33 breaks. Such breakage of the film, which is practically instantaneous, disturbs the parallelism of the filaments of thread carried by the thread-supporting bar members 9, which filaments, as previously indicated, are spread into a thin layer along the reel due to the surface tension of the processing liquid in the film which surrounds the thread on the reel.

When the filaments are so disturbed by the breakage of the film 33, certain filaments are thrown across or under the filaments of adjacent thread turns, as shown in Figure 11. Thereafter, when the thread in the turns containing such overwound or underwound filaments reaches the discharge point of the reel and is unwound from the reel as it leaves the reel, the disturbed filaments tend to break. Such breakage occurs either because (a) one or more filaments in the turns of thread leaving the reel is caught or snagged in a turn of thread still wound on the reel or (b) because one or more filaments of a thread turn still wound on the reel is caught or snagged in the portion of thread leaving the reel, such catching or snagging of the filaments arising from the condition illustrated in Figure 11. It has been found that a very considerable amount of filament breakage occurs under such circumstances.

In reels operating according to the present invention in which the retracted bar members are not withdrawn sufficiently to cause the secondary film of processing liquid forming between each retracted bar member and the thread layer to break, the thread filaments are undisturbed. As a result, the parallelism of the filaments is maintained. No overwinding or underwinding of filaments such as described above can occur. Consequently the possibility of filament breakage for the reasons described above is eliminated. Therefore, by means of reels operating according to the present invention, thread may be produced which is of a very high quality because of the absence of broken filaments.

Furthermore, uniform and thorough processing of the thread is made possible, since the thread may be successfully processed under conditions in which the previously described continuous film of processing liquid is formed. Moreover, because it makes possible the successful commercial production of such high quality thread according to a method in which a continuous film of processing liquid is formed about the thread winding on each reel, the present invention provides considerable economies in the production of the thread. As previously indicated, large savings result in such factors as the amount of processing liquid employed, the construction of apparatus, etc.

For a given diameter of reel, the number of bar members in each reel member and the width of the bar members are factors in determining the amount which the bar members of one reel member should be withdrawn within the thread-bearing periphery of the other reel member. These factors have pertinence to the amount which the retracted bar members are withdrawn, or, in the illustrated reel, to the amount of offset between the parallel planes in which the axes of the reel members are disposed, indicated at *b* in Figure 3, because such factors determine the distance between the chord subtended by the layer of thread and the corresponding arc of the

portion of the imaginary circle defined by the thread-carrying bar members. Thus, if each reel member, for a given diameter, embodies a relatively large number of bar members, the polygonal shape defined by the thread turns more nearly approaches a circle, and hence the retracted bar members may be withdrawn a smaller amount within the periphery of the thread-carrying bar members to maintain the film 33 than if the bar members were more widely spaced, in which case the polygonal shape defined by the thread turns would not so nearly approach a true circle.

In practice, very satisfactory results have been obtained when viscose artificial silk of 150 denier and 40 filaments is subjected to a liquid processing treatment on a cantilever reel of the illustrated type forming part of the apparatus of the general type shown in Figures 1 and 2. The substantially cylindrical periphery defined by the bar members of each reel member is 5" in diameter, each reel member comprising 14 bar members, the total length of the periphery of the reel covered by the thread winding being approximately 4". The bar members of the concentric reel member are $\frac{3}{8}$ " wide, while those of the eccentric reel member are $\frac{1}{8}$ " wide. The reel is inclined from the horizontal with its unsupported end higher than its supported end, the amount of such inclination being $\frac{1}{8}$ " per inch or 3° 35'. The thread is, of course, advanced toward the free end of the reel.

Processing liquid is applied to the thread on the reel in a single stream at the thread discharge end of the reel, the stream being directed against the direction of rotation of the reel and substantially tangentially thereto, substantially as shown in Figures 1 and 2. Approximately 270 c. c. of processing liquid per minute are supplied to the thread on the reel through an orifice .075" in diameter in reagent tube 24. If the processing liquid is any one of the various processing liquids employed in the manufacture of viscose artificial silk thread, a continuous film of processing liquid is formed entirely around the reel when the number of turns on the reel is between 20 and 60 turns per inch. The reel is rotated at 170 R. P. M., although good results are obtained with speeds of rotation up to 200 R. P. M.

With a reel of the above dimensions and operating under the above conditions, it has been found that the film 33 of processing liquid forming between the layer of thread and each retracted bar member does not rupture when the distance *b* between the parallel planes in which the axes of the reel members are disposed is $\frac{3}{8}$ ". This amount of offset permits the bar members of each reel member to be retracted sufficiently to permit the thread-advancing operation of the reel to occur with no interference. In this reel, therefore, the value of $\frac{3}{8}$ " is critical. The resulting thread is very thoroughly and uniformly processed and has no broken filaments.

The above-described apparatus and the above example of the invention being purely illustrative, various modifications may be made therein without departing from the spirit of the invention. For instance, while the invention has been described in connection with a method of operation of the reel in which a continuous film or sheet of processing liquid is formed entirely around the reel, the invention may, under certain circumstances, be advantageously applied to a

reel on which such a film or sheet of processing liquid is not formed. Moreover, reels employed in the practice of the present invention may operate on principles other than that of the reel illustrated. The term "thread or the like" in the appended claims is intended to include all materials which may be subjected to liquid treatment on a reel operating according to the present invention.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What is claimed is:

1. In a liquid processing of multiple filament thread or the like on a rotatable thread-advancing reel made up of a plurality of spaced, longitudinally extending bar members which support the thread or the like, which cooperate during rotation of the reel to advance it lengthwise thereof in a plurality of generally helical turns, and some of which are retracted within the periphery defined by adjacent bar members during operation of the reel, the method comprising applying processing liquid to the thread or the like on the reel, operating the reel in such manner as to spread the filaments of adjacent turns of thread or the like into a thin layer, and retracting each of said retractable bar members within the turns of thread or the like carried by adjacent bar members by an amount sufficient to cause the retracted bar member to break contact with the turns of thread or the like carried by said adjacent bar members but nevertheless insufficient to cause the retracted bar member to break contact with the processing liquid carried by said turns of thread or the like, whereby is prevented disarrangement of the filaments in adjacent turns of thread or the like.
2. In the liquid processing of thread or the like on a rotatable thread-advancing reel made up of a plurality of spaced, longitudinally extending bar members which support the thread or the like, which cooperate during rotation of the reel to advance it lengthwise thereof in a plurality of generally helical turns, and some of which are retracted within the periphery defined by adjacent bar members during operation of the reel, the method comprising applying processing liquid to the thread or the like on the reel, operating the reel in such manner that a film of processing liquid extending entirely around and for a substantial distance lengthwise of the reel forms on said turns of thread or the like, and retracting each of said retractable bar members within the turns of thread or the like carried by said adjacent bar members by an amount sufficient to cause the retracted bar member to lose its guiding influence on the turns of thread or the like carried by adjacent bar members but nevertheless insufficient to cause the retracted bar member to separate itself from the film of processing liquid carried by said turns.
3. In the liquid processing of thread or the like on a rotatable thread-advancing reel made up of a plurality of spaced, longitudinally extending bar members which support the thread or the like, which cooperate during rotation of the reel to advance it lengthwise thereof in a plurality of generally helical turns, and some of which are retracted within the periphery defined by adjacent bar members during operation of the reel, the method comprising applying processing liquid to the thread or the like, retracting each of said

retractable bar members in succession within the turns of thread or the like carried by adjacent bar members by an amount sufficient to cause the retracted bar member to lose its guiding influence on the turns of thread or the like carried by said adjacent bar members, but maintaining in the meanwhile indirect contact between said retracted bar member and the turns of thread or the like by means of a film of processing liquid.

4. In the liquid processing of thread or the like on a rotatable thread-advancing reel having a periphery made up of a plurality of cooperating thread-supporting elements at least some of which are retractable within the periphery of the reel, the step of applying processing liquid to the thread or the like, meanwhile retracting certain of said thread-supporting elements within the periphery of the reel by an amount sufficient to permit said retracted thread-supporting elements to move out of contact with the thread or the like over at least a portion of the periphery of the reel but nevertheless insufficient to cause breakage of the film of processing liquid which forms between one or more of the turns of thread or the like wound about the reel and each thread-supporting element as it is retracted.

5. In the liquid processing of thread or the like on a rotatable thread-advancing reel having a periphery made up of a plurality of cooperating thread-supporting elements at least some of which are retractable within the periphery of the reel, the step of applying processing liquid to the thread or the like in a manner lending itself to the formation of a film of processing liquid extending entirely around and for a substantial distance lengthwise of said reel, meanwhile re-

tracting certain of said thread-supporting elements within the periphery of the reel by an amount sufficient to permit said retracted thread-supporting elements to move out of contact with the thread or the like over at least a portion of the periphery of the reel but nevertheless insufficient to cause breakage of the film of processing liquid which forms between one or more of the turns of thread or the like wound about the reel and each thread-supporting element as it is retracted.

6. In the liquid processing of thread or the like on a rotatable thread-advancing reel having a periphery made up of a plurality of cooperating thread-supporting elements at least some of which are retractable within the periphery of the reel, the step of applying processing liquid to the thread or the like in a manner lending itself to the formation of a film of processing liquid extending entirely around and for a substantial distance lengthwise of said reel in which film the filaments making up the thread or the like are caused to spread out into a thin layer, meanwhile retracting certain of said thread-supporting elements within the periphery of the reel by an amount sufficient to permit said retracted thread-supporting elements to move out of contact with the thread or the like over at least a portion of the periphery of the reel but nevertheless insufficient to cause breakage of the film of processing liquid which forms between one or more of the turns of thread or the like wound about the reel and each thread-supporting element as it is retracted.

CLARENCE C. WALTERS.

CERTIFICATE OF CORRECTION.

Patent No. 2,272,233.

February 10, 1942.

CLARENCE C. WALTERS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 40, strike out the comma after "Figure 6"; and second column, line 41, for "opposite" read --apposite--; page 5, second column, line 15, claim 1, for "In a" read --In the--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 31st day of March, A. D. 1942.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.