

Feb. 21, 1950

L. S. FRYER ET AL
APPARATUS FOR PROCESSING THREAD
IN THE FORM OF A PACKAGE

2,498,540

Original Filed June 10, 1940

4 Sheets-Sheet 1

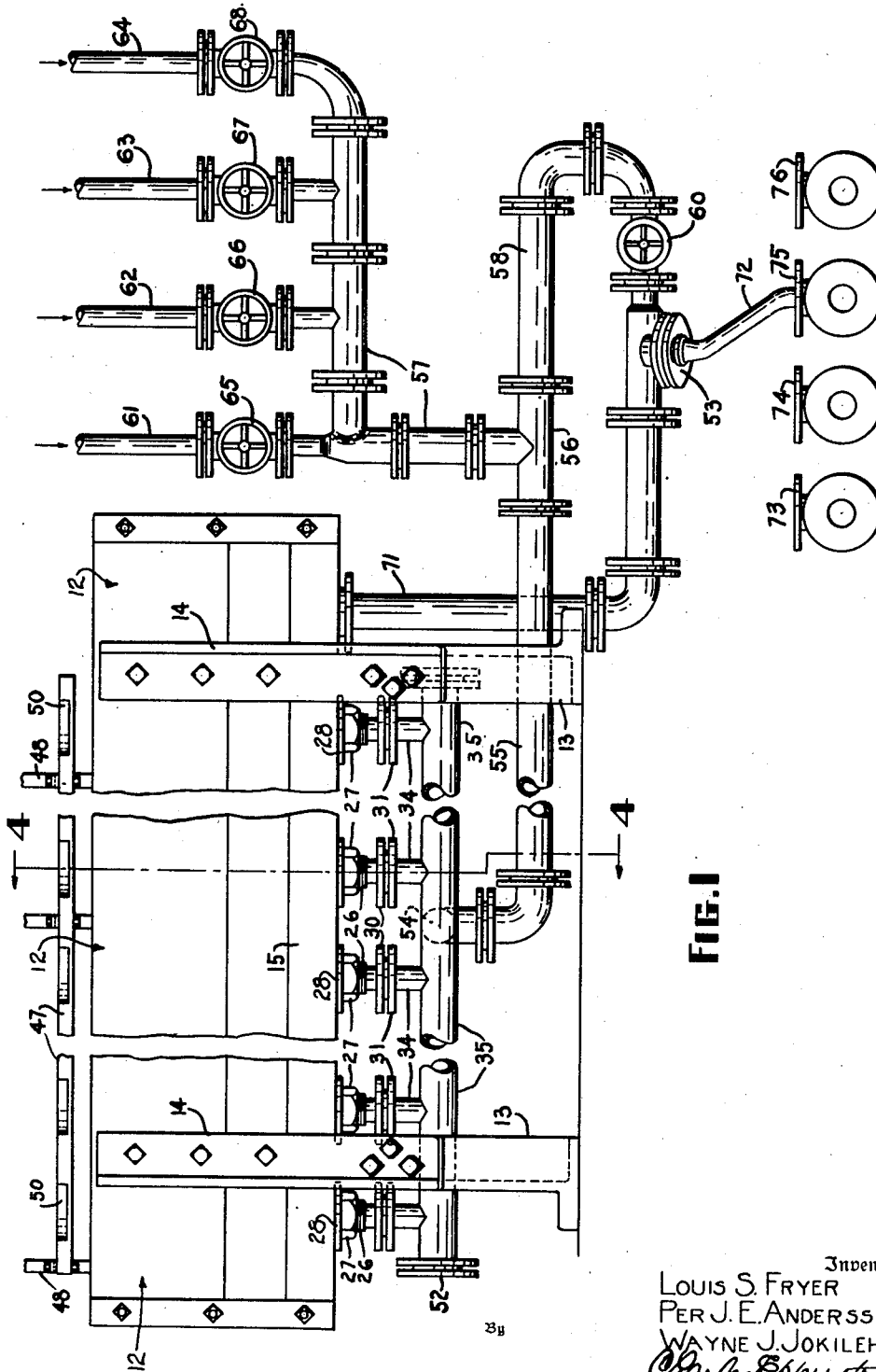


FIG. 1

Inventors
LOUIS S. FRYER
PER J. E. ANDERSSON
WAYNE J. JOKILEHTO
Charles E. Verrington
Attorney

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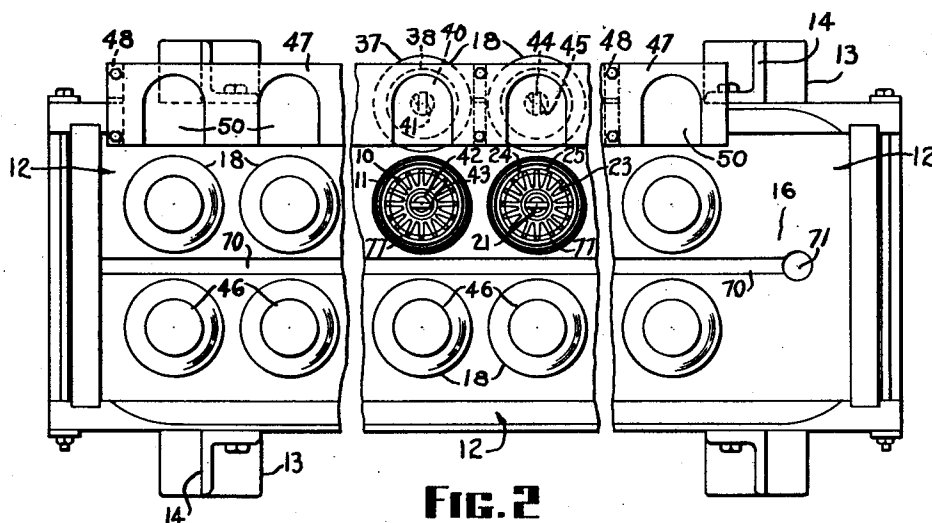
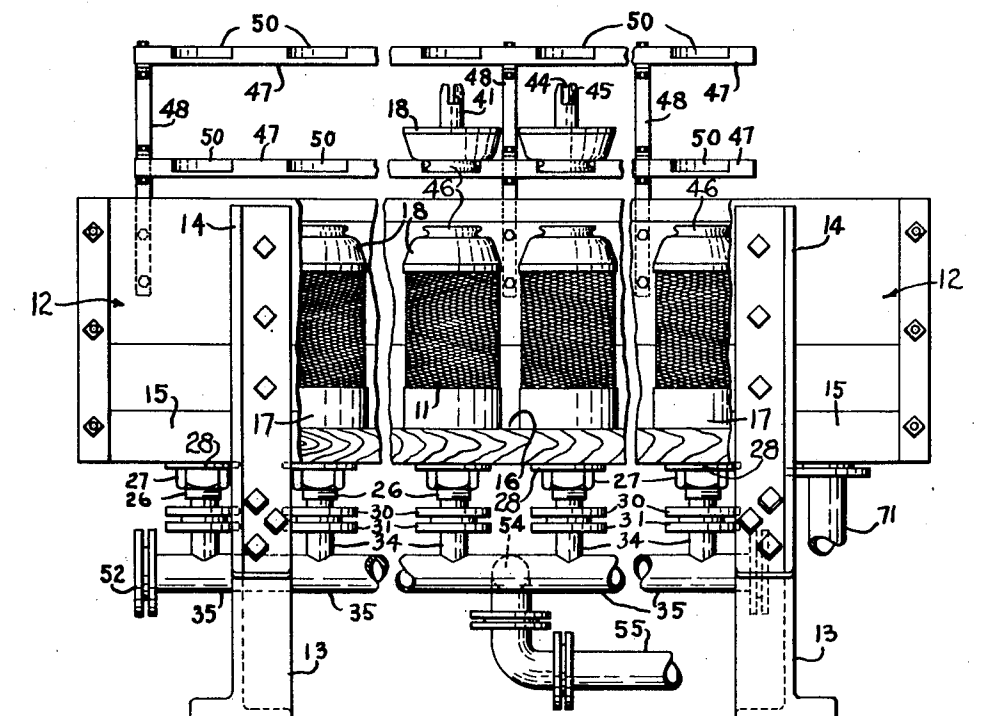


FIG. 2

**FIG. 3**

Inventors

LOUIS S. FRYER
PER J. E. ANDERSSON
WAYNE J. JOKILEHTO

WAYNE J. JOKILEHTO
Charles E. Kerrstrom
Attorney

Feb. 21, 1950

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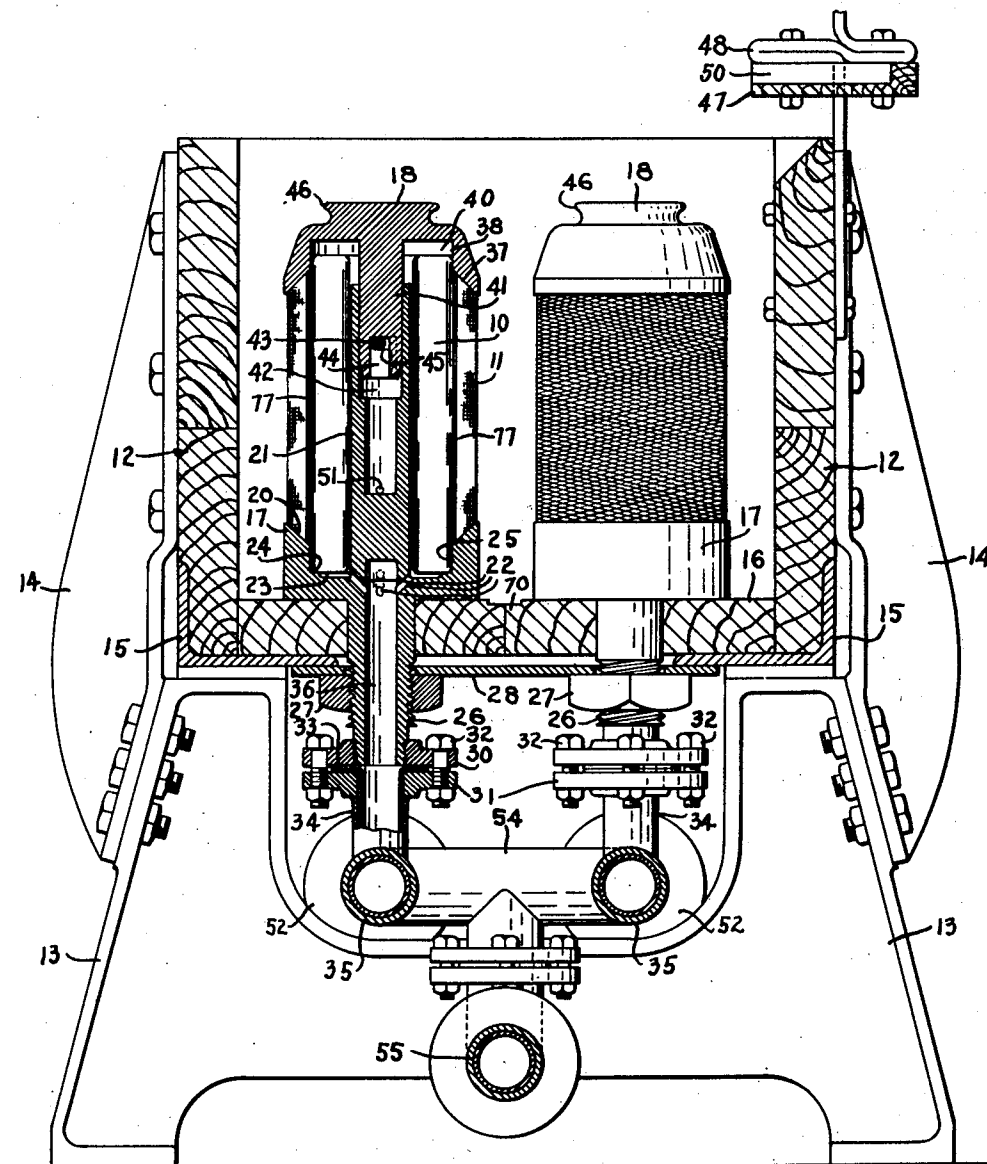


FIG. 4

Inventors
LOUIS S. FRYER
PER J. E. ANDERSSON
WAYNE J. JOKILEHTO
Charles E. Perraton
Attorney

Feb. 21, 1950

L. S. FRYER ET AL
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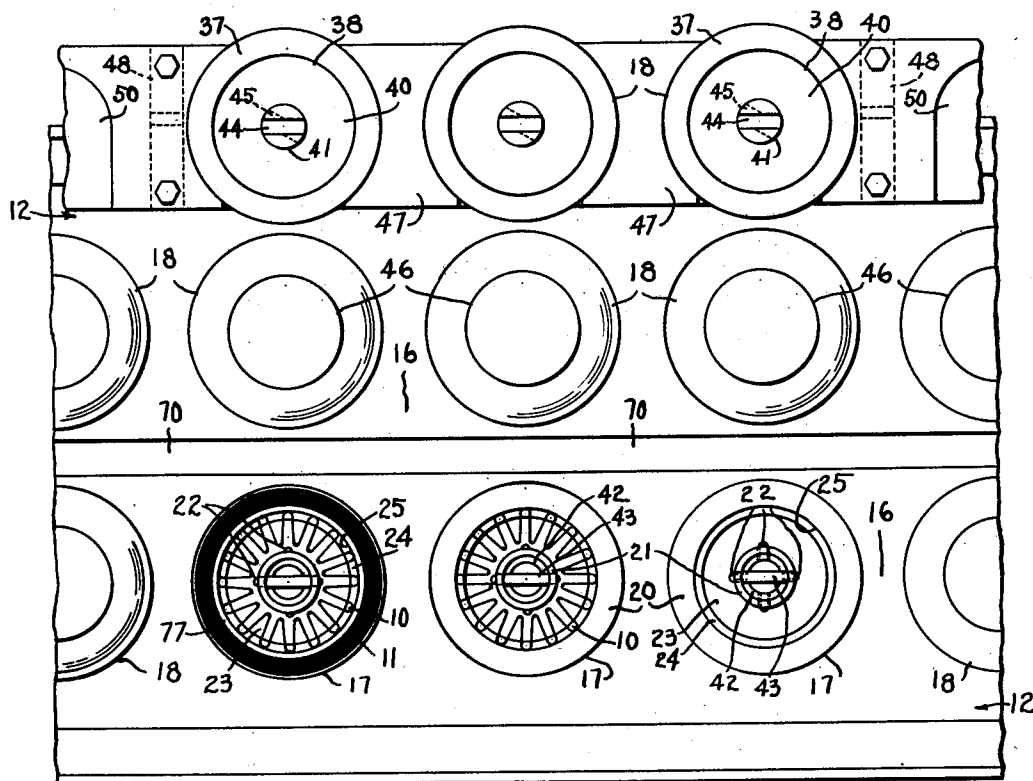


FIG. 5

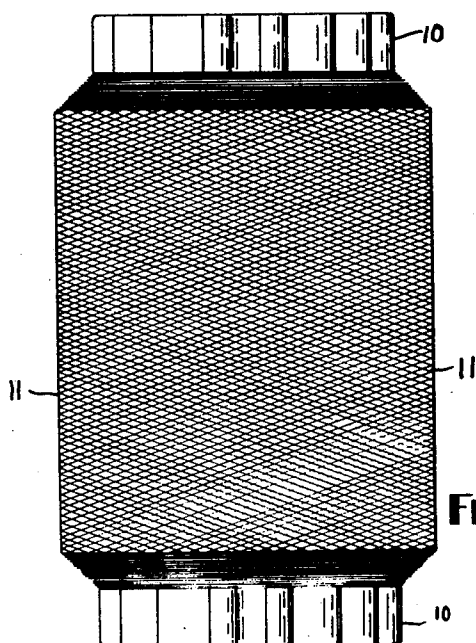


FIG. 6

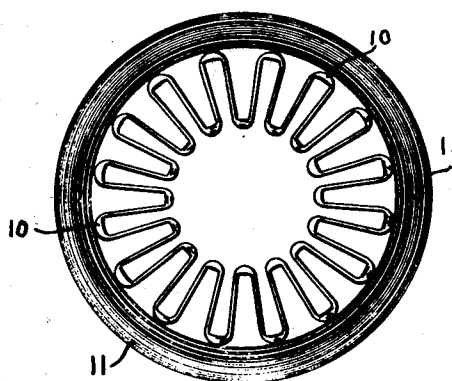


FIG. 7

Inventors
LOUIS S. FRYER
PER J. E. ANDERSSON
WAYNE J. JOKILEHTO
Charles E. Herrstrom
Attorney

UNITED STATES PATENT OFFICE

2,498,540

APPARATUS FOR PROCESSING THREAD IN
THE FORM OF A PACKAGE

Louis S. Fryer, Cleveland, Per J. E. Andersson,
Lakewood, and Wayne J. Jokilehto, Ashtabula,
Ohio, assignors to Industrial Rayon Corpora-
tion, Cleveland, Ohio, a corporation of Dela-
ware

Original application June 10, 1940, Serial No.
339,667. Divided and this application July 17,
1946, Serial No. 684,182

8 Claims. (Cl. 68—189)

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The instant invention relates to an apparatus for processing thread or the like in package form. More particularly, the invention is concerned with the production of threadlike articles of synthetic origin, such, for example, as tapes, bands, single-or multiple-filament threads, cords and the like, notably those adapted for weaving. Such products will be referred to hereinafter in the specification and in the appended claims in a generic sense as "thread".

This application is a division of application Serial No. 339,667, filed June 10, 1940 (now abandoned).

For convenience, the invention will be described hereinafter as employed in the manufacture of multiple filament viscose artificial silk thread.

In the manufacture of multiple filament viscose artificial silk thread according to the spool-spinning system, it has been the practice to employ a multiplicity of separate processing steps which necessitate frequent removal and handling of the thread packages. The thread according to customary practice is first collected in suitable package form upon a spin spool. The filled spool is removed from the spinning apparatus, washed to remove the acid, desulphurized, washed again, and finally placed in a suitable drying device and dried.

Next the thread to be processed is twisted, unwound from the twist bobbin, and formed into skeins. The skeins so formed are suspended from rods which are placed in and advanced lengthwise of a skein-treating machine, in which a plurality of endless chains or similar elements carries the skein rods through a succession of processing stages, including bleaching, washing, oiling, sizing and the like. Subsequent to the treatment of the thread, various methods are employed to dry and prepare it for the trade.

Obviously, the handling of such thread during its production is not only costly by reason of the great amount of labor required but also detrimental upon quality. Experiments have indicated that freshly spun viscose artificial silk thread is extremely sensitive, due largely to the fact that it is not completely coagulated in the early stages of its production. It is therefore extremely desirable to eliminate from the sequence of processing operations employed in the production of finished viscose artificial silk thread as many independent steps as possible.

The present invention, which contemplates among other things the production of a uniform, high quality thread especially adapted for the manufacture of woven fabrics, satisfies a desir-

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atum in that it makes possible the complete processing treatment of thread in its original package form, just as it is removed from the spinning apparatus. By virtue of the elimination of substantially all of the excessive handling of the thread hitherto required, the present apparatus accounts for a very considerable reduction in the cost of such operations. Other advantages inherent in the apparatus of the present invention will become apparent as the description of the invention proceeds.

In the illustrated embodiment of the invention, Figure 1 is an elevation of a typical apparatus including a processing tank and its associated equipment as employed in the practice of the instant invention. Figure 2 is a fragmentary plan of the apparatus illustrating the arrangement of a plurality of thread packages preparatory to performance of the processing operations. Figure 3 is a side elevation corresponding to Figure 2 with parts broken away.

Figure 4 is a sectional elevational on an enlarged scale taken from line 4—4 of Figure 1 illustrating in detail the method of supporting the thread package. Figure 5 is a partial plan corresponding to Figure 4, but with parts omitted, indicating the manner in which the spools and packages are inserted in the apparatus. Figure 6 is an elevation on an enlarged scale of a preferred type of flexible corrugated spool with a thread package wound thereon. Figure 7 is an end elevation of the spool and package of Figure 6.

For the purposes of the invention, it is preferable that a flexible core or spool be employed such, for example, as that designated by the reference character 10 in Figures 6 and 7. Illustrated spool 10 is generally tubular in form and is characterized by the presence of a plurality of axially extending corrugations. A core or spool of this type responds readily to compression or expansion without losing its shape. Such a spool is well adapted to use in connection with the invention, for the thread is constantly free from tension which might otherwise be developed in the course of the various processing operations.

Any appropriate form of package 11 may be wound upon spool 10, which is mounted upon the spin machine in the conventional manner, as by means of a suitable expansible mandrel. An open package, for example, a package of the nature of that shown in the Lovett Patent No. 2,267,983 is useful by virtue of the fact that it is highly porous but nevertheless self-supporting. This latter combination of features is desirable for the purposes of the present invention in view

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of the fact that the efficiency of operation of the apparatus is appreciably increased when the package is such that it can be supported independently of the spool.

The apparatus of the present invention includes, as illustrated in the accompanying drawings, a longitudinally extending processing trough 12 which comprises a frame casting 13, brackets 14 and longitudinally extending angle pieces 15 supporting the trough proper which may be constructed of wood or other suitable material resistant to the action of corrosive fluids customarily employed in the processing operations. Arranged preferably in parallel rows and extending longitudinally of the bottom 16 of trough 12 are a plurality of bases 17 each of which serves to accommodate a single spool 10 and forms a fluid-tight support for package 11. On the opposite end of each spool 10 is placed a cap 18 which like base 17 forms a fluid-tight seal for the upper end of package 11.

Base is designed to accommodate any conventional form of self-supporting thread package. It is illustrated as circular in shape and provided at its periphery with an upwardly extending shoulder portion 20 which is uniformly beveled toward the center, such shoulder portion accommodating the sloping shoulder of thread package 11. The inner diameter of shoulder portion 20 constitutes a compression ring 25 which is just slightly smaller in diameter than the normal outside diameter of flexible spool 10 after the thread package 11 is wound thereon. Therefore, upon insertion therein of one end of spool 10, compression ring 25 operates to compress the lower half of the spool slightly away from the interior of thread package 11.

At the center of base 17 is located an upwardly extending generally cylindrical guide 21 which, in addition to assisting in properly locating spool 10 when it is inserted in the apparatus, contains a plurality of angularly arranged openings 22 through which processing medium is introduced. Surrounding guide 21 in base 17 is an annular indentation 23 which terminates in a raised ring-shaped stop 24 extending to the base of shoulder portion 20. Base 17 is secured to the bottom 16 of trough 12 by means of a depending stem portion 26 which extends through the bottom 16 of trough 12, on the opposite side of which it is threaded to accommodate a jam nut 27 which forces a laterally extending plate 28 against angle pieces 15.

At its lower end, stem 26 is provided with flange plate 30 threaded thereon in such manner that, by means of a washer 33 and bolts 32, a fluid-tight connection is effected with a similar flange plate 31 on outlet 34 of manifold 35. The latter extends lengthwise of the apparatus, being employed to supply any desired processing liquid or liquids to the trough 12. Internal bore 36 in stem 26 serves not only to supply processing media to jet openings 22 of guide 21 from manifold 35, but also to drain the fluid out of the interior of spool 10 when the supply is shut off.

In practice, spool 10 is inserted in base 17 and compressed slightly by compression ring 25 in such manner as to permit shoulder portion 20 to support the package, thus leaving a generally cylindrically shaped open space 77 surrounding the outermost portion of the periphery of spool 10 between the spool itself and the inside of package 11. Thereafter a cap 18 provided with a tapered shoulder portion 37 adapted to contact the upper end of thread package 11, together with

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a compression ring 38, an annular chamber 40, and cylindrical stub portion 41, is applied to the upper end of spool 10, stub portion 41 thereof being inserted in socket 42 in the upper end of guide 21. Cap 18 and base 17 cooperate to seal both ends of the package against leakage of processing medium.

Any suitable form of locking means may be employed to hold cap 18 in proper relation to base 17. In the illustrated embodiment of the invention is shown one form of a bayonet type locking means which is well adapted to use in the apparatus in view of its simplicity and ease of operation. Pin 43, disposed laterally of socket 42, fits into slot 44 in stub portion 41 forming part of cap 18. By grasping hand grip 46 of cap 18, pressing downward, and turning the cap slightly at the same time, the operator causes shoulders 45 adjacent slot 44 to engage pin 43. A drain hole 51 may be provided to drain off any processing medium which may inadvertently collect in socket 42.

One or more shelves 47 supported by brackets 48 secured to one side of trough 12 are provided for temporarily storing caps 18 while the apparatus is not in use or during the interval when the spools and packages are changed. Any convenient number of such shelves 47 may be employed depending upon the number of spool positions provided in the trough 12. It is preferable, though not necessary, to provide a number of indentations 50 in spaced relation to each other lengthwise of shelf 47 to assist in positioning caps 18 thereon so that they may not be readily displaced.

As previously stated, longitudinally extending manifolds 35 supply processing media to the various positions occupied by packages 11 in trough 12. Manifolds 35 are preferably closed at the ends thereof by blank flanges 52 and interconnected in the manner illustrated in Figure 4 by pipe 54. Connecting with pipe 54 is a feed pipe 55 which, in view of the importance of maintaining a substantially equal pressure throughout the system, is connected at the approximate center of the apparatus. If a very long trough designed to accommodate a large number of spools is employed, it may be necessary to close entirely one or more jet openings 22 or to place inserts of varying diameter therein to vary the flow of liquid therethrough in order to keep the pressure more nearly equal throughout the system.

The other end of feed pipe 55 (Figure 1) is connected by means of one branch of a T 56 to a distributor pipe 57. To the other branch of T 56 is connected a by-pass 58 controlled by valve 60 which leads to drain outlet 53, which operates to clear the manifolds 35 and all connecting pipe lines of processing media remaining therein after each step of the processing treatment is completed. By utilizing the same feed lines in this way, it is possible to eliminate unnecessary pipe lines and thus simplify the piping arrangement.

As many different processing operations as may be required can be performed with the apparatus of the invention. For purposes of illustration, the apparatus is illustrated in Figure 1 as capable of supplying four different processing media to the thread packages. Thus, for instance, wash water, sodium sulfide, a bleaching solution, and an oil emulsion may be supplied from supply tanks (not shown) to distributor pipe 57 under a slight pressure, preferably approximately 3 pounds per square inch, by means of pipe lines

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61, 62, 63 and 64, respectively controlled by valves 65, 66, 67 and 68.

To provide for drainage of the processing liquids which have passed through thread package 11, a drain channel 70 leading toward one end of trough 12 is provided in the bottom 16 thereof. To said channel 70 is connected drain pipe 71, which in turn leads to drain outlet 53. Drain outlet 53 is equipped with a flexible metal hose 72 which serves to direct the processing liquids to sewer outlet 73, in the case of water or other liquids which cannot be economically reused, or to return lines 74, 75 and 76 to be directed to suitable storage and make-up means (not shown) provided to prepare such liquids for repeated use.

In the operation of the apparatus, a plurality of flexible spools 10 bearing freshly spun thread packages 11 are inserted into bases 17 in trough 12, whereupon caps 18 are placed upon the upper ends of spools 10 and locked in place in the manner previously described. Packages 11 are now wholly supported upon the shoulders 20 and 37 of the bases 17 and caps 18, respectively, independently of spools 10. Such packages are prevented from longitudinal expansion by said caps and bases, which are securely locked together.

Valve 65 on pipe line 61 is opened and wash water, preferably heated to a temperature of 65°-70° C., is introduced under a pressure of approximately 3 pounds per square inch into distributor pipe 57, whence it flows through feed pipe 55, pipe 54 and manifolds 35. From manifolds 35 the liquid passes by means of internal bore 36 of stem 26 through jet openings 22 into the interior of each spool 10. The interior of each spool 10 is, therefore, filled with processing medium under a slight pressure.

Due to the fact that the upper end of spool 10 is closed by cap 18, the wash water passes along the inside of the corrugations of spool 10 and may only escape from the interior thereof by way of the spaces above and below the ends of said spool formed by the circular indentation 23 and chamber 40 in the base 17 and cap 18, respectively. By virtue of the construction of base 17 and cap 18 leakage of liquid between the shoulders of the package and shoulder portions 20 and 37, respectively, thereof is virtually impossible. The wash water, therefore, in escaping from the interior of spool 10 can only pass around the ends of said spool and along the outside of the corrugations of said spool into space 77 on the inside of thread package 11.

When sufficient water has been introduced to the system, the water passes radially through thread package 11. After passing through the package, the wash water finds its way into drain channel 70, through drain pipe 71, drain outlet 53, and flexible hose 72 which is placed in sewer outlet 73. It is not ordinarily desirable to reuse the wash water, for the low cost of fresh water does not justify the expense of purifying waste water; however, this is not true with most other processing media.

When the washing operation is complete, as determined by testing according to usual practices, such, for example, as by means of methyl orange, valve 65 is closed and the system permitted to drain. Valve 60 is now opened and the liquid in the interior of the spools 10, manifolds 35 and all connecting pipe lines removed by means of by-pass 58. Jet openings 22, due to their angular disposition, operate to drain the last traces of processing fluid from circular indentation 23 in base 17.

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After the wash water has completely drained, hose 72 is removed from sewer outlet 73 and placed in return line 74. Valve 60 in by-pass 58 is closed and valve 66 in pipe line 62 opened and the processing treatment continued with the sodium sulfide solution. The latter passes through package 11 in the manner previously described, is caught in trough 12, and removed by return line 74 to a suitable storage reservoir (not shown). When this processing step is completed, valve 66 is closed and the entire system drained as before.

Thereafter, the thread packages are again subjected to washing to remove any traces of the sodium sulfide solution remaining therein.

After this washing, flexible hose 72 is placed in return line 75, valve 60 is closed, and valve 67 in pipe line 63 opened, introducing the bleaching solution into thread packages 11. When the bleaching operation is completed, valve 67 is closed and the entire system is again drained. After another washing step, performed in the manner previously explained to remove all traces of the bleaching solution from the thread, the hose 72 is placed in return line 76, valve 68 in pipe line 64, is opened, and the thread packages subjected to treatment by means of a suitable oil emulsion.

Following the oiling step, thread packages 11 carried by spools 10 may be removed from the apparatus by twisting cap 18 so as to disengage shoulders 45 from contact with pin 43 of the cap locking means. As the caps 18 are removed, they may be turned upside down so as to rest on handle portions 46 and placed temporarily on shelf 47 until the next set of spools and packages are ready for processing treatment. Thereafter, processed thread packages 11 may be placed in suitable drying apparatus and either dried on spools 10 or removed therefrom, skeined and dried. The apparatus is then placed in readiness for the next series of packages to be processed.

As hereinbefore stated, it has previously been necessary to expend considerable labor in handling each thread package to prepare it for processing treatment. By employment of the present invention, the large amount of labor required in conventional practice to shift the spools laden with thread from one processing stage to another is now unnecessary. Such handling has not infrequently resulted in harmful effects upon the thread; e. g., frayed and broken filaments, snarls, knots, etc., all of which are eliminated by the present invention.

Many modifications may be made without departing from the spirit of the invention. Thus spools bearing the individual thread packages may be placed in the troughs with their axes horizontal, rather than vertical. The imperforate spool may be provided with angular re-entrant portions and flat ridge portions without in any way impairing its flexibility or its application to the process of the present invention. As previously indicated, any suitable piping arrangement may be utilized so as to include other processing steps than those previously mentioned, such, for example, as sizing, dyeing or the like.

The apparatus of the present invention is not restricted to the manufacture of artificial silk thread. A variety of other uses, as for example, in the processing of thread packages made up of materials of different character, whether of natural or synthetic origin, will suggest themselves to those familiar with the art. It is, however,

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

We claim:

1. Apparatus for the processing of thread comprising, a contractible core upon which a thread package may be wound over less than the full length of said core so as to leave a portion of each end free of thread, recessed sealing means receiving the thread-free core ends into which said ends extend in frictional contact and to locate the package, said recesses in said sealing means having a lesser diameter than the uncontracted core and constricting the core away from the package, said sealing means making fluid-tight contact with the ends of the package to prevent leakage of a processing medium and elongation of the package, means for introducing a processing medium between the core and the package under a substantially uniform pressure, and means for collecting the spent processing medium.

2. Apparatus of the type described in claim 1 in which the sealing means comprises, a recessed base, a recessed cap, said recesses in said base and cap receiving the thread-free ends of the core in a constricting manner, and a locking means associated with said base and said cap for maintaining the base and cap in fixed spaced relation with respect to each other.

3. Apparatus of the type described in claim 1 in which the sealing means comprises, a recessed base having a stem portion extending axially thereof in the direction of the recessed cap, a recessed cap provided with an axially extending stub portion, and a locking means associated with said stub portion cooperating with the aforementioned stem portion of the base to maintain the base and the cap in fixed spaced relation with respect to each other.

4. Apparatus of the type described in claim 1 in which the sealing means comprises, a recessed base receiving the thread-free end of the core having associated therewith an axially extending stem in the direction of the cap one end of which is provided with a socket in which is deposited a pin, and a recessed cap receiving the other end of the core having depending therefrom an axially extending stub portion which is provided with a lateral slot and shoulder portions adjacent said slot so disposed that when the stub portion is inserted in the aforementioned socket formed in the stem of the base said shoulders engage the pin and serve to maintain said cap in fixed spaced relation to said base.

5. Apparatus for processing thread comprising, a contractible core upon which a thread package may be wound for over less than the full length of the core so as to leave a portion of each end of the core free of thread, a base supporting means for said core and package having a recess of lesser diameter than said uncontracted core receiving one end of said core and constricting said core when it is placed thereinto, said base supporting means being provided with a shoulder for receiving a package about said core and forming a fluid-tight contact with the end of said package, a cap also having a recess of lesser diameter than said uncontracted core and a shoulder receiving the other end of said core and package and forming a fluid-tight contact with the other end of the package, locking means associated with said supporting means for maintaining said base and said cap in spaced relation

and preventing elongation of the package, means for introducing between said spool and said package a processing medium under substantially uniform pressure, and means for collecting the spent processing medium.

6. Apparatus for the processing of thread comprising, a contractible core upon which a tapered package may be wound over less than the full length of the core so as to leave a portion of each end of the core free of thread, a longitudinally extending trough including a plurality of processing units each of which accommodates a core having a wound thread package and includes a base portion having a core receiving recess into which a core end constrictively extends, said base portion also being provided with a tapered shoulder for making fluid-tight contact with one tapered package end, a cap portion having a recess and a tapered shoulder constrictively receiving the other end of said core and making fluid-tight contact with said package, locking means associated with the cap portion cooperating with the base portion to prevent elongation of the package during processing treatment; means for introducing processing medium under a substantially uniform pressure between the core and the package, and means for removing the spent processing medium from said trough.

7. Apparatus for the processing of thread comprising, a contractible core having an undulating surface upon which a tapered package may be wound over less than the full length of the core so as to leave a portion of each end of the core free of thread, a longitudinally extending trough including a plurality of processing units each of which accommodates a core having a wound thread package and includes a recessed base portion adapted to constrictively receive one end of said core, said base portion being provided with a tapered shoulder for making fluid-tight contact with one end of the tapered shoulder of said package, a recessed cap portion having a tapered shoulder mounted upon the other end of said core and adapted to constrictively receive the thread-free portion of the core engaging and forming fluid-tight contact with the other end of said tapered shoulder of said package, said recesses in said base and cap portions being of a depth so as to space said base and cap from the core ends for the flow of a processing medium and having lesser diameters than said core for constricting said core, locking means associated with the cap portion cooperating with the base portion to prevent elongation of the package during a processing treatment, means for introducing a processing medium under substantially uniform pressure to the interior of said core; said shoulders in the cap portion and base portion directing said processing medium from the interior of said core around either end thereof through the undulations to its outer periphery; and means for removing the spent processing medium from said trough.

8. Apparatus for the processing of thread comprising, a flexible, generally cylindrical core having an undulating surface upon which a thread package may be wound for less than its full length leaving the core ends free of thread, recessed sealing means constrictively receiving either end of the thread-free ends of the core for a distance so as to leave a space between the core ends and the bases of the recesses for the passage of a processing medium, the recesses in

the sealing means being of lesser diameter than said core and compressing said core slightly away from the inner surface of the package, tapered shoulders in said sealing means forming fluid-tight contact against the ends of said tapered package and to prevent elongation thereof; means for introducing a processing medium into the interior of the core under substantially uniform pressure; said recesses in each of said sealing means being adapted to direct said processing medium around the ends of said undulating core to the outer periphery thereof so as to be substantially uniformly distributed to all portions of the inner surface of said package; and means for collecting the spent processing medium.

LOUIS S. FRYER.

PER J. E. ANDERSSON.

WAYNE J. JOKILEHTO.

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