

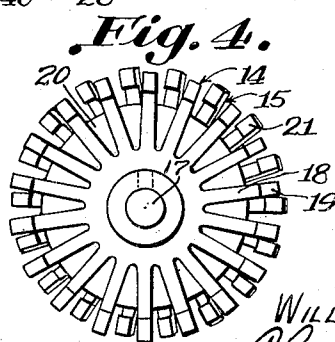
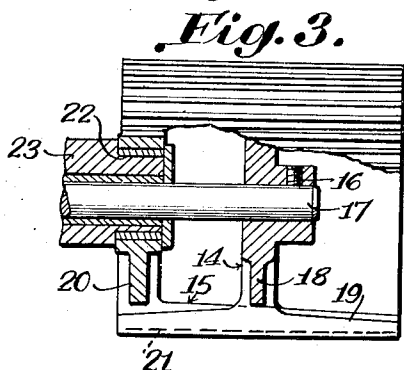
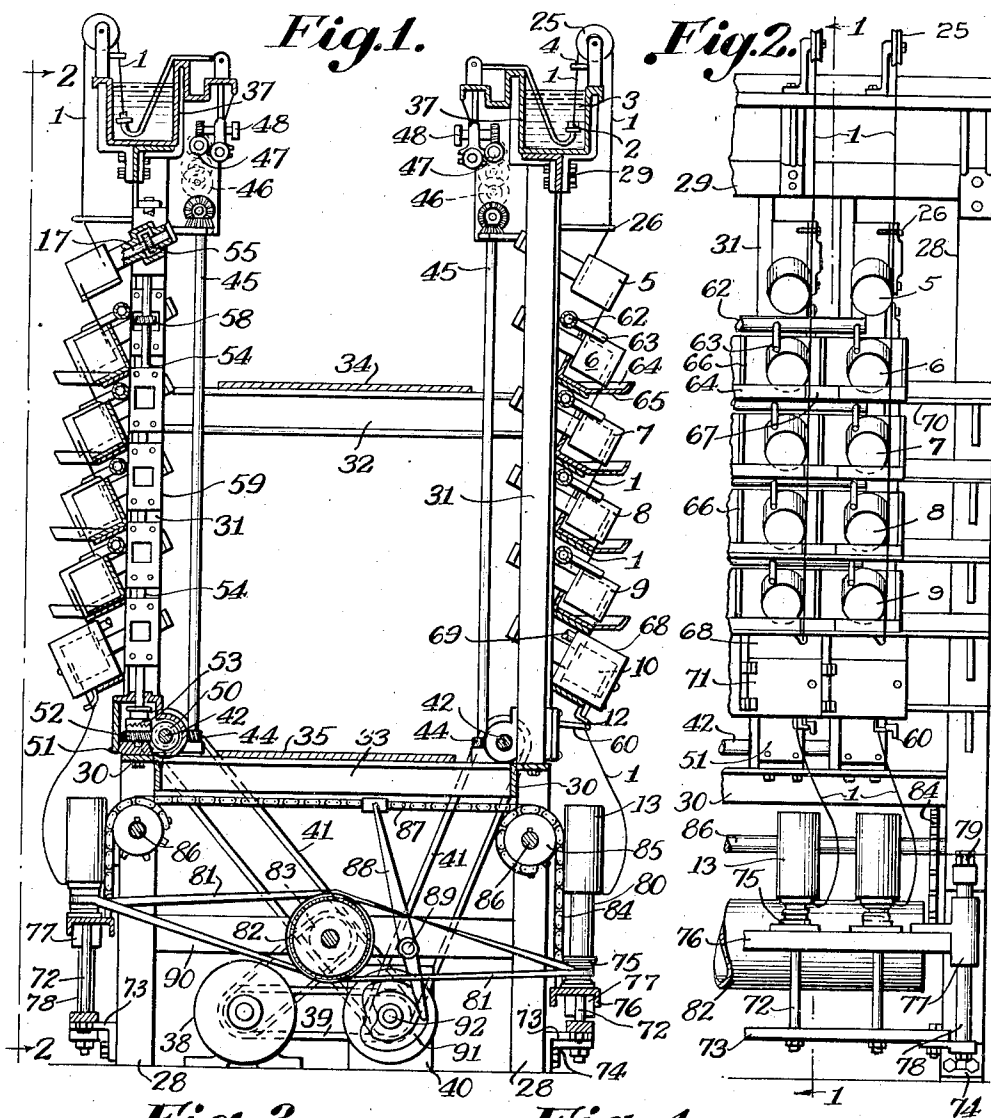
Oct. 21, 1941.

W. JANNELL

2,260,251

APPARATUS FOR PROCESSING THREAD OR THE LIKE

Original Filed Sept. 20, 1935



Inventor.

WILLIAM JANNELL

by *Charles E. Ström*
Attorney

UNITED STATES PATENT OFFICE

2,260,251

APPARATUS FOR PROCESSING THREAD OR
THE LIKE

William Jannell, Cleveland, Ohio, assignor to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Original application September 20, 1935, Serial No. 41,447. Divided and this application February 19, 1938, Serial No. 191,387

1 Claim. (Cl. 18—8)

This invention relates to apparatus for processing thread or the like by a continuous method; more particularly, to the continuous production and processing of artificial silk thread.

While the invention is capable of use in the continuous processing of any natural or synthetic thread-like article regardless of kind such, for example, as artificial silk thread produced by any of the known processes; viz., the cuprammonium, nitro-cellulose, cellulose acetate or viscose processes, it will be convenient but in no sense of limitation be described for illustrative purposes in connection with the processing of multiple filament viscose artificial silk thread. The invention will be described, further, in connection with apparatus in which the thread or the like is formed on the machine and subsequently processed, but it is obvious that other sources of the thread or the like might be provided.

This application is a division of application Serial No. 41,447, filed September 20, 1935, for "Apparatus for manufacturing and/or processing thread or the like."

According to the viscose process of manufacturing multiple filament artificial silk thread, a solution of sodium cellulose xanthate; i.e., viscose, is extruded, thereupon assuming the form of a thread, into an acid coagulating bath. The thread is then subjected to various processing steps, such as desulphurizing, washing, bleaching, soaping, etc., as desired. In ordinary practice, the thread after extrusion is collected on suitable package form and subjected to these various treatments in different types of processing apparatus, often being rewound, as for twisting, etc., in the intermediate steps of the process. In a continuous process, all of these processing steps are done on one machine, the thread as finally produced being ready for use. Analogous practices are followed in the production and/or processing of other kinds of thread or the like, whether of natural or synthetic origin.

An object of this invention is to provide new and improved arrangements of thread-storage devices, which arrangements permit convenient access to the thread-storage devices and their auxiliary apparatus and which permit the thread or the like to be readily started on said thread-storage devices. A further object is to provide apparatus employing such arrangements in which the thread-storage devices are arranged in banks with the axis of each disposed obliquely to a vertical plane parallel to the front of the bank. Another object is to provide mechanisms

embodying such arrangements of thread-storage devices which will provide for easy accessibility for control, repairs, adjustment and maintenance of the various parts thereof.

Another object is to provide improved mechanism in which the thread or the like is led to and successively along a series of thread-storage devices which may take the form of reels on each of which a sufficient length of thread or the like may be stored in the form of an advancing helix so that one or more processing steps may be administered to the thread or the like while on each device. Still another object is to provide mechanism of this kind built in units which may readily be multiplied to provide for expansion of production capacity. Further objects are in part obvious and will in part appear more in detail hereinafter.

In the drawing, illustrating only one of several possible embodiments of the invention, Figure 1 is a sectional elevation, along line 1—1 of Figure 2, of one form of apparatus embodying a vertically stacked arrangement of thread-storage devices. Figure 2 is a fragmentary front elevation, more or less diagrammatic, of the same apparatus as viewed from the line 2—2 in Figure 1. Figure 3 is a side elevation, partly in section, of one form of thread-storage device which may be used in this invention, while Figure 4 is a corresponding end elevation. Like reference characters refer to like parts throughout.

In the embodiment of the invention shown in Figures 1 and 2, the machine is composed of two banks of thread-storage devices of cantilever form having their free ends extending in the same direction; i. e., facing a common front paralleling the bank. The thread-storage devices of each bank are mounted from one end only thereof with their axes in the same vertical plane, all axes being parallel to each other but disposed obliquely to a vertical plane parallel to the front of the bank. Each device other than the first preferably is, but need not necessarily be, so positioned that its receiving end is in apposition to the discharge end of the preceding device. On each thread-storage device a considerable length of the thread is continuously but temporarily stored in the form of an advancing helix and subjected to one or more processing operations.

The multiple filament viscose artificial silk thread 1, which issues continuously from the spinneret 2 into coagulating bath 3, passes through thread guide 4 over some means for changing the direction of the thread such as

roller 25, through guide 26 and thence to the first thread-storage device 5 of a series of such devices. Any necessary or desirable number of thread-storage devices may be provided in the series, six, bearing reference numerals 5 to 10, inclusive, being shown for purposes of illustration. After the thread leaves the last thread-storage device, it passes through a guide 12 to a suitable collecting device, as, for example, the cap-twister 13.

A form of thread-storage device which may be used to advantage is the helix-forming device illustrated in Figures 3 and 4, which is of the type shown, described and claimed in copending application Serial No. 652,089, filed January 16, 1933, by Walter F. Knebusch, of which British Patent No. 413,414 is a counterpart. This device takes the form of a thread-advancing reel on the surface of which a predetermined length of thread or the like may be stored in a plurality of helical turns which are caused, by the action of the elements of the reel during rotation, to advance axially along the reel until they are discharged or otherwise taken off. Instead of the helix-forming devices herein illustrated, other thread-advancing devices may, if desired, be used.

Referring to Figures 3 and 4, the reel shown comprises two rigid members 14 and 15 each of which is of generally cylindrical form and has its outer periphery composed of longitudinal bars. Member 14, which may be termed the driving or concentric member because it is rigidly mounted by means of set screw 16 with its axis concentric with that of the drive shaft 17, is provided with a spider 18 on which are mounted the bars 19. Member 15, which, for reasons to be later explained, may be termed the driven or eccentric member is provided with a spider 20 supporting the bars 21. The peripheries of each of members 14 and 15 are provided with an equal number of bars, which number is preferably as large as is consistent with the proper construction, operation, and maintenance of the reel. The bars of member 15 are disposed alternately with those of member 14.

The eccentric or driven member 15 is so termed because it is rotatably mounted on the bushing 22, which is supported, as by the member 23, with its axis offset in a parallel plane from and inclined to that of the member 14, and is driven or caused to rotate by contact of its bars 21 with the bars 19 of the driving member 14. This offset and inclined relationship of the two members 14 and 15 causes the thread or the like to advance during rotation thereof in spaced substantially helical turns along the surfaces of the reel formed by these two members, in a manner more fully explained in the aforesaid Knebusch application. The reel herein shown is open-ended in the sense that it is supported from one end only and the other end is free from a projecting shaft, which feature provides advantages in threading-up or starting the thread or the like on the reel.

The machine as a whole comprises a frame which includes vertical columns or corner posts 28 bearing upper and lower longitudinal beams 29 and 30 to which are attached vertical members 31, each of which supports a vertical reel series, and upper and lower cross-beams 32 and 33. Upper cross-beams 32 carry an upper platform 34 on which the operator may stand when working at troughs 37, while a lower platform 35 supported by girders 33 may be provided from which operators may have access to the interior

of the machine, reel mechanism, drive shafts, etc. Power may be supplied at one end of the machine by some suitable means, as a motor 38, which is connected as by a belt or chain 39 to a speed reducer 40 from which the shafts 42 are driven by chains 41, one shaft for each face of the machine.

From shafts 42 may be driven, by helical gears 44, shafts 45 by means of which, through change gears 46, are rotated the drive shafts 47 for the pumps 48.

Each shaft 42 also rotates a gear 50 in the gear box 51 mounted on beam 30. Through gears 50, 52 and clutch 53 in each gear box 51, of which there is one for each series of reels, a reel drive shaft 54 is rotated, by which each reel in the series is driven through some means such as the helical gear 55 on the reel shaft 17 meshing with the helical gear 58 on the reel drive shaft 54. These gears may, if desired, be enclosed in a housing formed in the bracket 59 which supports each reel on the frame member 31. By means of its clutch 53, which may be actuated by some means such as the lever arm 60, any bank of reels may be stopped as desired while the rest of the machine is running. By engaging the clutches successively after the machine has started, the required starting torque may be greatly reduced.

A trough 37 for the reels on each face of the machine may be supported by each longitudinal frame member 29. The troughs in the embodiment shown are so located that they can easily be reached from the interior of the machine by an operator standing on platform 34 for the purpose of control, adjustment of pumps, etc. and from the exterior of the machine for the purpose of starting the threads from the bath over the roller 25 and to the first reel of the series. A suitable ladder (not shown), which may be adapted to slide in guides across each face of the machine, may be provided as part of the construction to enable an operator to reach the upper parts of the apparatus.

The first reel 5 may be and preferably is used as a set-up reel on which the thread is stored for a sufficient length of time to permit coagulation of the thread to occur. Reel 6 of the apparatus shown may, in the case of the viscose process, be devoted to desulphurizing of the thread, reel 7 to washing, reel 8 to bleaching, reel 9 to washing, and reel 10 to drying. Since reels 6, 7, 8 and 9 are all devoted to liquid processing treatments, the reagent supplying and collecting systems auxiliary to all reels of a given bath may conveniently be similar, as hereinafter explained.

By reason of the fact that the corresponding reels in adjacent vertical series on each face of the machine are all on the same level and are devoted to the same processing treatment, it is possible to simplify the reagent supplying and collecting systems. For instance, in connection with reel 6, a reagent supply pipe 62 may be provided to serve all the reels in the position corresponding to reel 6 in all the vertical series across one face of the machine. The reagent distributors 63 which may be of any suitable form communicate with this pipe 62 and are disposed to shower down the treating liquid on the reels below. Likewise the trough 64 may be common to all reels in the same processing position.

Trough 64 may be supported by member 70 which may be fastened to the corner beams 28 and which may also be supported by some or all of the vertical supporting members 31. The

trough 64 is provided with an extended portion 65 immediately in front of each reel, this portion being designed to collect any liquid that may run off the top surface of the reel. Partitions 66 in the trough are designed to prevent splashing and may be so disposed as to allow a passage-way at the bottom of the trough to permit the liquid to pass. The front portion of the trough may be provided with a notch 67 to allow the thread to pass directly to the reel below.

A collecting pipe (not shown) may be provided at some point in the bottom of the trough, preferably at one end, into which the liquid will drain. This drain pipe may lead to a sewer, particularly in the case of liquids it is desired to use only once, or, if it is desired to re-use the liquid, to a storage tank and a recirculating pump, in which case the reagent supply pipe 62 will be connected to the recirculating system. It is obvious, however, that various changes and modifications may be made in the reagent supplying and collecting systems without departing in any way from the spirit of the invention.

Provision may be made for drying the thread on the last reel 10 if desired. This means for drying may consist of a chamber 68 at least partly enclosing the periphery of the reel to which chamber heated air may be supplied through pipe 69 from a source not shown. A door 71 in the front of the chamber may be provided for convenience in threading up the reel within. Various other means for drying the thread may be used.

While any suitable means for collecting the thread either in the twisted or untwisted condition may be used, in the embodiment shown cap-twisters 13 are provided. All the twisters on one side of the machine may be operated in unison, thus simplifying the construction. This may be accomplished in the manner shown by supporting the stationary spindles 72 of cap-twisters 13 on each face of the machine on a common spinning rail 73 which is fastened at each end to the frame of the machine as by bracket 74. The rotatable whirls 75 and their bolsters may be mounted on a common lifting rail 76 which is guided in its vertical reciprocatory path by means of slides 77 adapted to slide on guide rods 78 which may be mounted on the frame of the machine by brackets 74 and 79. Two such guide means, one at each end of the apparatus, may be supplied for each lifting rail.

Whirls 75 on which are supported the twister bobbins 80 may be rotated in the conventional manner by belts 81 driven by a rapidly rotating drum 82. Drum 82 may be common to all cap-twisters on both faces of the machine as shown, and may be driven from a main driving means or motor 38 as by a belt or chain 83. The desired vertical reciprocatory motion of each lifting rail 76 may be supplied by some such means as that illustrated, which comprises a chain or other tension means 84 which is fastened at one end to the lifting rail 76 and at the other to a sprocket 85. Suitable motion of the shaft 86 to which the sprocket 85 is keyed or otherwise rigidly fastened causes the chain 84 to successively wind or unwind from the sprocket, thereby imparting a reciprocatory motion to the lifting rail 76.

A shaft 86 is provided for each side of the machine and a sprocket 85 and chain 84 may be supplied for each end of each lifting rail, though more than two may be used if desired. Each shaft 86 may be given a suitable oscillatory motion by means of a chain or tension means 87

fastened at each end at a suitable point on a sprocket fastened to each shaft 86. The chain 87 is given a reciprocatory motion, in the horizontal direction in this case, by the lever arm 88 which is caused to move with a suitable rocking motion about the pivot 89 mounted on frame member 90 by cam 91 which is rotated at suitable speed by the speed reducer 40.

The horizontal reciprocatory motion of chain 87, in combination with the weight of each lifting rail and part supported on it, causes the chain alternately to wind on and unwind from the sprocket on each shaft 86, thus imparting the desired motion to shafts 86. More than one unit comprising chain 87, lever 88, and cam 91, may, if desired, be provided per machine by mounting the cams on suitable extensions of the shaft 92. This arrangement for actuating shafts 86 has the advantage, among others, of being self-balancing; i. e., the weights of the lifting rails and cap-twisters on each side of the machine substantially balance each other, requiring the cam 91 and cam lever 88 to overcome only frictional resistance.

Construction of the machine substantially as illustrated results in economy of floor space, operating convenience, and accessibility of the various parts of the mechanism for operation, control, maintenance, etc. With the various units arranged side by side as shown, the only limit to the number of such units is that imposed by constructional limitations. The machine may conveniently be double-sided, as illustrated; that is, it may have two identical sides on which reels are mounted. With this construction it is possible, as explained, to use common power drives, reagent supplies, spin baths, etc., thus effecting operating economies and insuring uniformity of the product.

It is apparent that various changes and modifications may be made in the embodiments here illustrated and that numerous other embodiments devised without in any way departing from the spirit of the invention. For instance, changes in the various actuating mechanisms, such as those required for the drives for the reels, collecting devices, etc., may readily be made. Single-sided instead of double-sided machines may be used. Other forms of thread-storage devices than the reels shown may be used, the only requirements being that they be capable of storing a length of thread or the like and advancing the thread or the like continuously from one end to the other end of the device. Under certain conditions, and for the processing of thread or thread-like articles of sufficient strength, it is possible to cause the reels to rotate by the action of the thread or the like as it is drawn off them, thus obviating the necessity for positive drives of the reels.

As further examples of possible modifications of the invention, it is possible to effect stretching of the thread or the like by suitably adjusting the speeds of the reels. Other effects may be procured by suitably increasing or decreasing the speed of the drying reel with respect to the others, or constructing the drying reel that its diameter progressively increases or decreases as the thread or the like passes longitudinally over the surface of the reel while being dried, or by a combination of both effects. It may be desirable, and is obviously possible, to process thread or the like not formed on the machine on apparatus employing reel arrangements similar to those herein disclosed.

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

What is claimed is:

Thread processing apparatus characterized by an operating face which presents itself vertically to the operator comprising (1) a bank of unitary helix-forming devices each of which is of cantilever construction, adapted to advance thread or the like toward its unsupported end in a plurality of generally helical turns, and, at such unsupported end, unobstructed by anything impeding the discharge of the thread or the like, the helix-forming devices of said bank being arranged in vertical catenae in such manner that, within each catena, (a) the projections of all helix-forming

devices on a common horizontal plane coincide with each other, (b) the unsupported ends of all helix-forming devices extend in the general direction of said operating face, and (c) the supported ends of all helix-forming devices are equally accessible from said operating face; (2) a vertically extending drive shaft for each catena, each such drive shaft serving to operate the several helix-forming devices of the catena with which it is associated; (3) a common power source actuating the drive shafts serving said bank of helix-forming devices, said power source rotating all of said drive shafts in unison; and (4) means for individually disengaging said drive shafts from said common power source.

WILLIAM JANNELL.