Dec. 24, 1940. L. J. JORDAN 2,225,637

MANUFACTURE OF THREAD OR THE LIKE

Filed March 28, 1936 4 Sheets-Sheet 1

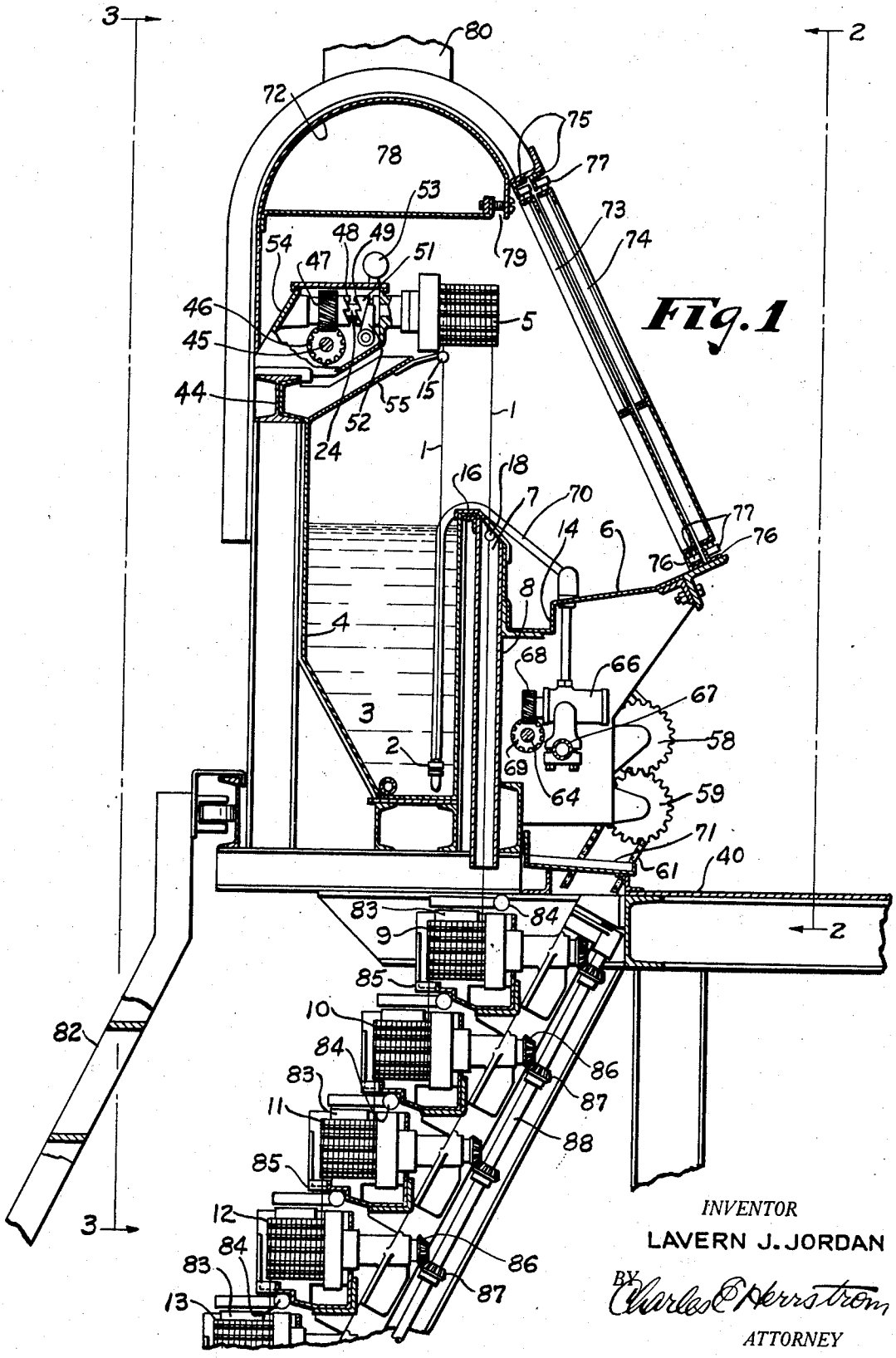


Fig. 1

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MANUFACTURE OF THREAD OR THE LIKE

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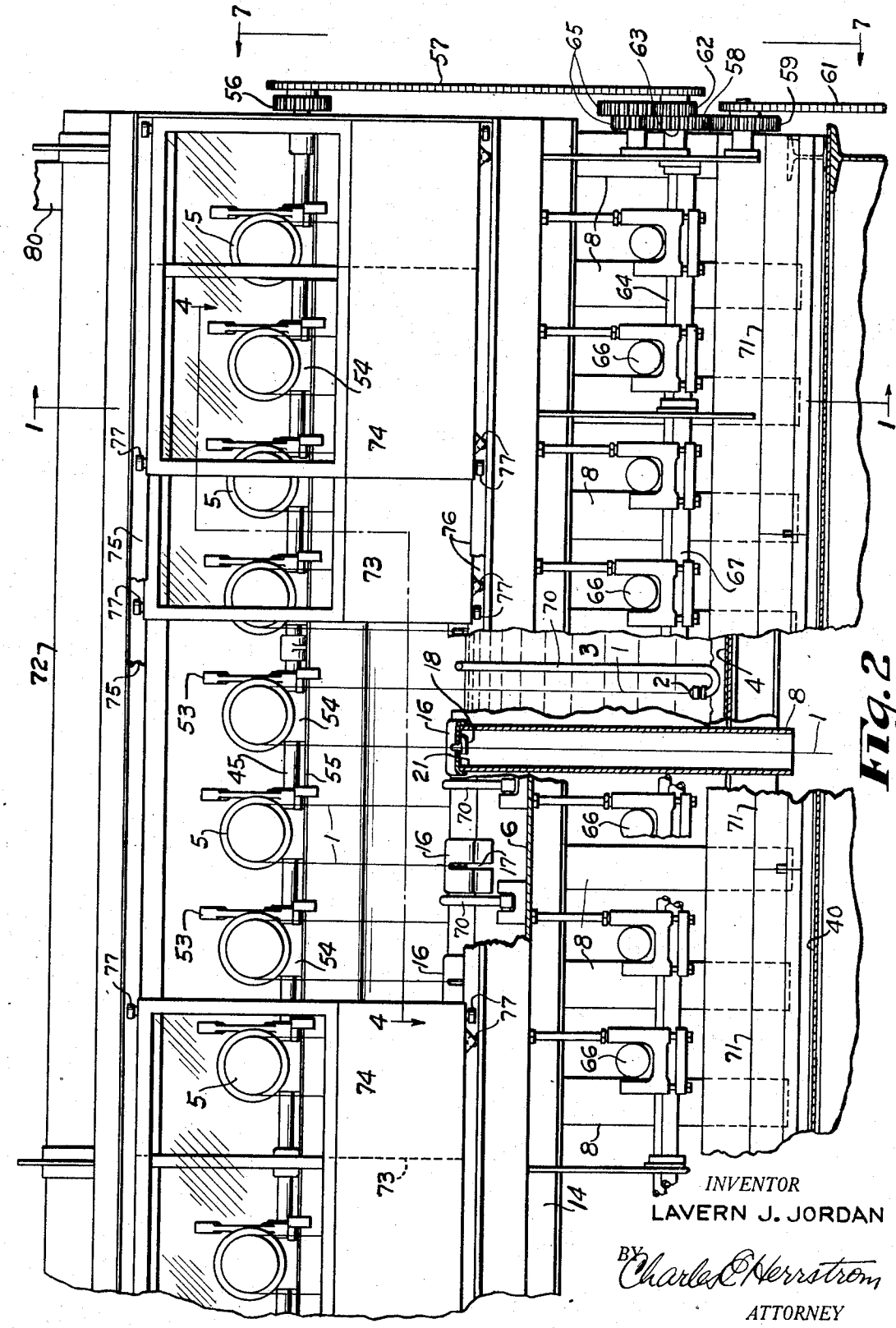


Fig. 2

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MANUFACTURE OF THREAD OR THE LIKE

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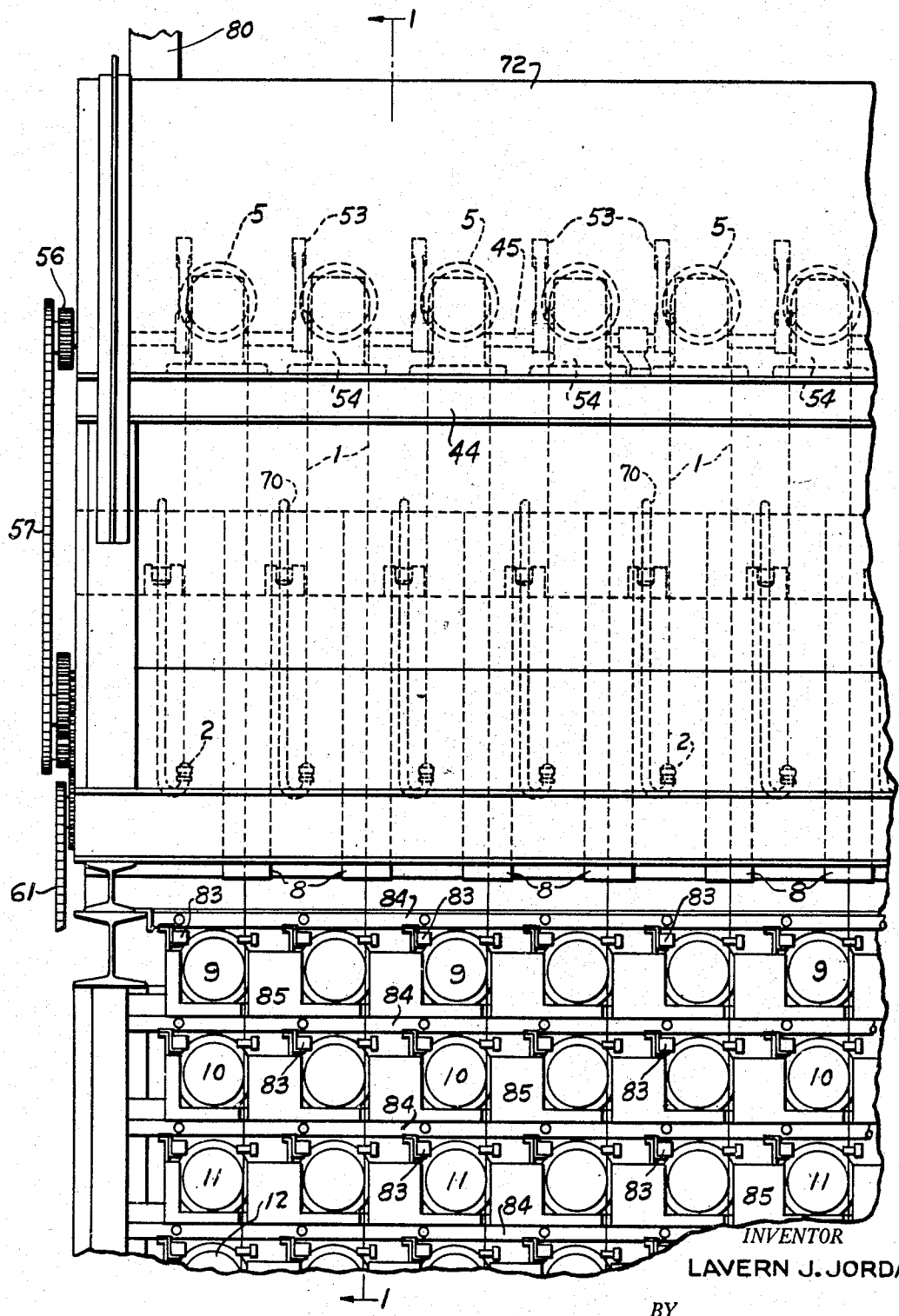


Fig. 3

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MANUFACTURE OF THREAD OR THE LIKE

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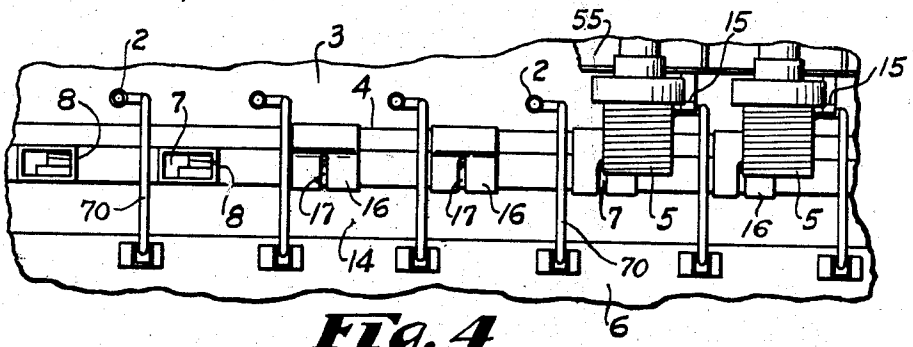


Fig. 4

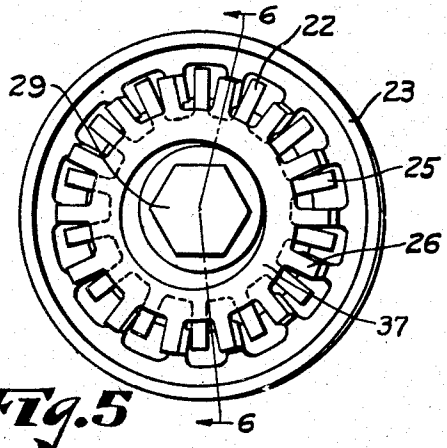


Fig. 5

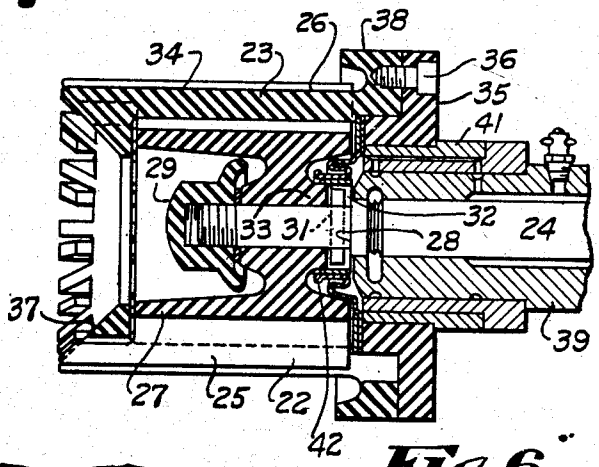


Fig. 6

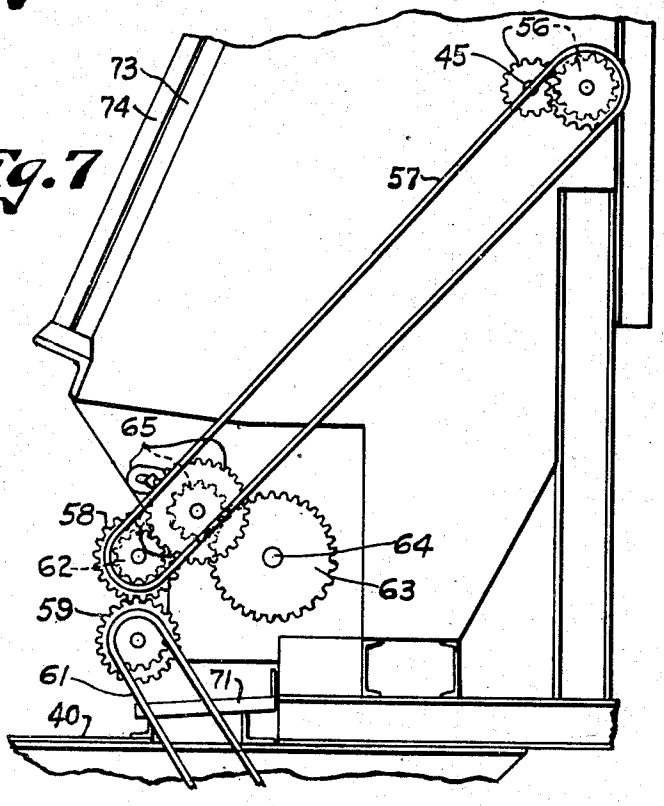


Fig. 7

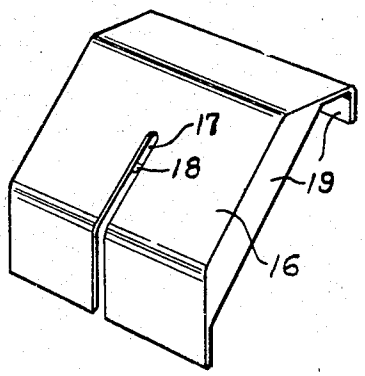


Fig. 8

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Patented Dec. 24, 1940 2,225,637

UNITED STATES PATENT OFFICE

2,225,637

MANUFACTURE OF THREAD OR THE LIKE

Lavern J. Jordan, Fairview Village, Ohio, assignor to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Application March 28, 1936, Serial No. 71,468

11 Claims. (Cl. 18—8)

This invention relates to the manufacture of thread or the like.

More particularly, the invention relates to apparatus of the type shown, described and claimed in prior application Serial No. 7,114, filed February 18, 1935, by Walter F. Knebusch and Alden H. Burkholder. The apparatus of said application embodies a plurality of laterally conjugated series of vertically spaced thread-storage, thread-advancing devices disposed in stepped arrangement in processing sequence with the thread discharge end of each thread-storage, thread-advancing device except the last disposed adjacent the thread-receiving end of the succeeding thread-storage, thread-advancing device. The thread or the like is formed by extrusion of a suitable mass from a series of spinning nozzles into a common coagulating bath contained in a trough extending along the top of the apparatus, each thread or the like so formed being withdrawn from the coagulating bath and passed downward to one of the above-mentioned series of thread-storage, thread-advancing devices. While the particular arrangement of the bath trough and associated apparatus shown and described in said application is well adapted to the requirements of the device as a whole, the improvements of the present invention offer advantages in respect of construction, accessibility, maintenance, protection from fumes and convenience for the operator, as well as other advantages.

The improvements of the present invention will be described in connection with apparatus for the continuous manufacture of viscose artificial silk thread, but will be understood to be of general application.

The invention is illustrated in the accompanying drawings, in which Figure 1 is a sectional elevation through the improved apparatus. Figure 2 is an elevation, from line 2—2 of Figure 1, showing the working face of the trough and associated apparatus. Figure 3 is an elevation of the apparatus from line 3—3 of Figure 1. Figure 4 is a sectional plan taken approximately on the line 4—4 of Figure 2. Figure 5 is an end elevation of one form of thread-storage, thread-advancing device which may be used in the practice of the invention. Figure 6 is a longitudinal section along line 6—6 of Figure 5 of the same thread-storage, thread-advancing device. Figure 7 is an elevation along line 7—7 of Figure 2 of the mechanism for actuating the upper thread-storage, thread-advancing device and associated apparatus. Figure 8 is a perspective of one of the covers for the channels through which the thread passes.

As in said prior application, the apparatus of the present invention includes a plurality of laterally conjugated series of vertically spaced thread-storage, thread-advancing devices disposed in processing sequence, preferably, but not necessarily, in stepped arrangement. Associated therewith along the top of the apparatus is a longitudinal trough 4 containing a coagulating bath. Each thread 1 formed by extrusion of viscose from a spinning nozzle 2 disposed in the coagulating bath 3 is withdrawn directly upward from the bath by a suitable thread-storage, thread-advancing device 5. The thread-storage, thread-advancing device 5 is preferably of the cantilever type, i. e., supported and driven from one end only, and is adapted to advance the thread from the supported end thereof to the free end thereof in a plurality of helical or generally helical turns. The thread-storage, thread-advancing device may be of any desired kind, but is conveniently of the preferred form hereinafter described.

The thread-storage, thread-advancing device 5 may be so positioned above the trough that its thread-receiving end; i. e., the supported end of the cantilever thread-storage, thread-advancing device shown, is disposed generally above the spinning nozzle 2. Its discharge end; i. e., the unsupported end of the cantilever thread-storage, thread-advancing device shown, may be disposed in opposite relation to an opening 7 in the working deck 6 extending along coagulating trough 4. That is, the thread-storage, thread-advancing device may be disposed with its unsupported end extending toward the working face of the trough 4; i. e., the face from which the operator has access to the trough. As shown in Figures 2 and 4, the thread-storage, thread-advancing device 5 is preferably so positioned that its thread-receiving end is directly above the spinning nozzle 2 and its thread-discharge end is directly above the opening 7. If desired, the opening 7 may comprise the entrance to a stationary channel 8, through which the thread may pass for a considerable distance.

In the apparatus illustrated, the channel 8 is vertically disposed, providing a passage through which the thread 1, after leaving the thread-storage, thread-advancing device 5, passes to the first thread-storage, thread-advancing device 9 of a series of like vertically spaced thread-storage, thread-advancing devices on which the thread is subjected to various processing treat-

ments. Five such devices bearing reference numerals 9 to 13, inclusive, are shown. It has been found desirable to position the openings 7 in the working deck 6 and their associated channels 8 so that they lie between the coagulating trough 4 and a waste trough 14 formed in the working deck 6 in juxtaposition to the coagulating trough 4. The channel 8 thus provides a clear, unobstructed passageway which protects the thread from contact with parts of the apparatus which might otherwise intercept it. The presence of channel 8 is particularly advantageous in starting the thread through the apparatus: the thread, after having been led upward from the spinning nozzle 2, through guide 15 and onto thread-storage, thread-advancing device 5, may without interference be dropped from the discharge end of thread-storage, thread-advancing device 5 onto the receiving end of the thread-storage, thread-advancing device 9 immediately below it.

If desired, a slotted closure 16 similar to that shown in perspective in Figure 8 may be provided for the purpose of closing the opening 7 at the entrance of channel 8. The use of such a closure prevents liquid carried by the thread from the bath 3 to the thread-storage, thread-advancing device 5 from dripping or splashing through channel 8 onto the thread-storage, thread-advancing devices therebelow. The cover 16 shown in Figure 8 is provided with a narrow slot 17 for the passage of the thread and a guide 18 below the slot to aid in guiding the thread as it passes through channel 8. The cover 16 may be put in place as shown in Figures 1, 2 and 4 after the thread or the like 1 has been started through channel 8. It is preferably provided with flanges 19 to hold it in place on the projecting end 21 of the channel 8. In Figure 4, the covers 16 are represented as having been removed from the two channels 8 at the left.

The thread-storage, thread-advancing devices may conveniently take the form of reels of the form illustrated in Figures 5 and 6. These reels are of a type similar to a reel shown, described and claimed in British Patent No. 413,414. From Figures 5 and 6 it can be seen that each reel comprises two rigid, generally cylindrical members 22 and 23. Member 22, which may be termed the concentric member, is mounted concentrically upon and for rotation with drive shaft 24 and has its periphery comprised of a plurality of bar members 25. Member 23, which may be termed the eccentric member, is rotatably mounted with its axis slightly offset from and inclined to that of concentric member 22 and has its periphery comprised of a plurality of bar members 26 equal in number to the bar members 25 and alternately disposed therewith.

Concentric member 22 may be formed as shown, having the bar members 25 formed on the periphery of a hollow cylindrical body 27, in which case great rigidity is imparted to the bar members 25. While member 22 may be mounted on the drive shaft 24 in various manners, in that shown it is held against a shoulder 28, formed on drive shaft 24, by cap nut 29 which is threaded on the end of the reel drive shaft 24. Member 22 is caused to rotate with drive shaft 24 by means of a pin 31 through the shaft 24, the projecting ends of which pin extend into a slot 32 formed in the hub 33 of concentric member 22. The projecting end of the drive shaft 24 and the nut 29 are thus contained within the body 27 of member 22 and are therefore protected from any liquids which may be carried by the thread or the like, or which may be applied to the thread or the like.

In the embodiment shown, the eccentric member 23 is formed of a rigid cage-like member 34 mounted concentrically upon an annular supporting member 35 as by bolts 36. Member 34 is formed of the aforesaid bar members 26 which are provided at their outer ends with an internal annular reinforcing rib 37 and at their inner ends with an external annular supporting rib 38 by means of which the cage-like member 34 is mounted on the annular supporting member 35. Annular supporting member 35 is rotatably supported in the desired offset and inclined position with respect to the axis of concentric member 22 by being rotatably mounted on frame member 39, the shaft 24 being journalled in or otherwise supported in correct relationship with frame member 39. A bushing 41 may be provided in annular supporting member 35 to act as a bearing if desired. Flexible sealing means 42 may be furnished if desired to prevent corrosion of the bearing members.

Rotation of the reel drive shaft 24 causes concentric member 22 fixed thereto to rotate, whereupon contact of bar members 25 of concentric member 22 with bar members 26 of eccentric member 23 causes said eccentric member to rotate at the same angular speed. During such rotation the offset relationship of the generally cylindrical members 22 and 23 causes the thread to transfer from the bar members of one generally cylindrical member to the bar members of the other generally cylindrical members. At the same time the inclined relationship of said generally cylindrical members causes the thread to advance in a plurality of spaced generally helical turns, the direction of the inclination of the axes of the generally cylindrical members being, of course, chosen to cause the thread to advance in the desired direction along the reel during the desired direction of rotation of the generally cylindrical members.

In the apparatus shown, the cantilever reels 5 are supported in the desired position on the frame member 44 with their axes at right angles to the longitudinal axis of the bath trough and with their unsupported ends extending toward the working deck 6, thus rendering them readily accessible from platform 40 for inspection, threading up, etc. Each of the reels 5 is driven from a common drive shaft 45, as by a helical gear 46 mounted thereon meshing with a helical gear 47 adapted to rotate the reel drive shaft 24. If desired, clutch mechanism may be provided to disengage each of the reels 5 from the common drive shaft 45. That shown comprises clutch teeth 48 formed on the hub of helical gear 47, which is rotatably mounted on the reel drive shaft 24, which teeth 48 engage clutch teeth 49 formed on a clutch member 51 slidably mounted on and for rotation with reel drive shaft 24. Clutch member 51 is actuated by a shifter fork 52 operating in a slot in the clutch member 51 which shifter fork 52 is operated by a lever 53 provided for each reel. Each reel 5 is mounted on a suitable housing member 54 which encloses the driving gears 46 and 47 and the clutch members and is mounted on the aforesaid frame member 44. A drip pan 55 may be provided beneath the bearings of the reels 5 to prevent any lubricant which may escape therefrom from dropping into the bath 3, in which drip pan may be mounted the guides 15 which guide the thread or the like as it starts on each reel.

The common drive shaft 45 may be rotated by any suitable means, but it is desirable to rotate it in timed relation to the viscose supply pumps and processing reels 9 to 13 inclusive. Thus in Figure 7 the shaft 45 is driven through gears, generally numbered 56, by means of a chain 57 driven from a gear 58 meshing with gear 59, which gear 59 is caused to rotate by a chain 61 driven from suitable power means which may also drive the processing reels 9 to 13. Mounted for rotation with gear 58 is a gear 62 from which the gear 63 mounted on the pump drive shaft 64 is driven through suitable change gear mechanism indicated generally at 65. Thus the speed of the pump drive shaft 64 may be adjusted as desired by means of change gear mechanism 65 and the pump drive shaft 64 may be driven in timed relationship with the reels 5 which take up the thread as it is formed. As in the conventional manner, each spinning pump 66, of which one is provided for each spinning nozzle 2, may be mounted on a common viscose supply conduit 67 and driven by gears 68, 69 from the common pump drive shaft 64, the viscose being supplied to each of the spinning nozzles 2 through a mass tube 70 which communicates with each pump 66. A drip pan 71 may be provided below the pumps 66.

If desired, the space above the bath 3 may be enclosed by suitable means. This may be for the maintainment of the desired conditions of temperature, humidity, etc., or for the protection and comfort of the operators in cases where gases are given off by the treating bath, as sometimes occurs in the spinning of viscose artificial silk thread. In the apparatus shown, the enclosing means comprise a hood 72 furnished with a plurality of sliding closures 73, 74 which provide access to the interior of the enclosing means. The closures 73, 74 are shown as being supported in an inclined position, being guided at their upper ends by tracks 75 mounted on hood 72 and at their lower ends by tracks 76 mounted at the outside edge of working deck 6. In such tracks operate the rotatable rollers 77 carried by the closures 73, 74. When access to the interior of the enclosing means at any point is desired, the corresponding closures 73, 74 may be opened, as shown in Figure 2, the closures 73 being pushed back of closures 74. The closures 73, 74 may be furnished with glass windows to enable the apparatus inside the enclosing means to be inspected without the necessity of opening the closures.

Suitable means for exhausting the gases from the interior of the enclosing means may be provided, such, for example, as the longitudinally extending duct 78 at the top of hood 72. Duct 78 communicates along its length with the space above the coagulating bath through slot 79, the gases being removed from the duct 78 through a suitable conduit 80. It has been found in the operation of apparatus of the type illustrated that gases given off on reels 9 to 13 by the processing operations performed thereon are drawn up through channels 8 into the enclosed space above the bath trough 4, since a pressure somewhat lower than atmospheric pressure is maintained therein. This condition obtains even though covers 16 be in place on the ends of the channels 8. Gases resulting from processing operations on the entire machine are thus removed by duct 78.

In the apparatus illustrated, the thread, after leaving the reel 5, passes through opening 7 and its associated channel 8 to the first thread-storage, thread-advancing reel 9 of a series of such reels on which the thread is subjected to various processing treatments. Reel 9 is preferably positioned as shown with its thread-receiving end, which, in the case of a cantilever reel may be the supported end thereof, directly below the discharge end of channel 8, and, as in the embodiment shown, directly below the discharge end of the reel 5 disposed above the coagulating trough 4. The thread-storage, thread-advancing reels 9 to 13, inclusive, may be positioned in stepped arrangement with the thread-receiving end of each reel adjacent the thread-discharge end of the preceding reel, the unsupported ends of the reels being presented toward an operator who may gain access thereto from a ladder 82. One or more of such ladders 82 adapted to slide along the face of the machine may be provided to enable the operator to reach the various processing reels 9 to 13.

Suitable means for applying processing treatments to the thread or the like while it is stored on the reels 9 to 13, inclusive, may be provided. For applying processing liquids, a reagent distributor 83 may be employed positioned above each of the reels and supplied from a conduit 84 which, in the apparatus shown, extends longitudinally of the machine and serves corresponding reels in adjacent vertical series. The processing liquid applied to each of the reels is collected in a trough 85 which may likewise extend longitudinally of the machine and serve like reels in adjacent vertical series. Suitable means, not shown, may be provided for draining each of the troughs 85 and passing the liquid so drained either to sewer, in the case of liquids such as wash water which it is desired to use only once, or to a recirculating system in conjunction with the corresponding reagent supply line 84. As shown, the reels 9 to 13, inclusive, of each series may be driven through gears 86, 87 from an inclined drive shaft 88. Drive shaft 88 may be driven from a suitable power source in timed relation to the common drive shaft 44 for the reels 5.

It is obvious that the improvements of the present invention may be applied to other apparatus than that shown and that various modifications may be made in the embodiment herein illustrated without in any way departing from the spirit of the invention. For instance, the invention need not necessarily be employed in connection with apparatus of the form described: other forms of thread-storage, thread-advancing devices may be employed; thread-storage, thread-advancing devices may be located in various other positions with respect to the coagulating trough than that shown; thread-storage, thread-advancing devices provided for the subsequent continuous processing of thread or the like may be disposed in other arrangements than that shown, etc.

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. Apparatus for the manufacture of thread or the like comprising a trough containing a coagulating bath; a spinning nozzle in said trough; a stationary vertical channel in proximity to said trough; means for withdrawing from said coagulating bath and passing through said stationary vertical channel the thread or the like formed by said spinning nozzle; and, mounted in juxtaposition to the discharge end of said

stationary vertical channel, a rotary helix-forming device to which the thread or the like proceeds from said stationary vertical channel.

2. Apparatus as in claim 1 in which said helix-forming device takes the form of a thread-advancing reel.

3. Apparatus as in claim 1 in which said helix-forming device takes the form of a thread-advancing reel of cantilever form.

4. Apparatus for the manufacture of thread or the like comprising a trough containing a coagulating bath; a spinning nozzle in said trough; a deck providing access to said trough, said deck including a waste trough; an opening in said deck on the same side thereof as said waste trough; and means for withdrawing from said coagulating bath and passing through the opening in said deck the thread or the like formed by said spinning nozzle.

5. Apparatus for the manufacture of thread or the like comprising a trough containing a coagulating bath; a spinning nozzle in said trough; a thread-storage, thread-advancing device disposed above said trough, said thread-storage, thread-advancing device having one end over said spinning nozzle; means enclosing the space above said trough, together with said thread-storage, thread-advancing device; and means through which the thread or the like discharged by said thread-storage, thread-advancing device leaves said enclosing means.

6. Apparatus for the manufacture of thread or the like comprising a trough containing a coagulating bath; a spinning nozzle in said trough; a channel in proximity to said trough; a thread-storage, thread-advancing device disposed above said trough, said thread-storage, thread-advancing device having its receiving zone over said spinning nozzle and its discharge zone over said channel; and means enclosing the space above said trough, together with said thread-storage, thread-advancing device.

7. Apparatus for the manufacture of thread or the like comprising a trough containing a coagulating bath; a spinning nozzle in said trough; a deck providing access to said trough; an opening in said deck; and a thread-storage, thread-advancing device mounted above said trough with its receiving zone over said spinning nozzle and its discharge zone over the opening in said deck.

8. Apparatus for the manufacture of thread or the like comprising a source of thread or the like; a trough containing a treating bath; a deck providing access to said trough; an opening in said deck; and, disposed above said trough, a thread-storage, thread-advancing device of cantilever form to the supported end of which the thread or the like proceeds from said treating bath, said thread-storage, thread-advancing device having its unsupported end over the opening in said deck.

9. Apparatus for the manufacture of thread or the like comprising a source of thread or the like; a trough containing a treating bath; a deck providing access to said trough; an opening in said deck; and, disposed above said trough, a thread-storage, thread-advancing device to one end of which the thread or the like proceeds from said treating bath, said thread-storage, thread-advancing device having its other end over the opening in said deck.

10. Apparatus for the manufacture of thread or the like comprising a source of thread or the like; a trough containing a treating bath; a stationary vertical channel in proximity to said trough; and, disposed above said trough, a thread-storage, thread-advancing device to one end of which the thread of the like proceeds from said treating bath, said thread-storage, thread-advancing device having its other end over said stationary vertical channel.

11. Apparatus for the manufacture of thread or the like comprising a source of thread or the like; a trough containing a treating bath; a stationary vertical channel in proximity to said trough; and, disposed above said trough, a thread-storage, thread-advancing device of cantilever form to the supported end of which the thread or the like proceeds from said treating bath, said thread-storage, thread-advancing device having its unsupported end over said stationary vertical channel.

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