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APPARATUS FOR THE MANUFACTURE OF THREAD OR THE LIKE

Filed April 14, 1936

2 Sheets-Sheet 1

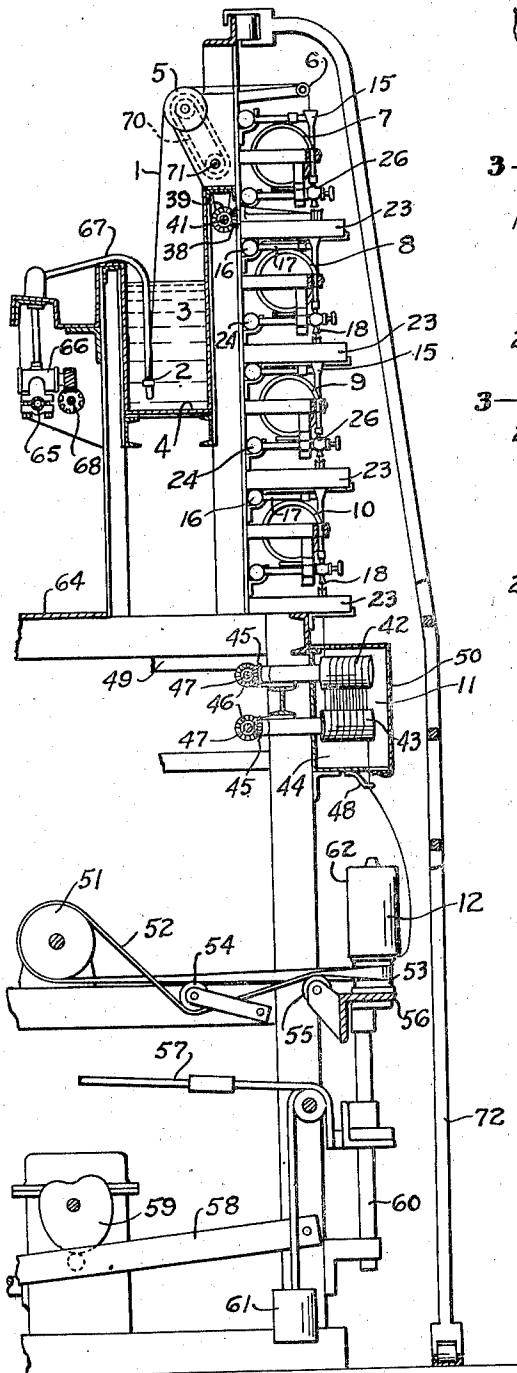


Fig. 1

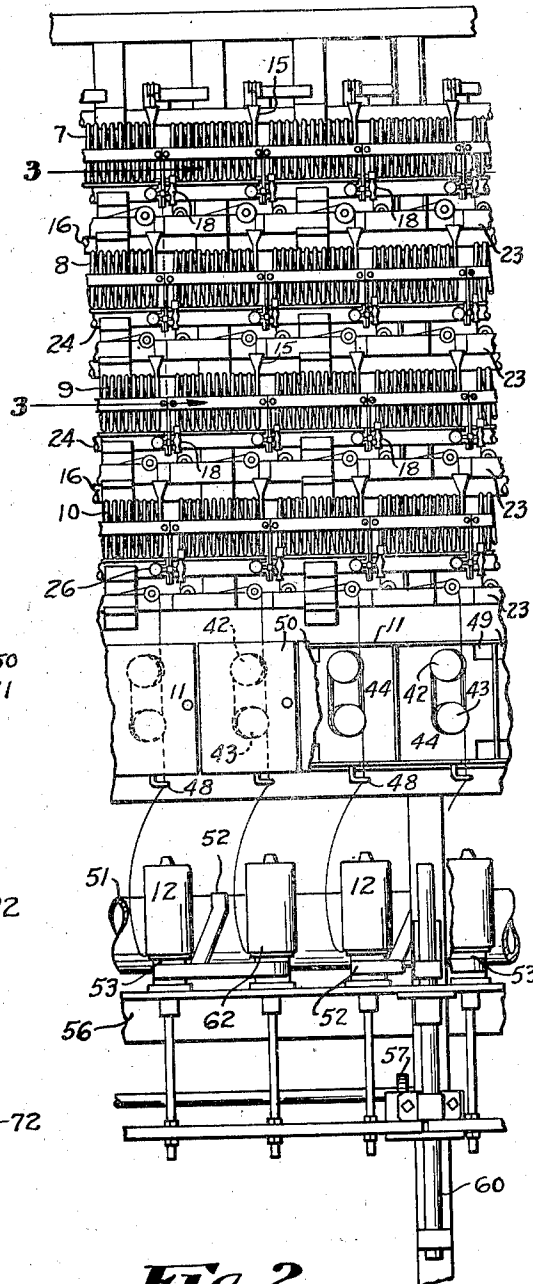


Fig. 2

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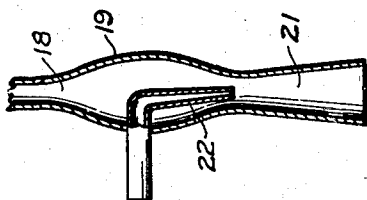
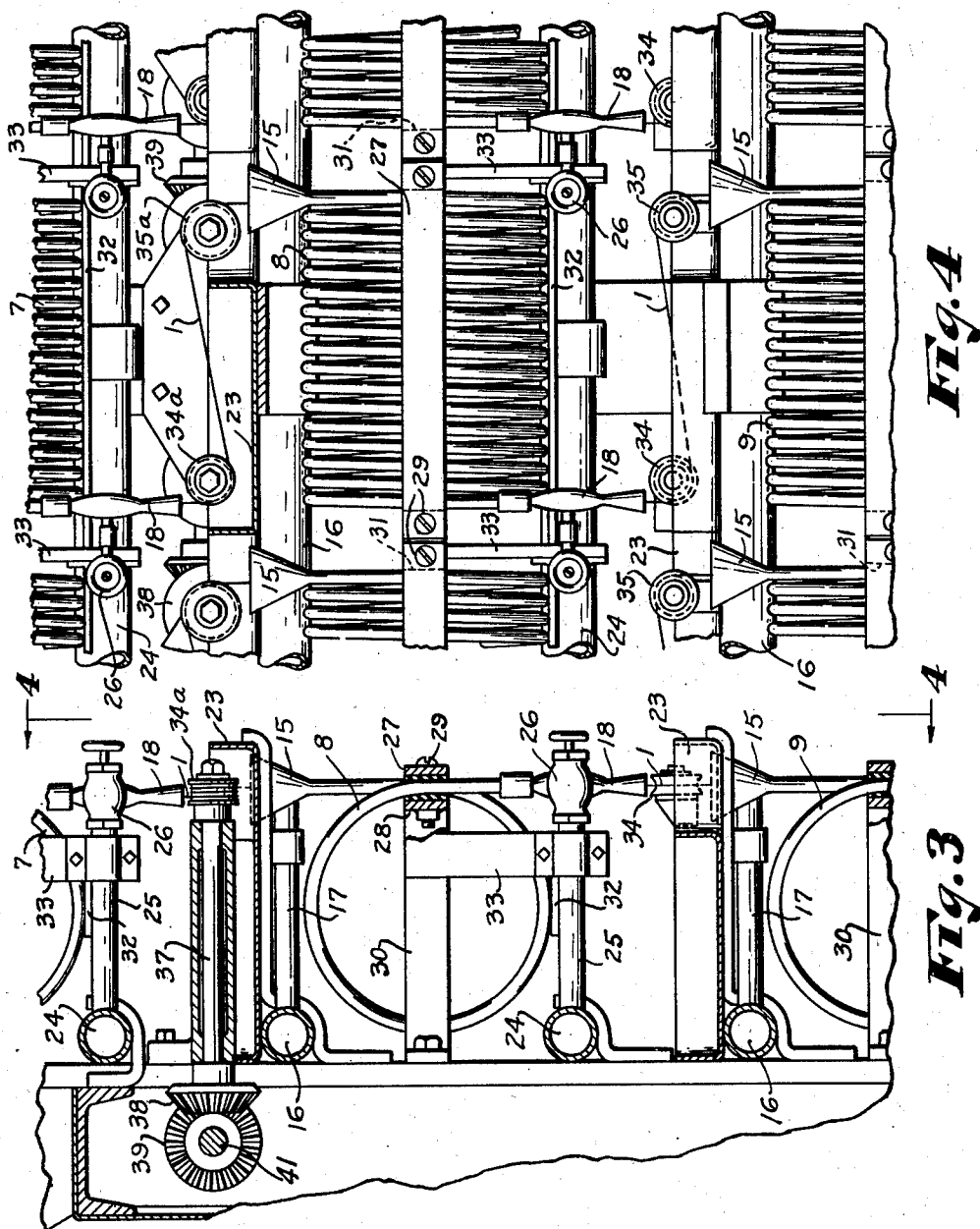


Fig. 5

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APPARATUS FOR THE MANUFACTURE OF
THREAD OR THE LIKE

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10 Claims. (Cl. 18—8)

This invention relates to apparatus for the manufacture of thread or the like of synthetic origin.

According to the invention, thread or the like from a suitable source, such as a spinning nozzle or other thread-forming means, is passed through one or more closed passages in which it is subjected to appropriate processing treatment, the passage or passages being preferably of sinuate form. By passing the thread or the like through a sinuate passage, as, for example, a passage of helicoidal shape, a relatively long length of thread or the like may be processed in a relatively small space. If a plurality of such passages are employed through each of which the thread or the like is caused to pass in sequence, a plurality of different processing treatments may be applied to the thread or the like.

The invention may be applied to the manufacture of various kinds of thread or the like of synthetic origin. For example, it may be employed in the manufacture of rubber thread produced by the extrusion into a coagulating bath of latex or other dispersions of rubber, artificial silk thread manufactured, for instance, by the viscose, cuprammonium, nitro-cellulose, or cellulose acetate process, staple fibre, artificial straw, artificial horsehair, etc. For convenience in illustration, but in no sense of limitation, it will be described hereinafter in connection with the manufacture and processing of multiple filament viscose artificial silk thread.

In the drawings, in which is shown one form of apparatus embodying the invention, Figure 1 is a sectional elevation through a machine for the continuous manufacture of thread or the like. Figure 2 is an elevation of the operating face of the machine. Figure 3 is an enlarged sectional elevation of a portion of the machine from line 3—3 of Figure 2. Figure 4 is an elevation on the same scale as that of Figure 3 from line 4—4 thereof. Figure 5 is a sectional elevation on an enlarged scale of ejector means which may be employed in the practice of the invention. In the drawings, like reference numerals refer to like parts throughout.

In the embodiment shown in Figures 1 and 2, the thread 1 is formed in the usual way by extrusion of viscose from the spinning nozzle 2 immersed in coagulating bath 3 contained in trough 4. Suitable means may be provided for withdrawing the thread from spinneret 2, such, for example, as a positively driven godet wheel 5 around which the thread may be passed one

or more times in a manner to prevent slip thereof. From the godet wheel 5 the thread may pass over suitable guide means, such as rotatable roller 6, to a group of serially disposed helicoidal tubular passages in which the thread is subjected 5 to processing treatment.

While any suitable number of such helicoidal tubular passages disposed in processing sequence may be provided, depending on the number and nature of the operations which it is desired to 10 perform on the thread, four, bearing reference numerals 7, 8, 9 and 10, particularly adapted for the application of processing liquid to the thread have been shown for purposes of illustration. Thus the thread 1 may be subjected to the action 15 of a coagulating liquid in helicoidal tubular passage 7; washed, as by water, in helicoidal tubular passage 8; desulphurized in helicoidal tubular passage 9; and again washed in helicoidal tubular passage 10. The thread 1, after leaving the 20 last helicoidal tubular passage 10 may be dried, as on drying means 11, after which it may be collected on any suitable device such as cap-twister 12.

The thread and processing medium therefor 25 are passed simultaneously through each helicoidal tubular passage; preferably, but not necessarily, in concurrent relation to each other. If, as in the usual case, a liquid processing medium is employed, it is preferable to maintain the heli- 30 coidal tubular passage completely filled with the liquid, the liquid being passed therethrough at a rate sufficient to carry the thread with it. It is desirable to impose the desired velocity on the liquid processing medium by withdrawing the 35 processing liquid at a suitable rate from the discharge end of the helicoidal tubular passage.

Each helicoidal tubular passage is preferably 40 mounted with its axis horizontal, the end through which the processing medium enters the helicoidal tubular passage extending upward and one end from which the processing medium is discharged therefrom extending downward. The individual coils of the helicoidal tubular pas- 45 sages may conveniently, but need not necessarily, be of circular cross-section. In the case where material of the size of thread is being passed therethrough, the helicoidal tubular passages may be of relatively small diameter, approach- 50 ing capillary fineness.

If desired, the entrance to each helicoidal tubular passage may be enlarged; for instance, it may take the form of the funnel 15 shown, thereby facilitating the operation of starting 55 the thread through the helicoidal tubular pas-

sage. The means illustrated for supplying processing liquid comprises a liquid supply conduit 16 communicating by means of a pipe 17 with the funnel 15, a constant head of liquid being maintained in the conduit 16 by suitable means such as a header box from which the liquid is supplied to the conduit 16. The means illustrated for withdrawing the processing liquid from the discharge end of each helicoidal tubular passage comprises an ejector 18 which may be of the type shown on enlarged scale in Figure 5.

The ejector 18 comprises an enlarged portion 19 in which is positioned a nozzle 22. The discharge end of the nozzle 22 is located at the throat of a Venturi tube 21 embodied in the ejector 18. When a suitable gaseous or liquid medium, such, for example, as the processing liquid being passed through the helicoidal tubular passage, is discharged at high velocity from nozzle 22, processing liquid in the helicoidal tubular passage is continuously withdrawn therefrom and discharged into a suitable collecting trough 23. In the apparatus shown, the ejector nozzle 22 is supplied with a liquid under suitable pressure from pipe 24 and conduit 25, a valve 26 being provided, if desired, to govern the discharge from the ejector nozzle 22 and consequently the rate at which the processing liquid is withdrawn from the tubular passage.

While the helicoidal tubular passages may be disposed in various arrangements, it is convenient to arrange them in vertical series with corresponding helicoidal tubular passages in adjacent series in the same relative position. The axes of the helicoidal tubular passages preferably extend parallel to and longitudinally of the operating face of the machine. When the helicoidal tubular passages are arranged as shown, with their axes parallel to the front of the machine, the entrance and discharge ends of the helicoidal tubular passages may be positioned in such relation that they are within easy reach of the operator.

The helicoidal tubular passages may be supported as desired in any one of various ways.

In that shown in the drawings, each helicoidal tubular passage is held between bar members 27, 28 fastened, as by screws 29 threaded into member 28, to brackets 30, which brackets 30 are provided with lugs 31 disposed between the bar members 27, 28, through which lugs the screws 29 pass. If desired, a yielding material such as rubber may be held under a slight compression between the bar members 27, 28 and the helicoidal tubular passages to prevent any undue or unequal pressure on the tubing. In addition, means 32 may be provided to support each helicoidal tubular passage from beneath. In the mounting means illustrated, by removing the screws 29 from the corresponding bars 27, 28 and brackets 30, any helicoidal tubular passage may readily be removed for replacement, cleaning, etc. A suitable member 33 may also be mounted on each bracket 31 to support the pipe 25 and ejector 18 for each helicoidal tubular passage.

If the helicoidal tubular passages in corresponding positions in adjacent vertical series are disposed as shown, the construction of the processing medium supply and removal systems is simplified. Thus the conduit 16 from which processing liquid is supplied to the helicoidal tubular passages, conduit 24 from which liquid is supplied to ejector nozzles 22, and collecting trough 23 may be common to a plurality of helicoidal tubular passages in a horizontal series.

The liquid collected in each trough 23 may be passed to sewer, especially if it is a liquid such as wash water which it is desired to use only once, or, if it is desired to re-use it, it may be recirculated.

If the helicoidal tubular passages in each vertical series are arranged as shown, the thread 1, after leaving the preceding helicoidal tubular passage, may pass around guide means 34, 35, which may be rollers as shown, to a succeeding helicoidal tubular passage. It may, therefore, be desirable to construct the collecting trough 23 in the form shown, in which the trough is provided with suitable re-entrant portions 36 in which the rollers 35, which guide the thread as it enters the succeeding helicoidal tubular passages, are positioned. Obviously, any other suitable shape may be employed in lieu of that shown.

It is sometimes desired to stretch the thread or allow it to shrink during its production. In the apparatus illustrated, provision is made for the stretching or shrinking of the thread between helicoidal tubular passages 7 and 8, the stretching or shrinking being accomplished by differences in the peripheral speeds of guide rollers 34a and 35a, around each of which the thread may be wound one or more times to prevent slip. The guide rollers 34a and 35a may be positively driven by rotation of shafts 37 by gears 38, 39 from a drive shaft 41 which may drive all the rollers 34a and 35a in a horizontal series and which may be driven by suitable means, not shown. The differences in peripheral speeds between rollers 34a and 35a may be obtained by suitable ratios of the gears 38, 39 or, as shown, by differences in diameters of the rollers 34a and 35a.

While various means may be provided for drying the thread after a liquid processing treatment has been applied thereto in a preceding helicoidal tubular passage, the drying device 11 shown comprises spaced, inclined rollers 42, 43 surrounded by a chamber 44, which rollers 42, 43 are positively driven through gears 45, 46 from shafts 47 which may extend longitudinally of the machine and serve like drying devices in adjacent units. Thread is continuously wound about both the rollers 42 and 43, and, because of the inclined relation of rollers 42 and 43, is caused to advance axially thereof until it is withdrawn therefrom, as by means of guide 48. While a comparatively long length of thread is thus continuously temporarily stored on the rollers 42, 43, it may be dried by drying medium, such as heated air, supplied through duct 49 to the chamber 44 which surrounds the rollers. A shutter, not shown, may be provided to close the duct 49 when the inclined rollers 42, 43 are being threaded up. A closure 50 may be provided at the front of chamber 44 to allow access to the rollers.

If desired, the drying stage may be omitted, the thread being collected in package form while still wet.

Cap-twister 12, employed as a collecting device in the embodiment illustrated, may be driven by any suitable apparatus such as that shown, which comprises a drum 51 from which, through belt 52, the bobbin-supporting whirls 53 of a pair of adjacent twisters are rotated. Guide pulleys 54, 55 are provided to guide the belt during vertical reciprocation of the whirls mounted on lifting rail 56. Lifting rail 56 is vertically reciprocated by tension members 57 which are operated by a lever 58 actuated by a cam 59, and is guided in its ver-

tical path by guide rods 60, a suitable counter-weight 61 being supplied, if desired, to counter-balance the weight of the reciprocating parts. By means of this apparatus, the thread 1 is passed under cap 62 on cap-twister 11 to a reciprocating and rapidly rotating bobbin, the thread being thereby simultaneously twisted and collected in the conventional manner. Obviously, other collecting means than the cap-twister illustrated may be employed, as, for example, a ring-twister, a spinning pot or even a collecting spool of the ordinary kind.

In the apparatus illustrated, access may be had from platform 64 to the coagulating bath trough 4 and associated apparatus which may include the conventional supply conduit 65 on which are mounted the spinning pumps 66 each of which communicates with a mass tube 67 on which is mounted a spinneret 2, drive shaft 68 for the spinning pumps 66, etc. In the operation of the apparatus, an operator standing on platform 64 withdraws from coagulating bath 3 the thread 1 formed by extrusion of viscose from spinneret 2. The thread may be then wound in one or more turns about the godet wheel 5 positively driven as by chain 70 from a longitudinal drive shaft 71. The end of the thread 1 is then led from the godet wheel 5 over roller 6 and dropped into the funnel entrance 15 of the first helicoidal tubular passage 7.

The processing liquid, the flow of which has been previously started through the helicoidal tubular passage 7 at a suitable rate governed by the valve 26 controlling the liquid supply to the discharge nozzle 22 of the ejector 18, carries the thread 1 through the helicoidal tubular passage 7, the leading end of the thread being discharged, together with processing liquid, through ejector 18 into the trough 23. An operator standing on ladder 72, adapted for sliding movement across the face of the machine, winds the thread 1 one or more times around each of the positively driven rollers 34a and 35a, and drops the end of the thread into the funnel entrance 15 of the succeeding helicoidal tubular passage 8. After the thread is discharged from said helicoidal tubular passage 8, it is led around the rotatable guide rollers 34, 35 therebelow in the manner indicated and started through the next helicoidal tubular passage 9, the same procedure being repeated for all succeeding helicoidal tubular passages. After the thread leaves the last helicoidal tubular passage 10, it is caused to wind about the offset and inclined rollers 42, 43 of the drying device 11, after which it is started on cap-twister 12.

The apparatus shown in Figures 1 and 2 may, if desired, be one operating face of a double-sided machine, the other operating face being identical therewith. Although the apparatus illustrated is adapted for the application to the thread or the like of but four liquid processing treatments, it is obvious that provision may be made by suitable modification of the apparatus for more or fewer processing treatments. The passages need not be of the helicoidal tubular form illustrated, since any other suitable sinuate form may be used by which a passage of relatively long length is provided in a relatively small space; furthermore, the axes of the passages, particularly if of the preferred helicoidal form illustrated, need not be disposed horizontally but may be disposed obliquely or even vertically. It is obvious that other means than that shown may be provided for pass-

ing the processing liquid through the passages; indeed, that in some cases the effect of gravity may be used to this end, either alone or in conjunction with means such as those herein disclosed.

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 of synthetic origin comprising a source of thread or the like; a tubular passage of helicoidal form through which the thread or the like is passed; means for supplying processing liquid to said tubular passage of helicoidal form; means for withdrawing the processing liquid from said tubular passage of helicoidal form; and means for collecting the thread or the like.

2. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a tubular passage of helicoidal form through which the thread or the like is passed; means for supplying processing liquid to said tubular passage of helicoidal form; means for withdrawing the processing liquid from said tubular passage of helicoidal form; means for stretching the thread or the like and means for collecting the thread or the like.

3. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a plurality of tubular passages of helicoidal form; means for passing the thread or the like in sequence through each of said tubular passages of helicoidal form; means for supplying a processing medium to each of said tubular passages of helicoidal form; and means for collecting the thread or the like.

4. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a tubular passage of helicoidal form through which the thread or the like is passed; means for supplying a processing medium to said tubular passage of helicoidal form at a rate to keep it substantially filled; and means for collecting the thread or the like.

5. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a tubular passage of helicoidal form through which the thread or the like is passed; means for supplying processing liquid to said tubular passage of helicoidal form; means for drying the thread or the like; and means for collecting the thread or the like.

6. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a plurality of tubular passages of helicoidal form; means for passing the thread or the like in sequence through each of said tubular passages of helicoidal form; means for supplying a processing medium to each of said tubular passages of helicoidal form; means for stretching the thread or the like between two or more of said tubular passages of helicoidal form; and means for collecting the thread or the like.

7. Apparatus for the manufacture of thread or the like of synthetic origin comprising a source of thread or the like; a tubular passage of helicoidal form through which the thread or the like is passed; means for supplying processing liquid to said tubular passage of helicoidal form at a rate sufficient to keep it filled with liquid; means for withdrawing the processing liquid from

said tubular passage of helicoidal form; and means for collecting the thread or the like.

- 5 8. Apparatus for the processing of thread or the like of synthetic origin comprising a source of thread or the like; a tubular member through which the thread or the like is passed; means for supplying processing liquid to said tubular member toward the end thereof into which the thread or the like is fed; and, affixed to said
10 tubular member at a point toward the other end thereof, an ejector for discharging the used

processing liquid, together with the thread or the like.

9. Apparatus as in claim 8 in which the ejector includes a nozzle disposed within an enlargement near the discharge end of said tubular member. 5

10. Apparatus as in claim 8 in which the ejector operates by means of processing liquid of the kind employed for processing the thread or the like in said tubular member.

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