June 20, 1939. W. F. KNEBUSCH ET AL 2,162,728

MANUFACTURE OF THREAD OR THE LIKE

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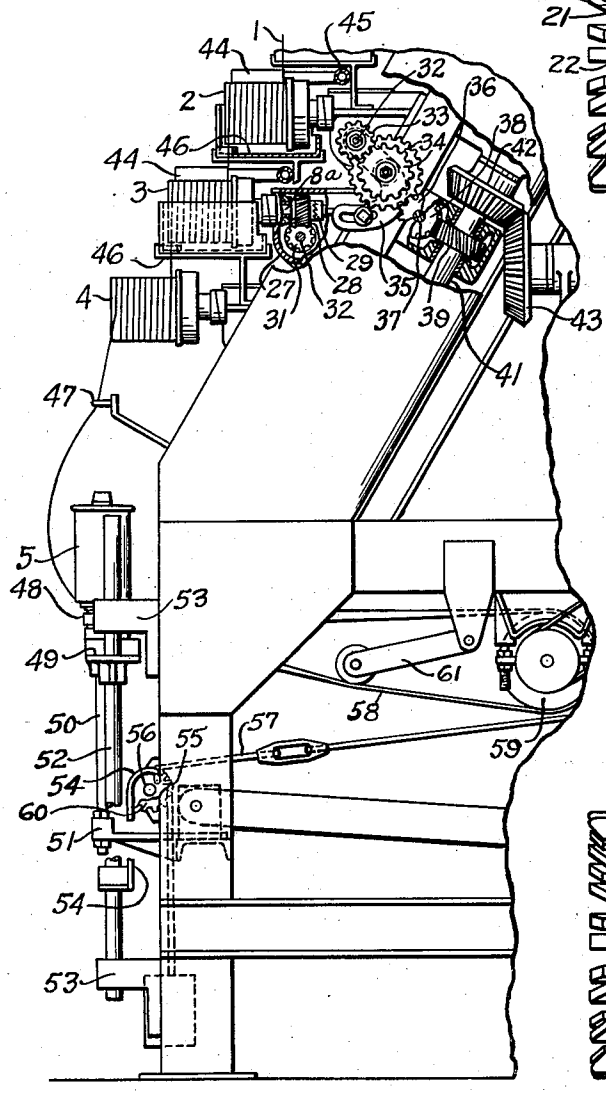


Fig. 1

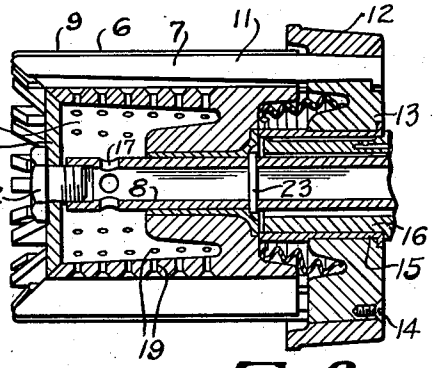


Fig. 2

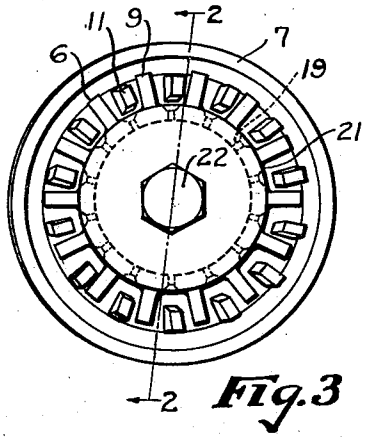


Fig. 3

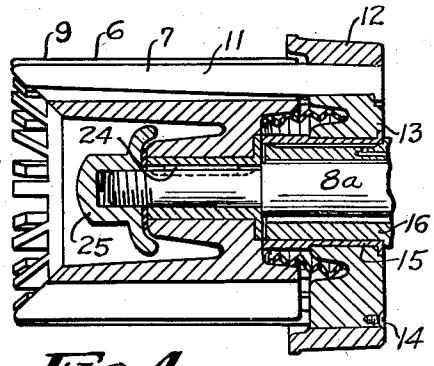


Fig. 4

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MANUFACTURE OF THREAD OR THE LIKE

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Application February 1, 1936, Serial No. 61,955

7 Claims. (Cl. 18—8)

This invention relates to the manufacture of artificial silk thread or the like; more particularly, to methods of twisting the thread or the like.

The present application is a continuation in part of application Serial No. 7,114, entitled "Manufacture of artificial silk", filed February 18, 1935, by Walter F. Knebusch and Alden H. Burkholder, in which is shown, described and claimed a form of apparatus suitable for the continuous processing of artificial silk thread or the like. On such apparatus, the thread or the like, which may, for example, be multiple filament artificial silk thread manufactured by the viscose process, is temporarily stored on each of a plurality of thread-storage, thread-advancing devices disposed in vertically stepped arrangement. Processing treatment is applied to the thread or the like on each of said thread-storage devices. On the last thread-storage device, the thread is dried, after which it is immediately twisted.

Among other things, certain methods of twisting the thread or the like which are outlined but not specifically claimed in the above-identified application comprise the subject matter of the present application.

In the accompanying drawing, forming a part hereof, Figure 1 is an end elevation with parts broken away of a portion of the apparatus disclosed in the above-mentioned application, the same embodying a series of vertically stepped thread-storage, thread-advancing devices with the associated twisting mechanism. Figure 2 is a sectional elevation of a thread-storage, thread-advancing device adapted for use in the step of drying the thread or the like. Figure 3 is a corresponding end elevation. Figure 4 is a sectional elevation corresponding generally to that of Figure 2 of a form of thread-storage, thread-advancing device which may be used to advantage in the wet processing of the thread or the like.

In the apparatus of Figure 1, the thread 1 passes in sequence to each of a plurality of thread-storage, thread-advancing devices of which three, bearing reference numerals 2, 3 and 4, are shown. On these devices, the thread or the like is continuously but temporarily stored while being subjected to processing treatment. Thus on thread-storage, thread-advancing device 2, a liquid processing operation such as bleaching may be performed on the thread or the like; on thread-storage, thread-advancing device 3, the thread or the like may be washed; while on thread-storage, thread-advancing device 4, the thread or the like may be dried, as by the application thereto of a suitable drying medium, such as heated air. After leaving the thread-storage device on which it is dried, the thread or the like is immediately twisted, as by cap-twister 5 disposed directly below the discharge end of the thread-storage, thread-advancing device 4.

The twisting operation is thus performed while the thread or the like is still warm from the drying operation, being ordinarily, but not necessarily, characterized in this condition by less than its normal regain moisture content. The normal regain moisture content may be defined as the normal percentage of moisture in the thread or the like on a basis of weight of moisture to the weight of the thread or the like in the bone dry condition: in viscose thread or the like, for instance, the normal regain moisture content is in the neighborhood of 10—12%. It has been found that twisting the thread or the like while still warm has the advantage that the thread or the like takes and holds the twist more readily.

The thread-storage, thread-advancing devices may take the form of thread-storage, thread-advancing reels of the types shown in Figures 2, 3 and 4.

Referring to Figures 2 and 3, it can be seen that the reel therein shown comprises two generally cylindrical members 6 and 7. Member 6, which may be termed the "concentric" member, comprises a drum-like member mounted with its axis concentric with that of the drive shaft 8 and provided at its periphery with a plurality of integral, longitudinally extending bar members 9. Member 7, which may be termed the "eccentric" member, is mounted with its axis slightly offset from and inclined to that of member 6. Member 7 is comprised of a plurality of longitudinally extending bar members 11 which are equal in number to those of member 6 and alternately disposed therewith. Bar members 11 may be supported in any suitable manner, such as that shown, in which they are supported from one end by being clamped between outer and inner ring-like members 12 and 13 which are respectively externally and internally tapered and held together as by screws 14.

Within inner ring-like member 13 a sleeve 15 may be concentrically mounted, by means of which the eccentric member 7 may be rotatably mounted on frame member 16 in the desired offset and inclined relationship to member 6.

The reel of Figures 2 and 3 is adapted to supply a gaseous processing medium, such as heated air, to the thread or the like stored on the reel. As can be seen, the processing medium is supplied to the interior of the reel through the drive shaft 8,

which is made hollow and is provided with ports 17 communicating with the chambered interior 18 of reel member 6. Holes 19 in the walls of the chamber portion 18 of the reel communicate with the exterior of the reel, the holes 19 being preferably positioned in the slots between the bar members 9 and reel member 6. If desired, the end of the chamber portion 18 may be closed by a disc or cover 21 held in place by plug bolt 22. The latter serves also to hold the concentric reel member 6 in place against pin 23 in drive shaft 8, which pin 23 serves both to locate the reel member 6 longitudinally and to drive the reel member.

Rotation of reel member 6 causes the eccentric reel member 7 to rotate therewith by contact of bar members 9 and 11. The offset and inclined relationship of the generally cylindrical members 6 and 7 during rotation thereof causes the thread or the like to wind on the reel and form spaced substantially helical turns which progress axially along the reel toward its discharge end. Since a reel of this type is open-ended; i. e., supported at one end only, important advantages are provided in threading up or starting the thread or the like on the reel. For convenience, the reel may be described as being of cantilever form, by which is meant that its free end is devoid of shaft extension, support or the like.

The reel of Figure 4 is of generally the same type as that of Figures 2 and 3, but differs therefrom in that no provision is made for applying the processing medium from the interior of the reel. The drive shaft 8a may therefore be solid, as shown in Figure 4. The reel member 6 may be mounted on the drive shaft by means of a key 24 and a nut 25 which nut locates reel member 6 longitudinally against a shoulder on the drive shaft, as shown. Since this reel is of substantially the same type as that previously described, no detailed description of its operation is necessary.

The reels may be mounted in vertically stepped series and driven in the manner shown, in which the reels are mounted on the front of a housing 27 in which are contained driving gears for the reels. The drive shaft 8a of each reel is driven by a gear 28 as through clutch 29 which may be provided to disengage each reel from its driving means, if desired. The gear 28 for each reel is driven by gear 31 mounted on shaft 32 which may extend longitudinally of the machine and drive a plurality of reels in a horizontal series. The shaft 32 is shown as driven from gear 33 mounted thereon through change gears 34 which are mounted on an adjustable arm 35. Gears 34 are driven from gear 36 which is mounted for rotation on a short shaft 37 having mounted thereon a gear 38 which is driven by gear 39 fixed for rotation with the drive shaft 41. Drive shaft 41 may drive all horizontal series of reels in a similar manner and may be driven through gears 42 and 43 by some suitable means, such as a motor.

Associated with each of the reels on which processing liquid is applied to the thread or the like is reagent distributor 44 supplied by conduit 45 from which the desired processing liquid may be showered down on the reel below. A collecting trough 46 is provided to collect the processing liquid. The reagent supply conduit 45 and the collecting trough 46 may be made common to all reels in a horizontal series, in which case advantages as to construction, handling of the liquids, etc. result. The drying reel 4 on which the thread or the like may be dried by the application of heated air may be mounted and driven in the same manner as the other reels, provision being made, of course, to supply the drying medium to the thread or the like on each reel 4.

A guide 47 is provided through which the thread or the like passes from drying reel 4 to cap-twister 5. The bobbin-supporting whirl 48 of each cap-twister 5 is mounted on a lifting rail 49 while the stationary spindle shaft 50 is mounted on the spindle rail 51. Lifting rail 49 is guided in its vertical movement by the spindle lifting rods 52 of which one may be provided at each end of the lifting rail and which slide in guides 53. The lifting rail is reciprocated vertically by the tension member 54 mounted to wind and unwind from sprocket 55 mounted on the shaft 56. Shaft 56 is given a desired movement by the tension member 57 which is caused to wind and unwind on sprocket 60 by suitable cam and lever means. The rotating whirls 48 for the cap-twisters may be driven by belts 58 from a rapidly rotating cylinder 59, tension equalizers 61 being provided for the belts, if desired.

It has been found that if thread or the like subjected to heated drying medium on reel 4 is twisted immediately thereafter, no subsequent operation for the setting of the twist is required.

In the apparatus herein disclosed, the thread or the like has an approximately straight travel from drying reel 4 to cap-twister 5, in consequence of which fact the actual twisting of the thread or the like takes place at least as far back as the point at which the thread or the like is discharged from the reel and perhaps even on the reel itself within a short distance of the point at which the thread or the like leaves the reel. Thus the thread or the like is twisted at substantially the temperature to which it is heated on reel 4. The advantage that the necessity for a subsequent twist-setting operation is eliminated holds over a wide range of moisture contents of the thread or the like: no subsequent twist-setting operation is required for thread or the like which is twisted while heated to a temperature substantially above room temperatures even though its moisture content ranges from bone dry to one in which the thread or the like is appreciably moist; that is, having a moisture content even substantially above the normal regain moisture content.

The temperatures at which the thread or the like is twisted should, for viscose threads of ordinary deniers and at ordinary spinning speeds, preferably be not below about 140° F., since at temperatures much below this point the twist in the thread or the like is not always set as firmly as might be desired. The upper limit of temperature is set by the temperature at which the thread or the like is damaged by the heat, the temperature at which the thread or the like is twisted being preferably substantially below this point. Within these limits, the temperature to which the thread or the like is heated; i. e., the twisting temperature, may be varied over a wide range. With apparatus of this general type, the operation of drying the thread or the like is preferably carried to a point at which the thread or the like is characterized by less than its normal regain moisture content; so that the thread or the like is twisted while in this condition.

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, in combination, a thread-storage device of cantilever form on which, by the action of the elements thereof, the thread or the like is positively advanced in generally helical form toward the free end of the device; means for drying the thread or the like on said thread-storage device; and means disposed directly below the free end of said thread-storage device for twisting the thread or the like immediately after completion of the drying operation.

2. In the viscose process of manufacturing thread or the like, the steps of subjecting the thread or the like to liquid processing treatment, drying the thread or the like, and twisting the thread or the like while it is at a temperature of at least 140° F., said steps being performed in a continous sequence of operations.

3. In the viscose process of manufacturing thread or the like, the step of twisting the thread or the like at a temperature of at least 140° F. while containing less than its normal regain moisture content.

4. In the viscose process of manufacturing thread or the like, the steps of subjecting the thread or the like to liquid processing treatment; heating the thread or the like to a temperature of at least 140° F. and, without permitting the thread or the like to cool appreciably, twisting the thread or the like, said steps being performed in a continuous sequence of operations.

5. Apparatus for the manufacture of thread or the like comprising, in combination, a unitary thread-storage, thread-advancing device of cantilever form on which, by the action of the elements thereof, the thread or the like is positively advanced in generally helical form toward the free end of the device; means for drying the thread or the like on said thread-storage, thread-advancing device; and apparatus for twisting the thread or the like, said twisting apparatus being so disposed with respect to said thread-storage, thread-advancing device that the thread or the like is twisted in immediate proximity to the free end of said thread-storage, thread-advancing device.

6. Apparatus for the manufacture of thread or the like comprising, in combination, a unitary thread-storage, thread-advancing device of cantilever form on which, by the action of the elements thereof, the thread or the like is positively advanced in generally helical form toward the free end of the device; means for applying heat to the thread or the like on said thread-storage, thread-advancing device; and apparatus for twisting the thread or the like, said twisting apparatus being so disposed with respect to said thread-storage, thread-advancing device that the thread or the like is twisted in immediate proximity to the free end of said thread-storage, thread-advancing device while still at an elevated temperature.

7. Apparatus for the manufacture of thread or the like comprising, in combination, a unitary thread-storage, thread-advancing device of cantilever form on which, by the action of the elements thereof the thread or the like is positively advanced in generally helical form toward the free end of the device; means for drying the thread or the like on said thread-storage, thread-advancing device; and means disposed in close proximity to the free end of said thread-storage, thread-advancing device for collecting the thread or the like in package form.

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