Nov. 16, 1943. E. J. ABBOTT 2,334,165

FORMING DYE PACKAGES

Filed Dec. 29, 1939 2 Sheets-Sheet 1

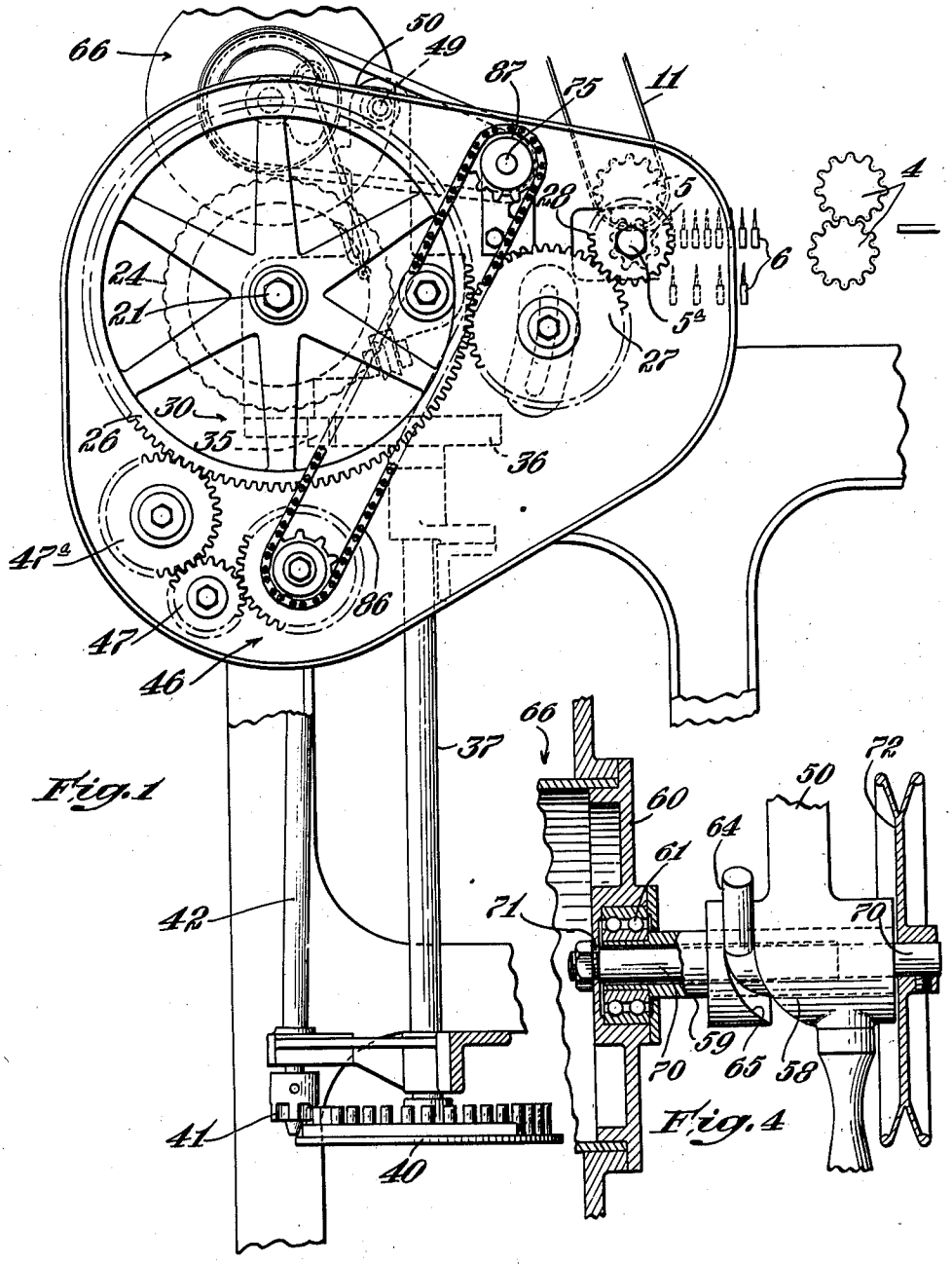



Fig. 1




Fig. 4

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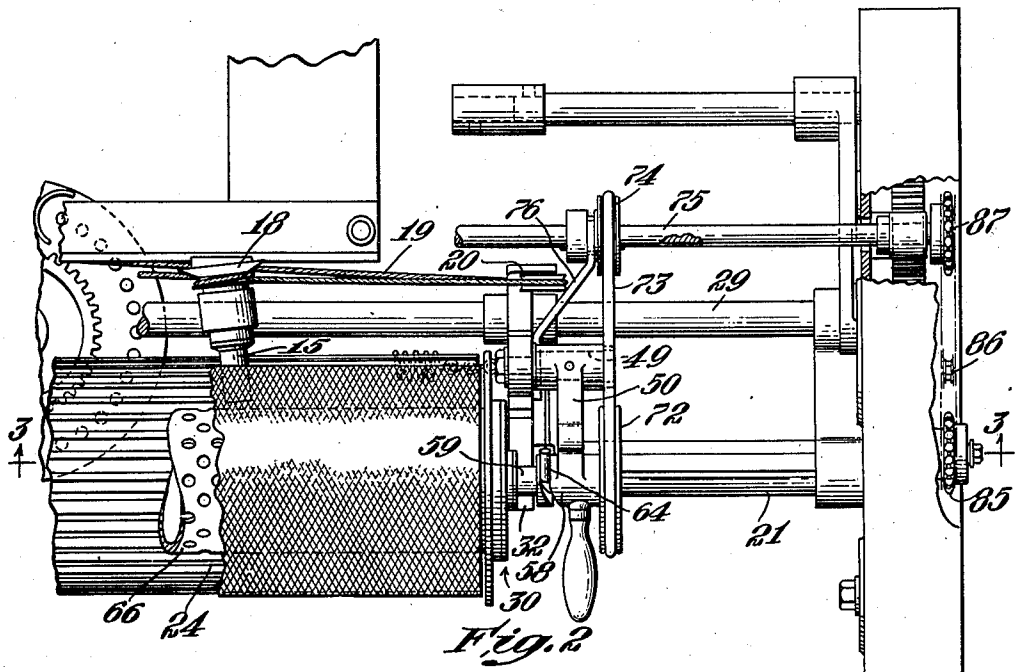



Fig. 2

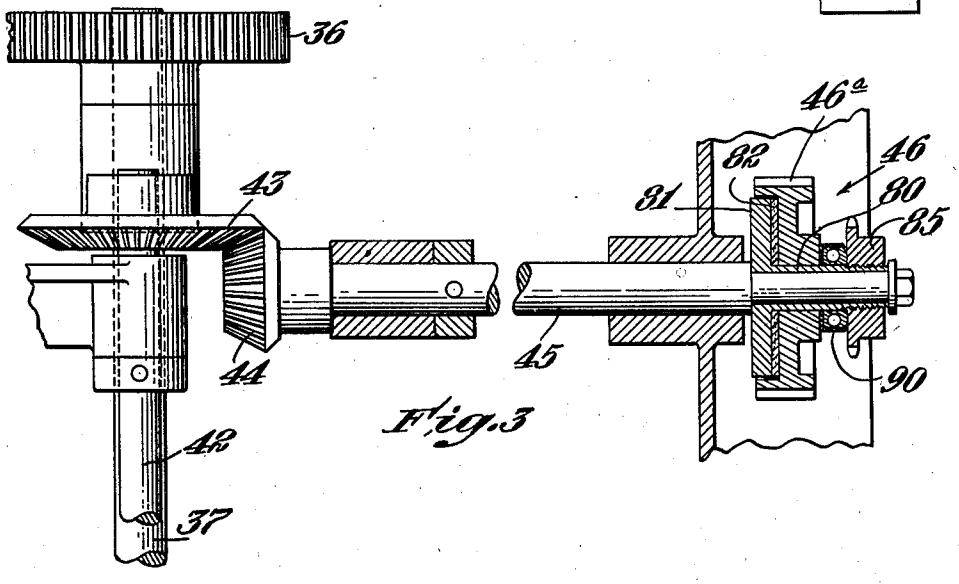



Fig. 3

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2,334,165

## FORMING DYE PACKAGES

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13 Claims. (Cl. 19—158)

This invention relates to a mechanism for forming dye packages consisting of unspun sliver cross wound upon a flanged perforated dye spool. The United States patent of Edward J. Abbott, No. 1,797,393, discloses and claims an apparatus of the general type to which this invention relates and on which this invention is an improvement.

The principal objects of the invention are to improve the regularity of the winding of sliver on the spool so as to produce a dye package that is more evenly affected by the dye liquid, to make the dye package more firmly wound at its inner layers, and further to increase the amount of sliver that can be wound on a given dye spool and to prevent the occurrence of ribbon winding.

Other objects of invention and features of advantage and utility will be apparent from this specification and its drawings wherein the invention is explained by way of example.

Referring to the drawings:

Fig. 1 is a side elevation of a sliver gilling and winding machine embodying the present invention;

Fig. 2 is a plan view of part of the mechanism of Fig. 1;

Fig. 3 is a vertical sectional view on the line 3—3 of Fig. 2; and

Fig. 4 is a fragmentary plan view partly in horizontal section and to a larger scale, of one of the supports for the winding spool, and of mechanism associated therewith.

The machine shown by way of example in the present drawings includes, like the machine of Patent No. 1,797,393, the usual rear draft rolls 4, fallers 6 and front draft rolls 5, acting to draw out the sliver and bring its fibers into parallel relation. The front draft rolls 5 are preferably provided with the usual endless apron 11. From the front draft rolls, the drafted sliver passes to guide trumpets, one of which is indicated at 15 in Fig. 2, this trumpet preferably being oscillated by means of a pulley 18 about which is wrapped one run of an endless cord 19 passing around pulleys 20 mounted upon a reciprocating carriage. The other run of the cord 19 is fastened at a suitable point to the frame of the machine, so that reciprocation of the carriage moves the run of the cord that engages the trumpet pulley 18, thus oscillating the trumpet. A horizontal shaft 21 carries a package drive drum 24 having a corrugated surface, on which rests the flanged perforated dye spool 66 upon which is wound gilled sliver, the drum 24 being splined to the shaft 21. The shaft 21 is driven by a gear 26 meshing with an idler gear 27 which is driven by a gear 28 secured to the end of the shaft $5^a$ which carries the front bottom draft roll 5. The carriage indicated generally at 30 is slidably mounted on a fixed guide rod 29 (Fig. 2) and on the shaft 21. The carriage end frame members one of which is indicated at 32 in Fig. 2, are slidably mounted on the shaft 21 and upon the guide rod 29, and engage the end of the drum 24, and cause this drum to partake of the reciprocating movement of the carriage. The lower part of the carriage 30 carries a rack bar 35 meshing with a pinion 36 (Figs. 1 and 3) on the upper end of a vertical shaft 37 which carries at its lower end a mangle gear 40. The mangle gear is driven by a pinion 41, shaft 42, (Figs. 1 and 3), bevel gears 43 and 44 (Fig. 3), horizontal shaft 45, and a pinion indicated generally at 46. Pinion 46 is driven by idler gears 47 and $47^a$ meshing with the gear 26 (Fig. 1).

The dye spool 66 is retained at its opposite ends by arms 50 (of which one is shown in Fig. 2) pivotally mounted at 49 on the end frame members of the carriage, so that the barrel of the spool is driven through the wound sliver by the friction drive drum 24.

The effect of this mechanism is to straighten out the fibers in the gilling apparatus and to wind these straightened fibers under tension in the form of a cross-wound sliver upon the dye spool.

In the said Abbott Patent No. 1,797,393, the pinion 46 was a plain pinion fast on the shaft 45, so that the effect of the gearing such as above-described was to reciprocate the carriage 30 at a constant rate of speed directly proportional to the surface speed of the package drive drum 24.

While in the machine of said Patent No. 1,797,393 the traversing motion of the carriage and winding spool was at a constant speed directly proportional to the surface speed of the package-driving drum 24 and that of the winding package, the machine of the present invention imparts to the carriage 30 and winding spool a traversing motion which is substantially proportional to the angular velocity of the winding package. By this means the machine is enabled to lay each turn of the cross-wound sliver either close beside or at any desired substantially constant distance from the next underlying similar turn, so that every portion of the winding on the spool lies in a regular pattern, avoiding the occurrence of any ribbon winding

and any irregularly occurring lumps in the wound mass. In practice, it is preferred to adjust the machine so as to lay each turn of sliver approximately four inches from the next underlying preceding turn.

Instead of driving the shaft 45 (which in turn operates the traverse mechanism) by a simple pinion which merely transmits the movement of gear 47 as in the said patent, the pinion 46 in the machine of this application is preferably constructed in the form of a friction clutch having regulating mechanism for adjusting its effective transmission of driving force in accordance with the momentary angular velocity of the winding package.

As in Patent No. 1,797,393, the spool-holding arms 50 are each provided with a boss 58 (Figs. 2 and 4) for the reception of a shaft 59 adapted to slide axially and also to rotate in a bore in the boss 58. A flanged head member 60 frictionally engages the end of the tubular spool 66 and turns freely on ball bearings 61 on the shaft 59. An actuating arm or handle 64 on the shaft 59 projects out through a cam slot 65 in the boss 58. The handle 64 in the position of Fig. 4 holds the shaft 59 against axial movement, but when turned in the cam slot 65 shifts the shaft 59 axially and removes the head member 60 from engagement with the spool.

In the machine of the present application, as distinguished from that shown in Patent No. 1,797,393, the shaft 59 at one side of the machine is hollow and receives an axially extending inner shaft 70 (Fig. 4) which is keyed at 71 to the head member 60. A pulley 72 is fastened at the other end of the inner shaft 70, so as to turn with the head member 60 and spool 66. The pulley 72 drives a belt 73 which turns a pulley 74 which is splined to a rotatable non-reciprocating shaft 75. A bracket 76 traveling with the carriage 30 shifts the pulley 74 along the shaft 75 as the carriage reciprocates. The shaft 75 is thus driven at a speed which is proportional to the momentary angular velocity of the winding package, its speed progressively diminishing as the angular velocity of the winding package diminishes during the winding.

Referring to Fig. 3, the right end of shaft 45 is of reduced diameter and carries fast thereon a sleeve 80. The left end of sleeve 80 is in the form of a plate 81 carrying a friction disk 82 constituting the driven element of a friction clutch. The driving element of this friction clutch is in the form of a pinion 46a loosely surrounding the sleeve 80 and recessed at its left face so as to receive and contact the friction disk 82.

A sprocket 85 is screw-threaded on the right end of the sleeve 80 and is driven by a chain 86 from a sprocket 87 on the shaft 75. The direction of the drive of the sprocket 85 and the screw-threads by which it is attached to the sleeve 80 are such that rotation of the sprocket 85 tends to screw it to the left along the sleeve 80 in Fig. 3.

Between the sprocket 85 and the pinion 46a, there is preferably interposed a ball bearing 90 so that motion of the sprocket 85 to the left acts through the ball bearing 90 to bring the pinion 46a into driving relation to the driven portion 82 of the friction clutch.

The pinion 85, driven at a speed proportional to the angular speed of the winding package, thus serves to regulate the speed at which the shaft 45 is driven through the pinion 46a. The speed of sprocket 85 continually decreases during the winding so that its tendency is continually to lag behind the pinion 46a which is driven in the same direction at a constant speed faster than any speed attained by the sprocket 85. This lagging of the sprocket 85 causes it to screw itself to the right along the sleeve 80, relieving the pressure of the bearing 90 on the pinion 46a, thus allowing the friction clutch to slip. This movement of the pinion 85 to the right is checked when the angular speed of the sleeve 80 is reduced to that of the sprocket 85, and in this manner the speed of shaft 45 is maintained substantially the same as that of sprocket 85 throughout the winding. Thus the rate of reciprocation of the carriage 30 is continuously maintained proportional to the angular velocity of the winding package.

It will be observed that in the above-described preferred form of variable-speed drive for the traverse device, the frictionally rotated winding spool 66 is not relied upon to supply the energy for driving the traverse device, but is merely employed to control the speed at which the traverse device is driven. Very little energy is required to drive the pinion 85 and its driving parts from the winding spool, so that the use of this device does not add substantially to the load of driving the winding spool.

In addition to producing a more evenly wound dye package, with the turns of sliver distributed according to a definite pattern, the invention has the further advantage of winding with a sharper pitch at the barrel of the spool than at the outside of a full package. This winds the yarn more firmly on the barrel of the spool, without the use of such expedients as springs or weights to load the spool when winding at and near the barrel. Since as the winding progresses the spool grows in weight and hence by its own weight tends to grip its driving drum more tightly, it has ordinarily been necessary in order to secure an even tension in the wound material to provide some special weighting attachment that will apply a greater weight to the package at the beginning of winding than toward the end of winding. Such specially acting weighting attachment is rendered unnecessary by the present invention, wherein the progressive decrease in pitch of the traverse tends to compensate for the progressive increase in weight of the spool, so as to produce approximate equality of tension in the wound material.

I claim:

1. Method of winding a dye package of twistless sliver on a perforated barrel, comprising supporting the barrel for winding, winding sliver thereon while rotating the barrel frictionally through the sliver traversing the sliver into cross-wound formation on the winding barrel, and progressively decreasing the pitch of traverse during the winding whereby the relatively sharper pitch of traverse at the beginning of winding tends to compensate for the relatively larger weight of the wound barrel near the end of winding in equalizing the tension of the wound sliver.

2. Method of winding a dye package of twistless sliver on a perforated barrel, comprising supporting the barrel for winding, winding sliver thereon while rotating the barrel frictionally through the sliver traversing the sliver into cross-wound formation on the winding barrel, and progressively decreasing the pitch of traverse at such rate as to cause the successive turns of wound sliver to be spaced approximately the same distance from one

another throughout the thickness of the wound barrel, thereby producing approximately uniform density of the material to be dyed.

3. Apparatus for preparing textile fibers for dyeing on spools, comprising a friction drive drum, a spool, means for guiding a sliver onto the spool, means for mounting said spool for driving by frictional contact of the drum and the sliver on the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, a variable speed drive mechanism connected at its output end to said traverse mechanism, a source of power connected to the input end of said variable speed drive mechanism, a rotatable member connected to said spool so as to turn in synchronism therewith, and means controlled by said rotatable member for adjusting the variable speed drive mechanism to drive the traverse device at a speed proportional to the angular velocity of the winding spool.

4. Apparatus for preparing textile fibers for dyeing on spools, comprising a friction drive drum, a spool, means for guiding a sliver onto the spool, means for mounting said spool for driving by frictional contact of the drum and the sliver on the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, a variable speed drive mechanism connected at its output end to said traverse mechanism, a source of power connected to the input end of said variable speed drive mechanism, said variable speed driving connection including a rotatable governing member acting to adjust the output speed of the variable speed connection proportionally to the speed of said rotatable governing member, and a connection between said spool and said rotatable governing member for driving said rotatable governing member at an angular velocity proportional to that of the spool.

5. Apparatus for preparing textile fiber for dyeing on spools comprising a friction drive drum, means for mounting a spool for driving by said drum, means for guiding a sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, a friction clutch connected to drive the traverse mechanism, a rotatable element associated with the clutch, connections for driving said rotatable element from the winding spool, and means controlled by said rotatable element for adjusting the friction clutch to drive the traverse device at a speed proportional to the angular velocity of the winding spool.

6. Apparatus for preparing textile fibers for dyeing on spools comprising a friction drive drum, means for mounting a spool for driving by said drum, means for guiding a sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, a friction clutch connected to drive the traverse mechanism, means for pressing the driving and driven elements of the clutch together, said last-named means including a rotatable element having a threaded connection to the driven element of the clutch, and a connection from the winding spool to said rotatable element, whereby the said rotatable element adjusts the friction clutch to drive the traverse device at a speed proportional to the angular velocity of the winding spool.

7. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a friction drive drum for rotating a flanged perforated dye spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, means for driving the drive drum in synchronism with the gilling mechanism so as to wind the gilled sliver under tension, a friction clutch connected to drive the traverse mechanism, a rotatable element associated with the clutch, connections for driving said rotatable element from the winding spool, and means controlled by said rotatable element for adjusting the friction clutch to drive the traverse device at a speed proportional to the angular velocity of the winding spool.

8. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a friction drive drum for rotating a flanged perforated dye spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, means for driving the drive drum in synchronism with the gilling mechanism so as to wind the gilled sliver under tension, a friction clutch connected to drive the traverse mechanism, means for pressing the driving and driven elements of the clutch together, said last-named means including a rotatable element having a threaded connection to the driven element of the clutch, and a connection from the winding spool to said rotatable element, whereby the said rotatable element adjusts the friction clutch to drive the traverse device at a speed proportional to the angular velocity of the winding spool.

9. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a friction drive drum for frictionally rotating a flanged perforated dye spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, connections for driving the drive drum from the gilling mechanism so as to wind the gilled sliver under tension, means for driving the traverse mechanism including a variable speed drive driven by said connections, the said variable speed drive thus deriving its driving power from a source other than through the frictionally rotated spool, and means responsive to the angular velocity of the spool for regulating said variable speed drive mechanism to reduce the speed of traverse relatively to the speed of winding progressively as the sliver is wound on the spool.

10. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a friction drive drum for rotating a flanged perforated dye spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, connections for driving the drive drum from the gilling mechanism so as to wind the gilled sliver under tension, means for driving the traverse mechanism including a friction clutch driven by said connections, a rotatable element associated with the clutch, means for driving said rotatable element from the winding spool, and means controlled by said rotatable element for adjusting the friction clutch to drive the

traverse device at a speed proportional to the angular velocity of the winding spool.

11. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a friction drive drum for frictionally rotating a flanged perforated dye spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism including a reciprocating carriage adapted to move the friction drive roll and spool to and fro causing the sliver to be distributed in cross-wound formation on the spool, connections for driving the drive drum from the gilling mechanism so as to wind the gilled sliver under tension, means for driving the traverse mechanism including a variable speed drive mechanism driven by said connections, the said variable speed drive thus deriving its driving power from a source other than through the frictionally rotated spool, and means responsive to the angular velocity of the spool for regulating said variable speed drive mechanism to reduce the speed of traverse relatively to the speed of winding progressively as the sliver is wound on the spool.

12. Apparatus for preparing textile fiber for dyeing spools comprising a friction drive drum, a spool means for mounting said spool for frictional driving by said drum, means for guiding a sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, means including a variable-speed transmission, for driving the traverse mechanism, said variable speed transmission including a rotatable governing member acting to adjust the output speed of the variable speed transmission proportionately to the speed of said rotatable governing member, and a connection between said spool and said rotatable governing member for driving said rotatable governing member at an angular velocity proportional to that of the spool.

13. Apparatus for preparing textile fiber for dyeing on spools comprising fiber-gilling mechanism, a flanged perforated dye spool, a friction drive drum for frictionally rotating said spool to receive a sliver from the gilling mechanism and means for mounting the spool for driving by said drum, means for guiding the sliver onto the spool, traverse mechanism for causing the sliver to be distributed in cross-wound formation on the spool, means for driving the drive drum in synchronism with the gilling mechanism so as to wind the gilled sliver under tension, means, including a variable-speed transmission, for driving the traverse mechanism, said variable speed transmission including a rotatable governing member acting to adjust the output speed of the variable speed transmission proportionally to the speed of said rotatable governing member, and a connection between said spool and said rotatable governing member for driving said rotatable governing member at an angular velocity proportional to that of the spool.

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