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R. PLACE
SLIVER FEED MECHANISM

2,674,013

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3 Sheets-Sheet 1

Fig. 1.

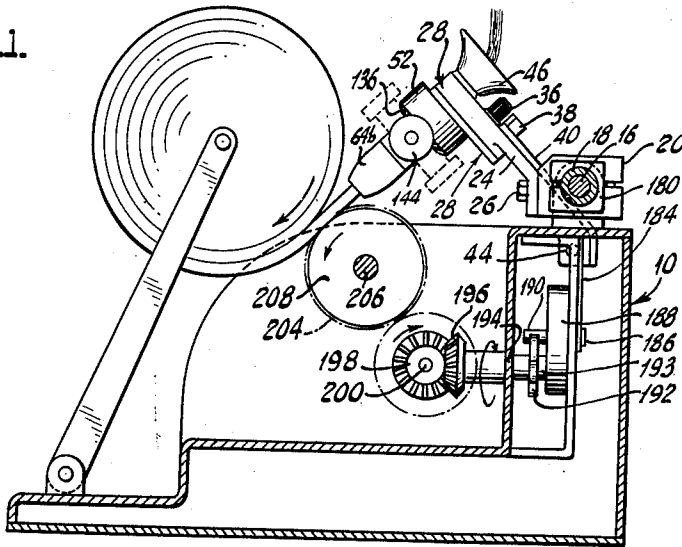
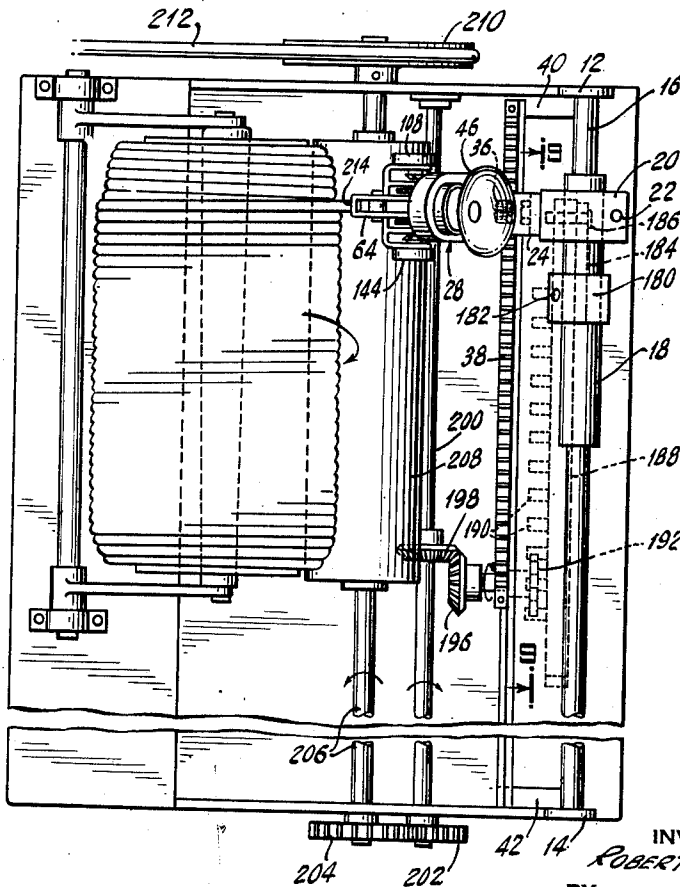


Fig. 2.



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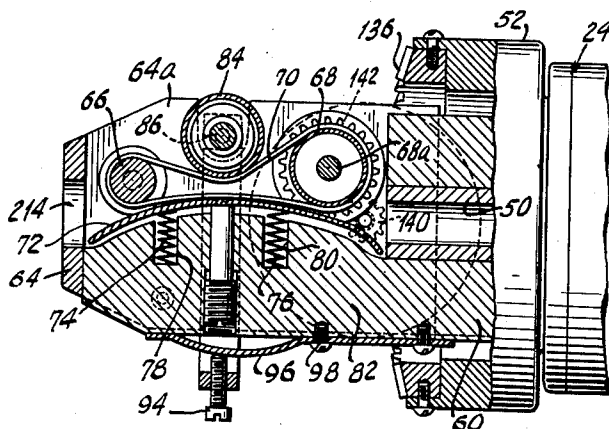
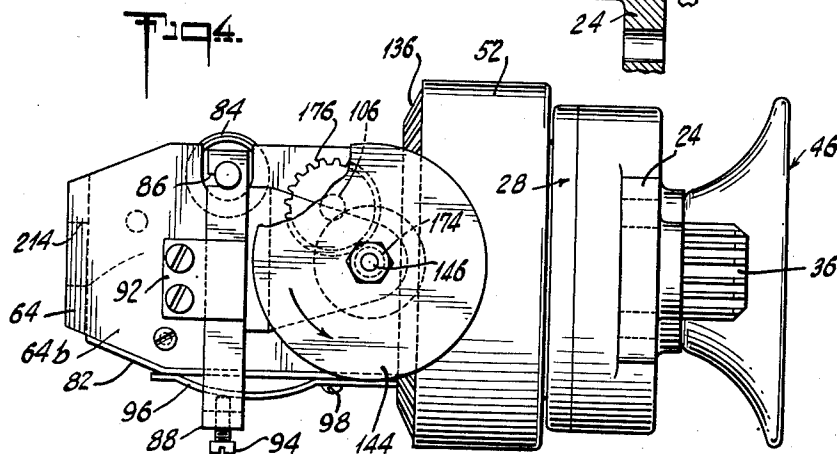
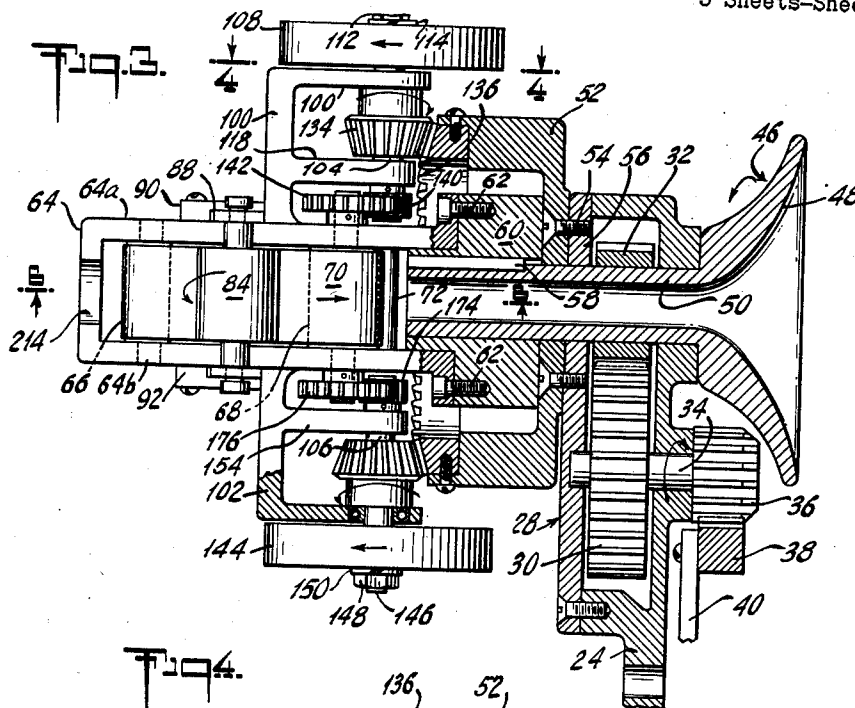
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3 Sheets-Sheet 2



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SLIVER FEED MECHANISM

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9 Claims. (Cl. 19—158)

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This invention relates to an apparatus for delivering a delicate sliver to a baller or other textile machine under controlled tension and surface speed while imparting a false twist greater than heretofore possible. This operation is carried out without drafting the material.

The methods and apparatus which are in use at the present time in textile industries for creating tension and imparting false twist, for example in a balling operation, are unsatisfactory because the tension is developed by pulling the sliver through a restricted orifice of many possible shapes which has a rotary twisting motion, thus causing uncontrolled longitudinal tension which results in thick and thin sliver which is non-uniform in cross-section. This is particularly true of light slivers because of their inherent lack of tensile strength. At the present time in the industry these light slivers are coiled loosely into cylindrical containers because of the lack of uniformity produced in current balling methods.

It is the desire of the textile industry to ball these slivers rather than coil them loosely in containers because of the added cost in handling and shipping plus the initial cost of the containers. In balling these light slivers, it is necessary to put into the sliver a high degree of false twist in order to produce a well packed, compact ball. This false twist produced in the sliver in the open space between the delivery end of the sliver feed mechanism and the nip point of the balling or other textile operation, permits a ball to be made under greater tension due to the inherent lack of drafting in this method.

An object of this invention is to deliver the sliver at a constant rate to the nip point of the baller or other textile machine and at the same time insert false twist into the sliver in the open space between the delivery end of the sliver feed mechanism and the nip point of the baller or other textile machine while rotating the sliver feed mechanism assembly first in one direction and then the other. Since the sliver is gripped while being advanced through the feed mechanism, it is possible to impart many more turns of twist or false twist than has been previously possible in the art. This is due to the fact that the shaped hole in the nozzle of a conventional false twist motion is limited to an end result of one or two turns of twist or false twist due to slippage of the sliver in the orifice opening, since the opening must allow for free passage of the sliver being pulled through it. If the opening

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is restricted to reduce this slippage or to attempt to create sufficient tension, then uncontrolled drafting takes place between the delivery end of the nozzle and the nip of the baller.

Another object of this invention is to provide a mechanism which will impart, from the conventional oscillatory reciprocating motion used in producing false twist, a simultaneous continuous feed motion, thus delivering a sliver at a constant speed to a baller or other textile machine.

Another object of this invention is to overcome the deficiencies of the prior art and provide method and apparatus of the above-mentioned kind, which are simple, practical and effective.

Another object of the invention is to provide such apparatus through which the sliver may be continuously advanced under control at high speed.

Another object of the invention is to provide means for delivering to a baller a sliver twisted with a sufficiently high amount of twist or false twist to produce a well packed, compact ball.

A further object of the invention is to provide a device of the above-mentioned kind movable back and forth along the reciprocatory path, through which a sliver may be advanced continuously, even during the moments at the ends of the reciprocatory path of the device when the device is stationary while its direction of travel is reversing.

An additional object of the invention is to provide a device of the above-mentioned kind which may remain stationary in space while oscillating around its longitudinal axis, at the same time the ball receiving sliver from this device, together with its holding bracket and drive roll and rack gear linkage, are moved back and forth along a reciprocatory path, through which the sliver would be advanced continuously by the device.

Other objects of the invention will be in part obvious or in part pointed out hereinafter.

The invention will best be understood if the following description is read in connection with the drawings, in which,

Figure 1 is a side elevation showing one embodiment of the invention mounted for delivering a sliver to a baller;

Figure 2 is a top plan view of the apparatus shown in Figure 1;

Figure 3 is a side elevation mostly in cross-section of apparatus embodying my invention;

Figure 4 is a side elevation taken on line 4—4 of Figure 3;

Figure 5 is a view similar to Figure 4 but with

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part of the casing broken away to show the internal structure in side elevation and mostly in cross-section;

Figure 6 is a section taken on the line 6—6 of Figure 3;

Figure 7 is a detail view taken on the line 7—7 of Figure 6 and showing one of the flywheels detached from its clutch mechanism;

Figure 8 is a view taken on the line 8—8 of Figure 6 showing the opposite flywheel in engagement with its clutch mechanism; and

Figure 9 is a fragmentary view taken on the line 9—9 of Figure 2.

Figure 10 is an end view of Figure 9.

The apparatus is described herein in connection with a baller, the apparatus delivering a sliver continuously to the baller for winding thereon, but the baller forms no part of the present invention. As illustrated herein the baller includes a support casing 10 from the opposite ends of which project upwardly lugs 12 and 14 which are apertured to receive the rod 16, upon which is slidably mounted the tubular member 18 which is reciprocated as will hereinafter be described.

Mounted on tubular member 18 is split block 20 secured by the set screw 22 and projecting from block 20 is arm 24 fastened at its lower end to block 20 by bolt 26. The upper end of arm 24 terminates in a gear box 28. Within the gear box 28 gears 30 and 32 are provided. Gear 30 is mounted on shaft 34 which extends through the gear box and has fixed on its outer end the gear 36 which is engaged with and travels on the horizontally disposed rack 38 which is supported by strap brackets 40 and 42 which project upwardly from the end walls of casing 10 respectively and are secured as by means of bolts 44.

Gear 32 which meshes with gear 30 is fixed on the exterior of a tubular member 46 having at its forward end the outwardly flared funnel-like portion or "trumpet" 48, from which extends the hollow shaft 50 on which said gear 32 is mounted. Shaft 50 extends entirely through gear box 28 and through the cup-shaped member 52 which is secured as by screws 54 to cover plate 56 of the gear box 28.

Keyed to shaft 50 by key 58, within said cup-shaped member 52 is a ring member 60. Secured to ring 60 as by screws 62 is the U-shaped bracket 64 between the arms 64^a and 64^b of which rollers 66 and 68 are mounted. Extending around rollers 66 and 68 is the endless member or belt 70 which through one reach passes over the control plate 72 which is urged against said reach of the belt by spring members 74 and 76 shown mounted in bores 78 and 80 provided in a lateral extension 82 of the ring 60. Pressing inwardly on the other reach of the belt is the roller 84 which is detachably mounted in the key slots 86 provided adjacent the free ends of a yoke member 88 which is slidably mounted for movement in a plane substantially at right angles to the said reach of the belt by means of L-shaped brackets 90 and 92 secured on the outside of bracket arms 64^a and 64^b respectively. The position of said bracket is adjustable by means of the screw 94 extending through the mid-portion of the yoke and pressing against the arched flat spring member 96 which is secured on extension 82 by means of screw 98. In the mid-portion of U-shaped bracket 64^a a bore 214 is provided through which the twisted sliver is led to the baller, as will be described.

Projecting outwardly in opposite directions

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from the bracket arms 64^a and 64^b are the L-shaped arms 100 and 102, and extending through the outer right-angled portions of said arms 100 and 102 respectively are the shafts 104 and 106 respectively. The outer end of the shaft 104 extends through flywheel 108 and has the reduced end 110 on which the nut 112 and washer 114 are provided. The inner end of shaft 104 extends through the bearing 116 in support 118 and at its extremity is keyed by key 120 to small gear 140. The reduced end portion 110 of shaft 104 beyond shoulder 124 is keyed by key 122 to the flywheel 108.

The flywheel 108 is provided on its internal face with the annular recess 126 (Figure 7) and mounted within said recess is a clutch member 128 having projecting therefrom the sleeve 130 which rotates on shaft 104 and on its inner end is keyed by key 132 to the bevel gear 134 which is in engagement with, and travels on, a stationary ring gear 136 supported on the periphery of the said cup-shaped member 52.

As shown in Figure 7 the clutch member 128 is provided with three inclined surfaces "s" terminating in the shoulders t and on each of said surfaces a roller r is provided, whereby, when the clutch is turned in one direction the rollers lock against the surrounding wall of the flywheel thus causing the flywheel to turn in the same direction as the clutch, but when the clutch is rotated in the opposite direction the rollers r travel down against the shoulders t and out of friction engagement with the flywheel, and the clutch member "free-wheels" without causing rotation of the flywheel. The clutch mechanism is shown retained within the recess in the flywheel by the cover plate 138.

Gear 140 on the inner extremity of shaft 104 is mounted in meshing relation with a gear 142 which is mounted on the shaft 68^a of roller 68 which actuates the endless belt 70.

The outer end of shaft 106 extends through flywheel 144 and has the reduced end 146 on which the nut 148 and washer 150 are provided. The inner end of shaft 106 extends through the bearing 152 in support 154 and at its extremity is keyed by key 156 to the small gear 174. The reduced end portion 146 of shaft 106 is keyed by key 158 to the flywheel 144.

The flywheel 144 is provided on its internal face with the annular recess 160, and mounted within said recess is a clutch member 162 having projecting therefrom the sleeve 164 which rotates on shaft 106 and on its inner end is keyed by key 166 to the bevel gear 168 which is in engagement with, and travels on the said stationary ring gear 136, which, as stated above, is supported on the periphery of said cup-shaped member 52. The clutch member 162 is similar to the clutch member 128 described above except the direction of gripping is opposite.

Gear 174 on the inner extremity of shaft 106 is mounted in mesh with gear 176 which is mounted on the shaft 68^b, which is aligned with shaft 68^a but extends from the other end of roller 68 which actuates the endless belt 70.

It will be readily understood that when gear 134 with which clutch 128 rotates, is turning in one direction, the gear 158, with which clutch 162 turns, will be rotated in the opposite direction due to the fact that said gears 134 and 168 are in mesh with said ring gear 136 on opposite portions of said ring gear and 180 degrees removed from one another around said ring gear. Accordingly, when one flywheel is being posi-

tively driven the other flywheel will not be engaged by its clutch and will simply be "free-wheeling," but both flywheels being linked together will be rotating in the same direction which is the direction of travel of a sliver through the funnel or "trumpet" 48, and hollow shaft 50. Since ring member 60, the U-shaped bracket 64, the L-shaped arms 100 and 102 and the shafts 104 and 106 of the gears and flywheels supported thereon respectively are rotating with said hollow shaft 50, due to the key 53 interconnecting shaft 50 and ring member 60, and since the direction of rotation of said hollow shaft 50 is being repeatedly reversed at the opposite ends of the travel of gear 36 on stationary rack 38, there will be a moment at the end of the travel of said members in each direction when the direction of travel is changing and during which the said shafts 104 and 106 and the gears 124 and 128 will not be positively driven in either direction, but during this moment the flywheels 132 and 144 will be "free-wheeling" and due to their stored energy will continue to rotate shafts 104 and 106, thereby actuating, through gears 142 and 176 and the shafts or trunnions 68^a respectively, the roller 68 by which endless belt 70 is actuated, whereby said belt will continue to turn and thus continue to advance the sliver without interruption.

The apparatus above described and in which my invention is embodied is mounted as stated above by arm 24 to the block 20 which is fastened on to tubular member 18 (Figure 2) which is reciprocated on shaft 16 as will now be described. Also mounted on tubular member 18 is the split block 180, tightened on the shaft 16 by the set screw 182, from which depends the arm 184 pivoted at its free end by pivot 186 to the walking beam 188. In one face of the walking beam is provided an oval track 189 surrounding a series of outwardly projecting pins 190 evenly spaced apart and adapted to be engaged by the teeth of a cog-wheel 192 which has on its hub the roller 193 adapted to travel in said track 189, and which is driven by shaft 194 from bevel gear 196, Figure 2, which in turn is driven by bevel gear 198 fixed to the shaft 200 on the end of which is also mounted gear 202 which is driven from gear 204 fixed on shaft 206 which is actuated through driving roller 208 from pulley 210 driven by belt 212 from any suitable source of power.

Surrounding the walking beam 188 a frame structure is shown, indicated generally by the numeral 215, the purpose of which is to prevent loose motion in pivot 186.

From the above description it will be understood that the apparatus embodying my invention will, when applied to the baller mechanism shown in Figures 1 and 2, be reciprocated back and forth through a space the length of which is controlled by the length of the walking beam 188 and the length of the stationary rack 38. While being reciprocated the sliver, shaft 50 together with its funnel or trumpet shaped mouth, the ring 62, the U-shaped bracket 64 and the shafts 104 and 106 carrying the flywheels 132 and 144, will be rotated first in one direction and then in the opposite direction but notwithstanding this change in the direction of rotation of these parts the endless belt 70 will be driven forward continuously in the same direction, being actuated by roller 68, which is driven during one reciprocation of the apparatus by the gear and clutch assembly which includes gear 134 and clutch 123, and being driven in the same direction during movement of the said apparatus in the opposite

direction by the gear and clutch assembly which includes gear 168 and clutch 162.

It will be understood that the forward drive of belt 70 is not interrupted even during the moments when gear 36 is not being positively driven, which occurs at the moment when the direction of travel of the apparatus is reversed, due to the fact that one or the other of said clutch assemblies will be "free-wheeling" and due to the inertia of the combined flywheels will continue to drive roller 68.

While the sliver is being continuously advanced it is held firmly between the belt 70 and the control plate 72 so, as the whole assembly is rotated first in one direction and then in the other, a tight twist is imparted into the portion of the sliver between the inner end of the control plate 72 and the nip of the drive roller 208 of the baller. This tight twist is very desirable in the process of balling light slivers as a very compact ball may be made without the danger of drafting of the sliver. Drafting of fine sliver in this stage has heretofore made it impossible to ball the finer grade of sliver with any of the present devices used in the art. It may be pointed out that uncontrolled drafting of textile sliver causes thick and thin spots in the sliver which must be corrected before good quality yarns can be made.

Not only does this device insure against drafting of a sliver by controlling its continuous forward motion and twist, but it also effects a considerable saving in handling costs of textiles because it makes, for example when applied to a balling operation, a very compact ball which when compared to the loose coiled package of the present method, takes less than half the space for shipping and eliminates one or more operations in the preparation for shipping. Also this device with its continuous feeding principle lends itself to the doffing on the run system which means that completed balls can be removed and new balls started without the necessity of shutting down the machine which is producing the sliver.

Although the belt engages the sliver against the control plate 72 and prevents relative rotative movement between the sliver and said rotatable assembly it does not exert any substantial longitudinal tension upon the sliver since it is moving in the same direction as the sliver and is imparting its own rate of forward motion to the sliver.

The device described herein may be reciprocated at high speed through a wide reciprocatory path and the sliver will be driven forward continuously through the apparatus at a correspondingly high speed while being given false twist and without being subjected to any substantial drafting tension whereby its cross-sectional uniformity will not be impaired by the twisting operation.

It will be seen that there has been provided by this invention a method and apparatus in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As various possible embodiments might be made of the mechanical features of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What I claim is:

1. A device which imparts to a textile sliver a controlled rate of flow, during the time it is alternately twisted in one direction and the other around an axis parallel to the flow, comprising an endless belt in contact with the sliver and a control plate opposed to said belt, the belt being driven by a combination of two clutches operative alternately as the rotation of the device changes, to engage and disengage flywheel means having sufficient inertia to maintain the forward speed of the sliver during the null in the rotation change.

2. A device for imparting false twist to a sliver which comprises, a housing, means for rotating said housing alternately in opposite directions, an endless member within said housing and means for driving said endless member in a plane parallel to the axis of rotation of said housing, said endless member being adapted to engage said sliver while moving with said sliver and to impart to the sliver the rotative movement of the housing, thereby imparting false twist to said sliver in an amount corresponding to the rotations of said housing, and a plurality of driving connections for said endless member actuated by the rotation of said housing, said driving connections each comprising a fly wheel and clutch means therefor, the clutch means of one fly wheel being operable when the housing is rotating in one direction and the clutch means for the other fly wheel being operable to engage its fly wheel when the said housing is rotating in the opposite direction.

3. A device for imparting false twist to a sliver which comprises, a housing, means for rotating said housing alternately in opposite directions, an endless member within said housing and means for driving said endless member in a plane parallel to the axis of rotation of said housing, said endless member being adapted to engage said sliver while moving with said sliver and to impart to the sliver the rotative movement of the housing, thereby imparting false twist to said sliver in an amount corresponding to the rotations of said housing, and a plurality of driving connections for said endless member actuated by the rotation of said housing, said driving connections comprising a fly wheel and clutch means therefor, the clutch means of one fly wheel being operable when the housing is rotating in one direction and the clutch means for the other fly wheel being operable to engage its fly wheel when the said housing is rotating in the opposite direction, the said fly wheels each being of sufficient mass so that the inertia of the fly wheel when unclutched at the moment when the direction of rotation of said housing is reversed is sufficient to cause said fly wheel to continue to positively actuate the driving connection of which it is a part until said belt is again positively driven by one or the other of said driving connections, whereby said endless member is positively driven forwardly even during the repeated periods when the direction of rotation of the housing is reversing.

4. A device for imparting false twist to a sliver which comprises, a housing, means for rotating said housing alternately in opposite directions, endless means within said housing and means for driving said endless means in a plane parallel to the axis of rotation of said housing, said endless means being adapted to engage said sliver while moving with said sliver and to impart to the sliver the rotative movement of the hous-

ing, thereby imparting false twist to said sliver in an amount corresponding to the rotations of said housing, and driving means for said endless means comprising rotatable means frictionally engaging said endless means, and a plurality of separate drive means connected to said rotatable means, one of said drive means being operable to drive said endless means forwardly when the housing is rotated in one direction and the other of said drive means being operable to drive said endless means forwardly when the housing is rotated in the opposite direction, whereby said endless means is continuously advanced in the same direction.

5. A device for imparting false twist to a textile sliver which comprises, a hollow housing, means for rotating said housing alternately in opposite directions, means within the housing for advancing a sliver therethrough while gripping it to prevent relative movement between it and the housing, a rack and a plurality of alternately operating drive means for said sliver advancing means, each of said driving means comprising, a pinion meshing with said rack, a clutch member, and means interconnecting said pinion and clutch member, a second clutch member driven by said first clutch member in one direction of rotation only, and means interconnecting said second clutch member and said sliver advancing means, said clutch means being alternately operable in response to alternate rotation of said housing in opposite directions.

6. A device which imparts to a textile sliver a controlled rate of flow while it is alternately twisted in one direction and then in the other direction around an axis parallel to the flow, comprising, a housing, means for rotating said housing alternately in opposite directions, endless means in contact with the sliver and drive means for said endless means comprising, a stationary circular rack, two pinions positioned in engagement with said rack, two clutch means, two fly wheels, means interconnecting said pinions and said clutch means respectively, and means interconnecting said clutch means respectively and said endless means, said pinions being angularly disposed around said rack for giving opposite rotation to the means interconnecting said pinions and said clutch means respectively whereby said clutch means are alternately engaged and disengaged in accordance with the rotation of said housing, and said fly wheels are alternately driven in the same direction, said fly wheels having sufficient inertia to maintain the forward speed of the sliver during the null in the rotation change when both of said clutch members are disengaged.

7. A device adapted to deliver a textile sliver to a baller with a controlled rate of speed and to twist it without drafting, comprising, means for traversing back and forth one member of the combination of device and baller relative to the other, means for converting the traversing motion into rotary motion, and means for utilizing the rotary motion for propelling the sliver continuously forward at a constant speed without substantial tension axially of the sliver while imparting twist to the sliver, comprising, a plurality of fly wheels, an endless belt for propelling the sliver, a roller for driving the endless belt, and drive connections between said fly wheels and said roller respectively including clutch means individual to said fly wheels, and gear means actuated by said traversing means to drive one or the other of said fly wheels accord-

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ing to the direction of said traversing movement, the fly wheel and clutch combinations being disposed so that said fly wheels are alternately clutched depending upon the direction of said traversing movement.

8. A device for imparting false twist to a sliver which comprises, an endless member, a surface over which a sliver may slide freely, means for leading a sliver between said endless member and said surface, means for revolving said member and said surface around an axis parallel to the longitudinal axis of the sliver, first in one direction and then in the other direction, means for simultaneously rotating said member continuously in the same direction and at the rate of speed desired for the travel of the sliver, thereby advancing said sliver under control so that twisting tension may be applied thereon between said member and means to which the sliver is delivered without causing drafting of the sliver, said surface being movable toward or away from the line of travel of the sliver, and means yield-

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ingly urging said surface toward the line of travel of said sliver.

9. Apparatus for continuously advancing a sliver which comprises, a plurality of surfaces, means for leading a sliver between said surfaces, means for moving at least one of said surfaces along an endless path to advance said sliver, means for revolving said surfaces and said sliver around an axis parallel to the longitudinal axis of the sliver, first in one direction and then in the other direction, including means for building up an inertia force during successive revolving movements sufficient to maintain the advance of the sliver during the null in the change of the revolving from one direction to the other.

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