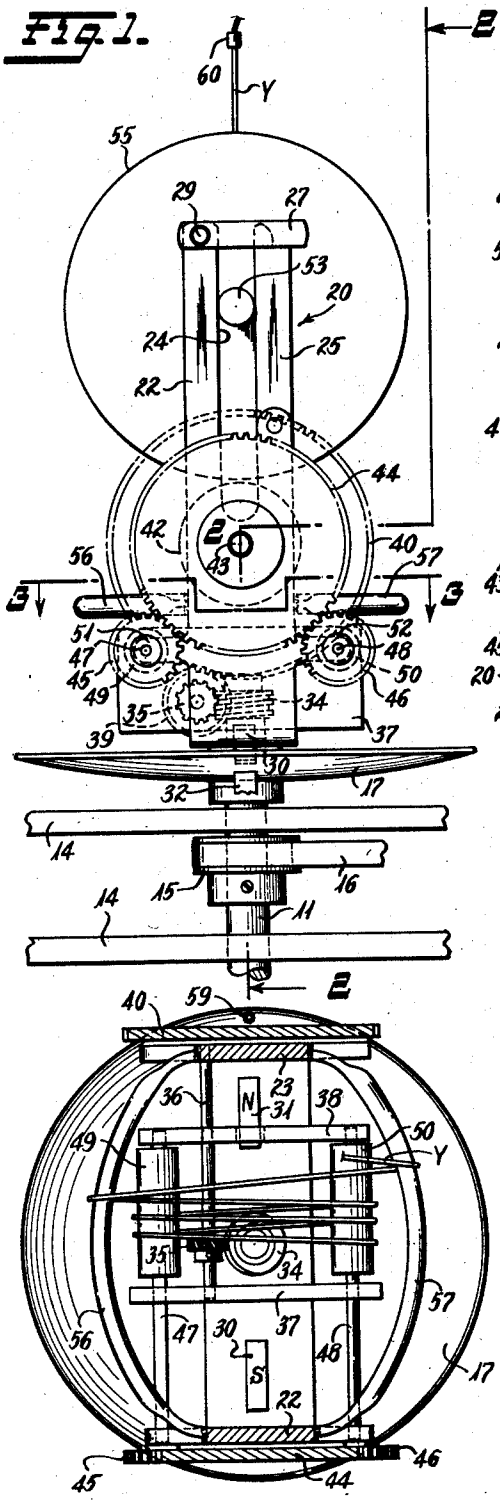
Dec. 1, 1959 H. M. BROWN 2,914,904

CORD TWISTER AND WINDER

Filed Dec. 10, 1956 2 Sheets-Sheet 1

Fig. 1.



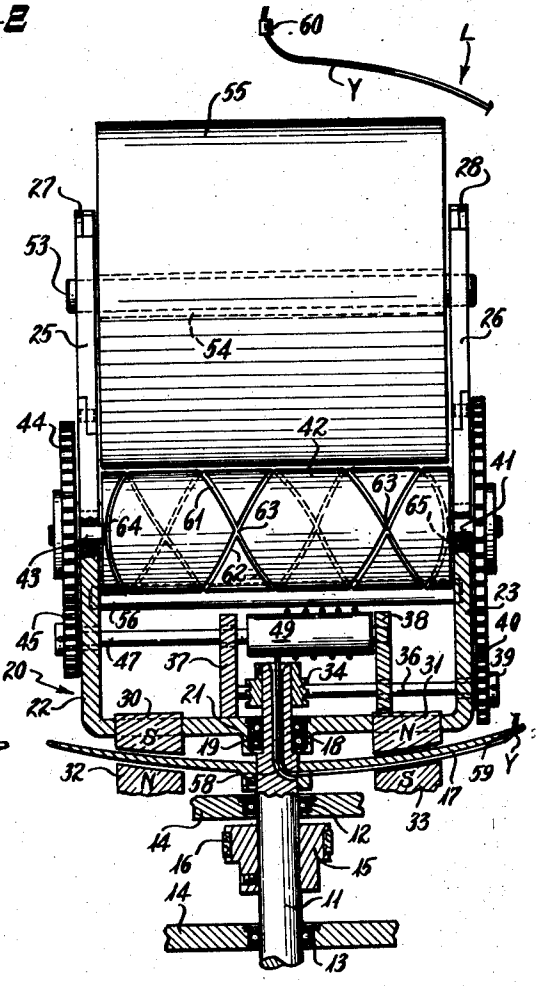


Fig. 2.

Fig. 3.

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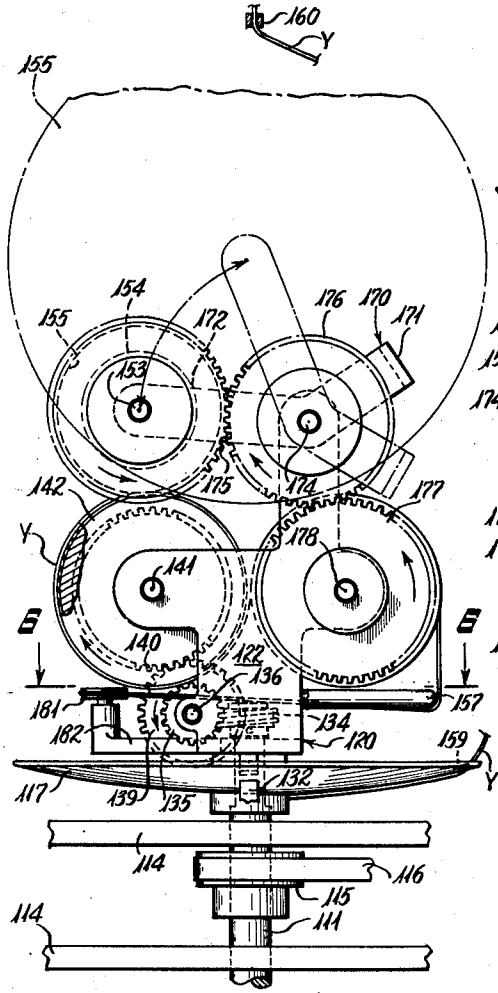

Fig. 4.

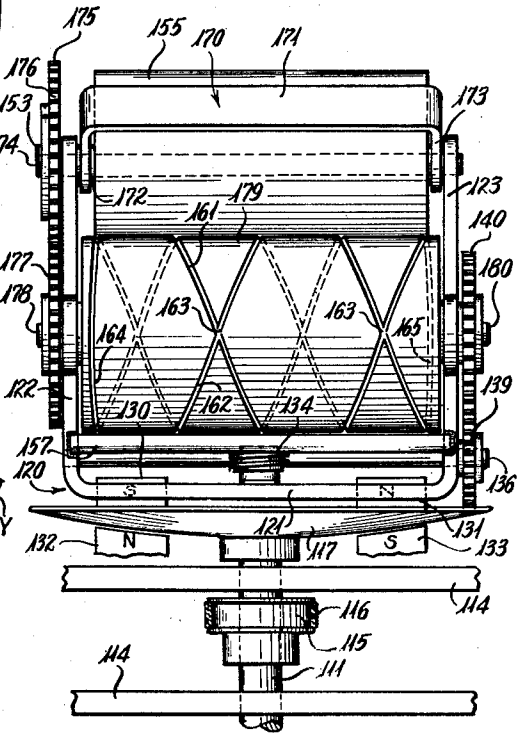

Fig. 5.

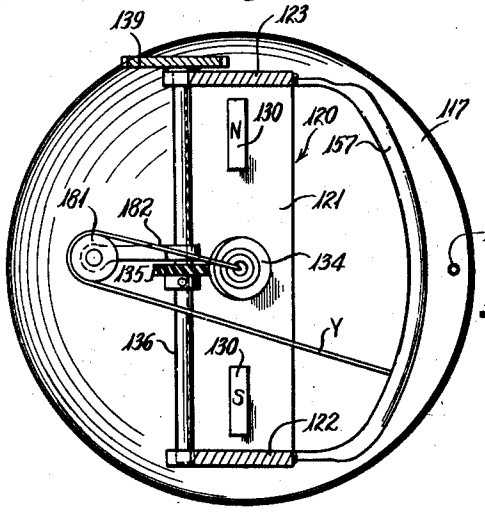

Fig. 6.

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2,914,904

CORD TWISTER AND WINDER

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Application December 10, 1956, Serial No. 627,364

5 Claims. (Cl. 57—58.65)

This invention relates to devices for twisting and winding yarn onto a take-up spool to form a package, such devices being used in making cord.

Most prior devices of this type use a reciprocating or oscillating yarn guide for traversing the yarn back and forth to build up a yarn mass on a spool or core to form a yarn package.

One object of the invention is to simplify such devices by eliminating the reciprocating or oscillating yarn guide used in former devices.

Another object is to provide a yarn-traversing means comprising a roller having right hand and left hand grooves of the reversing type, crossing each other, which grooves directly engage the yarn to traverse the yarn along a core in building a package.

A more specific object is to provide a friction drum type take-up device wherein the friction drum is provided with reversing screw type grooves directly engaging the yarn to traverse the yarn longitudinally of a core which is driven by the friction drum in building a package thereon.

Still another object is to provide a novel yarn traversing arrangement in which a substantial length of yarn is maintained between the point of last twisting and the take-up package, and the yarn is oscillated about an effective radius considerably greater than any straight line dimension within the winder.

The above and other objects will appear in connection with the following specification taken with the accompanying drawings forming a part thereof and in which like characters of reference represent like parts throughout the several figures.

Figure 1 of the drawing represents a side elevation of one form of my invention;

Figure 2 is a front elevation taken along the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a part sectional view taken on the line 3—3 of Figure 1, looking in the direction of the arrows;

Figure 4 is a side elevation of a modified form of the invention;

Figure 5 is a front elevation of the device of Figure 4; and

Figure 6 is a section on the line 6—6 of Figure 4 looking in the direction of the arrows.

A two-for-one twister is a device for imparting to filar material two twists or turns per revolution of a twisting spindle. This is accomplished by revolving a loop or balloon of the filar material about either a source of supply or a take-up package. In many common forms of the device, the supply or the take-up is maintained stationary in space but may partake of rotation for the purpose of unwinding or winding as the case may be.

Referring to the drawing, the two-for-one- twister shown in Figures 1 to 3 includes a rotatable spindle **11** mounted in suitable bearings **12, 13** supported in a frame **14**. A pulley **15** fixed on the spindle **11** is driven by a belt **16** to rotate the spindle. Above the bearing **12** a dish-shaped annular guide member **17** is fixed on the

spindle **11**, and above this guide the spindle is reduced in diameter as at **18** and has an anti-friction bearing **19** mounted thereon.

A generally U-shaped frame **20** is mounted at the yoke **21** thereof on the bearing **19**. The upper portions of upright arms **22** and **23** of the frame **20** are slotted, as at **24** in the arm **22** as seen in Figure 1, for a purpose later to appear. The arms **22, 23** are also provided with hinged portions **25, 26** forming the upper end portions of one finger or tine of the two arms. The hinged portions **25, 26** are normally held in vertical position by means of latches **27** and **28**, the latch **27** being shown as pivoted on a pin **29** in the upper end of the rigid tine of arm **22**. The purpose of the hinged construction is to provide for the insertion of a core or the doffing of a full package. The frame **20** is normally held stationary or non-revoluble by means of a pair of magnets **30, 31** mounted thereon substantially on a diameter of the guide member **17**. A second pair of magnets **32, 33**, with opposite polarity, are fixed in any suitable manner on the frame **14** and are arranged opposite magnets **30** and **31** with sufficient space between the opposed magnets to allow the loop L of the yarn to pass between them. The use of magnets in this manner is well known, and the precise arrangement thereof is not a part of this invention.

The upper end of the reduced portion **18** of the spindle **11** carries a worm **34** which meshes with a worm gear **35** mounted on a shaft **36** which is journaled in a pair of spaced plates **37** and **38** mounted on yoke **21** of frame **20**. Shaft **36** extends through a bearing in arm **23** and its outer end carries a pinion **39** which meshes with a gear **40** mounted on the horizontal shaft **41** of a grooved traversing drum **42**. The opposite end of the drum **42** carries a trunnion **43** on which there is mounted a gear **44** which meshes with pinions **45** and **46** on shafts **47** and **48**, respectively. Shaft **41** and trunnion **43** are journalled in bearings carried by arms **22** and **23**. The shafts **47** and **48** are journalled in plates **37** and **38** and carry feed rollers **49** and **50**, respectively. The outer ends of the shafts **47** and **48** are journalled in lugs **51** and **52**, respectively, mounted on the arm **22**.

A second horizontal shaft **53** rides in the slot **24** of arm **22** and in a corresponding slot in the arm **23**, and carries a core **54** upon which a package **55** of yarn Y is wound.

A pair of outwardly curved guide bars **56** and **57** are mounted on the arms **22** and **23** in substantially the same horizontal plane above feed rolls **49** and **50**. The center of curvature of guide bar **56** is located on the opposite side of the axis of spindle **11** and, likewise, the center of curvature of guide bar **57** is located on the opposite side of the axis of spindle **11**, although these bars are not necessarily curved to conform with circular arcs.

The spindle **11** is bored axially from its upper end to a point slightly below the guide disk **17** and laterally at this point to form a guide **58**. The disk **17** is provided with an aperture **59** near its outer edge, and directly in front of the lower opening of guide bore **58** to serve as a guide for yarn coming from a fixed guide **60** located above the winder on the axis of spindle **11**.

In operation, rotation of spindle **11** rotates guide disk **17**, but the U-shaped frame **20** is held against rotation by means of magnets **30, 31, 32** and **33** as described. Rotation of the spindle **11** drives the shaft **36** through worm **34** and gear **35**, and this shaft drives the pinion **39** and gear **40** to rotate the drum **42**. Rotation of this drum drives the feed rollers **49, 50**, by means of gear **44** and pinions **45** and **46**. A yarn (which may be an assembly of filar elements from a suitable source) passes through the guide **60** and into a loop portion L which rotates about the twister and then through the guides **59** and **58** to feed roller **49**. The yarn is twisted two turns for each

turn of the spindle 11 in passing from the guide 60 to the feed roller 49. The twisted yarn makes several passes about the rollers 49 and 50. The yarn from the last loop on roller 50 passes across the twister and is looped around guide bar 56 and is then returned and passes under guide bar 57 and then upwardly and inwardly to traverse drum 42. The drum 42 is provided with a pair of oppositely directed spiral yarn-guiding grooves 61, 62 which cross each other intermediate the ends of the drum as at 63 and which are joined at the ends of the drum by the groove portions 64, 65. The yarn upon being placed in the spiral groove at one point will follow the grooves 61, 62 as the drum 42 rotates and will be wound on the core 54 to form the yarn mass 55. The grooves 61, 62 cause the yarn to move back and forth from end to end of the core to form a self-supporting headless package of the well-known Fiji wind type. Rotation of the drum 42 rotates the core 54 (or the package 55) at a constant uniform peripheral speed. The feed rollers 49 and 50, being driven from the drum 42 by the gear 44 and pinions 45, 46 are rotated at a constant speed and feed the twisted yarn continuously and evenly to the package 55. In passing from the feed roller 50 to the package 55, the yarn passes over the two guide bars 56 and 57 which are suitably curved in a horizontal plane to permit a substantially constant length of yarn to be running between the feed roller 50 and the periphery of the drum 42. Also, due to the curvature of the bars 56 and 57 the loops of yarn looped around these bars do not remain stationary but shift to different positions along the length of the bars to follow the point at which the yarn is fed into the package by the traverse drum 42. The action is as if the yarn were being fed from a fixed point located at one side of drum 42 a distance equal to the length of yarn from the last point of contact on roller 50 to the point of contact with package 55.

In the modification of Figures 4 to 6, the twisting and winding device includes a spindle 111 suitably rotatably mounted in a frame 114. A pulley 115 is fixed on the spindle 111 and is driven by a belt 116. A dish-shaped guide disk 117 is fixed on the spindle above the frame 114. Above the guide disk 117 and rotatably mounted with respect to the spindle 111 there is a substantially U-shaped frame 120 comprising a bight portion 121 and upright arm portions 122, 123. The frame 120 is maintained stationary in space, i.e., it is prevented from revolving, by means of a pair of magnets 130 and 131 fixed thereon, and cooperating with a pair of magnets 132, 133, with oppositely arranged poles, fixed on the frame 114 below the disk 117. A worm 134 is mounted on the upper end of the spindle 111 and meshes with a worm gear 135 on a horizontal shaft 136 journalled in the arms 122 and 123 of frame 120. A pinion 139 is fixed on the shaft 136 outside the frame 120 adjacent the arm 123. The pinion 139 meshes with a gear 140 on a trunnion 141 on the end of a friction drive drum 142, the trunnion 141 being journalled in the arm 122. At its other end the drum 142 is journalled in the arm 123 by means of a suitable trunnion not shown. Drum 142 is covered with a material of high frictional coefficient, such as a pebbly rubber mat.

A substantially U-shaped frame 170 having a bight portion 171 and arms 172, 173 is pivoted on the arms 122, 123 by means of a shaft 174. A shaft 153 carrying a core 154 is rotatably supported between the end portions of arms 172 and 173. A gear 175 secured to shaft 153 meshes with an idler gear 176 on the shaft 174. The idler gear 176 meshes with a gear 177 on the trunnion 178 of a traverse drum 179, the trunnion 178 being suitably journalled in arm 122. At the other end of drum 179 there is another trunnion 180 journalled in the frame arm 123. The traverse drum 179 is provided with a pair of spiral grooves 161, 162 crossing intermediate the ends of the drum as at 163 and joined at their ends by circumferential grooves 164, 165.

A guide roller 181 is mounted to rotate about a vertical axis off-set from the axis of spindle 111, by means of a bracket 182 extending laterally from the frame yoke 121. A yarn guide aperture 159 is formed in the guide disk 117 near the periphery thereof. The spindle 111 has an axial bore at its upper end and a lateral guide passage which opens below the guide disk 117 towards guide aperture 159. The bore and guide are well known and are not shown herein since they form no part of the present invention. An example of such an arrangement is to be seen in the patent to Kimball, No. 2,505,050, issued April 25, 1950. A curved guide bar 157 is fixed on the arms 122 and 123 on the opposite side of spindle 111 from guide roller 181 and is so curved as to maintain a substantially constant length of yarn between the point where it leaves spindle 111 to the point where it is applied to the package being formed. The guide bar 157 need not have a fixed center of curvature, but the effective center at all times is on the opposite side of the spindle axis from the bar.

In operation, a strand Y of filar material is led from the guide 160 in a loop about the twisting device and through the guide 159, then inwardly through the lateral guide passage in spindle 111 and out of the axial bore at the upper end of the spindle and then laterally to the guide roller 181. The strand Y may take one or more turns about the guide roller 181 and then pass back through frame 120, and then under the bar 157, and finally upwardly into the groove of the traverse drum 179. From the traverse drum 179 the strand passes under the friction drum 142 and up to the core 154 to be wound into a package 155, shown in solid lines at the start of the winding and shown as a full package in dot-dash lines. In building the package, the package is rotated at a constant peripheral speed by frictional engagement with the periphery of drive drum 142. The rotating package drives the traverse drum 179 through idler gear 176. The angular rate of the traverse roller is made slightly less than that of the package so that the yarn is laid on the package in a precision manner. The frame 170 carrying the core 154 pivots about the shaft 174 as the diameter of the package increases. In passing over the drum 179, the strand engages the grooves 161 or 162 and is traversed lengthwise of the drum 179 and the drum 142 to be wound into a self-supporting package of the cross-wound or Fiji wind type.

In passing from the guide 160 to the guide roller 181, the strand receives two turns of twist per revolution of the spindle 111.

I claim:

1. A device for twisting and winding a strand of filar material comprising a rotatable spindle having a strand-guiding passage formed therein, a guide disc mounted on the spindle, a U-shaped winding frame carried by the spindle and pivotally mounted on the axis of said spindle, means preventing rotation of the winding frame, a friction drum on the winding frame, means carried by the spindle for driving the friction drum about its own axis, a package core and package driven by the friction drum, and means for traversing the strand along the package core comprising a rotary drum arranged parallel with said core and having a reversing spiral groove formed in the outer face thereof, means for feeding said strand from the passage in said spindle to said spiral groove, a gear mounted on and driven by the package core and meshing with an idler gear mounted on said U-shaped frame, said idler gear meshing with and driving a gear secured to said grooved traversing drum.

2. A device for twisting and winding a strand of filar material comprising a rotatable spindle having a strand-guiding passage formed therein, a guide disc mounted on the spindle, a winding frame carried by the spindle, means preventing rotation of the winding frame, a friction drum on the winding frame, means carried by the spindle for driving the friction drum about its own axis, a package core and package driven by the friction drum,

and means for traversing the strand along the package core comprising a rotary drum arranged parallel with said core and having a reversing spiral groove formed in the outer face thereof, and means for feeding said strand from the passage in said spindle to said spiral groove, comprising a strand-guiding element carried by said frame and spaced laterally from the axis of said spindle, and a second strand-guiding element carried by said frame and spaced laterally from the axis of said spindle in the opposite direction from said first guiding element.

3. A device according to claim 2 wherein said second strand-guiding element comprises a curved bar arranged generally parallel with the axis of said grooved drum and having an effective center of curvature located on the opposite side of the axis of said spindle.

4. A device for twisting and winding a strand of filar material comprising a rotatable spindle having a strand-guiding passage formed therein, a winding frame carried by the spindle, means preventing rotation of the winding frame, a package core, mounted on said frame, means driving said core from said spindle, means for traversing the strand along the package core comprising a rotary drum arranged parallel with said core and having a reversing spiral groove formed in the outer face thereof, and means for feeding said strand from the passage in said spindle to said spiral groove comprising a strand-guiding element carried by said frame and spaced laterally from the axis of said spindle, and a second strand-guiding element carried by said frame and spaced laterally from the axis of said spindle in the opposite direction from said first guiding element, said second strand-guiding element comprising a curved bar arranged generally parallel with the axis of said grooved drum and having an effective center of curvature located on the opposite side of the axis of said spindle.

5. A device according to claim 4 wherein said first-mentioned strand-guiding element comprises a second curved bar arrangement supported on said winding frame on the opposite side of the axis of said spindle from said first-mentioned curved bar and having an effective center of curvature located on the opposite side of said axis from said second curved bar.

References Cited in the file of this patent

UNITED STATES PATENTS

1,749,355	Reece	Mar. 4, 1930
2,002,590	Shinn	May 28, 1935
2,002,975	Brooks	May 28, 1935
2,505,050	Kimball	Apr. 25, 1950
2,732,681	Klein	Jan. 31, 1956
2,752,100	Strange	June 26, 1956