Nov. 15, 1949 H. C. UHLIG 2,487,838

TWISTING AND CABLING SPINDLE

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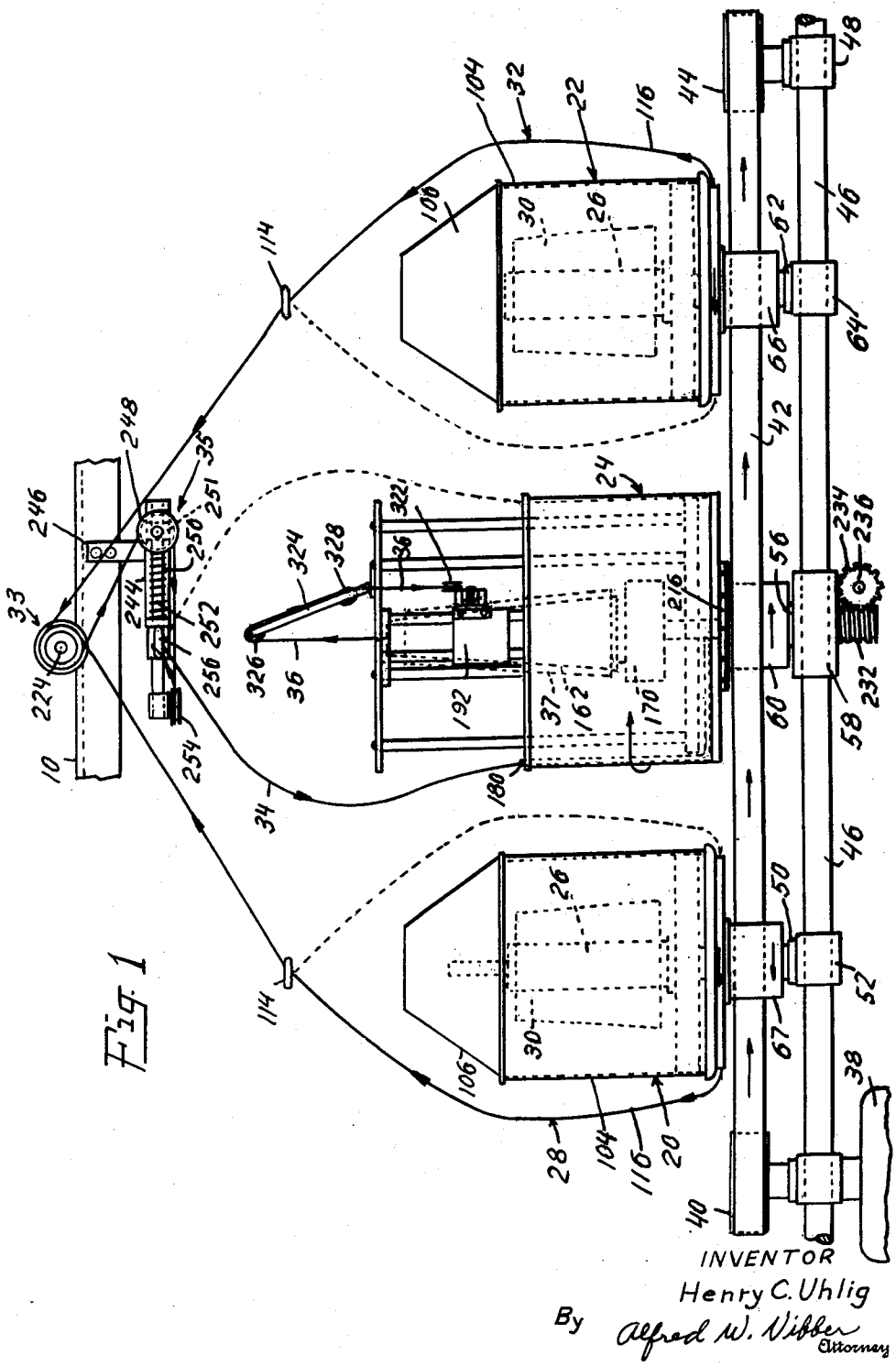


Fig. 1

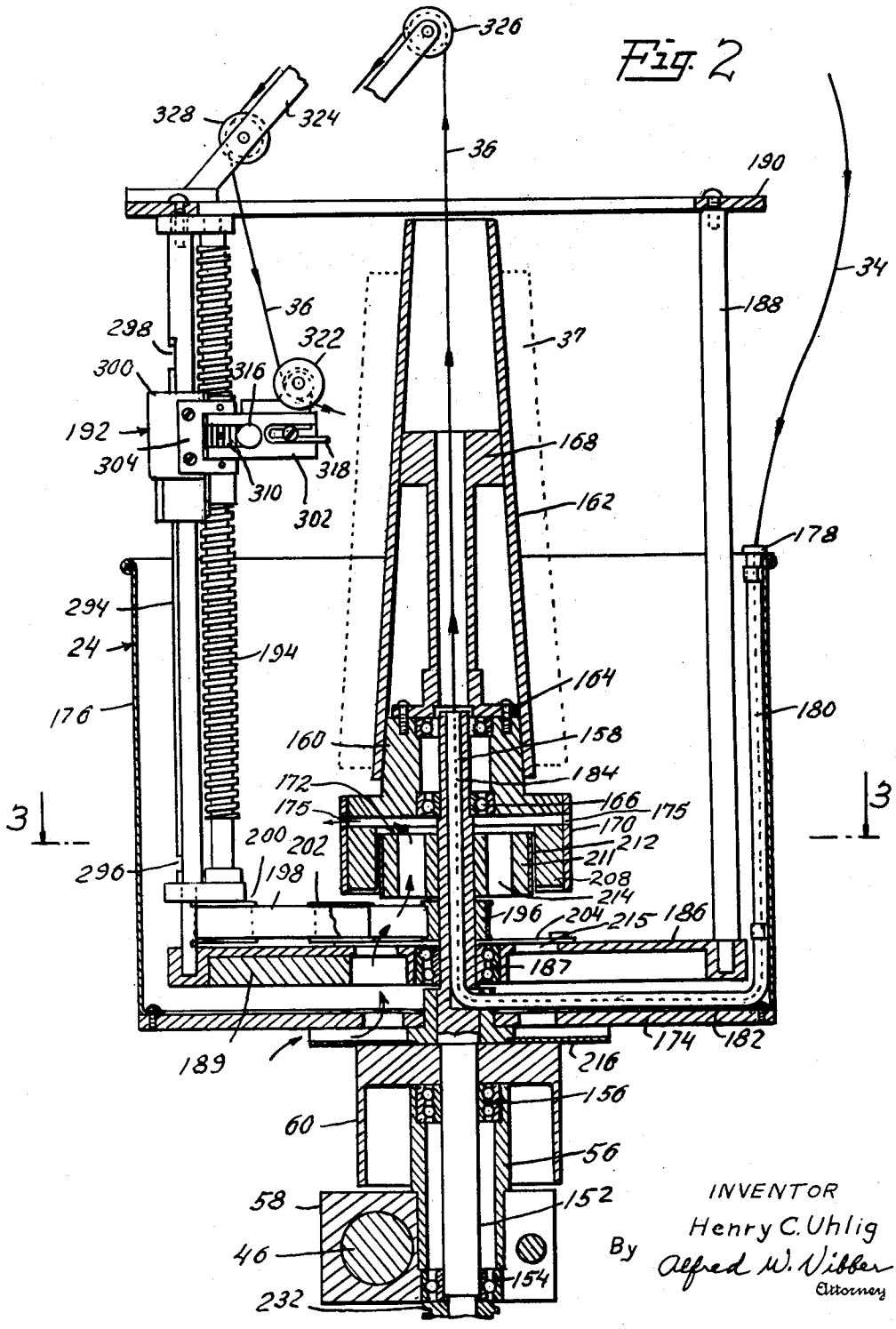
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Fig. 2



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Fig. 3

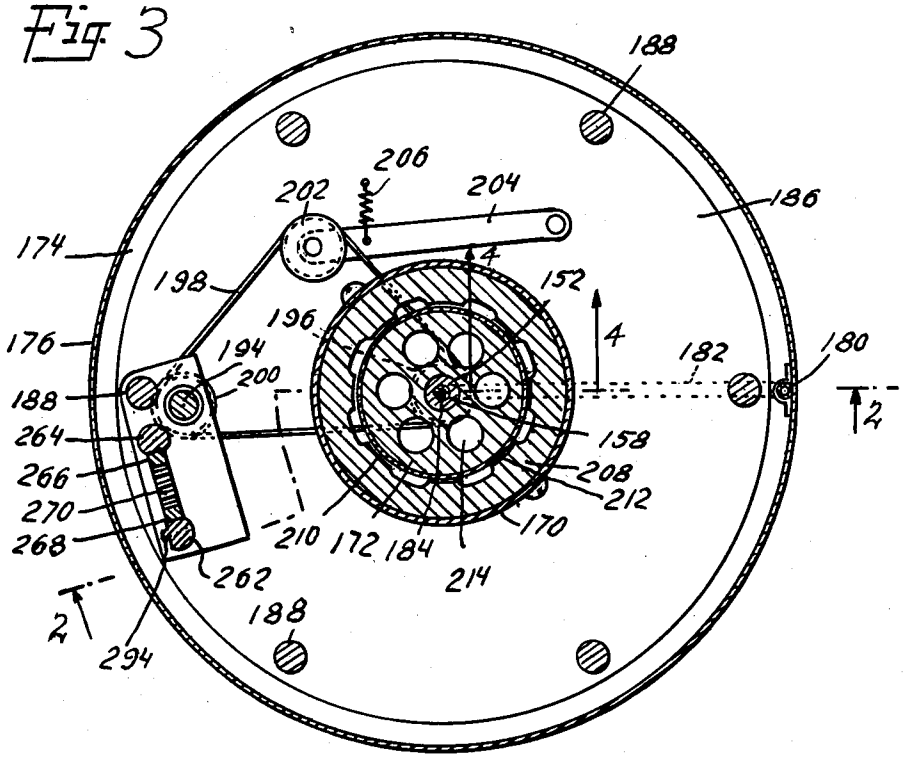
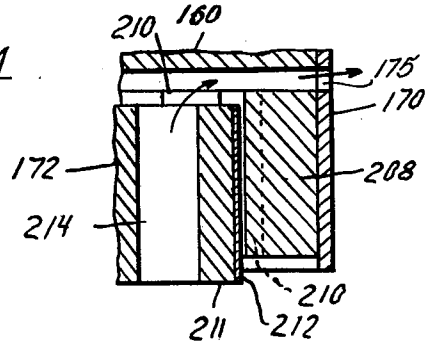


Fig. 4



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Fig. 5

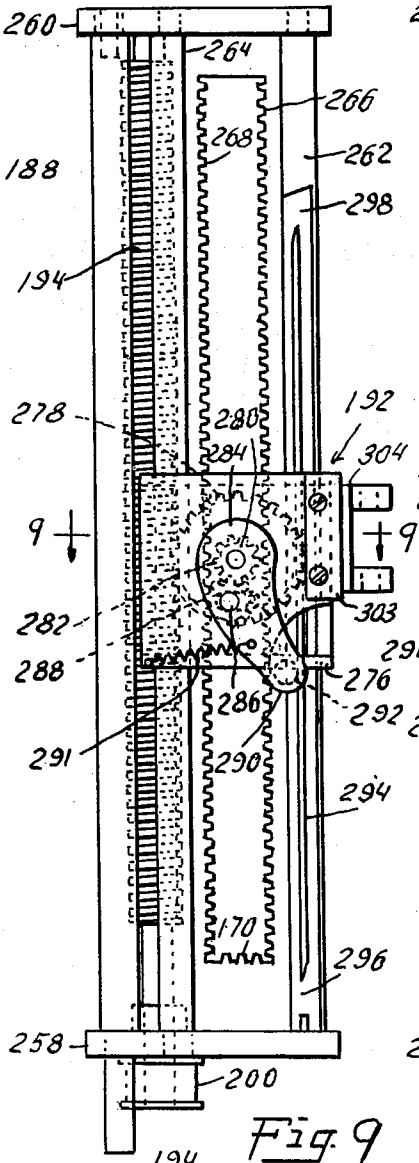


Fig. 6

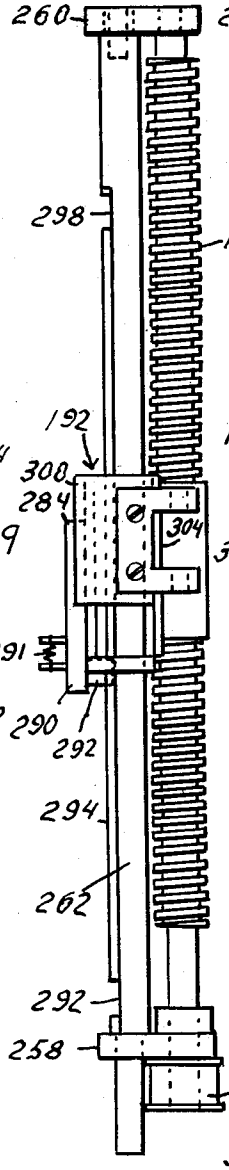


Fig. 7

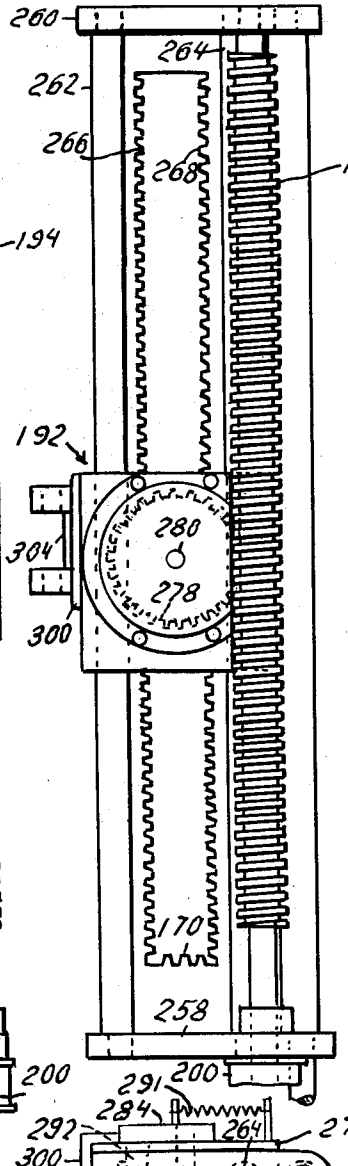


Fig. 9

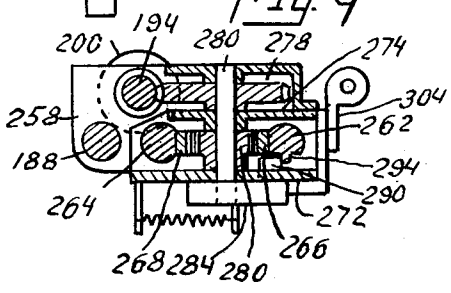
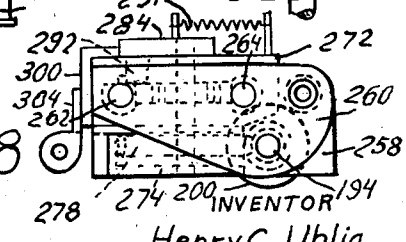


Fig. 8



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Fig. 10

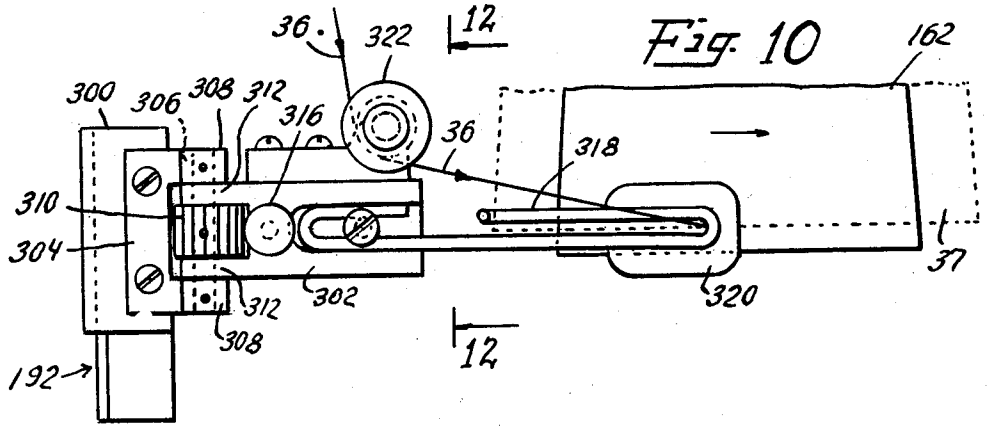


Fig. 11

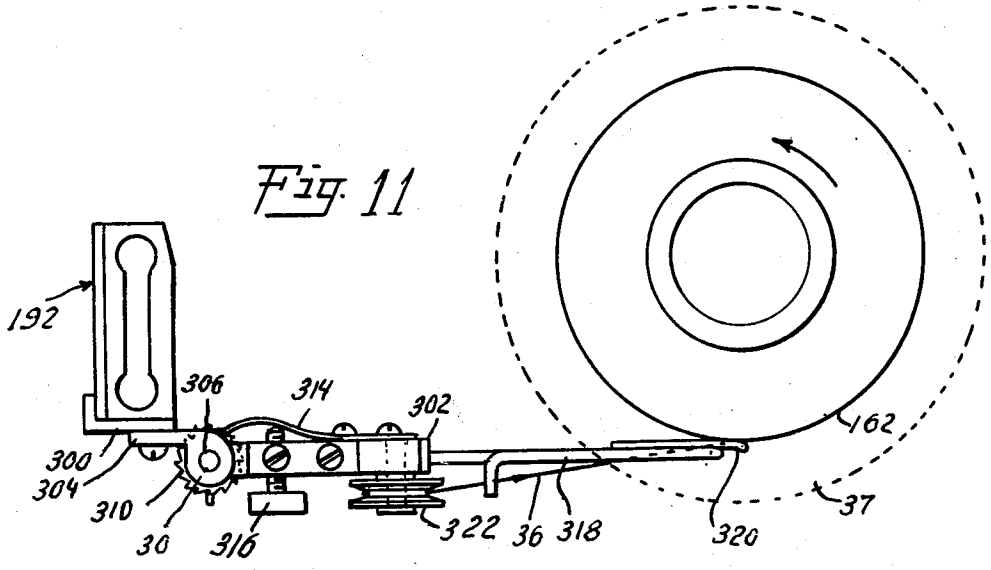
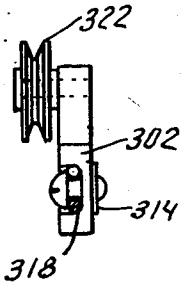


Fig. 12



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UNITED STATES PATENT OFFICE

2,487,838

TWISTING AND CABLING SPINDLE

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Original application August 1, 1947, Serial No. 765,577. Divided and this application January 4, 1949, Serial No. 69,190

9 Claims. (Cl. 57—58)

1

This invention relates to an apparatus for the twisting and reeling of elongated flexible material such as yarn, thread and the like.

The invention has among its objects the provision of an improved apparatus for the twisting and reeling of elongated flexible material, such apparatus being characterized by its stability of operation, thus allowing it to run for long periods without attention, and its simplicity and sturdiness of construction.

A further object of the invention, in a preferred embodiment thereof, resides in the provision of an improved double-twist twisting and cabling spindle wherein combined or doubled threads and the like fed thereto are twisted upon each other and reeled, such spindle having the above-indicated characteristics.

These and further objects of the invention will be more readily apparent in the following description of a preferred embodiment of the apparatus of the invention.

This application is a division of application Ser. No. 765,577, filed August 1, 1947, entitled "Method of and apparatus for twisting yarn."

The invention will be more readily understood by a consideration of the drawings appended hereto in which:

Fig. 1 is a view in front elevation of a machine for forming cords from yarns in one continuous operation, such machine incorporating the twisting and cabling spindle of the invention, the view being taken from a plane parallel with the axis of the twisting and cabling reel unit and with the axes of the yarn twisting spindles on either side thereof;

Fig. 2 is a view in vertical section through the axis of the cabling reel unit;

Fig. 3 is a view in cross-section through such cabling reel unit, the section being taken along the line 3—3 in Figure 2;

Fig. 4 is an enlarged view in vertical cross-section through the base of the cabling reel unit, the section being taken along the line 4—4 in Figure 3;

Fig. 5 is a view in front elevation of the traverse mechanism for the loading finger employed with the cabling reel unit;

Fig. 6 is a view in side elevation of such traverse mechanism;

Fig. 7 is a view in rear elevation of the traverse mechanism;

Fig. 8 is a view in plan of the traverse mechanism;

Fig. 9 is a horizontal section through the traverse mechanism, the section being taken along the line 9—9 in Figure 5;

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Fig. 10 is a fragmentary view in side elevation of the loading finger supporting unit;

Fig. 11 is a view in plan of the unit shown in Figure 10; and

Fig. 12 is a view in vertical section through such unit, the section being taken along the line 12—12 in Figure 10.

The twisting and cabling reel of the invention is shown in Fig. 1 in the relationship it assumes in the apparatus disclosed and claimed in application Serial No. 765,577, such apparatus being designed to form cords from a plurality of yarns in one continuous operation. Preferably the yarn employed with the apparatus is in the form of "flat yarn," that is, one in the form of a tape of generally rectangular cross-section, the width of the tape materially exceeding its thickness.

The embodiment of the yarn twisting apparatus shown generally in Fig. 1 includes a framework of which only the additional lower cross member 46 forming the supporting means for the yarn twisting units and the cabling reel unit is shown. Member 46 is attached to intermediate end frame members, not shown. In the apparatus illustrated in Fig. 1 there are employed two bobbin supporting and yarn twisting devices, the left hand such unit being designated 20, and the right hand such unit being designated 22.

The twisting and cabling reel unit shown at 24 is preferably, although not necessarily, located between yarn twisting devices 20 and 22. In the embodiment shown, the axes of spindles 20, 22, and 24 lie in a common plane. The axes of spindles 20 and 22 are spaced equal distances from that of spindle 24, as shown in Fig. 1. Capstan 33 is located with its axis substantially at a right angle to the axis of spindle 24, the axis of spindle 24 substantially intersecting the capstan. As a result, threads 28 and 32 travel substantially equal distances from their respective guiding eyes 114 to capstan 33. Flat rayon yarn from a wound package 30, shown mounted on a bobbin at 26 in twisting device 20, is fed therefrom in the form of a double twisted thread 28 through the eye 114 positioned coaxial of spindle 20, and the similar yarn from a package 30 in twisting device 22 is fed therefrom through the eye 114 coaxial with spindle 22 as twisted thread 32. The two such twisted threads are brought together at capstan 33 in parallel untwisted relationship, from the stepped capstan 33 continuing their travel in such relationship through the compensator and shock absorber generally desig-

nated 35, from which they emerge, as shown at 34. In that portion of its travel downwardly from the compensator until it enters the cabling reel unit 24, the two threads are given one twist about each other, and in that portion of its travel shown at 36 in which it rises through the center of the cord receiving bobbin, it receives another twist, following which it is laid or loaded onto the bobbin, as shown at 37 in Fig. 2.

The yarn twisting devices 20 and 22, the cabling reel unit 24, and the stepped capstan 33, are all driven by means of the vertically mounted electric motor 38 secured to the member 46 of the frame as shown in Fig. 1, the motor carrying pulley 40 over which and the idler pulley 44 is trained the flat belt 42. The idler pulley is supported on member 46 by means of the intermediate support 48, devices 20, 22, and 24 likewise deriving their support from member 46. Device 20 is supported on a sleeve, shown at 50, connected to intermediate support and journal bearing 52. Device 24 is provided with a supporting sleeve, generally designated 56, which is supported in the member 58 which also includes bearings, and device 22, which is similar in all respects to device 20, has the supporting sleeve 62 held in the support 64. As will be apparent from Fig. 1, the two yarn twisting units and the cabling unit are provided with drive pulleys engaging the same run of belt 42, pulley 67 for unit 20 and pulley 66 for unit 22 being positioned in front of such run of the belt 42, and pulley 60 for unit 24 being positioned in back of such run of the belt. Thus pulleys 66 and 67 and the parts of units 20 and 22 connected thereto, respectively, rotate in one direction, and pulley 60 of unit 24 and the parts connected to such pulley rotate in the opposite direction.

The axes of spindles 20, 22, and 24, which are parallel, all lie at a small angle, as for instance 12°, to the vertical so that the bobbin supporting structures in spindles 20 and 22 may be floatingly maintained in substantially one angular position by means of an eccentrically mounted weight on each such bobbin support. The cage of spindle 24 upon which the traversing cord laying device is mounted is also maintained floatingly in one angular position, as will appear hereinafter.

Spindles 20 and 22, each of which is provided with a circular bottom closure member 104 and a frusto-conical top closure member 106 on top thereof, both such closure parts being supported on the floatingly mounted bobbin support, are both of the two for one variety. Such spindles twist the yarn once in its passage from a tension imposing device mounted on the floatingly mounted bobbin support to a twisting guide (not shown) mounted on the driven rotary shaft of the spindle, and twist it once again in that portion of its passage shown at 116, between the outer end of the radial passage in the rotatable twisting disc and the eye 114, the yarn at the spindle passing sequentially from package 30, through the tension device in the spindle, through the rotary twisting guide, through an axial passage in the rotary shaft of the spindle, and through the aforementioned radial passage in the twisting disc, neither the axial passage nor the radial passage being shown.

The structure of the twisting and cabling reel unit 24 will be more readily apparent from a consideration of Figs. 2 to 12, inclusive. As shown in Fig. 2, supporting sleeve 56 is fixedly attached to support 58 and carries, rotatably mounted within it, the spindle 152, the lower ball bearing 154 and

the upper ball bearing 156 providing such support of the spindle in the sleeve. In its upper portion spindle 152 is provided with an axial bore 158 for the reception of a cord guide, as will more clearly appear hereinafter.

Floatingly mounted on the upper end of the spindle is a structure for supporting bobbin 162. Such structure includes the base member 160 supported on the spindle through the medium of the upper and lower ball bearings 164 and 166, respectively, and the mandrel 168 forming an extension of structure 160, the two parts 160 and 168 having upwardly converging conical surfaces, as shown, for supporting and driving connection with the inside of the bobbin 162.

The cabling reel unit of the invention includes means whereby the cabled yarn or cord is reeled with a predetermined amount of tension. Although such tension determining means may take the form of a friction slip-clutch, in the preferred embodiment of the device there is employed a magnetic slip-clutch. Such device is made up of the outer cage member 170, shown attached to and depending from the bottom of structure 160, and the inner rotor member 172 keyed to the spindle 152. The structure of such magnetic slip-clutch which will be more fully explained in connection with Figures 3 and 4, is such that rotation of member 172 within member 170, the latter of which includes a strong permanent magnet, induces current in the first member and thus yieldingly connects the two members for rotation together. Thus structure 160 and the bobbin mounted thereon is yieldingly driven from the spindle 152.

On the spindle 152 there is also mounted a disc 174 which is fixedly connected to the pulley 60. The disc 174 forms the base to which the cylindrical partial cover in the form of a can 176 is attached. Such can provides support for the U-shaped tubular cord guide 178, the outer leg 180 of which is secured in upright position to the inside of the can, the bottom portion 182 of which is positioned radially on top of disc 174, and the other or inner leg 184 of which is positioned within the bore 158 in the upper end of the spindle 152.

Also mounted on the spindle 152 is the disc 186, which is floatingly connected thereto through the medium of the ball bearings 187. Disc 186 serves as the support for the plurality of spaced upright standards 188, the tops of which are connected by the ring 190. Disc 186 is provided in one zone thereof with a heavy weight, such as the poured lead weight 189, so that the disc is unbalanced and thus when the spindle is positioned at a substantial angle to the vertical, as above indicated, the disc 186 and the structure attached thereto tend floatingly to remain in one angular position with weight 189 downwardly. Disc 186 also serves as support for the walker unit 192 and the frame therefor, more clearly shown in Figs. 5 to 9, inclusive, by which the cord loading finger is supported and traversed up and down the length of the bobbin 162. In general, such device includes the vertical rotatably mounted worm 194 driven from spindle 152 by means of the pulley 196 thereon, the flat belt 198 trained about such pulley and about pulley 200 on the bottom end of the worm. As shown in Fig. 3, there is provided a spring tensioned idler pulley 202 about which such belt runs, the idler pulley being mounted on the end of the arm 204 pivotally mounted on disc 186, the arm being urged outwardly by means of the coil spring 206.

The magnetic slip-clutch includes in its cage 170 the permanent magnet 208 the top surface of which is spaced from the bottom surface of part 160 as shown in Figs. 2 and 4. Magnet 208 has a plurality of equally spaced pole pieces 210 formed on its inner, generally cylindrical, surface. Such magnet is preferably made from the materials having high permeability, such as the alloy composed of 24–30% Ni, 9–13% Al, balance Fe, and the alloy composed of 24–30% Ni, 9–13% Al, 5–10% Co, balance Fe. The inner rotor 172 has its main body portion 211 made of soft annealed steel, there being provided on its periphery a sheath of non-magnetic metal 212 of high electrical conductivity, such as copper to provide a low resistance path for the eddy currents. It will be apparent that relative rotation between parts 170 and 172 induces electric currents in part 172, as in the rotor of a squirrel cage motor, and that the cage and rotor are thereupon coupled magnetically. The amount of torque at a given relative speed between the parts 170 and 172 depends upon the air-gap between them. Consequently variation of the air-gap by suitable dimensioning of the parts allows the selection of a predetermined amount of tension on the cord wound on the bobbin 162 driven by casing 170 of the clutch.

Because normal operation of the device involves considerable slip between the rotor and cage and thus appreciable eddy currents, there is substantial heating of the rotor. Heat is dissipated therefrom by providing a series of vertical holes 214 through the body 211 of the rotor 172, a series of holes 215 in disc 186, and an air impeller in the form of a fan 216 keyed to the spindle beneath member 174. When the spindle is rotated cooling air is thus caused to flow, as shown by the arrows in Figs. 2 and 4, upwardly through the rotor 211, thence laterally into the space between the top of magnet 208 and the bottom of part 160, and finally outwardly through the angularly spaced radial openings 175 through the outer part of rotor 170 below the bottom surface of part 160.

The stepped capstan 33 at which the two untwisted threads 28 and 32 are combined in untwisted side-by-side relationship also constitutes the means by which the number of turns per inch (pitch) in the cabling operation is governed. The capstan, which in the embodiment shown is provided with three steps of graduated diameter, is driven at a speed bearing a definite relationship to the speed of rotation of the spindle 152, and thus at least approximately to the speed of rotation of the bobbin 162. The capstan, of course, receiving as it does threads 28 and 32 from units 20 and 22, respectively, also determines the rate of paying out of the single twisted threads from such units. Variation in the number of turns per inch of the twist (pitch) in the single twisted threads may be accomplished by changing the diameter of drive pulleys 66 and 67 relative to that of pulley 60 driving the cabling reel unit.

The capstan 33 is affixed to the forward end of a cross shaft 224 journaled in pillow blocks (not shown) on the top of the machine frame, a portion of such frame being shown at 10. Such shaft is driven in synchronism with spindle 152 by means of the worm 232 affixed to the bottom of the spindle, such worm meshing with worm gear 234 keyed on the forward end of shaft 236, shafts 236 and 224 being positively drivingly connected together by a chain and sprocket drive, not shown.

Major changes in the speed ratio between shaft 152 and shaft 224, and thus changes in the number of turns per inch (the pitch) in the cabling operation, are effected by the use of suitable ratios of the sprockets in the drive between shafts 236 and 224. Minor changes in the pitch of the cabled cord, that is, number of turns per unit length, are made by shifting the threads 28 and 32 to the appropriate step of the capstan 33, such steps filling smoothly the gaps in the speed ratio obtainable by sprocket changes.

The combined threads 28 and 32, as yet untwisted on each other, which are fed from the capstan 33, travel to the compensator and shock-absorber 35 shown in Fig. 1. Such device, which has an elongated horizontally disposed main frame 244, is supported from member 10 of the machine frame by the depending support 246. The compensator includes a thread guide pulley 248, the supporting block 251 of which is mounted for longitudinal travel on the longitudinal rod 250 supported by the body 244, parallel thereto but spaced therefrom, pulley 248 being thrust to the right in Fig. 1 by means of the compression spring 252. Block 251 is bored to receive rod 250 therethrough, a key connection (not shown) being provided between block and rod to prevent turning of the block on the rod. The compensator is further provided with a fixed idler pulley 254 and a dead eye 256 as shown in Fig. 1, so that the combined threads fed downwardly from the capstan 33 are first led over pulley 248, thence to the left around pulley 254, and from there through the dead eye 256 from which they emerge at 34 to travel downwardly and into the leg 180 of guide tube 178 of the cabling reel unit. Eye 256, as shown in Fig. 1, is located substantially coaxial with spindle 24, and between the upper end of such spindle and capstan 33. Thus the balloon which forms in the cord 34 between eye 256 and cord guide 180 is symmetrical about the axis of spindle 24.

The construction of the walker unit 192 and of the frame on which it travels will be clearly apparent by a consideration of Figs. 5 to 9, inclusive. The frame on which such unit travels is mounted on the cabling reel unit 24, as shown in Figs. 2 and 3, parallel to the axis of the spindle 152. Such frame consists of the bottom cross member 258, a similar top member 260, a first longitudinally extending frame member 262, and a second such member 264 parallel thereto. One of the standards 188 is, as shown, also utilized in forming such frame. Such frame is attached between the disc 186 and the top 190 so as to be fixed thereon.

The two longitudinal members 262 and 264 are provided with inwardly facing rack gears 266 and 268, respectively, the bottoms of such rack gears being connected by a short horizontal rack 270. The walker unit 192 is made up of the front plate 272 and the rear plate 274, such plates being connected by suitable cross members, of which one is shown at 276 in the form of a bottom plate for such unit. The unit 192 is mounted and guided on the framework so as to travel from top to bottom thereof, such travel being effected as follows: The worm 194 is, as we have seen, driven by spindle 152 through the medium of belt 198, and pulleys 196 and 200. The walker unit 192 has mounted therein a transverse shaft 280 on one end of which there is affixed the worm gear 278 meshing with worm 194. Also keyed to shaft 280 is a pinion 282. Journaled on the walker unit frame coaxially of shaft 280 is a

cage 284 which is provided with a cross-shaft 286 carrying a pinion 288 constantly in mesh with pinion 282. Pinion 288 has a diameter somewhat less than the distance between rack gears 266 and 268. Thus, rocking of the cage 284 in a clockwise direction (Fig. 5) causes pinion 288 to mesh with rack gear 268 and rocking of such cage in a counter-clockwise direction frees pinion 288 from contact with rack 268 and causes it to mesh with rack 266. The cage is provided with an arm at 290 and with a cam follower 292 on the end thereof, such cam follower cooperating with the upstanding cam track 294 affixed to frame member 262. The cam track is provided at its bottom with an opening 296 through which the cam follower 292 may pass. The cam track terminates at its upper end at 298. In order to position cage 284 stably, a coil spring 291 is positioned between the arm and the frame of the walker unit to urge the cage in a clockwise direction, as shown in Fig. 5.

From the above description the manner of operation of the walker unit will be apparent. Rotation of worm 194 in one direction drives worm wheel 278 and thus pinions 282 and 288, causing such latter pinion to climb up or down the rack with which it is in mesh carrying with it the unit 192. Assume for example, that the worm is driven in such direction that the walker unit is progressing downwardly (Fig. 5). When pinion 288 reaches the bottom of rack 268 it then meshes with transverse rack 270, which causes cage 284 to be rocked counterclockwise, against the action of spring 291, since at this point the cam follower 292 lies opposite opening 296 in the cam track. The follower then travels upwardly to the right of the track, thus preventing the spring 291 from returning the cage to its former position. Pinion 288 then meshes with rack 266, and, still rotating in the same direction, causes the walker unit to climb in the frame. The unit continues travel in such direction until the cam follower 292 clears the upper end 298 of the cam track. Spring 291 then turns the cage clockwise to cause it to assume the position shown in Fig. 5, so that the unit then again travels downwardly.

The walker unit above described forms the support by which the loading finger is traversed up and down the length of the bobbin 162. Support for such finger on the walker unit is afforded by the mounting plate 300, to which the loading finger and the support therefor more clearly shown in Figs. 10, 11, and 12, are attached. Such loading finger support consists of the main body 302 which is pivotally mounted on an axis parallel to the axis of the bobbin on the attaching means 304. Means 304 in turn, is attached to plate 300. Means 304 has two spaced ears 308 between which are received the spaced ears 312 on the rear end of body 302. A shaft 306 is received in openings through the two pairs of aforementioned ears, being pinned as shown to ears 308. A toothed or ratchet wheel 310 is positioned on shaft 306 between ears 312 and is pinned to such shaft. There is provided a pawl in the form of leaf spring 314, the forward end of which is secured to the body and the rear end of which normally impinges on the ratchet wheel. It will be seen, particularly by considering Fig. 11, that when the pawl 314 is in operative relationship, body 302 may be swung quite freely in a clockwise direction but it is prevented from moving counter-clockwise by the pawl. Thus the loading finger mounted on body 302 is prevented from becoming jammed against the bobbin 162 or the cord 37 wound thereon. The finger is initially positioned by being placed in contact with the bobbin or the cord wound thereon, at its greatest diameter, after which the finger is automatically thrust outwardly at each repeated contact between it and the portion of the wound cord of greatest diameter. The pawl may be released to swing the body 302 counter-clockwise, when required, by means of the plunger 316 which when pressed upwardly (Fig. 11) removes the rear end of the pawl from contact with the ratchet wheel 310.

The loading finger, shown generally at 318, is adjustably mounted on the forward end of the body 302 so that it may be varied in its effective length. The forward end of the finger is provided with a guide shoe 320 which lies close to or engages, as the case may be, the outer layer of cord on the bobbin, thus insuring correct placement of the cord being laid. Body 302 is also provided with an idler pulley 322 under which cord 36 travels prior to its entry in the guide opening in the shoe 320.

The cabling reel unit 24 is also provided with an upwardly and inwardly inclined guide arm 324 positioned on top of ring 190, such arm carrying the upper idler guide pulley 326 and the lower idler guide pulley 328. The two threads 28 and 32, combined, as explained, in untwisted parallel relationship at the capstan 33 travel in that condition through the compensator 35. Immediately on emerging from eye 256 the two threads are cabled. The first twist of such cabling is given them in that portion of their travel in which the cord forms a loop or balloon, that is from the eye 256 to leg 180 of the cord guide tube, by reason of the rotation of the disc 174 and thus the cord guide carried thereby. Such first twisted cord is then given a second twist, in the same direction, in that portion of its travel, shown at 36, from the inner end of leg 182 of the cord guide to upper guide pulley 326. The double twisted cord then travels downwardly around the guide wheel 328, under guide wheel 322 on the walker unit, and thence to the shoe 320 of the loading finger 318 where it is laid on the bobbin 162 to form the wound package 37.

The twisting and reeling spindle of the invention, although shown and described, for purposes of illustration, in connection with its combination with the yarn twisting spindles and other allied elements of the apparatus described and shown in application Serial No. 765,577, is obviously capable of use for other purposes and in other combinations. Thus, the twisting and reeling spindle may be used to twist and reel threads from other sources than twisting spindles, or from twisting spindles not driven in synchronism with the twisting and reeling spindle. Furthermore, although the twisting and reeling spindle is described as working upon threads made fr[illegible] rayon yarn, it will be understood that it may be used to operate upon threads made from various other fibers or filaments, either natural or synthetic, including those made from fine wires.

Whereas I have described and illustrated a preferred embodiment of the twisting and cabling spindle of the invention, it will be understood that the invention in its broader aspects is capable of considerable variation as to details. The invention is therefore not limited to the embodiment thereof shown and described, but is defined by the scope of the following claims.

I claim as new the following:

1. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle, a bobbin support mounted on the upper end of such spindle, a driving connection between the spindle and the bobbin support, a thread guide supporting structure spaced radially of the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, means for maintaining the thread guide supporting structure in such position, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the thread guide supporting structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connecting with the passage in the spindle, the thread guide supporting structure having a yarn or thread guiding and loading device thereon, whereby an elongated material such as a yarn or thread fed from a point above the spindle through the passageways in the twisting disc and the spindle, and to the guiding and loading device on the thread guide supporting structure, and thence to the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

2. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at an angle to the vertical, a bobbin support mounted on the upper end of such spindle, a driving connection between the spindle and the bobbin support, a cage structure surrounding the bobbin support and floatingly mounted on the spindle to be maintained in a relatively stationary position, means for maintaining the cage structure in such position including an eccentrically mounted weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connecting with the passage in the spindle, the cage having a yarn or thread guiding and loading device thereon, whereby an elongated material such as yarn or thread fed from a point above the spindle through the passageways in the twisting disc and the spindle, and to the guiding and loading device on the cage structure, and thence to the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

3. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at a small acute angle to the vertical, a bobbin support mounted on the upper end of such spindle, a slip driving connection between the spindle and the bobbin support, a thread guide supporting cage surrounding the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, means for maintaining the cage structure in such position including an eccentrically located weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a

substantially radial passage therethrough and connected with the passage in the spindle, the cage having a yarn or thread guiding and loading device thereon, whereby an elongated material such as yarn or thread fed from a point above the spindle through the passageways in the twisting disc and the spindle, and to the guiding and loading device on the thread guide supporting cage structure, and thence to the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

4. In the combination recited in claim 3, the slip driving connection between the spindle and the bobbin support comprising a magnet attached to one of such elements and a rotor attached to the other of such elements, the magnet and rotor being located in spaced relationship so as to induce electric current in the rotor upon relative motion between the spindle and the bobbin support.

5. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at a small acute angle to the vertical, a bobbin support mounted on the upper end of such spindle, a slip driving connection between the spindle and the bobbin support, a thread guide supporting cage surrounding the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, means for maintaining the cage structure in such position including an eccentrically located weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connected with the passage in the spindle, the cage having a yarn or thread guiding device on the top thereof for receiving yarn or thread passing vertically upward from the passage in the spindle, the cage further having a walker unit, a vertical guideway structure therefor attached to the cage, and a yarn or thread guiding and loading finger attached to the walker unit, whereby an elongated material such as yarn or thread fed from a point above the spindle, through the passageways in the twisting disc and the spindle, upwardly to the first named guiding means on the cage and thence to the loading finger and the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

6. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at a small acute angle to the vertical, a bobbin support mounted on the upper end of such spindle, a slip driving connection between the spindle and the bobbin support, a thread guide supporting cage surrounding the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, means for maintaining the cage structure in such position including an eccentrically located weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connected with the passage in the spindle, the cage having a yarn or thread guiding device on the top thereof for receiving yarn or thread pass-

ing vertically upward from the passage in the spindle, the cage further having a walker unit, a vertical guideway structure therefor attached to the cage, and a yarn or thread guiding and loading finger attached thereto, the walker unit being designed to reciprocate in substantially timed relationship with the rotation of the bobbin, the driving means for the walker unit including a vertical driven worm paralleling the walker unit guideway structure, means drivingly connecting the worm with the spindle, and a gear on the walker unit meshing with the worm for driving the walker unit reversely in a vertical direction, whereby an elongated materal such as yarn or thread fed from a point above the spindle through the passageways in the twisting disc and the spindle, upwardly to the first named guiding means on the cage, and thence to the loading finger and the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

7. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at a small acute angle to the vertical, a bobbin support mounted on the upper end of such spindle, a slip driving connection between the spindle and the bobbin support, a thread guide supporting cage surrounding the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, said cage comprising a disc mounted on the spindle intermediate its ends and transversely thereto, a plurality of angularly spaced supports parallel to the spindle and surrounding the bobbin support affixed to the disc, means for maintaining the cage structure in a relatively stationary position including an eccentrically located weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connected with the passage in the spindle, the cage having a yarn or thread guiding device on the top thereof for receiving yarn or thread passing vertically upward from the passage in the spindle, the cage further having a walker unit, a vertical guideway structure therefor attached to the cage, and a yarn or thread guiding and loading finger attached thereto, whereby an elongated material such as yarn or thread fed from a point above the spindle through the passageways in the twisting disc and the spindle, upwardly to the first named guiding means on the cage, and thence to the loading finger and the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

8. A device for twisting and reeling elongated material such as yarn, thread, and the like, comprising a rotary driven spindle disposed at a small acute angle to the vertical, a bobbin support mounted on the upper end of such spindle, a slip driving connection between the spindle and the bobbin support, a thread guide supporting cage surrounding the bobbin support and floatingly mounted on the spindle so as to be maintained in a relatively stationary position, said cage comprising a disc mounted on the spindle intermediate its ends and transversely thereto, a plurality of angularly spaced supports parallel to the spindle and surrounding the bobbin support affixed to the disc, means for maintaining the cage structure in a relatively stationary positon including an eccentrically located weight attached thereto, a twisting device mounted on the spindle, the twisting device including a twisting disc mounted below the cage structure for rotation with the spindle, and a cylindrical container attached to the twisting disc and extending upwardly at least partially to enclose the bobbin, the spindle having an axial passage in its upper end, the twisting disc having a substantially radial passage therethrough and connected with the passage in the spindle, the container having a passage extending from its top edge to the disc and connecting with the outer end of the passage in the twisting disc, the cage having a yarn or thread guiding device on the top thereof for receiving yarn or thread passing vertically upward from the passage in the spindle, the cage further having a walker unit, a vertical guideway structure therefor attached to the cage, and a yarn or thread guiding and loading finger attached thereto, whereby an elongated material such as yarn, or thread fed from a point above the spindle, through the passageways in the container, the twisting disc and the spindle, upwardly to the first named guiding means on the cage, and thence to the loading finger and the bobbin, in that order, is given a double twist when the spindle is rotated and the yarn or thread is wound on the bobbin.

9. In the combination recited in claim 8, the slip driving connection between the spindle and the bobbin support comprising a permanent magnet attached to one of such elements and a rotor attached to the other of such elements, the magnet and rotor being located in spaced relationship so as to induce electric current in the rotor upon relative motion between the spindle and the bobbin support.

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No references cited.