United States Patent

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a part interest

[54] **TORQUE AND BACKSTOP DEVICE FOR WINCHES**
13 Claims, 8 Drawing Figs.

[52] **U.S. Cl.** **192/12,** 192/48.92, 254/150
[51] **Int. Cl.** **F16d 67/02,** F16d 41/07, B66d 1/30
[50] **Field of Search** ..... 192/48.92, 12 (B), 12 (B1); 254/150

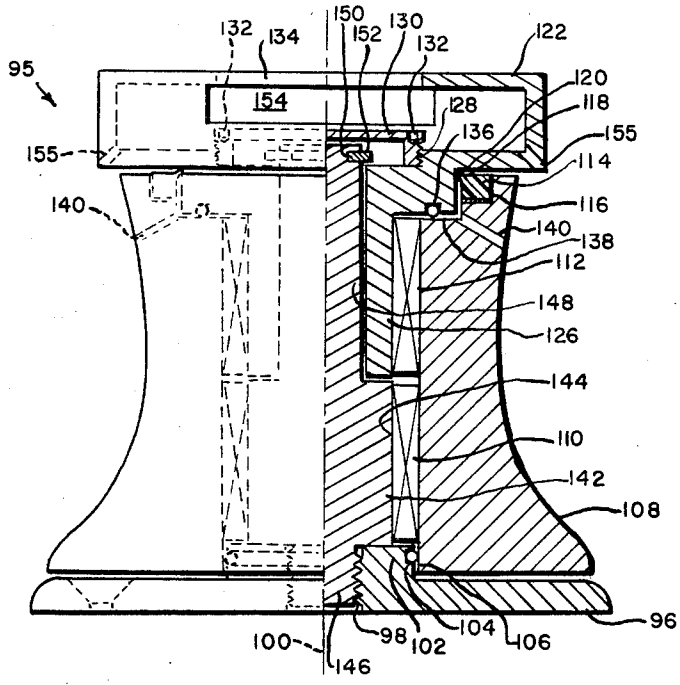
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ABSTRACT: Positive backstop-type silent infinitely variable reciprocating-to-unidirectional motion converter in the form of improved winch embodiments, each having a winch drum constrained to rotate in a single direction with respect to a winch spindle on which it is mounted, the constraint being achieved by a silent positive backstop action of a first roller, sprag or spring clutch engaging the drum and spindle, each winch also including a lever-receiving winch top structure mounted to rotate on the spindle and constrained by silent positive backstop action of a second roller, sprag or spring clutch engaging the top structure and winch drum to rotate with respect to the winch drum only in the opposite direction of the winch drum rotation.



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SHEET 1 OF 2

Fig. 1.

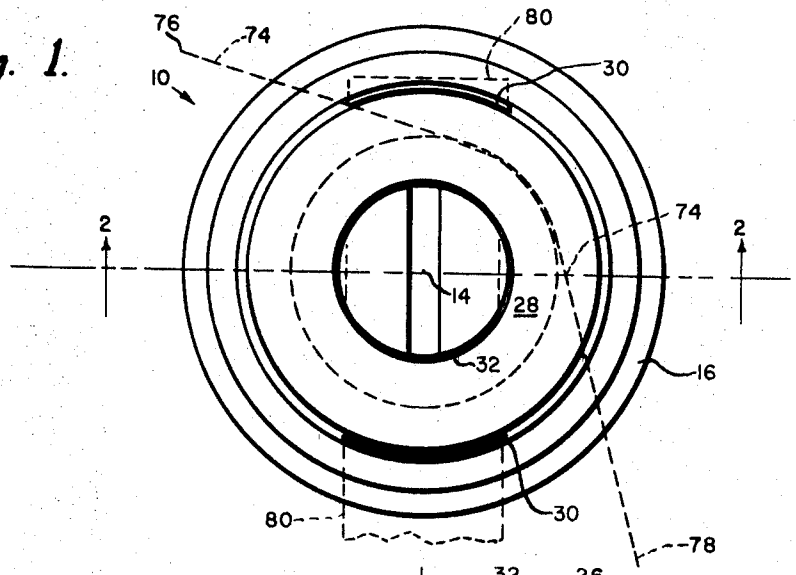


Fig. 2.

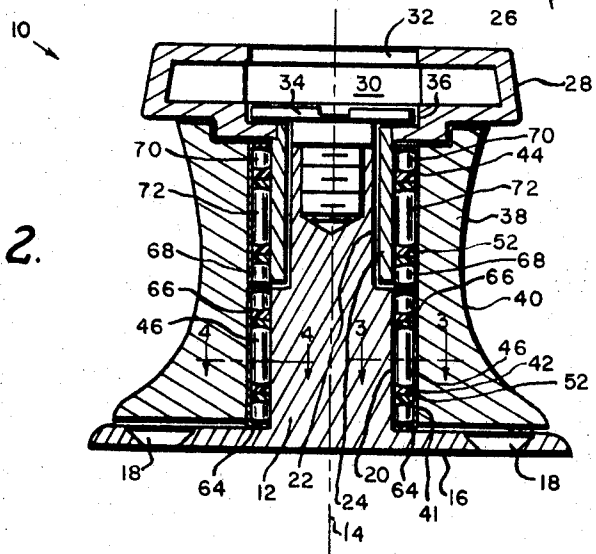
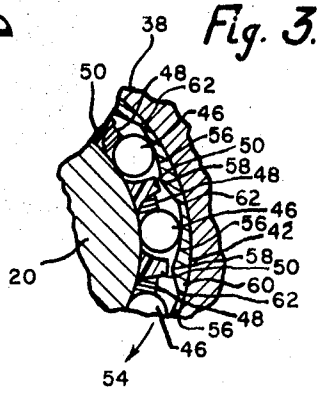


Fig. 3.



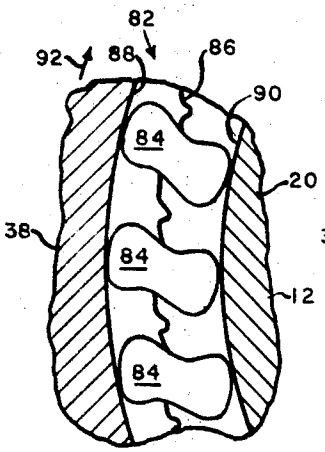


Fig. 4.

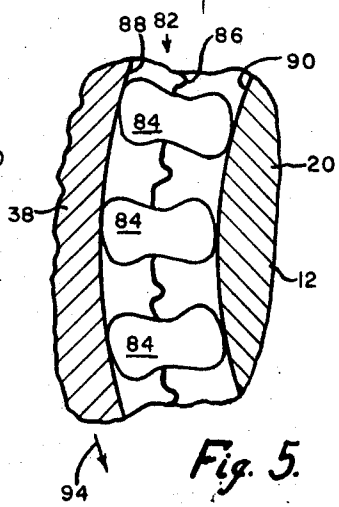


Fig. 5.

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Fig. 7

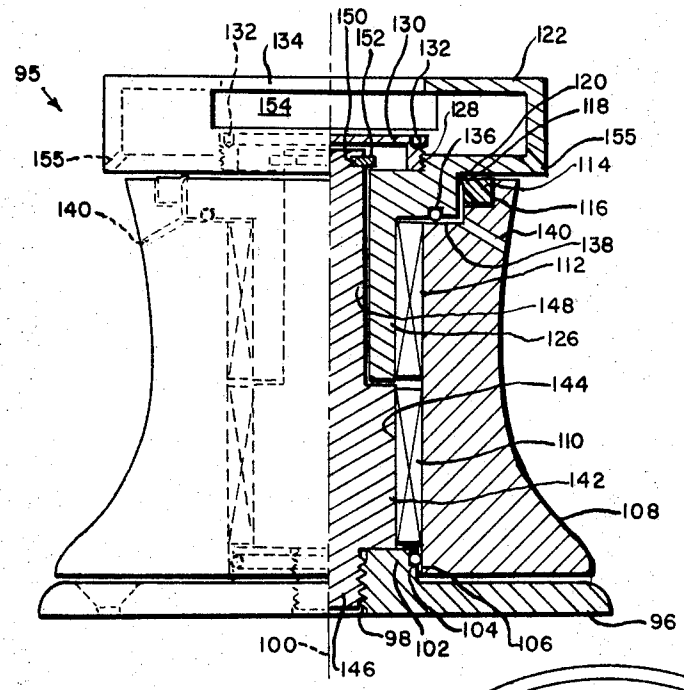


Fig. 6

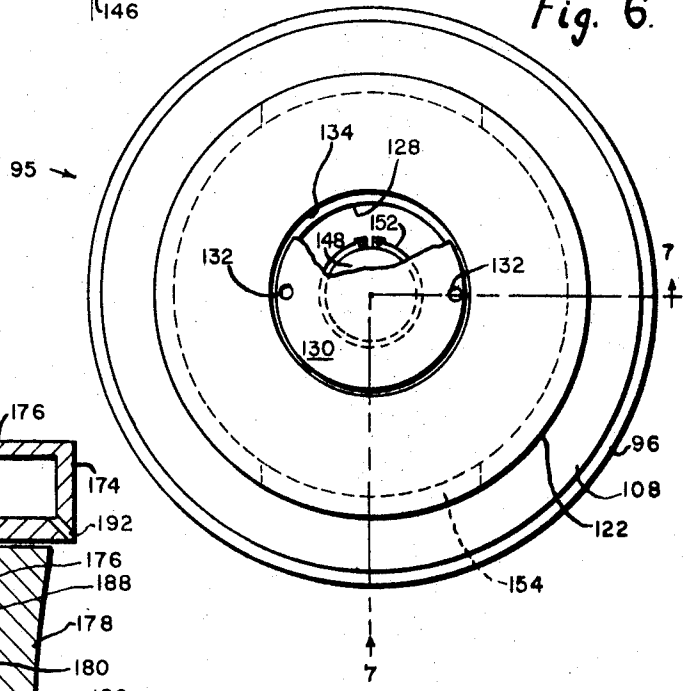
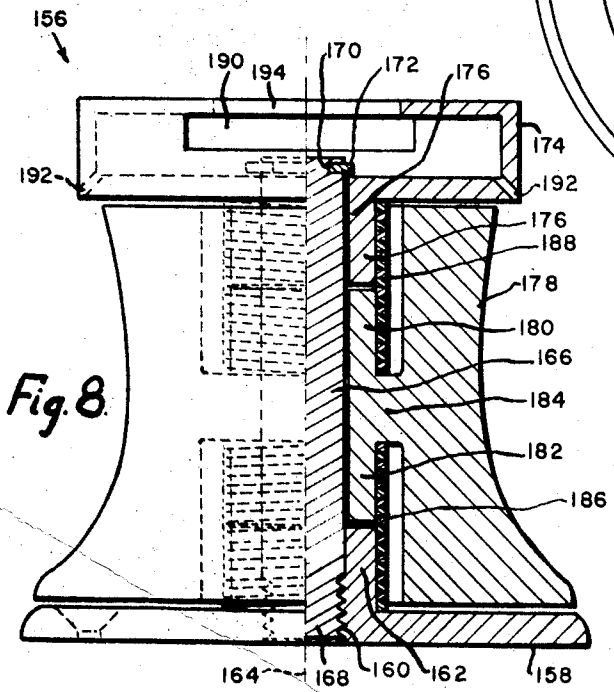


Fig. 8



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TORQUE AND BACKSTOP DEVICE FOR WINCHES

This invention relates to clutching devices and more particularly to clutching devices with positive backstop action and capacity for silently converting infinitely variable reciprocating motion to unidirectional motion creating improved winches and the like.

Heretofore, winches in general and particularly winches used to control the position of boat sails, by way of providing a means of controlling the sheet of a sail, have generally been undesirably noisy in operation. This undesirable noise is in the form of a loud audible clicking during rotational movement of the winch drum. Such clicking is not only disturbing to the quiet enjoyment of a peaceful sailing experience, but also a disadvantage in competitive sailing. In competitive race sailing, the audible clicking noise of the winch provides an undesirable giveaway signal of boat position and changing sail tactics to competitor boatmen.

The above mentioned undesirable clicking sound is caused by a ratchet or detent construction wherein the winch drum must be moved through a substantial minimum arc equal to at least the angular spacing of the detent latches. Thus a relatively large increment or arcuate movement of the winch drum is necessary for each sheet adjustment even through it is more desirable to have infinite positional locations of the winch drum possible so as to provide for more minute adjustment of the sail position.

The above problems and disadvantages have been overcome by the present invention of a positive backstop-type silent, infinitely variable reciprocating-to-unidirectional motion converter for winches and the like which also incorporates other desirable features and advantages. Among these other desirable features and advantages of the present invention is that of its ready adaptability not only to winches and capstans of substantially all types but also to general applicability to indexing and machine drives. Further desirable features include an inherent compactness of construction, relatively simple machine turning and boring operations for adapting components for operation therewith and adaptability for mass production.

A primary object of the present invention is the provision of a positive backstop-type silent infinitely variable reciprocating-to-undirection motion converter which is particularly adaptable for boat winches and the like.

Another object is the provision of an improved boat winch having capacity for substantially infinite positional locations of winch drum.

A further object is the provision of an improved winch having capacity for even minute adjustments of the winch drum and thereby of the sheet, halyard, preventer, vang and the like used therewith.

And a still further object is the provision of an improved winch which is silent in its operation.

Further objects include a structure which is compact, operable even under corrosive atmospheric conditions, and to the installation of which components may be adapted by relatively simple turning and boring machine operations.

These objects, features and advantages are achieved generally by the provision of a cylindrical spindle or center member having a longitudinal axis, a first torque-transmitting member fixed to the spindle, a second torque-transmitting member mounted for rotation about the axis, a first friction clutch having backstop action with respect to relative motion in one direction between the spindle and second torque-transmitting member for constraining the rotation of the second torque-transmitting member to a single direction about the axis, a third torque-transmitting member mounted for rotation about the axis, and a second friction clutch having backstop action with respect to relative motion in one direction between the third and second torque-transmitting members for constraining rotation of the third torque-transmitting member with respect to the second torque-transmitting member to a direction opposite the above mentioned single direction.

By making the clutches in the form of roller, sprag or helical spring clutches, readily available commercial clutches as well as precision in structure and operation with relatively easy minimal adaptive machining of components is thereby achieved.

By making the first torque-transmitting member in the form of a winch base adapted for rigidly holding the spindle on a reference support, the second torque-transmitting member in the form of a winch drum on the spindle and the third torque-transmitting member as a winch-lever-receiving structure, an improved winch with capacity for silent and infinite position adjustability of the drum and lever reciprocations is thereby achieved.

By providing a sealing cap over the spindle opening, O-rings and the like between parts surrounding the clutches, effective sealing of the clutches from even corrosive environments such as salt water is thereby achieved to permit even heat-treated carbon steels in the clutches.

By making the clutches of such material as stainless steel, titanium, beryllium-copper and the like, operation under corrosive conditions such as near sea water is achieved without the need for the above mentioned sealing structure.

These and other features, objects and advantages of the present invention will become more apparent from the following description taken in connection with the accompanying drawings and wherein:

FIG. 1 is a plan view of a preferred embodiment of a winch in accordance with the present invention and having a lever and line for use therewith schematically shown;

FIG. 2 is a cross-sectional view of the FIG. 1 embodiment taken on line 2–2 of FIG. 1;

FIG. 3 is a fragmentary view to enlarged scale taken on line 3–3 of FIG. 2 to more clearly show construction;

FIG. 4 is a fragmentary view to further enlarged scale showing an alternative clutch construction to that shown in FIG. 3;

FIG. 5 is a fragmentary view to the same scale of FIG. 4 showing a changed operating position of the clutch elements shown in FIG. 4;

FIG. 6 is a partially cutaway plan view showing a further alternative to the FIG. 1 embodiment;

FIG. 7 is a partial front elevation and partial cross-sectional view of the FIG. 6 embodiment taken on line 7–7 of FIG. 6;

FIG. 8 is a partial front elevation and partial cross-sectional view of a further alternative to the FIG. 1 embodiment.

Referring to the drawings in more detail, a preferred embodiment of an improved winch with backstop action, silent, infinitely variable reciprocating-to-unidirectional motion converter in accordance with the present invention is designated generally by the numeral 10 in FIGS. 1 and 2 respectively. The winch 10 has a cylindrical spindle or center member 12 with a longitudinal axis 14. The lower end of the spindle 12 has rigidly fixed thereto, by integral construction or attachment, a torque-transmitting member or base 16 having a plurality of tapered holes 18 preferably for screws to fasten the winch 20 to the deck of a boat or to other suitable support for torque and other loads as will be hereinafter further described.

The spindle 12 has a lower portion 20 of greater diameter than its upper portion 22 by an amount such that a sleeve 24 free to rotate about the periphery of the upper spindle portion 22 has an outside diameter preferably the same as the diameter of the lower spindle portion 20. The upper end of the sleeve 24 is rigidly fixed as by a press fit or brazing in an associated hole 26 in a torque-transmitting winch top structure 28. A rectangular lateral opening 30 in the winch top structure 28 is provided to receive a conventional lever for use as will hereinafter be further described.

The winch top structure 28 with its sleeve extension 24 forms a torque-transmitting member rotatively mounted on the upper portion 22 of the spindle 12. An opening 32 in the top of the winch top structure 28 permits insertion of a flat-headed screw 34 and carried in a threaded hole on the axis 14 in the top of the spindle 12. The head of the screw fits in recess 36 to clear the lever opening 30 and prevent axial movement

of the winch top structure 28 without impairing its rotational movement about the axis 14.

A winch drum 38 having a conventional outside or peripheral contour 40 has suitably fixed therein as by press fitting in an internal cylindrical bore or opening 41 two sets of drawn cup roller clutch and bearing assemblies 42 and 44 respectively which may be of the type commercially available from the Torrington Company, Torrington, Connecticut. The drawn cup roller clutch and bearing assemblies 42 and 44 may be identical in construction and preferably oriented for free rotation of the winch drum 38 clockwise with respect to the spindle 12 as viewed from the top of the winch 10. Thus clutch rollers 46 will have a backstopping action against the lower spindle portion 20 to prevent counterclockwise rotation of the winch drum 38 about the spindle 12. Also the sleeve extension 24 with the winch top structure 28 is free to rotate counterclockwise with respect to the winch drum 38 but will be prevented from rotating clockwise with respect to the winch drum 38 due to backstopping action of the clutch assembly 44 against the sleeve extension 24.

This backstopping action may be seen in FIG. 3 wherein clutch rollers 46 are continuously urged by yieldable spring elements 48, housed against crossbars 50 of a squirrel-cage-type retainer 52, in a clockwise direction 54. Thereby, the clutch rollers are yieldably urged along the gradual slopes or ramps 56 of the press-fitted assembly housing 60 in the direction of the respective peaks 58 of the drawn cup roller clutch-and-bearing assembly 42. Such yieldable urging results in the clutch rollers being in continuous contact with the periphery of the lower spindle portion 20 and respective ramps 56 so as to cause an immediate wedging or backstopping action with substantially no backlash or slippage in preventing counterclockwise movement of the winch drum 38 with respect to the spindle 12. On the other hand, for clockwise rotation of the winch drum 38 with respect to the spindle 12, the clutch rollers 46 tend to be released from wedging action as they ride toward the bottoms 62 of the ramps 56 of the drawn cup housing 60. The winch drum 38 is thereby free to rotate clockwise with respect to the spindle 12 but is prevented from even small amounts of counterclockwise movement with respect to the spindle 12 because of the above described back stopping of clutch rollers 46.

Because the wedging action of the clutch rollers 46 may produce substantial pressure against the periphery of the lower spindle portion 20 and ramps 56 depending upon the magnitude of counterclockwise torque on the winch drum 38, it is generally desirable to hardened clutch roller, ramp and spindle contact surfaces.

In the FIGS. 1 and 2 embodiment, the drawn cup clutch roller assembly 42 includes a set of conventional roller bearings 64 and 66 on respective ends of the clutch rollers 46 to enhance freedom of clockwise rotation of the winch drum 38 about the spindle 12. However ball bearing or sleeve bearing support for the winch drum may also be used.

As previously mentioned, the drawn cup clutch roller and bearing assembly 44 may be similar to the assembly 42 and have preferably roller bearing sets 68 and 70 similar to the bearing sets 64 and 66 for enhancing rotational freedom of the sleeve 24 and winch top structure 28. Since the clutch assembly 44 is oriented for operation in the same direction as the clutch assembly 42 it will follow the same operative relation with respect to sleeve 24 as described with respect to spindle 12 in connection with FIG. 3. Thus the rotation of sleeve 24 in a counterclockwise direction with respect to winch drum 38 may freely occur enhanced by roller bearings 68 and 70. However clutch rollers 72 provide a backstopping action to prevent even small clockwise rotation of the sleeve 24 with respect to the winch drum 38. This backstopping action causes the clockwise rotation of the winch top structure 28 and sleeve extension 24 to carry the winch drum 38 clockwise about the spindle 12 also. While the roller bearings 68 and 70 appear in the preferred embodiment, ball bearings or sleeve bearings may also be used, or in place thereof the upper spindle portion 22 may be used in conjunction with the inside bore surface of the sleeve 24 as bearing surfaces.

As in the case of clutch rollers 46 creating operating pressures from backstopping action explained above, the clutch rollers 72 and surfaces contacted thereby may come under heavy stress and are therefore preferably hardened surfaces.

In the operation of the winch 10, it is first secured to a suitable support such as the deck of a boat by screws through holes 18 in the base 16. A sheet or line 74, schematically shown by broken lines in FIG. 1, is wrapped around the periphery of the winch drum 38 in a clockwise direction as viewed from the top of winch 10. Because of the peripheral contour 40 of the winch drum 38, the wrapped portion of line 74 will tend to seek the portion of smallest diameter as shown in FIG. 1 wherein the end 76 is fastened to a sail or other line-tension-producing load (not shown). The free end 78 of the line 74 may be manually held for controlling the takeup or payout of line 74 at the fixed end 76. Tension caused by the load at the fixed end 76 will be transmitted to the periphery of the drum 38 by friction of the loop of line 74 about the winch drum 38 creating a counterclockwise torque. But the backstopping action of the clutch rollers 46 prevent the winch drum from counterclockwise rotation by this counterclockwise load torque. Therefore a relatively small tension force at the free end 78 is sufficient to hold the fixed end 76 stationary. By reducing the tension force at the free end 78 frictional slippage of the wrapped portion of line 74 about the winch drum will occur to effect a payout at the fixed end 76. Increasing the tension at the free end 78 beyond that at the fixed end 76 will cause the winch drum to rotate clockwise and take up line 74 at the fixed end 76. Such take up may be facilitated by inserting a conventional lever 80, shown schematically by broken lines in FIG. 1, through the lateral lever openings 30 in the winch top structure 28 and applying a clockwise torque to the winch top structure 28. Such clockwise lever torque will be transmitted through the backstopping action of the clutch rollers 72 to the winch drum 38 and will augment the clockwise torque from tension in the free end 78 of the line 74 to rotate the winch drum 38 clockwise and take up line 74 at the fixed end 76. The clockwise torque on the lever 80 may be continuous or intermittent by a reciprocating movement of the lever 80 of small or large arcuate increments as desired to effect small or large takeup increments of the winch drum 38 and corresponding takeup increments of the fixed end 76 of line 74. Only the clockwise portion of each reciprocating motion of the lever 80 is transmitted to the winch drum 38, for reasons explained above. Also, the backstopping and release action of the clutch rollers 46 and 72 being inherently silent, the above described movements and operation will be desirably silent.

While the above described operation of the winch 10 requires the line 74 being wrapped around the winch drum 38 in a clockwise direction, adaptation for counterclockwise wrapping of the line 74 may be made by reversing the cup drawn clutch and bearing assemblies 42 and 44.

The fragmentary views of FIGS. 4 and 5 show an alternative construction of clutching elements wherein the clutch rollers 46 and 72 with associated ramps 56, springs 48 and retainer 52 are replaced by sprag clutches 82 which include sprag elements 84 carried by a combined spring retainer and spacer 86 between the inner bore 88 of the winch drum 38 and the periphery 90 of the lower portion 20 of the spindle 12, and the periphery of the sleeve 24 in the case of replacement of clutch 72.

In FIG. 4 the sprag elements 84 are shown with a slight clockwise direction tilt permitting clockwise rotation 92 of the winch drum 38 with respect to the spindle 12. In FIG. 5 the sprag elements 84 are shown providing backstopping action by having become wedged between the winch drum bore surface 88 and periphery 90 of the spindle 12 and thereby preventing counterclockwise movement 94 of the winch drum 38 with respect to the spindle 12. Roller bearings such as 64 and 66, ball bearings or sleeve bearings as explained above in

connection with clutch rollers **46** may also be used with the sprag elements **84**.

Operation with the FIGS. **4** and **5** construction will be the same as that described in connection with the FIGS. **1** and **2** embodiment.

A further alternative winch structure having silent backstop clutching action and infinitely variable reciprocating-to-unidirectional motion conversion is shown in FIGS. **6** and **7**. Referring more particularly to FIGS. **6** and **7**, a winch designated generally by the numeral **95** has a base **96** which may be similar to the base **16** except in that it carries centrally thereof a threaded hole **98** concentric with a winch axis **100** and having a raised neck portion **102** about the axis **100**. The periphery of the raised neck portion **102** has a conventional groove and O-ring **104** with the O-ring engaging the inside cylindrical bore **106** of a winch drum **108** which may be similar to the winch drum **38**. The bore **106** is symmetrical about the axis **100** and has press fitted therein a pair of drawn cup roller clutch and bearing assemblies **110** and **112** which may be similar to the drawn cup and bearing assemblies **42** and **44** in FIG. **2** and similarly positioned for clockwise or counterclockwise operation as explained above in connection with FIG. **2**.

The upper end of the winch drum **108** is recessed and carries therein a flexible ring-shaped wiper element **114** in preferably a metal housing **116** pressed into position for holding the wiper **114** in place with a wiper tongue **118** engaging the undersurface **120** of a winch top structure **122** which may be similar to the winch top structure **28** except in that it has integral therewith a sleeve extension **126** and an internally threaded recess **128**. Screwed into the recess is a sealer cap **130** having spanner wrench holes **132** for facilitating fastening and removal of the sealer cap **130** through an opening **134** in top wall of the winch top structure **122**.

The winch top structure **122** also has a conventional groove and O-ring structure **136** with the O-ring engaging the top surface **138** of the winch drum **108**. The wiper tongue **118** prevents moisture from passing through the clearance area between the top of the winch drum **108** and the undersurface **120** of the winch top structure **122**. The O-ring structure **136** provides added protection against moisture reaching the clutch assembly **112**. drainage for any possible leakage past the wiper tongue **118** is provided by a plurality of sloping holes **140** about the winch drum **108**. For such purpose, the top surface **138** is also preferably sloped in the direction of the drainage holes **140**.

A winch spindle or center member **142** has a lower portion **144** of a diameter which is the same as the outside diameter of the sleeve extension **126** and of the proper dimension and finish for operation with the drawn cup roller clutch and bearing assemblies **110** and **112** respectively as described in connection with FIGS. **1** and **2**. The bottom end of the spindle **142** has a threaded screw **146** engaging the screw threads in the hole **98** so as to rigidly fasten the spindle **142** in place with its longitudinal axis coinciding with the axis **100**.

The spindle **142** has an upper reduced-diameter portion **148** receiving the sleeve extension **126** as a loose fit. The top of the spindle **142** has a groove **150** carrying a conventional retaining ring **152** overlapping the upper end of the sleeve extension **126** to prevent the winch top structure **122** from axial movement without interfering with rotary movement relative to the spindle **142**. The sealer cap **130** which may be of metal or plastic prevents moisture access to the spindle **142** and integral bearing surfaces of components thereon. The groove and O-ring structure **104** prevents moisture from rising to the internal winch structure through the clearance between the base **96** and bottom end of the winch drum **108**.

The top structure **122** has a lateral rectangular opening **154** for receiving a lever in manner similar to that described in connection with FIG. **2**. Sloping drain holes **155** are also provided about the winch top structure for removing moisture which may enter through the openings **134** and **154**.

The sealer cap **130**, wiper tongue **120** and O-rings **104** and **136** effectively seal the internal structure of the winch **95** so that the drawn cup roller clutch and bearing assemblies **110** and **112**, spindle **142** and sleeve **126** may be hardened carbon steel for maximum load capability of the winch **95**. While the sleeve **126** is shown as an integral part of the winch top structure **122**, it may also be a separate member pressed or otherwise fastened in place as described in connection with the sleeve **24** in FIG. **2**. Thus the sleeve **126** may be of case hardened or other heat-treatable steel while the winch top structure may be of cast aluminum, brass, bronze or other suitable material which also may be used for the base **96** and winch drum **108**.

Operation of the winch **95** is the same as that described above in connection with FIGS. **1** and **2**. The threads **98** are preferably left-hand threads when the drawn cup roller clutch and bearing assemblies **110** and **112** are positioned for clockwise rotation of the winch drum **108** as viewed from the top of the winch **95**. The threads **98** are preferably right-hand threads when the drawn cup roller clutch and bearing assemblies **110** and **112** are positioned for counterclockwise rotation of the winch drum **108**. Thus backstopping action of the clutches **110** and **112** tend to further tighten the screw **146** in the threads **98**. A pin through the screw threads **98** or other suitable locking means may also be used.

Another embodiment of an improved winch having silent backstopping action with infinitely variable reciprocating-to-unidirectional motion conversion in accordance with the present invention is shown in FIG. **8** and designated generally by the numeral **156**. The winch **156** has a base **158** with a threaded hole **160** and upwardly extending sleeve **162** having an axis coincident with a winch **156** axis **164**. A cylindrical spindle or center member **166** has a threaded end **168** engaging the threaded hole **160** to hold the spindle **166** in place on the base **158** with its longitudinal axis coinciding with the winch axis **164**.

The other end of the spindle **166** has a groove **170** about its periphery and carrying a conventional retainer ring **172** which overlaps the top end of a sleeve **176** to thereby prevent its axial movement without impairing its rotational freedom about the spindle **166**. The sleeve **176** is rigidly fixed to, as by being an integral part of, a winch top structure **174** which may be similar to the winch top structure **122** of FIG. **7**.

A winch drum **178** having an upwardly projecting sleeve **180** and a downwardly projecting sleeve **182** between the lower end of sleeve **176** and the upper end of the sleeve **162** respectively and rotatively carried on the spindle **166** is fixed by a web or land **184** to the outer portion of the winch drum **178**. The sleeves **180** and **182** and land **184** thereby mount the winch drum **178** on the center portion of the spindle **166** for rotation about the winch axis **164**. A coil spring clutch **186** is carried about the outer periphery of the base sleeve **162** and winch drum sleeve portion **182**. The spring **186** is wound with a right-hand helix and an inside diameter such that when no torque exists between the winch drum **178** and base **158** a light engagement exists between the spring **186** and sleeves **162** and **182**. The friction from this light engagement tightens the spring against the sleeves **162** and **182** when a counterclockwise torque is applied to the winch drum with respect to base **158** and thereby provides a backstopping action which prevents counterclockwise rotation of the winch drum **178**. Whereas a clockwise torque applied to the winch drum **178** tends to unwind the spring **186** so as to reduce its frictional grip on the periphery of the sleeves **162** and **182**, thereby permitting clockwise rotation of the winch drum **178** about the spindle **166**.

Another clutch spring **188** with a left-hand helix is similarly carried on the sleeves **180** and **176**. Thus a clockwise torque with respect to winch drum **178** on the winch top structure **174** causes the spring to tighten in a backstopping action to prevent relative rotation between the winch top structure **174** and winch drum **178**. Whereas a counterclockwise torque on the winch top structure **174** with respect to the winch drum

178 tends to unwind the spring 188 and allow counterclockwise rotation of the top structure 174 with respect to the winch drum 178. Therefore with a sheet or line such as the line 74 wrapped around the winch drum 178 in clockwise direction as described with respect to FIG. 1, and a lever such as the lever 80 of FIG. 1 inserted in a similar slot 190 in the winch top structure 174, operation of the winch 156 will be substantially the same as that described in connection with the FIG. 1 embodiment.

By reversing the helixes of the clutch springs 186 and 188, the winch 156 is thereby adapted for counterclockwise operation with lines such as the line 74 being wrapped around the winch drum 178 in a counterclockwise direction as viewed from the top of the winch 156.

While clutch springs 186 and 188 are shown as being of rectangular cross section for obtaining maximum contact area and thereby minimum stress concentration on the periphery of the respective sleeves 162, 182, 180 and 176 during loading, clutch springs of circular or other cross-sectional configuration may also be used. Drainage holes 192 are provided in the winch top structure 174 to prevent accumulation of moisture. A top opening 194 is also provided to facilitate assembly or removal of the retaining ring 172.

This invention is not limited to the specific details of construction and operation described as equivalents will suggest themselves to those skilled in the art.

What I claim is:

1. In a backstop-action-type silent infinitely variable reciprocating-to-unidirectional motion converter, the combination of a cylindrical spindle having a cylindrical periphery symmetrical about a longitudinal axis, a first torque-transmitting member fixed to said spindle, a second torque-transmitting member mounted for rotation about said axis and having a cylindrical bore symmetrical about said axis, a first combined drawn cup roller clutch and bearing assembly fixed in the bore of said second torque-transmitting member in operative relation to said bore and periphery to effect backstop action with respect to relative motion in one direction between said spindle and second torque-transmitting member for constraining said rotation with respect to said spindle to a single direction about said axis, a third torque-transmitting member mounted for rotation about said axis and having a portion with a cylindrical periphery symmetrical about said axis, and a second combined drawn cup roller clutch and bearing assembly fixed in the bore of said second torque-transmitting member in operative relation to said bore and last mentioned periphery to effect backstop action with respect to relative motion in one direction between said third and second torque-transmitting members for constraining said third torque-transmitting member to a direction opposite said single direction.

2. The combination as in claim 1 wherein said cylindrical spindle has two ends, said first torque-transmitting member is a winch base rigidly engaging one of said ends and adapted for mounting to a reference support, and said second torque-transmitting member is a winch drum.

3. The combination as in claim 2 wherein said third torque-transmitting member is adapted for receiving a lever for application of torque thereto about said axis.

4. The combination as in claim 2 wherein said third torque-transmitting member is a winch top structure at said other end of said spindle and adapted for receiving a lever for manual application of torque thereto about said axis.

5. The combination as in claim 4 wherein both said clutches are in the form of combined drawn cup roller clutch and roller bearing assemblies with each assembly having said roller clutch between two spaced-apart sets of roller bearings.

6. The combination as in claim 5 having additionally sealing means between said relative moving members and positioned for preventing moisture from reaching said clutches.

7. In a backstop-type silent infinitely variable reciprocating-to-unidirectional motion converter, the combination of a cylindrical spindle with two ends, a longitudinal axis, a lower portion adjacent one end and a smaller diameter upper portion adjacent the other end; a winch base rigidly fixed to one end of said spindle adapted for mounting to a reference support; a winch drum having a cylindrical bore symmetrical about said axis and carrying with a press fit therein two combined drawn cup roller clutch and bearing assemblies with each assembly having a roller clutch between two spaced-apart sets of roller bearings and one of said assemblies in operative engagement with said lower spindle portion and having backstop action with respect to relative motion in one direction between said spindle and winch drum for constraining said rotation with respect to said spindle to a single direction about said axis; a winch top structure adapted for receiving a lever for application of torque thereto about said axis and having a sleeve extension on said upper spindle portion for rotation about said axis and a periphery in operative engagement with the other combined drawn cup roller clutch and bearing assembly with backstop action in respect to relative motion in one direction between said winch top structure and winch drum for constraining said winch top structure rotation with respect to said winch drum to a direction opposite said single direction.

8. The combination as in claim 7 wherein said spindle has at said other end a peripheral groove with a retaining ring carried therein for constraining said winch top structure to rotary movement about said axis.

9. The combination as in claim 7 having additionally a screw extending into said upper spindle portion along said axis for constraining said winch top structure to only rotary movement about said axis.

10. In a winch, the combination of an elongated spindle having two ends and a cylindrical periphery symmetrical about a longitudinal axis, a base rigidly engaging one of said ends and adapted for mounting said winch to a reference support, a winch drum having a cylindrical bore symmetrical about said axis and mounted on said spindle for rotation about said axis, and a combined drawn cup roller clutch and bearing assembly fixed in said bore of said winch drum in operative relation to said periphery and bore to effect a backstopping relation to relative movement in one direction between said winch drum and spindle for providing confinement of said rotation to a single direction about said axis.

11. In a backstop-type silent infinitely variable reciprocating-to-unidirectional motion converter, the combination of a cylindrical spindle with two ends, a longitudinal axis, a lower portion adjacent one end and a smaller diameter upper portion adjacent the other end; a winch base rigidly fixed to one end of said spindle and adapted for mounting to a reference support; a winch drum having a cylindrical bore symmetrical about said axis and carrying with a press fit therein two combined drawn cup roller clutch and bearing assemblies with one of said assemblies in operative engagement with said lower spindle portion and having backstop action with respect to relative motion in one direction between said spindle and winch drum for constraining said rotation with respect to said spindle to a single direction about said axis; a winch top structure adapted for receiving a lever for application of torque thereto about said axis and having a sleeve extension on said upper spindle portion for rotation about said axis and a periphery in operative engagement with the other combined drawn cup roller clutch and bearing assembly with backstop action in respect to relative motion in one direction between said winch top structure and winch drum for constraining said winch top structure rotation with respect to said winch drum to a direction opposite said single direction; said spindle having at said other end a peripheral groove with a retainer ring carried therein for constraining said winch top structure to a rotary movement about said axis; and a sealing cap over said other end and an O-ring sealing structure engaging said winch drum above said other clutch assembly; and an O-ring sealing structure engaging said winch drum beneath said one clutch assembly.

12. In a backstop-type silent infinitely variable reciprocating-to-unidirectional motion converter, the combination of a

cylindrical spindle with two ends, a longitudinal axis, a lower portion adjacent a screw thread at one end and a smaller diameter upper portion adjacent the other end; a winch base adapted for mounting to a reference support and having a threaded hole about said axis engaging said screw thread for rigidly fixing said base to said one end of the spindle; a winch drum having a cylindrical bore symmetrical about said axis and carrying with a press fit therein two combined drawn cup roller clutch and bearing assemblies with one of said assemblies in operative engagement with said lower spindle portion and having backstop action with respect to relative motion in one direction between said spindle and winch drum for constraining said rotation with respect to said spindle to a single direction about said axis; a winch top structure adapted for receiving a lever for application of torque thereto about said axis and having a sleeve extension on said upper spindle portion for rotation about said axis and a periphery in operative engagement with the other combined drawn cup roller clutch and bearing assembly with backstop action with respect to relative motion in one direction between said winch top structure and winch drum for constraining said winch top structure rotation with respect to said winch drum to a direction opposite said single direction; said spindle having at said other end a peripheral groove with a retainer ring carried therein for constraining said winch top structure to a rotary movement about said axis; and said base and spindle screw threads being of a direction tending to tighten said spindle to said base in the backstopping action direction of said one clutch assembly.

13. In a backstop-type silent infinitely variable reciprocating-to-unidirectional motion winch, the combination of a spindle having a cylindrical periphery symmetrical about a longitudinal axis, a winch base rigidly fixed to said spindle and adapted for mounting to a reference support; a winch drum having a cylindrical bore symmetrical about said axis and carrying fixed therein two roller clutch and bearing assemblies with one of said assemblies in operative engagement with said spindle periphery and cylindrical bore for providing backstop action with respect to relative motion in one direction between said spindle and winch drum for constraining rotation with respect to said spindle to a single direction about said axis, a third winch member adapted for receiving a lever for application of torque thereto about said axis and having a portion with a cylindrical periphery symmetrical about said axis, the other roller clutch and bearing assembly being in operative engagement with said cylindrical bore and last mentioned cylindrical periphery for providing backstop action with respect to relative motion in one direction between said third winch member and winch drum for constraining said third winch member rotation with respect to said winch drum to a direction opposite said single direction.