United States Patent

[11] 3,618,896

[72] Inventor **Richard W. Bewley**
P.O. Box 531, Southport, Conn. 06490

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[54] **RATCHET WINCHES**
14 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **254/150,** 254/186, 74/405
[51] **Int. Cl.** **B66d 1/30**
[50] **Field of Search** ..... 254/150, 186 HC; 114/218; 74/405

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Primary Examiner—Harvey C. Hornsby
Assistant Examiner—Merle F. Maffei
Attorney—H. Gibner Lehmann

ABSTRACT: Direct-drive and gear-drive winches comprising a base for securement to a boat deck, said base having an upstanding post on which a winch drum is journaled. At the top of the drum there is a socket member adapted to receive a driving plug of a crank handle by which power is applied to the winch drum. The socket member, also journaled on the upstanding post of the base, either directly or through ring gearing drives one of a pair of ratchet wheels the other of which is connected to the drum, to effect rotation in one direction. In different embodiments, the drum and base have cooperable ratchet wheels constituting back checks. In one gear-driven embodiment of the invention the socket member and a central drive pinion have cooperable ratchet wheels, the pinion engaging idler gears on the base which in turn engage the drum through a ring gear carried thereby. The ratchet wheels provide for direct drive when the socket member is turned on one direction, and for a gear-reduction drive when the socket member is turned in the opposite direction. In another geared embodiment of the invention the socket member has a drive pinion engaging idler gears carried on a turnable spider, said idler gears engaging a ring gear of the stationary base. The turnable spider can have a direct drive of the winch drum through a pair of cooperable ratchet wheels, or it can be geared to the drum by other ratchet wheels and a second central drive pinion carried by the base. The second drive pinion engages idler gears turnably carried by the base, which latter gears in turn engage an internal ring gear on the winch drum. Turning of the socket member in one direction effects a gear drive having one specified ratio, and turning of the socket member in the opposite direction effects a gear drive to the winch drum having another ratio.

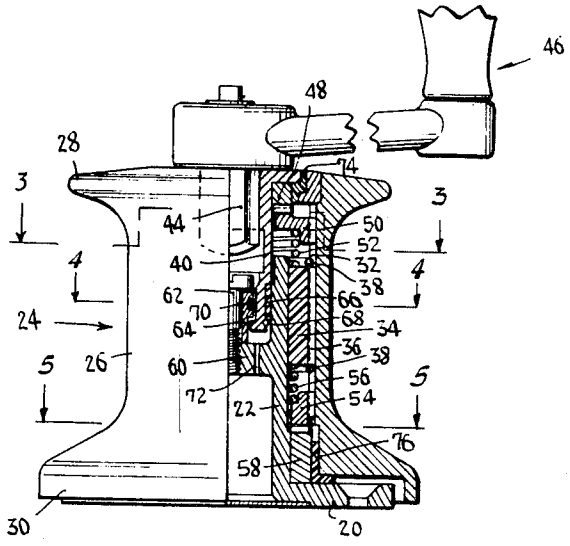


Fig. 1

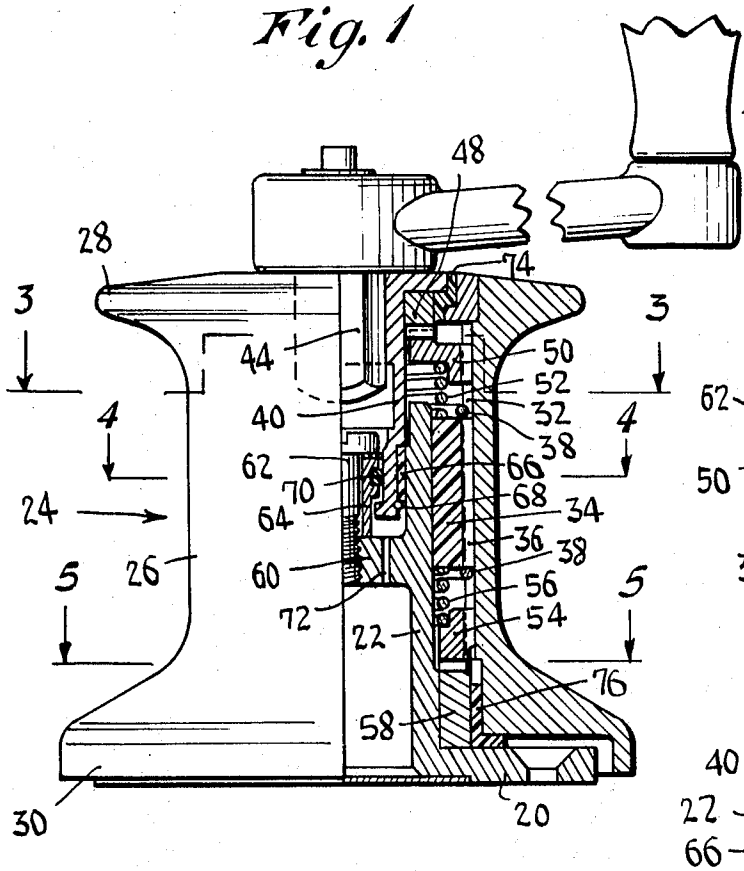


Fig. 3

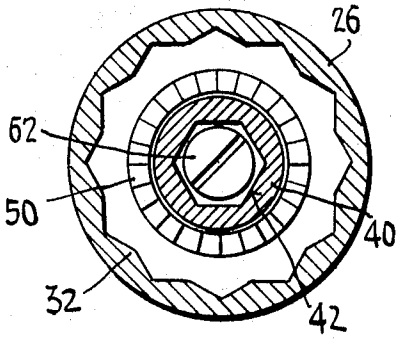


Fig. 4

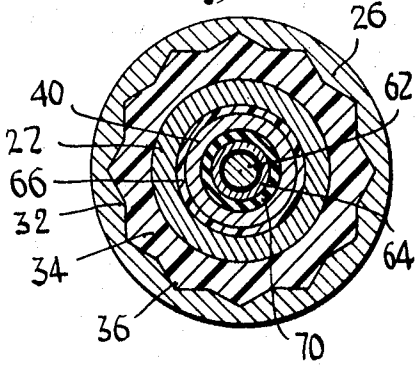


Fig. 2

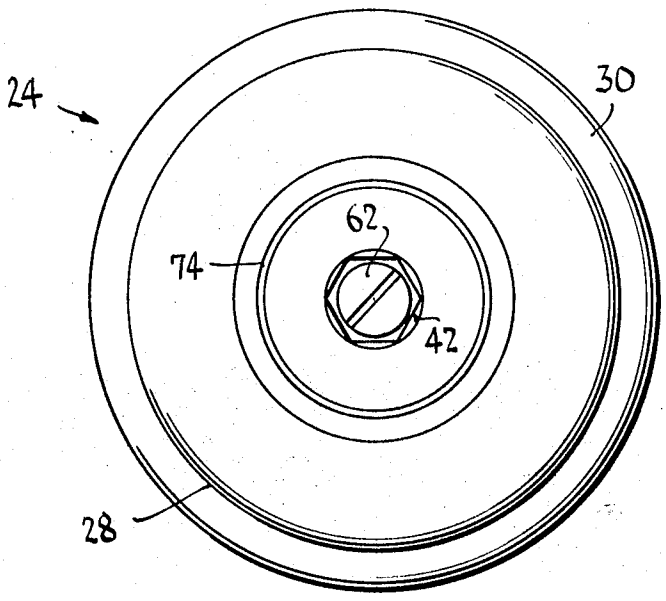
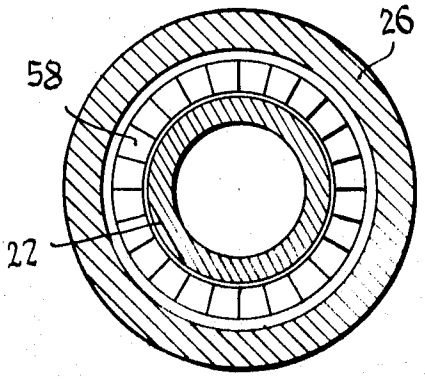


Fig. 5



INVENTOR.
Richard W. Bewley
BY
H. Gibbs Ehmann
AGENT

Fig. 6

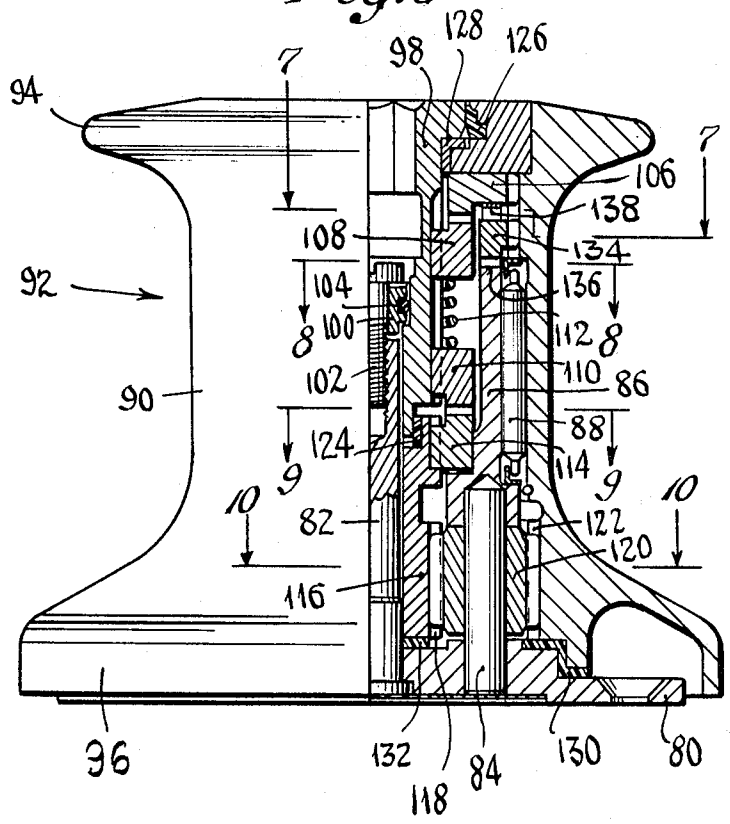


Fig. 7

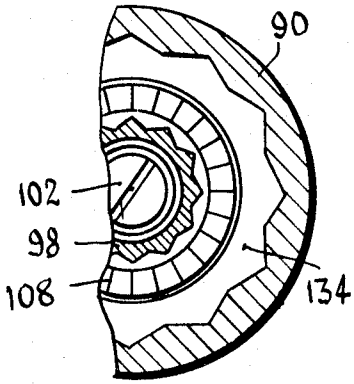


Fig. 8

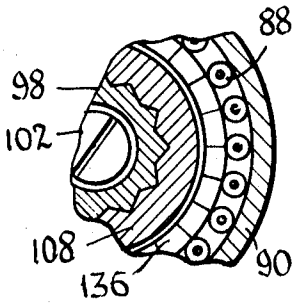


Fig. 10

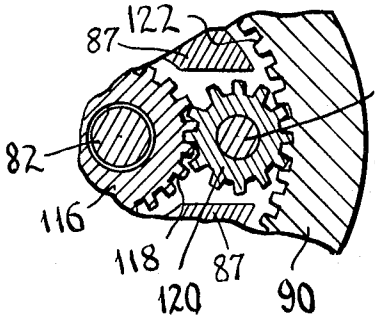
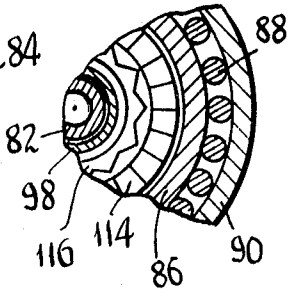


Fig. 9



INVENTOR.
Richard W. Bewley

BY
A. Gibner Schumann
AGENT

Fig. 11

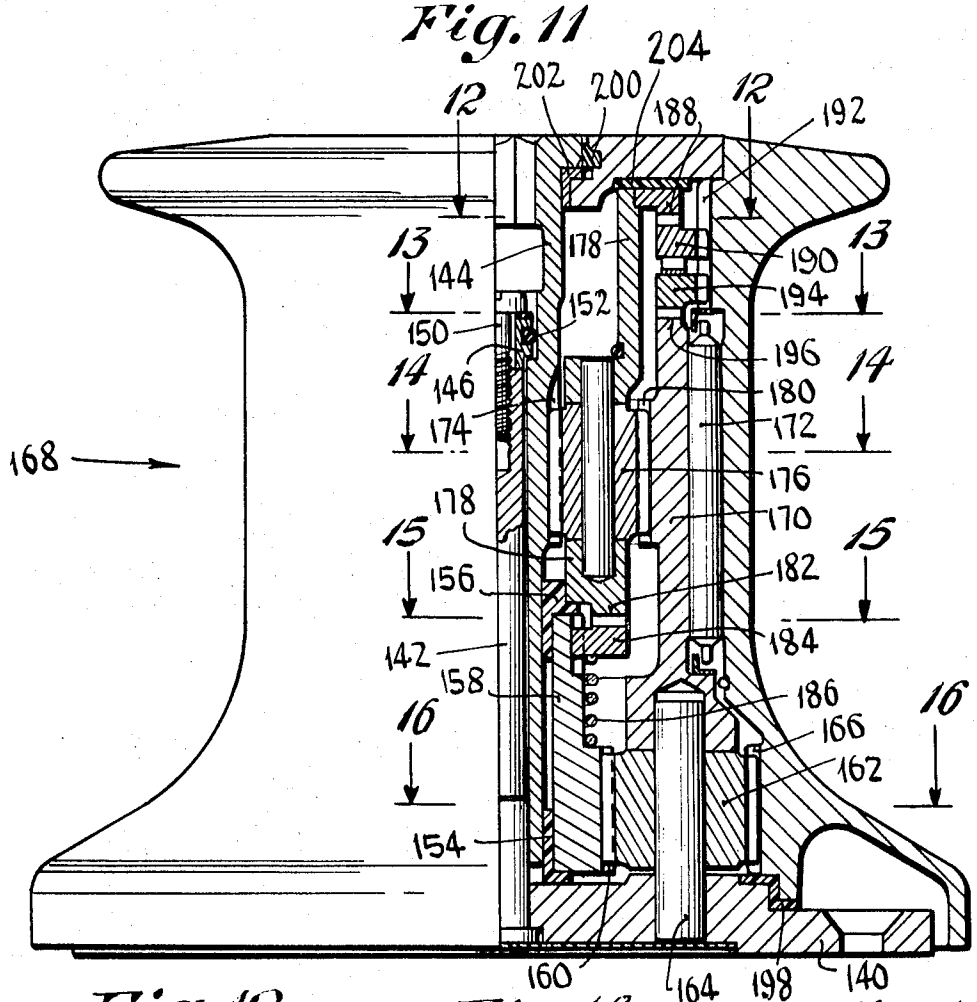


Fig. 12

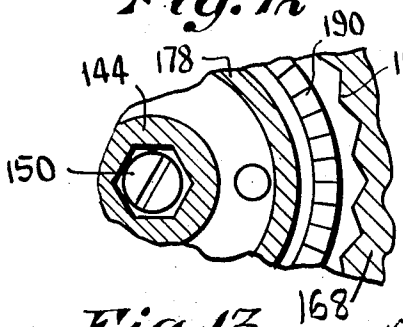


Fig. 14

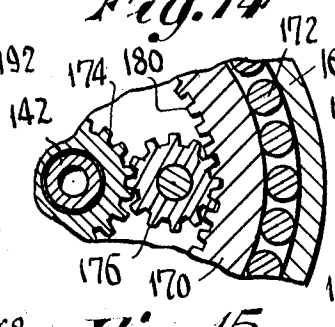


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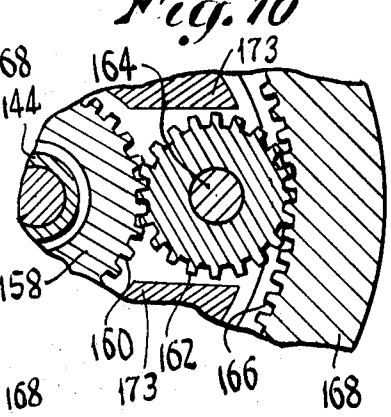


Fig. 13

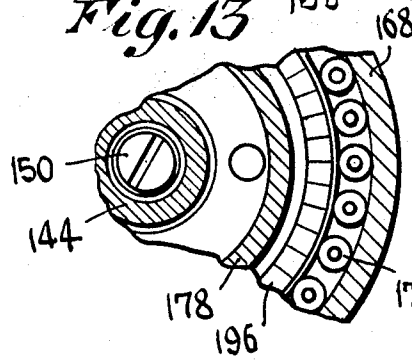
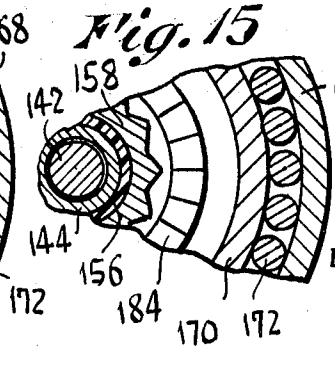


Fig. 15



INVENTOR.
Richard W. Bewley
BY
H. Gibner Lehmann
AGENT

RATCHET WINCHES

BACKGROUND

This invention relates to winches for use on boats and the like, and more particularly to gear drive and direct drive winches having ratchet mechanisms, especially winches intended to be hand powered. Heretofore, hand-powered winches employed pawls (small pivoted arms) which engaged ratchet wheels to effect the drive and back-check actions. While this conventional arrangement was as a rule satisfactory, it was not very compact or saving of space, nor did it possess especially great strength. Moreover the assembly of the pawl to the associated part was not as easy or quick as might be desired where pricing considerations were involved.

SUMMARY

The above shortcomings and drawbacks of prior direct drive and gear drive winches are obviated by the present invention, one object being the provision of an improved winch of the kind indicated wherein a simple and effective novel ratchet mechanism is incorporated, making for greater compactness and smaller size, as well as greater strength and easier assembly. This is accomplished by the provision of pairs of ring-shaped or annular ratchet members and splined drives therefor. The winch drum has a splined bore engageable with one or more of the ratchet members, to control its movements. By such organization the number of parts and gears are reduced, and there is effected not only a sturdy and reliable organization but also one which is saving of space and economical to produce. By the use of axially slidable, splined annular ratchets the manufacture and assembly of the various parts is also speeded and simplified.

Other objects and features of the invention reside in the provision of an improved ratchet winch as above set forth, which is smooth-acting, simple to install and operate, and which can be produced in a direct drive, or a gear drive instantly providing different ratios as may be required by the conditions of use. Other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is a view partly in side elevation and partly in axial section, illustrating a direct-drive, back-check-type ratchet winch constituting one embodiment of the invention.

FIG. 2 is a top plan view of the winch of FIG. 1.

FIG. 3 is a horizontal section taken on the line 3—3 of FIG. 1.

FIG. 4 is a horizontal section taken on the line 4—4 of FIG. 1.

FIG. 5 is a horizontal section taken on the line 5—5 of FIG. 1.

FIG. 6 is a view partly in side elevation and partly in axial section, illustrating a two-speed ratchet winch constituting another embodiment of the invention.

FIG. 7 is a horizontal section taken on the line 7—7 of FIG. 6.

FIG. 8 is a horizontal section taken on the line 8—8 of FIG. 6.

FIG. 9 is a horizontal section taken on the line 9—9 of FIG. 6.

FIG. 10 is a horizontal section taken on the line 10—10 of FIG. 6.

FIG. 11 is a view partly in side elevation and partly in axial section, of a two-speed, gear-reduction-type ratchet winch constituting yet another embodiment of the invention.

FIG. 12 is a horizontal section taken on the line 12—12 of FIG. 11.

FIG. 13 is a horizontal section taken on the line 13—13 of FIG. 11.

FIG. 14 is a horizontal section taken on the line 14—14 of FIG. 11.

FIG. 15 is a horizontal section taken on line 15—15 of FIG. 11.

FIG. 16 is a horizontal section taken on the line 16—16 of FIG. 11.

Considering first FIGS. 1–5, the ratchet winch illustrated therein comprises a flat circular base 20 having an upstanding central hollow portion or post 22 on which there is journaled a drum 24 having a body portion 26 and upper and lower flange portions 28, 30 respectively.

In accordance with the present invention, the drum 24 is provided with a fluted or splined bore, shown as having axially extending V-section ridges 32. In the bore of the drum 24 there is a bearing bushing 34 preferably constituted of Teflon or other suitable plastic having good bearing qualities and mechanical strength. The bushing 34 is turnably carried on the upright post 22 of the base 20, and the outer periphery of the bushing has splines or ribs 36 which mesh with the ribs 32 of the drum 24 to effect a splined or keyed connection between the drum and bushing. Metal snap rings 38 are accommodated in internal grooves in the splined bore of the drum 24 to position the bushing 34 and hold it against axial movement.

Turnably carried in the upper portion of the post 22 is a socket member 40 having an hexagonal socket 42 adapted to accommodate a similar-section plug 44 of a crank handle 46. In accordance with the invention, a novel, compact and easily assembled drive is provided from the member 40 to the drum 24. In effecting this the socket member 40 rigidly carries a toothed annulus or ring 48 constituting a ratchet, which is cooperable with a toothed ratchet annulus 50 whose outer periphery has splines cooperable with the splines 32 of the drum 24. A helical coil spring 52 engages the upper end of the bearing bushing 34 and the underside of the ratchet annulus 50, yieldably urging the latter upward to maintain engagement between the teeth thereof and the teeth of the ratchet 48. By such construction a sturdy yet simple unidirectional drive is effected between the socket member 40 and the winch drum 24.

The invention also provides a splined, ratchet type back-check organization comprising a toothed annulus 54 which is splined to the bore of the drum 24 and is engaged by a helical coil spring 56 engaging the bottom end of the bushing 34. The ratchet annulus 54 engages a cooperable toothed annulus 58 rigidly affixed to the base 20 at the bottom of the upright post 22. By such arrangement a back-check action is had, preventing retrograde movement of the drum 24 when driving power is not being applied to the crank handle 46.

The upright post 22 of the base has a transverse inner wall 60 which is bored and threaded to receive a screw 62 on which there is carried a bearing bushing 64. Cooperable shoulders on the bushing 64 and socket member 40 limit the upward axial movement of the latter, as will be understood. A Teflon bearing annulus 66 is disposed between the socket member 40 and the inside of the upright post 22, being retained on the socket member by means of a split ring 68. The bearing bushing 64 carries an O-ring 70 by which a seal is effected between the member 40 and the bushing 64. Thus, in conjunction with the seal effected by the Teflon ring 66 effectively prevents moisture and other foreign matter from gaining entrance to the space occupied by the driving and back-check ratchets. A drain hole 72 may be provided in the transverse wall 60 of the upright post 22 to permit drainage of any liquid which might seep past the O-ring 70.

Between the upper ends of the drum 24 and socket member 40 there is provided a stepped or shouldered annulus 74 constituting a sealing ring. A Teflon bottom seal is provided, comprising an annulus 76 of angular cross section, engaged with the bottom end of the drum 24 and with the base 20.

It will now be understood that turning of the socket member 40 in the direction which renders the upper ratchet rings drivingly operative will cause the drum 24 to be driven in such direction. The lower set of ratchet rings will click past each other during such driving movement. At any time that the drive is terminated, the lower set of ratchet rings will take over to prevent retrograde turning of the drums 24. The organization as provided in FIGS. 1–5 is seen to be extremely compact, occupying relatively little space. At the same time, the drive is sturdy and effective, and the various parts thereof are well protected against the entrance of water, dirt and the like.

Another embodiment of the invention is illustrated in FIGS. 6–10. There is here provided base 80 having a central upright post 82 and a stationary sleeve 86 as well as a plurality of stub shafts 84 disposed in a circle about the center. The sleeve 86 has downwardly extending portions 87 (see FIG. 10) which are secured, as by welding, to the base 80. Surrounding the sleeve 86 is a roller bearing assemblage 88 which also engages the bore of the body portion 90 of a winch drum 92 having upper and lower flange portions 94, 96 respectively.

Mounted in the upper portion of the drum 92 is a socket member 98 which is journaled on a bushing 100 clamped to the upright post 82 of the base by a screw 102 threaded into the central upright post 82. The bushing 100 has a sealing O-ring 104.

The drum 92 has a toothed ratchet annulus or ring 106 which is engageable with a cooperable toothed ratchet ring 108, the latter being loosely splined to the socket member 98. A second toothed ratchet ring 110 is also loosely splined to the socket member 98, both said rings being yieldably urged apart by a helical compression spring 112. The lower ratchet ring 110 is engageable with a toothed ratchet ring 114 which is carried by a sleeve 116 turnable on the central post 82 of the base. The sleeve 116 has a drive pinion 118 which is engageable with idler gears 120 carried on the stub shafts 84. The idler gears 120 in turn engage a ring gear 122 on the inside of the drum 92. There is a Teflon bearing ring 124 between the socket member 98 and the sleeve 116. Also, a resilient sealing ring 126 is provided between the socket member 98 and the upper portion of the drum 92, and a metal bearing ring 128 is provided below the sealing ring 126.

At the bottom of the drum 92 a shouldered Teflon sealing ring 130 is provided, and a flat Teflon thrust washer 132 is disposed between the bottom end of the sleeve 116 and the base 80.

With the above organization, a direct drive is established, by means of the ratchets 106 and 108, between the socket member 98 and the drum 92 when the member is turned in one direction. A back-check is provided, comprising an annular ratchet member 134 engageable with ratchet teeth 136 on the sleeve 86, said ratchet member being yieldably urged downward by a spring washer 138 disposed between it and the ratchet ring 106.

The back-check ratchets 134, 136 prevent retrograde movement of the drum 92 when the turning force is removed from the socket member 98. If, however, the socket member 98 should be turned in the opposite direction, the ratchets 110, 114 will become effective, establishing a drive to the pinion 118 whereby the drum 92 is driven through the intermediary of the idler gears 120. By such action a low gear ratio is established, enabling more power to be applied to the drum 92.

It will now be understood that the above organization, which utilizes the splined ratchet rings, constitutes a very compact assemblage which can be made to occupy small space while at the same time functioning as a sturdy and rugged, reliable means for effecting a two-speed drive to the drum 92.

Yet another embodiment of the invention is illustrated in FIGS. 11–16. In these FIGS. there is shown a base 140 having a central upright post 142 on which there is turnable a socket member 144. A bearing bushing 146 carried by a screw 150 threaded into the post 142 journals the socket member 144, there being a sealing O-ring 152 in the bushing 146. At its bottom end the socket member 144 is engaged by an annular bearing ring 154 which surrounds its exterior surface. Intermediate its ends, the socket member 144 has a bearing bushing 156. The bushings 154 and 156 journal a sleeve 158 having a driving pinion 160 which engages idler gears 162 carried on stub shafts 164 rigid on the base 140. The idler gears 162 engage a ring gear 166 at the inside of the winch drum 168.

The stub shafts 164 are mounted in a stationary sleeve member 170 which is disposed in spaced relation to a smooth inside bore of the drum 168, there being interposed a roller bearing assemblage 172 by which the drum is supported for rotation on the base. The sleeve member 170 has depending portions 173 (see FIG. 16) which are attached to the base 140. Intermediate its ends, the socket member 144 has a drive pinion 174 engaged with idler gears 176 carried by a rotary cage 178 which has a bearing at its lower portion on the bearing ring 156. The idler gears 176 engage a ring gear 180 on the inside of the sleeve 170. The cage 178 has ratchet teeth 182 engageable with an annular ratchet member 184 which is slidably splined to the sleeve 158 and yieldably urged upward by a helical compression spring 186. The cage 178 carries at its upper extremity an annular clutch member or ratchet 188 which is engageable with a cooperable ratchet ring 190 splined to and slidable in the drum 168, the latter having splines 192 for this purpose. A second ratchet ring 194 engaging the splines 192 has teeth engaging cooperable teeth 196 at the upper periphery of the sleeve 170.

Between the lower portions of the base 140 and drum 168 there is provided a shouldered Teflon sealing ring 198. A shouldered annular resilient ring 200 engages the socket member 144 and the drum 168 to provide a seal therebetween. Also, a shouldered bearing bushing 202 is provided between these parts. A flat washerlike Teflon bearing washer 204 is provided between the upper periphery of the cage 178 and the inner top surface of the drum 168, to provide a bearing for the cage.

Operation of the winch shown in FIGS. 11–16 is as follows: When the crank handle is inserted in the socket 144 and turned in one direction to effect driving engagement between the ratchets 188, 190, the winch drum 168 will be driven by means of such ratchets and the cage 178 which later is driven through its idler gears 176 which are engaged with the ring gear 180 of the sleeve 170 and the driving pinion 174 of the socket member 144. This will provide a given ratio of gear drive. The ratchets 194, 196 will be effective to prevent retrograde movement of the drum 168 when driving force is discontinued. If an opposite turning of the crank handle is done, the opposite turning of the socket member 144 will cause the ratchets 182, 184 to be drivingly effective whereby the sleeve 158 will be driven from the cage 178. In turn, the sleeve 158 and notably the pinion 160 thereof will drive the drum 168 through the intermediary of the idler gears 162 carried on the stub shafts 164 of the base. This will provide a higher ratio of gear drive to the drum 168.

It will now be seen from the foregoing that I have provided novel which drive mechanisms characterized by splined drive and back-check ratchets, whereby there are had compact organizations capable of occupying relatively small space. Various different gear ratios can be had, as well as a back-check action of the drum, providing an advantageous hand-powered winch device. The sealing of the various relatively turning parts effectively prevents the entrance of water and other foreign matter, whereby the movable parts of the mechanism are safe from contamination and have the relatively long, useful life.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. A winch comprising, in combination:
   a. a base,
   b. a drum part journaled on the base,
   c. a drive part centrally disposed in one end of the drum part and having exposed means engageable with a crank handle to receive torque therefrom,
   d. a ratchet comprising a pair of annuli located within the drum part and drivingly connected respectively to said parts, said annuli being disposed broadside to each other and having mutually engageable ratchet teeth, the teeth on each annulus being fixed and immovable thereon,
   e. a loose spline drive between one annulus and part whereby the annulus is axially movable on the part while relatively nonturning, and
   f. yieldable means tending to maintain the annuli and teeth thereof in engagement.

2. A winch as in claim 1, wherein:

a. the spline drive includes at least one spline carried by the drum part at the inside thereof.

3. A winch as in claim 2, and further including:

a. back-check means on the drum part and base,

b. said back-check means including a toothed annulus disposed in the drum part and having a spline engageable with the said spline of the drum part.

4. A winch as in claim 2, and further including:

a. a gear reduction drive connected between the other annulus and said drive part.

5. A winch as in claim 1, and further including:

a. a unidirectional, gear-reduction drive between said drive and drum parts,

b. said unidirectional drive and said ratchet being operative for driving, respectively for opposite turning movements of the drive part.

6. A winch as in claim 5, and further including:

a. a gear reduction drive connected between the other annulus and said drive part.

7. A winch as in claim 3, and further including:

a. a bearing bushing disposed inside of said drum part, having an outer periphery provided with a spline engaging the spline of the drum part,

b. said bearing bushing being located between the back-check means and said ratchet, and having a smooth bore engaged with the base to journal the drum thereon.

8. A winch as in claim 7, wherein:

a. the base comprises an upright hollow post,

b. said drive part extending into and being journaled in said post.

9. A winch as in claim 8, and further including:

a. a transverse wall in the hollow post of the base, and

b. means rotatably securing the drive part to the hollow post of the base, including a screw threaded into said transverse wall and passing through an aperture of the drive part.

10. A winch as in claim 1, wherein:

a. the drive part and drum part have splines,

b. back-check means on the drum part and base,

c. said back-check means including a toothed annulus disposed in the drum part and having a spline engageable with the said spline of the drum part,

d. said loose spline drive being between said one annulus and said drive part.

11. A winch as in claim 10, and further including:

a. a unidirectional, gear-reduction drive between said drive and drum parts,

b. said unidirectional drive and said ratchet being operative for driving, respectively for opposite turning movements of the drive part.

12. A winch as in claim 11, wherein:

a. the unidirectional drive includes an annulus having ratchet teeth and having a spline engaged with the spline of the drive part.

13. A winch as in claim 6, wherein:

a. the second-mentioned gear reduction drive comprises a rotary cage having a plurality of idler gears, comprising gears on the drive part and base, engaged with said idler gears,

b. said cage carrying said other annulus.

14. A winch as in claim 13, wherein:

a. the spline drive includes at least one spline carried by the drum part at the inside thereof,

b. back-check means on the drum part and base,

c. said back-check means including a toothed annulus disposed in the drum part and having a spline engageable with the said spline of the drum part.

* * * * *