

Aug. 13, 1957

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2,802,636

PORTABLE WINCH

Filed May 25, 1955

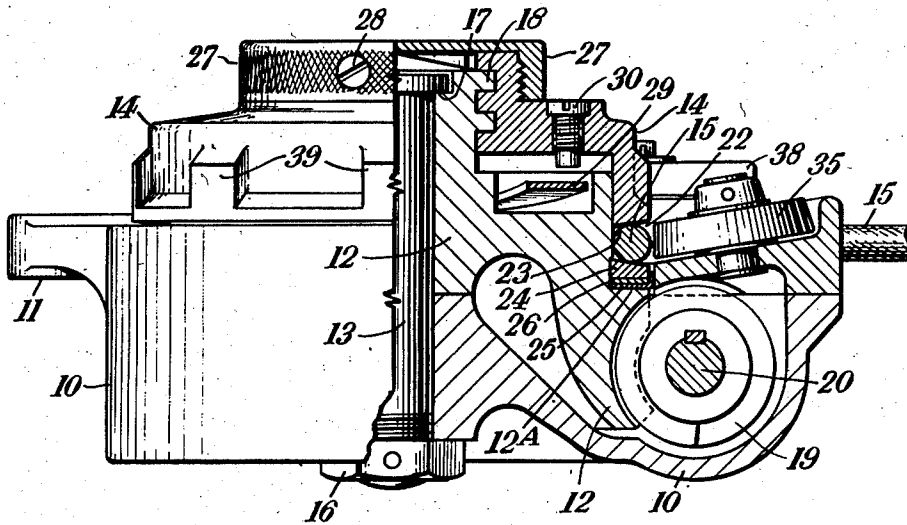


Fig. 1.

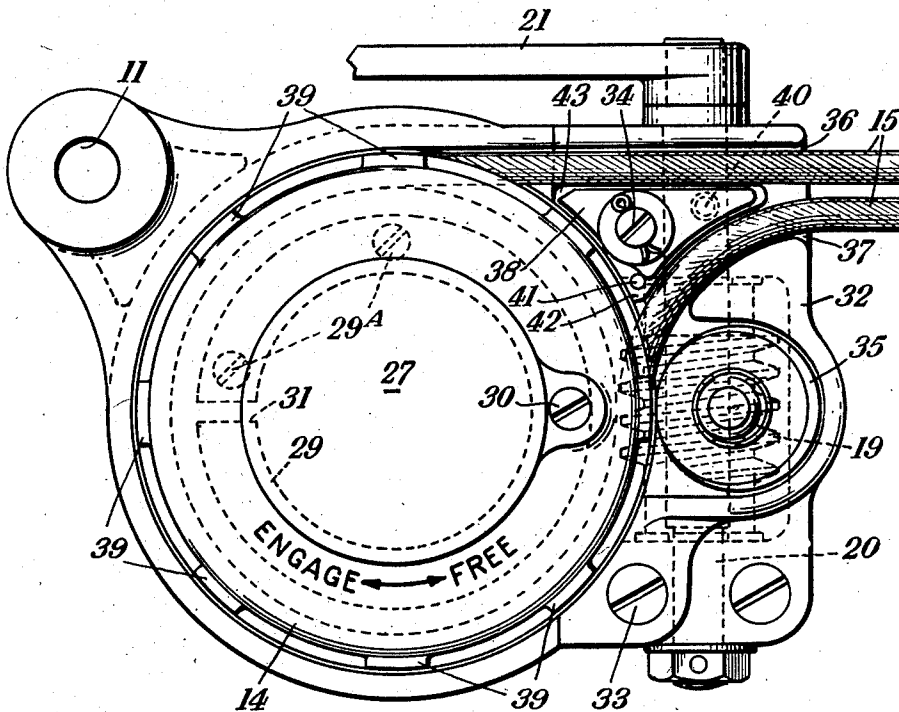


Fig. 2.

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PORTABLE WINCH

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Application May 25, 1955, Serial No. 510,978

Claims priority, application Great Britain February 4, 1955

6 Claims. (Cl. 254—150)

This invention relates to a portable winch for use in lifting or moving machinery or other heavy weights, felling trees, hauling logs, erecting masts, tensioning cables, loading trucks and wagons and for many other purposes. The winch according to the invention is used in conjunction with a flexible rope to which it can be attached at any desired point, thus providing for wide variations in the effective length of the pull. In use, the winch is attached to an anchorage and the rope to the load or vice versa.

The winch according to the invention comprises a housing adapted for attachment to a support, a rope supporting drum rotatably mounted in the housing, means for rotating said drum, a sleeve mounted on said drum coaxially therewith and having a clamping face opposing a clamping face on the drum and defining therewith a groove for accommodating and gripping a loop of the rope and a screw thread connecting the sleeve to the drum, the screw thread serving to permit of manual movement of the sleeve in relation to the drum to cause initial engagement of the clamping faces with the rope and serving thereafter, in the event of relative rotation of the drum and sleeve as the result of the rope slipping on the drum, to impart automatically axial movement to the sleeve towards the drum to apply further gripping pressure to the rope, thereby enabling the rope to be secured and wound through the winch.

It will be apparent that the diameter at which the rope is gripped, the pitch of the screw thread and the diameter of this screw thread must all be determined having regard to friction values to ensure that the frictional pull of the rope is sufficient to actuate the sleeve as intended.

In the preferred embodiment of the invention, means are provided for pressing the rope into the clamping groove as it is wound, holding it therein and ejecting it therefrom and these means may comprise one or more anti-friction rollers, a rope retaining guard covering the clamping groove, entry and exit channels, toe shaped ejectors scooping the rope from the groove and, with the object of facilitating ejection, outwardly divergent clamping surfaces within the groove, the angle of divergence being such that the rope is not expelled from the groove by the clamping pressure. Means are also provided for releasing the grip exerted by the clamping members and may comprise a pawl or the equivalent carried by the housing and adapted to be moved into engagement with the sleeve to hold the latter against rotation so that rotation of the drum in the reverse or load lowering direction will cause relative rotation to free the grip.

Said preferred embodiment of the invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side elevation partly in section of the device, and

Fig. 2 is a corresponding plan view.

The portable winch shown in the drawings comprises a housing 10, having an eye 11 by means of which it

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may be attached to a support or to the load, a drum 12 mounted for rotation in the housing on a pin 13 and a sleeve 14 which is mounted coaxially on the drum and is movable axially in relation thereto, as later described, to apply clamping pressure to a wire rope 15. The pin 13 is secured to the drum 12 by a nut 16, and a shoulder 17 on the pin holds the drum against axial movement in relation to the housing. The drum is formed with a right-handed double start square thread 18 engaging a corresponding thread on the sleeve 14 and also with teeth engaging a worm 19 fixed to a spindle 20 which is rotatable, by means of a crank arm 21, or a ratchet lever, to impart rotation to the drum. As an alternative the spindle 20 may be power driven.

The drum 12 and the sleeve 14 define between them a groove 22 for the reception of a loop of the rope, which is supported in the groove as shown. The groove 22 has outwardly divergent clamping faces, defined by a surface 23 on the sleeve and a slip washer 24, supported by a shoulder 12A on the drum. These clamping faces diverge outwards at approximately the angle of slip of the rope, i. e. at an angle to the perpendicular to the axis of the drum whose tangent is equal to the coefficient of friction between the rope and said surfaces. The purpose of this outward divergence is to facilitate ejection by the ejector toes hereinafter described of the rope as it is wound through the winch and limitation of the angle as stated ensures that the rope is not expelled from the groove by the clamping pressure alone. The slip washer 24 tends to slip with the rope and therefore serves to reduce wear on the rope while clamping pressure is being developed as later described. A packing washer 25, faced by a metal anti-friction washer 26, is located between the drum shoulder 12A and the slip washer 24 and serves to seal the gap between the drum 12 and the internal wall of the housing.

Screwed to the sleeve 14 and locked thereto by a set screw 28 is a cap 27, having a knurled external surface. By rotating the sleeve 14 by means of the cap 27, the sleeve will, due to its screw threaded connection with the drum 12, receive axial movement in relation to the drum. Clockwise movement of the sleeve 14, as seen in Fig. 2, moves its clamping face towards the drum shoulder 12A to close the groove 22. A spiral spring member 29 is disposed between the sleeve 14 and the drum 12. One end of the member 29 is secured to the drum by screws 29A and its other end 31 is free and presses against the lower face of the sleeve 14 during retraction and engages a limit stop 30 on the sleeve to limit its anti-clockwise or retracting movement.

The side wall of the housing 10 covers the clamping groove 22 and so acts as a guard to prevent any tendency for the rope to spring out when slack. It is therefore necessary to insert the rope sideways and the clamping sleeve 14 must be capable of retraction to a sufficient extent to enable this to be done. The worm cavity is enclosed by a cover plate 32 secured in position by bolts 33 and 34. It will be noted that the working and idle legs of the rope are accommodated respectively in channels 36, 37 in the cover plate 32 which act as fairleads.

The cover plate 32 also carries ejector toes 42, 43 which are, for convenience, associated with the rope channels 36, 37 and serve to eject the rope from the clamping groove 22 as it is wound. These ejector toes are formed integrally with the cover plate but, alternatively, may be attached thereto in which event they may be extended into the clamping groove 22 to better eject the rope.

An anti-friction roller 35 is rotatably mounted on the cover plate 32 and serves to press the idle leg of the rope into a clamping groove 22 especially when the device is being worked in the reverse or load lowering direction. For convenience in construction this anti-friction roller

is slightly coned and is located in a recess in the cover plate and set on an axis slightly inclined towards the drum axis so that at the point of contact with the rope its surface is parallel to that of the drum.

A pawl 38 is pivotally mounted on the bolt 34 and is normally held by a spring catch 40 in the position shown in Fig. 2. It can, however, be displaced by finger pressure into a position in which its nose engages against projections 39 on the sleeve 14 to prevent clockwise movement of the sleeve. A pin 41 positively limits disengaging movement of the pawl independently of the catch 40 as a safety measure.

In use of the device, the sleeve 14 is rotated anti-clockwise to expose the groove 22 and the rope is looped and inserted sideways into the groove, slack being taken up as far as possible by pulling the rope around the drum 12. When the rope is so inserted its working leg, in the channel 36, is in line with the attachment eye 11 and its idle leg is under and in contact with the anti-friction roller 35. The sleeve 14 is then rotated clockwise to obtain a preliminary grip on the rope. Further clamping action is entirely automatic. On anti-clockwise rotation of the drum 12 by means of the worm gearing the sleeve 14 is held frictionally by the rope and lags behind. The screw thread 18 accordingly causes the sleeve 14 to move axially towards the drum 12 until sufficient grip is developed on the rope to support and move the load.

The load can be lowered or the rope slacked off by rotating the drum 12 in the reverse direction. To free the grip, the release pawl 38 is moved manually into position to engage one of the projections 39 on the sleeve and the drum is given a few turns in the reverse or load lowering direction.

It will be appreciated that the radius at which the rope is gripped, the pitch of the screw thread 18 and the diameter of the screw thread must be so chosen, having regard to friction values, as to ensure the desired inward axial movement of the sleeve 14 to clamp the rope. In practice it has been found that a screw thread diameter of approximately one third the rope gripping diameter and a pitch angle of approximately 10° are most suitable if a square cut screw thread as shown is employed.

What I claim as my invention and desire to secure by Letters Patent is:

1. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a pair of rope clamping elements mounted for rotation in said housing about a common axis, one of said rope clamping elements being a rope supporting drum formed with a shoulder constituting a rope clamping face and the other rope clamping element being a sleeve having a rope clamping face opposing the rope clamping face on the drum, means for rotating one of said rope clamping elements to draw through the winch a rope introduced between said rope clamping faces, and a screw threaded connection between the drum and the sleeve permitting relative axial movement of said drum and sleeve to grip said rope between said rope clamping faces.

2. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a rope supporting drum rotatably mounted in the housing, said drum having a shoulder providing a clamping face for gripping the rope, means for rotating said drum, a sleeve mounted on said drum coaxially therewith and having a clamping face opposing the clamping face on the drum and defining therewith a groove surrounding

the drum for accommodating and gripping a loop of the rope and a screw threaded connection between the sleeve and the drum permitting of relative axial movement of the sleeve and the drum to grip the rope between said clamping faces.

3. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a rope supporting drum mounted for rotation in said housing, said drum having an axially extending cylindrical portion formed with an external screw thread and a shoulder providing an annular clamping face for gripping the rope, a sleeve having an internal screw thread engaging the screw thread on the drum and an annular clamping face opposing the clamping face on the drum and coacting therewith to grip the rope, and means for rotating the drum.

4. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a rope supporting drum mounted for rotation in said housing, said drum having an axially extending cylindrical portion formed with an external screw thread and a shoulder providing an annular clamping face for gripping the rope, a sleeve having an internal screw thread engaging the screw thread on the drum and an annular clamping face opposing the clamping face on the drum and defining therewith a groove surrounding the drum for accommodating the rope, said housing having an extension normally enclosing said groove for the major part of the circumference thereof and said screw thread permitting of axial retraction of the sleeve in relation to the drum to a position permitting entry of the rope into the groove, and means for rotating the drum.

5. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a rope supporting drum rotatably mounted in the housing and having a shoulder providing a clamping face, manually operable worm gearing for rotating said drum, a sleeve mounted on said drum coaxially therewith and having a clamping face opposing the clamping face on the drum and defining therewith a groove for accommodating and gripping a loop of the rope and a screw threaded connection between the sleeve and the drum permitting of relative axial movement of the sleeve and the drum to grip the rope between said clamping faces.

6. A portable winch for use with a flexible rope and comprising a housing adapted for attachment to a support, a rope supporting drum rotatably mounted in the housing, said drum having a shoulder providing a clamping face for gripping the rope, means for rotating said drum, a sleeve mounted on said drum coaxially therewith and having a clamping face opposing the clamping face on the drum and defining therewith a groove surrounding the drum for accommodating and gripping a loop of the rope, a screw threaded connection between the sleeve and the drum permitting relative axial movement of the sleeve and the drum to grip the rope between said clamping faces, and a pawl carried by the housing and movable into position to engage the sleeve to prevent rotation thereof when the drum is rotated to release the grip on the rope.

References Cited in the file of this patent

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