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HYDRAULICALLY ACTUATED WINCH MECHANISM

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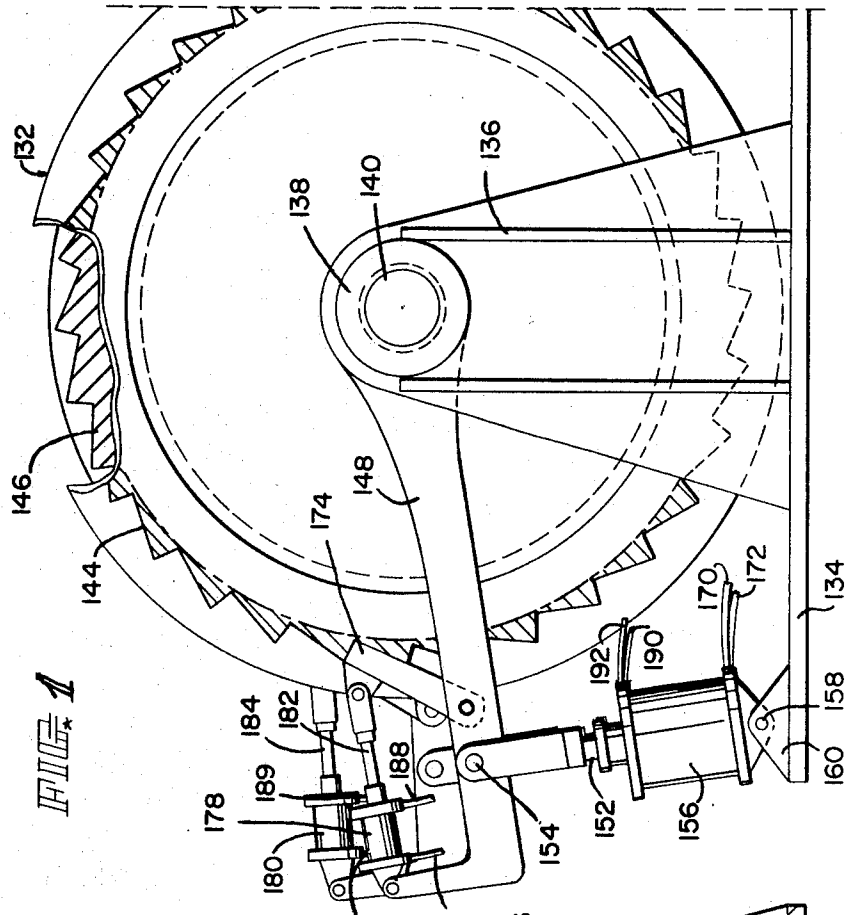


FIG. 1

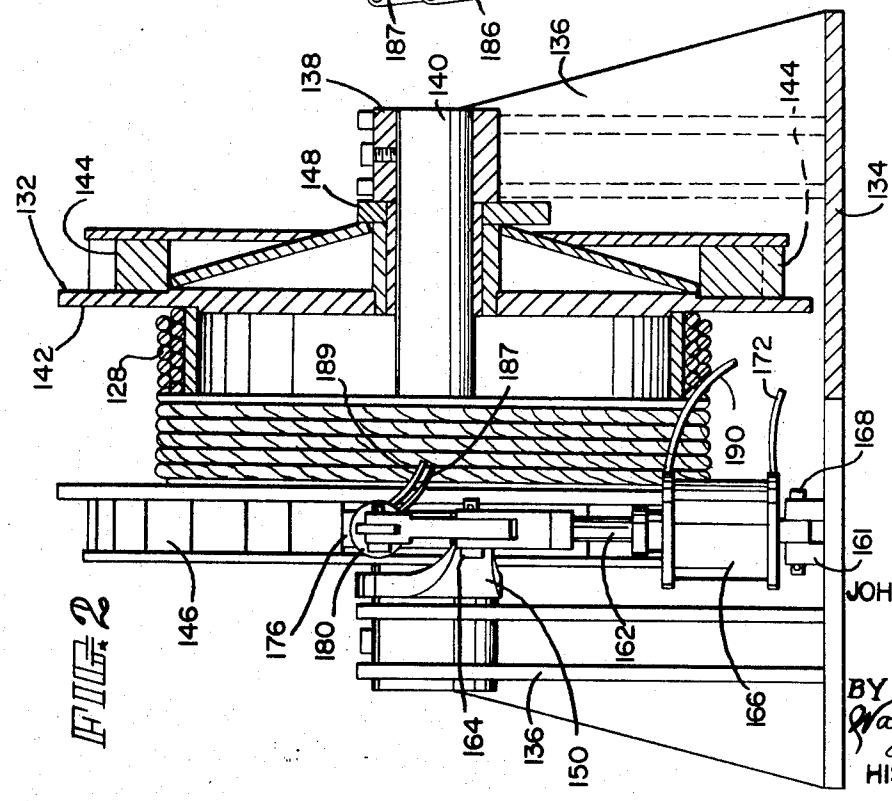


FIG. 2

JOHN HART WILSON
INVENTOR.

BY Wayland B. Keith
HIS AGENT

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HYDRAULICALLY ACTUATED WINCH MECHANISM

John Hart Wilson, % Wilson Mfg. Co., P.O. Box 1031, Wichita Falls, Tex. 76307

Original application Mar. 28, 1968, Ser. No. 716,813, now Patent No. 3,442,239, dated May 6, 1969. Divided and this application Apr. 9, 1969, Ser. No. 814,673
Int. Cl. B66d 1/30
U.S. Cl. 254—150 3 Claims

ABSTRACT OF THE DISCLOSURE

A fluid actuated winching mechanism for rotating a winch drum in one direction to lift a load and to permit the winch drum to rotate in the opposite direction to lower the load. The winch drum is operated by a pair of levers, each having a pawl thereon. Each pawl is moved into and out of engagement with circumferentially spaced ratchets on each side of a drum and when the several fluid cylinders and plungers are actuated in sequence, the winch drum may be positively turned to lift the load or to lower the load. A programming valving mechanism may be associated with the various cylinders, so each cylinder will be actuated at the proper time for efficient operation of the winch.

CROSS REFERENCES TO RELATED APPLICATIONS

This application is a division of application Ser. No. 716,813, filed Mar. 28, 1968, Submergible Stabilizer for Barges, now Pat. No. 3,442,239, issued May 6, 1969. This application also makes reference to co-pending applications Ser. No. 633,232, Automated Drill Stem and Pipe Positioner Device, filed Apr. 24, 1967 and Automated Pipe Tongs, Ser. No. 634,976, filed May 1, 1967.

BACKGROUND OF THE INVENTION

The present invention relates to fluid actuated winches, wherein, any fluid under pressure, such as air or hydraulic fluid may be used to rotate the winch in one direction or to permit the load to operate the winch in the opposite direction, but with controlled rotation.

It is desirable to lift heavy loads or to lower heavy loads with a winch at a relatively slow rate of speed but with great power, but at the same time make the winch as compact as possible, simple and inexpensive in construction, and yet sturdy and reliable in operation, and which will require a minimum of maintenance.

It is difficult to provide an effective fluid actuated winch incorporating the above mentioned desired design characteristics. Prior art winches to lift heavy loads have either employed bulky and expensive motors or other constructions which did not provide satisfactory operating characteristics.

SUMMARY OF THE INVENTION

A drum is mounted on a base in journaled relation to form a winch means for rotation of the winch means about an axis, with an arcuately movable lever means on each side of the drum, each of which lever means has a pawl means thereon actuated by fluid actuated means and each which lever means is actuated through an arcuate movement by a fluid actuated means. A fluid conduit means leads to the respective fluid actuating means, with the pawl means associated with each arcuately movable lever means to engage circumferentially spaced ratchet means on the drum so as to enable a combination of lever and fluid actuated means to provide compounded power to rotate a drum in one direction, when lifting a load, or

to permit the drum to rotate in the opposite direction in controlled relation, when lowering a load.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the fluid actuated stepping winch, with a portion being broken away to bring out the details of construction; and

FIG. 2 is an elevational view, taken at a right angle to the winch as shown in FIG. 1, with parts being broken away and with parts being shown in section to bring out the details of construction.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing wherein like reference characters designate corresponding parts throughout the several views thereof, the winch means is designated generally by the numeral **132**, which winch has a cable **128** wound thereon, as is best seen in FIG. 2.

A base **134** has upright bearing standards **136** thereon, each which bearing standard has a bearing or mounting **138** on the upper end thereof. A shaft **140** is mounted within bearings or mountings **138**, which shaft receives a drum **142** thereon in journaled relation. The winch drum **142** has ratchet teeth **144** and **146**, one set on each side of the winch drum on the flanges thereof. Outwardly extending levers **148** and **150** are mounted in journaled relation for arcuate movement about the axis of shaft **140**, with one lever being on each side of the winch drum **142**. The lever **148** has a plunger **152** connected thereto by a pivot pin **154**. The plunger **152** is mounted within a fluid cylinder **156**, which fluid cylinder is mounted on base **134** by pivot pin **158** which pin passes through apertured lugs **160** on base **134** and through an apertured lug on the lower end of cylinder **156**.

A plunger **162** is pivotally connected to lever **150** by a pivot pin **164**, which plunger extends into fluid cylinder **166**, which cylinder has an apertured lug on the lower end thereof, which cylinder **166** is pivotally connected, by a pivot pin **168**, to apertured lug **161** on base plate **134**, which pin passes through the apertured lugs on the base plate and an apertured lug on the cylinder to permit pivotal action therebetween.

The fluid cylinders **156** and **166** have conduits **170** and **172** respectively connected to the respective lower ends thereof for the introduction of fluid under pressure into cylinders **156** and **166** respectively, which will move the respective plungers **152** and **162** upwardly to move the respective levers **148** and **150** about the axis of shaft **140**. The lever **148** has a pawl **174** pivotally connected thereto engage ratchet teeth **144** formed around the periphery of winch drum **142**, on one side thereof. The lever **150** has a pawl **176** pivotally connected thereto to engage teeth **146** on the opposite side of the winch drum from the teeth **144**. It is preferable that the teeth **144** and **146** be staggered one-half pitch for smoothness of operation.

The levers **148** and **150** each have an apertured, upturned end to pivotally mount the respective fluid actuated cylinders **178** and **180** thereon. The respective fluid actuated cylinders **178** and **180** have plungers **182** and **184** respectively therein which extend outward therefrom, which plungers are pivotally connected to the respective pawls **174** and **176**, as will best be seen in FIGS. 1 and 2. The fluid cylinder **178** has conduits **186** and **188** connected to the opposite ends thereof, so upon applying fluid under pressure to conduit **186**, the plunger **182** will engage pawl **174** within a ratchet tooth **144** on drum **142**. Then, upon application of pressure to conduit **170**, the plunger **152** will be moved outward to move lever **148** and pawl **174** about the axis of shaft **140** to wind cable **128** onto winch

drum **142**. However, during the upward movement of plunger **152**, fluid under pressure is directed into conduit **190** and into the upper end of cylinder **166** to move the plunger **162** downward until pawl **176** is below one of the ratchet teeth **146**, whereupon, a conventional four-way, manually operated switching valve may be used to simultaneously switch fluid under pressure from conduits **170** and **190** into conduits **172** and **192**, whereupon fluid under pressure will move plunger **162** upward, while plunger **152** is being returned, due to fluid being introduced through conduit **192** into the upper portion of cylinder **156**. These valves may be manually operated or the valves may be sequentially switched by an automatic programming mechanism, such as shown in my co-pending applications, Ser. No. 633,232, Automated Drill Stem and Pipe Positioner Device, filed Apr. 24, 1967, and Ser. No. 634,976, Automated Pipe Tongs, filed May 1, 1967. Likewise, the fluid under pressure to the respective cylinders **178** and **180** may be timed to properly engage the pawls **174** and **176** with the respective ratchet teeth **144** and **146**, or fluid at low pressure may be maintained on conduits **186** and **187** to urge the respective plungers **182** and **184** outwardly to permit the pawls **174** and **175** to ratchet into place as the plungers **152** and **162** move the levers **148** and **150** to rotate the respective winch drums **142** to wind the cable **128** thereonto so as to maintain a predetermined tension on the respective cables **128**.

When it is desired to unwind cable **128** from drum **142**, the respective pawls **174** and **176** are alternately engaged against the teeth **144** and **146**, and after a pressure has been applied to permit the removal of one of the pawls from the toothed elements, the plungers **152** and **162** are permitted to alternately retract after engaging the teeth to permit regulated unwinding of cable **128** from winch drum **142** in the reverse manner from winding cable thereonto. The sequential valving arrangement mentioned in the above named co-pending applications can be so timed as to permit the unwinding of cable from the drum **142** in such manner as to maintain a predetermined, constant tension thereon in accordance with regulated fluid pressure to the respective conduits.

What is claimed is:

1. A winch for exerting tension on a cable, which winch comprises:

(a) a base,

(1) a shaft support means mounted on said base,

(2) a shaft mounted within said shaft support means,

(b) a winch drum mounted on said shaft for rotation about the axis thereof for winding cable thereonto,

(c) two sets of circumferentially spaced ratchet teeth associated with said winch drum,

(d) two sets of pawls, one set associated with each said set of circumferentially spaced ratchet teeth associated with said drum,

(e) fluid actuated cylinder means to selectively actuate each said pawl,

(1) one said fluid cylinder means being associated with each pawl of said sets of pawls to alternately move said pawls to selectively rotate said winch drum uniformly about the axis of said shaft, and

(f) each said pawl has further fluid cylinder means associated therewith to selectively engage and disengage said respective pawls to enable said winch drum to be selectively rotated in either direction.

2. A winch for exerting tension on a cable, as defined in claim **1**; wherein

(a) a movable lever means associated with each pawl for pivotal movement of said lever means coaxial with the axis of the winch drum,

(b) each said pawl being pivotally mounted on said lever means, and

(c) each said further fluid cylinder means being pivotally connected to each said lever means and to each said pawl to enable the pawls to be selectively actuated.

3. A winch for exerting tension on a cable, as defined in claim **1**; wherein

(a) the pitch of one set of said circumferentially spaced ratchet teeth are in off-set relation with respect to the other set of circumferentially spaced ratchet teeth so said pawls will engage said circumferentially spaced ratchet teeth in alternate relation.

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HARVEY C. HORNSBY, Primary Examiner

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74—159; 254—186