United States Patent [19]

Thiermann

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[54] **HYDRAULIC POLE JACK**

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[52] **U.S. Cl.** ..... **254/30,** 254/133 R, 254/93 R

[51] **Int. Cl.** **E21b 19/00**

[58] **Field of Search** ..... 254/30, 131, 133, 254/134, 93, 100, 133 R, 129

[56] **References Cited**

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[57] **ABSTRACT**

The hydraulic jack has a pole gripping attachment with a swivel chain attachment means operable in a slot therein to provide for chain tightening with minimum piston movement and little or no eccentric loading of the piston. The cylinder is of single acting design with dual tandem spring return. High hydraulic pressure (over 6,000 PSI) is used to facilitate light weight and compact design features.

5 Claims, 7 Drawing Figures

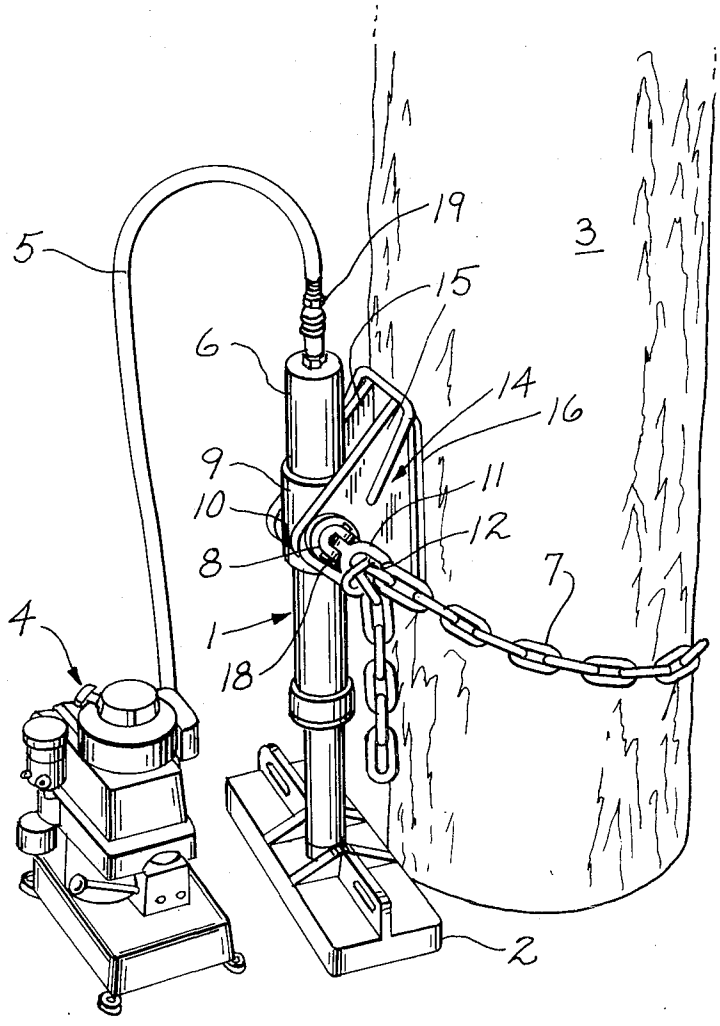


Fig. 1

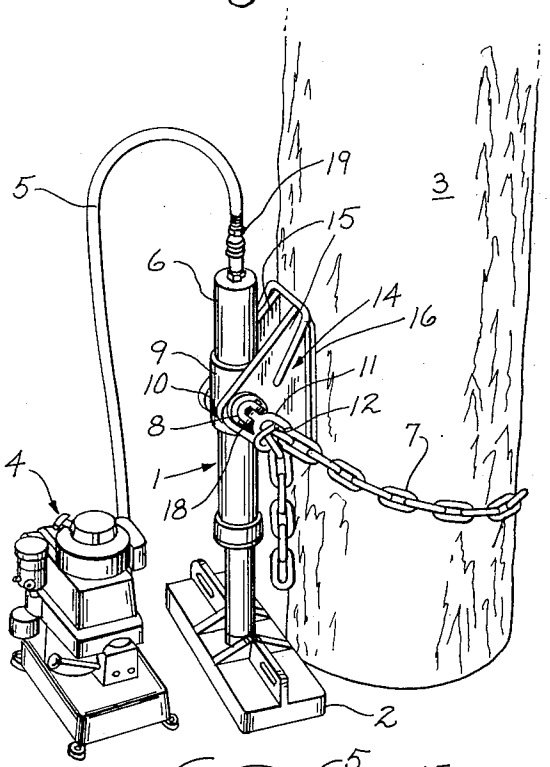


Fig. 2

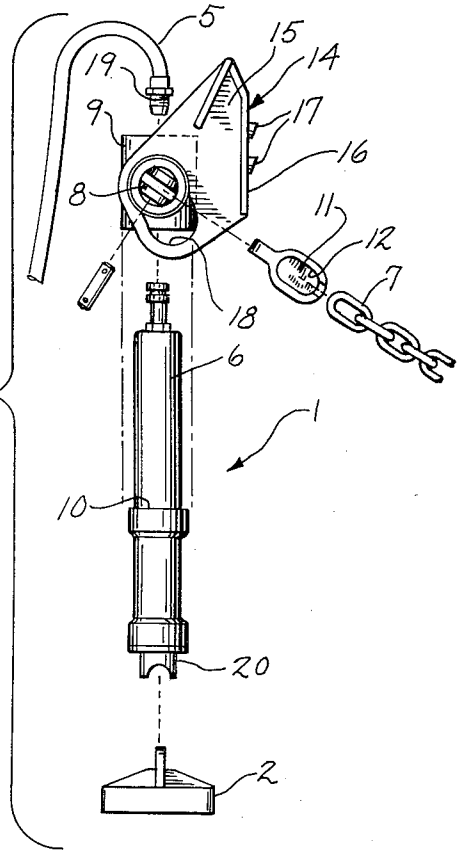


Fig. 3

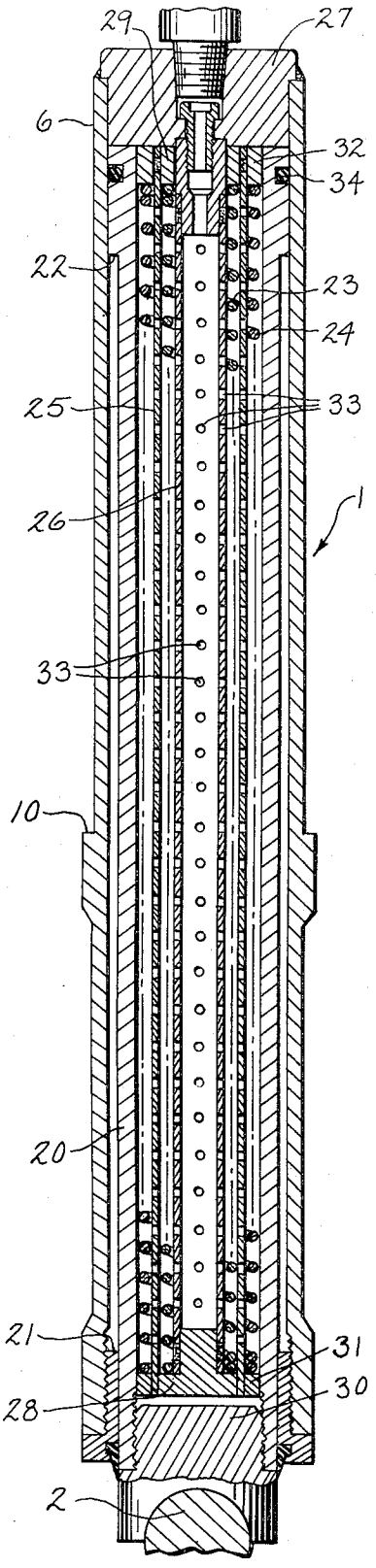


Fig. 4

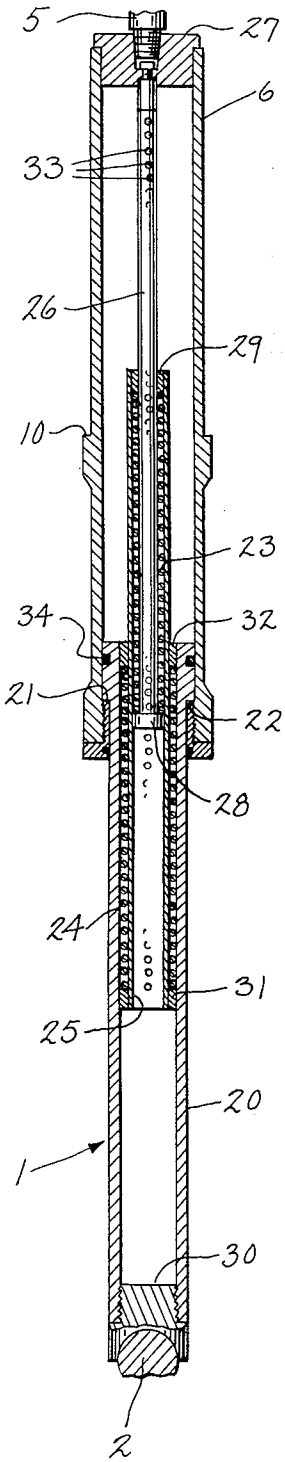


Fig. 5

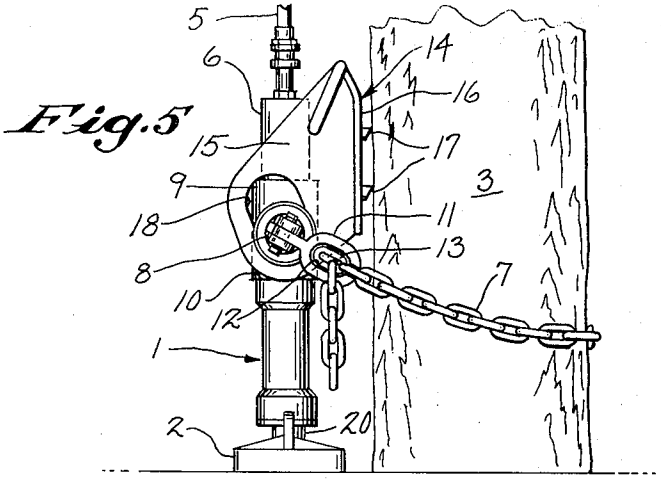


Fig. 6

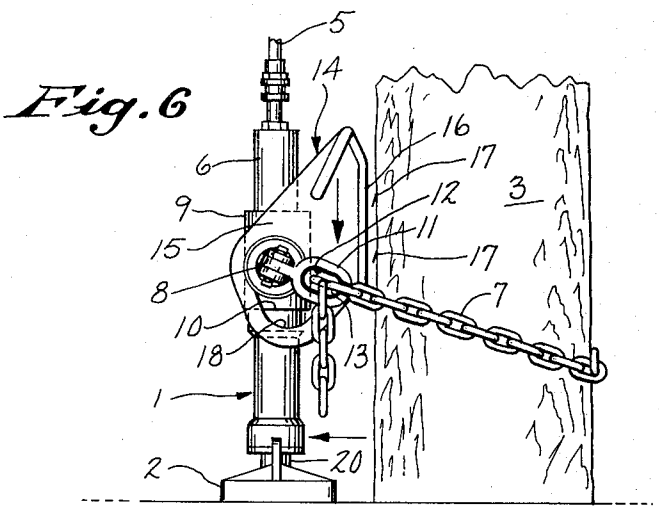
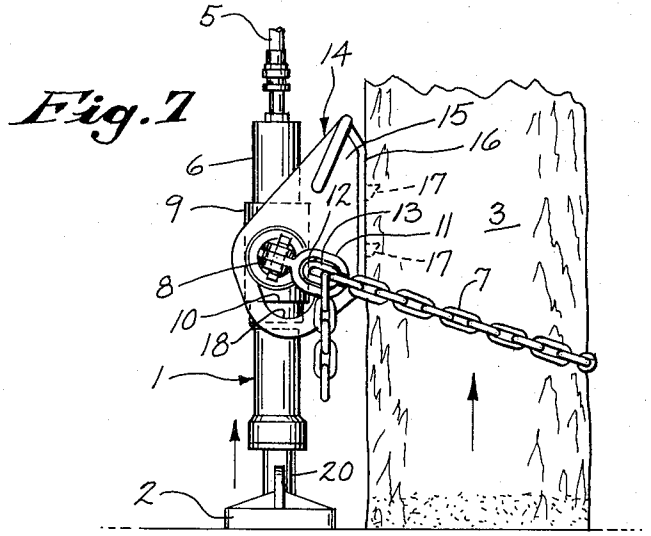


Fig. 7



HYDRAULIC POLE JACK

BACKGROUND OF THE INVENTION

This invention relates to hydraulic pole jacks or pullers of the general type employed in lifting poles or posts, usually wooden, vertically from their set position in the ground, as when it is desired to remove the same from the ground.

In the construction of jacks for this purpose it is generally desirable to provide a compact unit for ready portability either as a whole or in disassembled pieces, which gives sufficient lift to remove the pole without the need to dig out the butt. Digging out a pole butt (as the part of the pole in the earth is called) is very time consuming if done by hand as is often required; for many pole locations are inacessible to machines.

The pole jacks heretofore employed, use low pressure hydraulics, have a non-swiveling or non-floating chain hookup, and have no feature to tighten the chain prior to and during start of the lift. This results in considerable loss of effective lift per stroke due to chain slippage up the pole before blighting in, the use of larger heavier cylinders and pistons due to low hydraulic pressure and eccentric loading of piston and the use of a heavier chain due to poor chain hookup.

SUMMARY OF THE INVENTION

According to the present invention the chain which wraps around the pole has its ends secured in corresponding swivel members constituting trunnions on opposite sides of a tubular body that fits over the power cylinder and rests on a flange or upwardly facing shoulder on the cylinder.

A pole gripping attachment of generally U shape in plan view receives the tubular body between its sides and the latter have generally vertical slots therein through which the swivel trunnions extend, thereby mounting the attachment for limited floating vertically relative to the tubular body.

The back of the attachment is positioned to face the pole and has tread means thereon to grip the surface of the pole during lifting.

The slots in the sides of the channel shaped attachment are inclined outwardly from the pole tread to facilitate tightening of the chain prior to lifting.

For the purpose of providing more rapid return of the cylinder downwardly upon the piston following release of pressure from the power fluid, the piston is constructed as a hollow plunger facing upwardly into the cylinder and a plurality of concentric coil springs are disposed within the piston with an equalizer member effecting tandem actuation of the springs in compression as the cylinder is raised on the plunger-like piston.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate the best mode presently contemplated for carrying out the invention.

In the drawings:

FIG. 1 is a perspective view of the pole jack in operative position for lifting a pole;

FIG. 2 is an exploded side elevation of the jack;

FIG. 3 is an axial section of the power cylinder showing the return spring construction with the cylinder and piston collapsed;

FIG. 4 is a view similar to FIG. 3 with the cylinder and piston extended as immediately following a pole lift operation;

FIG. 5 is a detail side elevational view showing the jack as initially installed adjacent a pole and the chain manually assembled therewith;

FIG. 6 is a view similar to FIG. 5 showing the attachment dropped down to effect initial tightening of the chain prior to operation of the power lift cylinder; and

FIG. 7 is a view similar to FIG. 6 showing the jack after operation of the cylinder and with the pole lifted a distance generally corresponding to the movement of the cylinder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing the jack 1 is positioned on the base 2 adjacent to the pole 3 for lifting of the latter.

A hydraulic pump and control unit 4 is removably connected by a flexible hose 5 to the upper end of power cylinder 6 of jack 1.

A chain 7 is wrapped around the back side of pole 3 and has its opposite end portions secured in corresponding trunnion-like swivel members 8 on opposite sides of the cylinder 6.

The swivel members 8 may be mounted directly on cylinder 6, but preferably constitute trunnions on the opposite sides of a tubular sleeve-like body 9 which removably slips over the top of the cylinder and rests upon a flange-like upwardly facing shoulder 10 extending circumferentially of the cylinder.

Each swivel member 8 carries a chain hook 11 pivoted thereto and having a slotted recess 12 therein for receiving a selected link 13 of a pole gripping chain 7. The construction is such that the chain may be manually adjusted about the pole to a maximum tightness, leaving the chain links at the loose ends of the chain free to hang down from hook 11 without interfering with the operation of the jack.

A generally U-shaped or channel swivel attachment 14 has its side plates 15 swiveled on the trunnion members 8 and its back 16 provided with gripping prongs 17 to engage the pole 3.

Each side plate 15 of attachment 14 has a slot 18 receiving the corresponding trunnion 8 and permitting limited vertical movement of attachment 14 relative to cylinder 6.

The slots 18 are generally vertical with an outwardly inclined direction away from the pole engaging back 16, to provide for an initial take-up of slack in the chain 7 by manually moving the cylinder away from the pole and letting the attachment 14 drop relative to the trunnions 8 whereupon the slight incline of the slots 18 will effect a preliminary tightening of the chain and slant the cylinder away from the pole ready for a lifting operation.

The hose 5 from the pump and control unit 4 is next coupled to the top end of cylinder 6 by quick connection coupling 19 to complete assembly of the jack ready for operation.

In this assembly the cylinder 6 is inverted upon a vertically disposed plunger-like hollow piston 20 which is pivotally supported on base 2.

Upon admission of pressure fluid to the cylinder 6 through hose 5 from unit 4 the cylinder is lifted vertically on the piston 20 until a stop 21 disposed internally of the lower edge of the skirt portion of cylinder 6 engages a stop rim 22 at the upper end edge of the piston

20, whereupon further lifting movement of cylinder 6 is stopped.

If the pole 3 needs further lifting beyond a single stroke of cylinder 6, it is possible to secure the pole at its initial lifted position, then release the fluid pressure in cylinder 6 and drop the cylinder to a point where the chain 13 is loosened and can be disconnected.

After this the chain and jack are re-assembled with a grip on the pole lower down from the first grip and the pole is again and further lifted by actuation of the cylinder as previously described. In like manner the lifting can involve as many successive lifting steps as may be needed.

Where a liquid is utilized for the power fluid reliance solely upon the weight of cylinder 6 to force the liquid from the cylinder for returning the latter to a start position following a lifting operation generally involves too long a time.

In order to shorten the return time for cylinder 6 spring means are provided within the hollow piston 20 to encourage the downward piston movement.

For this purpose, and in order to provide for the full operative stroke of the cylinder 6 upon piston 20, two concentrically disposed coil springs 23 and 24 are operatively arranged in tandem by providing a floating equalizing member 25 therebetween.

In the embodiment illustrated in FIG. 3 the inner coil spring 23 is concentrically disposed longitudinally of a center post 26 depending from the top 27 of cylinder 6 into the hollow piston 20 for approximately the full length of the cylinder as represented by the stroke of the cylinder, and which has a circumferential flange 28 at its lower end which supports the spring.

The upper end of inner spring 23 engages an inner upper flange 29 on the upper end of sleeve-like equalizing member 25 to support the latter.

The member 25 is shown as a sleeve containing the inner spring 23 and about which the outer spring 24 is disposed, and the post 26, spring 23, sleeve member 25 and spring 24 all have a length generally corresponding to the length of the space between the top 27 of the cylinder and the bottom head 30 within the hollow plunger-like piston 20.

The floating equalizer sleeve member 25 has an outer circumferential flange 31 at its lower end supporting outer coil spring 24.

The upper end of coil spring 24 presses against an inner flange 32 on the upper end edge of piston 20.

The center post 26 is tubular and closed at the bottom by the flange head 28, and is provided with lateral holes 33 therein for free flow of power fluid from coupling 19 into and out of the cylinder 6. Similar holes may be provided in member 25.

A suitable circumferential seal 34 is provided between the inner surface of cylinder 6 and the outer surface of the plunger or piston 20 near the upper end of the latter.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

I claim:

1. A hydraulic pole jack comprising a power cylinder adapted to be disposed adjacent to a pole and substantially parallel thereto with one element of the power cylinder fixedly supported, a chain adapted to wrap around the pole with its opposite end portions secured to the movable element of said power cylinder, swivel means having opposed aligned turnnions carried by the movable element of said power cylinder on opposite sides thereof, and means pivotally secured to each trunnion on a transverse axis with respect thereto and adjustably receiving the corresponding end portions of said chain.

2. The jack of claim 1, and a sleeve member carrying said trunnions and adapted to slip over the upper end of said power cylinder, and abutment means on the movable element of said power cylinder to support said sleeve member.

3. The construction of claim 2 and pole gripping means mounted on said trunnions and comprising a channel member with its back adapted to engage the pole and with means in each side wall thereof adapted to receive said trunnions to provide for pivoting of said gripping means relative to said power cylinder generally upon the axis of said trunnions to substantially reduce any eccentric loading of the piston as it is extended.

4. The construction of claim 3 in which a slot is provided in each side wall of said gripping means and through which the corresponding trunnion extends, said slots providing for limited vertical movement of said gripping means relative to said power cylinder to increase the tightness of said chain upon the pole generally prior to actuation of said power cylinder and during initial actuation of the cylinder.

5. The construction of claim 4 in which said slots are inclined away from the back of said gripping means to more effectively tighten said chain upon the pole as said gripping means drops relative to the pole.

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