June 29, 1937. L. D. NILSON 2,085,720

HYDRAULIC JACK

Filed Aug. 20, 1935 2 Sheets-Sheet 1

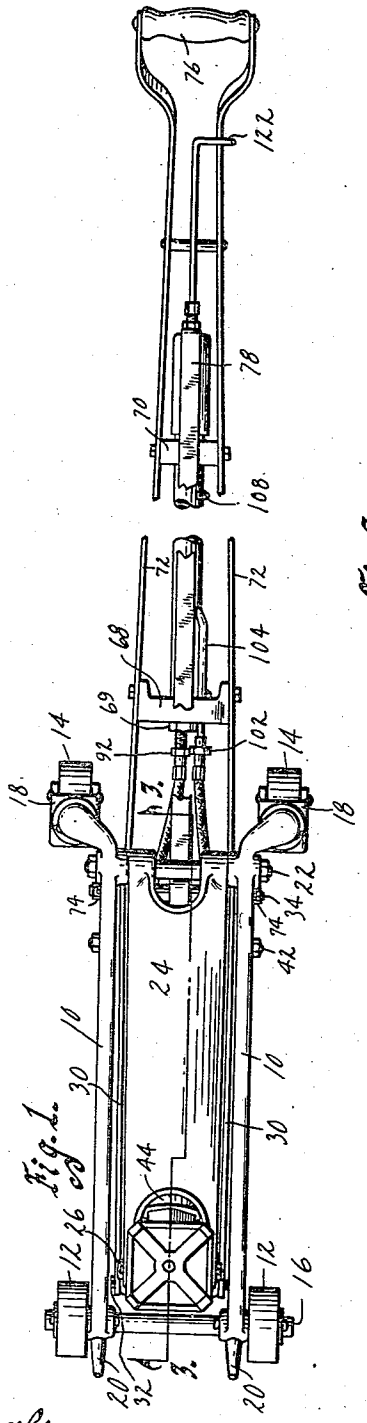


Fig. 1.

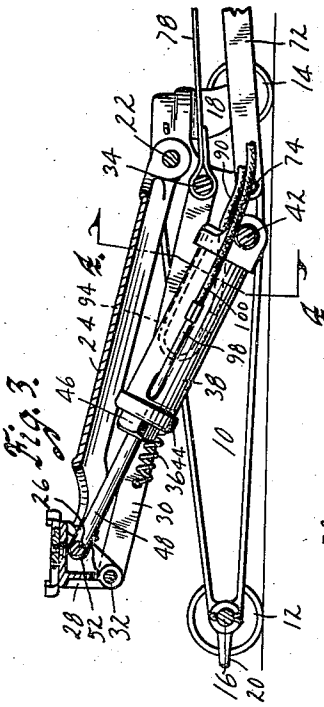


Fig. 3.

Fig. 2.

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Filed Aug. 20, 1935 2 Sheets-Sheet 2

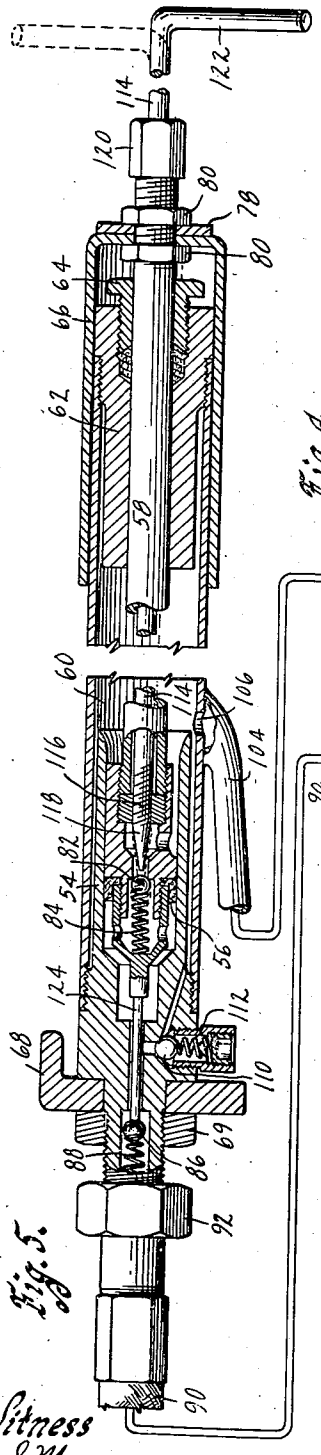


Fig. 5.

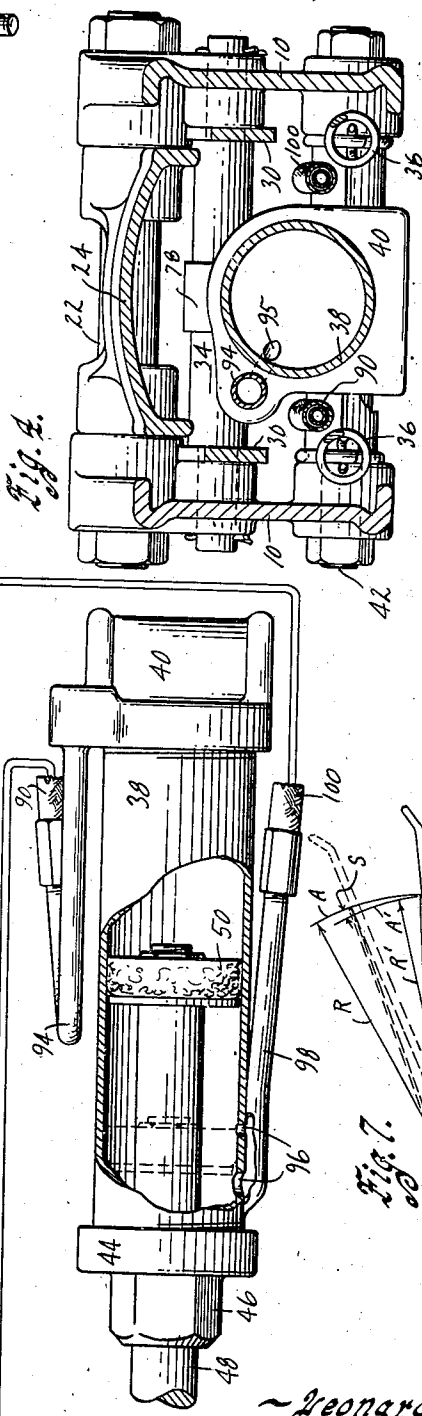


Fig. 4.

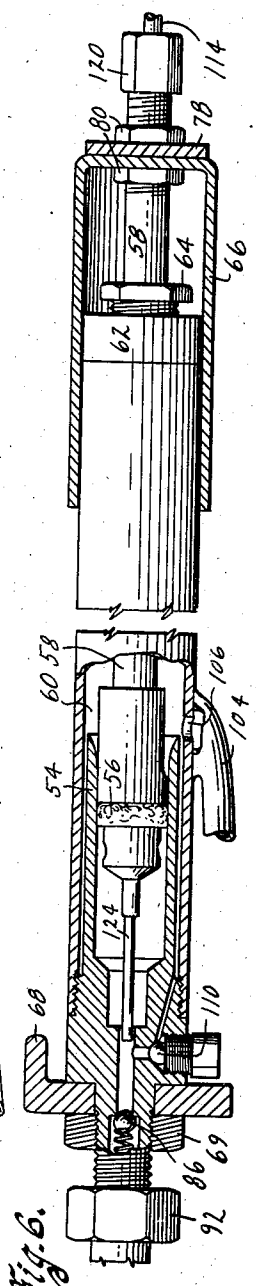


Fig. 6.

Fig. 7.

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2,085,720

HYDRAULIC JACK

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Application August 20, 1935, Serial No. 37,008

15 Claims. (Cl. 254—2)

An oject of my present invention is to provide a hydraulic jack structure of simple, durable and inexpensive construction which is characterized by a comparatively high lift from a comparatively low position of the lifting head when in its lowered position.

A further object is to provide a jack structure comprising a wheeled frame having a lifting arm pivoted thereon, a hydraulic piston for raising the lifting head, a manipulating handle pivoted to the frame and carrying a pump structure for operating the hydraulic piston, the pump structure being operable by oscillating the handle.

A further object is to provide novel connecting means between the pump and lifting cylinder whereby each may pivot independent of the other, yet an effective leak proof hydraulic connection is provided.

A further object is to provide a hydraulic lifting jack having a pump cylinder mounted on a pivoted handle and extending longitudinally thereof, a link connection being provided between the pump piston and the frame of the jack to which the cylinder is pivoted whereby the link connection serves as an actuator for the pump when the cylinder is oscillated, the pivot connections of the link and handle to the frame of the jack being relatively close together as compared to the length of the handle to provide considerable leverage for operating the pump, this construction providing thrust operation of the pump so that the handle is not subjected to bending strains as in the usual type of elongated handle operators for hydraulic pumps.

Still another object is to provide the pump for the lifting handle independent of the lifting cylinder so that the pivotal connection of the lifting cylinder to the jack frame can be quite low to secure low positioning of the lifting head when the jack is in its lowered position, this being especially desirable for flat balloon tires.

Another object is to provide a hydraulic jack assembly which enables the user to gain access to the various parts without draining oil from the jack, thus making it easy to replace, clean or repair parts of the jack without going to the bother of draining the oil from the jack and refilling it after such operations are performed.

With these and other objects in view my invention consists in the construction, arrangement and combination of the various parts of my device, whereby the objects contemplated are attained as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of a hydraulic jack structure embodying my invention.

Figure 2 is a side elevation of the same showing the lifting arm in raised position by dotted lines.

Figure 3 is a central sectional view on the line 3—3 of Figure 1 showing the lifting arm partially raised.

Figure 4 is a sectional view on the line 4—4 of Figure 3.

Figure 5 is a sectional view on the line 5—5 of Figure 2, a plan view of the lifting cylinder being shown in connection therewith and connected hydraulically therewith in diagrammatic form.

Figure 6 is a sectional view similar to the upper portion of Figure 5 showing the parts in a different position; and

Figure 7 is a diagrammatic view showing the action of the parts for pumping oil to the lifting cylinder.

On the accompanying drawings, I have used the reference numeral 10 to indicate a side frame. Two of the side frames 10 are provided and these are wheel mounted on wheels 12 and caster wheels 14. An axle 16 is provided for the wheels 12 while yokes 18 are provided for the caster wheels 14.

The side frames 10 are provided with point-like extensions 20 adapted to contact with the floor surface when the jack is up-ended for storing it in an out-of-the-way corner of a garage or the like when not in use. This prevents contact of the wheels 12 with the floor and consequent rolling of the jack from its up-ended position.

Pivoted on a pin 22, I provide a lifting arm 24 carrying a pin 26 at its outer end. A lifting head 28 is pivoted on the pin 26 and is steadied by parallelogram links 30 pivoted to pins 32 and 34. The pin 32 is carried by the lifting head 28 while the pin 34 is carried by the side frame members 10.

A pair of springs 36 are connected with the links 30 and the frame 10 respectively for normally retaining the lifting head 28 in its lowered position. For raising the lifting head, I provide a lifting cylinder 38 having a hub 40 at one end pivoted on a pin 42 carried by the side frame 10. The other end of the cylinder 38 is provided with a head 44 having a packing nut 46 through which a piston rod 48 extends.

Within the cylinder 38 a piston 50 is secured to the position rod 46. Outside of the cylinder the opposite end of the piston rod 48 abuts against the pin 26 of the lifting head 28. It is

retained against displacement therefrom by a strap 52, the lifting strains being always in a direction away from the head 44 of the cylinder 38.

For pumping oil into the lifting cylinder 38 I provide a pump structure, the cylinder of which is indicated at 54 in Figure 5. A cup leather piston is provided at 56 and it is connected with a tubular piston rod 58. The rod 58 extends through a reservoir cylinder 60, in the lower end of which the pump cylinder 54 is mounted, and out of the reservoir cylinder through a head member 62 and packing nut 64. The outer end of the piston rod 58 is guided by and retained against bending by a sleeve 66 telescoping over the reservoir cylinder 60.

The reservoir cylinder 60 is supported by a pair of cross members 68 and 70 which in turn are supported by a pair of straps 72 which constitute a handle. The handle 72 is pivoted to the jack frame, the pivot means being indicated at 74 in Figure 2. The outer end of the handle 72 is provided with a hand grip cross piece 76 for oscillating the handle about the pivot 74.

Oscillating movement of the handle 72 is transformed into reciprocating movement of the piston rod 58 by means of a link 78 having one end pivoted on the pin 34 and its other end connected (together with the sleeve 66) to the piston rod 58 by lock nuts 80.

Within the pump piston 56 I provide an intake check valve 82 seated by a spring 84. Within the lower end of the pump cylinder 54 I provide an outlet check valve 86, held seated by a spring 88. Oil is conducted from the check valve 86 to the cylinder head 40 through a flexible high pressure hose 90 having its ends connected respectively by a disconnectible coupling 92 with the lower end of the pump cylinder 54 and by a tubular extension 94 with the head 40.

In Figure 7 I have diagrammatically by radius line R shown the swing of the pump link 78 about its pivot 34 while by radius line R' the swing of the handle 72 about its pivot 74 is illustrated. Since the pivots 34 and 74 are in different positions, the radius lines R and R' will describe different arcs indicated at A and A', thus resulting in a stroke indicated at S when moving the handle through an arc represented by the full and dotted lines in Figure 7. If there is not room enough for swinging the lever through an arc as great as illustrated, it can be swung through a shorter arc and regardless of the arc through which it may be swung, pumping action will occur, thus making it possible to raise the lifting head of the jack when only restricted space is available in which to operate the handle.

On the intake stroke of the pump piston 56 or movement thereof in a right hand direction in Figure 5 relative to the pump cylinder 54 oil will be drawn through the intake valve 82 from the reservoir handle 60. On the down stroke, it will be forced through the outlet valve 86 and the flexible hose 90 to the space in the cylinder 38 below the piston 50 for expelling the piston. Oil above the piston will flow through openings 96 and a tube 98 to a second flexible hose 100 which is connected by a coupling 102 (see Figure 1) to a pipe 104. The pipe 104 discharges through an opening 106 back into the reservoir cylinder 60. Thus the space in the cylinder 38 above the piston 50 acts as a reservoir supplemented by the reservoir cylinder 60 which has to take care of only the displacement of the piston rod 48. By such an arrangement a non-vented filler plug 108 (see Figure 1) can be provided and an air space left in the cylinder 60 to accommodate the displacement without the necessity of having to vent the filler plug.

I have provided a safety valve 110 (see Figure 5) loaded by a spring 112 to whatever pressure is necessary to prevent overloading the jack. For instance, if the capacity of the jack is five tons, the spring 112 can be loaded to a pressure which prevents opening of the valve 110 except when the operator attempts to lift a load greater than five tons whereupon the pump will generate a pressure sufficient to by-pass the oil through the valve 110 back to the reservoir cylinder 60 and thus prevent operation of the jack. This is a safety feature to prevent overloading the jack.

For lowering the jack, I provide within the tubular pump piston rod 58 a control rod 114. It is threaded with a coarse thread at 116 so that upon rotation it moves longitudinally relative to the piston 56. The lower end of the control rod 114 is pointed at 118 to engage and open a valve 82 while the upper end extends through a packing nut 120 of the piston rod 58 and terminates in a handle 122. When the handle is in the full line position of Figure 5 the control rod 114 is inoperative while in the dotted position it is operative to open the valve 82.

The valve 86 must also be opened and this is accomplished by providing an extension pin 124 on the pump piston 56 which opens the valve 86 at the lower limit of movement of the handle 72, this position being shown in Figures 2 and 5.

With both valves 82 and 86 open, it will be obvious that the load on the lifting head 28 and the springs 36 or the springs 36 only will lower the jack by forcing the oil from the piston 38 through the flexible hose 90 and the two check valves to the reservoir cylinder 60 while oil also flows from the reservoir cylinder 60 through the flexible hose 100 to the space in the cylinder 38 above the piston 50. Thus only when the control handle 122 is set for lowering position and the handle 72 is in its lowered position will the jack operate in a lowering direction.

It will be noted that the pump is entirely independent of the lifting cylinder and connected therewith by flexible connections. This makes it easy for removing the lifting cylinder and piston by merely removing the two pins 42 and 26 and disconnecting the two couplings 92 and 102. The lifting cylinder can thus be easily repaired or replaced or parts thereof replaced without draining any oil from the pump and the reservoir cylinder. Likewise the parts of the pump can be repaired or replaced by simply disconnecting the pump from the cross members 68 and 70 and disconnecting the couplings 92 and 102. Also if the valve 86 becomes clogged, it can readily be cleaned out by disconnecting the couplings 92 while the pump piston and its associated parts can readily be removed by disconnecting the link 78 from the pin 34 and the head member 62 in Figure 5 from the reservoir cylinder 60.

It will be noted that the strains on the parts for operating the pump, that is on the handle 72 and the link 78, are in directions longitudinally to these members, thus eliminating any bending strains and making it possible to use a very light handle for supporting and operating the pump. By pivoting the lifting cylinder at a low point and then having it incline downwardly therefrom when in lowered position, the lifting head can be initially positioned very close to the floor and lifted to a very high position as shown by

dotted lines in Figure 2 in which latter position the lifting piston rod is thrusting almost directly upward.

The advantages outlined and many others are inherent in the construction of my jack. Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. In a hydraulic jack structure, a wheeled frame, a lifting arm pivoted thereto, a cylinder pivoted thereto, a lifting piston in said cylinder, a piston rod connected with said lifting piston and operatively associated with said lifting arm to raise the same when oil is pumped to said cylinder, a pump structure pivoted to and extending from said frame, a flexible hose connection between said pump structure and said cylinder, said pump structure including a piston rod movable toward and away from the pivotal connection of said pump to said frame and a link having one end connected with said piston rod and its other end pivoted to said frame at a point spaced from the pivotal connection of said pump structure thereto.

2. In a hydraulic jack structure, a wheeled frame, a lifting arm pivoted thereto, a cylinder pivoted thereto, a lifting piston in said cylinder, a piston rod connected with said lifting piston and operatively associated with said lifting arm to raise the same when oil is pumped to said cylinder, a pump structure pivoted to and extending from said frame and including a reservoir and flexible hose connections between one end of said cylinder and said pump and between the other end of said cylinder and said reservoir, said pump structure including a piston rod movable toward and away from the pivotal connection of said pump to said frame and a link having one end connected with said piston rod and its other end pivoted to said frame at a point spaced from the pivotal connection of said pump structure thereto.

3. In a hydraulic jack structure, a wheeled frame, a lifting arm, a pivotal connection between said lifting arm and the top of said frame, said arm normally extending forwardly and downwardly from said pivotal connection, a cylinder pivoted to said frame below and ahead of said pivotal connection, a lifting piston in said cylinder, a piston rod connected with said lifting piston and operatively associated with the lifting end of said lifting arm to raise the same when oil is pumped to said cylinder, said cylinder normally assuming a supine position but assuming a substantially vertical position when raised, a pump structure extending from said frame, a flexible hose connection between said pump structure and said cylinder, said pump structure including inlet and outlet check valves and means for positively retaining said valves in open position to permit lowering of said lifting head.

4. In a hydraulic jack structure, a wheeled frame, a lifting arm pivoted thereto, a cylinder pivoted thereto, a lifting piston in said cylinder, a piston rod connected with said lifting piston and operatively associated with said lifting arm to raise the same when oil is pumped to said cylinder, a pump structure extending from said frame and including a reservoir and flexible hose connections between one end of said cylinder and said pump and between the other end of said cylinder and said reservoir, said pump structure including inlet and outlet check valves and means for positively retaining said valves in open position to permit lowering of said lifting head.

5. In a hydraulic jack structure, a lifting cylinder, a lifting piston therein, a frame for supporting said cylinder, a pump structure pivoted to and extending from said frame and a flexible hose connection between said pump structure and said cylinder, said pump structure including a piston rod movable toward and away from the pivotal connection of said pump to said frame and a link having one end connected with said piston rod and its other end pivoted to said frame at a point spaced from the pivotal connection of said pump structure thereto.

6. In a hydraulic jack structure, a frame, a lifting cylinder pivoted thereto, a lifting piston therein, a pump structure pivoted to and extending from said frame and a flexible hose connection between said pump structure and said cylinder permitting pivotal movement of both the cylinder and the pump structure relative to the frame, said pump structure including inlet and outlet check valves and means for positively retaining said valves in open position to permit lowering of said lifting head.

7. In a hydraulic jack structure, a lifting cylinder, a lifting piston thereon, a frame for supporting said cylinder, a pump structure pivoted to and extending from said frame, an oil transmission connection between said pump structure and said cylinder which permit pivotal movement of said pump structure and cylinder relative to said frame, said pump structure including a piston rod movable toward and away from the pivotal connection of said pump to said frame and a link having one end connected with said piston rod and its other end pivoted to said frame at a point spaced from a pivotal connection of said pump structure thereto.

8. In a hydraulic jack structure, a lifting cylinder, a lifting piston therein, a frame for supporting said cylinder, a pump structure pivoted to and extending from said frame, an oil transmission connection between said pump structure and said cylinder which permits pivotal movement of said pump structure and cylinder relative to said frame, said pump structure comprising a pump cylinder having its longitudinal dimension extending substantially from the pivot of the pump structure to said frame, a pump piston in said cylinder, a piston rod connected with said pump piston and a link connection between said piston rod and a point on said frame spaced from the pivotal connection of said pump structure thereto.

9. In a hydraulic jack structure, a wheeled frame, a lifting arm pivoted thereto, a lifting head pivoted to said lifting arm, parallelogram links connected with said lifting head and frame to retain the head substantially level in all positions thereof, a cylinder pivoted to said frame, a piston in said cylinder, a piston rod connected with said piston and operatively associated with said lifting arm to raise the same when oil is pumped into said cylinder, a pump structure extending from said frame and an oil transmission connection between said pump structure and said cylinder which permits pivotal movement of said cylinder relative to said pump structure.

10. In a hydraulic jack structure, a wheeled frame, hydraulically operated lifting means thereon, a pump structure for pumping oil to said

hydraulic lifting means, said pump structure being pivoted to and extending from said frame and including a piston rod movable toward and away from the pivotal connection of said pump to said frame and a link having one end connected with said piston rod and its other end pivoted to said frame at a point spaced from the pivotal connection of said pump structure thereto.

11. In a hydraulic jack structure, a wheeled frame, a lifting arm, a pivotal connection between said lifting arm and the top of said frame, said arm normally extending forwardly and downwardly from said pivotal connection, a cylinder pivoted to said frame below and slightly ahead of said pivotal connection, a lifting piston in said cylinder, a piston rod having one end connected with said lifting piston and its other end directly connected with the lifting end of said lifting arm to raise the same when oil is pumped to said cylinder, said cylinder normally assuming a supine position extending from its pivotal connection to the frame toward the lifting end of said lifting arm, said cylinder swinging from said supine position to a substantially vertical position when raised, a pump cylinder extending from and pivoted to said frame, a pump piston thereon, an operative connection from said pump piston to said frame, said operative connection being pivoted to said frame at a point spaced from the pivotal connection of said pump cylinder there and a flexible hose connection between the discharge of said pump cylinder and said lifting cylinder.

12. In a hydraulic jack structure, a wheeled frame, a lifting arm, a pivotal connection between said lifting arm and said frame, a cylinder pivoted to said frame at a point spaced from said pivotal connection, a lifting piston in said cylinder, a piston rod connected with said lifting piston and operatively associated with the lifting end of said lifting arm to raise the same when oil is pumped to said cylinder, a pump cylinder pivoted to and extending from said frame, a flexible hose connection between said pump cylinder and said lifting cylinder, a pump piston in said pump cylinder, a piston rod extending from said pump piston to the exterior of said pump cylinder and a link between the extending end of said piston rod and a point on said frame spaced from the pivotal connection of said pump cylinder thereto.

13. In a hydraulic jack structure, a frame, a lifting cylinder pivoted thereto, a lifting piston therein, a pump structure pivoted to said frame independent of said lifting cylinder and extending from said frame, a flexible hose connection between said pump structure and said cylinder permitting pivotal movement of both the cylinder and the pump structure relative to the frame and of each independent of the other, a fluid supply reservoir for said pump, said pump including pumping mechanism for pumping the fluid from said supply reservoir through said flexible hose connection to said cylinder and means for returning liquid from said cylinder to said fluid supply reservoir.

14. In a hydraulic jack structure, a frame, a lifting cylinder pivoted thereto, a lifting piston therein dividing said cylinder into a lifting chamber and a reservoir chamber, a pump structure extending from said frame, means pivotally connecting said pump structure with said frame and including a reservoir and flexible hose connections between the lifting chamber of said cylinder and the discharge of said pump and between the reservoir chamber of said cylinder and the reservoir of said pump permitting pivotal movement of both the cylinder and the pump structure relative to the frame and of each independent of the other.

15. In a hydraulic jack structure, a frame, a lifting cylinder pivoted thereto, a lifting piston therein, a pump structure, means pivotally connecting said pump structure with said frame independent of the pivotal connection of said lifting cylinder thereto and extending from said frame and an oil transmission connection between said pump structure and said cylinder, said oil transmission connection being flexible to permit pivotal movement of both said pump structure and said cylinder relative to said frame and of each independent relative to the other.

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