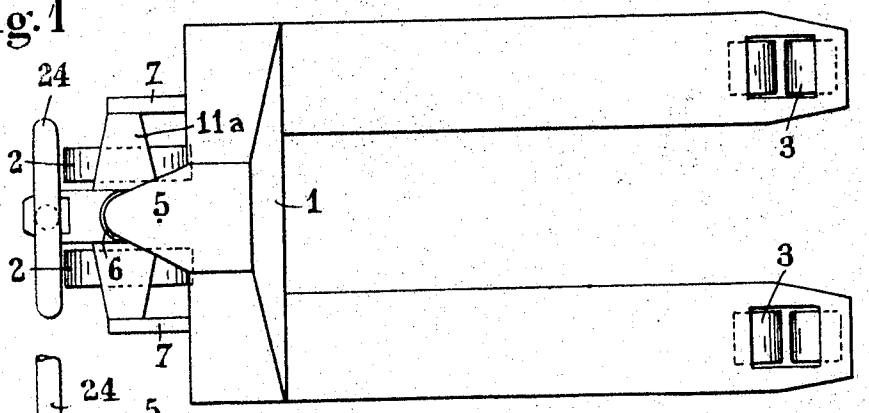
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HYDRAULIC LIFT TRUCK

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Fig. 1



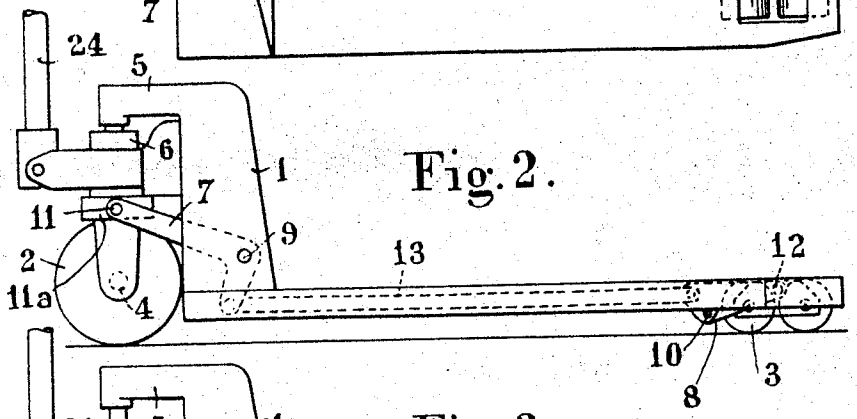


Fig. 2.

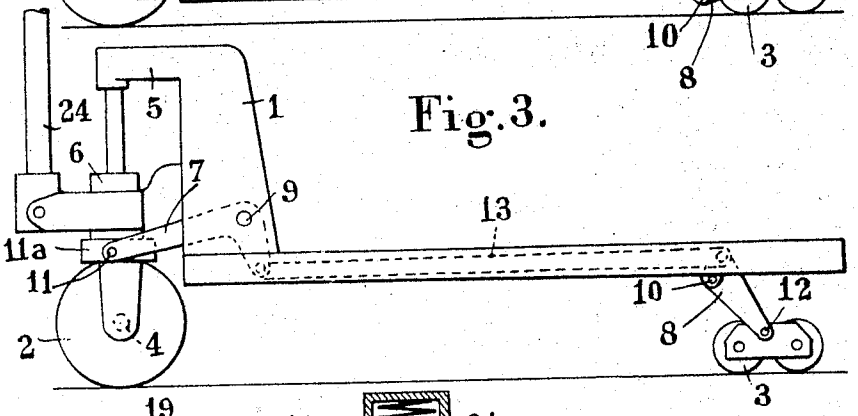


Fig. 3.

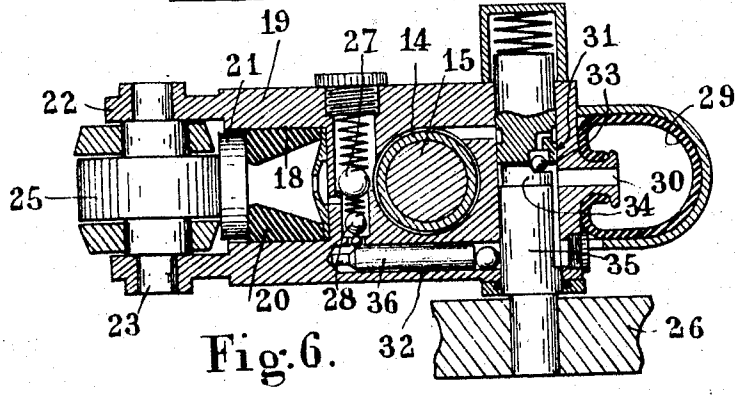


Fig. 6.

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Fig.5.

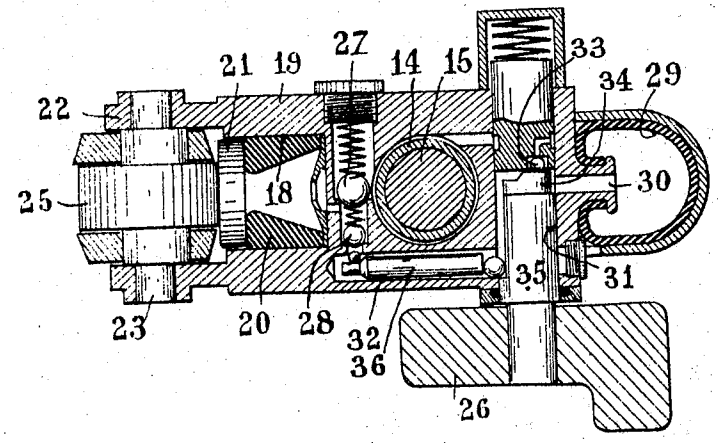


Fig.4.

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3,462,167

HYDRAULIC LIFT TRUCK

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Continuation-in-part of application Ser. No. 410,903, Nov. 13, 1964. This application June 5, 1967, Ser. No. 643,608
Claims priority, application France, Nov. 18, 1963, 954,092
Int. Cl. B66f 5/04; B62b 3/02
U.S. Cl. 280—43.12 5 Claims

ABSTRACT OF THE DISCLOSURE

A movable apparatus comprising a lift platform, wherein the hydraulic jack cylinder is disposed vertically, directly above the axle of the steerable front wheels, the upper portion of its piston supporting directly the front portion of said lift platform, the pump cylinder being disposed horizontally and machined in an enlarged portion provided to this end at the upper and front portion of the jack cylinder; the steering pole is adapted to pivot about a horizontal shaft carried by a strap consisting of an extension of the pump cylinder and comprises, about said shaft, an eccentric adapted directly to control the reciprocating movements of the pump piston.

CROSS-REFERENCES TO RELATED APPLICATIONS

This is a continuation-in-part of my application Ser. No. 410,903, filed Nov. 13, 1964, and entitled "Improvements in Hydraulic Jack," now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a specific arrangement of a hydraulic truck of the type adapted to be operated manually by means of a pole, such as a pallet transfer truck, a lift truck, a material handling truck and the like; this arrangement is so designed that the vertical dimension of the hydraulic mechanism is considerably reduced in comparison with hitherto known arrangements of this character, with the dual advantage of increasing the space available for transport purposes and improving the stability of the apparatus equipped therewith.

To this end and according to a specific feature of this invention, the hydraulic jack is disposed vertically, directly on the front axle of the apparatus, and the upper portion of its piston carries directly or through the medium of a ball-and-socket coupling the front end of the lift platform; the pole is adapted to swing about a transverse shaft mounted in a strap provided to this end in the front and upper portion of the hydraulic jack cylinder and comprises, about said shaft, an eccentric which, when said pole is moved alternatively up and down in a vertical plane controls directly the horizontal reciprocation of the pump piston actuating said hydraulic jack, the cylinder of said piston consisting of a horizontal bore formed to this end in the front portion of an enlarged portion of the upper section of said jack.

The complete hydraulic circuit between the pump, the jack and the fluid reservoir provided for compensating any changes in the quantity of hydraulic fluid contained in the jack cylinder according as the piston thereof is in its top dead center position or its bottom dead center position, is machined in said enlarged portion; said fluid reservoir consists of a bladder-like container filled completely with oil and therefor free of any air. The jack cylinder, the pump cylinder and the aforesaid hydraulic circuit are machined in a same and common aluminium or light-alloy block.

Under these conditions, the number of parts, the weight

and the overall dimensions of the apparatus are reduced considerably and the complete fluid circuit is constantly sealed against any contact with air, thus avoiding any damage thereto and improving the regular operation of the apparatus.

BRIEF DESCRIPTION OF THE DRAWING

The attached drawing illustrates diagrammatically by way of example a typical form of embodiment of the apparatus constituting the subject matter of this invention. In the drawing:

FIGURE 1 is a plan view from above of the apparatus;

FIGURES 2 and 3 are side elevational views showing the lift platform respectively in its lower and upper positions;

FIGURE 4 is a longitudinal fragmentary section showing on a larger scale the lift mechanism;

FIGURE 5 is a section taken along the line V—V of FIGURE 4, showing the component elements of the hydraulic system in their "lift" position;

FIGURE 6 is a similar view showing the same component elements in their "down" position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The apparatus illustrated consists essentially of a lift platform **1** carried at the front by a train of wheels **2** and at the rear by a pair of trailing bogies **3**; mounted between the axle shaft **4** of the front steerable wheels and the front portion **5** of the lift platform **1** is the hydraulic jack **6** and two armed levers **7**, **8** are pivotally mounted respectively on pins **9** and **10** carried by the lift platform **1**, the front arms of levers **7** bearing at **11** against lateral extensions of a collar **11***a* carried by the cylinder of the aforesaid hydraulic jack **6** which is adapted to swivel in this collar, and therefore on the front wheels **2**, the rear longer arms of levers **8** bearing at **12** on the rear or trailing bogies; the other arms of these two-armed rear levers **8** being connected to the other arms of the front two-armed levers **7** by means of rods **13**; the dimensions and relative arrangement of these two-armed levers **7** and **8** are such that when the jack **6** lifts the front end **5** of the lift platform **1** with respect to the front train of wheels **2** its rear end is raised to the same extent in relation to the rear train of wheels **3**, so that the lift platform remains constantly horizontal.

As shown on a larger scale in FIGURE 4 the cylinder **14** of jack **6** is mounted directly on the axle shaft **4** of the front train of wheels **2**; its piston **15** sliding in its screwed head **16** carries at its upper portion, through the medium of a ball-and-socket coupling **17**, the front portion **5** of said lift platform **1**.

Machined in an enlarged portion at the top of the jack cylinder **14** is the horizontal bore **18** of pump **19**; the pump piston may consist, as contemplated in the U.S. Patent No. 3,370,684, of the combination of a resilient pad **20** having a tapered through bore, with a bearing plate **21** engaging the front or outer face of said pad; a strap **22** constitutes the front extension of the aforesaid enlarged portion, and a pivot pin **23** is mounted in this strap; the pole **24** is pivotally mounted on this pin **23** and comprises an internal eccentric **25** mounted on said pivot pin; the outer surface of this eccentric, which rotates bodily with the pole **24**, is in constant engagement with the outer face of the bearing plate **21** constituting the pump piston.

Thus, the angular movements of pole **24** about its pivot pin **23** in a vertical plane produce corresponding horizontal reciprocating movement of the piston **21** of pump **19** in its cylinder **18**; besides, when the pole is pulled or pushed, the complete apparatus is moved, and

a lateral movement of said pole will swing the jack cylinder and the front wheels 2 rigid therewith.

In the position of the component elements which is shown in FIGURE 5, which is obtained by depressing the pedal 26 and corresponds to the "lift" movement, during the compression stroke of piston 21 of pump 19 hydraulic fluid is compressed in and forced out from the cylinder 14 of jack 6, above the head 16 thereof; during the suction of said hydraulic fluid into the cylinder 18 of pump 19, the ball valve 27 is closed and ball valve 28 is open whereby the reserve of fluid contained in the flexible or bladder-like reservoir 29 mounted at the rear of jack 14 can flow into the pump through the duct 30, the transverse bore 31, the longitudinal bore 32; the delivery side is isolated from the suction side by the ball valve 33 seated by the cam 34.

In the "neutral" position obtained by depressing the pedal 26 the cam 34 keeps the ball valve 33 in its seated position and cam 35 keeps the ball valve 28 open through the medium of a push-rod 36; thus, the cylinder 14 of pump 19 communicates freely with the reserve of fluid 29 and the fluid under pressure contained in the cylinder 14 of jack 6 is sealed therein by the closed ball-valves 27 and 33.

In the "down" position illustrated in FIGURE 6 and obtained by means of a complementary rotation, or possibly a reverse rotation, of pedal 26, the cam 34 releases the valve 33 and the oil under pressure in the cylinder 14 of jack 6 can flow more or less rapidly into the reservoir 29.

This hydraulic system may be completed by a load limiter or any other suitable safety device (not shown).

A rigid socket 37 is fitted in the neck of the resilient bladder-like reservoir 29 and adapted to be closed by a suitable stopper 38 when this reservoir is filled; the capacity of this reservoir is sufficient to compensate the differences in the volume of fluid which the cylinder 14 of jack 6 may contain, according as its piston 15 is in its uppermost or lowermost position; the assembly comprising the hydraulic circuit and the flexible reservoir 29 is filled completely with hydraulic fluid and the socket 37 is then sealed by means of the fluid-tight plug 38 so as to preclude the presence of air at any point in the circuit, whereby, as contrasted with conventional apparatus of this character, the hydraulic fluid, for example oil, is constantly sealed from any contact with atmospheric air and has a considerably longer useful life since any risk of oxidation is thus safely avoided.

It may thus be seen that a hydraulic lift truck has been provided which is particularly adapted for its purposes. Although the invention has been described with specific reference to a particular embodiment thereof, it is to be understood that it is not to be so limited since changes and modifications may be brought therein within the scope of the invention as defined by the appended claims.

What I claim is:

1. A movable apparatus comprising a lift platform, having at its front portion at least one steerable wheel, a vertical jack cylinder rotatably rigid with said wheel,

a piston slidably mounted in said cylinder and supporting with its upper end the front portion of said lift platform, an enlarged portion of the upper section of said piston cylinder, a pump cylinder adapted to actuate said jack, which consists of a horizontal bore formed in the front portion of said enlarged portion, a piston adapted to be reciprocated horizontally in said cylinder, a hydraulic circuit arranged between said pump and the jack cylinder, a strap consisting of a forward extension of said pump cylinder, a horizontal shaft mounted in said strap, a pole adapted to swing in a vertical plane about said shaft, an eccentric rigid with the rear end of said pole which is mounted in said strap about said shaft in the vertical plane containing said pole, the pump cylinder axis and the jack cylinder axis, and the relative positions of said eccentric and pump piston being such that the angular movements impresed to said pole in its vertical plane control the operation of the pump and jack, and also the lifting of said lift platform, the lateral movements of said pole causing the rotation of the jack cylinder and of the front wheel of the apparatus.

2. An apparatus as set forth in claim 1, comprising a pair of front steerable wheels and a common shaft for said wheels, wherein the lower portion of said vertical jack cylinder bear directly upon the common shaft of said pair of wheels.

3. An apparatus as set forth in claim 1, wherein said pump piston, as seen from its inner end to its outer end, consists of a pad formed with a coaxial through hole of tapered configuration with rounded edges, and of a bearing plate closing the hole of said pad on the side of its minor base.

4. An apparatus as set forth in claim 1, wherein the hydraulic circuit between said pump and said jack cylinder is machined completely in the enlarged portion of the upper section of said jack cylinder and is also connected to a reverse of liquid consisting of the content of a flexible, bladder-like reservoir, said hydraulic circuit and said reservoir being filled completely with hydraulic fluid to avoid any contact thereof with atmospheric air.

5. An apparatus as set forth in claim 1, wherein said jack cylinder, said pump cylinder and the complete hydraulic circuit are machined in a same and common aluminium block.

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U.S. Cl. X.R.

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