July 20, 1954 F. L. HILL 2,684,165

LATERALLY SHIFTABLE FORK LIFT FOR TRACTORS

Filed June 9, 1952 3 Sheets-Sheet 1

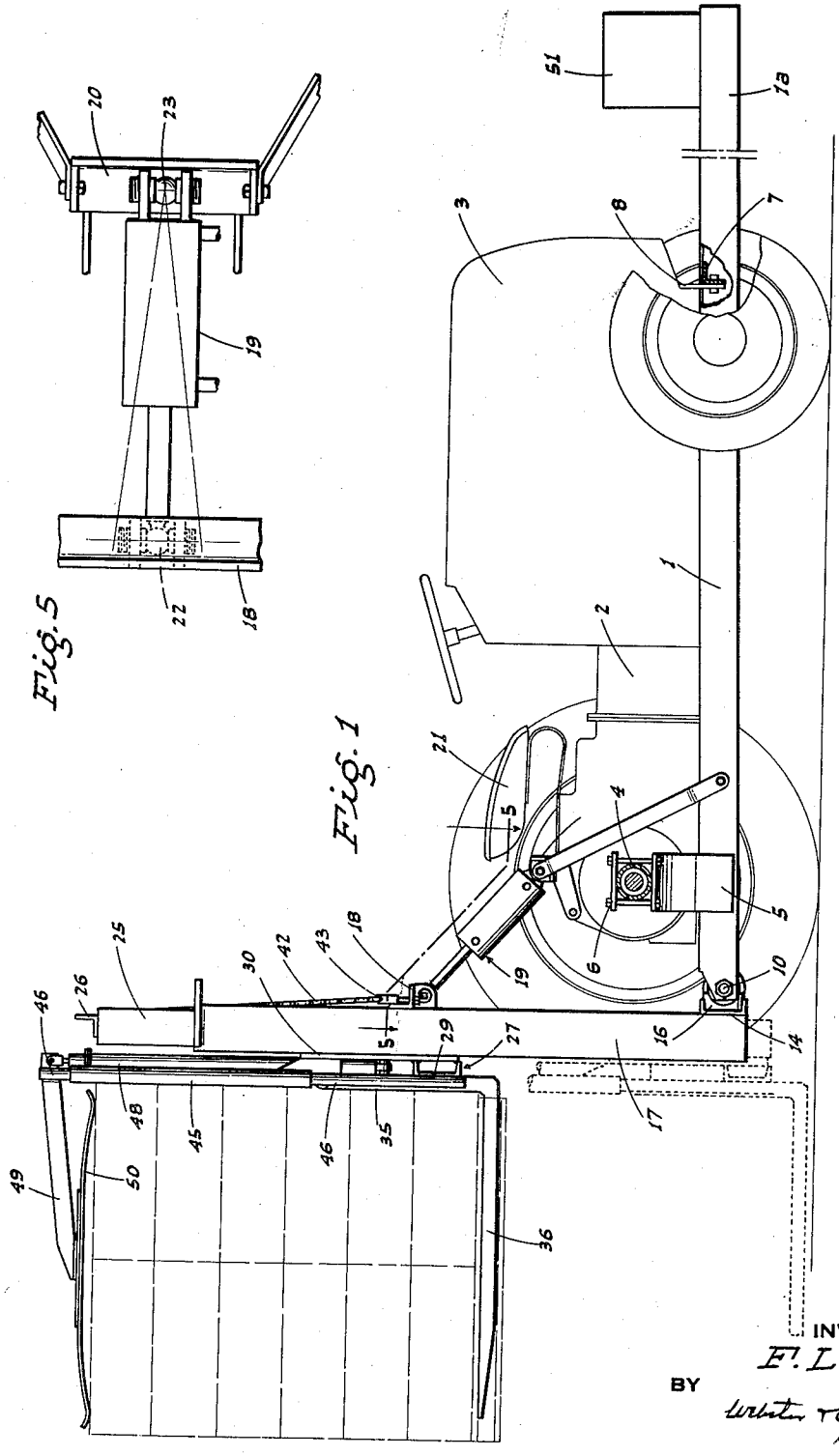


Fig. 1

Fig. 5

INVENTOR
F. L. Hill

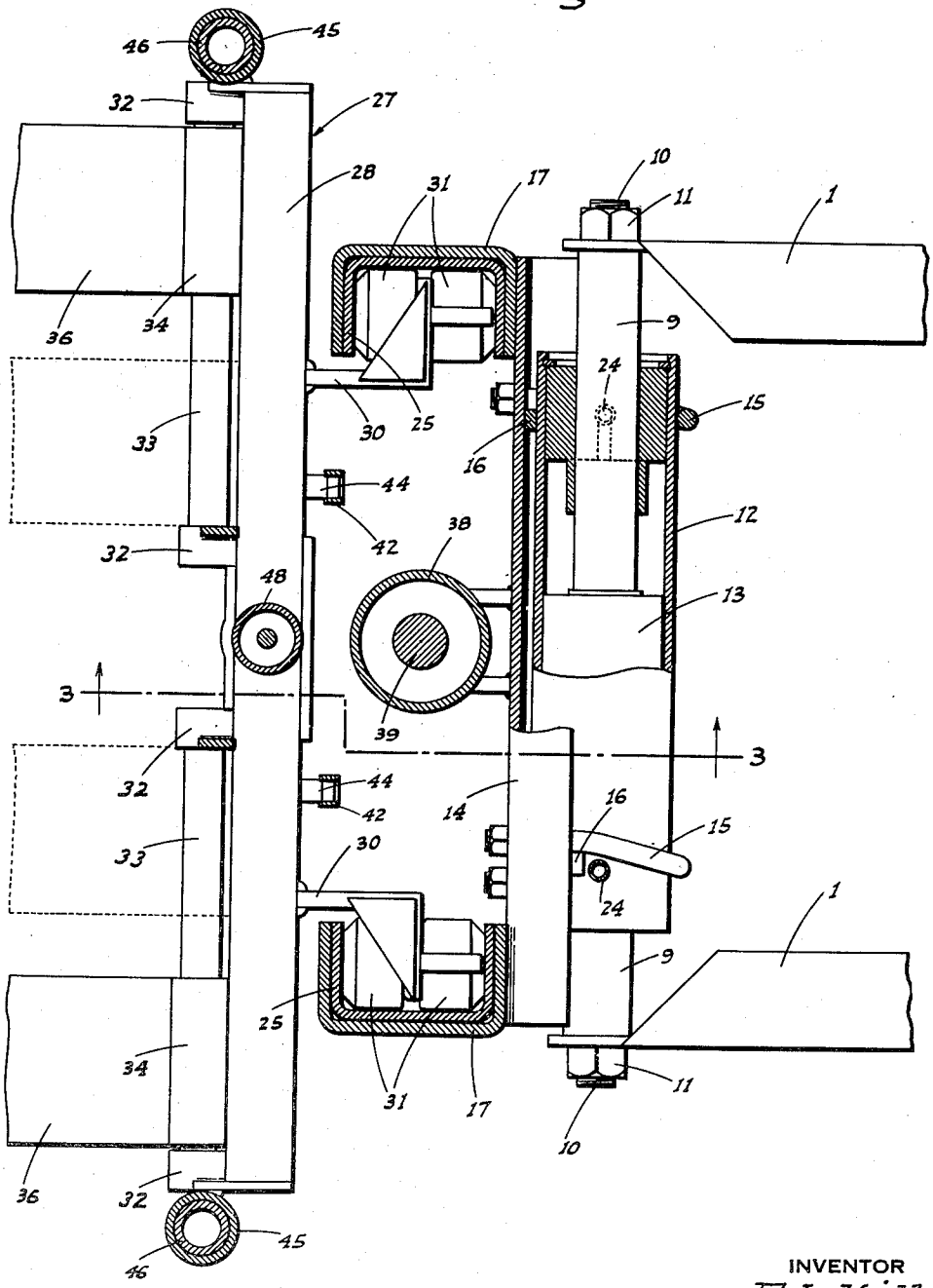
BY
Wilson Worth
ATTYS

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Fig. 2



INVENTOR
F. L. Hill

BY
Webster & Webster
ATTYS

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Fig. 3

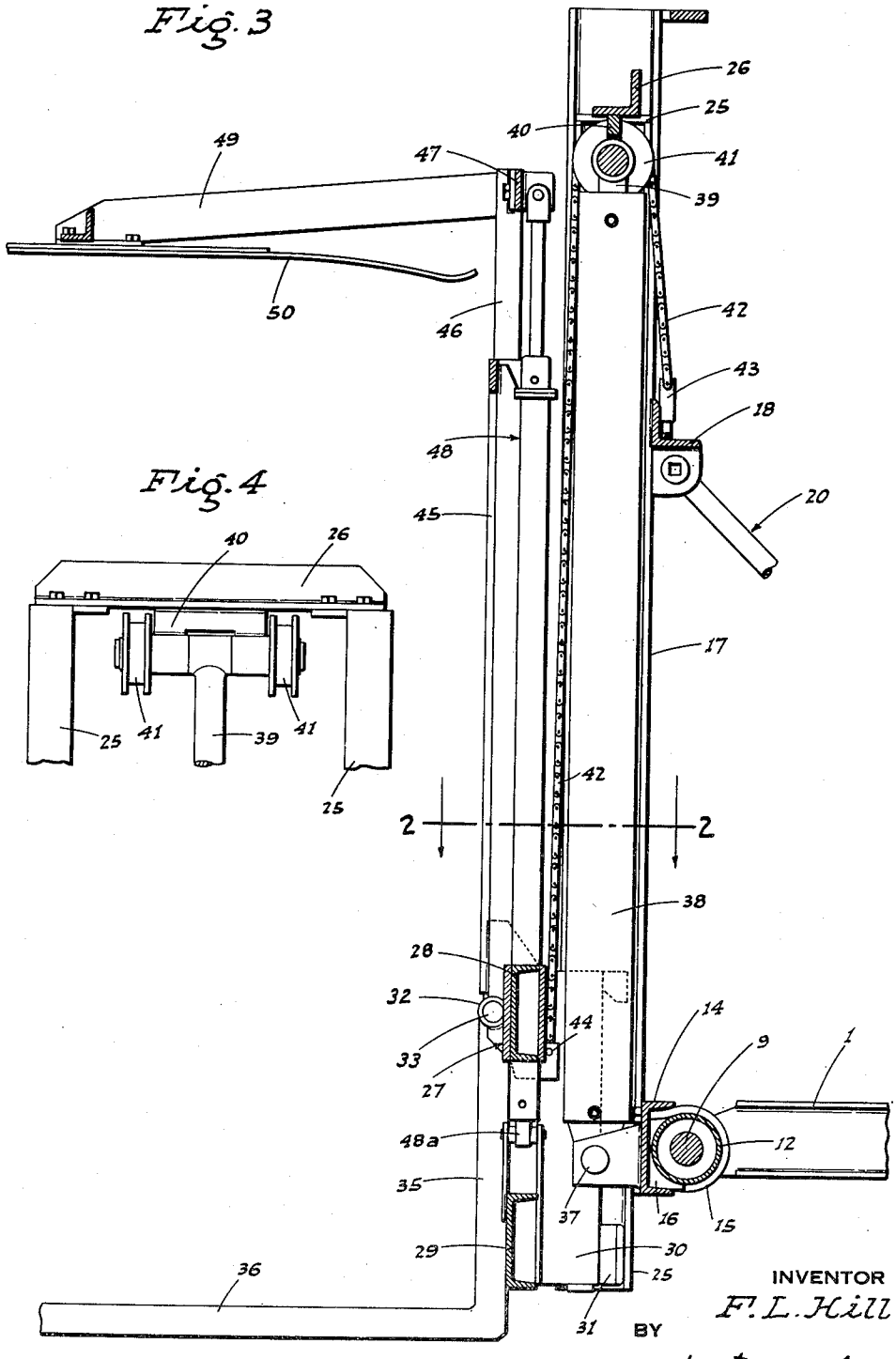


Fig. 4

INVENTOR
F. L. Hill
BY
ATTYS

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LATERALLY SHIFTABLE FORK LIFT FOR TRACTORS

Fredrick L. Hill, Rio Vista, Calif., assignor, by mesne assignments, to Blackwelder Manufacturing Co., Rio Vista, Calif., a corporation of California

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6 Claims. (Cl. 214—654)

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This invention relates to that class of industrial load lifting and conveying devices commonly known as "Fork lifts"; any one of which includes—in one form or another—a wheeled support, or truck, an upstanding elevator frame on the truck, and load supporting forks movable up and down on the frame.

When approaching a load to pick the same up, it is usually necessary that the forks be spotted accurately transversely of the load, which frequently calls for time-consuming maneuvering of the truck or tractor to properly effect loading.

It is, therefore, the principal object of this invention to avoid the necessity of such maneuvering of the truck by mounting the elevator frame, and all parts mounted thereon, for lateral adjustment relative to the truck.

The elevator frame is pivotally mounted, as usual, for fore and aft tilting movement, and another object of the invention is to incorporate the lateral-adjustment means with the frame pivoting means as a single compact unit. Power means is provided to control the tilting of the elevator frame, which is arranged so that lateral adjustment of the frame does not interfere with the operation of said power means.

It is frequently desirable to hold the load down so as to prevent shifting of the same while being transported over rough terrain, and another object of the invention is to provide a load hold-down device mounted as a unit with the forks for up and down movement therewith without separate manipulation, but which is also vertically movable at will relative to the forks so that it may be accommodated to loads of different heights.

It is also an object of this invention to provide a fork lift structure arranged as an attachment adapted to be readily applied to a standard form of wheeled tractor, so that the engine of the tractor may be used as the source of power to operate the lift fork structure.

Still another object of the invention is to provide a fork lift, for the purpose, which is practical, reliable, and durable, and also exceedingly effective for the purpose for which it is designed.

These objects are accomplished by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings:

Fig. 1 is a side elevation of the fork lift structure as mounted on a tractor, and as supporting a load in an elevated position; the tractor being partly broken away.

Fig. 2 is an enlarged cross sectional plan on line 2—2 of Fig. 3, certain parts being broken away and in section.

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Fig. 3 is a sectional elevation on line 3—3 of Fig. 2, with the forks in their lowermost position.

Fig. 4 is a fragmentary rear end view of the upper end portion of the secondary elevator frame.

Fig. 5 is a fragmentary sectional plan showing the tilt control power unit or ram, and its mounting means, taken on line 5—5 of Fig. 1.

It may here be noted that the necessary and conventional pipe or hose lines to and from the various hydraulic rams have been omitted in the various views to simplify the showing.

Referring now more particularly to the characters of reference on the drawings, the fork lift structure comprises side frame beams 1 adapted to extend alongside the body 2 of a tractor 3 laterally inward of the wheels thereof, as shown.

Adjacent its rear end, each beam is secured to and under the adjacent portion of the rear axle housing 4 by means of a bracket 5 upstanding from the beam and clamped to said housing by a clamp unit 6.

At the forward end of the tractor, the beams 1 are connected by a cross member 7 which is secured to ears 8 on the tractor, as shown in Fig. 1.

The beams 1, at their rear end, project rearwardly of body 2 and are connected by a heavy cross shaft 9, the ends of which are formed as reduced-size studs 10 projecting through the back of the beams and secured thereto by nuts 11, as shown in Fig. 2. The shaft slidably and turnably projects through a hydraulic cylinder 12 shorter than said shaft. A piston 13 is fixed on the shaft within the cylinder and is disposed midway of the length thereof when the cylinder is centered relative to the beams 1.

The cylinder is rigidly secured in connection with a transverse channel beam 14 by means of U-bolts 15; the cylinder seating in saddles 16 in the beam 14. Beam 14 is at the lower end of, and rigid with, the upstanding elevator-frame beams 17, which are of channel form and disposed in facing relation to each other.

Intermediate their ends, but above the tractor body 2, beams 17 are connected, on their front side, by a cross member 18. A hydraulic ram 19 extends between said member 18 and a similar cross member 20 fixed on the tractor body 2 just rearwardly of seat 21, as shown in Fig. 1. The ram, at its ends, is swivelly connected to members 18 and 20 by suitable means, such as ball and socket joints 22 and 23, respectively. This ram, of

course, controls the fore and aft tilting of the elevator frame about shaft 9 as an axis.

By reason of the ram construction, of which said shaft forms a part, admission of fluid into the cylinder 12 on one side or the other of the fixed piston 13 (through the ports 24 provided for the purpose) will cause the cylinder, together with beam 14 and the elevator beams 17, as well as the load engaging forks supported thereby as will be hereinafter seen, to be shifted laterally to one side or the other relative to the shaft 9 and to the tractor with which said shaft is rigid. At the same time, such movement does not bind the tilt control ram 19 or affect its operation because of the swivel joints at the ends of the ram.

Since the operation of the ram 12 is, of course, under the control of the operator of the tractor on seat 21, it is an easy matter to accurately position the lift structure relative to a load to be lifted, after the tractor has been moved to a generally correct position.

Slidable in the elevator beams 17 are the channel beams 25 of the primary elevator, said beams 25 being tied together at the top by a cross beam 26. Disposed just to the rear of beams 17 is the fork supporting carriage 27 which includes upper and lower vertically spaced transverse beams 28 and 29, respectively. These beams are rigidly connected by plates 30 which project forwardly adjacent and laterally inward of the elevator and are provided with guide members 31 which slidably engage in the elevator beams 25; the plates being quite short vertically as compared to the height of the elevator.

Supported from, and clear of, the upper beam 26 by end members 32 are shafts 33 on which relatively short sleeves 34 are mounted. Standards 35 depend from the sleeves and are provided, at their lower end, with rearwardly projecting fork members 36. The standards bear against the rear face of the lower beams 29 so that the forks are maintained horizontal, and by reason of their shaft mounting, said forks may be adjusted laterally of the structure as the lateral limitations of any particular load may require.

In order to lift the elevator a predetermined distance, and at the same time lift the carriage double such distance, the following arrangement is provided:

Supported from the back side of beam 14 centrally between beams 17, as at 37, is an upstanding ram 38 whose piston rod 39 is connected, at its upper end, by a cross head 40 to the cross member 26. Direction changing pulleys 41 are mounted on the cross head at its ends; chains 42, or similar flexible elements, passing over said pulleys and depending therefrom. At their forward lower end, the chains are anchored to cross member 18, as at 43. At their rear lower end, said chains are anchored to the upper beam 26 of the carriage 27, as at 44. By reason of this arrangement, it will be seen that, as the elevator is lifted by the ram, the carriage will be lifted twice as far by the chains.

At times, it is desirable that the load supported by the forks (such as a stack of lug boxes) shall be held down while being transported. This is here accomplished in the following manner:

Rigid with and projecting upwardly from carriage beam 28, at its ends, are tubular guide sleeves 45 in which uprights 46—also preferably tubular for lightness—are slidably mounted. The uprights 46 are rigidly connected, at their upper end, by a cross member 47 which is connected to one end of a hydraulic ram 48, the lower end of which is anchored on the carriage, as at 48a. Projecting rearwardly from the uprights are rigid arms 49 which, on their under side, support longitudinally extending leaf springs 50 which are adapted to engage the load on top, as shown in Fig. 1; the necessary hold-down pressure being imparted to said springs by suitable actuation of the ram 48.

The slidable mounting of the hold-down elements provides for a great variation in the height of the load with equal hold-down pressure being exertible on a load of any height. At the same time, the guide sleeves 45 are disposed so that their rear edges are alined with the rear side of the standards 35, so that said sleeves, as well as the standards, form back-stops for the load.

In order to prevent a possible overbalancing of the tractor when lifting a heavy load, the frame beams 1 are extended some distance in front of the tractor, as at 1a, and a suitable balancing load 51 is mounted on the extended beam portions.

The lateral adjustment of the elevator frame and supported forks, by power and selectively to right or left, is also of great advantage in spotting a load as on a truck bed or the like.

From the foregoing description it will be readily seen that there has been produced such a device as substantially fulfills the objects of the invention, as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described the invention, the following is claimed as new and useful, and upon which Letters Patent are desired:

1. In a fork lift structure, an elevator frame, a supporting frame, means between the frames pivoting the elevator frame for fore and aft tilting movement and including a transverse shaft secured to the supporting frame, power means included with the first named means to shift the elevator frame laterally on the shaft without affecting the tilting of the elevator frame, and means to control the tilting of the elevator frame and including a hydraulic ram normally extending in a plane at right angles to the axis of the shaft, means swivelly mounting the ram at one end on the elevator frame, and means swivelly mounting the ram at its other end in connection with the supporting frame.

2. In a fork lift structure, an elevator frame, a supporting frame, a hydraulic ram extending transversely of the frames and connecting the same together so as to form a pivot about which the elevator frame may tilt relative to the supporting frame, the ram including a cylinder and a double-ended piston, means securing the cylinder on one frame, means securing the rod at its ends on the other frame, a tilt control device extending between the frames, and means swivelly mounting said device at its ends on the frames.

3. In a fork lift structure, an elevator frame including uprights and a transverse beam connecting the uprights at their lower end, a supporting frame including transversely spaced beams, a shaft connected at its ends to the last named beams, a hydraulic cylinder shorter than the shaft turnable and slidable thereon, means securing the cylinder in rigid connection with the transverse beam, and a piston fixed on the shaft within the

cylinder and centered therein when the cylinder is centered on the shaft.

4. A fork lift attachment for a tractor comprising elevator frame, a supporting frame including transversely spaced beams projecting horizontally from the elevator frame and connected at one end thereto, said beams being adapted to extend along the sides of a tractor between the body wheels thereof, and means to removably and rigidly secure said beams on the tractor; the elevator frame being disposed at one end of the tractor and the beams extending a considerable distance beyond the opposite end of the tractor, and a counterweight on the front end of the extended portion of the beams.

5. In a fork lift structure, an elevator, a carriage movable up and down the elevator and including rearwardly projecting lift forks, and vertically adjustable load hold-down means mounted on and movable with the carriage; said hold-down means including transversely spaced guide sleeves secured on the carriage, uprights slidable in the sleeves, a cross member connecting the uprights above the sleeves, a hydraulic ram extending between and connected to the cross member and carriage, arms projecting rearwardly from and rigid with the uprights at their upper end, and load engaging elements supported on the rear end of the arms.

6. In a fork lift structure having projecting left forks, an elevator frame, a supporting frame, and means mounting the elevator frame on the supporting frame for shifting motion laterally of the direction of projection of the forks; said means including a power cylinder operative to effect such motion, the body of said cylinder being connected to one frame, and the piston rod being double ended and attached at its ends to the other frame.

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