Nov. 11, 1941. E. J. ABBE 2,261,930

LOAD ELEVATING MECHANISM FOR INDUSTRIAL TRUCKS

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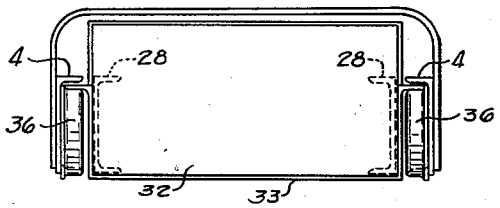


Fig. 2

Fig. 1

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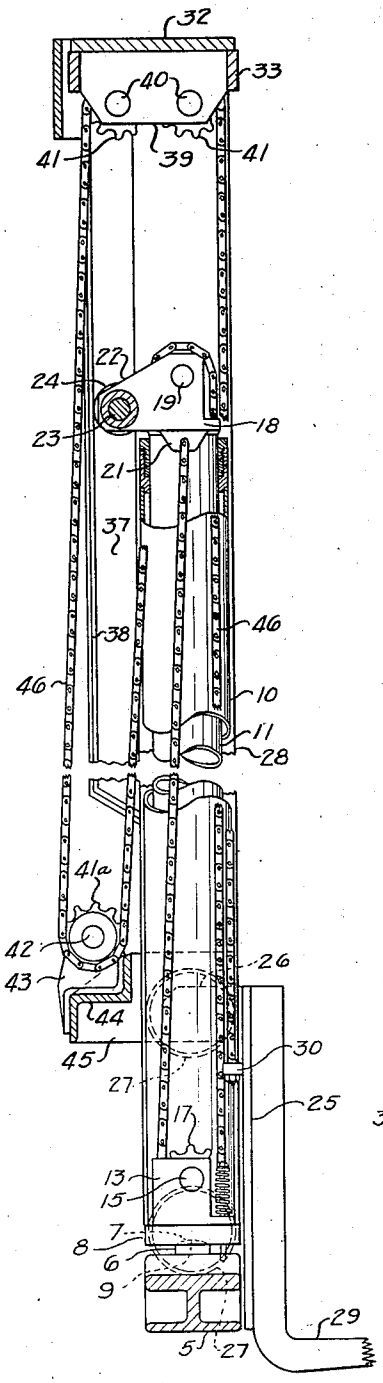


Fig. 4

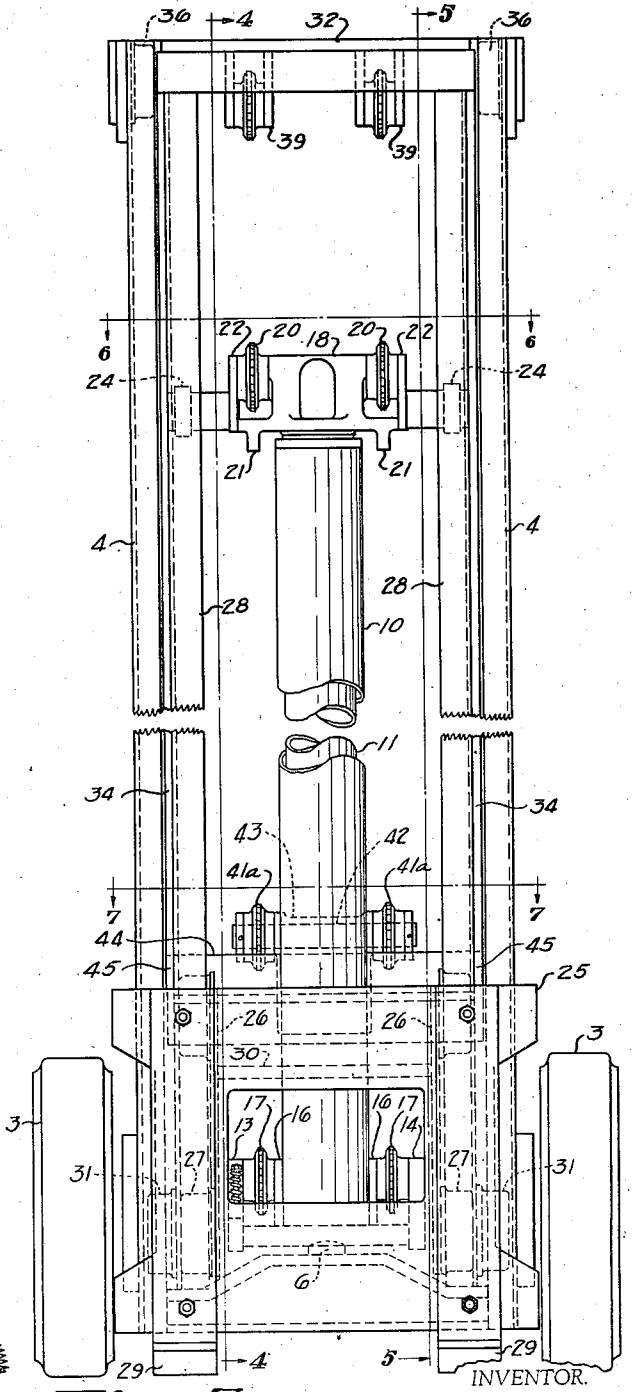


Fig. 3

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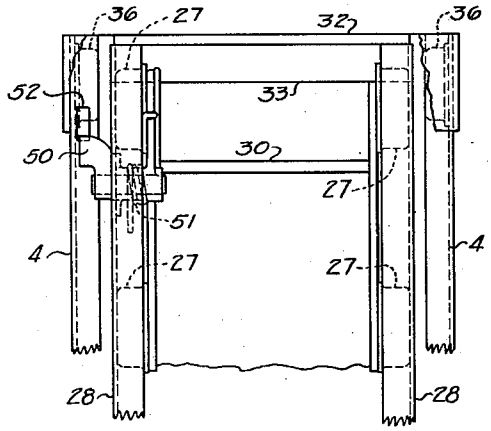


Fig. 8

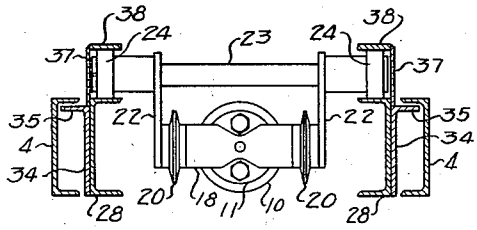


Fig. 6

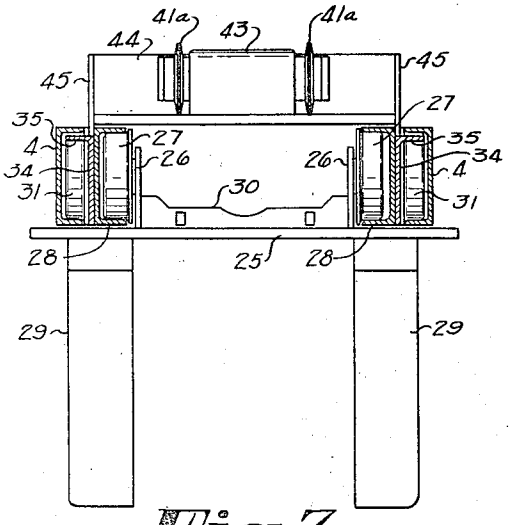


Fig. 7

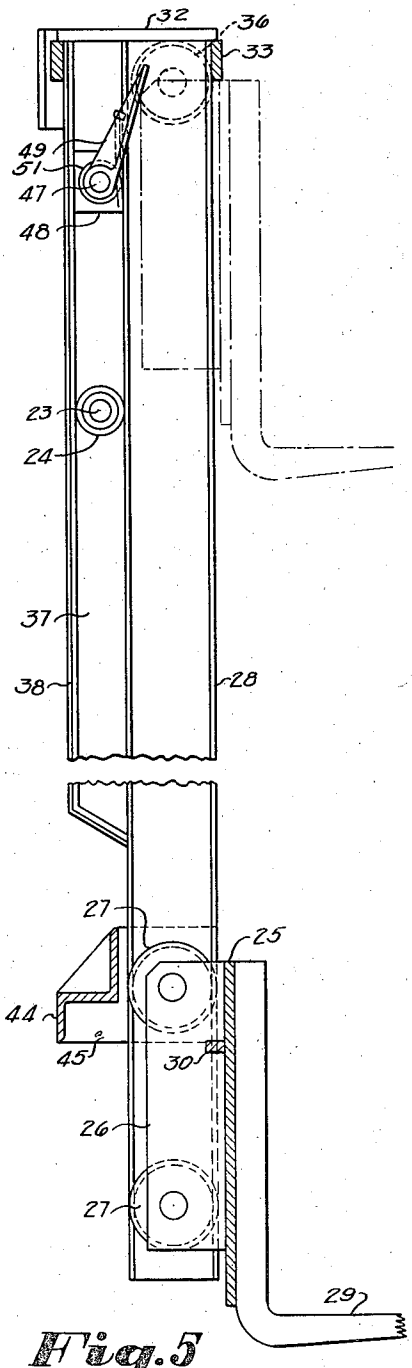


Fig. 5

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Patented Nov. 11, 1941 2,261,930

UNITED STATES PATENT OFFICE

2,261,930

LOAD ELEVATING MECHANISM FOR INDUSTRIAL TRUCKS

Edward J. Abbe, Cleveland Heights, Ohio, assignor to The Elwell-Parker Electric Co., Cleveland, Ohio, a corporation of Ohio

Application March 14, 1940, Serial No. 323,920

7 Claims. (Cl. 214—113)

This invention relates to industrial trucks of the load-lifting and transporting type, but has reference more particularly to the load elevating mechanism of such trucks.

A primary object of the invention is to provide mechanism of the aforesaid character, the overall height of which is maintained at a minimum to provide for passage thereof under relatively low overhead obstructions, without sacrificing anything in the way of utility insofar as elevation of the load-lifting carriage of the mechanism is concerned.

Another object of the invention is to provide mechanism of the character described, in which a relatively small movement of the elevating mechanism is translated into a relatively large movement of the load-lifting carriage.

A further object of the invention is to provide mechanism of the character described comprising a relatively stationary frame structure, a frame structure slidable relatively to said stationary frame structure, a load lifting carriage slidable relatively to the slidable frame structure, and means for insuring against movement of the slidable frame structure until the carriage has been elevated to a predetermined height.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same:

Fig. 1 is a side elevation of an industrial truck embodying the invention;

Fig. 2 is a plan view of the load elevating mechanism of the truck;

Fig. 3 is a fragmentary front elevation of the truck;

Fig. 4 is a fragmentary vertical cross-sectional view of the truck, taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary vertical cross-sectional view of the truck taken on the line 5—5 of Fig. 3;

Fig. 6 is a fragmentary horizontal cross-sectional view, taken on the line 6—6 of Fig. 3;

Fig. 7 is a fragmentary horizontal cross-sectional view, taken on the line 7—7 of Fig. 3; and

Fig. 8 is a fragmentary rear elevation of the upper portion of the load-elevating mechanism.

Referring more particularly to the drawings, it will be seen that the truck comprises a main frame 1, supported at its rear end by a pair of dirigible wheels 2 and at its forward end by a pair of driving and load-bearing wheels 3. The truck is further provided with an internal combustion engine (not shown), connected through suitable clutch and power-transmission mechanism with the driving wheels, the dirigible wheels 2 being controlled by suitable steering mechanism (not shown).

At the forward end of the truck is an upright guideway, consisting of spaced channels 4, secured at their lower ends to a cross-member or bolster 5, provided with a central pin 6 having a spherical upper end 7.

Mounted on the pin 6 is a lifting cylinder assembly comprising a cross-bar 8 having in its lower surface a recess or depression 9, the surface of which is rounded to conform with the surface 7 of the pin 6, and a cylinder 10 mounted on the cross-bar 8 and extending vertically therefrom. Disposed within the cylinder 10, in concentric spaced relation to the latter is a hollow piston 11 designed to be elevated upon admission of oil or the like into the space between the cylinder and piston through an inlet (not shown). The cross-bar 8 is provided at its ends with upright flanges 13 and 14 forming supports for spindles 15, the inner ends of which are supported by brackets 16 which extend from the bar 8 at points adjacent the cylinder 10. The spindles 15 have loosely journalled thereon sprockets 17.

The lifting cylinder assembly further includes a cross-head 18 which closes the upper end of the piston 11 and extends to either side of the cylinder, being provided with spindles 19 on which are loosely journalled sprockets 20, these sprockets being disposed directly above the sprockets 17. The cross-head is further provided with depending ears or lugs 21, which are coplanar with the sprockets 20 and 17 and serve a purpose to be presently described. Secured to the cross-head 18 are triangularly shaped brackets 22, which serve not only to support the outer ends of the spindles 19, but also a shaft 23, which is disposed rearwardly of the cross-head and has mounted on the ends thereof rollers 24, the function of which will be presently described.

The load elevating mechanism further includes an elevator comprising a frame 25 provided with spaced rearwardly extending flanges 26, which form supports for pairs of vertically spaced rollers 27, which engage the flanges of a pair of spaced, oppositely facing channels 28. The frame 25 has secured thereto a pair of forwardly extending forks 29, and is also provided with a rearwardly extending web 30, to which is secured one end of each of the drive chains to be presently described.

The channels 28 normally rest on the bolster

plate 5, and are provided at their lower ends with rollers 31 which engage the flanges of the channels 4. They are connected at their upper ends by means of tie-plate 32. An apron plate or bar 33 also interconnects the front flanges of the channels 28, immediately below the plate 32.

Secured to the outer surface of the web of each of the channels 28, and extending from the upper end of the channel downwardly for a substantial portion of the length of said channel, is an angle member 34, one leg 35 of which extends outwardly and into the channel 4. The channels 4 have mounted on the inner web surfaces thereof at points adjacent their upper ends rollers 36, which, when the elevator is moved upwardly, as will be presently described, engages the legs 35 of the angles 34 to thereby prevent the load from tilting the elevator forwardly.

Secured to the outer surfaces of the webs of channels 28 are plates 37, which extend rearwardly of such channels and have secured to the rear edges thereof other plates 38, which cooperate with the rear flanges of the channels to provide a trackway for the rollers 24 of the lifting cylinder assembly, whereby to prevent such assembly from tilting forwardly or rearwardly during elevation or lowering thereof.

The plate 32 is provided with depending pairs of bearing brackets 39, which support spindles 40 upon which are journalled sprockets 41 which are coplanar with the sprockets 20 and 17. Similar sprockets 41*a* are journalled on a spindle 42 mounted on a bracket 43, which, in turn, is mounted on a Z-bar 44, the ends of which are secured to the rearwardly extending portions of plates 45, which are secured to the outer surfaces of the webs of channels 28, immediately below the angles 34.

Secured to the web 30 of the frame 25 are the ends of drive chains 46, such chains being looped over the sprockets 41, 41*a*, 20 and 17 successively, and having their other ends secured to the lugs 21 on the cross-head 18.

Upon the admission of oil into the cylinder 10, the piston 11 is caused to be elevated, the movement of the piston being in turn, communicated to the frame 25 through the intermediary of the chains 46, thereby causing the forks 29 to be elevated. The arrangement of the sprockets and the manner in which the chains are reeved thereabout are such that for any given movement of the piston 11, the frame 25 will be moved approximately thrice the distance the piston is moved. Stated in another way, the frame 25 is moved at thrice the speed of the piston.

When the frame 25 reaches the position indicated by the dot and dash lines in Fig. 5, it engages the bar 33, and thereafter the channels 28 and associated parts may be elevated to the position shown by the dotted lines in Fig. 1. In other words, the load-lifting forks may be elevated to a position considerably above the upper ends of the channels 4, a feature which is highly advantageous in that it permits the overall height of the mechanism to be maintained at a minimum to provide for passage of such mechanism under relatively low overhead obstructions without sacrificing anything in the way of utility insofar as elevation of the load-lifting forks is concerned.

In order to avoid binding of any parts of the load-lifting mechanism during use thereof, it is desirable that the cylinder 10 have a certain degree of freedom of movement about its support, and this is permitted by virtue of the coacting surfaces 7 and 9 of the pin 6 and cross-bar 8 respectively.

When the mechanism is relatively new and for some time thereafter, the rollers 27 may become jammed in the channels 28, so as to cause such channels to rise concurrently with the elevation of the frame 25. To avoid this, and to insure that such channels will not start to move until the frame 25 has been elevated to the position shown in Fig. 5, latching mechanism is provided for positively preventing elevation of such channels until the frame 25 has moved to such position.

Such mechanism is best shown in Fig. 5 and comprises a rock shaft 47 which is journalled in a bracket 48 extending rearwardly from one of the channels 28. Shaft 47 has keyed to one end thereof a shaft-actuating lever 49 and to the other end thereof a detent 50. A coil spring 51 is provided, one end of which bears against the channel 28 and the other end of which bears against the lever 49 to normally maintain such lever in the position shown in Fig. 5, the detent 50 at such times being disposed beneath a lug or abutment 52 on the channel 4, so that any attempt to elevate the channels 28 will be resisted by said abutment.

When, however, the frame 25 has been elevated to the position shown in Fig. 5, one of the flanges 26 of the latter comes into engagement with the lever 49, and on continued upward movement of said frame, the lever is rocked in a counterclockwise direction as viewed in Fig. 5, thereby rocking the shaft 47 and releasing the detent 50 from engagement with the abutment 52. Thereafter, the channels 28 are free to move upward.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. The combination with an industrial truck of a load-elevating apparatus, said apparatus comprising an upright frame structure mounted on said truck, a second frame structure slidable relatively to said first frame structure, a load-lifting carriage slidable relatively to said second frame structure, and actuating mechanism for said carriage and second frame structure comprising hydraulic piston and cylinder reacting upon said first frame structure, a cross-head mounted on said mechanism, guide members carried by and adjacent the top of said slidable frame structure, by said slidable frame structure adjacent the lower end thereof, by said cross-head and by and adjacent the lower end of said mechanism, and a flexible member actuated by and secured at one end thereof to said mechanism and reeved about all of said guide members, said flexible member being secured at the other end thereof to said carriage.

2. The combination with an industrial truck of a load-lifting apparatus, said apparatus comprising an upright frame structure mounted on said truck, a second frame structure slidable relatively to said first frame structure, a load-lifting carriage slidable relatively to said second frame structure, and actuating mechanism for said carriage and second frame structure, a cross-head mounted on said mechanism, sprockets mounted upon and adjacent the top and bottom of said second frame structure, a sprocket mounted on

said cross-head, a sprocket adjacent the bottom of said upright frame structure, and a chain secured at one end to said cross-head and passing successively over said sprockets in an order reverse to that named, and secured at its other end to said carriage.

3. The combination of an industrial truck of a load-lifting apparatus, comprising load tiering mechanism having a telescopic upright frame structure slidable within an upright frame structure mounted on the truck, a load-lifting carriage slidably mounted on the slidable frame structure, an actuating mechanism for the load-lifting carriage and the slidable frame structure comprising a hydraulic cylinder reacting upon the frame structure fixed to the truck, an upwardly extending ramp disposed centrally of both upright frame structures and a flexible member having one end thereof attached to the load-lifting carriage, and the other end fixed to a part of the elevating mechanism which is immovable relative to the truck, said flexible member extending over rotatable guide members mounted upon and adjacent to the top of the movable frame structure and extending downwardly at the rear of the elevating mechanism to pass around a second guiding means and then upwardly and over a guiding means carried on said ramp and latching means for maintaining the slidable upright frame structure immovable relative to the fixed upright frame structure during substantially the complete elevating movement of the load-lifting carriage and releasable by contact therewith, whereby the load-lifting carriage is caused to move upwardly the complete opposite height of the slidable frame structure before the slidable frame structure has an elevating movement imparted thereto by continuous upward movement of said ramp.

4. In an industrial truck, a load-lifting apparatus comprising a frame structure mounted on the truck, a slidable frame structure carried thereby, a load-lifting carriage mounted on the slidable frame structure and movable relative thereto, and an actuating mechanism for the slidable frame structure and the load-lifting carriage, comprising a hydraulically operated ramp, a pair of sprockets mounted on the ramp, a piston on the truck for operating the ramp, a pair of sprockets carried by the frame structure which is mounted on the truck, a pair of sprocket members mounted upon the lower part of the slidable frame structure, a fourth pair of sprocket members mounted upon a lower part of the frame structure carried by the truck, and a pair of chain members secured at one end to the load-lifting carriage and at the other end to the piston.

5. The combination with an industrial truck of a load lifting apparatus comprising a fixed guide member supported by said truck, an element movably supported by said truck, a guide member supported by said element, a carriage adapted to be elevated relatively to said truck, a flexible member one end of which is connected to said element, the other end of which is connected to said carriage and the body of which passes over said guide members, and means for actuating said movable element.

6. The combination with an industrial truck of load elevating apparatus comprising an upright frame on said truck, an elevating frame slidable relatively to said upright frame, a load lifting carriage slidable relatively to said elevating frame, actuating mechanism comprising piston and cylinder elements, a cross-head actuated by one of said elements, guide members one carried by and adjacent the top of said elevating frame, another carried by and adjacent the lower end of said elevating frame, another carried by said cross-head and another adjacent the lower end of said mechanism, and a flexible member actuated by and secured at one end thereof to said cross-head, reeved about all of said guide members and secured to said carriage.

7. The combination with an industrial truck of load lifting apparatus comprising an upright frame on said truck, a load lifting carriage slidably mounted on said frame, hydraulically extensible elements one of which is supported by said truck, a guide member carried by the other of said elements, a guide member carried by said frame, and a flexible member secured at one end to the other of said elements, reeved over said guide members, and secured at the other end thereof to said carriage.

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