

March 27, 1945.

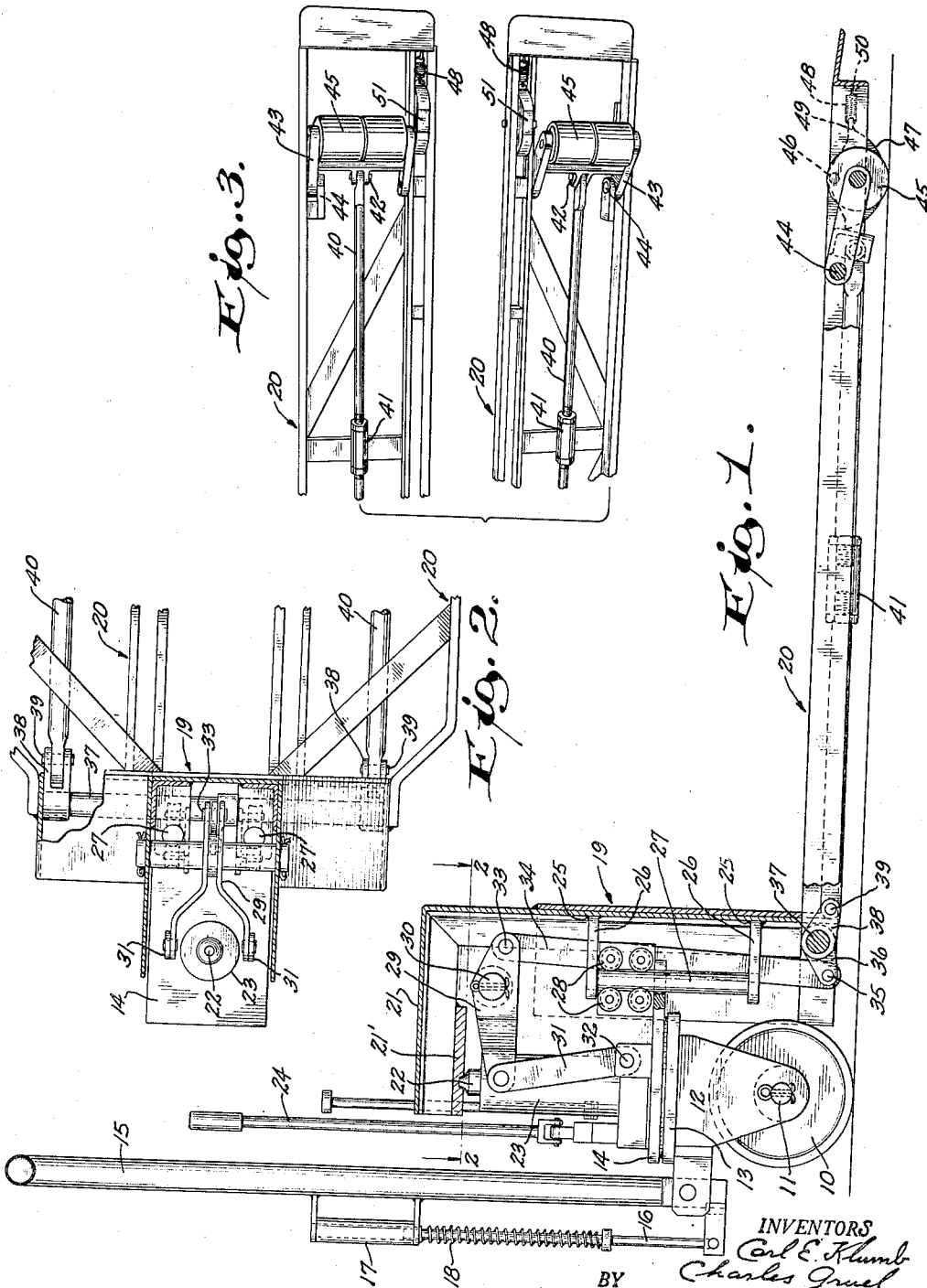
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2,372,585

LIFT TRUCK

Filed Aug. 9, 1943

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 5.

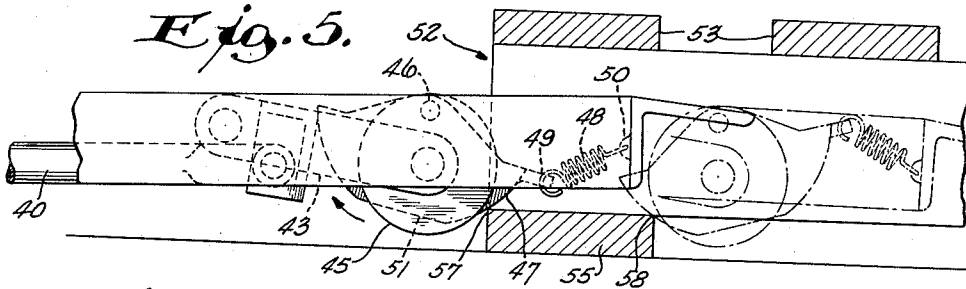


Fig. 6.

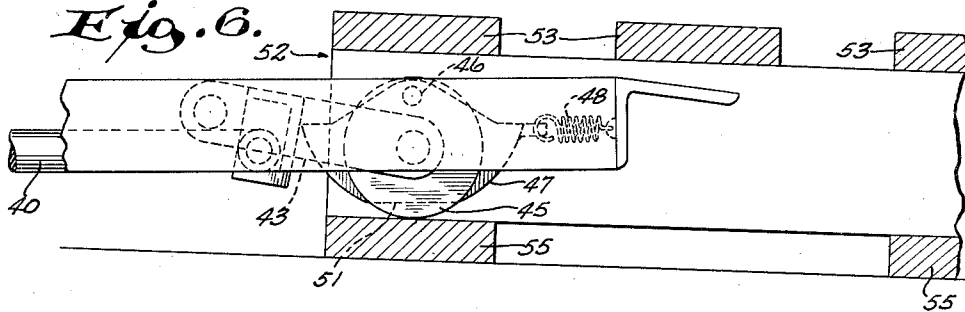


Fig. 7.

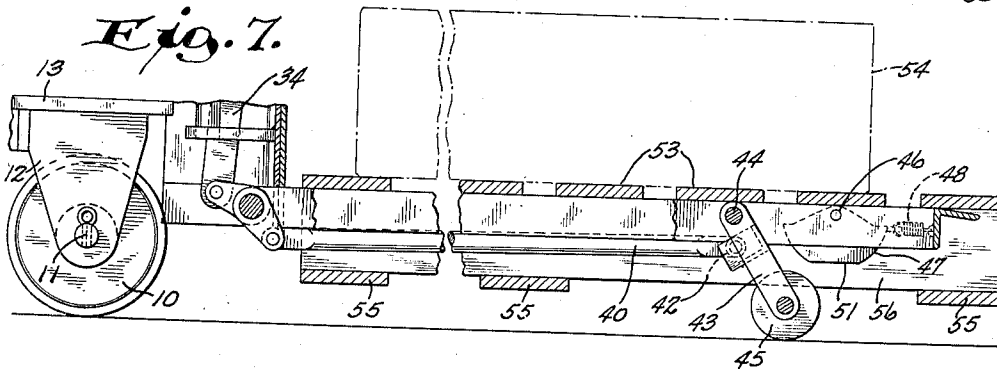
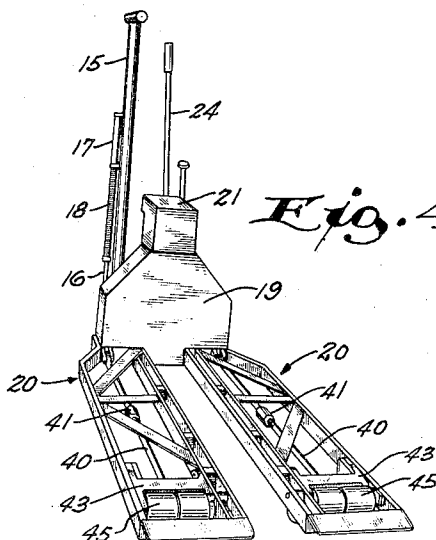


Fig. 4.



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2,372,585

LIFT TRUCK

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Application August 9, 1943, Serial No. 497,882

3 Claims. (Cl. 280—49)

This invention relates to improvements in lift trucks.

Lift trucks are commonly employed in factories and warehouses to move material from one location to another. Frequently such material is stacked on a pallet or supporting base and it is desirable that the lift truck be constructed for insertion in the pallet to move the latter together with the article stacked thereon. Some of these pallets are of the double faced type—that is, there is a top article supporting face and a bottom face forming a base and spaced below the top face a sufficient distance to permit the insertion of the fork of a lift truck between said two faces. Other pallets, of the single face type, have only the top article supporting face together with means for spacing the same a short distance above the floor. It is highly desirable that lift trucks be constructed for interchangeable use either with a single faced pallet or a double faced pallet. Where a double faced pallet is employed, the bottom face usually comprises several widely spaced slats. Thus the rear wheels of the lift truck, that is the wheels below the free end of the fork, must ride over the edges of these slats during insertion of the fork in the pallet as well as during withdrawal. This causes undesirable jarring of the lift truck and pallet and injury to the edges of the slats and end boards of the pallet.

It has heretofore been proposed to facilitate the insertion of a lift truck fork into a double faced pallet by providing a plurality of rollers at variable distances in each direction away from the main fork supporting rollers, said plurality of rollers being progressively smaller in size. This type of construction, however, is expensive to manufacture because of the numerous sets of rollers required, and does not eliminate the damage to the edges of the slats when the rollers are pushed against said edges.

It is a general object of the present invention to provide an improved lift truck wherein means preferably in the form of rocking cams are utilized adjacent the supporting rollers to facilitate the movement of the fork into and out of a double faced pallet, whereby the same set of cams may accomplish the desired purpose both during insertion and withdrawal and wherein jarring, when the cams engage the edges of the slats, is minimized because of the immediate pivoting action which takes place, the cams serving as jacks during said pivoting action to elevate the fork until the rollers are able to engage the upper surface of the slat.

A further object of the invention is to provide an improved lift truck having improved means for causing lifting movement of the fork portion, when a pallet is being elevated, and for vertically guiding and bracing the fork during said elevating movement.

A further object of the invention is to provide a construction as above described, wherein novel means is utilized for causing lowering of the fork supporting wheels as the fork is being elevated.

A further object of the invention is to provide an improved lift truck which may be used with both single and double faced pallets.

With the above and other objects in view, the invention consists of the improved lift truck and all its parts and combinations as set forth in the claims and all equivalents thereof.

In the accompanying drawings illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

Fig. 1 is a side elevational view of the improved lift truck, parts being broken away and shown in vertical longitudinal section;

Fig. 2 is a fragmentary sectional view taken approximately on the line 2—2 of Fig. 1, parts being broken away;

Fig. 3 is a bottom view, in slight perspective of the outer end of the fork;

Fig. 4 is a perspective view of the complete lift truck;

Fig. 5 is a fragmentary side elevational view showing the outer end of the fork as it is about to enter a double faced pallet, the pallet being shown in vertical longitudinal section. In this figure the dot-and-dash lines indicate the position of the parts when the lift truck is being withdrawn from the pallet or when it is being inserted and is about to ride past the inner edge of the first slat;

Fig. 6 is a view similar to Fig. 5 showing the fork supporting rollers in engagement with the top surface of the slat; and

Fig. 7 is a fragmentary side elevational view of the lift truck, parts being broken away and shown in vertical longitudinal section, illustrating how the pallet is elevated by the lift truck. Part of this view is broken away intermediate the length thereof to conserve space.

Referring now more particularly to the drawings the numeral 10 designates the steerable front wheel which is rotatable on an axle 11 extending through a downwardly extending projecting fork 12. The fork has its upper end rigidly connected to a swivel disk 13 and said disk is pivoted be-

neath a non-rotatable plate 14. Suitable anti-friction bearings may be utilized between the rotatable disk 13 and the plate 14.

A steering and pulling handle 15 is pivotally connected to the fork 12. Means, such as the pivoted rod 16 guided in a sleeve 17 against the tension of a coil spring 18, may be utilized to normally hold the handle 15 in the upright position when the handle is not being used for pulling.

The non-rotatable plate 14 projects into the open front of an upright frame portion 19. This upright frame portion has its lower end rigidly connected to the fork portions 20 and has its upper end horizontally bent as at 21. Said upper portion also includes a relatively strong horizontal plate 21' which is rigidly connected to the upright portion 19. This plate is engaged by the movable ram 22 of an hydraulic cylinder 23 supported on the non-rotatable plate 14. Hydraulic fluid may be forced under pressure into the cylinder 23 to raise the ram 22 by reciprocal movement of a pivoted handle 24 operating a suitable fluid pump. This extension of the ram 22 causes raising of the upright frame portion 19, and vertical movement of the forks 20 which are connected to the lower end of the frame portion 19.

Projecting into the interior of the frame portion 19 and rigidly connected thereto as at 25 are arms 26. These arms support upright rods 27. The rods 27 are guided during vertical movement of the frame portion 19 by the anti-friction rollers 28. The rollers 28 are supported on the non-rotatable plate 14 so that these rollers do not move vertically when the frame portion 19 is elevated. Thus the rollers 28 cooperate with the guide rods 27 to prevent rotation of the plate 14 during steering and also serve as guides during the elevating movement of the frame portion 19 and the forks 20.

A lever member 29 is pivoted on a horizontal shaft 30. The forward end of the lever 29 is forked and the ends of the fork are pivotally connected to links 31. The lower ends of the links 31 are in turn pivotally connected to the plate 14 as at 32. The rear end of the lever 29 projects beyond the shaft 30 and is pivotally connected as at 33 to the upper end of a link 34. The lower end of the link 34 is pivotally connected as at 35 to an arm 35. Said arm is rigidly connected to a rock shaft 37. Each end of the rock shaft is provided with a rigidly connected arm 38. The arms 38 are pivotally connected as at 39 to the forward ends of rods 40. There is one rod 40 for each of the fork portions 20. The rods 40 may be provided intermediate their length with turn buckle adjustments 41.

Referring to Figs. 1 and 3 the rear end of each rod 40 is pivotally connected as at 42 to a roller supporting assembly 43. The roller supporting assembly has its upper ends pivotally connected to the fork portion as at 44, and fork supporting rollers 45 are rotatably mounted in the roller supporting assemblies 43.

As a result of this arrangement when the forks 20 are elevated, due to operation of the hydraulic ram 22, then there is an upward pull on the pivot point 33 at the upper end of the link 34. This causes rocking of the lower shaft 37 and movement of the fork supporting rollers 45 from the position of Fig. 1 to the position of Fig. 7.

Each fork portion 20 has suspended therefrom on a pivot 46 a cam member 47. When the fork supporting rollers 45 are in the normal position of Fig. 1, the pivot points 46 for the cams 47 are

in vertical alinement with the axles for the rollers 45. The coil spring 48 has one end connected to the cam member as at 49, and has its other end connected to the fork as at 50. There is, of course, a spring 40 for each of the cams 47. These springs tend to normally hold the cams in the position of Fig. 1. Pivotal movement of the cams in either direction tends to stretch the springs. Each cam preferably has its bottom flattened as at 51.

The use of this lift truck in connection with a double faced pallet 52 is illustrated in Figs. 5, 6 and 7. The top face of this pallet may comprise a plurality of transverse slats 53 on which articles 54 may be supported or stacked. The bottom face comprises slats 55 which are spaced more widely than the slats 53. The top and bottom faces are held in vertically spaced relationship by means of longitudinally extending side members 56, and the ends of the pallet are open.

When the free end of the forked portion 20 is being pushed into the space between the two faces of the pallet, the cams 47 engage the front edge of the first slat 55 as at 57 (Fig. 5). This does not cause an abrupt stop of the inward movement of the fork. Instead, the cams immediately start to pivot in the direction indicated by the arrow in Fig. 5 and the fork continues to move inwardly. However, at the same time the cams are serving as jacks to swing the fork upwardly as it is moved inwardly. During such upward swinging movement the point of engagement 57 between the cams and the slats remains the same and the upward swinging movement continues until the cam pivots 46 are almost in vertical alinement with the contact points 57. By this time, however, the fork has been elevated to such a point that the bottom-most portions of the rollers 45 are in the horizontal plane of the top surface of the slat 55. The rollers 45 will then take the load, and due to the flat portions 51 of the cams being above the lowermost portions of the rollers, the cams will swing back to the normal position of Fig. 6. This return movement of the cams is assured by the springs 48. The fork of the lift truck will then be in the position of Fig. 6. Upon continued insertion of the fork into the pallet the opposite sides of the cams will then come into play and will contact the inner edges of the slats 55 as at 58 (Fig. 5). The fork will then be again lowered, as indicated by the dot-and-dash lines in Fig. 5, until the rollers contact the floor. As the fork is inserted farther into the pallet the operation just described is repeated in going over additional bottom slats.

Upon withdrawal of the fork from the pallet the reverse action takes place and the first engagement with a slat is that indicated by dot-and-dash lines in Fig. 5, with the full line position of Fig. 5 illustrating the position during withdrawal when the fork is being lowered from the edge of a slat.

After the fork of the lift truck has been fully inserted in a pallet, then the lever 24 for the hydraulic pump may be operated to raise the fork and to simultaneously lower the fork supporting wheels 45 to the position of Fig. 7. This causes the pallet, as well as the articles 54 thereon, to be elevated so that the pallet and articles may be moved to a new location. The lowering of the fork supporting wheels 45 must, of course, take place when the wheels 45 are located over a space between the bottom slats as in Fig. 7.

It is thus apparent that during the insertion and withdrawal of the fork from a pallet that the cams function to gradually elevate the fork until the rollers are in the plane of the upper surfaces of the slats. Thus, all jarring is eliminated. It is further apparent that the swinging movement of the cams permits said raising to take place without stopping the forward movement of the fork. The contact between the cams and the slat edges is not a rolling contact but the points 57 and 58 of Fig. 5 remain fixed until the raising or lowering has been completed. The cams, therefore, function as lifting jacks.

It is also apparent that a very simple mechanism has been provided for elevating the fork and pallet and for simultaneously lowering the fork supporting wheels. This mechanism includes the novel guiding arrangement on the rollers 28 during the vertical elevating movement of the fork. It is to be noted that the hydraulic cylinder 23 does not pivot during steering of the front wheel assembly and remains vertically fixed during elevating of the frame portion 19 and fork.

In the claims the load supporting fork 20 is referred to as an insertable portion inasmuch as the insertable portion does not necessarily have to be in two parts. Also in the claims the cam members 47 are referred to generally as lifting members, inasmuch as the function can be performed by shapes which vary from the cam shape illustrated.

Various changes and modifications may be made without departing from the spirit of the invention and all of such changes are contemplated as may come within the scope of the claims.

What we claim is:

1. In a lift truck having a portion insertable between the two faces of a double faced pallet, roller means normally supporting said insertable portion, and a cam shaped lifting member pivotally suspended from said insertable portion on a pivot which is directly above the axis of said roller means when the latter is in normal position, the bottommost edge of said lifting member being normally directly above the lowermost portion of said roller means and portions of said lifting member normally projecting beyond the roller means in each direction to engage slat edges of

the pallet prior to the roller means during insertion or withdrawal movement of the lift truck, and spring means for quickly returning said lifting member to said normal position of suspension after the lifting member has been swung in either direction.

2. In a lift truck having a portion insertable between the two faces of a double faced pallet, roller means normally supporting said insertable portion and projecting below the bottom thereof, and a cam shaped lifting member pivotally suspended from said insertable portion on a pivot which is directly above the axis of said roller means when the latter is in normal position, the bottommost edge of said lifting member being normally above the lowermost portion of said roller means and portions of said lifting member having curved edges which normally extend beyond the roller means in each direction longitudinally of the lift truck and intersect the horizontal plane of the bottom of the insertable portion so that one of said curved edges may engage a slat edge of a pallet prior to the roller means during insertion or withdrawal movement of the lift truck, the top of each lifting member projecting no higher than the horizontal plane of the top of said insertable portion.

3. In a lift truck having a portion insertable between the two faces of a double faced pallet, roller means normally supporting said insertable portion, a cam shaped lifting member pivotally suspended from said insertable portion on a pivot which is directly above the axis of said roller means when the latter is in normal position, the bottommost edge of said lifting member being normally directly above the lowermost portion of said roller means, and portions of said lifting member normally projecting beyond the roller means in each direction to engage slat edges of the pallet prior to the roller means during insertion or withdrawal movement of the lift truck, a spring connected at one end to the insertable portion of the truck and connected at its other end to the lifting member, the points of connection being so located that the spring is stretched when the lifting member is swung in either direction from its normal position of suspension.

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