July 9, 1963 D. H. NORTON ETAL 3,096,896

ATTACHMENT FOR FORKLIFT TRUCKS

Filed May 4, 1961 3 Sheets-Sheet 1

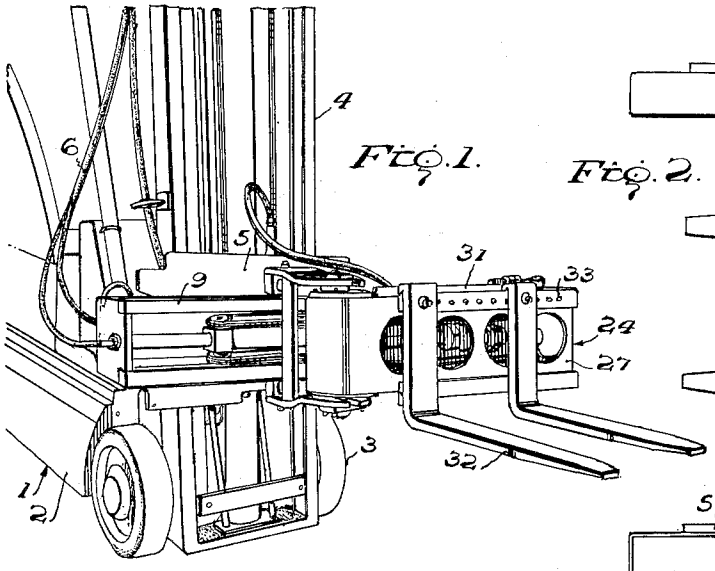

Fig. 1.

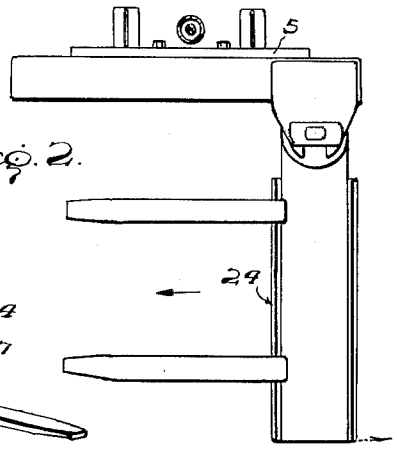

Fig. 2.

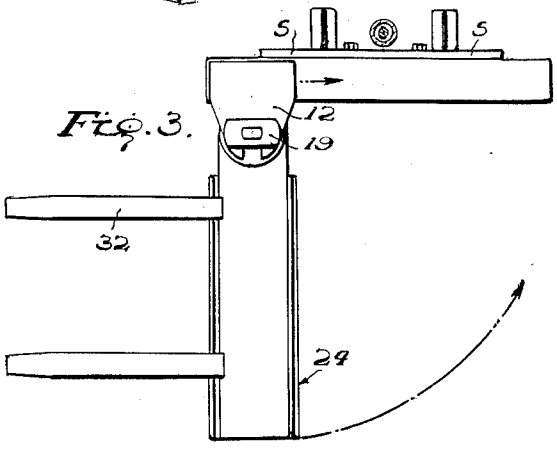

Fig. 3.

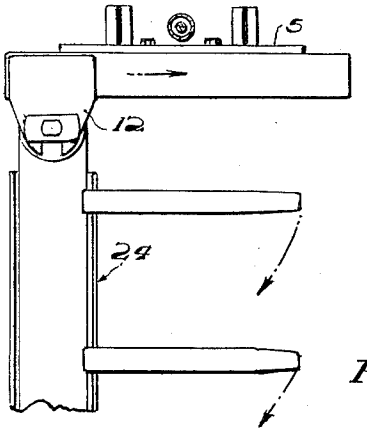

Fig. 4.

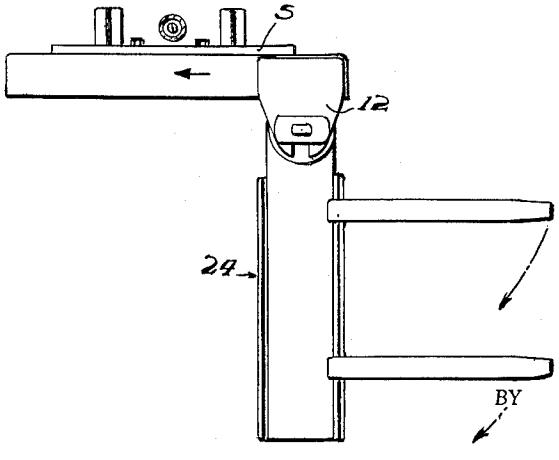

Fig. 5.

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Fig. 6

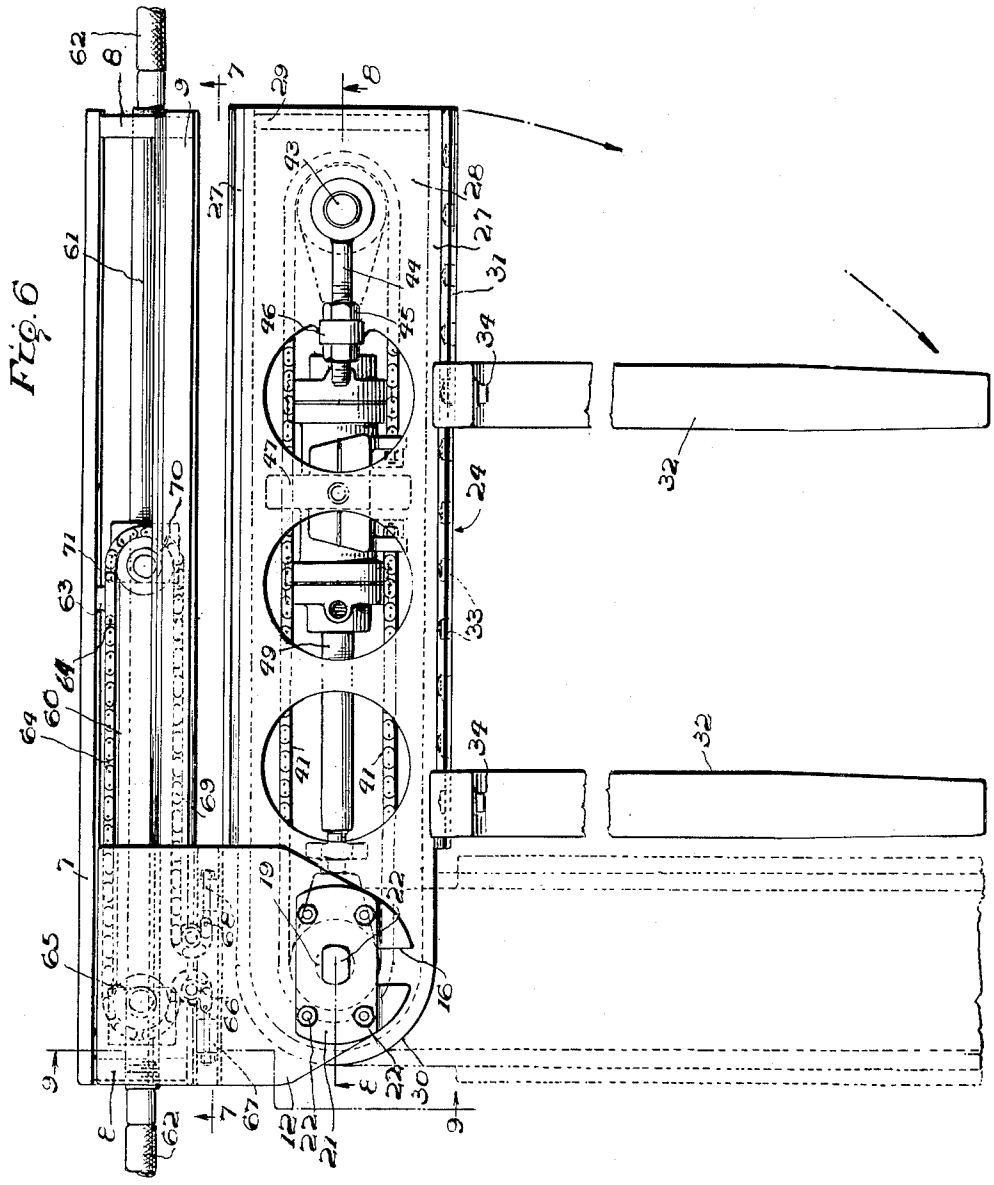

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Fig. 7.

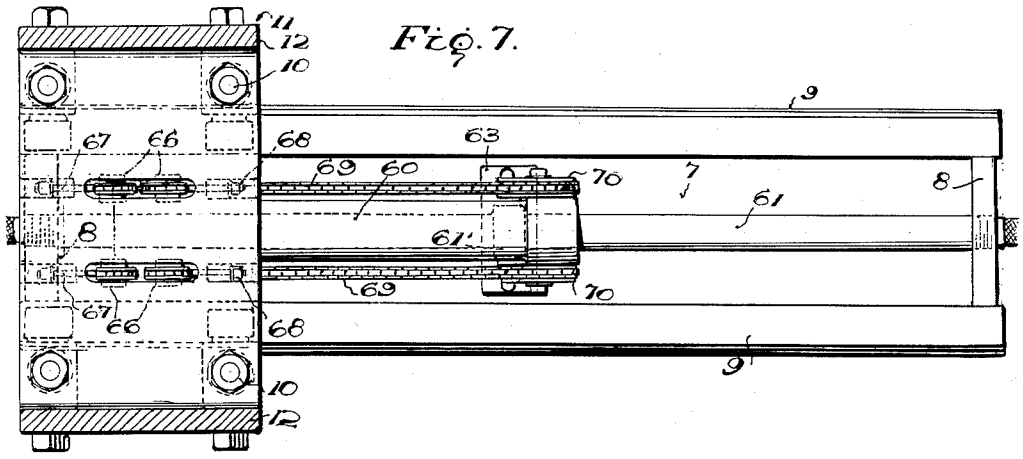


Fig. 8.

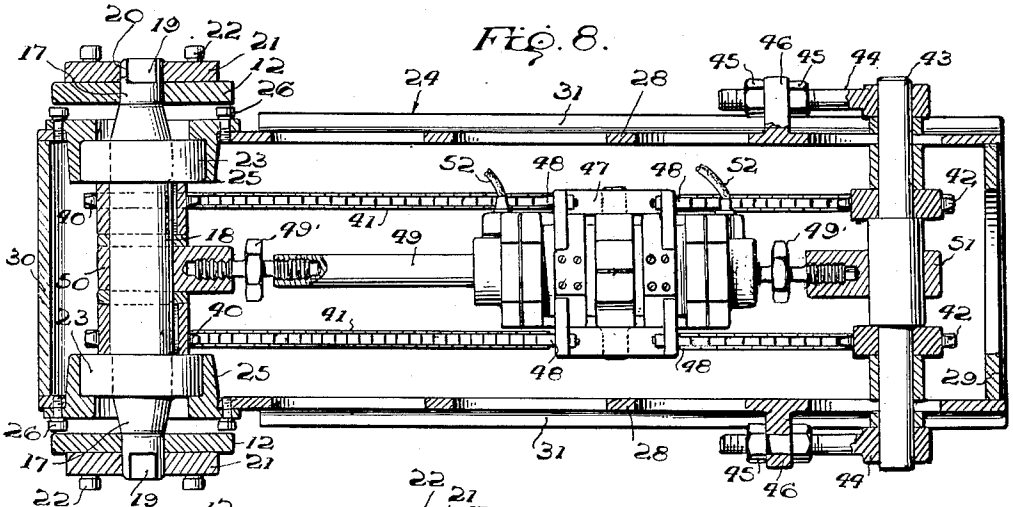
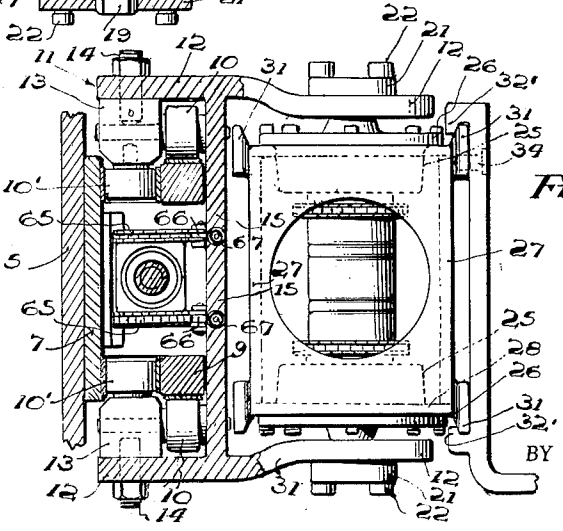


Fig. 9.



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3,096,896

ATTACHMENT FOR FORKLIFT TRUCKS

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Filed May 4, 1961, Ser. No. 107,868
10 Claims. (Cl. 214—730)
(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to forklift trucks and more particularly to an attachment for such trucks whereby the conventional truck may be readily but temporarily modified so as to operate within the relatively narrow aisles of rack storage warehouses, as well as for longitudinal or bulk storage.

Another object of the invention consists in the provision of a relatively simple attachment for conventional forklift trucks which may be secured in operative position to perform the above-mentioned functions by merely bolting the same to the backing plate of the vertically movable carriage.

A further object of the invention consists in providing an attachment for lift trucks in which a bearing assembly is mounted for transverse movement on the mast of the truck and carries a boom which is associated with a bearing assembly so as to be capable of a swinging movement through 180°.

A still further object of the invention consists in the provision of such an attachment in which the pivoted boom on which the forks are mounted is so constructed that the forks may be suspended from one side or the other by means of a readily detachable dove-tail connection so as to simplify the operation of servicing either side of the aisle.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view of a conventional lift truck with the novel attachment applied thereto;

FIGURES 2 and 3 are diagrammatic views showing two positions of the forks when suspended from the right-hand side of the boom, with arrows showing the direction of movement;

FIGURES 4 and 5 are diagrammatic views showing two positions of the forks when suspended from the left-hand side of the boom, with arrows showing the direction of movement;

FIGURE 6 is an enlarged plan view of the attachment;

FIGURES 7 and 8 are longitudinal sectional views taken on the lines 7—7 and 8—8 of FIGURE 6; and

FIGURE 9 is a transverse sectional view taken on the line 9—9 of FIGURE 6.

Referring to the drawings in greater detail and particularly to FIGURE 1, the numeral 1 indicates generally a conventional forklift truck including a body 2, wheels 3, mast 4, vertically movable backing plate 5, and hydraulic system 6.

Detachably mounted on the backing plate 5 of the conventional carriage, from which the forks or other load carrier has been removed, is a transverse frame comprising a back plate 7 and end plates 8. To the top and bottom of these end plates at the forward ends thereof are upper and lower tracks 9 on which ride the rollers 10—10′ of a bearing assembly indicated generally by the reference numeral 11. This assembly comprises upper and lower bearing plates 12—12 to which are bolted

upper and lower blocks 13—13 by bolts 14. These blocks carry the rollers 10—10′ just referred to. The bearing plates 12 are welded or otherwise connected to the upper and lower ends of a plate 15 to complete this part of the assembly.

The bearing plates 12 extend forwardly of the upright plate 15 and are provided with slots 16 which are open at their outer ends to slidably receive the upper and lower ends 17 of the vertical shaft 18. These ends of the shaft extend beyond the plates 12 and are flattened on their sides as indicated at 19 to engage the flat sides of openings 20 in plates 21 which are bolted to plates 12 by means of bolts 22. By this means, the shaft ends 17 are held against rotation within the slots 16. Oscillatably mounted on the shaft 18 by means of thrust bearings 23 is a fork-hanger boom 24; the bearing being supported on the boom in casings 25 which are fixed to the upper and lower walls of the boom as by means of bolts 26.

The boom 24 is substantially square in cross section and is composed of two side plates 27, top and bottom plates 28, outer end plate 29, and an inner semi-cylindrical end 30, all suitably united as by welding or the like. Upper and lower beveled rails 31 are secured to the edges of the plates 27 and serve as supports for the load-carrying forks 32 which are provided with upper and lower hooked portions 32′ to provide a dove tail connection with the rails 31. The upper rail 31 on each side of the boom is provided with a series of horizontally spaced depressions 33 for cooperation with any preferred type of pin or latch 34 for releasably locking the forks against lateral movement.

The fork-hanger boom 24 is adapted to be oscillated through a total angle of 180°, i.e., 90° to the right or to the left of its central position, depending upon which side of the boom the forks 32 are mounted. To this end, the fixed shaft 18 is provided with upper and lower fixed sprocket wheels 40 cooperating with upper and lower sprocket chains 41 which, in turn cooperate with upper and lower sprocket wheels 42 mounted for oscillation on a fixed shaft 43 at the opposite end of boom 24. This latter shaft is mounted for adjustment along the length of the boom 24 so as to adjust or take up any slack that might develop in the sprocket chains, and for this purpose adjusting bolts 44 engage the opposite ends of the shaft 43 and receive adjusting nuts 45 engaging opposite sides of eyes 46 mounted on top and bottom plates 28 of the boom. By viewing FIGURES 6 and 8, it will be noted that the respective ends of the sprocket chains 41 are fixed to a double-acting cylinder 47 as indicated at 48. This cylinder is slidably mounted on a piston rod 49 which has its opposite ends anchored to the shafts 18 and 43, as indicated by the sleeves 50 and 51, respectively. To compensate for variations in the spacing between the shafts 18 and 43 made to adjust the tension in the chains 41 by adjusting the adjusting bolts 44, adjusting screws 49′ are interposed between the opposite ends of the piston rod 49 and the sleeves 50 and 51 and form the connection between these parts. Adjusting screws 49′ have threads of opposite hand on the opposite ends thereof so that the effective length of the piston rod 49 may be readily and accurately varied for the purpose above stated. Hydraulic fluid is admitted to and released from the opposite ends of the cylinder 47 by means of hose 52 connected to the opposite ends thereof, as seen in FIGURE 8. It will thus be seen that as the cylinder is caused to pull on one end or the other of the chains, the boom will be caused to swing in one direction or the other about the shaft 18 as a pivot.

The bearing assembly 11 and the boom 24 are reciprocated along the tracks 9 by means of a double-acting hydraulic cylinder 60 (FIGURES 6 and 7) which is re-

ciprocably mounted on a piston rod 61 fixedly supported in the end plates 8—8 of the frame 7—8, and provided with a fixed piston 61'. The piston rod 61 is hollow and, as clearly indicated in FIGURE 6, hydraulic pressure is conducted to and from the rod and thence to the cylinder 60 by means of hose 62 connected to opposite ends of the rod. A T-head 63 is mounted on the inner face of the back wall 7 of the frame 7—8, and each of two chains 64 (FIGURE 6) has one end fixed to the T-head, as indicated at 64'. These chains are then reeved around upper and lower rollers 65 mounted on the end of the cylinder and thence around guide rollers 66 (FIGURE 6), and the opposite ends thereof are anchored to the bearing assembly 11, as indicated at 67. One end of a second pair of chains 69—69 is anchored to the bearing assembly 11, as indicated by the numeral 68. These chains are reeved about rollers 70 mounted on the opposite end of the cylinder 60 and are also attached to the T-head 63, as indicated at 71. The admission of the fluid to the respective ends of the piston rod 61 will cause the cylinder to move from one end to the other of the frame 7—8 and, in so doing, will likewise move the bearing assembly 11 and the boom 24 which is pivotally mounted thereon.

It thus appears that by mere operation of the control valves of the hydraulic system, the load-bearing element, i.e., the forks 32, may be caused to travel from one side of the lift truck to the other and may be caused to swing through 90° from the center position to direct the forks laterally and vice versa, depending upon which side of the boom the forks are carried. Also that, when desired, the forks may be maintained at their central position for longitudinal loading and unloading.

From the foregoing description taken in connection with the accompanying drawings, it will be apparent to those skilled in the art that we have devised a rather simple and inexpensive, yet sturdy and reliable, structure by which a conventional fork lift truck may be readily converted into one in which the loads may be handled in the conventional longituidinal direction or can be hydraulically swung for operation laterally to handle loads at the side of the truck as in narrow aisle rack storage, as well as permitting the truck to carry long loads, such as pipes, etc., longitudinally through narrow doorways and along aisleways.

While this novel device has been described as an attachment to conventional trucks, it will be understood that the same structure could well be incorporated as a permanent part of a fork lift truck as originally constructed.

In accordance with the patent statutes, we have described what we now consider to be the preferred form of the invention, but inasmuch as various minor changes may be made in structural details without in any way departing from the spirit of the invention, it is intended that all such changes be included within the scope of the appended claims.

We claim:

1. An attachment for lift trucks, comprising a transverse frame adapted to be fixed to the backing plate of the carriage of the truck, a bearing assembly reciprocably mounted on said frame, means for reciprocating the assembly, a fork-hanger boom pivoted in said assembly, and means mounted in the boom and assembly for swinging the boom about its pivot, said means comprising a cylinder and piston assembly mounted in the boom and having a movable element, a fixed sprocket wheel on the pivot of the boom, a fixed shaft and a rotatable sprocket wheel carried by the boom, and a sprocket chain meshed with said sprockets and driven by the movable element of said piston and cylinder assembly.

2. An attachment for lift trucks, comprising a transverse frame adapted to be fixed to the backing plate of the carriage of the truck, a bearing assembly reciprocably mounted on said frame, means for reciprocating the assembly, a fork-hanger boom pivoted in said assembly, and means mounted in the boom and assembly for swinging

the boom about its pivot, said means including a horizontal cylinder and piston assembly mounted in the boom and having a movable element, a fixed sprocket wheel on the pivot of the boom, a fixed shaft and a rotatable sprocket wheel mounted on the boom, and a sprocket chain meshed with said sprockets and fixed at opposite ends thereof to the movable element of the piston and cylinder assembly so as to be driven thereby.

3. An attachment for forklift trucks, comprising a frame adapted to be mounted upon the carriage of a forklift truck, a bearing assembly mounted on said frame, a fork-hanger boom pivotally mounted in said bearing assembly, a fixed sprocket coaxial with the axis of swinging movement of said fork-hanger boom, a sprocket on said boom freely rotatable upon a shaft fixedly mounted on the boom and providing an axis spaced from the axis of swinging movement of the boom, a sprocket chain in mesh with both of said sprockets, and means for selectively applying oppositely directed driving forces to said sprocket chain so as to generate forces between said fixed sprocket and boom effective to swing the boom in opposite directions.

4. An attachment for forklift trucks as defined in claim 3 wherein the force applying means selectively applies oppositely directed pull to the opposite ends of said sprocket chain so as to cause said boom to swing in opposite directions.

5. An attachment for forklift trucks as defined in claim 3 wherein the means for selectively applying oppositely directed driving forces to said sprocket chain is a piston and cylinder assembly in the boom selectively to pull said sprocket chain in opposite directions.

6. An attachment for forklift trucks as defined in claim 3 wherein the fork-hanger boom is pivotally mounted adjacent one end thereof to said bearing assembly and the freely rotatable sprocket is mounted adjacent the other end of the boom.

7. An attachment for forklift trucks, comprising a frame adapted to be mounted upon the carriage of a forklift truck, a bearing assembly mounted on said frame, a fork-hanger boom pivotally mounted in said bearing assembly, a fixed sprocket coaxial with the axis of swinging movement of said fork-hanger boom, a sprocket supported by said boom for rotation upon a shaft fixedly mounted on the boom and providing an axis remote from the axis of swinging movement thereof, a sprocket chain in mesh with said two sprockets, and a piston and cylinder assembly including an element reciprocable on an axis extending between the axis of swinging movement of said boom and the remote axis, the opposite ends of said sprocket chain being fixed to said reciprocable element so as to be pulled thereby in opposite directions.

8. An attachment for forklift trucks, comprising a frame adapted to be mounted upon the carriage of a forklift truck, a bearing assembly mounted on said frame, a fork-hanger boom pivotally mounted in said bearing assembly, a fixed sprocket coaxial with the axis of swinging movement of said fork-hanger boom, a sprocket supported by said boom for rotation upon a shaft fixedly mounted on the boom and providing an axis remote from the axis of swinging movement thereof, a sprocket chain in mesh with said two sprockets, a piston rod fixed to extend between said fixed and remote axes, a piston fixed on said piston rod, and a cylinder mounted in reciprocable relationship to said piston rod and piston, the opposite ends of said sprocket chain being fixed to said cylinder so as to be pulled thereby in opposite directions.

9. An attachment for forklift trucks, comprising a frame adapted to be mounted upon the carriage of a forklift truck, a bearing assembly mounted on said frame, a shaft fixedly mounted in said bearing assembly, a fork-hanger boom pivotally mounted on said fixed shaft, a sprocket fixed upon said fixed shaft in coaxial relation thereto, a second shaft fixedly mounted in said boom remote from said fixed shaft and having its axis parallel to the axis thereof, a sprocket freely rotatable upon said

remote shaft, a sprocket chain meshed with said two sprockets, a piston rod supported at opposite ends thereof from said two shafts, respectively, a piston fixed on said piston rod, and a double acting cylinder mounted in operative relationship with said piston and piston rods, the opposite ends of said chain being fixed to said cylinder so that pull may be applied thereby to said sprocket chain selectively in opposite directions.

10. An attachment for forklift trucks, comprising a frame adapted to be mounted upon the carriage of a forklift truck, a bearing assembly mounted on said frame, a shaft fixedly mounted in said bearing assembly, a fork-hanger boom pivotally mounted on said fixed shaft, a sprocket fixed upon said fixed shaft in coaxial relation thereto, a second shaft fixedly mounted in said boom remote from said fixed shaft and having its axis parallel to the axis thereof, a sprocket freely rotatable upon said remote shaft, a sprocket chain meshed with said two sprockets, a piston rod supported at opposite ends thereof from said two shafts, respectively, a piston fixed on

said piston rod, a double acting cylinder mounted in operative relationship with said piston and piston rod, the opposite ends of said chain being fixed to said cylinder so that pull may be applied thereby to said sprocket chain selectively in opposite directions, means for adjusting said remote shaft toward and from said fixed shaft and means to accommodate the length of said piston rod to variations in the spacings between said fixed and remote shafts.

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