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[54] **POWER-OPERATED TILT-UP LIFT FORK**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **214/700,** 214/750
[51] **Int. Cl.** **B66f 9/10**
[50] **Field of Search** ..... 214/750, 700, 701, 701 (P), 730, 731

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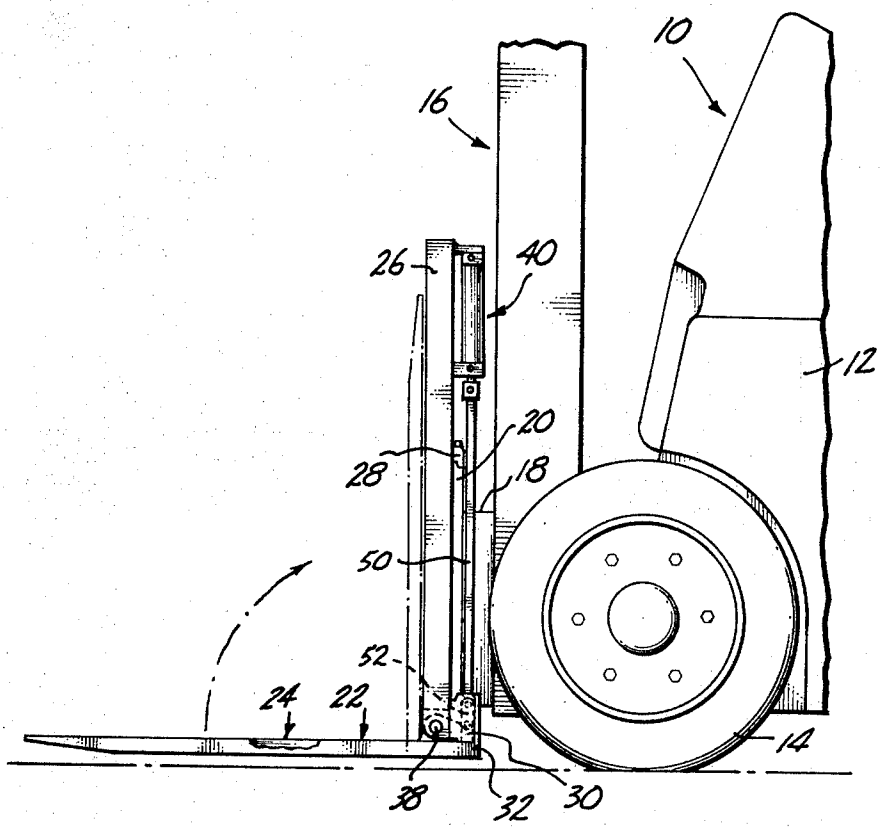
ABSTRACT: A lift truck with pivoted lift forks in which each lift fork has a pivot connection mounting the fork adjacent the base of a carriage in the lift truck. The pivot connection accommodates swinging of the fork between lowered and raised positions. An upright hydraulic ram disposed rearwardly of the pivot connection for the fork is provided for swinging the fork. The ram is connected to the fork through a movable link which moves to a position releasably holding the fork in its raised position on adjustment of the ram to raise the fork.



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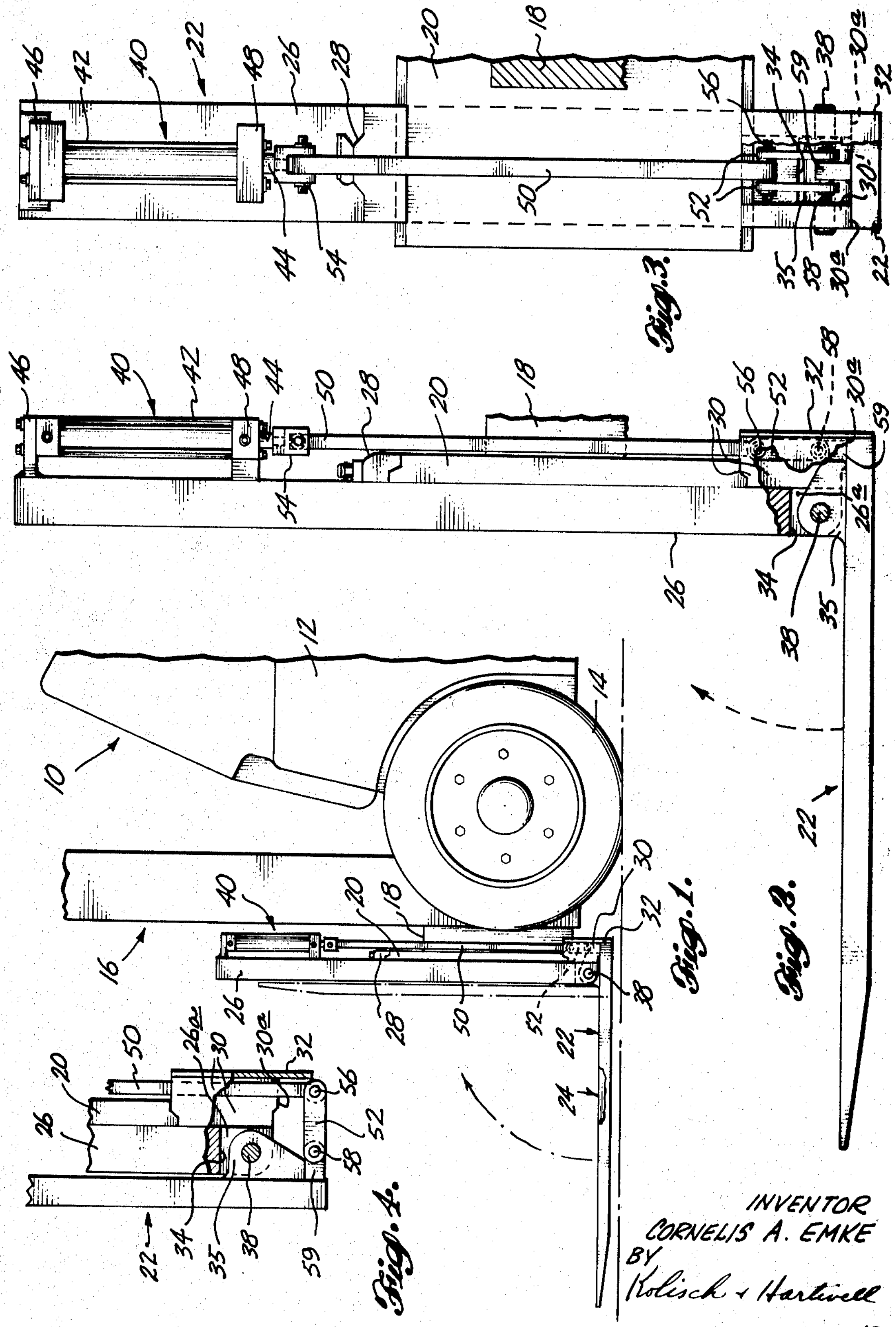

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POWER-OPERATED TILT-UP LIFT FORK

This invention relates to a lift fork attachment for a lift truck, and more particularly, to such an attachment which includes a fork mounted for swinging between lowered and raised positions, with power-operated means provided for swinging the fork between such positions.

The usual forklift truck includes a pair of laterally spaced forks mounted on an upright plate carried on a vertically movable carriage that forms part of a mast assembly in the truck. During a load handling operation, the forks occupy a lowered position where they extend out forwardly and generally horizontally from the truck. However, at other times, when the truck is not handling a load, for example when it is traveling unloaded over a highway, it is desirable that the forks be swung out of the way—preferably to an upright raised position—to make maneuvering of the truck easier.

Lift fork constructions have been proposed in the past which accommodate swinging of a fork between lowered and raised positions, but such constructions have not been entirely satisfactory. In many known constructions it is necessary that a truck operator, or someone else, swing the forks by hand, and this is a fairly time-consuming operation. In addition, the forks in these constructions are usually held in their tilted-up positions through manually operated latching mechanisms whose adjustment requires additional time.

A general object of the present invention is to provide a novel lift fork attachment which includes a fork that may be swung between lowered and raised positions, and which takes care of the above-mentioned deficiencies in known constructions in a satisfactory and practical manner.

More specifically, an object of the invention is to provide such an attachment including a fork which may be swung between lowered and raised positions, with power-operated means provided for swinging the fork.

Another object of the invention is to provide such an attachment which further comprises novel fork retaining means for releasably holding the fork in its raised position automatically upon the fork being swung to such position.

A further object is to provide an attachment of the type so far described which is relatively compact in construction, and which may readily be mounted on the carriage in a lift truck without appreciably affecting the lost load center of the truck.

These and other objects and advantages attained by the invention will become more fully apparent as the description which follows is read in conjunction with the accompanying drawings, wherein:

FIG. **1** is a simplified fragmentary side elevation illustrating the front part of a conventional lift truck, and a lift fork attachment constructed according to the invention mounted on the lift truck;

FIG. **2** is an enlarged side elevation with portions broken away illustrating details of the mounting of one fork in the attachment;

FIG. **3** is a view on the same scale as FIG. **2** taken from the right side of FIG. **2**; and

FIG. **4** is similar to portions of FIG. **2**, but showing the fork raised.

Turning now to the drawings, and referring first to FIG. **1**, indicated generally at **10** is the front part of a conventional lift truck having the usual truck frame **12** supported for movement over the ground by a wheel assembly, such as assembly **14**.

Mounted on the front of frame **12** is an upright telescopic mast assembly **16** supported through the usual pivot means (concealed) enabling limited forward and rearward tilting of the assembly. Forming part of the mast assembly is a vertically movable carriage **18**, on the front face of which is mounted a conventional upright mounting plate **20**. Laterally opposite sides of plate **20** project outwardly beyond laterally opposite sides of carriage **18**, as can be seen for one side of the plate in FIG. **3**.

Mounted adjacent opposite side margins of plate **20**, in a manner which will be more fully described, is a pair of lift forks **22**, **24** in a fork attachment which is mounted on the carriage.

Lift forks **22**, **24** are substantially the same in construction, and only fork **22** will be described in detail. Referring now more particularly to FIGS. **2** through **4**, shown at **26** is an elongated upright mounting member disposed against the front face of plate **20**. The upper end of the member extends well above the top edge of the plate. Member **26** is releasably secured in place on plate **20** by means of a releasable clamping mechanism **28** which engages the top edge of the plate, and a pair of laterally spaced upright lug plates **30** which are secured as by welding to the base of member **26** and have top margins engaging the base of plate **20**. The lug plates include downwardly facing substantially horizontal surfaces **30*a***, the function of which will be more fully explained later. Joined to and extending across the rear edges of the lug plates is an upright guide plate **32**, the lower extremity of which extends below surfaces **30*a***.

The base of member **26** contains a channel, the top of which is shown at **34** in FIGS. **2** and **3**. The channel is about as wide as the spacing between lug plates **30**, and is bounded on each side by legs such as leg **26*a*** shown in FIG. **2**. Joined to the top of fork **22**, and extending upwardly into the channel, as well as between the lug plates, is a block **35**. A pivot pin **38** pivotally joins block **35** and legs **26*a*** of member **26**. In this way, the fork is pivoted to the base of member **26** for swinging about a substantially horizontal axis which extends transversely of the longitudinal axis of the fork.

Fork **22** is swung or pivoted under power, by a hydraulic ram **40** including a cylinder **42** and a rod **44**. The ram is disposed in an upright position with rod **44** projecting downwardly from the lower end of cylinder **42** in a region behind plate **20**. Ram **40** is secured in place by means of anchors **46**, **48** which anchor opposite ends of the cylinder to the upper end of mounting member **26**. The ram may be connected to a suitable source of pressure fluid provided on truck **10** through the usual hose connections, with actuation of the ram controlled by a suitable control valve provided adjacent the operator's station in the truck.

The ram and lift fork in the attachment are interconnected through an elongated upright bar **50**, and a pair of elongated links, or parts **52**. Bar **50** extends downwardly from rod **44** closely adjacent the rear face of plate **20**. The upper end of bar **50** is connected to rod **44** through a coupling **54**. The lower end of the bar is connected to the upper set of ends of links **52** through a pivot pin **56**. A pivot pin **58** connects the lower set of ends of the links to a post **59** which is joined to the back of block **35** and welded to the top of fork **22**.

It will be noted that with the lift fork in its lowered position (as shown in FIGS. **2** and **3**), and the ram contracted, the lower end of bar **50** is disposed within the region bounded by lug plates **30**, plate **32**, and the rear face of mounting member **26**. It will be noted further that links **52** are in upright positions within this region, with their longitudinal axes substantially paralleling the longitudinal axis of bar **50**.

To swing fork **22** to its raised position (the position illustrated in FIG. **4**), ram **40** is extended. Upon extension of the ram, bar **50** shifts downwardly, and through the action of links **52**, causes the fork to swing upwardly about pivot pin **38**. The ends of the links which are connected to the lower end of bar **50** by pin **56**, as well as the lower end of the bar, are braced against rearward movement by the front face of plate **32**. Thus they are guided for movement along a substantially straight upright path, and this action ensures proper raising of the fork.

With the fork occupying its fully raised position, links **52** extend horizontally as shown in FIG. **4**. With the links extending horizontally, and with rearward movement of the links inhibited by plate **32**, the fork becomes effectively locked in an upright position without dependence upon hydraulic fluid in the ram. The fork may be returned to its lowered position only with contraction of ram **40** and pulling up on the rear ends of

the links. The links and plate or member **32** thus constitute fork retaining means in the invention.

With fork **22** in its horizontal or lowered position, the top face thereof at the rear end of the fork engages surfaces **30***a* of lug plates **30**. These surfaces, therefore, are stop surfaces defining the lowered position of the fork.

It should be obvious that the invention provides a novel lift fork attachment wherein the problems of manual control presented in past constructions are avoided. Raising and lowering of a lift fork may easily be accomplished by a truck operator from the operator's station in the truck. The novel links and guide plate provided in the attachment ensure proper raising and lowering of a fork, and further produce automatic releasable locking of the fork in a raised position.

With the ram in the attachment mounted in the fashion described herein, the attachment occupies little space in front of the frame in a truck, and thus has little appreciable effect on the lost load center of the truck.

While an embodiment of the invention has been described herein, it is appreciated that variations and modifications may be made without departing from the spirit of the invention. Accordingly, it is desired to cover all such variations and modifications which would be apparent to one skilled in the art and that come within the scope of the appended claims.

I claim:

1. In a lift truck comprising an upright mast assembly including a vertically shiftable carriage with such having:

an upright front plate;

an elongated lift fork;

pivot means supported on and disposed forwardly of said plate pivoting said fork adjacent one of its ends at a location adjacent the base of the plate for swinging between lowered and raised positions about a substantially horizontal axis extending transversely of the truck;

said fork when in its said lowered position extending substantially horizontally forwardly from the truck, and in its said raised position being upright;

an elongated substantially upright ram located rearwardly of said plate, and operatively interposed between said plate and said fork, operable to swing the fork under power from its said lowered to its said raised position; and

fork retaining means operatively interposed between said fork and said ram including a movable part which moves toward a position effective to hold said fork in its said raised position independently of said ram on adjustment of the ram to raise the fork.

2. The lift truck of claim **1**, wherein said ram includes a cylinder mounted above said plate, and a rod extending downwardly from said cylinder, and which further comprises means extending along the rear side of said plate operatively interconnecting said rod and said one end of said fork.

3. The lift truck of claim **2**, wherein said pivot means is supported on said plate through an elongated upright member mounted on the front face of the plate, said member extends upwardly to an upper end located above the top of the plate, and said cylinder is mounted on said member adjacent said upper end.

4. The lift truck of claim **1**, wherein said ram includes a rod positioned above and extending downwardly toward said one end of said fork, there is an elongated upright bar operatively connected to and extending downwardly from said rod, and said movable part comprises an elongated link having one end pivoted to said bar and its other end pivoted to said one end of said fork, said link occupying an upright position with its longitudinal axis substantially paralleling the longitudinal axis of said bar with the fork in its said lowered position, and occupying a generally horizontal position with its longitudinal axis disposed at substantially a right angle to the longitudinal axis of the bar with the fork in its said raised position.

5. The lift truck of claim **4**, wherein said fork retaining means further comprises an upright member disposed adjacent and rearwardly of said link, said member being constructed to guide said one end of said link for movement along a substantially upright path with adjustment of said ram to raise and lower the fork.