May 21, 1963 H. THIELE 3,090,494

LIFT TRUCK ATTACHMENTS

Filed July 22, 1960 2 Sheets-Sheet 1

FIG. 1

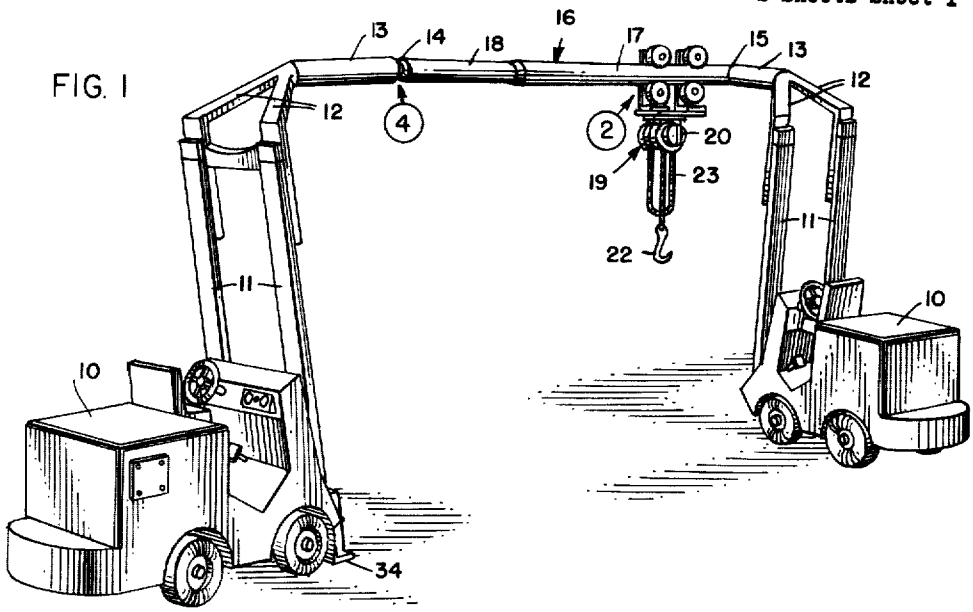


FIG. 2

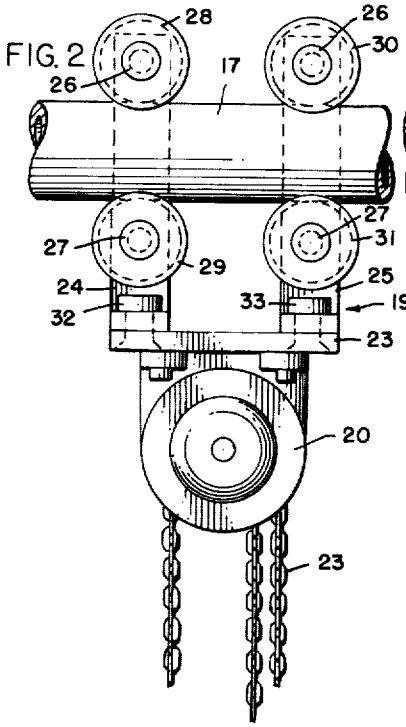


FIG. 4

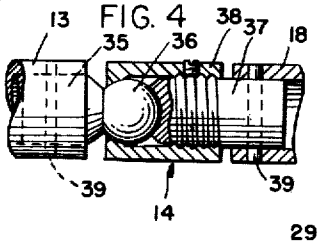
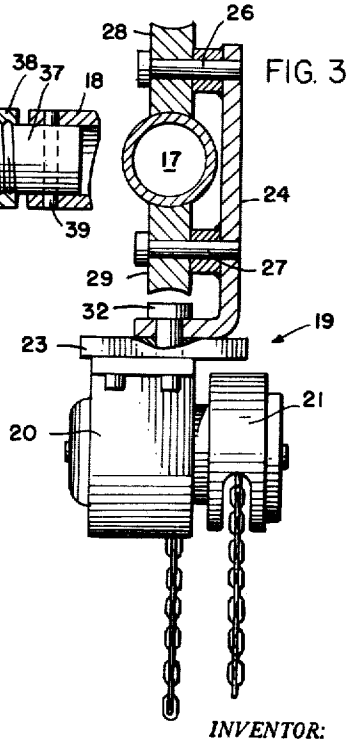


FIG. 3



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FIG. 5

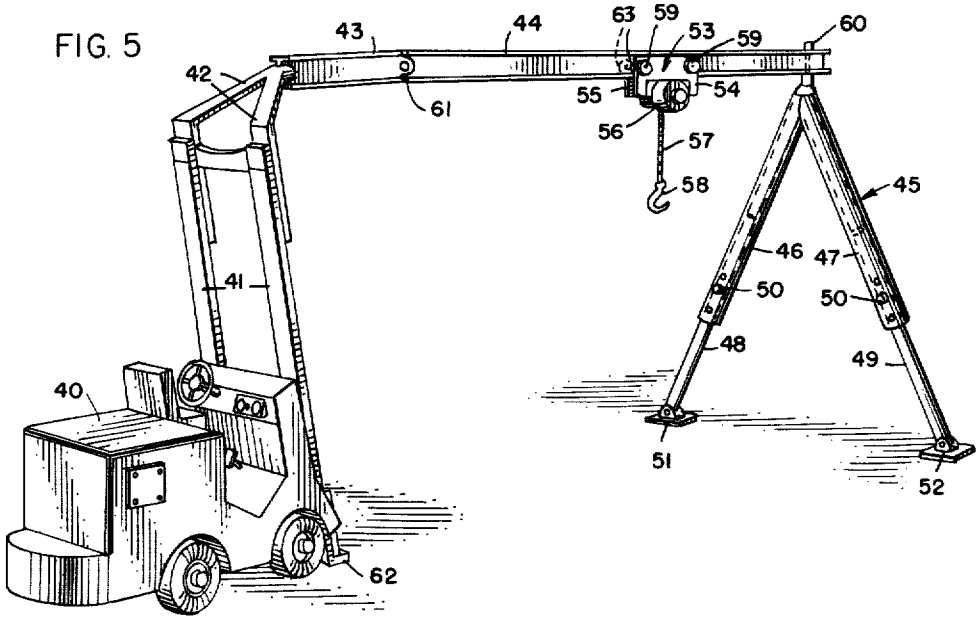
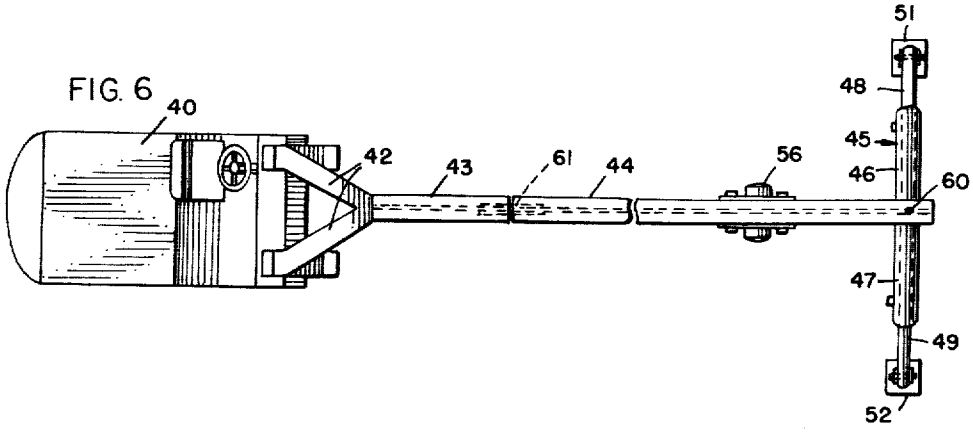


FIG. 6



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3,090,494

LIFT TRUCK ATTACHMENTS

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8 Claims. (Cl. 212—13)

This operation relates to improvements which considerably enlarge the range of use of mobile lift trucks. Mobile lift trucks, with their vertically movable lifts, are used in many industrial plants to pick up, transport, and set down loads of various kinds. Their range of operation in loading and unloading can be extended somewhat by means for shifting or swinging the load boom, by tipping the truck chassis or by means for horizontal movement of the entire lifting mechanism. The extent of the range of operation, however, is always dependent on the stability of the lift truck so that it does not tip over by unbalance due to an overextended load. The load on the truck can only be picked up or deposited within the range of movement of the lift with the further proviso that the weight of the load does not cause the truck to tip.

The basic objective of this invention is the enlargement of the range of operation in lift trucks. This objective is accomplished by utilizing a load-bearing member and associated lifting means on said beam in connection with the lift or lifts of one or two mobile lift trucks. The load-bearing member has two spaced supports, at least one of which is the lift of a lift truck. In this combination, the load weight, though situated outside the normal range for the torque arm of the load on the lift truck has, in effect, a torque arm relative to the lift truck within the range wherein the lift truck does not tip under the load.

According to the invention, the lift truck is pivotally connected to a load-bearing member supported at its opposite end on a fixed or movable support. The position and/or length of the load-bearing member can be changed to facilitate loading or unloading.

The pivotal connection of the lift and the load bearing member is at a position within the range wherein the load applied on the pivotal connection through the load-bearing member does not tip the truck.

This position is normally at or less than the maximum torque arm for the anticipated maximum capacity load for the lift truck operated without the auxiliary load bearing beam or member, above-described. For example, in a lift truck whose lift has a boom with a hook at the outer end, the load-bearing member is pivotally connected to the boom of the lift. The lift truck can thereby elevate the pivotally connected end of the loading bearing member to the desired height.

An especially favored combination is the load-bearing member supported at spaced points by two lift trucks. In this case, the second lift truck also is a readily-movable support for the intermediate load-bearing member. It is borne on a member of the lifts, e.g., the booms of two lift trucks. In this arrangement, the load-bearing member is connected to each lift by a ball-and-socket joint. The mobility of the combination makes this combination versatile in many loading and unloading situations.

The desired or required length of the load-bearing member will vary under different loading or unloading situations. Interchangeable load-bearing members of different lengths can be used. A preferred arrangement, however, consists of a load-bearing member which is adjustable in length; e.g., a telescopic load-bearing member whose length is automatically adjustable in correspondence to the relative positions of the two lift trucks upon which it is supported. In this embodiment of the invention, the entire unit of the two lift trucks supporting the load-bearing member can be moved about before, during or after the performance of the assigned tasks.

In a special development of the invention, the intermediate load-bearing member has a load lifting mechanism which is movable back and forth on said member. It frequently happens that it is impossible to drive a lift truck near enough up to the load to be moved, in order to grip said load with its boom and lift it. Where overhead cranes or trolleys cannot be used, e.g., because pipe lines are present, complicated lifting units may have to be set up and later again removed. For such situations, the present invention provides both cost-savings and time-savings.

In one type of construction, the load-bearing member can be a girder or pipe which is supported by the lift truck at one end and its other end on a non-mobile support at the requisite height. This support may be a V-shaped support to which the load-bearing member is attached, either rigidly or by a pivotable joint. In the lifting of a remotely situated load, its effective force is disposed of within the permissible torque arm range of the lift truck. The raised load on the load-bearing member is slid toward the lift truck and is taken over directly by the lift truck. If the load-bearing member is arranged between the booms of two lift trucks, the lifting and conveyance of such unfavorably situated loads situated outside the range of each individual truck is accomplished in a still simpler fashion. After lifting and sliding the load onto one boom, the load is carried by this truck, while the other truck directly takes over the transport of the load-bearing member as soon as it is detached from the first truck. It is possible, in order to get around obstacles, such as pipes or bulky machinery parts, that movements of the stacker combination will be necessary before the load is taken over by one stacker. These movements are made possible with telescopic load-bearing member.

When the circumstances make it necessary, the booms of the lift trucks and loading bearing member can be locked with respect to each other so that the combination forms a substantially rigid frame. Further, for increasing of the stability of the lift trucks and also for increasing the power which can be applied to release clamped or stuck loads, hydraulically-operated supports can be provided on the lift trucks to broaden their effective bases.

The present invention is described further with the aid of the drawings of particular embodiments of the invention.

FIG. 1 is a perspective view of load-lifting equipment on a load-bearing member connected to two lift trucks;

FIG. 2 is a side view of the load-lifting mechanism mounted on the load-bearing member designated by the circled numeral 2 in FIG. 1;

FIG. 3 is an end view, partly in cross-section, of the mechanism of FIG. 2;

FIG. 4 is a side elevation, partly in cross-section, of the universal joint designated by the circled numeral 4 in the embodiment of FIG. 1; and

FIGS. 5 and 6 are a perspective view and a top plan view, respectively, of another embodiment of the invention.

The embodiment illustrated in FIGS 1–4 utilizes two lift trucks **10**, each having a pair of parallel lift arms **11**. Booms on the lift trucks are composed of a pair of bifurcated arms **12** which are mounted on the arms **11**. These lift booms are raised and lowered on the arms **11** by conventional hydraulic or mechanical mechanism, which is

not illustrated in detail. At the juncture of the bifurcated arms **12** there is a tubular, forwardly-extending segment of the boom on each mobile lift truck. The lift need not, necessarily, be a boom, but may be any structure suitably adapted for attachment to the load-bearing member.

The tubular segments **13** are connected by ball-and-socket joints **14** and **15** to a tubular load-bearing member **16** which consists of telescoped tubular sections **17** and **18**. The telescopic tubular load-bearing member is easily adjustable in length to accommodate various loading and unloading situations requiring different lengths of the load-bearing member.

A load-lifting mechanism **19** is movably supported on the load-bearing member **16**. The load-lifting mechanism may be of any conventional construction. Load-lifting mechanism **19** in the embodiment illustrated comprises a power driven chain hoist having a motor **20** and pulley arrangement **21**. A load grasping hook **22** is attached to the end of the chain **23** of the power driven hoist.

The power driven hoist has its base mounted rigidly on a plate **23**. On the opposite side of the plate is attached a pair of right angle support arms **24** and **25**. Journal pins **26** and **27** are mounted in the sides of the support arms, upon which journal pins wheels **28**, **29**, **30** and **31** are mounted. These wheels ride upon the upper and lower surfaces of the tubular load-bearing member **16** so that the load-lifting mechanism **19** can be moved as desired.

The arms **24** and **25** are preferably secured to the plate **23** by journal pins **32** and **33** so that the arms **24** and **25** are pivotable relative to each other on the plate **23**. In this arrangement, the load-lifting unit may be run between the tubular load-bearing member **16** and one of the tubular segments **13** of the booms of the lift trucks **10** when they are angularly disposed with relation to each other. This type of mounting gives the combination greater versatility in handling various loading situations by permitting the angular disposition of the booms of the trucks with relation to the load-bearing member **16**. If desired, hydraulically-operated, retractable stabilizers **34** may be mounted on the fronts of the lift trucks so that the trucks have added stability when the stabilizers are lowered in contact with the floor during loading and unloading.

Ball-and-socket joints **14** and **15** are the most advantageous type of joints providing greatest versatility in various positions of the lift trucks **10** with relation to the load-bearing member **16**. A connection permitting pivoting of the member **16** with relation to the booms **13** in the vertical plane is essential so that the booms of the lift trucks **10** can be raised and lowered in accordance with the loading or unloading requirements in positioning the hook **22**. A connection allowing for pivotal movement of the booms **13** with relation to the tubular load-bearing member **16** is desirable because it permits the lift trucks to take various positions relative to the load-bearing member **16**. A ball-and-socket joint satisfies both requirements.

The ball-and-socket joint may be of any conventional construction. The ball-and-socket joint **14** is illustrated in greater detail in FIG. 4. The ball-and-socket joint **15** may be of like construction. The tubular segment **13** of the boom of the lift truck has tightly secured in its hollow end a cylindrical base **35**, on the protruding end of which is a ball **36**. The section **18** of the load-bearing member **16** has a cylindrical member **37** tightly secured in its open end. The protruding end of the member **37** has external threads which are threaded into the socket **38** of the ball-and-socket joint. The end of the member **37** is tightly seated against the ball **36** and forms with the socket **38** and ball **36** the ball-and-socket joint. The purpose of the threaded connection is to permit the quick disassembly of the tubular load-bearing member **16** on the booms of lift trucks **10**. A set screw may be used to lock

the threaded connection. Furthermore, pins **39** may be used to secure the members **35** and **37** on the ends of the tubular members **13** and **18**, respectively.

The embodiment illutrated in FIGS. 5 and 6 is one utilizing only one lift truck **40** which supports one end of the load-bearing member. The other end of the member is supported on a structural member. The lift truck **40** is similar in construction to the lift truck **10**. It has lift arms **41** and a pair of bifurcated arms **42** forming a part of the elevatable boom. In this embodiment, however, the end segment of the boom is an I beam girder **43** of like construction with the I beam girder **44** which onstitutes a load-bearing member. One end of the I beam **44** is mounted on a support **45** which is adjustable in height. The support **45** is an inverted V having tubular legs **46** and **47** in which are slidably mounted tubular extensions **48** and **49**, respectively. The extensions **48** and **49** provide for the height adjustment of the support **45** and are held in the desired position by bolts **50** extending through holes in the legs **46** or **47** and extensions **48** or **49**. Support feet **51** and **52** are hingedly connected to the end connections **48** and **49**, respectively.

The load-lifting mechanism **53** consists of a pair of plates **54** and **55** mounted on opposite sides of the I beam **44**. These plates support the power driven hoist mechanism **56** which raises and lowers chain **57** and its hook **58**. The load-lifting mechanism **53** is supported on four wheels **63** which ride upon the upper surface of the lower section of the I beam. Each wheel is supported upon a stub axle **59** extending through the plates **54** and **55**.

The I beam segment **43** of the boom of the lift truck **40** and the I beam load-bearing member **44** are connected by a hinge joint **61** which is pivotable in a vertical plane. This hinge connection **61** allows the boom to be raised and lowered while it is connected with the load-bearing member **44**. With this type of hinge, the I beam segment **43** is always in substantial alignment with the I beam load-bearing member **44**. If it is desired to permit the boom **43** to be angularly positioned with relation to the load-bearing I beam **44** in the horizontal plane, this can be done by providing a second hinge at right angles to the hinge **61**—giving a universal joint.

The I beam **44** can be rigidly attached to the support **45** or it can be attached by a removable pin connection **60**. Further, the pin connection at **60** may be rigid or may permit swinging of the I beam **44** relative to the support **45** in the horizontal plane, as desired. A retractable stabilizer **62** similar in construction to the stabilizer **34**, may be utilized on the lift truck **40** to provide additional stability in loading and unloading. The support **45** may be replaced by a lift truck in the embodiment of FIGS. 5 and 6 in a manner similar to the embodiment of FIGS. 1–4 in which case the lift truck may be connected to the load-bearing member by a ball-and-socket joint or by hinge pivotable only in the vertical plane.

The foregoing embodiments of the invention are merely exemplary of the many possible types of construction which can be used to realize the generic concepts of this invention. This invention has many advantages and can be utilized in a wide variety of situations where loading and unloading situations prevent or inhibit the utilization of lift trucks, per se. In many cases, fixed installations of overhead cranes and the like can be dispensed with in favor of the combinations of this invention. When lift trucks are available in a given plant, the invention also provides a considerable saving in costs besides the facilitation of operations and versatile possibilities of utilization for the lift trucks.

The invention is hereby claimed as follows:

1. Load transferring apparatus comprising a mobile, industrial lift truck with a lift on the front of said truck, means for raising and lowering said lift, a load-bearing member, a hinge pivotable in the vertical direction connecting said load-bearing member to said lift, means on

said load-bearing member spaced from said hinge for additionally supporting said load-bearing member, and means on said load-bearing member for holding a load.

2. The combination of claim 1 wherein said hinge is a ball-and-socket joint.

3. The combination of claim 1 wherein the last-mentioned means is mounted to travel along said load-bearing member.

4. Load transferring apparatus comprising two mobile, industrial lift trucks with a lift on the front of each truck, means on each truck for raising and lowering its respective lift, a load-bearing member extending between the lifts of said trucks, a ball-and-socket joint at each end of said load-bearing member connecting said member to said lifts on said two mobile, industrial lift trucks, and means on said load-bearing member for holding a load.

5. The combination of claim 4 wherein the last-mentioned means is mounted to travel along said load-bearing member.

6. Load transferring apparatus comprising two mobile, industrial lift trucks with a lift on the front of each truck, means on each truck for raising and lowering its respective lift, a load-bearing member extending between the lifts of said trucks, said load-bearing member comprising telescoping sections whereby said load-bearing member can be lengthened or shortened, a ball-and-socket joint at

each end of said load-bearing member connecting said member to said lifts on said two mobile, industrial lift trucks, and means on said load-bearing member for holding a load.

7. Load transferring apparatus comprising two mobile, industrial lift trucks with a lift on the front of each truck, means on each truck for raising and lowering its respective lift, a load-bearing member extending between said lifts, a ball-and-socket joint at each end of said load-bearing member connecting said member to a boom on each of said lifts, means for holding a load, and wheel means supporting said last-mentioned means on said load-bearing member whereby said last-mentioned means can be moved along said load-bearing member as well as onto or off of either of said booms.

8. A load transferring apparatus as claimed in claim 7 wherein said means for holding a load is a chain hoist.

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