June 14, 1960 W. B. HOLM 2,940,625

MATERIAL LIFT TRUCK

Filed March 29, 1956 3 Sheets-Sheet 1

Fig. 1

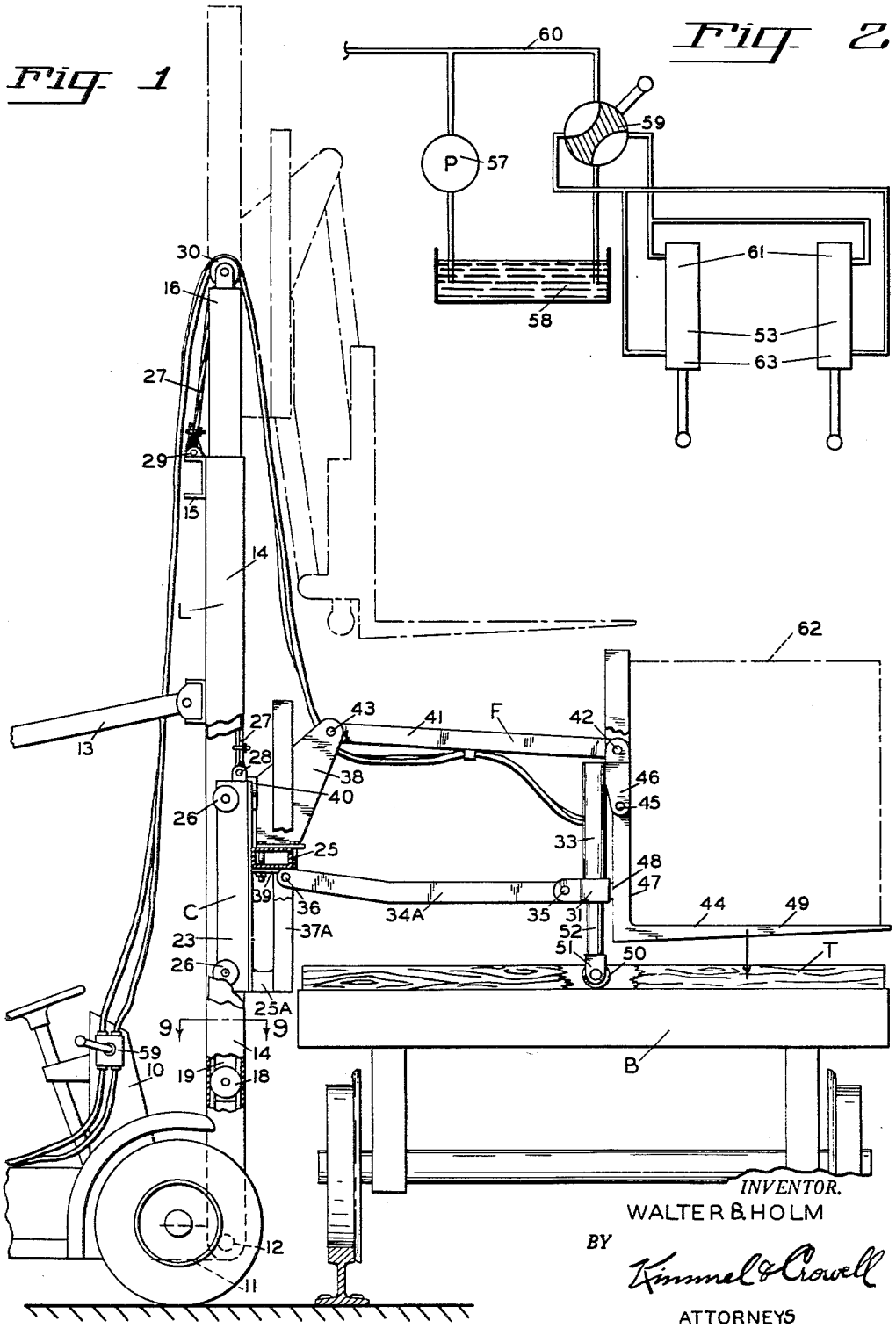

Fig. 2

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Fig. 3

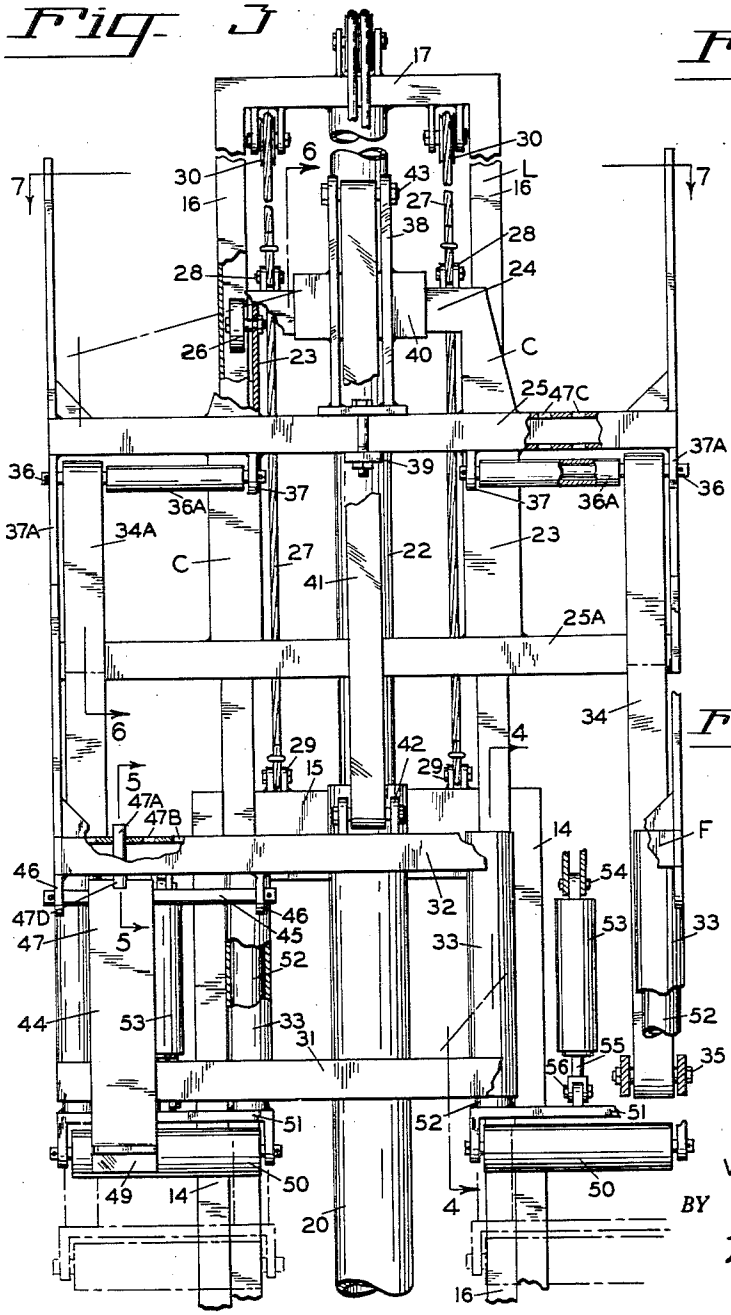


Fig. 4

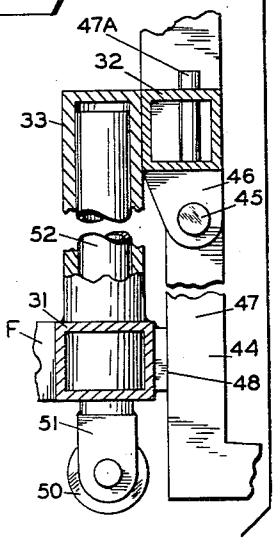
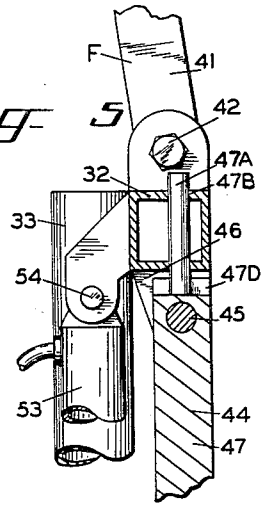


Fig. 5



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Filed March 29, 1956 3 Sheets-Sheet 3

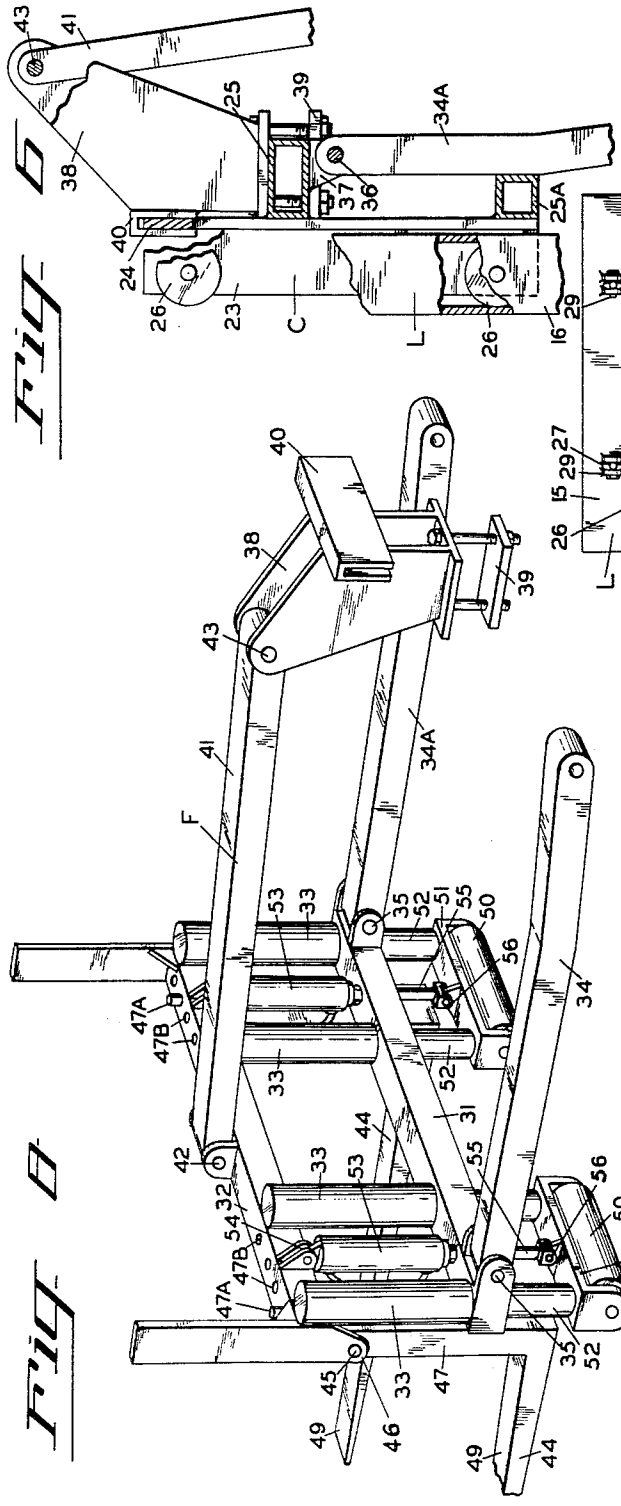

Fig. 8

Fig. 6

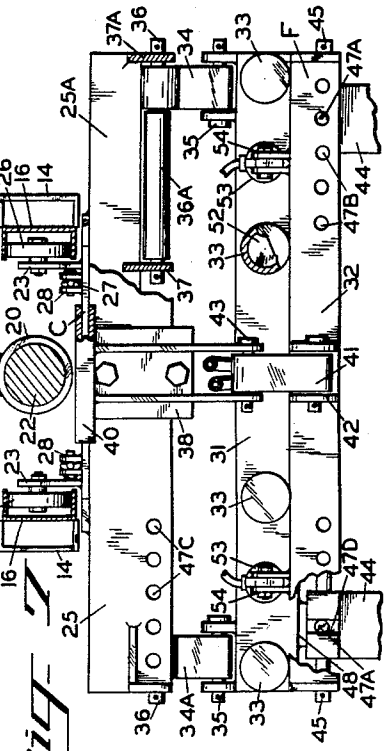

Fig. 7

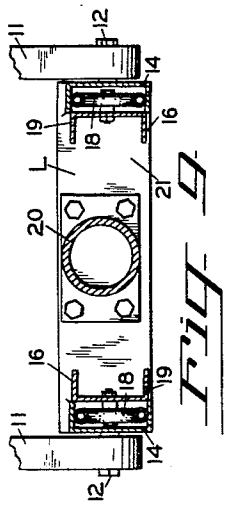

Fig. 9

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2,940,625

MATERIAL LIFT TRUCK

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16 Claims. (Cl. 214—660)

The present invention relates to material lift trucks, and particularly to trucks which are adapted for the handling of lumber and similar material.

The primary object of the invention is to provide an attachment for lift trucks which will permit the forks of the truck to move longitudinally of the truck while supporting a load thereon.

Another object of the invention is to provide a lift truck attachment of the class described above which will permit lateral movement of a stack of lumber with relation to a freight car without overbalancing the lift truck.

A still further object of the invention is to provide an attachment for the lifting forks of a lift truck which will permit the lifting forks to be tilted, along with the load thereon.

A further object of the invention is to provide longitudinally movable forks on a lift truck in which the action of the forks can be controlled completely from the driver's seat.

A still further object of the invention is to provide a lift truck attachment of the class described above which will be inexpensive to manufacture, simple to use, and durable in service.

Other objects and advantages will become apparent in the following specification when considered in the light of the attached drawings, in which:

Figure 1 is a fragmentary side elevation of the invention with a dotted line showing of the forks in elevated retracted position.

Figure 2 is a diagrammatic view of the circuits involved in the hydraulic system of the invention.

Figure 3 is a fragmentary front elevation of the invention shown partially in section for purposes of clarity.

Figure 4 is an enlarged fragmentary vertical cross-section taken along the line 4—4 of Figure 3, looking in the direction indicated.

Figure 5 is an enlarged fragmentary vertical section taken along the line 5—5 of Figure 3, looking in the direction indicated.

Figure 6 is an enlarged fragmentary vertical cross-section taken along the line 6—6 of Figure 3, looking in the direction indicated.

Figure 7 is a horizontal transverse cross-section taken along the line 7—7 of Figure 3, looking in the direction indicated.

Figure 8 is a fragmentary rear perspective view of the attachment removed from the lift truck.

Figure 9 is a transverse cross-section taken along the line 9—9 of Figure 1, looking in the direction indicated.

Referring now to the drawings in detail wherein like reference numerals indicate like parts throughout the several figures, the reference numeral 10 indicates a conventional lift truck of the type including a frame 11, and suitable power means (not shown). A conventional vertical lift assembly indicated at L is pivotally supported to the frame 11 of the truck 10 as indicated at 12 in Figure 1. A movable brace 13 supports the lift assembly L from a point adjacent the rear of the lift truck 10.

The lift assembly L of the lift truck 10 can be tilted at an angle to the vertical by any suitable means not here shown connected to the brace 13. The construction described above is conventional and forms no part of the present invention.

The lift assembly L includes a pair of vertical channels 14 mounted in spaced apart parallel relation and pivoted at their lower ends to the frame 11 at the point 12. The channels 14 are connected adjacent their upper ends by means of a cross-channel member 15. A pair of secondary channels 16 are mounted in facing parallel relation between the channels 14 and are adapted to vertically reciprocate with relation to the channels 14.

Trunnion wheels 18 are journalled to the lower ends 19 of the channels 16, as best seen in Figures 1 and 8, and are adapted to operate within the vertical channels 14. A hydraulic cylinder 20 is mounted upon the cross-brace 21 formed on the lower ends of the vertical channels 14 and has the upper portion thereof fixedly secured to the cross-frame 15 extending between the upper ends of the vertical frames 14. A piston rod 22 is slidably mounted within the hydraulic cylinder 20 and has its upper free end portion fixedly secured to a cross-frame member 17 secured to the upper ends of the vertical frame 16 by welding or any other suitable means, as best illustrated in Figure 3. The piston rod 22 supports the secondary frame 16 and is adapted to raise and lower the frame 16 with relation to the vertical channels 14 and the lift truck 10.

A fork supporting carriage C is mounted for vertical reciprocation in the channel frames 16 and consists of a pair of vertical frame members 23 joined at their top edges by a cross-member 24. Laterally extending frame members 25 and 25A are secured to the frame members 23 in any suitable manner, such as welding or the like. Trunnion wheels 26 are journalled to the vertical frame members 23 of the carriage C and engage within the channel 16, as illustrated in Figure 7.

A pair of cables 27 have one of their ends fixedly secured to the carriage C at the point 28 with their opposite ends fixedly secured to the cross-frames 15 at 29. The cables 27 are trained about the sheaves 30 mounted to the cross-member 17 at the upper end of the vertical frame 16. In the operation of the carriage C, when the piston rod 22 is in lowered position the carriage C will be at its lowermost elevation as will be the vertical channel member 16. When hydraulic fluid is applied to the cylinder 20 the piston 22 will rise raising the vertical frame 16 and the sheaves 30 causing the cable 27 to raise the carriage to the top of the vertical frame 16 at the upper limit of their travel. The above described elevating mechanism L and carriage C is of conventional design.

The present invention consists of an attachment to provide longitudinally movable forks for the carriage C. The mechanism for supporting the forks is indicated by the letter F. Referring particularly to Figures 3, 4, 5, 7 and 8, it can be seen that the fork supporting mechanism consists of a basic frame member 31 having a secondary transverse frame 32 mounted parallel thereto and spaced therefrom by the pair of cylindrical vertical frame members 33, the base member 31 is connected to the carriage C by means of the links 34 and 34A. The links 34 and 34A are pivotally connected to the base members 31 and and 35 and have their opposite ends connected to the shafts 36 which are secured to the transverse frame members 25 of the carriage C by the ears 37 and side frames 37A of the carriage.

Tubular members 36A are positioned on the shafts 36 to space the arms 34 and 34A relative to the carriage C. A bracket 38 is clamped to the transverse frame member 25 of the carriage C by the clamping plate 39 and extends

upwardly and forwardly therefrom. The bracket 38 is further supported on and secured to the cross-member 24 of the carriage C by means of an inverted U-shaped jaw 40 which is adapted to engage downwardly over the cross-member 24, as illustrated in Figure 6.

A link 41 is pivotally connected to the secondary frame member 32 of the fork lift F at one end thereof by means of a pivot 42, while its opposite end is connected by pivot 43 to the bracket 38. Referring particularly to Figures 1, 4, 7 and 8, it will be seen that a standard pair of lift forks 44 are connected to ears 46 formed on the secondary transverse cross-frame 32 of the fork lifting unit F by means of pivot pins 45. The heels 47 of the lift forks 44 are adapted to contact the face 48 of the transverse basic frame member 31 maintaining toes 49 of the forks 44 in a horizontal position.

The lateral spacing of the forks 44 can be varied along the supporting shafts 45 in the following manner. Tapered pins 47A pass through the openings 47B in the transverse member 32 and register with the cross slots 47D formed on the upper ends of the lift forks 44. The heel 47 of the fork 44 comes against the transverse member 25A of the carriage C in the construction of the supporting unit F. The fork holding unit F is supported on the rollers 50 when the unit is in partially extended or extended position, as illustrated in Figure 1. The rollers 50 are journalled to the forks 51. The forks 51 have plungers 52 forming parts thereof which are adapted to operate within the cylindrical frames or cylinders 33 providing guides for supporting the forks 51 relative to the unit F. Hydraulic cylinders 53 are pivotally connected to the cross-frame 32 by means of pivots 54 while their piston rods 55 are connected at 56 to the forks 51. The hydraulic cylinders 53 are adapted to raise and lower the forks 51 together with the rollers 50 on the lower end thereof.

Referring now particularly to Figure 2, the hydraulic pump 57 of the lift truck 10 is diagrammatically illustrated along with its oil supply reservoir 58. The pump 57 and reservoir 58 are of standard construction and form a part of the basic lift truck to which the present invention is to be attached. A two-way valve 59 is connected to the pump 57 by means of a pipe line 60 so that in one position of the valve 59 fluid from the pump 57 will be delivered to the upper ends 61 of the cylinders 53 and in the other position of the valve 59 fluid will be delivered to the lower ends 63 of the cylinders 53. Thus, the control valve 59 will regulate the position of the rollers 50 with relation to the supporting surface over which the forks 44 are being moved.

In the use and operation of the invention, when it is desired to pick up a load of material, such as lumber, the fork supporting mechanism F will be in the broken line position shown in Figure 1 and will be lowered to the ground surface so that the forks 44 may enter under a stack of lumber by forward movement of the lift truck 10. The carriage C is then raised in the ordinary manner raising the lumber on the forks 44 to a height above that on which the lumber is to be piled. The lift truck 10 is then moved until the forks 44 overlie the bed B of a flat car whereupon the carriage C is lowered until the rollers 50 come in contact with the upper surface of the bed B of the flat car. The valve 59 is then operated to cause fluid from the pump 57 to flow to the upper ends 61 of the cylinders 53 thus transferring the weight of the load 62 from the carriage C to the rollers 50.

The carriage C is then further lowered with relation to the truck 10 so that the forks 44 through the operation of the links 41, 34 and 34A are caused to move away from the carriage C across the bed B of the flat car. When the load 62 reaches the opposite side of the flat car, or the final position desired, the valve 59 is reversed permitting the forks 44 to lower the load 62 onto support timbers T, thus releasing the load 62 from the forks 44 and permitting the forks 44 to be withdrawn from under the load 62 by backing the lift truck 10 away from the flat car. If there is insufficient space for backing of the lift truck 10 away from the flat car to disengage the forks 44 the carriage C can be raised which will act to pull the forks 44 from under the load 62 and into the position illustrated in dotted lines in Figure 1. In removing the load 62 from the bed B of the flat car, the opposite action takes place, with the load 62 being lifted onto the forks 44 by means of the cylinders 53 and rollers 50, and then picked up by the lift truck by raising the carriage C in the usual manner.

Having thus described the preferred embodiment of the invention, it should be understood that numerous structural modifications and adaptations may be resorted to without departing from the scope of the appended claims.

What is claimed is:

1. A lift truck attachment for lift trucks of the type having a vertically extending frame and a carriage mounted for vertical reciprocation on said frame comprising; links pivotally attached to said carriage extending forwardly of said truck, a second frame carried by the forward ends of said links, a pair of hydraulic piston and cylinder units secured at one set of ends to said second frame, a support roller for each unit, the supporting rollers being carried by the opposite ends of said units for engagement with a surface, means supplying hydraulic actuating fluid to said units to raise said second frame with respect to said rollers, and a pair of spaced lift forks carried by and extending forwardly of said second frame.

2. A device as claimed in claim 1 wherein means are provided on said lift truck for vertically moving said carriage and said forks secured thereto by said links independently of the hydraulic piston and cylinder units secured to said second frame.

3. A device as claimed in claim 1 wherein means are provided on said second frame for supporting said forks for lateral adjustment thereon.

4. A lift truck attachment for lift trucks of the type having a vertically extending frame and a vertically reciprocating carriage mounted in said frame comprising; a pair of forks positioned forwardly of said carriage, a second frame supporting said forks, a first link means connecting the lower portion of said second frame to said carriage, a second link means connecting the upper portion of said second frame to said carriage and extending parallel to said first link means, at least one of said link means including a plurality of links, each of said links having one end thereof pivoted to said carriage and the opposite end thereof pivoted to said second frame, ground engaging means on said second frame for raising said second frame and said forks independently of said carriage, and means on said lift truck for raising said carriage on said frame raising said forks therewith.

5. A device as claimed in claim 4 wherein the means for raising said forks independently of said carriage includes a pair of hydraulic rams, a roller for each ram, the rollers being carried by the lower ends of said rams, and remotely controlled means for supplying hydraulic actuating fluid to said rams.

6. A device as claimed in claim 4 wherein said forks are laterally adjustable on said second frame.

7. An attachment for a lift truck of the type having a vertical mast and a carriage movable along the mast, a load-engaging unit, and means positively connecting said load-engaging unit to said carriage operable to project said load-engaging unit forwardly of said carriage as a result of lowering movement of said carriage at a time when said load-engaging unit is resting on a supporting surface.

8. An attachment for a lift truck of the type having a a vertically movable carriage, a fork unit for said carriage, means for moving said fork unit longitudinally of the truck, said means including a plurality of parallel links connecting said fork unit to said carriage for movement from a lower position adjacent said carriage to a position forwardly of said carriage and at a higher level relative to said carriage, said means also including roller means

on said fork unit so that upon lowering movement of said carriage at a time when said roller means are in contact with a supporting surface, said fork unit will be urged to move forwardly to a projected position with respect to said carriage.

9. An attachment for lift trucks of the type having a vertically extending mast and a power operated vertically reciprocating carriage on said mast, comprising a load-engaging unit, means positively connecting the load-engaging unit to said carriage operable to project said load-engaging unit from a position adjacent said carriage forwardly of said carriage upon lowering movement of said carriage at a time when said load-engaging unit is resting on a supporting surface, said connecting means being capable of transmitting a lifting force from said carriage to said unit of sufficient magnitude to lift said unit and its load by virtue of an upward movement of said carriage only after retracting said unit to said position adjacent said carriage, said connecting means mounting said load-engaging unit on said carriage for vertical movement with respect to said carriage independently of the movement of said carriage, and means on said load-engaging unit adapted to engage a supporting surface for raising and lowering said load-engaging unit relative to such surface independently of the movement of said carriage to enable said load-engaging unit to pick up and deposit a load.

10 An attachment for a lift truck of the type having a vertical mast and a carriage movable vertically along the mast, comprising a secondary carriage having load-engaging means, means connected said carriages to support the secondary carriage for swinging movement from a lower position adjacent the first-named carriage to a second position spaced forwardly of said first-named carriage and disposed at a higher level relative thereto so that said secondary carriage may be projected forwardly of said first-named carriage by swinging the secondary carriage relative to said first-named carriage in an upward and forward direction.

11. An attachment for a lift truck of the type having a vertical mast and a carriage movable along the mast, comprising a secondary carriage having load-engaging means, means connecting said carriages to support the secondary carriage for swinging movement from a lower position adjacent the first-named carriage to a second position spaced forwardly of said first-named carriage and disposed at a higher level relative thereto so that said secondary carriage may be projected forwardly of said first-named carriage by swinging the secondary carriage relative to said first-named carriage in an upward and forward direction, and means for maintaining said secondary carriage in an upright position during its movement relative to said first-named carriage.

12. An attachment for a lift truck of the type having a vertical mast and a carriage movable vertically along the mast comprising a load-engaging unit, means connecting said carriage and load-engaging unit and supporting said load-engaging unit in depending relation from said carriage in a position below the carriage and providing for upward and forward swinging movement of said load-engaging unit to a position projecting forwardly of the carriage and at approximately the same level so that when the carriage is lowered, the load-engaging unit may be brought into engagement with a supporting surface and may move outwardly along such surface by virtue of this upward and forward movement relative to said carriage, and means for effecting such movement of said load-engaging unit.

13. An attachment as set forth in claim 12 in which the last-named means includes roller means on said load-engaging unit for rolling engagement with said supporting surface.

14. An attachment for a lift truck of the type having an upright mast and a carriage movable vertically along the mast comprising a load-engaging unit, means positively connecting the load-engaging unit to said carriage for projecting the load-engaging unit from a position adjacent said carriage forwardly of said carriage upon lowering movement of said carriage at a time when said load-engaging unit is resting on a supporting surface, said connecting means mounting said unit on said carriage for vertical movement with respect to said carriage independently of the movement of said carriage, roller means on said load-engaging unit for engaging a supporting surface to support said load-engaging unit independently of the means connecting said unit to said carriage, and means for vertically moving said roller means relative to said unit to adjust the height of said load-engaging unit relative to said surface to enable a load on said load-engaging unit to be deposited on a suitable support and to enable the load-engaging unit to properly engage a load.

15. An attachment as set forth in claim 14 in which the load-engaging unit includes a pair of horizontal load-engaging fork arms.

16. A load-handling means comprising a vertical guide, a carriage movable along said guide, a load-engaging unit, means connecting said unit to said carriage and supporting said load-engaging unit in depending relation from said carriage in a position below the carriage and providing for upward and forward swinging movement of said load-engaging unit to a position projecting forwardly of the carriage and at approximately the same level so that when the carriage is lowered the load-engaging unit may be brought into engagement with a supporting surface and may move outwardly along such surface by virtue of this upward and forward movement relative to said carriage, and means for effecting such movement of said load-engaging unit.

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